FED. RD. DIV. NO.	FEDERAL PROJECT NO.		SHEET NO.
6	STP 2B24(243)VRU		1
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	RANDALL	
CONT.	SECT.	JOB	HIGHWAY NO.
2635	02	038	SL335

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

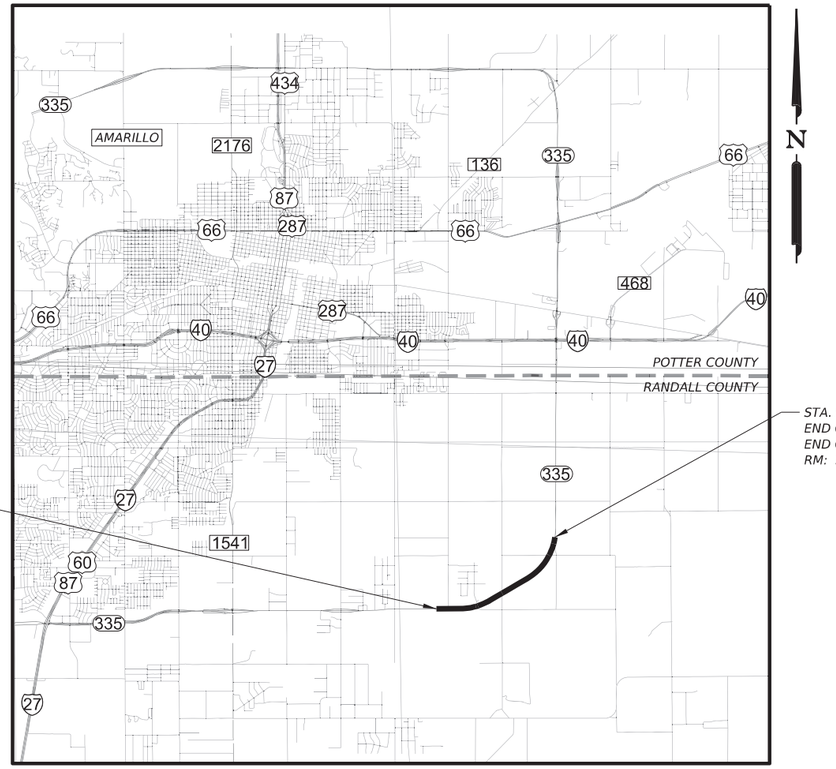
PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL PROJECT: STP 2B24(243)VRU
HIGHWAY - SL 335
RANDALL COUNTY
CONTROL: 2635-02-038

FOR THE CONSTRUCTION OF CONTINOUS LEFT TURN LANE.
CONSISTING OF OVERLAY, WIDENING, AND TWO WAY TURN LANE.

PROJECT LIMITS FROM: EASTERN ST.
TO: FARMERS AVE.
ROADWAY LENGTH = 15,234.11 FT. = 2.885 MILES
TOTAL LENGTH = 15,234.11 FT. = 2.885 MILES

DESIGN SPEED = 50 MPH
2024 ADT = 8,410
2044 ADT = 11,782
PRINCIPAL ARTERIAL - URBAN

INDEX OF SHEETS



STA. 378+13.57
BEGIN CONTROL: 2635-02-038
BEGIN CSJ: 2635-02-038
RM: 326+0.755

STA. 530+47.68
END CONTROL: 2635-02-038
END CSJ: 2635-02-038
RM: 324+0.290

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

PLANS PREPARED BY:

AECOM

AECOM Technical Services, Inc.- F-3580

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, OCTOBER 23, 2023).

2024 Texas Department of Transportation

RECOMMENDED FOR LETTING: DATE: 5/6/2024
DocuSigned by: Joe Crumpell 2A500C249D094BA...
AREA ENGINEER

DATE: 5/7/2024
DocuSigned by: Kit Black 9B5A6EA6AE8B46E...
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: DATE: 5/8/2024
DocuSigned by: Blair Johnson 8B80E3AEB2BC43A...
DISTRICT ENGINEER

INDEX OF SHEETS

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
4/24/2024
P.E.

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

STATE OF TEXAS
JOHN J. TIETZ
144928
LICENSED
PROFESSIONAL ENGINEER
4/24/2024

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

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

INDEX OF SHEETS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335

DIST	COUNTY	SHEET NO.
AMA	RANDALL	2

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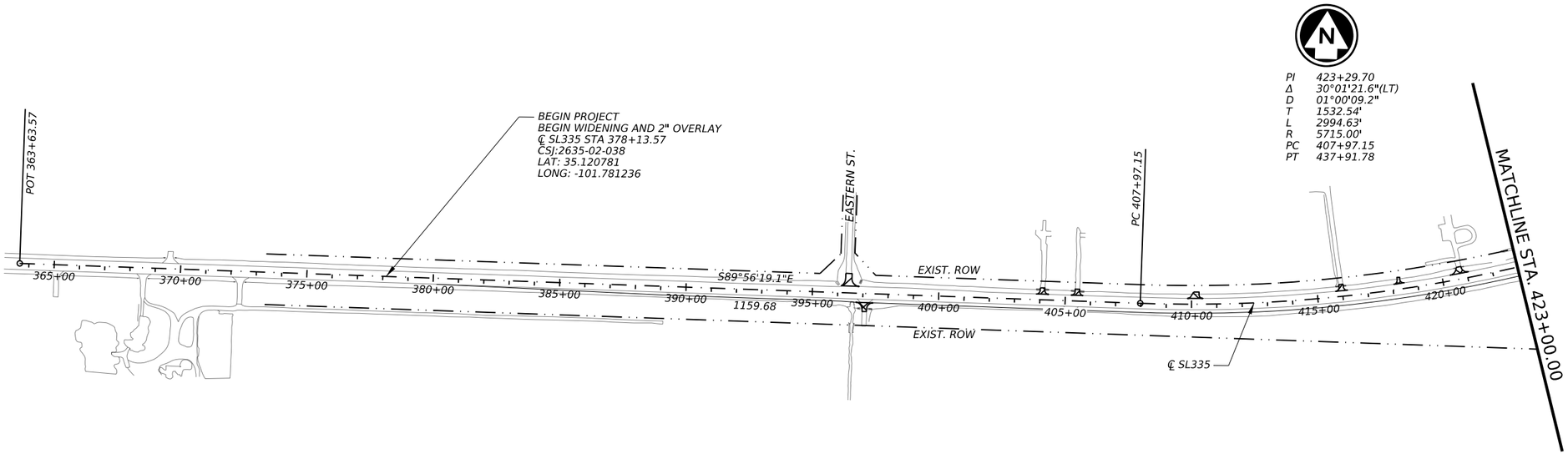

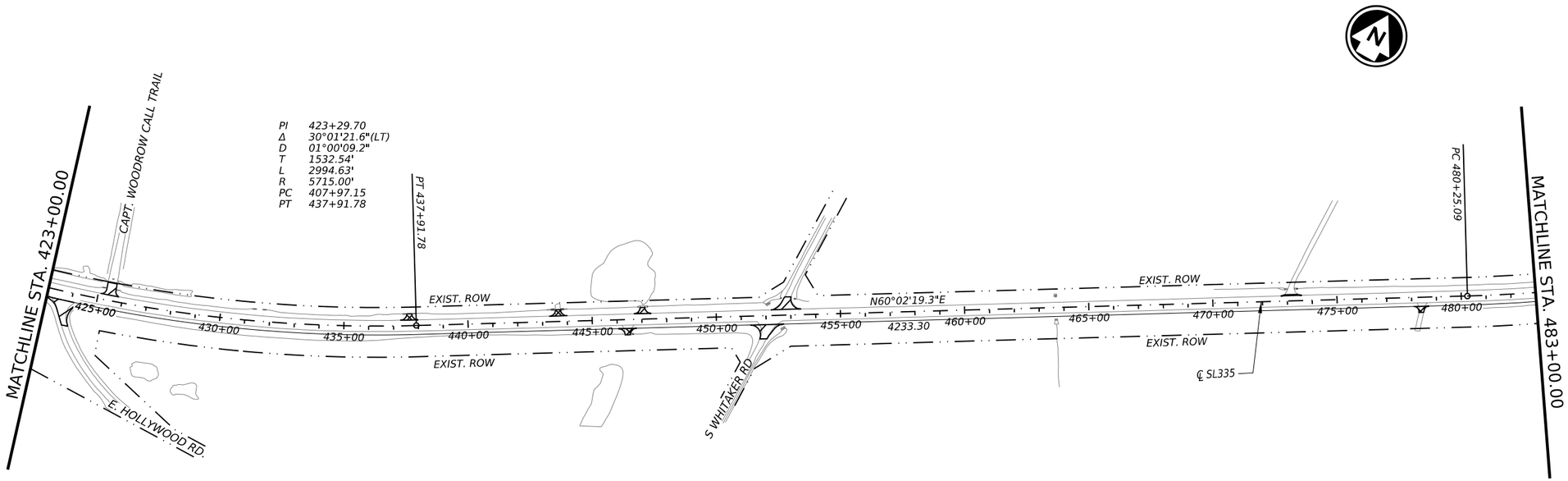

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
2/1/2024

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

PROJECT LAYOUT

BEGIN TO STA 483+00

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		3

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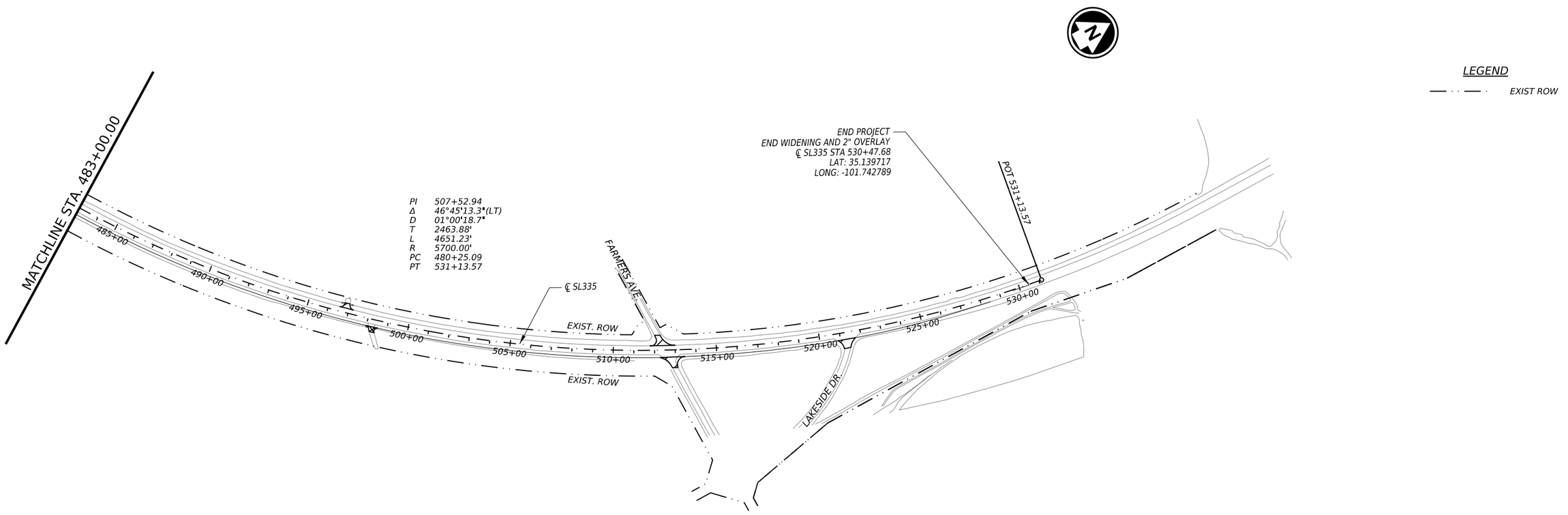
CK DW CK DW



ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
2/1/2024
Salcido Ernesto, P.E.

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

PROJECT LAYOUT

STA 483+00 TO END

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		4

DATE: 2/1/2024 5:30:45 PM
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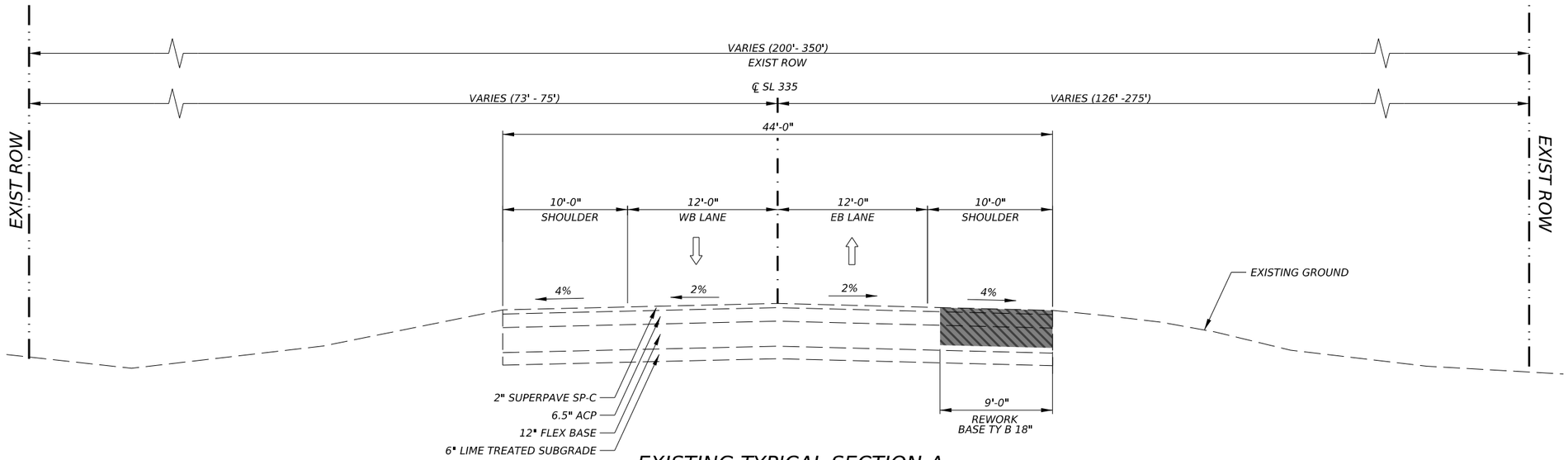
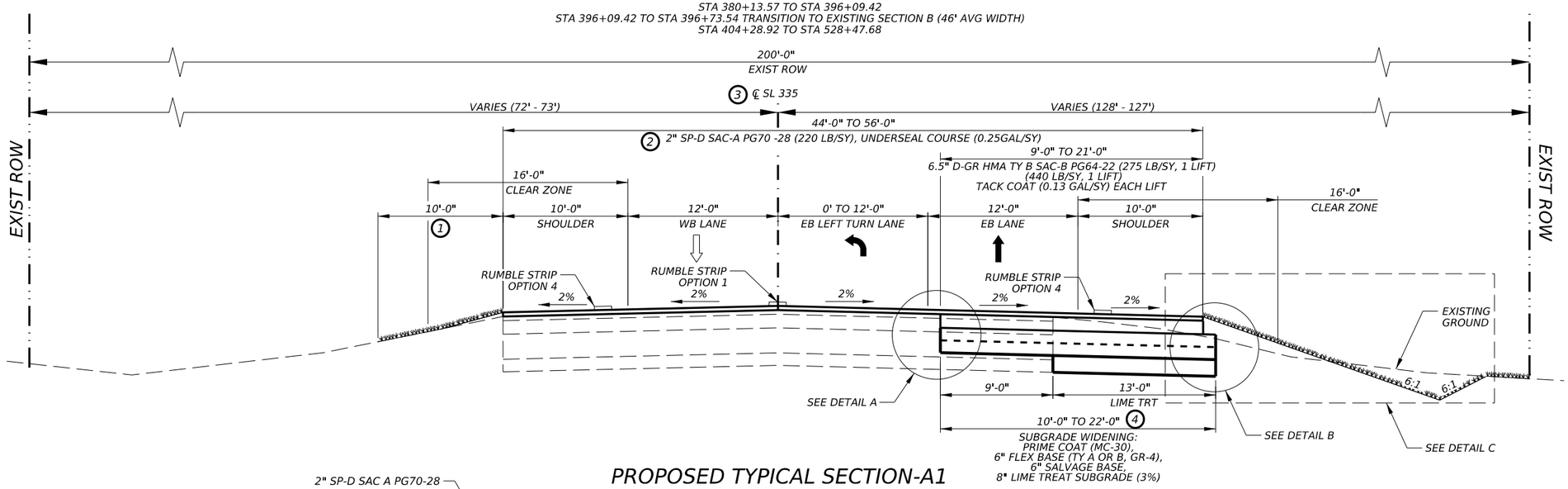


EXISTING TYPICAL SECTION-A

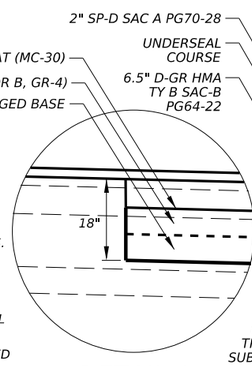
STA 380+13.57 TO STA 396+09.42
STA 396+09.42 TO STA 396+73.54 TRANSITION TO EXISTING SECTION B (46' AVG WIDTH)
STA 404+28.92 TO STA 528+47.68



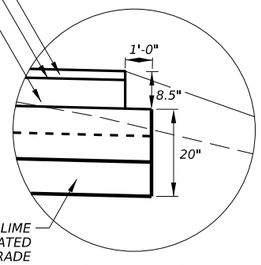
PROPOSED TYPICAL SECTION-A1

STA 380+13.57 TO STA 389+13.54 TRANSITION FROM EXISTING TO LEFT TURN LANE & 10' SHLD (50' AVG WIDTH)
STA 389+13.54 TO STA 396+13.54
STA 396+13.54 TO STA 396+73.54 TRANSITION FROM 21' WIDENING TO 23' WIDENING

1. TYPE A BACKFILL
2. NOTCHED WEDGE LONGITUDINAL JOINT WILL BE REQUIRED AT ALL LONGITUDINAL HOT MIX JOINTS. VARIANCE TO THE DIMENSIONS SHOWN WILL BE ALLOWED ONLY AS APPROVED BY THE ENGINEER.
3. CENTERLINE LOCATION IS APPROXIMATE; IT WAS RECREATED USING RIGHT-OF-WAY MAP AMA263502AB, OBTAINED FROM THE TXDOT REAL PROPERTY ASSET MAP DATABASE.
4. FOR CONSTRUCTABILITY PURPOSES, LIME TREATED SUBGRADE AT BEGINNING OF TAPER SHALL BE 5' MINIMUM. PAYMENT FOR ADDITIONAL WORK SHALL BE SUBSIDIARY TO ITEM 260.



DETAIL A
N.T.S



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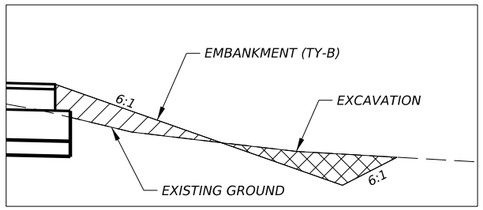

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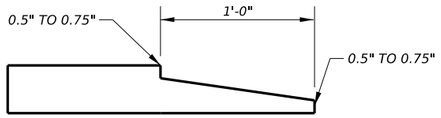

DETAIL D
NOTCHED WEDGE
LONGITUDINAL JOINT DETAIL
N.T.S

H: 0 5 10
V: 0 2.5 5
SCALE IN FEET

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
4/30/2024
Salcido Pavia, P.E.

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Dallas, Texas 75240
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AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

ROADWAY TYPICAL SECTIONS

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		5

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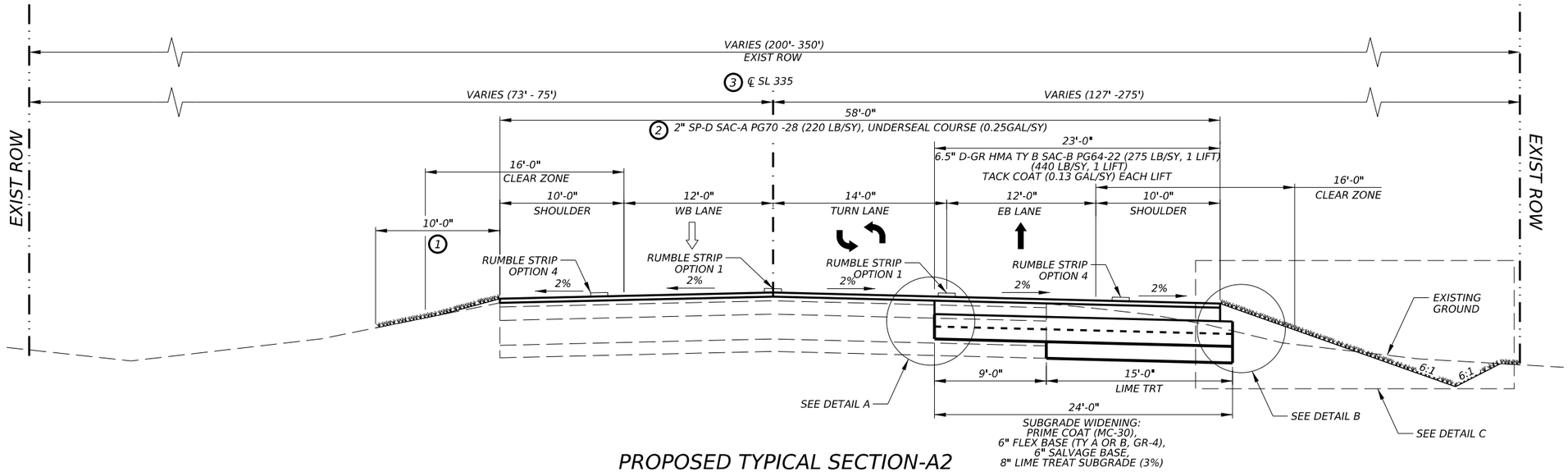
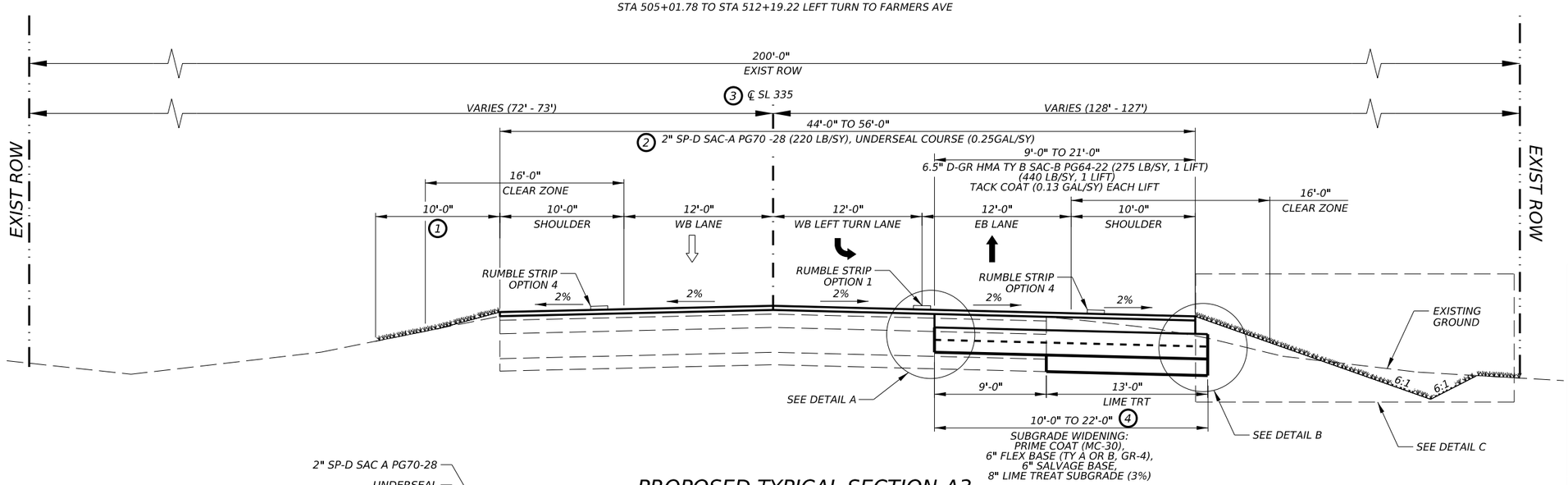
CK | DW | CK | DW



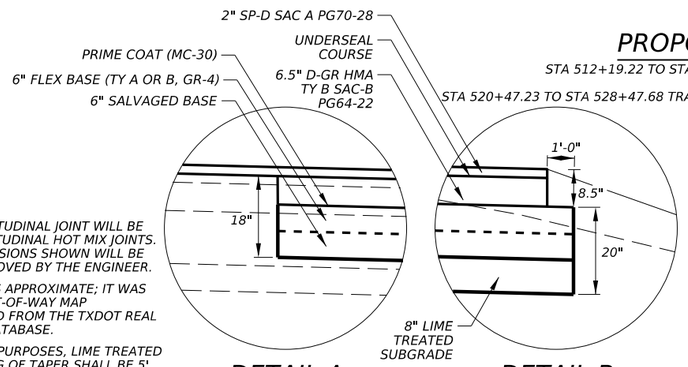
PROPOSED TYPICAL SECTION-A2

STA 404+28.92 TO STA 505+01.78
STA 505+01.78 TO STA 512+19.22 LEFT TURN TO FARMERS AVE



PROPOSED TYPICAL SECTION-A3

STA 512+19.22 TO STA 513+47.38 TRANSITION FROM 23' WIDENING TO 21' WIDENING
STA 513+47.38 TO STA 520+47.23
STA 520+47.23 TO STA 528+47.68 TRANSITION FROM LEFT TURN LANE TO EXISTING LANE & 10' SHLD (50' AVG WIDTH)

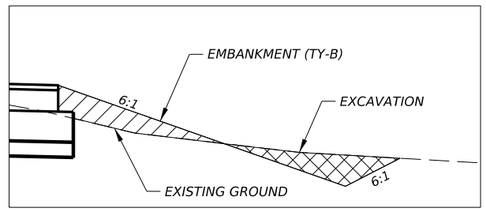


DETAIL A

N.T.S

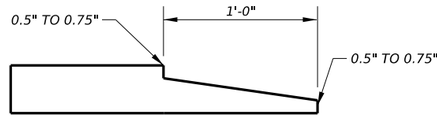
DETAIL B

N.T.S



DETAIL C

N.T.S



DETAIL D

NOTCHED WEDGE
LONGITUDINAL JOINT DETAIL
N.T.S

1. TYPE A BACKFILL
2. NOTCHED WEDGE LONGITUDINAL JOINT WILL BE REQUIRED AT ALL LONGITUDINAL HOT MIX JOINTS. VARIANCE TO THE DIMENSIONS SHOWN WILL BE ALLOWED ONLY AS APPROVED BY THE ENGINEER.
3. CENTERLINE LOCATION IS APPROXIMATE; IT WAS RECREATED USING RIGHT-OF-WAY MAP AMA2635O2AB, OBTAINED FROM THE TXDOT REAL PROPERTY ASSET MAP DATABASE.
4. FOR CONSTRUCTABILITY PURPOSES, LIME TREATED SUBGRADE AT BEGINNING OF TAPER SHALL BE 5' MINIMUM. PAYMENT FOR ADDITIONAL WORK SHALL BE SUBSIDIARY TO ITEM 260.

H: 0 5 10
V: 0 2.5 5
SCALE IN FEET

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
4/30/2024

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

ROADWAY TYPICAL SECTIONS

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		6

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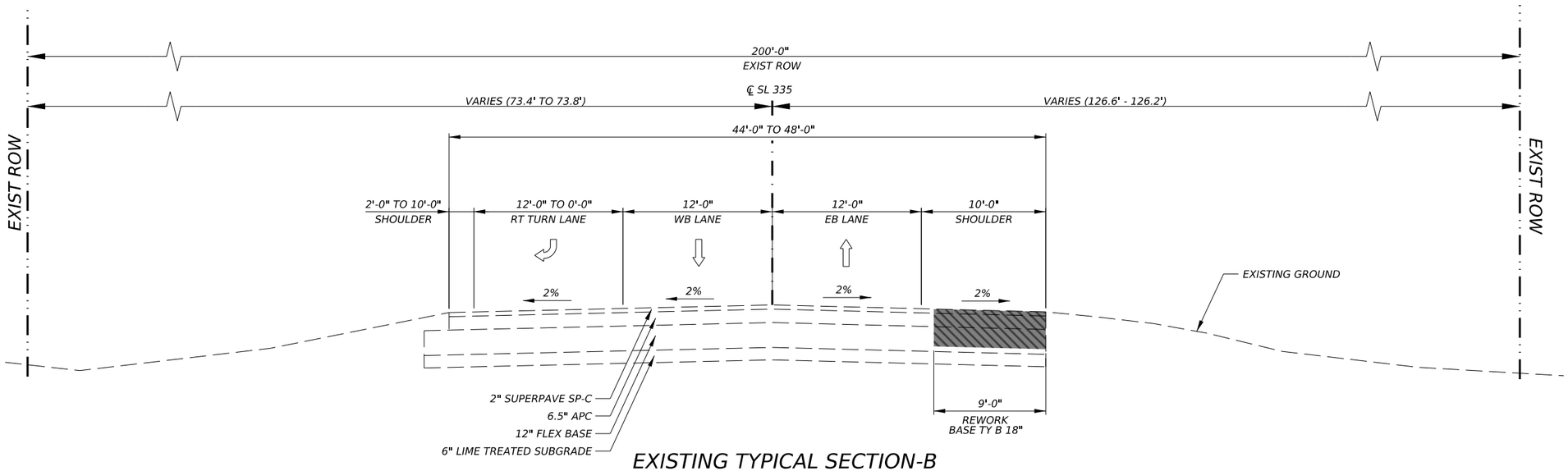
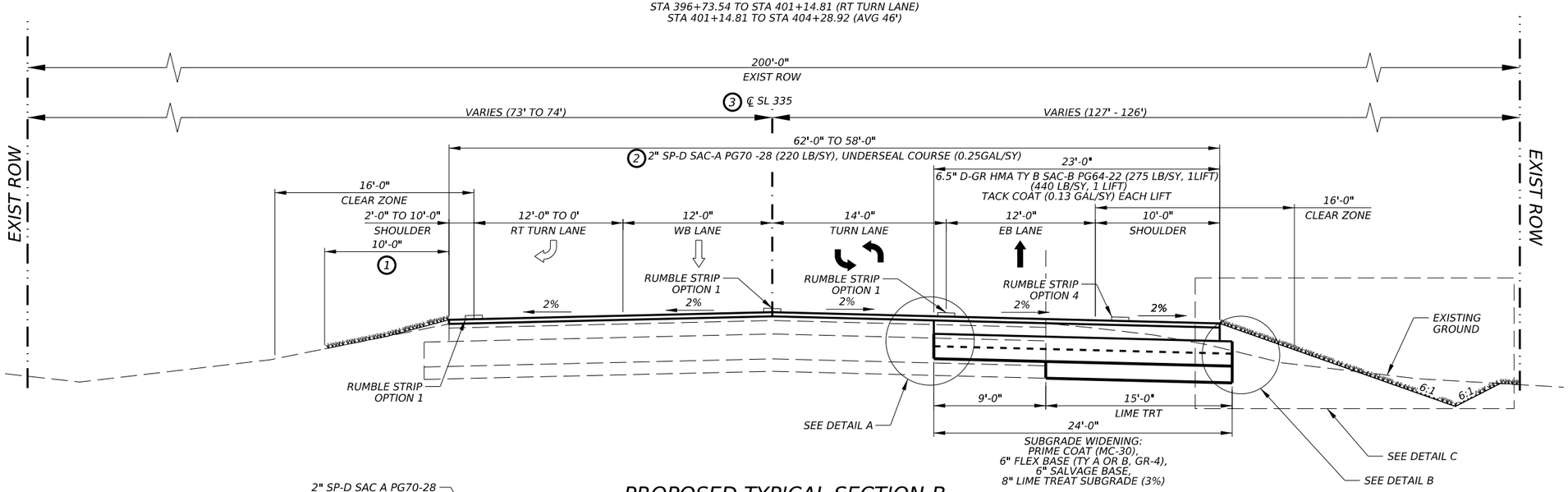
CK | DW | CK | DW



EXISTING TYPICAL SECTION-B

STA 396+73.54 TO STA 401+14.81 (RT TURN LANE)
STA 401+14.81 TO STA 404+28.92 (AVG 46')



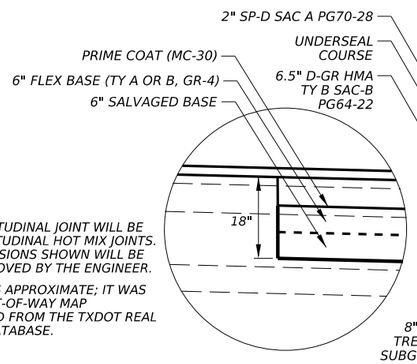
PROPOSED TYPICAL SECTION-B

STA 396+73.54 TO STA 401+14.81
STA 401+14.81 TO STA 404+28.92 TRANSITION TO PROPOSED SECTION A2 (60' AVG WIDTH)

1 TYPE A BACKFILL

2 NOTCHED WEDGE LONGITUDINAL JOINT WILL BE REQUIRED AT ALL LONGITUDINAL HOT MIX JOINTS. VARIANCE TO THE DIMENSIONS SHOWN WILL BE ALLOWED ONLY AS APPROVED BY THE ENGINEER.

3 CENTERLINE LOCATION IS APPROXIMATE; IT WAS RECREATED USING RIGHT-OF-WAY MAP AMA263502AB, OBTAINED FROM THE TXDOT REAL PROPERTY ASSET MAP DATABASE.



DETAIL A

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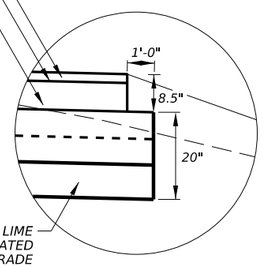

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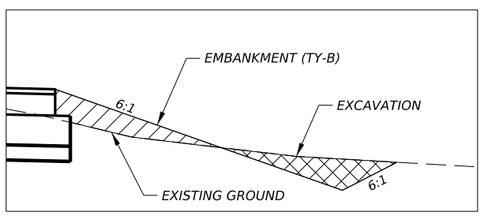
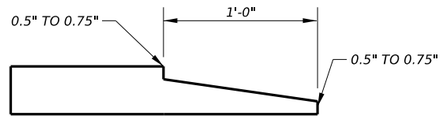


DETAIL C

N.T.S



DETAIL D

NOTCHED WEDGE
LONGITUDINAL JOINT DETAIL
N.T.S

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
4/30/2024

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

ROADWAY TYPICAL SECTIONS

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		7

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DW CK DW CK

GENERAL NOTES

CSJ: 2635-02-038

BASIS OF ESTIMATE FOR CONSTRUCTION

Item	Description	Unit	Rate	
164	SEEDING		SEE PLAN SHEETS	
166	FERTILIZER		SEE PLAN SHEETS	
260	LIME (HYD, COM, OR QK (SLURRY))	TON	3% Lime at 23.4 LBS/SY	
310	PRIME COAT (MC-30)	GAL	0.25 GAL/SY	
314	EMULSION ASPHALT (MULTI) (MS-2 OR SS-1)	GAL	SEE NOTE 2	
3076(1)	D-GR HMA TY-B SAC-B PG64-22	TON	2.5”	275 LB/SY/2000
		TON	4”	440 LB/SY/2000
3076(3) or 3077	TACK COAT	GAL	0.13 GAL / SY	
3077(1)	SP-D SAC-A PG70-28	TON	2”	220 LB/SY/2000
3085	UNDERSEAL COARSE	GAL	SEE GENERAL NOTE FOR RATE INFORMATION	

NOTE:

(1)	D-GR HMA & SP-C SAC-A 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:	Amarillo Area Engineer	Joe.Chappell@txdot.gov
CC:	Assistant Area Engineer	CC.Sysombath@txdot.gov
	Director of Construction	Wes.Kimmell@txdot.gov
	Construction Manager	Darrell.Caldwell@txdot.gov

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

For Q&A’s on Proposals navigate to:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

Use the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink of the project you want to view the Q&A for and click on the link in the window that pops up.

All relevant project documentation including CTD and cross sections will be posted to TxDOT District’s FTP website.

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

Verify all survey control prior to beginning construction. Notify Engineer of any discrepancies in control prior to beginning construction.

There are approximately 2 "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 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.

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 16 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.

Any work necessary to provide temporary ingress and egress during construction (such as building gravel ramps, etc.) Will not be paid for directly, but will be considered as subsidiary work to the various bid items.

Verify all existing grades, elevations, and cross slopes that will connect to any proposed grades and elevations. If adjustments are warranted, the Contractor is to submit proposed changes to the Engineer for verification.

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 12.68 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 acceptance, 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.
Prosecute the work following the sequence shown in the traffic control plan narrative and corresponding traffic control plan. Prosecuting the work in concurrent phases is not allowed unless approved in writing by the engineer.

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.

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.

Prior to excavation and placement of embankment, the top-soil (6-inch depth) within the areas to be disturbed will be bladed into a windrow, or stockpiled, outside the limits of the fill slope. After all grading is completed; the top soil (6-inch depth) will be spread over the disturbed areas that will not receive concrete riprap. This work is not paid for directly, but will be considered as 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 247 Flexible Base

SPECIFICATION FOR FLEX BASE TY A, B OR D, GR 4								
GRADING REQUIREMENTS PERCENT RETAINED – SIEVES SIEVE SIZES INCHES					***SOIL CONSTANTS***		***MAX WET BALL ****	***MAX % INCREASE IN PASSING # 40 ****
1 3/4	***7/8***	***3/8***	***# 4***	***# 40***	*L.L. MAX*	*P.I. MAX*		
0	*17-32*	*40-60*	*50-70*	*70-85*	*40*	*12*	*45*	*20*

*Applies to TY A & D material only.

Item 260 Lime Treatment (Road-Mixed)

All required moisture added for mixing and compaction operations is to be injected through the mixing process. Sprinkle the subgrade or base to prevent excessive loss of moisture as directed by the Engineer.

Spread the lime with a vane feeder system approved by the Engineer that is capable of spreading the lime uniformly to within 5 percent of the specified rate.

Item 314 Emulsified Asphalt Treatment

A 10 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 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.

100% virgin polypropylene fibrillated fibers (macro fibers typical length 1 ½" or greater) are to be added to all (HPC) concrete at a rate of 1.5 lbs/cy
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.

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.

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.

Notify the Engineer 24 hours prior to any lane closure.

Item 504 Field Office and Laboratory

The following building(s) 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.

All-weather parking area and chain link security fence will not be required.

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 and three chairs. 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 140° 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.

For this project, asphalt content will be determined utilizing the ignition method so the structure is to provide for the following in lieu of the item 504 requirements for asphalt content by extraction. The room to contain the ignition oven is to be adequately power ventilated and contain a NEMA 6-50r (208/240 v, 50 a) outlet within 2.5 feet of the ignition oven location and an independent exhaust outlet to the outside no further than 8 feet from the oven. The surface for the ignition oven location is to be level, sturdy, and fireproof with at least 6-inch clearance between the furnace and other vertical surfaces.

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.

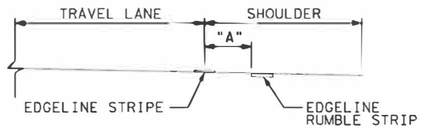
Item 506 Temporary Erosion, Sedimentation, and Environmental Controls

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

Use wooden stakes to secure erosion control logs. Do not use rebar stakes.

Item 533 Milled Rumble Strips

Use the applicable option in the table below for installation of the continuous milled depressions, as shown on the Edge Line Rumble Strips standard RS(2)-23.



EDGELINE RUMBLE STRIP DETAIL

NTS

(MIRROR FOR INSIDE SHOULDER)

SHOULDER WIDTH (SW)	RUMBLE STRIP WIDTH (RS)	PLACEMENT "A"	OPTION (SEE RS(1)-23 or RS(2)-23)
SW ≤ 2'	8" RS	SEE RS(2)-23	Option 1
2' < SW ≤ 8'	8" RS	4" OFF EDGELINE	Option 3
SW ≥ 8'	16" RS	24" OFF EDGELINE	Option 4
All Inside Shoulders on 4-lane Divided Highways	16" RS	4" OFF EDGELINE	Option 3

Use milled option 1 for installation of the Centerline Rumble Strips, as shown on the Standard Sheet RS(4)-23.

Item 585 Ride Quality for Pavement Surfaces

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."

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.

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 677 Eliminating Existing Pavement Markings and Markers

Do not remove any existing pavement markings in any area in which the contractor is not able to place work zone pavement markings at the proper location within the same day.

Item 3076 Dense Graded Hot Mix Asphalt

Use aggregate that meets the SAC requirement of class A.

Use of RAS is not allowed.

Provide a laboratory mixture design with the minimum target asphalt binder content shown below:

D-GR HMA TY B 4.6%

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.

Provide a Hot Asphalt type Tracking Resistant Asphalt Interlayer (TRAIL) for tack coat found on the TxDOT Material Producer List is required for mix placed on any driving lane or roadway shoulder. An alternate tack coat material is permitted in small production areas such as flexible pavement structure repair, driveways, mailbox pullouts or other areas as designated by the Engineer. All alternate tack coat material must adhere to the requirements of SS3076.

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 3077 Superpave Mixtures

Intent of this project is to utilize SP-D material. SP-D can be substituted for SP-C with approval of the engineer.

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. The Contractor may use a substitute PG binder one grade below the PG binder originally specified; however, the mixture made with the substitute PG binder must meet the minimum number of passes on the Hamburg Wheel test (TEX-242-F) for the originally specified PG binder grade as shown in Table 11.
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
310, 314	All Year
3076, 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, (2-1)-18, (3-1)-13, and (3-3)-14 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.

Item 6362 Recessed Reflective Pavement Markers

Remove all existing raised pavement markers as directed by the Engineer, removing existing markers will be subsidiary to Item 6362.

Place all recessed reflective pavement markers in proper alignment with the guides/stripes. The maximum deviation rate in alignment is 1 in. per 200 ft. of roadway. The maximum deviation is to not exceed 2 in. or be abrupt.

Reflector face must be free of any adhesive or the reflector shall be cleaned or replaced.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2635-02-038 **DISTRICT** Amarillo **COUNTY** Randall
HIGHWAY SL 335

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2635-02-038**			
		PROJECT ID		**A00193226**			
		COUNTY		**Randall**			
		HIGHWAY		**SL 335**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	149.000		149.000	
	110-6001	EXCAVATION (ROADWAY)	CY	9,618.000		9,618.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	20,213.000		20,213.000	
	134-6001	BACKFILL (TY A)	STA	149.000		149.000	
	164-6034	DRILL SEEDING (PERM) (RURAL) (SANDY)	AC	34.000		34.000	
	164-6053	DRILL SEEDING (TEMP)(WARM OR COOL)	AC	34.000		34.000	
	247-6237	FL BS (CMP IN PLC)(TY A OR B GR 4)(6")	SY	37,713.000		37,713.000	
	251-6082	REWORK BS MTL (TY B)(18")(DENS CONT)	SY	14,834.000		14,834.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	267.000		267.000	
	260-6027	LIME TRT (EXST MATL)(8")	SY	22,785.000		22,785.000	
	310-6009	PRIME COAT (MC-30)	GAL	9,429.000		9,429.000	
	314-6009	EMULS ASPH (EROSN CONT)(MULTI)	GAL	3,157.000		3,157.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	4,475.000		4,475.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	13.800		13.800	
	462-6054	CONC BOX CULV (6 FT X 3 FT)(EXTEND)	LF	12.000		12.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	60.000		60.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	36.000		36.000	
	464-6018	RC PIPE (CL IV)(24 IN)	LF	41.000		41.000	
	467-6214	SET (TY I)(S= 6 FT)(HW= 4 FT)(6:1) (C)	EA	1.000		1.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	467-6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	EA	3.000		3.000	
	467-6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	EA	3.000		3.000	
	480-6001	CLEAN EXIST CULVERTS	EA	4.000		4.000	
	496-6004	REMOV STR (SET)	EA	10.000		10.000	
	496-6007	REMOV STR (PIPE)	LF	23.000		23.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	4.000		4.000	
	496-6050	REMOV STR (DRIVEWAY CULVERT)	EA	2.000		2.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	7.000		7.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	500.000		500.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	500.000		500.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,227.000		1,227.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	27,580.000		27,580.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	23,060.000		23,060.000	
	560-6025	RELOCATE EXISTING MAILBOX	EA	6.000		6.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	6.000		6.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6.000		6.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2635-02-038 **DISTRICT** Amarillo **COUNTY** Randall
HIGHWAY SL 335

		CONTROL SECTION JOB		**2635-02-038**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00193226**			
		COUNTY		**Randall**			
		HIGHWAY		**SL 335**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	644-6028	IN SM RD SN SUP&AM TYS80(1)SA(P-BM)	EA	7.000		7.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	2.000		2.000	
	644-6070	RELOCATE SM RD SN SUP&AM TY S80	EA	5.000		5.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	13.000		13.000	
	658-6081	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND(BI)	EA	104.000		104.000	
	658-6099	INSTL OM ASSM (OM-2Z)(WFLX)GND	EA	14.000		14.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	14,380.000		14,380.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	720.000		720.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	2,245.000		2,245.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	130.000		130.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	8.000		8.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	8.000		8.000	
	666-6308	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)	LF	34,015.000		34,015.000	
	666-6317	RE PM W/RET REQ TY I (Y)6"(BRK)(090MIL)	LF	5,270.000		5,270.000	
	666-6320	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	LF	31,885.000		31,885.000	
	3076-6002	D-GR HMA TY-B SAC-B PG64-22	TON	12,894.000		12,894.000	
	3076-6066	TACK COAT	GAL	9,378.000		9,378.000	
	3077-6058	SP MIXES SP-D SAC-A PG70-28	TON	10,833.000		10,833.000	
	3077-6075	TACK COAT	GAL	159.000		159.000	
	3085-6001	UNDERSEAL COURSE	GAL	23,995.000		23,995.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	95.000		95.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000		40.000	
	6362-6002	REC REFL PAV MRKR TY I-C	EA	116.000		116.000	
	6362-6004	REC REFL PAV MRKR TY II-A-A	EA	980.000		980.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF ROADWAY ITEMS (CSJ: 2635-02-038)															
LOCATION	110 6001	132 6004	134 6001	247 6237	251 6082	260 6012	260 6027	310 6009	354 6021	530 6005	3076 6002	3076 6066	3077 6027	3077 6075	3085 6001
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY B)	BACKFILL (TY A)	FL BS (CMP IN PLC)(TY A OR B GR 4)(6")	REWORK BS MTL (TY B)(18")(DENS CONT)	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY) (3% at 23.4 LB/SY)	LIME TRT (EXST MATL)(8")	PRIME COAT (MC-30) (0.25 GAL/SY)	PLANE ASPH CONC PAV(0" TO 2")	DRIVEWAYS (ACP)	D-GR HMA TY-B SAC-B PG64-22 (6.5" at 935 LB/SY)	TACK COAT (0.13GAL/SY)	SP MIXES SP-D SAC-A PG70-28 (2" AT 220 LB/SY)	TACK COAT (0.13GAL/SY)	UNDERSEAL COURSE (0.25 GAL/SY)
	CY	CY	STA	SY	SY	TON	SY	GAL	SY	SY	TON	GAL	TON	GAL	GAL
EXISTING TYP SECTION-A					14079										
EXISTING TYP SECTION-B					755										
TYP SECTION A-1	1912	637	17	3464		21	1754	866			1173	853	1071		2434
TYP SECTION A-2	6208	17883	108	28774		210	17984	7194			9858	7170	7649		17385
TYP SECTION A-3	579	1335	16	3461		21	1788	865			1173	853	1058		2403
TYP SECTION B	919	358	8	2014		15	1259	504			690	502	565		1283
ADDITIONAL AREA									4475	1227			490	159	490
PROJECT TOTALS	9618	20213	149	37713	14834	267	22785	9429	4475	1227	12894	9378	10833	159	23995

100
6002
PREPARING ROW
STA
17
108
16
8
149

SUMMARY OF DRAINAGE ITEMS (CSJ: 2635-02-038)											
CULVERT NAME	432-6001	462-6054	464-6007	464-6008	467-6214	467-6422	467-6453	480-6001	496-6004	496-6007	496-6008
	RIPRAP (CONC)(4 IN)	CONC BOX CULV (6 FT X 3 FT)(EXTEND)	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	SET (TY I)(S= 6 FT)(HW= 4 FT)(6:1) (C)	SET (TY II) (30 IN) (RCP) (6: 1) (C)	SET (TY II) (36 IN) (RCP) (6: 1) (C)	CLEAN EXIST CULVERTS	REMOV STR (SET)	REMOVE STR (PIPE)	REMOV STR (BOX CULVERT)
	CY	LF	LF	LF	EA	EA	EA	EA	EA	LF	LF
CULVERT A1		12			1			1	1		4
CULVERT A2	13.8		20			1		1		3	
CULVERT B				36			3	1	3	12	
CULVERT C			40			2		1	2	8	
PROJECT TOTALS	13.8	12	60	36	1	3	3	4	6	23	4

SUMMARY OF DRIVEWAY CULVERT ITEMS (CSJ: 2635-02-038)					
CULVERT #	CULVERT NAME	464-6018	467-6395	496-6004	496-6050
		RC PIPE (CL IV)(24 IN)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	REMOV STR (SET)	REMOV STR (DRIVEWAY CULVERT)
		LF	EA	EA	EA
1	DW397+12R	41	2	2	1
2	DW498+39R			2	1
PROJECT TOTALS		41	2	4	2

SUMMARY OF SIGNING ITEMS (CSJ:2635-02-038)							
LOCATION	560 6025	644 6001	644 6004	644 6028	644 6033	644 6070	644 6076
	RELOCATE EXISTING MAILBOX	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(P-BM)	IN SM RD SN SUP&AM TYS80(1)SA(U)	RELOCATE SM RD SN SUP&AM TY S80	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA	EA	EA
PROJECT TOTALS	6	6	6	7	2	5	13

SUMMARY OF PAVEMENT MARKING ITEMS (CSJ:2635-02-038)													
LOCATION	533 6001	533 6002	658 6081	658 6099	666 6035	666 6047	666 6053	666 6077	666 6308	666 6317	666 6320	6362 6002	6362 6004
	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND(BI)	INSTL OM ASSM (OM-2Z)(WFLX)GND	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	REFL PAV MRK TY I (W)(ARROW)(090MIL)	REFL PAV MRK TY I (W)(WORD)(090MIL)	RE PM W/RET REQ TY I (W)6"(SLD)(090MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(090MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(090MIL)	REC REFL PAV MRKR TY I-C	REC REFL PAV MRKR TY II-A-A
	LF	LF	EA	EA	LF	LF	EA	EA	LF	LF	LF	EA	EA
PROJECT TOTALS	27580	23060	104	14	2245	130	8	8	34015	5270	31885	116	980

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS (CSJ: 2635-02-038)		
LOCATION	662 6008	662 6111
	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2
	LF	EA
PHASE 1		
PHASE 2	14380	
PHASE 3		720
PROJECT TOTALS	14380	720

SUMMARY OF EROSION CONTROL ITEMS (CSJ:2635-02-038)					
LOCATION	164 6034	164 6053	314 6009	506 6040	506 6043
	DRILL SEEDING (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP)(WARM OR COOL)	EMULS ASPH (EROSN CONT)(MULTI) 0.1 GAL/SY	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	AC	AC	GAL	LF	LF
PROJECT TOTALS	34	34	3157	500	500

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Texas Department of Transportation

SL 335
SUMMARY SHEET

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		10

DATE: 4/23/2024 12:52:58 PM
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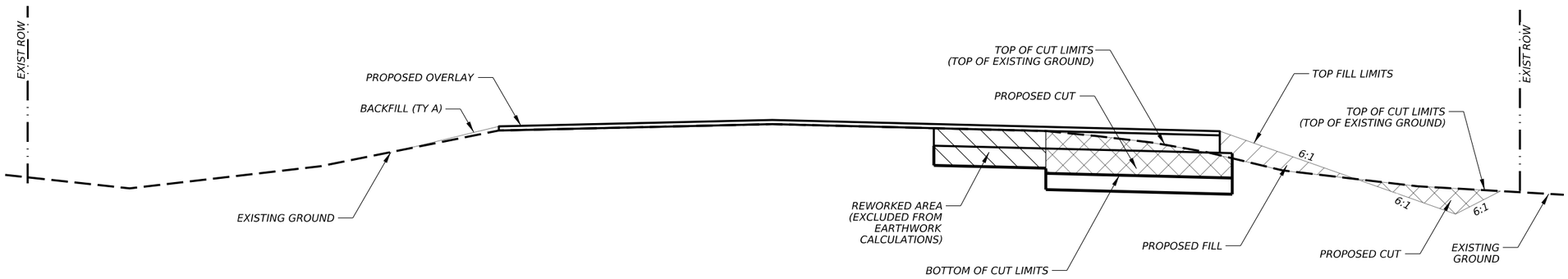

LEGEND

- FILL
- EXCAVATION (CUT)
- REWORKED AREA

SUMMARY OF EARTHWORK ITEMS (CSJ: 2365-02-038)			EARTHWORK CUT/FILL VALUES	
LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6004 EMBANKMENT (FINAL)(DENS CONT)(TY B)	CUT (EXCAVATION)	FILL (EMBANKMENT)
	CY	CY	SF	SF
380+13.57	0	0	1.92	1.28
381+00.00	42	7	24.22	3.20
382+00.00	111	18	35.98	6.74
383+00.00	132	25	35.12	7.02
384+00.00	132	23	36.00	5.37
385+00.00	137	22	37.99	6.28
386+00.00	138	27	36.70	8.46
387+00.00	149	36	43.67	10.99
388+00.00	144	41	34.36	11.32
389+00.00	129	43	35.51	11.89
390+00.00	135	45	37.34	12.32
391+00.00	129	47	32.28	12.98
392+00.00	114	49	29.06	13.25
393+00.00	92	66	20.62	22.46
394+00.00	82	69	23.83	14.96
395+00.00	98	54	28.83	14.18
396+00.00	148	65	51.01	20.93
397+00.00	200	39	56.99	0.01
398+00.00	163	28	31.02	15.01
399+00.00	106	51	26.38	12.53
400+00.00	88	56	21.17	17.89
401+00.00	77	67	20.46	18.15
402+00.00	88	55	26.83	11.58
403+00.00	99	37	26.71	8.33
404+00.00	98	25	26.10	5.17
405+00.00	105	12	30.42	1.38
406+00.00	89	20	17.88	9.19
407+00.00	59	59	14.24	22.90
408+00.00	55	94	15.40	27.76
409+00.00	54	125	13.54	39.53
410+00.00	54	160	15.78	46.64
411+00.00	56	180	14.32	50.40
412+00.00	60	189	17.84	51.68
413+00.00	73	180	21.56	45.34
414+00.00	80	174	21.77	48.86
415+00.00	80	180	21.69	48.38
416+00.00	84	168	23.72	42.43
417+00.00	90	156	24.72	41.97
418+00.00	86	146	21.95	36.99
419+00.00	81	143	21.64	40.46
420+00.00	85	162	24.34	46.76
421+00.00	83	176	20.51	48.46
422+00.00	77	170	21.07	43.35
423+00.00	86	126	25.12	24.89
424+00.00	83	53	19.86	3.85
425+00.00	83	95	25.16	47.69
426+00.00	95	176	26.21	47.21
427+00.00	98	181	26.57	50.49
428+00.00	96	195	25.22	54.81
429+00.00	94	200	25.58	53.27
430+00.00	101	214	29.00	62.20
431+00.00	96	240	22.99	67.28
431+23.15	92	247	22.02	69.89
432+00.00	77	270	18.80	78.55
433+00.00	83	293	25.99	79.61
434+00.00	91	291	23.26	77.70
435+00.00	93	268	26.90	66.79
436+00.00	97	242	25.28	64.15
437+00.00	90	220	23.40	54.75
438+00.00	86	161	22.97	32.06

SUMMARY OF EARTHWORK ITEMS (CSJ: 2365-02-038)			EARTHWORK CUT/FILL VALUES	
LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6004 EMBANKMENT (FINAL)(DENS CONT)(TY B)	CUT (EXCAVATION)	FILL (EMBANKMENT)
	CY	CY	SF	SF
439+00.00	80	105	20.33	24.54
440+00.00	78	79	21.86	18.34
441+00.00	86	64	24.64	16.14
442+00.00	96	55	27.04	13.67
443+00.00	98	56	25.63	16.72
444+00.00	82	75	18.47	23.89
445+00.00	64	96	16.23	27.84
446+00.00	60	111	16.11	32.32
447+00.00	60	122	16.33	33.54
448+00.00	65	149	18.97	46.97
449+00.00	68	176	17.83	48.16
450+00.00	63	187	16.35	52.89
451+00.00	65	178	18.68	43.11
452+00.00	88	80	28.64	0.09
453+00.00	82	69	15.41	37.20
454+00.00	41	162	6.56	50.08
455+00.00	19	209	3.92	62.88
456+00.00	15	227	4.05	59.73
457+00.00	19	210	6.03	53.89
458+00.00	19	221	4.21	65.53
459+00.00	18	209	5.39	47.11
460+00.00	23	172	6.80	45.59
461+00.00	27	162	7.81	41.72
462+00.00	26	178	5.97	54.16
463+00.00	21	208	5.13	58.27
464+00.00	24	203	7.71	51.28
465+00.00	26	172	6.35	41.85
466+00.00	28	145	8.72	36.68
467+00.00	26	163	5.53	51.40
468+00.00	17	206	3.44	59.83
469+00.00	17	204	5.99	50.53
470+00.00	20	193	4.61	53.56
471+00.00	16	221	4.10	65.54
472+00.00	16	245	4.58	66.71
473+00.00	20	226	6.10	55.55
474+00.00	22	203	5.70	54.04
475+00.00	21	195	5.78	51.22
476+00.00	22	184	6.36	48.07
477+00.00	25	153	7.37	34.76
478+00.00	31	110	9.42	24.79
479+00.00	34	106	9.06	32.62
480+00.00	45	129	15.07	37.18
481+00.00	49	186	11.22	63.19
482+00.00	42	227	11.50	59.45
483+00.00	44	210	12.41	53.84
484+00.00	48	188	13.32	47.44
485+00.00	52	175	14.50	47.09
486+00.00	57	167	16.47	43.30
487+00.00	62	158	16.90	42.18
488+00.00	68	156	19.99	42.31
489+00.00	76	150	20.79	38.48
490+00.00	79	152	21.73	43.51
491+00.00	77	173	19.98	49.83
492+00.00	80	175	23.19	44.55
493+00.00	86	174	23.38	49.31
494+00.00	76	174	17.90	44.57
495+00.00	59	154	14.16	38.54
496+00.00	50	142	12.63	37.93
497+00.00	46	133	12.00	33.99
498+00.00	55	108	17.53	24.59
499+00.00	45	104	6.94	31.40

SUMMARY OF EARTHWORK ITEMS (CSJ: 2365-02-038)			EARTHWORK CUT/FILL VALUES	
LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6004 EMBANKMENT (FINAL)(DENS CONT)(TY B)	CUT (EXCAVATION)	FILL (EMBANKMENT)
	CY	CY	SF	SF
500+00.00	26	124	7.21	35.58
501+00.00	30	130	9.10	34.53
502+00.00	34	132	9.36	36.93
503+00.00	32	150	8.02	44.04
504+00.00	32	153	9.24	38.76
505+00.00	34	155	9.25	44.84
506+00.00	34	164	9.16	43.57
507+00.00	30	181	6.95	53.96
508+00.00	25	207	6.72	57.61
509+00.00	26	208	7.48	54.91
510+00.00	30	199	8.75	52.50
511+00.00	30	195	7.63	52.69
512+00.00	29	195	8.14	52.65
513+00.00	38	111	12.41	7.16
514+00.00	33	109	5.20	51.58
515+00.00	23	173	7.16	41.76
516+00.00	29	142	8.53	34.79
517+00.00	32	125	8.71	32.65
518+00.00	34	115	9.51	29.48
519+00.00	38	94	11.10	21.44
520+00.00	42	74	11.32	18.46
521+00.00	47	46	13.91	6.17
522+00.00	47	54	11.60	23.05
523+00.00	45	81	12.47	20.95
524+00.00	47	75	13.01	19.46
525+00.00	42	63	9.66	14.52
526+00.00	35	39	8.97	6.66
527+00.00	26	20	5.27	4.31
528+00.00	16	12	3.29	1.97
528+47.66	5	2	2.75	0.79
PROJECT TOTALS	9618	20213		

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SL 335

EARTHWORK SUMMARY SHEET

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		11

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cx | dw | cx | cx

CK | DW | CK | DW

PHASE 1: ADVANCED WARNING AND CULVERT EXTENSION

1. PLACE ADVANCED WARNING SIGNS, IN CONFORMANCE WITH BC STANDARDS.
2. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS TO PLACE EROSION CONTROL DEVICES, AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER.
3. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR CLEANING OF EXISTING CULVERTS, REMOVAL OF EXISTING SAFETY END TREATMENTS, AND FOR CULVERT EXTENSION CONSTRUCTION.

PHASE 2: ROADWAY WIDENING

1. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR UNEVEN LANES
2. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR SHOULDER WORK VEHICLES TO PERFORM ROADWAY WIDENING
3. PERFORM ROADWAY WIDENING AND GRADING

PHASE 3: OVERLAY AND PAVEMENT MARKINGS

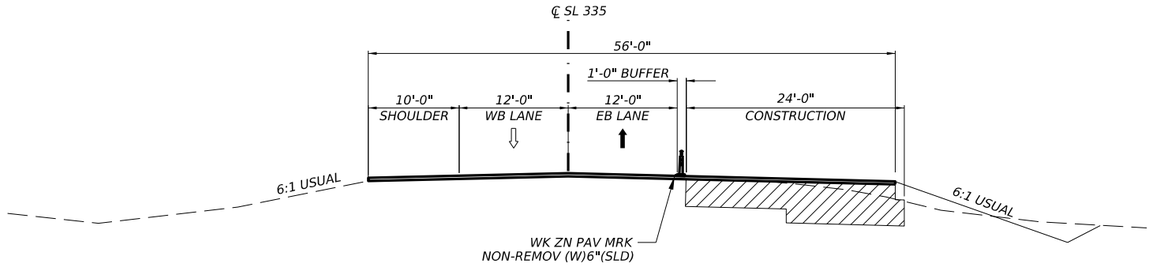
STAGE 1
1. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR SHORT DURATION TRAFFIC SHIFT FOR OVERLAY OPERATIONS.
2. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR PLACEMENT OF TEMPORARY TABS DURING OPERATION OF EACH LENGTH OF WORK.
3. PLACE PERMANENT SIGNAGE

STAGE 2
1. PLACE TRAFFIC CONTROL PER APPLICABLE TCP STANDARDS FOR PLACEMENT OF PERMANENT PAVEMENT MARKINGS, PLACEMENT OF RAISED PAVEMENT MARKERS, AND PREFORMED THERMOPLASTIC STRIPS.

STAGE 3
1. REMOVE ADVANCED WARNING SIGNS.
2. PER APPLICABLE TCP STANDARDS ADD TRAFFIC CONTROL TO REMOVE EROSION CONTROL DEVICES ONCE VEGETATIVE COVER IS ESTABLISHED.

GENERAL NOTES

1. THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK AND IF THIS PROPOSAL IS IMPLEMENTED, THE CONTRACTOR WILL BE RESPONSIBLE FOR DEVELOPING DETAILED PLAN SHEETS TO BE SEALED BY A LICENSED PROFESSIONAL ENGINEER WITH THE STATE OF TEXAS. THE CONTRACTOR CANNOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED PHASE/SEQUENCE UNTIL WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER. IF AT ANY TIME DURING CONSTRUCTION THE CONTRACTOR'S PROPOSED PLAN OF OPERATION FOR HANDLING TRAFFIC DOES NOT PROVIDE FOR SAFE TRAFFIC MOVEMENT, THE CONTRACTOR WILL IMMEDIATELY CHANGE THEIR OPERATION TO CORRECT THE UNSATISFACTORY CONDITION.
2. DO NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT AT ANY LOCATION THAT WILL CONSTITUTE A HAZARD AND WILL ENDANGER TRAFFIC. DO NOT STORE EQUIPMENT OUTSIDE DESIGNATED RIGHT OF WAY WITHOUT THE PERMISSION GRANTED FIRST BY THE PROPERTY OWNER.
3. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
4. ACCESS TO ADJOINING PROPERTIES MUST BE MAINTAINED AT ALL TIMES.
5. SIGN AND TREAT EDGE CONDITIONS IN ACCORDANCE WITH WZ(UL)-13 AND TXDOT STANDARD, "TREATMENT FOR VARIOUS EDGE CONDITIONS" (EDGECON-21).
6. THE CONTRACTOR SHALL PERFORM WORK DURING THE DAY AND MAINTAIN ROADWAY LANES OPEN TO TRAFFIC AT NIGHT.



SL 335 TCP PHASE 2
NOT TO SCALE

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SL 335
TCP NARRATIVE

 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		12

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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

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REVISIONS 4-03 7-13	2635	02	038	SL 335
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5-10 5-21	AMA	RANDALL		13

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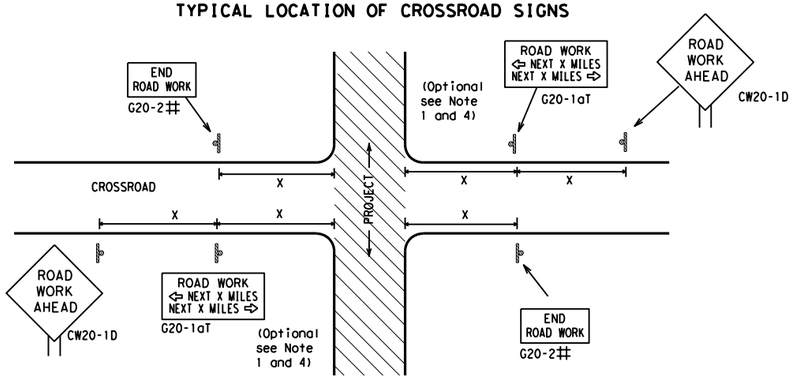
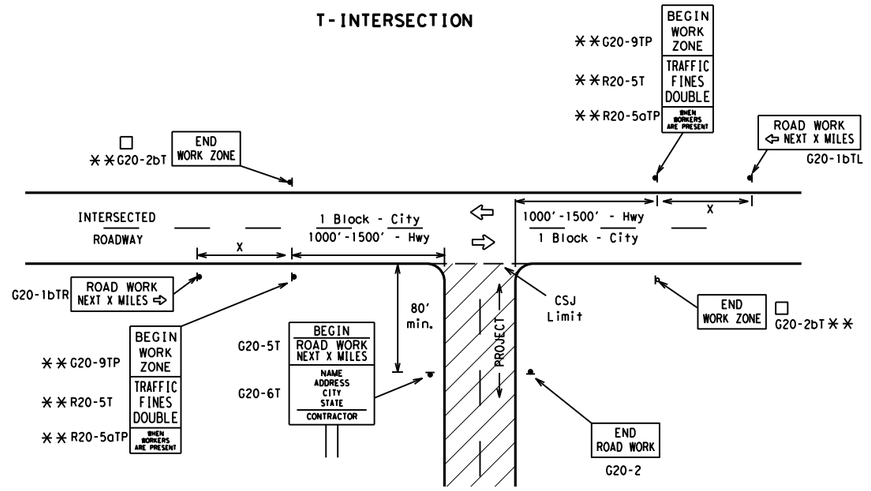
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

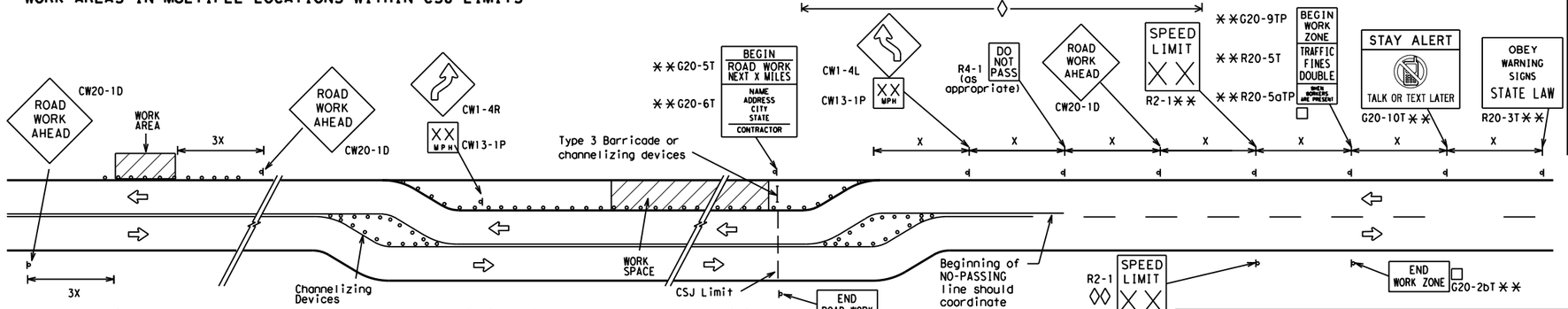
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

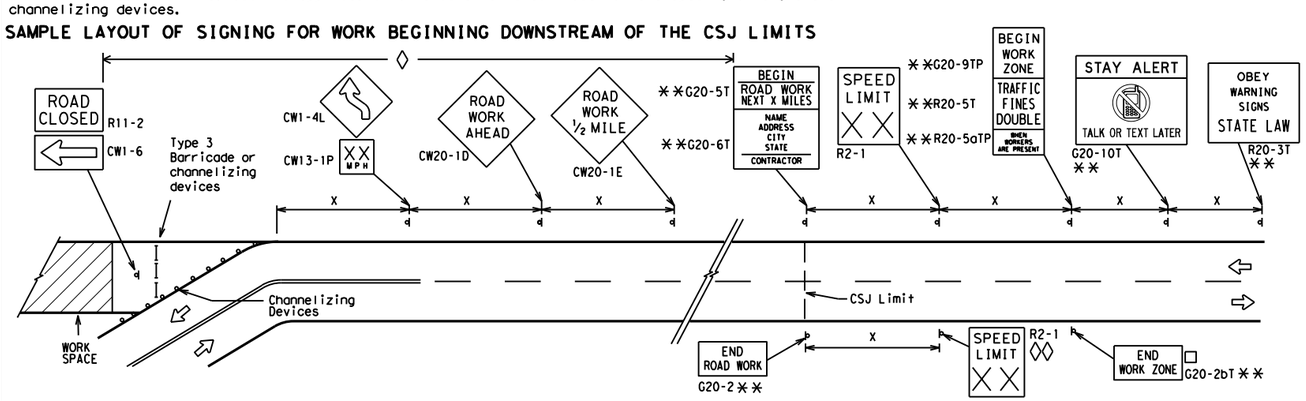
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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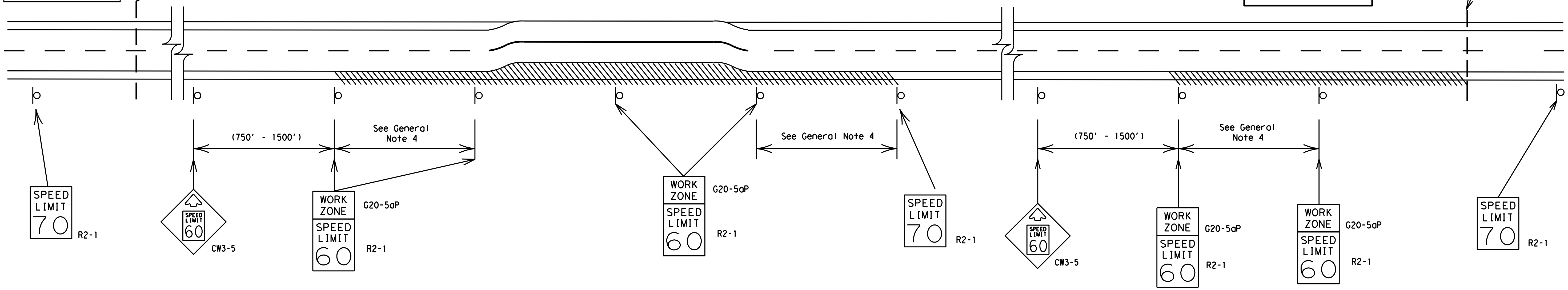
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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.

Signing shown for one direction only. See BC(2) for additional advance signing.



Signing shown for one direction only. See BC(2) for additional advance signing.

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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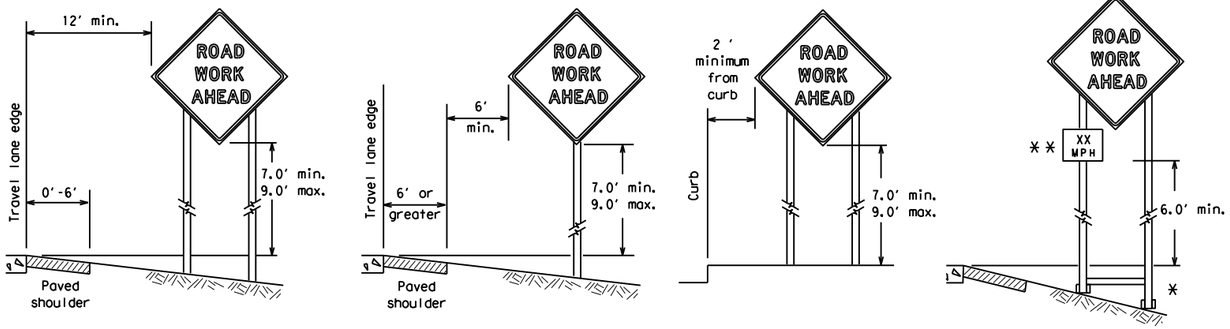
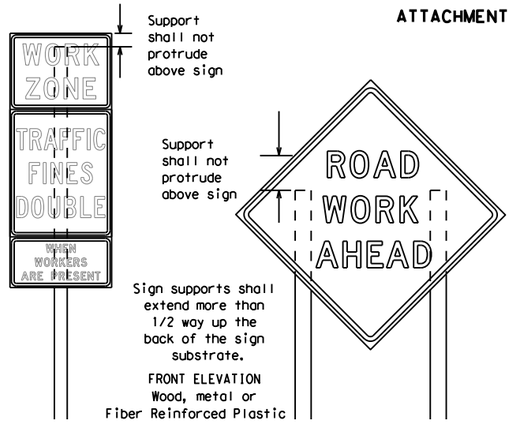
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

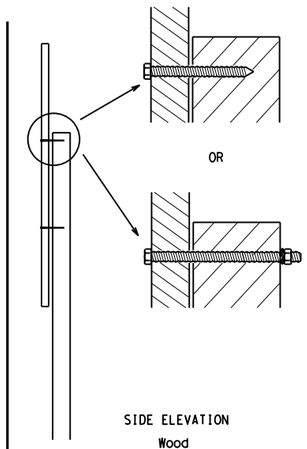


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





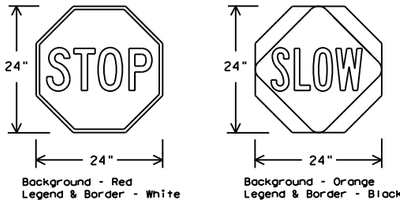
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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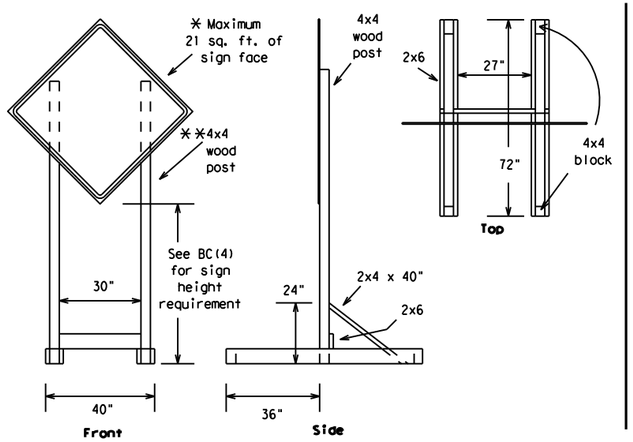
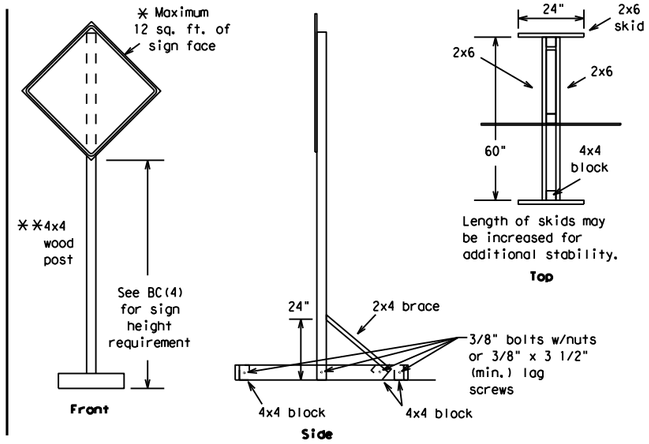
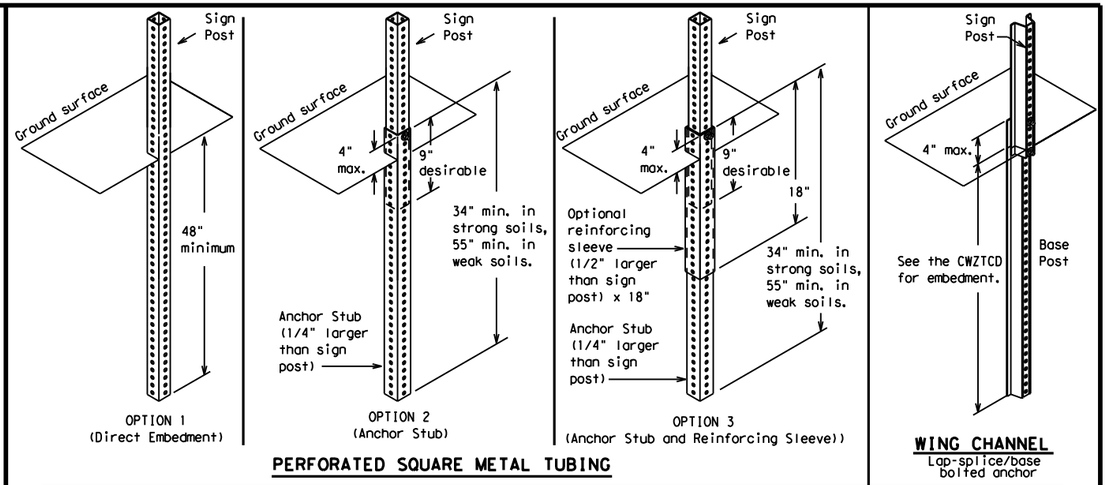




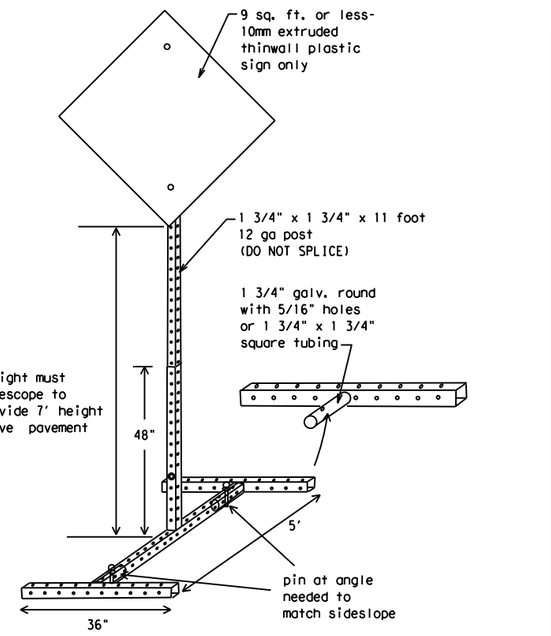
SKID MOUNTED WOOD SIGN SUPPORTS

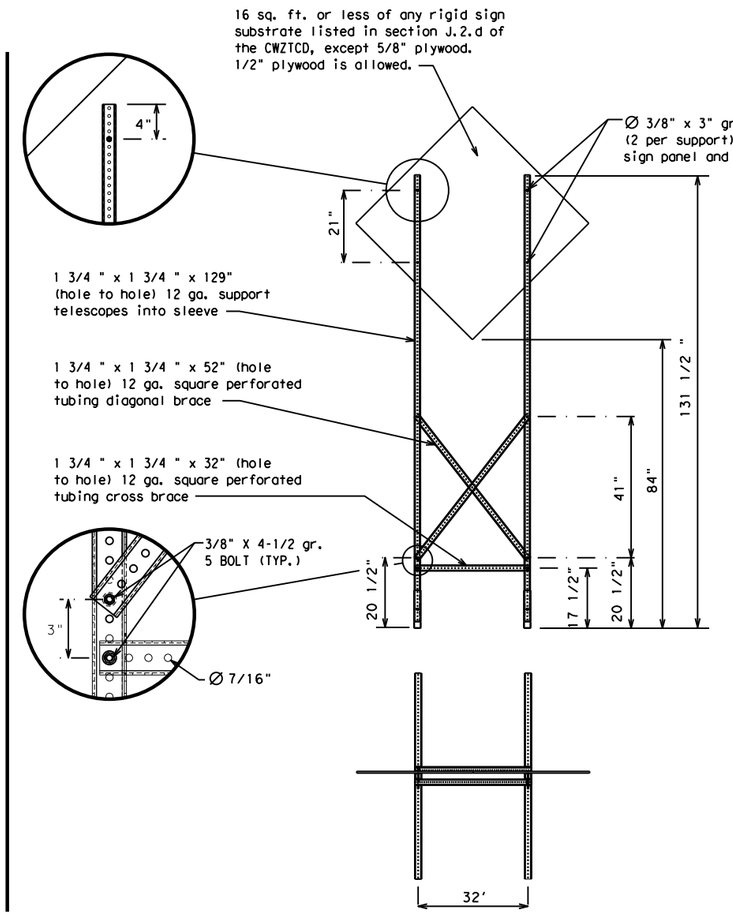
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

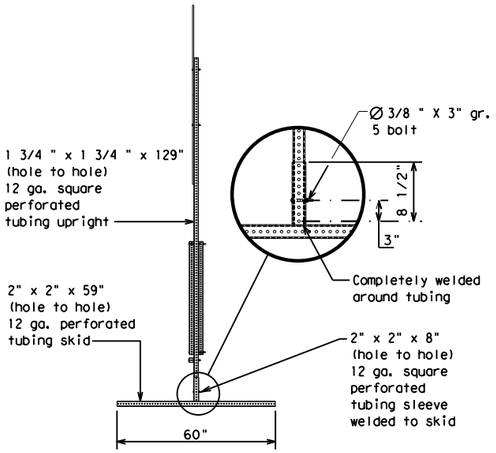


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	RANDALL		17

DATE: 2/1/2024 5:34:18 PM
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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
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

* See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	RANDALL		18

100

DATE: 2/1/2024 5:34:19 PM
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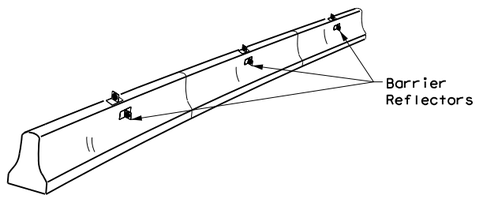
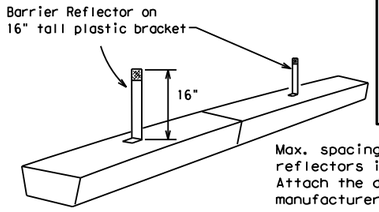
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

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

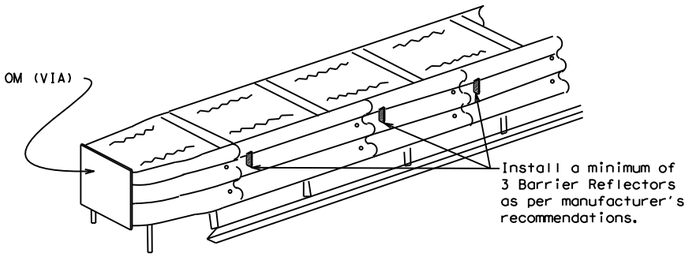


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

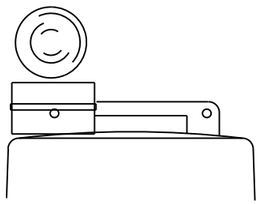


DELINEATION OF END TREATMENTS

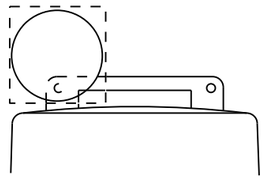
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

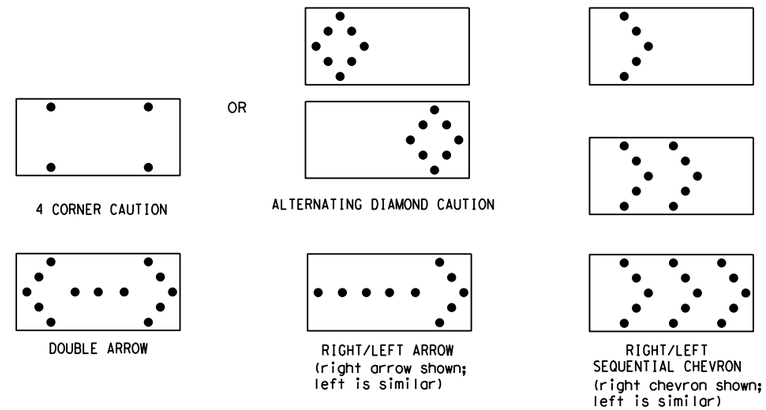
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

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.

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	2635	02	038	SL 335
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	RANDALL		19

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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:

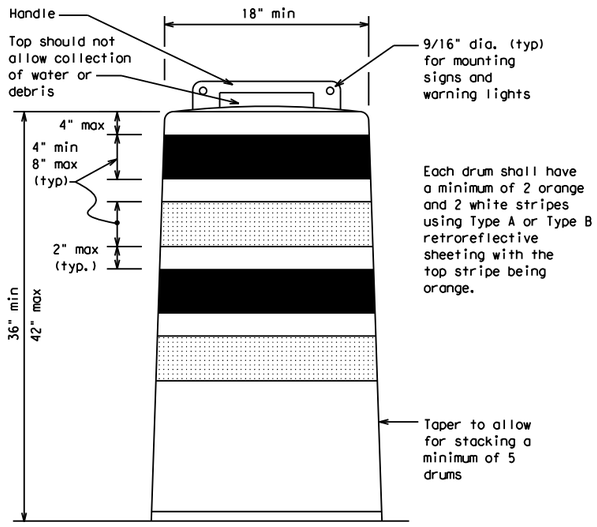
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

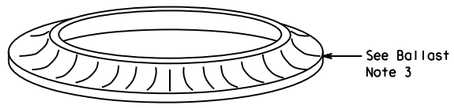
RETROREFLECTIVE SHEETING

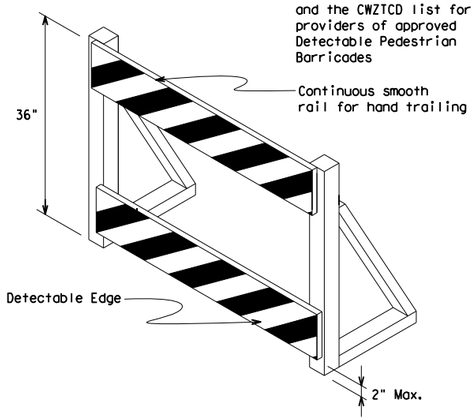
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

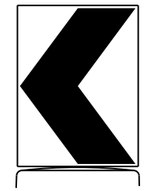




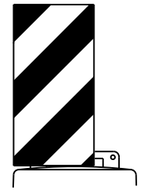


DETECTABLE PEDESTRIAN BARRICADES

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.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2635	02	038	SL 335
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	AMA	RANDALL		20
7-13				

DATE: 2/1/2024 5:34:20 PM
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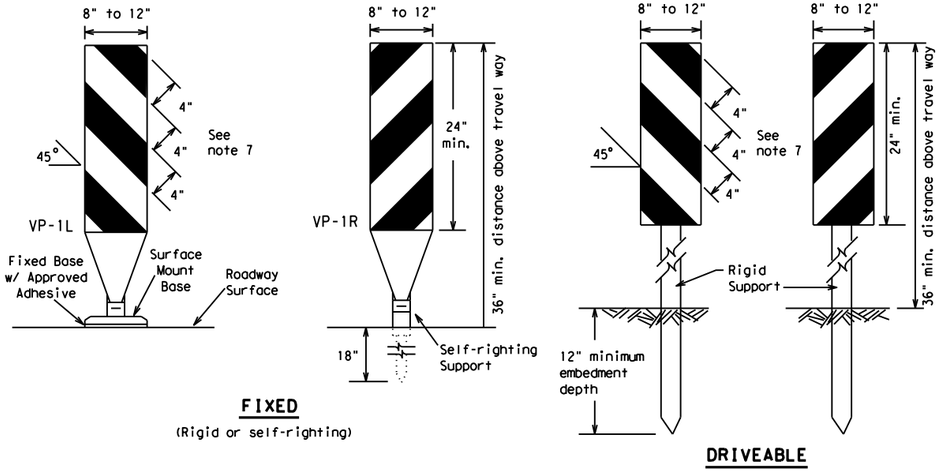
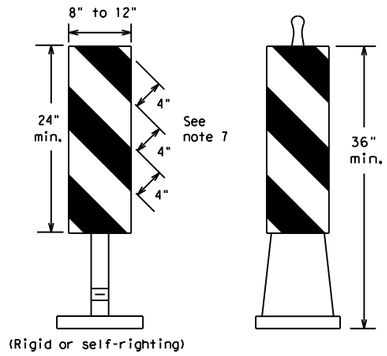


FIXED
(Rigid or self-righting)

DRIVEABLE

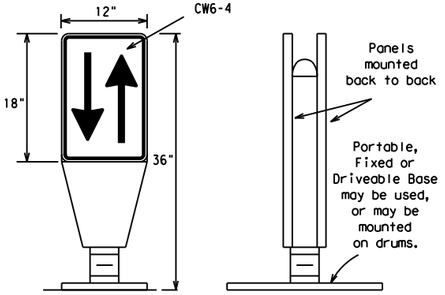


(Rigid or self-righting)

PORTABLE

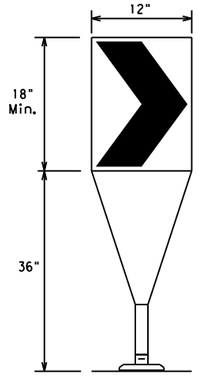
VERTICAL PANELS (VPs)

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



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)



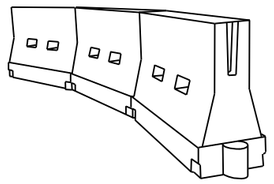
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

BC(9)-21

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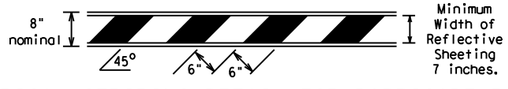
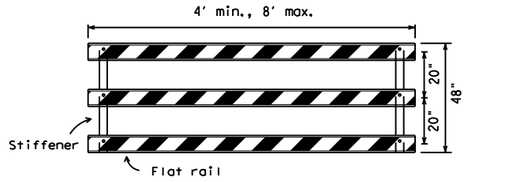
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



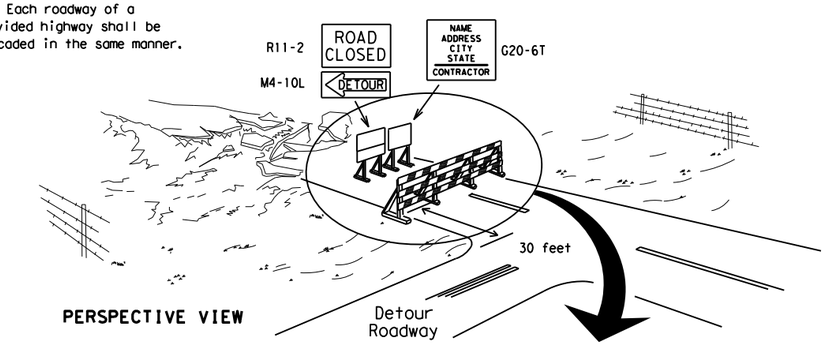
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

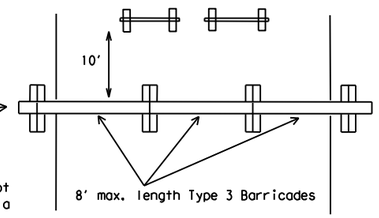
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

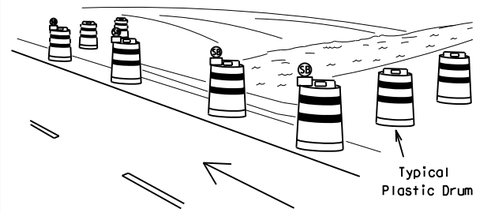
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

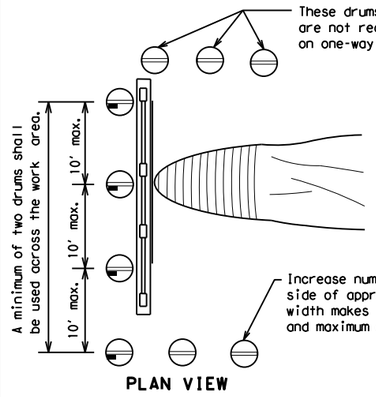
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

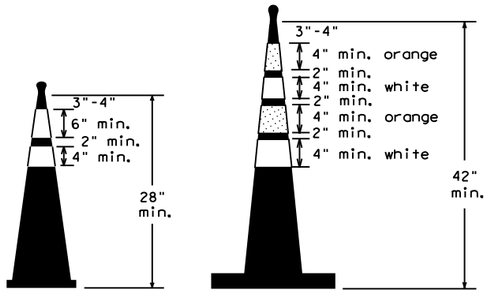
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

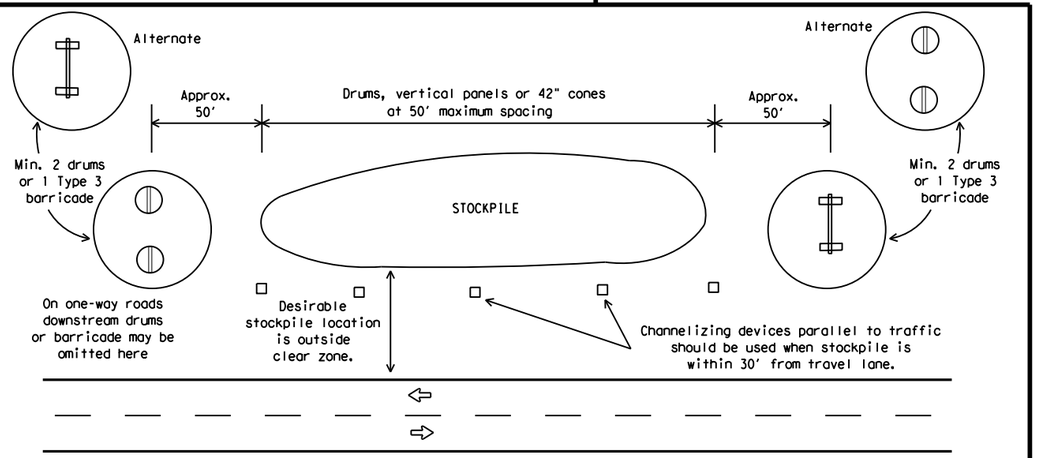
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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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.

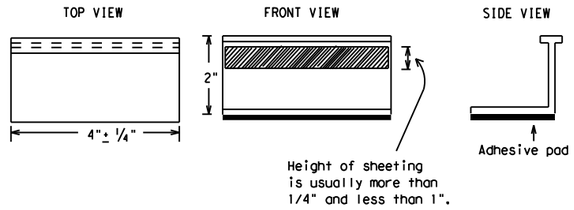
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	AMA	RANDALL		23
11-02 8-14				

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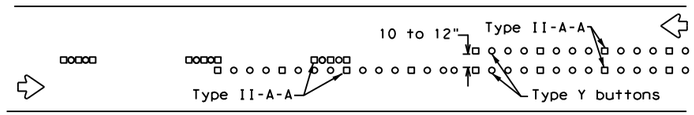
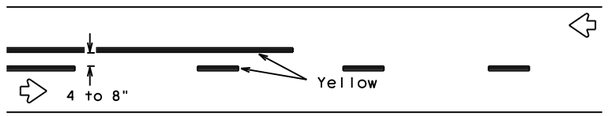
PAVEMENT MARKING PATTERNS

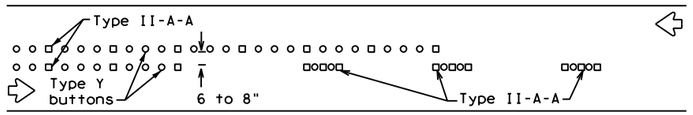
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



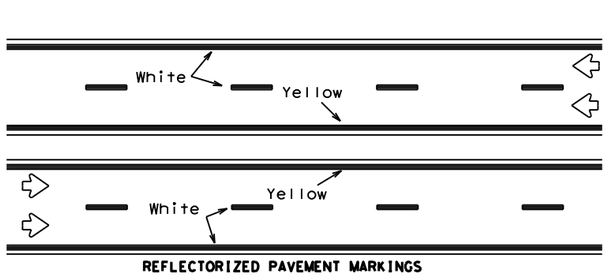
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



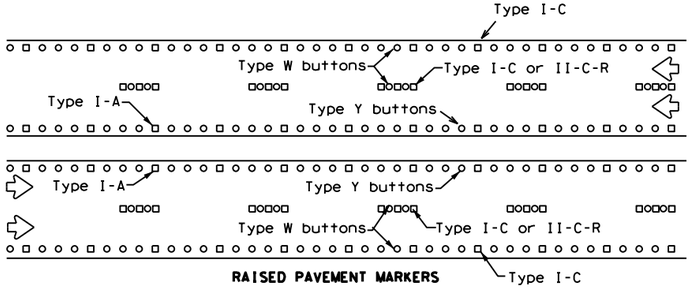
RAISED PAVEMENT MARKERS - PATTERN B

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

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



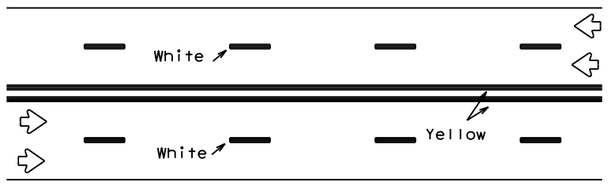
REFLECTORIZED PAVEMENT MARKINGS



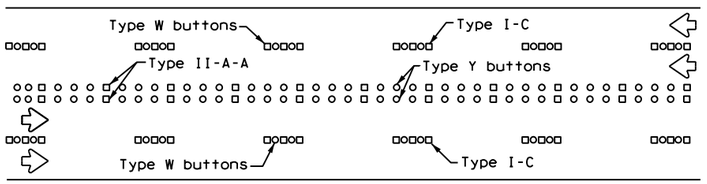
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



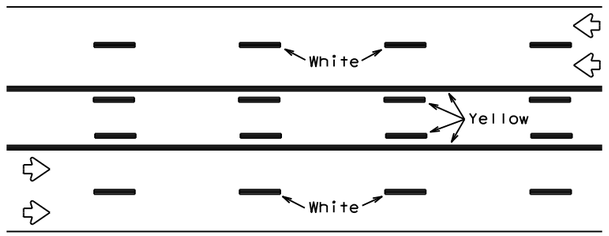
REFLECTORIZED PAVEMENT MARKINGS



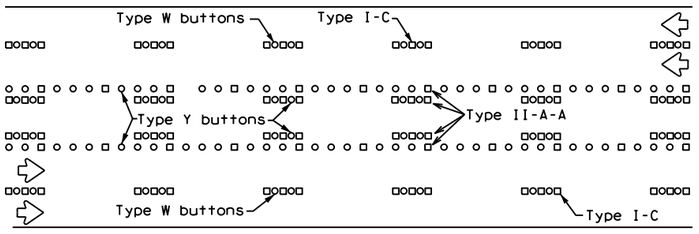
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

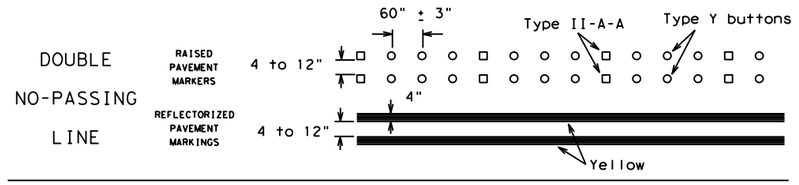
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

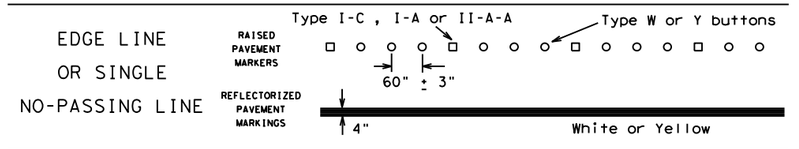
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

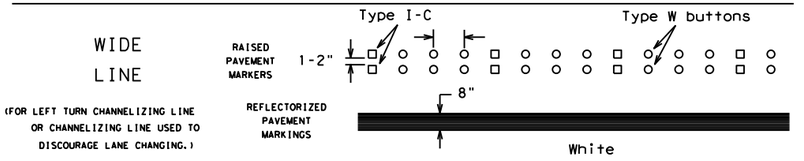


EDGE LINE OR SINGLE NO-PASSING LINE



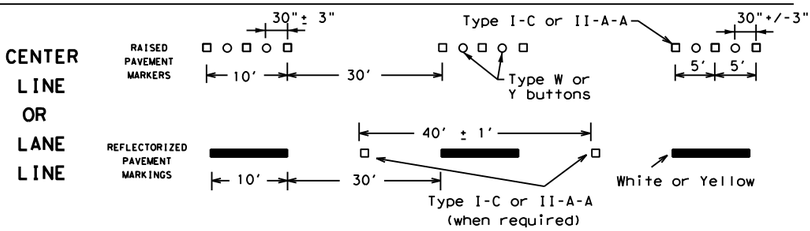
WIDE LINE

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

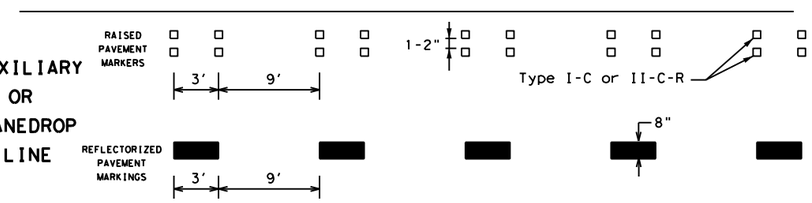


BROKEN LINES

CENTER LINE OR LANE LINE

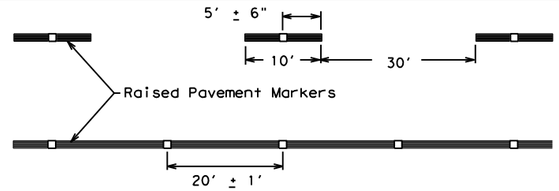


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

SHEET 12 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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1-97 9-07 5-21	DIST	COUNTY		SHEET NO.
2-98 7-13	AMA	RANDALL		24
11-02 8-14				

106

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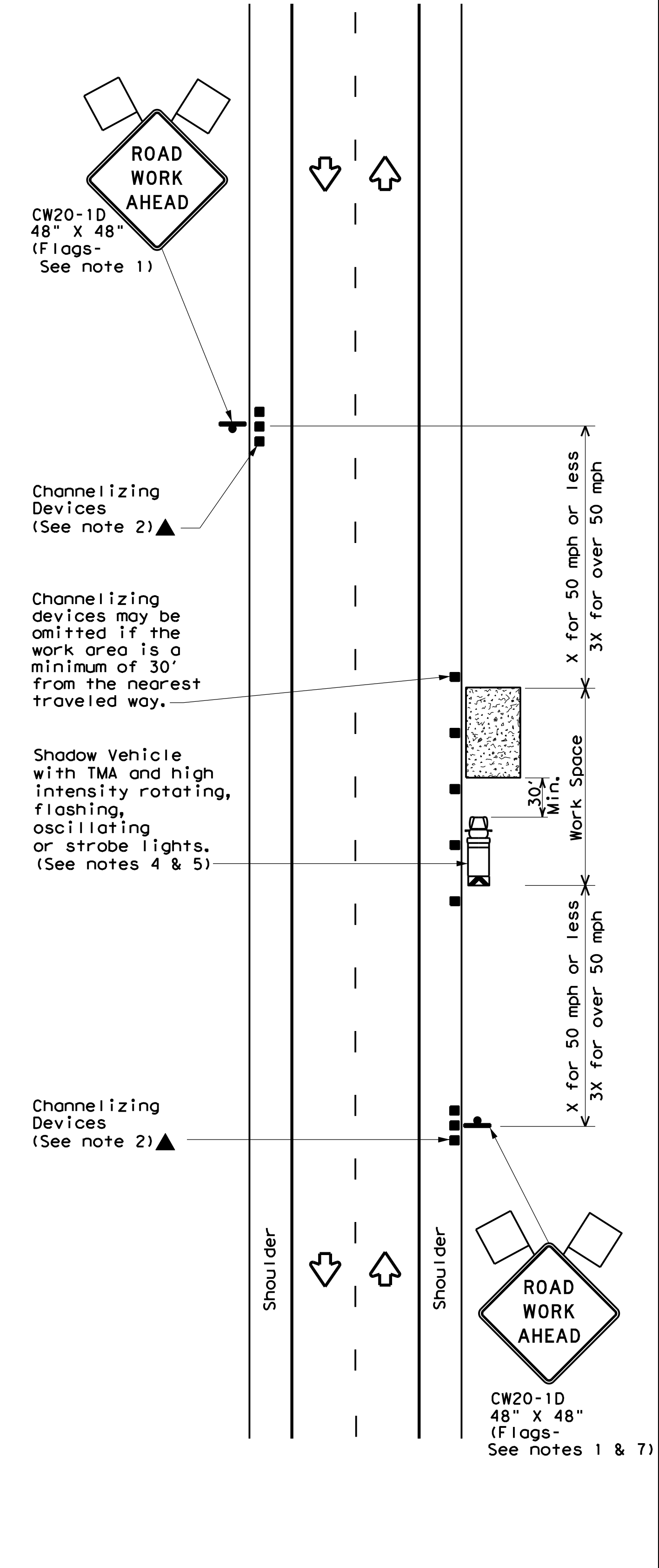
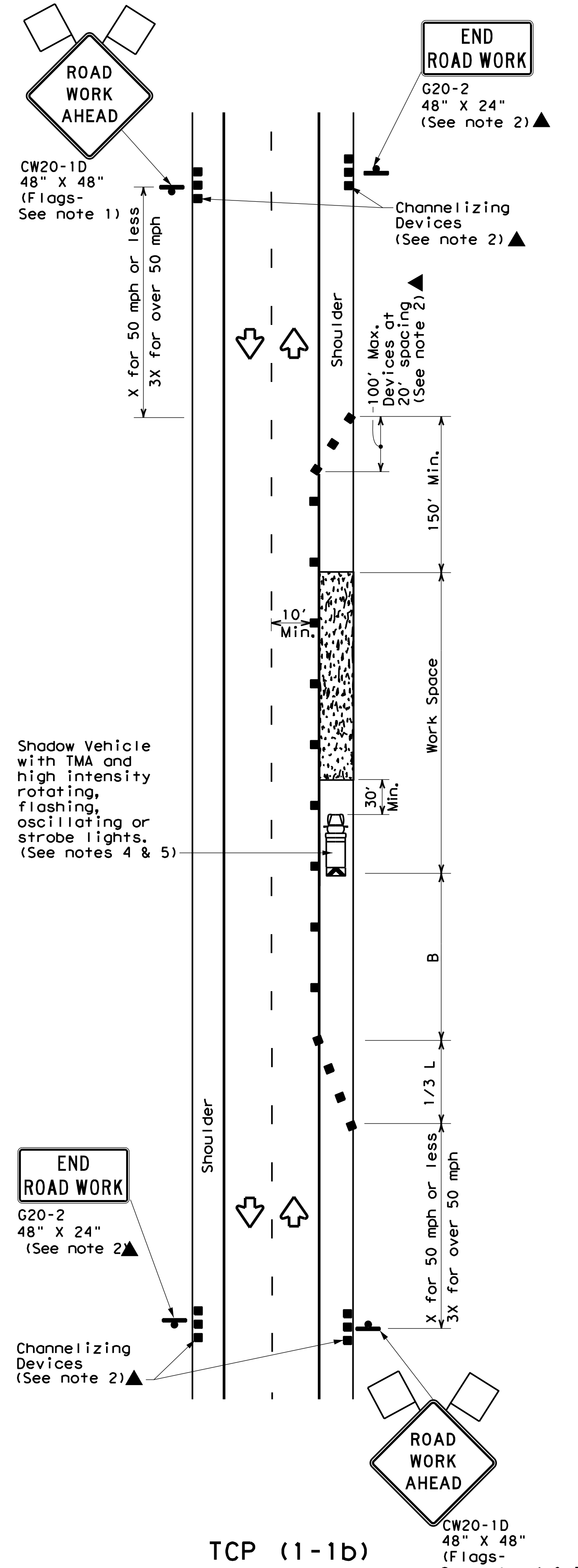


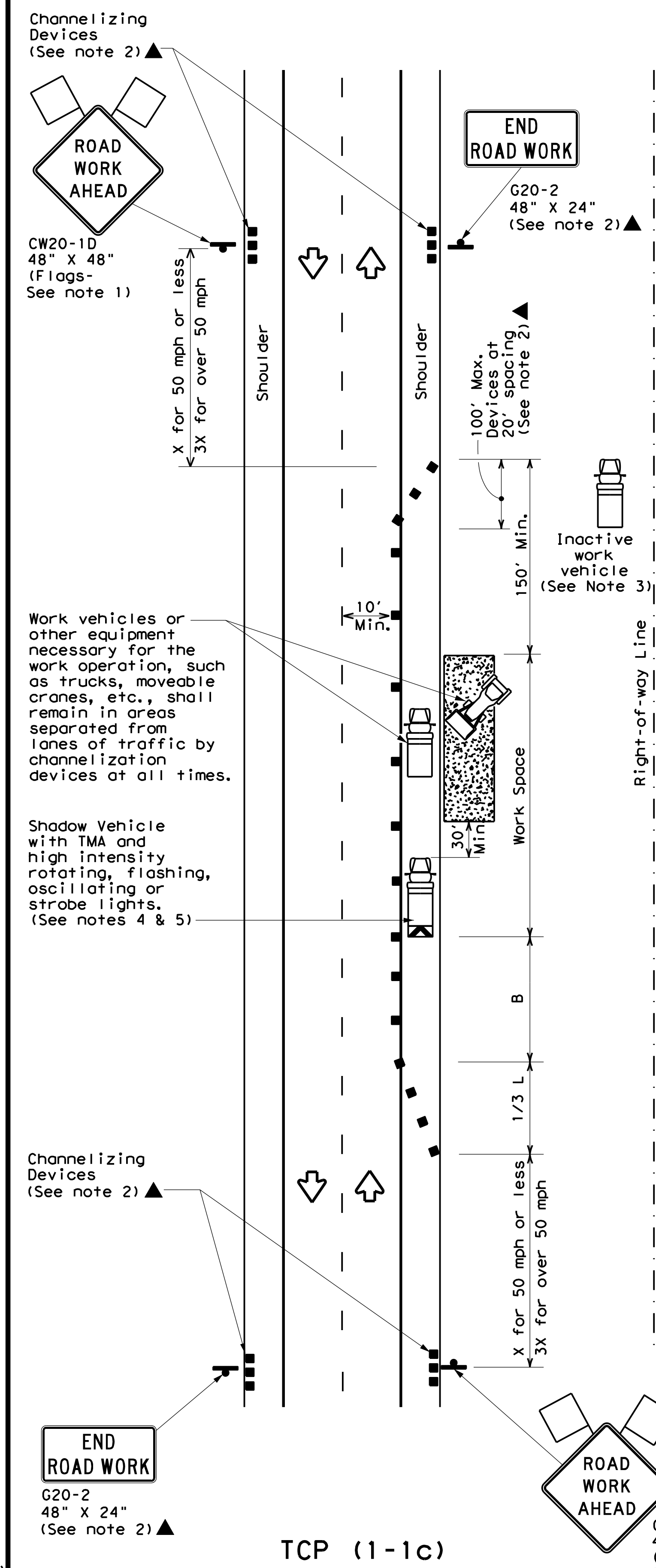
TCP (1-1a)

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 **			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. 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 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 2-94 4-98 / 8-95 2-12 / 1-97 2-18	DIST AMA		COUNTY RANDALL	SHEET NO. 25

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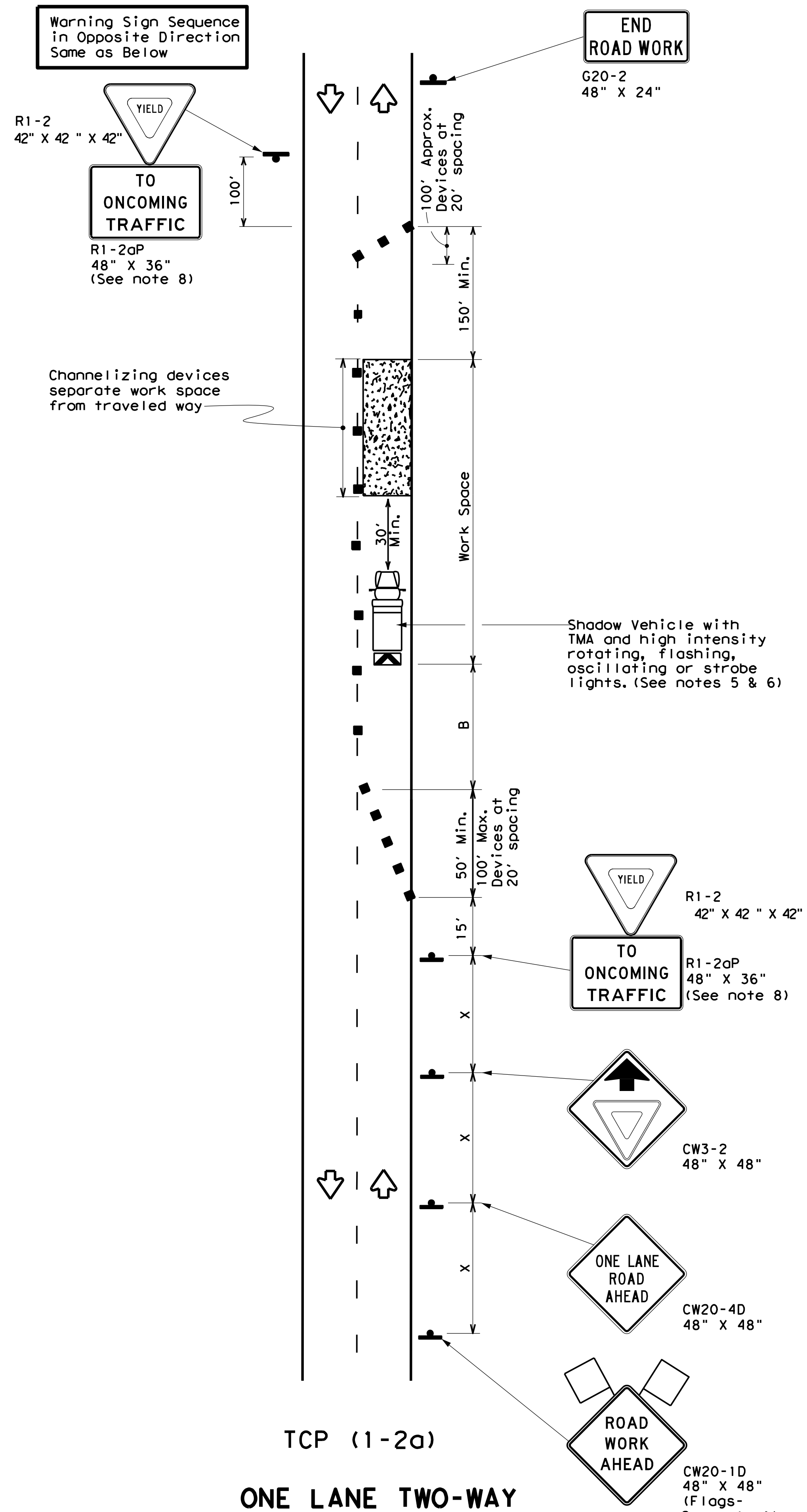
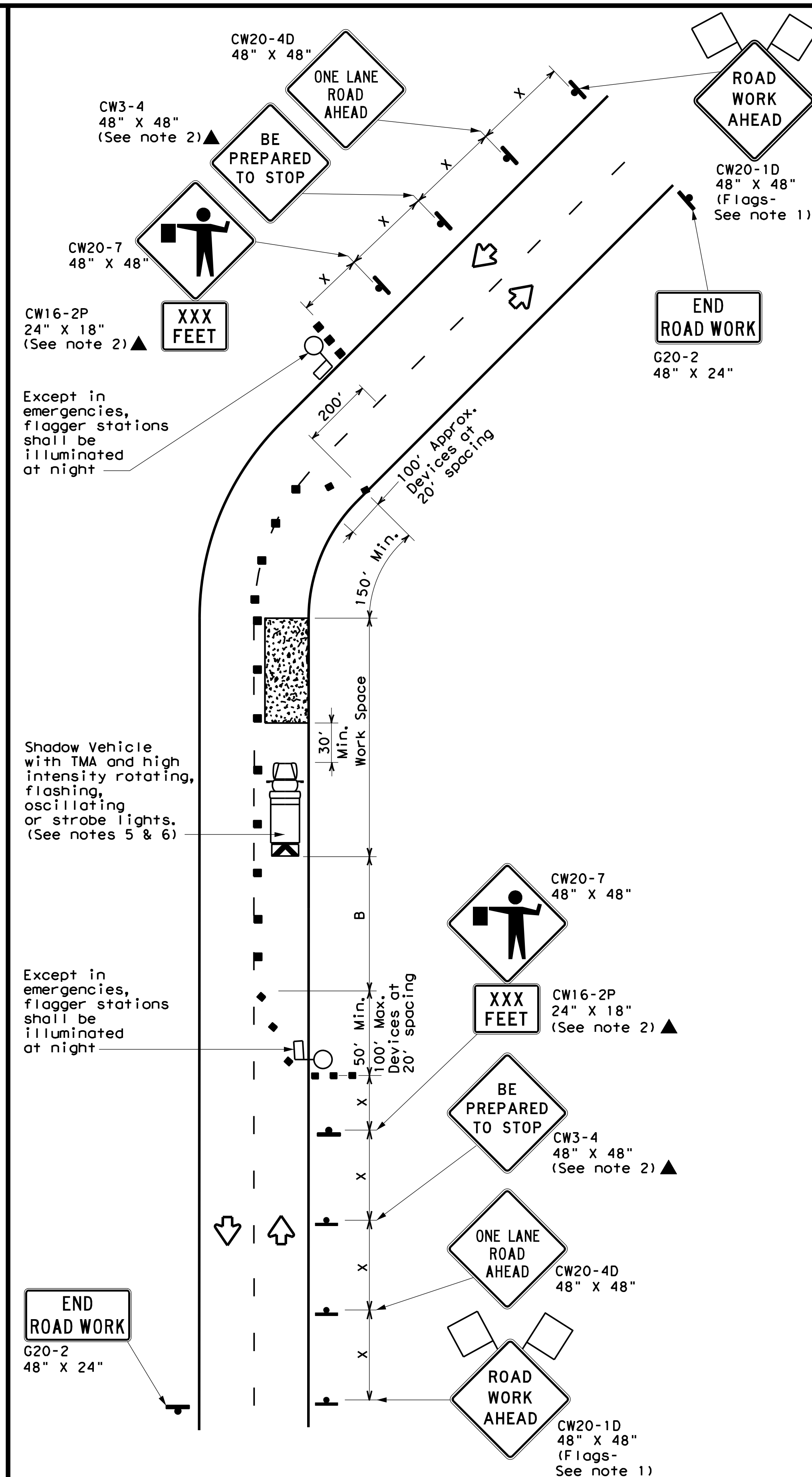


TCP (1-2a)

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		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"	Stopping Sight Distance
		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'	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)

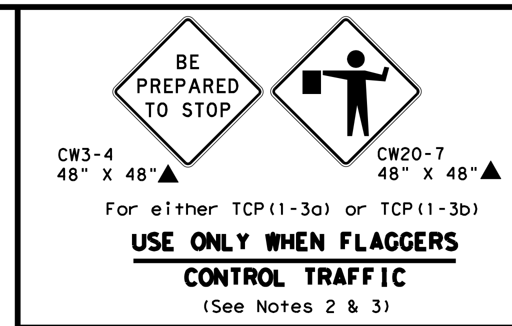
9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain 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.

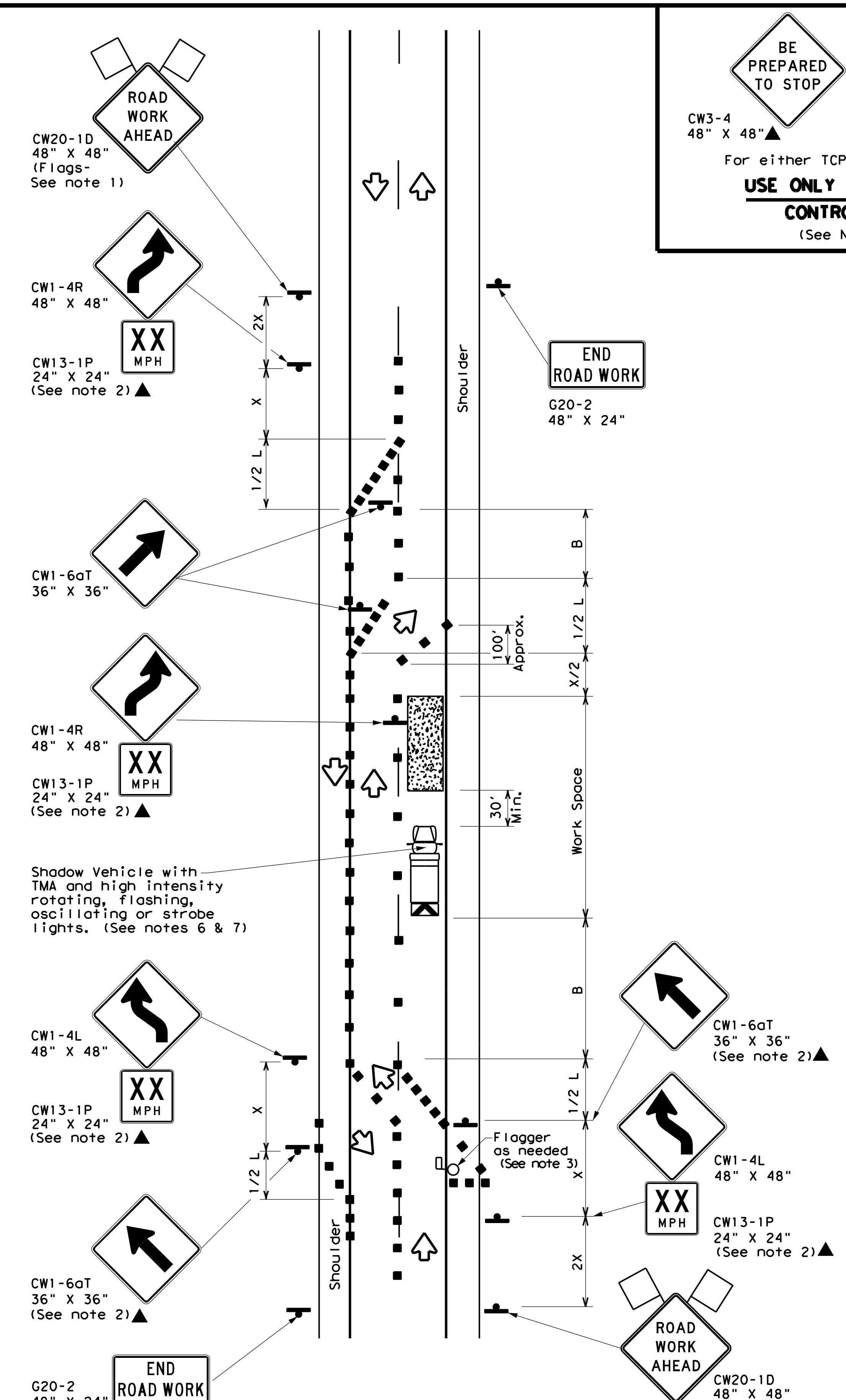
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

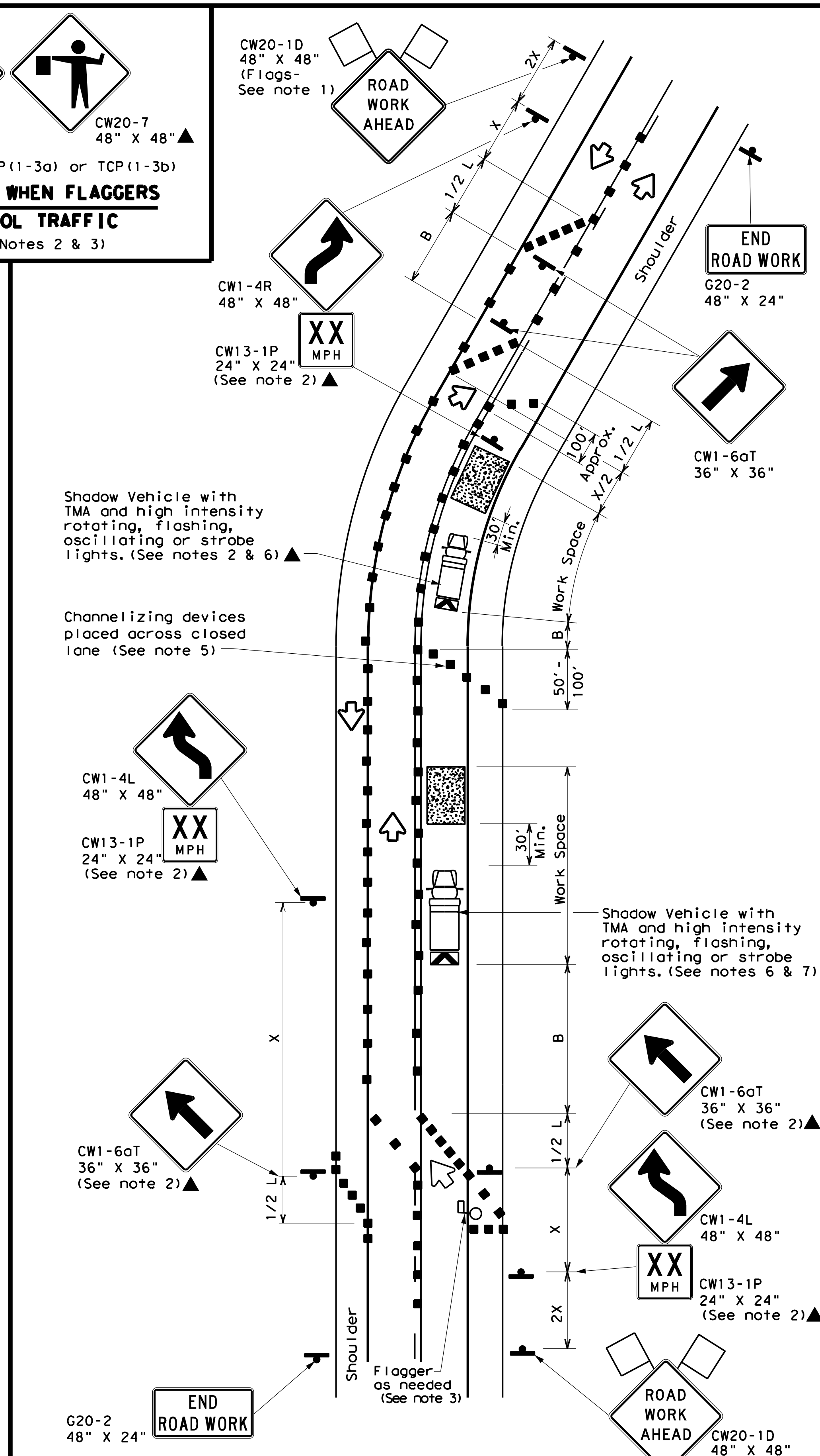
FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	DIST AMA		COUNTY RANDALL	SHEET NO. 26





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

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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	Ⓜ	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
	✓	✓		

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	2635	02	038	SL 335
2-94 4-98	DIST		COUNTY	SHEET NO.
8-95 2-12 1-97 2-18	AMA		RANDALL	27

153

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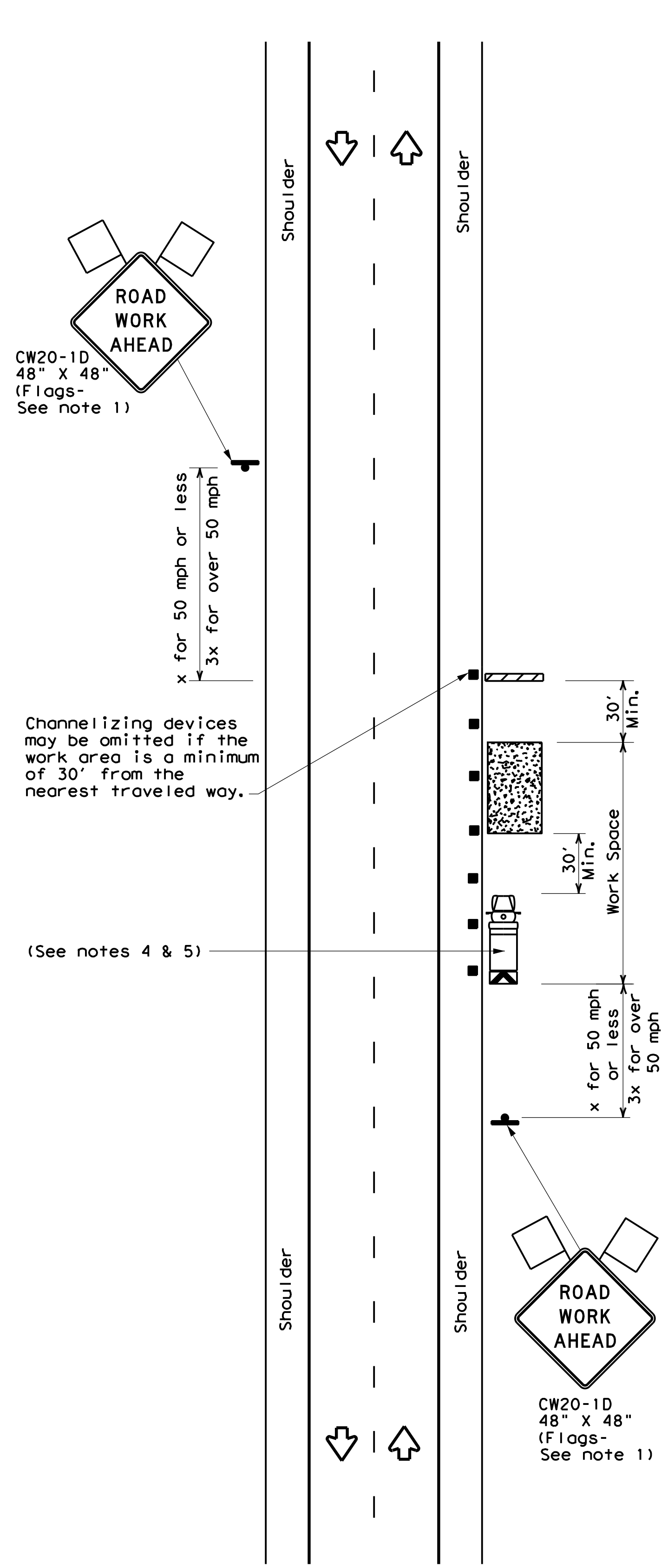
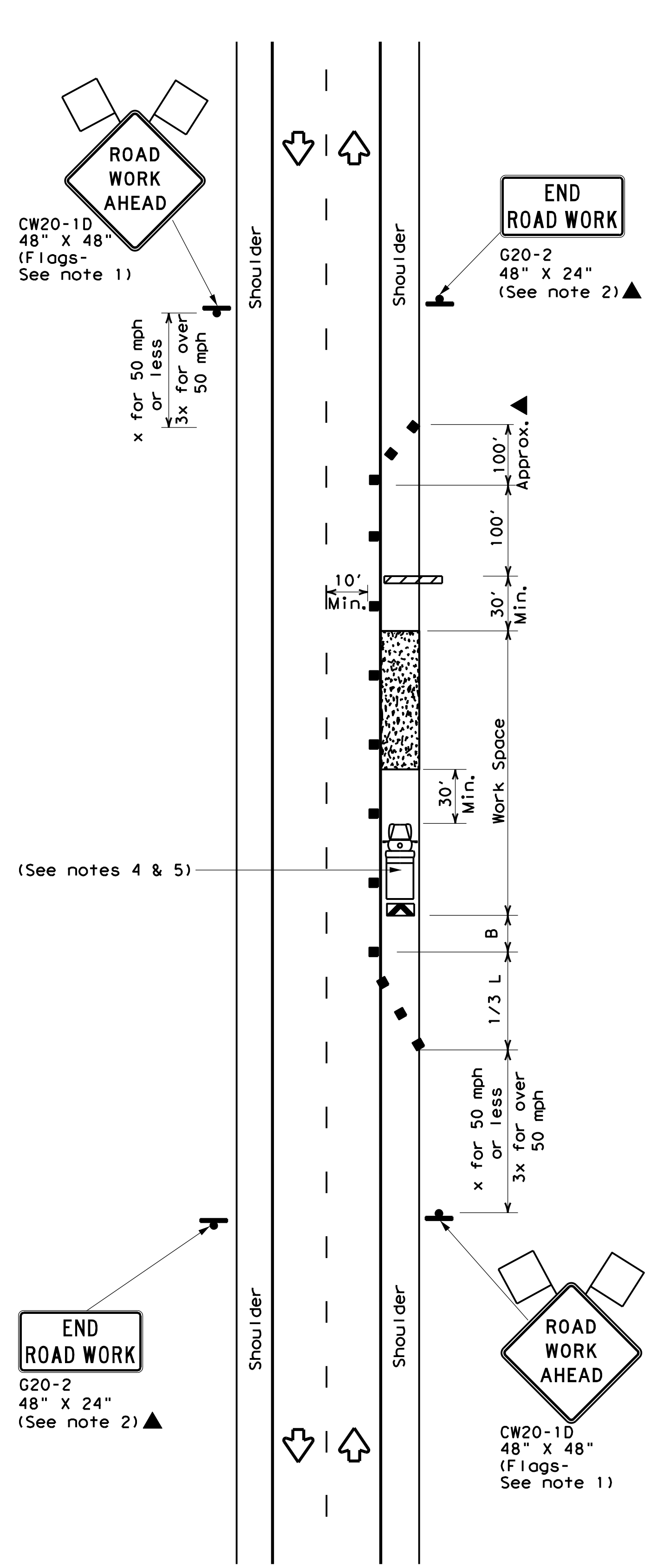


TCP (2-1a)

WORK SPACE NEAR SHOULDER

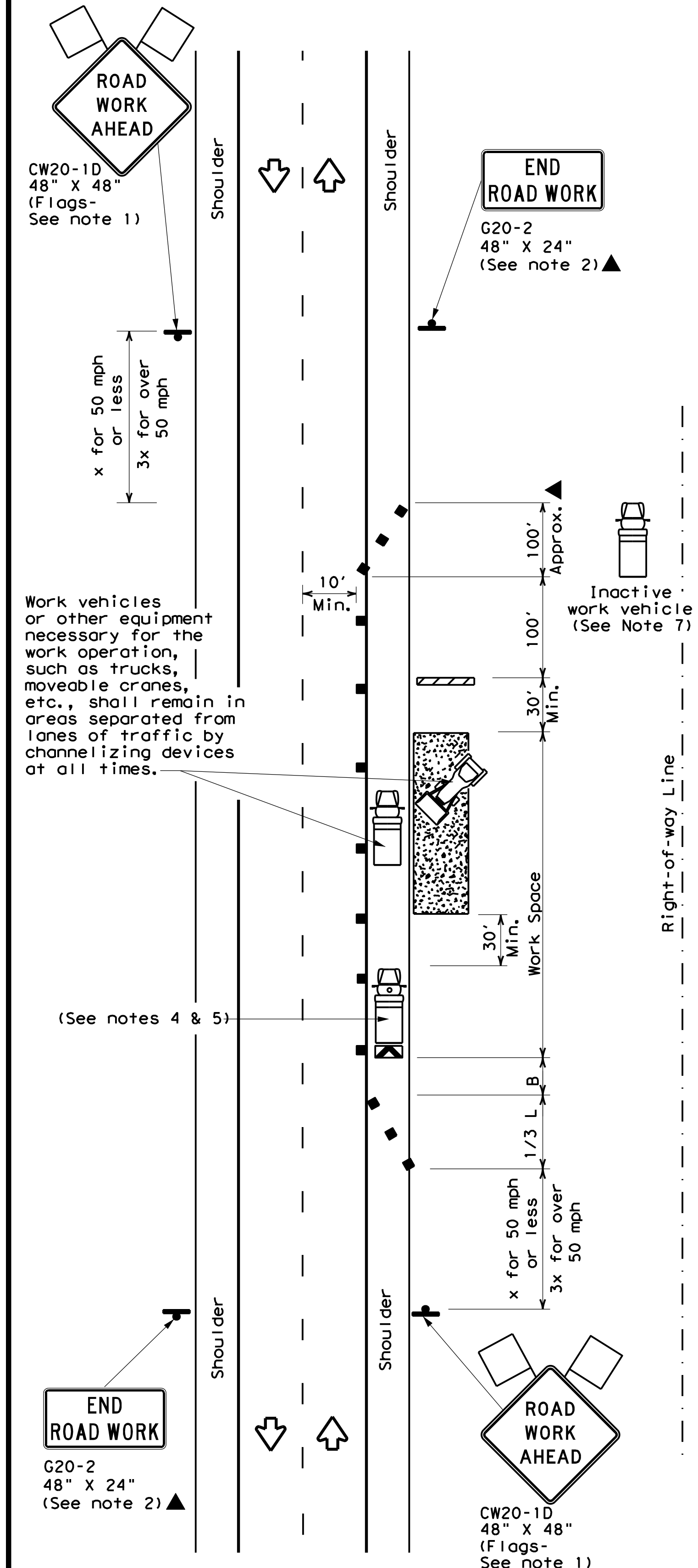
Conventional Roads



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		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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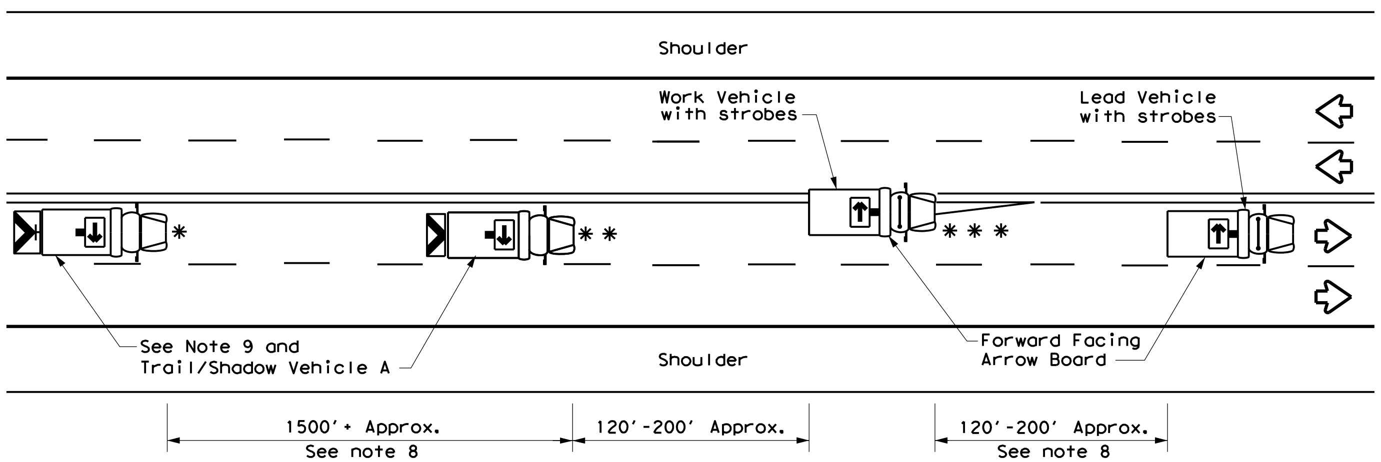
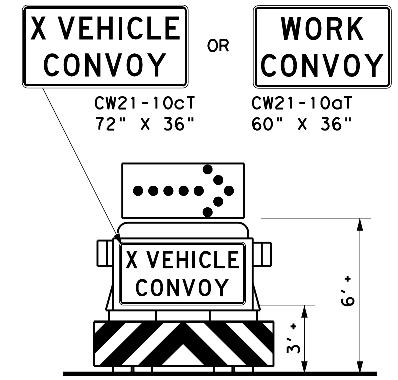
© TxDOT December 1985	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	DIST AMA		COUNTY RANDALL	SHEET NO. 28

161



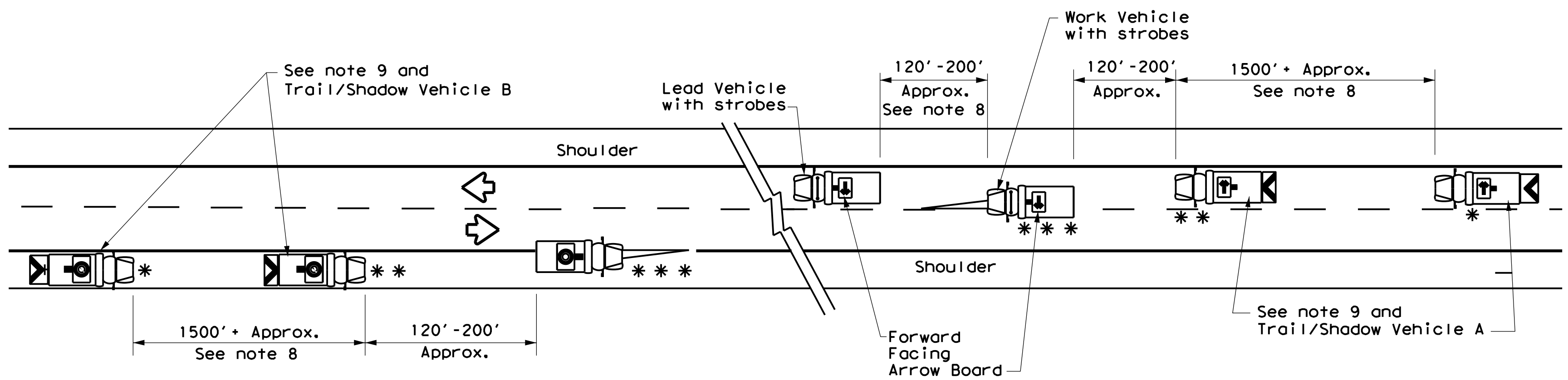
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

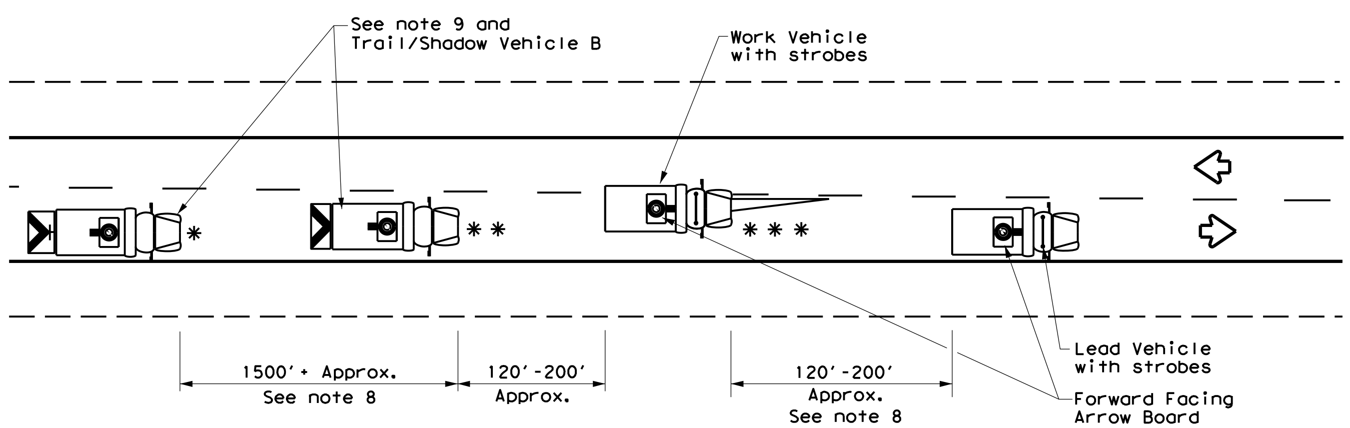


WORK ON SHOULDER

WORK ON TRAVEL LANE

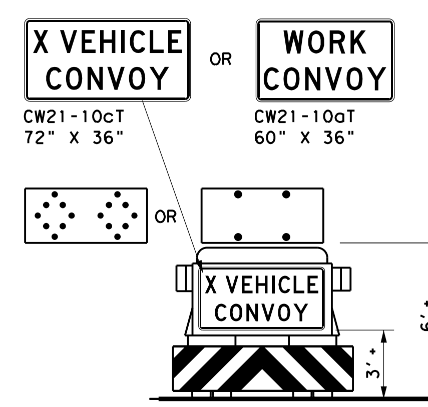
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

LEGEND

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

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.

3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.

4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.

5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.

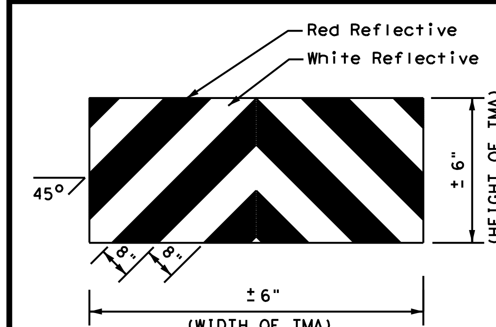
6. Each vehicle shall have two-way radio communication capability.

7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.

8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.

9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.

10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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	AMA		RANDALL	29

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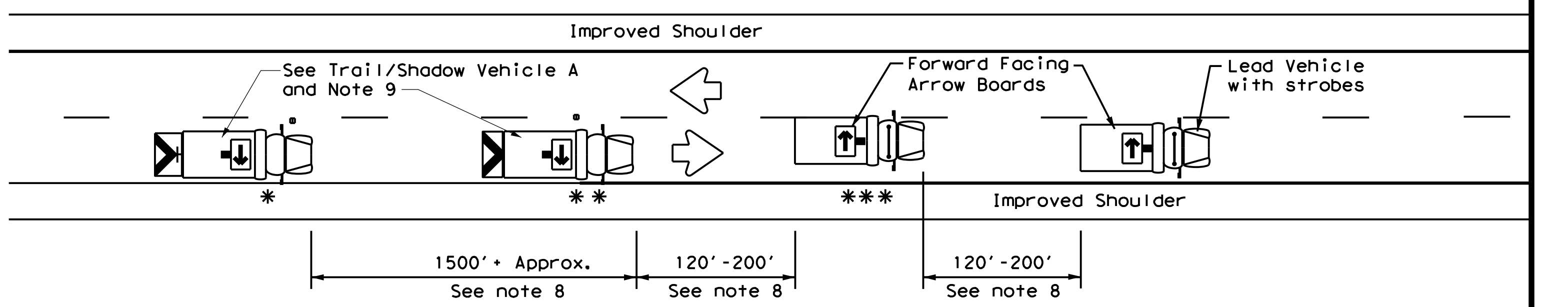
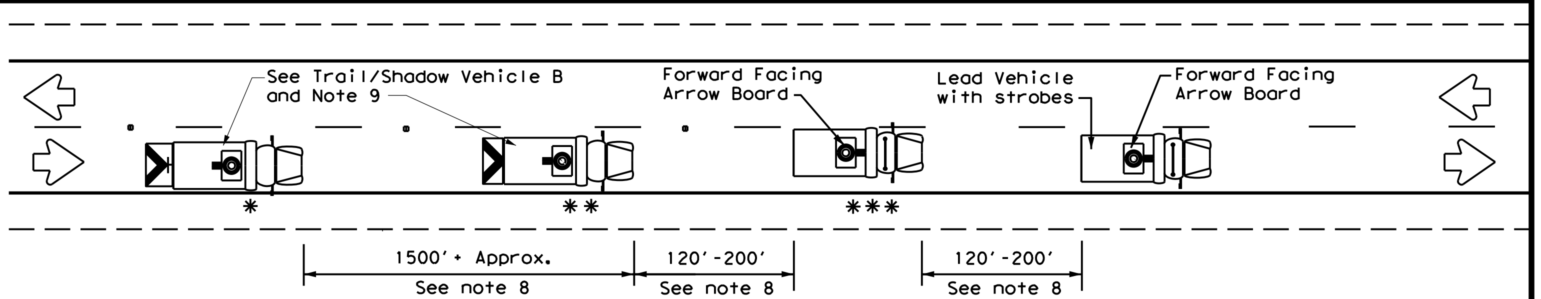


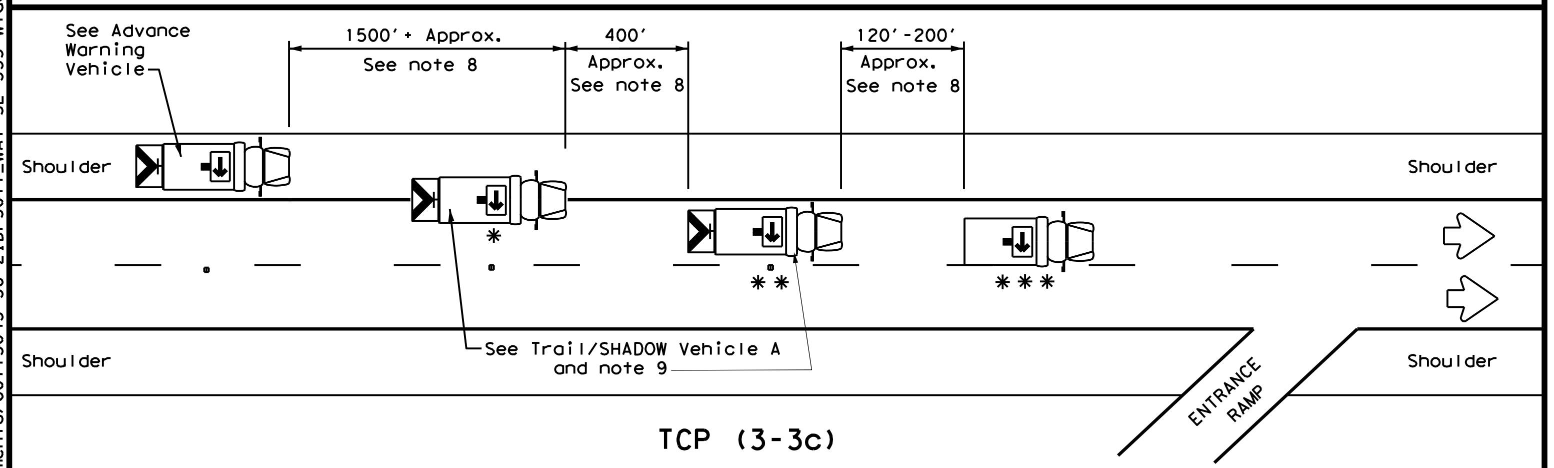
TCP (3-3a)

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



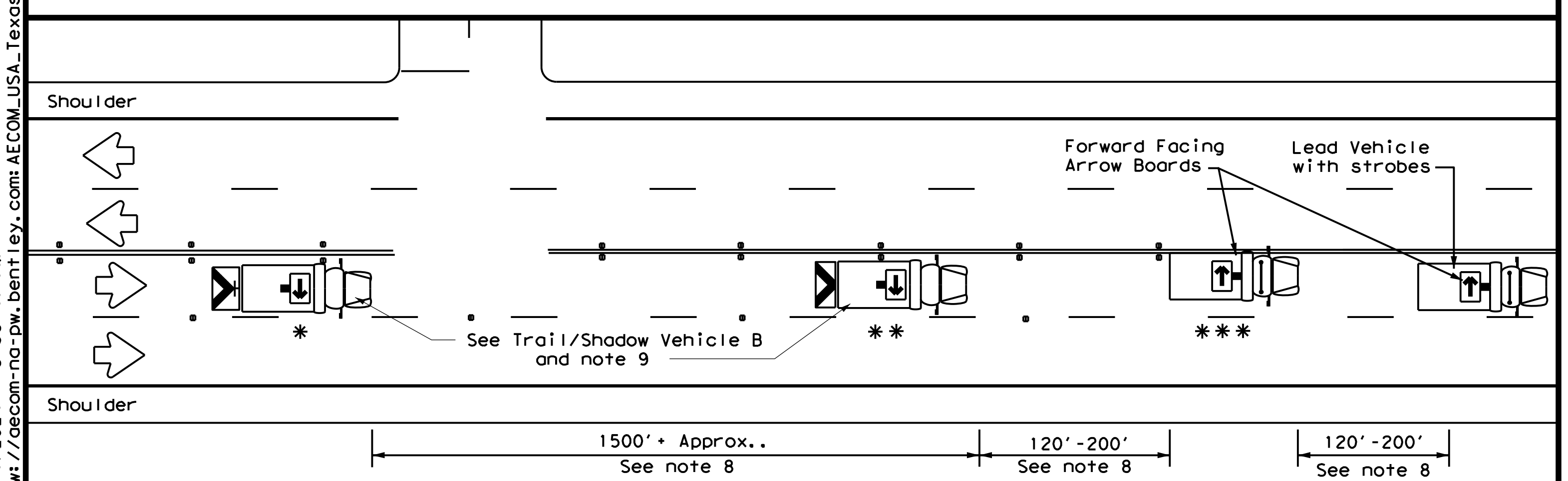
TCP (3-3b)

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



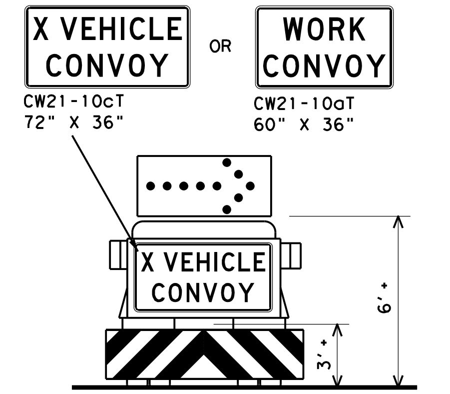
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



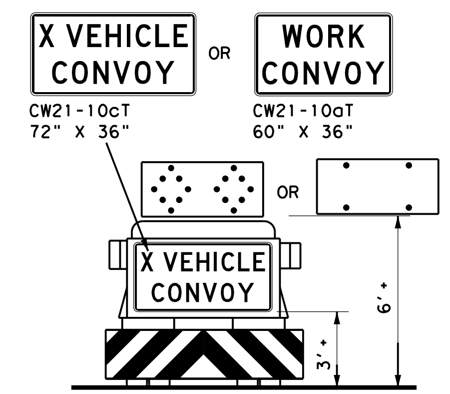
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



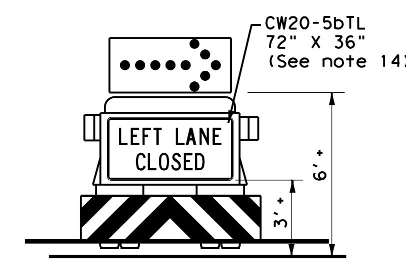
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

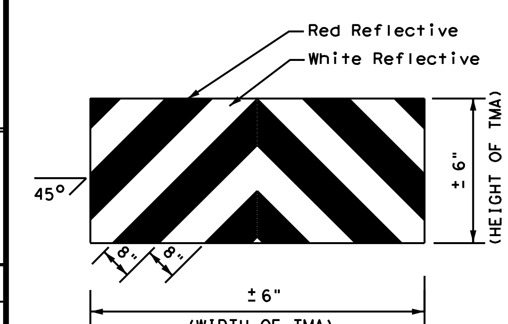


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL
TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST		COUNTY	SHEET NO.
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177

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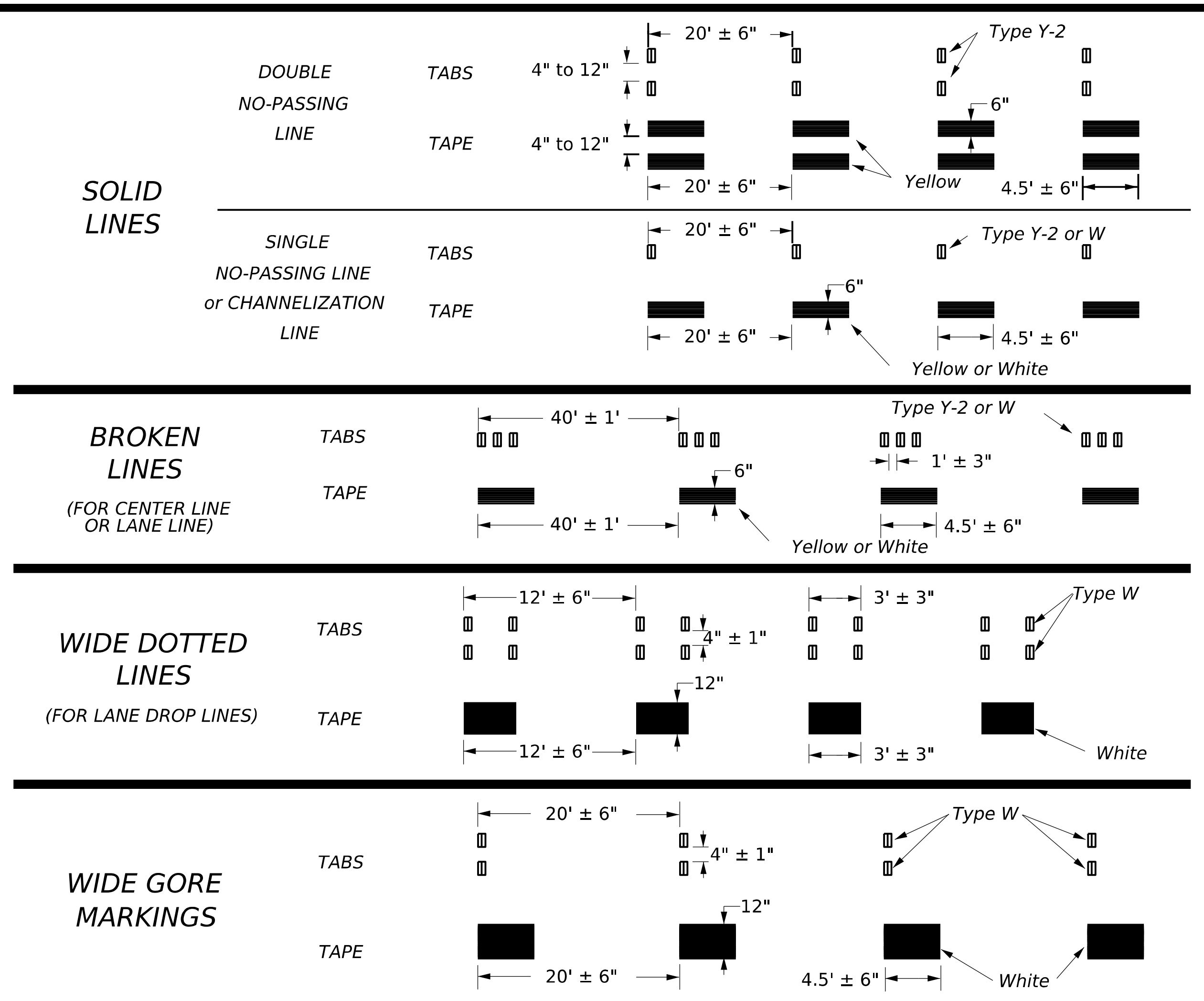
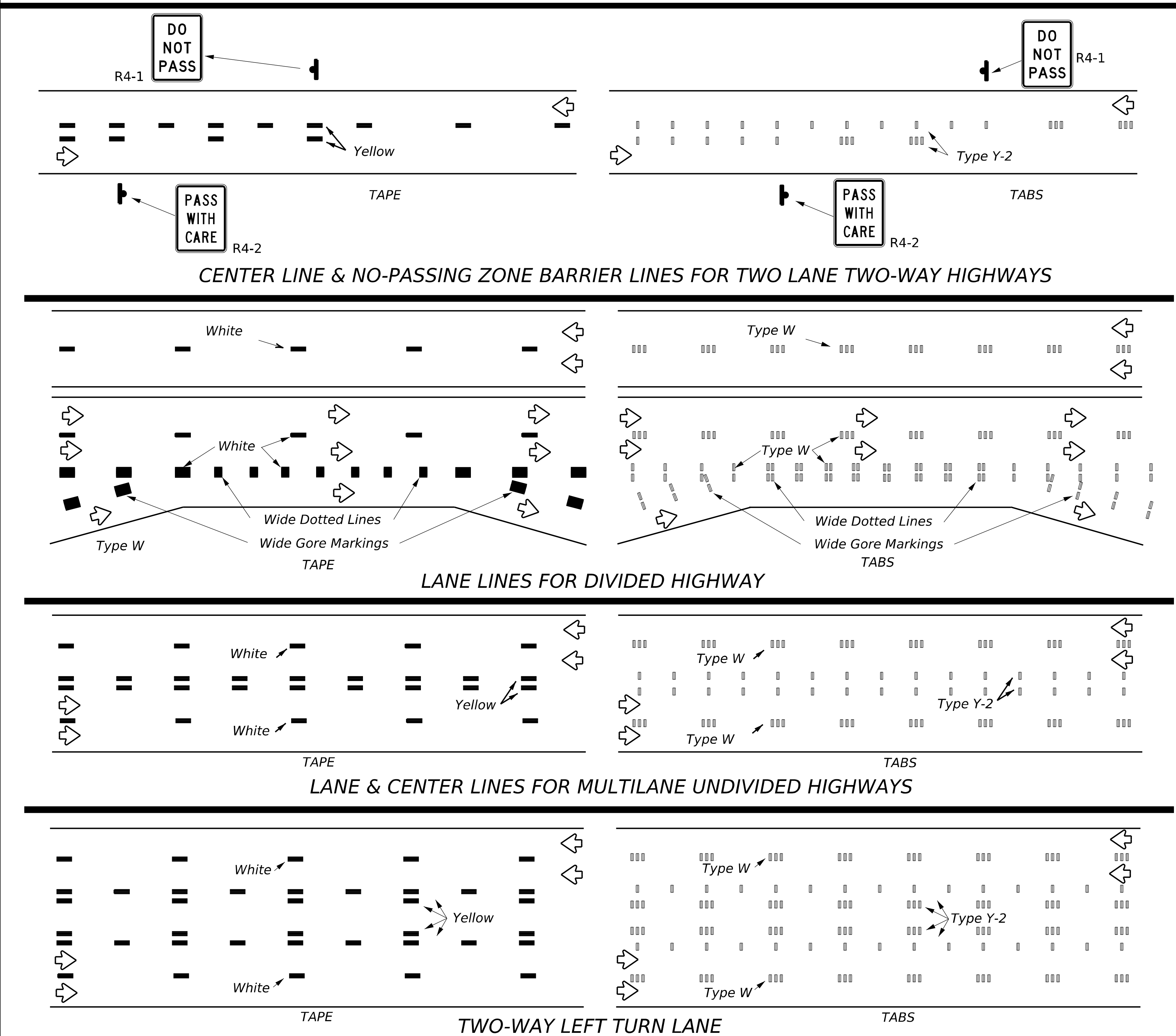
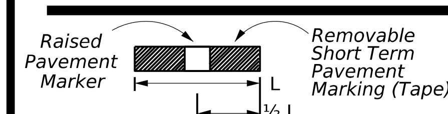
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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.

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.

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 Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

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© TxDOT	February 2023	CONT	SECT	JOB	HIGHWAY
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1-97 2-23 3-03		AMA		RANDALL	31

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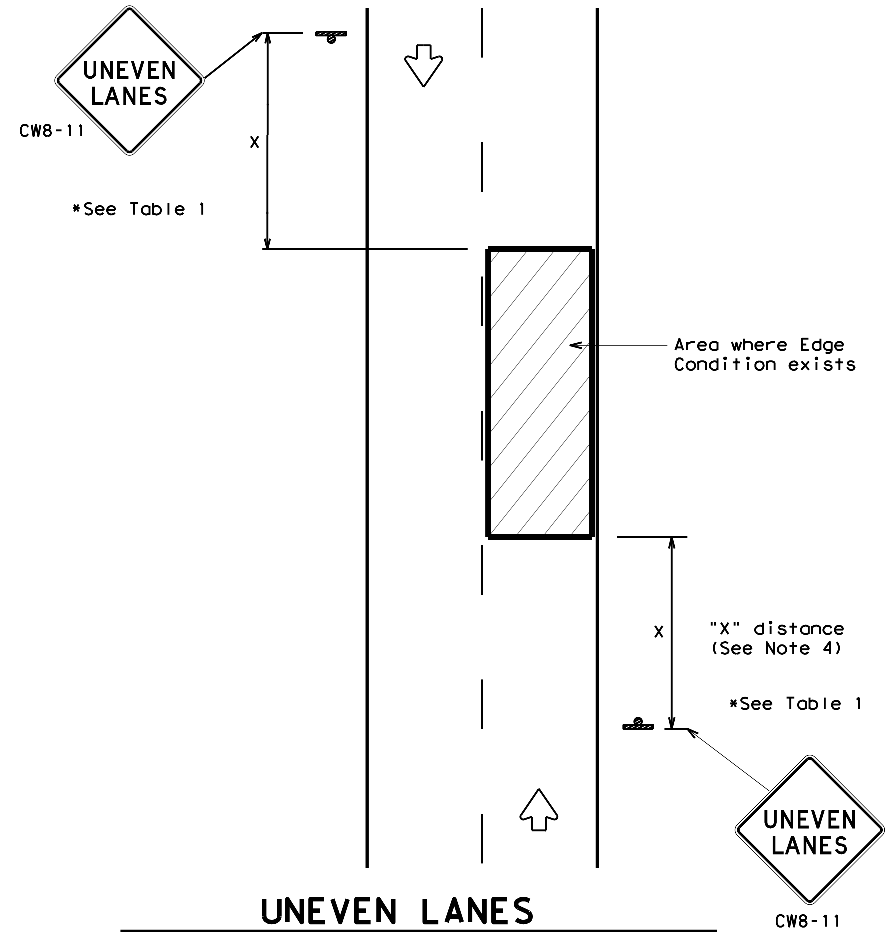
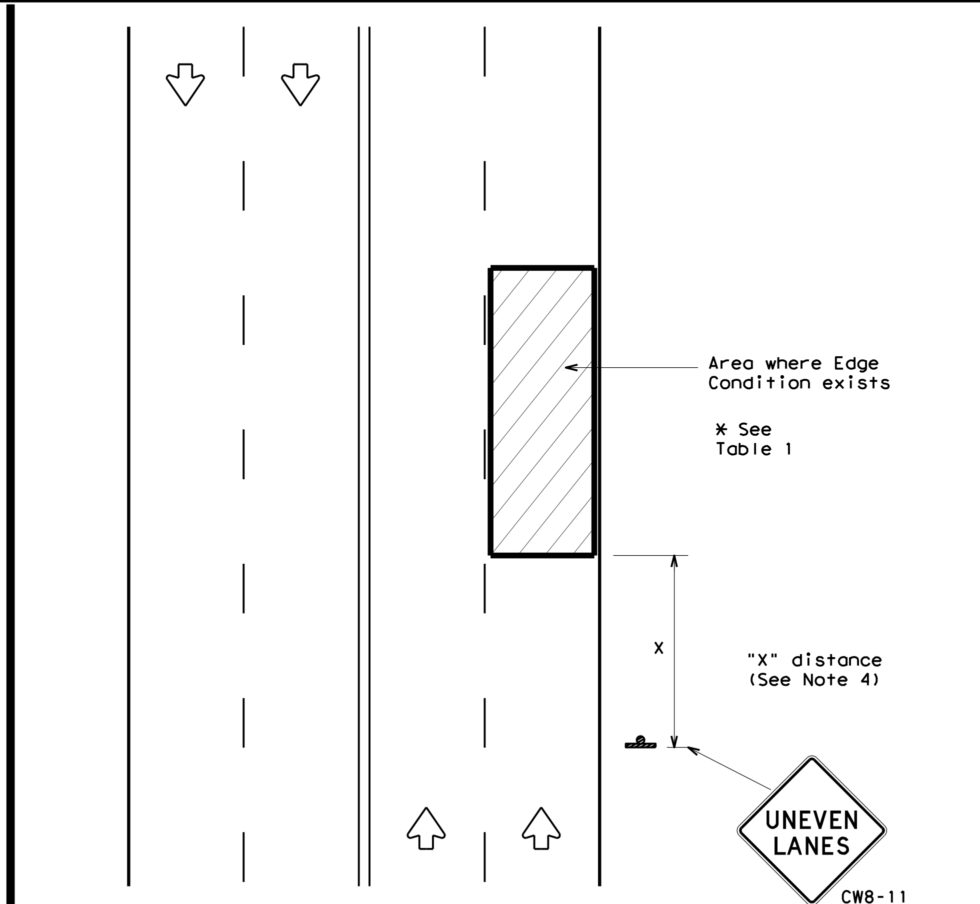
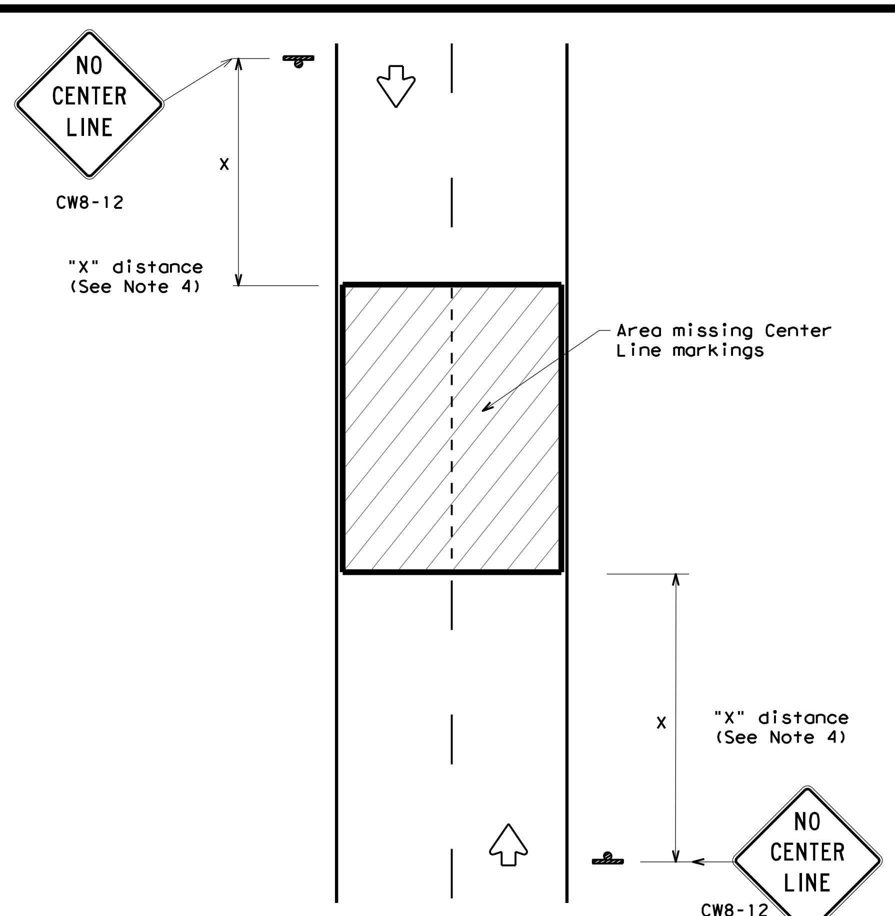


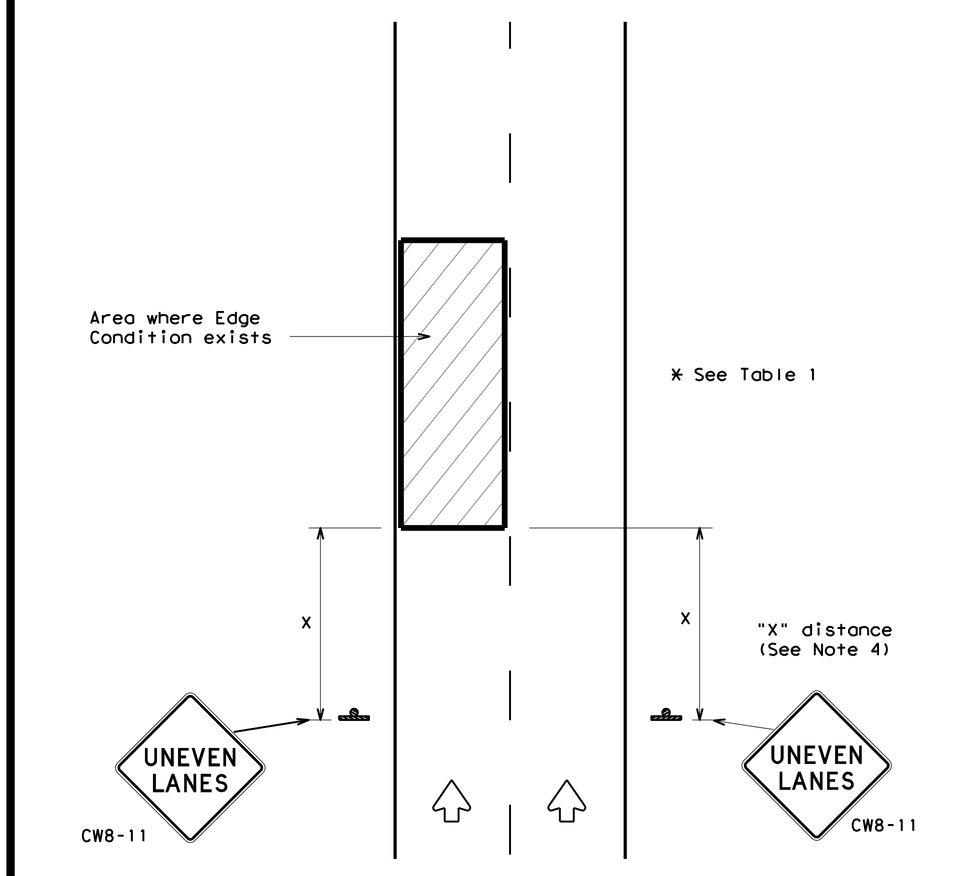
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



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 (D)	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 (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") 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"

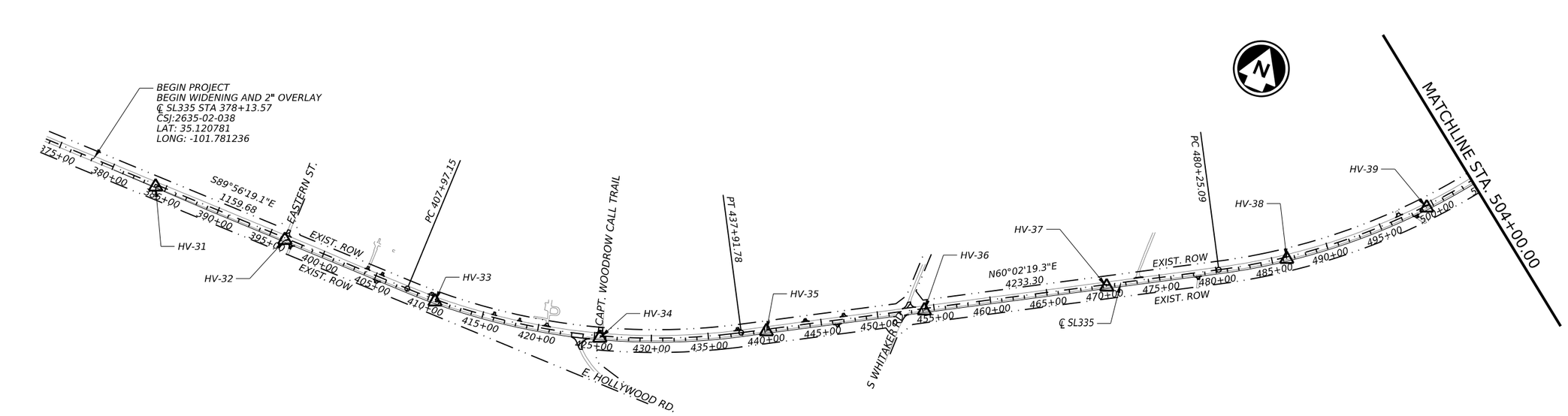
Texas Department of Transportation
Traffic Operations Division Standard

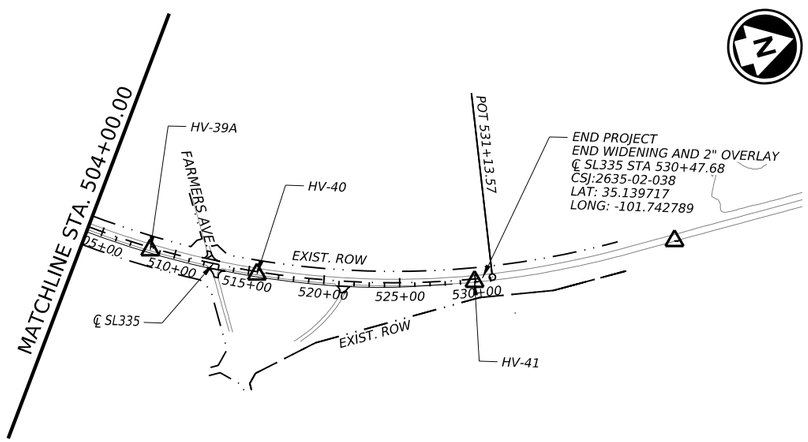
SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
8-95 2-98 7-13 1-97 3-03	DIST AMA		COUNTY RANDALL	SHEET NO. 32

112





POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
HV31	3689785.80	572044.89	3602.1	hv31
HV32	3689785.47	573273.91	3599.74	hv32
HV33	3689790.97	574699.10	3599.99	hv33
HV34	3690048.95	576160.51	3595.48	hv34
HV35	3690660.16	577492.24	3582.37	hv35
HV36	3691360.71	578704.73	3582.61	hv36
HV37	3692166.75	580104.97	3582.51	hv37
HV38	3692995.02	581475.47	3585.55	hv38
HV39	3693882.21	582439.36	3589.43	hv39
HVA39	3694607.22	582971.27	3590.77	hv40
HV40	3695243.88	583312.32	3590.94	hv41
HV41	3696616.77	583740.37	3587.27	hv42

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AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

SURVEY CONTROL INDEX

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		33

DATE: 2/1/2024 5:38:09 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/05 GENERAL/Sheets/SL335_AEC_HV_IN_001.dgn

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-31	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

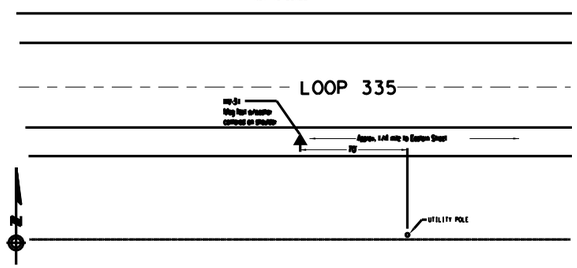
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'14.6497"N	North (Y): 3688862.060	North (Y): 3689785.799
Longitude: 101°46'54.4341"W	East (X): 571901.681	East (X): 572044.892
		NAVD-88 Elevation: 3602.10

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-32	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

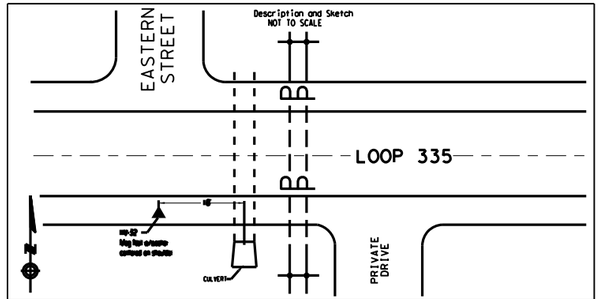
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'14.6808"N	North (Y): 3688861.734	North (Y): 3689785.473
Longitude: 101°46'39.6422"W	East (X): 573130.391	East (X): 573273.910
		NAVD-88 Elevation: 3599.74

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-33	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

Stations from which the horizontal position was established:
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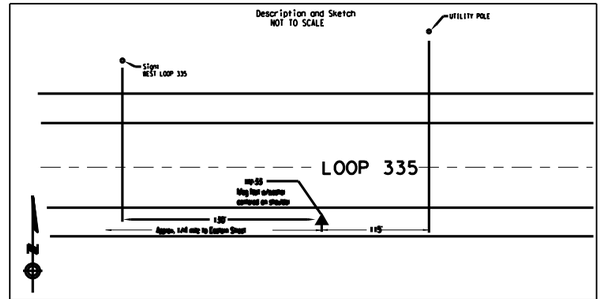
Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'14.7744"N	North (Y): 3688867.229	North (Y): 3689790.969
Longitude: 101°46'22.4894"W	East (X): 574555.223	East (X): 574699.099
		NAVD-88 Elevation: 3599.99

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

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Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

SURVEY CONTROL SHEET

SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		34

DATE: 2/1/2024 5:38:33 PM
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Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-34	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

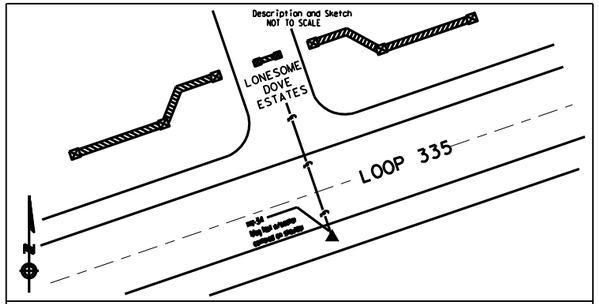
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'17.3651"N	North (Y): 3689125.142	North (Y): 3690048.947
Longitude: 101°46'04.9090"W	East (X): 576016.265	East (X): 576160.507
		NAVD-88 Elevation: 3595.48

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-35	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

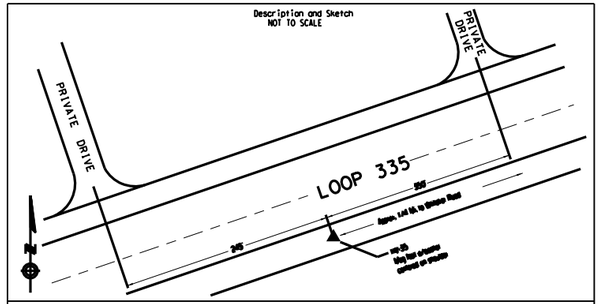
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'23.4446"N	North (Y): 3689736.205	North (Y): 3690660.163
Longitude: 101°45'48.9003"W	East (X): 577347.667	East (X): 577492.242
		NAVD-88 Elevation: 3582.37

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-36	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

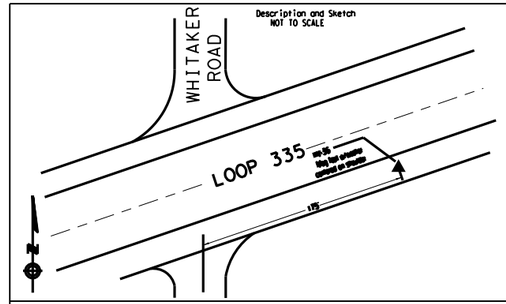
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'30.4039"N	North (Y): 3690436.575	North (Y): 3691360.709
Longitude: 101°45'34.3290"W	East (X): 578559.855	East (X): 578704.734
		NAVD-88 Elevation: 3582.61

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

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(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

SURVEY CONTROL SHEET

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		35

DATE: 2/1/2024 5:38:34 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/05 GENERAL/Sheets/SL335 AEC HV 001.dgn

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-37	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

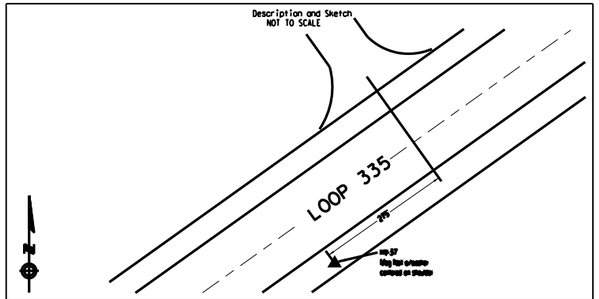
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'38.4106"N	North (Y): 3692142.413	North (Y): 3692166.748
Longitude: 101°45'17.5005"W	East (X): 579959.741	East (X): 580104.970
		NAVD-88 Elevation: 3582.51

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-38	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

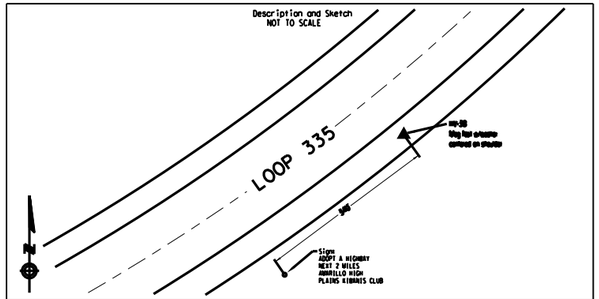
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'46.6358"N	North (Y): 3692070.476	North (Y): 3692995.018
Longitude: 101°45'01.0297"W	East (X): 581329.898	East (X): 581475.470
		NAVD-88 Elevation: 3585.55

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-39	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

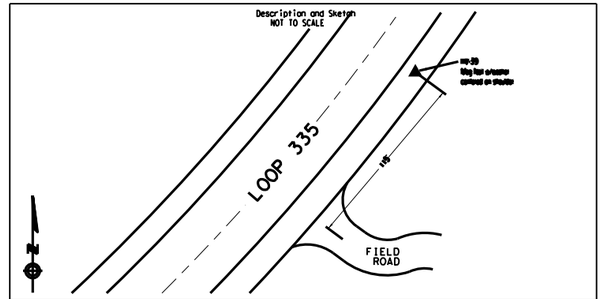
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°07'55.4330"N	North (Y): 3692957.440	North (Y): 3693882.205
Longitude: 101°44'49.4542"W	East (X): 582293.544	East (X): 582439.358
		NAVD-88 Elevation: 3589.43

Description and Sketch
NOT TO SCALE



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01-19-2007 Field Date
A.RAMIREZ Prepared By

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

SURVEY CONTROL SHEET

SHEET 3 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		36

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-39A	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

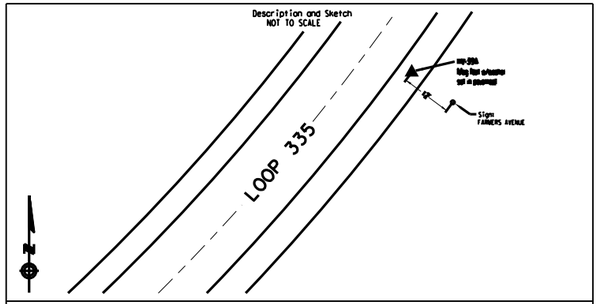
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°08'02.6156"N	North (Y): 3693682.278	North (Y): 3694607.224
Longitude: 101°44'43.0730"W	East (X): 582825.325	East (X): 582971.272
		NAVD-88 Elevation: 3590.77

Description and Sketch
NOT TO SCALE



Use of this control point data for any purpose other than for the specified project for which it was established carries no expressed or implied warranties by TxDOT for the accuracy, completeness, reliability, usability or suitability of this control point data. The department assumes no responsibility for incorrect results or damages resulting from the use of this data.

01-19-2007 — Field Date
A.RAMIREZ — Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-40	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

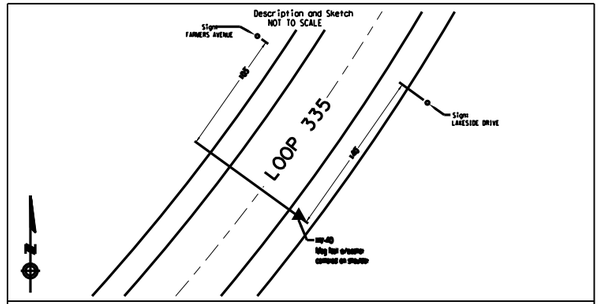
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°08'08.9197"N	North (Y): 3694318.774	North (Y): 3695243.880
Longitude: 101°44'38.9865"W	East (X): 583166.292	East (X): 583312.324
		NAVD-88 Elevation: 3590.94

Description and Sketch
NOT TO SCALE



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01-19-2007 — Field Date
A.RAMIREZ — Prepared By

Texas Department of Transportation
Amarillo District
Horizontal and/or Vertical Control Station

Company: TxDOT
Crew Chief:

Station Name: HV-41	Date Established: 3/21/2007	County: RANDALL

CSJ No. for which station was established:	Highway:	Surface Adjustment Factor for project for which station was established:
04-76-2635-02-022	LOOP 335	1.000250413

Horizontal position was established by: (RTK GPS/STATIC GPS/CONVENTIONAL TRAV) GPS RTK

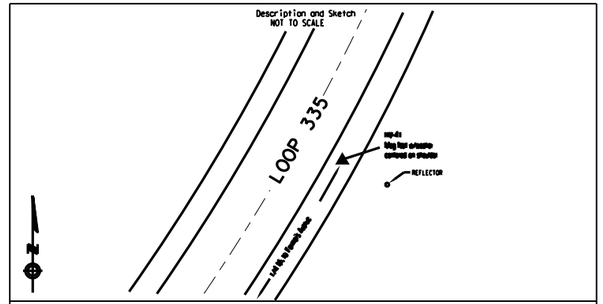
Stations from which the horizontal position was established:
CP2 CP3 CP4 CP5 CP6 CP7 CP8 CP9 CP10 CP11 CP12 CP13 CP14 CP15 CP16

Vertical position was established by: (RTK GPS/STATIC GPS/DIFF. LEVEL/TRIG. LEVEL) DIFF. LEVEL

Stations from which the vertical position was established:
NGS MONUMENT Q1491 ELEVATION= 3656.12

NAD-83 (19) Geodetic Position	NAD-83 (State Plane Coordinates Texas North Zone (US Survey Feet)	Project Coordinates (US Survey Feet):
Latitude: 35°08'22.5063"N	North (Y): 3695691.324	North (Y): 3696616.773
Longitude: 101°44'33.8744"W	East (X): 583594.231	East (X): 583740.370
		NAVD-88 Elevation: 3587.27

Description and Sketch
NOT TO SCALE



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01-19-2007 — Field Date
A.RAMIREZ — Prepared By

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Texas Department of Transportation

SL 335

SURVEY CONTROL SHEET

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		37

HORIZONTAL ALIGNMENT REPORT

Alignment Name: CL SL 335

	STATION	X	Y
POT	36363.570	3689806.661	569997.504
PC	40797.155	3689801.912	574431.086
Tangential Direction:	S89.939°E		
Tangential Length:	4433.585		
PC	40797.155	3689801.912	574431.086
PI	42329.697	3689800.27	575963.628
CC		3695516.908	574437.208
PT	43791.784	3690565.645	577291.365
Radius:	5715		
Delta:	30.023° Left		
Degree of Curvature (Arc):	1.003°		
Length:	2994.629		
Tangent:	1532.542		
Chord:	2960.487		
Middle Ordinate:	195.027		
External:	201.917		
Back Tangent Direction:	S89.939°E		
Back Radial Direction:	S0.061°W		
Chord Direction:	N75.050°E		
Ahead Radial Direction:	S29.961°E		
Ahead Tangent Direction:	N60.039°E		
PT	43791.784	3690565.645	577291.365
PC	48025.086	3692679.819	580958.941
Tangential Direction:	N60.039°E		
Tangential Length:	4233.302		
PC	48025.086	3692679.819	580958.941
PI	50752.941	3694042.151	583322.253
CC		3697618.088	578112.275
PT	53113.566	3696737.237	583743.803
Radius:	5700		
Delta:	51.149° Left		
Degree of Curvature (Arc):	1.005°		
Length:	5088.48		
Tangent:	2727.855		
Chord:	4921.188		
Middle Ordinate:	558.456		
External:	619.113		
Back Tangent Direction:	N60.039°E		
Back Radial Direction:	S29.961°E		
Chord Direction:	N34.464°E		
Ahead Radial Direction:	S81.110°E		
Ahead Tangent Direction:	N8.890°E		

SL 335 SUPERELEVATON TRANSITION TABLE

DESCRIPTION	BEGIN TRANSITION (RT)		END TRANSITION (RT)		LENGTH
	STA	e	STA	e	FT
TRANSITION	404+60.00	-2.82%	409+40.00	3.00%	480
FULL SUPER	409+40.00	3.00%	436+50.00	3.00%	
TRANSITION	436+50.00	3.00%	441+30.00	-3.11%	480
TRANSITION	477+45.00	-0.61%	481+45.00	3.00%	400
FULL SUPER	481+45.00	3.00%	530+47.68	3.00%	

1 = SLOPES AT BEGINNING AND END OF SUPERELEVATION TRANSITIONS WERE MEASURED FROM THE 2007 TXDOT LIDAR

NOTES

1. SUPERELEVATION TRANSITIONS HAVE BEEN CALCULATED FOR THE RIGHT SIDE OF THE ROAD. THE EXISTING SUPERELEVATION SLOPES WILL BE MAINTAINED ON THE LEFT SIDE OF THE ROAD.

2. EXISTING SUPERELEVATION SLOPES WERE ESTIMATED FROM THE 2007 TXDOT LIDAR. SUPERELEVATION SLOPES IN FIELD MAY DIFFER FROM ESTIMATED SLOPES DUE TO AN OVERLAY PROJECT CONSTRUCTED ON SL 335 IN 2019.

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Texas Department of Transportation

SL 335

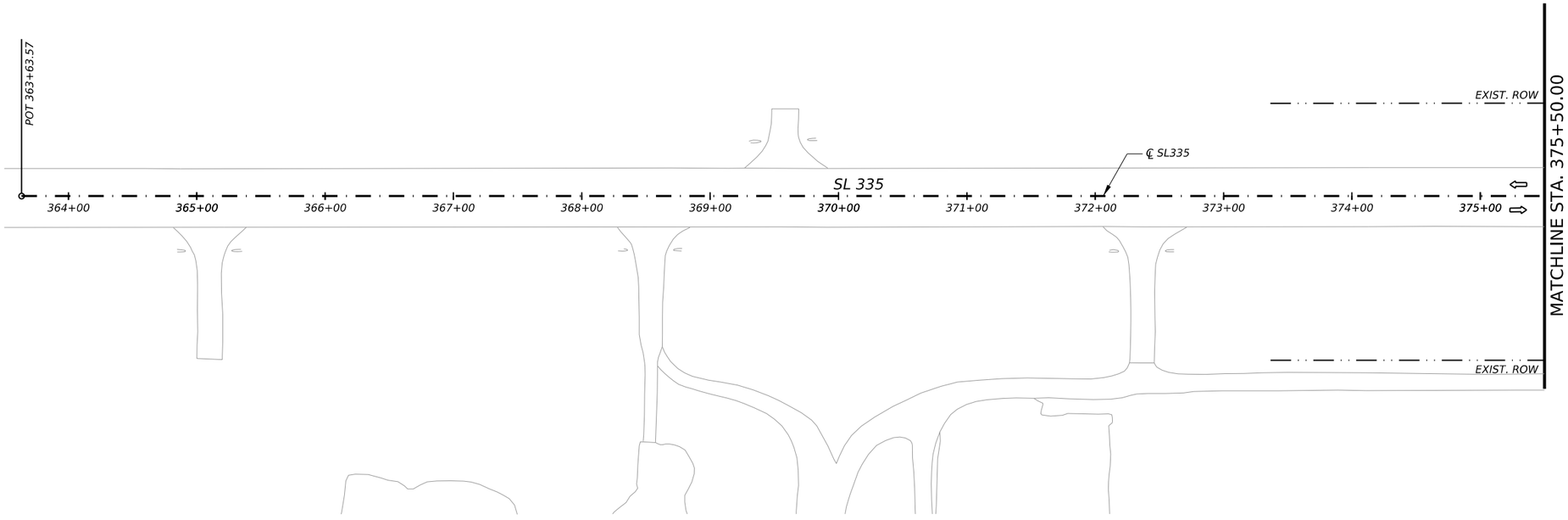
HORIZONTAL ALIGNMENT AND SUPERELEVATION DATA

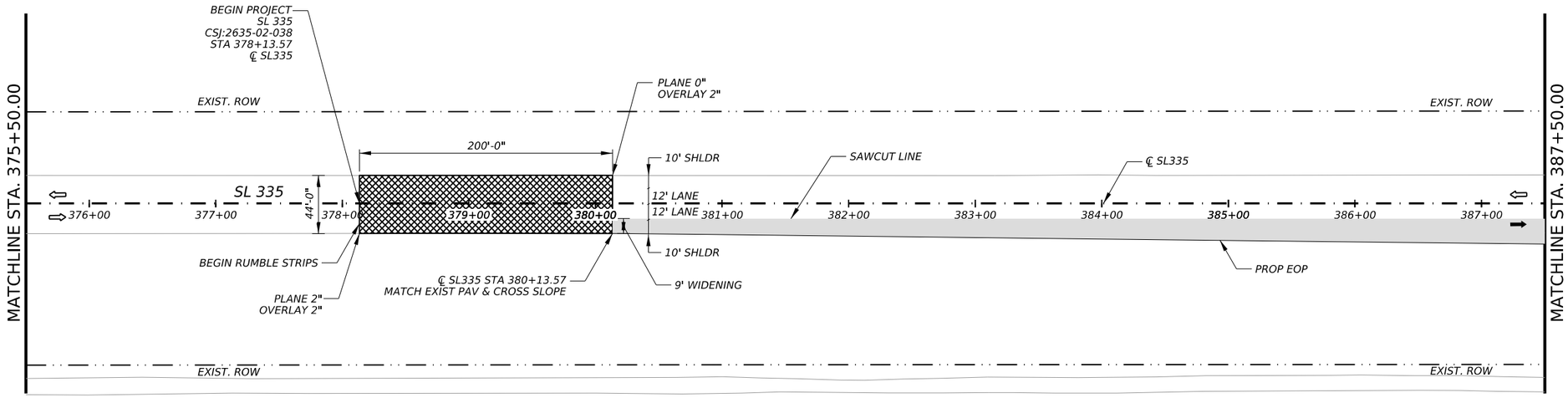
 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		38

DATE: 2/1/2024 5:38:58 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/07_ROADWAY/Sheets/SL335_AEC_HA_001.dgn

DW | CK | DW | CK





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SCALE IN FEET

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

1. EXIST ROW LINE AND EASEMENTS LOCATIONS ARE APPROXIMATE; SHOULD BE USED FOR REFERENCE PURPOSES ONLY.
2. CENTERLINE LOCATIONS ARE APPROXIMATE; IT WAS RECREATED USING RIGHT-OF-WAY MAP AMA263502AB, OBTAINED FROM THE TXDOT REAL PROPERTY ASSET MAP DATABASE.

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SL 335

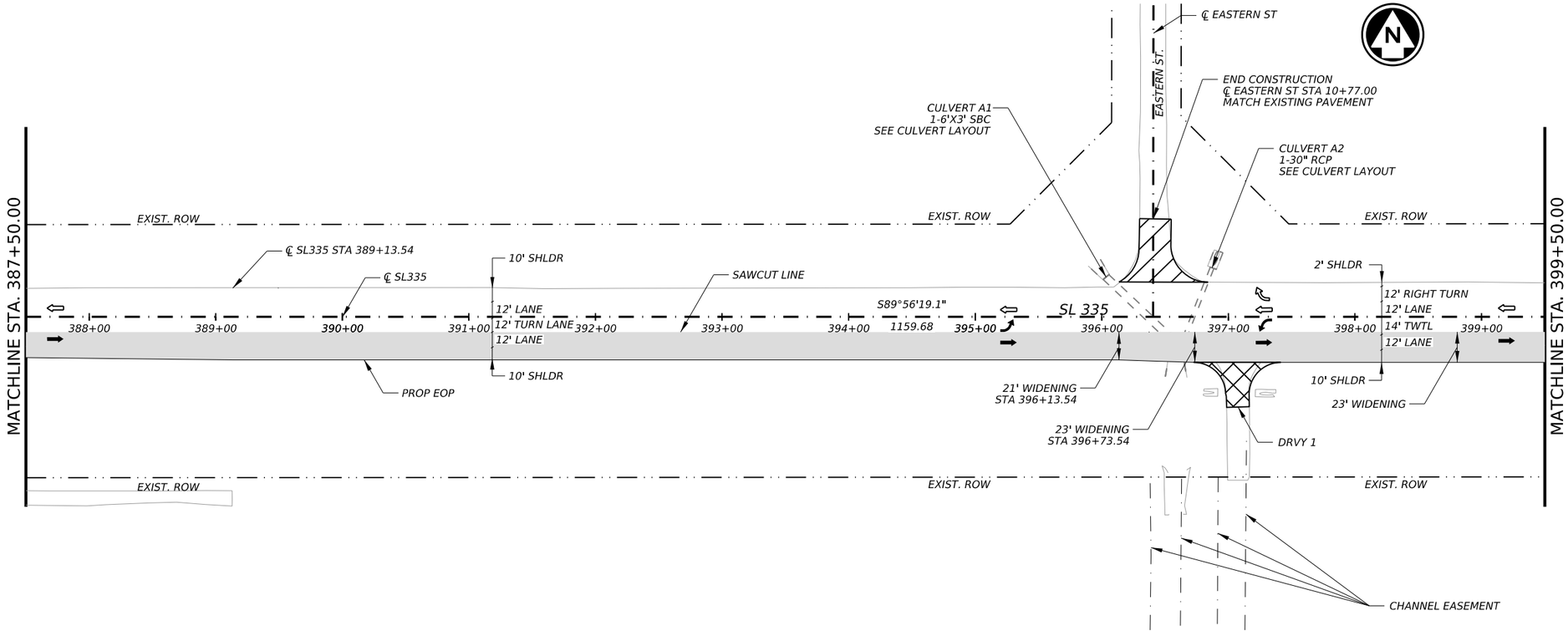
ROADWAY PLAN

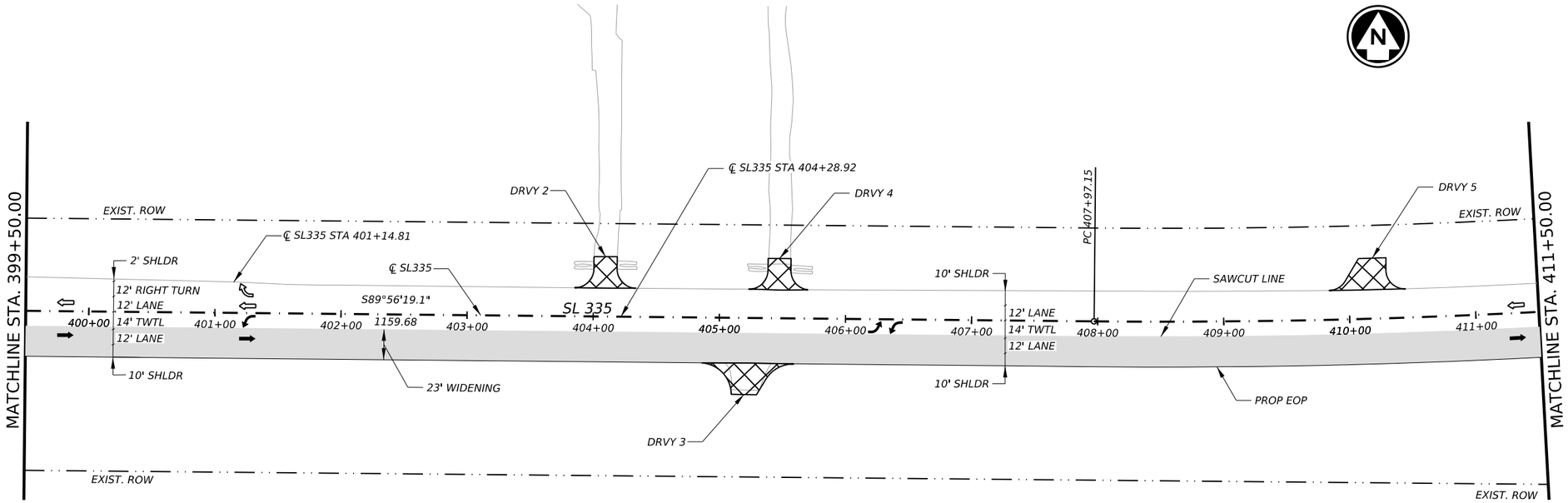
BEGIN TO STA 387+50

SHEET 1 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		39

DATE: 2/1/2024 5:39:25 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/07 ROADWAY/Sheets/SL335 AEC RD PLN 001





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SCALE IN FEET

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

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Texas Department of Transportation

SL 335

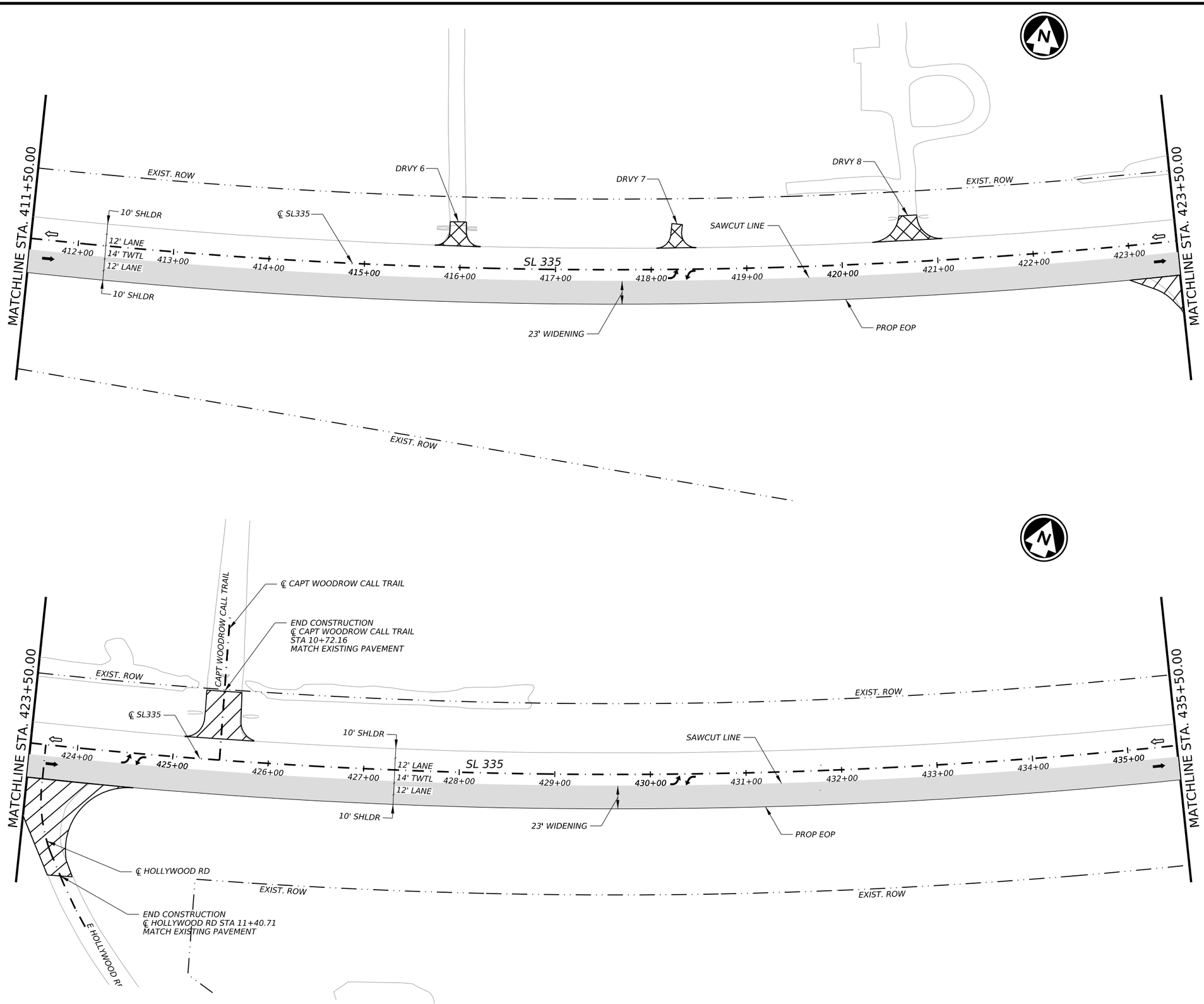
ROADWAY PLAN

STA 387+50 TO STA 411+50

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		40

DATE: 2/1/2024 5:39:26 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/07 ROADWAY/Sheets/SL335 AEC RD PLN 001

CK DW CK DW



ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

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Texas Department of Transportation

SL 335

ROADWAY PLAN

STA 411+50 TO STA 435+50

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		41

DATE: 2/1/2024 5:39:26 PM
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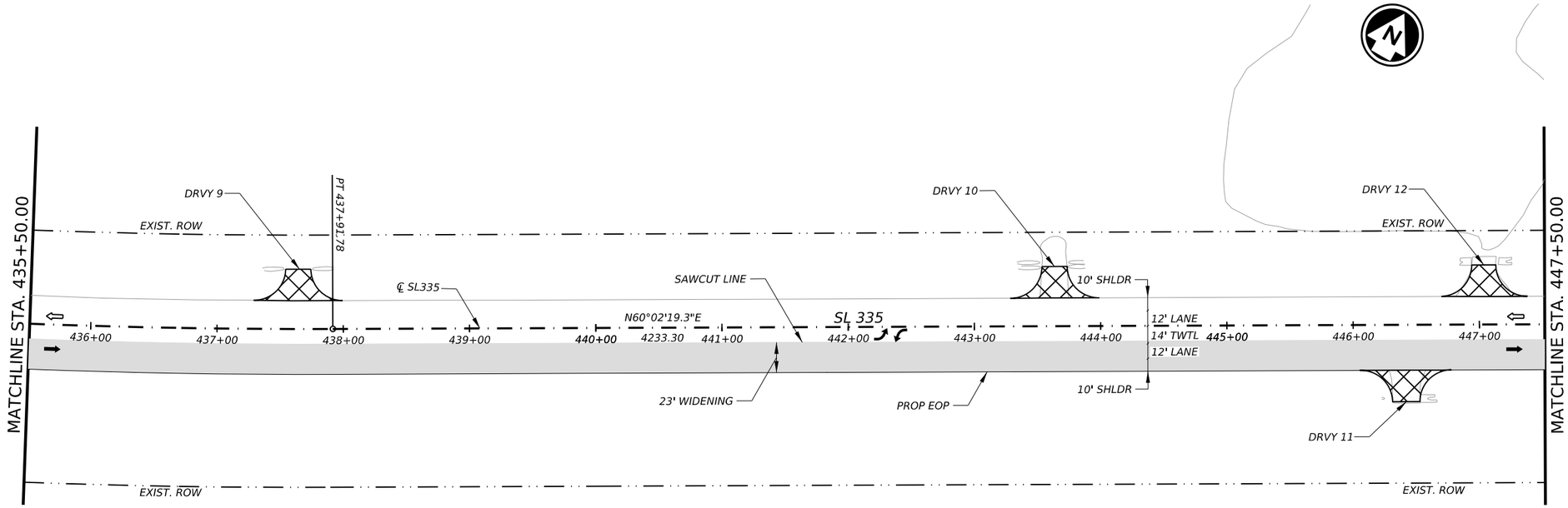
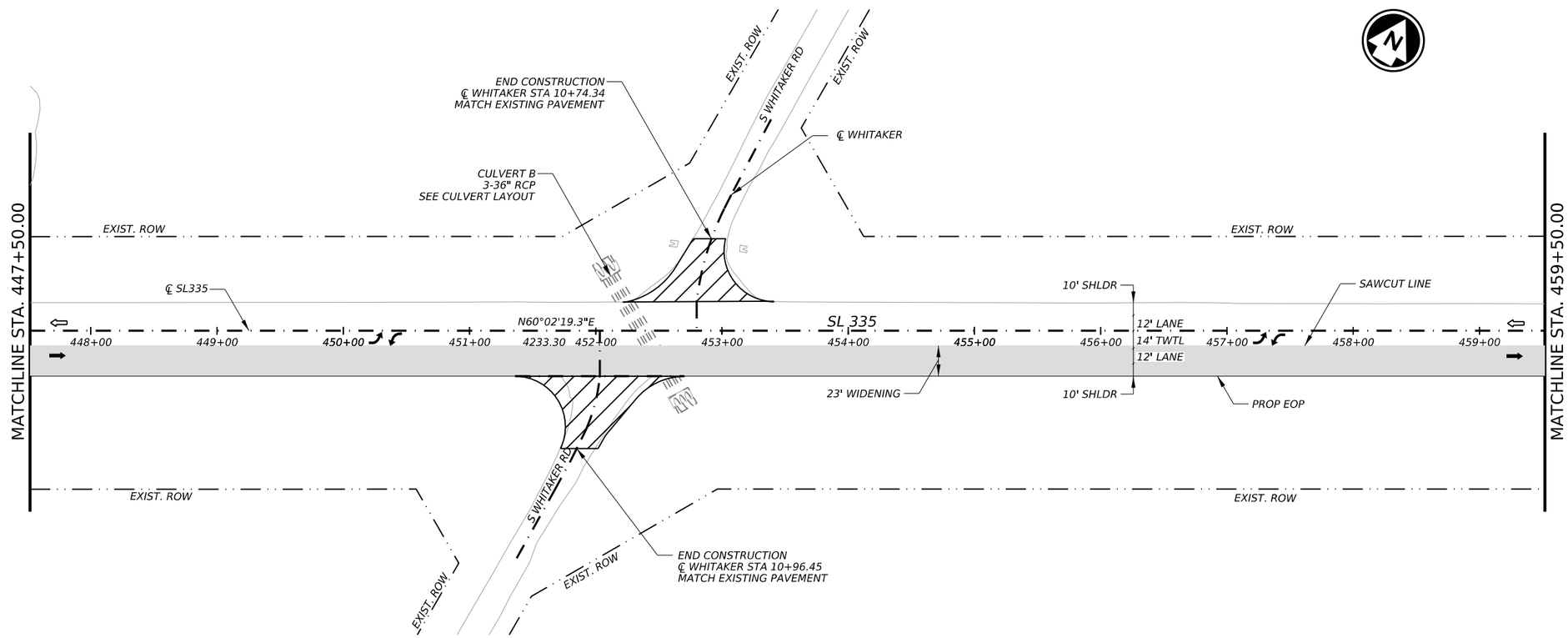
CK DW CK DW





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SCALE IN FEET

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

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Texas Department of Transportation

SL 335

ROADWAY PLAN

STA 435+50 TO STA 459+50

SHEET 4 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		42

DATE: 2/1/2024 5:39:27 PM
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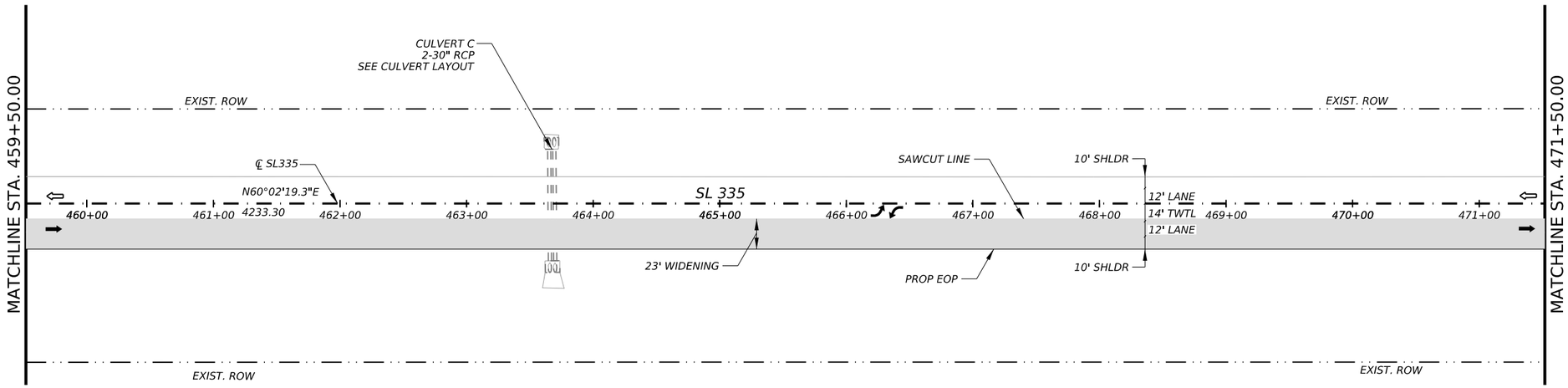
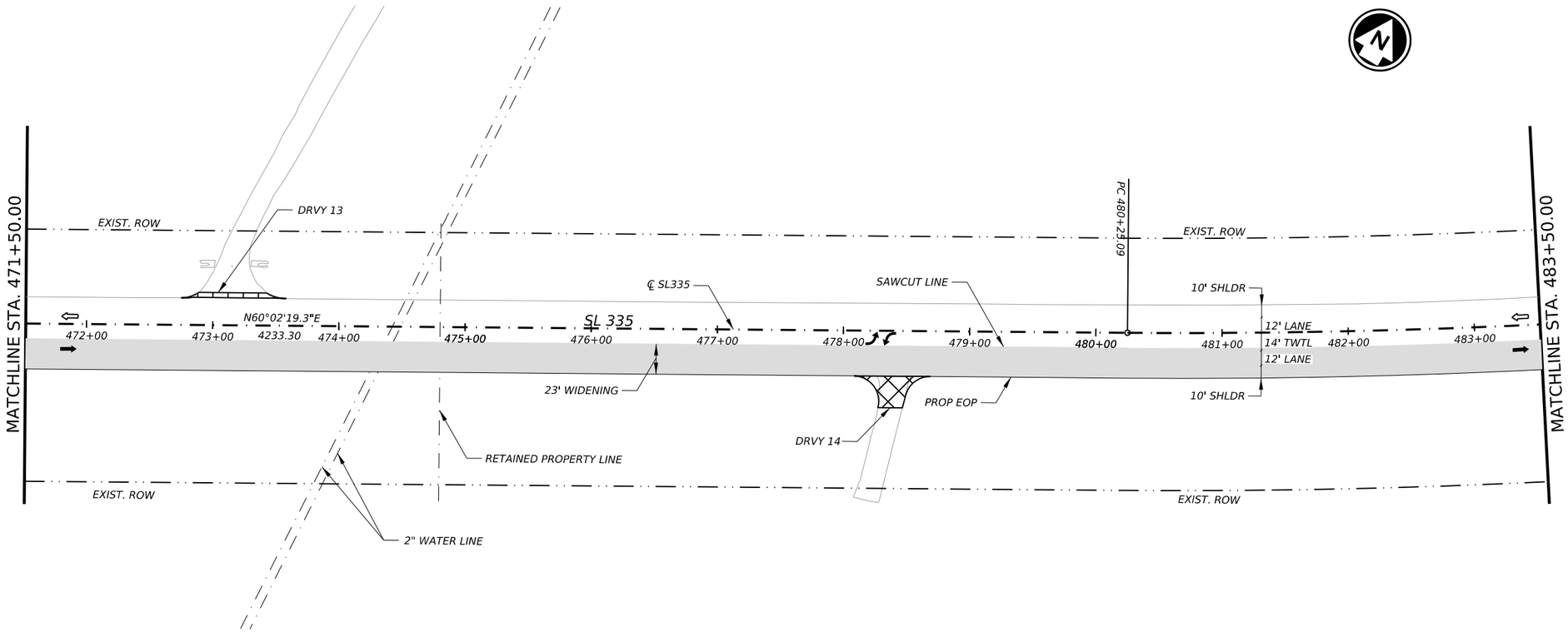
CK | DW | CK | DW





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SCALE IN FEET

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

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SL 335

ROADWAY PLAN

STA 459+50 TO STA 483+50

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		43

DATE: 2/1/2024 5:39:27 PM
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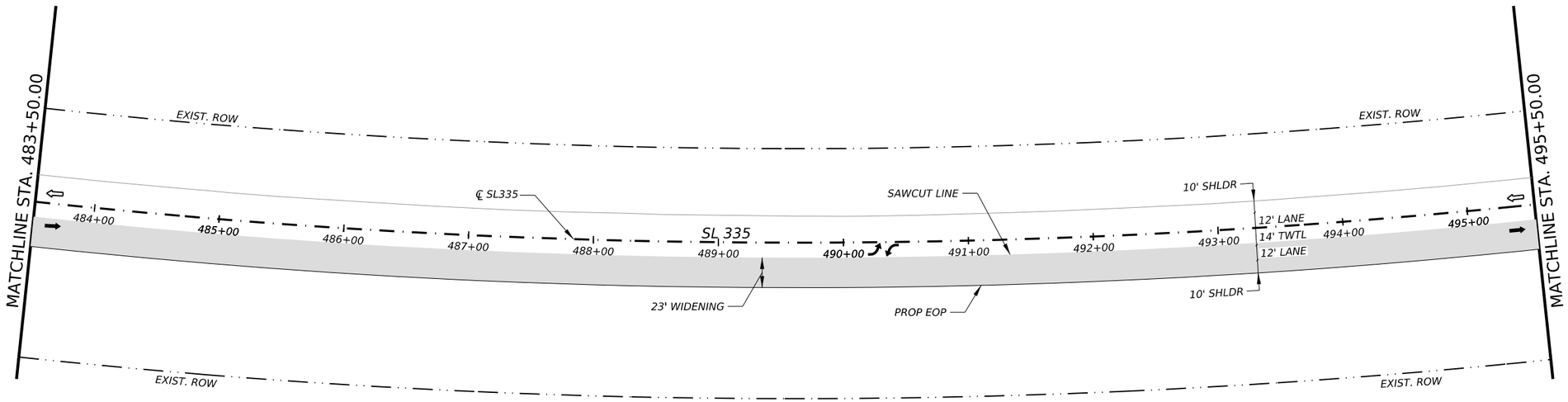

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

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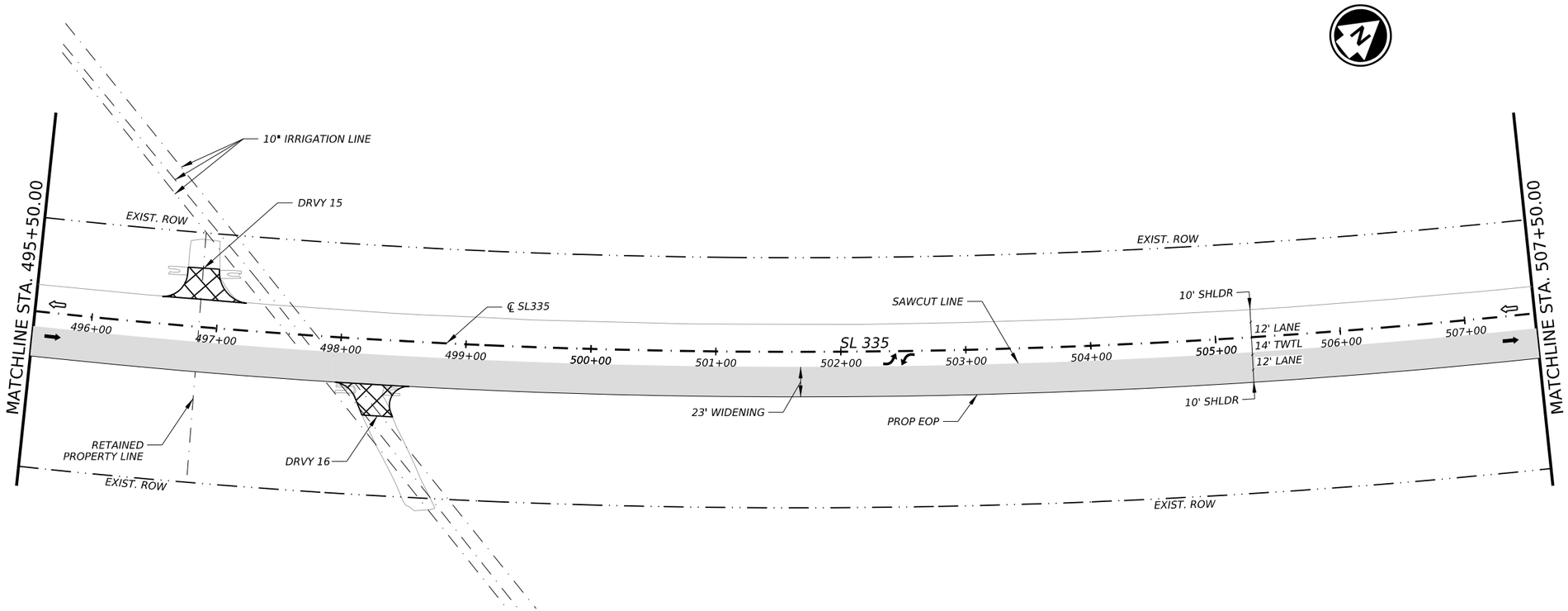

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Texas Department of Transportation

SL 335

ROADWAY PLAN

STA 483+50 TO STA 507+50

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		44

DATE: 2/1/2024 5:39:28 PM
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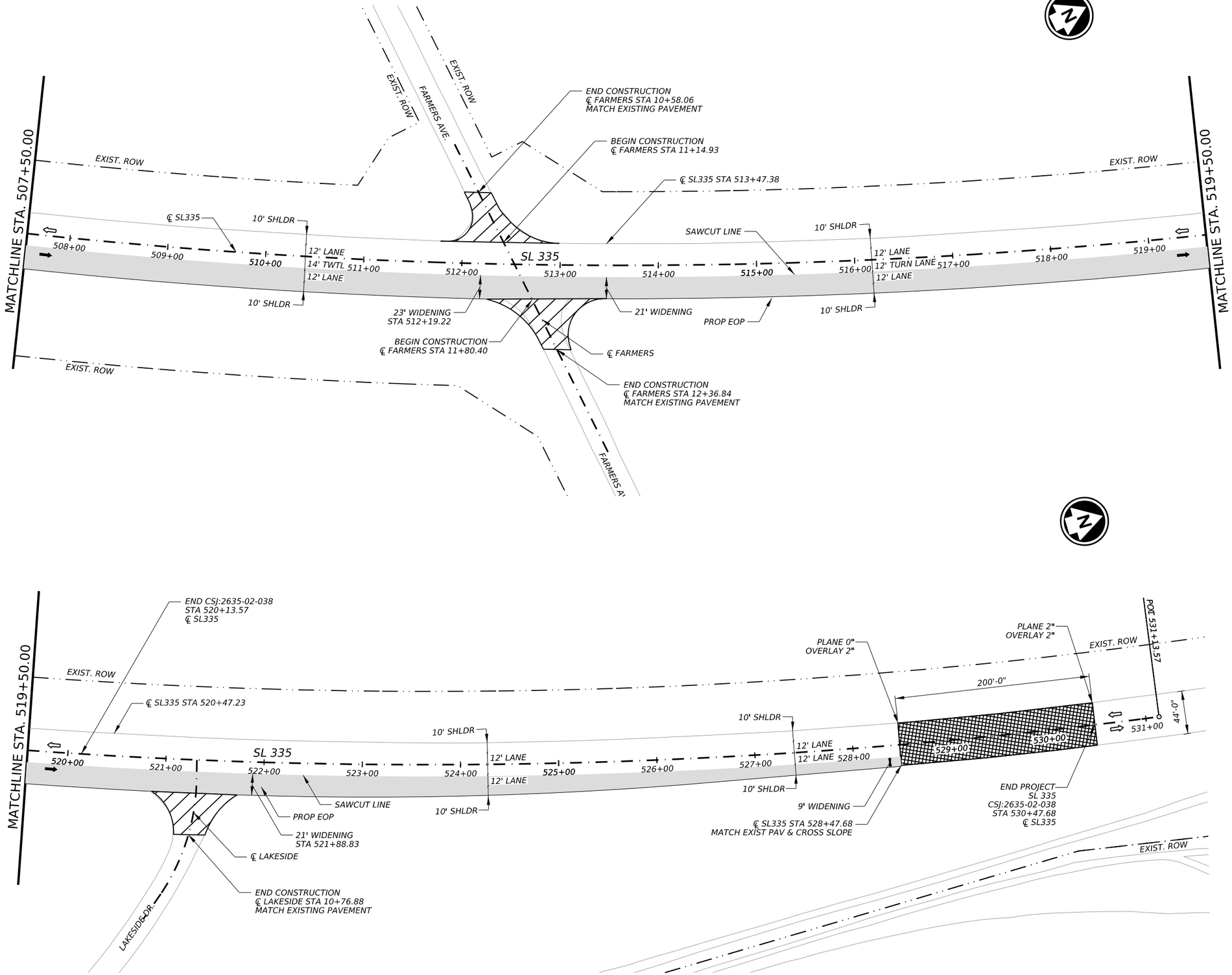

ROADWAY LEGEND

- EXISTING ROW
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC TURN (PROP)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC TURN (EXIST)
- INTERSECTION
- DRIVEWAY (PAVED)
- DRIVEWAY (UNPAVED)
- PROPOSED OVERLAY TRANSITION
- PROPOSED WIDENING

NOTES:

1. EXIST ROW LINE AND EASEMENTS LOCATIONS ARE APPROXIMATE; SHOULD BE USED FOR REFERENCE PURPOSES ONLY.
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ERNESTO SALCIDO
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4/19/2024

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Texas Department of Transportation

SL 335

ROADWAY PLAN

STA 507+50 TO END

SHEET 7 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		45

DATE: 4/19/2024 6:44:42 PM
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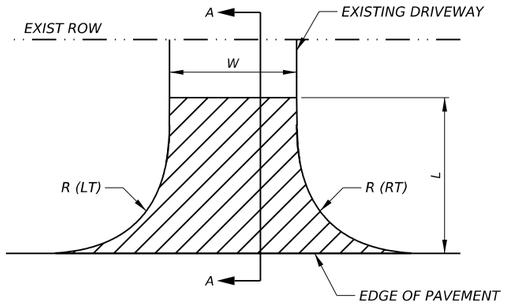
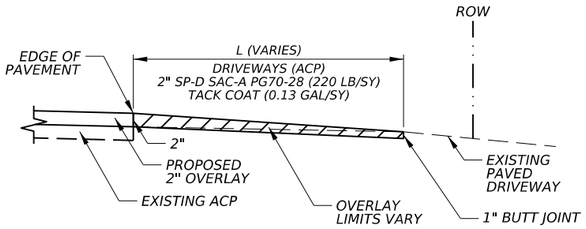
CK | DW | CK | DW

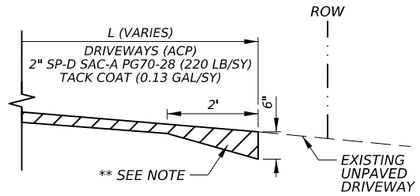


TYPICAL DRIVEWAY APRON

NOT TO SCALE



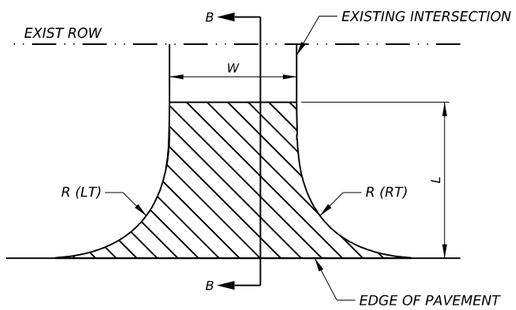
PAVED DRIVEWAY



UNPAVED DRIVEWAY

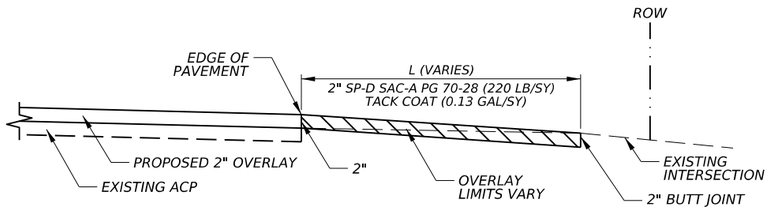
TYPICAL DRIVEWAY APRON - SECTION A-A

NOT TO SCALE



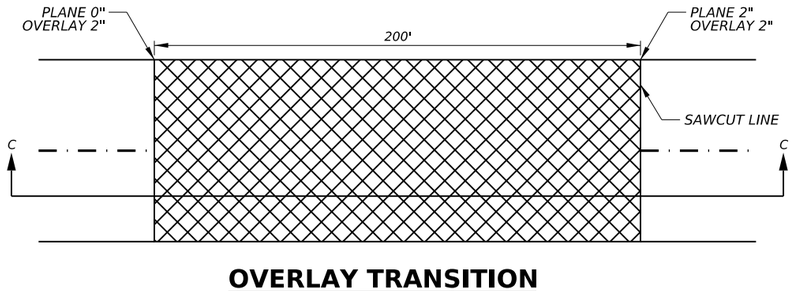
TYPICAL INTERSECTION TIE-IN

NOT TO SCALE



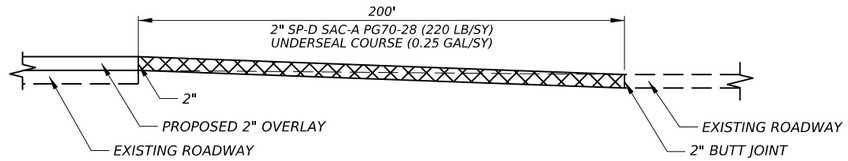
TYPICAL INTERSECTION TIE-IN - SECTION B-B

NOT TO SCALE



OVERLAY TRANSITION

NOT TO SCALE



OVERLAY TRANSITION - SECTION C-C

NOT TO SCALE

LEGEND

PLANE ASPH CONC PAV 0" - 1"
TACK COAT (0.13 GAL/SY)
2" SP-D SAC-A PG 70-28 (220 LB/SY)*

PLANE ASPH CONC PAV 0" - 2"
TACK COAT (0.13 GAL/SY)
2" SP-D SAC-A PG70-28 (220 LB/SY)

PLANE ASPH CONC PAV 0"-2"
UNDERSEAL COURSE (0.25 GAL/SY)
2" SP-D SAC-A PG70-28 (220 LB/SY)

* 2" SP-D FOR DRIVEWAYS TO BE PAID FOR WITH ITEM 530-6005 DRIVEWAYS (ACP).

** ADDITIONAL EXCAVATION SHALL BE INCIDENTAL TO ITEM 530-6005.

SUMMARY OF ADDITIONAL AREA ITEMS FOR CSJ: 2635-02-038

DESCRIPTION	LOCATION	CONSTRUCTION TYPE	LENGTH (L)	WIDTH (W)	RADIUS (R)		354 6021 PLANE ASPH CONC PAV(0" TO 2")	530 6005 DRIVEWAYS (ACP)	3077 6058 SP MIXES SP-D SAC-A PG70-28	3077 6075 TACK COAT	3085 6001 UNDERSEAL COURSE
									(220 LB/SY)	(0.13 GAL/SY)	(0.25 GAL/SY)
	STATION	-	FT	FT	LT	RT	SY	SY	TON	GAL	GAL
BEGIN PROJECT OVERLAY TRANSITION	378+13.57	PAVED					978		108		245
EASTERN ST.	396+40.53 LT	PAVED	50.1	25.0	30	30	174		19		
DRVY 1	397+07.73 RT	UNPAVED	35.3	18.0	25	25		102		13	
DRVY 2	404+09.37 LT	UNPAVED	25.0	18.5	15	15		62		8	
DRVY 3	405+19.98 RT	UNPAVED	25.1	20.0	25	25		95		12	
DRVY 4	405+47.35 LT	UNPAVED	24.9	18.2	15	15		61		8	
DRVY 5	410+19.16 LT	UNPAVED	25.1	21.9	15	15		88		11	
DRVY 6	415+96.97 LT	UNPAVED	25.4	17.0	15	15		59		8	
DRVY 7	418+24.81 LT	UNPAVED	25.5	11.0	15	15		42		5	
DRVY 8	420+71.16 LT	UNPAVED	26.2	18.9	30	25		91		12	
E HOLLYWOOD ST.	423+66.58 RT	PAVED	99.1	26.1	65	50	621		68		
CAPT WOODROW CALL TRAIL	425+48.98 LT	PAVED	50.0	36.8	20	20	229		25		
DRVY 9	437+64.35 LT	UNPAVED	25.0	20.0	25	25		86		11	
DRVY 10	443+63.62 LT	UNPAVED	25.0	20.0	25	25		85		11	
DRVY 11	446+41.83 RT	UNPAVED	25.0	21.7	25	25		83		11	
DRVY 12	447+03.66 LT	UNPAVED	25.0	19.0	25	25		90		12	
S WHITAKER RD 1	452+03.17 RT	PAVED	57.2	29.7	50	40	350		39		
S WHITAKER RD 2	452+79.89 LT	PAVED	49.9	25.7	60	40	275		30		
DRVY 13	473+15.04 LT	PAVED	25.0	19.4	25	30	28	28		4	
DRVY 14	478+34.43 RT	UNPAVED	4.0	54.0	20	20		76		10	
DRVY 15	496+85.84 LT	UNPAVED	25.2	25.2	20	25		94		12	
DRVY 16	498+21.54 RT	UNPAVED	25.0	24.4	15	20		85		11	
FARMERS AVE. 1	512+53.47 LT	PAVED	50.6	27.6	25	70	239		26		
FARMERS AVE. 2	512+53.47 RT	PAVED	50.2	28.2	35	80	279		31		
LAKESIDE DR.	521+31.52 RT	PAVED	50.0	32.0	75	50	324		36		
END PROJECT OVERLAY TRANSITION	530+47.68	PAVED	50.0	32.0	75	50	978		108		245
PROJECT TOTALS							4475	1227	490	159	490

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SL 335

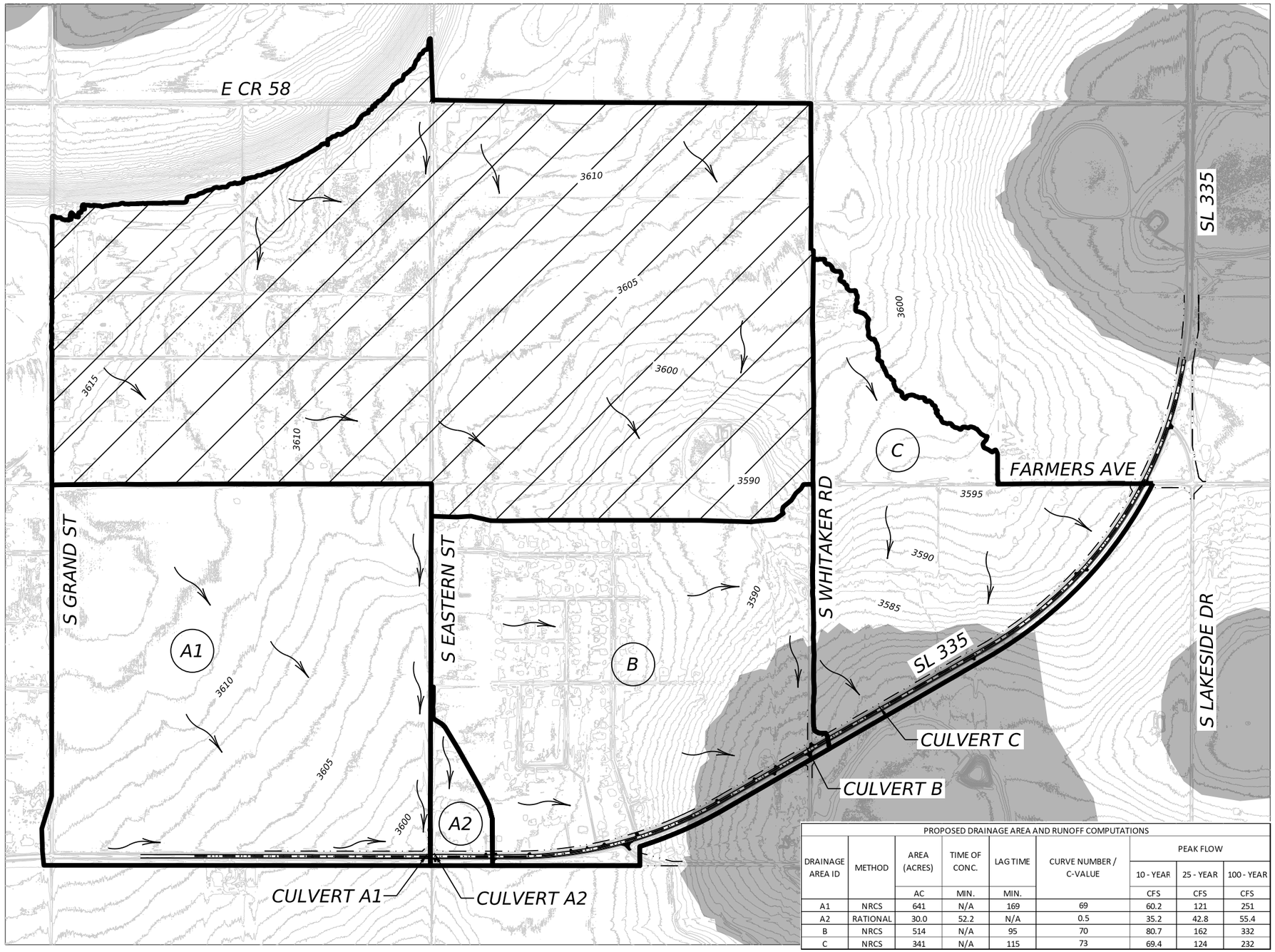
ADDITIONAL AREAS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		46

DATE: 4/30/2024 6:49:57 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/07 ROADWAY/Sheets/SL 335 AEC RD ADD 001.dgn

CK DW CK



0 750 1500
SCALE IN FEET

LEGEND

- X — DRAINAGE AREA ID
- EXISTING ROW
- PROPOSED ROW
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION ARROW
- 100-YR FEMA FLOODPLAIN
- DRAINS TO PLAYA

NOTES:

1. HYDROLOGY FOR DA A1, B, C PERFORMED IN HEC-HMS VERSION 4.5.
2. HYDROLOGY FOR DA A2 PERFORMED USING RATIONAL METHOD.
3. RAINFALL INTENSITY-DURATION-FREQUENCY COEFFICIENTS FOR TEXAS, BASED ON THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) HISTORIC RAINFALL STUDY "ATLAS 14".
4. 1FT CONTOUR LINES FROM 2018 USGS 70CM LIDAR.
5. INITIAL ABSTRACTION INCREASED FROM 0.2S TO .45S TO MODEL UPSTREAM RETENTION AND PRODUCE HISTORICALLY ACCURATE RESULTS.
6. SEE FEMA FIRM MAPS 48381C0095E, 48381C0235E, AND 48381C0115E FOR ADDITIONAL FLOODPLAIN INFORMATION.

PROPOSED DRAINAGE AREA AND RUNOFF COMPUTATIONS

DRAINAGE AREA ID	METHOD	AREA (ACRES)	TIME OF CONC.	LAG TIME	CURVE NUMBER / C-VALUE	PEAK FLOW		
						10 - YEAR	25 - YEAR	100 - YEAR
		AC	MIN.	MIN.		CFS	CFS	CFS
A1	NRCS	641	N/A	169	69	60.2	121	251
A2	RATIONAL	30.0	52.2	N/A	0.5	35.2	42.8	55.4
B	NRCS	514	N/A	95	70	80.7	162	332
C	NRCS	341	N/A	115	73	69.4	124	232

STATE OF TEXAS
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144928
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AECOM Technical Services, Inc.- F-3580

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SL 335

DRAINAGE AREA MAP

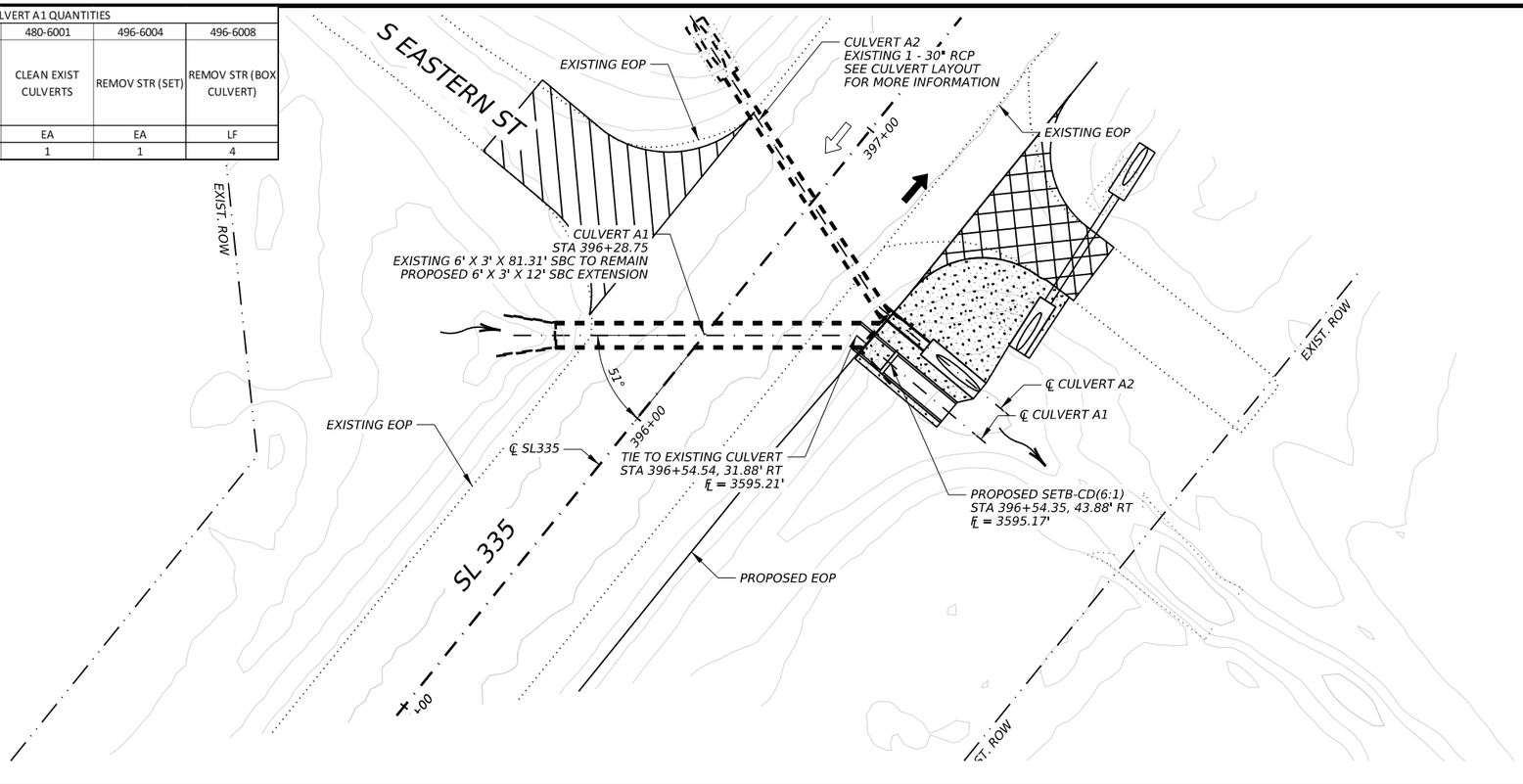
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		47

DATE: 1/26/2024 4:25:45 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/09 DRAINAGE/Sheets/LJA DA Sheet.dgn

DW: CK: DW: CK:

CULVERT A1 QUANTITIES				
462-6054	467-6214	480-6001	496-6004	496-6008
CONC BOX CULV (6 FT X 3 FT)(EXTEND)	SET (TY I)(S= 6 FT)(HW= 4 FT)(6:1) (C)	CLEAN EXIST CULVERTS	REMOV STR (SET)	REMOV STR (BOX CULVERT)
LF	EA	EA	EA	LF
12	1	1	1	4



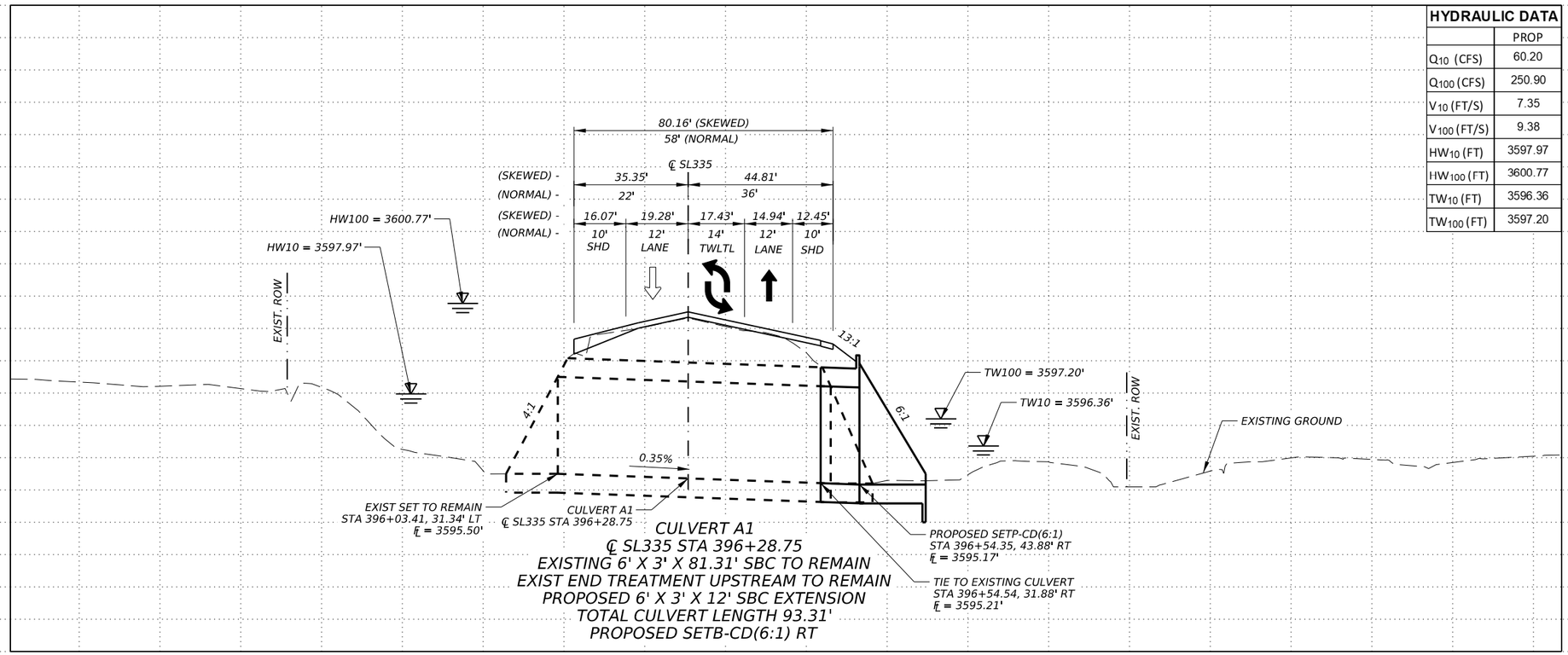
H: 0 20 40
V: 0 2 4
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING GROUND
- CULVERT CENTERLINE
- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED ROADWAY
- PROPOSED DRIVEWAY
- PROPOSED RIPRAP
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC (EXIST)

NOTES:
1. ANALYSIS PERFORMED USING HY-8 VERSION 7.50.
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. EXISTING CULVERT ELEVATION & LOCATION NOT FROM SURVEYED DATA. CONTRACTOR TO VERIFY.
4. EXISTING CONTOURS SHOWN.
5. REFER TO CULVERT CALCULATIONS SHEETS FOR ADDITIONAL CULVERT ANALYSIS.

HYDRAULIC DATA	
	PROP
Q_{10} (CFS)	60.20
Q_{100} (CFS)	250.90
V_{10} (FT/S)	7.35
V_{100} (FT/S)	9.38
HW_{10} (FT)	3597.97
HW_{100} (FT)	3600.77
TW_{10} (FT)	3596.36
TW_{100} (FT)	3597.20



STATE OF TEXAS
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CULVERT LAYOUT
CULVERT A1

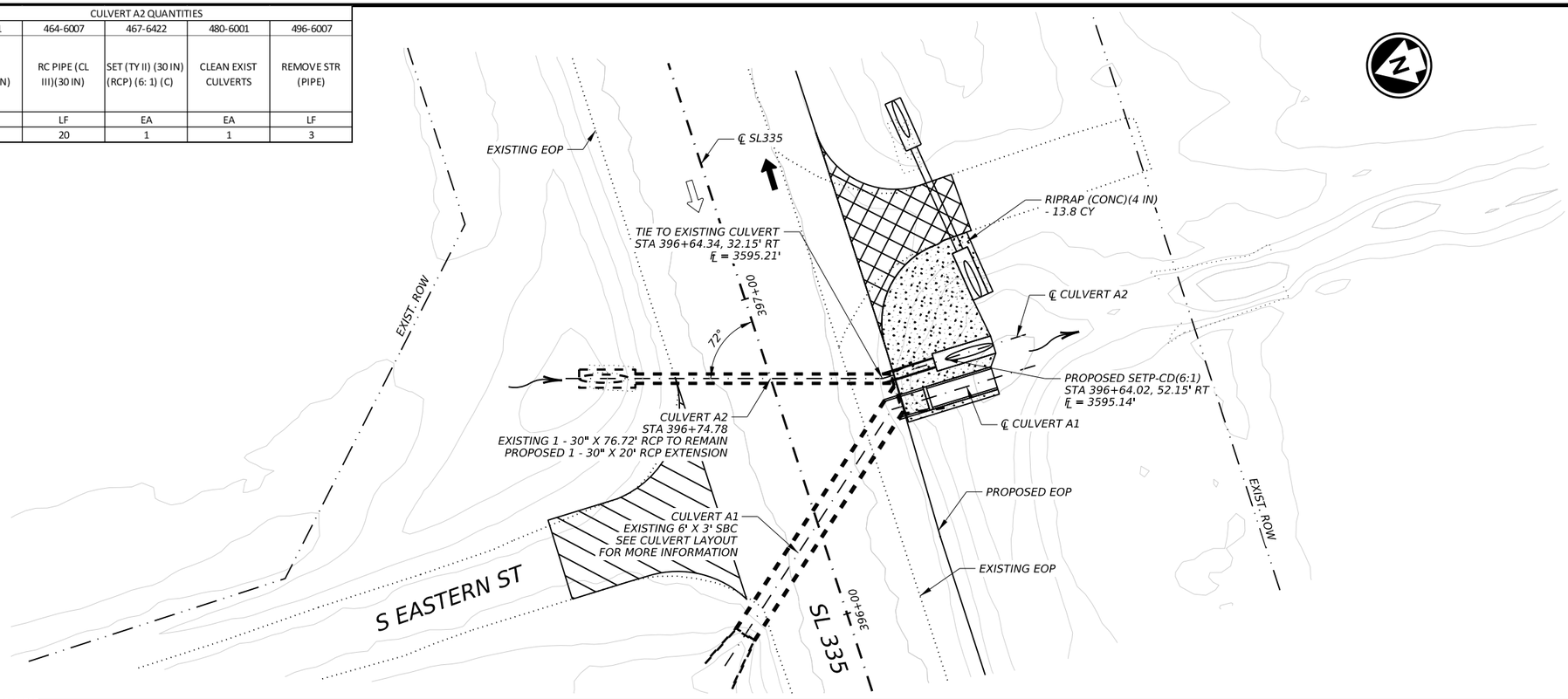
SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		48

DATE: 1/26/2024 4:14:50 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/CULVERT A1 - CULVERT A1.dgn

CK DW CK

CULVERT A2 QUANTITIES				
432-6001	464-6007	467-6422	480-6001	496-6007
RIPRAP (CONC)(4 IN)	RC PIPE (CL III)(30 IN)	SET (TY II) (30 IN) (RCP) (6: 1) (C)	CLEAN EXIST CULVERTS	REMOVE STR (PIPE)
CY	LF	EA	EA	LF
13.8	20	1	1	3

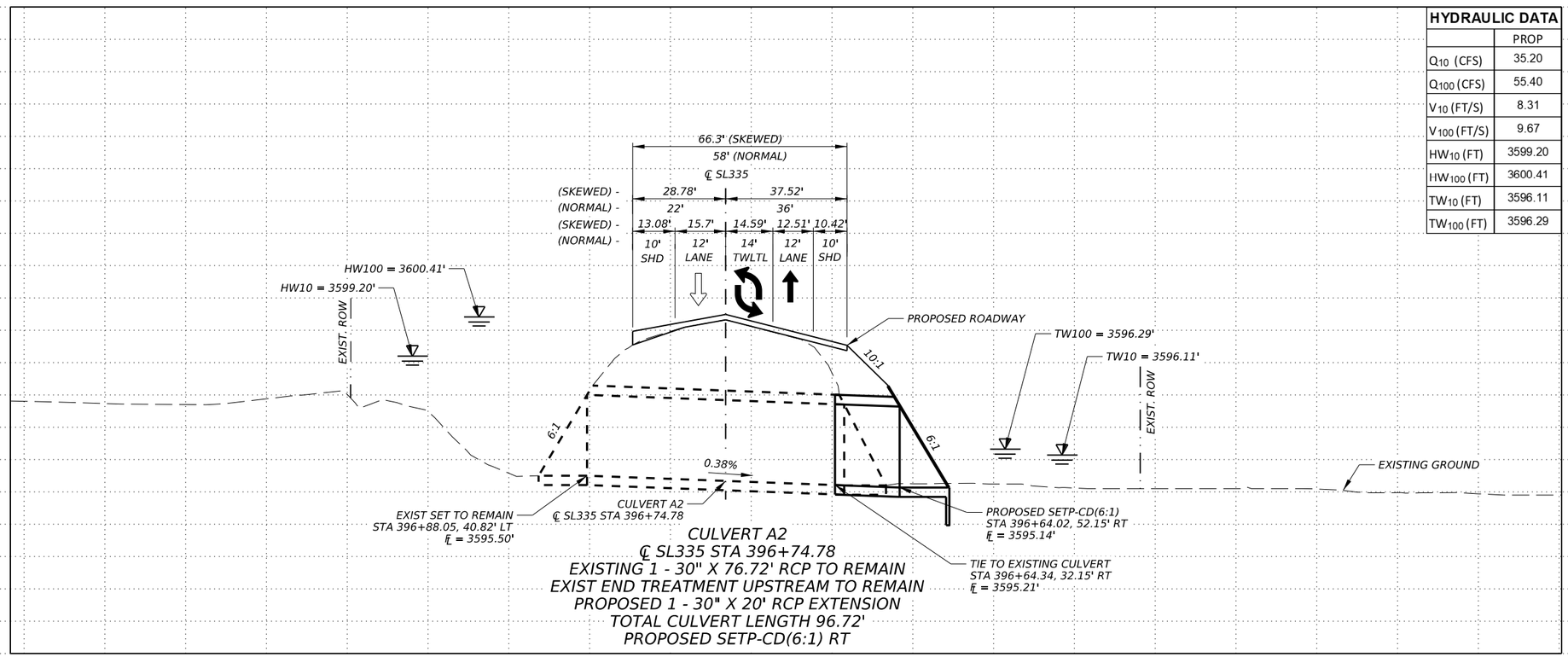


H: 0 20 40
V: 0 2 4
SCALE IN FEET

LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING GROUND
- CULVERT CENTERLINE
- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED ROADWAY
- PROPOSED DRIVEWAY
- PROPOSED RIPRAP
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC (EXIST)

NOTES:
1. ANALYSIS PERFORMED USING HY-8 VERSION 7.50.
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. EXISTING CULVERT ELEVATION & LOCATION NOT FROM SURVEYED DATA. CONTRACTOR TO VERIFY.
4. EXISTING CONTOURS SHOWN.
5. REFER TO CULVERT CALCULATIONS SHEETS FOR ADDITIONAL CULVERT ANALYSIS.



HYDRAULIC DATA	
	PROP
Q_{10} (CFS)	35.20
Q_{100} (CFS)	55.40
V_{10} (FT/S)	8.31
V_{100} (FT/S)	9.67
HW_{10} (FT)	3599.20
HW_{100} (FT)	3600.41
TW_{10} (FT)	3596.11
TW_{100} (FT)	3596.29

CULVERT A2
℄ SL335 STA 396+74.78
EXISTING 1 - 30" X 76.72' RCP TO REMAIN
EXIST END TREATMENT UPSTREAM TO REMAIN
PROPOSED 1 - 30" X 20' RCP EXTENSION
TOTAL CULVERT LENGTH 96.72'
PROPOSED SETP-CD(6:1) RT

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JOHN J. TIETZ
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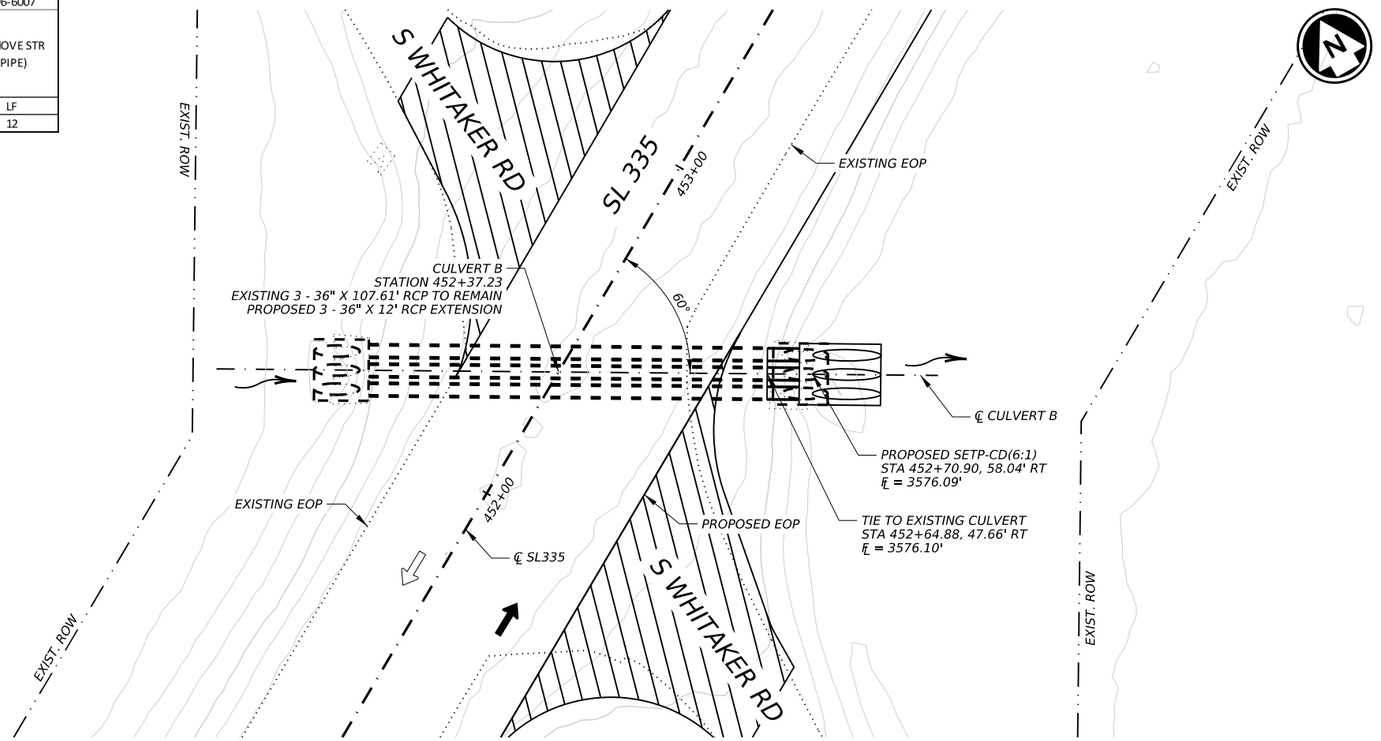
CULVERT LAYOUT
CULVERT A2

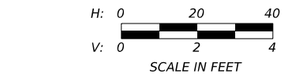
CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		49

DATE: 1/26/2024 4:15:57 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/CULVERT A2 - CULVERT A2.dgn

CK DW CK

CULVERT B QUANTITIES				
464-6008	467-6453	480-6001	496-6004	496-6007
RC PIPE (CL III)(36 IN)	SET (TY II) (36 IN) (RCP) (6: 1) (C)	CLEAN EXIST CULVERTS	REMOV STR (SET)	REMOVE STR (PIPE)
LF	EA	EA	EA	LF
36	3	1	3	12

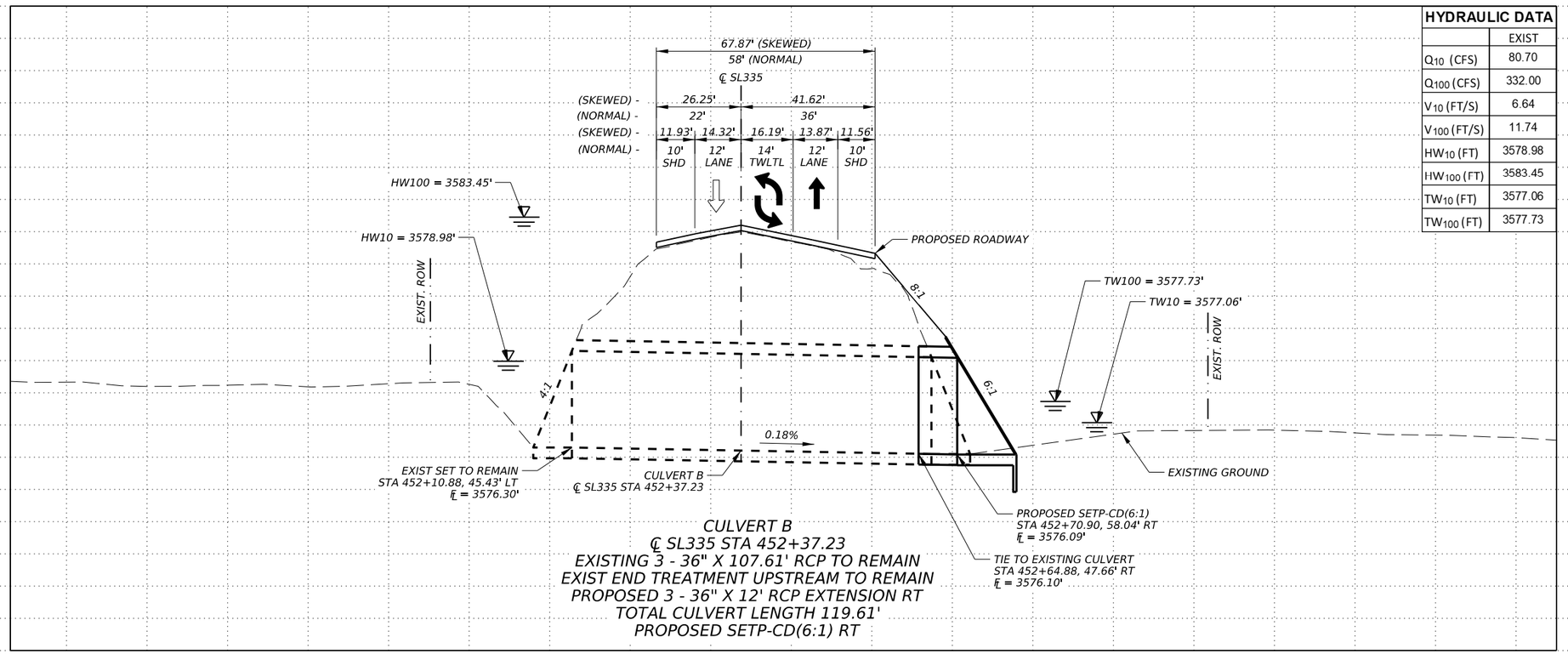




LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING GROUND
- CULVERT CENTERLINE
- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED ROADWAY
- PROPOSED DRIVEWAY
- PROPOSED RIPRAP
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC (EXIST)

NOTES:
1. ANALYSIS PERFORMED USING HY-8 VERSION 7.50.
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. EXISTING CULVERT ELEVATION & LOCATION NOT FROM SURVEYED DATA. CONTRACTOR TO VERIFY.
4. EXISTING CONTOURS SHOWN.
5. REFER TO CULVERT CALCULATIONS SHEETS FOR ADDITIONAL CULVERT ANALYSIS.



HYDRAULIC DATA	
	EXIST
Q_{10} (CFS)	80.70
Q_{100} (CFS)	332.00
V_{10} (FT/S)	6.64
V_{100} (FT/S)	11.74
HW_{10} (FT)	3578.98
HW_{100} (FT)	3583.45
TW_{10} (FT)	3577.06
TW_{100} (FT)	3577.73

CULVERT B
℄ SL335 STA 452+37.23
EXISTING 3 - 36" X 107.61' RCP TO REMAIN
EXIST END TREATMENT UPSTREAM TO REMAIN
PROPOSED 3 - 36" X 12' RCP EXTENSION RT
TOTAL CULVERT LENGTH 119.61'
PROPOSED SETP-CD(6:1) RT

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SL 335

CULVERT LAYOUT
CULVERT B

SHEET 3 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		50

DATE: 1/26/2024 4:16:43 PM
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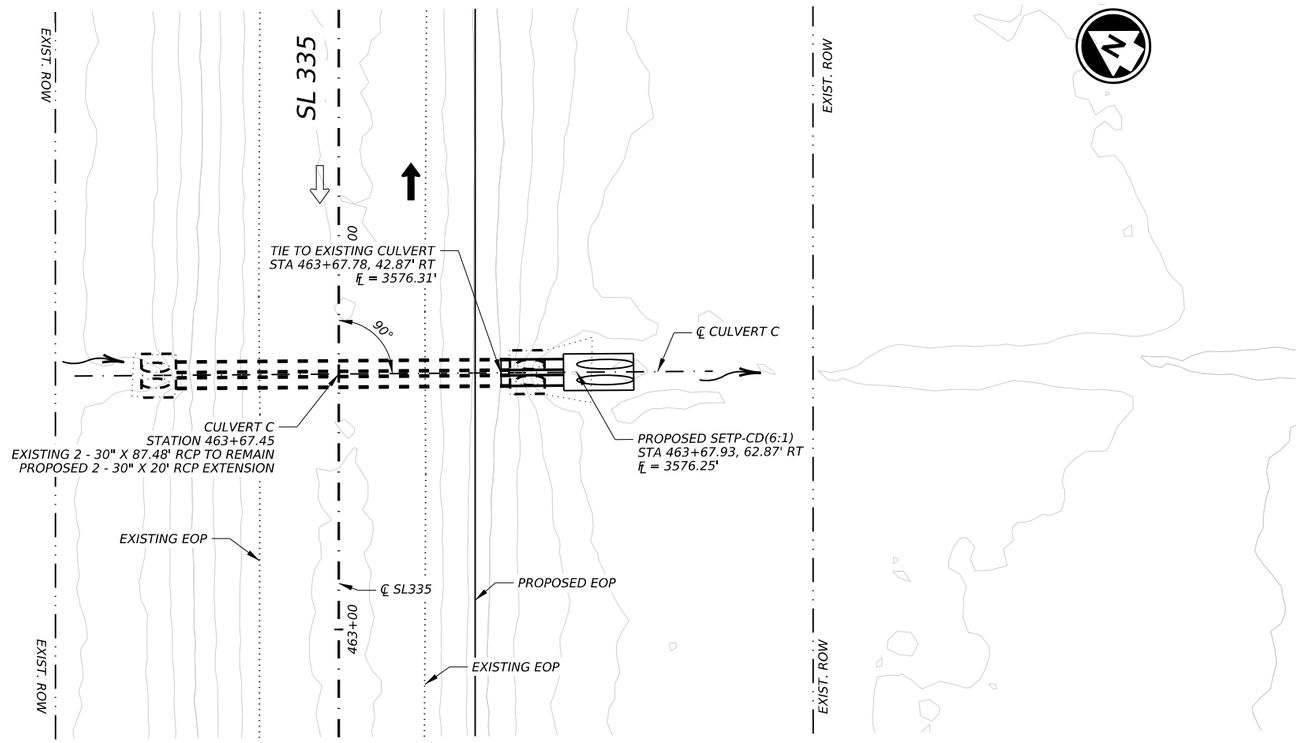
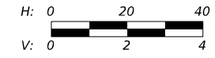
CK DW CK CK

CULVERT C QUANTITIES				
464-6007	467-6422	480-6001	496-6004	496-6007
RC PIPE (CL III)(30 IN)	SET (TY II) (30 IN) (RCP) (6: 1) (C)	CLEAN EXIST CULVERTS	REMOV STR (SET)	REMOVE STR (PIPE)
LF	EA	EA	EA	LF
40	2	1	2	8



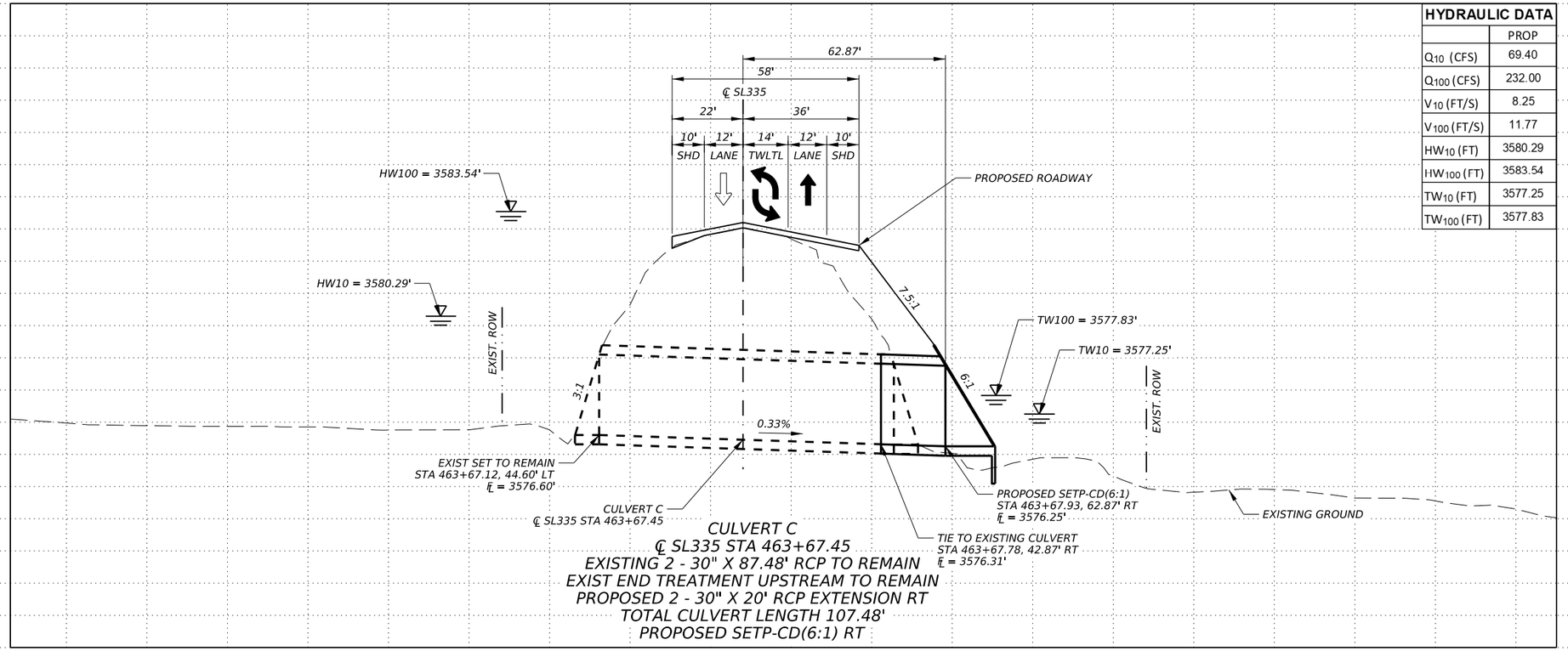


LEGEND

- EXISTING R.O.W.
- PROPOSED R.O.W.
- EXISTING GROUND
- CULVERT CENTERLINE
- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED ROADWAY
- PROPOSED DRIVEWAY
- PROPOSED RIPRAP
- DIRECTION OF TRAFFIC (PROP)
- DIRECTION OF TRAFFIC (EXIST)

NOTES:
1. ANALYSIS PERFORMED USING HY-8 VERSION 7.50.
2. TW ELEVATIONS ESTABLISHED USING OUTFALL CHANNEL GEOMETRY.
3. EXISTING CULVERT ELEVATION & LOCATION NOT FROM SURVEYED DATA. CONTRACTOR TO VERIFY.
4. EXISTING CONTOURS SHOWN.
5. REFER TO CULVERT CALCULATIONS SHEETS FOR ADDITIONAL CULVERT ANALYSIS.

HYDRAULIC DATA	
	PROP
Q_{10} (CFS)	69.40
Q_{100} (CFS)	232.00
V_{10} (FT/S)	8.25
V_{100} (FT/S)	11.77
HW_{10} (FT)	3580.29
HW_{100} (FT)	3583.54
TW_{10} (FT)	3577.25
TW_{100} (FT)	3577.83



CULVERT C
℄ SL335 STA 463+67.45
EXISTING 2 - 30" X 87.48' RCP TO REMAIN
EXIST END TREATMENT UPSTREAM TO REMAIN
PROPOSED 2 - 30" X 20' RCP EXTENSION RT
TOTAL CULVERT LENGTH 107.48'
PROPOSED SETP-CD(6:1) RT

STATE OF TEXAS
JOHN J. TIETZ
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LICENSED
PROFESSIONAL ENGINEER
01/26/2024

LJA Engineering, Inc.
FRN - F-1386

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Dallas, Texas 75240
(214) 741-7777
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Texas Department of Transportation

SL 335

CULVERT LAYOUT
CULVERT C

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		51

DATE: 1/26/2024 4:17:34 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/Culvert C - Culvert C.dgn

CULVERT A1 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	BOX
ENTRANCE	SET
PROFILE	STRAIGHT
DESIGN EVENT	10 year
DESIGN DISCHARGE (CFS)	60.20
100-YR DISCHARGE (CFS)	250.90
n VALUE	0.012
PIPE DIAMETER (IN)	-
CULVERT SPAN (FT)	6
CULVERT RISE (FT)	3
NUMBER OF BARRELS	1.00
INLET STATION	0.00
INLET ELEVATION (FT)	3595.50
BROKEN BACK STATION	0.00
BROKEN BACK ELEVATION (FT)	0.00
OUTLET STATION	93.31
OUTLET ELEVATION (FT)	3595.17
TOTAL CULVERT LENGTH (FT)	93.31
CULVERT SLOPE 1 (FT/FT)	-
CULVERT SLOPE 2 (FT/FT)	0.004

Site Data - Culvert A1

Site Data Option: Culvert Invert Data	
Inlet Station:	0.00 ft
Inlet Elevation:	3595.50 ft
Outlet Station:	93.31 ft
Outlet Elevation:	3595.17 ft
Number of Barrels:	1.00

Tailwater Channel Data - Proposed Culvert A1

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 6.30 (_:1)
Channel Slope: 0.052
Channel Manning's n: 0.0350
Channel Invert Elevation: 3595.17 ft

Roadway Data for Crossing: Proposed Culvert A1

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 3600.30 ft
Roadway Surface: Paved
Roadway Top Width: 45.00 ft

Table 1 - Summary of Culvert Flows at Crossing: Proposed Culvert A1

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3597.97	10 year	60.2	60.20	0	1
3600.77	100 year	251	153.69	97.16	7
3600.30	Overtopping	140.86	140.86	0.00	Overtopping

Table 2 - Culvert Summary Table: Proposed Culvert A1

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 year	60.2	60.2	3597.97	2.469	0.857	1-S2n	1.366	1.462	1.366	1.187	7.347	6.781
100 year	251	153.69	3600.77	5.269	4.743	7-M2c	3	2.731	2.731	2.027	9.378	9.689

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert A1)

Discharge Names	Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10 year	60.2	3596.36	1.19	6.78	3.85	1.55
100 year	251	3597.2	2.03	9.69	6.58	1.7

NOTES:
1. *ANALYSIS PERFORMED USING HY-8 VERSION 7.50.*
2. *LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK.*

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SL 335

CULVERT HYDRAULIC DATA
CULVERT A1 - PROPOSED

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		52

CULVERT A2 HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	PIPE
ENTRANCE	SET
PROFILE	STRAIGHT
DESIGN EVENT	10 year
DESIGN DISCHARGE (CFS)	35.20
100-YR DISCHARGE (CFS)	55.40
n VALUE	0.012
PIPE DIAMETER (IN)	30
CULVERT SPAN (FT)	-
CULVERT RISE (FT)	-
NUMBER OF BARRELS	1.00
INLET STATION	0.00
INLET ELEVATION (FT)	3595.50
BROKEN BACK STATION	0.00
BROKEN BACK ELEVATION (FT)	0.00
OUTLET STATION	96.72
OUTLET ELEVATION (FT)	3595.14
TOTAL CULVERT LENGTH (FT)	96.72
CULVERT SLOPE 1 (FT/FT)	-
CULVERT SLOPE 2 (FT/FT)	0.004

Site Data - Culvert A2

Site Data Option: Culvert Invert Data	
Inlet Station:	0.00 ft
Inlet Elevation:	3595.50 ft
Outlet Station:	96.72 ft
Outlet Elevation:	3595.14 ft
Number of Barrels:	1.00

Tailwater Channel Data - Proposed Culvert A2

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 6.30 (_:1)
Channel Slope: 0.052
Channel Manning's n: 0.0350
Channel Invert Elevation: 3595.14 ft

Roadway Data for Crossing: Proposed Culvert A2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 3600.30 ft
Roadway Surface: Paved
Roadway Top Width: 45.00 ft

Table 1 - Summary of Culvert Flows at Crossing: Proposed Culvert A2

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3599.20	10 year	35.2	35.20	0	1
3600.41	100 year	55.4	44.48	10.72	7
3600.30	Overtopping	43.72	43.72	0.00	Overtopping

Table 2 - Culvert Summary Table: Proposed Culvert A2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 year	35.2	35.2	3599.2	3.704	3.667	7-M2c	2.5	2.012	2.012	0.971	8.313	5.93
100 year	55.4	44.48	3600.41	4.91	4.894	7-M2c	2.5	2.216	2.216	1.151	9.667	6.642

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert A2)

Discharge Names	Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10 year	35.2	3596.11	0.97	5.93	3.15	1.5
100 year	55.4	3596.29	1.15	6.64	3.73	1.54

NOTES:
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CULVERT HYDRAULIC DATA
CULVERT A2 - PROPOSED

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		53

DATE: 1/26/2024 4:20:23 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/Culvert Data A2.dgn

DW: CK: DW: CK:

CULVERT B HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	PIPE
ENTRANCE	SET
PROFILE	STRAIGHT
DESIGN EVENT	10 year
DESIGN DISCHARGE (CFS)	80.70
100-YR DISCHARGE (CFS)	332.00
n VALUE	0.012
PIPE DIAMETER (IN)	36
CULVERT SPAN (FT)	-
CULVERT RISE (FT)	-
NUMBER OF BARRELS	3.00
INLET STATION	0.00
INLET ELEVATION (FT)	3576.30
BROKEN BACK STATION	0.00
BROKEN BACK ELEVATION (FT)	0.00
OUTLET STATION	119.61
OUTLET ELEVATION (FT)	3576.09
TOTAL CULVERT LENGTH (FT)	119.61
CULVERT SLOPE 1 (FT/FT)	-
CULVERT SLOPE 2 (FT/FT)	0.002

Site Data - Culvert B

Site Data Option: Culvert Invert Data	
Inlet Station:	0.00 ft
Inlet Elevation:	3576.30 ft
Outlet Station:	119.61 ft
Outlet Elevation:	3576.09 ft
Number of Barrels:	3.00

Tailwater Channel Data - Existing Culvert B

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 7.70 (_:1)
Channel Slope: 0.186
Channel Manning's n: 0.0350
Channel Invert Elevation: 3576.09 ft

Roadway Data for Crossing: Existing Culvert B

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 3583.00 ft
Roadway Surface: Paved
Roadway Top Width: 45.00 ft

Table 1 - Summary of Culvert Flows at Crossing: Existing Culvert B

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3578.98	10 year	81	80.70	0	1
3583.45	100 year	332	240.28	91.39	9
3583.00	Overtopping	228.17	228.17	0.00	Overtopping

Table 2 - Culvert Summary Table: Existing Culvert B

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 year	81	80.7	3578.98	2.519	2.676	2-M2c	2.142	1.673	1.673	0.967	6.636	11.215
100 year	332	240.28	3583.45	7.091	7.15	7-M2c	3	2.77	2.77	1.643	11.744	15.972

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert B)

Discharge Names	Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10 year	81	3577.06	0.97	11.21	11.22	2.84
100 year	332	3577.73	1.64	15.97	19.07	3.11

NOTES:
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CULVERT HYDRAULIC DATA
CULVERT B - EXISTING

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		54

CULVERT C HYDRAULIC DATA	
MATERIAL	CONCRETE
SHAPE	PIPE
ENTRANCE	SET
PROFILE	STRAIGHT
DESIGN EVENT	10 year
DESIGN DISCHARGE (CFS)	69.40
100-YR DISCHARGE (CFS)	232.00
n VALUE	0.012
PIPE DIAMETER (IN)	30
CULVERT SPAN (FT)	-
CULVERT RISE (FT)	-
NUMBER OF BARRELS	2.00
INLET STATION	0.00
INLET ELEVATION (FT)	3576.60
BROKEN BACK STATION	0.00
BROKEN BACK ELEVATION (FT)	0.00
OUTLET STATION	107.48
OUTLET ELEVATION (FT)	3576.25
TOTAL CULVERT LENGTH (FT)	107.48
CULVERT SLOPE 1 (FT/FT)	-
CULVERT SLOPE 2 (FT/FT)	0.003

Site Data - Culvert C

Site Data Option: Culvert Invert Data	
Inlet Station:	0.00 ft
Inlet Elevation:	3576.60 ft
Outlet Station:	107.48 ft
Outlet Elevation:	3576.25 ft
Number of Barrels:	2.00

Tailwater Channel Data - Proposed Culvert C

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 11.00 (_:1)
Channel Slope: 0.0555
Channel Manning's n: 0.0350
Channel Invert Elevation: 3576.25 ft

Roadway Data for Crossing: Proposed Culvert C

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 100.00 ft
Crest Elevation: 3583 ft
Roadway Surface: Paved
Roadway Top Width: 45.00 ft

Table 1 - Summary of Culvert Flows at Crossing: Proposed Culvert C

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert H Discharge (cfs)	Roadway Discharge (cfs)	Iterations
3580.29	10 year	69.4	69.40	0	1
3583.54	100 year	232	113.05	118.81	7
3583.00	Overtopping	106.95	106.95	0.00	Overtopping

Table 2 - Culvert Summary Table: Proposed Culvert C

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 year	69.4	69.4	3580.29	3.649	3.686	7-M2c	2.5	1.999	1.999	1.002	8.246	6.29
100 year	232	113.05	3583.54	6.936	6.917	7-M2c	2.5	2.363	2.363	1.575	11.765	8.505

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert C)

Discharge Names	Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10 year	69.4	3577.25	1	6.29	3.47	1.57
100 year	232	3577.82	1.57	8.51	5.45	1.69

NOTES:
1. *ANALYSIS PERFORMED USING HY-8 VERSION 7.50.*
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CULVERT HYDRAULIC DATA
CULVERT C - PROPOSED

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		55

DATE: 1/26/2024 4:22:02 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2/DP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/Culvert Data C.dgn

DW: CK: DW: CK:

AREA ID	AREA (ac)	AREA TIME OF CONC (min)	AREA TIME OF CONC USED (min)	AREA C-VALUE	AREA 5 YR INTENSITY (in/hr)	AREA 5 YR DISCHARGE (cfs)	AREA 100 YR INTENSITY (in/hr)	AREA 100 YR DISCHARGE (cfs)
Ditch 01R	14.90	7.00	10.00	0.52	6.00	46.49	9.48	73.45
Ditch 02R	2.40	4.00	10.00	0.63	6.00	9.07	9.48	14.33
Ditch 03R	4.30	5.00	10.00	0.63	6.00	16.25	9.48	25.68
Ditch 04R	5.60	6.00	10.00	0.63	6.00	21.17	9.48	33.45
Ditch 05R	1.40	3.00	10.00	0.41	6.00	3.40	9.48	5.38

NOTES:
1. *AREA HYDROLOGY WAS CALCULATED USING THE RATIONAL METHOD.*

CK:
DW:
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DATE: 1/26/2024 4:37:34 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/Hydrologic Data Areas.dgn

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SL 335

HYDROLOGIC DATA
AREAS

©TxDOT SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		56

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DW:
CK:
DW:

DATE: 1/26/2024 4:22:51 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay_Illumination/900-CAD GIS/910_CAD/09 DRAINAGE/Sheets/Ditch Data_01

Ditch 01R

FROM				TO				BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW	SLOPE	NORMAL DEPTH	FREEBOARD	VELOCITY	SHEAR STRESS	COMMENTS
STATION	OFFSET	LT/RT	FLOWLINE ELEVATION	STATION	OFFSET	LT/RT	FLOWLINE ELEVATION												
(ft)	(ft)		(ft)	(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(ft)	(f/s)	(lbs/ft^2)	
385+64	42.72	RT	3599.18	386+64	39.89	RT	3598.84	0.00	6.0	6.0	2.03	0.033	31.20	-0.003	1.54	0.49	2.19	0.16	
386+64	39.89	RT	3598.84	387+64	41.67	RT	3598.50	0.00	6.0	6.0	2.45	0.033	31.96	-0.003	1.55	0.90	2.21	0.16	
387+64	41.67	RT	3598.50	388+64	43.68	RT	3598.15	0.00	6.0	6.0	2.68	0.033	32.72	-0.003	1.56	1.12	2.24	0.17	
388+64	43.68	RT	3598.15	389+64	45.48	RT	3597.80	0.00	6.0	6.0	2.81	0.033	33.48	-0.003	1.57	1.24	2.26	0.17	
389+64	45.48	RT	3597.80	390+64	47.94	RT	3597.45	0.00	6.0	6.0	2.78	0.033	34.24	-0.003	1.59	1.19	2.27	0.17	
390+64	47.94	RT	3597.45	391+64	48.16	RT	3597.10	0.00	6.0	6.0	2.68	0.033	35.00	-0.003	1.60	1.08	2.28	0.17	
391+64	48.16	RT	3597.10	392+64	51.95	RT	3596.75	0.00	6.0	6.0	2.62	0.033	35.76	-0.003	1.61	1.01	2.29	0.17	
392+64	51.95	RT	3596.75	393+64	53.83	RT	3596.35	0.00	6.0	6.0	2.77	0.033	36.52	-0.004	1.58	1.19	2.42	0.20	
393+64	53.83	RT	3596.35	394+64	56.10	RT	3595.95	0.00	6.0	6.0	2.73	0.033	37.28	-0.004	1.60	1.13	2.44	0.20	
394+64	56.10	RT	3595.95	395+64	57.64	RT	3595.60	0.00	6.0	6.0	2.82	0.033	38.04	-0.003	1.65	1.17	2.33	0.18	
395+64	57.64	RT	3595.60	396+39	60.10	RT	3595.31	0.00	6.0	6.0	2.72	0.033	38.80	-0.004	1.63	1.09	2.43	0.19	

Ditch 02R

FROM				TO				BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW	SLOPE	NORMAL DEPTH	FREEBOARD	VELOCITY	SHEAR STRESS	COMMENTS
STATION	OFFSET	LT/RT	FLOWLINE ELEVATION	STATION	OFFSET	LT/RT	FLOWLINE ELEVATION												
(ft)	(ft)		(ft)	(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(ft)	(f/s)	(lbs/ft^2)	
397+44	60.74	RT	3596.05	397+64	59.00	RT	3596.15	0.00	6.0	6.0	1.75	0.033	7.70	0.005	0.85	0.90	1.78	0.13	
397+64	59.00	RT	3596.15	398+64	55.00	RT	3596.50	0.00	6.0	6.0	1.62	0.033	6.93	0.003	0.87	0.75	1.52	0.09	
398+64	55.00	RT	3596.50	399+64	53.70	RT	3596.85	0.00	6.0	6.0	1.52	0.033	6.16	0.003	0.83	0.69	1.48	0.09	
399+64	53.70	RT	3596.85	400+64	53.58	RT	3597.20	0.00	6.0	6.0	1.25	0.033	5.39	0.003	0.79	0.46	1.43	0.09	
400+64	53.58	RT	3597.20	401+64	51.27	RT	3597.51	0.00	6.0	6.0	0.93	0.033	4.62	0.003	0.77	0.16	1.31	0.07	
401+64	51.27	RT	3597.51	402+64	50.06	RT	3597.82	0.00	6.0	6.0	1.02	0.033	3.85	0.003	0.72	0.30	1.25	0.07	
402+64	50.06	RT	3597.82	403+64	47.31	RT	3598.13	0.00	6.0	6.0	1.20	0.033	3.08	0.003	0.66	0.54	1.19	0.06	
403+64	47.31	RT	3598.13	404+64	44.99	RT	3598.50	0.00	6.0	6.0	0.92	0.033	2.31	0.004	0.57	0.35	1.18	0.07	

Ditch 03R

FROM				TO				BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW	SLOPE	NORMAL DEPTH	FREEBOARD	VELOCITY	SHEAR STRESS	COMMENTS
STATION	OFFSET	LT/RT	FLOWLINE ELEVATION	STATION	OFFSET	LT/RT	FLOWLINE ELEVATION												
(ft)	(ft)		(ft)	(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(ft)	(f/s)	(lbs/ft^2)	
405+64	43.58	RT	3598.78	406+64	42.65	RT	3598.71	0.00	6.0	6.0	0.93	0.033	0.69	-0.001	0.50	0.43	0.47	0.01	
406+64	42.65	RT	3598.71	407+64	45.69	RT	3598.41	0.00	6.0	6.0	0.73	0.033	1.46	-0.003	0.50	0.23	0.97	0.05	
407+64	45.69	RT	3598.41	408+64	48.53	RT	3598.11	0.00	6.0	6.0	1.06	0.033	2.23	-0.003	0.59	0.47	1.08	0.05	
408+64	48.53	RT	3598.11	409+64	51.61	RT	3597.81	0.00	6.0	6.0	1.14	0.033	3.00	-0.003	0.66	0.48	1.16	0.06	
409+64	51.61	RT	3597.81	410+64	54.44	RT	3597.51	0.00	6.0	6.0	1.16	0.033	3.77	-0.003	0.71	0.45	1.23	0.07	
410+64	54.44	RT	3597.51	411+64	56.93	RT	3597.21	0.00	6.0	6.0	1.35	0.033	4.54	-0.003	0.77	0.58	1.29	0.07	
411+64	56.93	RT	3597.21	412+64	60.55	RT	3596.91	0.00	6.0	6.0	1.57	0.033	5.31	-0.003	0.81	0.76	1.34	0.07	
412+64	60.55	RT	3596.91	413+64	57.92	RT	3596.61	0.00	6.0	6.0	1.73	0.033	6.08	-0.003	0.85	0.88	1.39	0.08	
413+64	57.92	RT	3596.61	414+64	59.64	RT	3596.31	0.00	6.0	6.0	1.77	0.033	6.85	-0.003	0.89	0.88	1.43	0.08	
414+64	59.64	RT	3596.31	415+64	59.88	RT	3596.01	0.00	6.0	6.0	1.57	0.033	7.62	-0.003	0.93	0.64	1.47	0.09	
415+64	59.88	RT	3596.01	416+64	59.21	RT	3595.71	0.00	6.0	6.0	1.89	0.033	8.39	-0.003	0.96	0.93	1.50	0.09	
416+64	59.21	RT	3595.71	417+64	61.31	RT	3595.41	0.00	6.0	6.0	2.25	0.033	9.16	-0.003	1.00	1.25	1.54	0.09	
417+64	61.31	RT	3595.41	418+64	62.79	RT	3595.11	0.00	6.0	6.0	2.42	0.033	9.93	-0.003	1.03	1.39	1.57	0.09	
418+64	62.79	RT	3595.11	419+64	59.09	RT	3594.81	0.00	6.0	6.0	2.50	0.033	10.70	-0.003	1.06	1.44	1.60	0.10	
419+64	59.09	RT	3594.81	420+64	60.66	RT	3594.51	0.00	6.0	6.0	2.40	0.033	11.47	-0.003	1.08	1.32	1.63	0.10	
420+64	60.66	RT	3594.51	421+64	60.48	RT	3594.21	0.00	6.0	6.0	2.02	0.033	12.24	-0.003	1.11	0.91	1.65	0.10	
421+64	60.48	RT	3594.21	422+64	62.38	RT	3593.91	0.00	6.0	6.0	1.62	0.033	13.01	-0.003	1.14	0.48	1.68	0.10	

COMMENTS:
1. *DITCH REQUIRES BERM TO MEET CAPACITY DEMANDS. TOP OF BERM SHALL BE 1.80 FEET ABOVE FLOWLINE.*

NOTES:
1. *DITCH HYDRAULICS CALCULATED USING MANNINGS EQUATION.*
2. *THE NEED FOR CHANNEL PROTECTION/LINING IS BASED ON A MAXIMUM SHEAR STRESS OF 1.00 LBS/SF FOR RETARDANCE CLASS C VEGETATION LINED DITCHES.*
3. *DITCHES HAVE BEEN DESIGNED TO THE 5 YEAR AEP UNLESS NOTED OTHERWISE.*

STATE OF TEXAS
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SL 335

DITCH HYDRAULIC DATA

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		57

Ditch 04R																			
FROM				TO				BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW	SLOPE	NORMAL DEPTH	FREEBOARD	VELOCITY	SHEAR STRESS	COMMENTS
STATION	OFFSET	LT/RT	FLOWLINE ELEVATION	STATION	OFFSET	LT/RT	FLOWLINE ELEVATION												
(ft)	(ft)		(ft)	(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(ft)	(f/s)	(lbs/ft^2)	
424+64	59.66	RT	3593.17	425+64	60.88	RT	3592.05	0.00	6.0	6.0	1.47	0.033	0.28	-0.011	0.21	1.26	1.06	0.07	
425+64	60.88	RT	3592.05	426+64	61.37	RT	3591.15	0.00	6.0	6.0	1.58	0.033	0.78	-0.009	0.32	1.26	1.25	0.09	
426+64	61.37	RT	3591.15	427+64	62.69	RT	3589.88	0.00	6.0	6.0	1.62	0.033	1.28	-0.013	0.36	1.26	1.61	0.14	
427+64	62.69	RT	3589.88	428+64	64.37	RT	3588.64	0.00	6.0	6.0	1.64	0.033	1.78	-0.012	0.41	1.23	1.74	0.16	
428+64	64.37	RT	3588.64	429+64	66.54	RT	3587.53	0.00	6.0	6.0	1.64	0.033	2.28	-0.011	0.46	1.18	1.77	0.16	
429+64	66.54	RT	3587.53	430+64	66.10	RT	3586.25	0.00	6.0	6.0	1.47	0.033	2.78	-0.013	0.49	0.98	1.97	0.19	
430+64	66.10	RT	3586.25	431+64	66.26	RT	3585.15	0.00	6.0	6.0	1.49	0.033	3.28	-0.011	0.53	0.96	1.94	0.18	
431+64	66.26	RT	3585.15	432+64	70.05	RT	3583.95	0.00	6.0	6.0	1.26	0.033	3.78	-0.012	0.55	0.71	2.08	0.20	
432+64	70.05	RT	3583.95	433+64	69.28	RT	3582.88	0.00	6.0	6.0	1.21	0.033	4.28	-0.011	0.59	0.62	2.05	0.19	
433+64	69.28	RT	3582.88	434+64	71.42	RT	3581.75	0.00	6.0	6.0	1.80	0.033	4.78	-0.011	0.61	1.19	2.15	0.21	1
434+64	71.42	RT	3581.75	435+64	64.64	RT	3581.45	0.00	6.0	6.0	1.80	0.033	5.28	-0.003	0.81	0.99	1.34	0.07	1
435+64	64.64	RT	3581.45	436+64	59.30	RT	3581.15	0.00	6.0	6.0	1.80	0.033	5.78	-0.003	0.84	0.96	1.37	0.08	1
436+64	59.30	RT	3581.15	437+64	53.95	RT	3580.85	0.00	6.0	6.0	1.80	0.033	6.28	-0.003	0.87	0.93	1.40	0.08	1
437+64	53.95	RT	3580.85	438+64	54.17	RT	3580.55	0.00	6.0	6.0	1.80	0.033	6.78	-0.003	0.89	0.91	1.43	0.08	1
438+64	54.17	RT	3580.55	439+64	52.45	RT	3580.25	0.00	6.0	6.0	1.80	0.033	7.28	-0.003	0.91	0.89	1.45	0.08	1
439+64	52.45	RT	3580.25	440+64	47.52	RT	3579.95	0.00	6.0	6.0	1.80	0.033	7.78	-0.003	0.94	0.86	1.48	0.09	1
440+64	47.52	RT	3579.95	441+64	49.06	RT	3579.65	0.00	6.0	6.0	1.80	0.033	8.28	-0.003	0.96	0.84	1.50	0.09	1
441+64	49.06	RT	3579.65	442+64	50.43	RT	3579.35	0.00	6.0	6.0	1.80	0.033	8.78	-0.003	0.98	0.82	1.52	0.09	1
442+64	50.43	RT	3579.35	443+64	52.99	RT	3579.05	0.00	6.0	6.0	1.80	0.033	9.28	-0.003	1.00	0.80	1.54	0.09	1
443+64	52.99	RT	3579.05	444+64	55.29	RT	3578.75	0.00	6.0	6.0	1.80	0.033	9.78	-0.003	1.02	0.78	1.56	0.09	1
444+64	55.29	RT	3578.75	445+64	57.67	RT	3578.45	0.00	6.0	6.0	1.80	0.033	10.28	-0.003	1.04	0.76	1.58	0.10	1
445+64	57.67	RT	3578.45	446+64	59.70	RT	3578.15	0.00	6.0	6.0	1.80	0.033	10.78	-0.003	1.06	0.74	1.60	0.10	1
446+64	59.70	RT	3578.15	447+64	61.85	RT	3577.85	0.00	6.0	6.0	1.80	0.033	11.28	-0.003	1.08	0.72	1.62	0.10	1
447+64	61.85	RT	3577.85	448+64	64.01	RT	3577.55	0.00	6.0	6.0	1.80	0.033	11.78	-0.003	1.09	0.70	1.64	0.10	1
448+64	64.01	RT	3577.55	449+64	65.99	RT	3577.25	0.00	6.0	6.0	1.80	0.033	12.28	-0.003	1.11	0.69	1.66	0.10	1
449+64	65.99	RT	3577.25	450+64	65.91	RT	3576.95	0.00	6.0	6.0	1.80	0.033	12.78	-0.003	1.13	0.67	1.67	0.10	1
450+64	65.91	RT	3576.95	451+14	66.65	RT	3576.80	0.00	6.0	6.0	1.50	0.033	13.28	-0.003	1.14	0.35	1.69	0.11	

Ditch 05R																			
FROM				TO				BOTTOM WIDTH	LEFT SIDE SLOPE	RIGHT SIDE SLOPE	CHANNEL DEPTH	MANNING'S "n"	DESIGN FLOW	SLOPE	NORMAL DEPTH	FREEBOARD	VELOCITY	SHEAR STRESS	COMMENTS
STATION	OFFSET	LT/RT	FLOWLINE ELEVATION	STATION	OFFSET	LT/RT	FLOWLINE ELEVATION												
(ft)	(ft)		(ft)	(ft)	(ft)		(ft)	(ft)	x:1	x:1	(ft)		(cfs)	(ft/ft)	(ft)	(ft)	(f/s)	(lbs/ft^2)	
522+14	42.41	RT	3587.05	522+64	40.80	RT	3586.97	0.00	6.0	6.0	0.92	0.033	1.50	-0.002	0.57	0.35	0.77	0.03	
522+64	40.80	RT	3586.97	523+64	38.78	RT	3586.81	0.00	6.0	6.0	1.22	0.033	2.10	-0.002	0.65	0.58	0.84	0.03	
523+64	38.78	RT	3586.81	523+89	41.12	RT	3586.77	0.00	6.0	6.0	1.11	0.033	2.50	-0.002	0.69	0.42	0.88	0.03	

COMMENTS:
1. *DITCH REQUIRES BERM TO MEET CAPACITY DEMANDS. TOP OF BERM SHALL BE 1.80 FEET ABOVE FLOWLINE.*

NOTES:
1. *DITCH HYDRAULICS CALCULATED USING MANNINGS EQUATION.*
2. *THE NEED FOR CHANNEL PROTECTION/LINING IS BASED ON A MAXIMUM SHEAR STRESS OF 1.00 LBS/SF FOR RETARDANCE CLASS C VEGETATION LINED DITCHES.*
3. *DITCHES HAVE BEEN DESIGNED TO THE 5 YEAR AEP UNLESS NOTED OTHERWISE.*

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SL 335

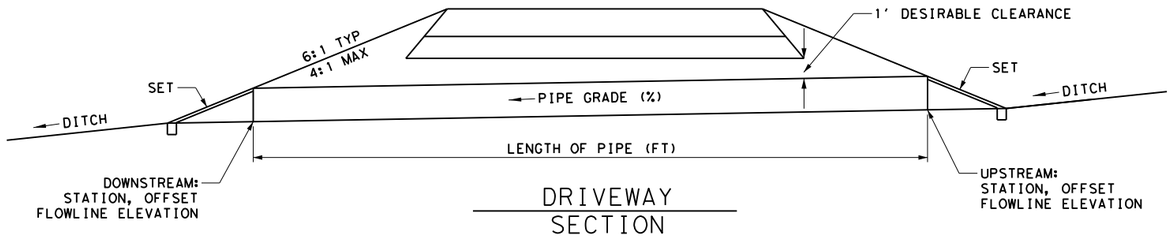
DITCH HYDRAULIC DATA

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		58

DATE: 1/26/2024 4:23:50 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/Ditch Data_02

PIPE NAME	LENGTH OF CULVERT (FT)	NUMBER OF BARRELS	RCP SIZE (IN)	SET TYPE	SET SIDE SLOPE (X:1)	U.S. SL 335 STATION	U.S. OFFSET (FT)	U.S. FLOWLINE	D.S. SL 335 STATION	D.S. OFFSET (FT)	D.S. FLOWLINE	PIPE GRADE (%)	CONCRETE CLASS	DW ELEVATION (FT)	COVER (FT)	PIPE SIZE (FT)
DW397+12R	41	1	24	SETP-PD	6	397+31.31	62.33	3595.60	396+90.55	66.77	3595.18	1.03%	IV	3598.54	0.69	2.00

NOTES:
1. *ANALYSIS PERFORMED USING HY-8 VERSION 7.50.*
2. *LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK.*



DRIVEWAY
SECTION
NTS

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SL 335

DRIVEWAY CULVERT DETAILS

©TxDOT SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 355
DIST	COUNTY		SHEET NO.
AMA	RANDALL		59

DATE: 1/26/2024 4:24:53 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910_CAD/09_DRAINAGE/Sheets/DW Culverts

DW: CK: DW: CK:

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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" (2) Conc (Curb) (CY)	Class "C" (3) Conc (Wingwall) (CY)	Total Wingwall Area (SF)
Culvert A1 (RT) SL335 STA 396+28.75	1~6'x3'	3'	SCP-6	SETB-CD	0°	6:1	7"	7"	0.670'	4.000'	N/A	N/A	22.000'	N/A	7.167'	0.0	0.4	11.2	N/A

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

STATE OF TEXAS
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01/26/2024

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Texas Department of Transportation

Bridge Division Standard

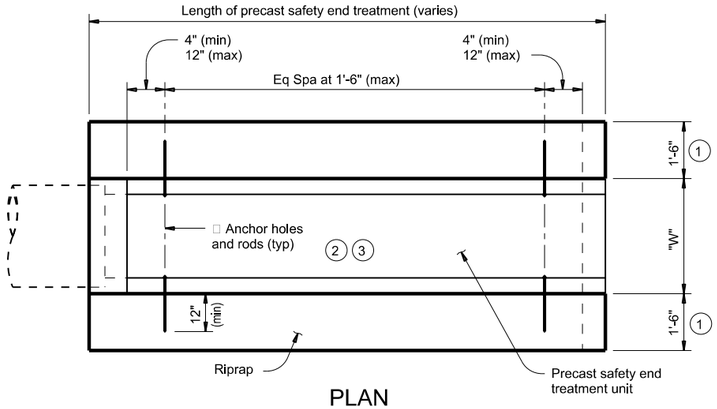
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

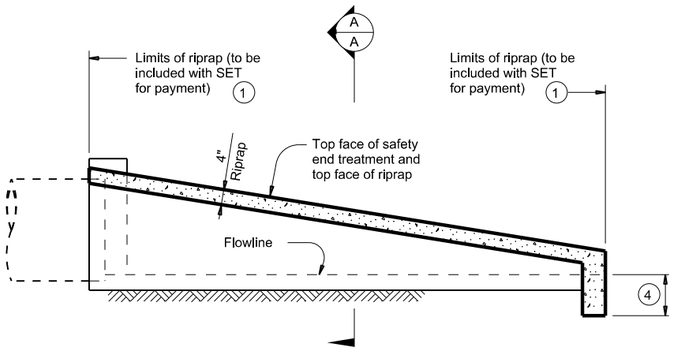
FILE: CD-BCS-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		60

DATE:
FILE:

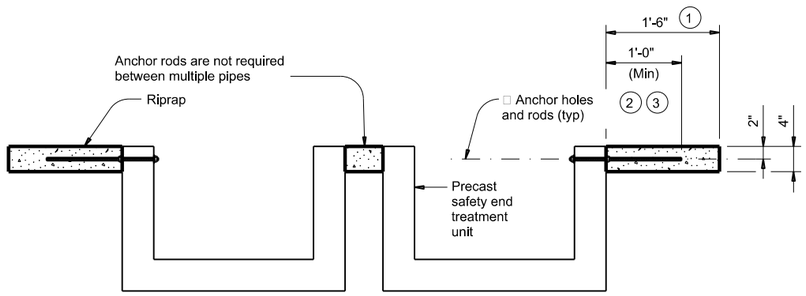
DATE:
FILE:



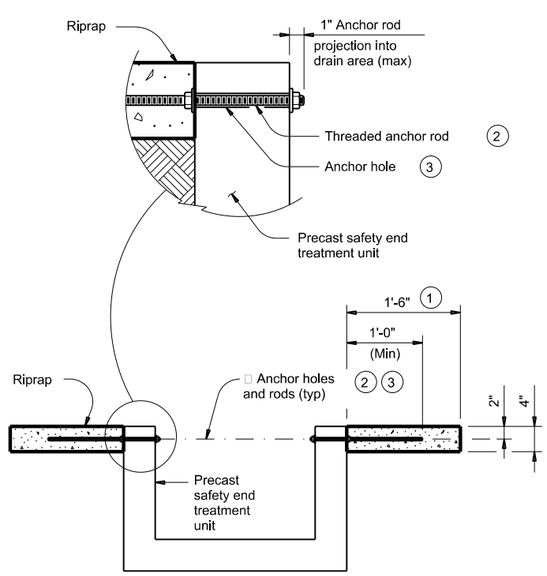
PLAN



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: CD-PSET-RR-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		61

DATE: 2/1/2024 5:46:30 PM
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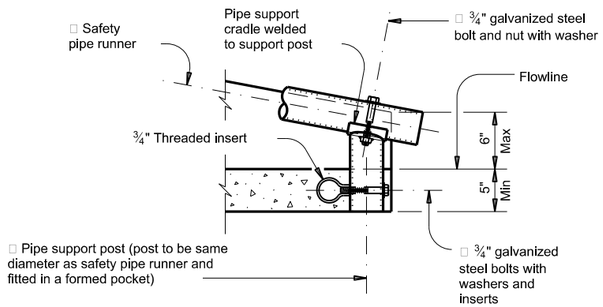
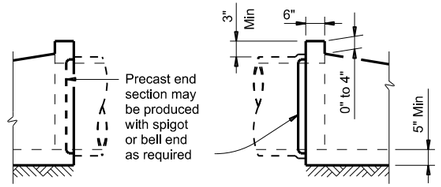
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		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"				



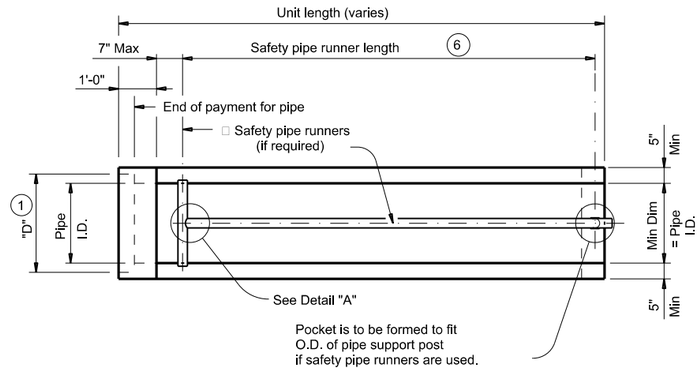
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



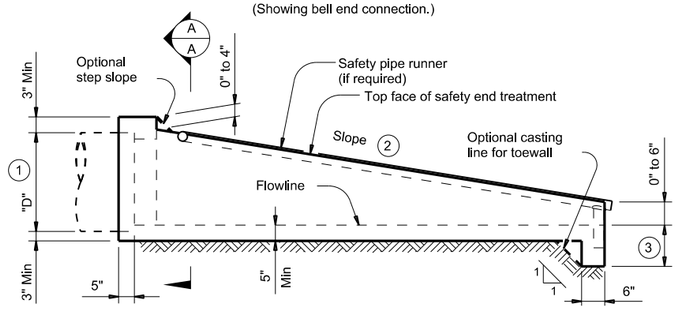
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



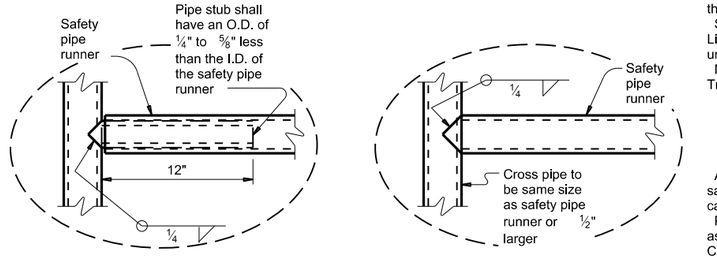
PLAN

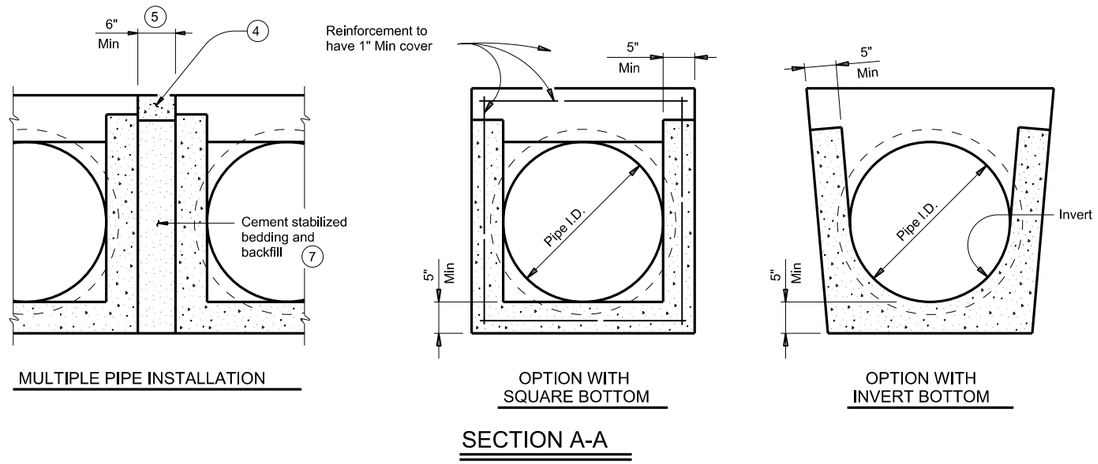
(Showing bell end connection.)

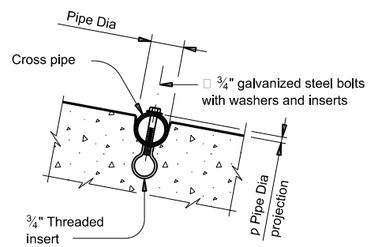


LONGITUDINAL ELEVATION

(Showing bell end connection.)







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: CD-PSET-SC-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		62

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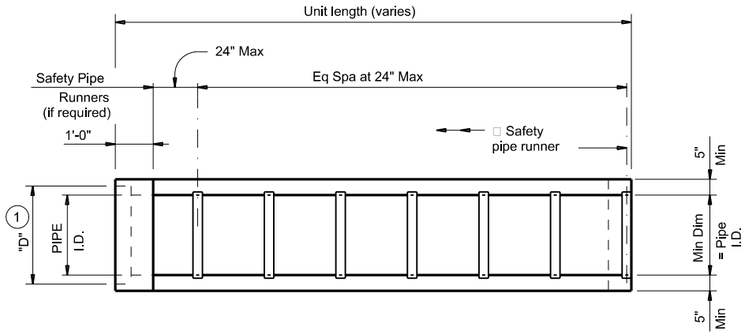
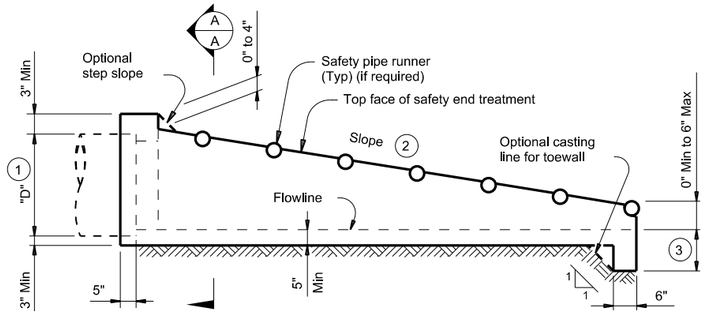


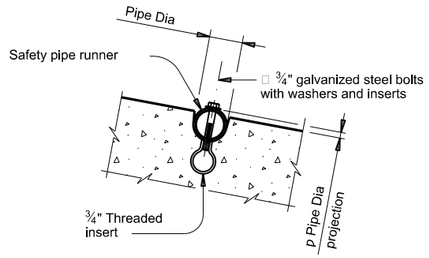
PLAN

(Showing bell end connection.)



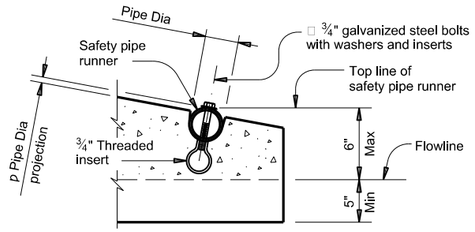
LONGITUDINAL ELEVATION

(Showing bell end connection.)

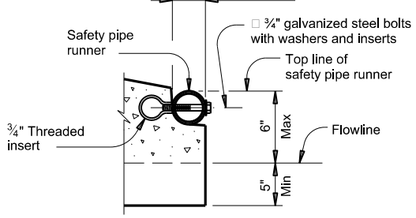


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



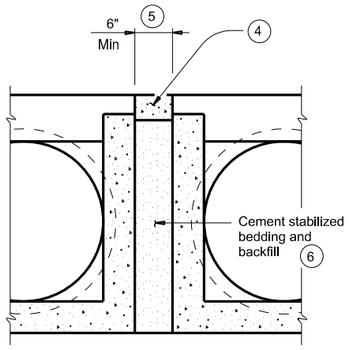
OPTION A



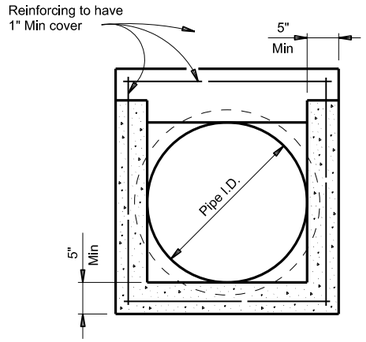
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

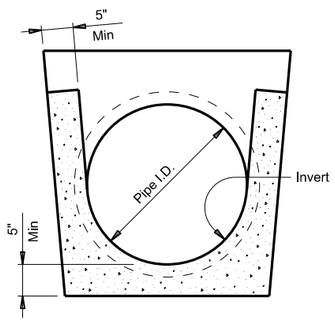
(If required)



MULTIPLE PIPE INSTALLATION

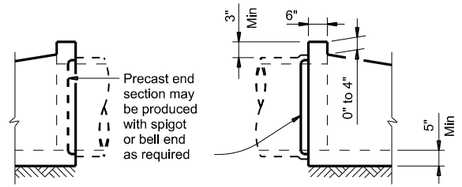


OPTION WITH SQUARE BOTTOM



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: CD-PSET-SP-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		63

DATE: 2/1/2024 5:47:13 PM
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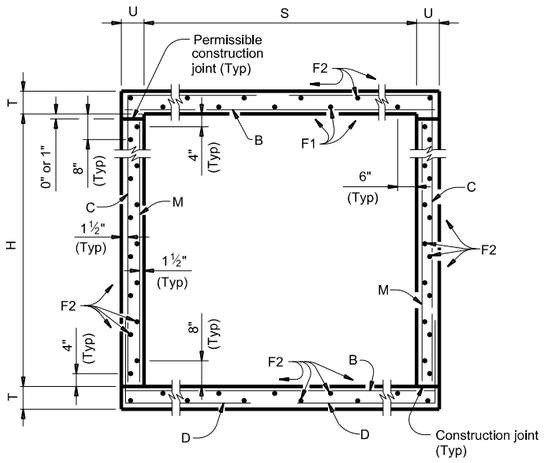
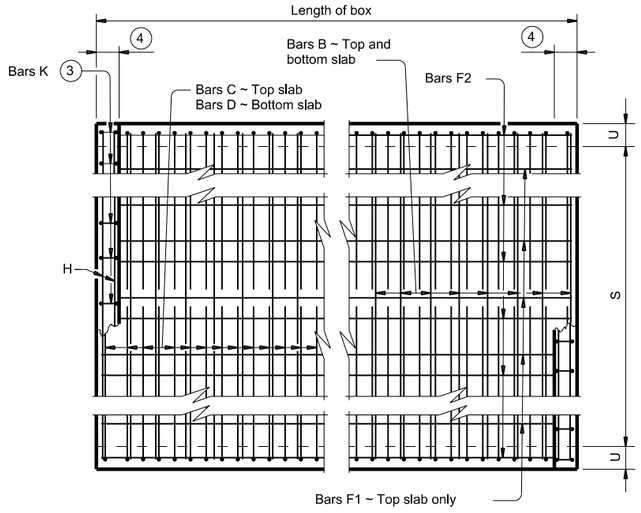
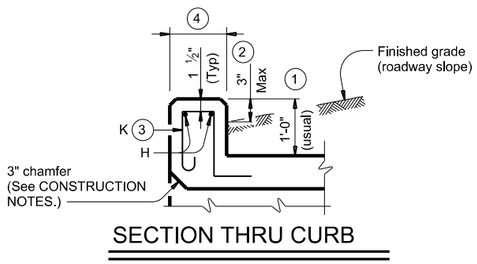


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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

CONSTRUCTION NOTES:

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

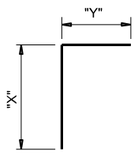
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

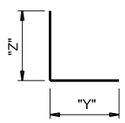
GENERAL NOTES:

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

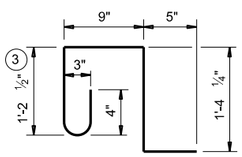
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE

0' TO 30' FILL

SCC-5 & 6

FILE: CD-SCC56-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		64

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' - 0"	2' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 3"	704	2' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' - 0"	2' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 4"	713	2' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' - 0"	3' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 3"	817	3' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' - 0"	3' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 4"	826	3' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' - 0"	4' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 3"	929	4' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' - 0"	4' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 4"	939	4' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' - 0"	5' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 3"	1,042	5' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' - 0"	5' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 4"	1,051	5' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' - 0"	2' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	6' - 7"	742	2' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' - 0"	2' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	6' - 8"	1,126	2' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' - 0"	2' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	6' - 10"	1,155	2' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	2' - 0"	110	5	39' - 9"	133	25	39' - 9"	664	7' - 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' - 0"	3' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	7' - 7"	854	3' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' - 0"	3' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	7' - 8"	1,295	3' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' - 0"	3' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	7' - 10"	1,324	3' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	3' - 0"	164	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' - 0"	4' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	8' - 7"	967	4' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' - 0"	4' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	8' - 8"	1,464	4' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' - 0"	4' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	8' - 10"	1,493	4' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	4' - 0"	219	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' - 0"	5' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	9' - 7"	1,080	5' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' - 0"	5' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	9' - 8"	1,633	5' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' - 0"	5' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	9' - 10"	1,661	5' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	5' - 0"	274	5	39' - 9"	133	33	39' - 9"	876	7' - 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' - 0"	6' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	10' - 7"	1,192	6' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' - 0"	6' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	10' - 8"	1,802	6' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' - 0"	6' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	10' - 10"	1,830	6' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	6' - 0"	329	5	39' - 9"	133	37	39' - 9"	982	7' - 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

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

DATE: 2/1/2024 5:47:14 PM
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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

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

SCC-5 & 6

FILE: CD-SCC56-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		65

DATE: 2/1/2024 5:47:35 PM
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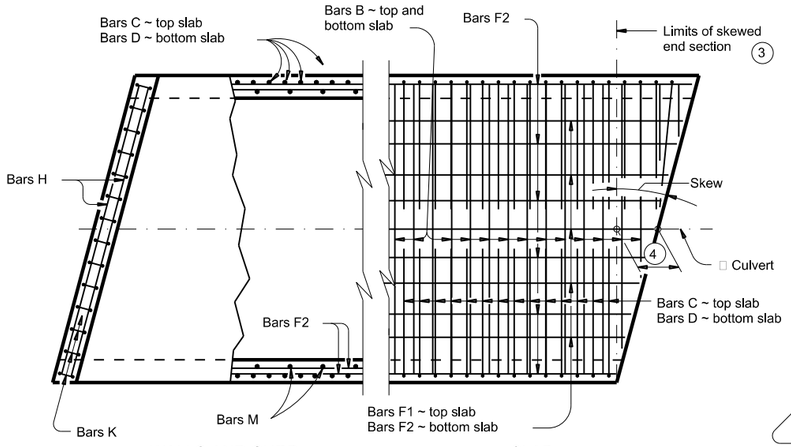
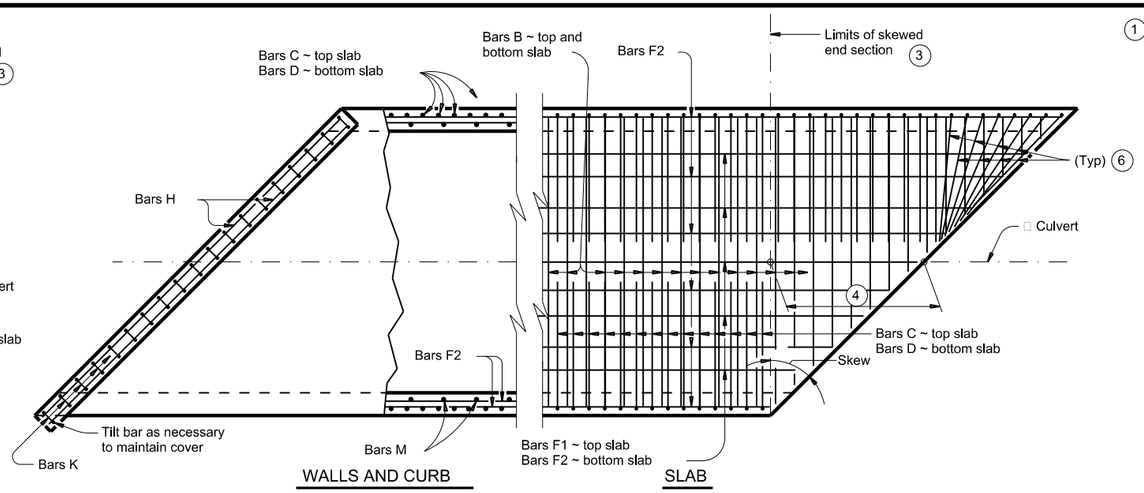
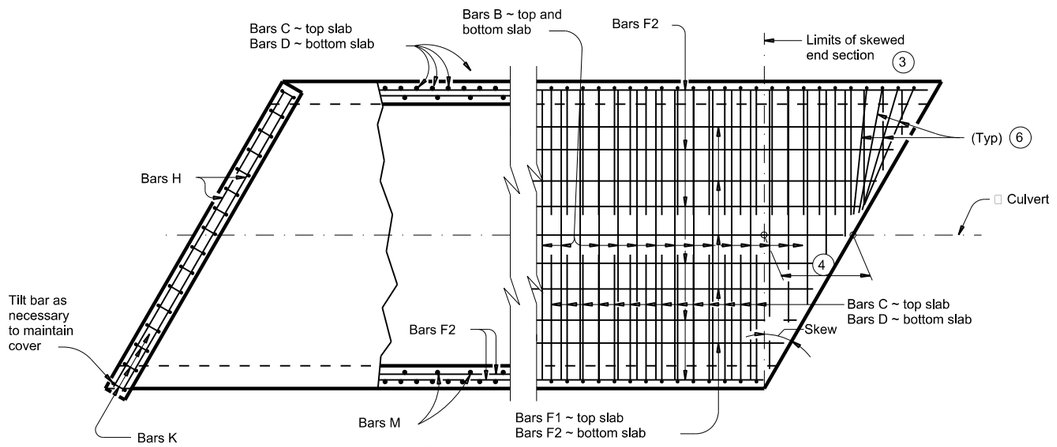


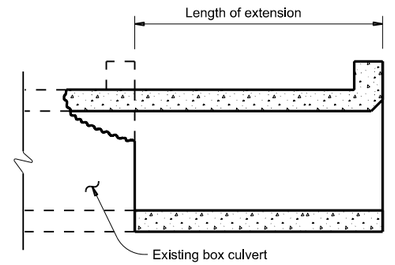
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



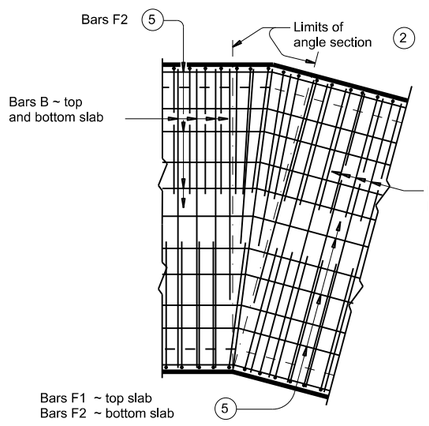
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



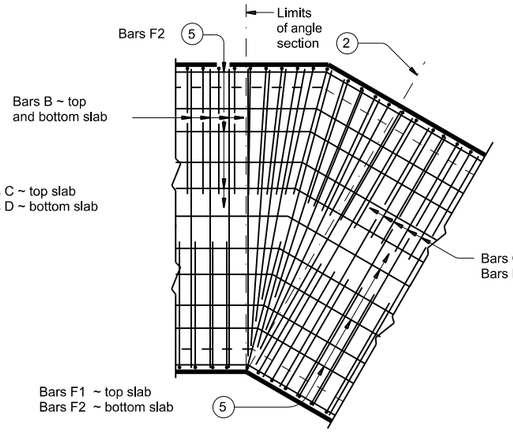
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



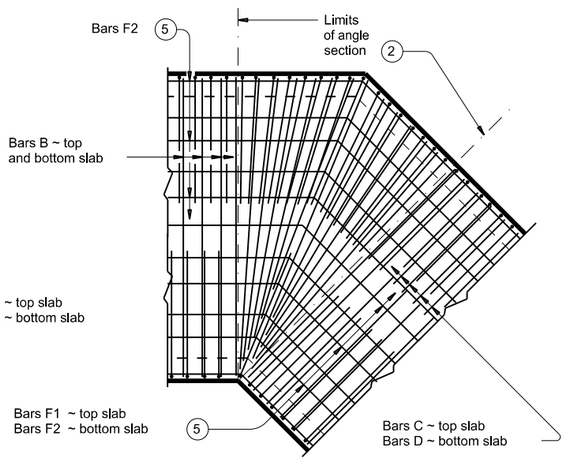
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F 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 1 ½" clear cover.

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: CD-SCC-MD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		66

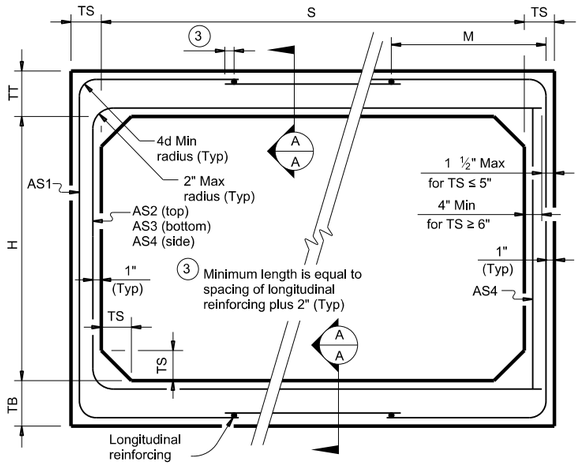
DATE: 2/1/2024 5:47:56 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21DP5017_WAI-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/16_STANDARDS/DRAINAGE/CD-SCP06-20.dgn

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	-	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	-	-	-	6.8
6	2	7	7	7	3 - 5	43	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	-	-	-	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	-	-	-	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	-	-	-	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	-	-	-	6.8
6	3	8	7	7	< 2	-	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	-	-	-	7.5
6	3	7	7	7	3 - 5	39	0.17	0.18	0.17	0.17	-	-	-	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	-	-	-	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	-	-	-	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	-	-	-	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	-	-	-	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	-	-	-	7.5
6	4	8	7	7	< 2	-	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	-	-	-	8.2
6	4	7	7	7	3 - 5	39	0.17	0.21	0.19	0.17	-	-	-	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	-	-	-	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	-	-	-	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	-	-	-	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	-	-	-	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	-	-	-	8.2
6	5	8	7	7	< 2	-	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	-	-	-	8.9
6	5	7	7	7	3 - 5	43	0.17	0.23	0.21	0.17	-	-	-	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	-	-	-	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	-	-	-	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	-	-	-	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	-	-	-	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	-	-	-	8.9
6	6	8	7	7	< 2	-	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	-	-	-	9.6
6	6	7	7	7	3 - 5	52	0.17	0.24	0.22	0.17	-	-	-	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	-	-	-	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	-	-	-	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	-	-	-	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	-	-	-	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	-	-	-	9.6

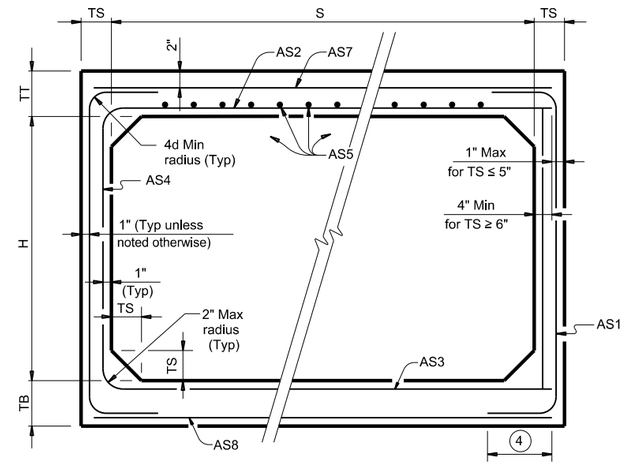
(1) For box length = 8'-0"

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



CORNER OPTION "A" CORNER OPTION "B"

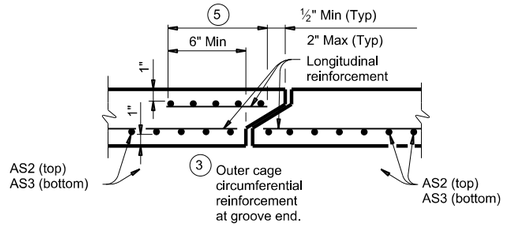
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:
Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.
Provide Class H concrete (f'c = 5,000 psi).

GENERAL NOTES:
Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)."

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS PRECAST
6'-0" SPAN

SCP-6

FILE: CD-SCP06-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		67

DATE: 2/1/2024 5:48:16 PM
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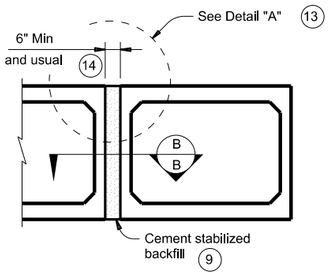
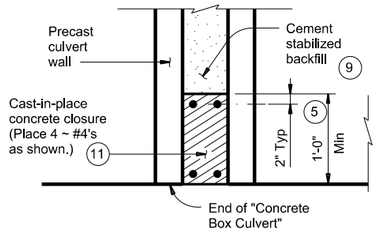
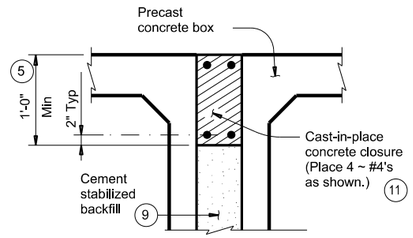


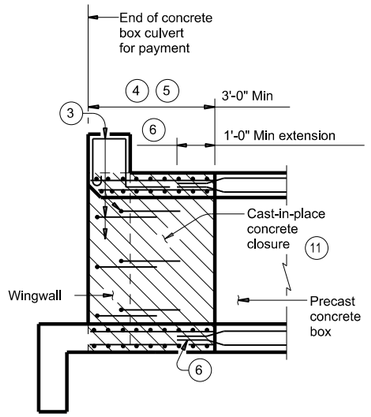
MULTIPLE UNIT PLACEMENT



SECTION B-B

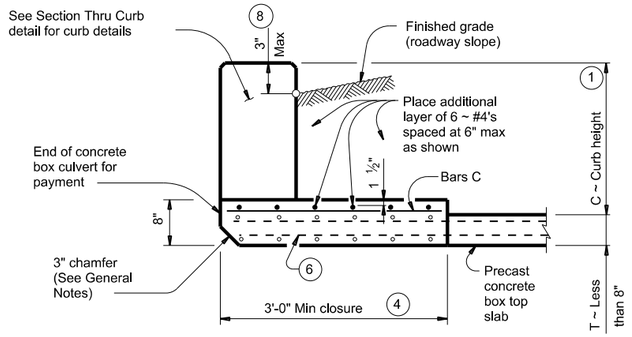


DETAIL "A" (13)

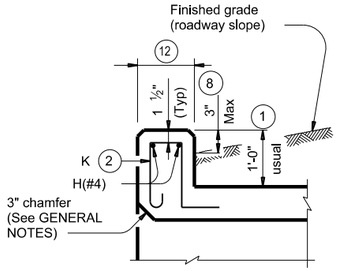


WINGWALL CONNECTION

(Also applies to safety end treatment.)

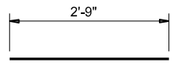


SECTION THRU TOP SLABS LESS THAN 8"

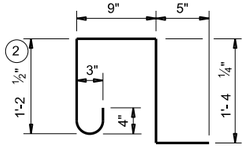


SECTION THRU CURB

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



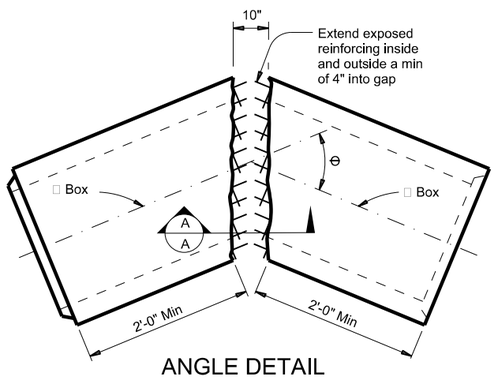
BARS C (#4)
(Spa = 1'-0" Max)



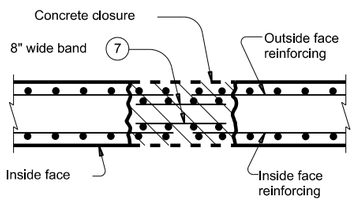
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

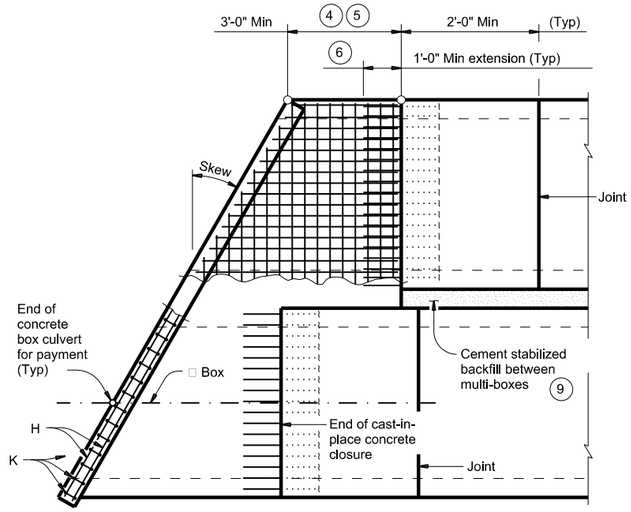
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." No payment will be made for any additional material in the gap between adjacent boxes.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

MATERIAL NOTES:

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

GENERAL NOTES:

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: CD-SCP-MD-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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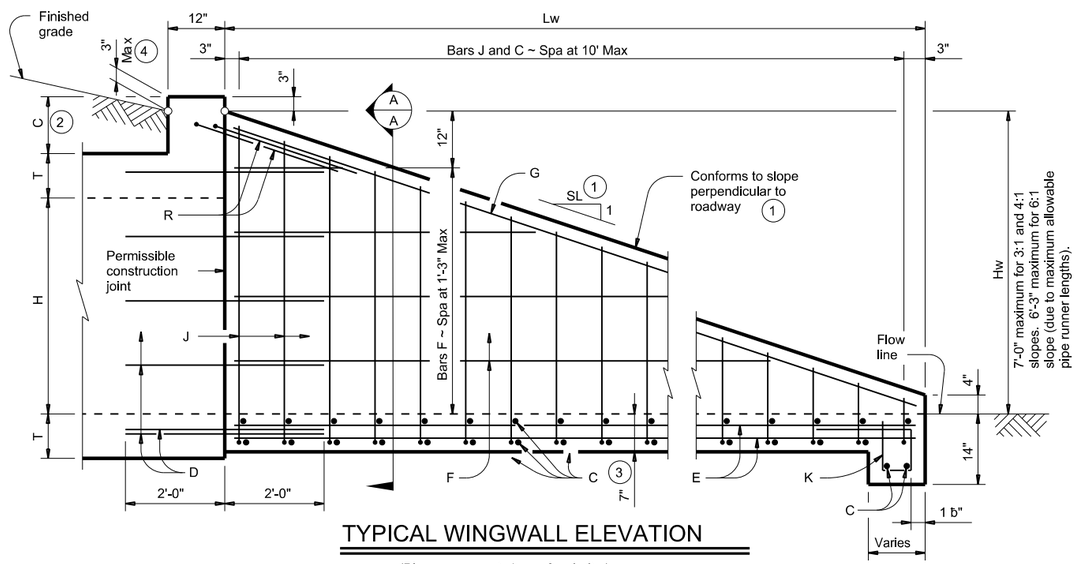
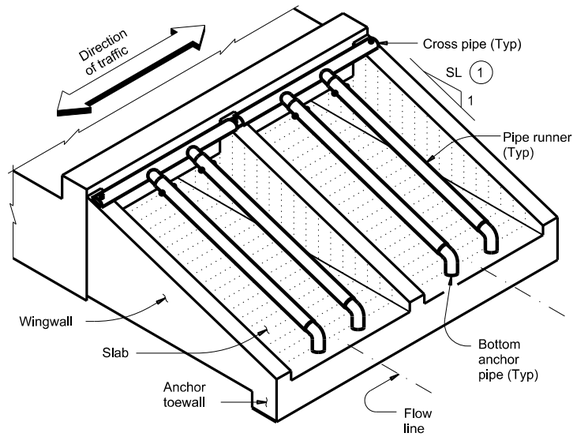


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250'
Lw = (Hw - 0.333') (SL)

For cast-in-place culverts:
Atw = (N) (S) + (N + 1) (U)
For precast culverts:
Atw = (N) (2U + S) + (N - 1) (0.500')

Total Wingwall Area (SF)
= (0.5) (Hw + 0.333') (Lw) (N + 1)
Total Concrete Volume (CY)
= [(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.

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.

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

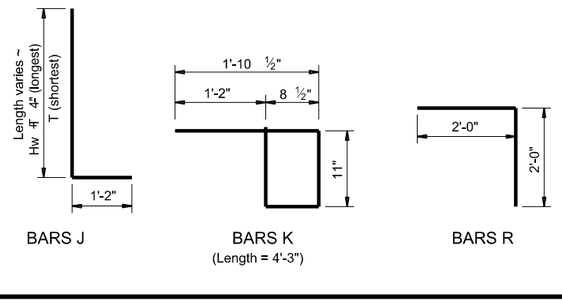


TABLE OF REINFORCING BAR SIZES AND SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown

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.

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: CD-SETBCD-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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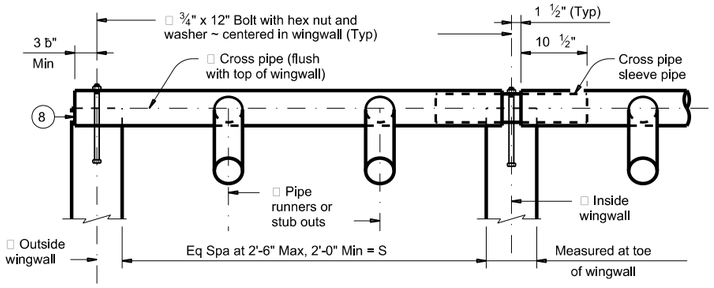
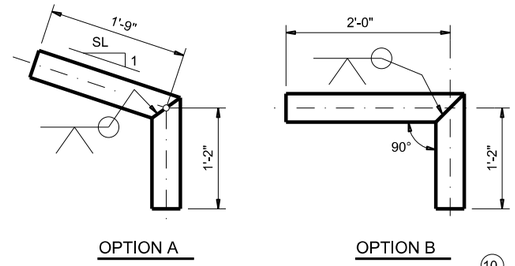


NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a ∃" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A OPTION B

BOTTOM ANCHOR PIPE DETAILS

(10)

(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.

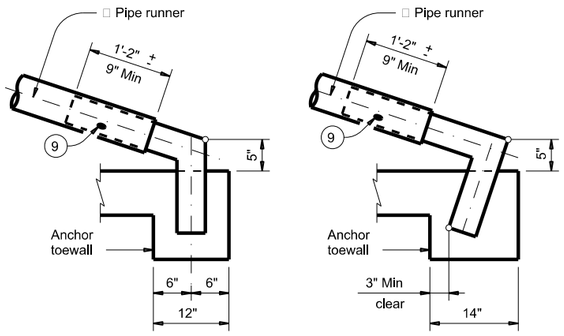
(9) After installation, inspect the 1#2" hole to ensure that the lap of the safety pipe runner with the bottom anchor pipe is adequate.

(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.

(6)

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

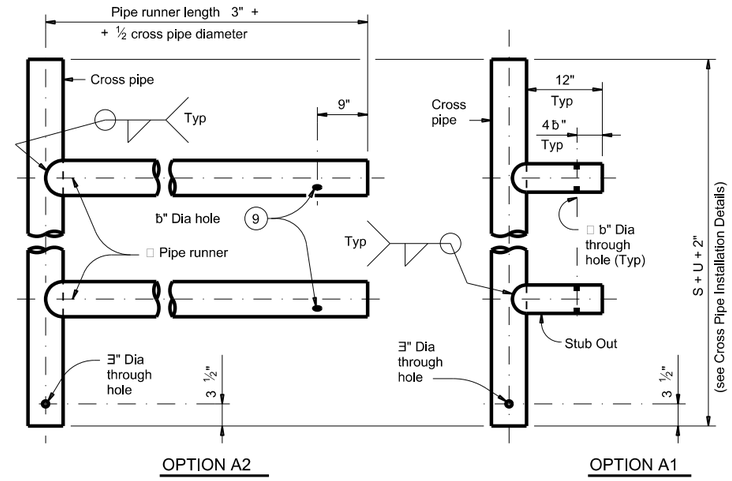
Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10'- 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'- 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34'- 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"



OPTION B1 OPTION B2

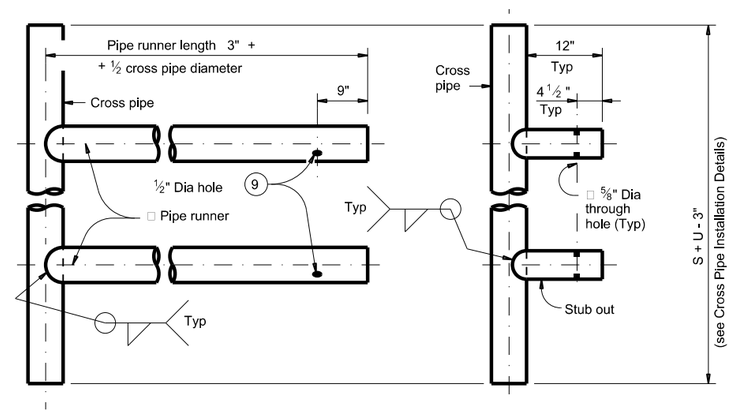
BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)



OPTION A2 OPTION A1

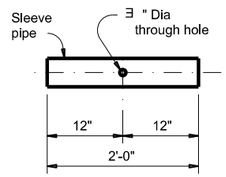
FOR USE IN OUTSIDE CULVERT BAY



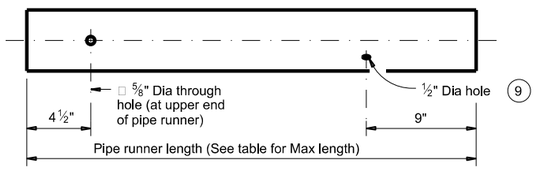
OPTION A2 OPTION A1

FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS

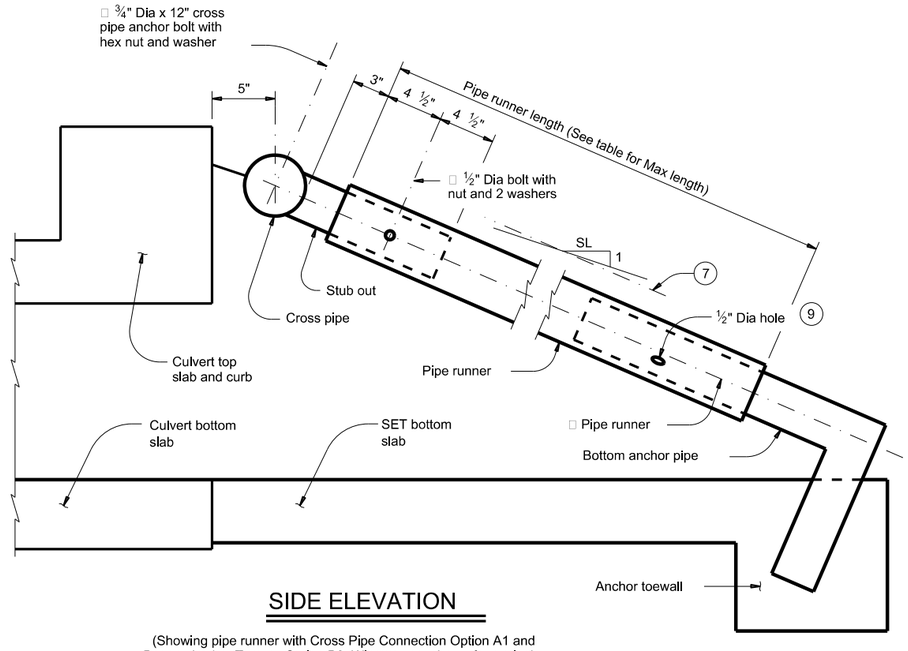


CROSS PIPE SLEEVE PIPE DETAILS



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.)

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

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	AMA	RANDALL		70

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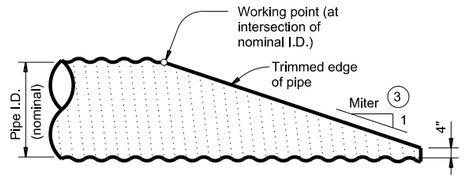
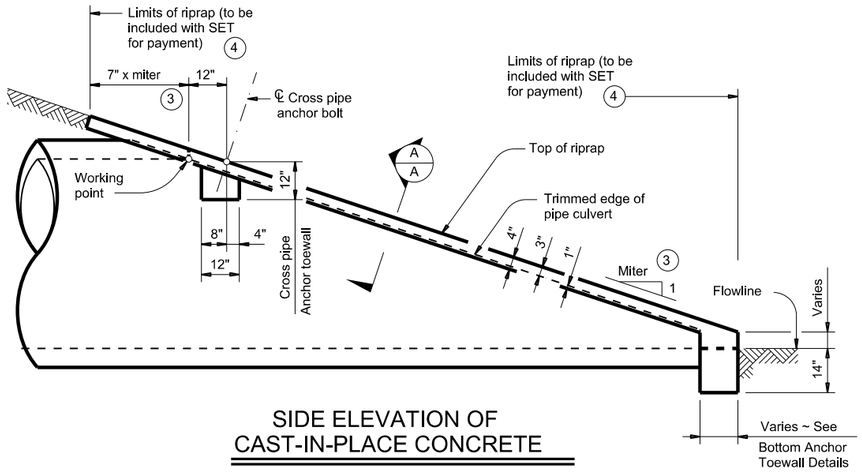


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

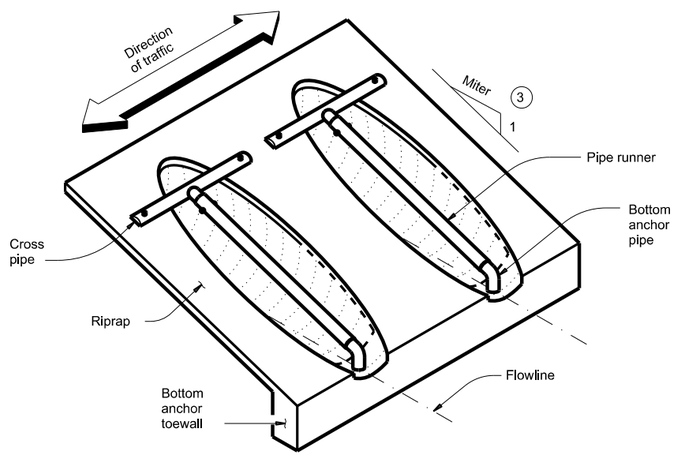
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(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.

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: CD-SETP-CD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		71

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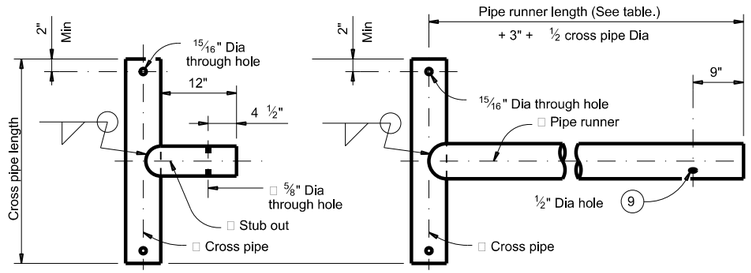
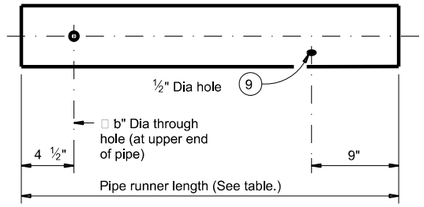


OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS

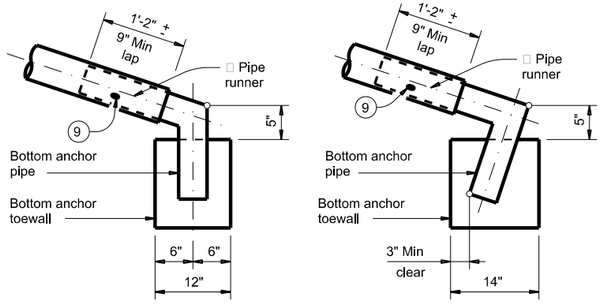


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

OPTION B1 OPTION B2

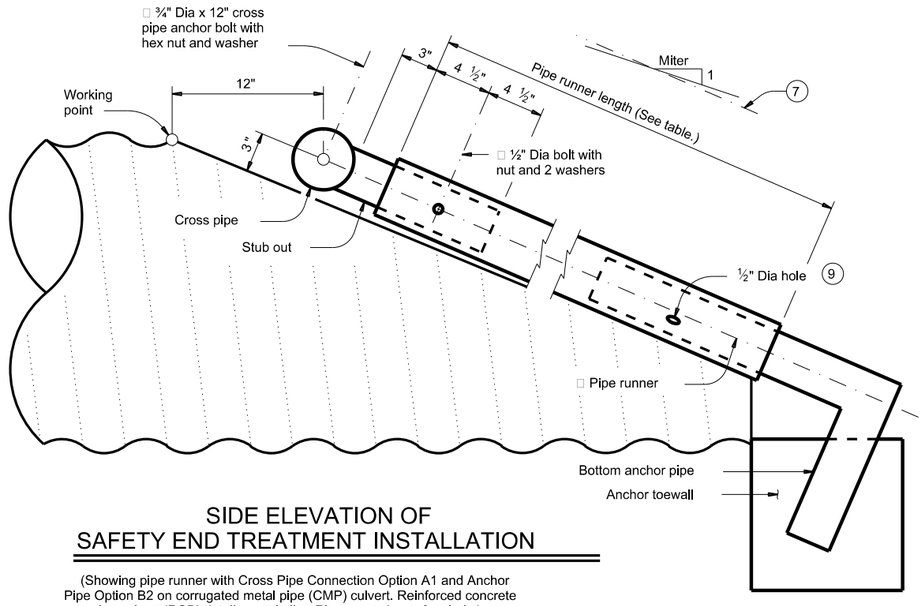
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

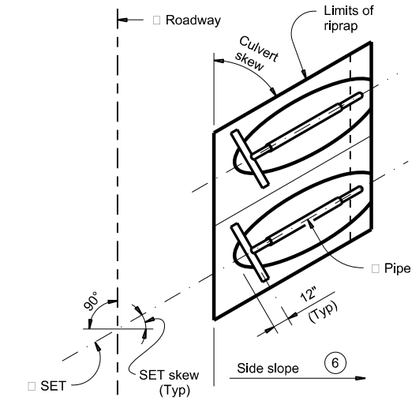
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)

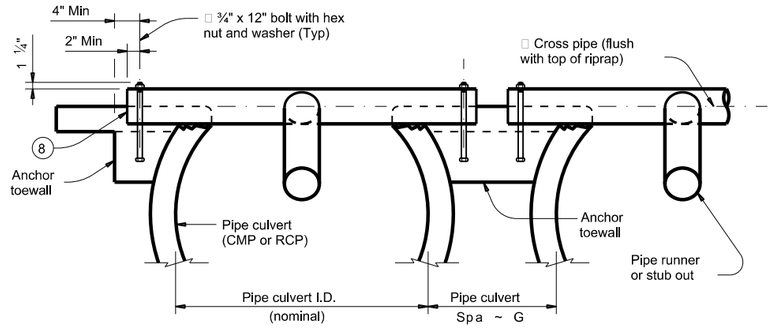


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

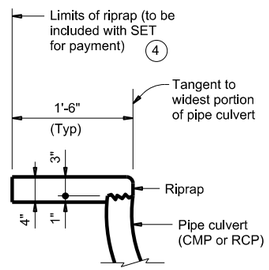
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)



PLAN OF SKEWED INSTALLATION



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap."

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Payment for riprap and toewall is included in the price bid for each safety end treatment.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."

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: CD-SETP-CD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		72

DATE: 2/1/2024 5:49:19 PM
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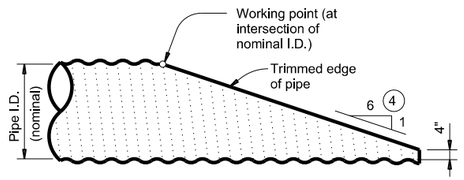
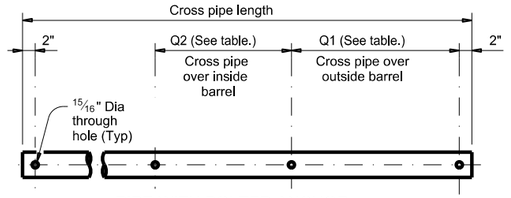


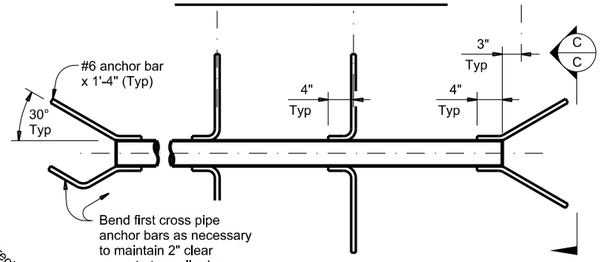
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

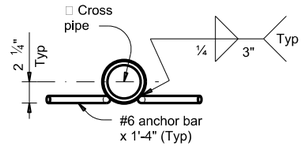
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

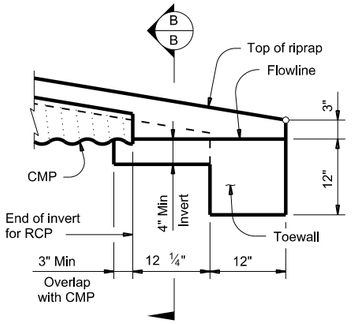


PIPE WITH ANCHOR BARS



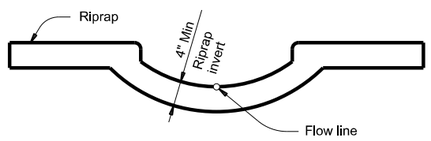
SECTION C-C

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 1/2" 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.

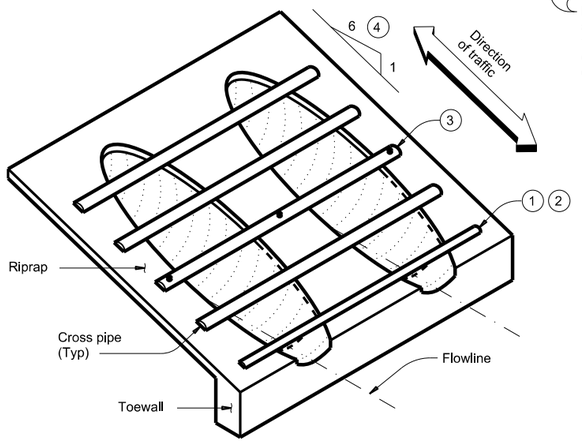
GENERAL NOTES:

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.

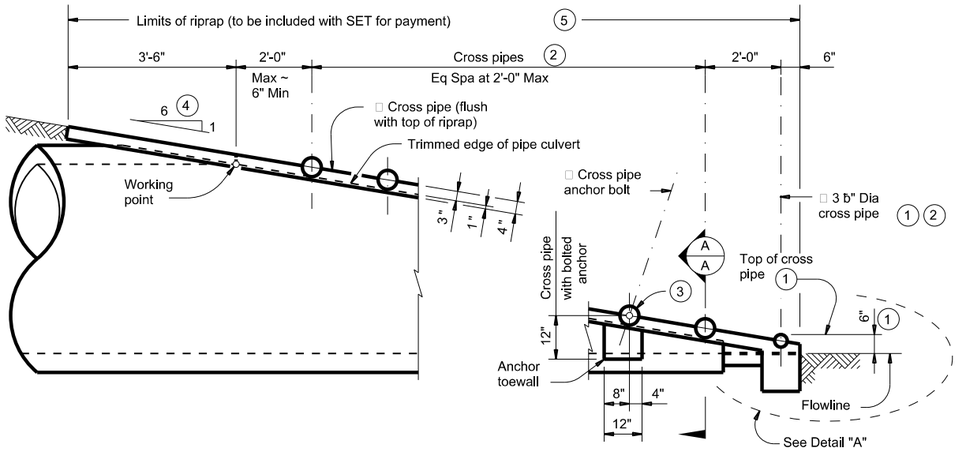
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

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.

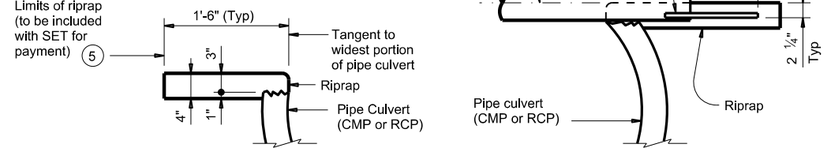


ISOMETRIC VIEW OF TYPICAL INSTALLATION



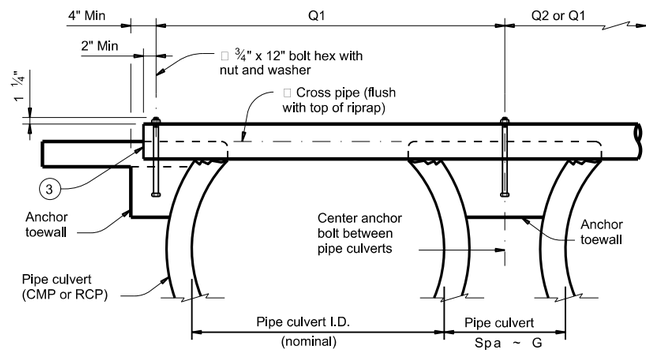
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH ANCHOR BAR

SHOWING TYPICAL PIPE CULVERT AND RIPRAP



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

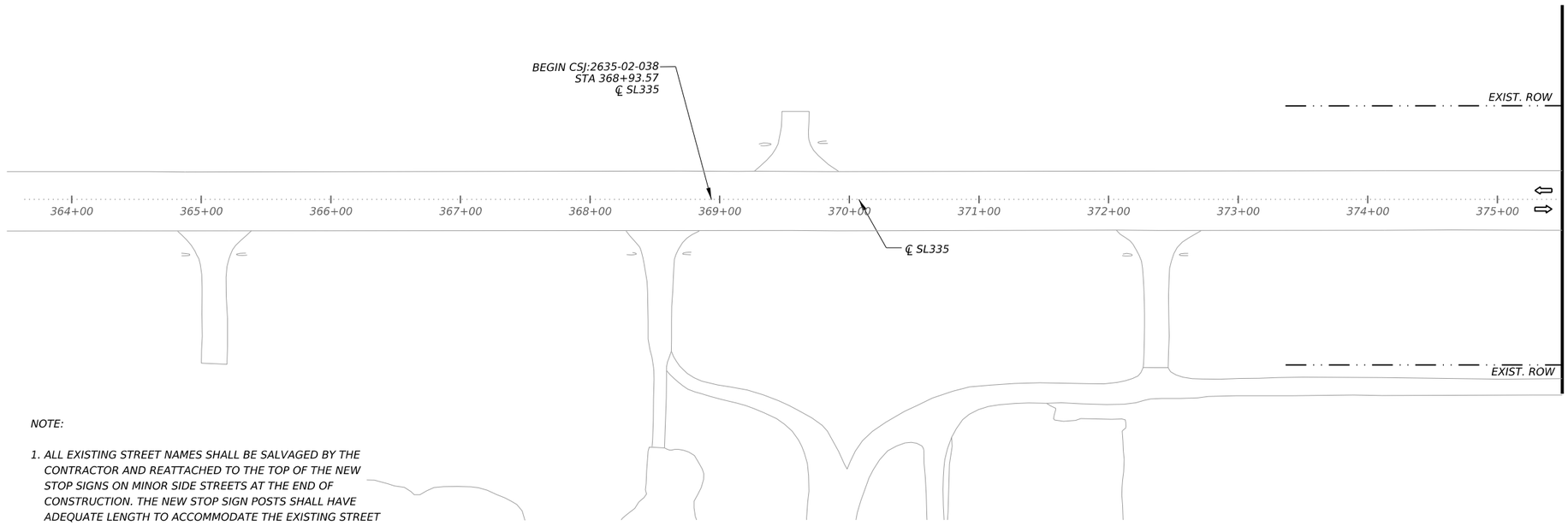
Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT
FOR 12" DIA TO 72" DIA PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: CD-SETP-PD-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		73

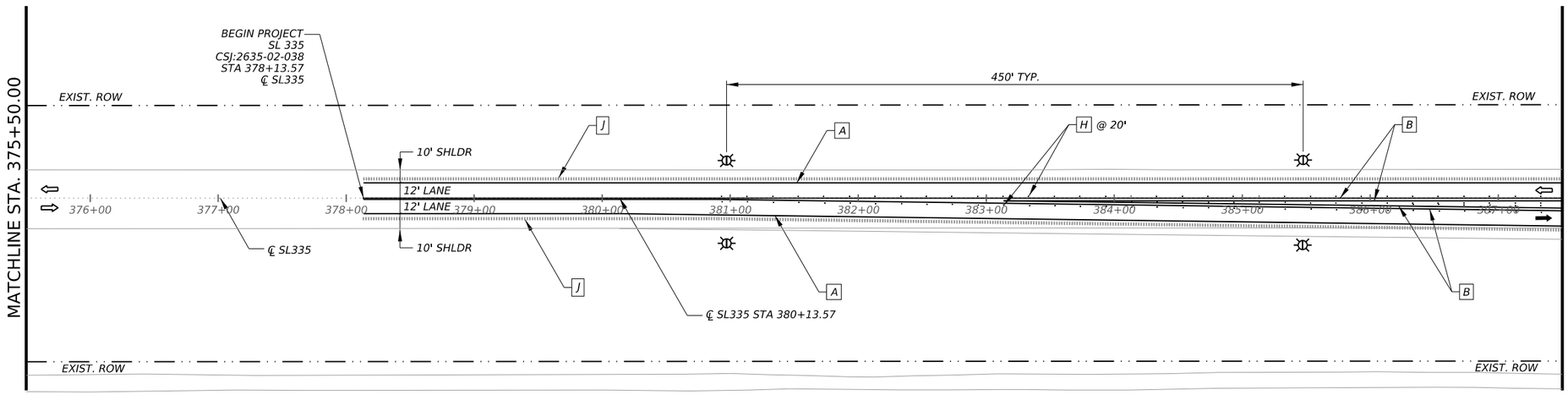


NOTE:

1. ALL EXISTING STREET NAMES SHALL BE SALVAGED BY THE CONTRACTOR AND REATTACHED TO THE TOP OF THE NEW STOP SIGNS ON MINOR SIDE STREETS AT THE END OF CONSTRUCTION. THE NEW STOP SIGN POSTS SHALL HAVE ADEQUATE LENGTH TO ACCOMMODATE THE EXISTING STREET NAMES. NEW POST TOP SIGN BRACKETS MAY BE REQUIRED TO MATCH EXISTING POST DIAMETER. BRACKETS AND RELATED APPURTENANCES SHALL BE SUBSIDIARY TO ITEM 644.

2. RELOCATION OF EXISTING STREET NAMES SHALL BE SUBSIDIARY TO ITEM 644.

3. RECESSED REFLECTORIZED PAVEMENT MARKERS (RPMS) TO BE INSTALLED ON NEW ASPHALT SECTIONS.



0 50 100
SCALE IN FEET

LEGEND

- A — RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)
- B — RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)
- C — RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL) 10' STRIPE + 30' GAP
- D — REFL PAV MRK TY I (W) 8" (SLD) (100MIL)
- E — REFL PAV MRK TY I (W) 24" (SLD) (100MIL)
- F — REFL PAV MRK TY I (W)(ARROW)
- G — REFL PAV MRK TY I (W)(WORD)
- H — REFL PAV MRKR TY II-A-A (RECESSED)
- I — REFL PAV MRKR TY I-C (RECESSED)
- J — RUMBLE STRIPS (MILLED SHOULDER)
- K — RUMBLE STRIPS (MILLED CENTERLINE)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC (PROP)
- PROP DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- PROP OBJECT MARKER (OM-2Y) (WC)GND
- EXIST SMALL SIGN
- EXIST SMALL SIGN TO BE REMOVED
- PROP SMALL SIGN
- E# — EXISTING SIGN ASSEMBLY TO REMAIN
- R# — EXISTING SIGN ASSEMBLY TO BE RELOCATED
- # — PROPOSED SMALL SIGN ASSEMBLY
- EXISTING MAILBOX

STATE OF TEXAS
ERNESTO SALCIDO
100177
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PROFESSIONAL ENGINEER
2/1/2024

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Texas Department of Transportation

SL 335

SIGNING AND PAVEMENT MARKING LAYOUT

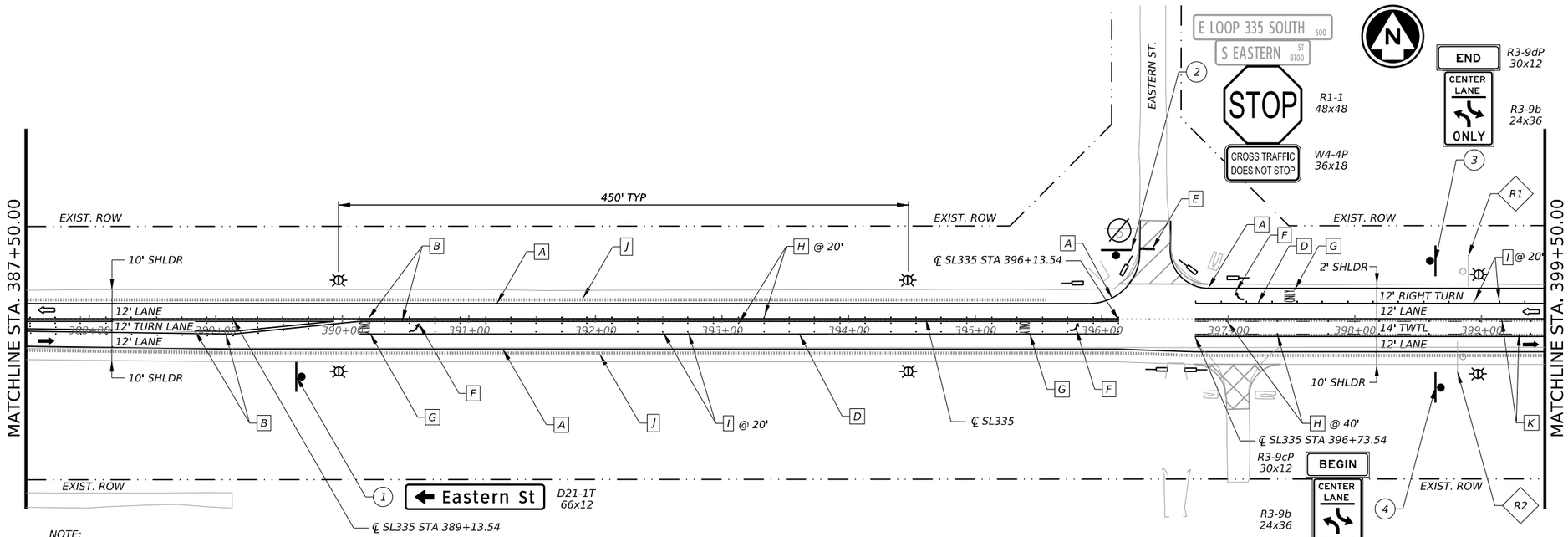
BEGIN TO STA 387+50

 SHEET 1 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		74

DATE: 2/1/2024 5:49:47 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335_SPM_PLN_001.dgn

CK DW CK DW



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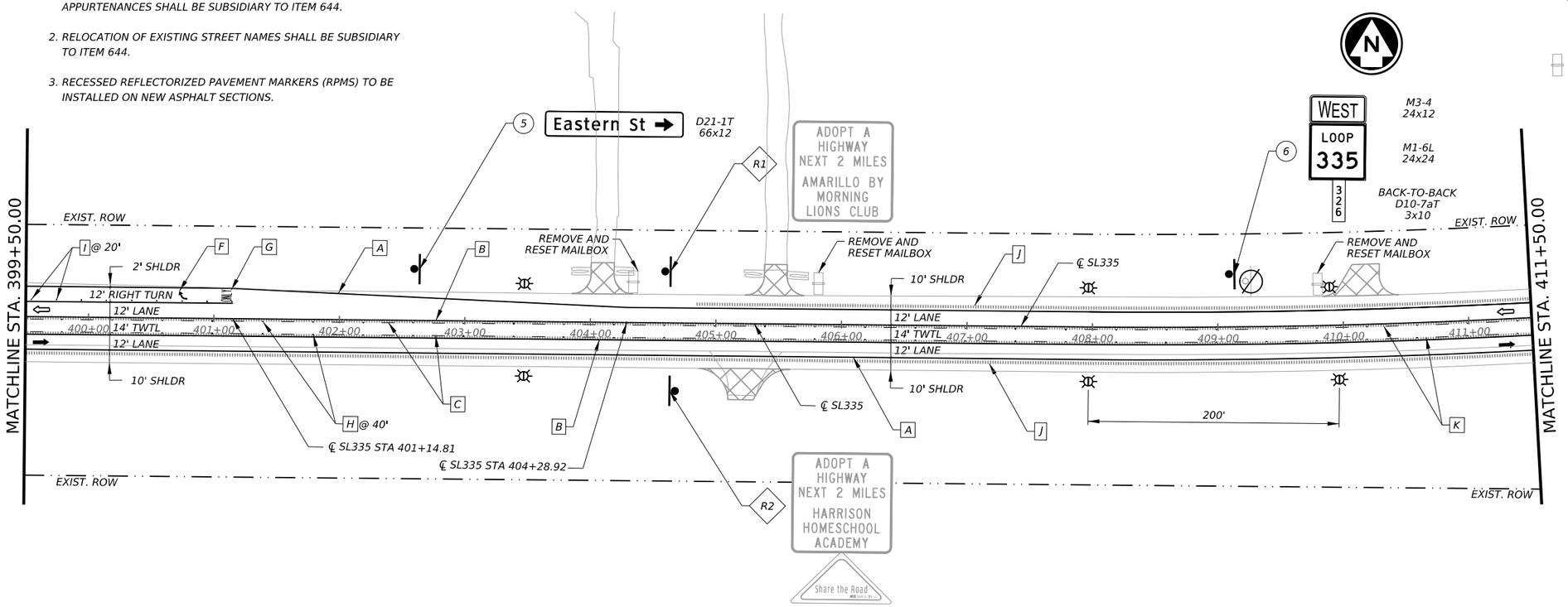

0 50 100
SCALE IN FEET

LEGEND

- A — RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)
- B — RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)
- C — RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL) 10' STRIPE + 30' GAP
- D — REFL PAV MRK TY I (W) 8" (SLD) (100MIL)
- E — REFL PAV MRK TY I (W) 24" (SLD) (100MIL)
- F — REFL PAV MRK TY I (W)(ARROW)
- G — REFL PAV MRK TY I (W)(WORD)
- H — REFL PAV MRKR TY II-A-A (RECESSED)
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- J — RUMBLE STRIPS (MILLED SHOULDER)
- K — RUMBLE STRIPS (MILLED CENTERLINE)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC (PROP)
- PROP DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- PROP OBJECT MARKER (OM-2Y) (WC)GND
- EXIST SMALL SIGN
- EXIST SMALL SIGN TO BE REMOVED
- PROP SMALL SIGN
- E# — EXISTING SIGN ASSEMBLY TO REMAIN
- R# — EXISTING SIGN ASSEMBLY TO BE RELOCATED
- # — PROPOSED SMALL SIGN ASSEMBLY
- EXISTING MAILBOX

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Texas Department of Transportation

SL 335

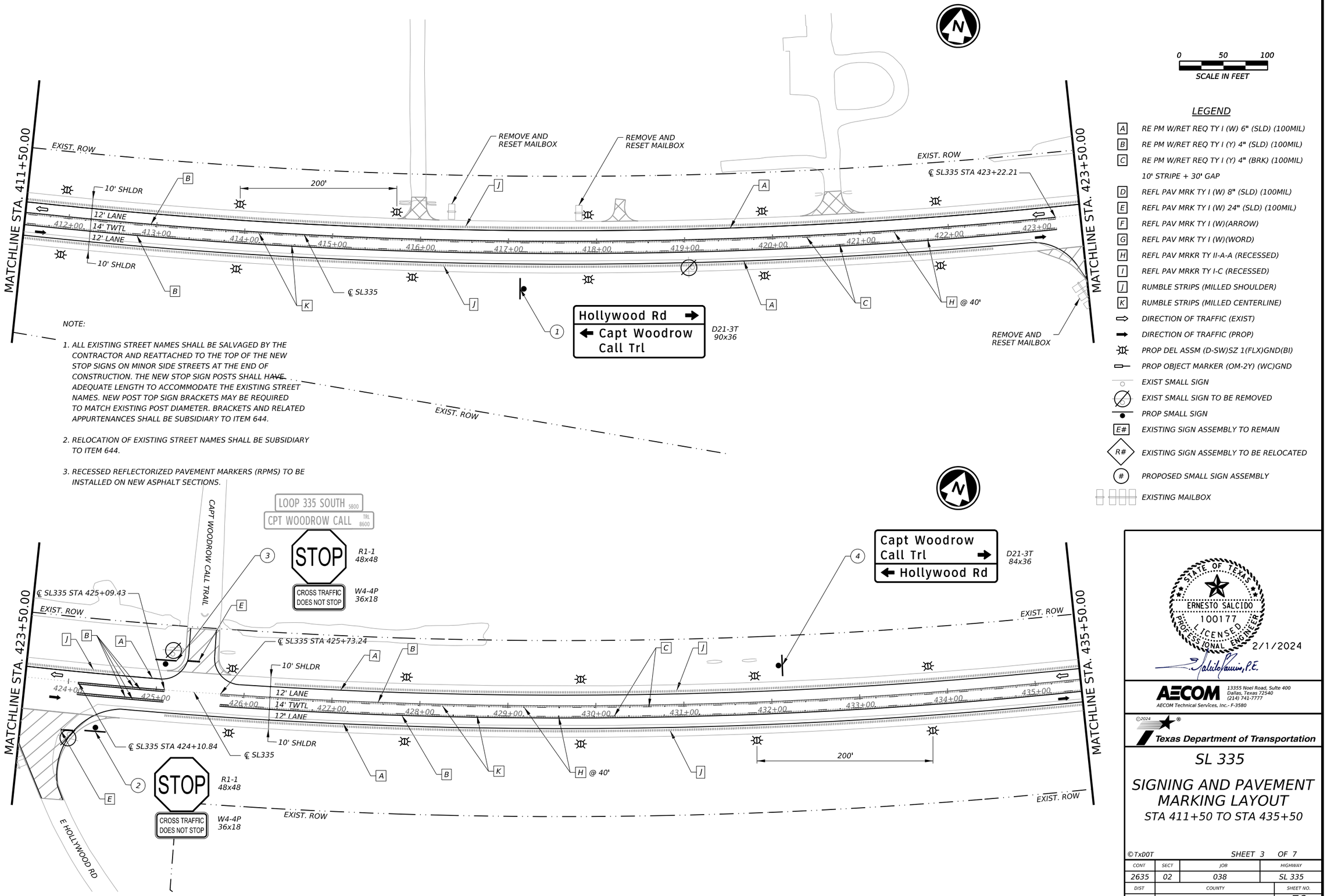
SIGNING AND PAVEMENT MARKING LAYOUT

STA 387+50 TO STA 411+50

SHEET 2 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		75

DATE: 2/1/2024 5:49:50 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335 SPM PLN 001.dgn



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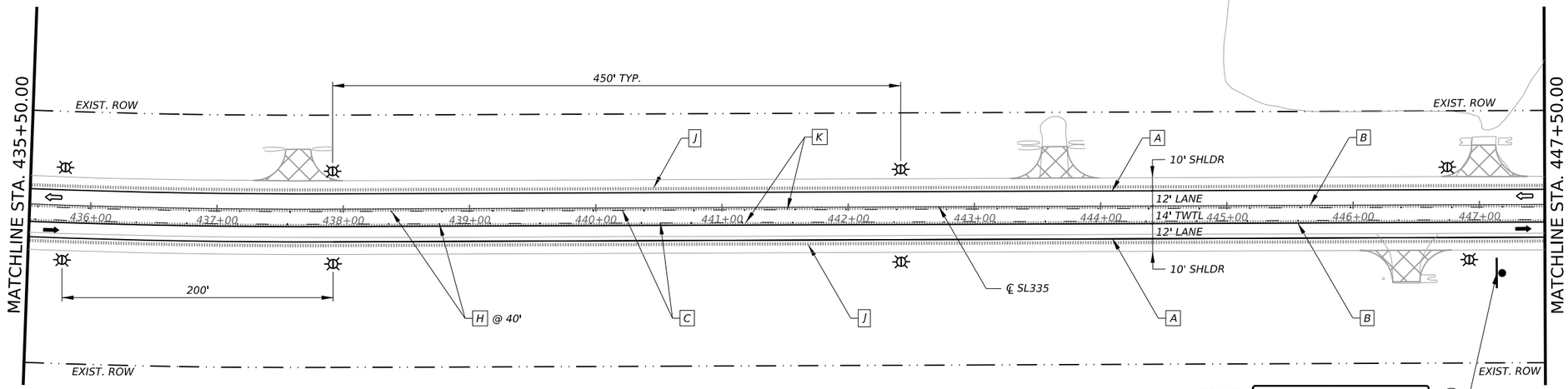
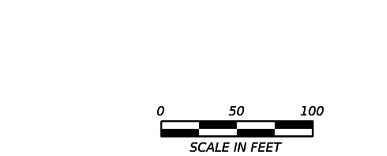
SL 335

SIGNING AND PAVEMENT MARKING LAYOUT

STA 411+50 TO STA 435+50

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		76





LEGEND

- A — RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)
- B — RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)
- C — RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL) 10' STRIPE + 30' GAP
- D — REFL PAV MRK TY I (W) 8" (SLD) (100MIL)
- E — REFL PAV MRK TY I (W) 24" (SLD) (100MIL)
- F — REFL PAV MRK TY I (W)(ARROW)
- G — REFL PAV MRK TY I (W)(WORD)
- H — REFL PAV MRKR TY II-A-A (RECESSED)
- I — REFL PAV MRKR TY I-C (RECESSED)
- J — RUMBLE STRIPS (MILLED SHOULDER)
- K — RUMBLE STRIPS (MILLED CENTERLINE)
- DIRECTION OF TRAFFIC (EXIST)
- DIRECTION OF TRAFFIC (PROP)
- PROP DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- PROP OBJECT MARKER (OM-2Y) (WC)GND
- EXIST SMALL SIGN
- EXIST SMALL SIGN TO BE REMOVED
- PROP SMALL SIGN
- E# — EXISTING SIGN ASSEMBLY TO REMAIN
- R# — EXISTING SIGN ASSEMBLY TO BE RELOCATED
- # — PROPOSED SMALL SIGN ASSEMBLY
- EXISTING MAILBOX

NOTE:

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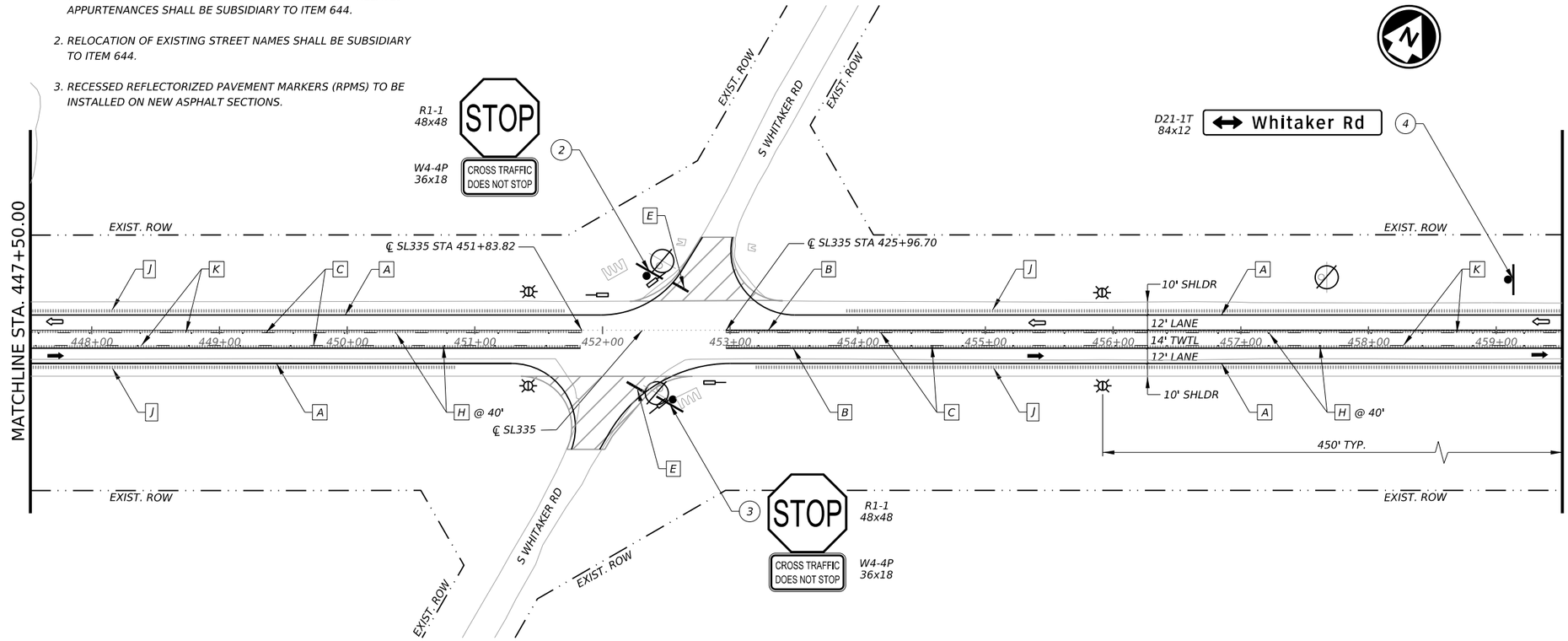

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Salcido Ernesto, P.E.

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Texas Department of Transportation

SL 335

SIGNING AND PAVEMENT MARKING LAYOUT

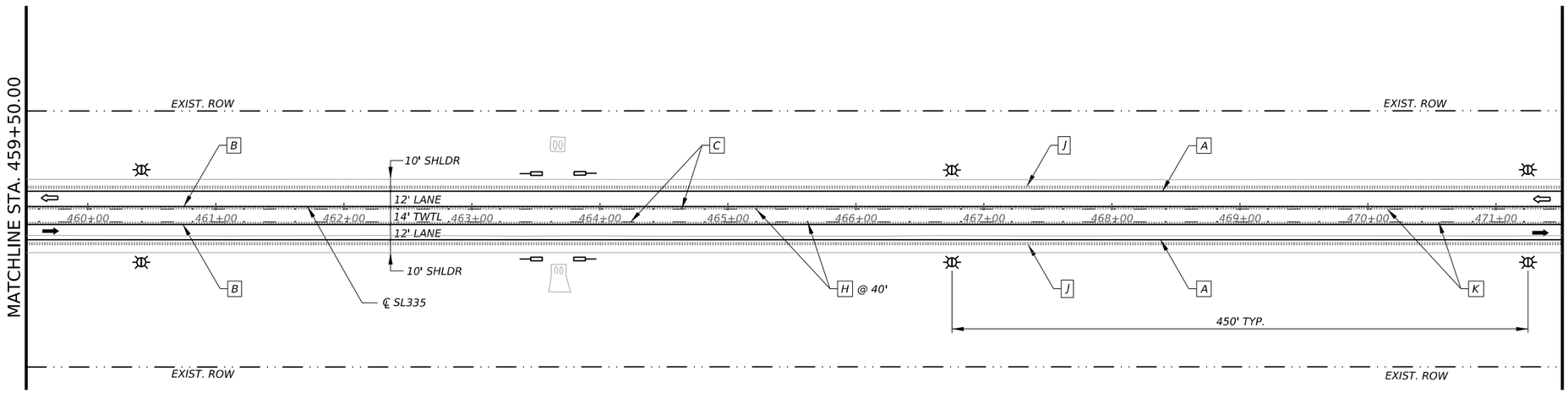
STA 435+50 TO STA 459+50

SHEET 4 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		77

DATE: 2/1/2024 5:49:55 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335_SPM_PLN_001.dgn

CK DW CK DW



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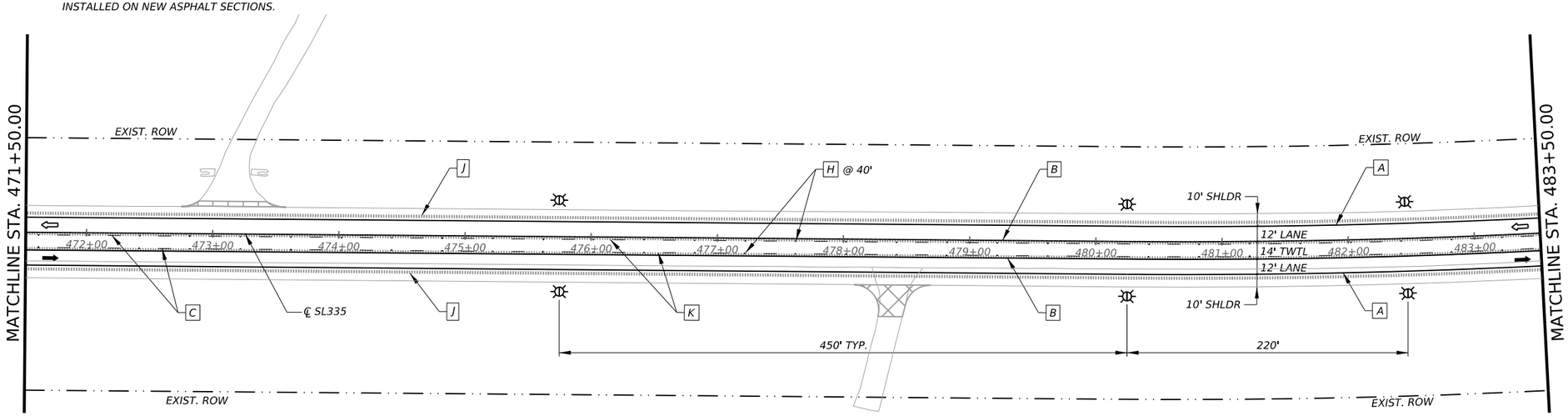

0 50 100

SCALE IN FEET

LEGEND

- A — RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)
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- DIRECTION OF TRAFFIC (PROP)
- PROP DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
- PROP OBJECT MARKER (OM-2Y) (WC)GND
- EXIST SMALL SIGN
- EXIST SMALL SIGN TO BE REMOVED
- PROP SMALL SIGN
- E# — EXISTING SIGN ASSEMBLY TO REMAIN
- R# — EXISTING SIGN ASSEMBLY TO BE RELOCATED
- # — PROPOSED SMALL SIGN ASSEMBLY
- EXISTING MAILBOX

STATE OF TEXAS
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Texas Department of Transportation

SL 335

SIGNING AND PAVEMENT MARKING LAYOUT

STA 459+50 TO STA 483+50

SHEET 5 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		78

DATE: 2/1/2024 5:49:57 PM
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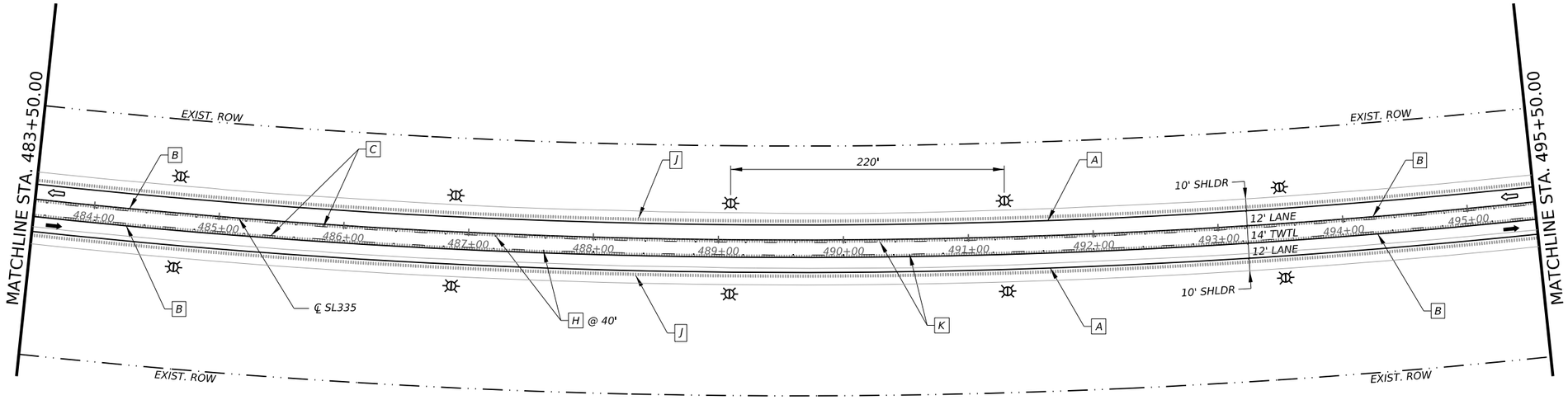

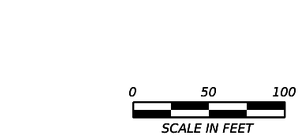

LEGEND

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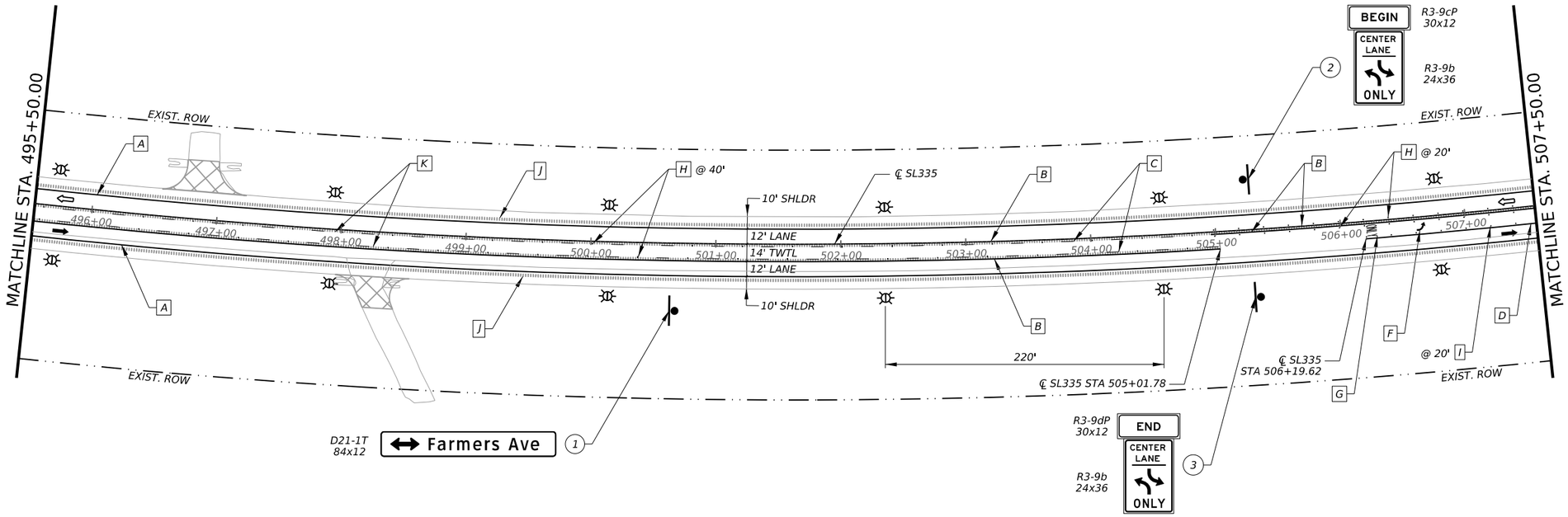

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED PROFESSIONAL ENGINEER
2/1/2024
Salcido Ernesto, P.E.

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Texas Department of Transportation

SL 335

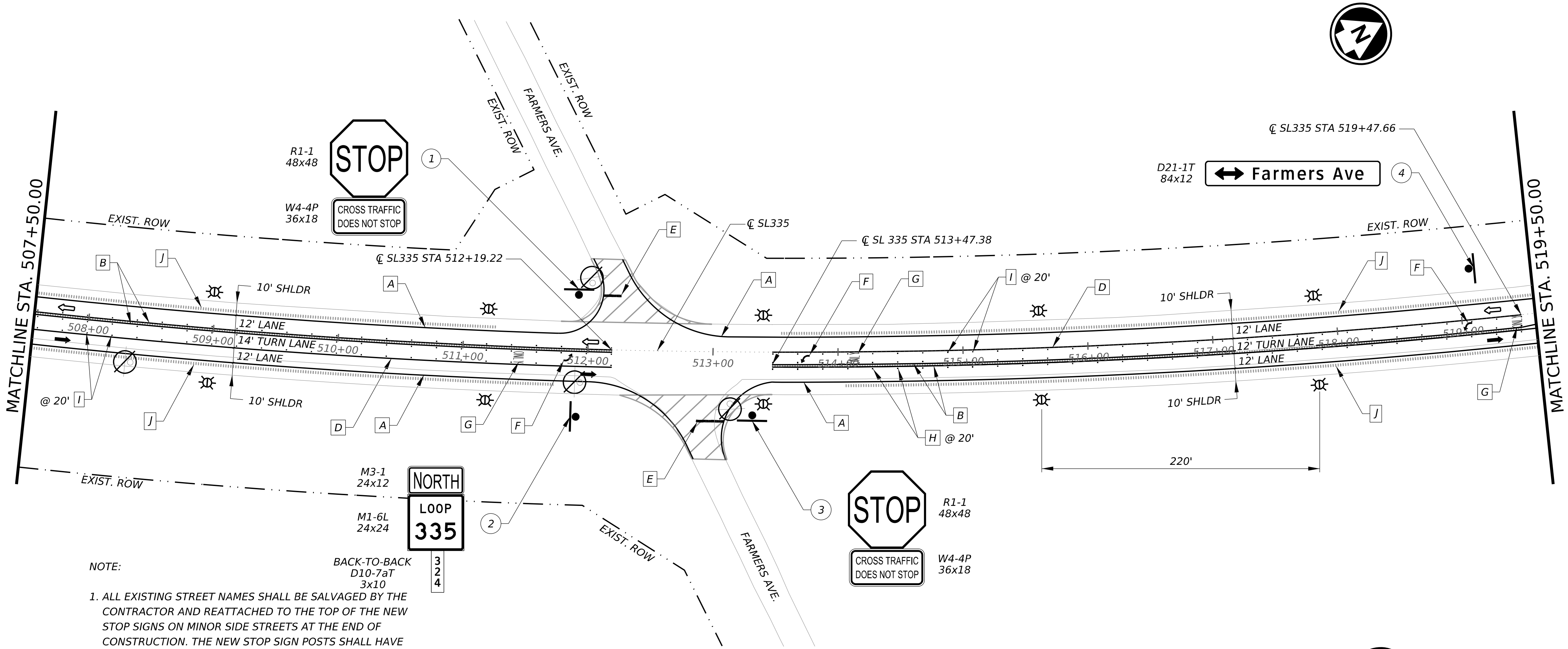
SIGNING AND PAVEMENT MARKING LAYOUT

STA 483+50 TO STA 507+50

SHEET 6 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		79

DATE: 2/1/2024 5:50:00 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335_SPM_PLN_001.dgn



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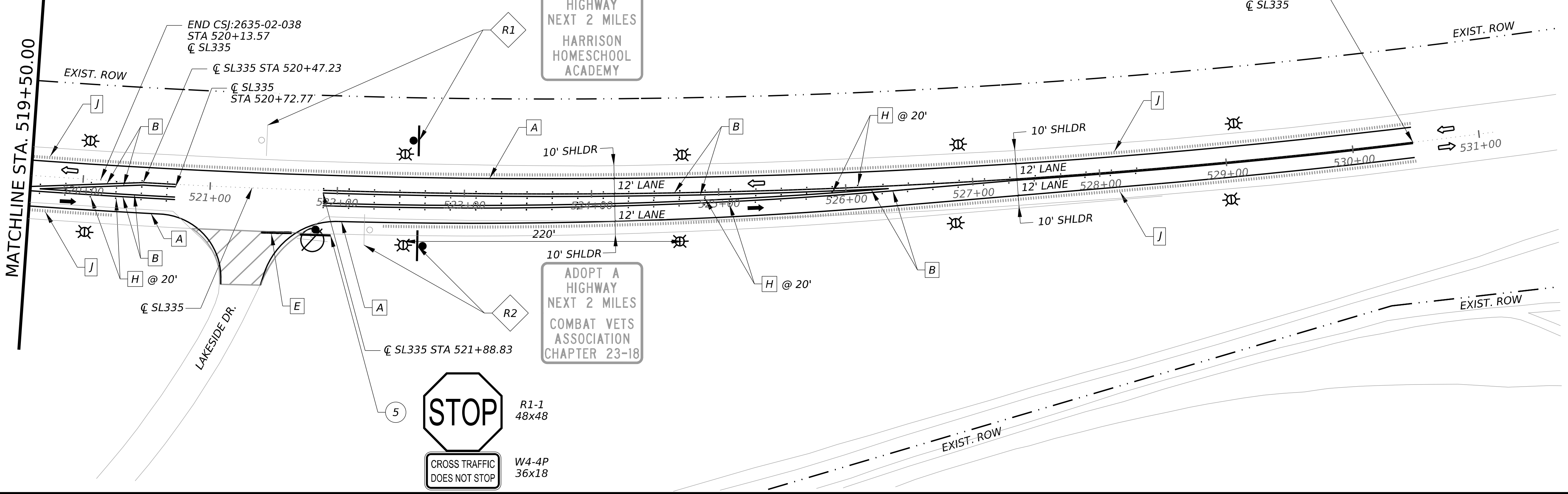

SCALE IN FEET (0 50 100)

LEGEND

A	RE PM W/RET REQ TY I (W) 6" (SLD) (100MIL)
B	RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)
C	RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL)
	10' STRIPE + 30' GAP
D	REFL PAV MRK TY I (W) 8" (SLD) (100MIL)
E	REFL PAV MRK TY I (W) 24" (SLD) (100MIL)
F	REFL PAV MRK TY I (W)(ARROW)
G	REFL PAV MRK TY I (W)(WORD)
H	REFL PAV MRKR TY II-A-A (RECESSED)
I	REFL PAV MRKR TY I-C (RECESSED)
J	RUMBLE STRIPS (MILLED SHOULDER)
K	RUMBLE STRIPS (MILLED CENTERLINE)
⇨	DIRECTION OF TRAFFIC (EXIST)
➡	DIRECTION OF TRAFFIC (PROP)
	PROP DEL ASSM (D-SW)SZ 1(FLX)GND(BI)
	PROP OBJECT MARKER (OM-2Y) (WC)GND
	EXIST SMALL SIGN
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#	PROPOSED SMALL SIGN ASSEMBLY
	EXISTING MAILBOX

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PROFESSIONAL ENGINEER
2/1/2024

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AECOM Technical Services, Inc.- F-3580

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SL 335
SIGNING AND PAVEMENT MARKING LAYOUT
STA 507+50 TO END

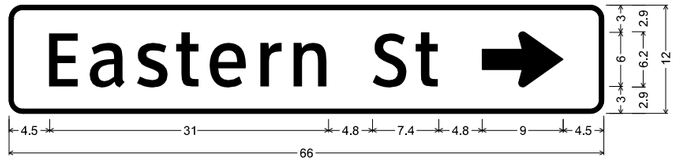
SHEET 7 OF 7

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		80

DATE: 2/1/2024 5:50:02 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-21DP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335_SPM_PLN_001.dgn

D21-1T_66x12;
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°; "Eastern St", ClearviewHwy-3-W;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 2 OF 7, SIGN 1

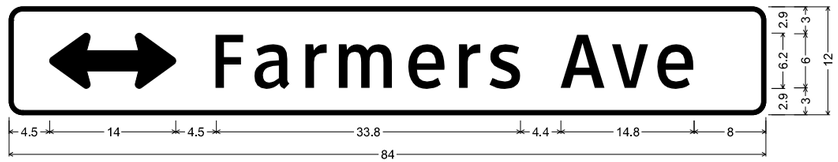


D21-1T_66x12;
1.5" Radius, 0.5" Border, White on Green;
"Eastern St", ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0°;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 2 OF 7, SIGN 5

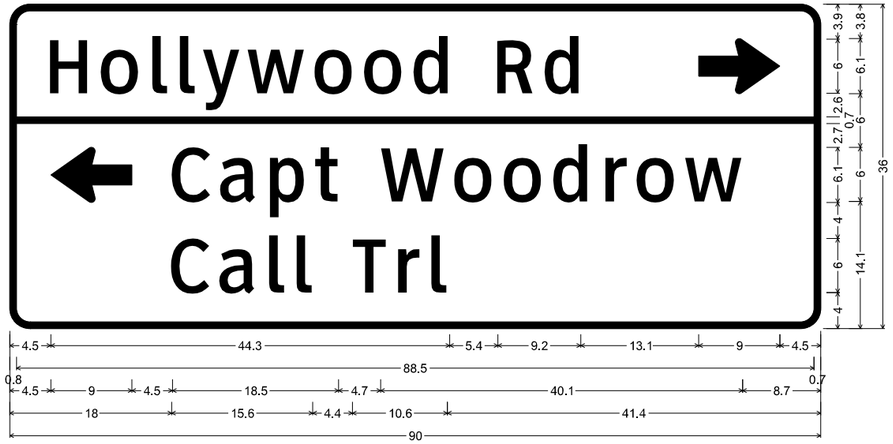
D21-1T_84x12;
1.5" Radius, 0.5" Border, White on Green;
Double Headed Arrow Custom - 14.0" 0°; "Whitaker Rd", ClearviewHwy-3-W;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 4 OF 5, SIGN 1
SHEET 4 OF 5, SIGN 4



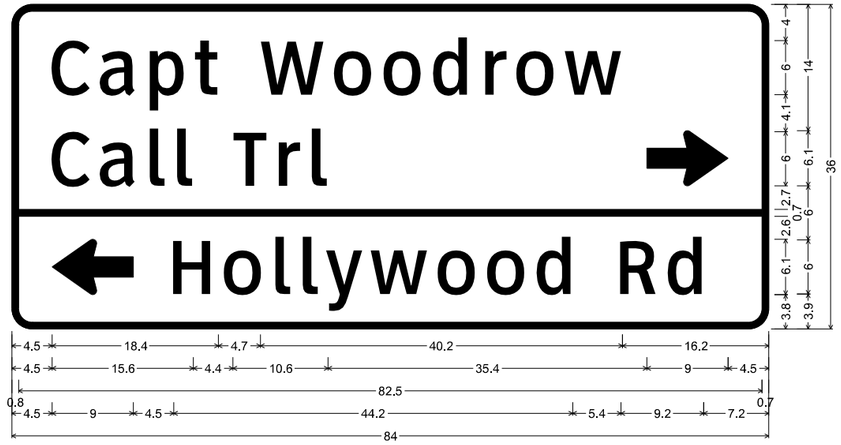
D21-1T_84x12;
1.5" Radius, 0.5" Border, White on Green;
Double Headed Arrow Custom - 14.0" 0°; "Farmers Ave", ClearviewHwy-3-W;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 6 OF 7, SIGN 1
SHEE 7 OF 7, SIGN 4



D21-3T_90x36;
2.3" Radius, 0.8" Border, White on Green;
"Hollywood Rd", ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0°; Standard Arrow Custom 9.0" X 6.1" 180°;
"Capt Woodrow", ClearviewHwy-3-W; " Call Trl", ClearviewHwy-3-W;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 3 OF 7, SIGN 1



D21-3T_84x36;
2.3" Radius, 0.8" Border, White on Green;
"Capt Woodrow", ClearviewHwy-3-W; "Call Trl", ClearviewHwy-3-W; Standard Arrow Custom 9.0" X 6.1" 0°;
Standard Arrow Custom 9.0" X 6.1" 180°; "Hollywood Rd", ClearviewHwy-3-W;

SIGNING AND PAVEMENT MARKING LAYOUT
SHEET 3 OF 7, SIGN 4

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
2/1/2024
Salcido Pavon, P.E.

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Texas Department of Transportation

SL 335

SMALL SIGN DETAILS

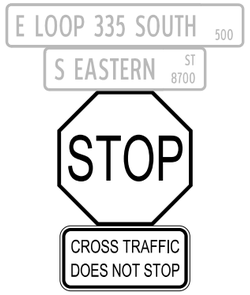
 SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		81

DATE: 2/1/2024 5:50:24 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335_SN_DET.dgn
DW CC DW CC

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
2 OF 7	1	D21-1T		66x12	X		10BWG	1	SA	T		
2 OF 7	2	N/A		RELOCATED	X							
		N/A		EXISTING SIGNS	X		S80	1	SA	P	BM	
		R1-1		48x48	X							
		W4-4P		36x18	X							
2 OF 7	3	R3-9dP		30x12	X		10BWG	1	SA	P		
		R3-9b		24x36	X							
2 OF 7	4	R3-9cP		30x12	X		10BWG	1	SA	P		
		R3-9b		24x36	X							
2 OF 7	5	D21-1T		66x12	X		10BWG	1	SA	T		
2 OF 7	R1	N/A		RELOCATED EXISTING SIGN	X		S80	1	SA	T		

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

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

http://www.txdot.gov/

NOTE:

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

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SL 335

SUMMARY OF SMALL SIGNS

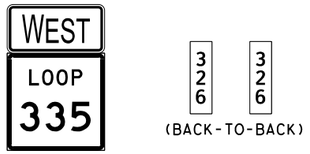
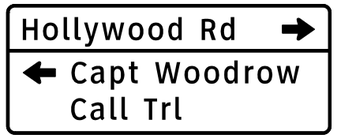
 SHEET 1 OF 5

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		82

DATE: 2/1/2024 5:50:48 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM USA Texas/Documents/60713043-36-2IDP5017 WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910 CAD/11 TRAFFIC/Sheets/SL335 SN SOSS 001.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
2 OF 7	R2	N/A		RELOCATED	X		S80	1	SA	T		
				EXISTING SIGNS	X							
2 OF 7	6	M3-4		24x12	X		10BWG	1	SA	P		
		M1-6L		24x24	X							
		D10-7aT		3x10	X							
		D10-7aT		3x10	X							
3 OF 7	1	D21-3T		90x36	X		S80	1	SA	U		
3 OF 7	2	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							
3 OF 7	3	N/A		RELOCATED	X		S80	1	SA	P	BM	
		N/A		EXISTING SIGNS	X							
		R1-1		48x48	X							
		W4-4P		36x18	X							

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

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NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
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SL 335

SUMMARY OF SMALL SIGNS

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		83

DATE: 2/1/2024 5:50:48 PM
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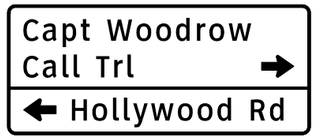
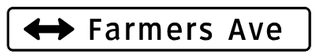
SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
3 OF 7	4	D21-3T		84x36	X		S80	1	SA	U		
4 OF 7	1	D21-1T		84x12	X		10BWG	1	SA	T		
4 OF 7	2	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							
4 OF 7	3	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							
4 OF 7	4	D21-1T		84x12	X		10BWG	1	SA	T		
6 OF 7	1	D21-1T		84x12	X		10BWG	1	SA	T		
6 OF 7	2	R3-9cP		30x12	X		10BWG	1	SA	P		
		R3-9b		24x36	X							

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

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SL 335

SUMMARY OF SMALL SIGNS

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		84

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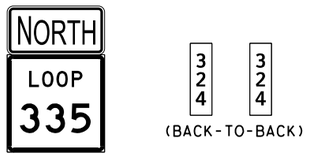
SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
6 OF 7	2	R3-9dP		30x12	X		10BWG	1	SA	P		
		R3-9b		24x36	X							
7 OF 7	1	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							
7 OF 7	2	M3-1		24x12	X		10BWG	1	SA	P		
		M1-6L		24x24	X							
		D10-7aT		3x10	X							
		D10-7aT		3x10	X							
7 OF 7	3	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							
7 OF 7	4	D21-1T		84x12	X		10BWG	1	SA	T		
7 OF 7	5	R1-1		48x48	X		S80	1	SA	P	BM	
		W4-4P		36x18	X							

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

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

http://www.txdot.gov/

NOTE:

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SL 335

SUMMARY OF SMALL SIGNS

SHEET 4 OF 5

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		85

DATE: 2/1/2024 5:50:49 PM
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
7 OF 7	R1	N/A	ADOPT A HIGHWAY NEXT 2 MILES HARRISON HOMESCHOOL ACADEMY	RELOCATED EXISTING SIGN	X		S80	1	SA	T		
7 OF 7	R2	N/A	ADOPT A HIGHWAY NEXT 2 MILES COMBAT VETS ASSOCIATION CHAPTER 23-18	RELOCATED EXISTING SIGN	X		S80	1	SA	T		

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

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

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NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
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SL 335

SUMMARY OF SMALL SIGNS

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		86

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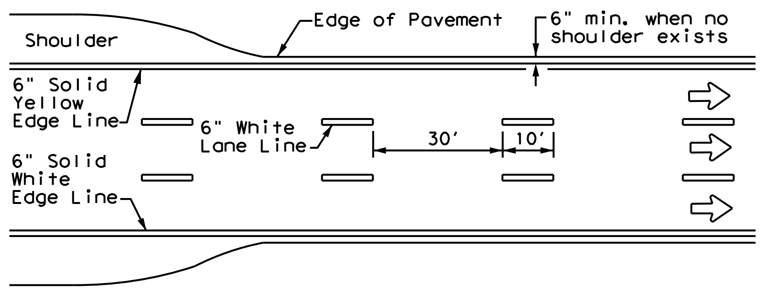
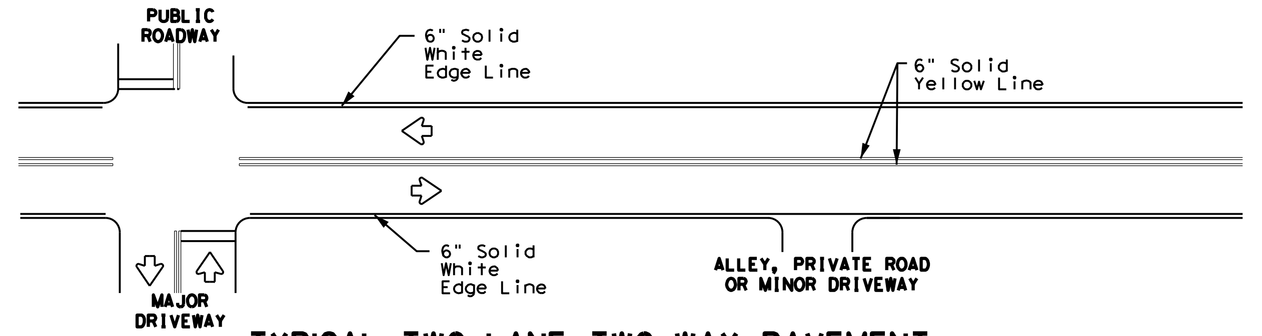


EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS

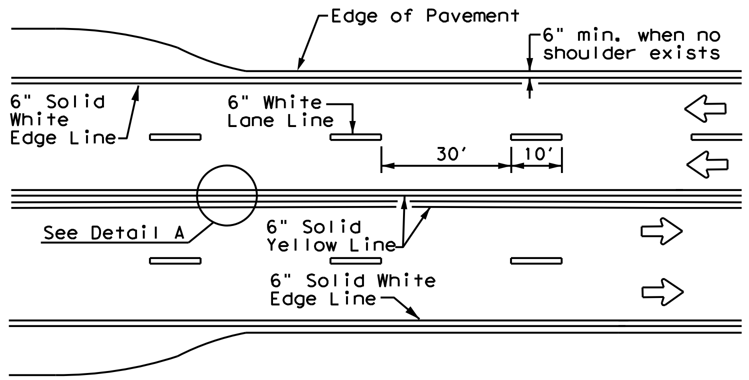
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

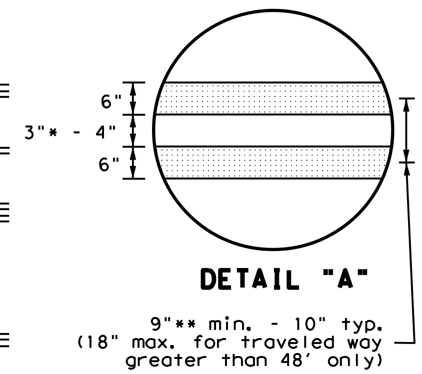
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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.



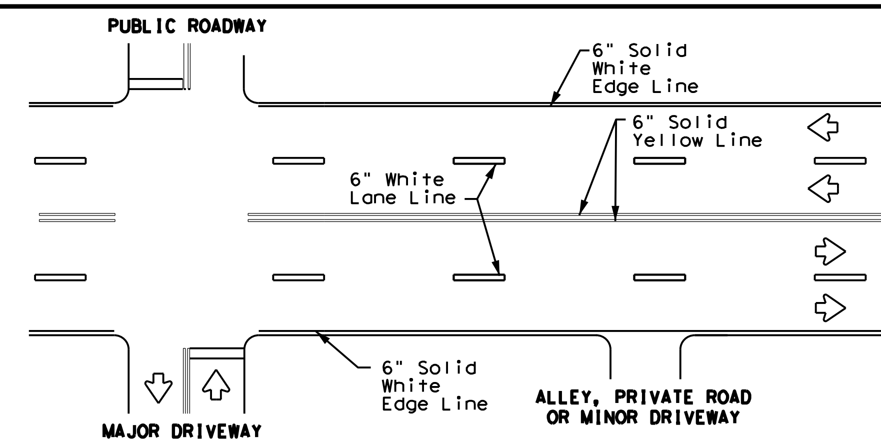
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



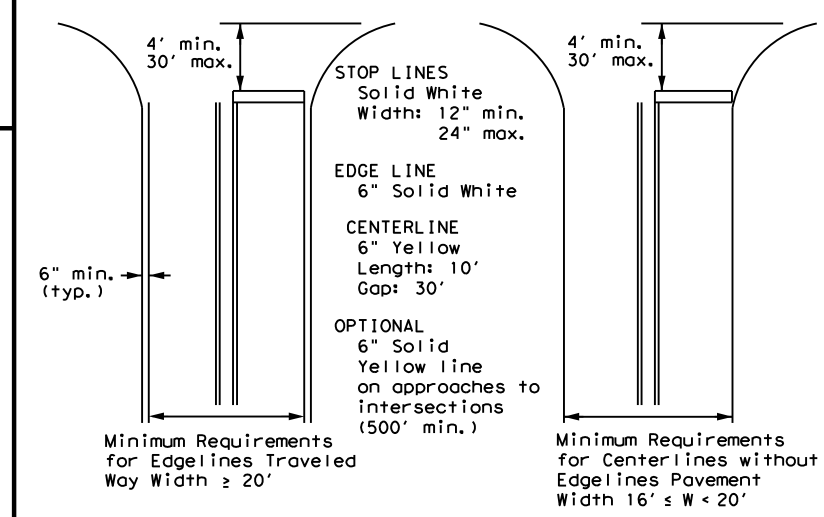
DETAIL "A"

* 2" minimum for restripe projects when approved by the Engineer.

** 8" minimum for restripe projects when approved by the Engineer.



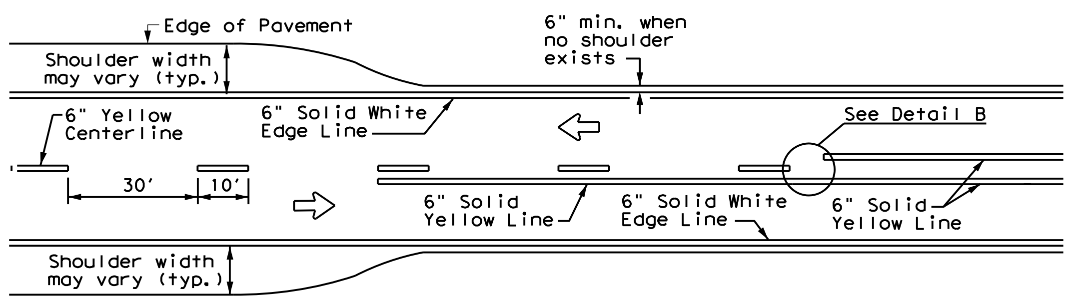
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



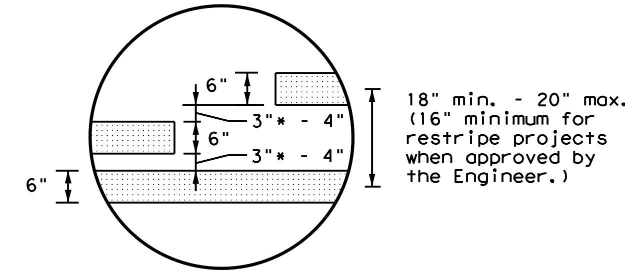
NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

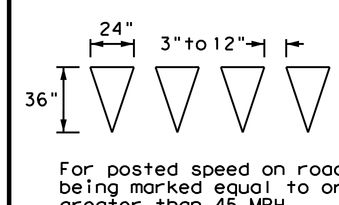


TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



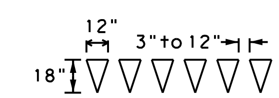
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

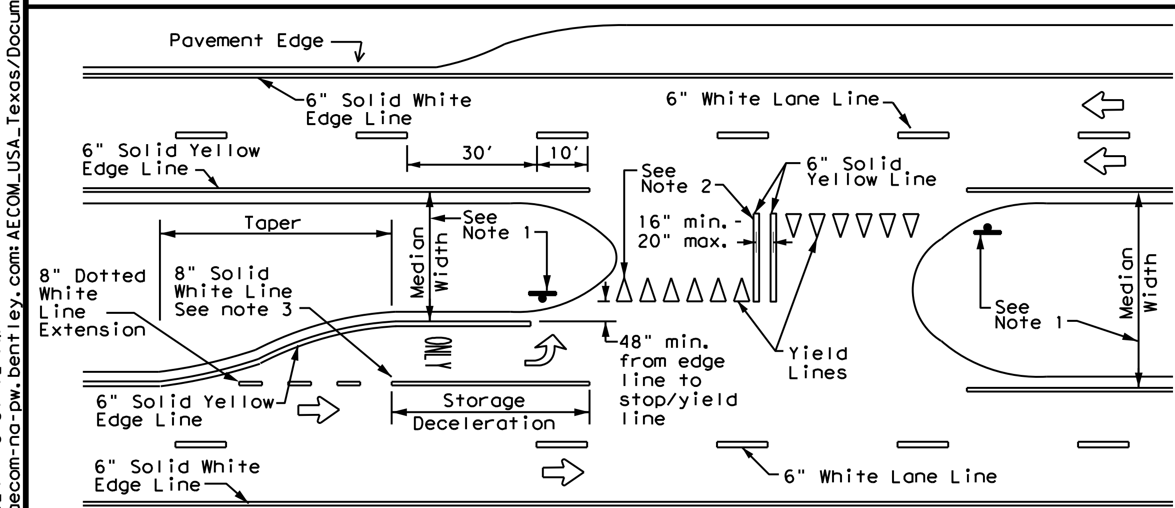


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.



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 and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines 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.

Texas Department of Transportation

Traffic Safety Division Standard

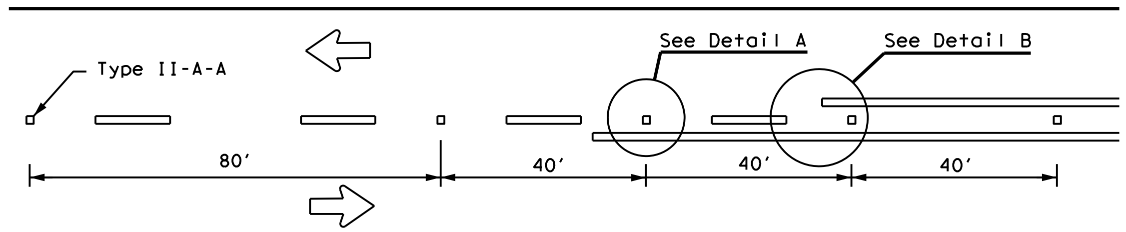
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

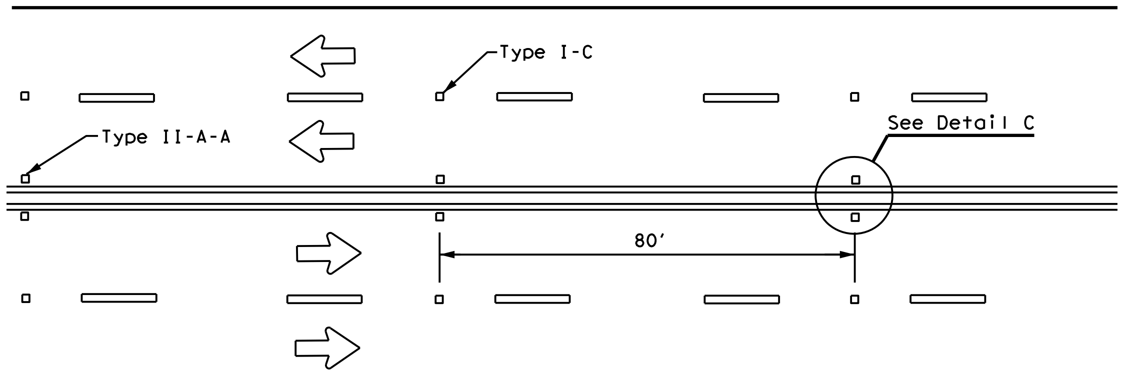
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		87

22A

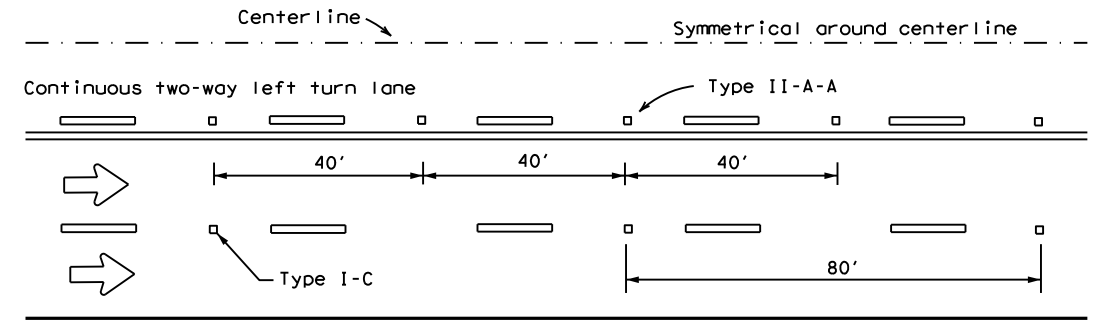
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



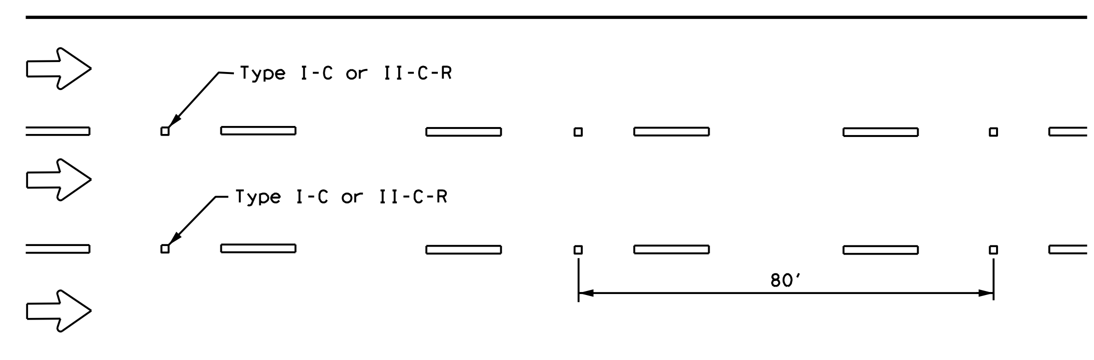
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



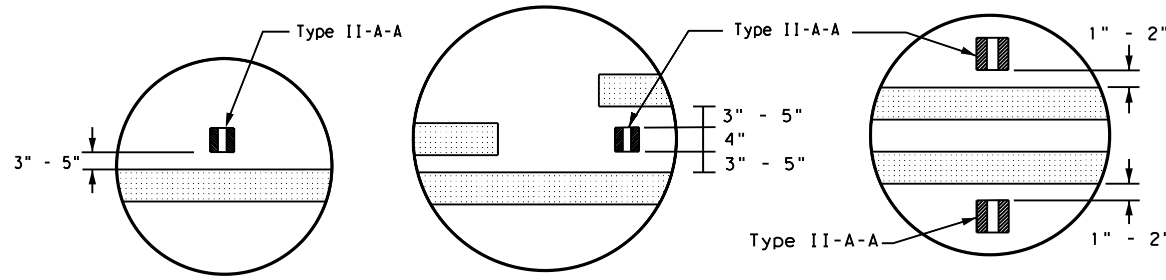
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.

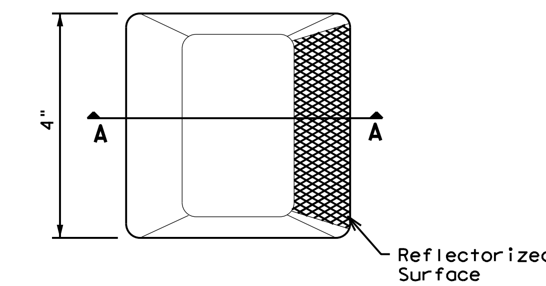
See Note 3.



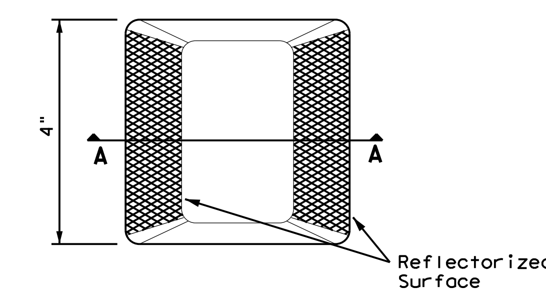
DETAIL "A" DETAIL "B" DETAIL "C"

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

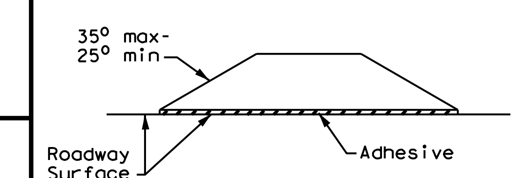
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

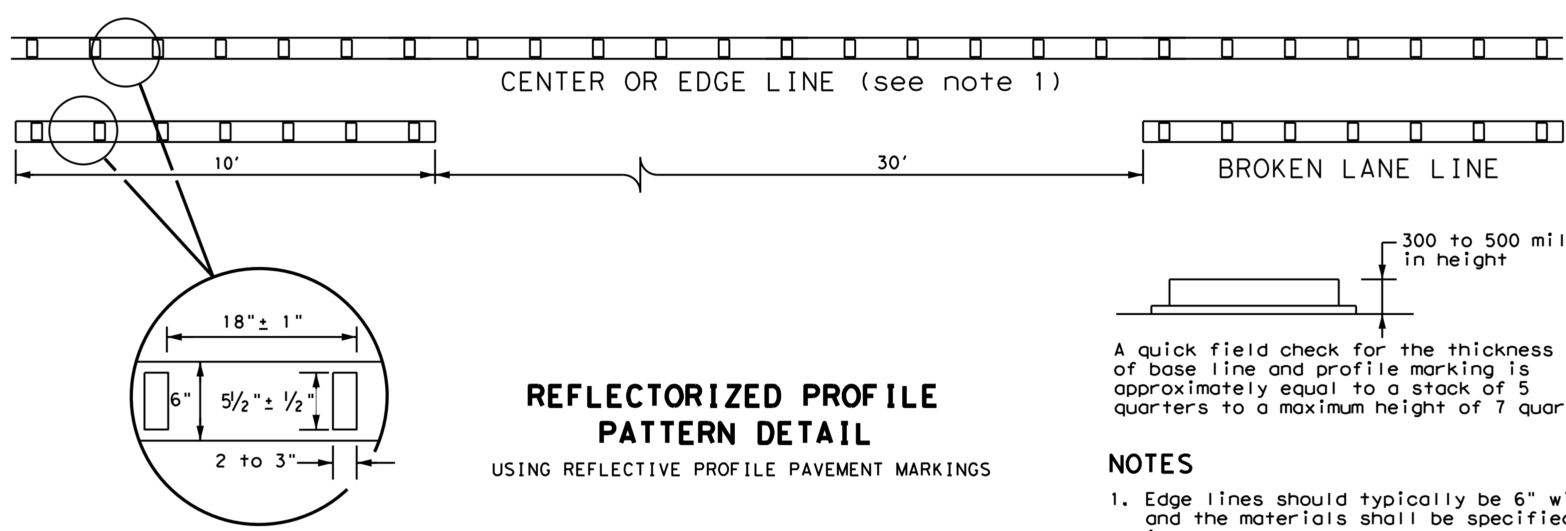


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

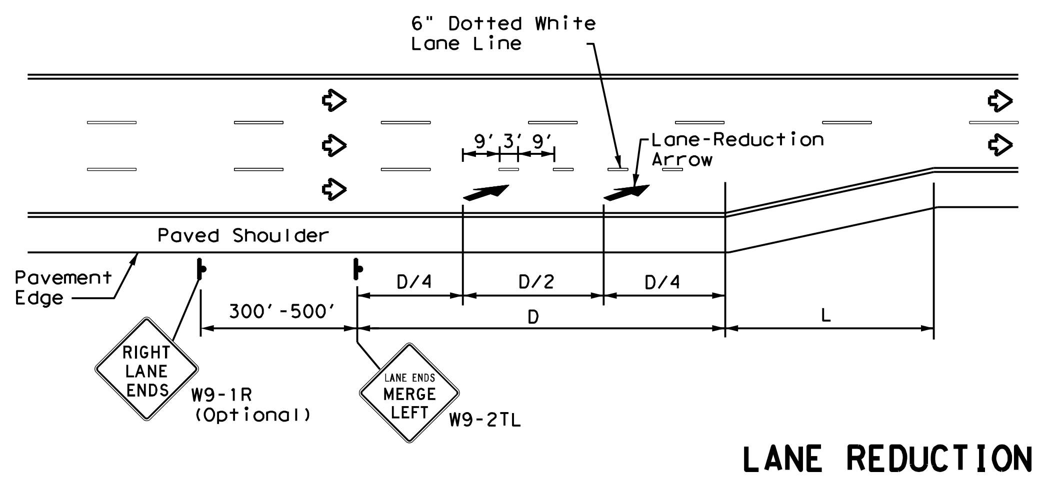
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation — Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	2635	02	038	SL 335
	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	88

22B



LANE REDUCTION

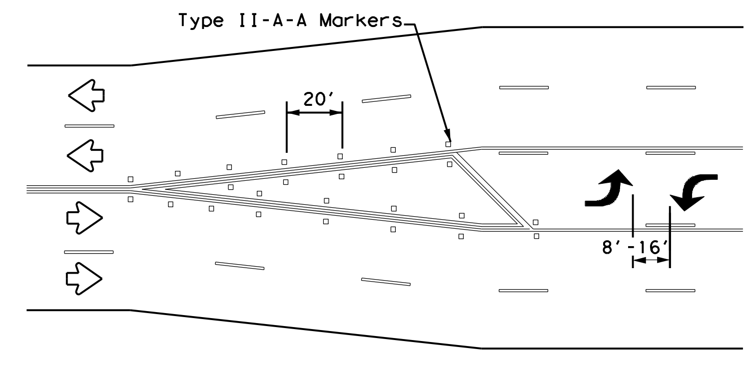
NOTES

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 RIGHT LANE ENDS (W9-1R) 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.

ADVANCED WARNING SIGN DISTANCE (D)		
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	

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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

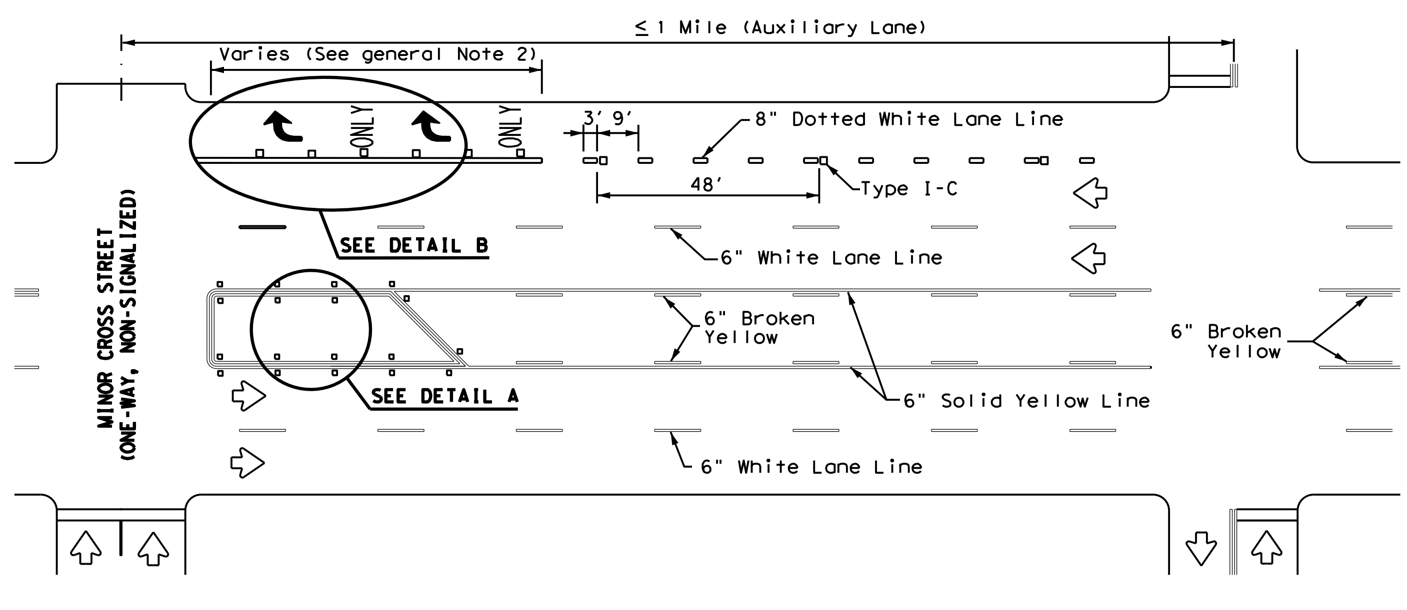


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

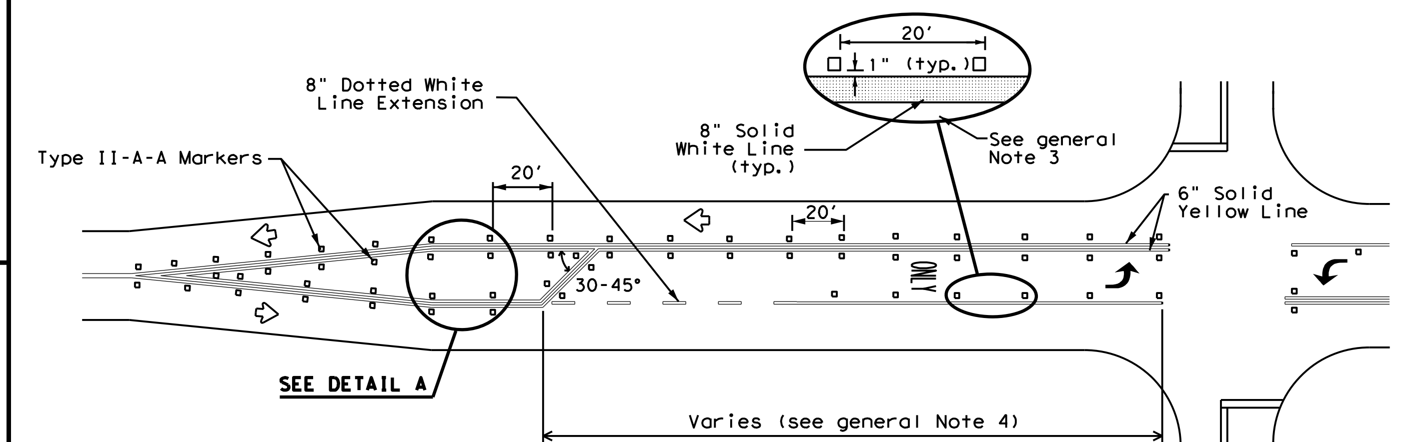
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

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

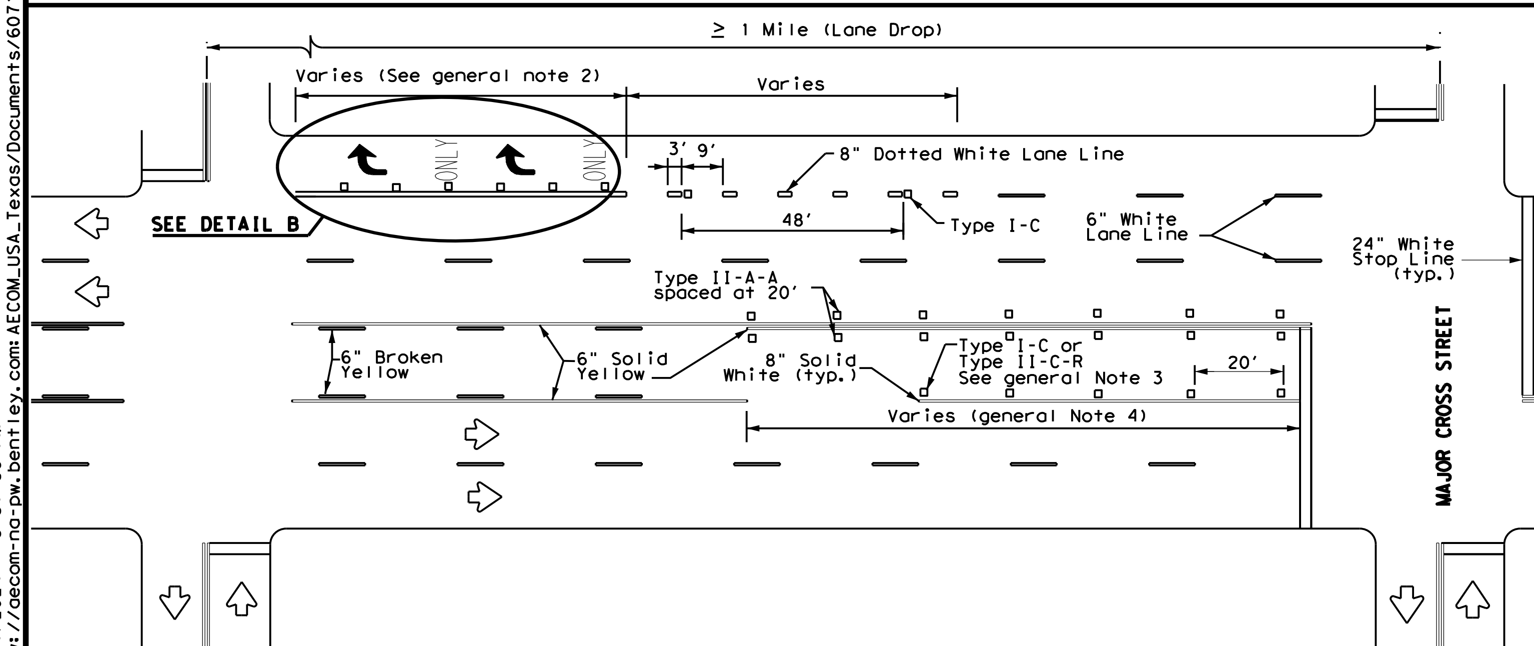
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



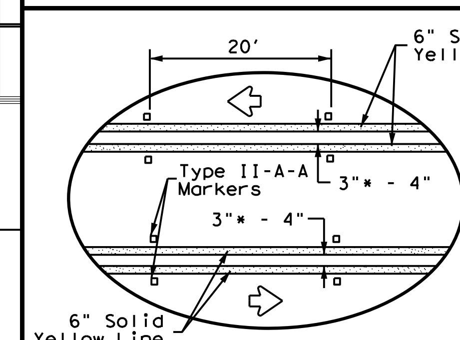
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



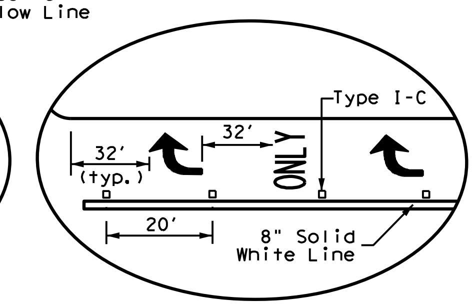
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

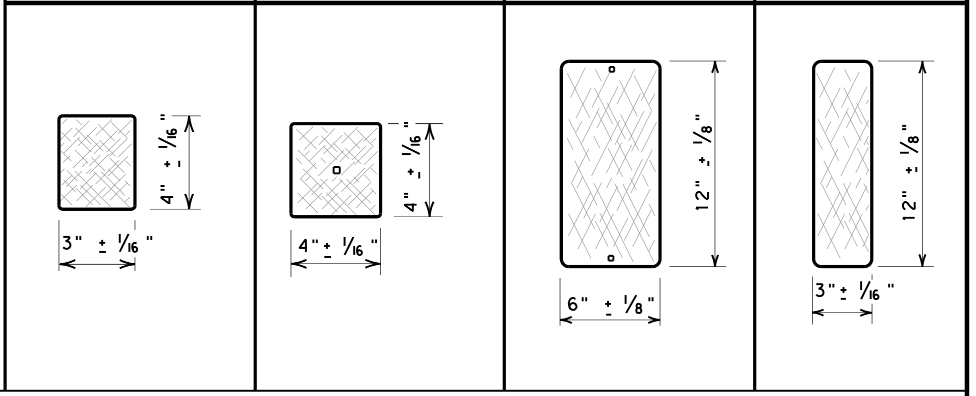
PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	DIST AMA		COUNTY RANDALL	SHEET NO. 89

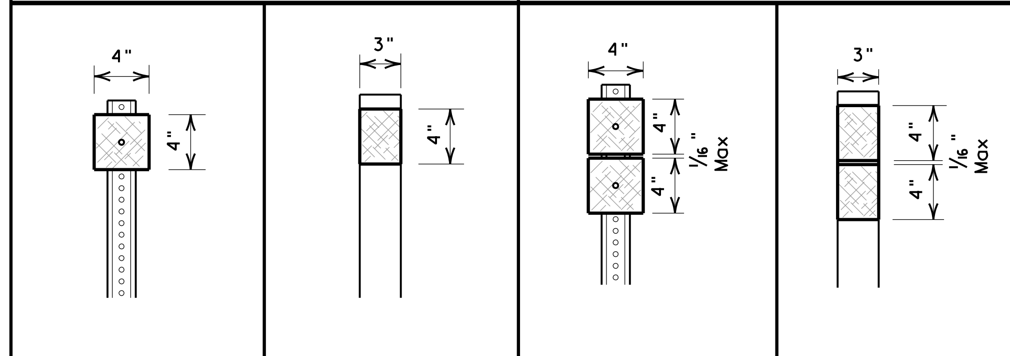
22C

DATE: 2/1/2024 5:51:59 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2...

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

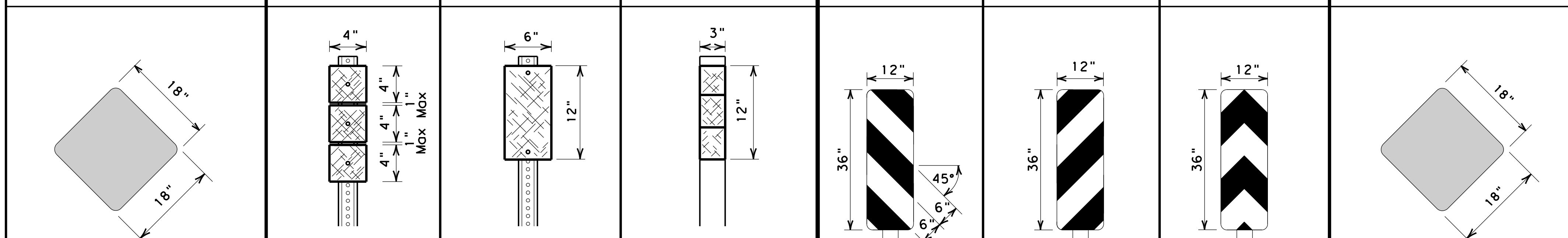
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

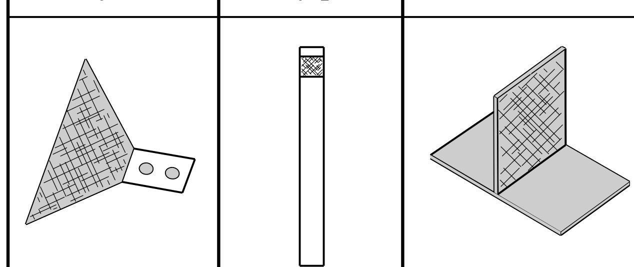
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

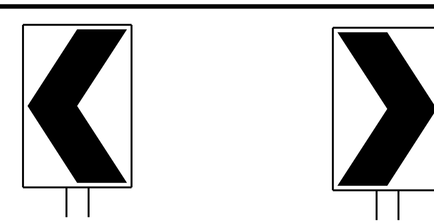
DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

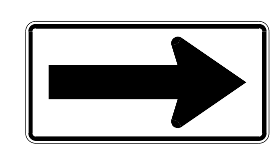
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4′-0" or 7′-0"		7′-0" Only	

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7′-0"	

NOTE

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).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: doml-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 10-09 3-15 4-10 7-20	DIST AMA		COUNTY RANDALL	SHEET NO. 90

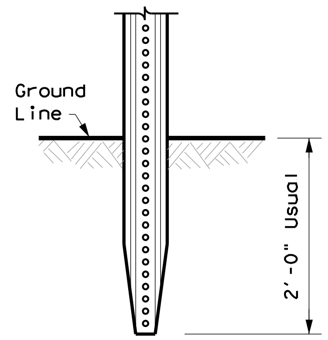
20A

DATE: 2/1/2024 5:52:20 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2...STANDARDS\TRAFFIC\doml-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

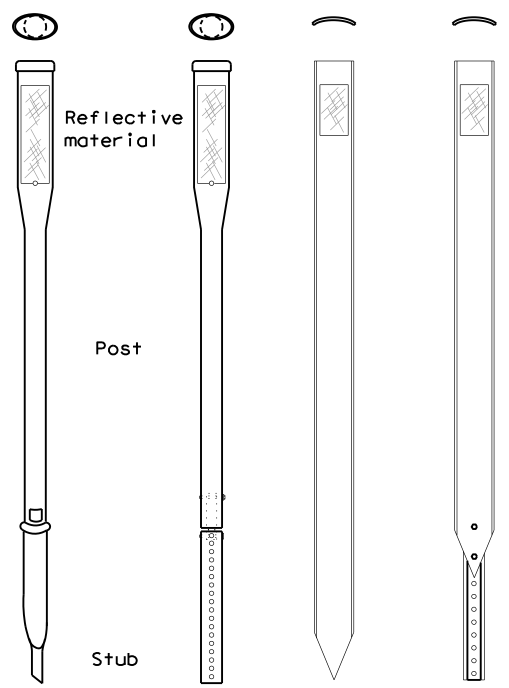


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

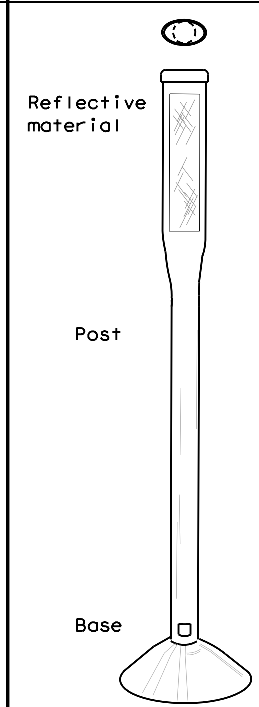
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



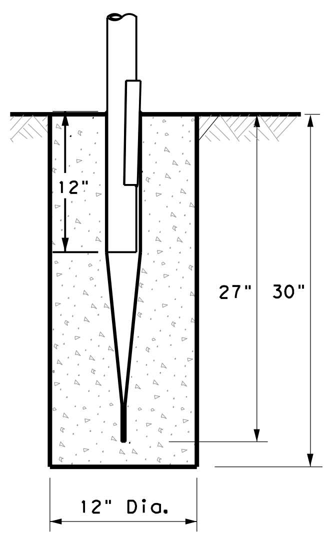
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

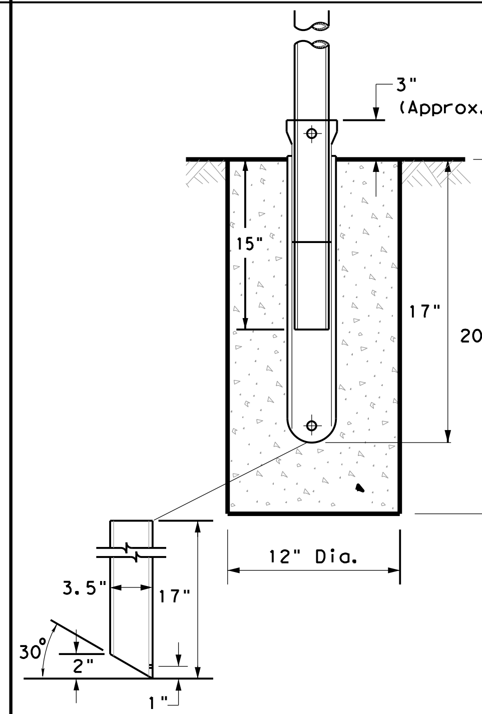
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

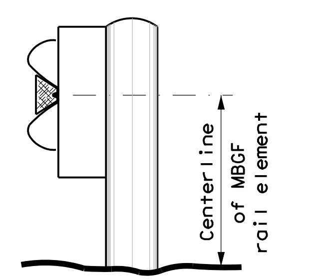
NOTE

1. Install per manufacturer's recommendations.

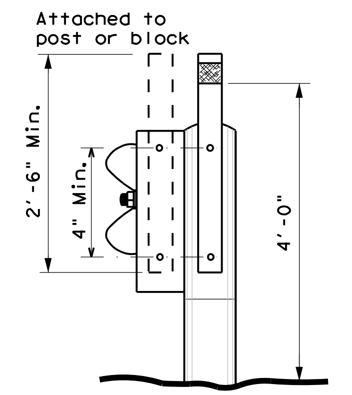
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

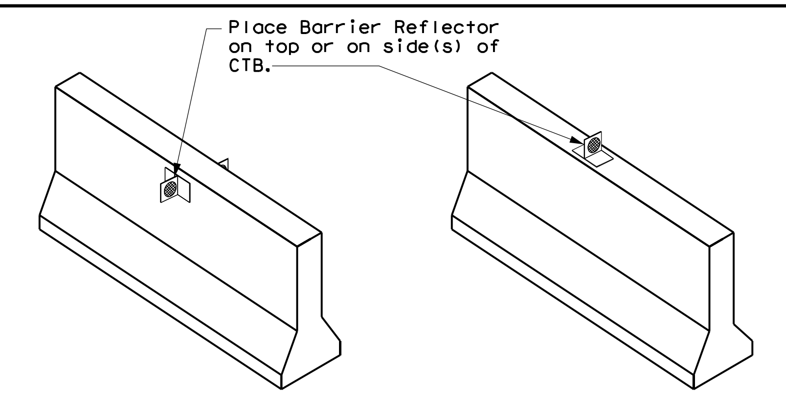
GF1



GF2



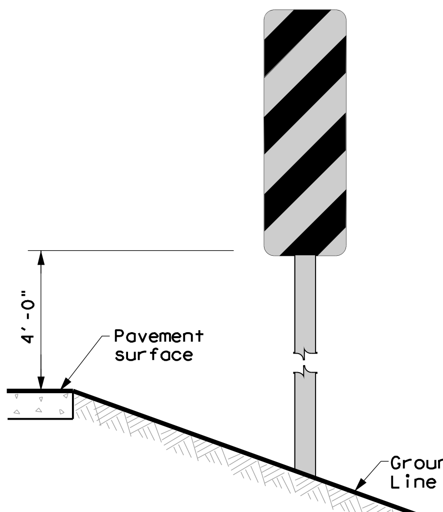
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

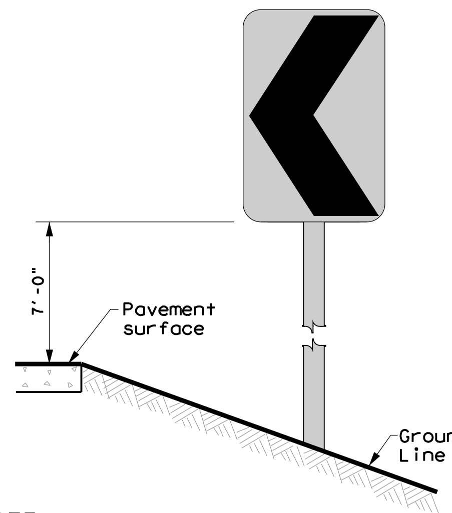
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

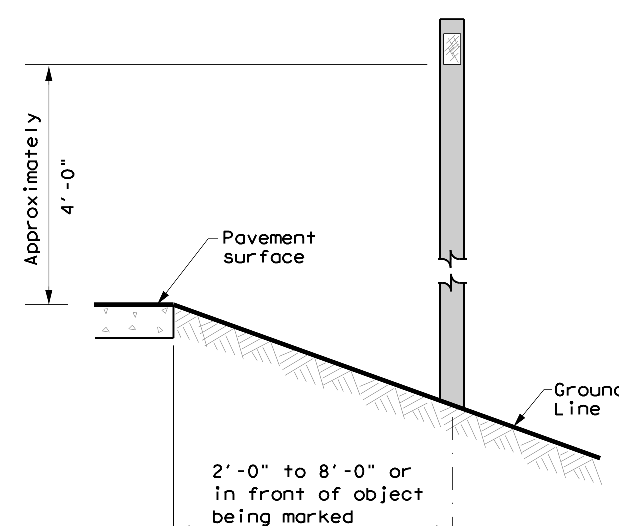
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation | Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	AMA		RANDALL	91

20B

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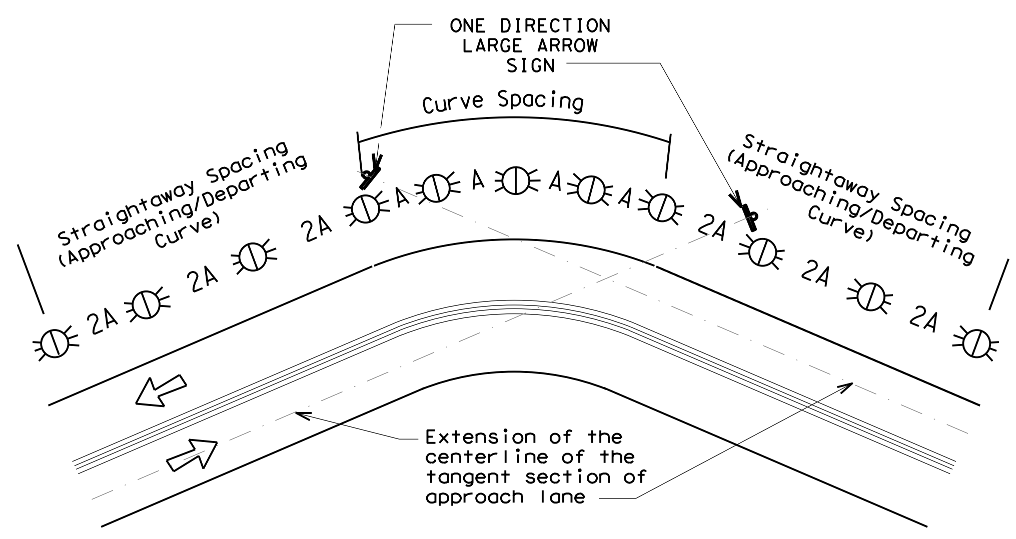
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

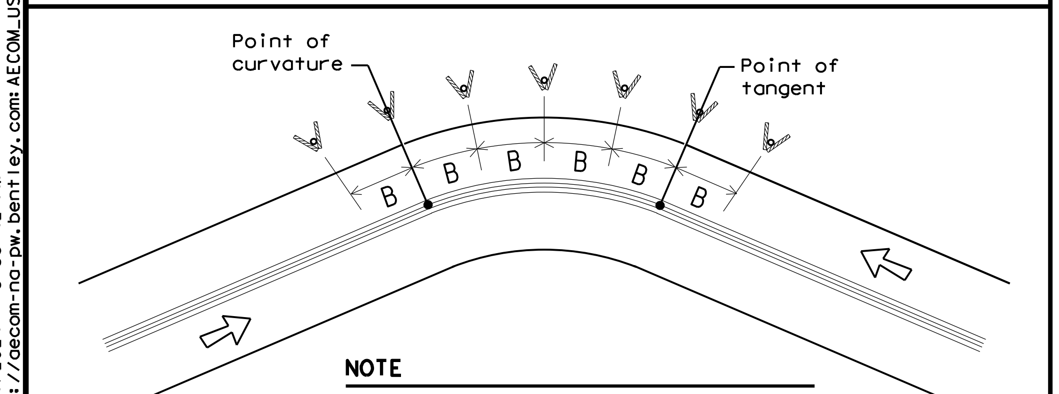
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

(symbol)	Bi-directional Delineator
(symbol)	Delineator
(symbol)	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 3-15 8-15 8-15 7-20	DIST AMA		COUNTY RANDALL	SHEET NO. 92

20C

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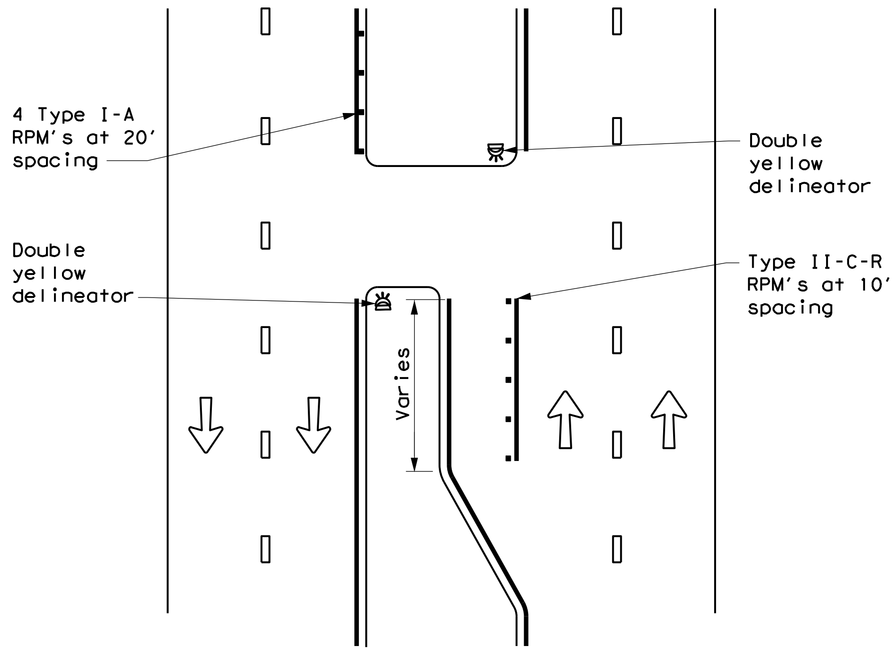
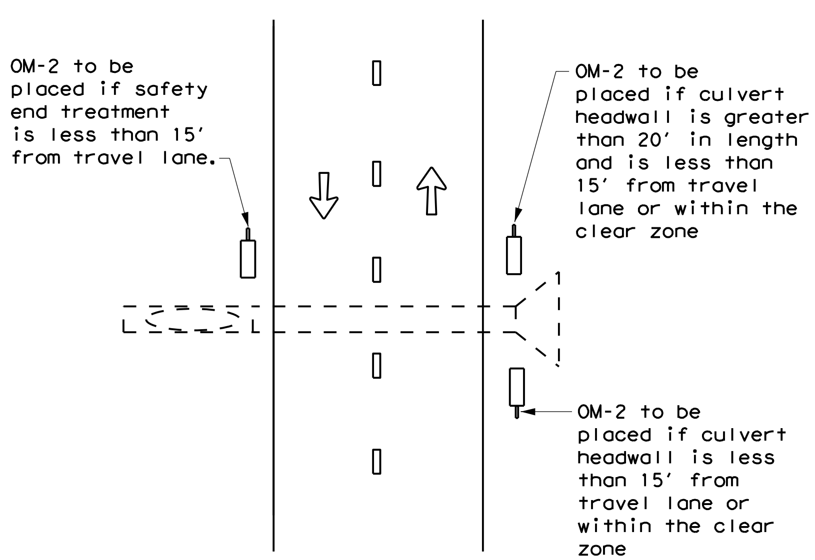
CROSSOVERS



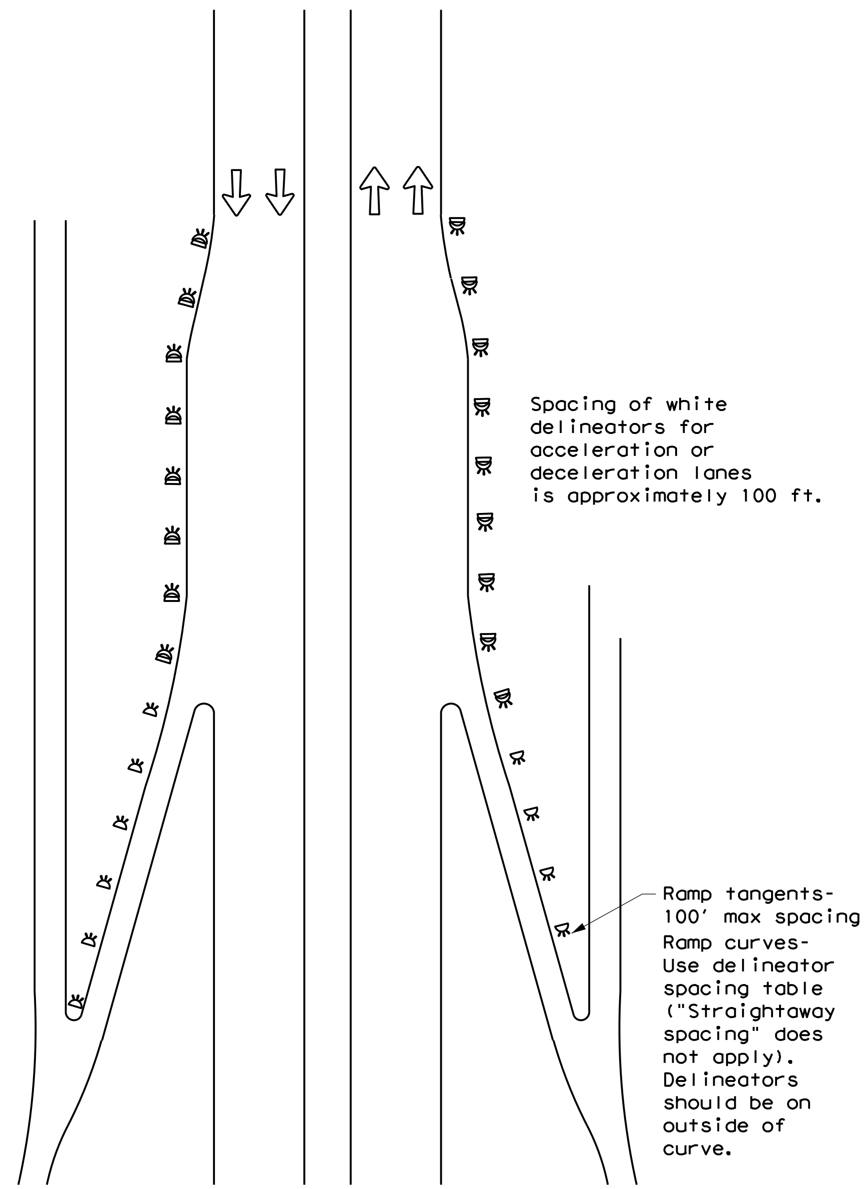
DETAIL 1

FOR CULVERTS WITHOUT MBGF



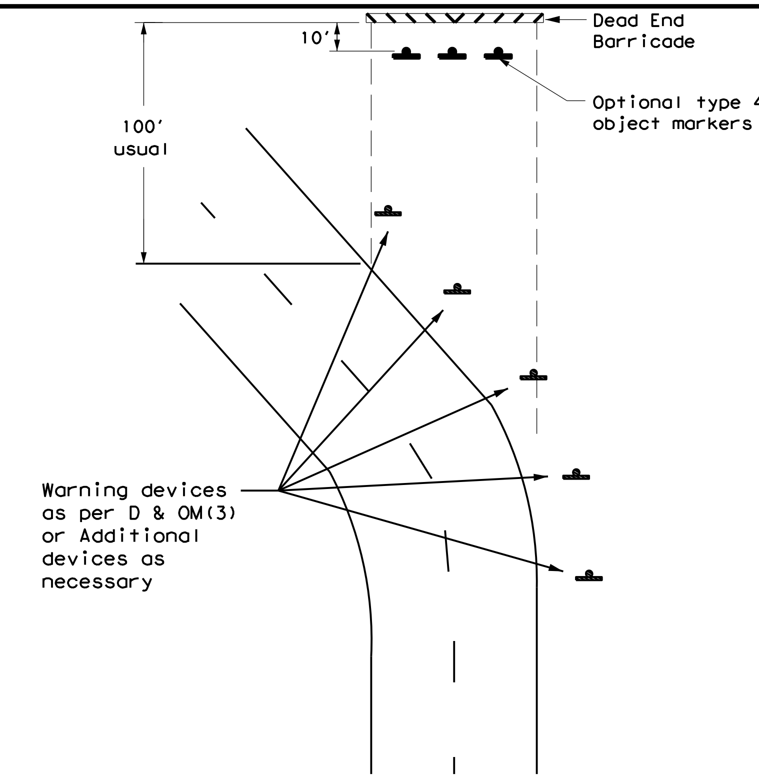
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



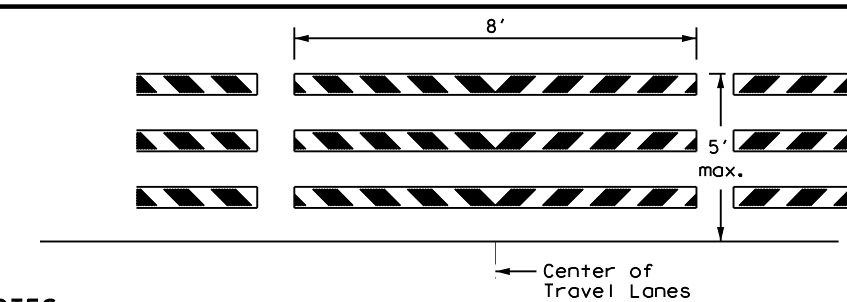
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

Symbol	Description
[symbol]	Bidirectional Delineator
[symbol]	Delineator
[symbol]	OM-3
[symbol]	Barricade
[symbol]	Sign
[symbol]	OM-2
[symbol]	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

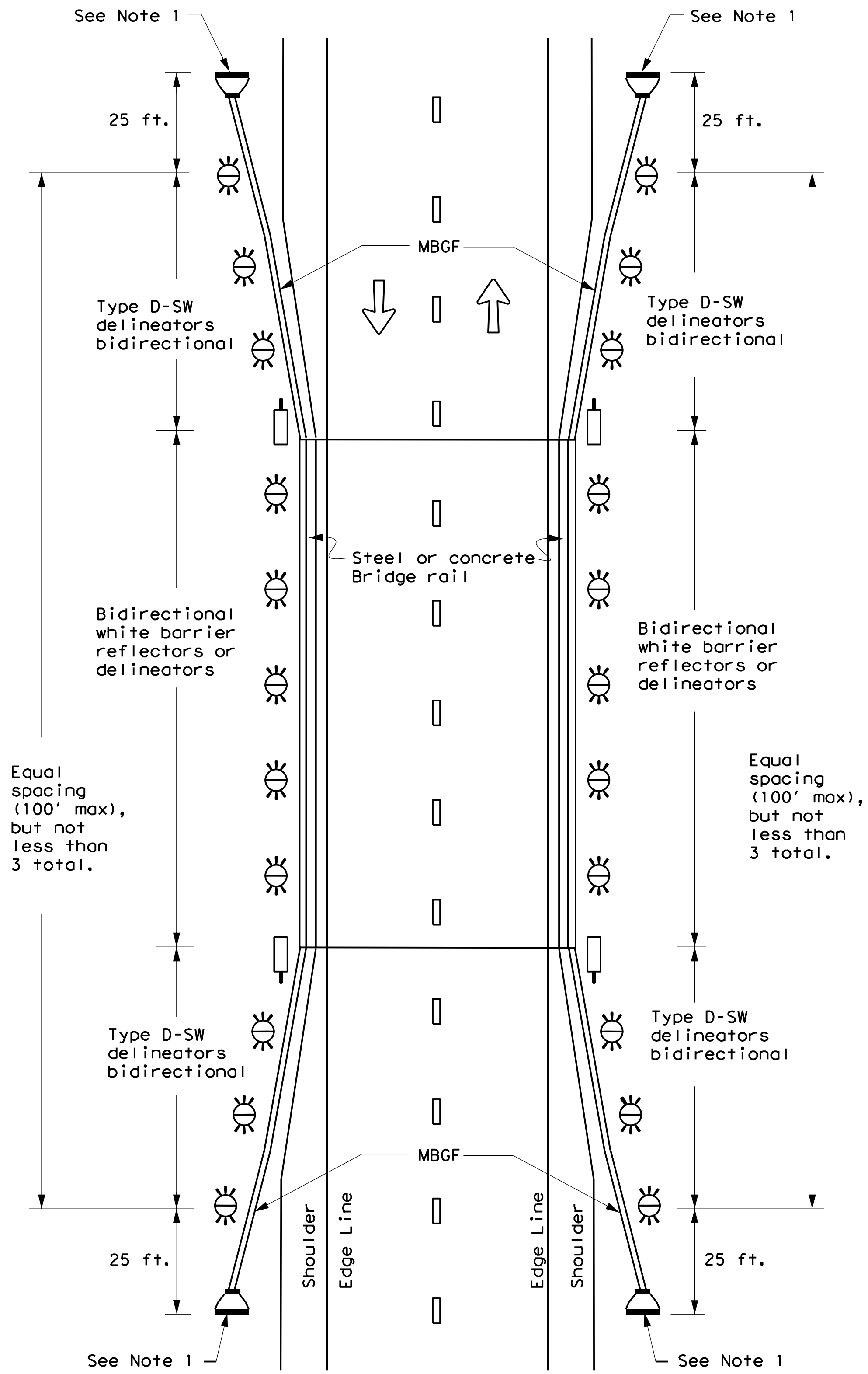
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-15 7-20	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		93

20D

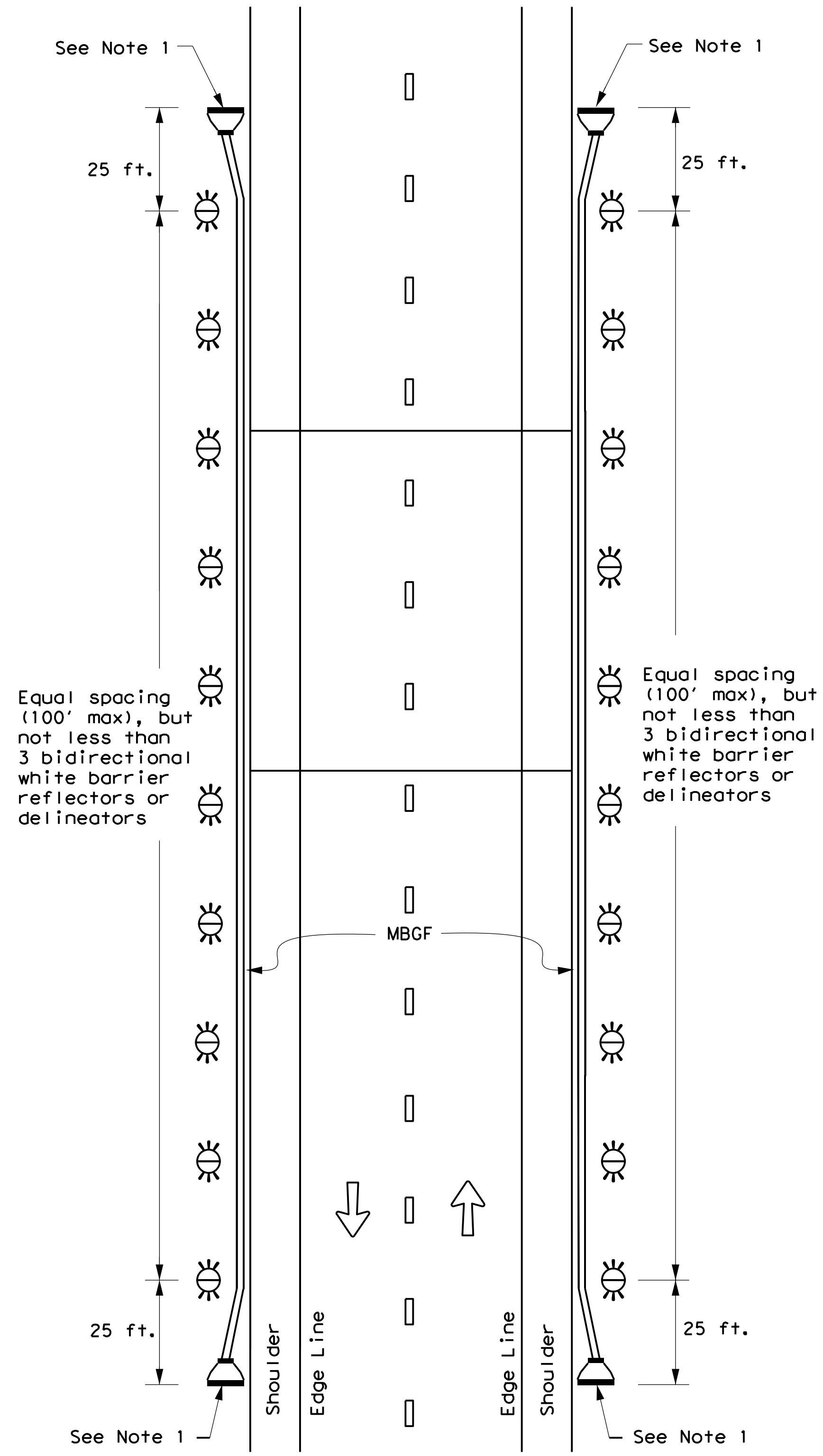
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

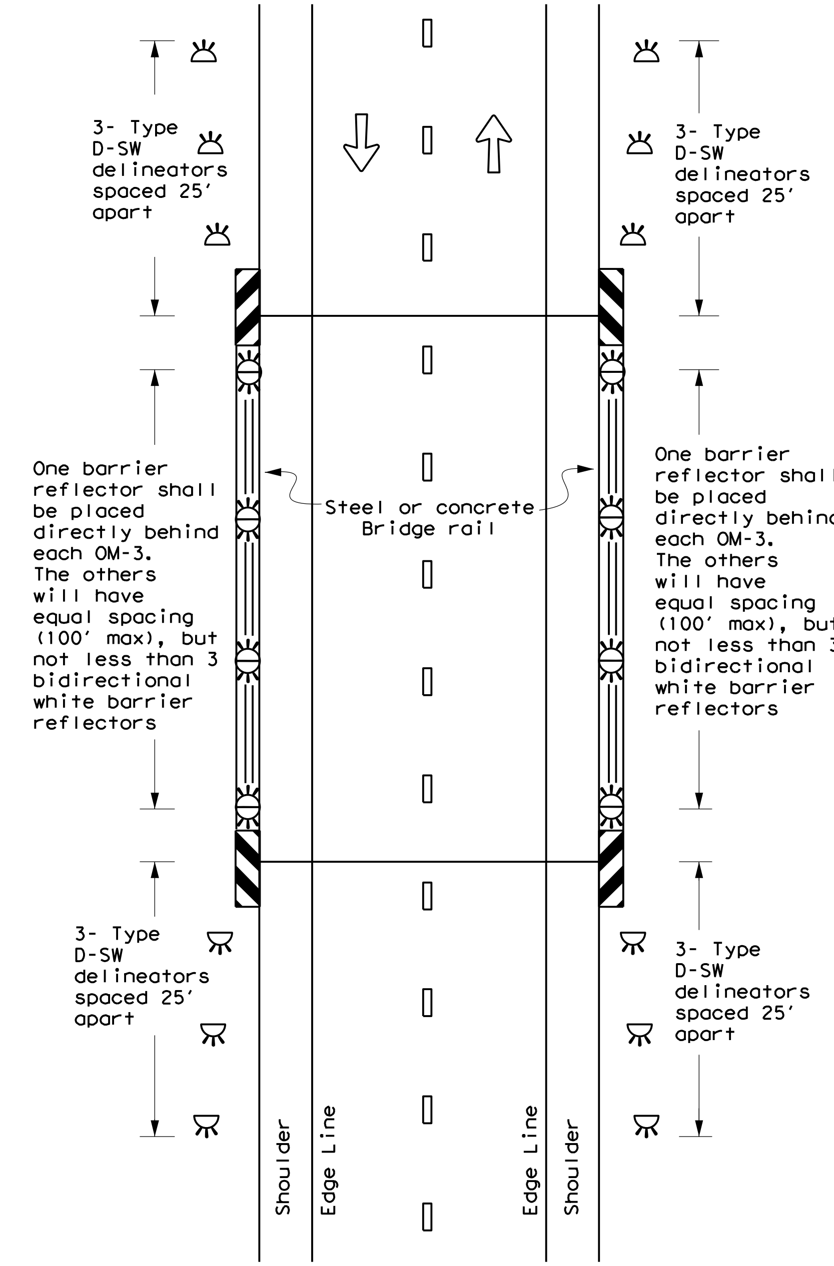
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

Symbol	Description
	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	2635	02	038	SL 335
7-20	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	94

20E

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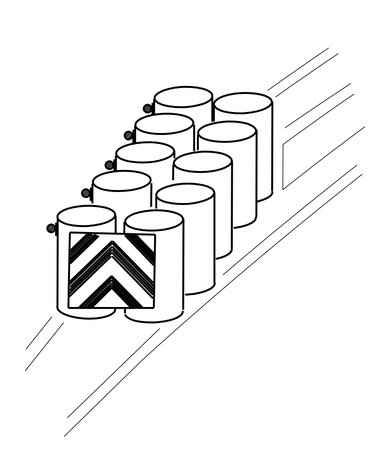
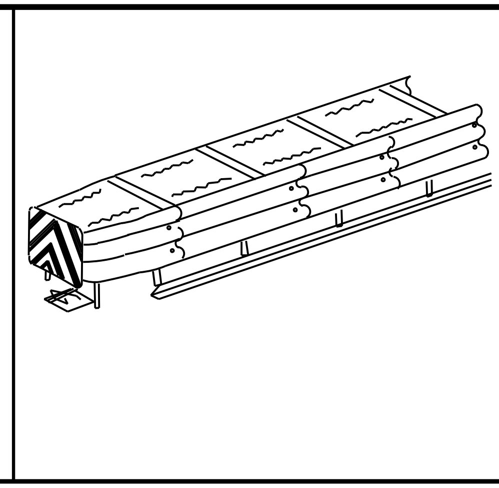
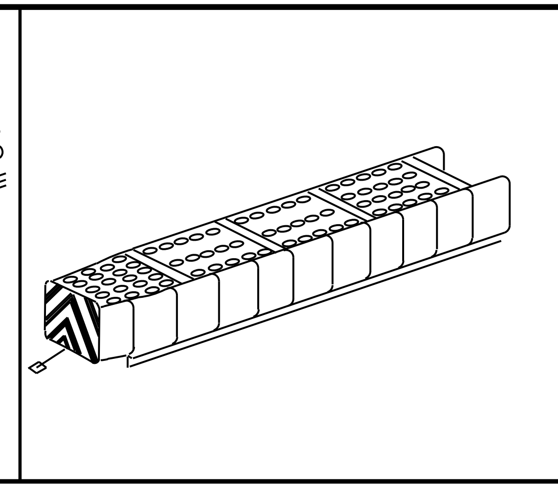
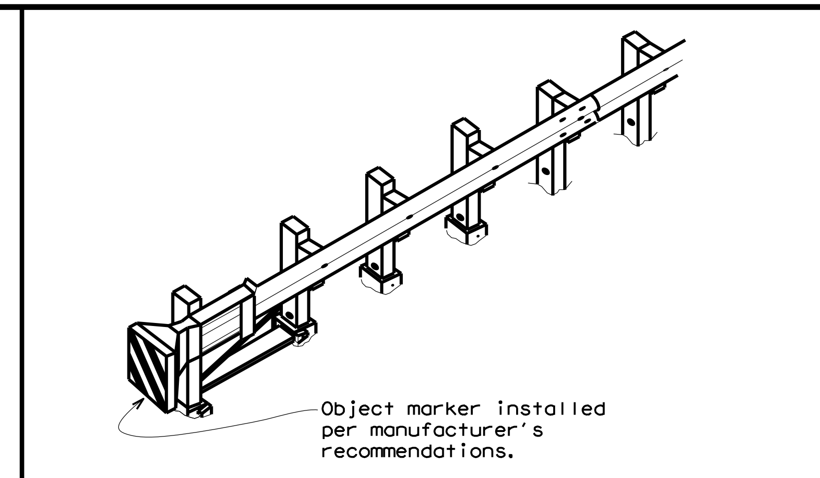
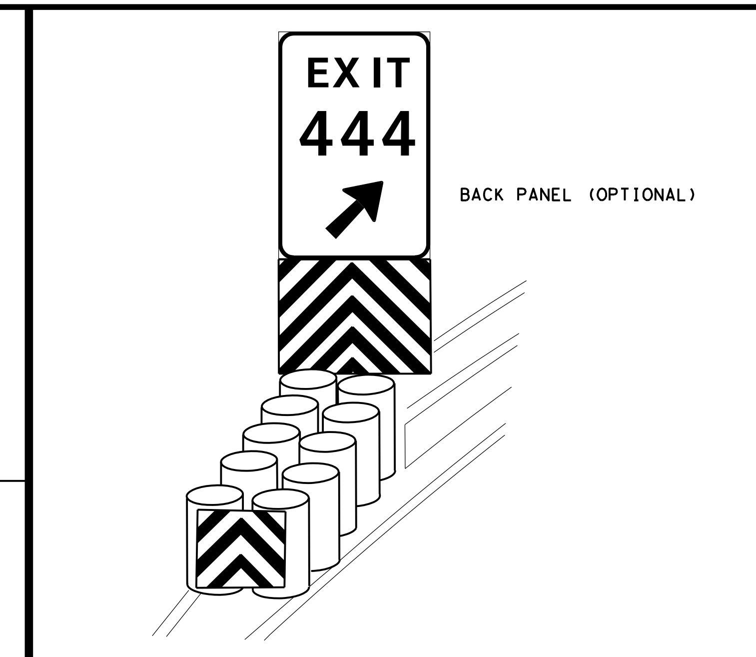
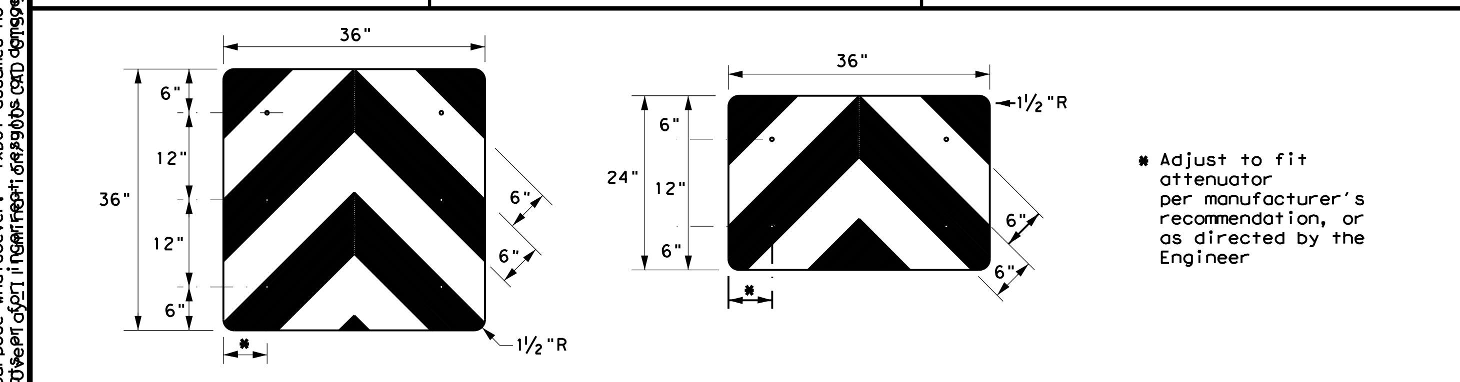


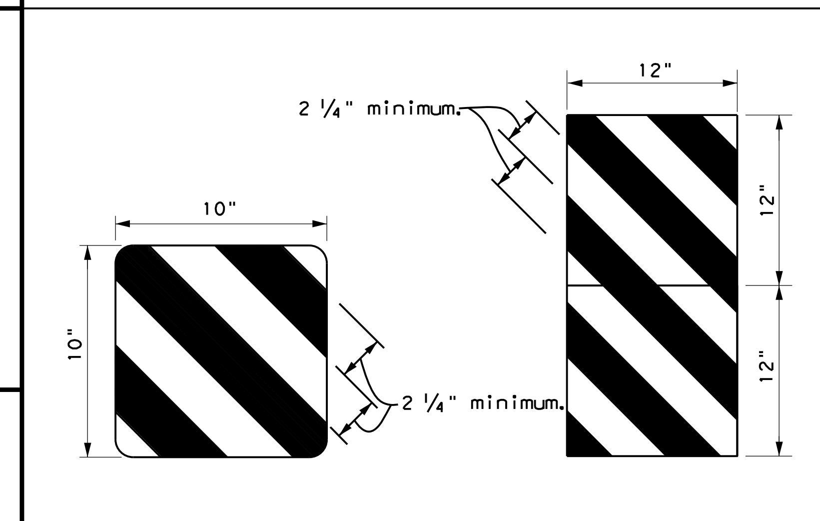




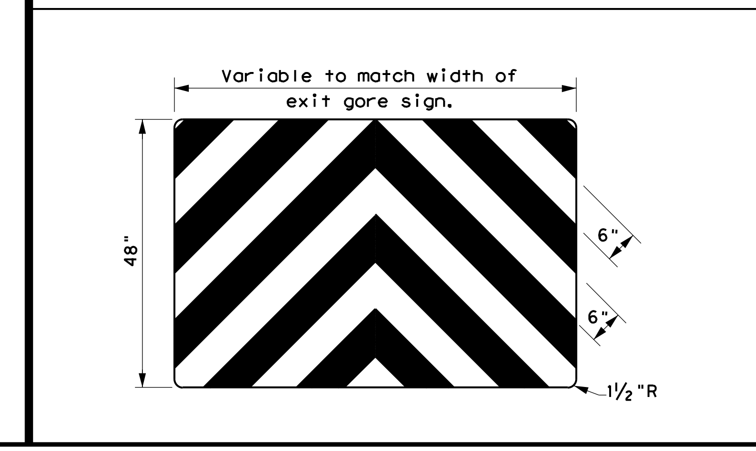


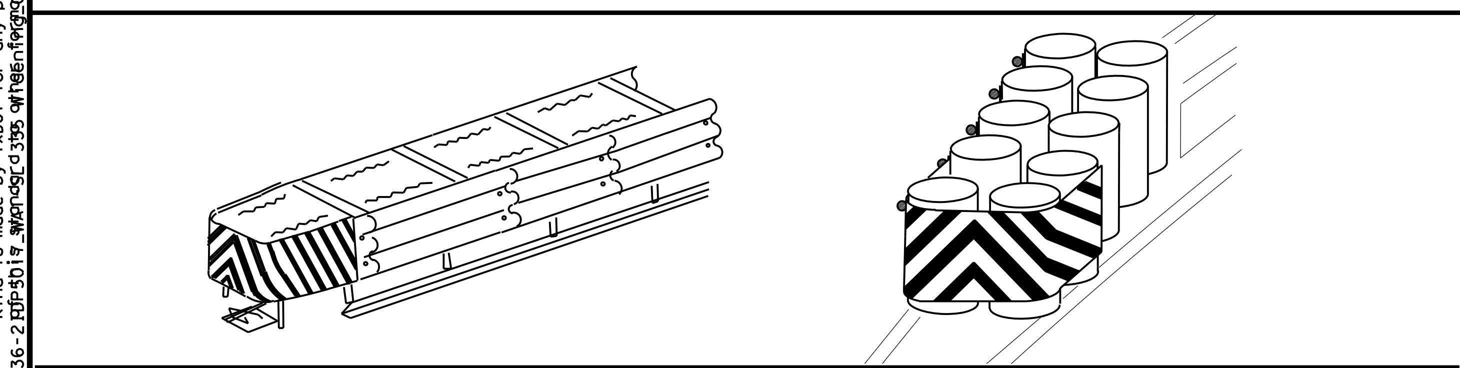


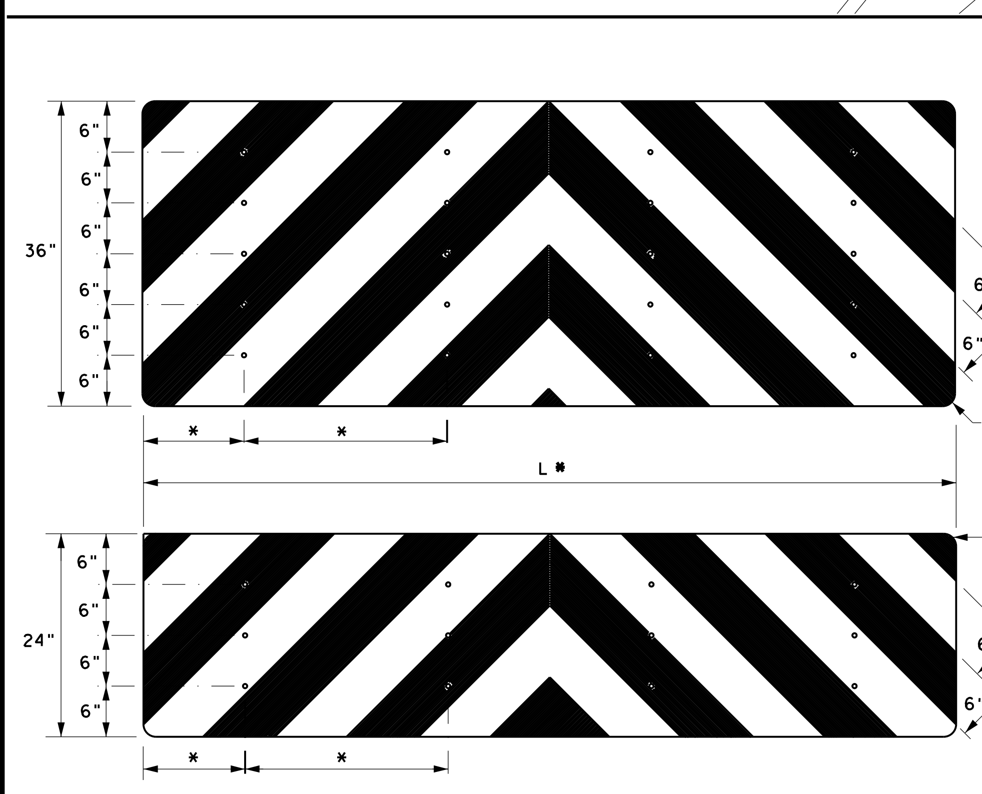




OBJECT MARKERS SMALLER THAN 3 FT^2







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	2635	02	038	SL 335
4-92 8-04 / 8-95 3-15 / 4-98 7-20	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	95

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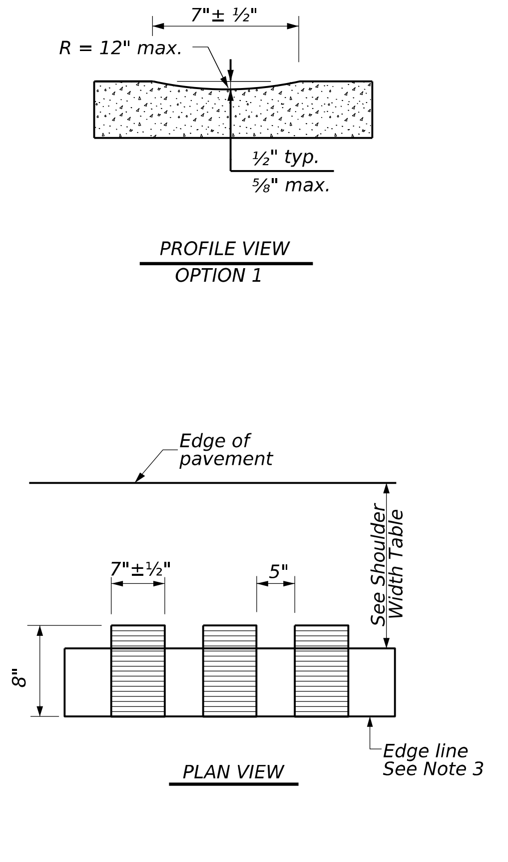
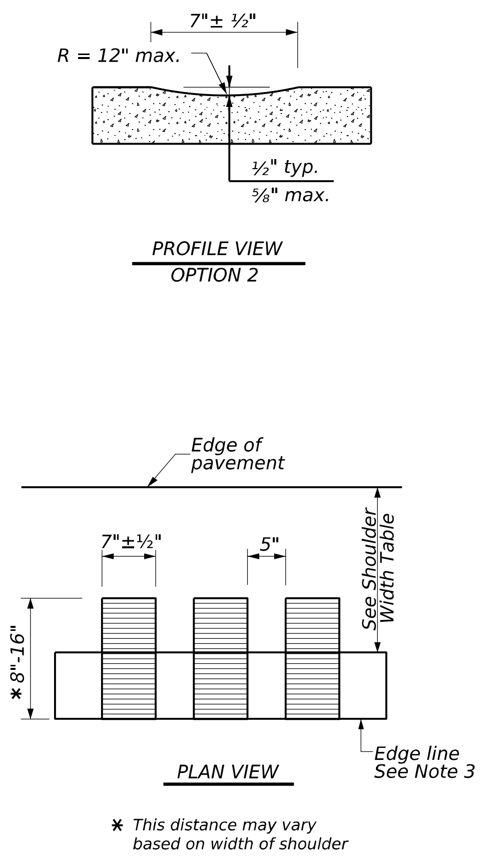


CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



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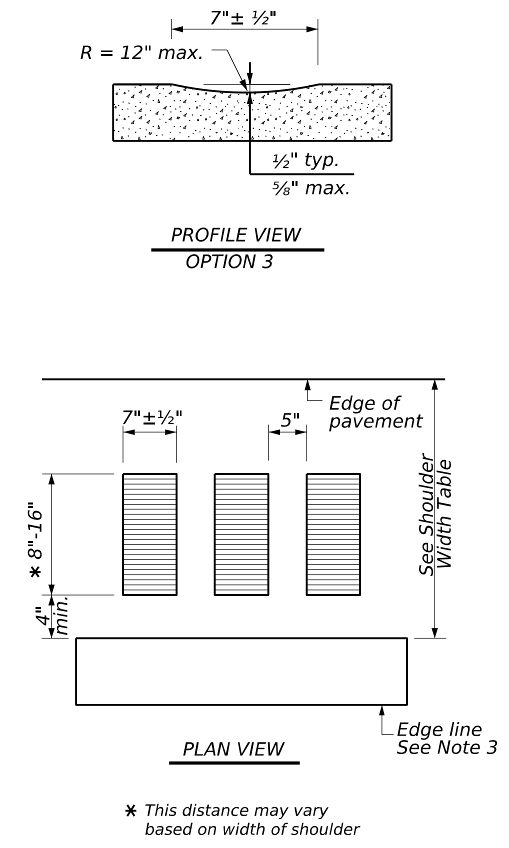

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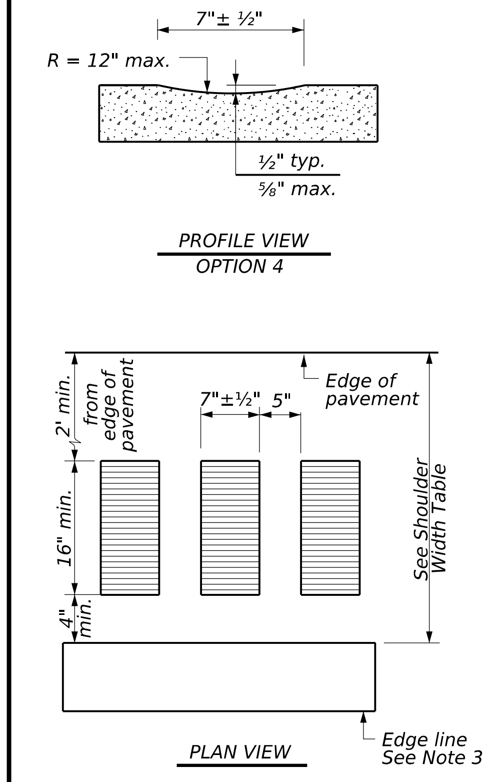

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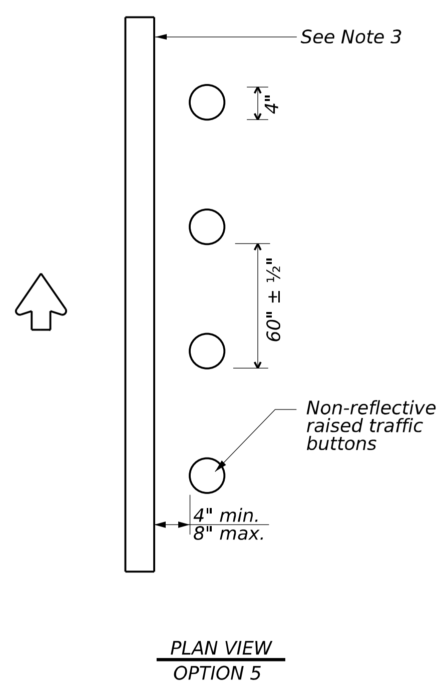
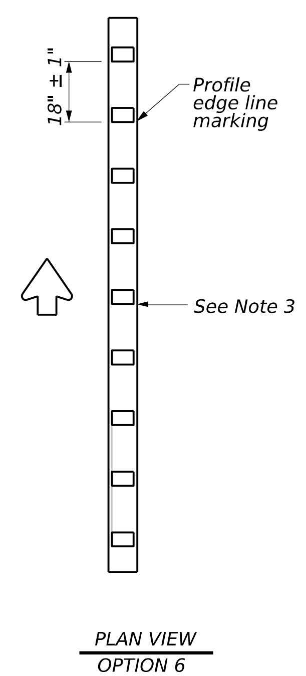
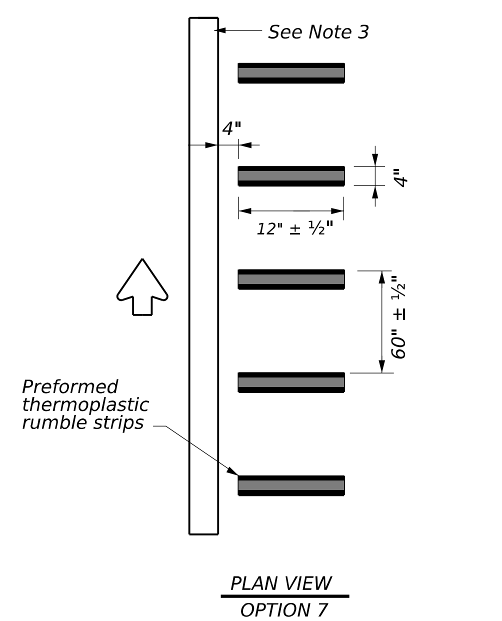


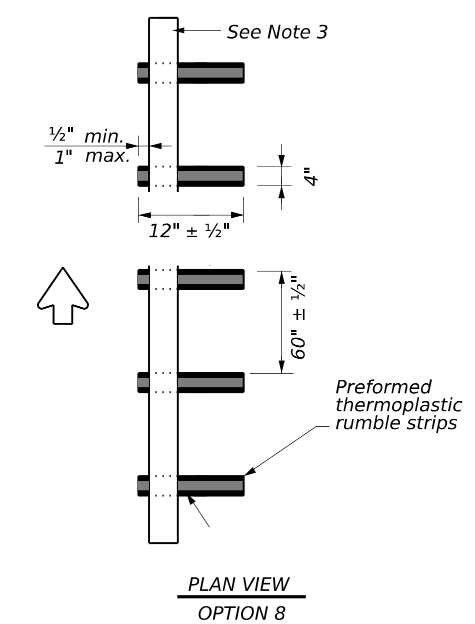
RAISED EDGE LINE
(Rumble Strips)



PROFILE EDGE LINE MARKINGS
(Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE
(Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE
(Rumble Strips)

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, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

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) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE 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 edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line 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. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-13 1-23	2635	02	038	SL 335
	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	96

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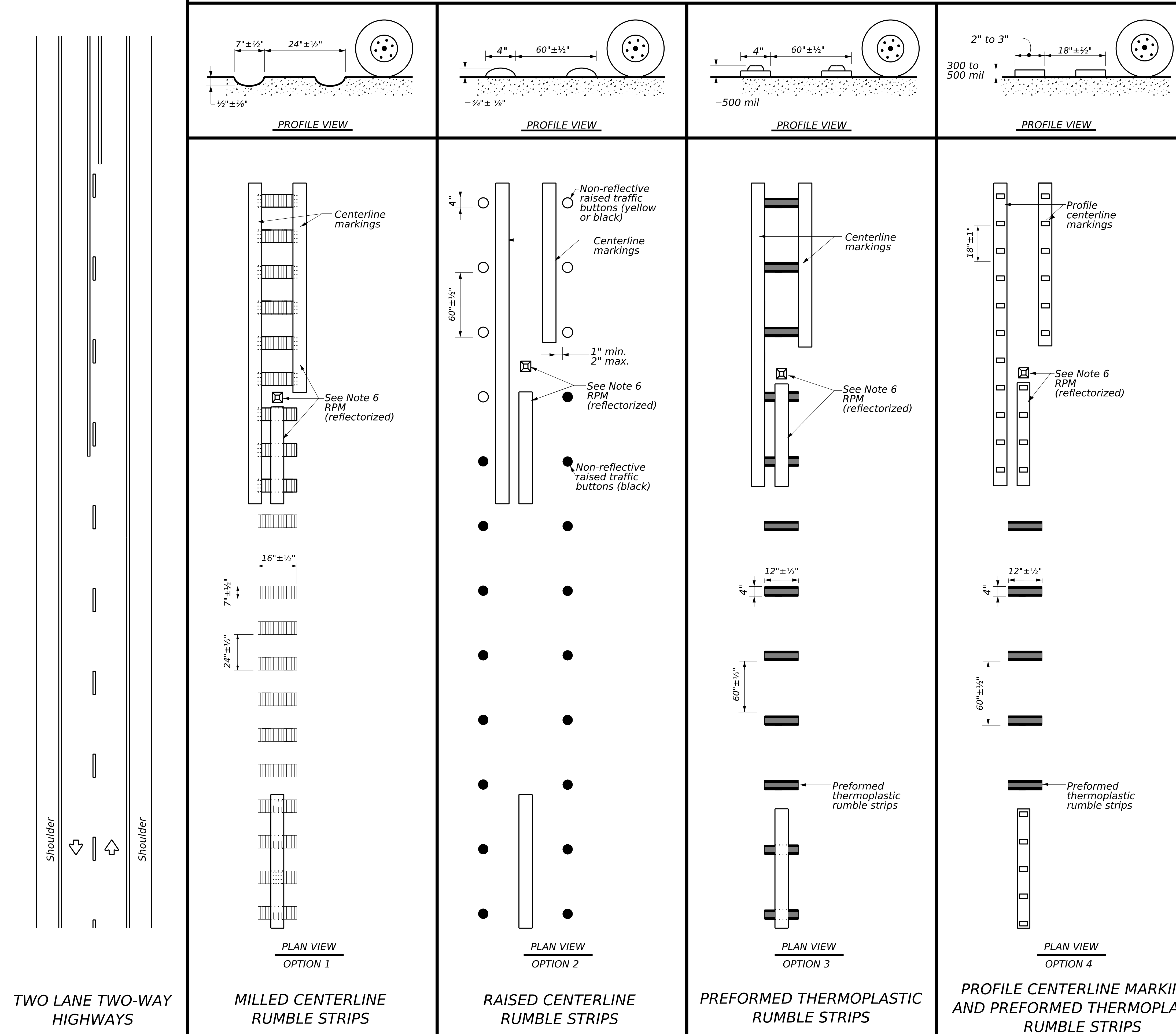
CENTERLINE RUMBLE STRIPS



GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line 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 Safety 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 or 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 to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) 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.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-13 1-23	2635	02	038	SL 335
	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	97

93

DATE: 2/1/2024 5:56:04 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM*USA*Texas/Documents/60713043-36-21DP5017*WAI-SL 335 Widening*Overlay*Illumination/900-CAD GIS/910*CAD/16*STANDARDS/TRAFFIC/smdgen.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

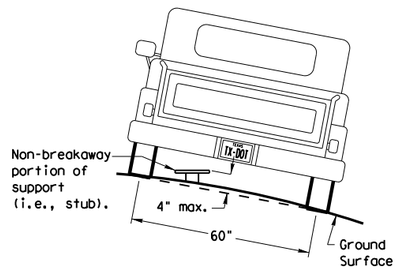
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

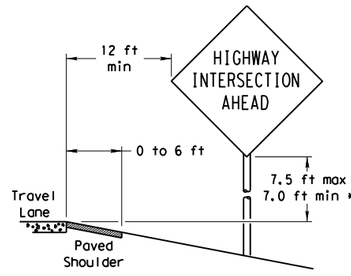
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

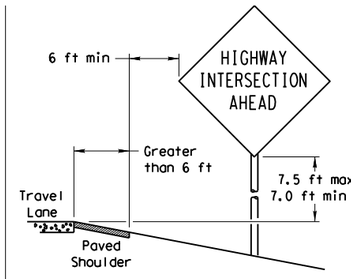
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

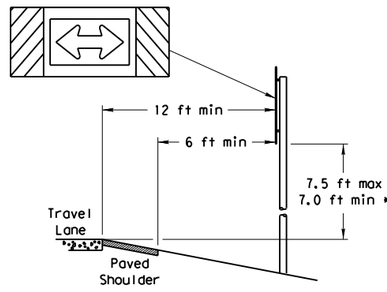
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



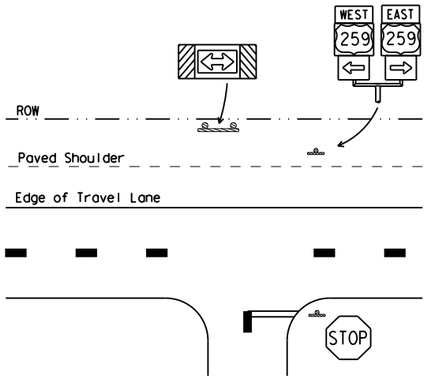
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

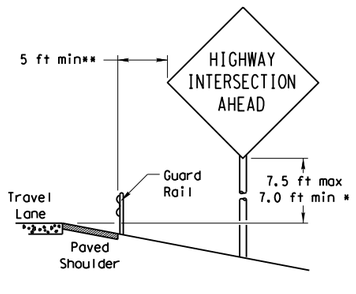
T-INTERSECTION



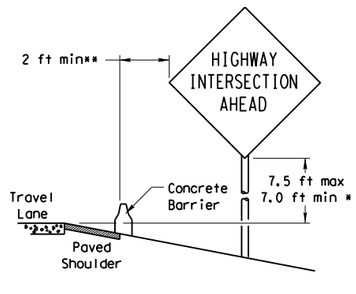
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER

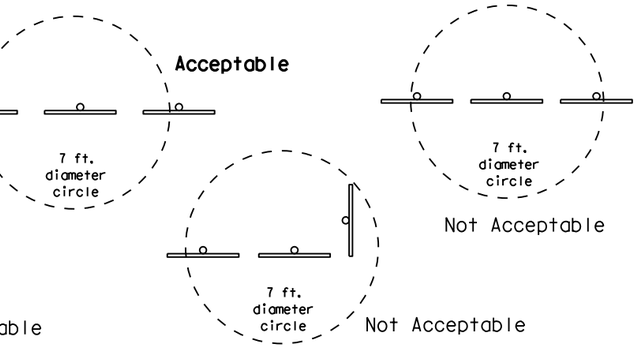


BEHIND GUARDRAIL



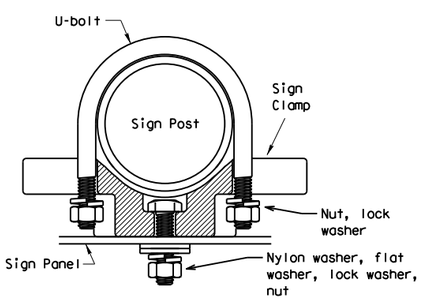
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

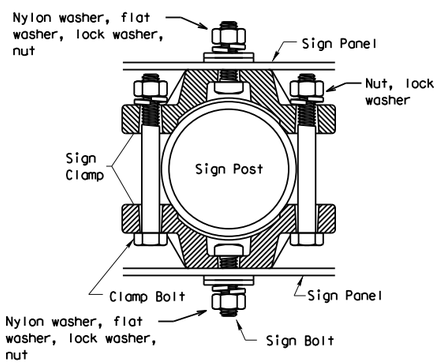


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

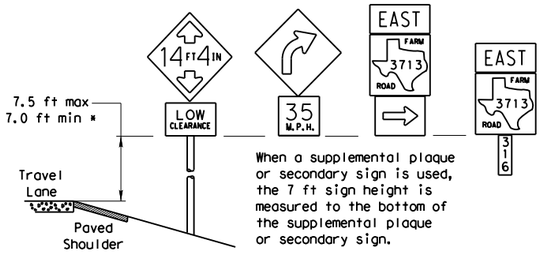
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



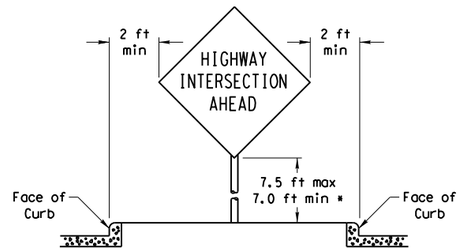
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



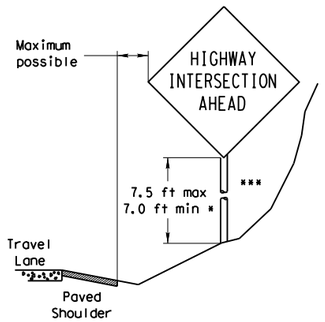
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2635	02	038	SL 335

DIST	COUNTY	SHEET NO.
AMA	RANDALL	98

DATE: 2/1/2024 5:56:33 PM
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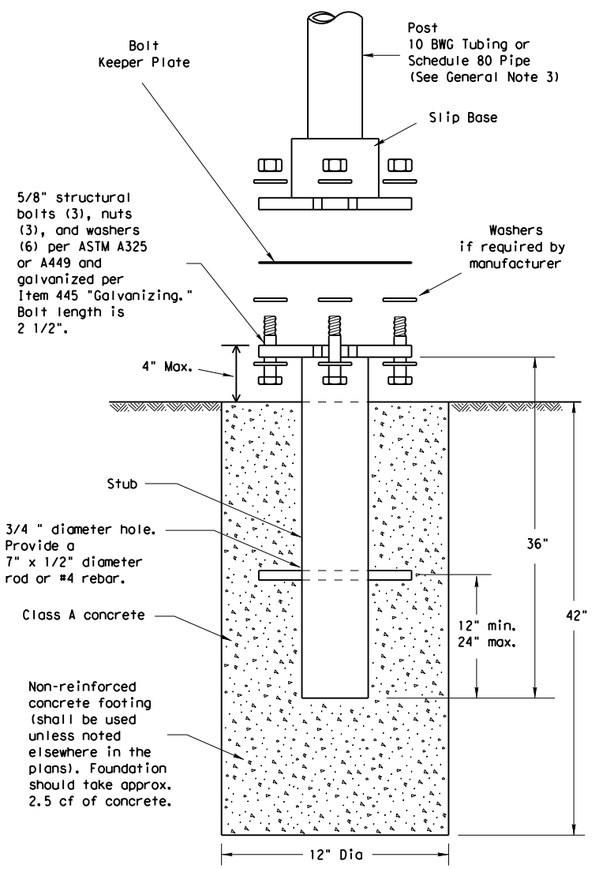
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

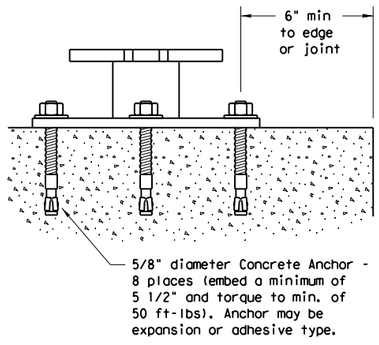
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 9-08			

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335

DIST	COUNTY	SHEET NO.
AMA	RANDALL	99

DATE: 2/1/2024 5:56:57 PM
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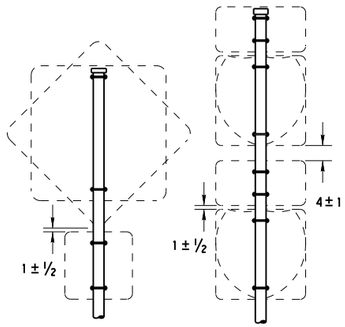
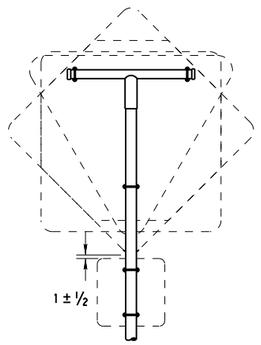
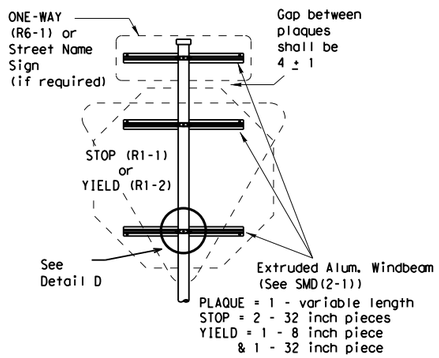


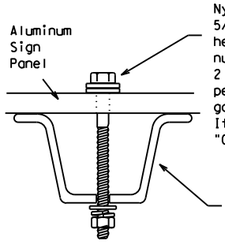
SM RD SGN ASSM TY XXXXX(1)XX(P)



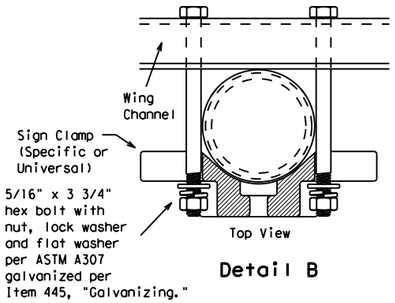
SM RD SGN ASSM TY XXXXX(1)XX(T)



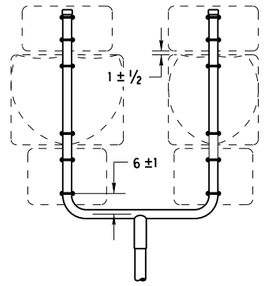
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



Detail B



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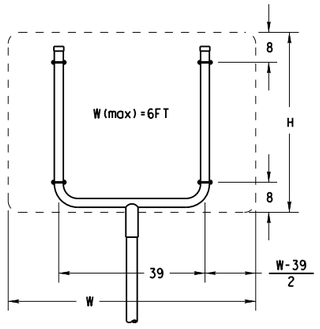

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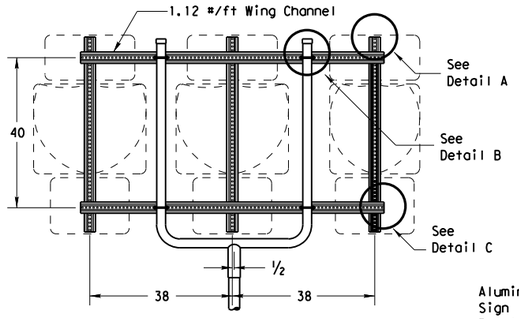
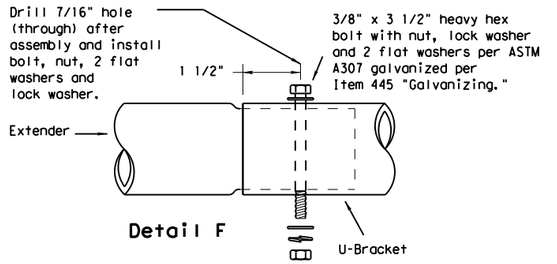
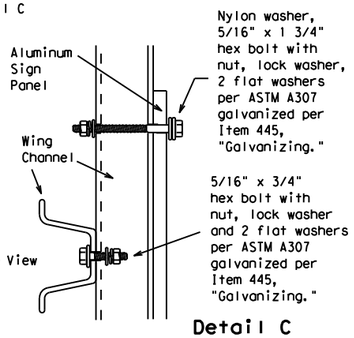


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

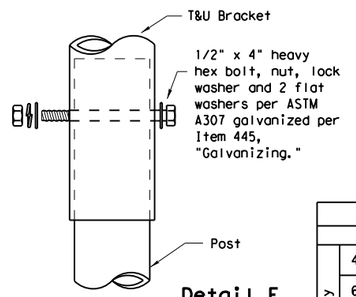


Detail F

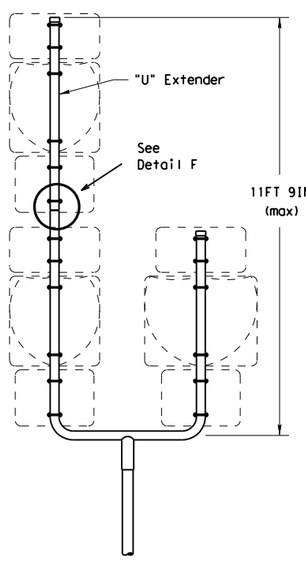
Splices shall only be allowed behind the sign substrate.



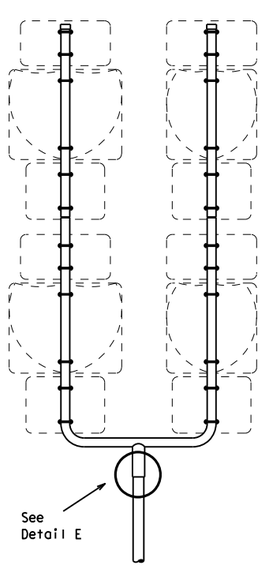
Detail C



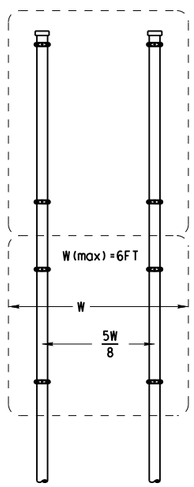
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

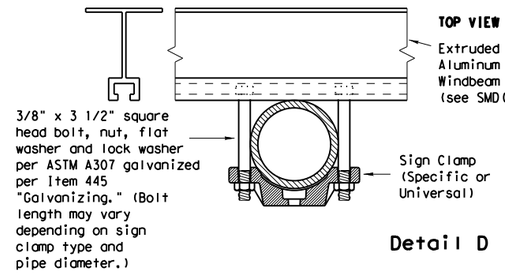


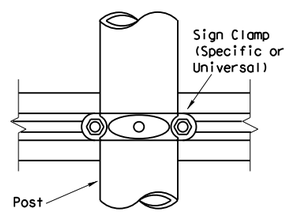
SM RD SGN ASSM TY S80(1)XX(U-2EXT)



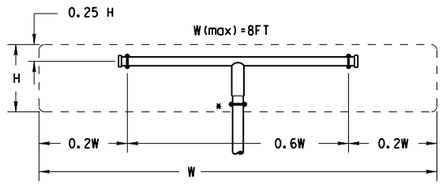
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW





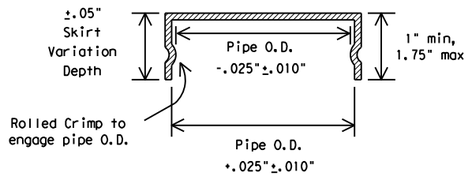
Detail D



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

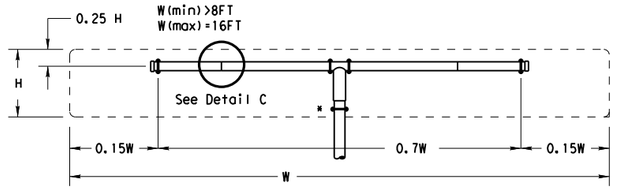
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

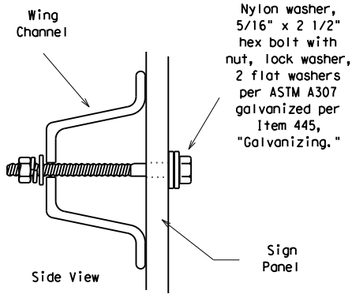
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		100

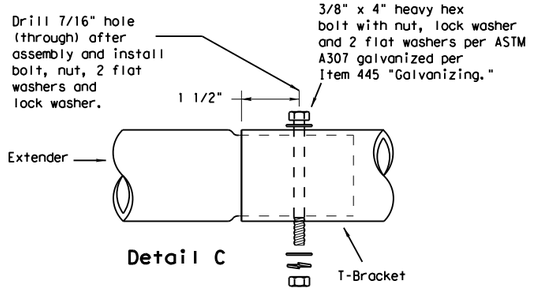
DATE: 2/1/2024 5:57:17 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM*USA*Texas/Documents/60713043-36-21DP5017*WA1-SL 335 Widening*Overlay*Illumination/900-CAD GIS/910*CAD/16*STANDARDS/TRAFFIC/smds3.dgn



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



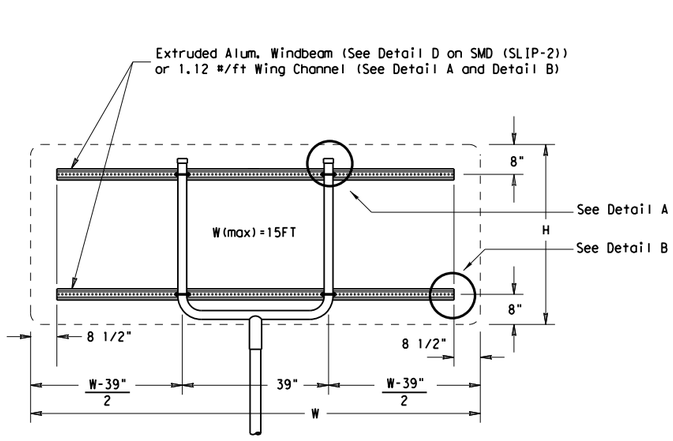
Detail C

Splices shall only be allowed behind the sign substrate.

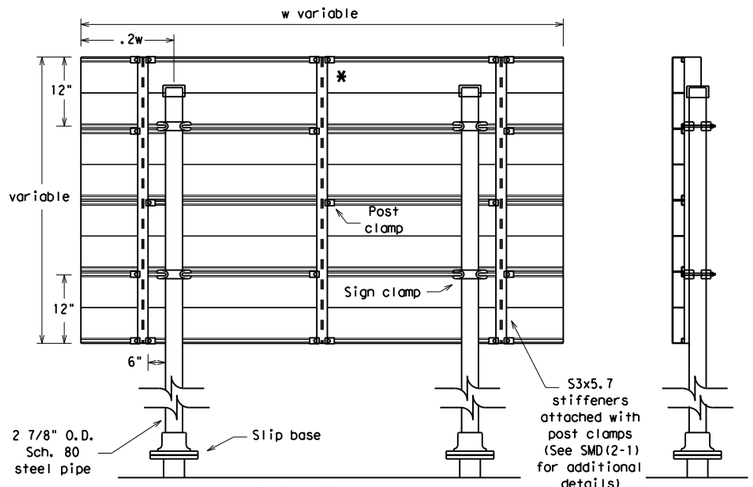
GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.



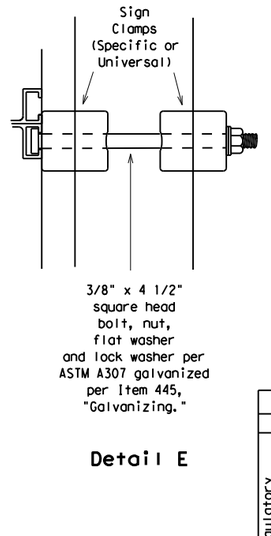
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



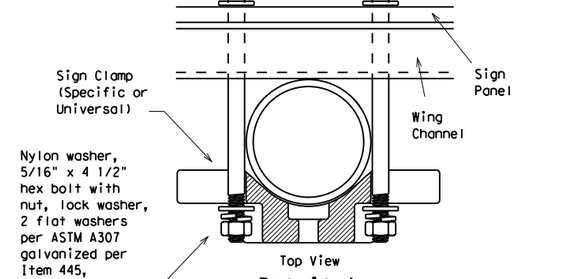
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

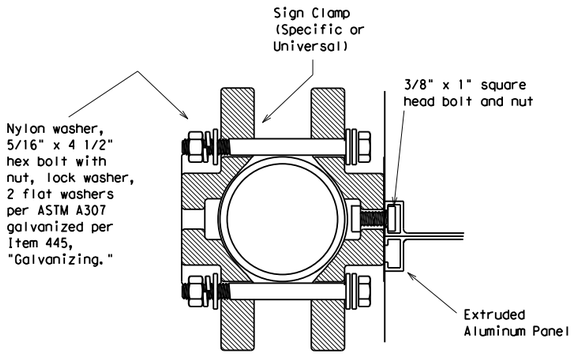
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



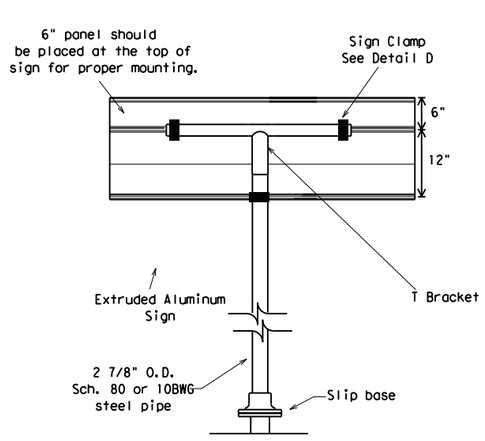
Detail E



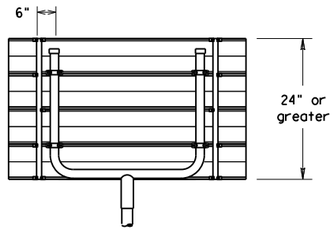
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

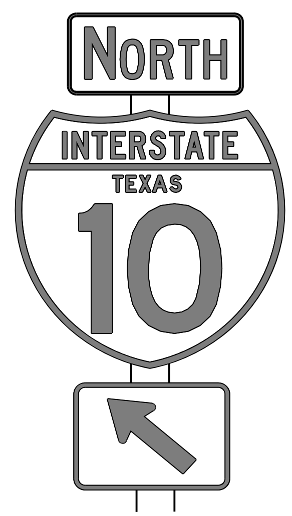
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

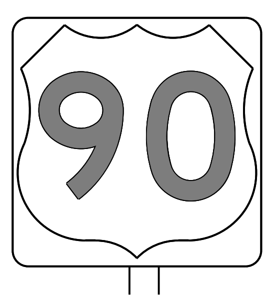
SMD(SLIP-3)-08

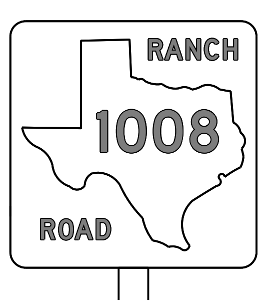
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		101

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



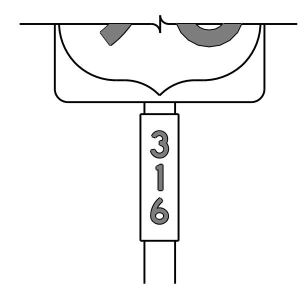


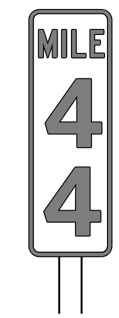


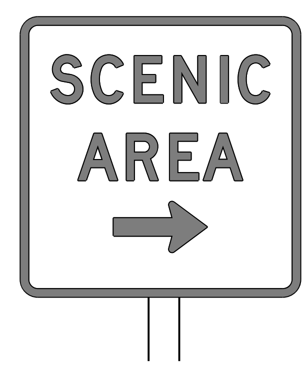
TYPICAL EXAMPLES

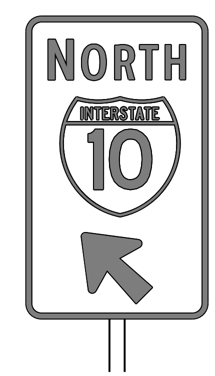
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

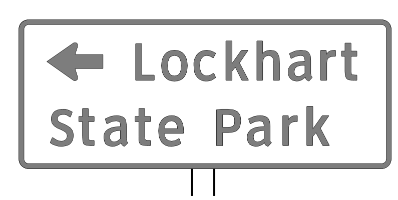
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

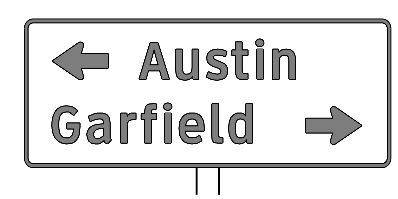












TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

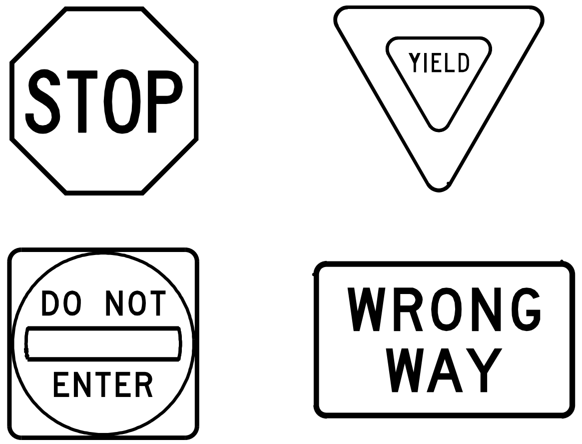
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	102

3

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

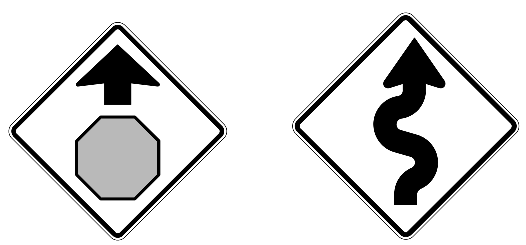
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE:	tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08		2635	02	038	SL 335
		DIST		COUNTY	SHEET NO.
		AMA		RANDALL	103

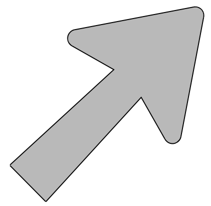
4

DATE: 2/1/2024 5:58:03 PM

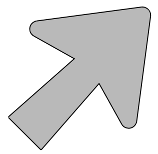
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2...TRAFFIC/tsr4-13.dgn

ARROW DETAILS

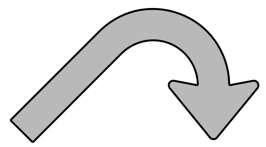
for Large Ground-Mounted and Overhead Guide Signs



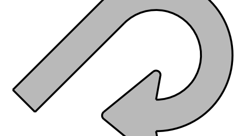
Type A



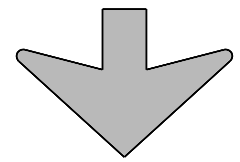
Type B



E-3



E-4



Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

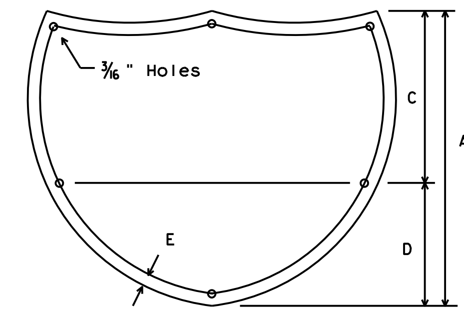
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

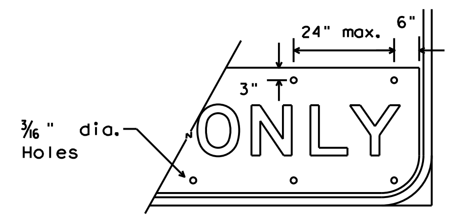
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

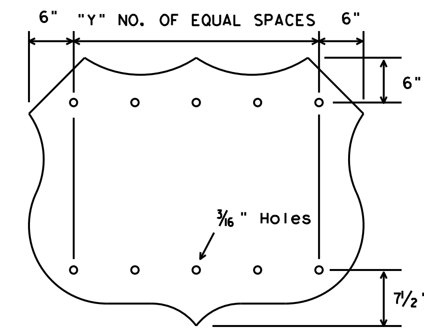


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

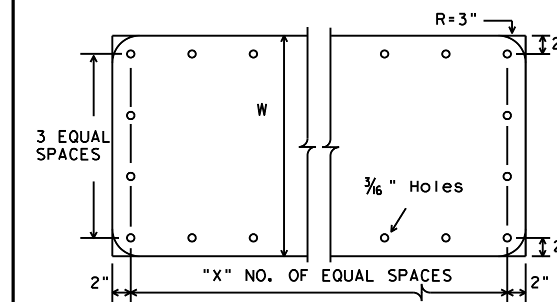


EXIT ONLY PANEL



U.S. ROUTE MARKERS

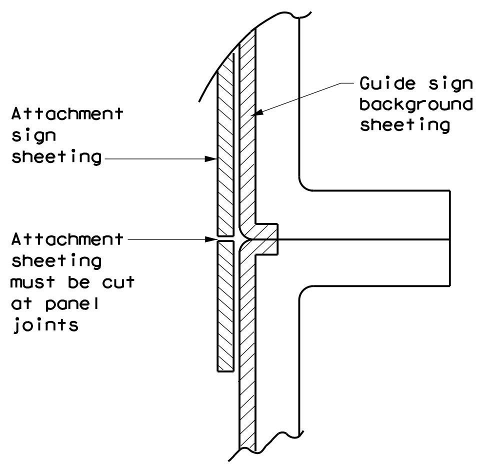
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

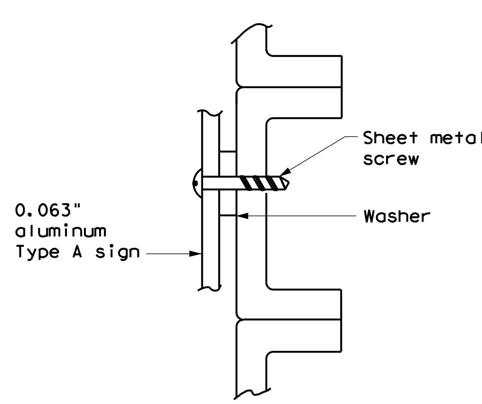
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



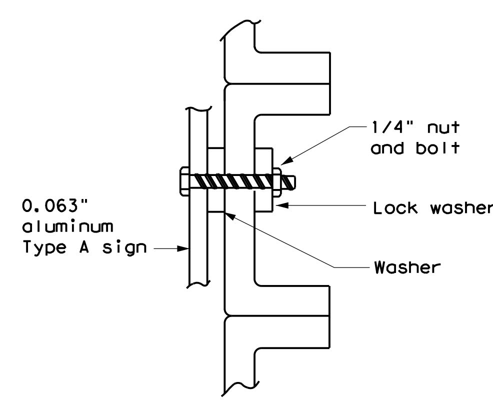
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



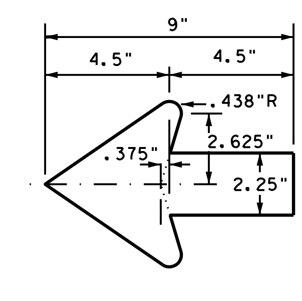
NUT/BOLT ATTACHMENT

NOTE:

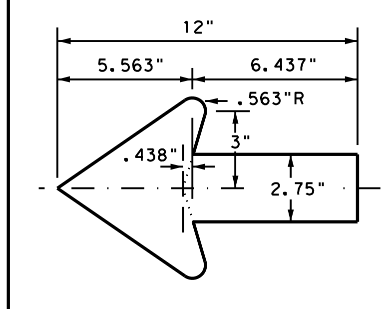
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

DATE: 2/1/2024 5:58:26 PM
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Texas Department of Transportation

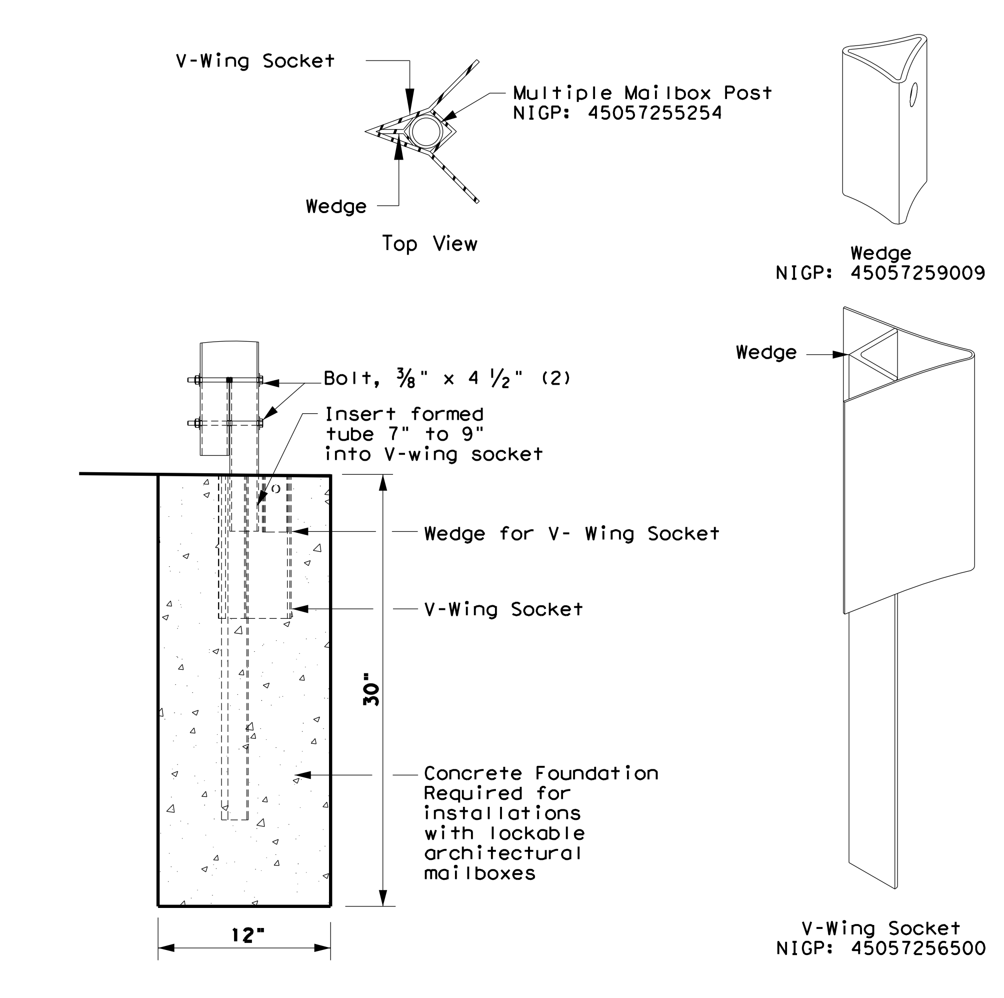
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

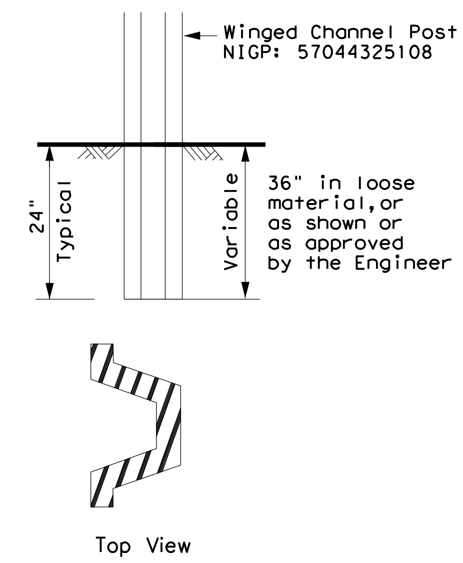
TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT 2635	SECT 02	JOB 038	HIGHWAY SL 335
REVISIONS 12-03 7-13 9-08	DIST AMA	COUNTY RANDALL		SHEET NO. 104

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage



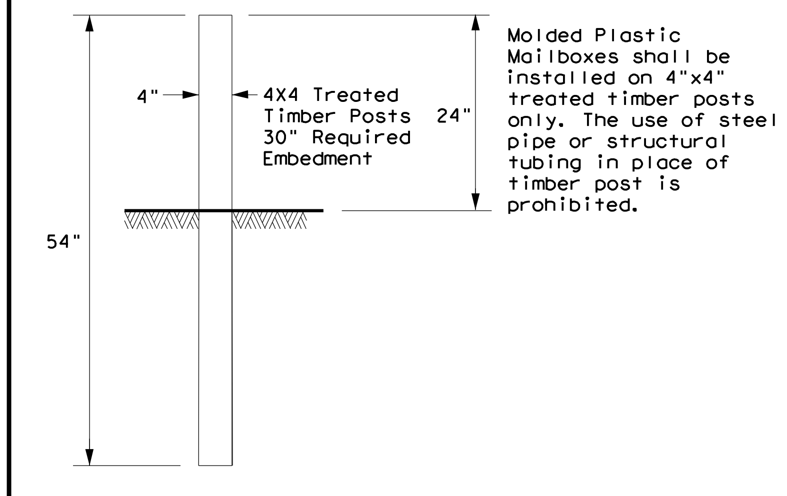
TYPE 3 - SUPPORT/FOUNDATION



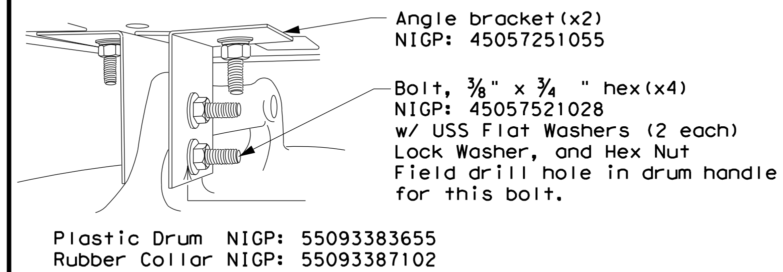
NOTES:

1. Attach Object Marker(OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



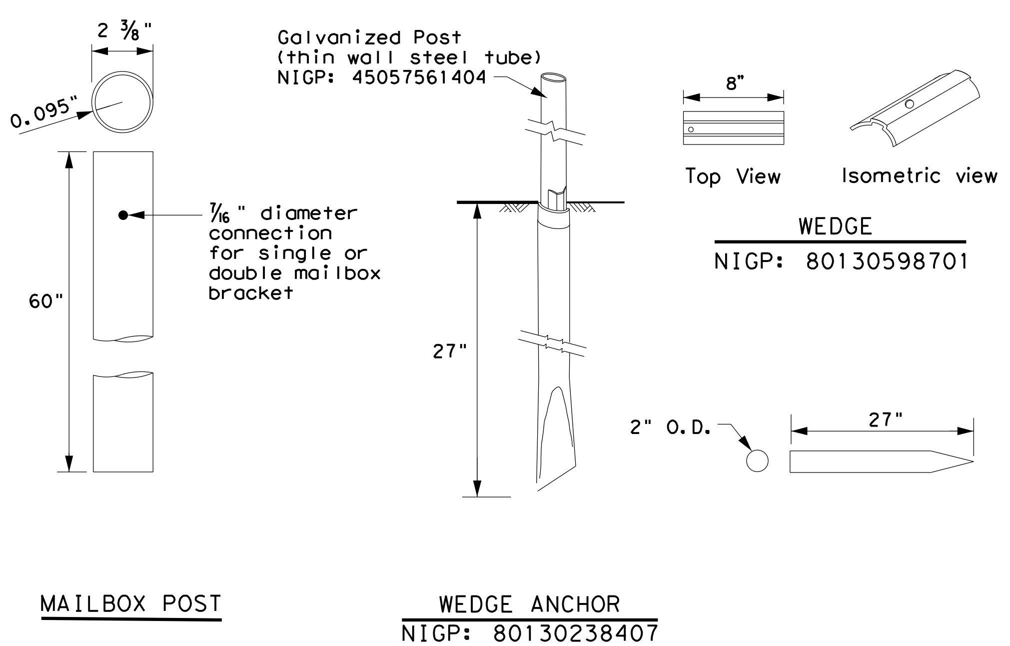
NOTES:

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

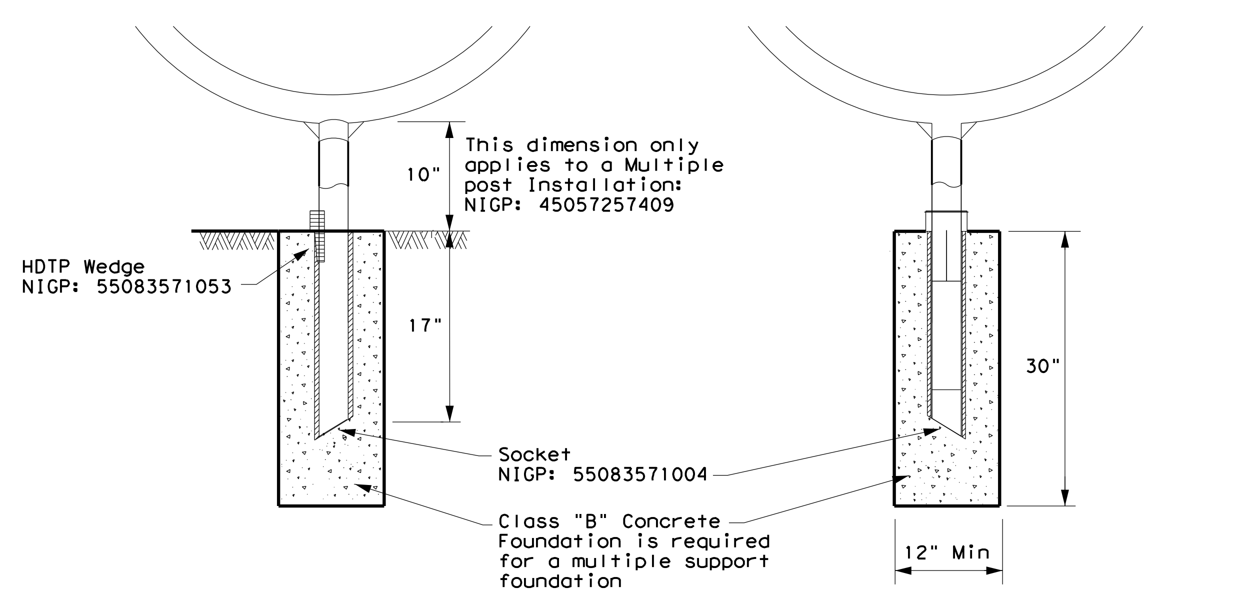
GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



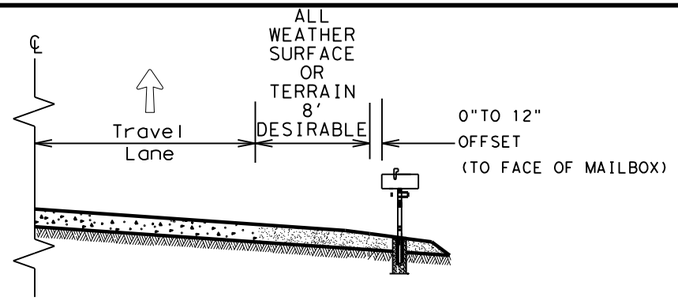
SHEET 3 OF 4

Texas Department of Transportation — Maintenance Division Standard

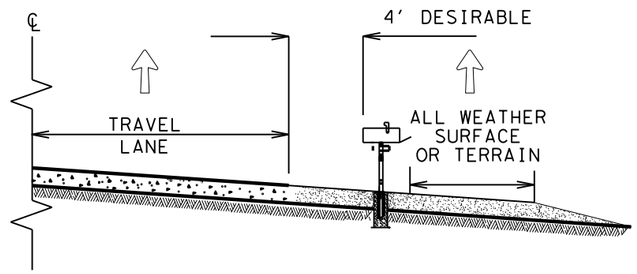
MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

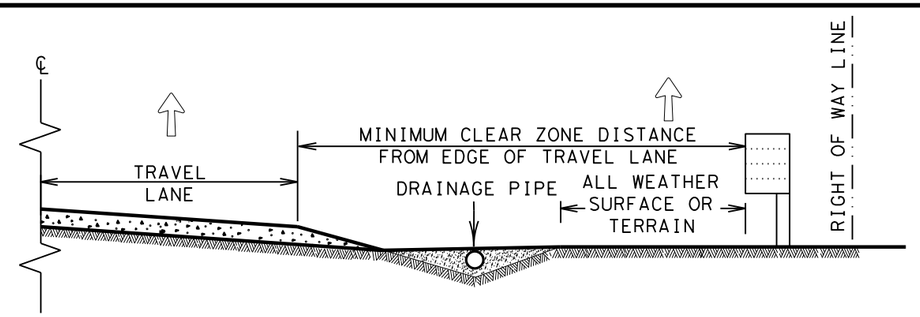
FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2635	02	038	SL 335
	DIST		COUNTY	SHEET NO.
	AMA		RANDALL	105



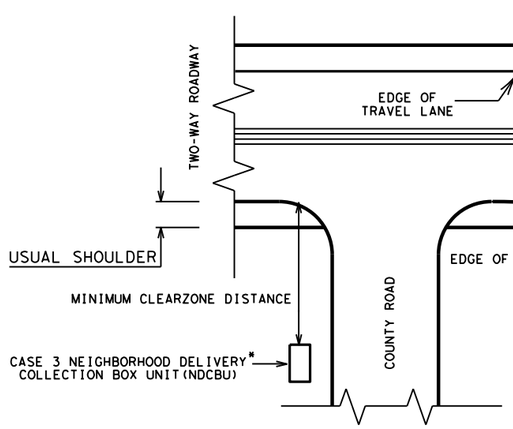
CASE 1. OFF TRAVEL WAY DELIVERY

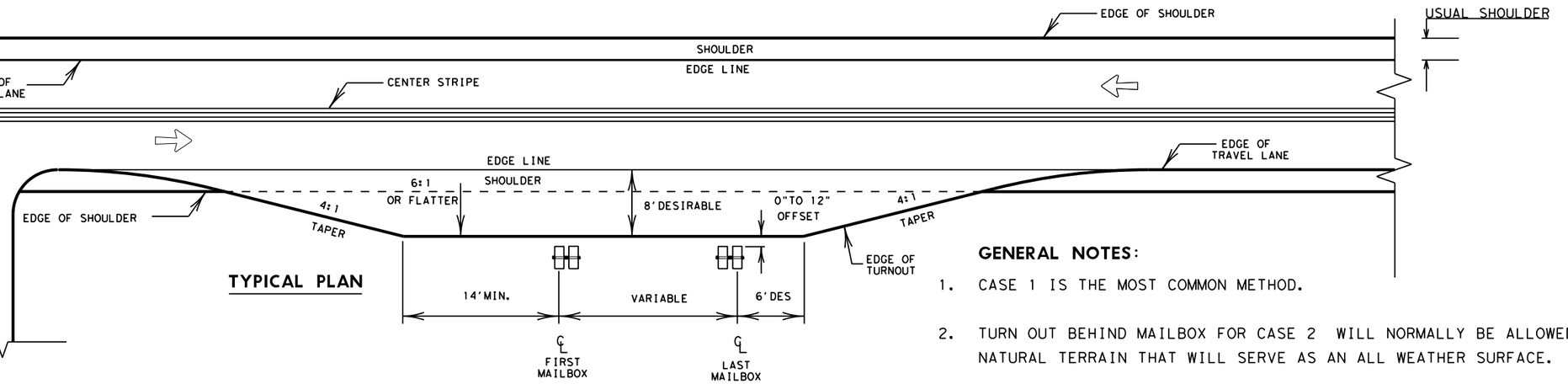


CASE 2. BACK SIDE DELIVERY

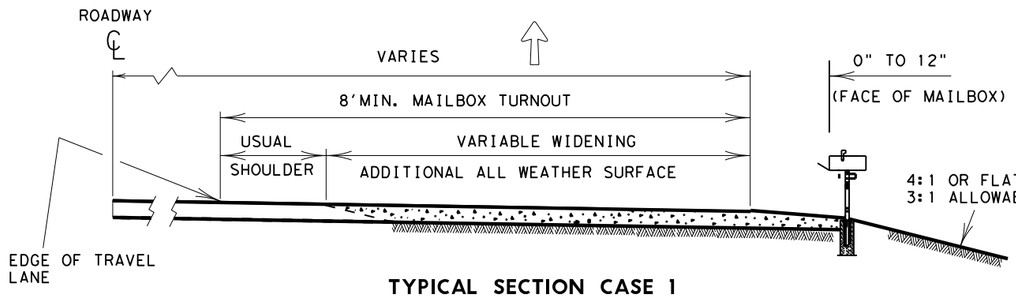


CASE 3. DELIVERY NEAR RIGHT OF WAY LINE





TYPICAL PLAN



TYPICAL SECTION CASE 1

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. WHEN 3 OR MORE MULTI-RACKS ARE ANTICIPATED, THE USE OF AN NDCBU IS RECOMMENDED. ONLY RURAL PATRONS LOCATED ON STATE MAINTAINED HIGHWAYS MAY HAVE A MAILBOX OR NDCBU SLOT ON TXDOT RIGHT OF WAY.

*NDCBU MAY BE INSTALLED ON COUNTY ROAD ROW WITH APPROVAL OF COUNTY.

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

SHEET 1 OF 2

Texas Department of Transportation

Maintenance Division Standard

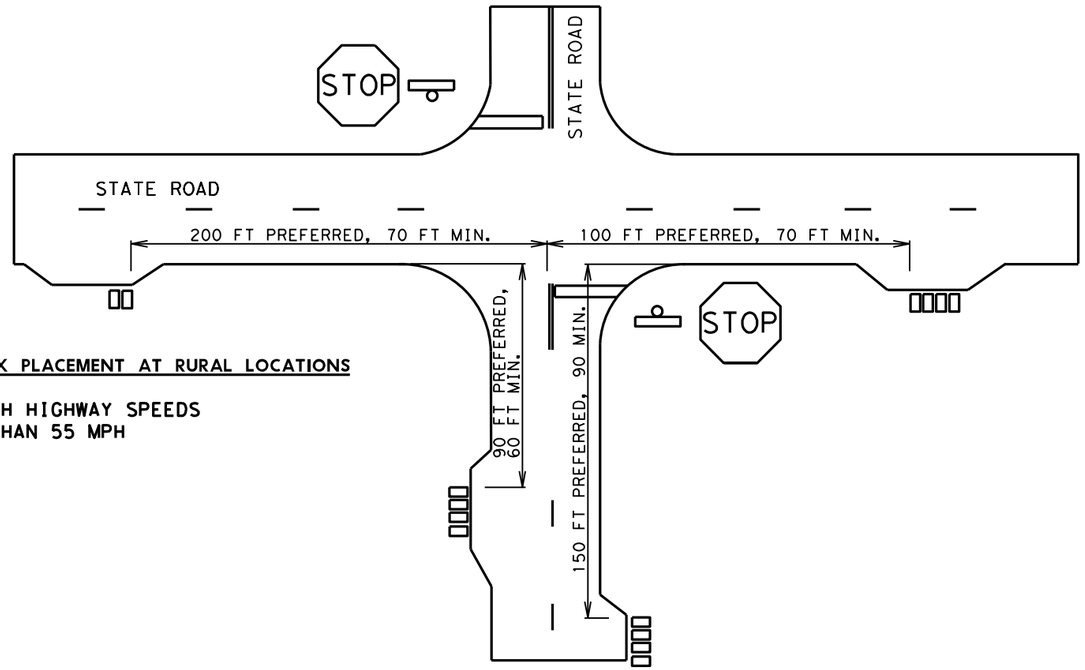
Guideline

MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

MBP(1)-22

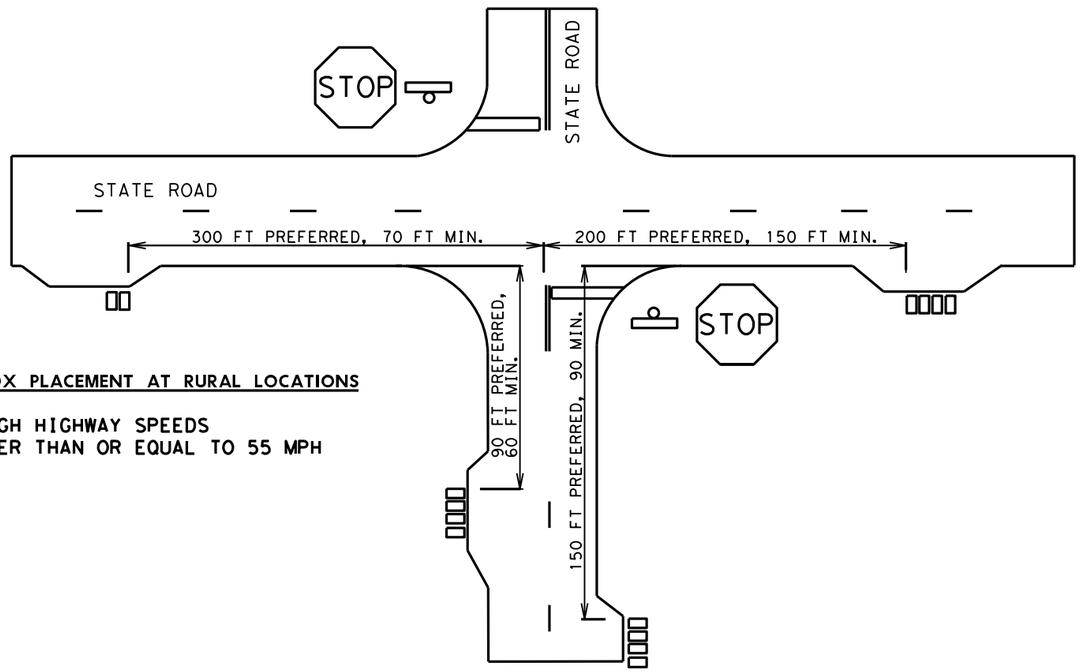
FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 12/2012 5/2014	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		106

DATE: 2/1/2024 5:59:13 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2\MBP(1)-22 (1).dgn



MAILBOX PLACEMENT AT RURAL LOCATIONS

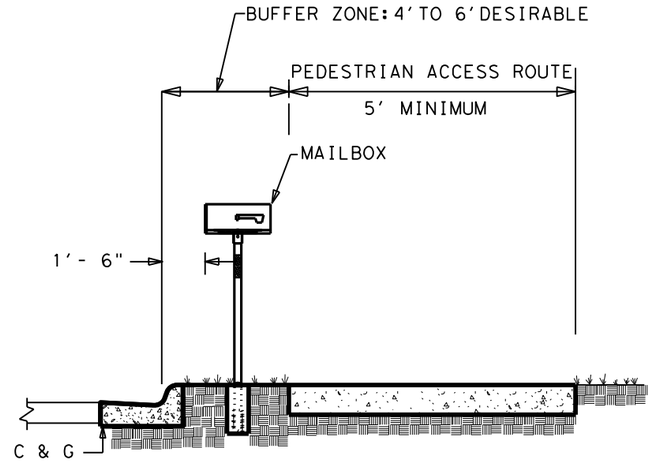
THROUGH HIGHWAY SPEEDS
LESS THAN 55 MPH



MAILBOX PLACEMENT AT RURAL LOCATIONS

THROUGH HIGHWAY SPEEDS
GREATER THAN OR EQUAL TO 55 MPH

CURB AND GUTTER MAILBOX INSTALLATION



NOTES:

1. A NON-TRAVERSABLE SURFACE MUST BE INSTALLED NEAR THE MAILBOX (NATURAL VEGETATION OR OTHER) IN THE BUFFER ZONE. ALTERNATIVELY, A BASE WITH A MINIMUM HEIGHT OF 2.5 INCHES MAY BE INSTALLED SO THAT THE EDGE OF THE MAILBOX DOES NOT EXTEND OUT MORE THAN 4 INCHES HORIZONTALLY BEYOND THE BASE.

2. THE SIDEWALK WIDTH MAY BE REDUCED TO 4 FOOT FOR SHORT DISTANCES AROUND THE MAILBOX IF NEEDED.

3. MAINTAIN A MINIMUM OF 5 FEET BETWEEN OBSTRUCTIONS IN THE PEDESTRIAN ACCESS ROUTE.

Texas Department of Transportation | Maintenance Division Standard

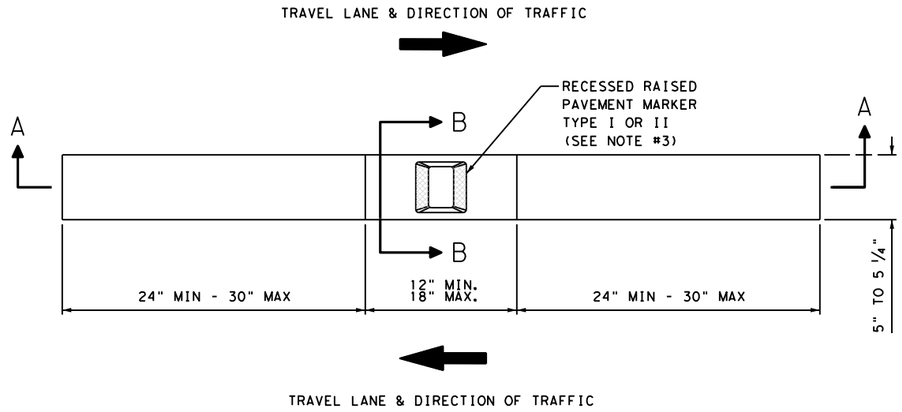
MAILBOX PLACEMENT CURBS & INTERSECTIONS

MBP(2)-22

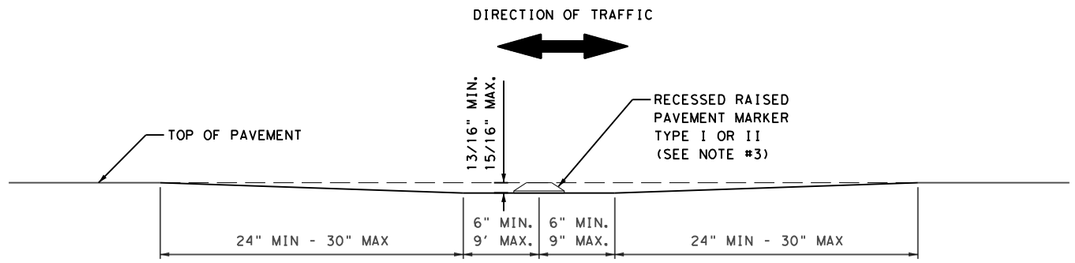
FILE: MBP-22.DGN	DN: VS	CK:	DW: VS	CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 12/2012 5/2014	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		107

DATE: 2/1/2024 5:59:14 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21MBP-22 (1).dgn

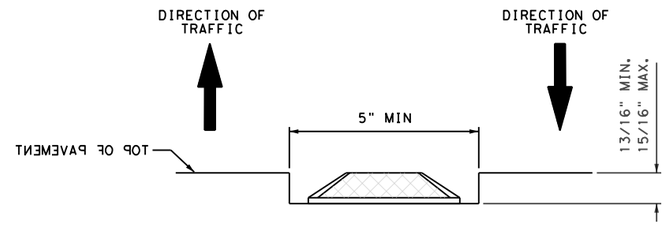
RECESSED RAISED PAVEMENT MARKER DETAIL FOR TWO LANE TWO-WAY HIGHWAY OR MULTILANE UNDIVIDED HIGHWAY



PLAN VIEW



SECTION A-A



SECTION B-B

LEGEND

BI-DIRECTIONAL RAISED PAVEMENT MARKER TYPE II (SEE NOTE #3).

MONO-DIRECTIONAL RAISED PAVEMENT MARKER TYPE I.

NOTES

1. DEPTH AND WIDTH OF GROOVE MAY BE ADJUSTED SLIGHTLY TO FIT PHYSICAL DIMENSIONS OF MARKER SELECTED IF APPROVED IN ADVANCE BY THE ENGINEER.
2. ALL PAVEMENT MARKING MATERIALS WILL MEET THE REQUIRED DEPARTMENTAL MATERIAL SPECIAL SPECIFICATIONS FOR 6362.
3. SEE ELSEWHERE IN PLANS FOR SPECIFIED TYPE AND REFLECTORIZED SURFACE LIGHT COLOR.

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
4/24/2024
Salcido Ramos, P.E.

AMARILLO DISTRICT
RECESSED RAISED PAVEMENT MARKER DETAIL FOR TWO LANE TWO-WAY HIGHWAYS OR MULTILANE UNDIVIDED HIGHWAYS

SCALE: N.T.S.

2024 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
TXDOT	TXDOT	2635	02	038	SL 335
DRWN	CK	DIST	COUNTY		SHEET NO.
TXDOT	TXDOT	AMA	RANDALL		107A

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DISCLAIMER:
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Notes To Designer:
1. Do not alter Sheet Design or Font style, size or weight - match text attributes.
2. If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from its relative position.
3. All areas should be addressed thoroughly and verify the necessary pay items are set up to support actions needed.

Filed Out: 01/05/2024
Prepared by: Name/Section

I. STORMWATER POLLUTION PREVENTION PLAN-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Perrmit 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 adjacent MS 4 Operator(s) that receive discharges from this project. They need to be notified prior to construction activities.
(Note: Leave blank only if no adjacent MS 4 Operator(s) are affected.)

1.

2.

☐ No Action Required ☒ Required Action

Action Number:

Action 1: The project disturbs five or more acres of surface area: TxDOT must file a NOI and coordinate with TCEQ for CGP. The contractor is responsible for the PSL as defined in the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2004 Edition, Section 7.19.F, Page 55.) The total disturbed acreage is the combined acreage to be disturbed on the project and the contractors PSL. This includes, as required, posting a site notice and NOI for the PSL. Identify all MS4 Permit holders that may be impacted by the project.

Commitment 1: Comply with TPDES CGP. The project requires that a NOI and a Large Site Notice be posted. TxDOT must file an NOI with TCEQ and send a copy to any non-TxDOT MS4 operator that receives discharge from the project. Implement and maintain the SW3P. Refer to the SW3P Plan Sheet, BMPs, and Detail.

Action 2: TxDOT must file a NOT for the project when final stabilization has been achieved.

Commitment 2: The contractor must stabilize the project site as stated in the SW3P.

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. No equipment is allowed in any sream channel below the ordinary High Water Mark except on approved temporary stream crossings or drill pads.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required
☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List Waters of the US Permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

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 for applicable 401 General Conditions:
(Note: If CORP Permit not required, do not check boxes.)

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 Number:

1. If 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.

2.

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 Number:

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 would be in accordance with Item 164, Seeding for Erosion Control in TxDOT's Standard Specifications for the construction of Highways, Streets, and Bridges.

2.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS TREATY ACT.

☐ No Action Required ☒ Required Action

Action Number:

1. If any species on the Potter County Threatened & Endangered List is sighted in the project area during construction, stop construction and notify the Area Engineer.
2. Swift Fox: 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. Woodhouse's Toad, Texas Horned Lizard, Western Box Turtle, Western Hognose Snake, Western Mossosougo, Prairie Rattlesnake: 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.
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 port or in whole, without a Federal permit issued in accordance within the Act's policies and regulations. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young would be avoided.

   If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If coves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corp 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 appropiate for any hazardous materials used.

Obtain and keep on-site Safety Data Sheets (SDS) 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, canisters, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation(s) or replacement(s) (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notifiy DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action Number:

1.

2.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action Number:

1. Avoid direct impacts to playa lakes adjacent to the right-of-way during construction. Ensure sediment and erosion controls near the playa lakes to prevent additional sedimentation into these water features.

2.

GENERAL NOTE:

Any change orders and/or deviations from the final design must be reported to the Engineer prior to commencement of construction activities, as additional environmental clearance may be required.

LAST REVISION: 1/15/15

 Texas Department of Transportation
Amarillo District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	(SEE TITLE SHEET)		SL 335
STATE	DISTRICT	COUNTY	
TEXAS	AMARILLO	RANDALL	
CONTROL	SECTION	JOB	SHEET NO.
2635	02	038	108

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
2635-02-038

1.2 PROJECT LIMITS:
From: Eastern Street

To: Farmers Avenue

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 35.120781 ,(Long) -101.781236

END: (Lat) 35.139717 ,(Long) -101.742789

1.4 TOTAL PROJECT AREA (Acres): 68.55

1.5 TOTAL AREA TO BE DISTURBED (Acres): 12.68

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Widening, overlay, and addition of safety lighting.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Estacado clay loam, 0 to 1 percent slopes	Well-drained. Negligible runoff
Lofton clay loam, 0 to 1 percent slopes, occasionally ponded	Moderately well-drained. Negligible runoff.
Pullman clay loam, 0 to 1 percent slopes	Well-drained. Medium amount of runoff
Pullman clay loam, 1 to 3 percent slopes	Well-drained. High amount of runoff
Pantex silty clay loam, 0 to 1 percent slopes	Well-drained. Medium amount of runoff

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☒ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☒ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☒ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☐ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☒ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Playa Lake 40, Unnamed Stream, Lake Tanglewood	*Upper Prairie Dog Town Fork Red River (0229); Impaired for pH and depressed DO in water
Playa Lake 39, Playa Lake 38, Unnamed Stream, Thomas Draw	*Upper Prairie Dog Town Fork Red River (0229); Impaired for pH and depressed DO in water

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STATE OF TEXAS
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
2/1/2024
Salcido Jr., P.E.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		109
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	RANDALL	
CONT.	SECT.	JOB	HIGHWAY NO.
2635	02	038	TEXAS

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☒ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

TBD - WAITING TO SEE IF DISTURBED AREA IS MORE THAN 10 AC. PER OUTFALL AREA AT ONE TIME

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
N/A		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☒ Loaded haul trucks to be covered with tarpaulin
- ☒ Stabilized construction exit
- ☒ Daily street sweeping
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☐ Dust Control
- ☒ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To
N/A		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STATE OF TEXAS
ERNESTO SALCIDO
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PROFESSIONAL ENGINEER
5/23/2024
Salcido Ramos, P.E.

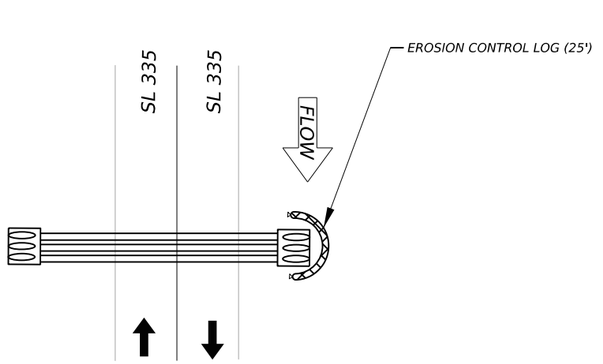
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

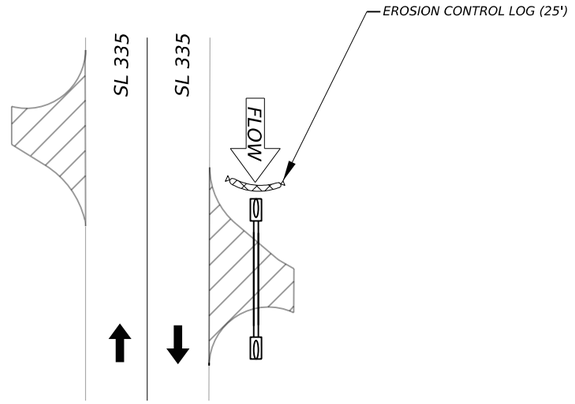
July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		110
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	RANDALL	
CONT.	SECT.	JOB	HIGHWAY NO.
2635	02	038	TEXAS

BMP'S RECORD LOG			
STATION	BMP	INSTALL DATE	REMOVAL DATE
396+40.52 WB	1		
397+07.73 EB	2		
404+09.37 WB	3		
405+47.35 WB	4		
410+19.16 WB	5		
415+96.97 WB	6		
418+24.81 WB	7		
420+71.16 WB	8		
425+48.98 WB	9		
437+64.35 WB	10		
443+63.62 WB	11		
446+41.83 EB	12		
447+03.66 WB	13		
452+36.82 WB	14		
463+67.62 EB	15		
473+15.04 WB	16		
496+85.84 WB	17		
498+21.54 EB	18		
512+41.86 WB	19		
512+71.60 EB	20		



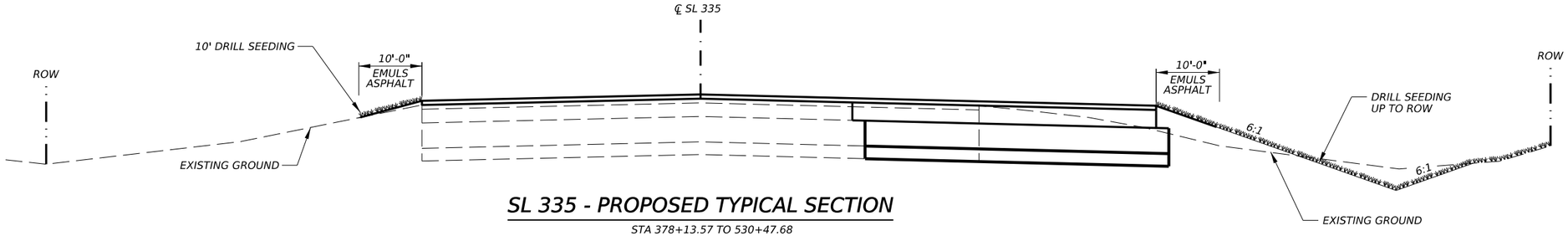


LEGEND

EROSION CONTROL LOG
25' EACH

TYPICAL EROSION CONTROL LOG LAYOUT

APPLIES ONLY TO CULVERT ENDS WHERE WORK IS BEING PERFORMED
AND ARE TO BE INSTALLED UPSTREAM



SL 335 - PROPOSED TYPICAL SECTION

STA 378+13.57 TO 530+47.68

STATE OF TEXAS
ERNESTO SALCIDO
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PROFESSIONAL ENGINEER
2/1/2024
Salcido Pavia, P.E.

AECOM
13355 Noel Road, Suite 400
Dallas, Texas 72540
(214) 741-7777
AECOM Technical Services, Inc.- F-3580

Texas Department of Transportation

SL 335

EROSION CONTROL LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2635	02	038	SL 335
DIST	COUNTY		SHEET NO.
AMA	RANDALL		111

DATE: 2/1/2024 6:00:26 PM
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening Overlay Illumination/900-CAD GIS/910_CAD/12_ENVIRONMENTAL/Sheets/SL335_AEC_SW3P_ENV01.dgn

ck | dw | ck

DATE: 2/1/2024
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21DP5017_WAI-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/12_ENVIRONMENTAL/Sheets/AMARILLO DIST

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
ERNESTO SALCIDO
100177
LICENSED
PROFESSIONAL ENGINEER
2/1/2024
Ernesto Salcido, P.E.

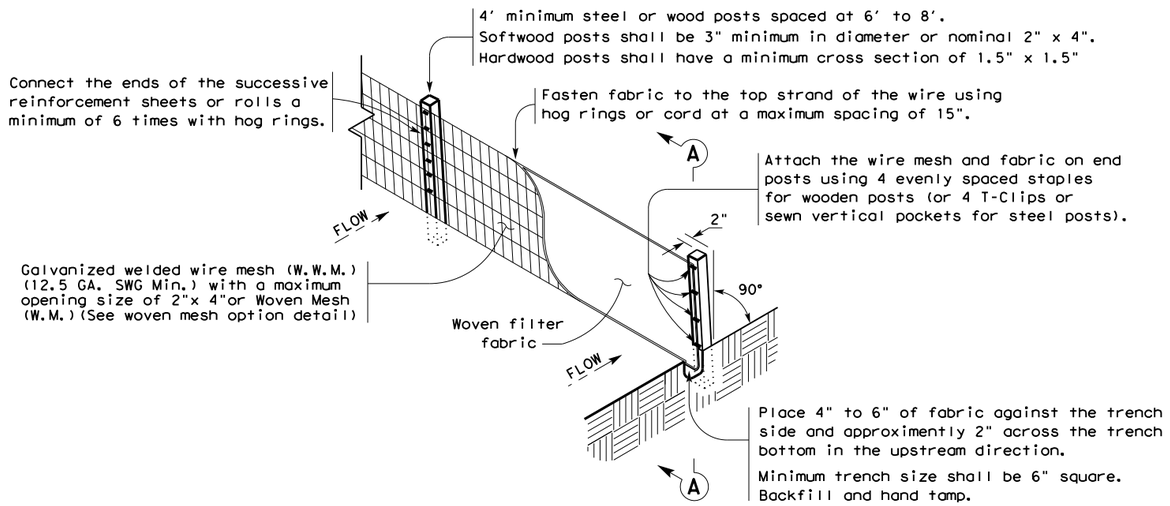
Texas Department of Transportation

AMARILLO DISTRICT STANDARD

VEGETATION SPECIFICATION SHEET

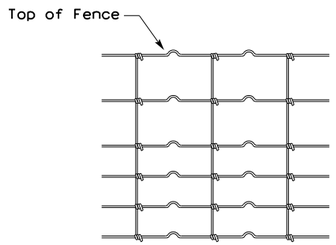
FEDERAL AID PROJECT	DN: ADD	CK: ADD	DW: ADD	CK: ADD
SEE TITLE SHEET	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
03/27/20	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		112

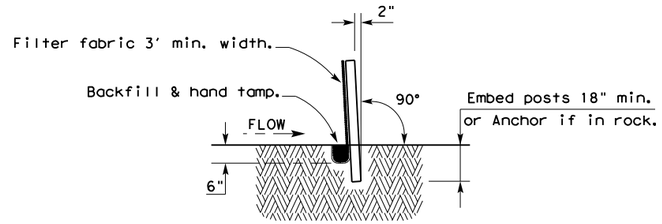
2/1/2024
pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21DP5017_WAI-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/16_STANDARDS/ENVIRONMENTAL/EC(1)-16.dgn



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

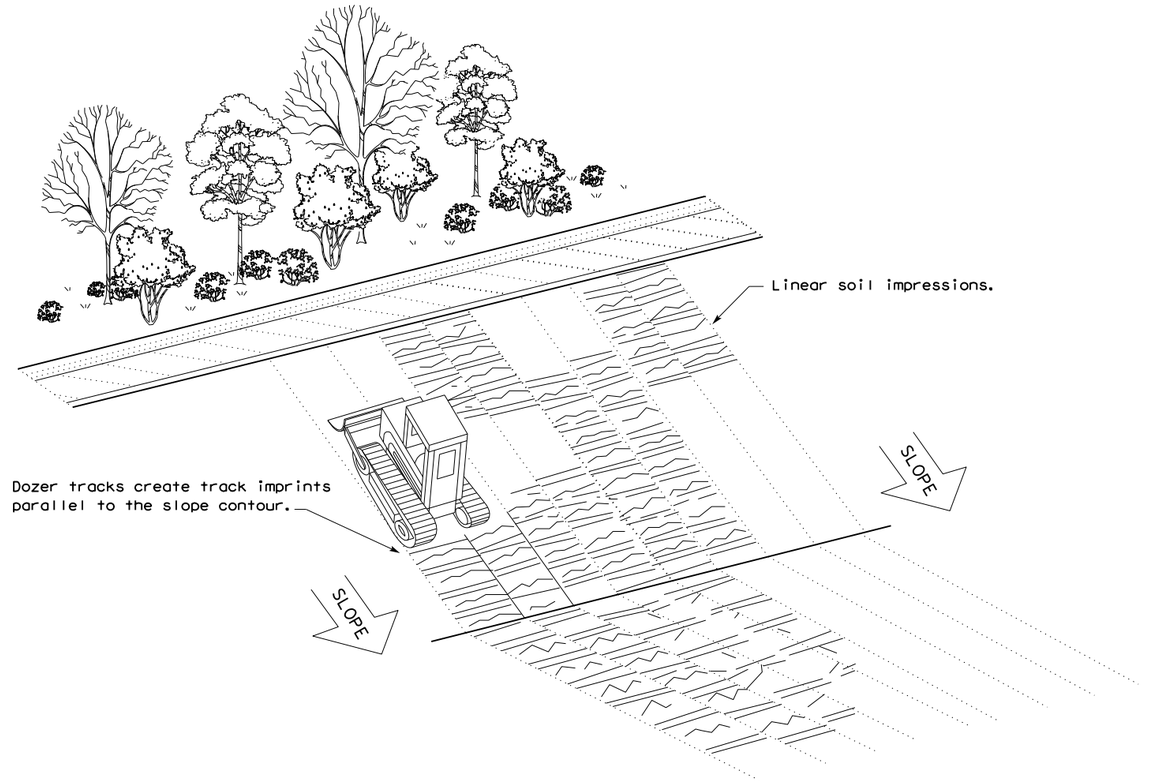
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

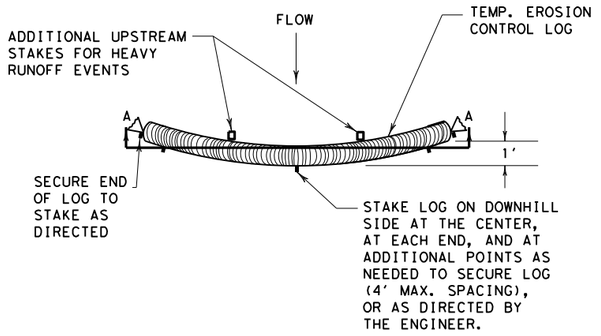
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

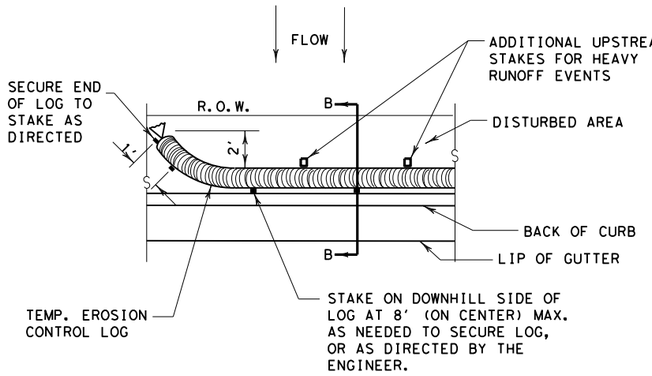
EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		113

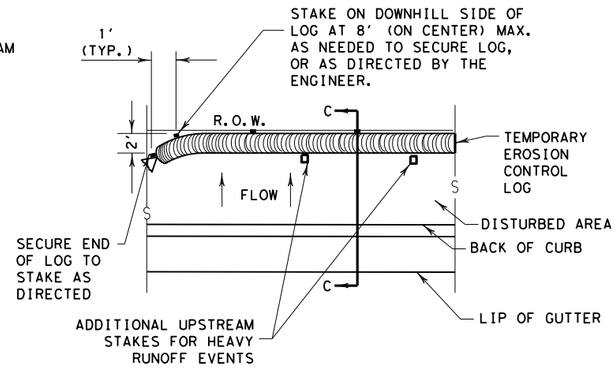
DATE: 2/1/2024
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21DP5017_WA1-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/16_STANDARDS/ENVIRONMENTAL/EC(9)-16.dgn



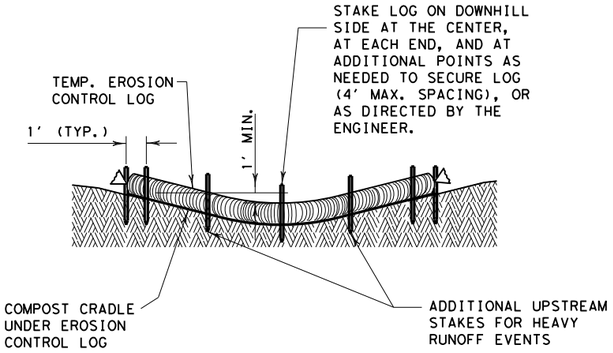
PLAN VIEW



PLAN VIEW



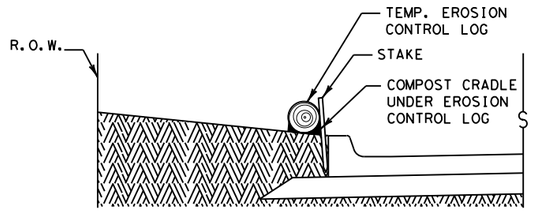
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

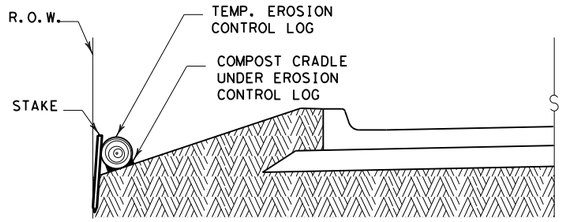
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

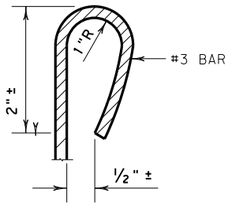
CL-BOC



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.

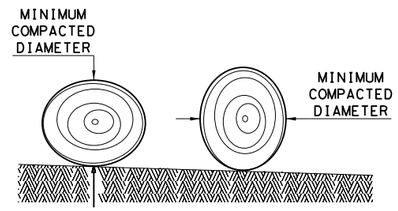
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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

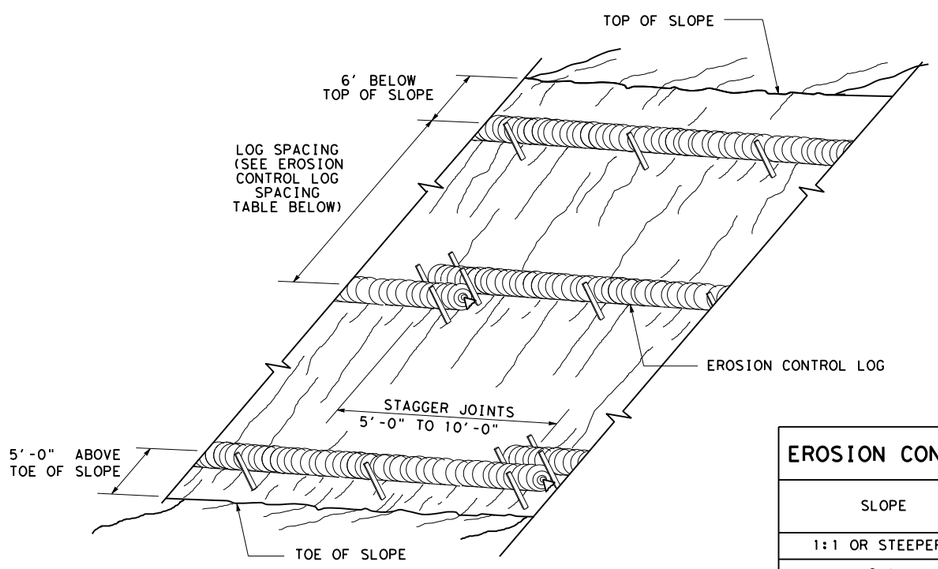
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

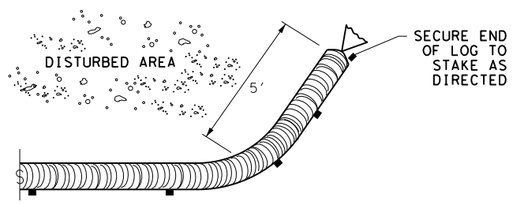
FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2635	02	038		SL 335		
	DIST		COUNTY				SHEET NO.
	AMA		RANDALL				114

DATE: 2/1/2024
FILE: pw://aecom-nc-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-21DP5017_WA1-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/16_STANDARDS/ENVIRONMENTAL/EC(9)-16.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

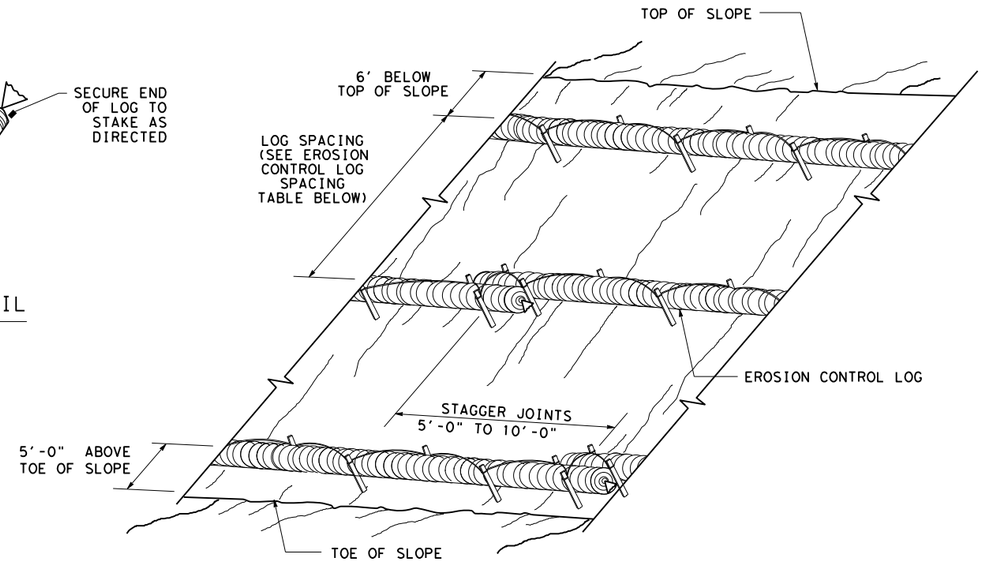
CL-SST



END SECTION RAP DETAIL

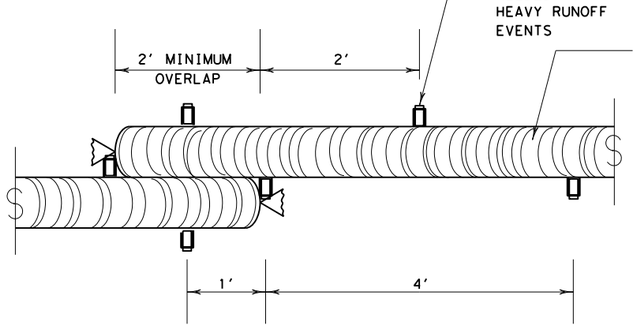
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

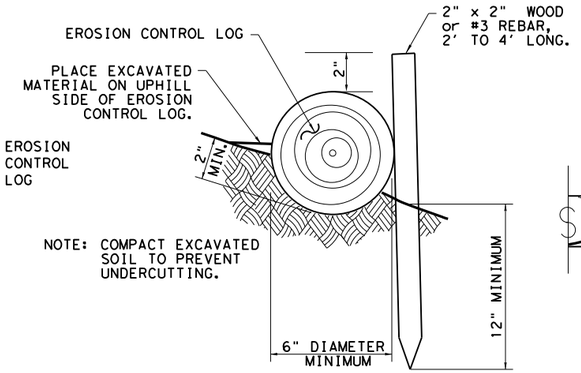
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

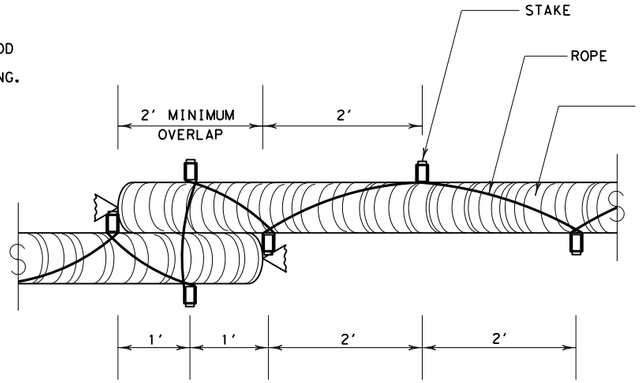


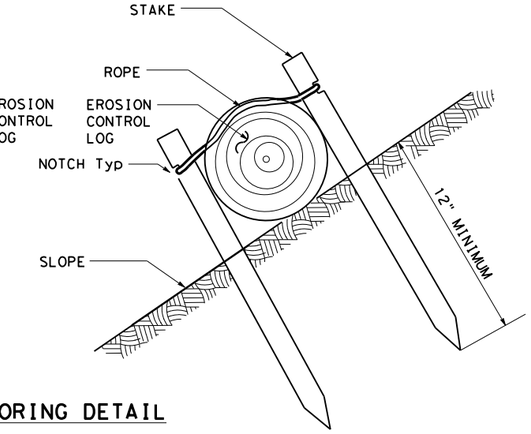


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

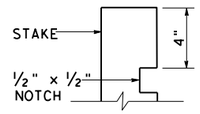
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

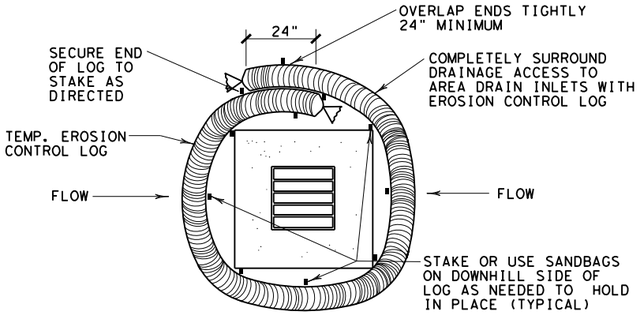
SHEET 2 OF 3

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

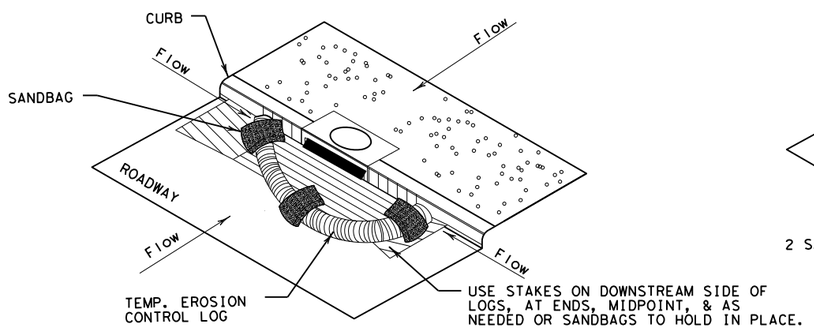
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2635	02	038	SL 335
	DIST	COUNTY		SHEET NO.
	AMA	RANDALL		115

DATE: 2/1/2024
FILE: pw://aecom-na-pw.bentley.com:AECOM_USA_Texas/Documents/60713043-36-2IDP5017_WA1-SL 335 Widening_Overlay_Illumination/900-CAD GIS/910_CAD/16_STANDARDS/ENVIRONMENTAL/EC(9)-16.dgn



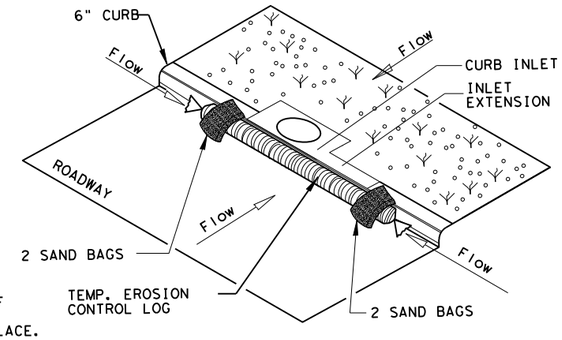
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

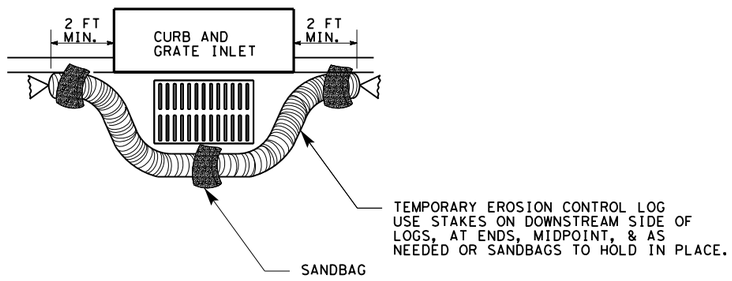
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

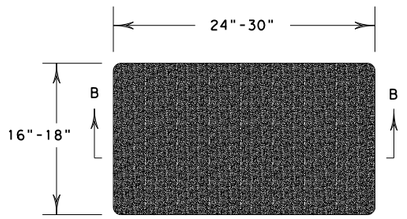
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

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	2635	02	038		SL 335	
	DIST	COUNTY				SHEET NO.
	AMA	RANDALL				116