FED.RD. DIV.NO.	FEDERAL PROJECT NO.		SHEET NO.
6	F 2021(650)		1
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	POTTER	
CONT.	SECT.	JOB	HIGHWAY NO.
2494	01	015	RM 2381

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL PROJECT: F 2021(650)
HIGHWAY - RM 2381
POTTER COUNTY

CONTROL: 2494-01-015

FOR THE CONSTRUCTION OF (SAFETY IMPROVEMENT PROJECTS).
CONSISTING OF (REALIGN INTERSECTION; INSTALL SAFETY ILLUMINATION).

PROJECT LIMITS: RM 1061 INTERSECTION
ROADWAY LENGTH = 2,514 FT. = 0.476 MILES
BRIDGE LENGTH = 0 FT. = 0.000 MILES
TOTAL LENGTH = 2,514 FT. = 0.476 MILES

DESIGN SPEED = 40
2021 ADT = 3,000
2041 ADT = 4,200
MAJOR COLLECTOR

FINAL PLANS

LETTING DATE: _____

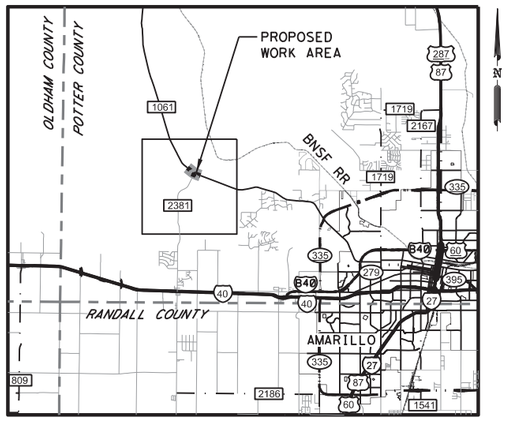
DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

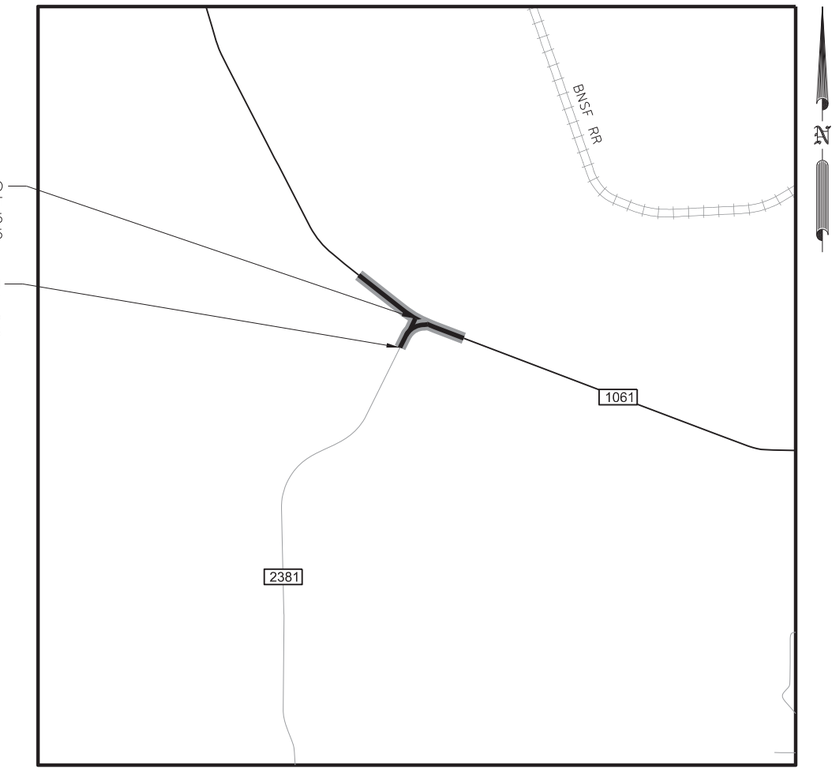
FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

INDEX OF SHEETS



VICINITY MAP



EXCEPTIONS:
NONE

RAILROADS:
NONE

EQUATIONS:
RM 1061: STA. 543+63 BK = 100+00 AH

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, MAY 2012).

2021 Texas Department of Transportation

RECOMMENDED FOR LETTING:
DocuSigned by: Roy C. Nelkam 1D152781DAD9462...
DATE: 3/29/2021

DocuSigned by: Kit Black 9B5A6EA6AE8B46E...
DATE: 3/30/2021
...R OF TRANSPORTATION
...ELOPMENT

APPROVED FOR LETTING:
DocuSigned by: Blair Johnson 8B80E3AEB2BC43A...
DATE: 3/31/2021

INDEX OF SHEETS

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

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms

03/31/2021

INDEX OF SHEETS

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		2

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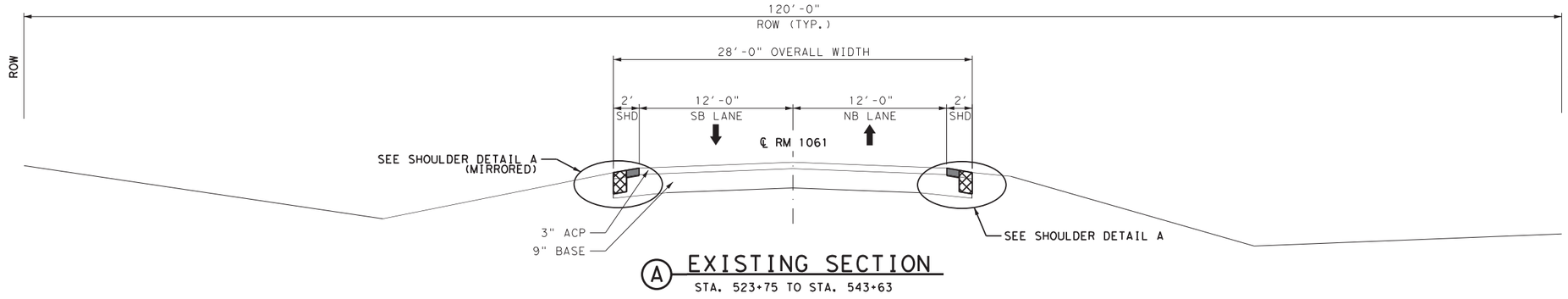
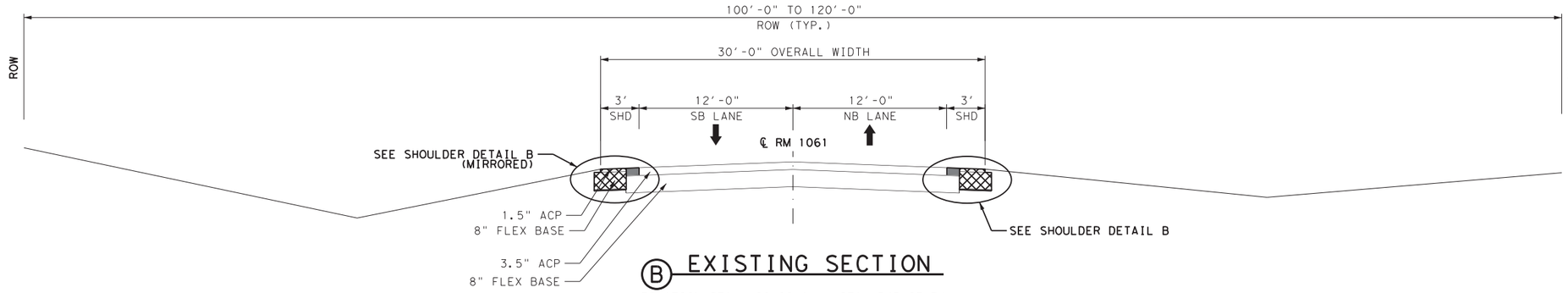


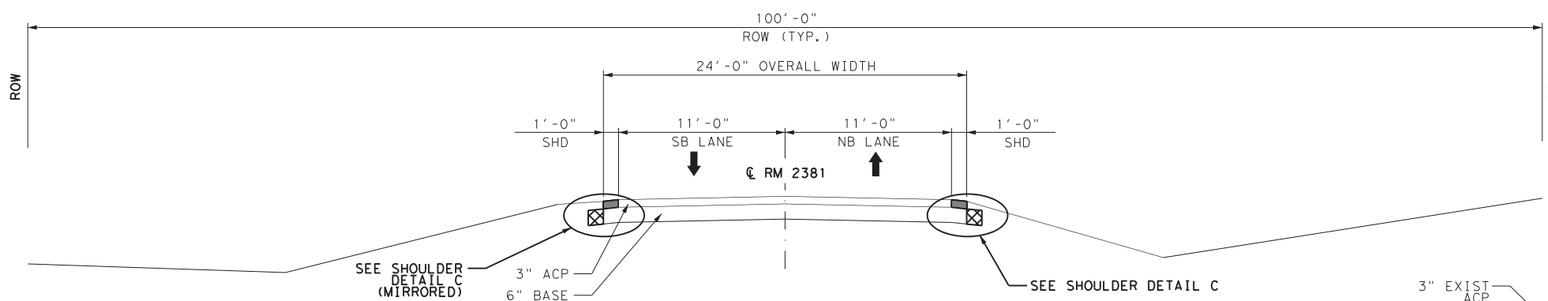
(A) EXISTING SECTION

STA. 523+75 TO STA. 543+63



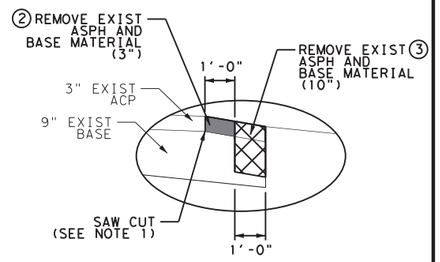
(B) EXISTING SECTION

EQUATION STA. 100+00 AH = STA. 543+63 BK
STA. 100+00 TO STA. 104+76
STA. 104+76 TO STA. 116+21 (REMOVAL ON RT ONLY)



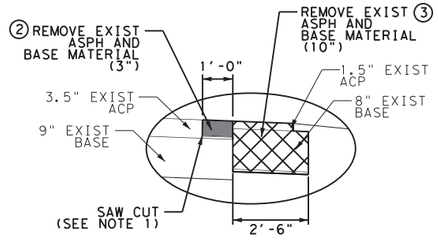
(C) EXISTING SECTION

STA. 6+53 TO STA. 8+55



SHOULDER DETAIL A

SCALE H: 1"=5'
V: 1"=2.5'



SHOULDER DETAIL B

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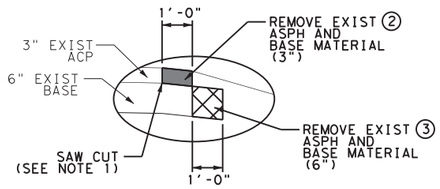
V: 1"=2.5'



SHOULDER DETAIL C

SCALE H: 1"=5'
V: 1"=2.5'

NOTES:

1. SAW CUT AS APPROVED BY THE ENGINEER.
2. EXIST ASPH AND BASE (3") TO BE REMOVED AFTER PROPOSED FLEX BASE PASSES INSPECTON.
3. REMAINING BASE AND SUBGRADE MATERIAL TO BE REMOVED PAID FOR BY ITEM 110.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TYPICAL SECTIONS

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

2021 Texas Department of Transportation

SHEET 1 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		3

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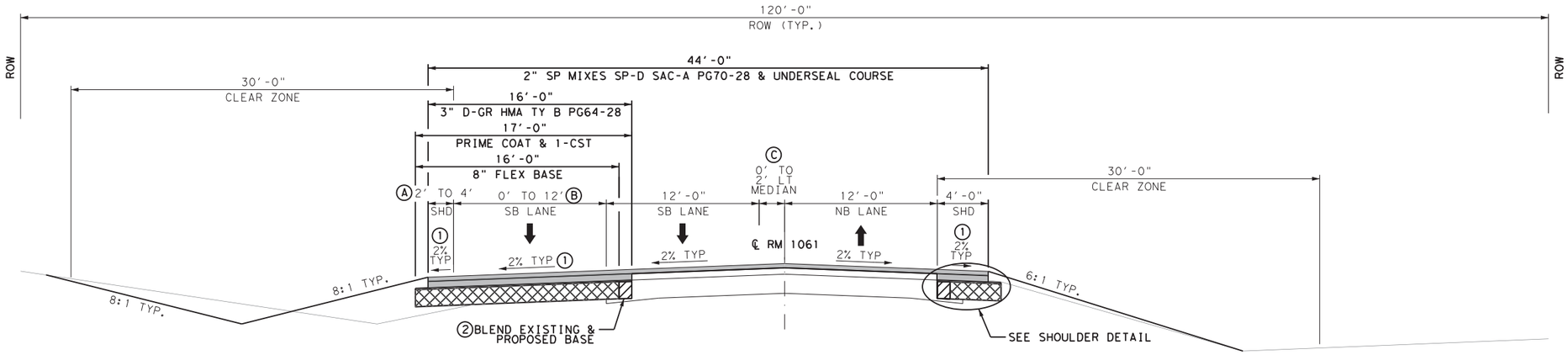
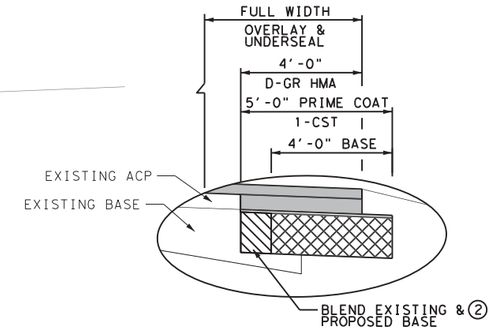


A1 PROPOSED SECTION

STA. 523+75 TO STA. 526+40 LT TRANS 32' TO 44' (38' AVG)
STA. 526+40 TO STA. 527+35

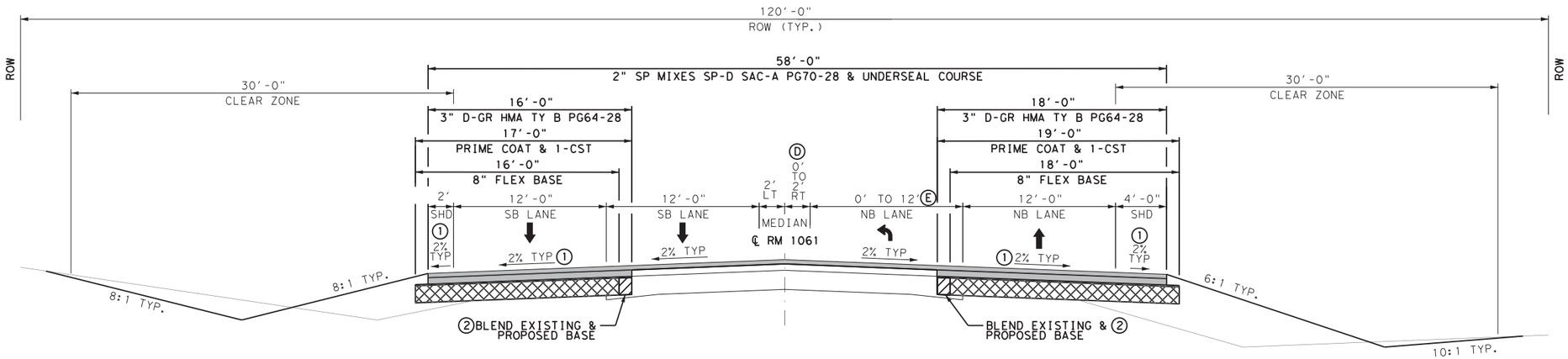
TRANSITION NOTES:

Ⓐ LT SHLD TRANS STA. 523+75 (4') TO STA. 526+40 (2')
Ⓑ SB LANE TRANS STA. 523+75 (0') TO STA. 526+40 (12')
Ⓒ MEDIAN TRANS STA. 523+75 (0') LT TO STA. 526+40 (2') LT



SHOULDER DETAIL

SCALE H: 1"=5'
V: 1"=2.5'



A2 PROPOSED SECTION

STA. 527+35 TO STA. 531+85 RT TRANS 44' TO 58' (51' AVG)
STA. 531+85 TO STA. 538+40

TRANSITION NOTES:

Ⓓ MEDIAN TRANS STA. 527+35 (0') RT TO STA. 531+85 (2') RT
Ⓔ NB LANE TRANS STA. 527+35 (0') TO STA. 531+85 (12')

NOTES:

① MATCH EXISTING PAVEMENT CROSS SLOPE FOR SHOULDER AND LANE WIDENING.
② SUBSIDIARY TO ITEM 247

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms

03/31/2021

TYPICAL SECTIONS

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

2021 Texas Department of Transportation

SHEET 2 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		4

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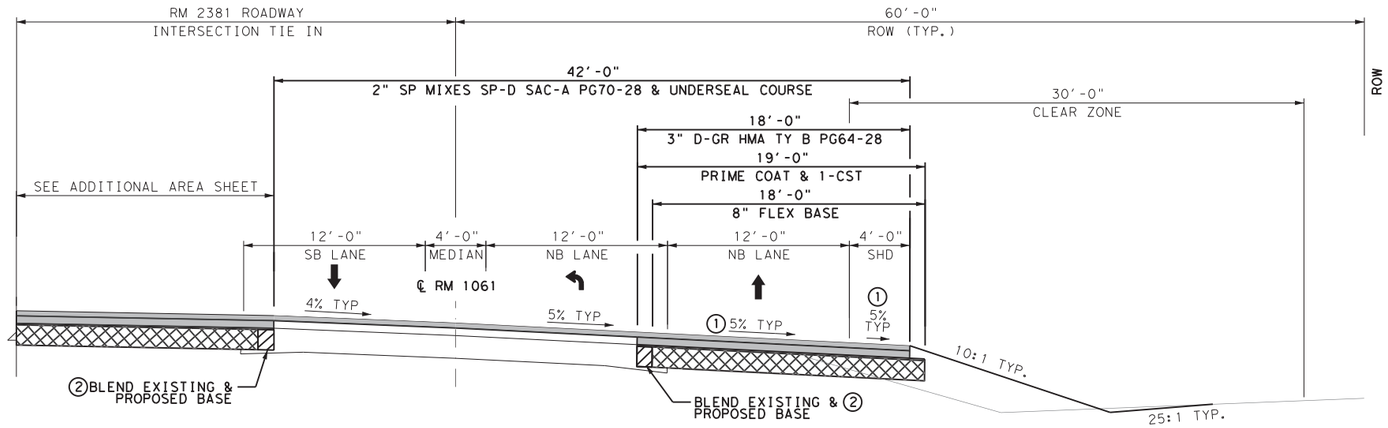
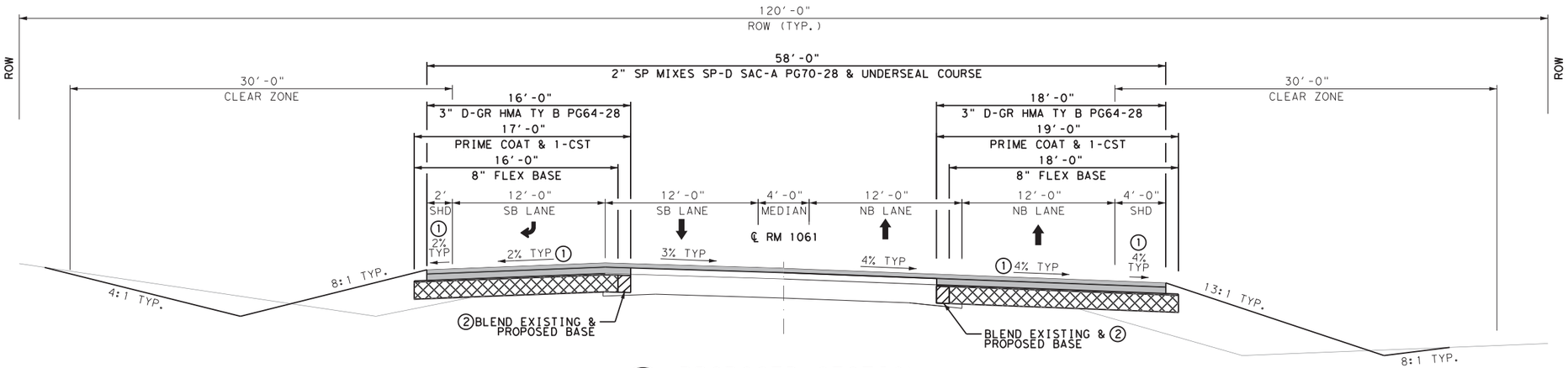


A3 PROPOSED SECTION

STA. 538+40 TO STA. 541+65



A4 PROPOSED SECTION

STA. 541+65 TO STA. 543+63

NOTES:

① MATCH EXISTING PAVEMENT CROSS SLOPE FOR SHOULDER AND LANE WIDENING.

② SUBSIDIARY TO ITEM 247

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TYPICAL SECTIONS

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

2021 Texas Department of Transportation

SHEET 3 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		5

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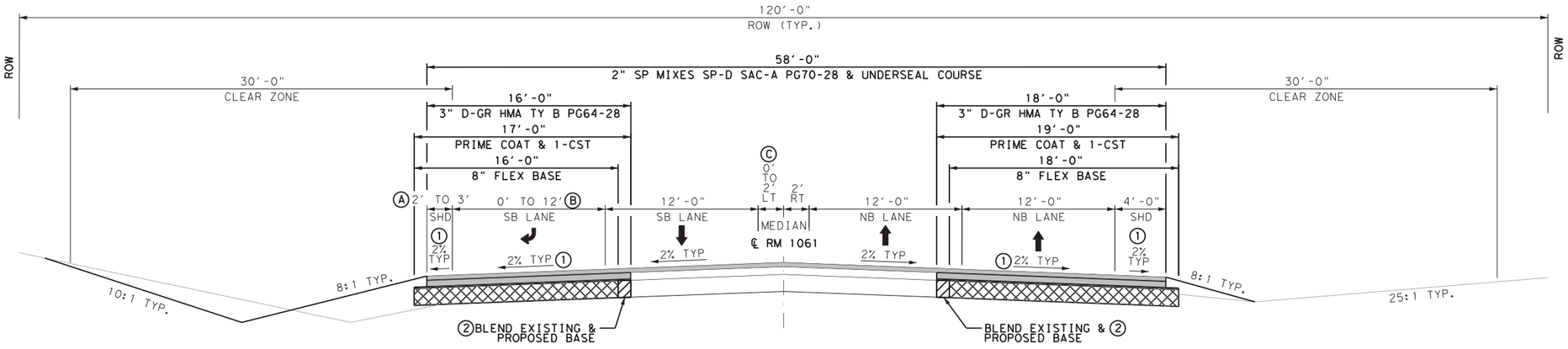
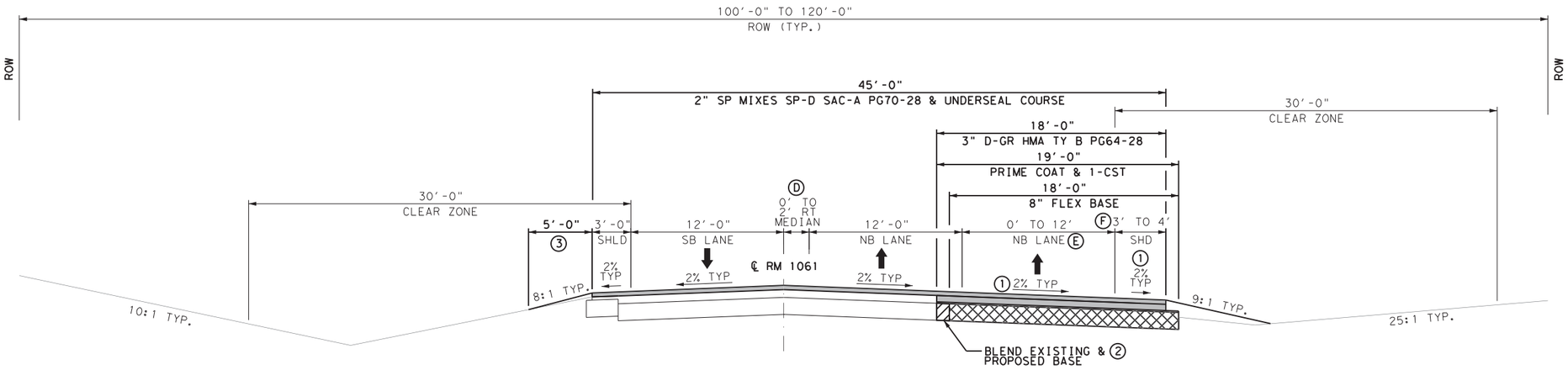


B1 PROPOSED SECTION

EQUATION: STA. 543+63 BK = STA. 100+00 AH
STA. 100+00 TO STA. 103+76
STA. 103+76 TO STA. 104+76 LT TRANS 58′ TO 45′ (51.5′ AVG)

TRANSITION NOTES:

Ⓐ LT SHLD TRANS STA. 103+76 (2′) TO STA. 104+76 (3′)
Ⓑ SB LANE TRANS STA 103+76 (12′) TO STA. 104+76 (0′)
Ⓒ MEDIAN TRANS STA. 103+76 (2′) LT TO STA. 104+76 (0′) LT



B2 PROPOSED SECTION

STA. 104+76 TO STA. 107+81 RT TRANS 45′ TO 43′ (44′ AVG)
STA. 107+81 TO STA. 116+21 RT TRANS 43′ TO 30′ (36.5′ AVG)

TRANSITION NOTES:

Ⓓ MEDIAN TRANS STA. 104+76 (2′) RT TO STA. 107+81 (0′) RT
Ⓔ NB LANE TRANS STA. 107+81 (12′) TO STA. 116+21 (0′)
Ⓕ RT SHLD TRANS STA. 107+81 (4′) TO STA. 116+21 (3′)

NOTES:

① MATCH EXISTING PAVEMENT CROSS SLOPE FOR SHOULDER AND LANE WIDENING.
② SUBSIDIARY TO ITEM 247
③ PREP ROW AND TYPE A BACKFILL

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER
03/31/2021

TYPICAL SECTIONS

SCALE H: 1" = 10′
V: 1" = 5′

2021 Texas Department of Transportation

SHEET 4 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		6

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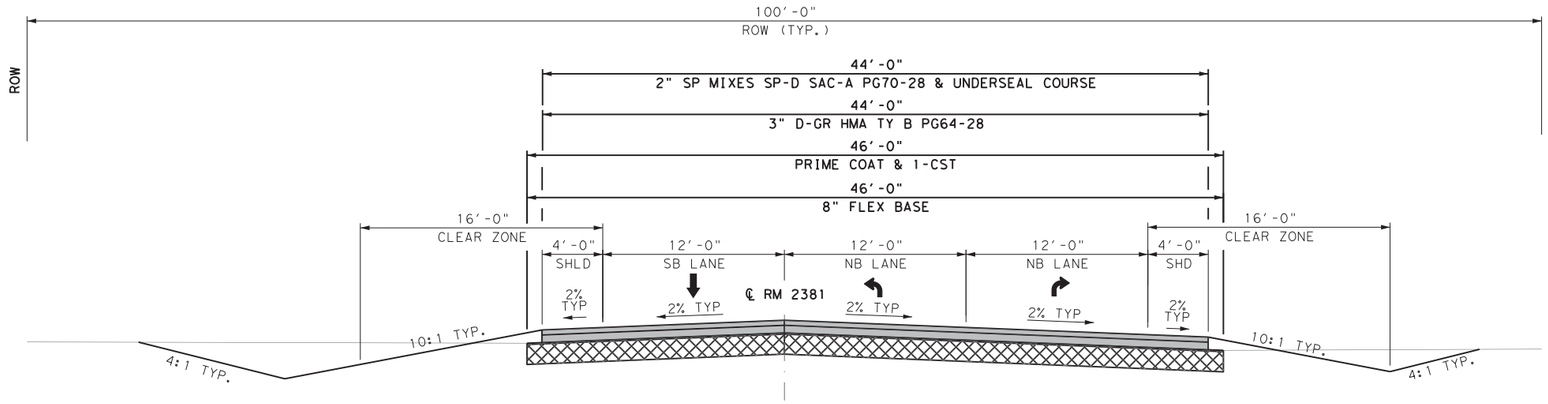
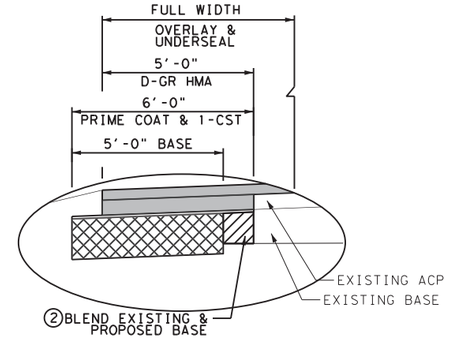


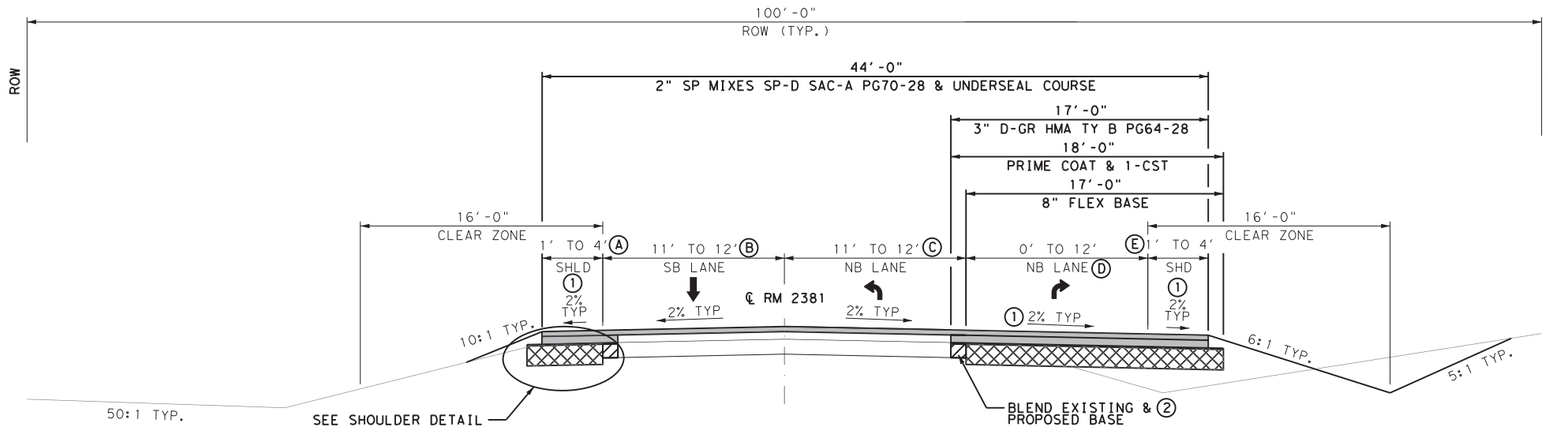
C1 PROPOSED SECTION

(SEE ADDIITONAL AREAS STA. 0+12 TO STA. 1+83)
STA. 1+83 TO STA. 6+53



SHOULDER DETAIL

SCALE H: 1"=5'
V: 1"=2.5'



C2 PROPOSED SECTION

STA. 6+53 TO STA. 7+55
STA. 7+55 TO STA. 8+55 LT AND RT TRANS 44' TO 24' (34' AVG)

TRANSITION NOTES:

(A) LT SHLD TRANS STA. 7+55 (4') TO STA. 8+55 (1')
(B) SB LANE TRANS STA. 7+55 (12') TO STA. 8+55 (11')
(C) NB LANE TRANS STA. 7+55 (12') TO STA. 8+55 (11')
(D) NB LANE TRANS STA. 7+55 (12') TO STA. 8+55 (0')
(E) RT SHLD TRANS STA. 7+55 (4') TO STA. 8+55 (1')

NOTES:

(1) MATCH EXISTING PAVEMENT CROSS SLOPE FOR SHOULDER AND LANE WIDENING.
(2) SUBSIDIARY TO ITEM 247

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER
03/31/2021

TYPICAL SECTIONS

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

2021 Texas Department of Transportation

SHEET 5 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		7

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GENERAL NOTES

CSJ: *2494-01-015*

BASIS OF ESTIMATE FOR CONSTRUCTION

Item	Description	Unit	Rate	
164	SEEDING		SEE PLAN SHEETS	
310	PRIME COAT (MC-30)	GAL	0.25 GAL/SY	
314	EMULSION ASPHALT (MULTI) (MS-2 OR SS-1)	GAL	SEE NOTE 2	
316	ASPH (AC-5)	GAL	0.38 GAL/SY	
	AGGR (TY-B GR-4 SAC-B)	CY	110 SY/CY	
3076(1)	D-GR HMA	TON	3”	330 LB/SY/2000
3077	TACK COAT	GAL	0.13 GAL / SY	
3077(1)	SUPERPAVE MIXTURES	TON	2”	220 LB/SY/2000
3085	UNDERSEAL COARSE	GAL	SEE GENERAL NOTE FOR RATE INFORMATION	

NOTE:

(1)	*“D-GR HMA & SUPERPAVE MIXTURES”* Weight Based On 110Lbs/SY/In
(2)	40% Emulsified Asphalt 60% Water Mixture Applied At 0.25 Gal/Sy. Paid using 0.1 Gal/Sy.

General

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

TO:	Amarillo Area Engineer	Roy.Neukam@txdot.gov
CC:	Assistant Area Engineer	CC.Sysombath@txdot.gov
	Director of Construction	Kenneth.Petr@txdot.gov
	Construction Manager	Thomas.Nagel@txdot.gov

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

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

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

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

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

There is approximately *1* "reference marker" within the project limits. If a marker needs to be moved for any reason during construction operations, the Contractor is to remove it, install it in a temporary location and then reinstall it in its correct permanent location. Both the temporary and permanent locations are to be on a line that is perpendicular to the original "station" along the roadway. The temporary location is to be at or near the right-of-way. The permanent location is to be directed by the Engineer.

The following Standard Detail Sheets have been modified:

TSR(3)-13 (MOD)
TSR(4)-13 (MOD)

The Contractor is advised that 60 (RM 1061) and 55 (RM 2381) mph construction speed zones will be applicable for this project. The construction speed zone is to be limited to the actual work areas under construction.

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

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

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

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

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 7 Legal Relations and Responsibilities

No significant traffic generator events identified.

The total area disturbed for this project is approximately *8.25* acres. The disturbed area in this project, all project locations in the Contract, and the Contractor Project Specific Locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.

Item 8 Prosecution and Progress

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

Milestone A – Construct RM 2381 at RM 1061 Intersection CSJ: 2494-01-015

Milestone A to construct RM 2381 is designated to facilitate construction as fast as possible.

The time allowed for the roadway construction is 28 working days in accordance with Article 8.3.1.2. Six-Day Workweek.

Milestone A time charges will start when RM 2381 is fully closed to traffic. Fully closed is defined as, when traffic is shifted to the detours defined in the plans, for more than a 2-hour duration.

Milestone A time charges will end when the following requirement are met:

1. Both lanes of traffic are open on RM 2381 with all pavement complete to the exception of the final overlay
2. Detour not used for any portion of roadway closure

If Milestone A is complete earlier than the stated number of working days, a bonus of $2,500 per day will be awarded; up to a maximum of 18 bonus days. If the Milestone A is not completed within the stated number of days, contract administration and road user costs of $1,000 per day will be assessed for each day in excess of the stated number of allowable working days for the roadway until the milestone requirements are met. The working period charged during Milestone A will also be included in the computation of the total contract time charges for the overall project.

Item 100 Preparing Right Of Way

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

All tree removal activities are to take place outside nesting season. The nesting season is April 1st thru August 30th.

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

Item 105 Removing Treated and Untreated Base and Asphalt Pavement

The base and asphalt material removed is estimated at 1,666 CY for this project.

Ensure that 100% of reclaimed material passes a 2-in sieve.

Stockpile the material at: South-East quadrant intersection of US 60 & FM 1912.

The stockpile will be shaped as directed by the Engineer so that adequate measurement can be done. The excess material is not to be compacted by the equipment used in the stockpiling operation.

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.

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 247 Flexible Base

SPECIFICATION FOR FLEX BASE TY A OR B 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 material only.

Item 300 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
316	From May 1st through August 31st
316 (Underseal Application)	From April 15th through October 31st
351, 3076, 3077	From April 15th through October 31st

Item 314 Emulsified Asphalt Treatment

Place finished material adjacent to each shoulder treated with an emulsified asphalt mixture according to plans. 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 316 Seal Coat

Place one course surface treatment on finished base course as soon as practical, but no later than 7 calendar days after completion of the base treatment process.

For items of work that include both summer and winter materials or the Asphalt (Multi Option), the Engineer will determine which asphalt to apply based on timing and prevailing weather conditions. The Asphalt (Multi Option) is to consist of the following choices and rates:

ASPH (AC-5) @ 0.38 GAL/SY

The rates shown are for estimating purposes and that the Engineer can dictate higher or lower rates based on roadway conditions

Item 351 Flexible Pavement Structure Repair

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

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

Item 354 Planing and Texturing Pavement

The material planed from existing roadway is estimated at 51 CY for this project.

The Contractor will retain ownership of planed materials.

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.

Provide an intermediate toe wall when rip rap exceeds 25’ vertically.

Use of #3 rebar for reinforcing is required.

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)-16 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)-14 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 buildings will be required for this project:

One Type (D) structure, asphalt mix control laboratory

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

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

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

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

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

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

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

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

Item 506 Temporary Erosion, Sedimentation, and Environmental Controls

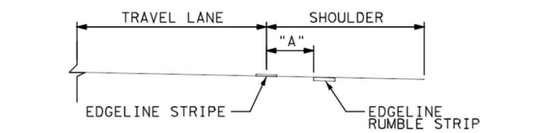
Erosion control devices are to be installed as needed in coordination with the work progress, or as directed by the Engineer.

Item 529 Concrete Curb, Gutter, and Combined Curb and Gutter

Expansion joints are to be at least one-half inch thick and spaced at maximum intervals of 40 feet. Planes of weakness are to be spaced at approximately ten feet intervals. Joint material will comply with ASTM-D 1751.

Item 533 Milled Rumble Stripes

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



EDGELINE RUMBLE STRIP DETAIL
NTS
(MIRROR FOR INSIDE SHOULDER)

Shoulder Width (SW)	Rumble Strip Width (RS)	Placement "A"	Standard Option RS(1)-13 or RS(4)-13
SW ≤ 2’	8" RS		Option 1
2’ < SW < 6’	8” - 16" RS	4" off edgeline*	Option 3
SW ≥ 6’	16" RS	24” off edgeline*	Option 4
*All inside shoulders on divided highways will be placed 4" off the edgeline			

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

Use IN-LANE standard option for installation of the transverse rumble strips, as shown on the Standard Sheet RS(5)-13.

Item 610 Roadway Illumination Assemblies

Furnish and install steel (not aluminum) roadway illumination poles. Fabricate roadway illumination assemblies in accordance with shop drawings approved by the department. Submit shop drawings for each project, or use pre-approved standard shop drawings.

For project specific shop drawings, furnish seven sets of drawings of the complete assembly in accordance with item 441, “steel structures”. Deliver shop drawings to the Engineer at the project address.

To be eligible to use pre-approved standard shop drawings, the shop drawing must be submitted and approved by the department prior to use on the project. Deviation from the pre-approved standard shop drawing will require resubmission of the shop drawings. The Engineer may approve, in writing, the use of updated standard drawings in cases where the standard drawings have been updated and the updated version has been approved by the department.

For pre-approval and updates to previously approved standard shop drawings, furnish seven sets of drawings of the complete assembly in accordance with item 441, “steel structures” to the director of traffic operations division, Texas Department of Transportation, 125 East 11th Street, Austin, Texas 78701-2483.

Copies of the standard shop drawings are on file with traffic operations division, bridge division, and the materials section of construction division. Additional shop drawings for roadway illumination assemblies built in accordance with these drawings are not required. Pre-approved shop drawing manufacturers and assembly model numbers can be found at http://www.dot.state.tx.us/business/materialproducerlist.htm. Category is roadway illumination and electrical supplies

The Roadway Illumination Pole (RIP-11) standard details were developed for

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

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

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

Item 618 Conduit

The locations of conduit as shown are for diagrammatic purposed only and may be varied to meet local conditions, subject to approval. Backfill all open trenches before the end of the workday and do not leave any trench open overnight.

Item 620 Electrical Conductors

Provide breakaway electrical connectors for breakaway poles. Use Bussman HEBW, Littlefuse LEB, Ferraz-Shawmut FEB, or equal on ungrounded conductors. For grounded conductors, use Bussman HET, Littlefuse LET, Ferraz-Shawmut FEBN, or equal. These breakaway connectors have a white colored marking and a permanently installed solid neutral. See the latest RID (2) standard for additional details.

Item 624 Ground Boxes

Do not place ground boxes in driveways or wheelchair ramps. Alternate ground box locations will be as directed.

Item 628 Electrical Services

Notify the utility company as soon as possible in order to minimize delay and coordinate the work necessary for the utility company to provide power.
Cost for utility-owned power line extensions, connection charges, meter charges, consumption charges, and other charges will be paid for by the Department. The Department will reimburse the Contractor the amount billed by the utility plus an additional 5% of the invoice cost will be paid for labor, equipment, administrative costs, superintendence, and profit. The contractor will consult with the appropriate utility company to determine costs and requirements and will coordinate the utility company's work as approved by the Engineer. The contractor will submit to the Engineer a utility company invoice indicating it has been paid in full by the contractor and the reimbursement will be paid for under Force Account work.

When requesting new electric service activation, set up monthly billing accounts for power as "Texas Department of Transportation (TxDOT)" unless otherwise shown on the plans or as directed by the Engineer.

Provide the Electric Utility providers name, meter number, location account number and location address to the Engineer after the utility company sets the meter and connects power. The Engineer will submit this information to the TxDOT district point of contact for electric billing accounts.

Item 644 Small Roadside Sign Supports and Assemblies

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

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

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

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

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

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

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

Install yellow sheeting on all other small sign posts.

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

Item 658 Delineator and Object Marker Assemblies

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

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

Item 662 Work Zone Pavement Markings

The adhesive used for temporary flexible-reflective roadway marker tabs is to be butyl rubber pads.

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

Hot Mix will be D-GR HMA TY-B PG64-28 or approved equal, by the engineer.

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%

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 3077 Superpave Mixtures

Use aggregate that meets the SAC requirement of class A.

Only fractionated RAP is allowed.

Use of RAS is not allowed.

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

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

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

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

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

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

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

Item 3085 Underseal Course

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

Item	Option	Material	Application Rate	Conversion Rate
316	Seal Coat	AGGR[4]	110 SY/CY	0.66[1]
		ASPH[5]	0.38 Gal/SY	
3002	Spray Applied Underseal Membrane	ASPH	0.25 Gal/SY	1.0[2]

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. Use GR4 TY B SAC B in accordance with Item 316
4. Use AC-10 or other equivalent as approved by the Engineer.

Item 6001 Portable Changeable Message Sign

Supply *4* Portable Changeable Message Signs (Type II – Lamp Matrix) for this project. This work will be paid at the unit price bid for each unit, which will include any moving, maintenance, and removing of the PCMS. No payment will be made for removing and replacing damaged PCMS. The Portable Changeable Message Signs will become property of the Contractor at the completion of the project.

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

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

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide 0 additional shadow vehicle(s) with TMA for TCP *(1-1)-18, (1-2)-18, (1-3)-18, (1-4)-18, (1-6)-18, (2-1)-18, (2-2)-18, (2-3)-18, (2-4)-18, (2-5)-18, (3-1)-13, (3-3)-14, (3-4)-13, (7-1)-13* as detailed on the General Notes of this standard sheets.

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

QUANTITY SHEET

CONTROLLING PROJECT ID 2494-01-015 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY RM 2381

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2494-01-015**			
		PROJECT ID		**A00137507**			
		COUNTY		**Potter**			
		HIGHWAY		**RM 2381**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6001	PREPARING ROW	AC	0.320		0.320	
	100-6008	PREPARING ROW (TREE) (0" TO 6" DIA)	EA	115.000		115.000	
	100-6009	PREPARING ROW (TREE) (6" TO 24" DIA)	EA	2.000		2.000	
	105-6005	REMOVING STAB BASE AND ASPH PAV (3")	SY	721.000		721.000	
	105-6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	45.000		45.000	
	105-6013	REMOVING STAB BASE & ASPH PAV (9")	SY	5,195.000		5,195.000	
	105-6044	REMOVING STAB BASE AND ASPH PAV (10")	SY	1,026.000		1,026.000	
	110-6001	EXCAVATION (ROADWAY)	CY	5,749.000		5,749.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	3,279.000		3,279.000	
	134-6001	BACKFILL (TY A)	STA	18.000		18.000	
	164-6036	DRILL SEEDING (PERM) (RURAL) (CLAY)	AC	8.360		8.360	
	164-6053	DRILL SEEDING (TEMP)(WARM OR COOL)	AC	8.700		8.700	
	247-6227	FL BS (CMP IN PLC)(TY A OR B GR 4)(8")	SY	13,808.000		13,808.000	
	310-6009	PRIME COAT (MC-30)	GAL	3,622.000		3,622.000	
	314-6009	EMULS ASPH (EROSN CONT)(MULTI)	GAL	984.000		984.000	
	316-6001	ASPH (MULTI OPTION)	GAL	5,503.000		5,503.000	
	316-6078	AGGR(TY-B GR-4 SAC-A)	CY	141.000		141.000	
	351-6012	FLEXIBLE PAVEMENT STRUCTURE REPAIR(2")	SY	2,025.000		2,025.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	1,801.000		1,801.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	184.000		184.000	
	432-6003	RIPRAP (CONC)(6 IN)	CY	61.000		61.000	
	462-6007	CONC BOX CULV (5 FT X 3 FT)	LF	30.000		30.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	66.000		66.000	
	467-6172	SET (TY I)(S= 5 FT)(HW= 3 FT)(4:1) (C)	EA	1.000		1.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	4.000		4.000	
	496-6004	REMOV STR (SET)	EA	1.000		1.000	
	496-6006	REMOV STR (HEADWALL)	EA	4.000		4.000	
	496-6007	REMOV STR (PIPE)	LF	26.000		26.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	10.000		10.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	75.000		75.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	75.000		75.000	
	529-6001	CONC CURB (TY I)	LF	374.000		374.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	9,455.000		9,455.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	2,265.000		2,265.000	
	610-6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	23.000		23.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	4,810.000		4,810.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 2494-01-015 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY RM 2381

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2494-01-015**			
		PROJECT ID		**A00137507**			
		COUNTY		**Potter**			
		HIGHWAY		**RM 2381**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	90.000		90.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	5,150.000		5,150.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	10,300.000		10,300.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	3.000		3.000	
	628-6047	ELC SRV TY A 240/480 060(NS)SS(E)TP(O)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	8.000		8.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	10.000		10.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	28.000		28.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	30.000		30.000	
	658-6080	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND	EA	15.000		15.000	
	658-6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	EA	12.000		12.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	7,574.000		7,574.000	
	662-6010	WK ZN PAV MRK NON-REMOV (W)8"(DOT)	LF	225.000		225.000	
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	LF	4,013.000		4,013.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	14.000		14.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA	7.000		7.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)	EA	7.000		7.000	
	662-6030	WK ZN PAV MRK NON-REMOV(W)18"(YLD TRI)	EA	10.000		10.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	14,298.000		14,298.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	1,108.000		1,108.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	794.000		794.000	
	666-6029	REFL PAV MRK TY I (W)8"(DOT)(090MIL)	LF	225.000		225.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	4,077.000		4,077.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	14.000		14.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	7.000		7.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	7.000		7.000	
	666-6099	REF PAV MRK TY I(W)18"(YLD TRI)(100MIL)	EA	10.000		10.000	
	666-6146	REFL PAV MRK TY I (Y)24"(SLD)(090MIL)	LF	310.000		310.000	
	672-6007	REFL PAV MRKR TY I-C	EA	230.000		230.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	501.000		501.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	5,538.000		5,538.000	
	3076-6005	D-GR HMA TY-B PG64-28	TON	2,265.000		2,265.000	
	3077-6058	SP MIXESSP-DSAC-A PG70-28	TON	2,862.000		2,862.000	
	3077-6075	TACK COAT	GAL	235.000		235.000	
	3085-6001	UNDERSEAL COURSE	GAL	6,044.000		6,044.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000		4.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 2494-01-015 **DISTRICT** Amarillo **COUNTY** Potter
HIGHWAY RM 2381

		CONTROL SECTION JOB		**2494-01-015**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00137507**			
		COUNTY		**Potter**			
		HIGHWAY		**RM 2381**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6024-6005	HPPM W/RET REQ TY I(W)4"(SLD)(090MIL)	LF	9,919.000		9,919.000	
	6024-6014	HPPM W/RET REQ TY I(Y)4"(BRK)(090MIL)	LF	100.000		100.000	
	6024-6017	HPPM W/RET REQ TY I(Y)4"(SLD)(090MIL)	LF	15,098.000		15,098.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF	128.000		128.000	
	6185-6002	TMA (STATIONARY)	DAY	165.000		165.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	100.000		100.000	
	18	ELECTRICAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		ENVIRONMENTAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF WORKZONE ITEMS

LOCATION	662 6004 WK ZN PAV MRK NON-REMOV (W)4"(SLD) LF	662 6010 WK ZN PAV MRK NON-REMOV (W)8"(DOT) LF	662 6012 WK ZN PAV MRK NON-REMOV (W)8"(SLD) LF	662 6016 WK ZN PAV MRK NON-REMOV (W)24"(SLD) LF	662 6017 WK ZN PAV MRK NON-REMOV (W)(ARROW) EA	662 6029 WK ZN PAV MRK NON-REMOV (W)(WORD) EA	662 6030 WK ZN PAV MRK NON-REMOV(W) 18"(YLD TRI) EA	662 6034 WK ZN PAV MRK NON-REMOV (Y)4"(SLD) LF	662 6109 WK ZN PAV MRK SHT TERM (TAB)TY W EA	662 6111 WK ZN PAV MRK SHT TERM (TAB)TY Y-2 EA
STRIPING LAYOUT SUMMARY SHEET	7,574	225	4,013	14	7	7	10	14,298	1,108	794
PROJECT TOTALS:	**7,574**	**225**	**4,013**	**14**	**7**	**7**	**10**	**14,298**	**1,108**	**794**

SUMMARY OF REMOVAL ITEMS

LOCATION	100 6008 PREPARING ROW (TREE) (0" TO 6" DIA) EA	100 6009 PREPARING ROW (TREE) (6" TO 24" DIA) EA	105 6005 REMOVING STAB BASE AND ASPH PAV (3") SY	105 6008 REMOVING STAB BASE AND ASPH PAV (6") SY	105 6013 REMOVING STAB BASE & ASPH PAV (9") SY	105 6044 REMOVING STAB BASE AND ASPH PAV (10") SY	354 6021 PLANE ASPH CONC PAV (0" TO 2") SY	644 6076 REMOVE SM RD SN SUP&AM EA	658 6060 REMOVE DELIN & OBJECT MARKER ASSMS EA	677 6001 ELIM EXT PAV MRK & MRKS (4") LF
TYPICAL SECTION A			442			442				3,976
TYPICAL SECTION B			234			584				1,562
TYPICAL SECTION C			45	45						
REMOVAL LAYOUT SHEET 1 OF 3	17								2	
REMOVAL LAYOUT SHEET 2 OF 3	45	2			5,195				25	
REMOVAL LAYOUT SHEET 3 OF 3	53								3	
ROADWAY LAYOUT SHEET 1 OF 5							534			
ROADWAY LAYOUT SHEET 2 OF 5							667			
ROADWAY LAYOUT SHEET 5 OF 5							600			
SIGNING LAYOUT SHEET 2 OF 6								3		
SIGNING LAYOUT SHEET 3 OF 6								23		
SIGNING LAYOUT SHEET 5 OF 6								2		
PROJECT TOTALS:	**115**	**2**	**721**	**45**	**5,195**	**1,026**	**1,801**	**28**	**30**	**5,538**

SUMMARY OF ROADWAY ITEMS

LOCATION	100 6001 PREPARING ROW AC	134 6001 BACKFILL (TY A) STA	247 6227 FL BS (CMP IN PLC) (TY A OR B GR 4) (8") SY	310 6009 PRIME COAT (MC-30) (0.25 GAL/SY) GAL	316 6001 ASPH (MULTI OPTION) (0.38 GAL/SY) GAL	316 6078 AGGR (TY-B GR-4 SAC-A) (110 SY/CY) CY	351 6012 FLEXIBLE PAVEMENT STRUCTURE REPAIR (2") SY
TYPICAL SECTION A1			624	176	269	7	
TYPICAL SECTION A2			3,825	1,018	1,548	38	
TYPICAL SECTION A3			650	172	261	7	
TYPICAL SECTION A4			748	199	302	8	
TYPICAL SECTION B1			1,727	460	697	19	
TYPICAL SECTION B2	0.14	12	1,464	398	605	15	
TYPICAL SECTION C1			2,403	602	914	23	
TYPICAL SECTION C2			384	108	164	6	
ROADWAY LAYOUT SHEET 1 OF 5	0.06	2					
ROADWAY LAYOUT SHEET 2 OF 5	0.06	2					
ROADWAY LAYOUT SHEET 5 OF 5	0.06	2					
ADDITIONAL AREA SHEET			1,983	489	743	18	
PAVEMENT REPAIR DETAILS SHEET							2,025
PROJECT TOTALS:	**0.32**	**18**	**13,808**	**3,622**	**5,503**	**141**	**2,025**

PROJECT SUMMARIES

2021 Texas Department of Transportation

SHEET 1 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		10

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SUMMARY OF ROADWAY ITEMS (CONT.)

LOCATION	432 6003 RIPRAP (CONC) (6 IN) CY	529 6001 CONC CURB (TY I) LF	533 6001 RUMBLE STRIPS (SHOULDER) LF	533 6002 RUMBLE STRIPS (CENTERLINE) LF	3076 6005 D-GR HMA TY-B PG64-28 (330 LB/SY) TON	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LB/SY) TON	3077 6075 TACK COAT (0.13 GAL/SY) GAL
TYPICAL SECTION A1					104	176	
TYPICAL SECTION A2					633	746	
TYPICAL SECTION A3					108	167	
TYPICAL SECTION A4					125	141	
TYPICAL SECTION B1					287	330	
TYPICAL SECTION B2					243	540	
TYPICAL SECTION C1					380	253	
TYPICAL SECTION C2					65	97	
ROADWAY LAYOUT SHEET 1 OF 5						59	70
ROADWAY LAYOUT SHEET 2 OF 5						74	87
ROADWAY LAYOUT SHEET 5 OF 5						66	78
ADDITIONAL AREA SHEET					320	213	
ISLAND DETAILS SHEET	61	374					
STRIPING LAYOUT SUMMARY SHEET 1 OF 4			2,442	1,040			
STRIPING LAYOUT SUMMARY SHEET 2 OF 4			3,453	570			
STRIPING LAYOUT SUMMARY SHEET 3 OF 4			2,650	200			
STRIPING LAYOUT SUMMARY SHEET 4 OF 4			910	455			
PROJECT TOTALS:	**61**	**374**	**9,455**	**2,265**	**2,265**	**2,862**	**235**

SUMMARY OF ROADWAY ITEMS (CONT.)

LOCATION	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY) GAL	6056 6001 PREFORMED IN-LANE (TRANS) RUMBLE STRIP LF
TYPICAL SECTION A1	397	
TYPICAL SECTION A2	1,694	
TYPICAL SECTION A3	380	
TYPICAL SECTION A4	319	
TYPICAL SECTION B1	750	
TYPICAL SECTION B2	1,225	
TYPICAL SECTION C1	575	
TYPICAL SECTION C2	220	
ADDITIONAL AREA SHEET	484	
STRIPING LAYOUT SUMMARY SHEET 4 OF 4		128
PROJECT TOTALS:	**6,044**	**128**

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PROJECT SUMMARIES

2021 Texas Department of Transportation

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		11

SUMMARY OF DRAINAGE ITEMS

LOCATION	462 6006 CONC BOX CULV (5 FT X 2 FT) LF	464 6007 RC PIPE (CL III)(30 IN) LF	467 6172 SET (TY I) (S=5 FT) (HW=3FT) (4:1) (C) EA	467 6419 SET (TY II)(30IN) (RCP) (4:1) (C) EA	496 6004 REMOV STR (SET) EA	496 6006 REMOV STR (HEADWALL) EA	496 6007 REMOV STR (PIPE) LF
CULVERT LAYOUT SHEET 1 OF 2	30	38	1	2	1	2	18
CULVERT LAYOUT SHEET 2 OF 2		28		2		2	8
PROJECT TOTALS:	**30**	**66**	**1**	**4**	**1**	**4**	**26**

SUMMARY OF ILLUMINATION ITEMS

LOCATION	416 6029 DRILL SHAFT (RDWY ILL POLE) (30 IN) LF	610 6254 IN RD IL (TY ST) 40T-8 (250W EQ) LED EA	618 6023 CONDT (PVC) (SCH 40) (2") LF	618 6047 CONDT (PVC) (SCH 80) (2") (BORE) LF	620 6007 ELEC CONDR (NO.8) BARE LF	620 6008 ELEC CONDR (NO.8) INSULATED LF	624 6002 GROUND BOX TY A (122311) W/APRON EA	628 6047 ELC SRV TY A 240/480 060 (NS)SS(E)TP(O) EA
ILLUMINATION LAYOUT SHEET 1 OF 2	64	8	1,590		1,670	3,340	1	1
ILLUMINATION LAYOUT SHEET 2 OF 2	120	15	3,220	90	3,480	6,960	2	
PROJECT TOTALS:	**184**	**23**	**4,810**	**90**	**5,150**	**10,300**	**3**	**1**

SUMMARY OF SIGNING ITEMS

LOCATION	644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P) EA	644 6004 IN SM RD SN SUP&AM TY10BWG (1)SA(T) EA	644 6033 IN SM RD SN SUP&AM TYS80(1)SA(U) EA	658 6080 INSTL DEL ASSM (D-SW)SZ1 (WFLX)GND EA	658 6100 INSTL OM ASSM (OM-2Z) (WFLX)GND(BI) EA
SIGN LAYOUT SHEET 1 OF 6	1	1		9	
SIGN LAYOUT SHEET 2 OF 6	2	1		3	4
SIGN LAYOUT SHEET 3 OF 6	2	3	1		4
SIGN LAYOUT SHEET 4 OF 6	2	2		3	4
SIGN LAYOUT SHEET 5 OF 6	1	2			
SIGN LAYOUT SHEET 6 OF 6		1			
PROJECT TOTALS:	**8**	**10**	**1**	**15**	**12**

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PROJECT SUMMARIES

2021 Texas Department of Transportation

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		12

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	666	666	666	666	666	666	666	672
	6029	6035	6047	6053	6077	6099	6146	6007
	REFL PAV MRK TY I (W) 8" (DOT) (090MIL)	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)	REF PAV MRK TY I (W) 18" (YLD TRI) (090MIL)	REFL PAV MRK TY I (Y) 24" (SLD) (090MIL)	REFL PAV MRKR TY I-C
	LF	LF	LF	EA	EA	EA	LF	EA
STRIPING LAYOUT SUMMARY SHEET 1 OF 4	45							4
STRIPING LAYOUT SUMMARY SHEET 2 OF 4	141	3,002	14	6	6	10		168
STRIPING LAYOUT SUMMARY SHEET 3 OF 4		1,075		1	1		310	54
STRIPING LAYOUT SUMMARY SHEET 4 OF 4	39							4
PROJECT TOTALS:	**225**	**4,077**	**14**	**7**	**7**	**10**	**310**	**230**

SUMMARY OF PAVEMENT MARKING ITEMS (CONT.)

LOCATION	672	6024	6024	6024
	6009	6005	6014	6017
	REFL PAV MRKR TY II-A-A	HPPM W/RET REQ TY I (W) 4" (SLD) (090MIL)	HPPM W/RET REQ TY I (Y) 4" (BRK) (090MIL)	HPPM W/RET REQ TY I (Y) 4" (SLD) (090MIL)
	EA	LF	LF	LF
STRIPING LAYOUT SUMMARY SHEET 1 OF 4	54	2,442		2,804
STRIPING LAYOUT SUMMARY SHEET 2 OF 4	233	3,917		6,884
STRIPING LAYOUT SUMMARY SHEET 3 OF 4	202	2,650	50	4,700
STRIPING LAYOUT SUMMARY SHEET 4 OF 4	12	910	50	710
PROJECT TOTALS:	**501**	**9,919**	**100**	**15,098**

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	164	164	314	506	506
	6036	6053	6014	6040	6043
	DRILL SEEDING (PERM) (RURAL) (CLAY)	DRILL SEEDING (TEMP) (WARM OR COOL)	EMULS ASPH (EROSN CONT) (MS-2) (0.1 GAL/SY)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	AC	AC	GAL	LF	LF
EROSION CONTROL LAYOUT SHEET 1 OF 3	0.68	0.86	193	25	25
EROSION CONTROL LAYOUT SHEET 2 OF 3	5.49	5.51	428		
EROSION CONTROL LAYOUT SHEET 3 OF 3	2.19	2.33	363	50	50
PROJECT TOTALS:	**8.36**	**8.70**	**984**	**75**	**75**

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PROJECT SUMMARIES

2021 Texas Department of Transportation

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		13

RM 1061 EARTHWORK SUMMARY

STATION	110 6001 EXCAVATION (ROADWAY) CY	132 6004 EMBANKMENT (FINAL) (DENS CONT) (TY B) CY
523+75 R4	0	0
524+00 R4	4	7
524+50 R4	10	18
525+00 R4	13	20
525+50 R4	19	20
526+00 R4	23	21
526+50 R4	24	25
527+00 R4	22	36
527+50 R4	20	53
528+00 R4	27	73
528+50 R4	36	76
529+00 R4	34	68
529+50 R4	28	65
530+00 R4	30	60
530+50 R4	35	56
531+00 R4	32	60
531+50 R4	23	69
532+00 R4	19	74
532+50 R4	30	73
533+00 R4	56	83
533+50 R4	63	73
534+00 R4	42	59
534+50 R4	30	66
535+00 R4	31	61
535+50 R4	31	51
536+00 R4	36	37
536+50 R4	43	30
537+00 R4	45	28
537+50 R4	49	29
538+00 R4	58	32
538+39 R4	47	27
538+50 R4	8	8
539+00 R4	11	25
539+50 R4	12	23
540+00 R4	13	22
540+50 R4	15	21
541+00 R4	18	22
541+50 R4	20	18
541+65 R4	6	5
542+00 R4	40	16
542+50 R4	87	29
543+00 R4	95	19
543+50 R4	95	12
TOTAL:	**1,380**	**1,670**

RM 1061 EARTHWORK SUMMARY

STATION	110 6001 EXCAVATION (ROADWAY) CY	132 6004 EMBANKMENT (FINAL) (DENS CONT) (TY B) CY
100+00 R5	20	4
100+50 R5	56	19
101+00 R5	34	28
101+50 R5	30	30
102+00 R5	33	25
102+50 R5	29	24
103+00 R5	24	29
103+50 R5	20	38
104+00 R5	19	48
104+50 R5	15	55
105+00 R5	9	50
105+50 R5	6	44
106+00 R5	6	44
106+50 R5	6	46
107+00 R5	6	44
107+50 R5	8	34
108+00 R5	11	24
108+50 R5	13	16
109+00 R5	12	15
109+50 R5	11	17
110+00 R5	10	17
110+50 R5	10	15
111+00 R5	8	15
111+50 R5	7	14
112+00 R5	9	9
112+50 R5	10	6
113+00 R5	8	9
113+50 R5	6	17
114+00 R5	5	19
114+50 R5	5	15
115+00 R5	5	12
115+50 R5	4	9
116+00 R5	2	7
116+21 R5	1	3
TOTAL:	**458**	**801**
RM 1061 TOTALS:	**1,838**	**2,471**

RM 2381 EARTHWORK SUMMARY

STATION	110 6001 EXCAVATION (ROADWAY) CY	132 6004 EMBANKMENT (FINAL) (DENS CONT) (TY B) CY
1+83 R1	0	0
2+00 R1	62	1
2+50 R1	236	0
3+00 R1	264	0
3+50 R1	246	0
4+00 R1	235	0
4+50 R1	242	0
5+00 R1	220	1
5+50 R1	154	5
6+00 R1	95	15
6+50 R1	81	18
7+00 R1	59	20
7+50 R1	35	27
8+00 R1	29	26
8+50 R1	15	16
8+55 R1	1	1
RM 2381 TOTALS:	**1,974**	**130**

ADDITIONAL AREA EARTHWORK SUMMARY

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6004 EMBANKMENT (FINAL) (DENS CONT) (TY B) CY
RM 2381 TRANSITION AREA	530	678
EXISTING RAMP 1 REMOVAL (1)	718	0
EXISTING RAMP 2 REMOVAL (2)	689	0
ADDITIONAL AREA TOTALS:	**1,937**	**678**
PROJECT TOTALS:	**5,749**	**3,279**

NOTES:
(1) ESTIMATED AT 1.20 CY/FT
(2) ESTIMATED AT 1.25 CY/FT

PROJECT SUMMARIES

Texas Department of Transportation

SHEET 5 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		14

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1. GENERAL GUIDELINES

1. MAINTAIN PROPERTY OWNER ACCESS ACROSS WORK ZONE AT ALL TIMES. TRAFFIC BARRELS WILL BE USED TO DELINEATE INTERSECTIONS AND DRIVEWAYS. UNLESS OTHERWISE NOTED.

2. PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL BE PLACED PER MUTCD GUIDELINES AND MUST BE PLACED 72 HOURS IN ADVANCE OF THE BEGINNING OF THE CONSTRUCTION.

3. ALL BARRICADES, SIGNS, AND FLAGGERS SHALL BE SUBSIDARY TO ITEM 502 BARRICADES, SIGNS AND TRAFFIC HANDLING. ALL EROSION AND SEDIMENT CONTROL DEVICES WILL BE PAID FOR UNDER ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROL. ALL OTHER WORK AND MATERIALS SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS UNLESS OTHERWISE INDICATED IN THE PLANS.

4. THE CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE THROUGHOUT THE CONSTRUCTION OF THE PROJECT. THE CONTRACTOR SHALL CORRECT DRAINAGE DEFICIENCIES THAT PRESENT A HAZARD TO THE TRAVELING PUBLIC AND/OR ADJACENT PROPERTY. CONTRACTOR WILL BE PLACE TEMPORARY CAPS WHERE NEEDED TO FACILITATE TEMPORARY DRAINAGE PATTERNS.

5. DO NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT IN A LOCATION THAT WILL CONSTITUTE A HAZARD AND COULD ENDANGER THE TRAVELLING PUBLIC.

6. THE CONTRACTOR WILL BE REQUIRED TO PROVIDE PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) PER TMUTCD GUIDANCE AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.

7. THE CONTRACTOR SHALL INSTALL AND MAINTAIN BARRICADES, WARNING AND DIRECTIONAL SIGNS AS INDICATED ON THE PLANS AND AS DIRECTED BY THE ENGINEER.

8. ALL SEQUENCE OF WORK ON THIS PROJECT SHALL BE COORDINATED TO COINCIDE WITH ANY PROJECTS WITHIN OR ADJACENT TO THIS PROJECT.

9. COVER ANY PERMANENT OR EXISTING SIGNS IF NOT USED AND IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS. THIS IS SUBSIDIARY TO ITEM 502.

10. NOTIFY THE ENGINEER 5 BUSINESS DAYS IN ADVANCE OF ANY TEMPORARY OR PERMANENT LANE, RAMP,ETC. CLOSURES / DETOURS, RESTRICTIONS TO LANE WIDTHS, ALTERATIONS TO VERTICAL CLEARANCES OR MODIFICATIONS TO RADII. ANY OTHER MODIFICATIONS TO THE ROADWAY THAT MAY ADVERSELY AFFECT THE MOBILITY OF OVERSIZED / OVERWEIGHT TRUCKS ALSO REQUIRE 5 BUSINESS DAYS ADVANCE NOTICE TO THE ENGINEER.

11. ALL TRAFFIC BARRIER PLACEMENT, PAVEMENT LEVEL-UPS, TEMPORARY PAVEMENT PLACEMENT AND RESTRIPING OPERATIONS WILL OCCUR AT NIGHT UNLESS OTHERWISE NOTED ON THE PLANS OR DIRECTED/APPROVED BY THE ENGINEER.

12. ALL DETOURS, HORIZONTAL TRAFFIC MOVEMENTS, TEMPORARY CTB, DRAINAGE, ETC. ARE DIRECTLY RELATED TO THE SEQUENCE OF WORK. THEREFORE, PROCEED WITH CONSTRUCTION OPERATIONS IN CONFORMITY WITH THE DETAILS AS SHOWN ON THE PLANS. THE CONTRACTOR MAY PROPOSE MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. INCLUDE ALL CHANGES TO THE VARIOUS PAY ITEMS, IMPACTS TO TRAFFIC, EFFECTS ON OVERALL PROJECT TIME AND COSTS AND REVISE SCHEDULE FOR ANY RECOMMENDATIONS OR MAJOR MODIFICATIONS.

13. ALL EDGE OF PAVEMENT DROP OFFS NOT PROTECTED BY A POSITIVE BARRIER, WHETHER SHOWN IN THE TCP PLAN OR NOT, SHALL BE TREATED WITH A 3:1 (OR FLATTER) SAFETY SLOPE.

14. PORTABLE CONCRETE TRAFFIC BARRIER THAT HAS LESS THAN 2 FEET OF LATERAL DISTANCE BEHIND THE BARRIER SHALL BE PINNED TO THE PAVEMENT IN A MANNER TO BE APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL SUBMIT DRAWINGS OF THE METHOD OF PINNING BARRIERS TO THE ENGINEER FOR HIS APPROVAL PRIOR TO PLACEMENT.

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

2. SEQUENCE OF WORK

PHASE 1

1. THE WORK IN THIS PHASE IS TO CONSTRUCT THE PROPOSED RM 1061 NB WIDENING.
2. TO COMPLETE THIS WORK, A RIGHT SHOULDER CLOSUREWILL BE UTILIZED ALONG RM 1061 NB ACCORDING TO TCP (2-1)-18.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. EXTEND CULVERTS AND CONSTRUCT END TREATMENTS IN ACCORDANCE WITH BC (10)-14.
8. PERFORM WIDENING AS SHOWN ON PLANS.
9. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 2

1. THE WORK IN THIS PHASE IS TO CONSTRUCT THE PROPOSED RM 2381 INTERSECTION.
2. TO COMPLETE THIS WORK, A RIGHT SHOULDER CLOSURE WILL BE UTILIZED ALONG RM 1061 SB ACCORDING TO TCP (2-1)-18.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. CONSTRUCT ROADWAY AS SHOWN ON PLANS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 3A

1. THE WORK IN THIS PHASE IS TO OBLITERATE THE EXISTING RM 2381 ROADWAY AND RAMPS FROM STA 3+90 TO STA 6+53.
2. TO COMPLETE THIS WORK, A FULL ROADWAY CLOSURE WILL BE UTILIZED ON RM 2381 AT RM 1061 INTERSECTION ACCORDING TO THE LATEST TMUTCD, BC, AND TCP STANDARDS. RM 2381 TRAFFIC WILL FOLLOW THE DETOUR ROUTE OUTLINED ON THE DETOUR LAYOUT SHEETS.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. REMOVE ROADWAY AS SHOWN ON REMOVAL LAYOUT SHEETS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 3B

1. THE WORK IN THIS PHASE IS TO CONSTRUCT THE PROPOSED RM 2381 ROADWAY AND PROPOSED WIDENING FROM STA 3+90 TO STA 6+53.
2. TO COMPLETE THIS WORK, A FULL ROADWAY CLOSURE WILL BE UTILIZED ON RM 2381 AT RM 1061 INTERSECTION ACCORDING TO THE LATEST TMUTCD, BC, AND TCP STANDARDS. RM 2381 TRAFFIC WILL FOLLOW THE DETOUR ROUTE OUTLINED IN THE DETOUR LAYOUT SHEETS.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. CONSTRUCT ROADWAY AND PERFORM WIDENING AS SHOWN ON PLANS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP NARRATIVE

SCALE: N/A

2021 Texas Department of Transportation

SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		15

DATE: 2/10/2021 4:44:17 PM
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PHASE 3C

1. THE WORK IN THIS PHASE IS TO OBLITERATE THE EXISTING RM 2381 RAMPS FROM RM 1061 TO STA 3+90.
2. TO COMPLETE THIS WORK, A RIGHT SHOULDER CLOSURE WILL BE UTILIZED ALONG RM 1061 SB ACCORDING TO TCP (2-1)-18.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. REMOVE ROADWAY AS SHOWN ON REMOVAL LAYOUT SHEETS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 4A

1. THE WORK IN THIS PHASE IS TO CONSTRUCT THE PROPOSED RM 1061 SB DECEL LANE WIDENING.
2. TO COMPLETE THIS WORK, A RIGHT SHOULDER CLOSURE WILL BE UTILIZED ALONG RM 1061 SB ACCORDING TO TCP (2-1)-18.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. PERFORM WIDENING AS SHOWN ON PLANS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 4B

1. THE WORK IN THIS PHASE IS TO CONSTRUCT THE PROPOSED RM 1061 SB ACCEL LANE WIDENING.
2. TO COMPLETE THIS WORK, A RIGHT SHOULDER CLOSURE WILL BE UTILIZED ALONG RM 1061 SB ACCORDING TO TCP (2-1)-18.
3. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. EXTEND CULVERTS AND CONSTRUCT END TREATMENTS IN ACCORDANCE WITH BC (10)-14.
8. PERFORM WIDENING AS SHOWN ON PLANS.
9. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

PHASE 5

1. THE WORK IN THIS PHASE IS TO PERFORM THE PROPOSED FULL WIDTH OVERLAY ON RM 2381 AND RM 1061.
2. PLACE ADVANCE WARNING SIGNS PER LATEST BC (2) STANDARDS PRIOR TO COMMENCING WORK.
3. PLACE TRAFFIC CONTROL DEVICES ACCORDING TO APPLICABLE STANDARDS.
4. INSTALL EROSION CONTROL DEVICES AS SHOWN ON SWP3 LAYOUTS. THIS WORK MUST BE DONE BEFORE ANY CLEARING OR CONSTRUCTION CAN TAKE PLACE AND MUST BE APPROVED BEFORE ANY FURTHER WORK CAN BEGIN.
5. REMOVE OR COVER EXISTING SIGNING AND PAVEMENT MARKINGS IN CONFLICT WITH TEMPORARY TRAFFIC CONTROL OPERATIONS AS DIRECTED BY THE ENGINEER.
6. INSTALL CHANNELIZING DEVICES AS INDICATED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.
7. PERFORM OVERLAY AS SHOWN ON PLANS.
8. PERFORM CLEANUP AND REMOVE ALL CHANNELIZING DEVICES, TEMPORARY SIGNS, DETOUR SIGNS, AND SW3P DEVICES.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP NARRATIVE

SCALE: N/A

2021 Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		16

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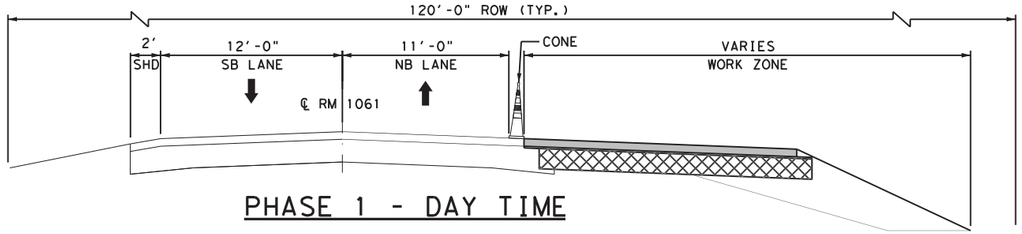
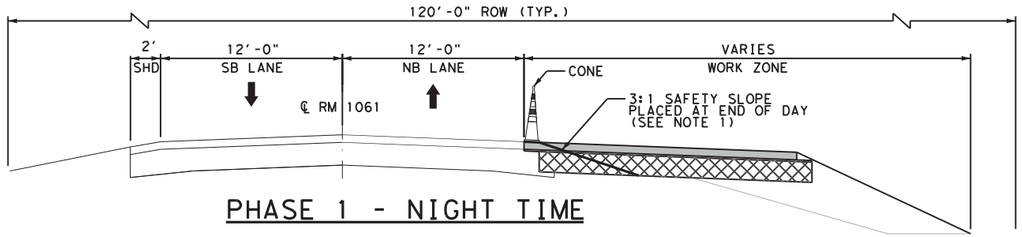


PHASE 1 - DAY TIME



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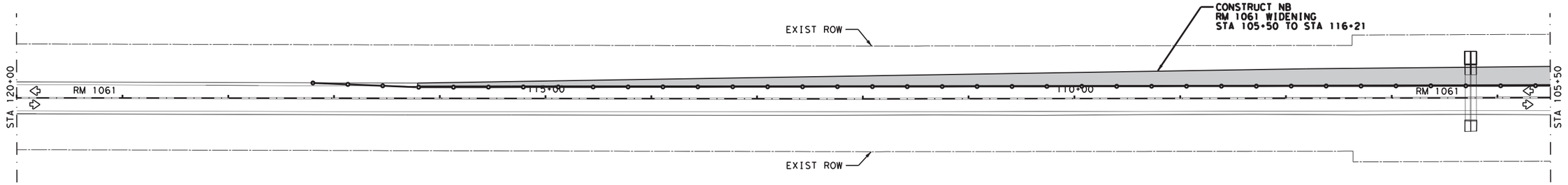

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

PHASE 1 - CONSTRUCT RM 1061 NB WIDENING

STATE OF TEXAS
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03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		17

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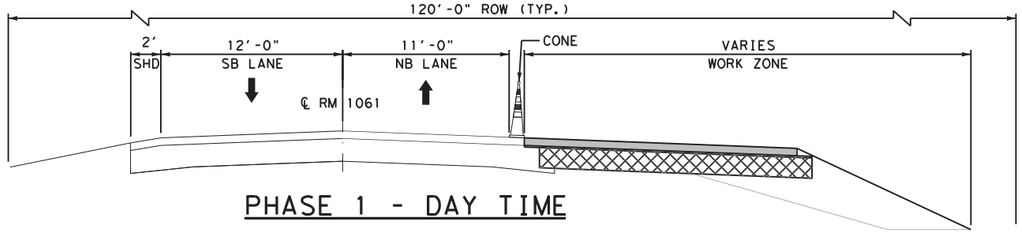
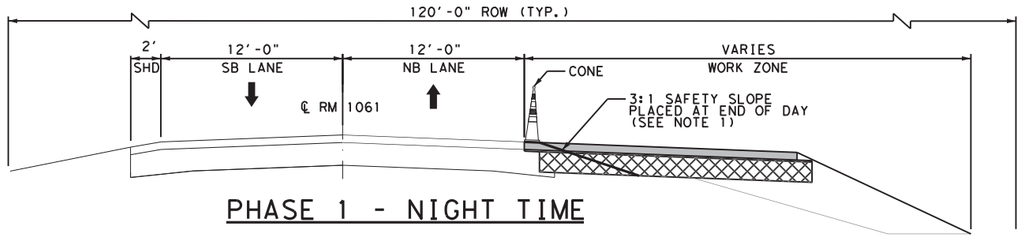
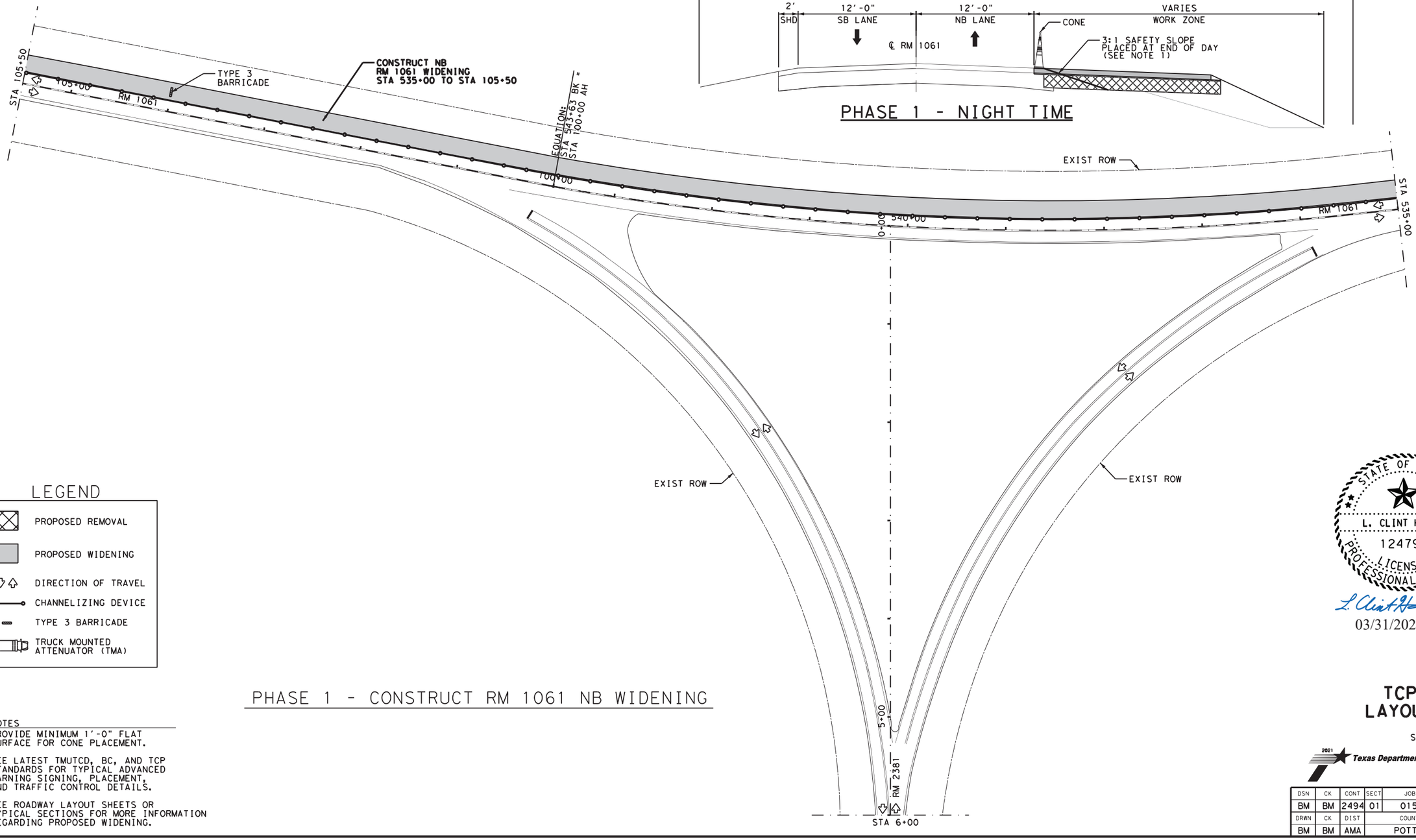


PHASE 1 - DAY TIME



PHASE 1 - NIGHT TIME



PHASE 1 - CONSTRUCT RM 1061 NB WIDENING

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

STATE OF TEXAS
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03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 2 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		18

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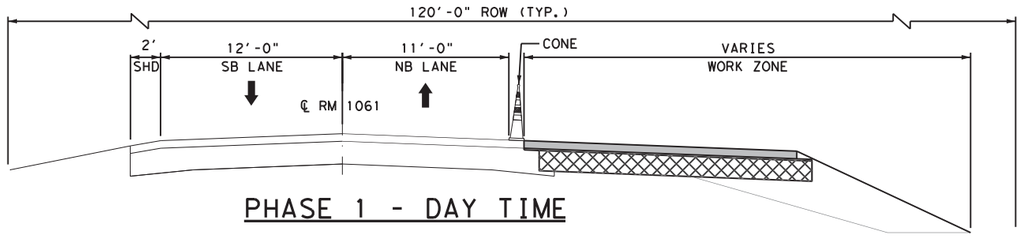
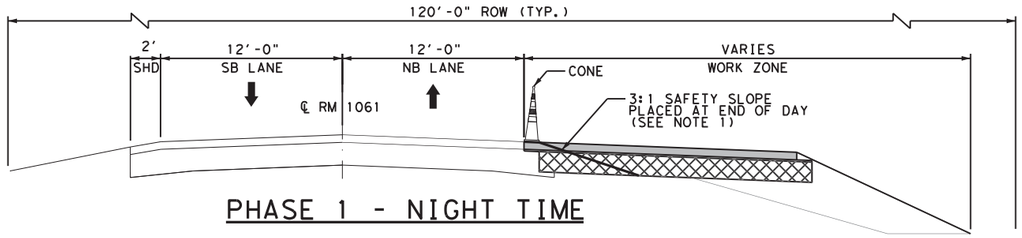
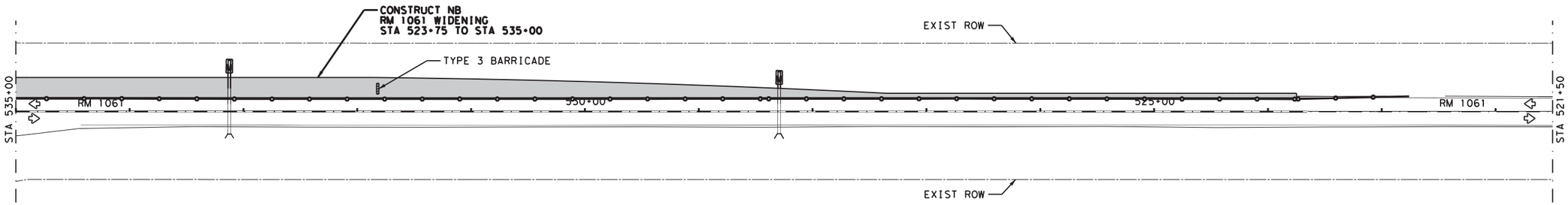


PHASE 1 - DAY TIME



PHASE 1 - NIGHT TIME



LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

PHASE 1 - CONSTRUCT RM 1061 NB WIDENING

STATE OF TEXAS
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03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 3 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		19

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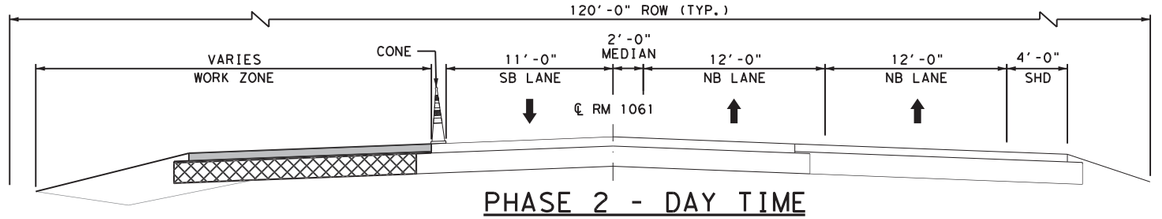
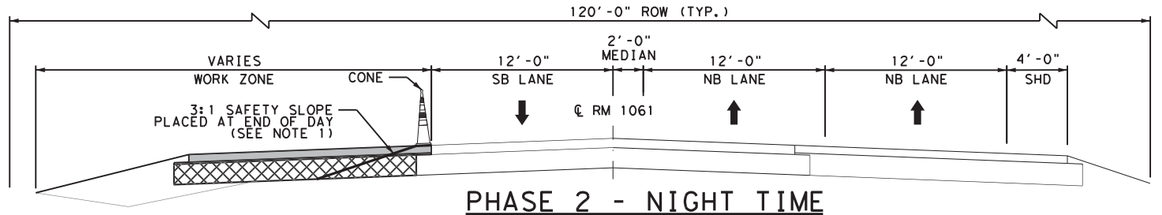
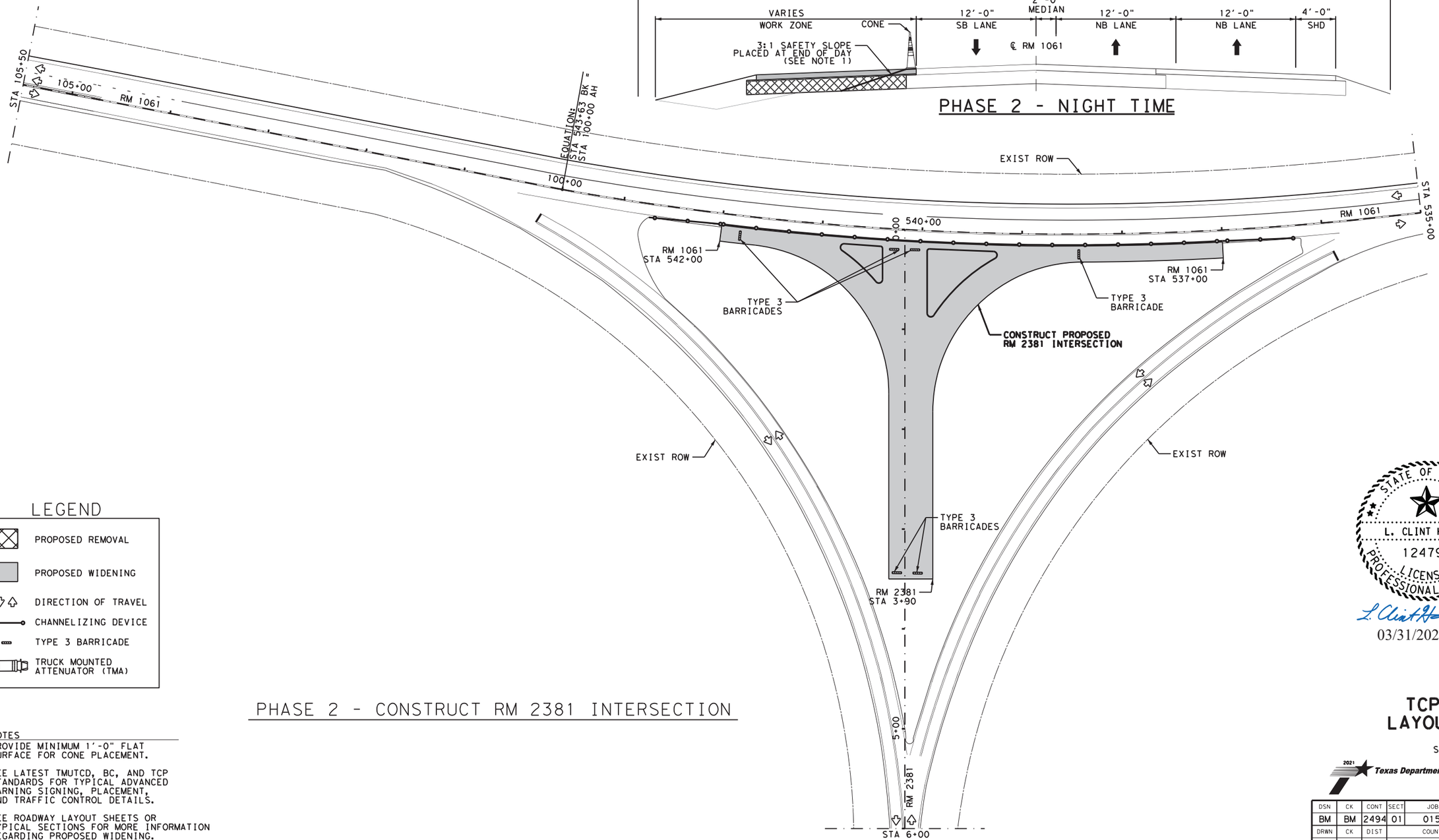


PHASE 2 - DAY TIME



PHASE 2 - NIGHT TIME



PHASE 2 - CONSTRUCT RM 2381 INTERSECTION

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

STATE OF TEXAS
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124794
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PROFESSIONAL ENGINEER

03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 4 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		20

DATE: 2/10/2021 4:46:00 PM
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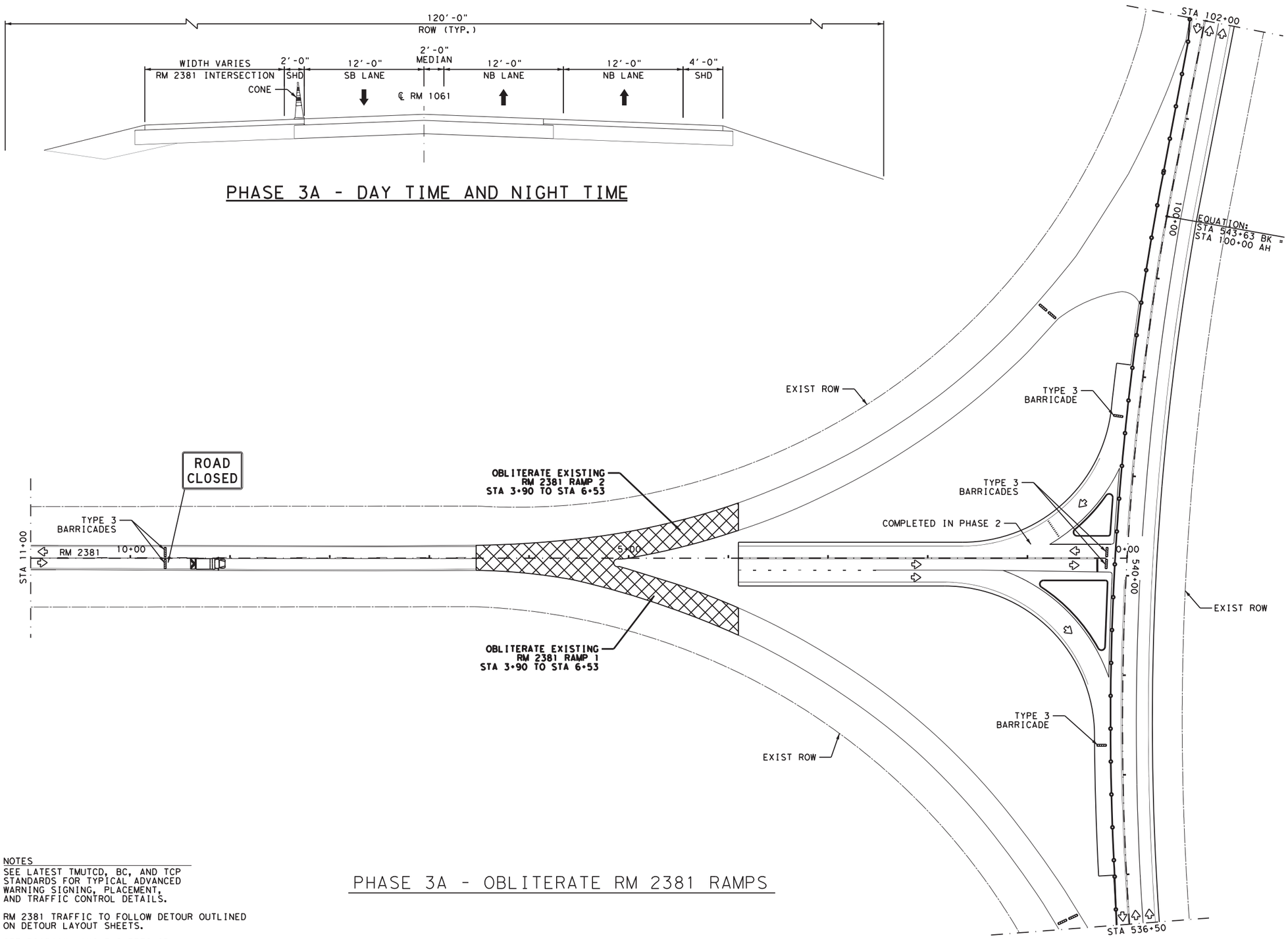
PHASE 3A - DAY TIME AND NIGHT TIME



PHASE 3A - OBLITERATE RM 2381 RAMPS

NOTES

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

RM 2381 TRAFFIC TO FOLLOW DETOUR OUTLINED ON DETOUR LAYOUT SHEETS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

SEE REMOVAL LAYOUT FOR MORE INFORMATION REGARDING ROADWAY REMOVAL.

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 5 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		21

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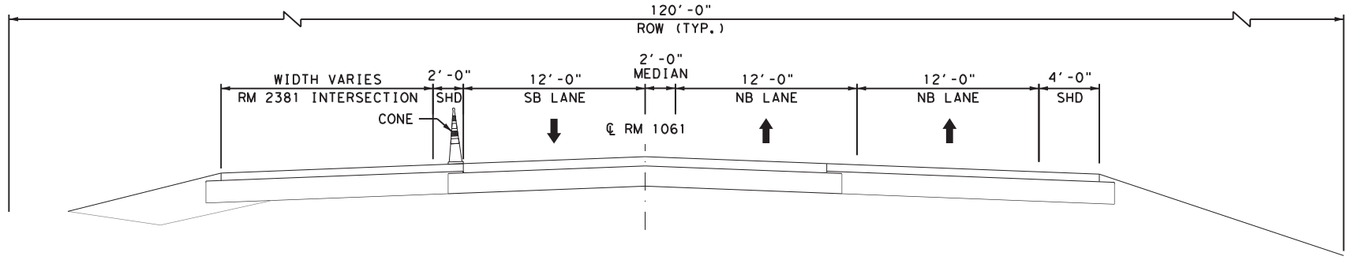

PHASE 3B - DAY TIME AND NIGHT TIME

PHASE 3B - CONSTRUCT RM 2381 WIDENING AND TIE IN

NOTES

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

RM 2381 TRAFFIC TO FOLLOW DETOUR OUTLINED ON DETOUR LAYOUT SHEETS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 6 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		22

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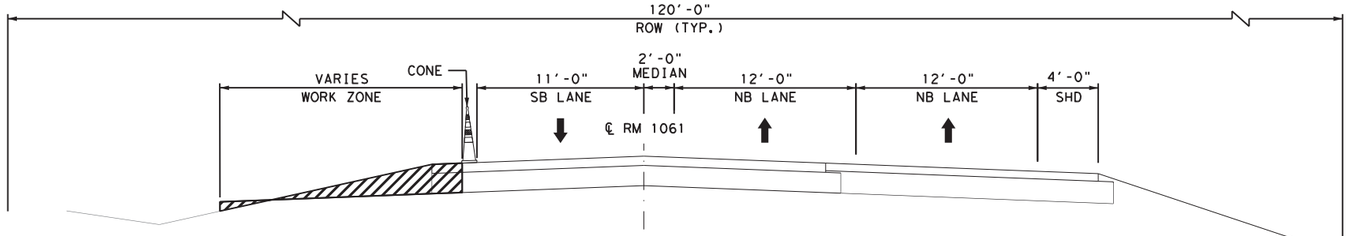
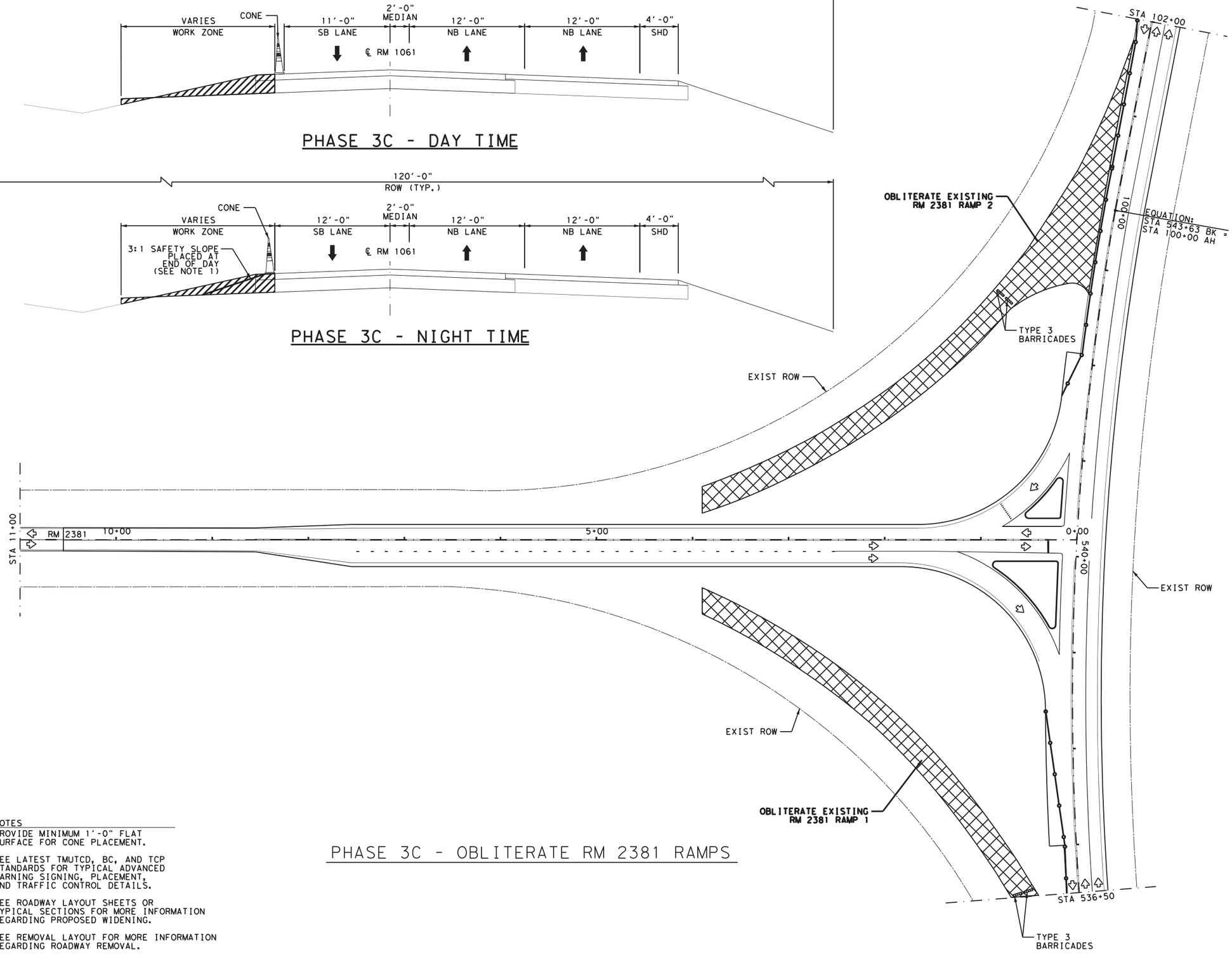


PHASE 3C - DAY TIME

PHASE 3C - NIGHT TIME



PHASE 3C - OBLITERATE RM 2381 RAMPS

NOTES

1. PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

   SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

   SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

   SEE REMOVAL LAYOUT FOR MORE INFORMATION REGARDING ROADWAY REMOVAL.

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 7 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		23

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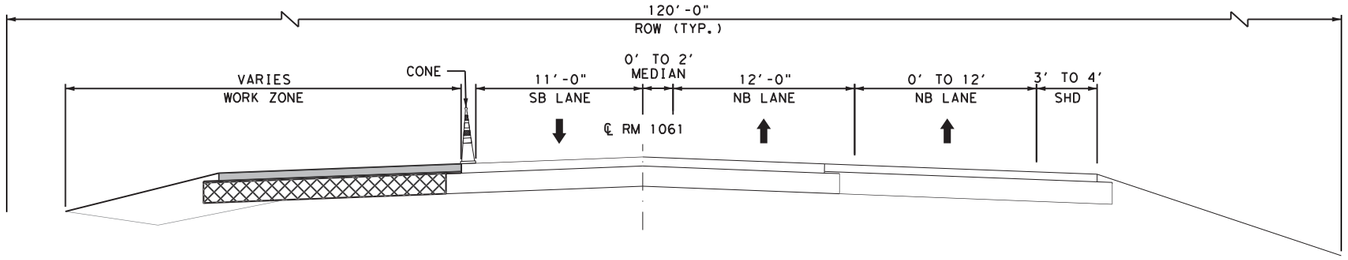
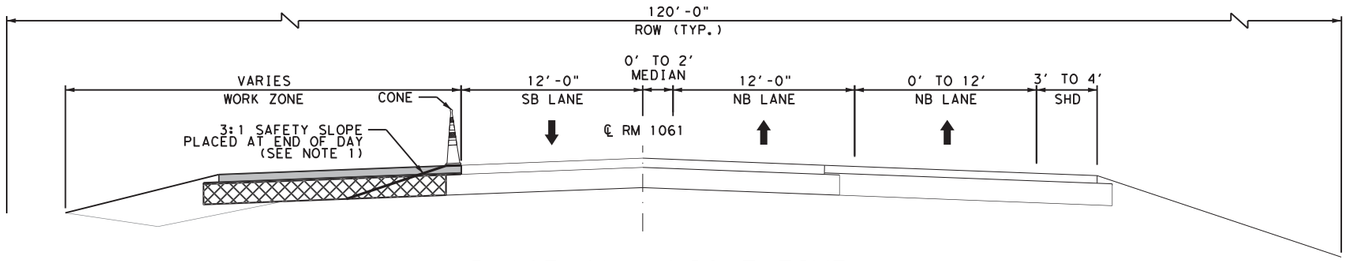
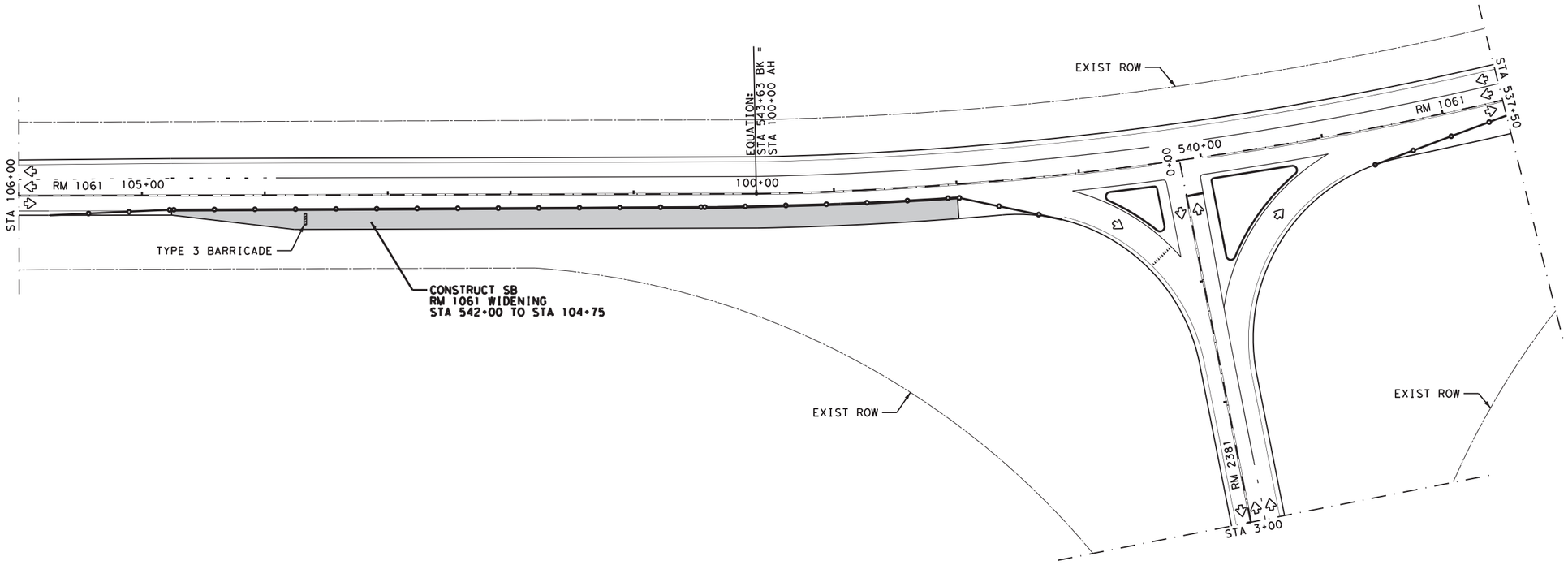


PHASE 4A - DAY TIME



PHASE 4A - NIGHT TIME



LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

PHASE 4A - CONSTRUCT RM 1061 SB DECEL WIDENING

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms
03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 8 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		24

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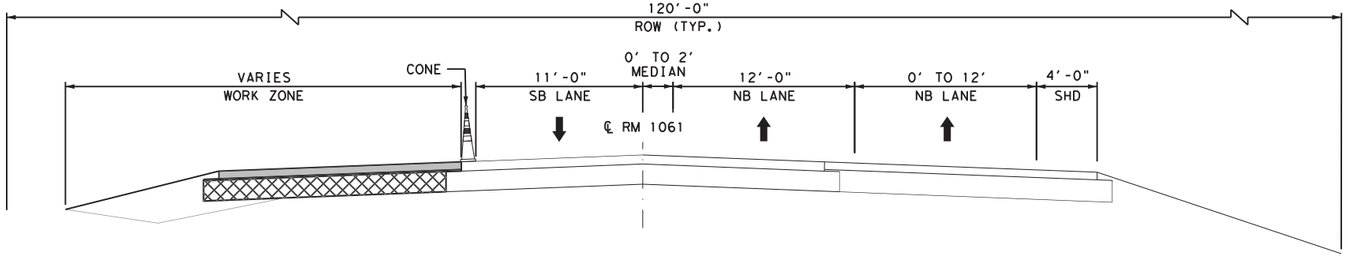
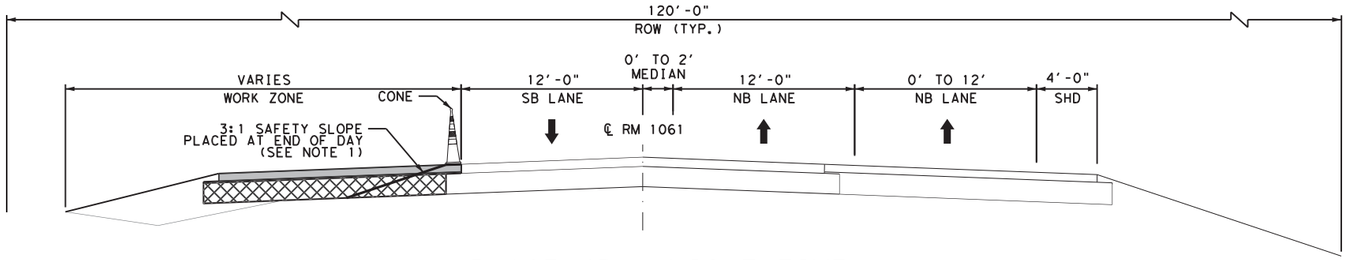


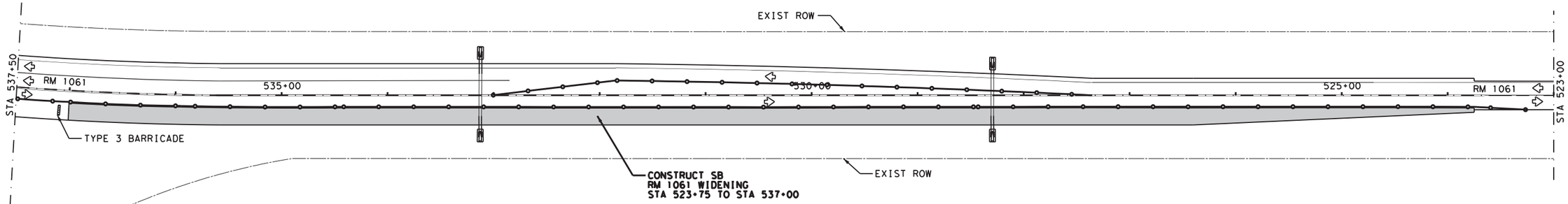
PHASE 4B - DAY TIME



PHASE 4B - NIGHT TIME

LEGEND

- PROPOSED REMOVAL
- PROPOSED WIDENING
- DIRECTION OF TRAVEL
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TRUCK MOUNTED ATTENUATOR (TMA)



PHASE 4B - CONSTRUCT RM 1061 SB ACCEL WIDENING

NOTES

(1) PROVIDE MINIMUM 1'-0" FLAT SURFACE FOR CONE PLACEMENT.

SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED WIDENING.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TCP LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 9 OF 9

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		25

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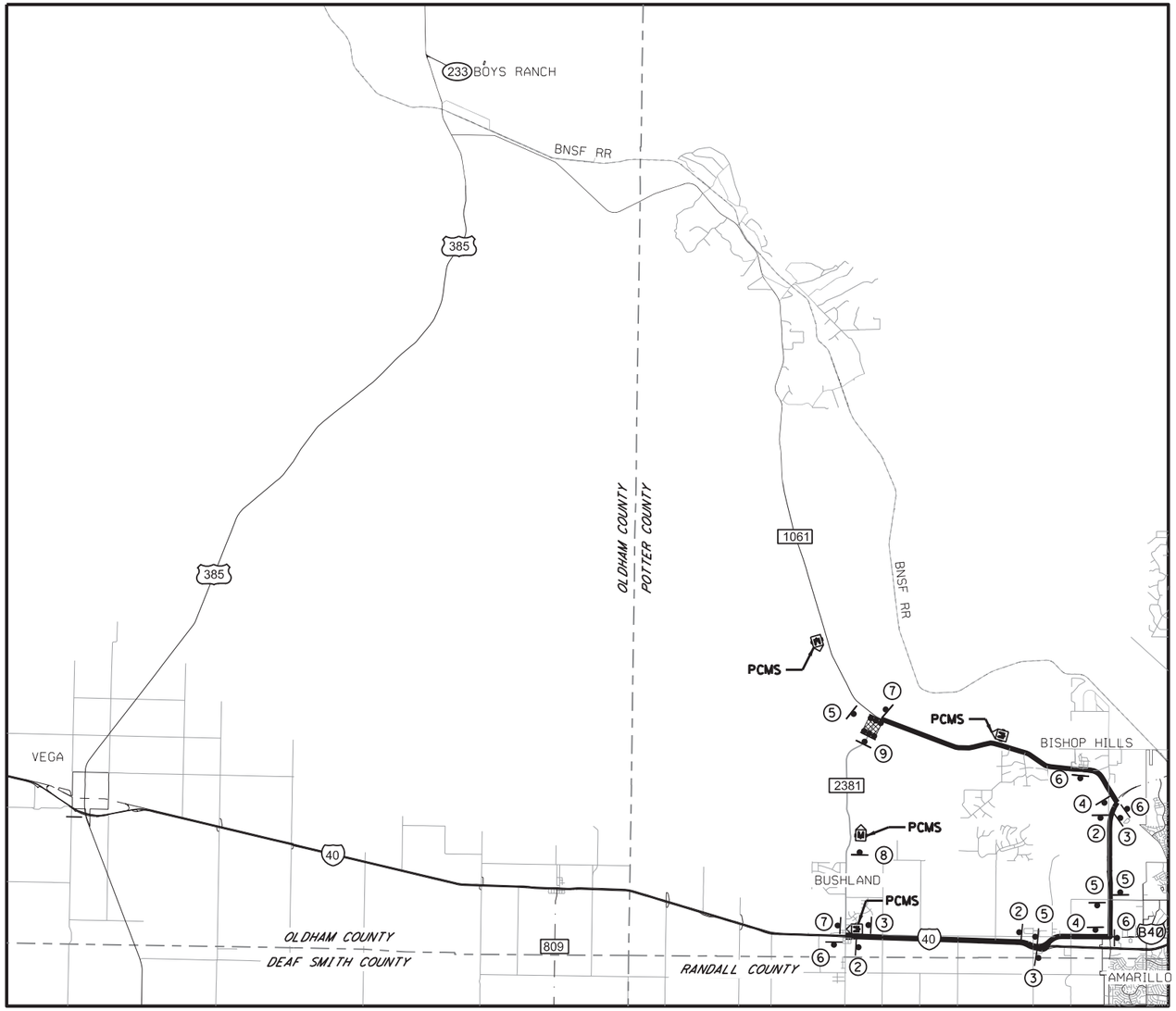

N

RM 1061 TO RM 2381 DETOUR LENGTH:
18.10 MILES

LEGEND:

- WORK ZONE
- SIGN
- TYPE III BARRICADE
- PCMS
- PROPOSED DETOUR ROUTE

NOTES:

1. SEE LATEST TMUTCD, BC, AND TCP STANDARDS FOR TYPICAL ADVANCED WARNING SIGNING, PLACEMENT, AND TRAFFIC CONTROL DETAILS. ADJUSTMENTS MAY BE NECESSARY BASED ON CURRENT FIELD CONDITIONS.

RM 2381 DETOUR ROUTES

① DETOUR AHEAD — CW20-2D (36" X 36")

② DETOUR — M4-8 (24" X 12")
RANCH 2381 ROAD — M1-6R-4 (24" X 24")
CW16-7PL (21" X 15")

③ DETOUR — M4-8 (24" X 12")
RANCH 2381 ROAD — M1-6R-4 (24" X 24")
CW16-7PR (21" X 15")

④ DETOUR — M4-8 (24" X 12")
RANCH 2381 ROAD — M1-6R-4 (24" X 24")
CW16-5PR (21" X 15")

⑤ DETOUR — M4-8 (24" X 12")
RANCH 2381 ROAD — M1-6R-4 (24" X 24")
CW16-5PR (24" X 18")

⑥ DETOUR — M4-8 (24" X 12")
RANCH 2381 ROAD — M1-6R-4 (24" X 24")
CW16-5PL (21" X 15")

⑦ END DETOUR — M4-8A (24" X 18")

⑧ ROAD CLOSED 4 MILES AHEAD LOCAL TRAFFIC ONLY — R11-3a (60" X 30")

⑨ ROAD CLOSED — R11-2 (48" X 30")

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER
03/31/2021

DETOUR LAYOUT

SCALE: 1" = 20000'

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		26

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

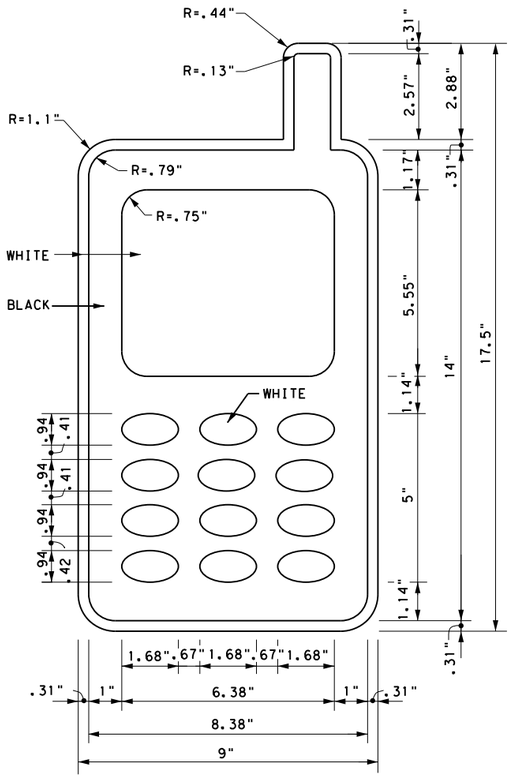
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

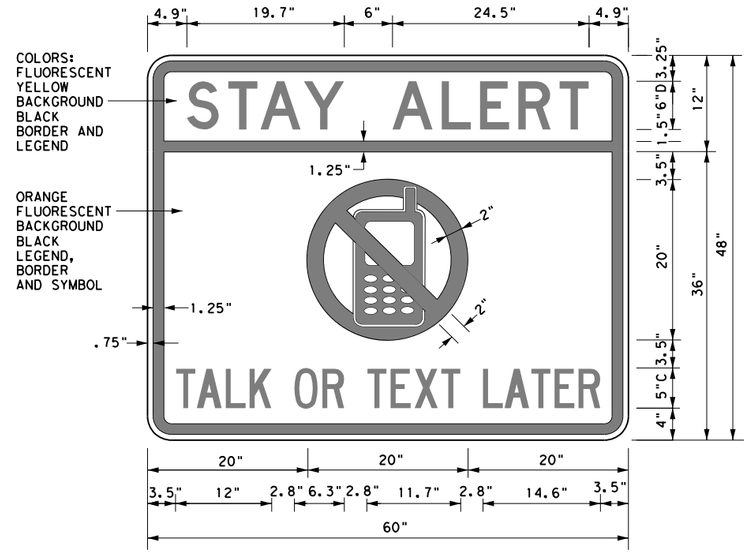
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	AMA	POTTER		27

DATE: 2/10/2021 4:47:16 PM
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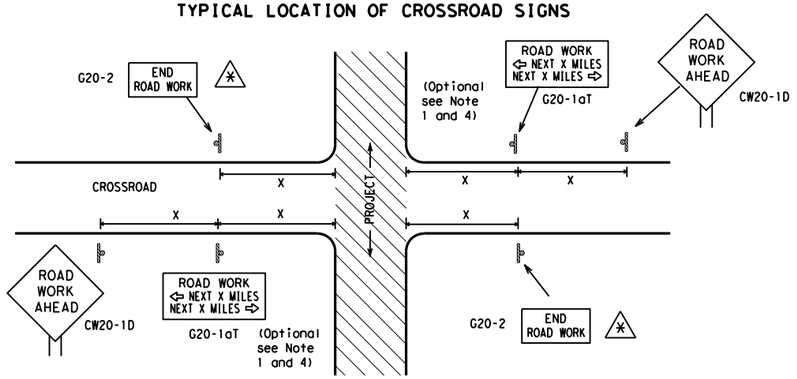
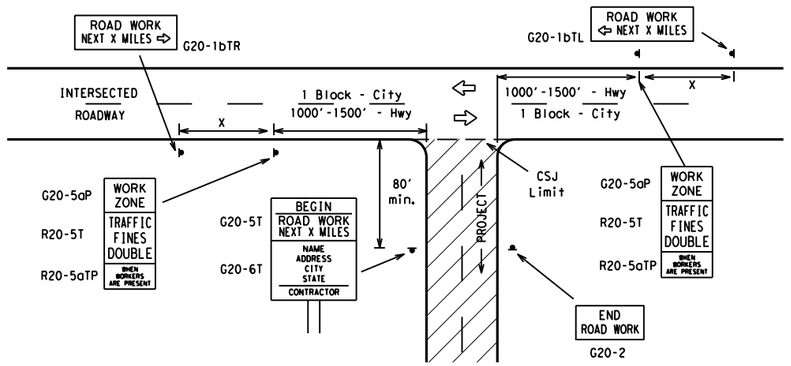
TYPICAL LOCATION OF CROSSROAD SIGNS



(*) 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. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

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

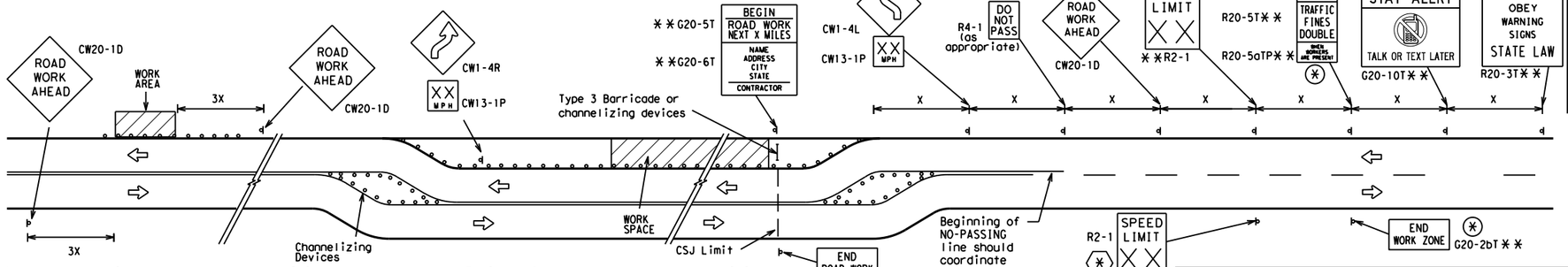
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

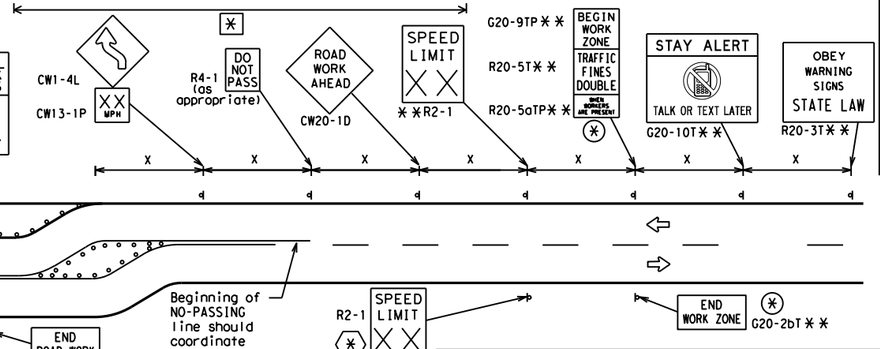
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

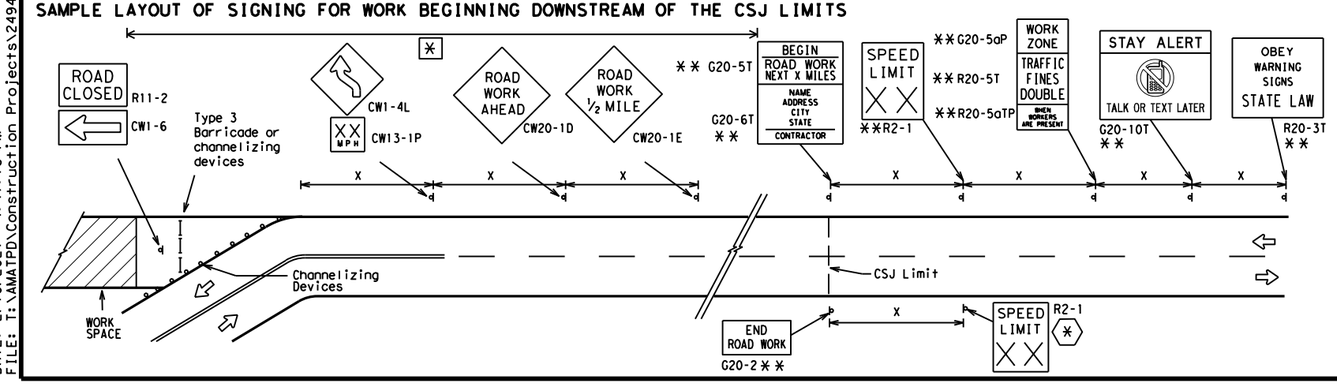


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

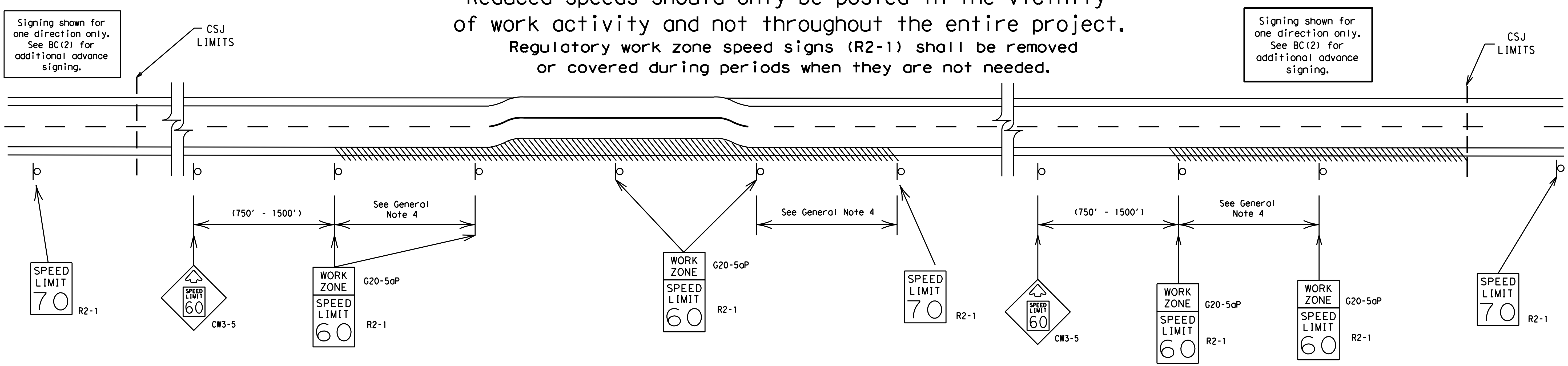
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AMA	POTTER		28

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2494	01	015	RM 2381
9-07 8-14	DIST		COUNTY	SHEET NO.
7-13	AMA		POTTER	29

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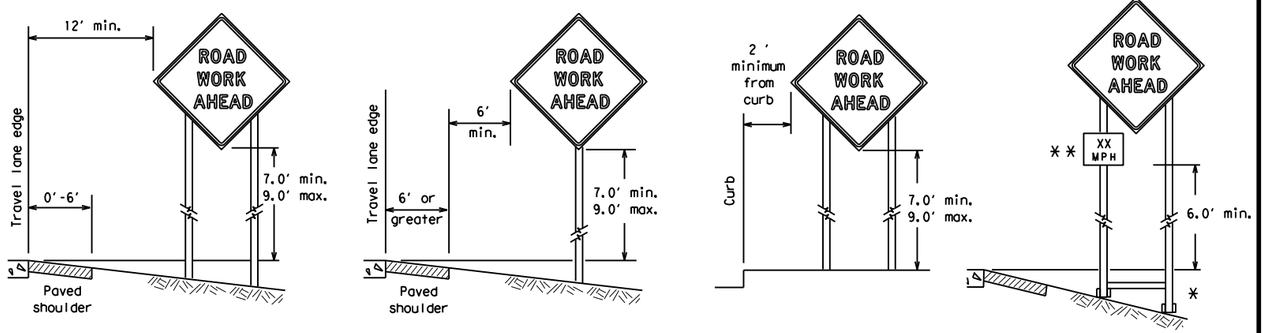
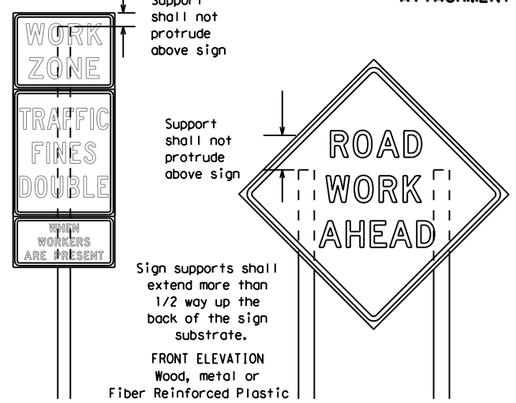
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



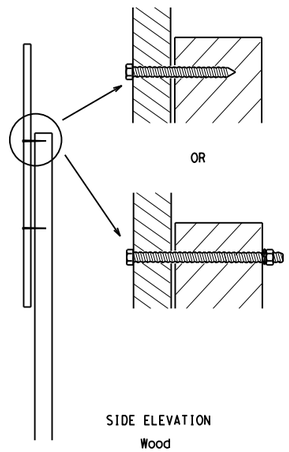
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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



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

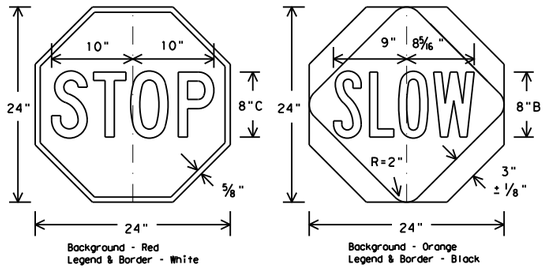


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AMA	POTTER		30

DATE: 2/10/2021 4:47:22 PM
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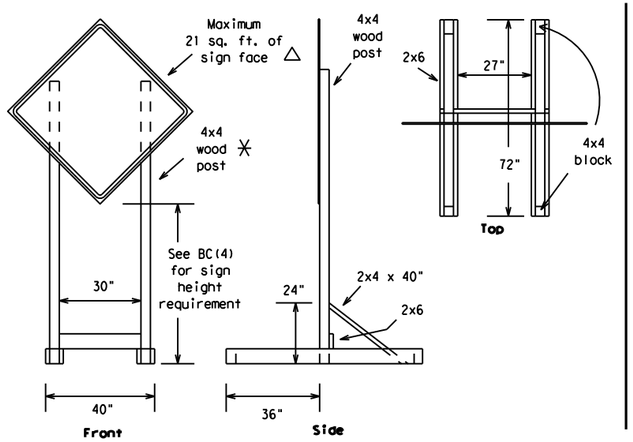
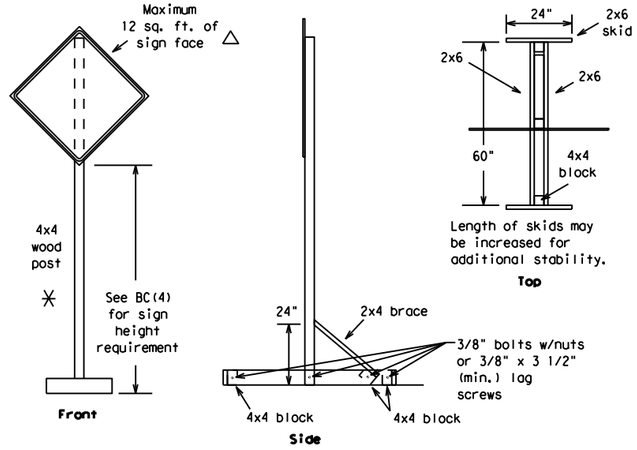
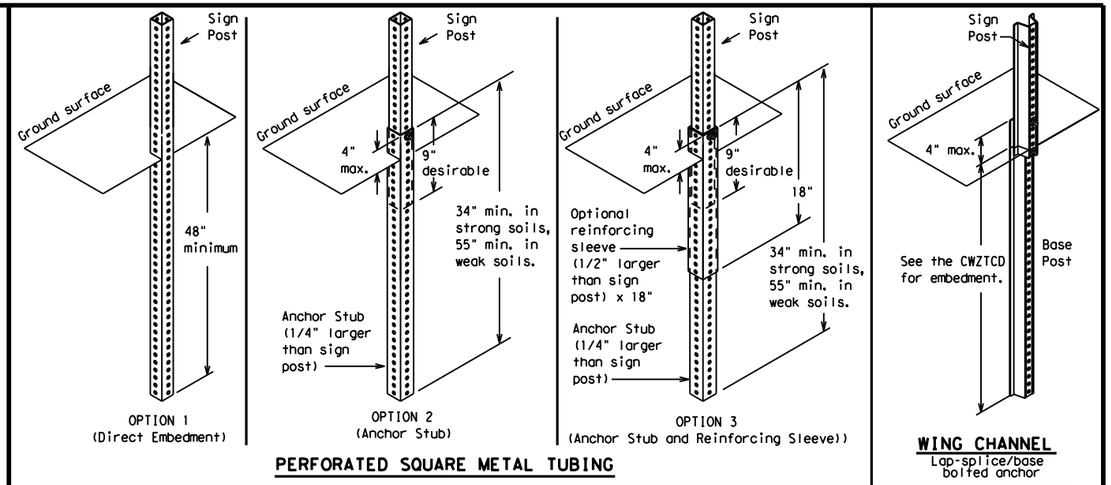




SKID MOUNTED WOOD SIGN SUPPORTS

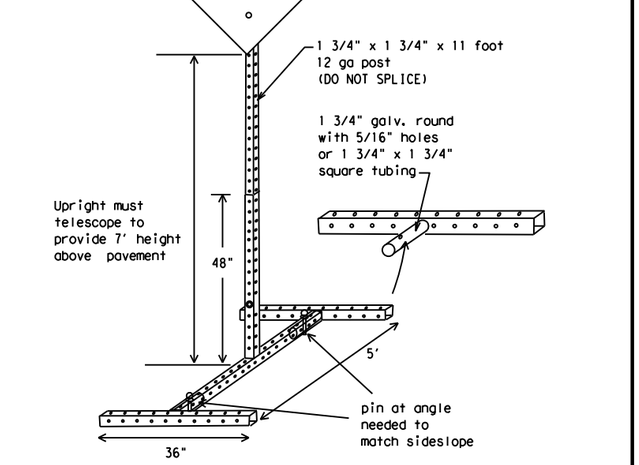
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

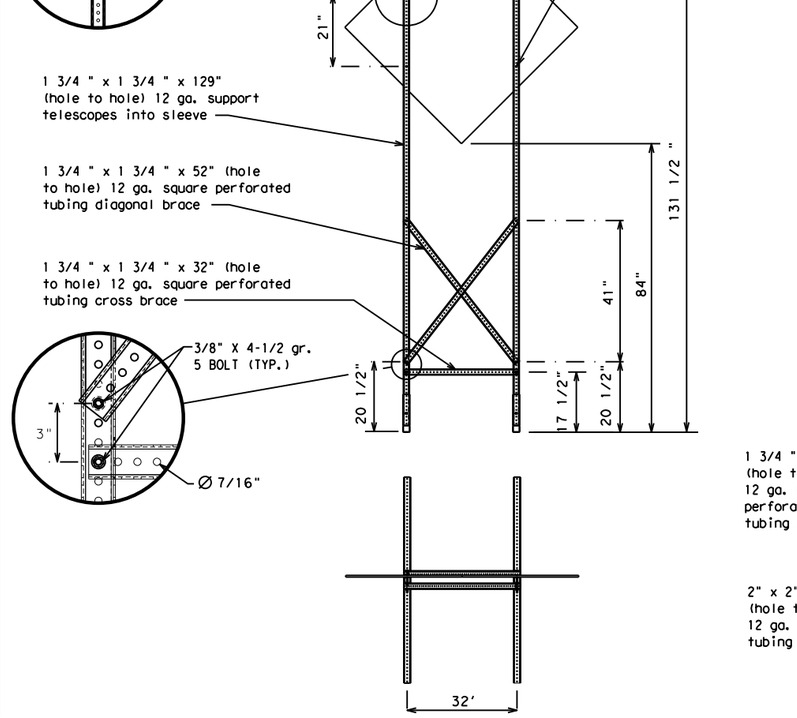


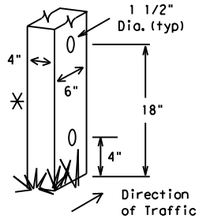
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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

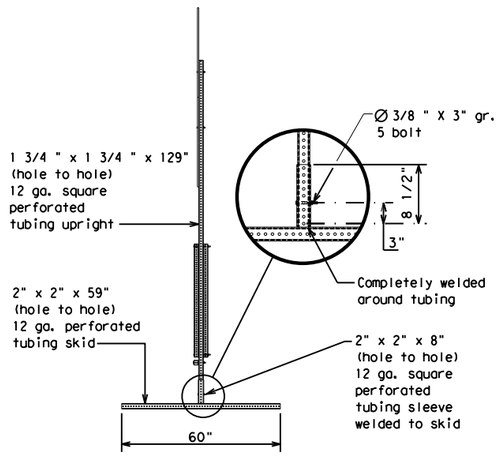






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AMA	POTTER		31

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AMA	POTTER		32

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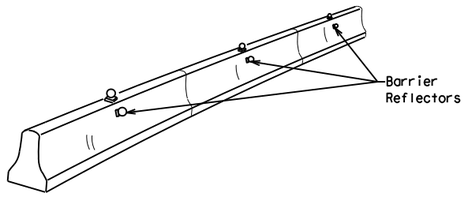
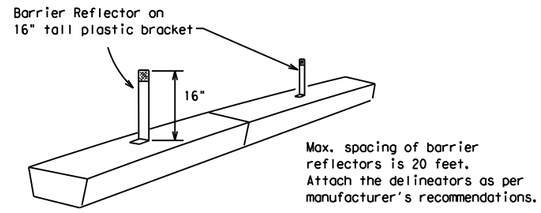
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

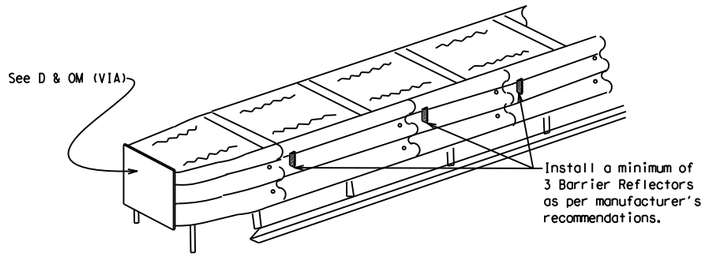


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

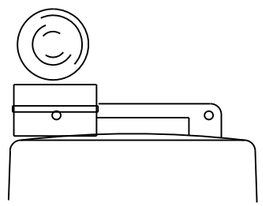


DELINEATION OF END TREATMENTS

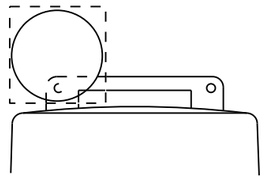
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

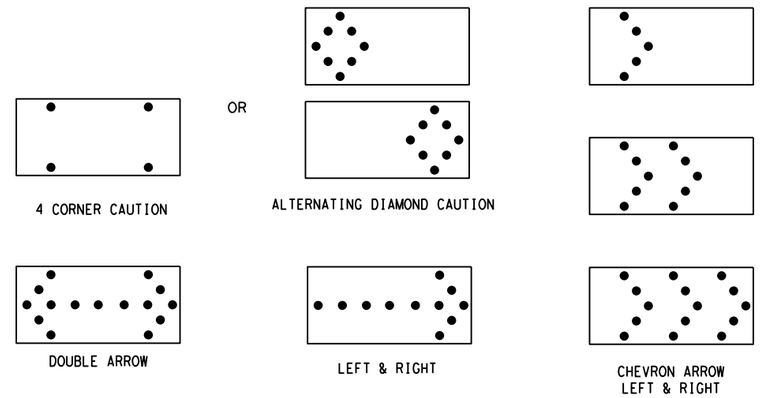
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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7-13	AMA	POTTER		33

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

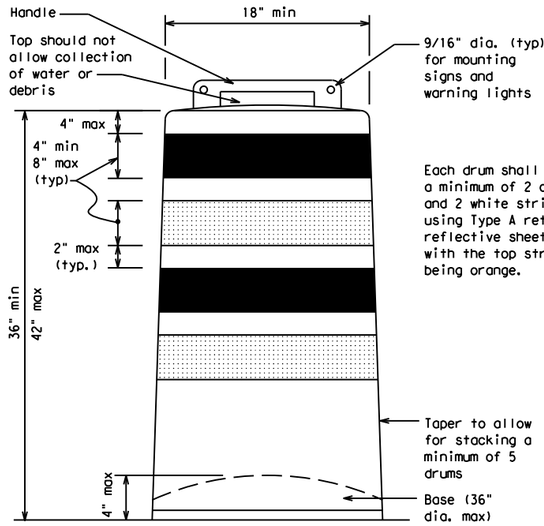
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

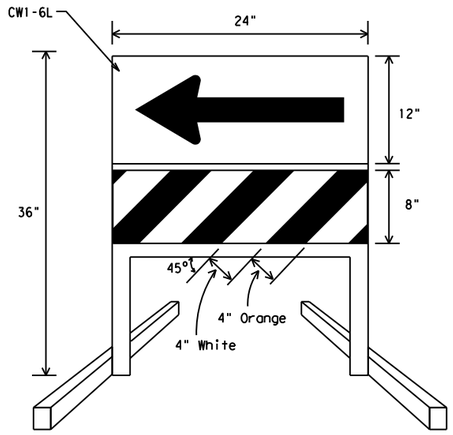
RETROREFLECTIVE SHEETING

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

BALLAST

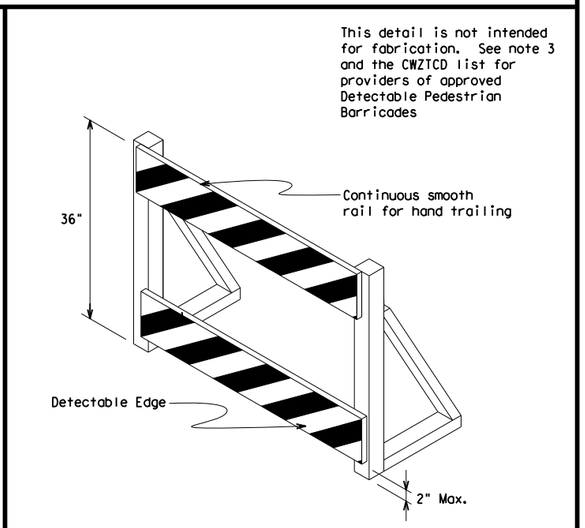
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





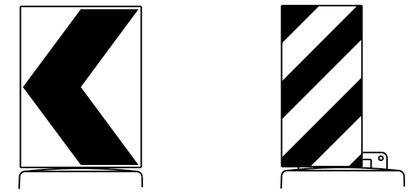
DIRECTION INDICATOR BARRICADE

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



DETECTABLE PEDESTRIAN BARRICADES

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



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

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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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9-07 8-14	AMA	POTTER		34

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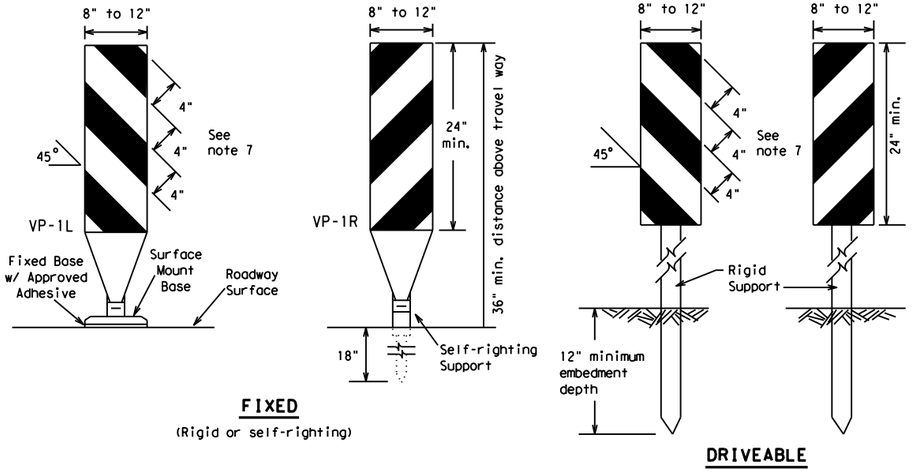
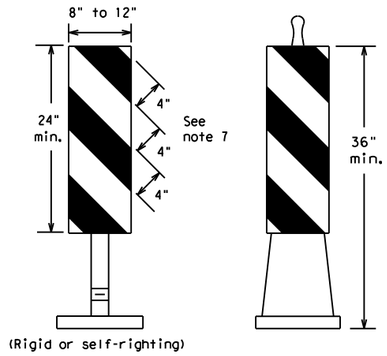


FIXED
(Rigid or self-righting)

DRIVEABLE

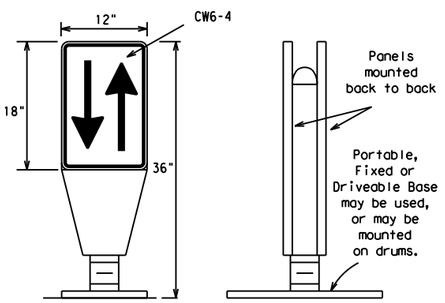


(Rigid or self-righting)

PORTABLE

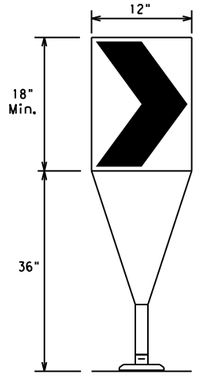
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



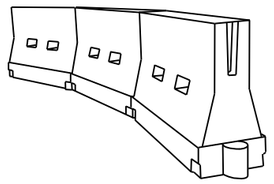
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AMA	POTTER		35

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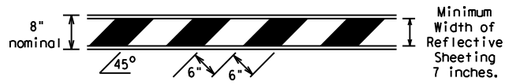
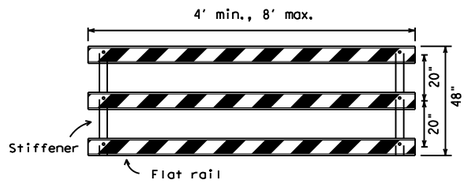
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



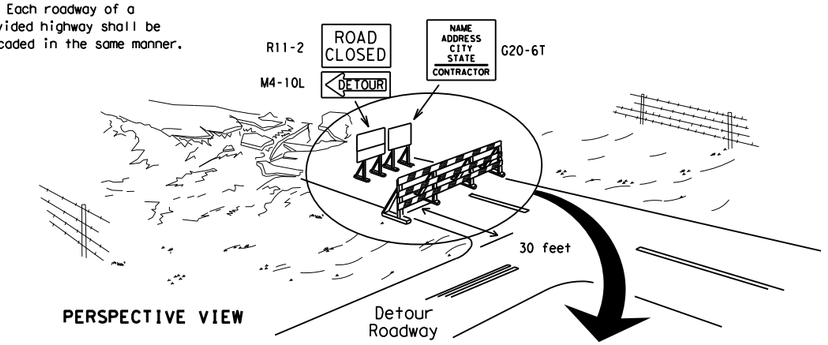
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

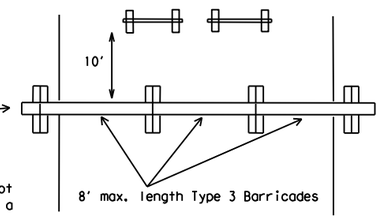
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

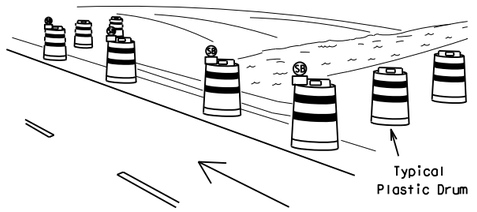
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

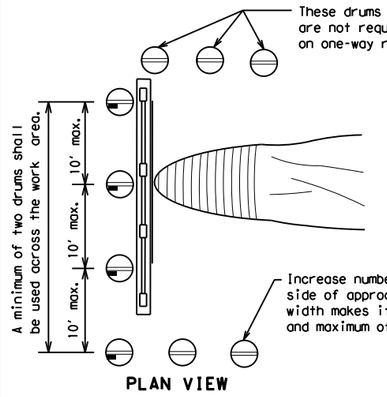
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

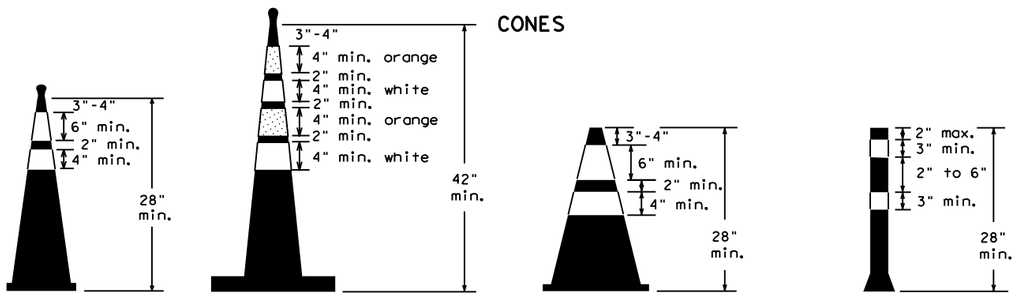
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

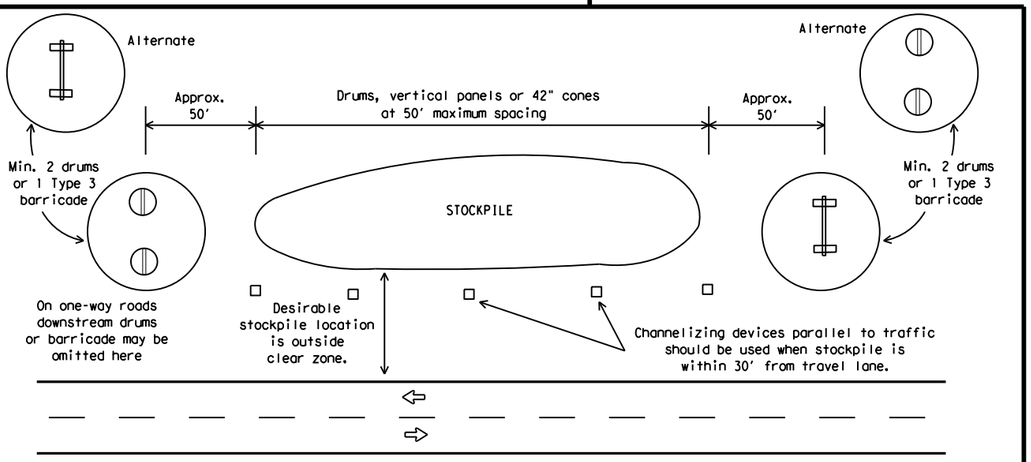
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

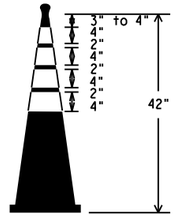
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

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Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

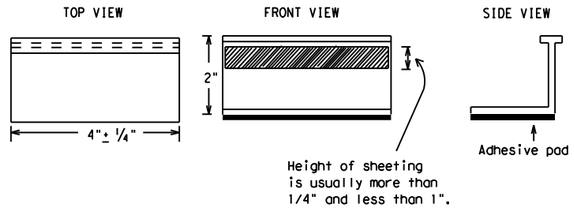
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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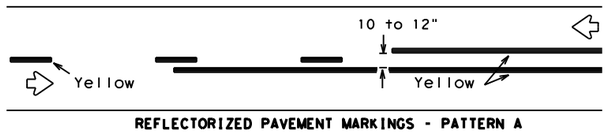
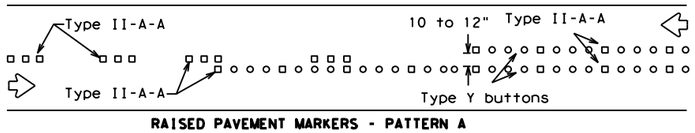
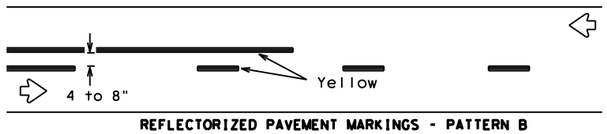
PAVEMENT MARKING PATTERNS



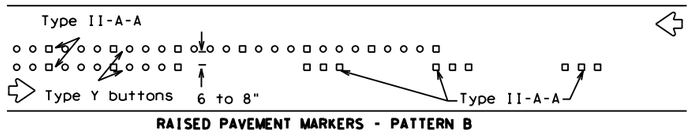
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



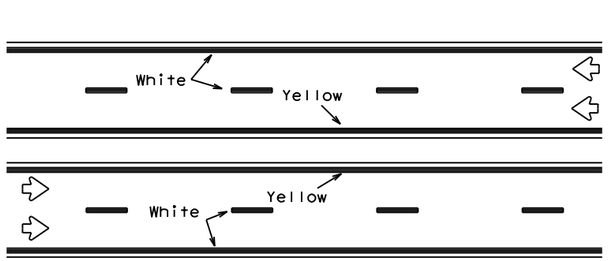
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



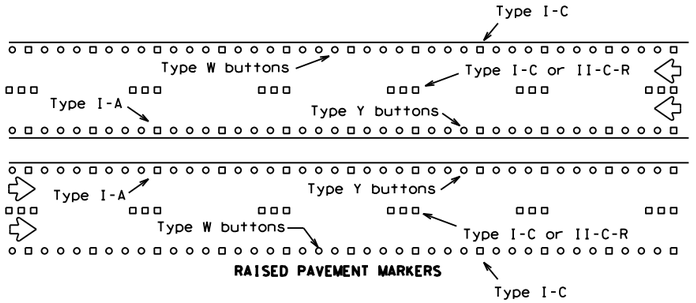
RAISED PAVEMENT MARKERS - PATTERN B

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

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



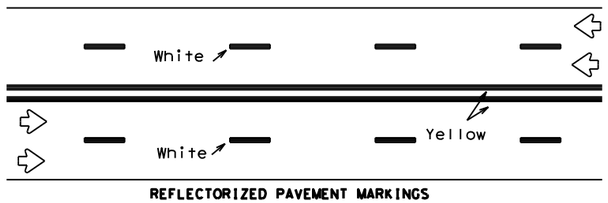
REFLECTORIZED PAVEMENT MARKINGS



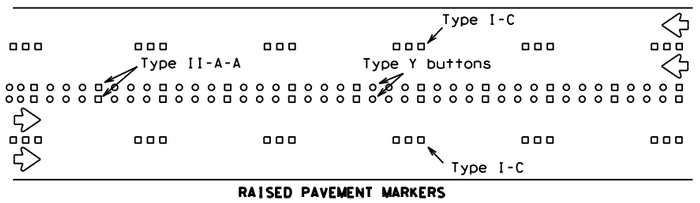
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



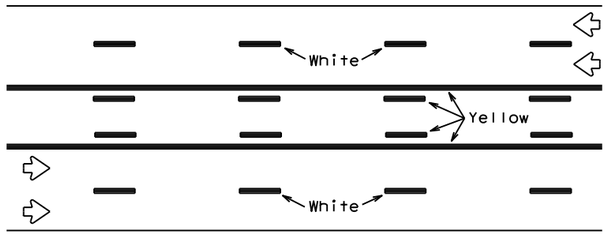
REFLECTORIZED PAVEMENT MARKINGS



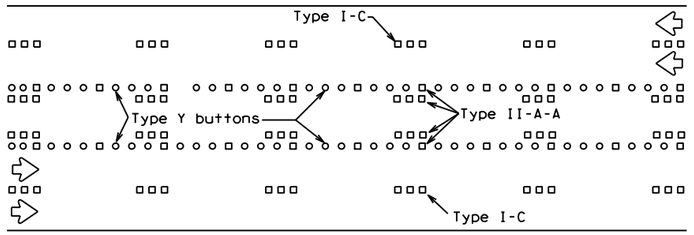
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

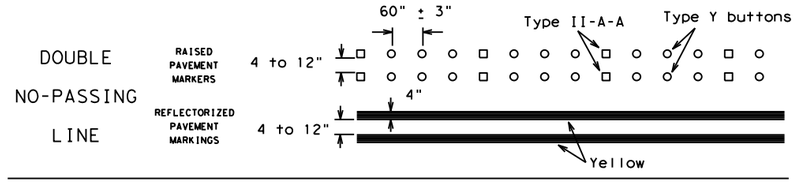
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

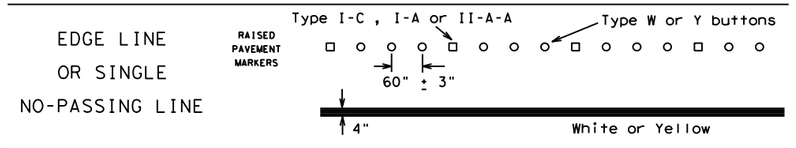
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

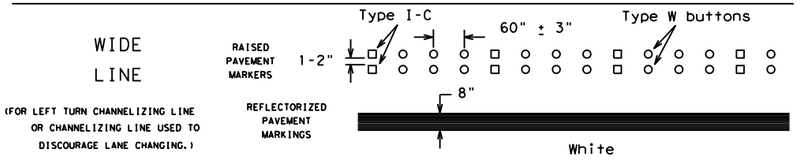


EDGE LINE OR SINGLE NO-PASSING LINE



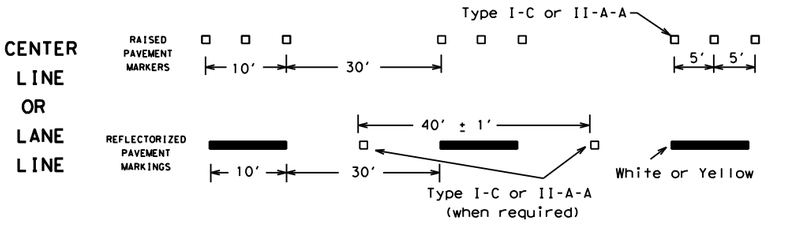
WIDE LINE

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

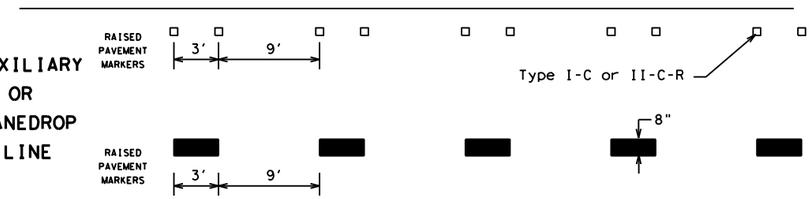


BROKEN LINES

CENTER LINE OR LANE LINE

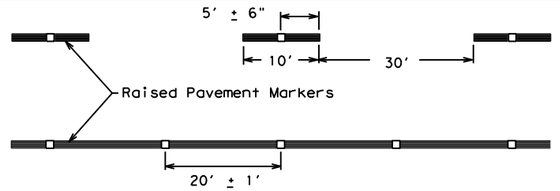


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	AMA	POTTER		38
11-02 8-14				

106

DATE: 2/10/2021 4:47:39 PM
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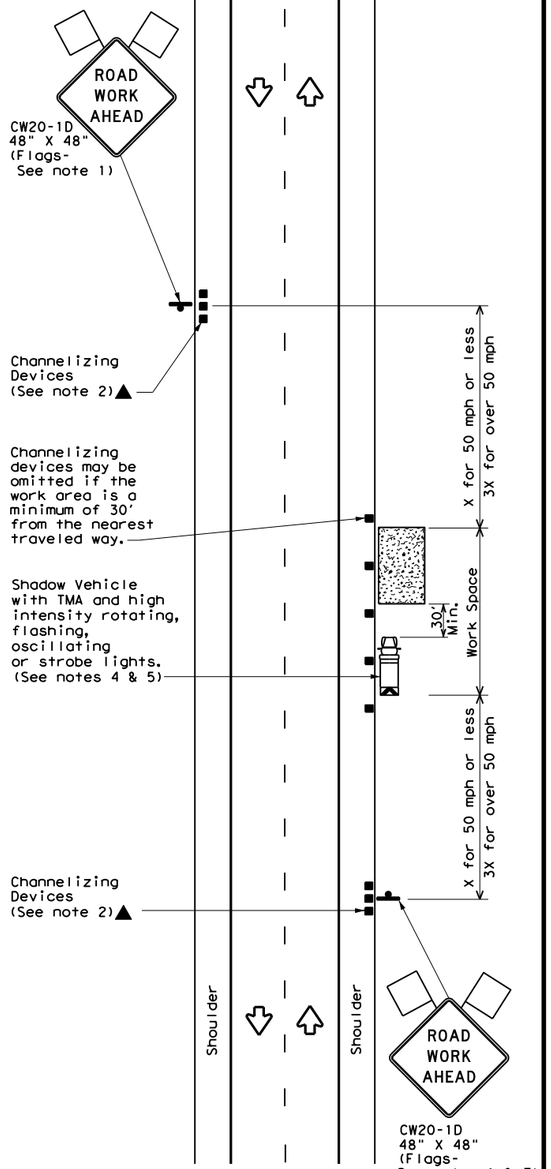
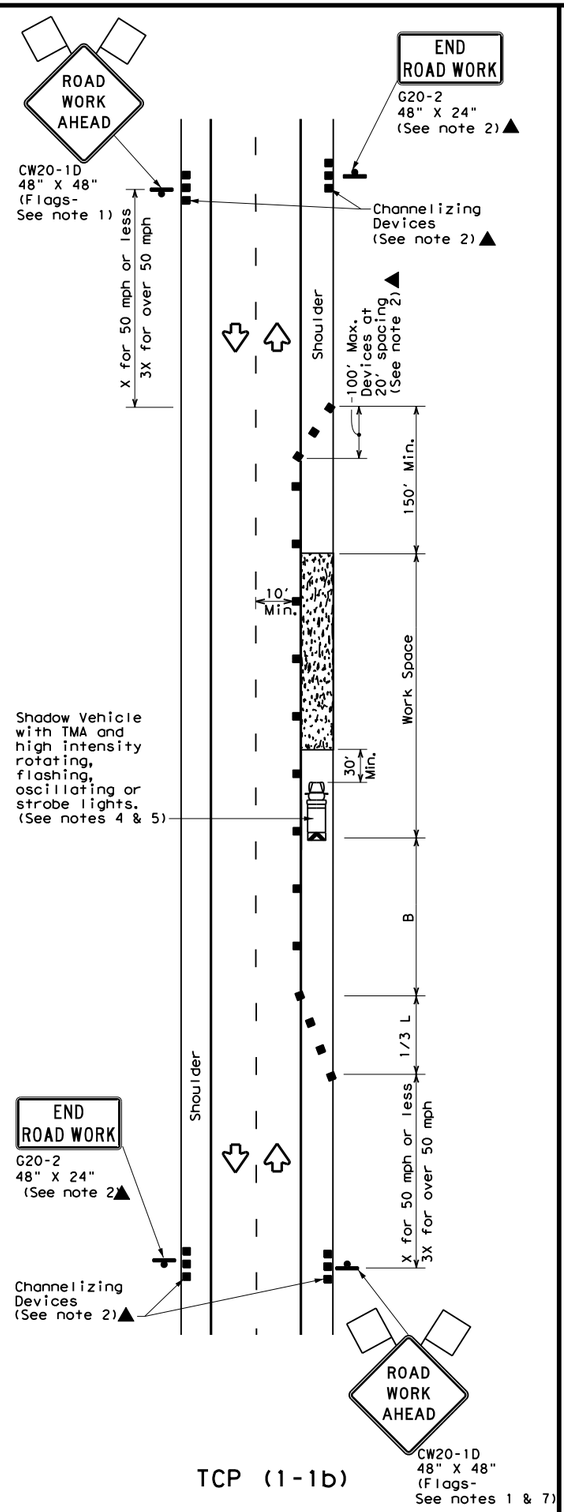


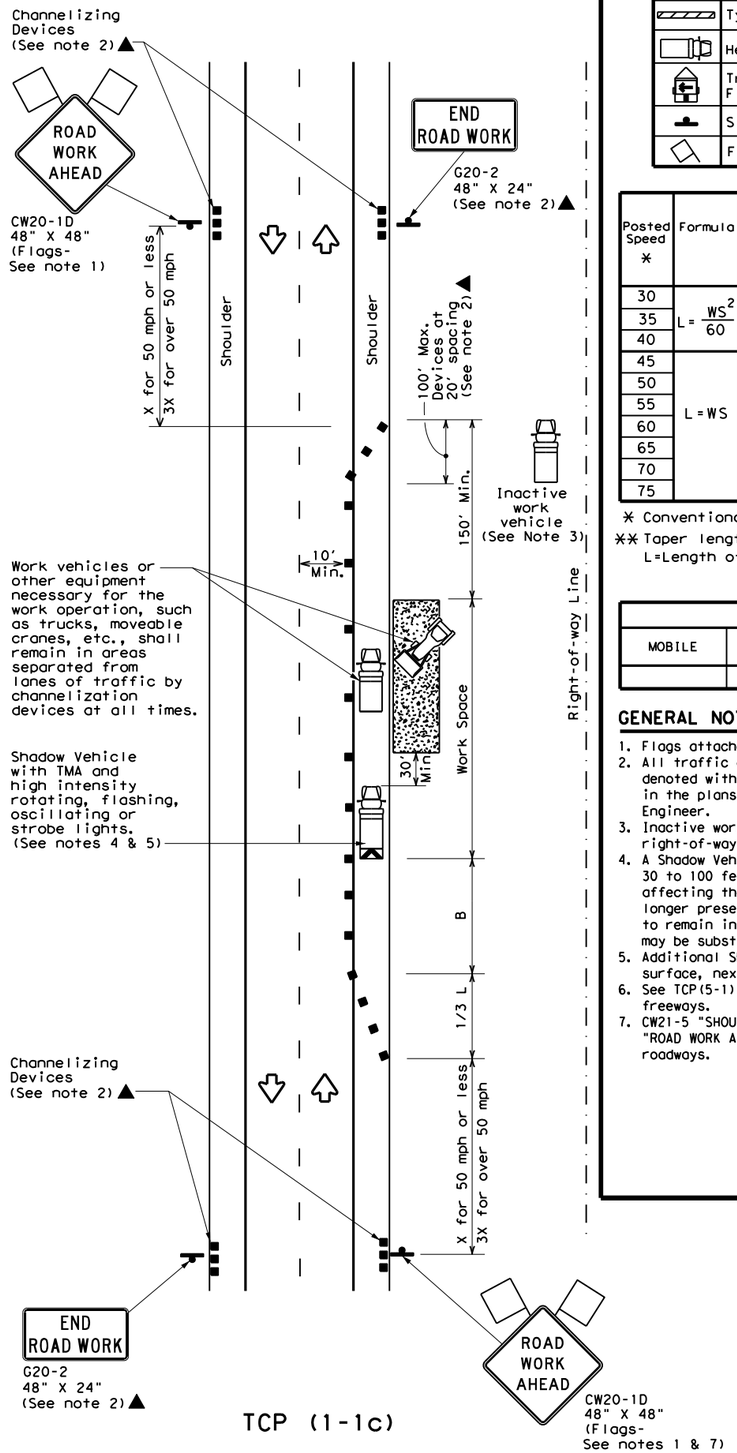
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	AMA	POTTER		39

151

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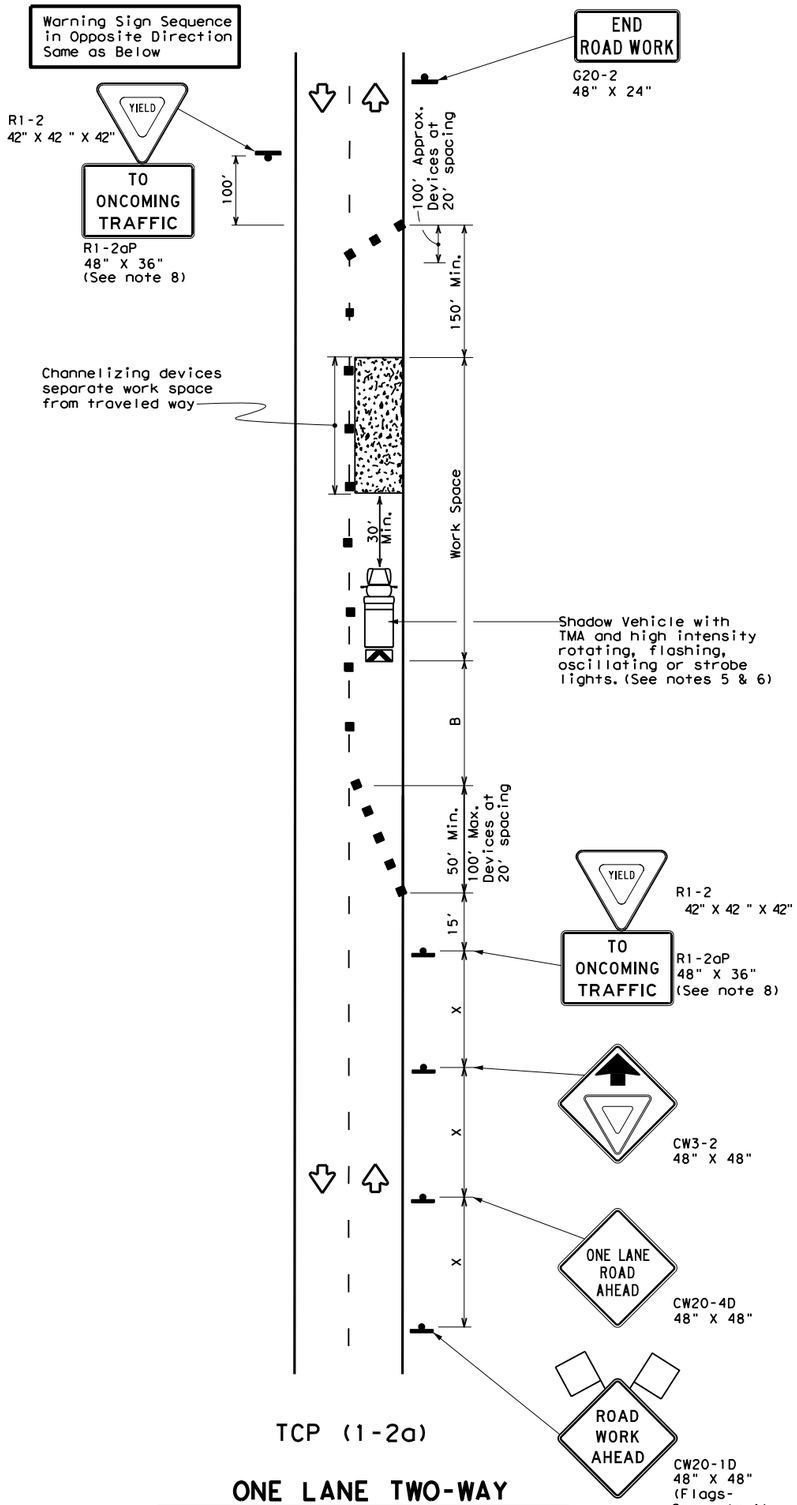
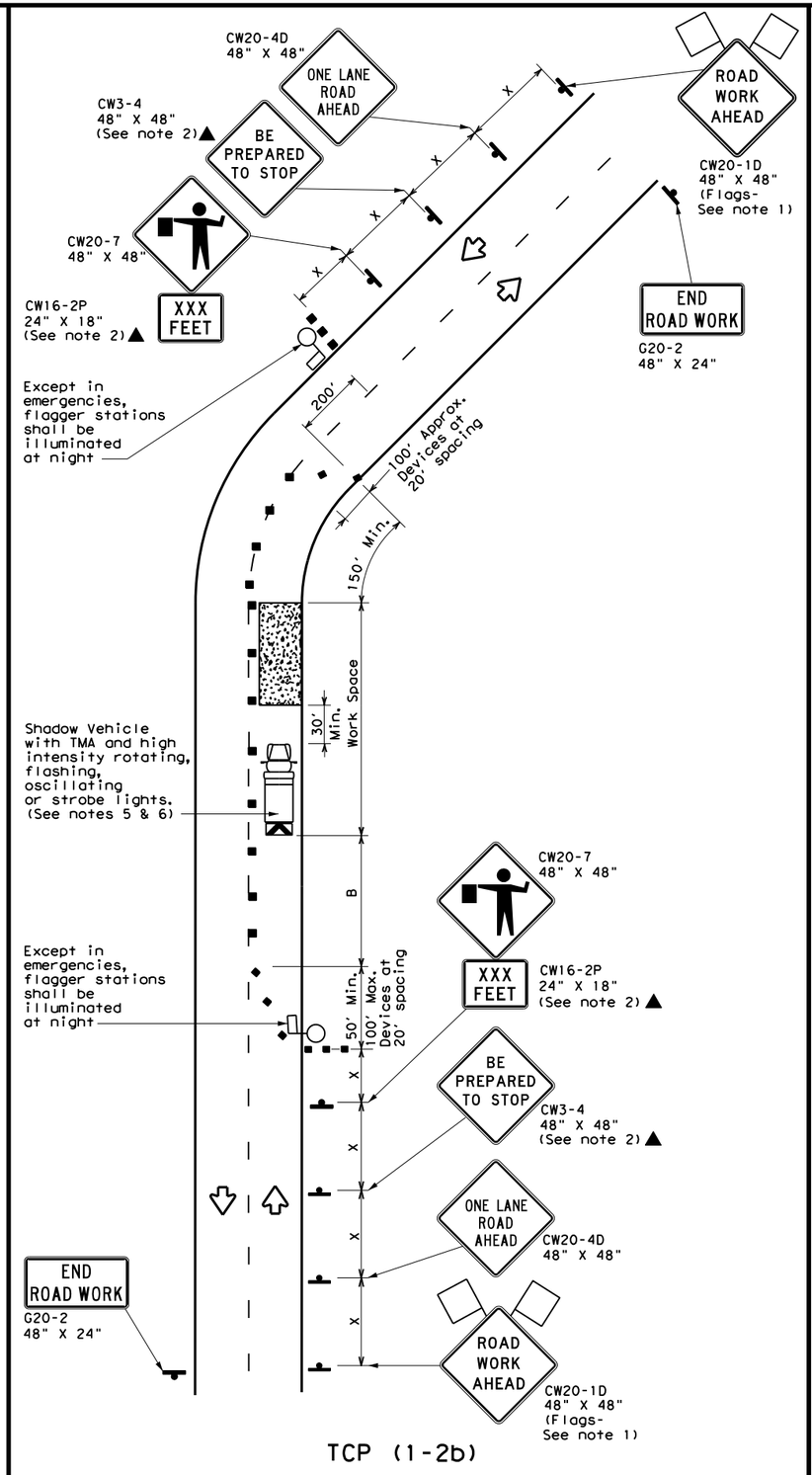


TCP (1-2a)

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



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		40

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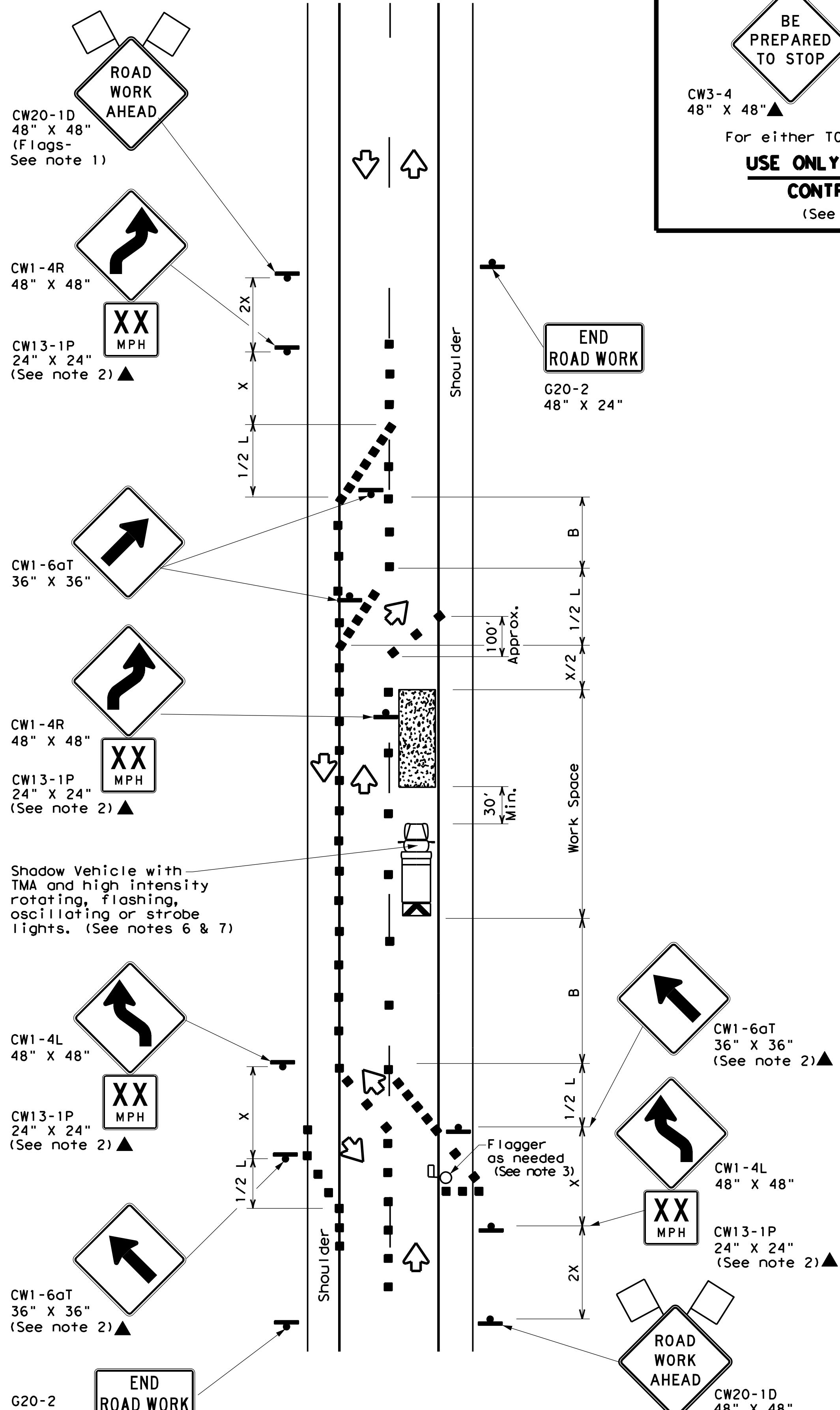
For either TCP(1-3a) or TCP(1-3b)

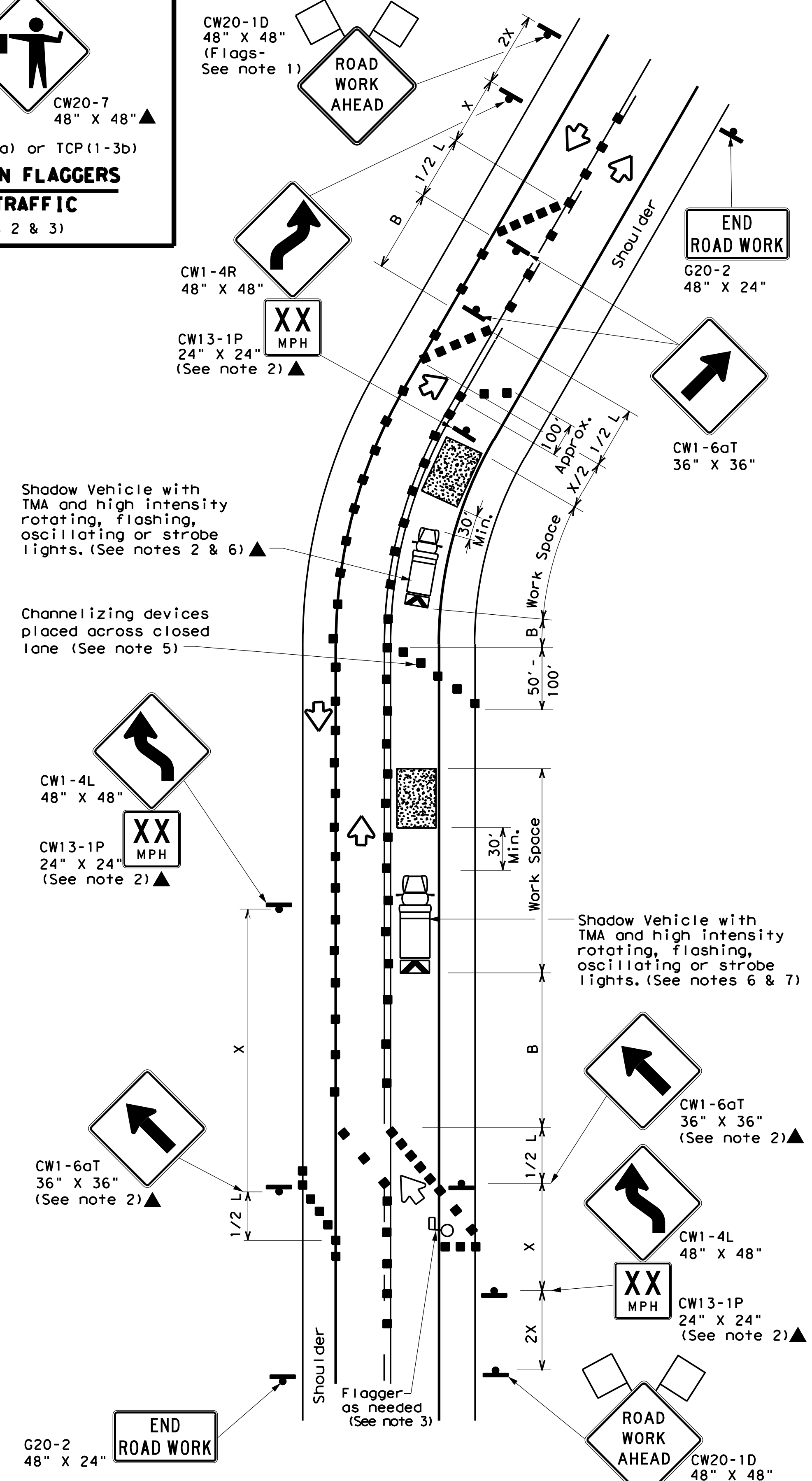
USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



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

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY	
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	2494	01	015	RM 2381	
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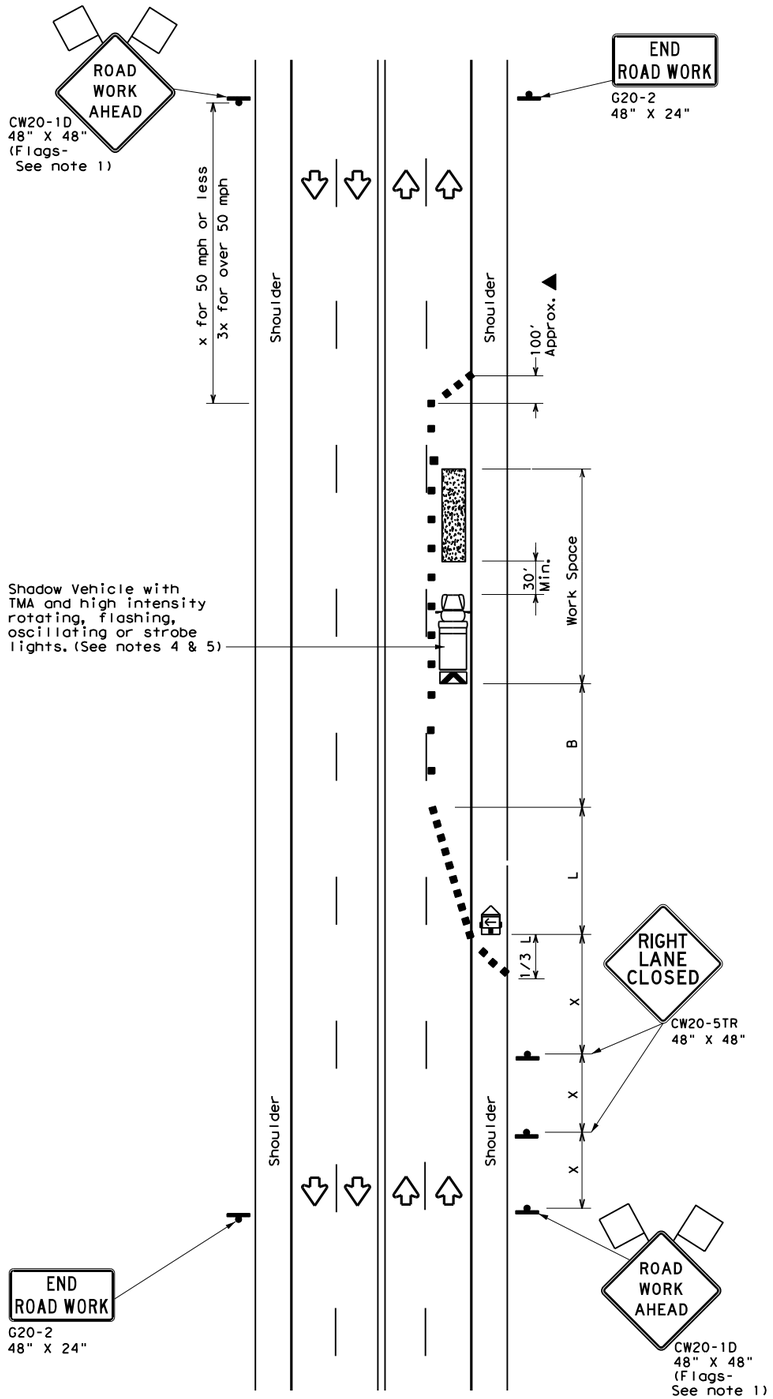
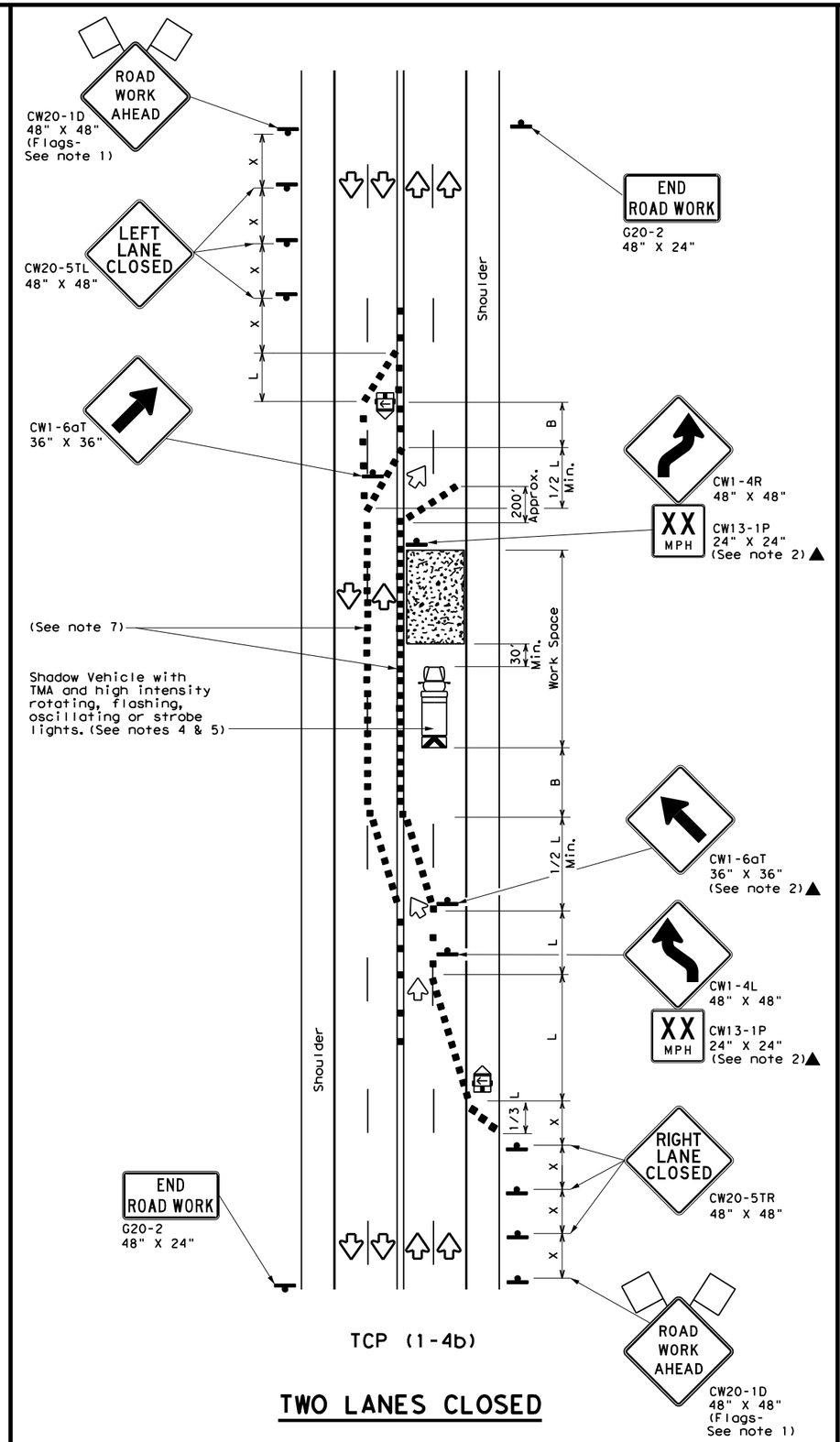


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

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

TCP (1-4a)

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

TCP (1-4b)

7. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

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8-95 2-12	AMA	POTTER		42
1-97 2-18				

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TCP (1-6a)

ONE LANE TWO-WAY CONTROL WITH STOP/SLOW AFADs

TCP (1-6b)

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

LEGEND

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
AUTOMATED FLAGGER ASSISTANCE DEVICES (AFADS)

TCP(1-6)-18

FILE: tcp1-6-18.dgn	DN:		CK:	DW:		CK:
© TxDOT February 2012	CONT	SECT	JOB		HIGHWAY	
REVISIONS 2-18	2494	01	015		RM 2381	
	DIST	COUNTY			SHEET NO.	
	AMA	POTTER			43	

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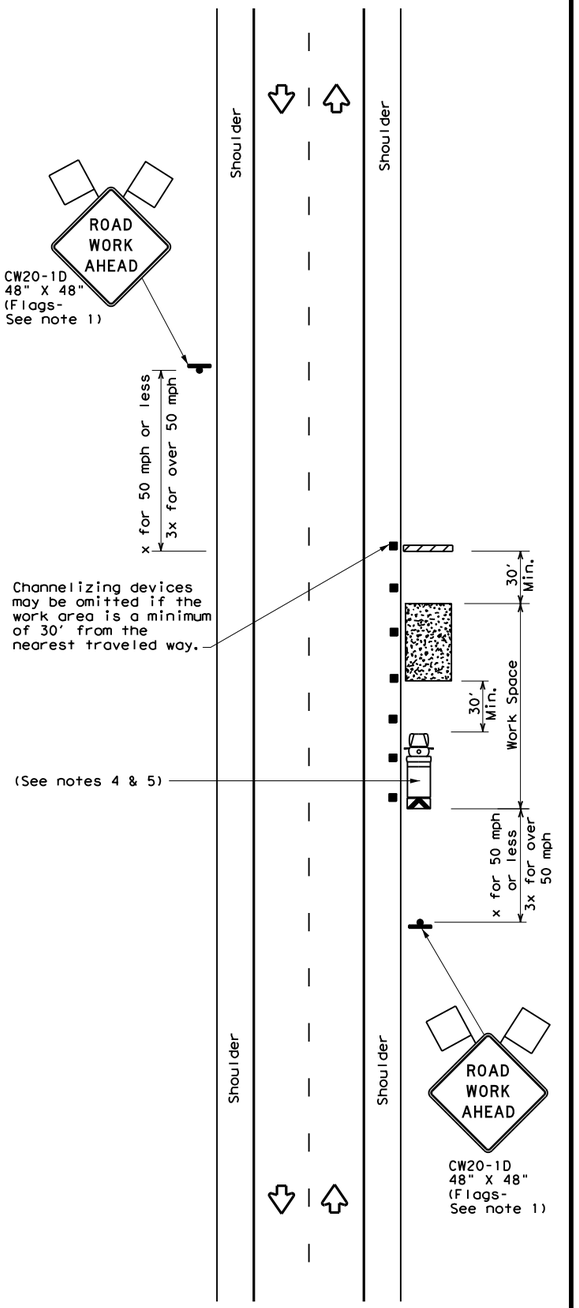
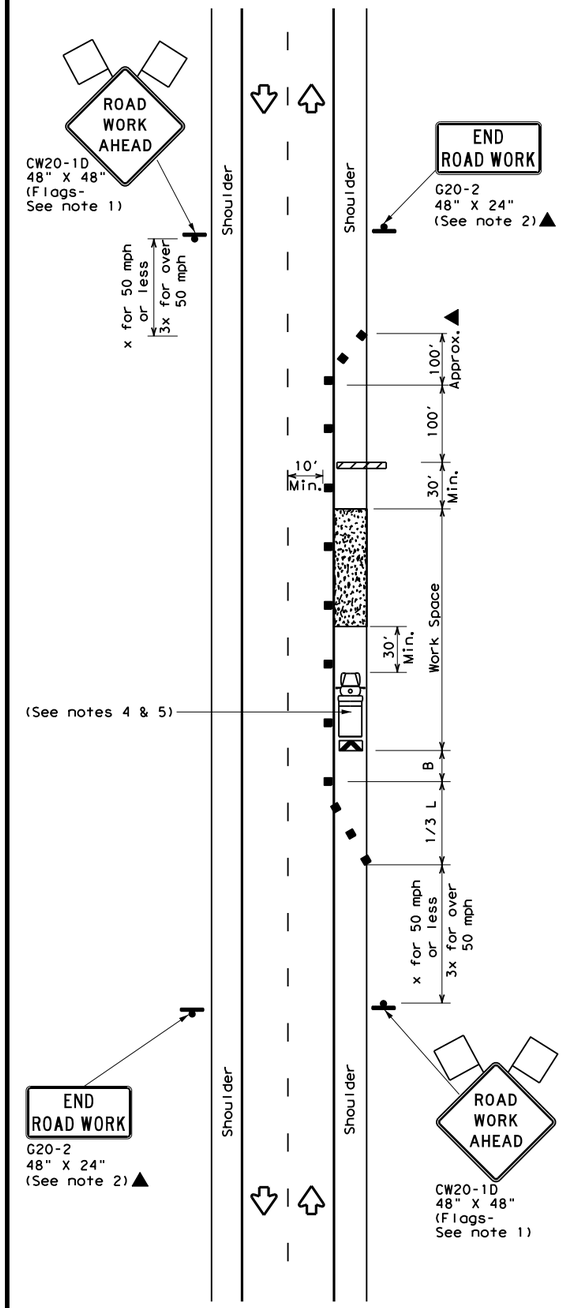


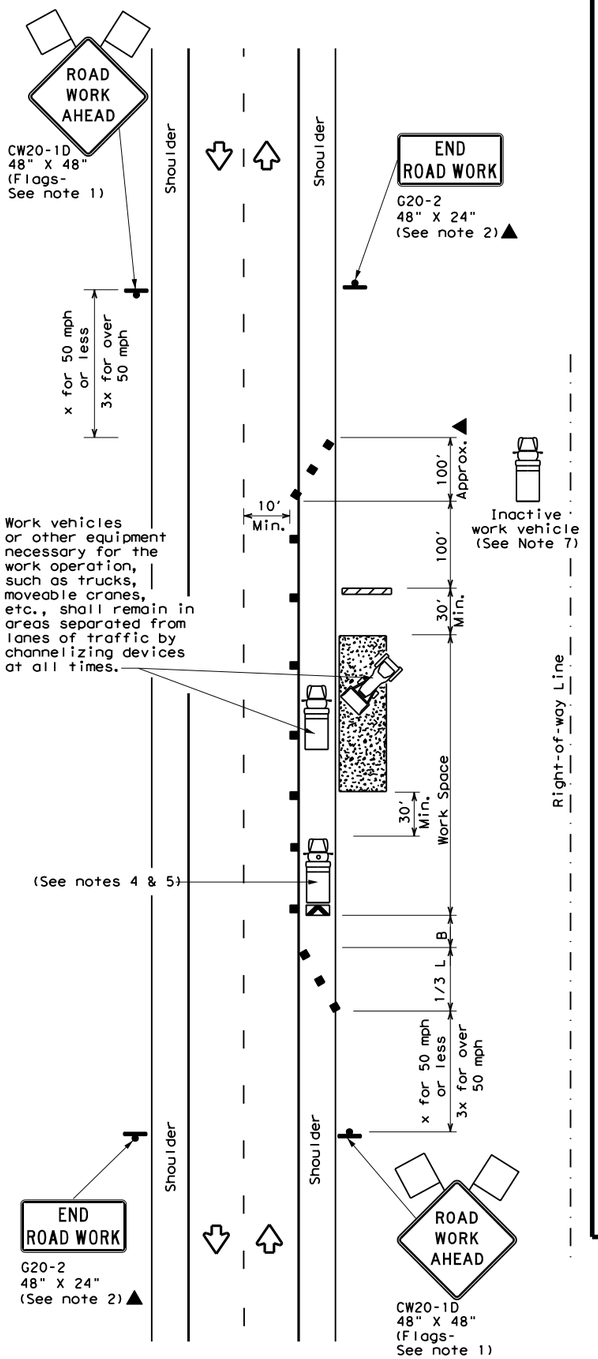
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AMA	POTTER		44
1-97 2-18				

DATE: 2/10/2021 4:48:00 PM
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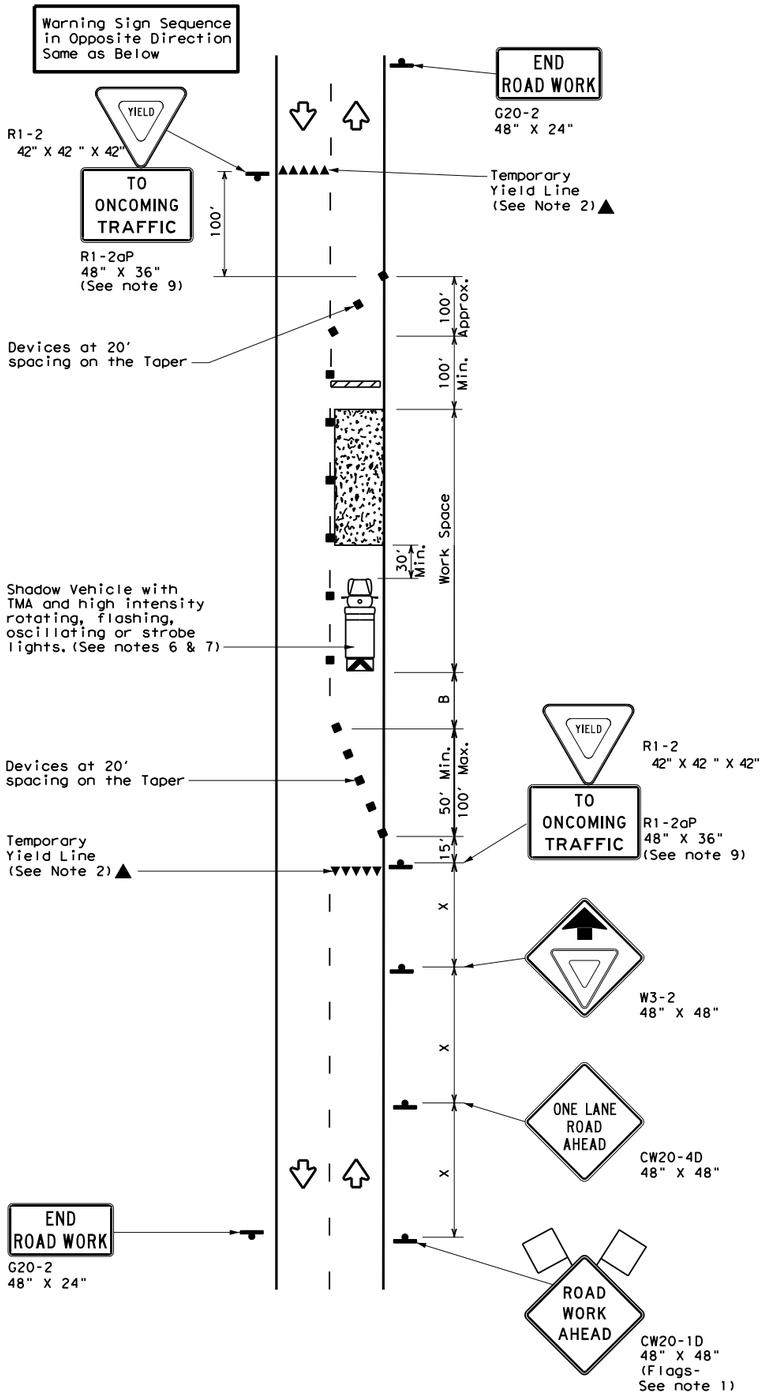
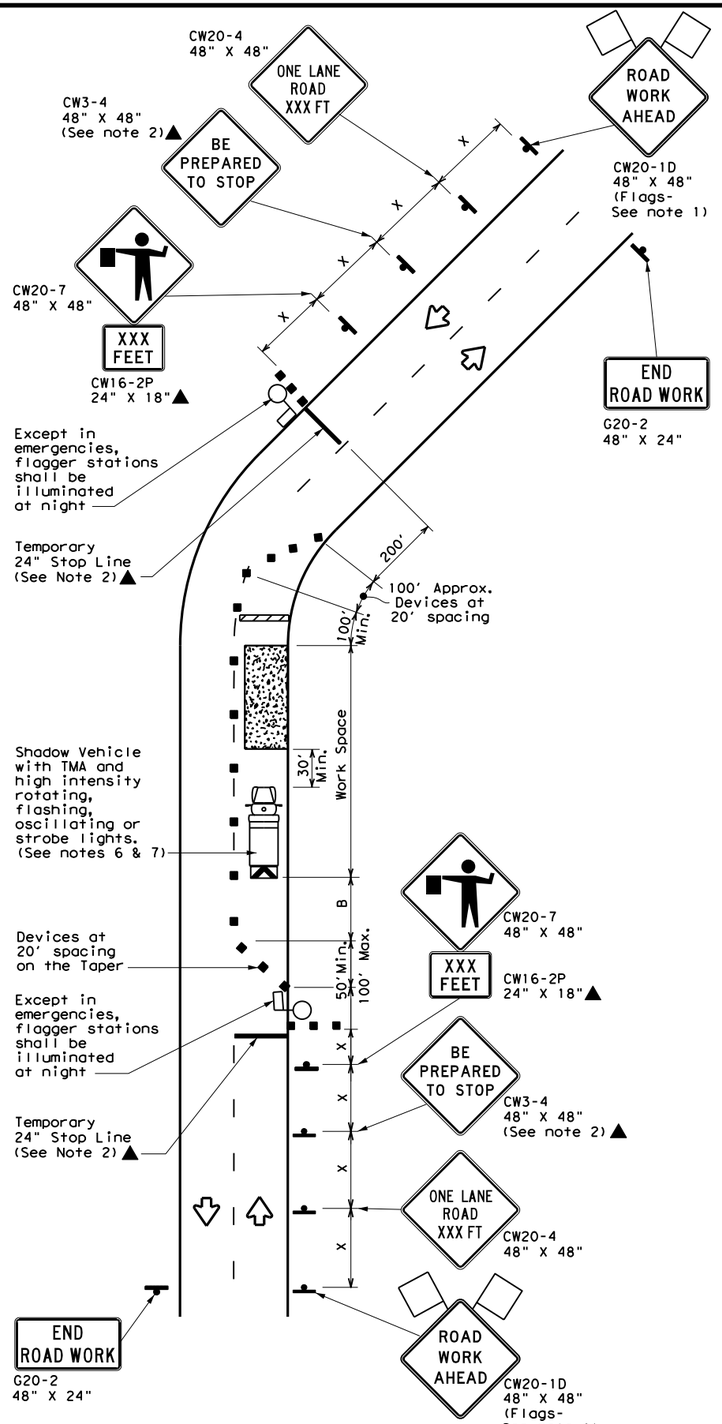


TCP (2-2a)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		45

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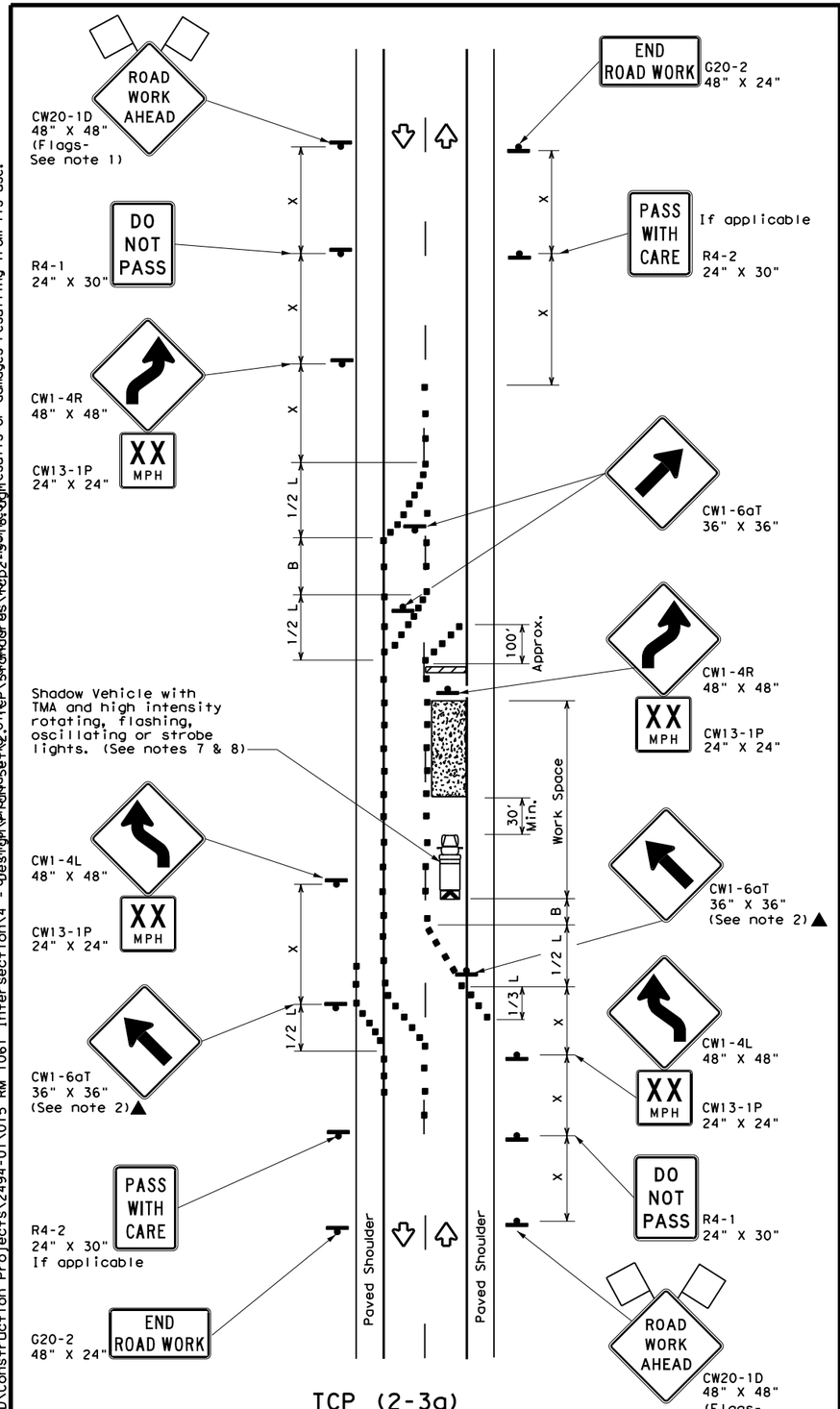
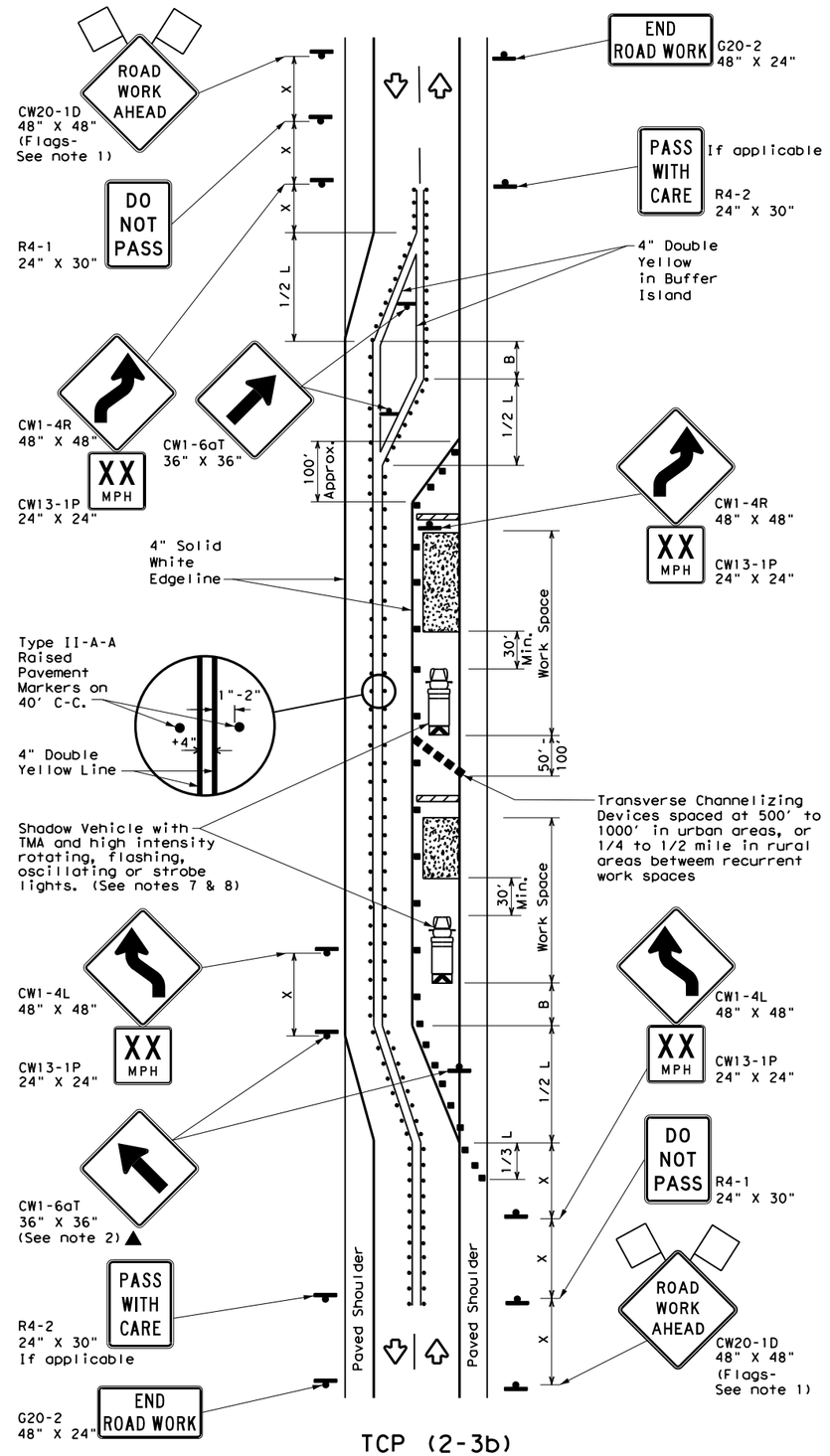


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-3a)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	AMA	POTTER		46
4-98 2-18				

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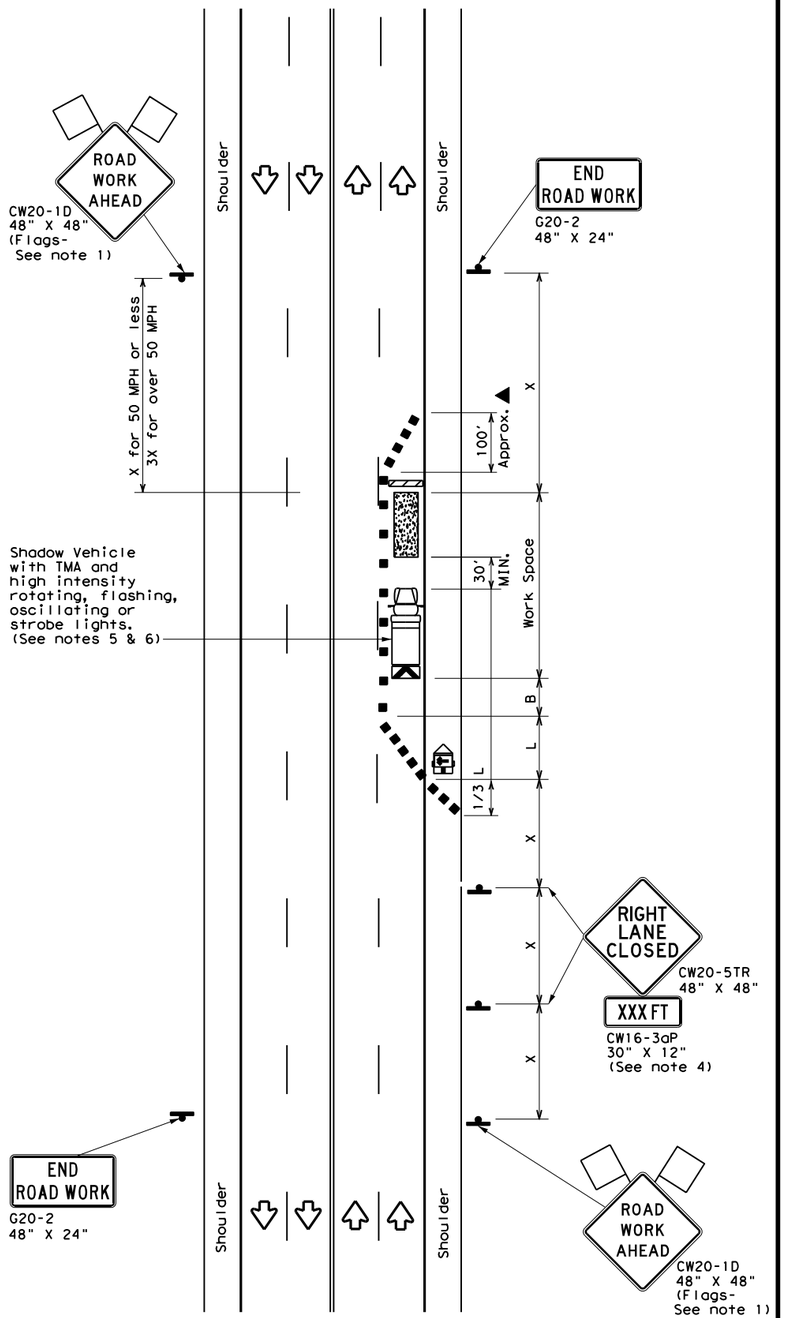
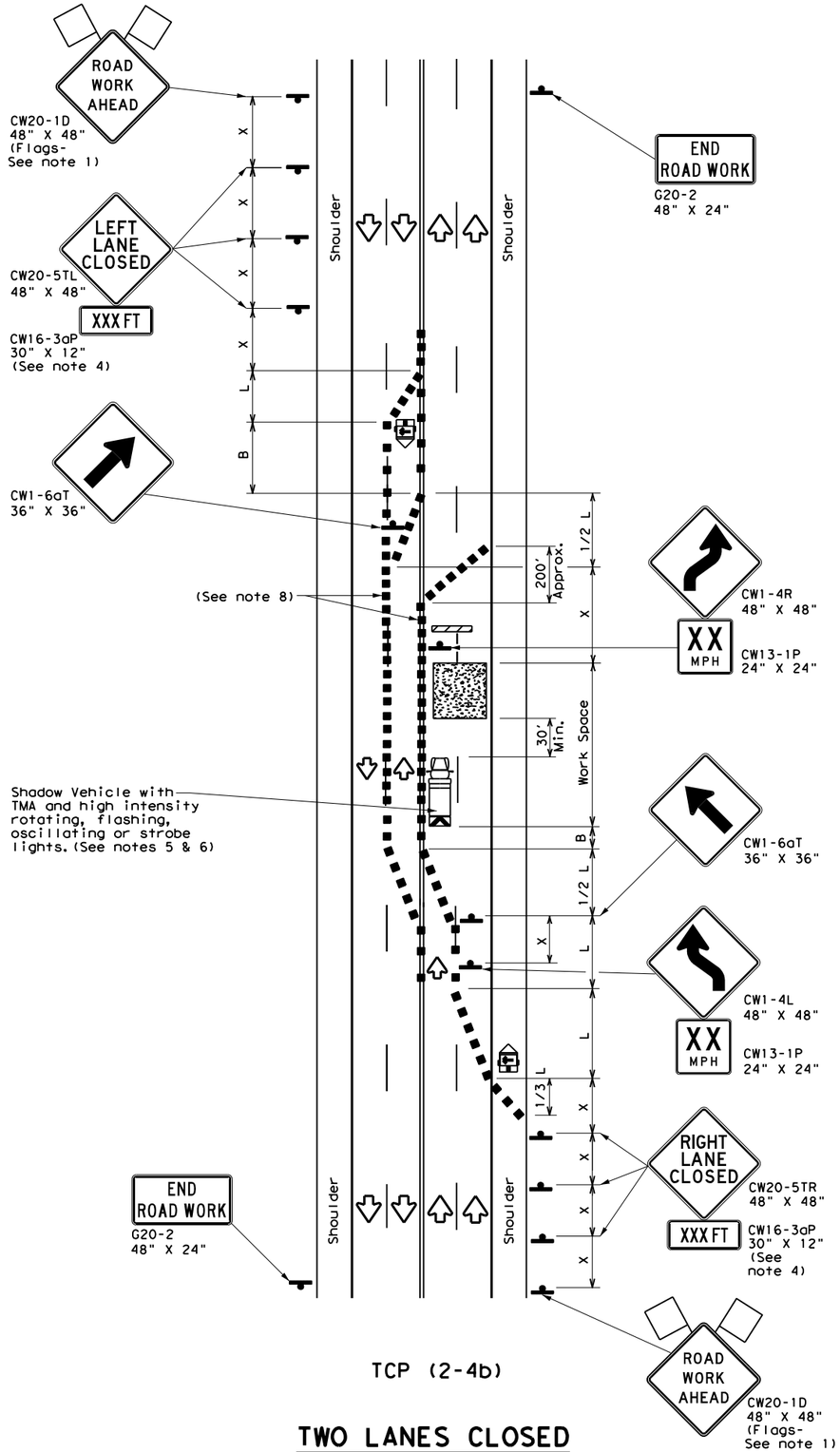


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	AMA	POTTER		47

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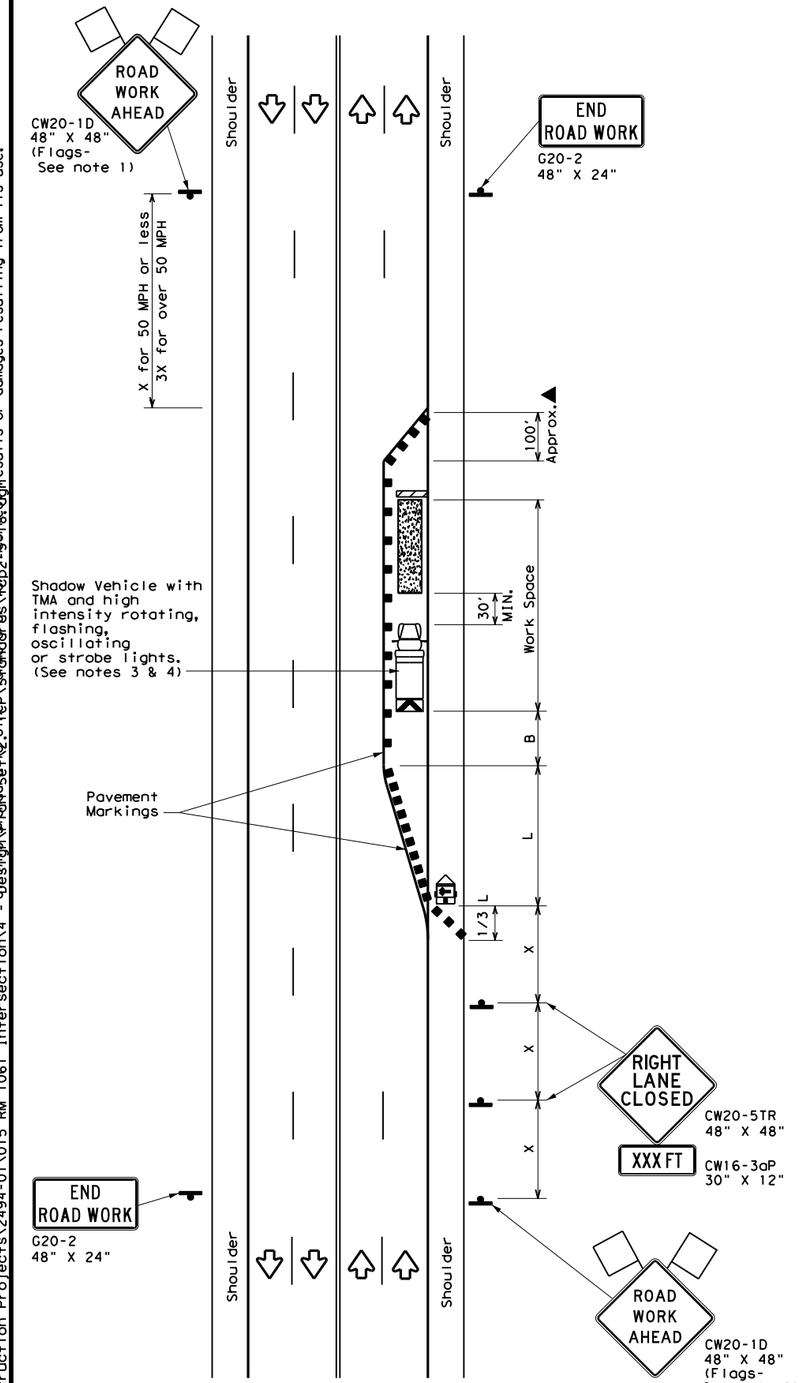
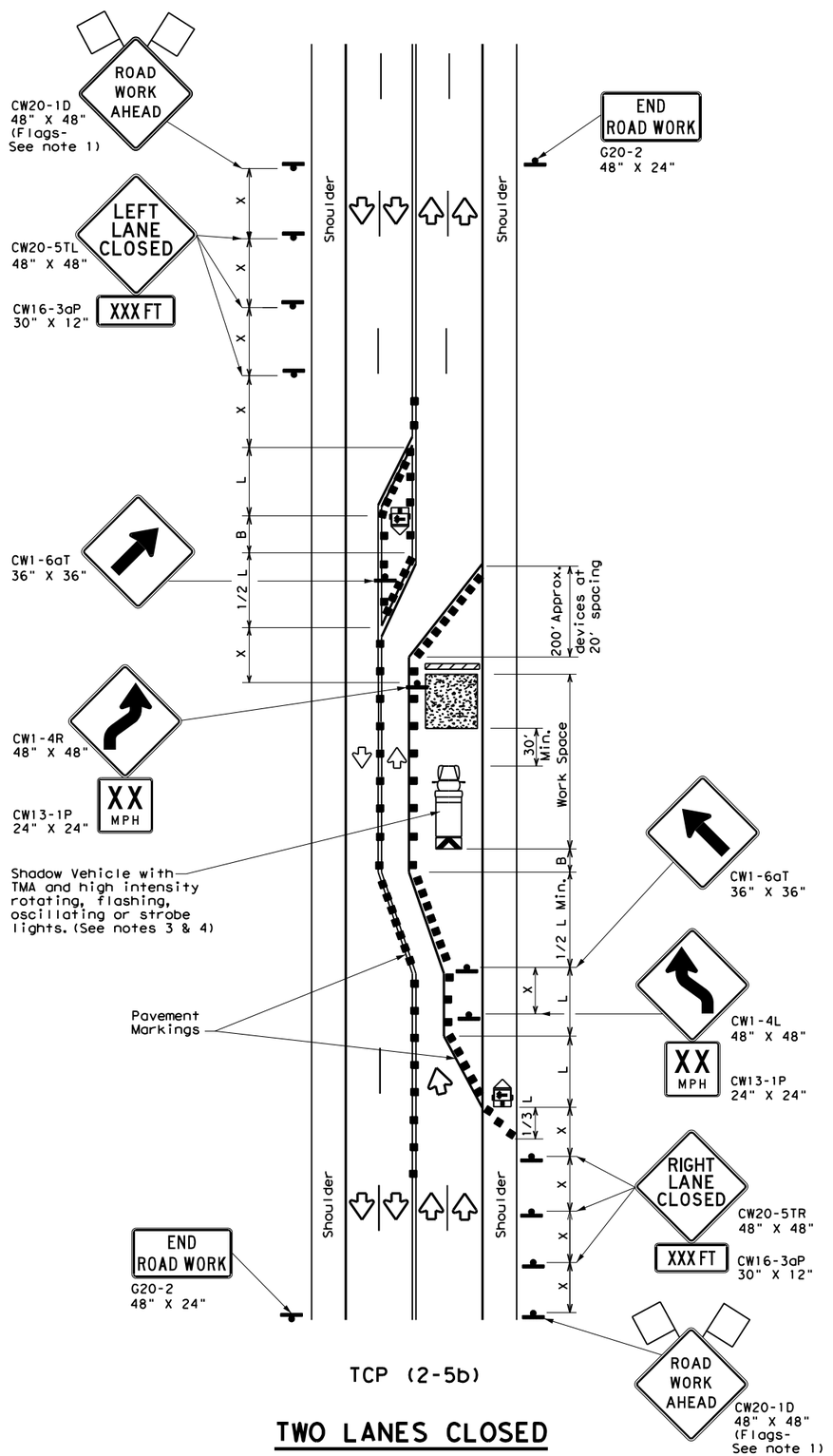


TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew eposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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

TCP (2-5b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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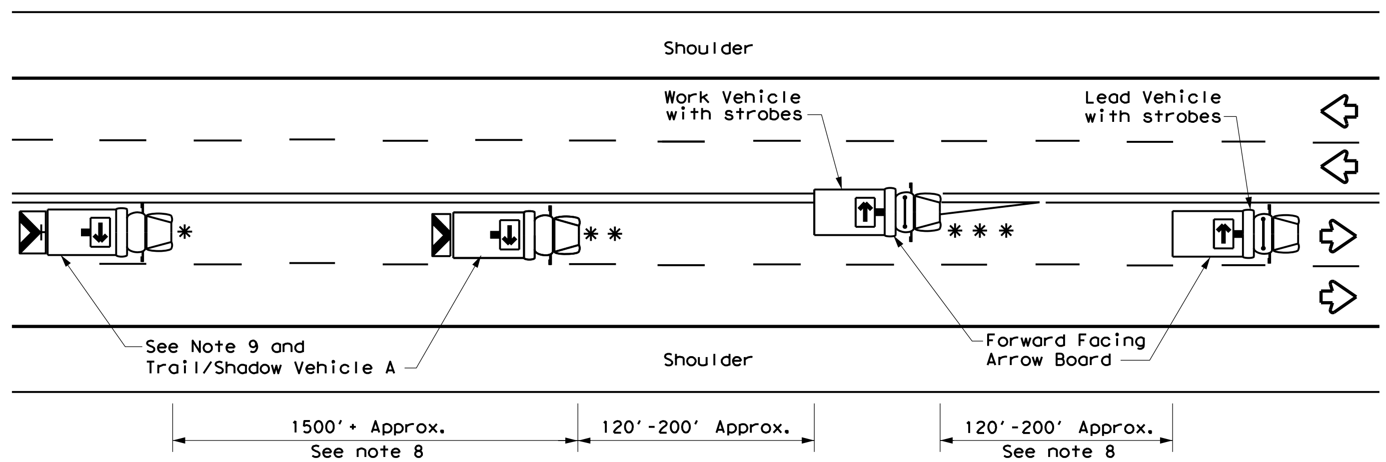
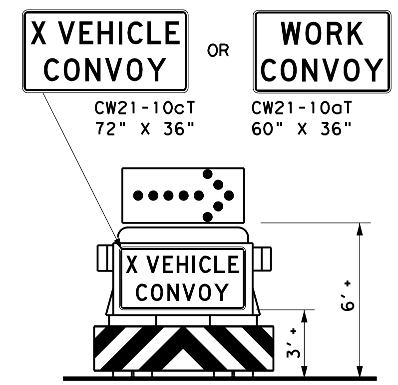
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	AMA	POTTER		48



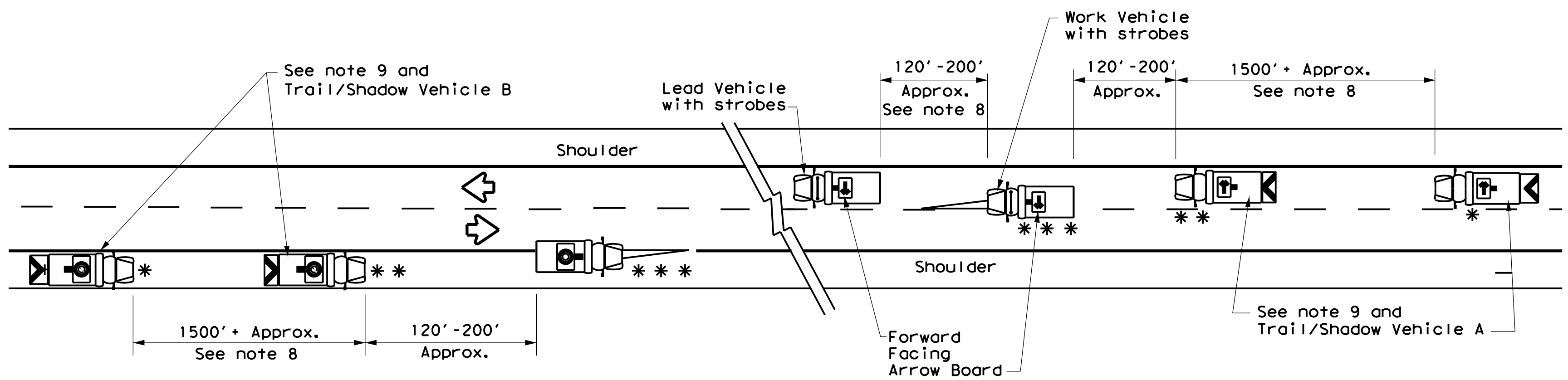
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

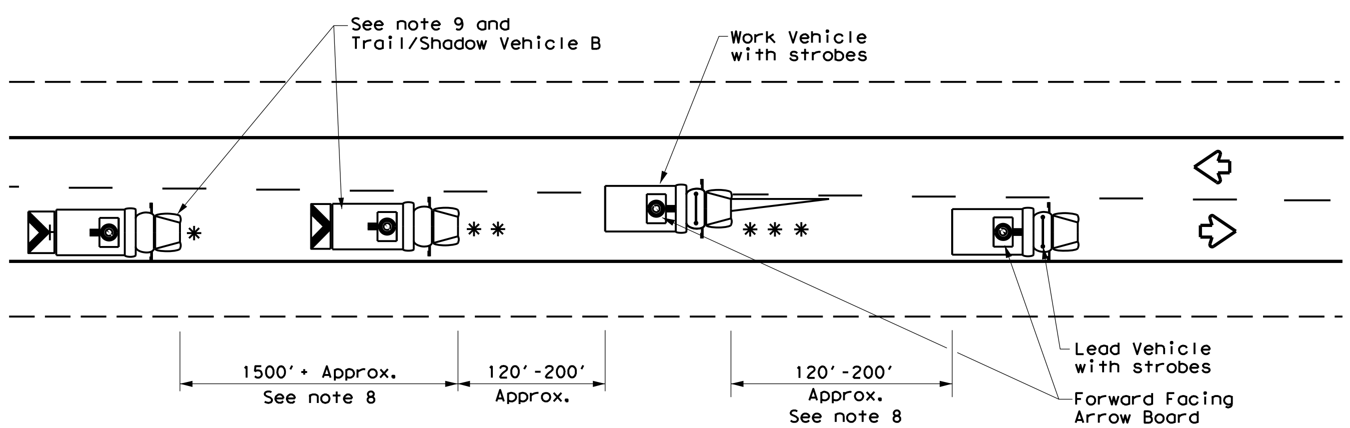


WORK ON SHOULDER

WORK ON TRAVEL LANE

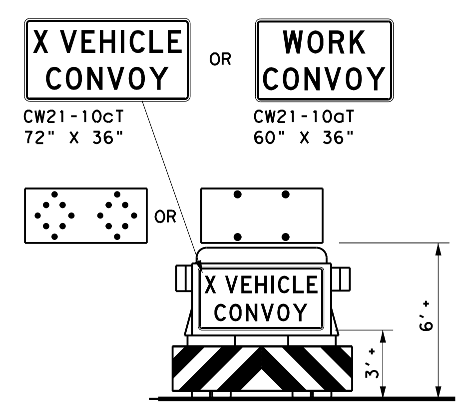
TCP (3-1b)

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

Symbol	Description	Arrow Board Symbol	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 the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

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

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

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

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

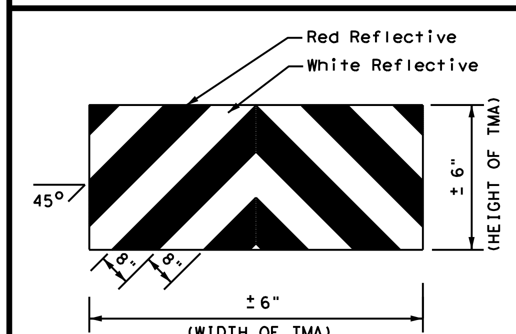
6. Each vehicle shall have two-way radio communication capability.

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

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

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

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS 2-94 4-98 8-95 7-13 1-97	DIST AMA		COUNTY POTTER	SHEET NO. 49

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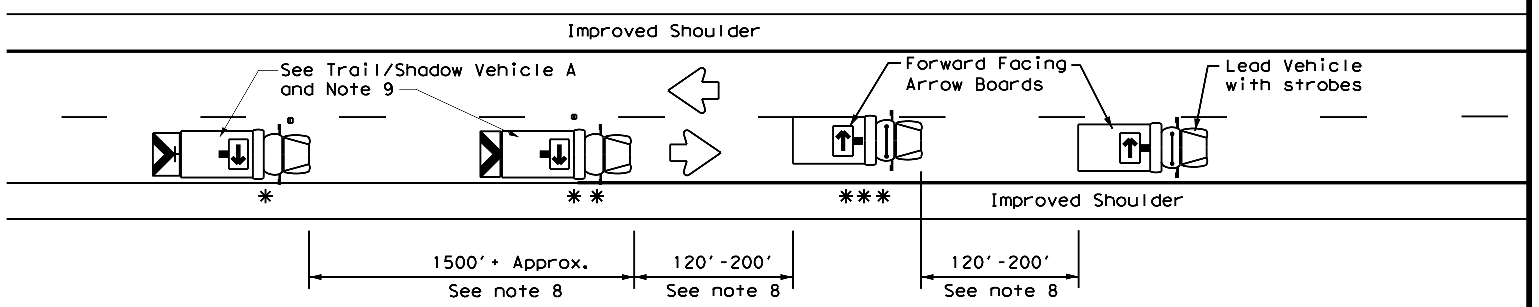
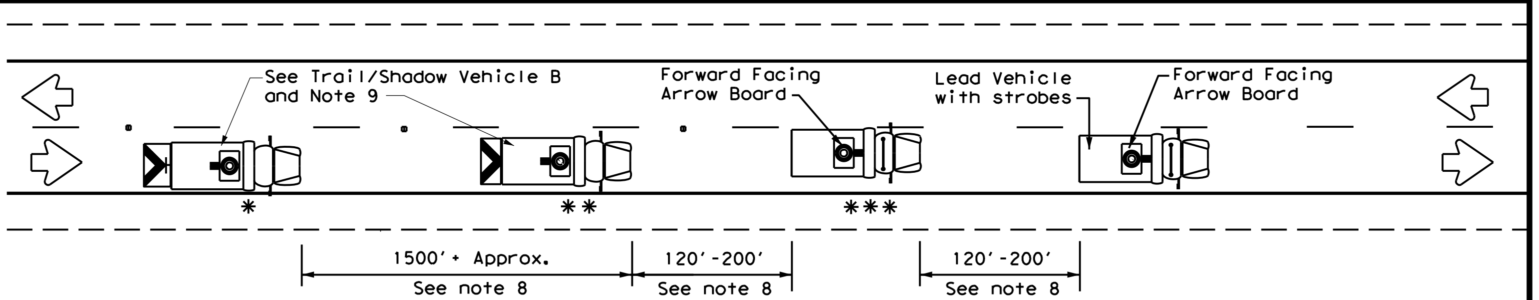


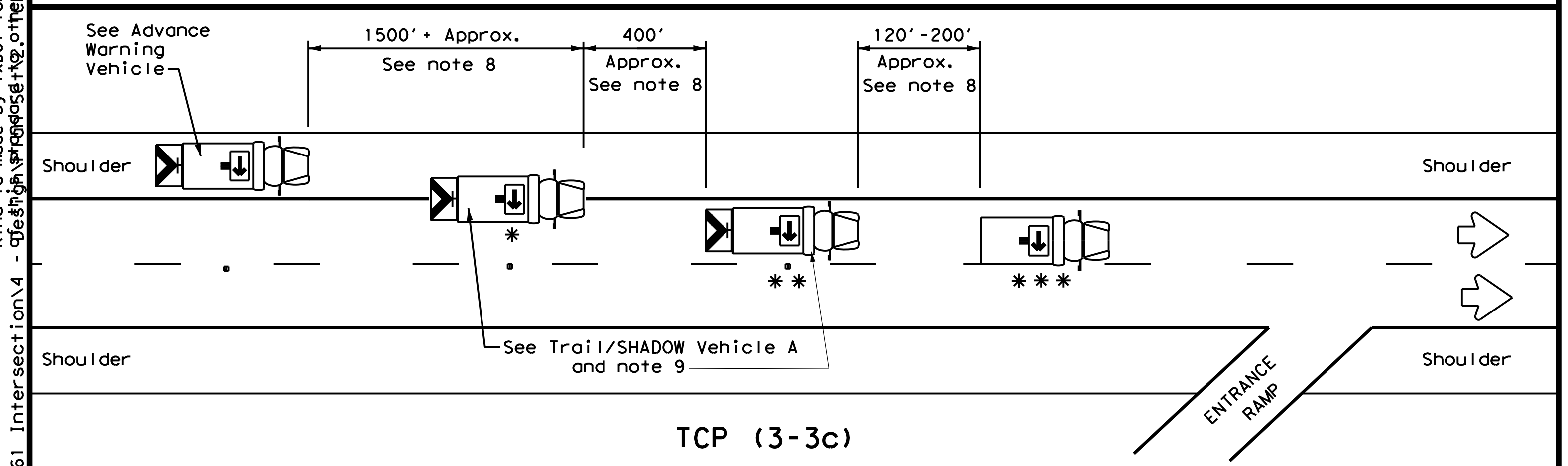
TCP (3-3a)

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



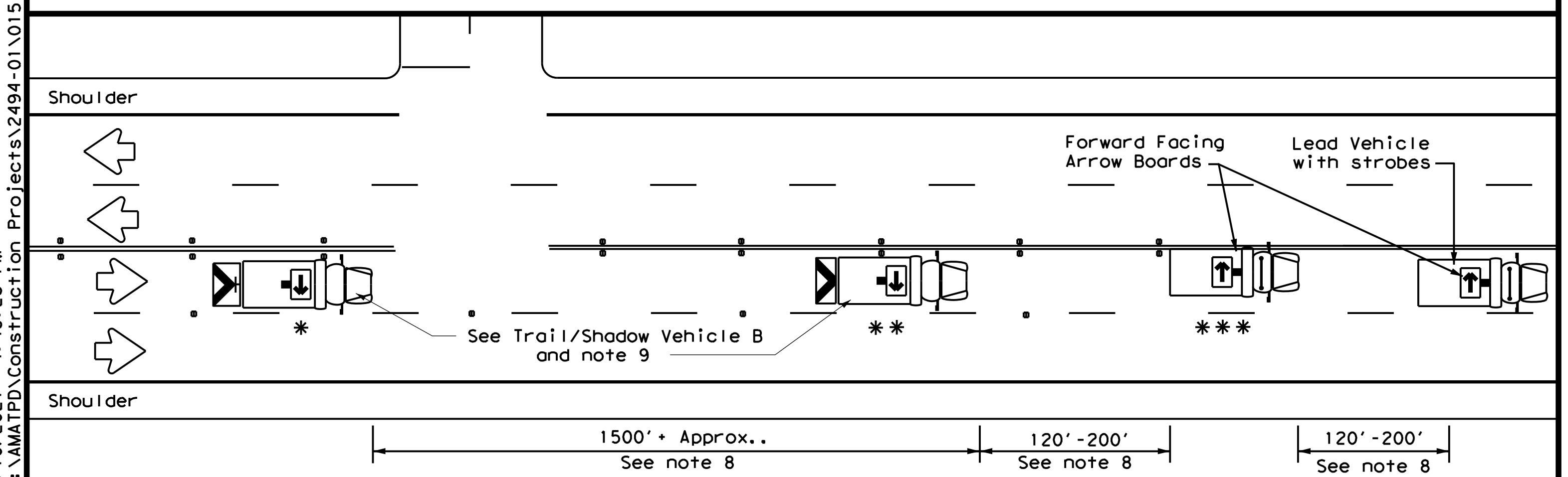
TCP (3-3b)

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



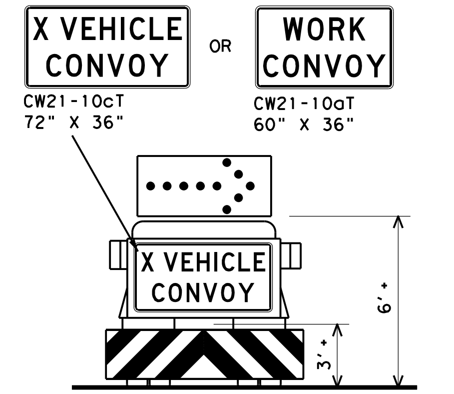
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



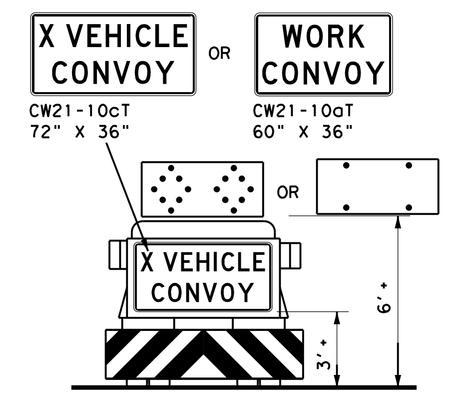
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



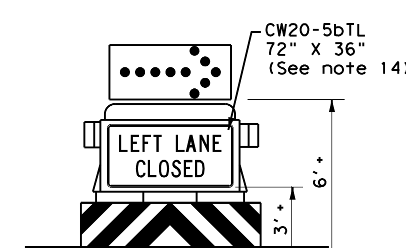
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

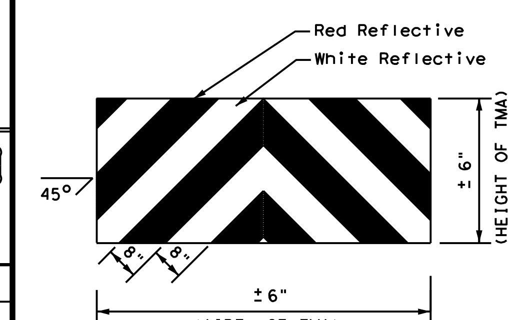


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

Symbol	Description	Symbol	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

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REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	DIST AMA		COUNTY POTTER	SHEET NO. 50

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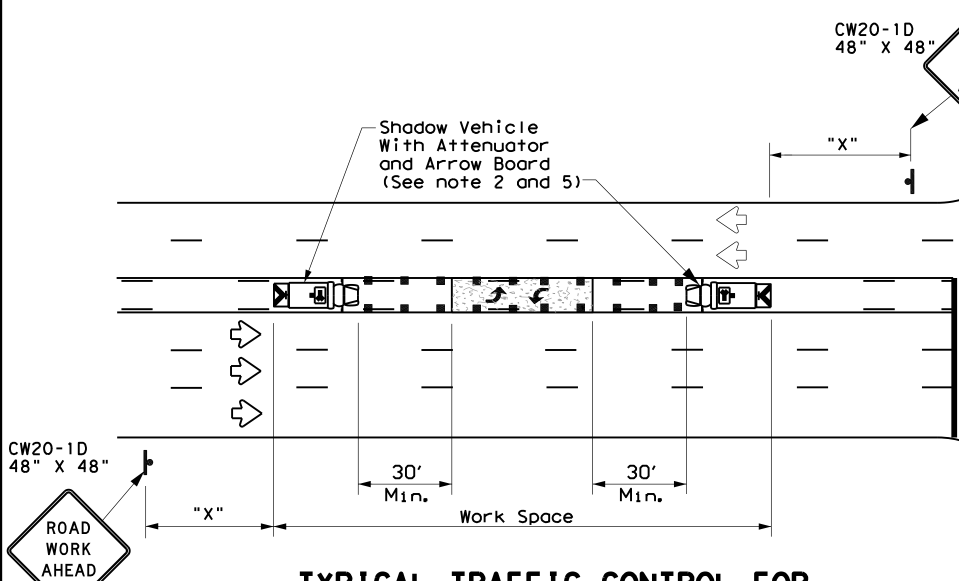
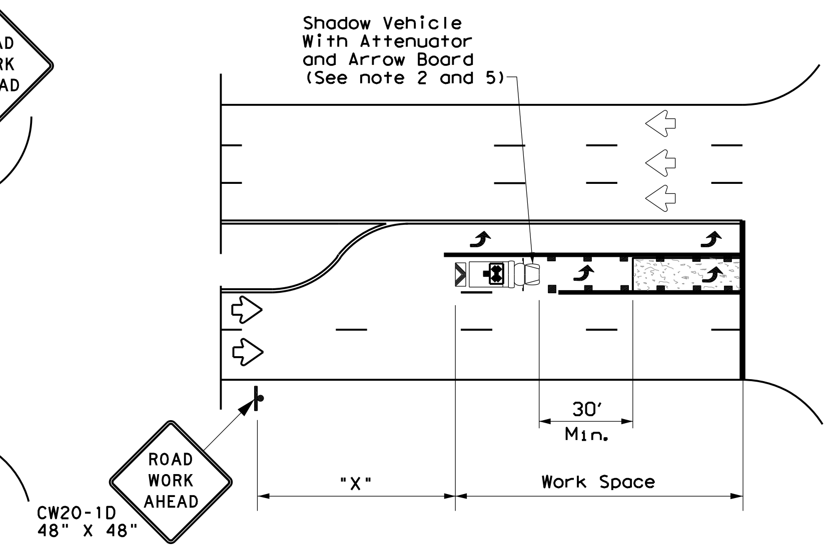
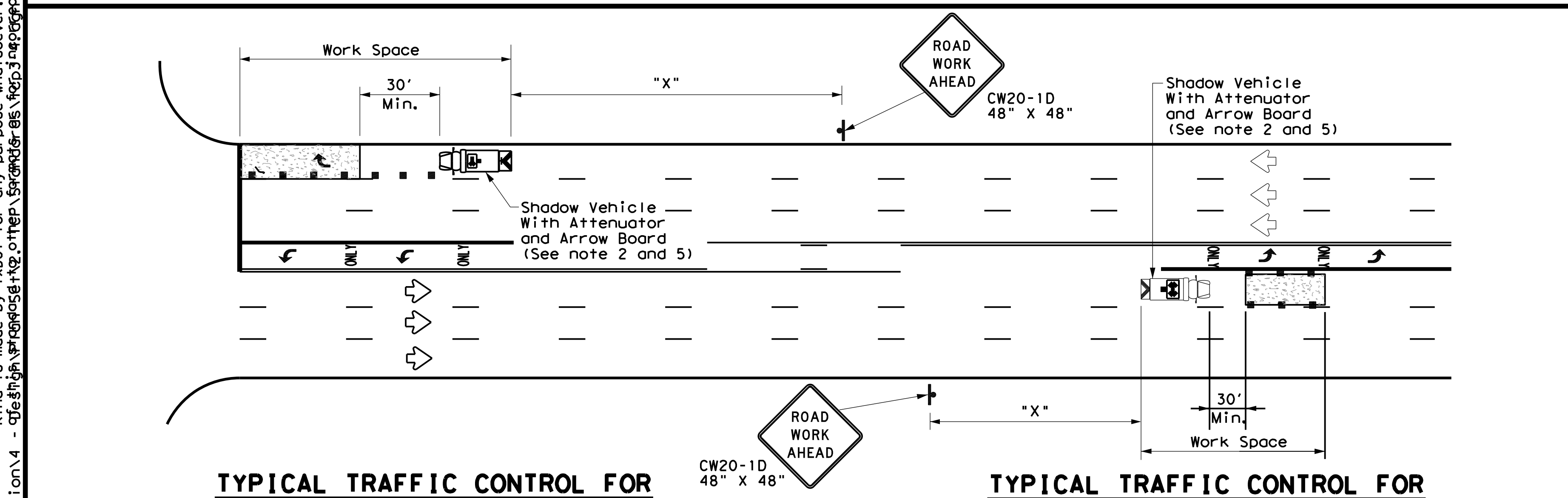


TYPICAL TRAFFIC CONTROL FOR CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

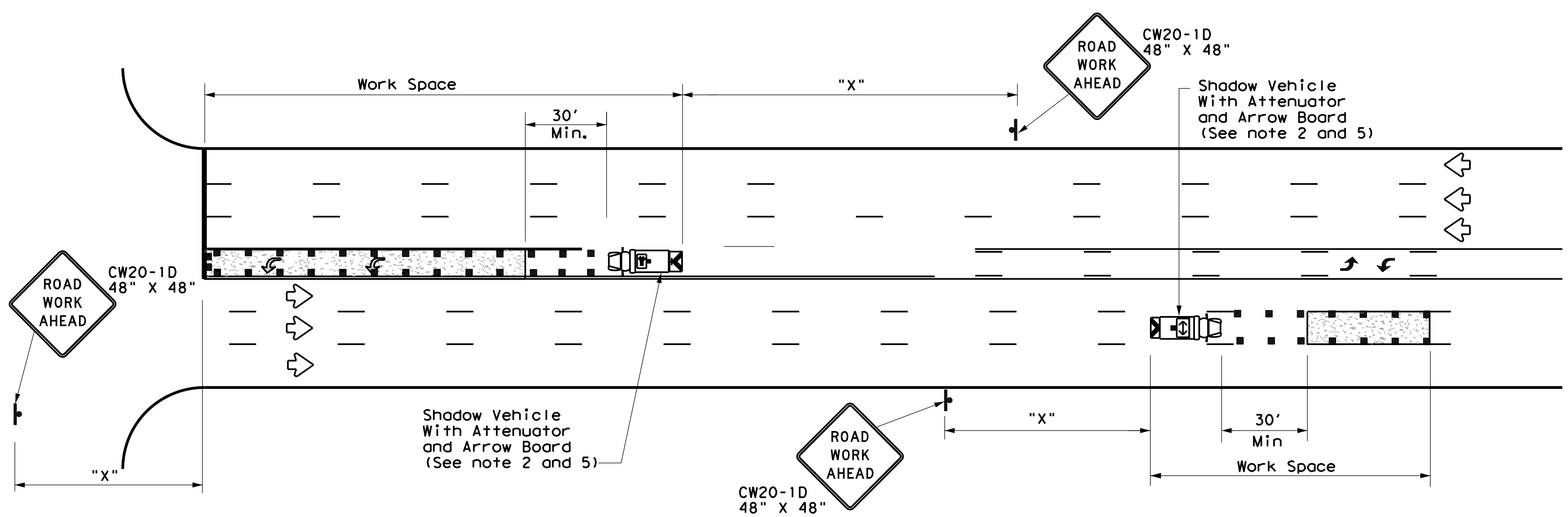


TYPICAL TRAFFIC CONTROL FOR OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR CENTER LANE MARKINGS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

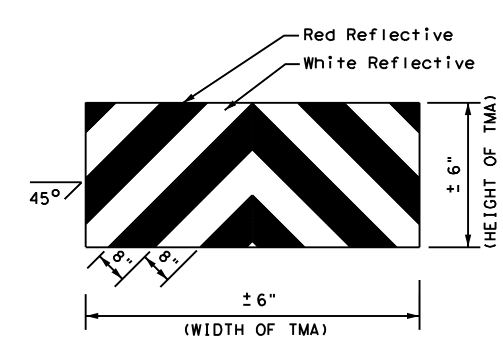
1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.

2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.

3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.

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

5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

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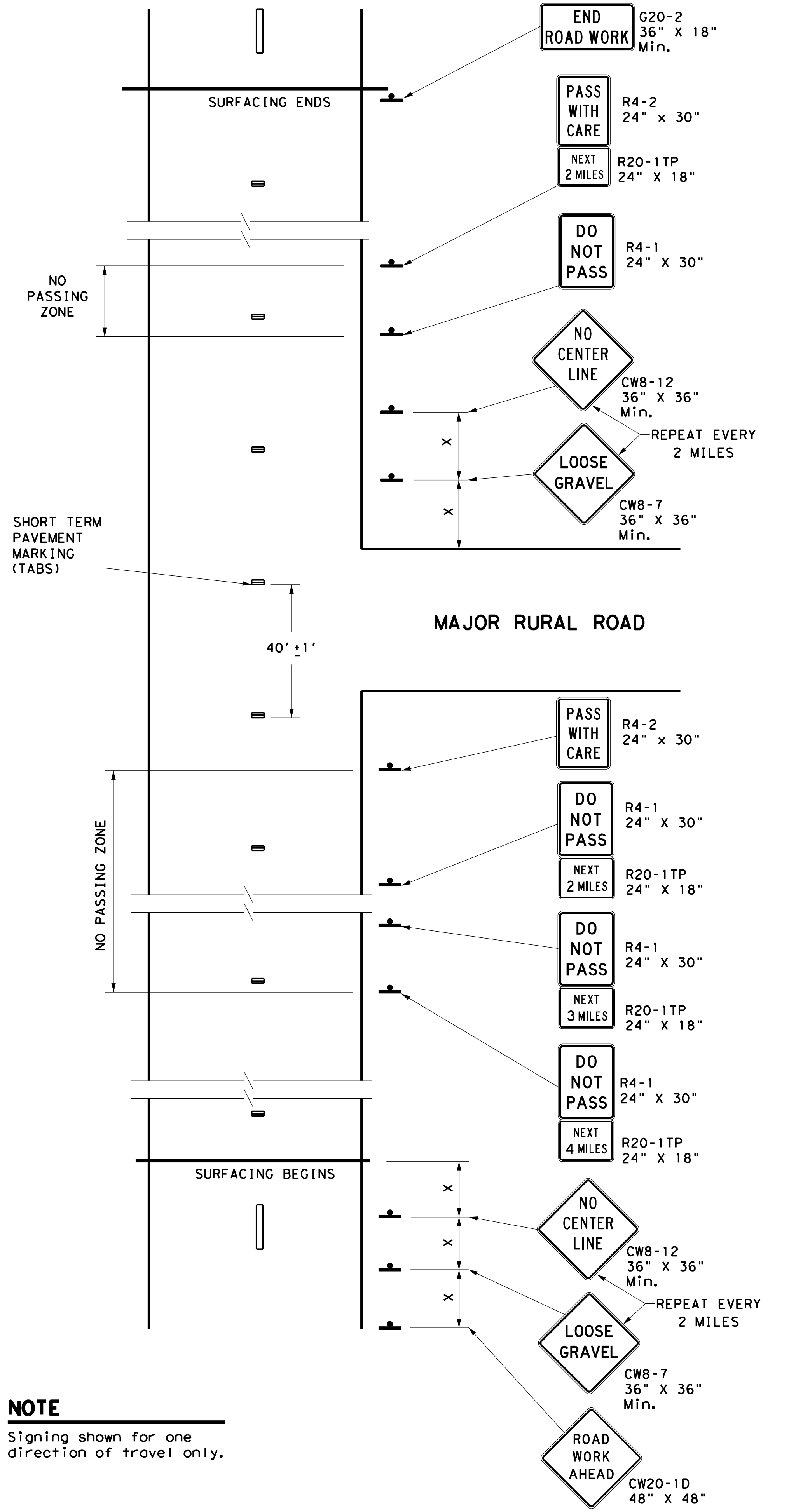
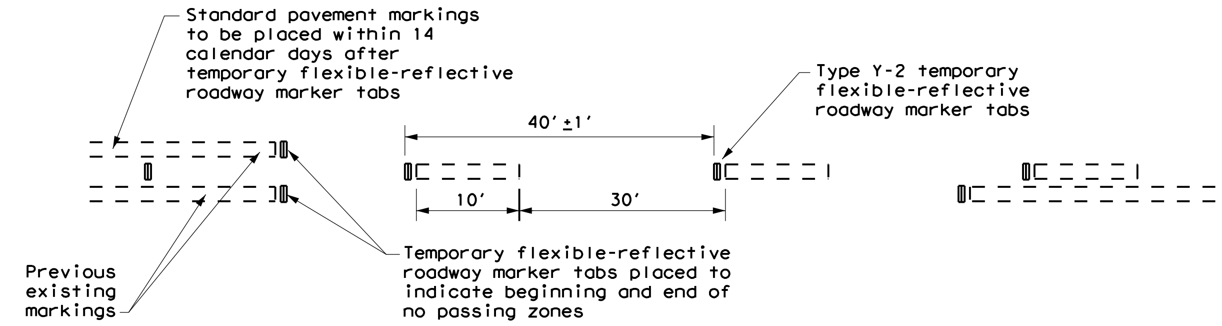


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.

2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.

3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.

4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".

5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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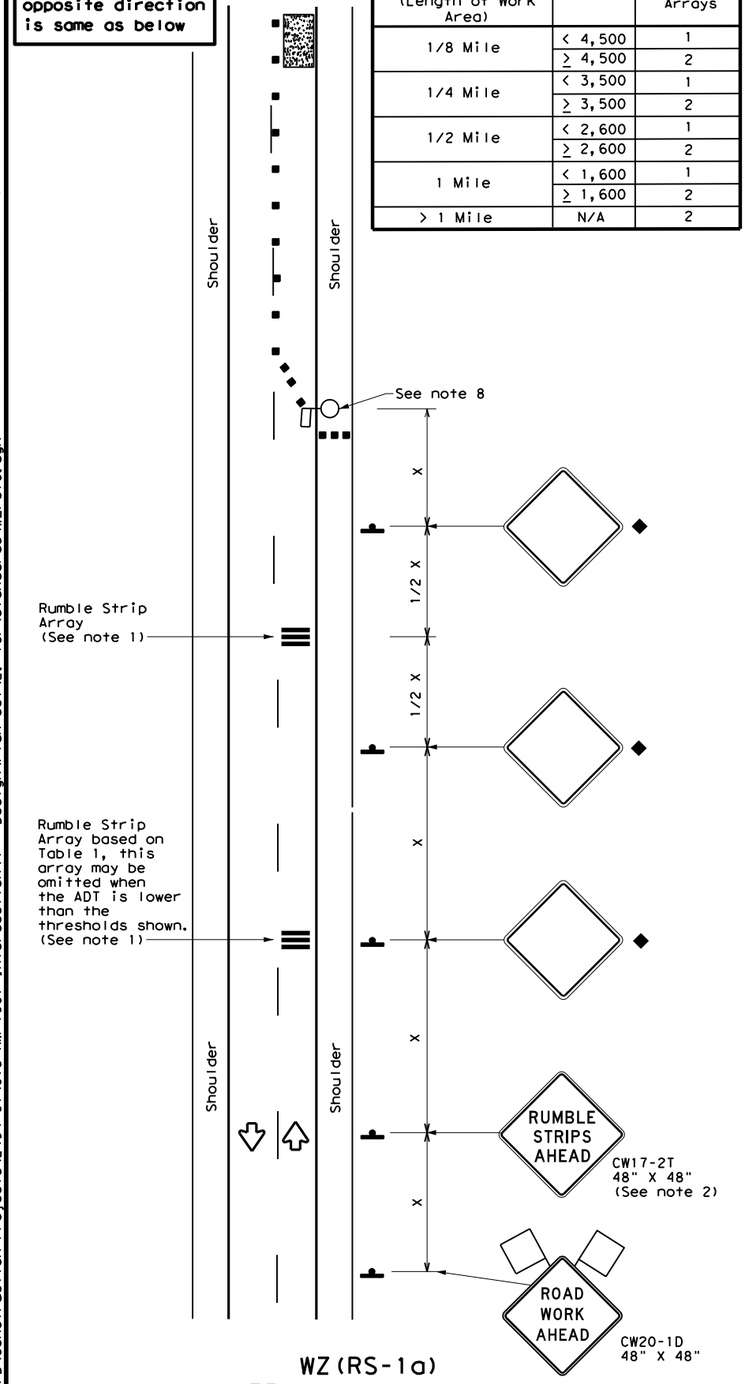
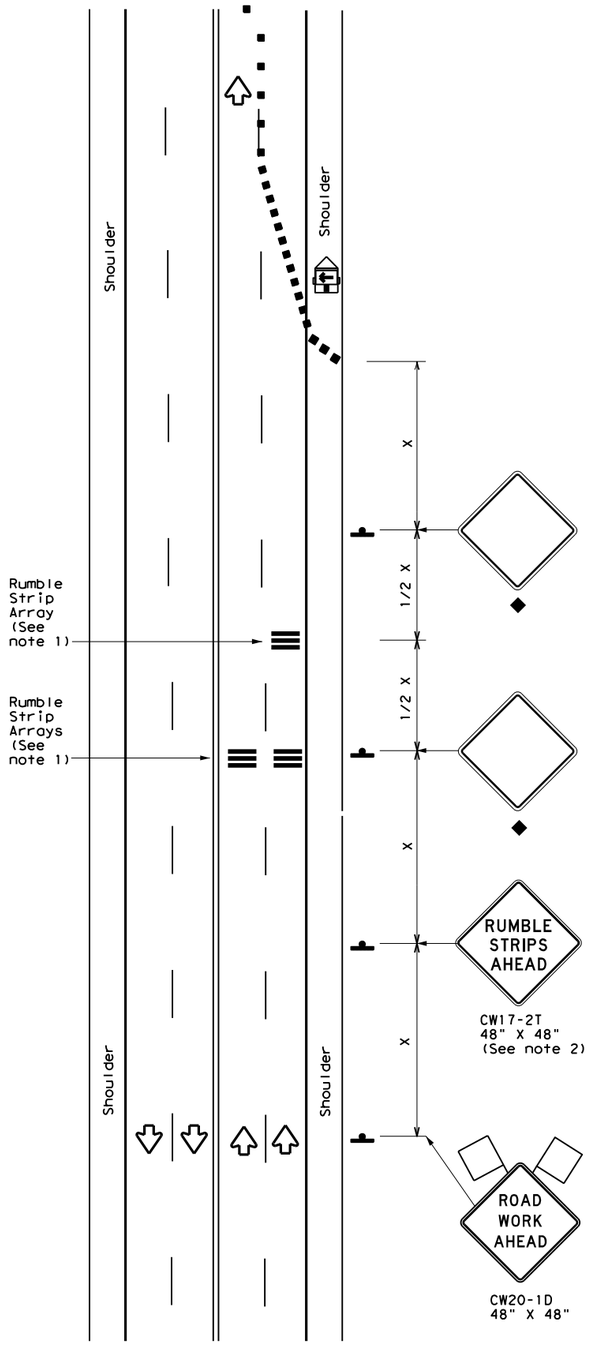
Warning sign and rumble strip sequence in opposite direction is same as below

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

Texas Department of Transportation

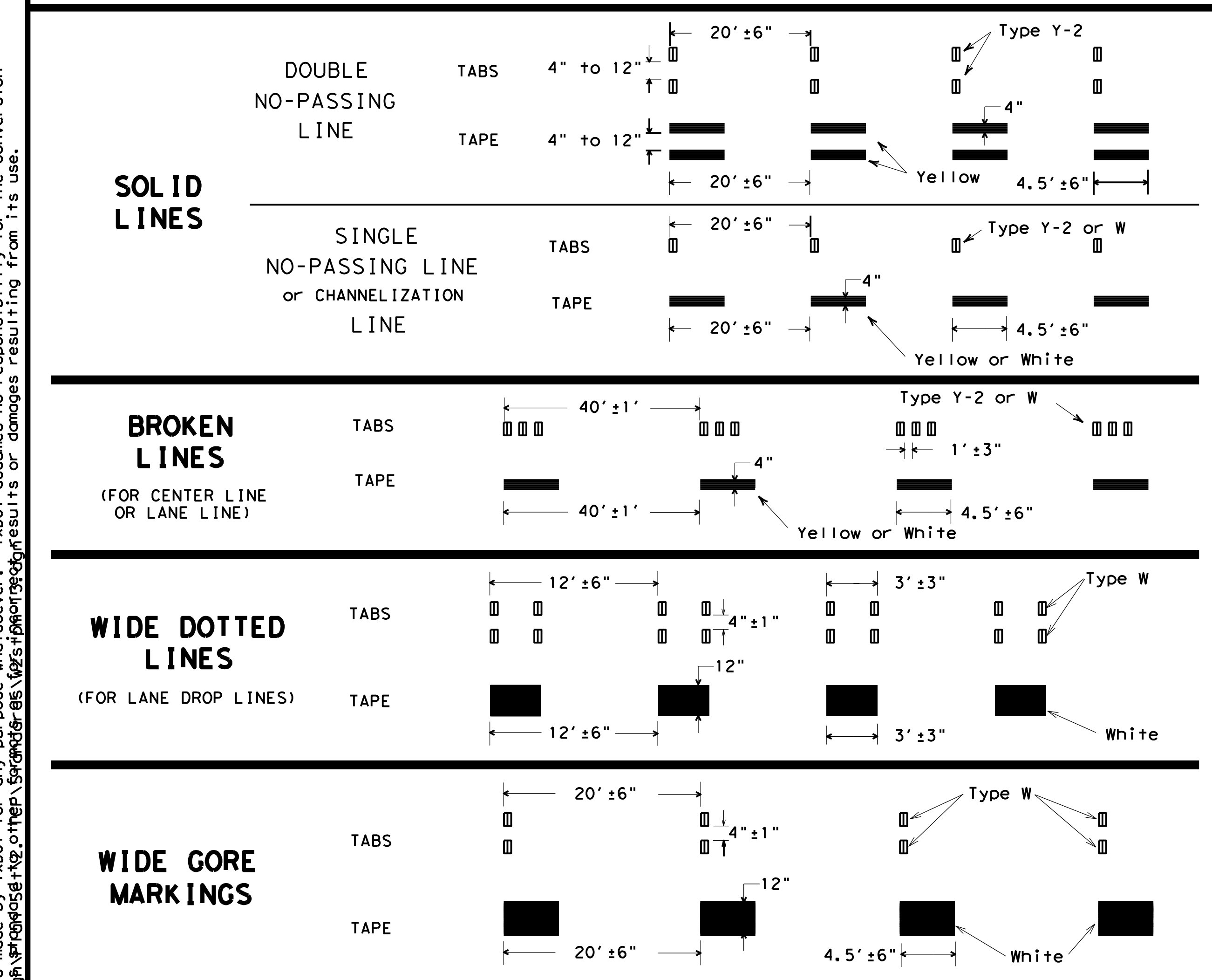
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

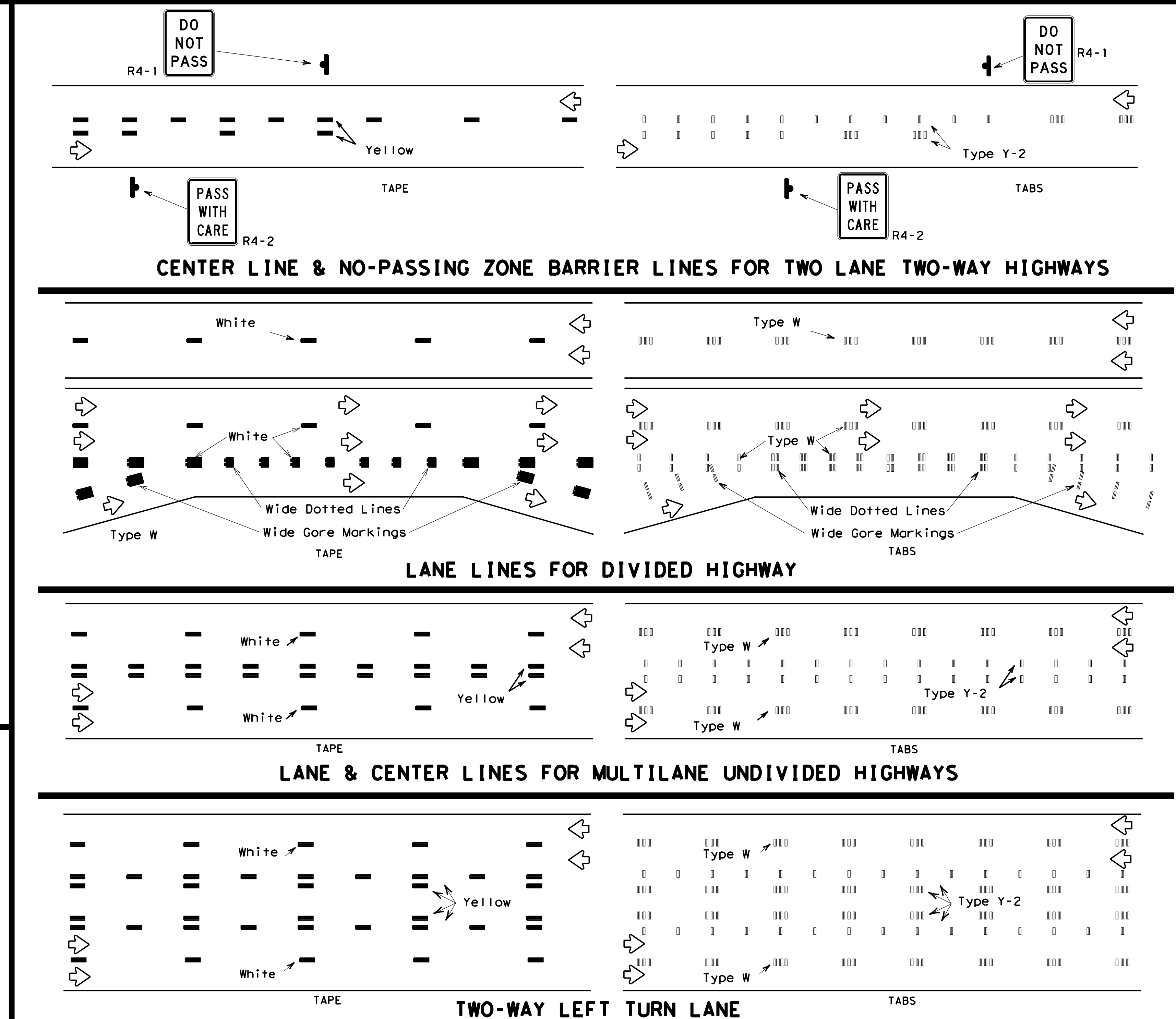
WZ(RS)-16

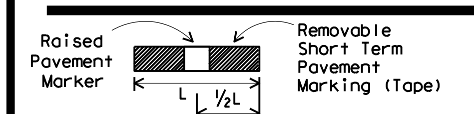
FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
2-14	DIST	COUNTY		SHEET NO.
4-16	AMA	POTTER		53

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 Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 3-03 7-13		2494	01	015	RM 2381
		DIST		COUNTY	SHEET NO.
		AMA		POTTER	54

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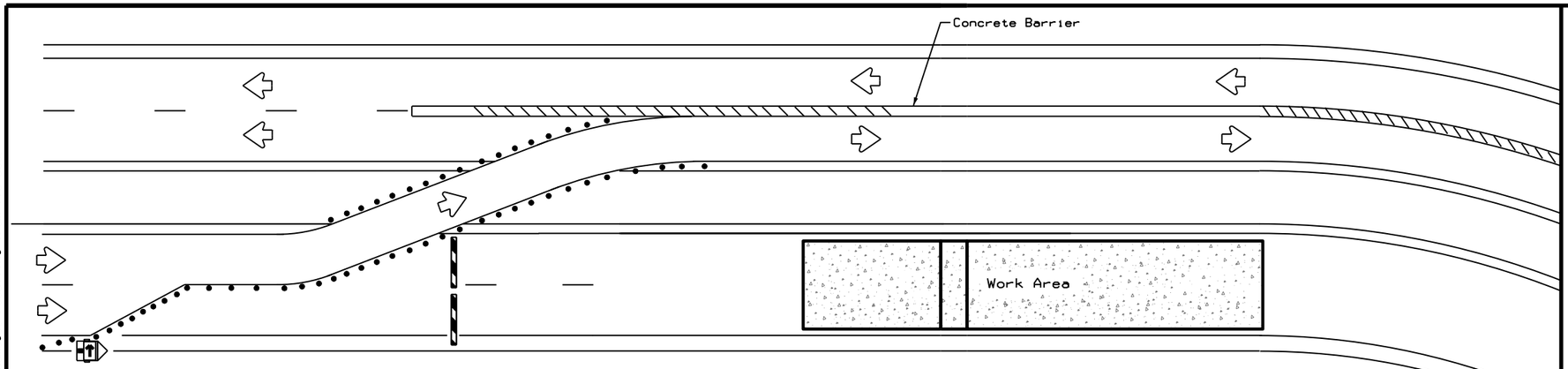


NOTES:

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

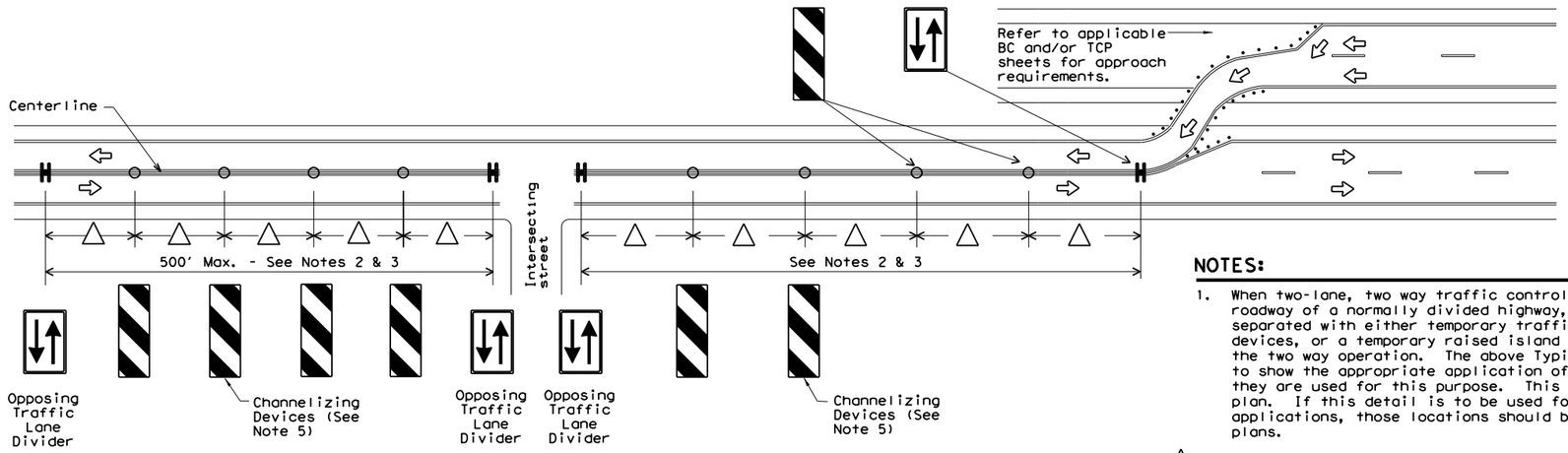
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. △ Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		55

110

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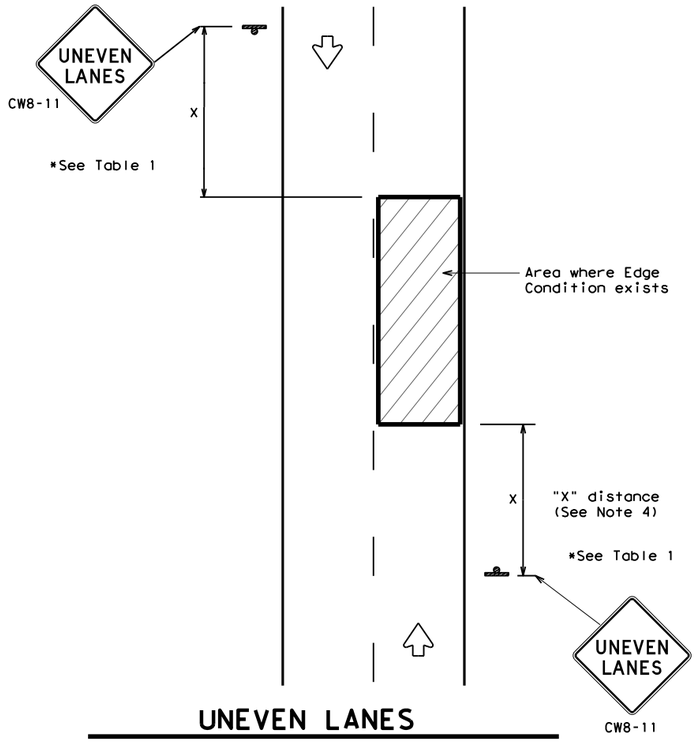
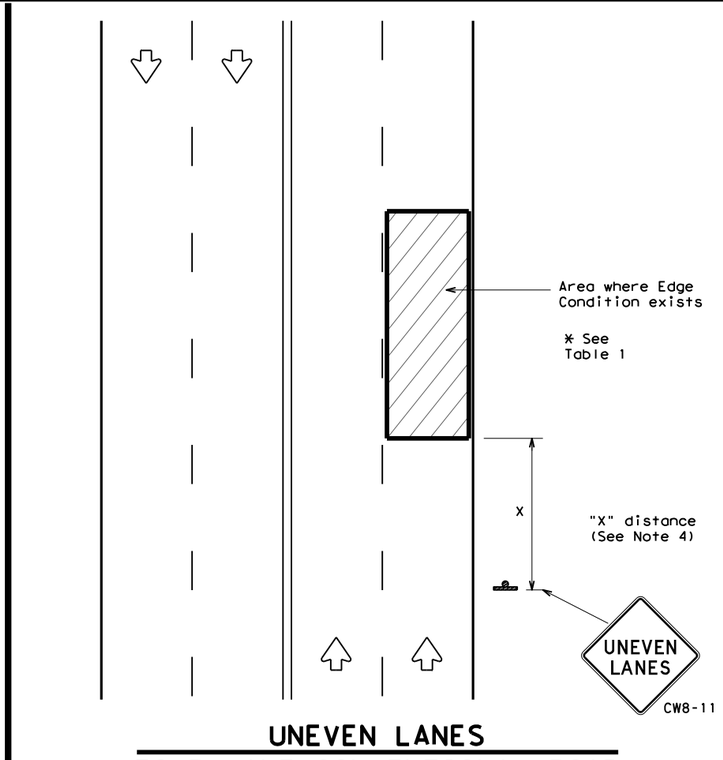
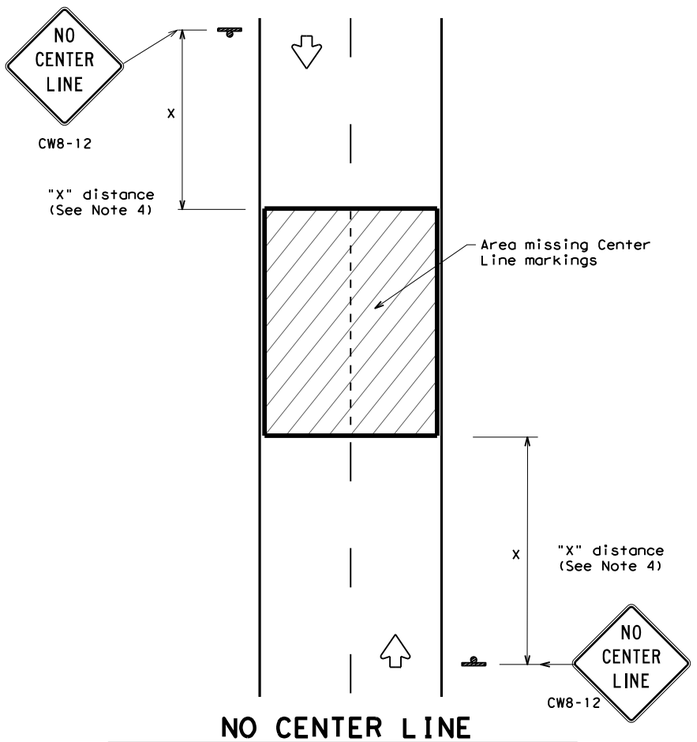


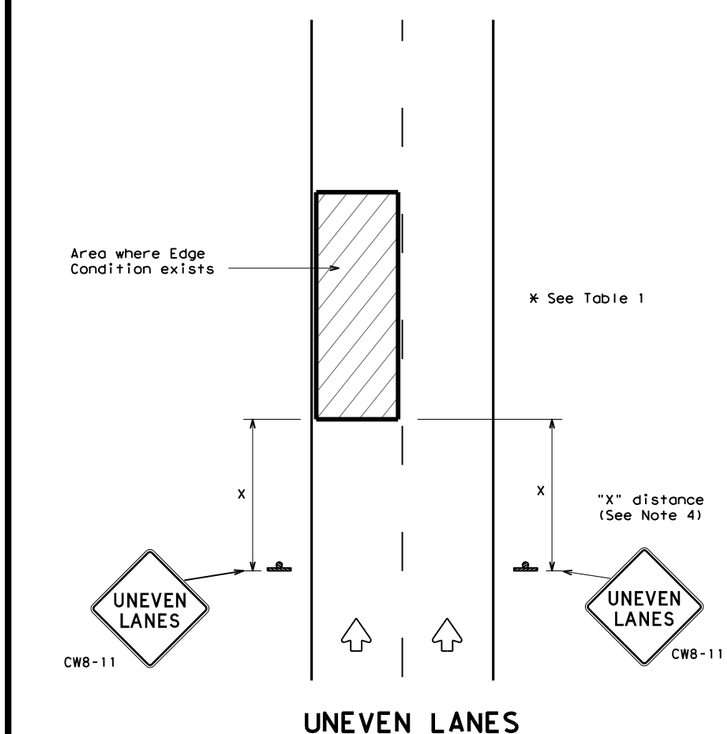
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

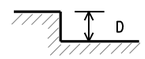
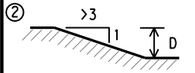
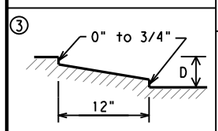
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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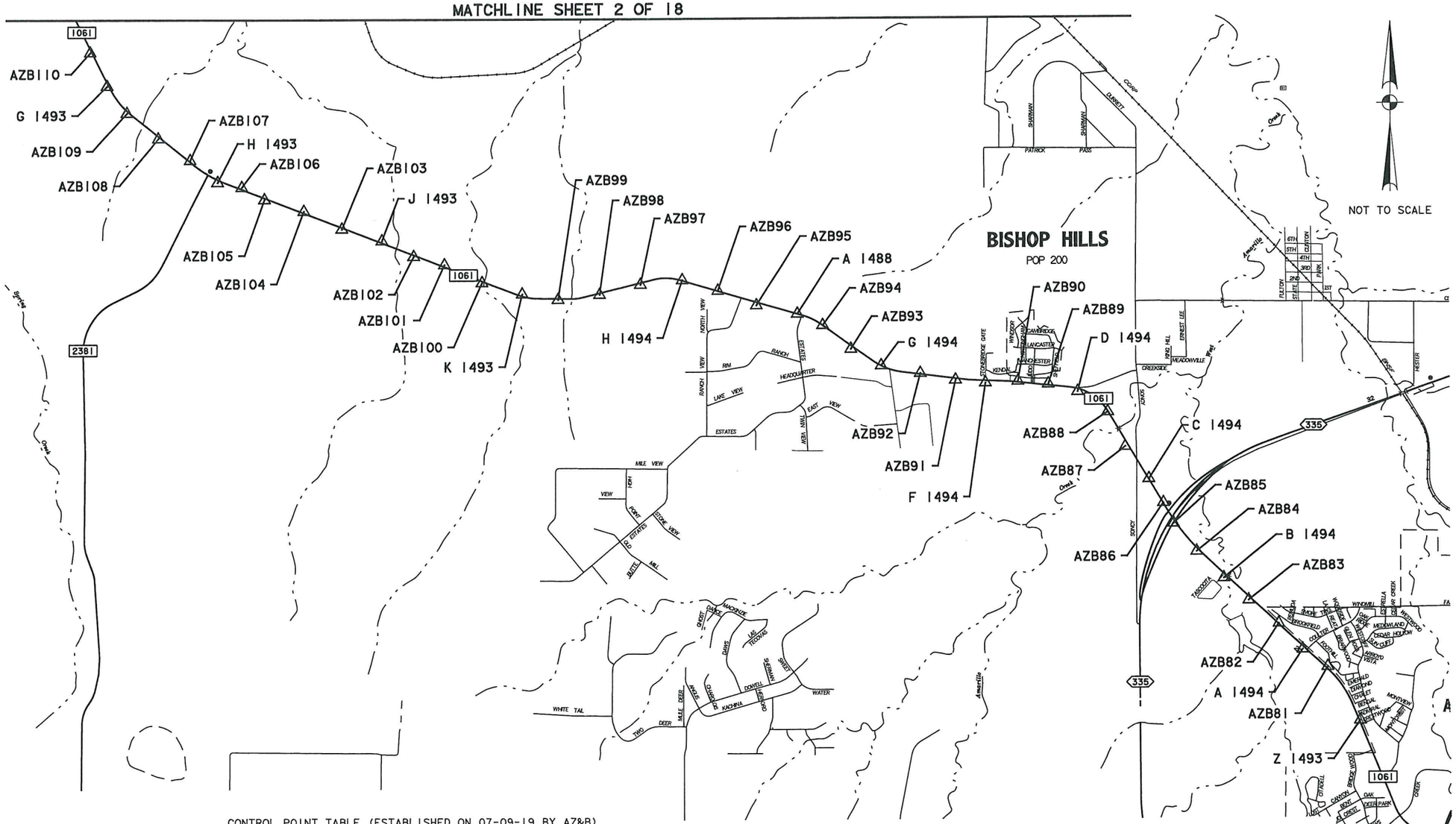
REVISIONS	2494	01	015	RM 2381
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	AMA	POTTER		56

MATCHLINE SHEET 2 OF 18



CONTROL POINT TABLE (ESTABLISHED ON 07-09-19 BY AZ&B)

POINT	SURFACE COORDINATES NORTHING	EASTING	ELEVATION	DESCRIPTION
PRIMARY CONTROL				
Z 1493	3,727,651.715	533,281.875	3,633.49′	DATUM ROD WITH MISSING ACCESS COVER
A 1494	3,730,161.639	531,258.573	3,565.57′	DATUM ROD WITH MISSING ACCESS COVER
B 1494	3,732,691.082	528,456.629	3,478.47′	DATUM ROD WITH ACCESS COVER
C 1494	3,736,195.350	525,783.801	3,466.08′	DATUM ROD WITH YELLOW CAP AND ACCESS COVER
D 1494	3,739,288.586	523,276.078	3,459.12′	DATUM ROD WITH ACCESS COVER
F 1494	3,739,611.090	519,995.617	3,496.73′	DATUM ROD WITH ACCESS COVER
G 1494	3,740,239.413	516,287.975	3,534.11′	DATUM ROD WITH ACCESS COVER
A 1488	3,742,077.058	513,310.688	3,655.43′	DATUM ROD WITH MISSING ACCESS COVER
H 1494	3,743,289.794	509,215.850	3,579.48′	DATUM ROD WITH ACCESS COVER
K 1493	3,742,814.015	503,539.835	3,542.09′	DATUM ROD WITH ACCESS COVER
J 1493	3,744,699.902	498,539.430	3,504.80′	DATUM ROD WITH ACCESS COVER
H 1493	3,746,769.130	492,686.454	3,483.83′	DATUM ROD WITH ACCESS COVER
G 1493	3,750,167.242	488,739.319	3,505.49′	DATUM ROD WITH ACCESS COVER
SECONDARY CONTROL				
AZB81	3,729,545.334	532,149.998	3,610.75′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB82	3,731,080.019	530,411.076	3,531.80′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB83	3,731,904.102	529,337.388	3,497.03′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB84	3,733,631.062	527,485.695	3,490.46′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB85	3,734,622.386	526,659.987	3,495.88′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB86	3,735,349.532	526,297.229	3,474.34′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB87	3,737,341.578	524,953.337	3,447.77′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB88	3,738,566.122	524,336.892	3,462.40′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR

POINT	SURFACE COORDINATES NORTHING	EASTING	ELEVATION	DESCRIPTION
SECONDARY CONTROL				
AZB89	3,739,562.630	522,233.319	3,471.77′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB90	3,739,664.370	521,152.864	3,484.46′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB91	3,739,717.258	518,930.177	3,503.34′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB92	3,739,963.119	517,674.246	3,513.75′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB93	3,740,828.565	515,211.499	3,595.42′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB94	3,741,670.798	514,202.691	3,640.24′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB95	3,742,384.923	511,868.783	3,631.92′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB96	3,742,908.829	510,489.171	3,589.38′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB97	3,743,136.361	507,730.582	3,575.89′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB98	3,742,788.912	506,277.602	3,554.23′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB99	3,742,614.903	504,806.883	3,532.39′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB100	3,743,217.145	502,113.571	3,520.27′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB101	3,743,852.241	500,769.357	3,546.54′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB102	3,744,145.132	499,668.041	3,508.42′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB103	3,745,118.769	497,105.788	3,470.79′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB104	3,745,751.231	495,763.112	3,476.15′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB105	3,746,163.310	494,353.530	3,488.43′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB106	3,746,596.278	493,544.009	3,480.20′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB107	3,747,547.478	491,713.350	3,478.82′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB108	3,748,315.831	490,567.918	3,478.00′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB109	3,749,215.633	489,444.046	3,477.08′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR
AZB110	3,751,355.056	488,128.896	3,464.15′	2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR

NOTES:

HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, NORTH ZONE 4201, NORTH AMERICAN DATUM 1983 (NAD83) (2011 ADJ), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.0002441 (PROJECT SPECIFIC). ALL VALUES ARE DERIVED FROM LEVEL 3 GPS OBSERVATIONS, USING THE TXDOT RTN. ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED FROM LEVEL 3 GPS OBSERVATIONS AND ADJUSTED BY DIFFERENTIAL LEVEL LOOP HOLDING NGS BENCHMARK ELEVATIONS OF Z1492=3,508.74 AND N1492=3,180.11.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS REGISTERED HEATH W. BROWN 6189 PROFESSIONAL LAND SURVEYOR

Heath W. Brown 1-14-2020

HEATH W. BROWN RPLS NO. 6189 DATE

NO.	REVISIONS	BY	DATE

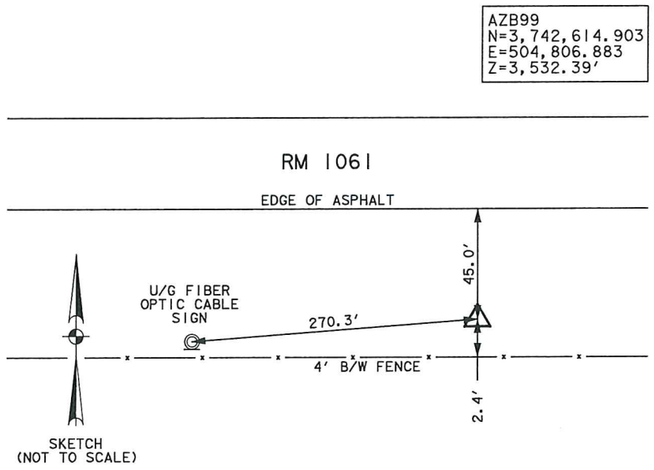
AZ&B
ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214) 341-9900
FIRM REGISTRATION No. F-10098
TBPLS REGISTRATION No. 10088700

Texas Department of Transportation

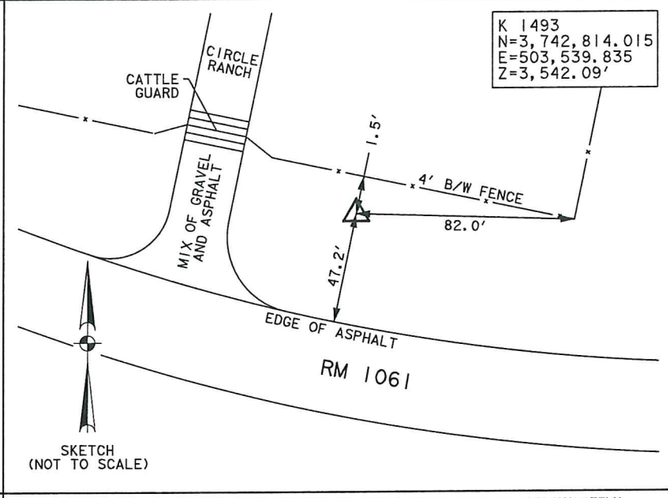
SURVEY CONTROL INDEX SHEET

SHEET 1 OF 1

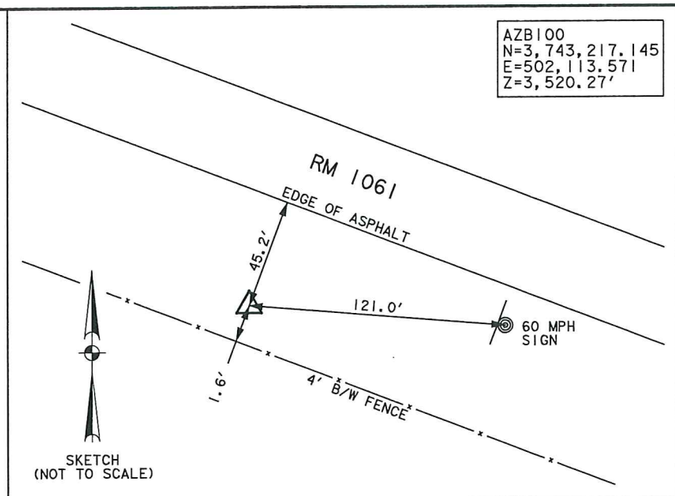
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		57
STATE	DISTRICT	COUNTY	
TEXAS	04	POTTER	
CONTROL	SECTION	JOB	HIGHWAY NO.
2494	01	015	RM 2381



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB99", LOCATED APPROXIMATELY 6,440' WEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND RANCH VIEW DR.



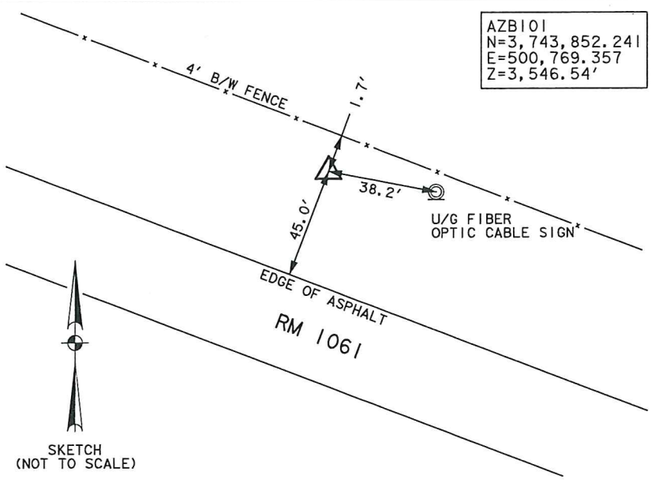
DATUM ROD WITH ACCESS COVER STAMPED "K 1493" FOUND LOCATED APPROXIMATELY 7,710' WEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND RANCH VIEW DR.



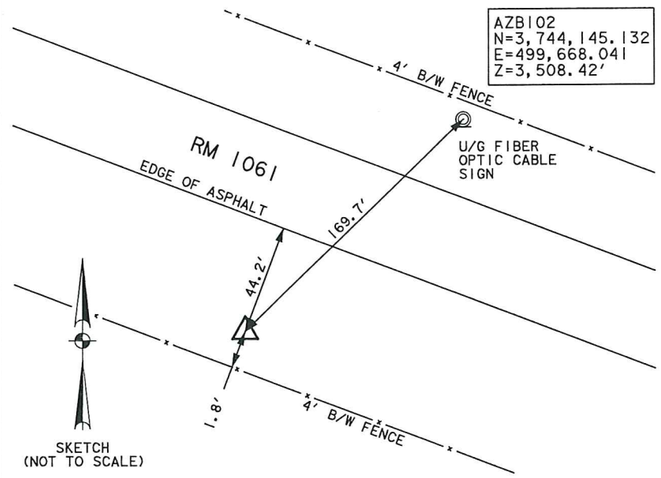
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB100", LOCATED APPROXIMATELY 9,152' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND RANCH VIEW DR.

NOTES:

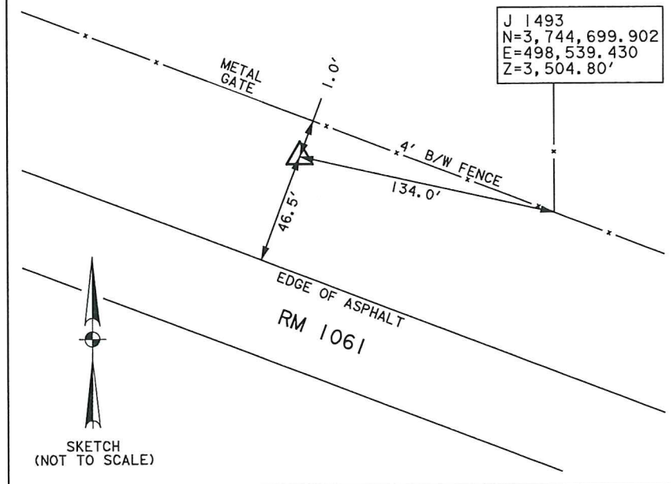
HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, NORTH ZONE 4201, NORTH AMERICAN DATUM 1983 (NAD83) (2011 ADJ), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.0002441 (PROJECT SPECIFIC). ALL VALUES ARE DERIVED FROM LEVEL 3 GPS OBSERVATIONS, USING THE TXDOT RTN. ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED FROM LEVEL 3 GPS OBSERVATIONS AND ADJUSTED BY DIFFERENTIAL LEVEL LOOP HOLDING NGS BENCHMARK ELEVATIONS OF Z1492=3,508.74 AND N1492=3,180.11.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB101", LOCATED APPROXIMATELY 8,547' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB102", LOCATED APPROXIMATELY 7,412' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



DATUM ROD WITH ACCESS COVER STAMPED "J 1493" FOUND LOCATED APPROXIMATELY 6,161' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
HEATH W. BROWN
6189
PROFESSIONAL
LAND SURVEYOR

Heath W. Brown 1-14-2020

HEATH W. BROWN DATE
RPLS NO. 6189

NO.	REVISIONS	BY	DATE

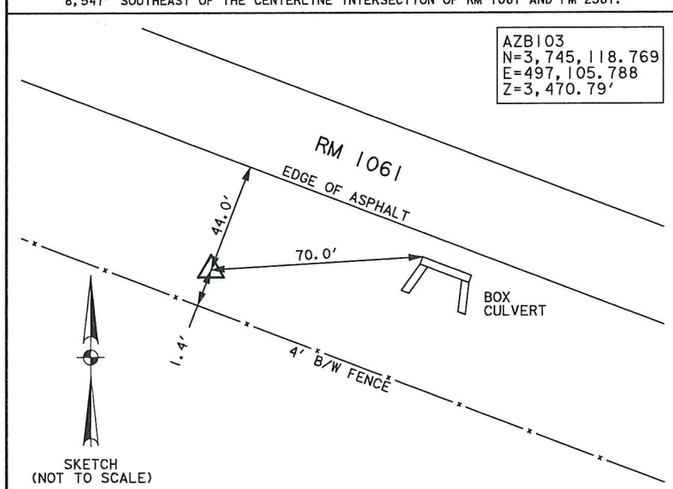
AZ&B
ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214) 341-9900
FIRM REGISTRATION No. F-10098
TBPLS REGISTRATION No. 10088700

Texas Department of Transportation

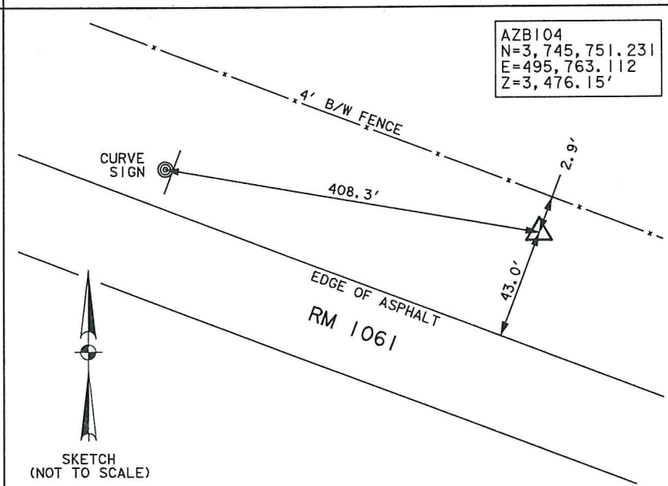
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 1 OF 2

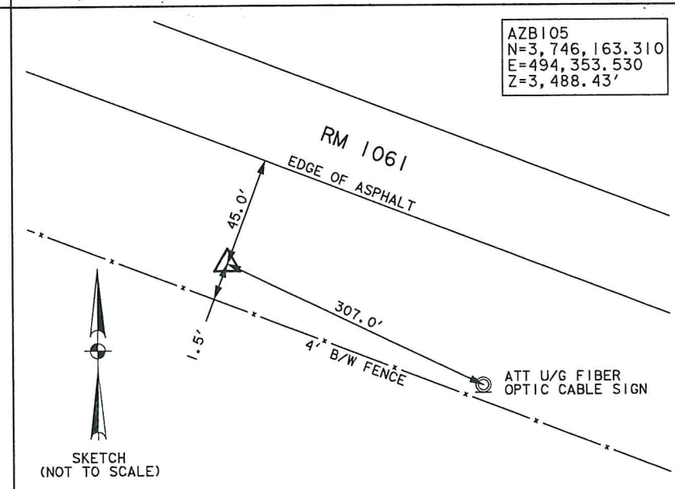
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		58
STATE	DISTRICT	COUNTY	
TEXAS	04	POTTER	
CONTROL	SECTION	JOB	HIGHWAY NO.
2494	01	015	RM 2381



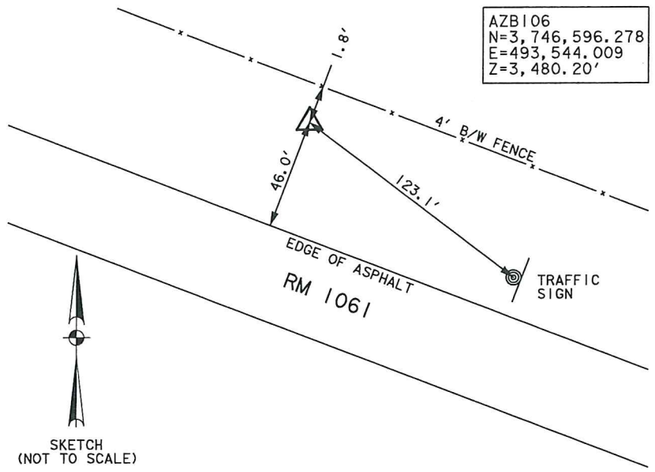
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB103", LOCATED APPROXIMATELY 4,670' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



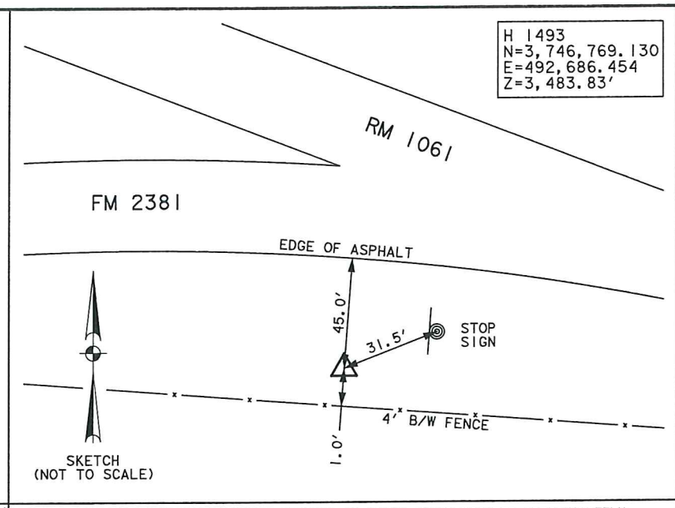
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB104", LOCATED APPROXIMATELY 3,192' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



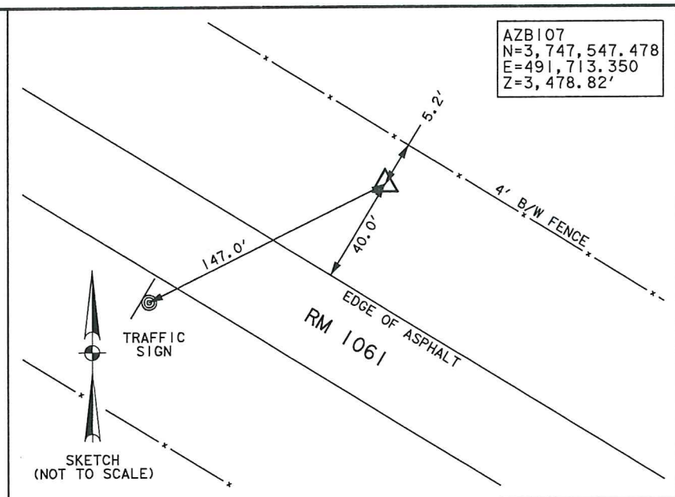
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB105", LOCATED APPROXIMATELY 1,732' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB106", LOCATED APPROXIMATELY 825' SOUTHEAST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



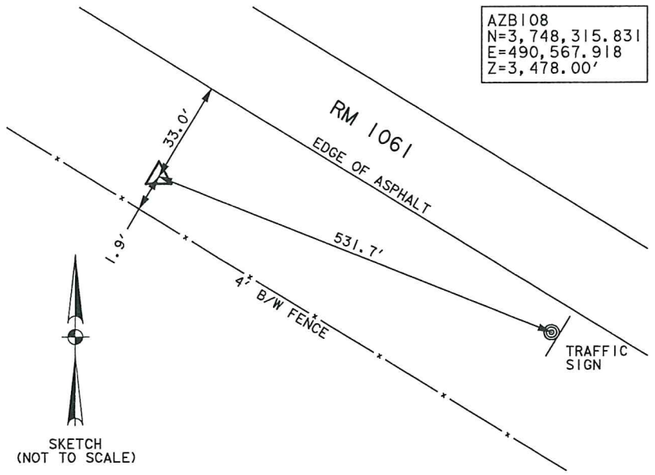
DATUM ROD WITH ACCESS COVER STAMPED "H 1493" FOUND LOCATED APPROXIMATELY 95' SOUTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



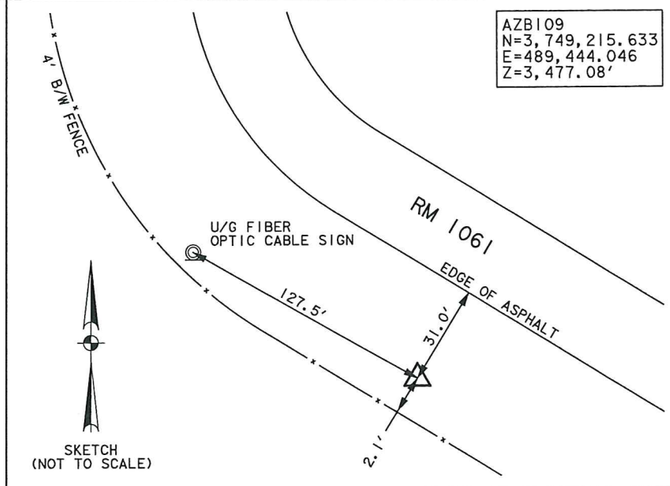
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB107", LOCATED APPROXIMATELY 297' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.

NOTES:

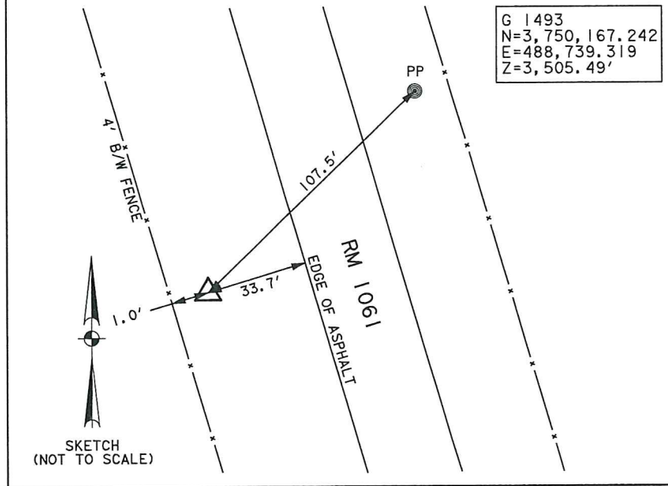
HORIZONTAL COORDINATES ARE IN U.S. SURVEY FEET BASED ON THE TEXAS COORDINATE SYSTEM OF 1983, NORTH ZONE 4201, NORTH AMERICAN DATUM 1983 (NAD83) (2011 ADJ), EPOCH 2010.00, GEOID 12B MODEL, WITH A GRID TO SURFACE ADJUSTMENT FACTOR OF 1.0002441 (PROJECT SPECIFIC). ALL VALUES ARE DERIVED FROM LEVEL 3 GPS OBSERVATIONS, USING THE TXDOT RTN. ELEVATIONS ARE IN U.S. SURVEY FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) DERIVED FROM LEVEL 3 GPS OBSERVATIONS AND ADJUSTED BY DIFFERENTIAL LEVEL LOOP HOLDING NGS BENCHMARK ELEVATIONS OF Z1492=3,508.74 AND N1492=3,180.11.



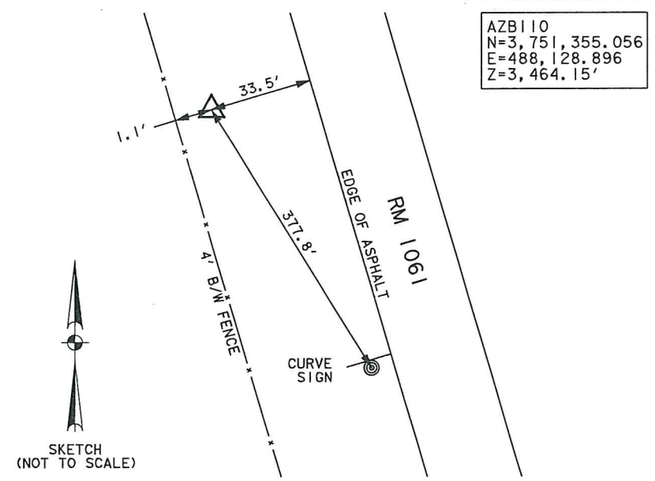
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB108", LOCATED APPROXIMATELY 1,670' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



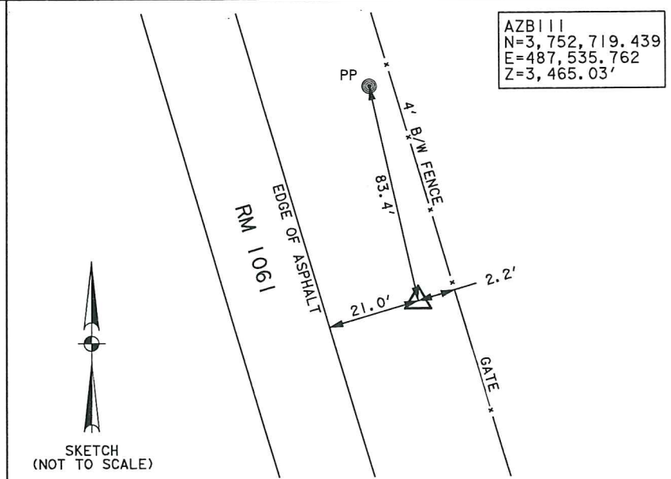
2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB109", LOCATED APPROXIMATELY 3,115' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



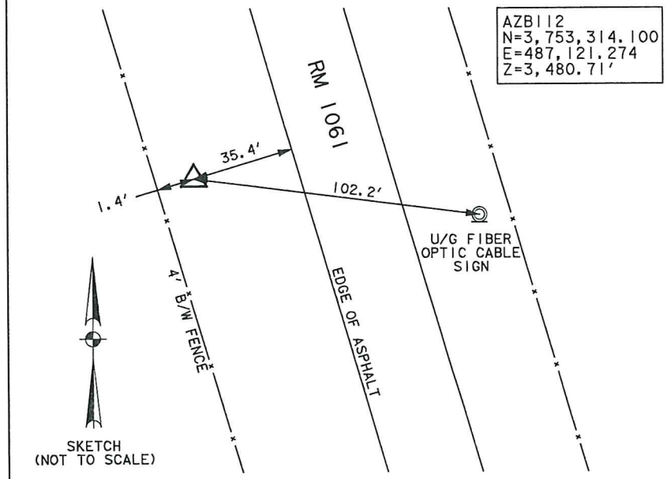
DATUM ROD WITH ACCESS COVER STAMPED "G 1493" FOUND LOCATED APPROXIMATELY 4,256' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB110", LOCATED APPROXIMATELY 5,526' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB111", LOCATED APPROXIMATELY 6,942' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.



2" ALUMINUM DISK SET ON A 5/8" STEEL REBAR STAMPED "AZB112", LOCATED APPROXIMATELY 7,668' NORTHWEST OF THE CENTERLINE INTERSECTION OF RM 1061 AND FM 2381.

I, THE UNDERSIGNED, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE COORDINATE AND ELEVATION INFORMATION SHOWN WERE DERIVED FROM A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
HEATH W. BROWN
6189
PROFESSIONAL
LAND SURVEYOR

Heath W. Brown 1-14-2020

HEATH W. BROWN DATE
RPLS NO. 6189

NO.	REVISIONS	BY	DATE

AZ&B
ARREDONDO, ZEPEDA & BRUNZ, LLC
11355 McCree Road - Dallas, Texas 75238
(214)341-9900
FIRM REGISTRATION No. F-10098
TBPLS REGISTRATION No. 10088700

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		59
STATE	DISTRICT	COUNTY	
TEXAS	04	POTTER	
CONTROL	SECTION	JOB	HIGHWAY NO.
2494	01	015	RM 2381

RM 2381 - HORIZONTAL ALIGNMENT DATA

Chain 2381RDCL contains:
1 2

Beginning chain 2381RDCL description
Feature: Road_Centerline

Point 1	N 3,746,126.8527	E 492,194.6079	Sta	0+00.00
Course from 1 to 2 S 27° 02' 01.58" W Dist 3,053.4018				
Point 2	N 3,743,407.0693	E 490,806.7891	Sta	30+53.40

Ending chain 2381RDCL description

RM 2381 - VERTICAL ALIGNMENT DATA

Beginning profile 2381*VP description:
Feature: Road*Centerline

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	0+14.00	3,488.4707				
VPI	2	6+00.00	3,500.9206	2.1246			
VPI	3	6+53.00	3,502.2717	2.5493			
VPI	4	7+53.00	3,505.3164	3.0447			
VPI	5	8+53.00	3,508.2108	2.8944			
VPI	6	10+55.00	3,513.7375	2.7360			

Ending profile 2381*VP description

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

ALIGNMENT DATA SHEET

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		60

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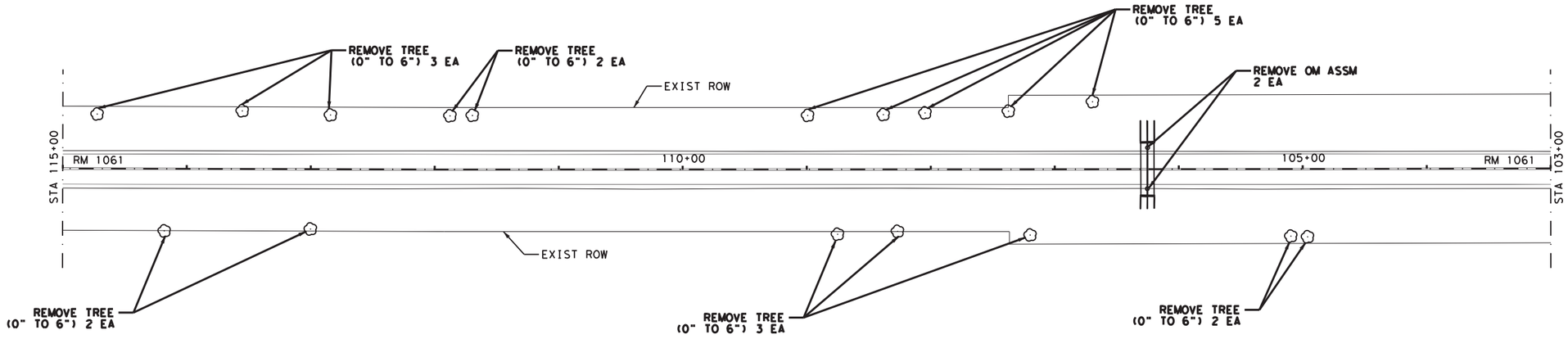


RM 1061 REMOVAL

STA 103+00 TO STA 115+00

NOTES:

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING EXISTING PAVEMENT

SEE TCP NARRATIVE AND TCP LAYOUTS FOR MORE INFORMATION REGARDING PROJECT PHASING.

SEE SIGN LAYOUT AND SOSS FOR INFORMATION REGARDING EXISTING SIGN REMOVAL.

REMOVAL LAYOUT SHEET SUMMARY		
	100	658
	6008	6060
LOCATION	PREPARING ROW (TREE) (0" TO 6" DIA)	REMOVE DELIN & OBJECT MARKER ASSMS
	EA	EA
RM 1061: STA 103+00 TO STA 115+00	17	2
SHEET TOTALS:	**17**	**2**

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

REMOVAL LAYOUT

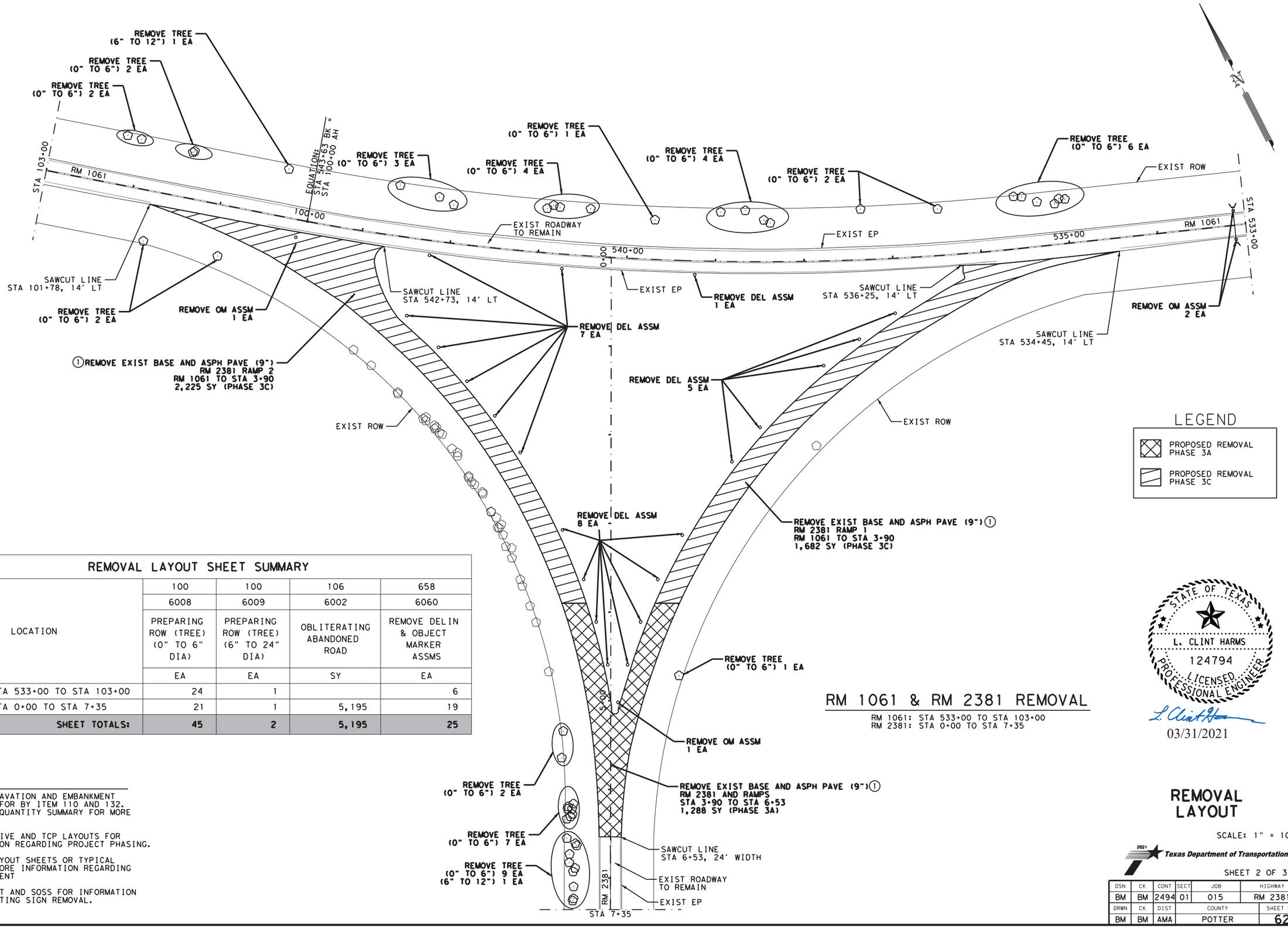
SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		61

DATE: 3/9/2021 10:30:05 AM
FILE: I:\AMA\PD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\3. Roadway\015_Removal Layout.dgn



REMOVAL LAYOUT SHEET SUMMARY

LOCATION	100 6008 PREPARING ROW (TREE) (0" TO 6" DIA) EA	100 6009 PREPARING ROW (TREE) (6" TO 24" DIA) EA	106 6002 OBLITERATING ABANDONED ROAD SY	658 6060 REMOVE DELIN & OBJECT MARKER ASSMS EA
RM 1061: STA 533+00 TO STA 103+00	24	1		6
RM 2381: STA 0+00 TO STA 7+35	21	1	5,195	19
SHEET TOTALS:	**45**	**2**	**5,195**	**25**

NOTES:

1 ADDITIONAL EXCAVATION AND EMBANKMENT REQUIRED PAID FOR BY ITEM 110 AND 132. SEE EARTHWORK QUANTITY SUMMARY FOR MORE INFORMATION.

SEE TCP NARRATIVE AND TCP LAYOUTS FOR MORE INFORMATION REGARDING PROJECT PHASING.

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING EXISTING PAVEMENT

SEE SIGN LAYOUT AND SOSS FOR INFORMATION REGARDING EXISTING SIGN REMOVAL.

RM 1061 & RM 2381 REMOVAL

RM 1061: STA 533+00 TO STA 103+00
RM 2381: STA 0+00 TO STA 7+35

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

REMOVAL LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 2 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		62

DATE: 3/9/2021 10:25:04 AM
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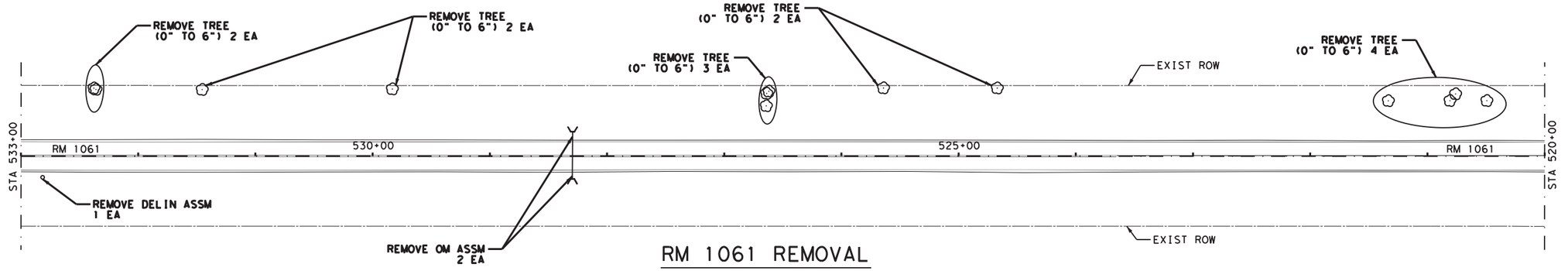
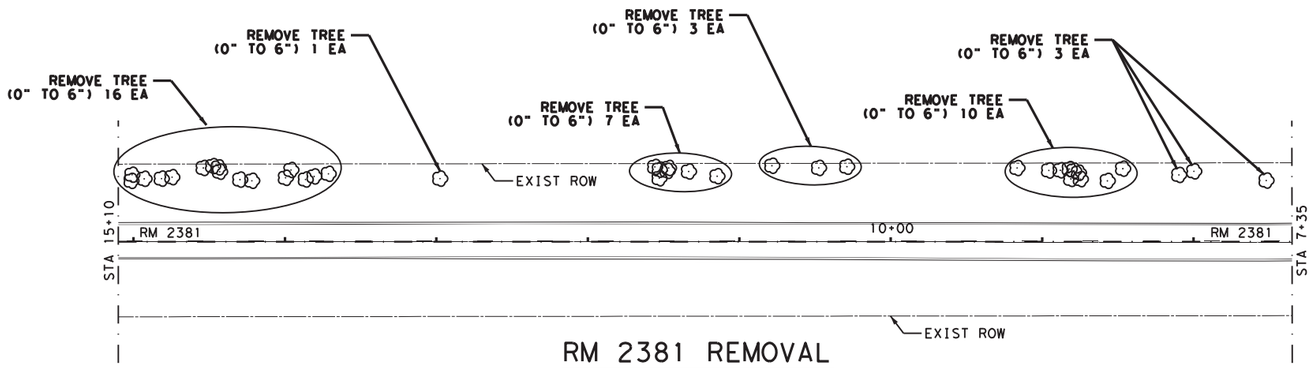


RM 1061 REMOVAL

STA 520+00 TO STA 533+00



RM 2381 REMOVAL

STA 7+35 TO STA 15+10

REMOVAL LAYOUT SHEET SUMMARY		
LOCATION	100 6008 PREPARING ROW (TREE) (0" TO 6" DIA) EA	658 6060 REMOVE DELIN & OBJECT MARKER ASSMS EA
RM 1061: STA 520+00 TO STA 533+00	13	3
RM 2381: STA 7+35 TO STA 15+10	40	
SHEET TOTALS:	**53**	**3**

NOTES:

SEE ROADWAY LAYOUT SHEETS OR TYPICAL SECTIONS FOR MORE INFORMATION REGARDING EXISTING PAVEMENT

SEE TCP NARRATIVE AND TCP LAYOUTS FOR MORE INFORMATION REGARDING PROJECT PHASING.

SEE SIGN LAYOUT AND SOSS FOR INFORMATION REGARDING EXISTING SIGN REMOVAL.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

REMOVAL LAYOUT

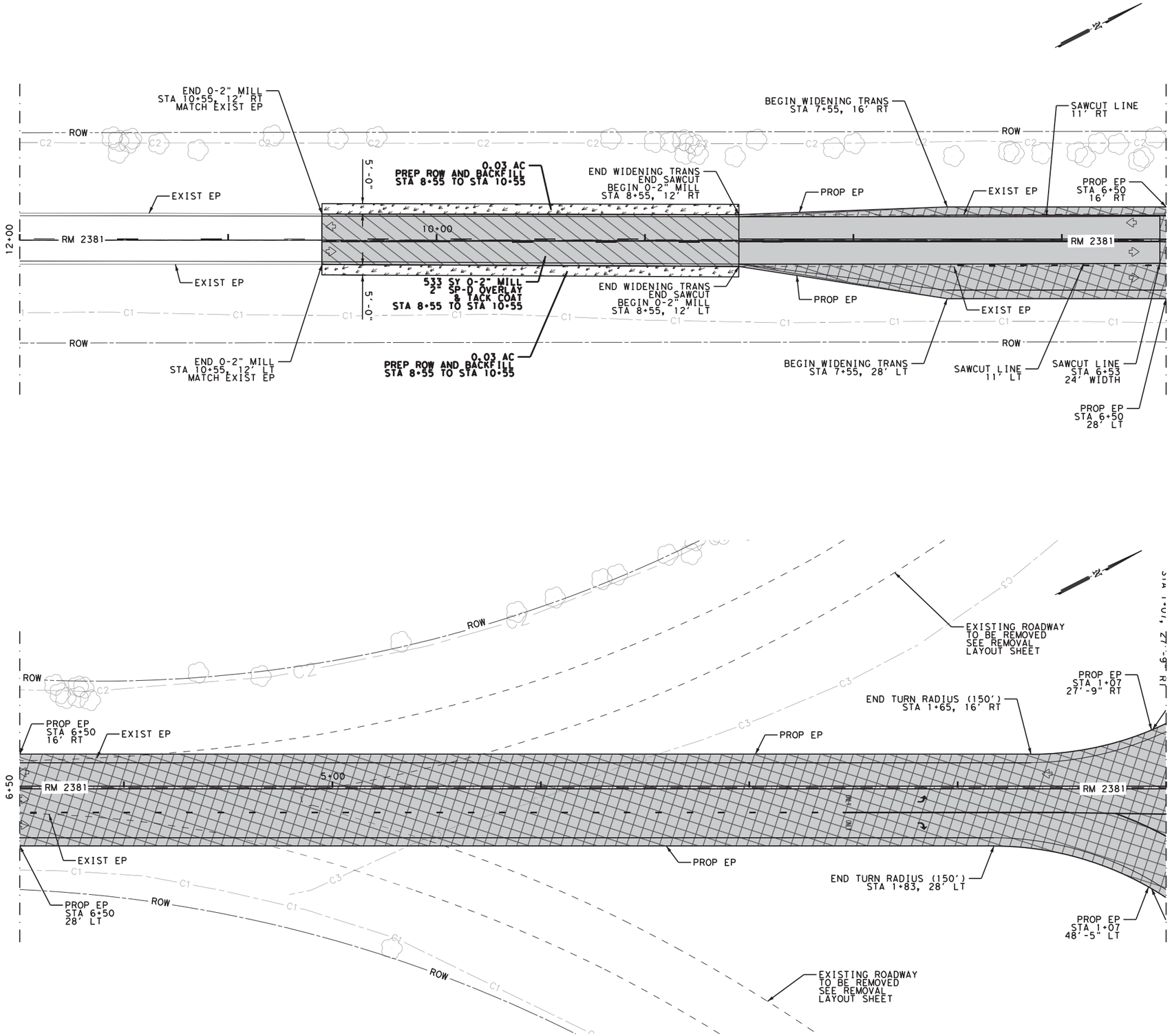
SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 3 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		63

DATE: 3/10/2021 10:57:41 AM
FILE: I:\AMA\PD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\3. Roadway\015_Removal Layout.dgn



LEGEND

- 0-2" MILL
- PROP WIDENING
- FULL WIDTH OVERLAY (2")
- CONC RIP RAP ISLAND (5")
- PREP ROW AND BACKFILL
- EXIST EP
- DIRECTION OF TRAVEL
- EXIST ROW
- C1 — AT&T (FO/DUCT)
- C2 — AT&T (TELE)
- C3 — ZAYO (FO/DUCT)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TREE

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms

03/31/2021

ROADWAY LAYOUT

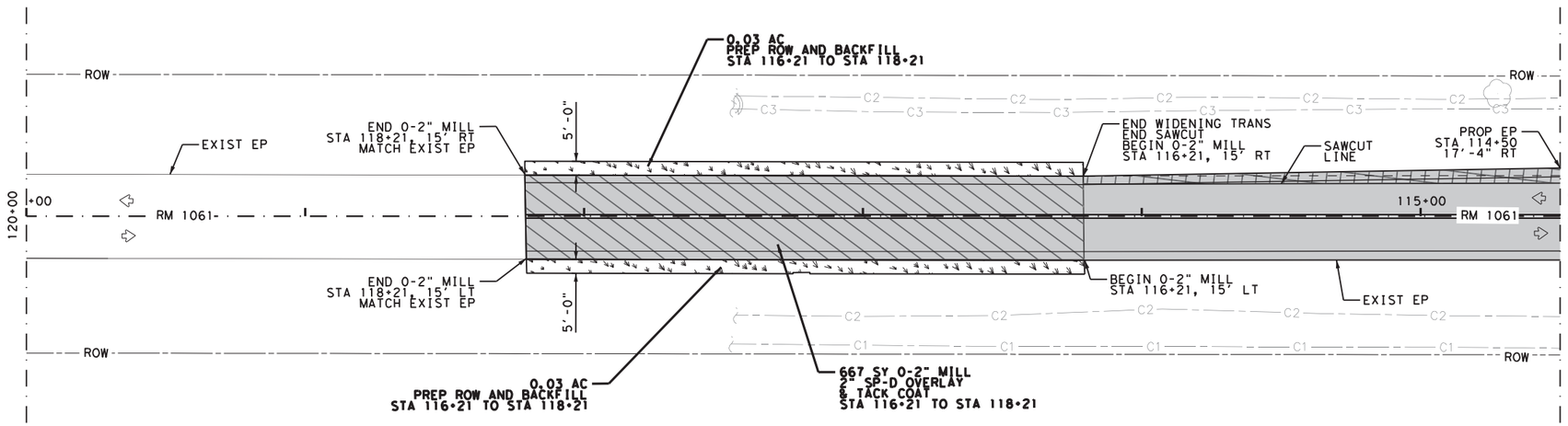
SCALE: 1" = 50'

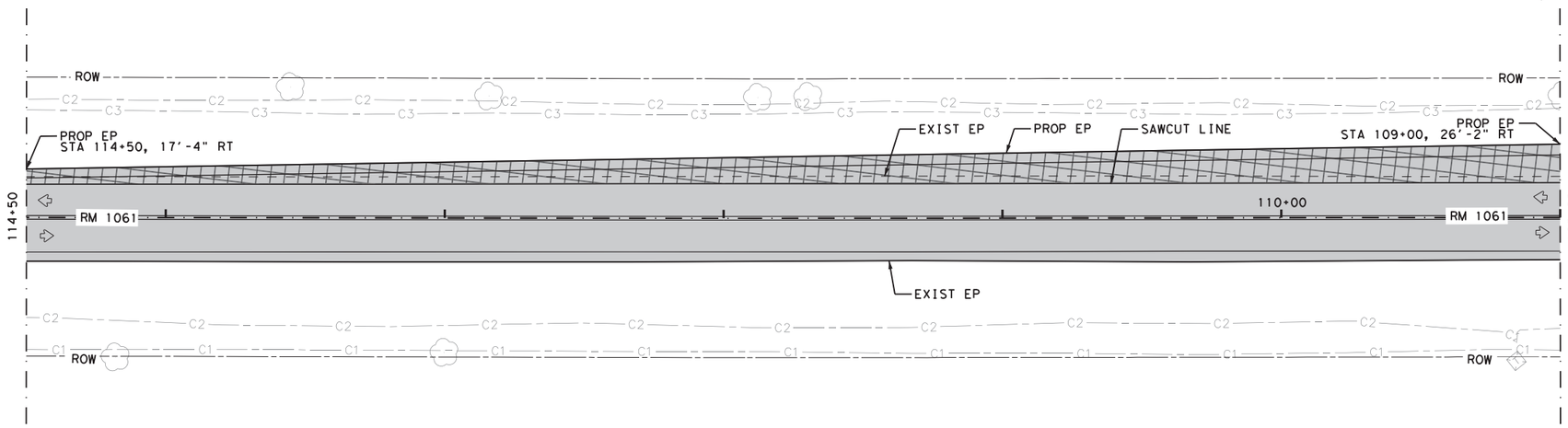
2021 Texas Department of Transportation

SHEET 1 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		64

DATE: 3/9/2021 5:31:37 PM
FILE: I:\AMAIPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\3. Roadway\1061_Intersection_Prop_Sheets.dgn





LEGEND

- 0-2" MILL
- PROP WIDENING
- FULL WIDTH OVERLAY (2")
- CONC RIP RAP ISLAND (5")
- PREP ROW AND BACKFILL
- EXIST EP
- DIRECTION OF TRAVEL
- EXIST ROW
- C1 AT&T (FO/DUCT)
- C2 AT&T (TELE)
- C3 ZAYO (FO/DUCT)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TREE

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

ROADWAY LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 2 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		65

DATE: 3/9/2021 5:31:39 PM
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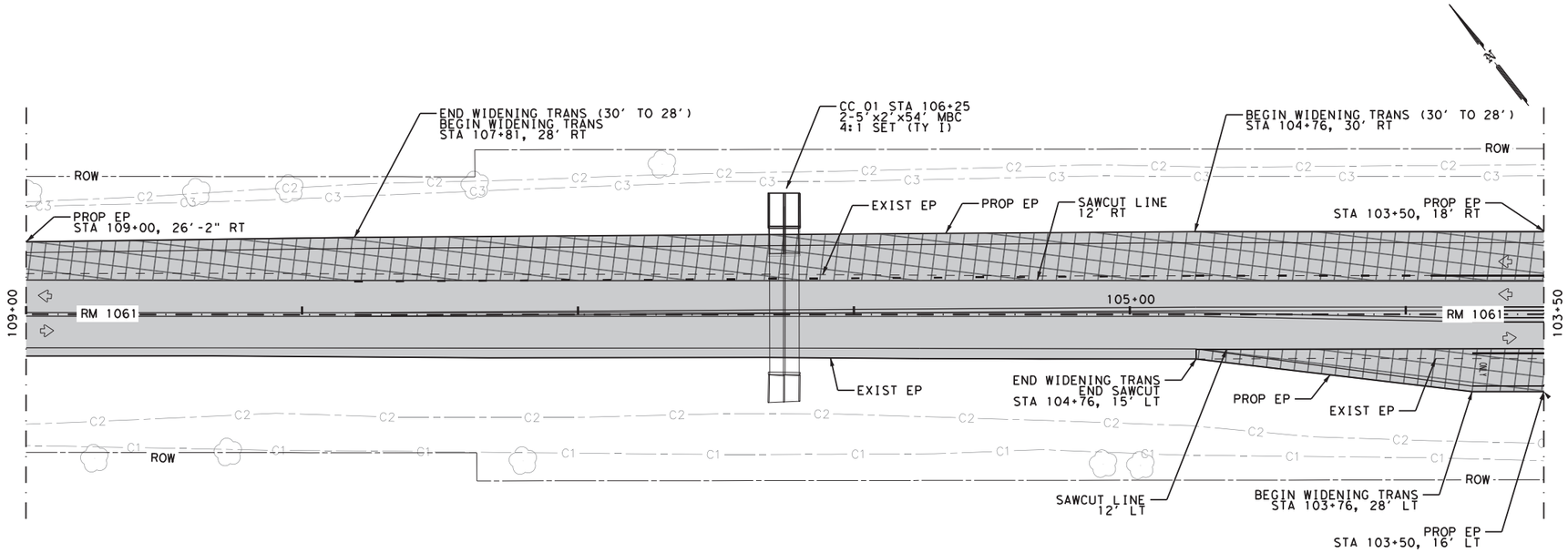

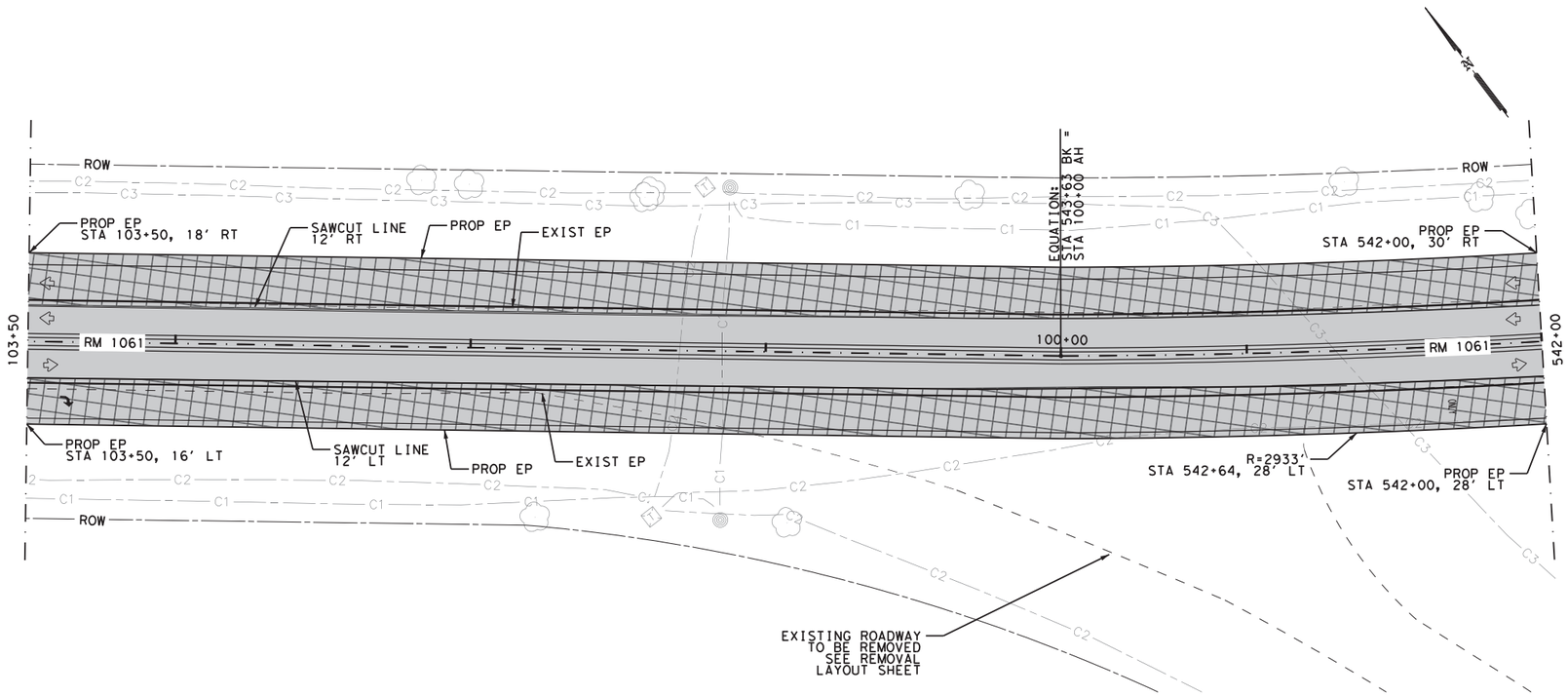

LEGEND

- 0-2" MILL
- PROP WIDENING
- FULL WIDTH OVERLAY (2")
- CONC RIP RAP ISLAND (5")
- PREP ROW AND BACKFILL
- EXIST EP
- DIRECTION OF TRAVEL
- EXIST ROW
- C1 — AT&T (FO/DUCT)
- C2 — AT&T (TELE)
- C3 — ZAYO (FO/DUCT)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TREE

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

ROADWAY LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 3 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		66

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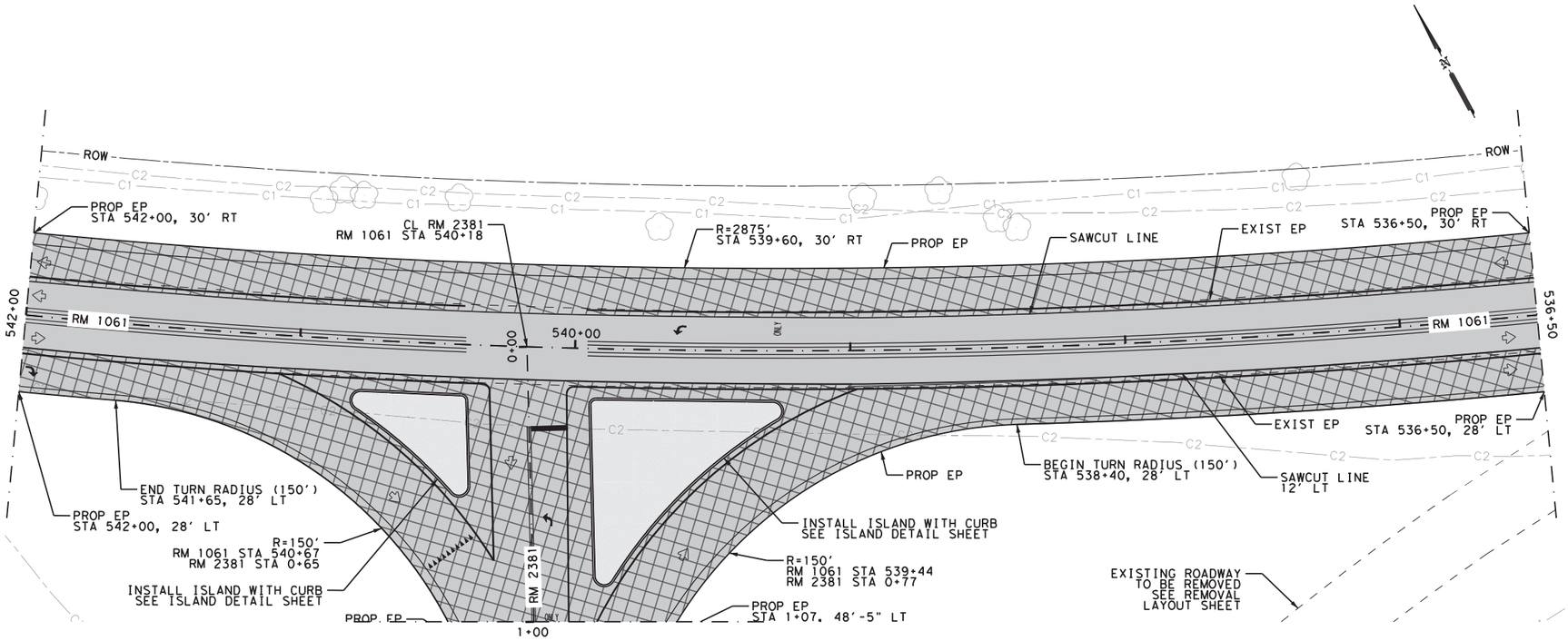

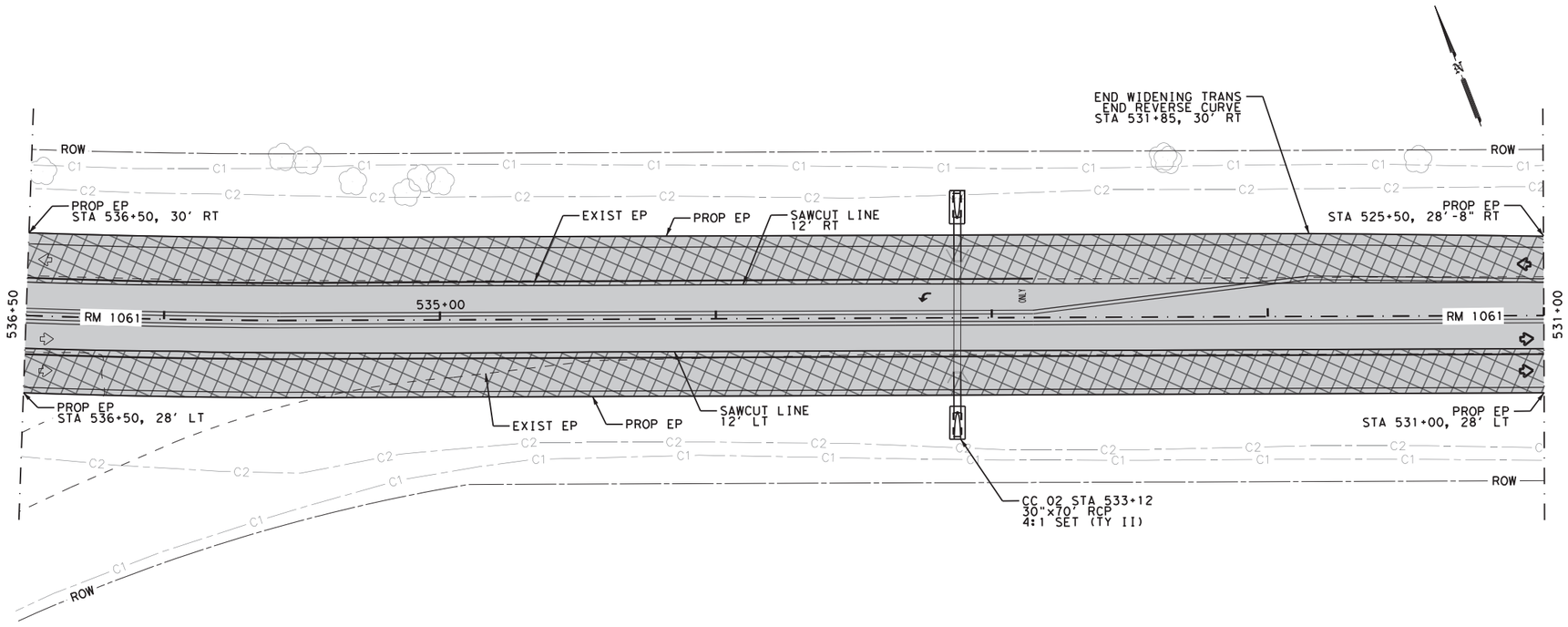

LEGEND

- 0-2" MILL
- PROP WIDENING
- FULL WIDTH OVERLAY (2")
- CONC RIP RAP ISLAND (5")
- PREP ROW AND BACKFILL
- EXIST EP
- DIRECTION OF TRAVEL
- EXIST ROW
- C1 AT&T (FO/DUCT)
- C2 AT&T (TELE)
- C3 ZAYO (FO/DUCT)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TREE

STATE OF TEXAS
L. CLINT HARMS
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PROFESSIONAL ENGINEER

03/31/2021

ROADWAY LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 4 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		67

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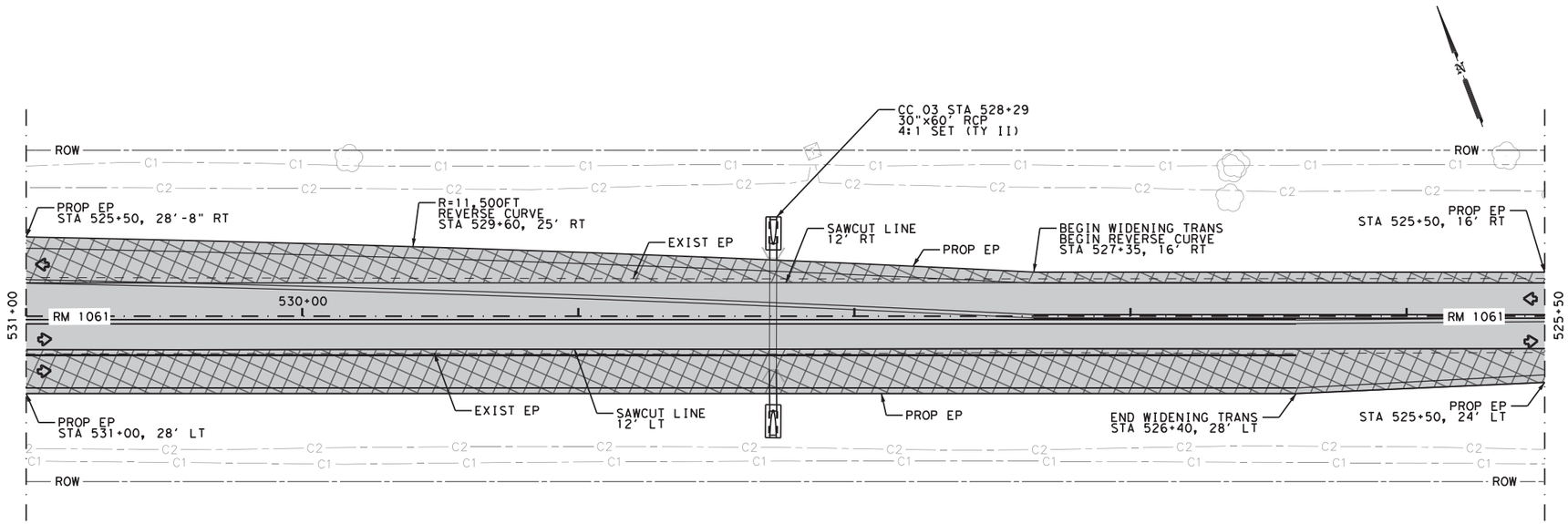

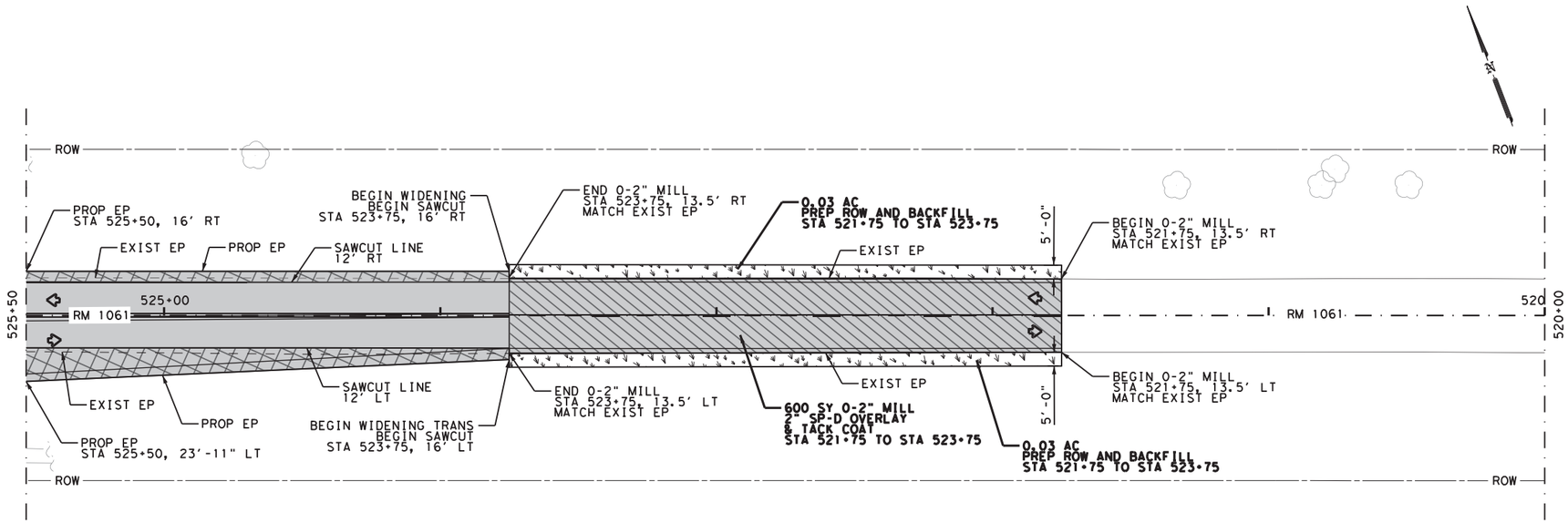

LEGEND

- 0-2" MILL
- PROP WIDENING
- FULL WIDTH OVERLAY (2")
- CONC RIP RAP ISLAND (5")
- PREP ROW AND BACKFILL
- EXIST EP
- DIRECTION OF TRAVEL
- EXIST ROW
- C1 AT&T (FO/DUCT)
- C2 AT&T (TELE)
- C3 ZAYO (FO/DUCT)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TREE

STATE OF TEXAS
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L. Clint Harms

03/31/2021

ROADWAY LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 5 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		68

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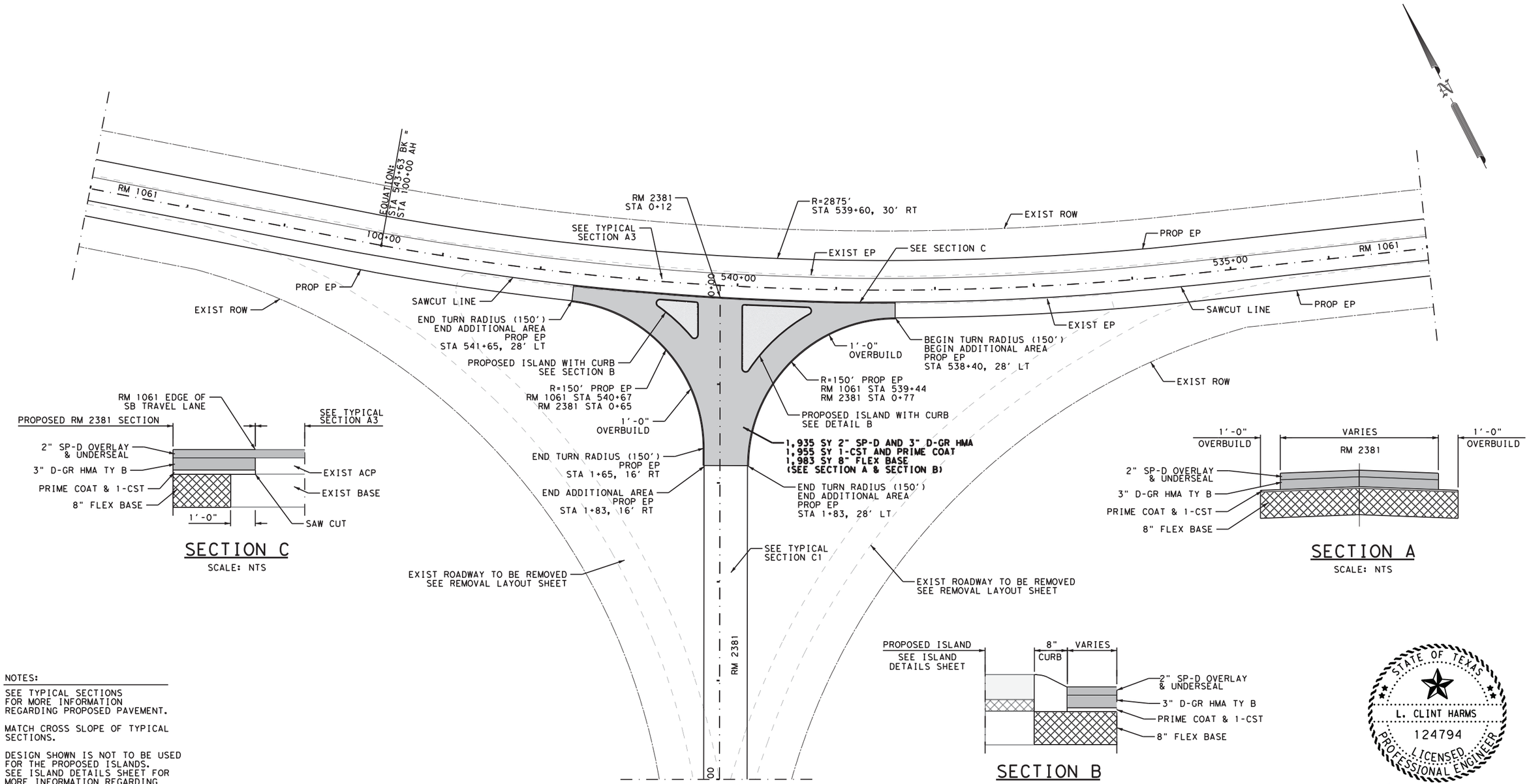

SECTION C

SCALE: NTS

SECTION A

SCALE: NTS

SECTION B

SCALE: NTS

NOTES:

SEE TYPICAL SECTIONS FOR MORE INFORMATION REGARDING PROPOSED PAVEMENT.

MATCH CROSS SLOPE OF TYPICAL SECTIONS.

DESIGN SHOWN IS NOT TO BE USED FOR THE PROPOSED ISLANDS. SEE ISLAND DETAILS SHEET FOR MORE INFORMATION REGARDING ISLAND FOUNDATION DESIGN.

ADDITIONAL AREAS SHEET SUMMARY

LOCATION	310 6009 PRIME COAT (MC-30) (0.25 GAL/SY) GAL	316 6001 ASPH (MULTI OPTION) (0.38 GAL/SY) GAL	316 6078 AGGR (TY-B GR-4 SAC-A) (110 SY/CY) CY	247 6227 FL BS (CMP IN PLC) (TY A OR B GR 4)(8") SY	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LB/SY) TON	3076 6001 D-GR HMA TY-B PG64-28 (330 LB/SY) TON	3085 6001 UNDERSEAL COURSE GAL
STA 538+40 TO STA 541+65 (RM 1061) STA 0+12 TO STA 1+83 (RM 2381)	489	743	18	1,983	213	320	484
PROJECT TOTALS:	**489**	**743**	**18**	**1,983**	**213**	**320**	**484**

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ADDITIONAL AREA

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		69

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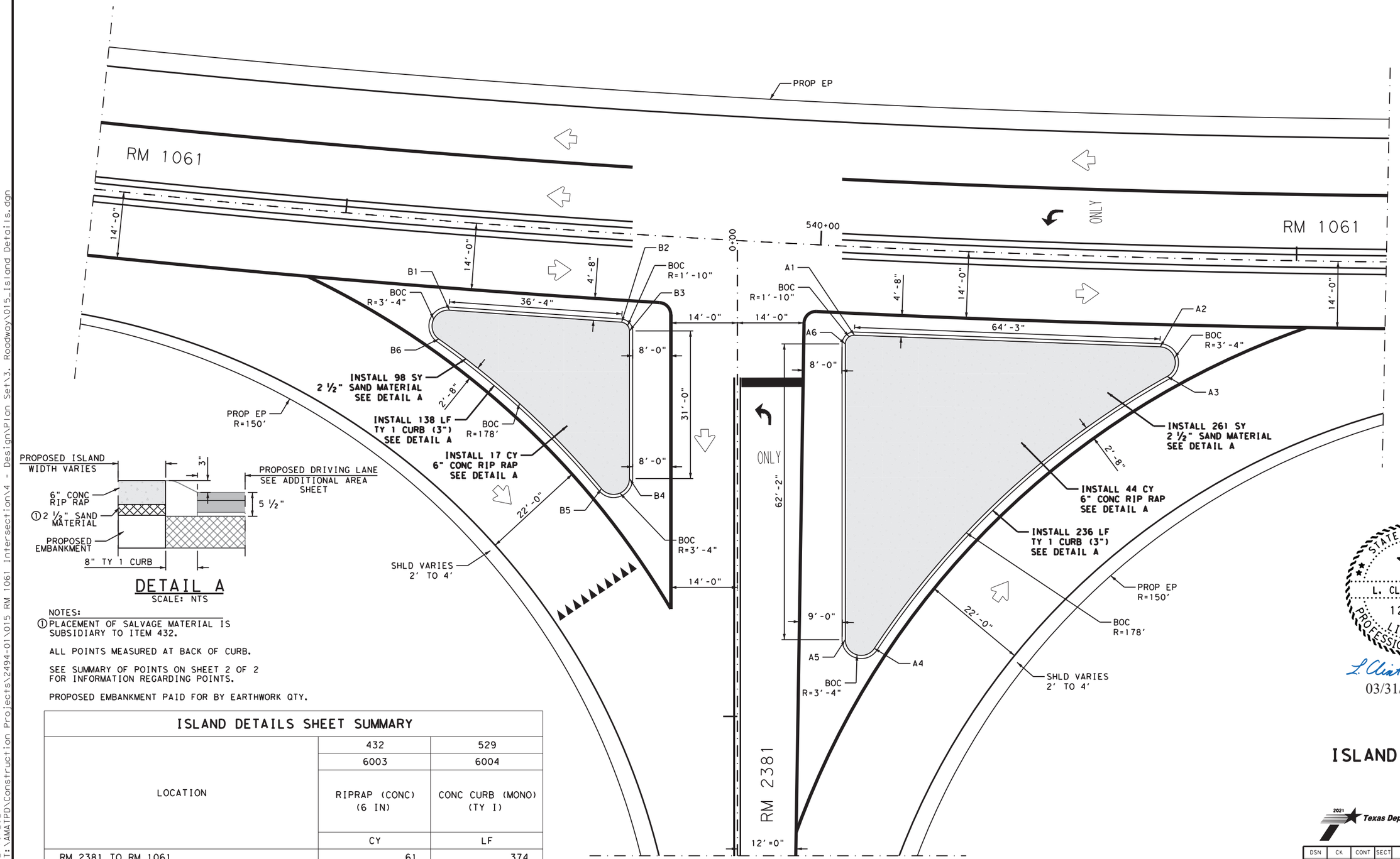

DETAIL A

SCALE: NTS

NOTES:

① PLACEMENT OF SALVAGE MATERIAL IS SUBSIDIARY TO ITEM 432.

ALL POINTS MEASURED AT BACK OF CURB.

SEE SUMMARY OF POINTS ON SHEET 2 OF 2 FOR INFORMATION REGARDING POINTS.

PROPOSED EMBANKMENT PAID FOR BY EARTHWORK QTY.

ISLAND DETAILS SHEET SUMMARY

LOCATION	432 6003 RIPRAP (CONC) (6 IN) CY	529 6004 CONC CURB (MONO) (TY I) LF
RM 2381 TO RM 1061	61	374
PROJECT TOTALS:	**61**	**374**

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ISLAND DETAILS

SCALE: 1" = 20'

2021 Texas Department of Transportation

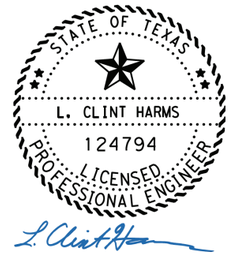
SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		70

DATE: 2/10/2021 4:51:31 PM
FILE: T:\AMA\PD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\3. Roadway\015_Island Details.dgn

SUMMARY OF POINTS (ISLAND A)						
	RM 1061			RM 2381		
Point	STA.	OFFSET	LT OR RT	STA.	OFFSET	LT OR RT
A1	539+92	18′-8"	LT	0+20	24′-6"	LT
A2	539+28	18′-8"	LT	0+22	88′-10"	LT
A3	539+26	24′-10"	LT	0+28	90′-2"	LT
A4	539+85	84′-1"	LT	0+86	28′-9"	LT
A5	539+91	82′-6"	LT	0+84	22′-8"	LT
A6	539+94	20′-6"	LT	0+22	22′-8"	LT

SUMMARY OF POINTS (ISLAND B)						
	RM 1061			RM 2381		
Point	STA.	OFFSET	LT OR RT	STA.	OFFSET	LT OR RT
B1	540+77	18′-8"	LT	0+15	60′-6"	RT
B2	540+41	18′-8"	LT	0+17	24′-4"	RT
B3	540+39	20′-4"	LT	0+19	22′-8"	RT
B4	540+37	51′-3"	LT	0+50	22′-8"	RT
B5	540+43	52′-9"	LT	0+52	28′-7"	RT
B6	540+78	24′-10"	LT	0+21	62′-9"	RT



03/31/2021

ISLAND DETAILS

Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		71

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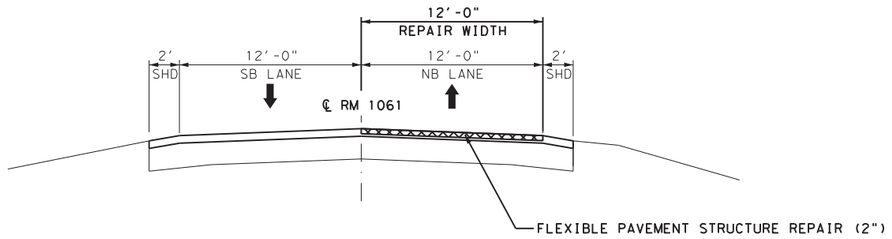
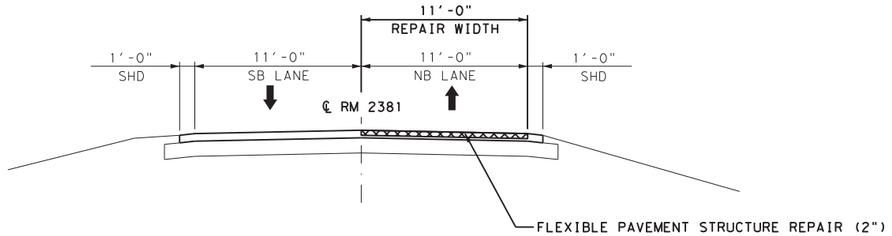


PAVEMENT REPAIR DETAIL RM 1061

STA. 523+75 TO STA. 543+63
EQUATION STA. 100+00 AH = STA. 543+63 BK
STA. 100+00 TO STA. 116+21



PAVEMENT REPAIR DETAIL RM 2381

STA. 6+53 TO STA. 8+55

PAVEMENT REPAIR DETAILS SHEET SUMMARY			
LOCATION	351	354	3077
	6012	6045	6058
	FLEXIBLE PAVEMENT STRUCTURE REPAIR (2")	PLANE ASPH CONC ① PAV (2")	SP MIXES SP-D ① SAC-A PG70-28 (220 LBS/SY)
	SY	SY	TON
RM 1061	1,926	1,926	213
RM 2381	99	99	11
SHEET TOTALS:	**2,025**	**2,025**	**224**

BASED ON 20% PAVEMENT REPAIR FOR THE TRAVEL LANES.

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

LEGEND

FLEXIBLE PAVEMENT STRUCTURE REPAIR (2")
CONSISTING OF:
PLANE ASPH CONC PAV (2")
2" SP-D SAC-A PG 70-28

NOTES

1. QUANTITIES CARRIED TO PROJECT SUMMARY.
2. CONTRACTOR WILL NOT REMOVE MORE MATERIAL THAN CAN BE REPLACED IN A SINGLE WORK DAY.
3. LOCATIONS OF PAVEMENT REPAIR TO VARY AS DIRECTED BY THE ENGINEER.
4. PAVEMENT REPAIR AREA WILL BE A MINIMUM 20′-0" IN LENGTH.
5. EXTEND REPAIR WIDTH TO INCLUDE INTERIOR EXISTING PAVEMENT JOINTS, WHERE INSTRUCTED BY THE ENGINEER. PAVEMENT REPAIR ON OUTSIDE EDGE OF TRAVEL LANE WILL INCLUDE AN OVERLAP OF 6" ONTO SHOULDER.
6. FLEX BASE TO NOT BE EXPOSED DURING THE PAVEMENT REPAIR OPERATION. IF CONTRACTOR EXPOSES BASE, INTENTIONALLY OR OTHERWISE, THE BASE WILL BE PRIMED PRIOR TO PLACING ACP. PAYMENT WILL BE CONSIDERED SUBSIDIARY TO ITEM 351.
7. HOT MIX TO BE USED FOR FLEXIBLE PAVEMENT REPAIR WILL BE SP-D SAC-A PG70-28 OR APPROVED EQUAL, BY THE ENGINEER.
8. TRACKLESS TACK COAT WILL BE USED FOR ALL REPAIR AREAS.
9. SEE PAVEMENT REPAIR SUMMARY FOR PLANING AND PAVEMENT REPAIR DEPTH.

STATE OF TEXAS
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03/31/2021

PAVEMENT REPAIR DETAILS

SCALE H: 1" = 10′
V: 1" = 5′

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		72

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DATE: 2/10/2021 4:51:43 PM
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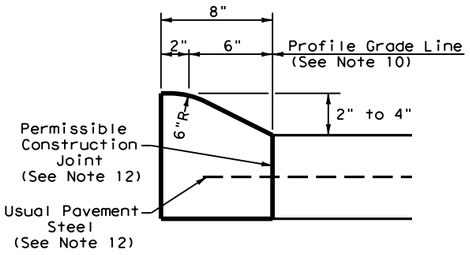
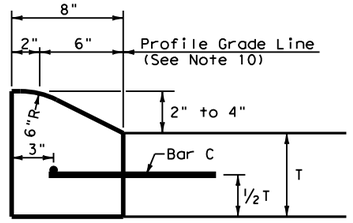
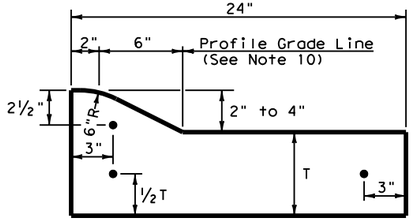


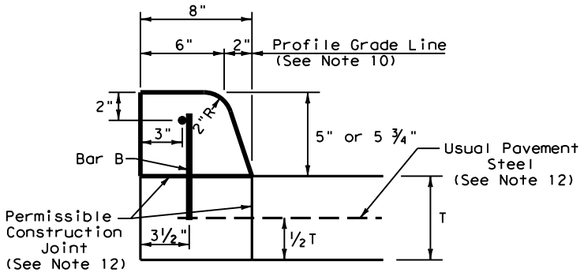
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



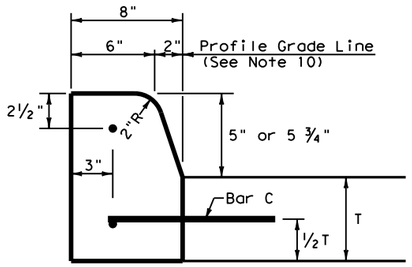
TYPE I CURB
2" - 4" HEIGHT



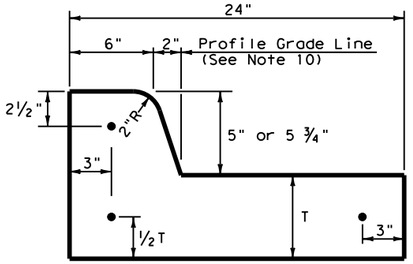
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



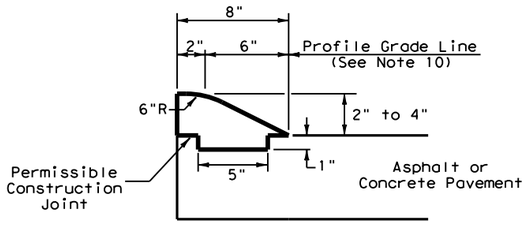
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



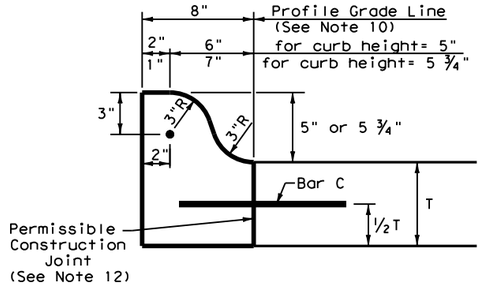
TYPE II CURB
5" - 5 ¾" HEIGHT



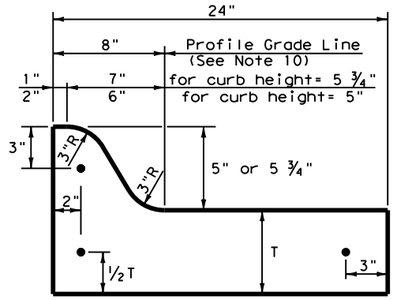
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



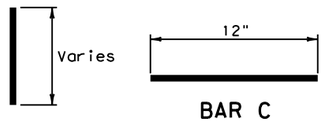
TYPE III CURB (KEYED)
2" - 4" HEIGHT



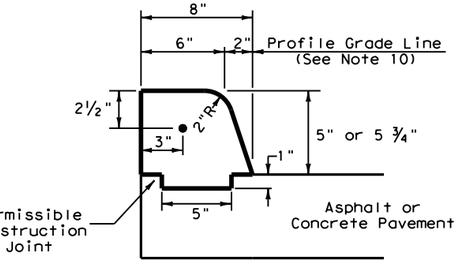
TYPE IIa CURB
5" - 5 ¾" HEIGHT



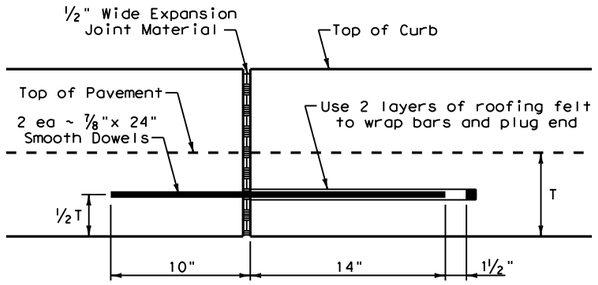
TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



BAR B BAR C

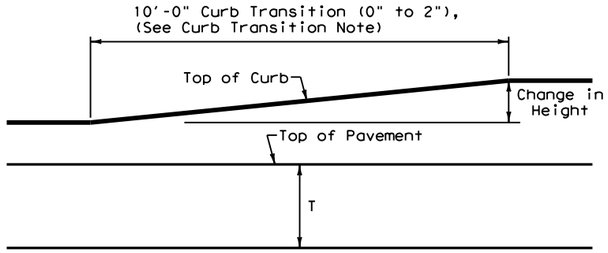


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

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



CURB TRANSITION
Note: To be paid for as Highest Curb

General Notes

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

Texas Department of Transportation

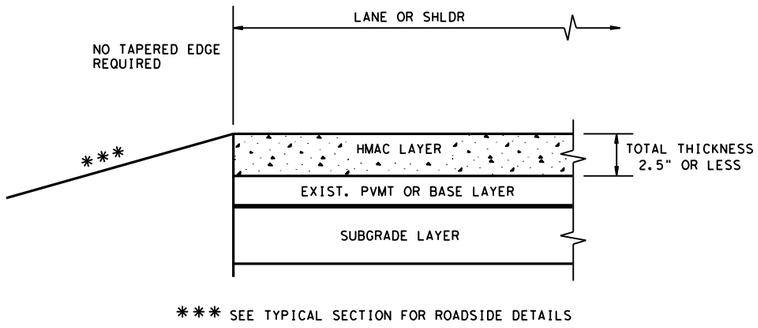
Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-12

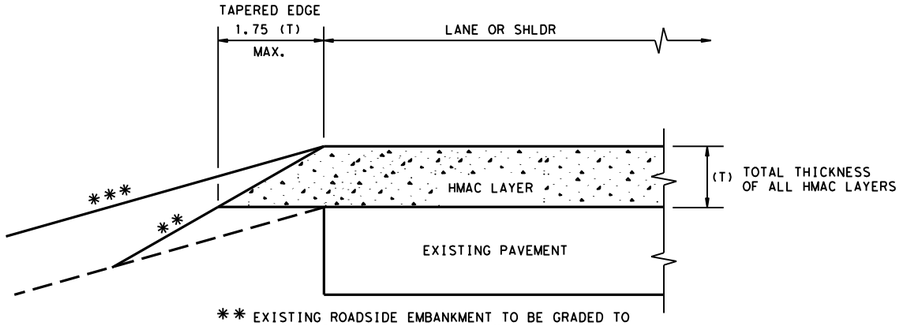
FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP
	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		73

DATE: 2/10/2021
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\3. Roadway\Standards\tehmac11.dgn



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

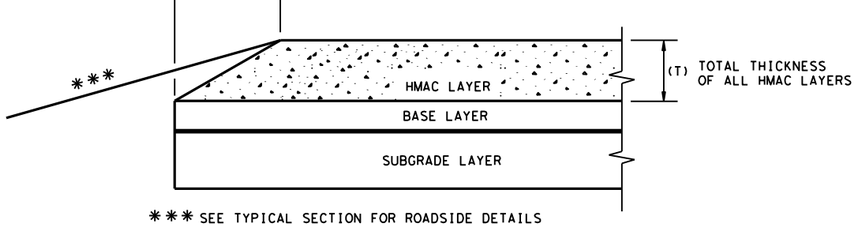
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

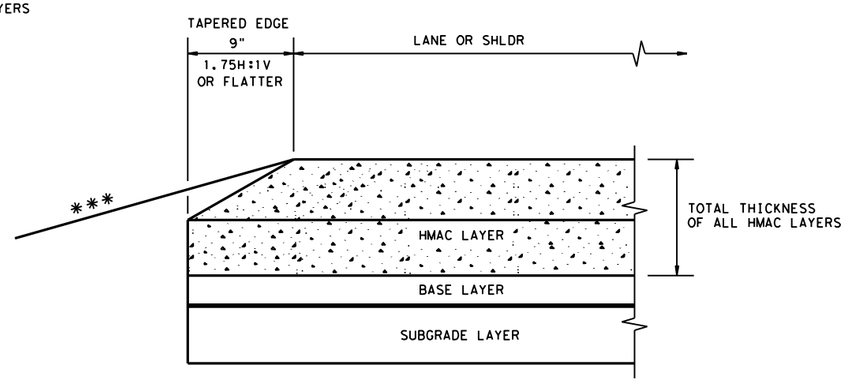
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

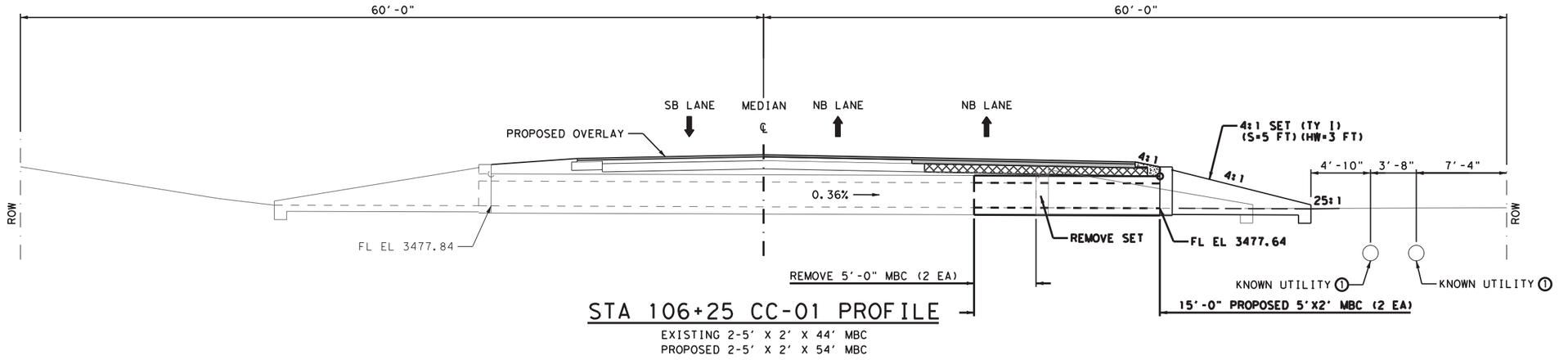
1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE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

Texas Department of Transportation | Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

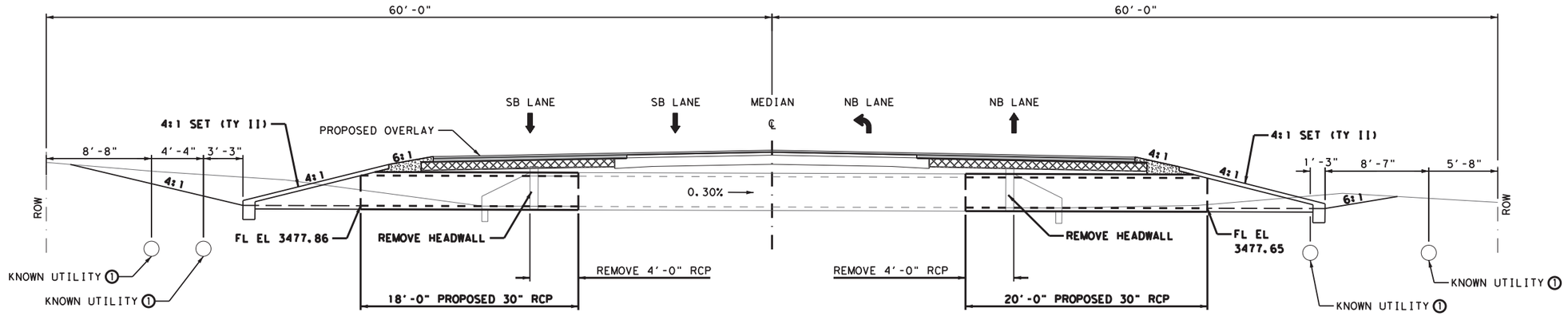
TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
©TxDOT January 2011 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		74



STA 106+25 CC-01 PROFILE

EXISTING 2-5' X 2' X 44' MBC
PROPOSED 2-5' X 2' X 54' MBC



STA 533+12 CC-02 PROFILE

EXISTING 1-30" X 40' RCP
PROPOSED 1-30" X 70' RCP

SUMMARY OF CULVERT LAYOUT SHEET 1 OF 2							
LOCATION	462	464	467	467	496	496	496
	6006	6007	6172	6419	6004	6006	6007
	CONC BOX CULV (5 FT X 2 FT)	RC PIPE (CL III) (30 IN)	SET (TY I) (S= 5 FT) (HW= 3 FT) (4:1) (C)	SET (TY II) (30 IN) (RCP) (4: 1) (C)	REMOV STR (SET)	REMOV STR (HEADWALL)	REMOV STR (PIPE)
	LF	LF	EA	EA	EA	EA	LF
STA 106+25 CC-01	30		1		1		10
STA 533+12 CC-02		38		2		2	8
SHEET TOTALS:	**30**	**38**	**1**	**2**	**1**	**2**	**18**

NOTE:

(1) DIMENSIONS SHOWN ARE APPROXIMATE.
ALL UTILITIES SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. SEE ROADWAY LAYOUT SHEETS FOR MORE INFO.

SEE TYPICAL SECTIONS FOR
MORE INFORMATION REGARDING PROPOSED ROADWAY WIDENING.

CONTRACTOR SHALL CONFIRM ALL PIPE SIZES AND LOCATIONS PRIOR TO CONSTRUCTION. SAFETY END TREATMENTS TO BE BUILT AS PER TXDOT STANDARDS OR AS DIRECTED BY THE ENGINEER.

BLADE DITCH TO MAINTAIN EXISTING DITCH FLOWLINE. MAINTAIN EXISTING CULVERT WIDTHS.

EMBANKMENT ACCOUNTED FOR IN CUT/FILL CALCULATIONS.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

CULVERT LAYOUT

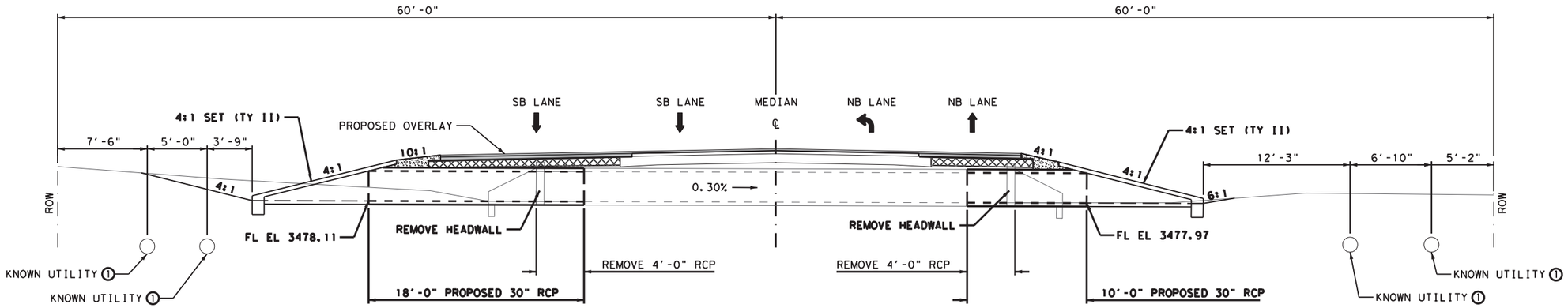
SCALE: 1" = 10'

2021 Texas Department of Transportation

SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		75

DATE: 2/11/2021 10:45:15 AM
FILE: T:\AMA\PDN\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\5. Drainage\015_CULVERTLAYOUT.dgn



STA 528+29 CC-03 PROFILE

EXISTING 1-30" X 40' RCP
PROPOSED 1-30" X 60' RCP

SUMMARY OF CULVERT LAYOUT SHEET 2 OF 2				
	464	467	496	496
	6007	6419	6006	6007
LOCATION	RC PIPE (CL III)(30 IN)	SET (TY II) (30 IN) (RCP) (4: 1) (C)	REMOV STR (HEADWALL)	REMOV STR (PIPE)
	LF	EA	EA	LF
STA 528+29 CC-03	28	2	2	8
SHEET TOTALS:	**28**	**2**	**2**	**8**

NOTE:

(1) DIMENSIONS SHOWN ARE APPROXIMATE.
ALL UTILITIES SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. SEE ROADWAY LAYOUT SHEETS FOR MORE INFO.

SEE TYPICAL SECTIONS FOR
MORE INFORMATION REGARDING PROPOSED ROADWAY WIDENING.

CONTRACTOR SHALL CONFIRM ALL PIPE SIZES AND LOCATIONS PRIOR TO CONSTRUCTION. SAFETY END TREATMENTS TO BE BUILT AS PER TXDOT STANDARDS OR AS DIRECTED BY THE ENGINEER.

BLADE DITCH TO MAINTAIN EXISTING DITCH FLOWLINE. MAINTAIN EXISTING CULVERT WIDTHS.

EMBANKMENT ACCOUNTED FOR IN CUT/FILL CALCULATIONS.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

CULVERT LAYOUT

SCALE: 1" = 10'

2021 Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		76

DATE: 2/11/2021 10:45:17 AM
FILE: I:\AMA\PD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\5. Drainage\015_CULVERTLAYOUT.dgn

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
STA 106+25 (RT)	2 ~ 5' X 2'	5'-0"	MC-5-20	SETB-CD	0°	4:1	8	7	0.750	3.167	N/A	N/A	11.333	N/A	11.750	0.0	0.3	4.5	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.

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.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms

03/31/2021

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		77

DATE: 2/10/2021 4:52:01 PM
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DATE: 2/10/2021 4:52:04 PM
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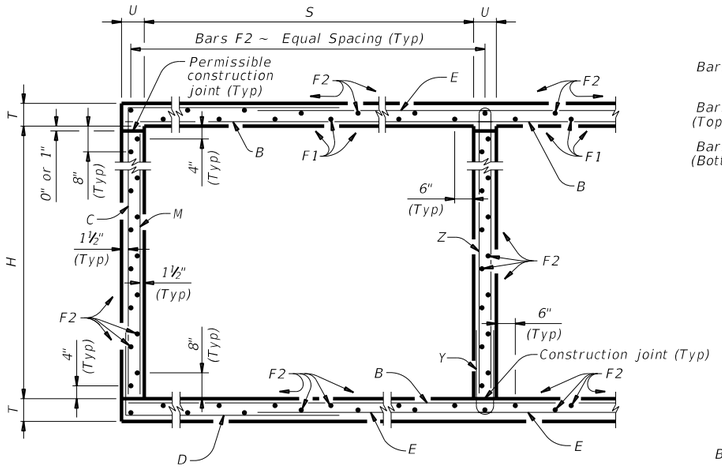
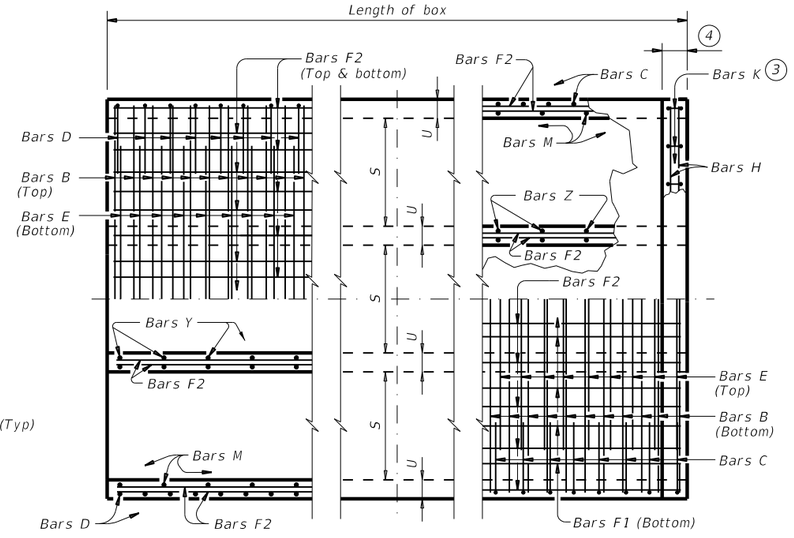
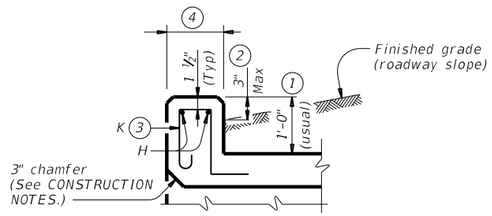


TYPICAL SECTION



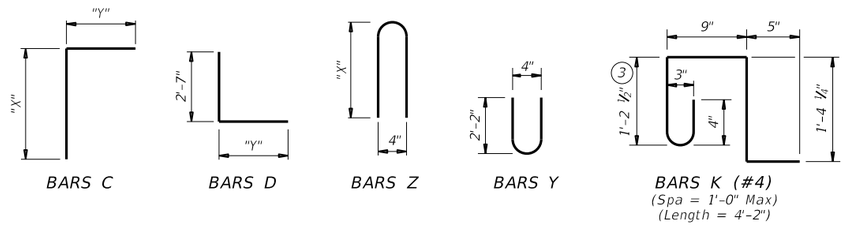
BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

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



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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		78

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

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

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS	DIST AMA	COUNTY POTTER		SHEET NO. 79

DATE: 2/10/2021 4:52:06 PM
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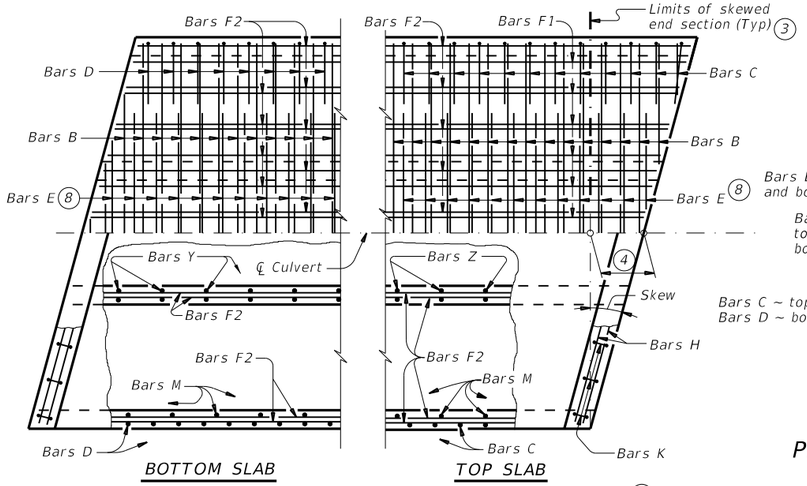
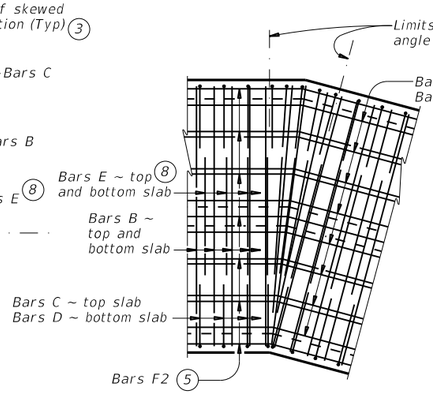
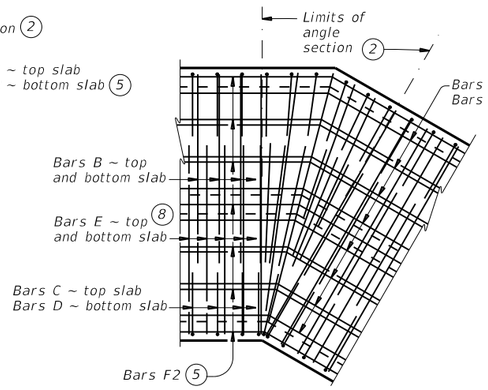


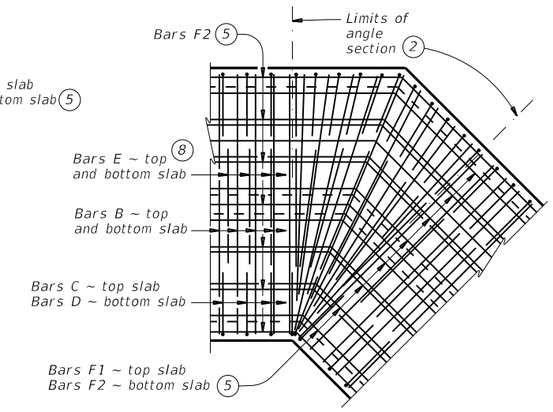
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



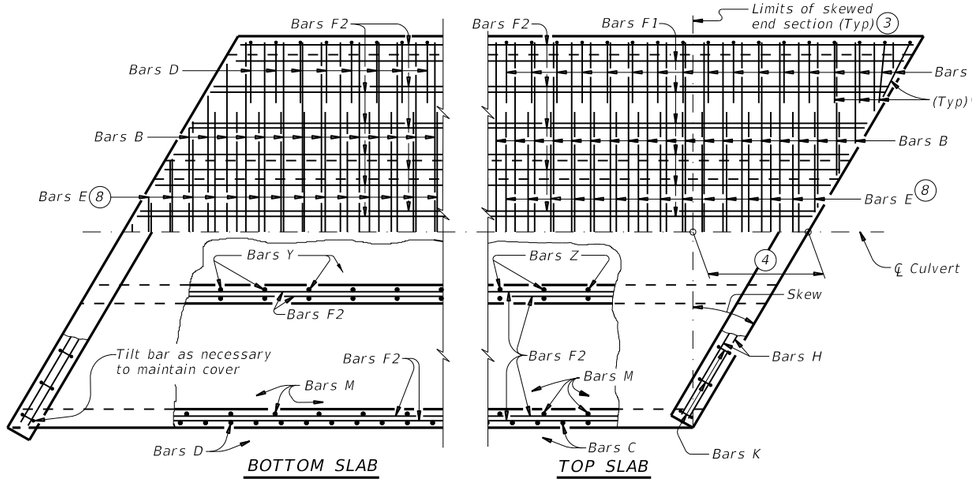
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



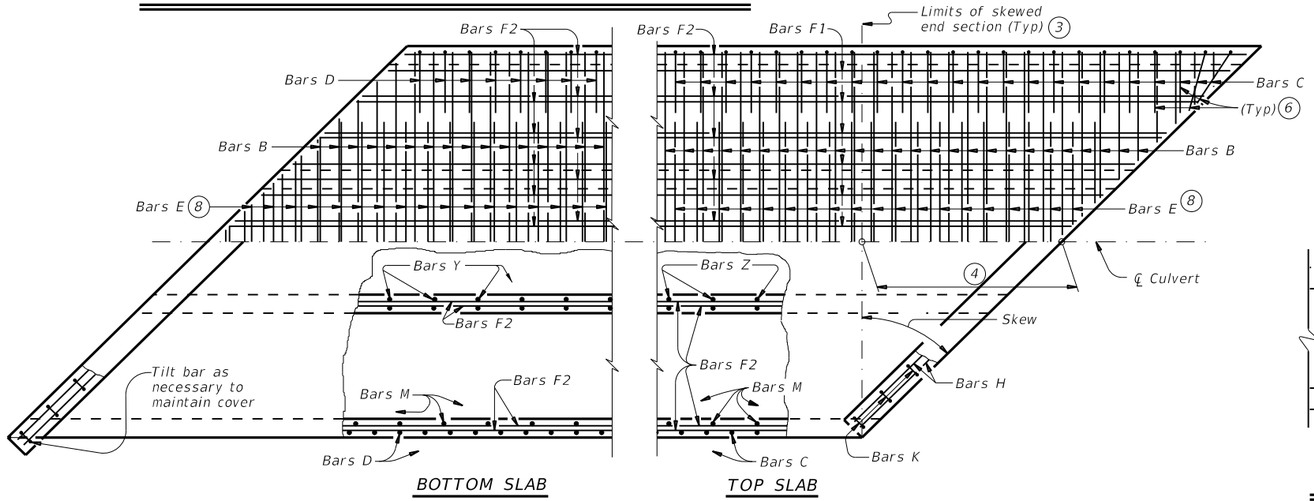
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

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

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

2 When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

3 The length of Bars B and Bars E will vary in the skewed end sections.

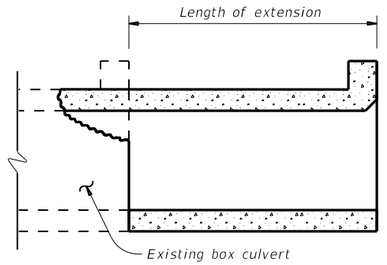
4 [One half of overall width] x [tangent of the skew angle]

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

6 When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

7 At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

8 Extend Bars E as shown on the MC standard sheet for direct traffic culverts.



LENGTHENING DETAIL 1

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

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

GENERAL NOTES:

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

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		80

DATE: 2/10/2021 4:52:13 PM
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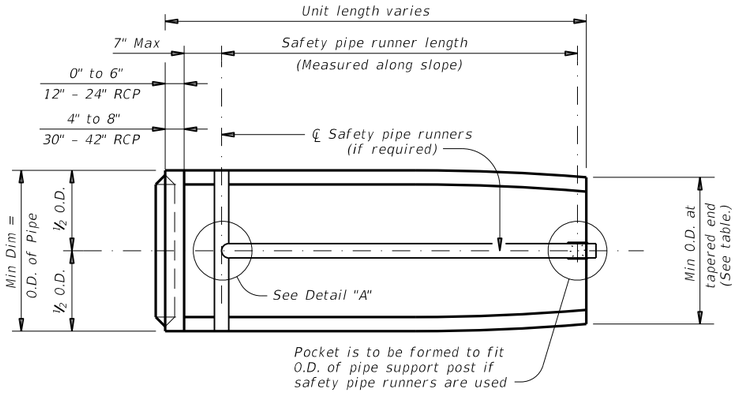
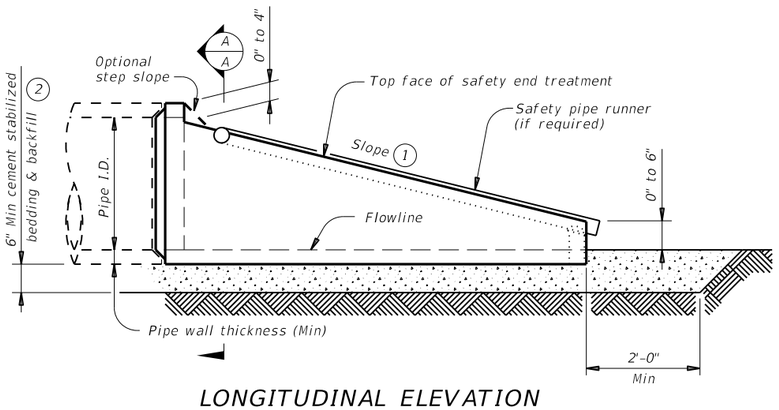


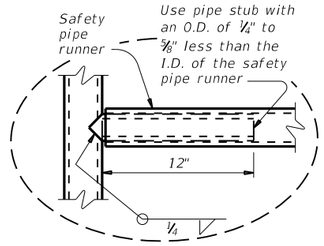
PLAN VIEW

(Showing spigot end connection.)

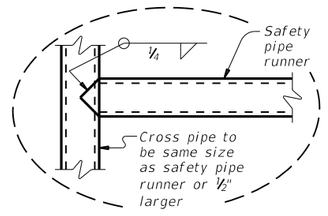


LONGITUDINAL ELEVATION

(Showing spigot end connection.)

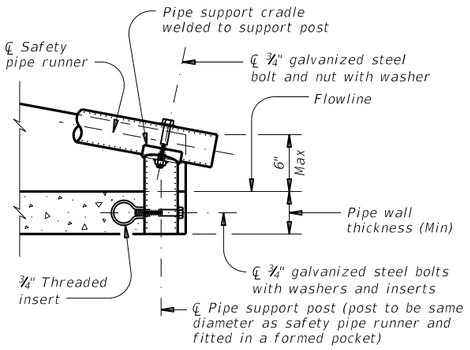


OPTION A



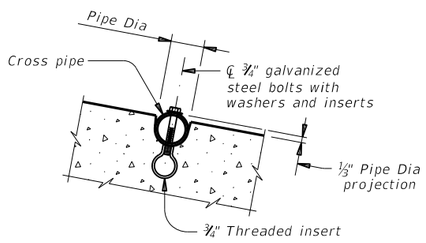
OPTION B

DETAIL A



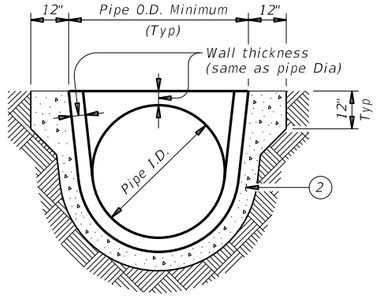
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

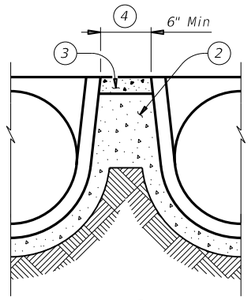


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

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

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

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

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

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

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' – 0"	≤ 45°	No	≤ 45°	No
					4:1	2' – 8"				
					6:1	4' – 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' – 10"	≤ 45°	No	≤ 45°	No
					4:1	3' – 9"				
					6:1	5' – 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
					4:1	4' – 10"				
					6:1	7' – 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' – 3"	≤ 45°	No	≤ 30°	No
					4:1	7' – 0"			> 30°	Yes
					6:1	10' – 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' – 3"	≤ 15°	No	≤ 15°	No
					4:1	8' – 2"	> 15°	Yes	> 15°	Yes
					6:1	12' – 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' – 10"	= 0°	No	≥ 0°	Yes
					4:1	10' – 4"	> 0°	Yes		
					6:1	15' – 4"				
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' – 6"	≥ 0°	Yes	≥ 0°	Yes
					4:1	12' – 6"				
					6:1	18' – 7"				

MATERIAL NOTES:

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

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

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

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

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

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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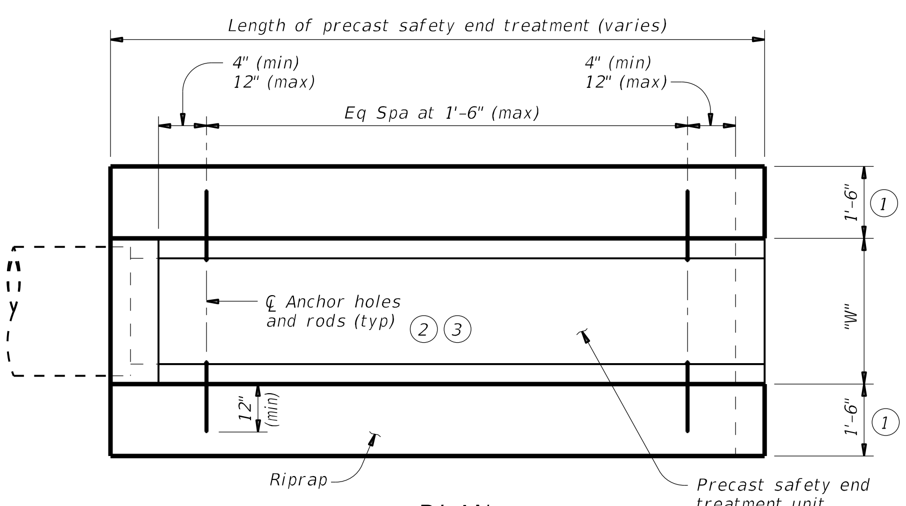
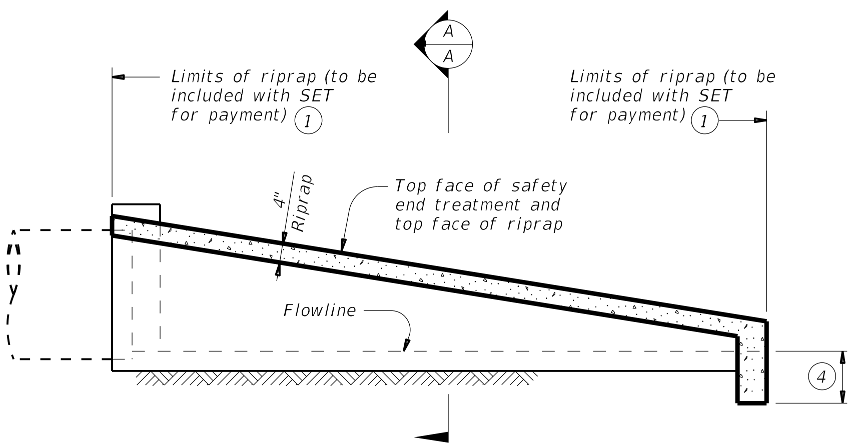
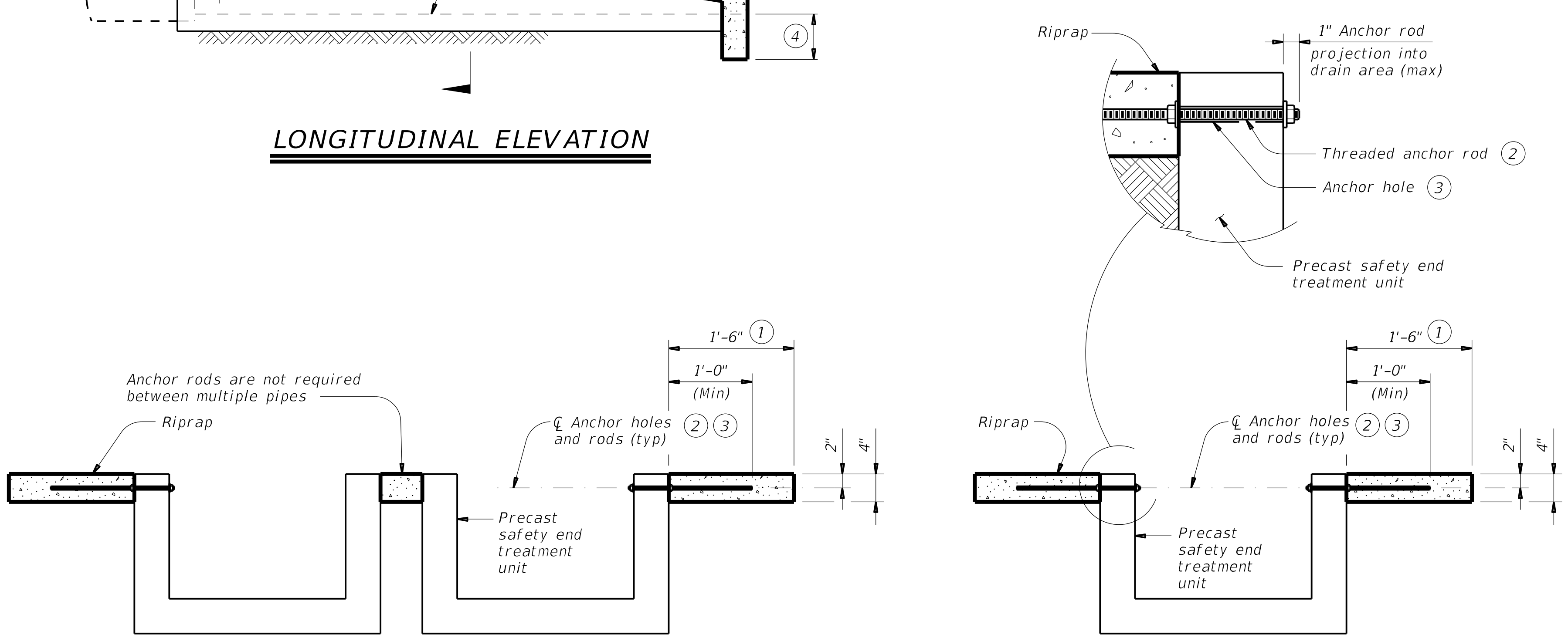
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		81



PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION

SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards				PSET-RC and PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".

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

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.

For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.

Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

Texas Department of Transportation | Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II RIPRAP DETAILS

PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		82

DATE: 2/10/2021 4:52:17 PM
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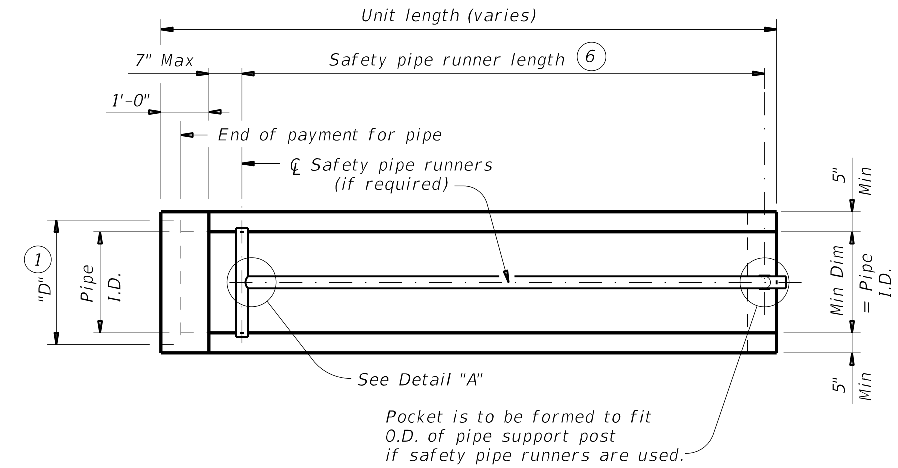
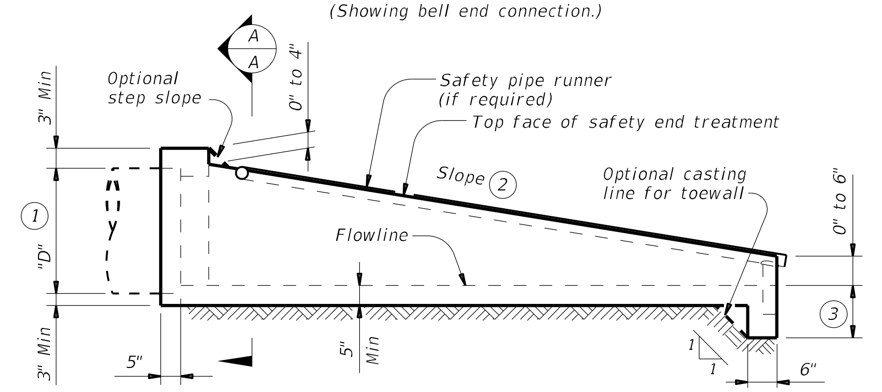
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe: Skew	Single Pipe: Pipe Runners Required	Multiple Pipes: Skew	Multiple Pipes: Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 1/4"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 1/2"	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 1/2"	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 1/2"	N/A	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



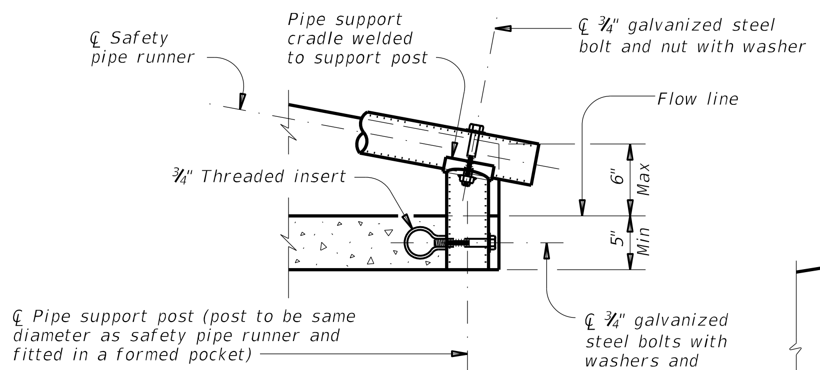
PLAN

(Showing bell end connection.)



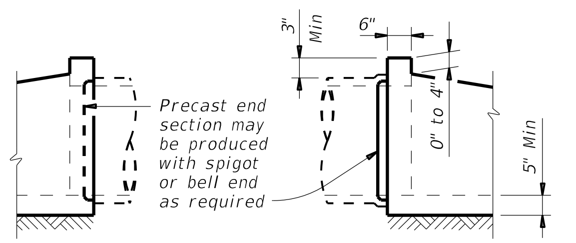
LONGITUDINAL ELEVATION

(Showing bell end connection.)



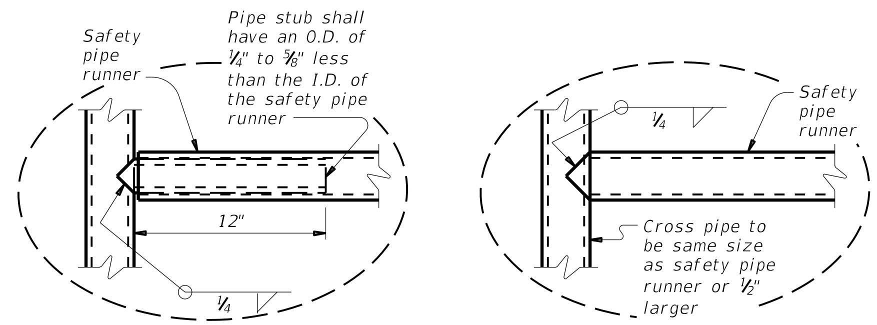
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)

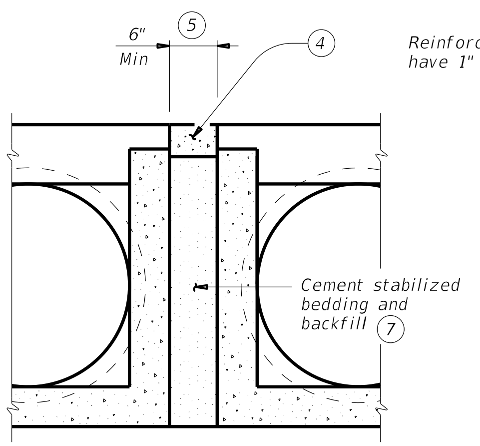


OPTION A

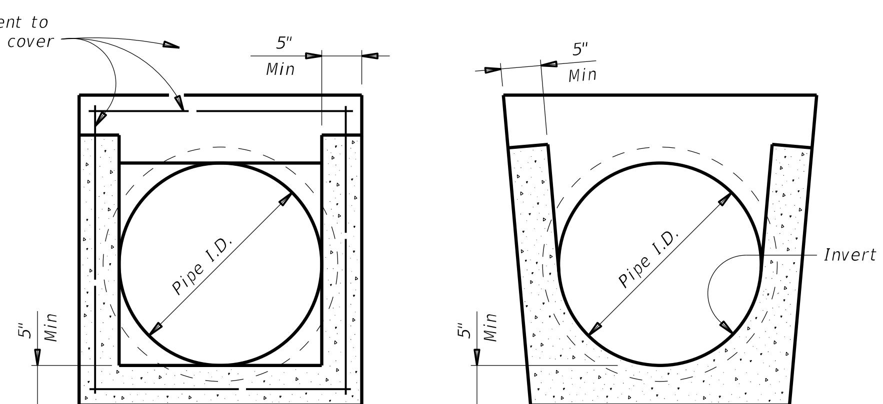
DETAIL A

(If required)

OPTION B



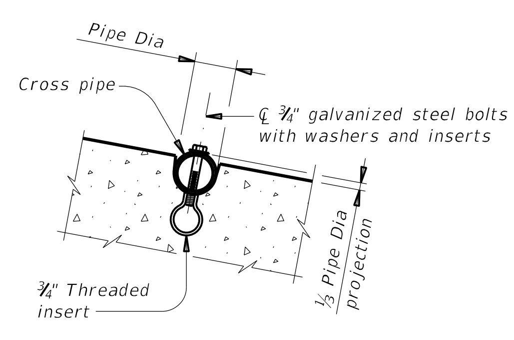
MULTIPLE PIPE INSTALLATION



OPTION WITH SQUARE BOTTOM

OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size: Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

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

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

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

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

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

(6) Measured along slope.

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

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

GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS	DIST AMA	COUNTY POTTER		SHEET NO. 83

DATE: 2/10/2021 4:52:20 PM
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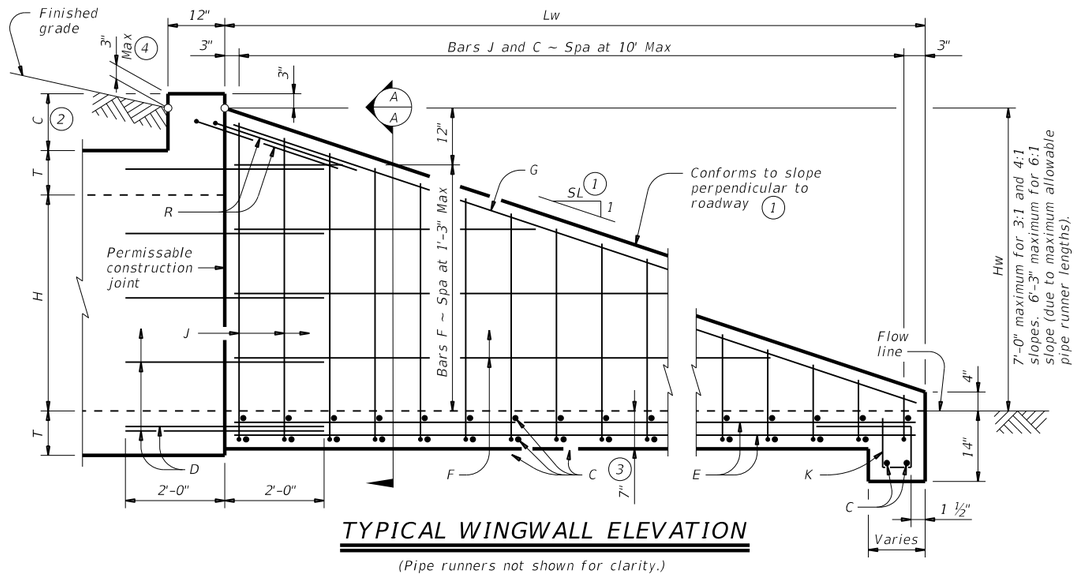
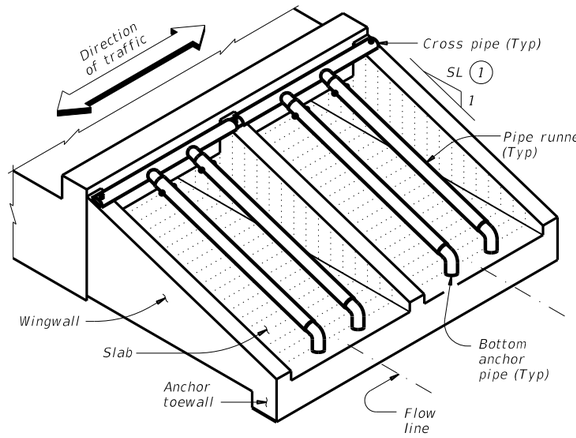


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

$Hw = H + T + C - 0.250'$

$Lw = (Hw - 0.333') (SL)$

For cast-in-place culverts:

$Atw = (N) (S) + (N + 1) (U)$

For precast culverts:

$Atw = (N) (2U + S) + (N - 1) (0.500')$

Total Wingwall Area (SF)
$= (0.5) (Hw + 0.333') (Lw) (N + 1)$

Total Concrete Volume (CY)
$= [(\text{Wingwall Area}) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.167') (1.167' - 0.583')] \div (27)$

PIPE RUNNER DIMENSION CALCULATIONS:

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

Total Reinforcing (Lb)
$= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K2) (Hw) (N + 1) (\sqrt{Lw})$

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

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

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

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

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

(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.

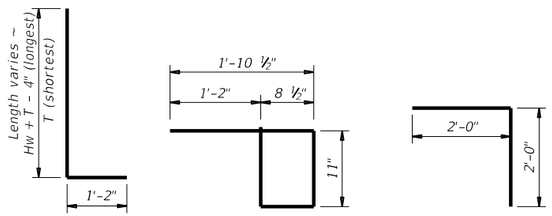
(3) Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.

(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.

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



BARS J

BARS K
(Length = 4'-3")

BARS R

SHEET 1 OF 2

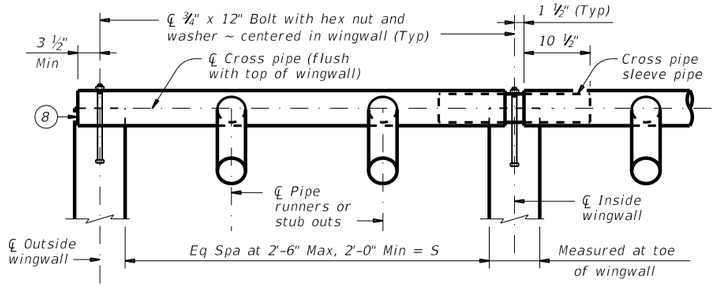
Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

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

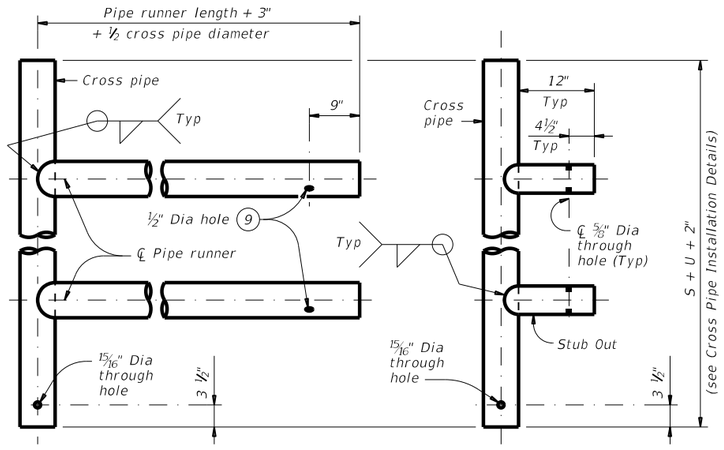
SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		84

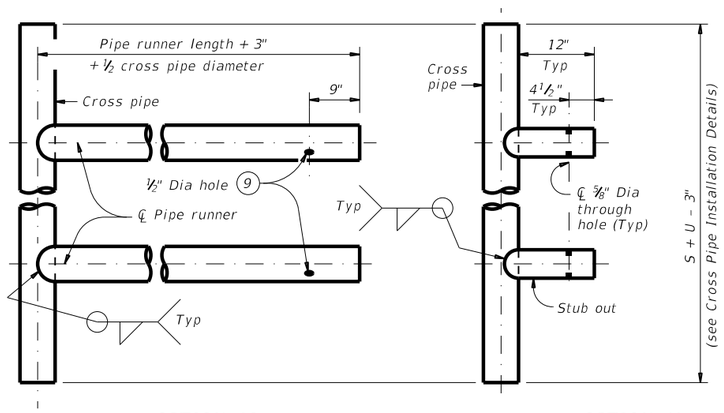


NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a 15⁄16" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS

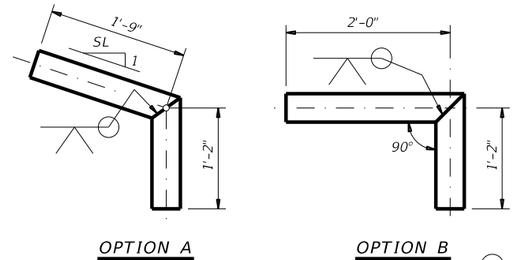


FOR USE IN OUTSIDE CULVERT BAY



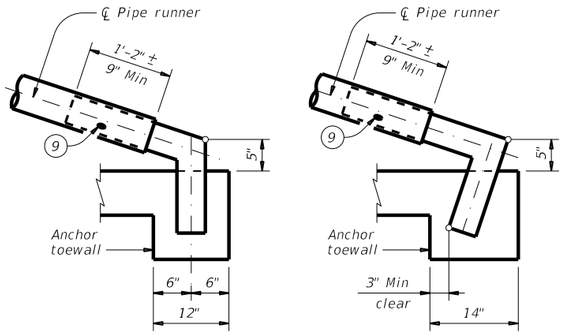
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

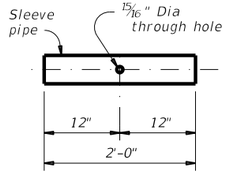
BOTTOM ANCHOR PIPE DETAILS (10)



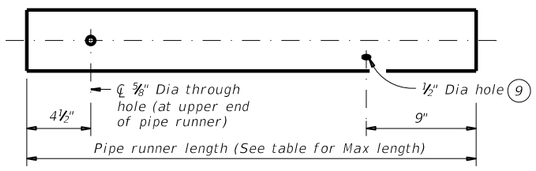
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

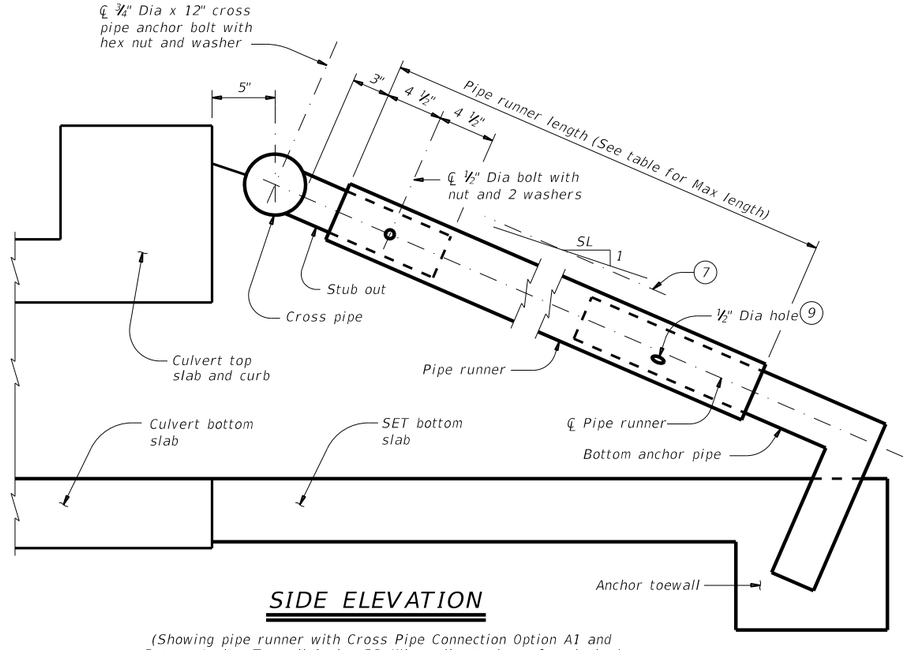


CROSS PIPE SLEEVE PIPE DETAILS



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

PIPE RUNNER DETAILS



SIDE ELEVATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

(6) Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

(7) Note that actual slope of safety pipe runner may vary slightly from side slope.

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

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

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

MAXIMUM PIPE RUNNER LENGTHS AND (6) REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

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

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

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

SETB-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AMA	POTTER		85

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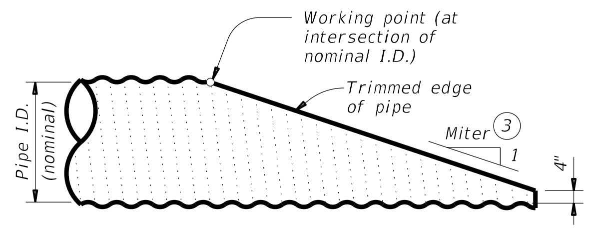
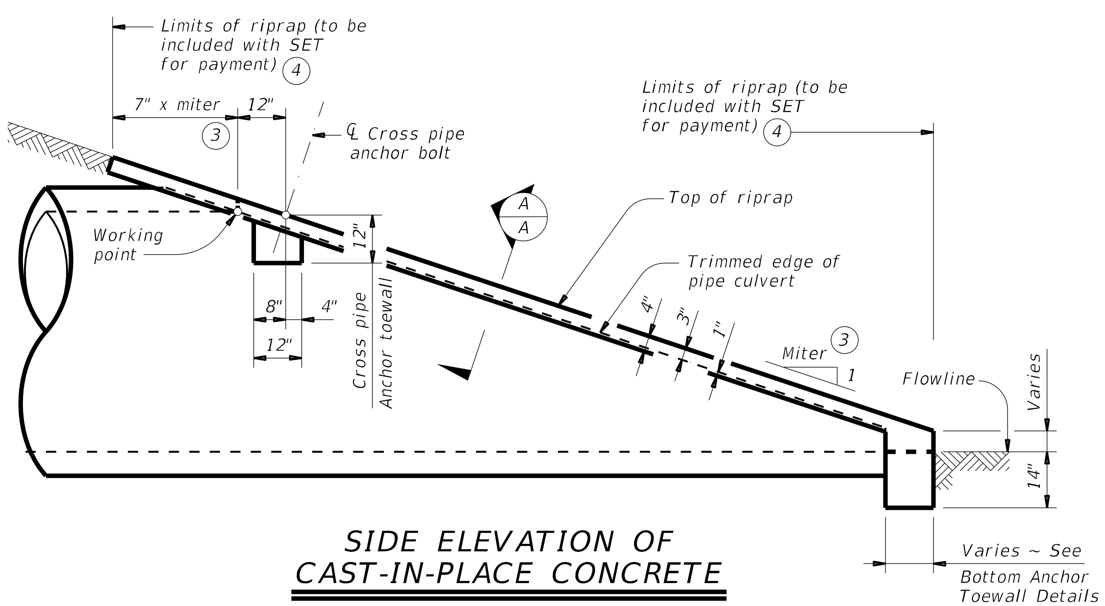


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

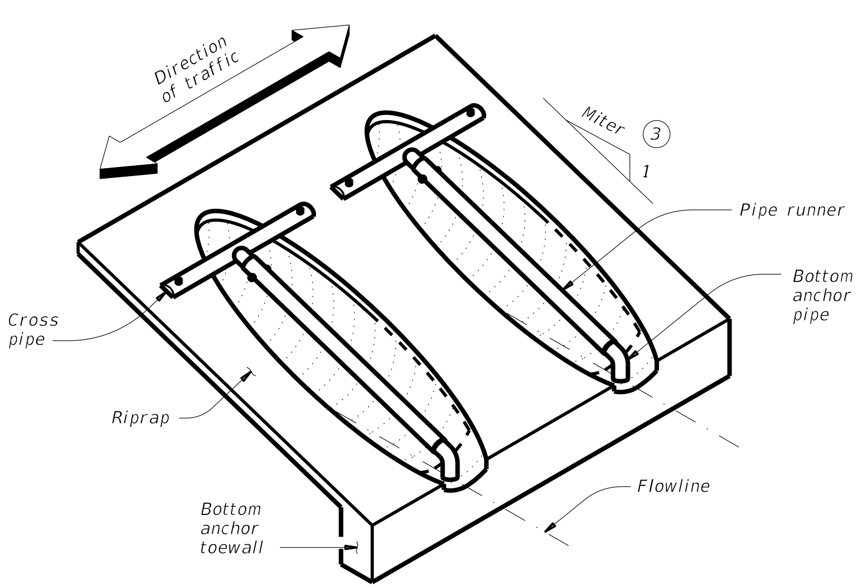
(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



Varies ~ See Bottom Anchor Toewall Details

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: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS	DIST AMA	COUNTY POTTER		SHEET NO. 86

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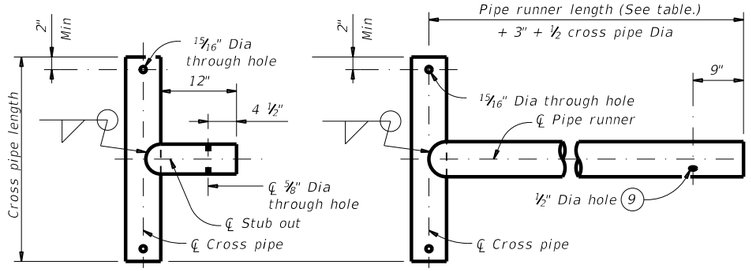
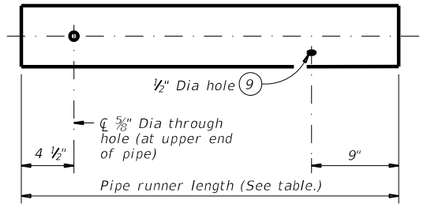


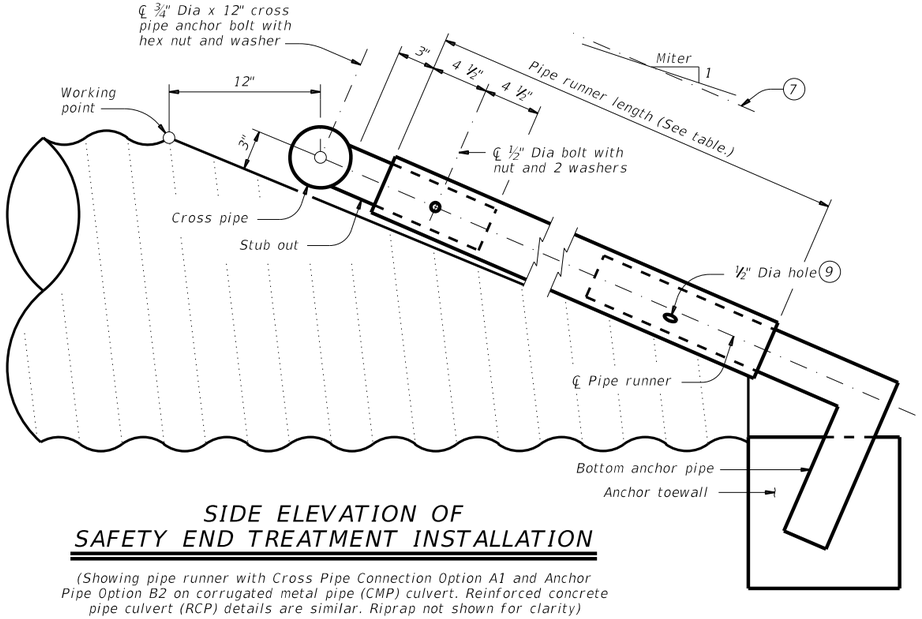
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



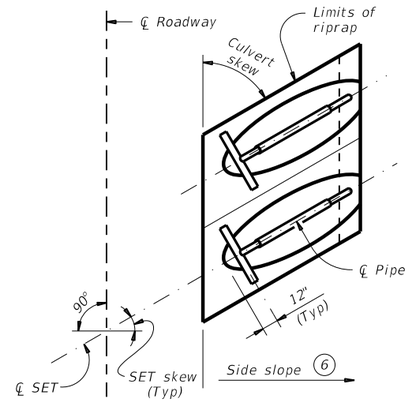
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

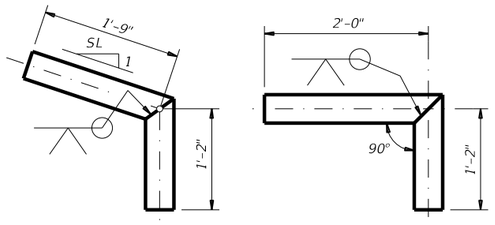


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

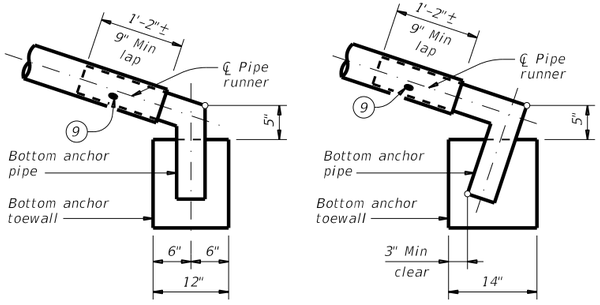


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

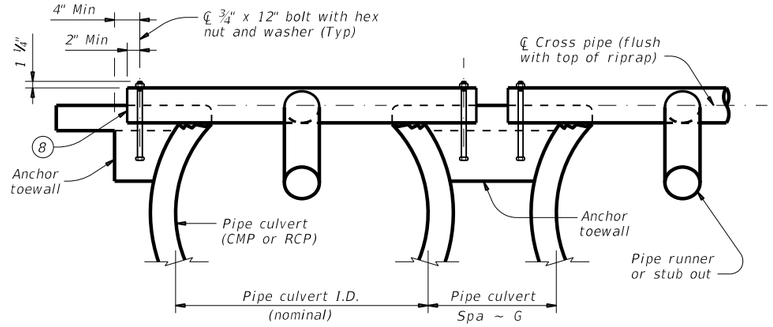
BOTTOM ANCHOR PIPE DETAILS (10)



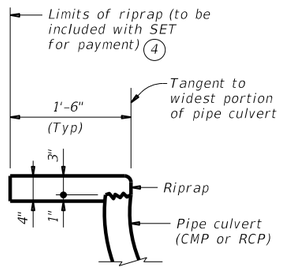
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

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

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

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

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

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

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

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

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		87

SCHEDULE OF ILLUMINATION POLE ASSEMBLIES

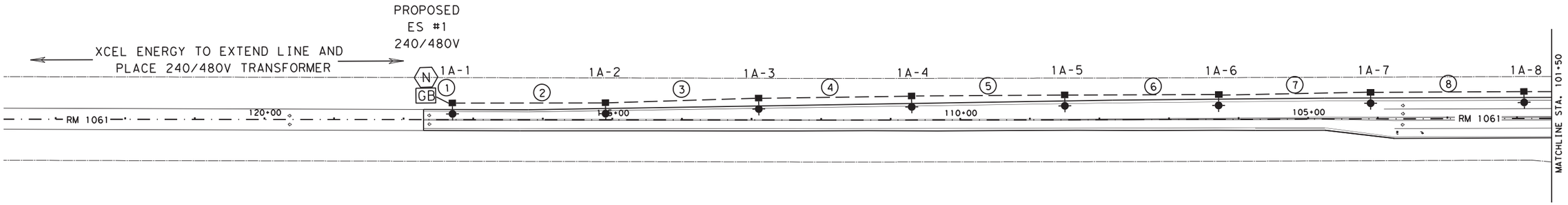
POLE	STATION	TYPE ASSEMBLY	30" FDN.
1A-1	117+30	(TY ST) 40T-8 (250W EQ) LED	8
1A-2	115+10	(TY ST) 40T-8 (250W EQ) LED	8
1A-3	112+90	(TY ST) 40T-8 (250W EQ) LED	8
1A-4	110+70	(TY ST) 40T-8 (250W EQ) LED	8
1A-5	108+50	(TY ST) 40T-8 (250W EQ) LED	8
1A-6	106+30	(TY ST) 40T-8 (250W EQ) LED	8
1A-7	104+10	(TY ST) 40T-8 (250W EQ) LED	8
1A-8	101+90	(TY ST) 40T-8 (250W EQ) LED	8
		TOTAL	64

SCHEDULE OF CONDUIT AND CONDUCTORS

RUN NO.	GROUND LENGTH (FEET)	CONDUCTOR NO. AND LENGTH (FEET)	CONDUIT LENGTH (FEET)	
	#8 BARE	#8 XHHW	CONDT (PVC) (SCH 40) (2") (TRENCH)	CONDT (PVC) (SCH 80) (2") (BORE)
1	60	2-60 (120)	50	
2	230	2-230 (460)	220	
3	230	2-230 (460)	220	
4	230	2-230 (460)	220	
5	230	2-230 (460)	220	
6	230	2-230 (460)	220	
7	230	2-230 (460)	220	
8	230	2-230 (460)	220	
TOTAL	1,670	3,340	1,590	

LEGEND

- CONDUIT & CONDUCTOR (TRENCHED)
- CONDUIT & CONDUCTOR (BORED)
- CONDUIT RUN NUMBER
- GB A\C — GROUND BOX (RPM) (TYPE)
- N — ELECTRICAL SERVICE
- PROPOSED RDWY ILL ASSEMBLY
- OE — EXISTING OVERHEAD POWER LINE
- 1A-1 — POLE DESIGNATION
  - POLE OR LUMINAIRE #
  - CIRCUIT #
  - SERVICE #



SHEET SUMMARY

ITEM	DESCRIPTION	UNIT	QTY
416 6029	DRILL SHAFT (RDWY ILL POLE) (30")	LF	64
610 6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	8
618 6023	CONDT (PVC) (SCH 40) (2")	LF	1,590
620 6007	ELEC CONDR. (NO. 8) BARE	LF	1,670
620 6008	ELEC CONDR. (NO. 8) INSULATED	LF	3,340
624 6002	GROUND BOX TY A (122311) W/APRON	EA	1
628 6047	ELC SRV TY A 240/480 060(NS)SS(E)TP(O)	EA	1

NOTE:
XCEL ENERGY WILL EXTEND LINE
AND INSTALL NEW TRANSPORMER AT
TIME OF SERVICE REQUEST.
877.354.6395
http://xcelenergy.force.com/FastApp

XCEL ENERGY ENGINEER CONTACT:
SARAH RITCHIE
806.640.6404
SARAH.E.RITCHIE@XCELENERGY.COM

ELECTRICAL SERVICE DATA

ELEC. SERVICE NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5)-14)	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT.BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BOARD / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT BREAKER POLE/AMPS	KVA LOAD
ES-1	ELC SRV TY A 240/480 060 (NS) SS (E) TP (O)	2"	3/#6	N/A	2P/60	60	N/A	A	2P/20	4.8

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms
03/31/2021

ILLUMINATION LAYOUT

SCALE: 1" = 150'

2021 Texas Department of Transportation

SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		88

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SCHEDULE OF ILLUMINATION POLE ASSEMBLIES

POLE	STATION	TYPE ASSEMBLY	30" FDN.
1A-9	543+33	(TY ST) 40T-8 (250W EQ) LED	8
1A-10	541+13	(TY ST) 40T-8 (250W EQ) LED	8
1A-11	538+93	(TY ST) 40T-8 (250W EQ) LED	8
1A-12	536+73	(TY ST) 40T-8 (250W EQ) LED	8
1A-13	534+53	(TY ST) 40T-8 (250W EQ) LED	8
1A-14	532+33	(TY ST) 40T-8 (250W EQ) LED	8
1A-15	530+13	(TY ST) 40T-8 (250W EQ) LED	8
1A-16	527+93	(TY ST) 40T-8 (250W EQ) LED	8
1A-17	525+73	(TY ST) 40T-8 (250W EQ) LED	8
1A-18	523+53	(TY ST) 40T-8 (250W EQ) LED	8
1A-19	0+90	(TY ST) 40T-8 (250W EQ) LED	8
1A-20	3+10	(TY ST) 40T-8 (250W EQ) LED	8
1A-21	5+30	(TY ST) 40T-8 (250W EQ) LED	8
1A-22	7+50	(TY ST) 40T-8 (250W EQ) LED	8
1A-23	9+70	(TY ST) 40T-8 (250W EQ) LED	8
		TOTAL	120

SCHEDULE OF CONDUIT AND CONDUCTORS

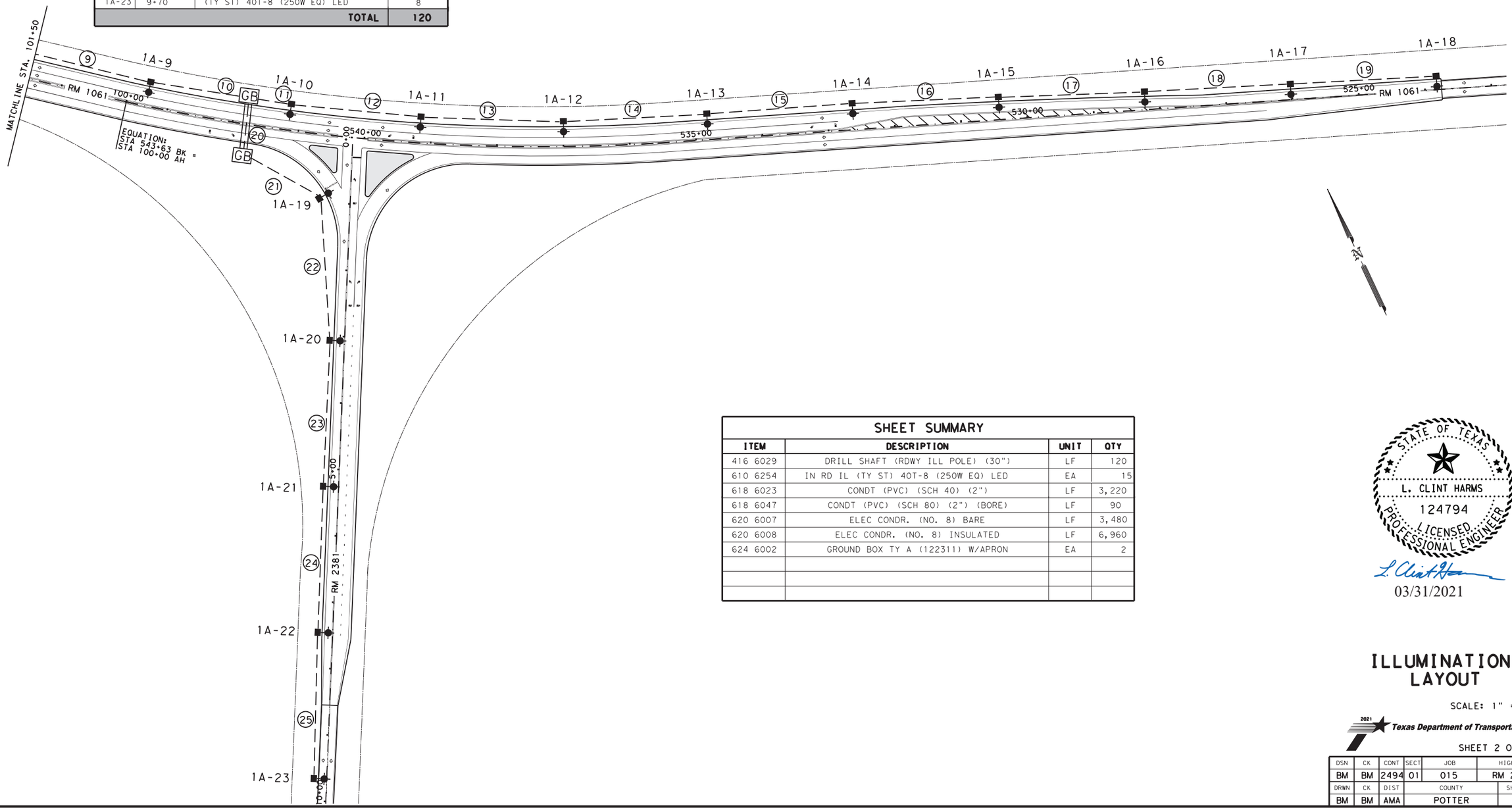
RUN NO.	GROUND LENGTH (FEET)	CONDUCTOR NO. AND LENGTH (FEET)	CONDUIT LENGTH (FEET)	
	#8 BARE	#8 XHHW	CONDT (PVC) (SCH 40) (2") (TRENCH)	CONDT (PVC) (SCH 80) (2") (BORE)
9	230	2-230 (460)	220	
10	160	2-160 (320)	150	
11	80	2-80 (160)	70	
12	230	2-230 (460)	220	
13	230	2-230 (460)	220	
14	230	2-230 (460)	220	
15	230	2-230 (460)	220	
16	230	2-230 (460)	220	
17	230	2-230 (460)	220	

SCHEDULE OF CONDUIT AND CONDUCTORS (CONT.)

RUN NO.	GROUND LENGTH (FEET)	CONDUCTOR NO. AND LENGTH (FEET)	CONDUIT LENGTH (FEET)	
	#8 BARE	#8 XHHW	CONDT (PVC) (SCH 40) (2") (TRENCH)	CONDT (PVC) (SCH 80) (2") (BORE)
18	230	2-230 (460)	220	
19	230	2-230 (460)	220	
20	100	2-100 (200)		90
21	150	2-150 (300)	140	
22	230	2-230 (460)	220	
23	230	2-230 (460)	220	
24	230	2-230 (460)	220	
25	230	2-230 (460)	220	
TOTAL	**3,480**	**6,960**	**3,220**	**90**

LEGEND

- CONDUIT & CONDUCTOR (TRENCHED)
- CONDUIT & CONDUCTOR (BORED)
- (9) CONDUIT RUN NUMBER
- GB A\C GROUND BOX (RPM) (TYPE)
- (N) ELECTRICAL SERVICE
- PROPOSED RDWY ILL ASSEMBLY
- OE EXISTING OVERHEAD POWER LINE
- 1A-1 POLE DESIGNATION
  - POLE OR LUMINAIRE #
  - CIRCUIT #
  - SERVICE #



SHEET SUMMARY

ITEM	DESCRIPTION	UNIT	QTY
416 6029	DRILL SHAFT (RDWY ILL POLE) (30")	LF	120
610 6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	15
618 6023	CONDT (PVC) (SCH 40) (2")	LF	3,220
618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	90
620 6007	ELEC CONDR. (NO. 8) BARE	LF	3,480
620 6008	ELEC CONDR. (NO. 8) INSULATED	LF	6,960
624 6002	GROUND BOX TY A (122311) W/APRON	EA	2

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

ILLUMINATION LAYOUT

SCALE: 1" = 150'

2021 Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		89

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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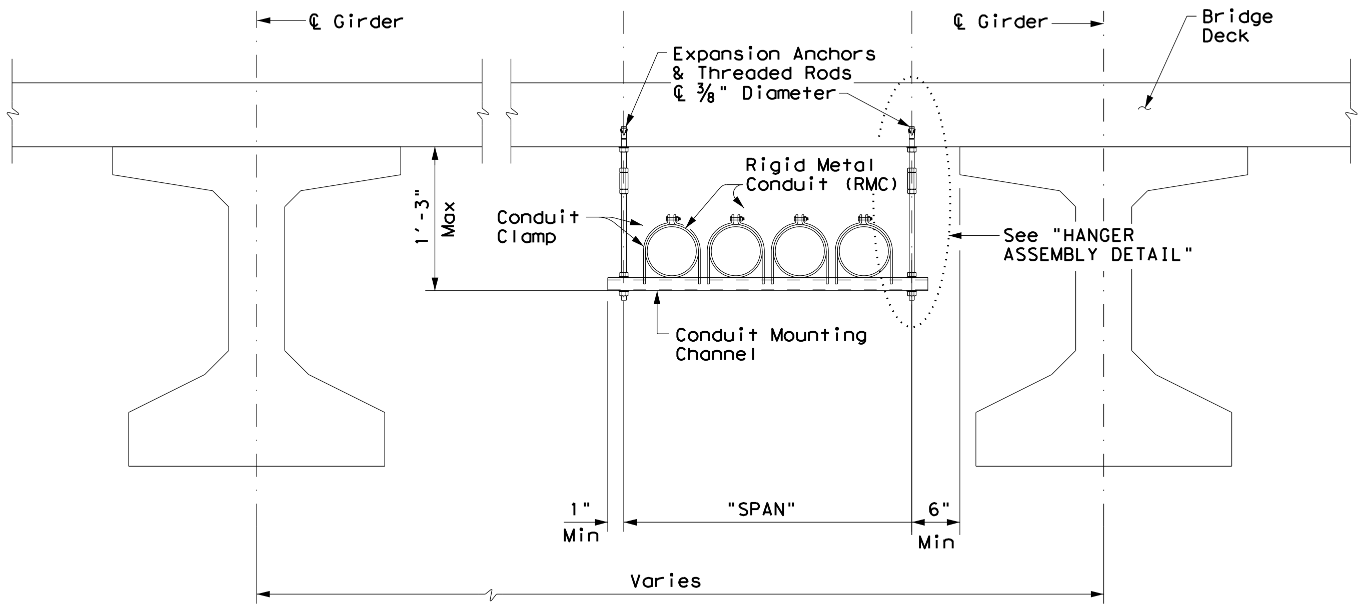
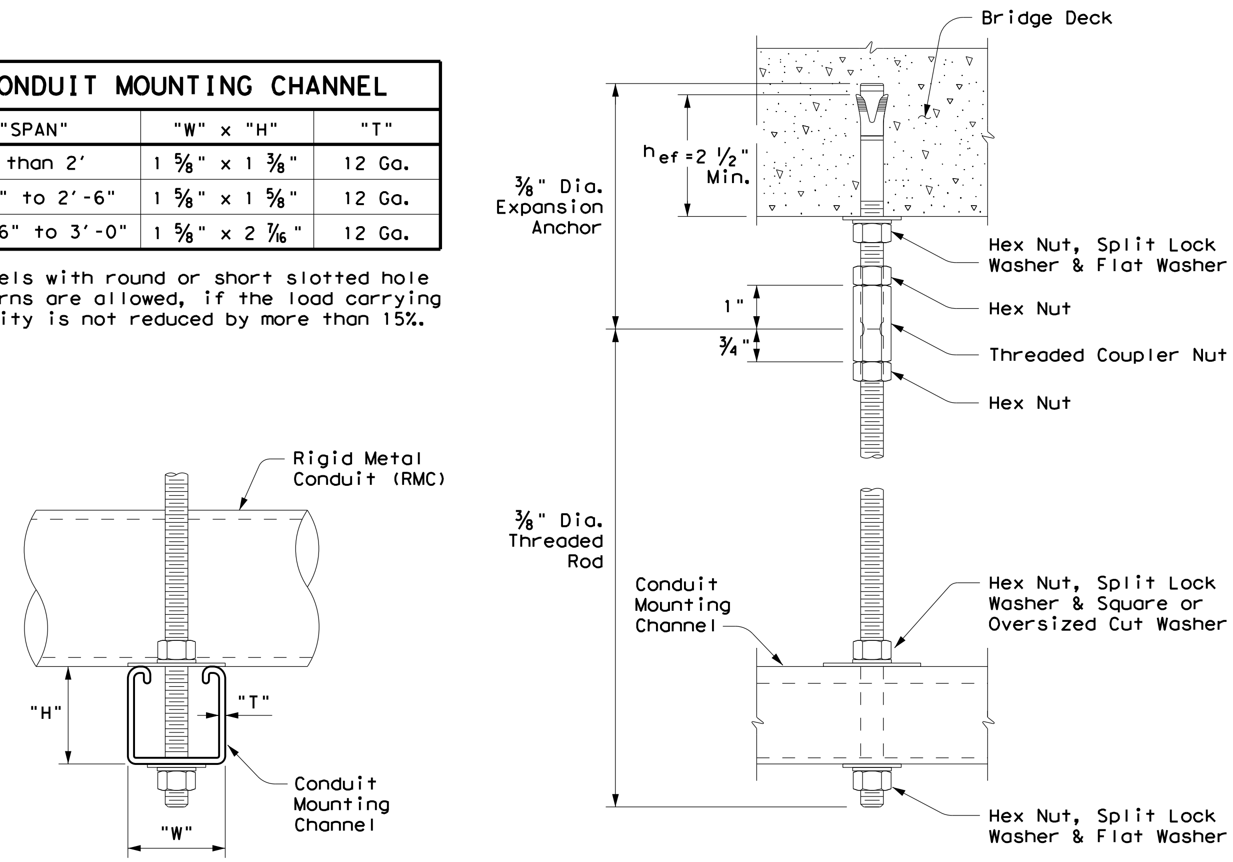


CONDUIT HANGING DETAIL

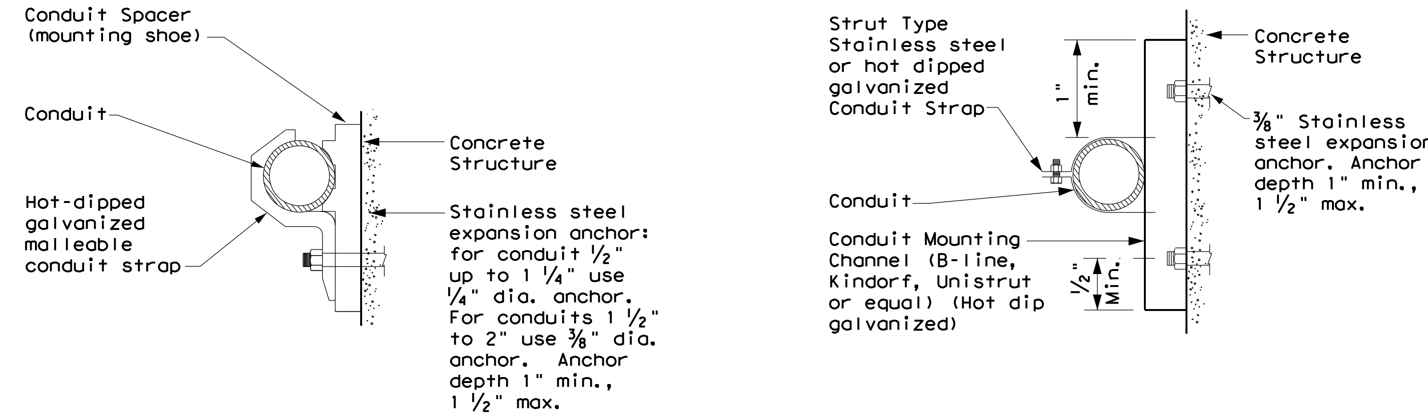
CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



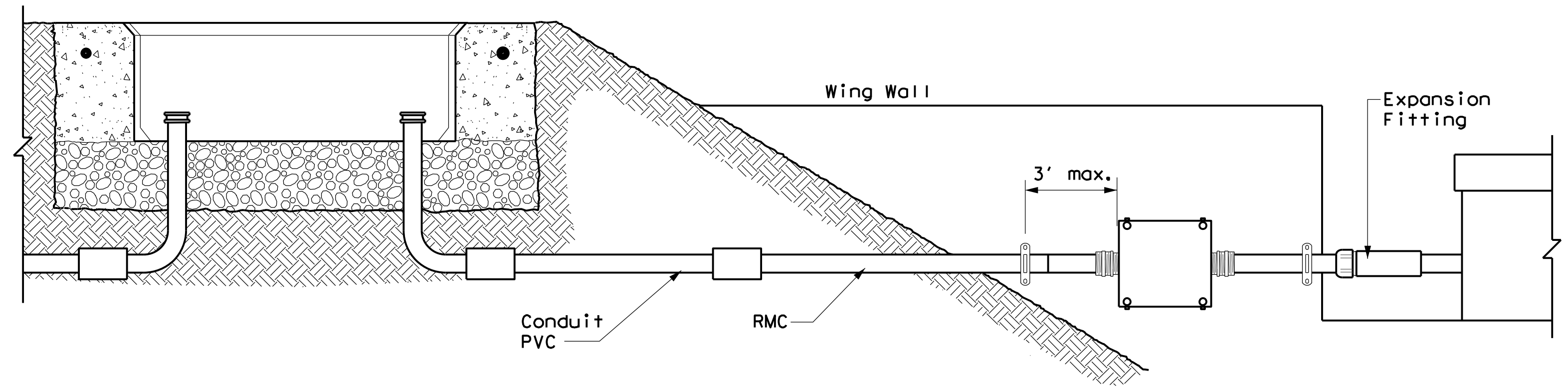
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.

4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

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ELECTRICAL DETAILS CONDUIT SUPPORTS

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	AMA		POTTER	91

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

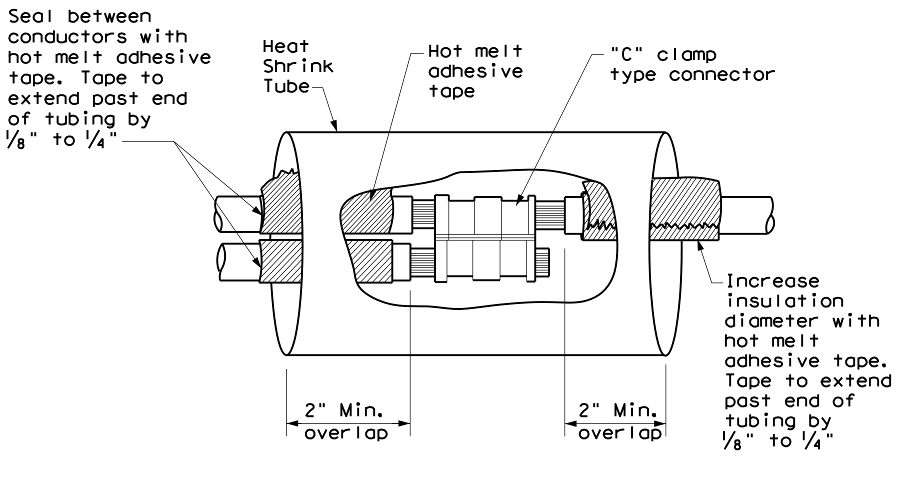
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

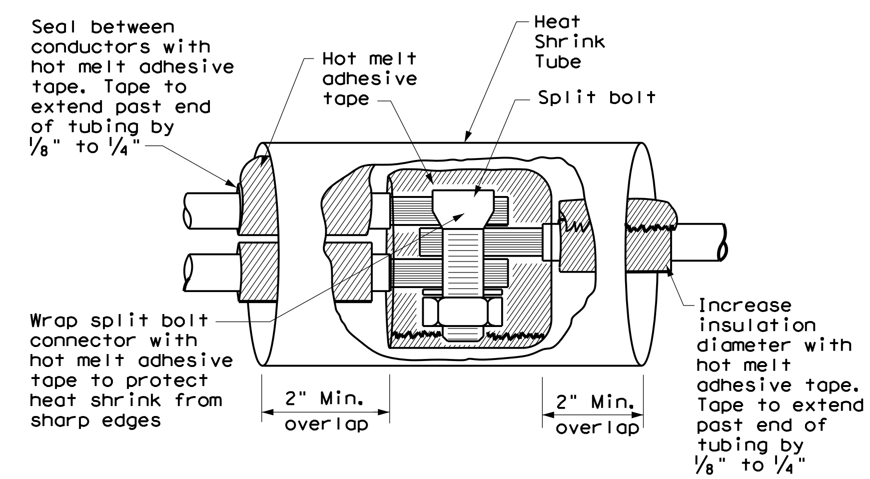
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

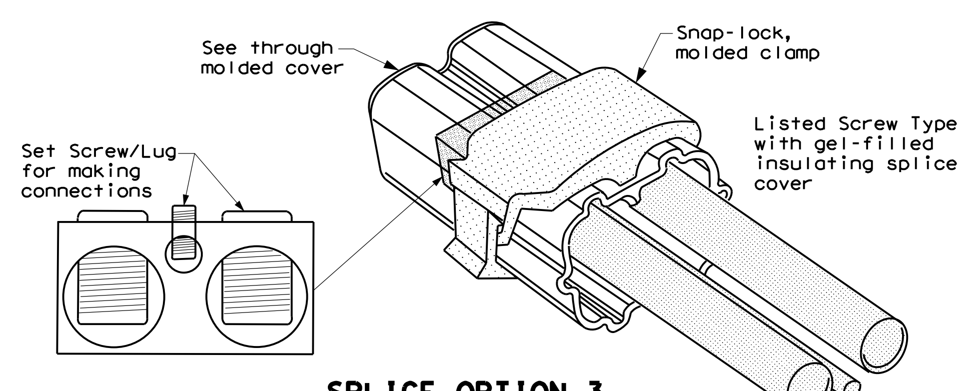
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation	Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

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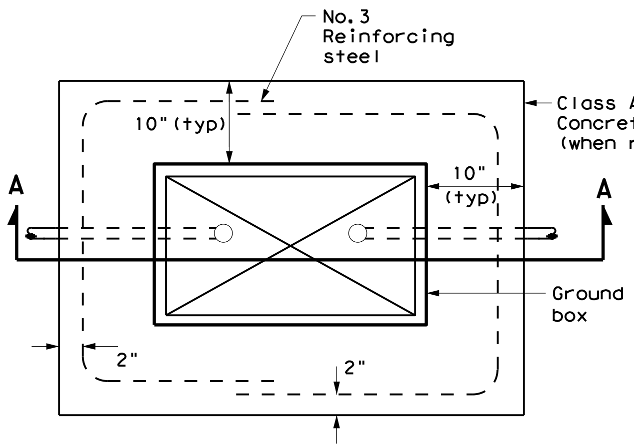
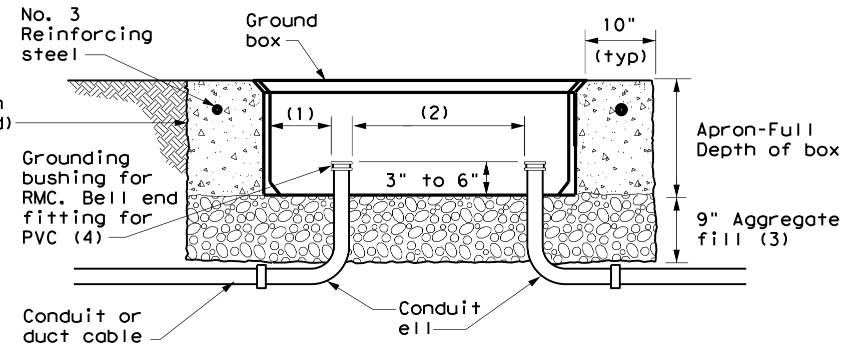


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

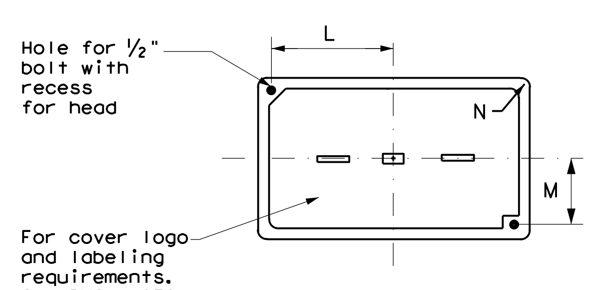
1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

GROUND BOX DIMENSIONS

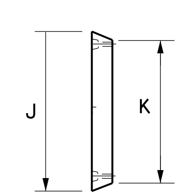
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS

TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



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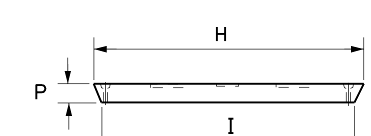

SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

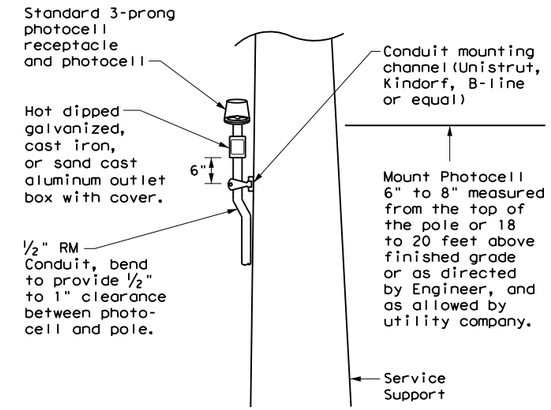
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
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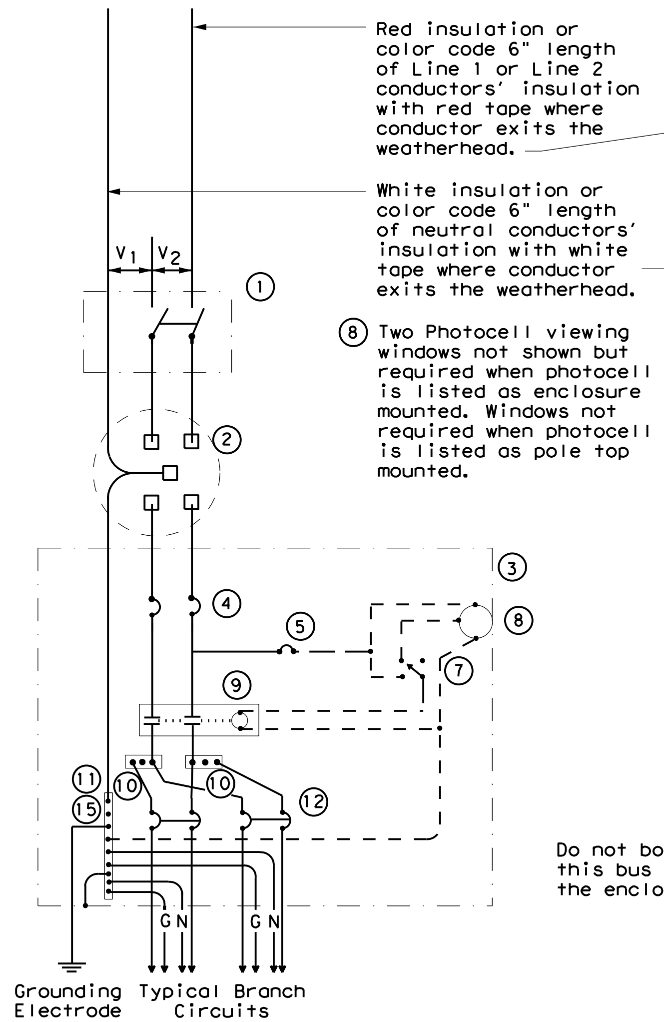
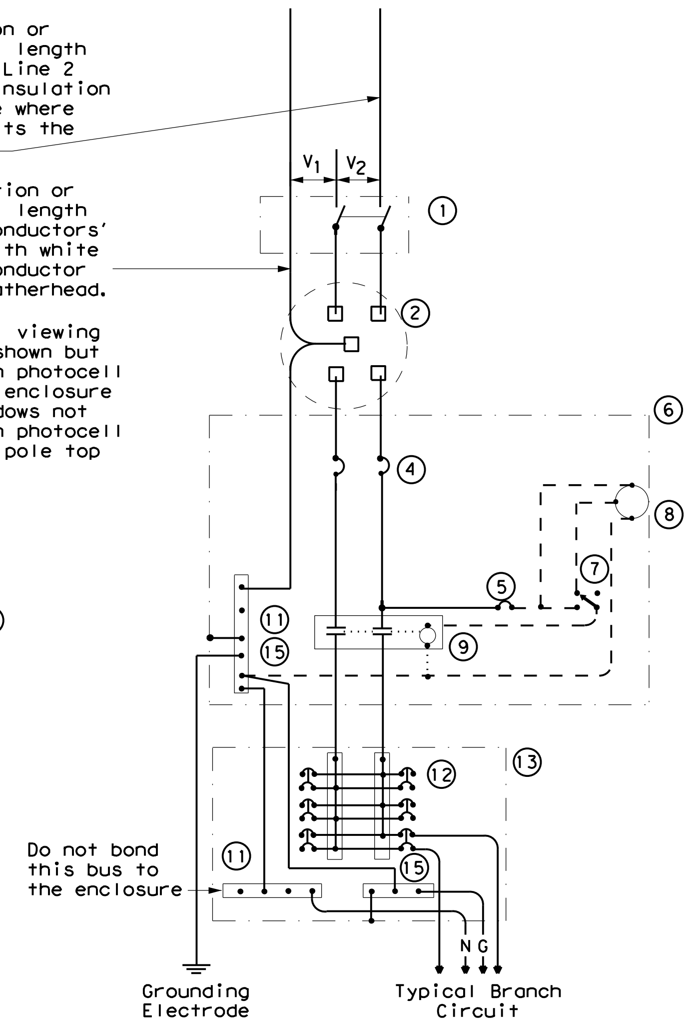
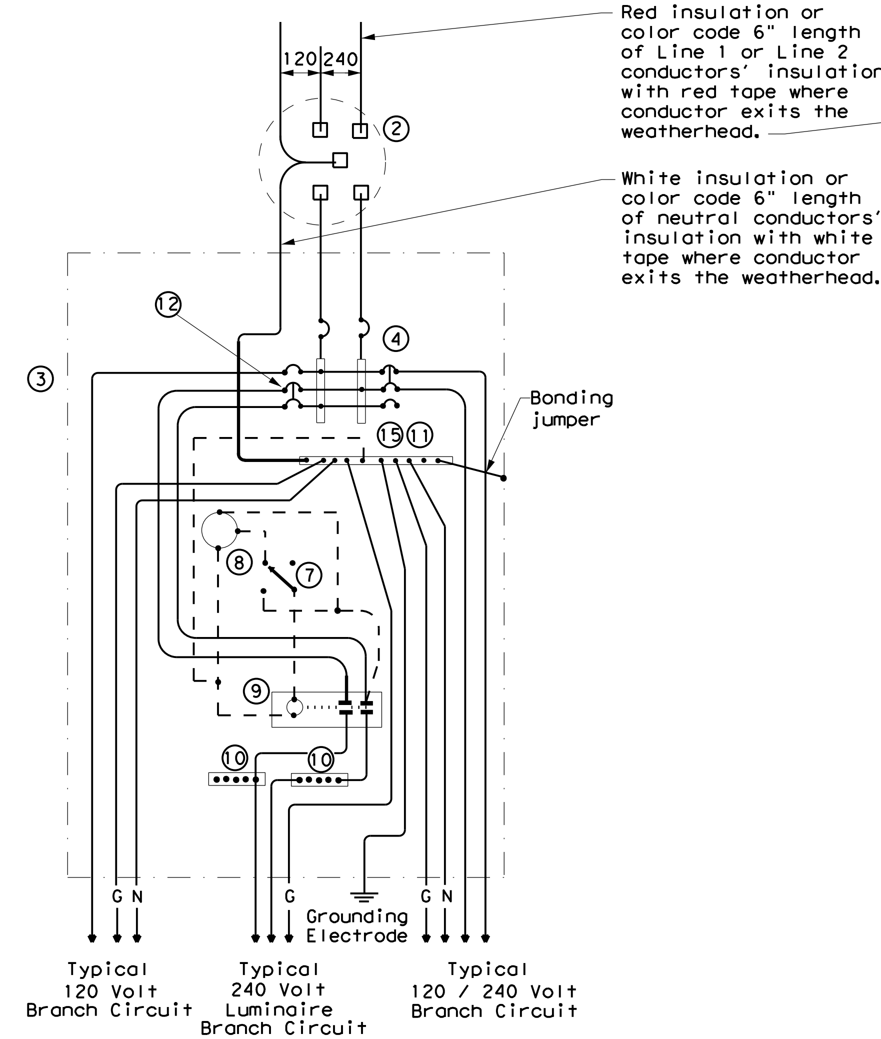


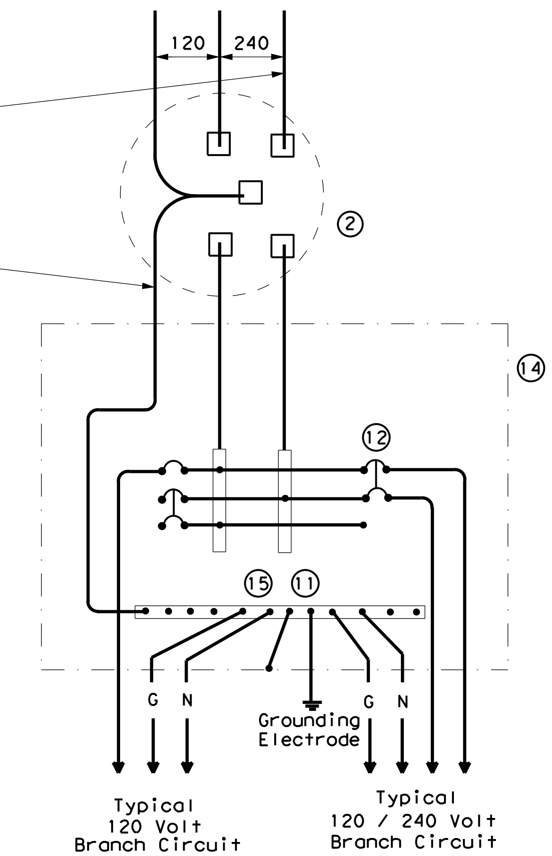
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T

120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

WIRING LEGEND	
——	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 5/8 in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

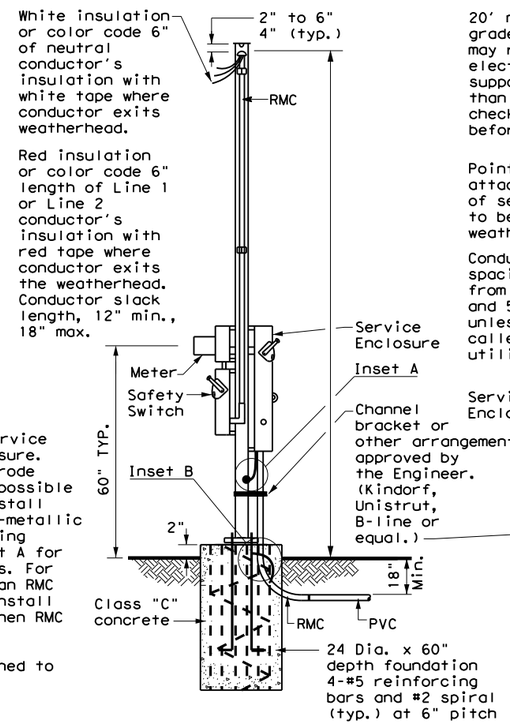
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

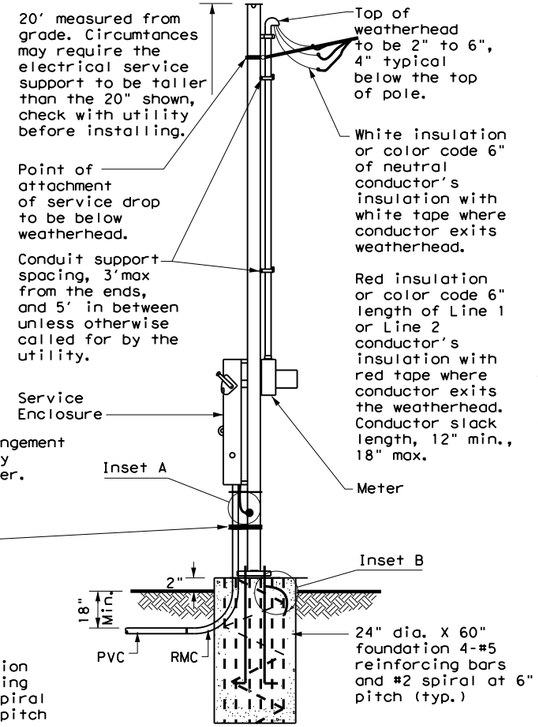
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

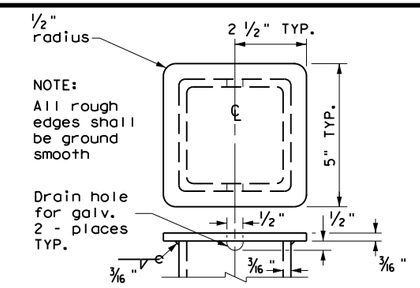


WITH SAFETY SWITCH

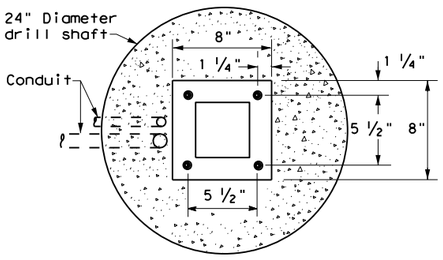


WITHOUT SAFETY SWITCH

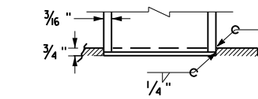
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

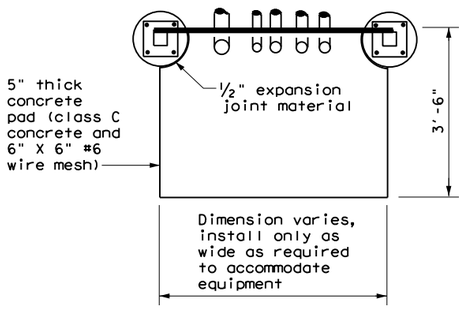


BASE PLATE DETAIL



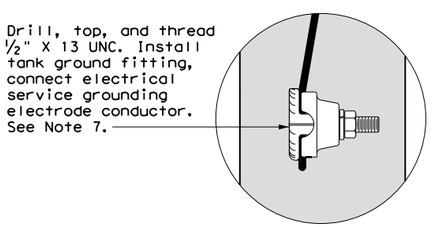
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



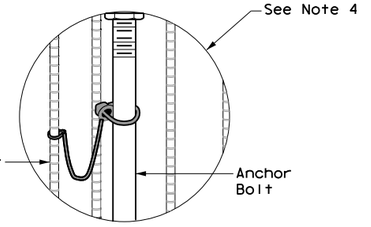
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

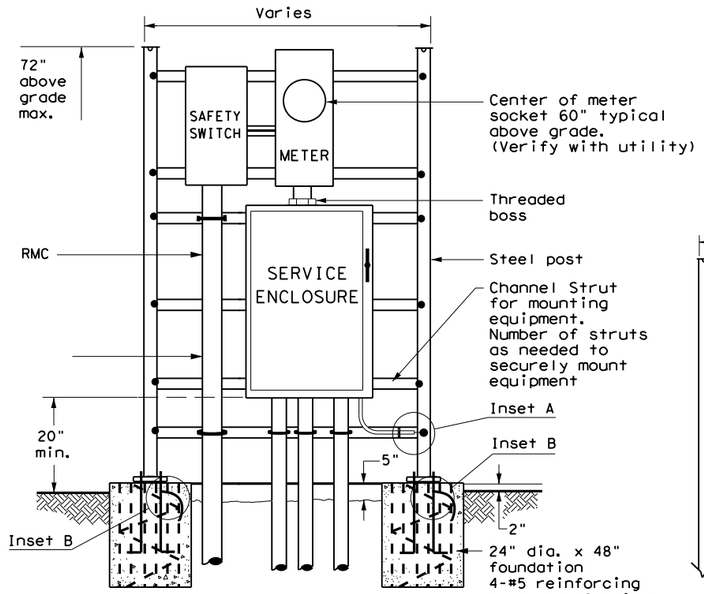


FRONT VIEW

INSET A

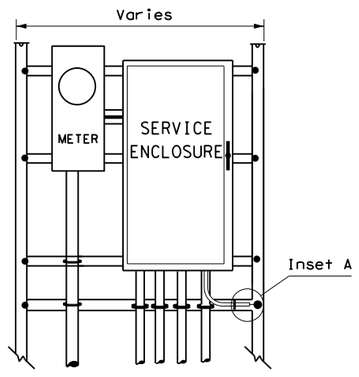


INSET B



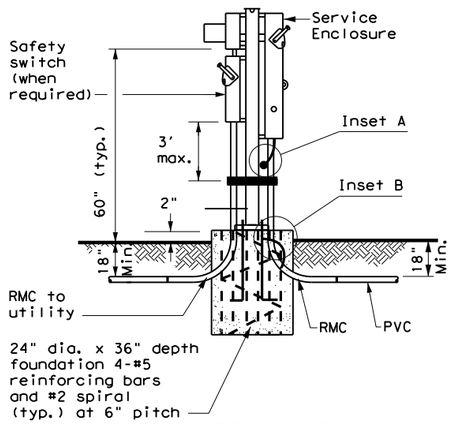
WITH SAFETY SWITCH

FRONT VIEW

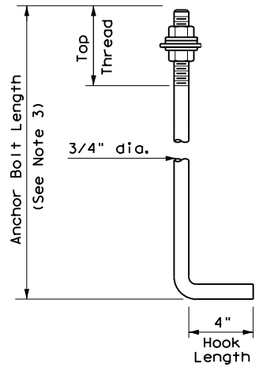


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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	AMA	POTTER		96

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

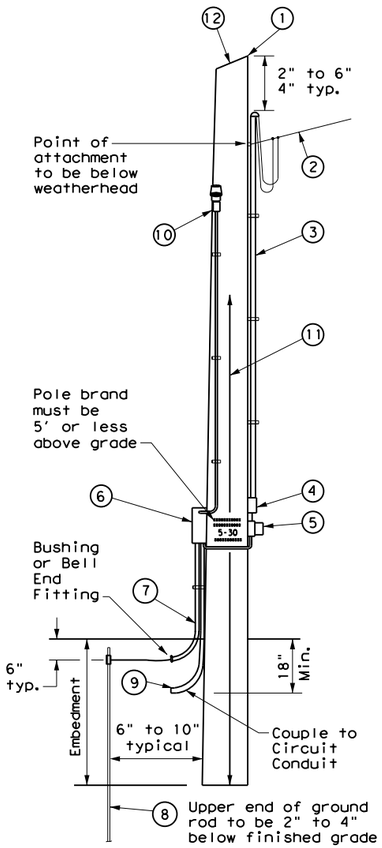
(8) ⅝ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

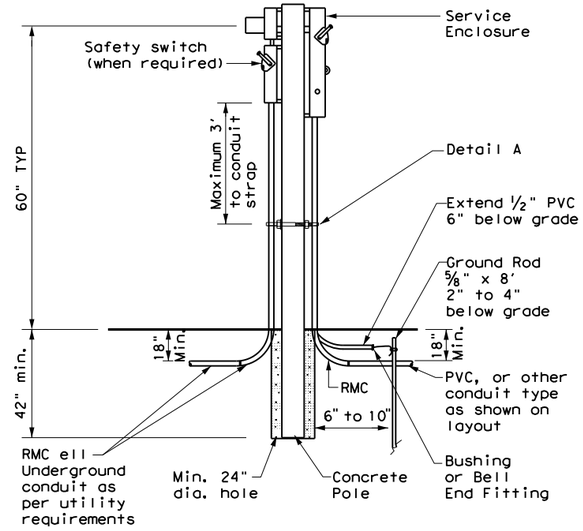


SERVICE SUPPORT TYPE TP (O)

GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

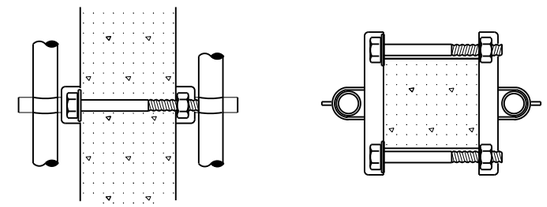
Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



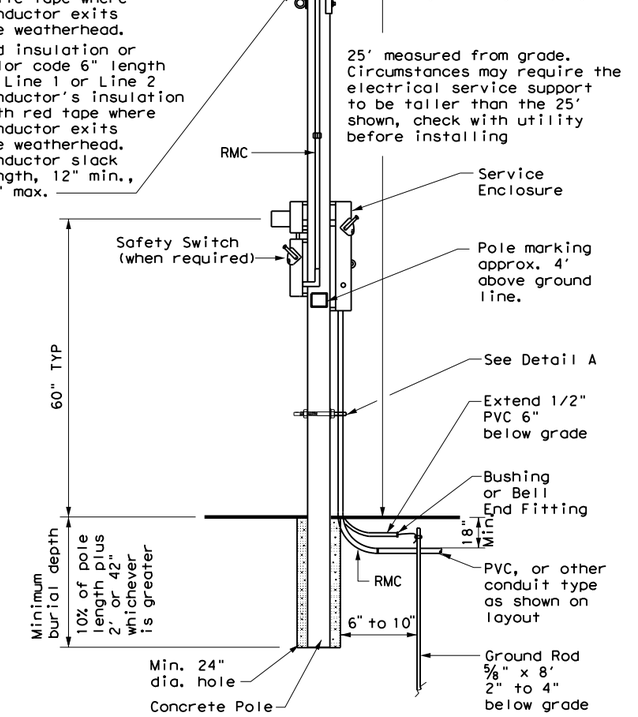
CONCRETE SERVICE SUPPORT

Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.



CONCRETE SERVICE SUPPORT

Overhead (O)

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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REVISIONS	2494	01	015	RM 2381
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DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.

2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.

3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.

4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.

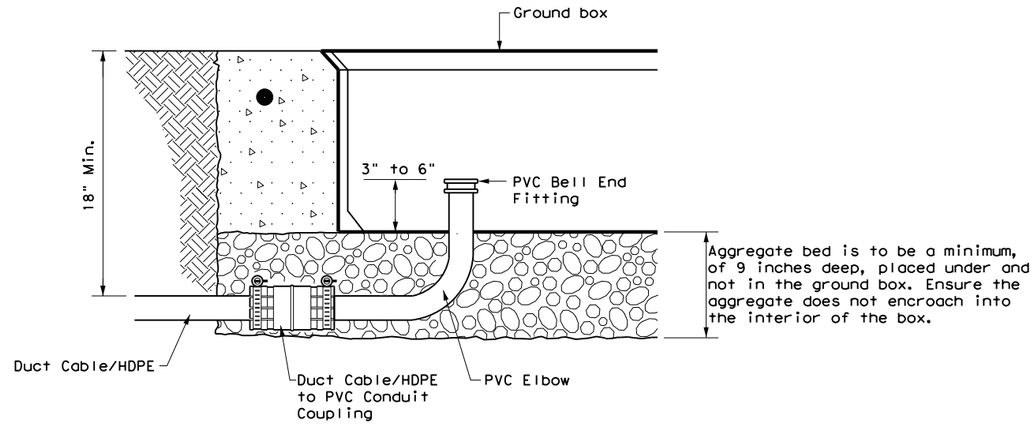
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."

6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.

7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.

8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.

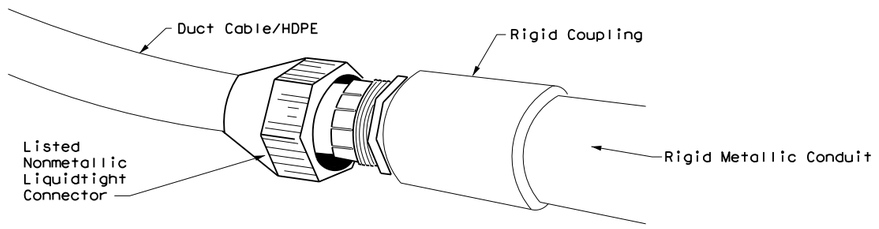
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.



DUCT CABLE/HDPE AT GROUND BOX

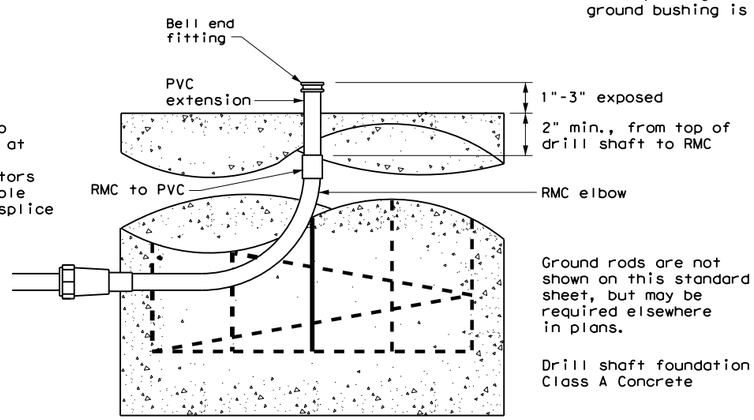
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.

DUCT CABLE/HDPE TO PVC

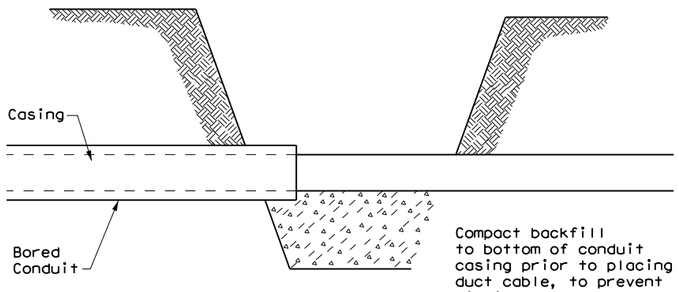


DUCT CABLE/HDPE TO RMC

Couple duct to conduit elbow at foundations. Ensure conductors extend into pole base. Do not splice conductors in conduit.



DUCT CABLE / HDPE AT FOUNDATION



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC),TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA),and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

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

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

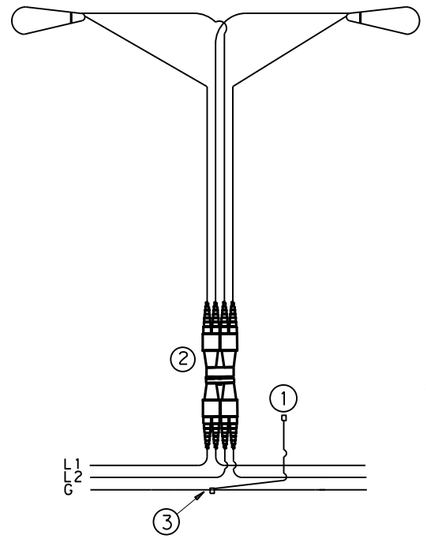
      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

NOTES:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.

Texas Department of Transportation

Traffic Operations Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-17

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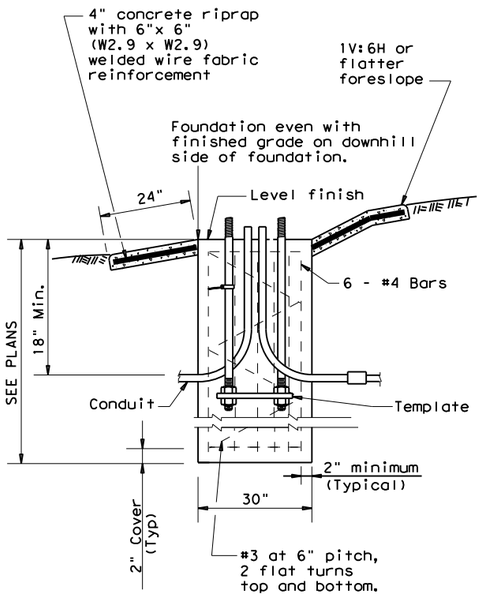
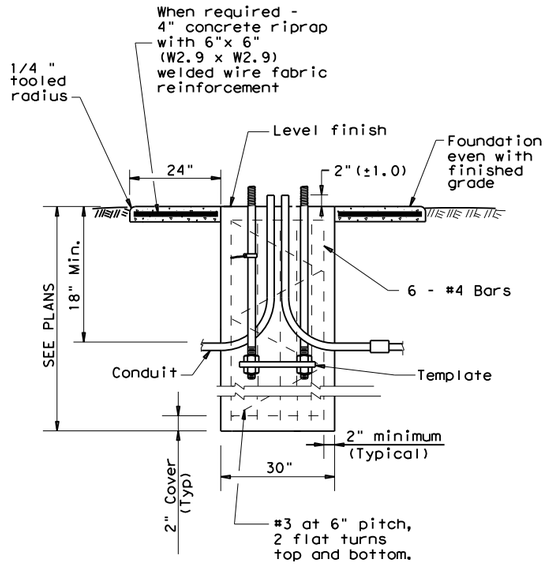


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS
(See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6′	6′	6′
>20 ft. to 30 ft.	8′	6′	6′
>30 ft. to 40 ft.	8′	8′	6′
>40 ft. to 50 ft.	10′	8′	6′

TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Use riprap on T-base foundations that are located on sloped grades.

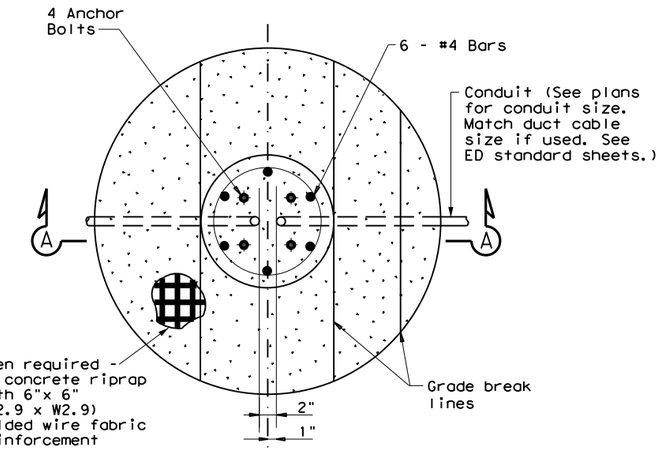
TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

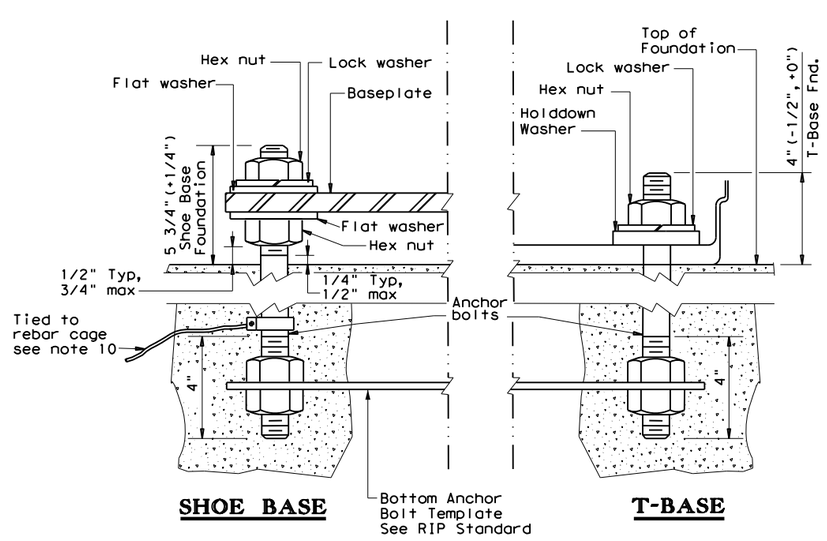
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

RID(2)-17

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation Pole	A1	A2	Luminaire	Quantity	T-Base Designation Pole	A1	A2	Luminaire	Quantity	CSB/SSCB Mounted Designation Pole	A1	A2	Luminaire	Quantity
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED	
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)			(250W EQ) LED	
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED	
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)			(250W EQ) LED	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
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	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED	
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)			(250W EQ) LED	
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
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	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)			(400W EQ) LED	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
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	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)			(400W EQ) LED	

OTHER Designation Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
ST: Pole and mast arm must be steel.
AL: Pole and mast arm must be aluminum.
SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

SHEET 1 OF 4

Texas Department of Transportation | Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

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7-17 12-19	DIST		COUNTY	SHEET NO.
	AMA		POTTER	101

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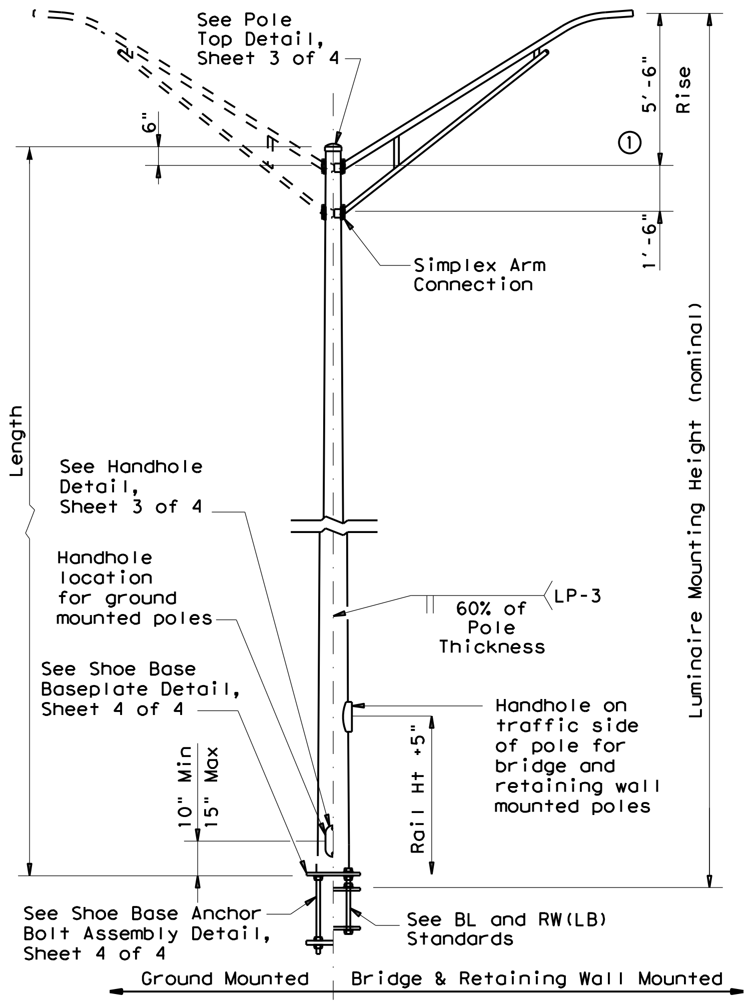
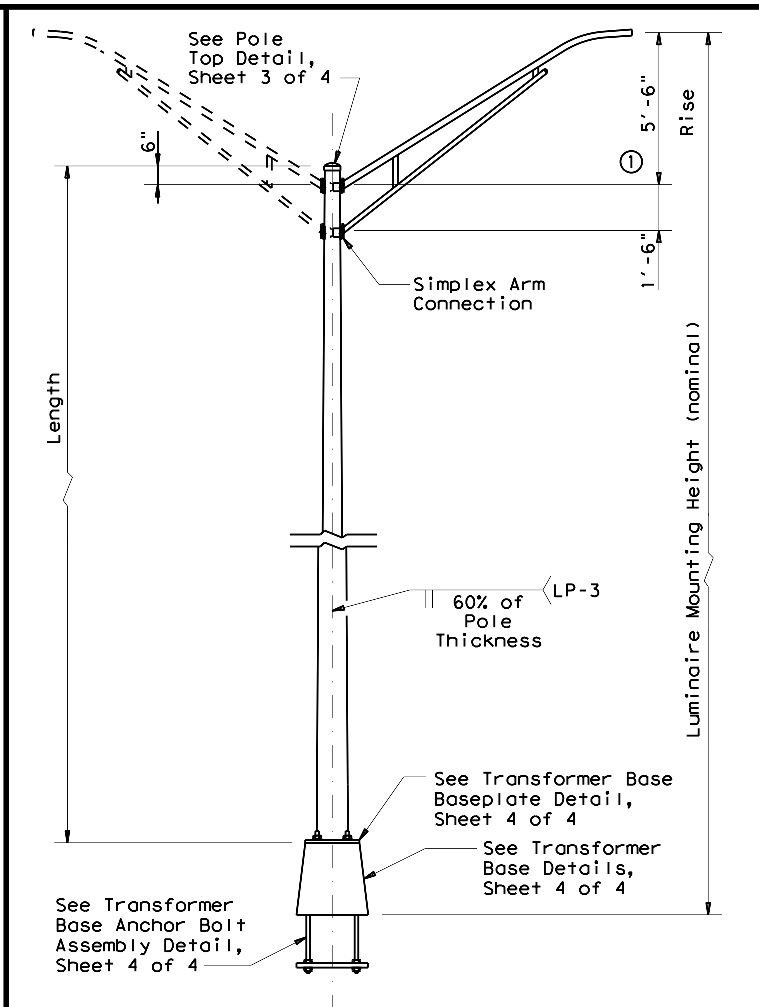
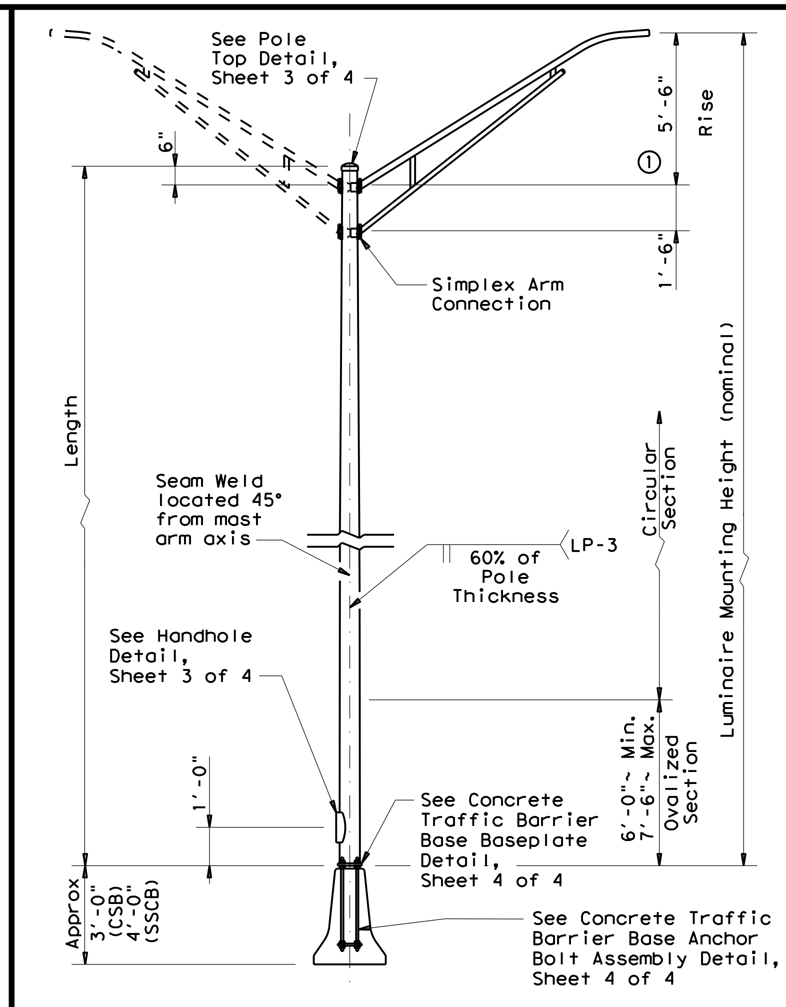


SHOE BASE POLE



TRANSFORMER BASE POLE



CONCRETE TRAFFIC BARRIER BASE POLE

SHOE BASE POLE

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3

TRANSFORMER BASE POLE

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)

Luminaire Mounting Height (Nominal) (ft)	Base ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.

2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.

3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.

5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."

6. Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.

7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.

8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.

9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."

10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.

11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."

12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.

13. Erect transformer base poles in accordance with sheet RID(1).

SHEET 2 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(2)-19

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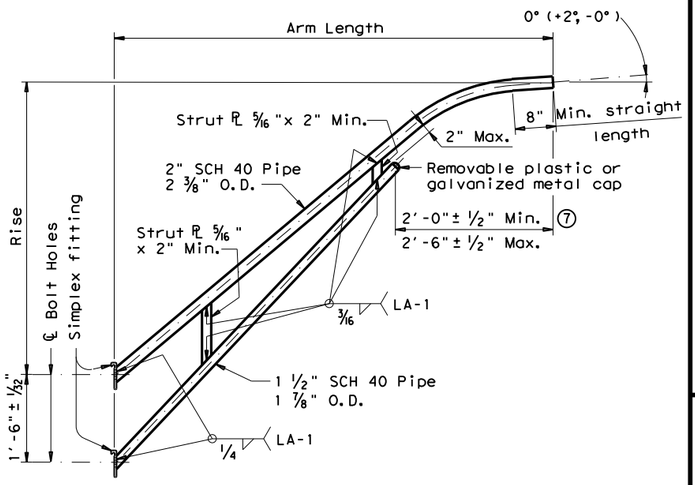
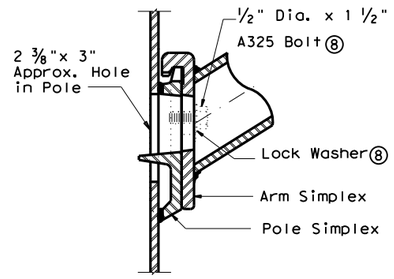


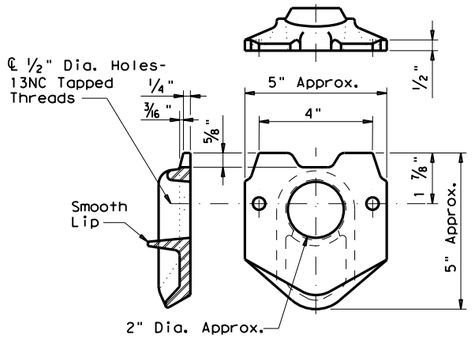
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

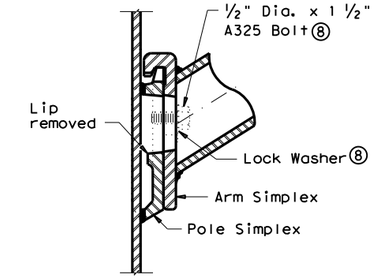
ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"



UPPER SIMPLEX FITTING
(Gusset not shown for clarity)

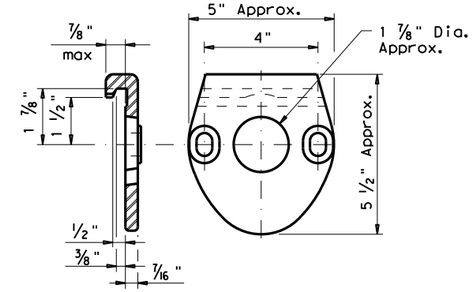


POLE SIMPLEX DETAIL ⑨



LOWER SIMPLEX FITTING
(Gusset not shown for clarity)

SECTION B-B



ARM SIMPLEX DETAIL ⑨

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

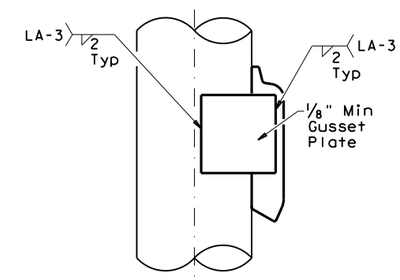
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

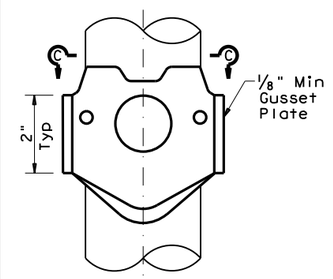
⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

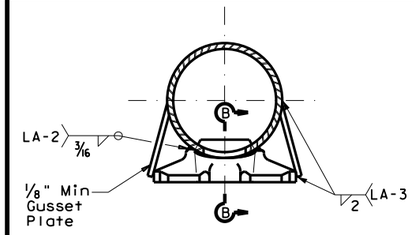
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



SIDE

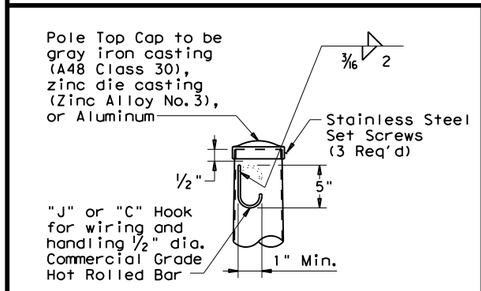


ELEVATION

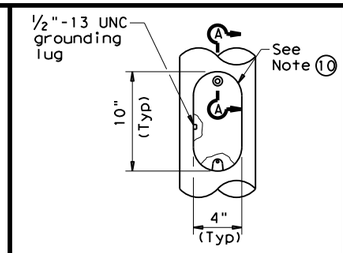


SECTION C-C

SIMPLEX ATTACHMENT DETAIL



POLE TOP



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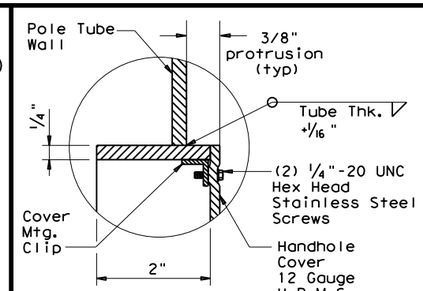

SECTION A-A

HANDHOLE

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

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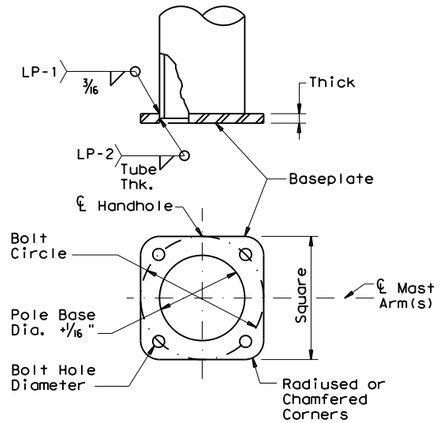
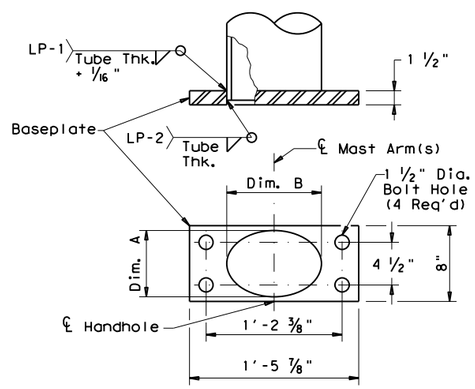


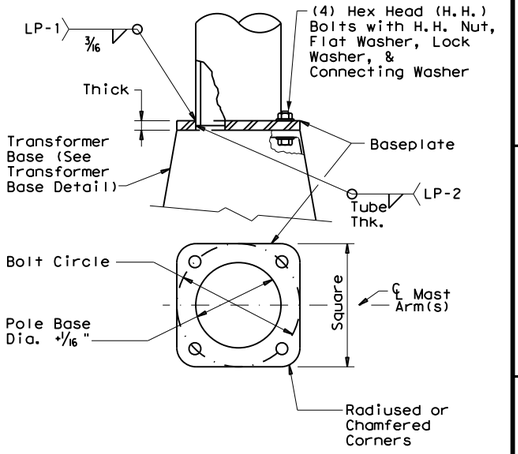
SHOE BASE BASEPLATE

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



CONCRETE TRAFFIC BARRIER BASE BASEPLATE

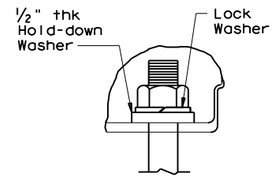
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



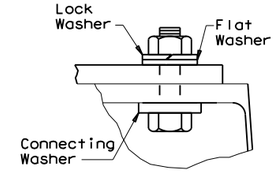
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFOMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

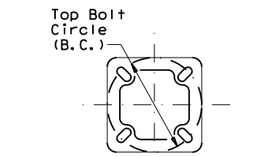
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



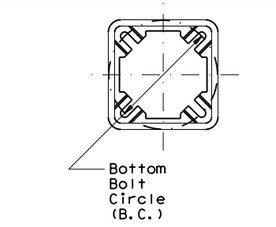
DETAIL A



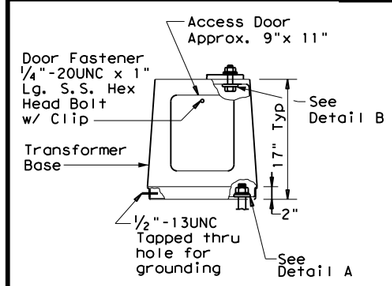
DETAIL B



TOP PLAN



BOTTOM PLAN



ELEVATION

GENERAL NOTES:

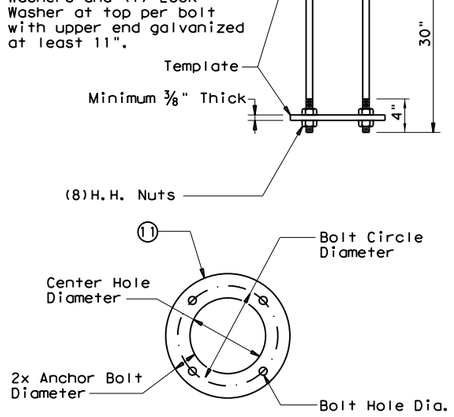
1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
3. Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
4. Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
5. Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

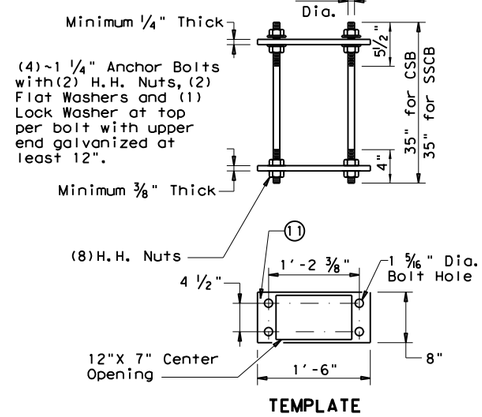
(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



SHOE BASE ANCHOR BOLT ASSEMBLY

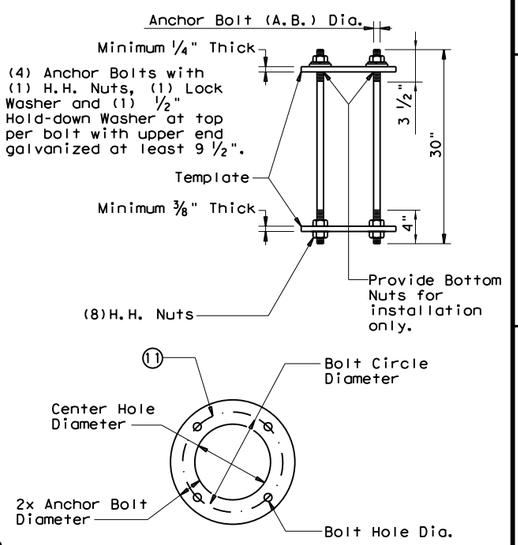
SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20'-39'	1"	13"	11"	1 1/16"
40'-50'	1 1/4"	15"	12 1/2"	1 5/16"



TEMPLATE

CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE DETAILS

SHEET 4 OF 4

Texas Department of Transportation — Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

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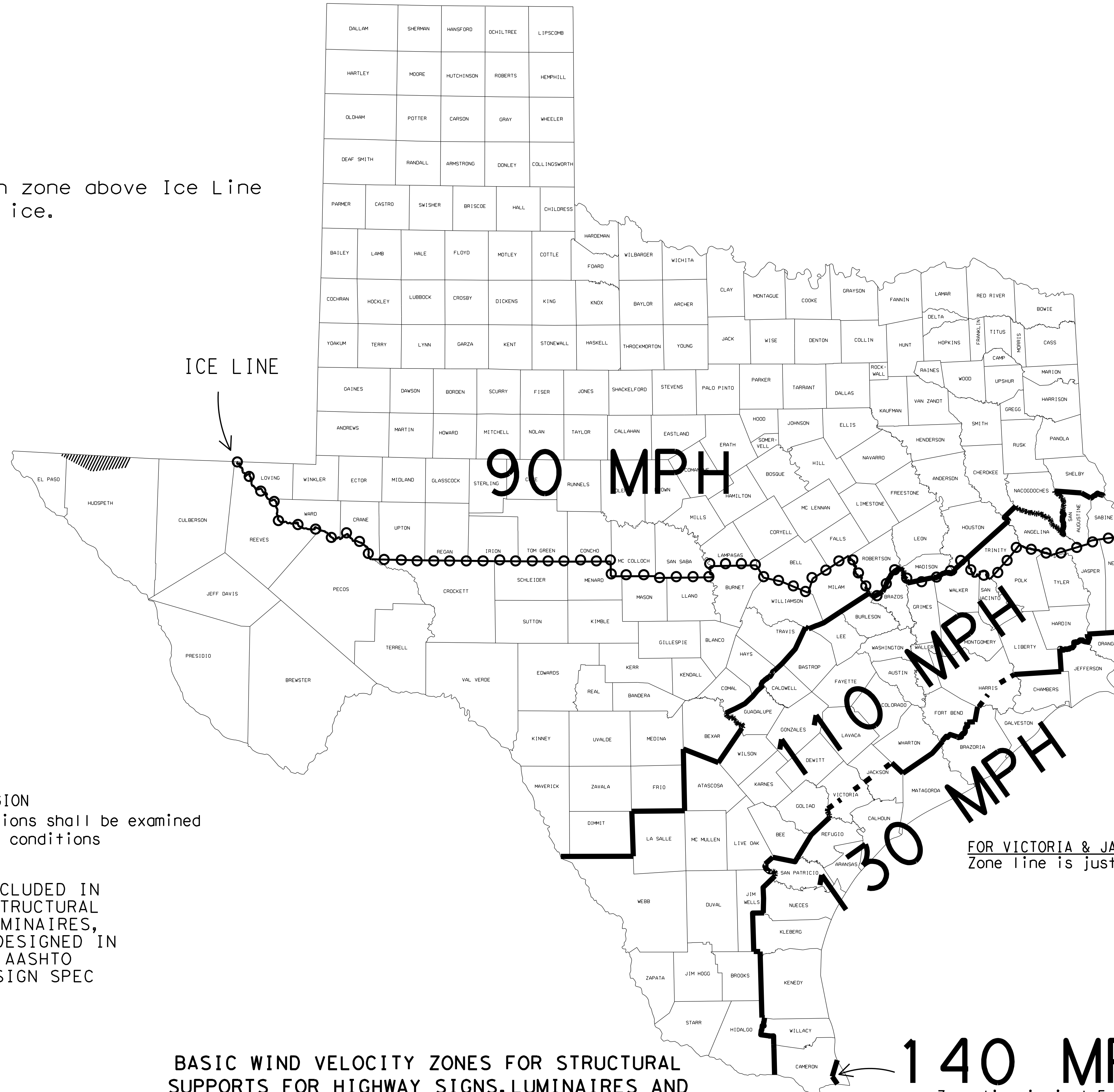
730

NOTE: Structures in zone above Ice Line to be designed for ice.



SPECIAL WIND REGION
Special wind regions shall be examined for unusual wind conditions

FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR VICTORIA & JACKSON COUNTIES ONLY
Zone line is just South of US 59.

140 MPH
Zone line is just East of both CO 1847 & FM 511

THIS SHEET IS TO BE INCLUDED IN ALL P.S.&E.'s HAVING STRUCTURAL SUPPORTS FOR SIGNS, LUMINAIRES, AND/OR TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

BASIC WIND VELOCITY ZONES FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

Values are nominal design 3-sec gust wind speeds in mph at 33 ft above ground for Exposure C category. (50-year mean recurrence interval)

NOTE: AASHTO 2001 THRU 2013 LTS DESIGN SPEC =AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 4th thru 6th Edition

DATE: 2/10/2021 4:54:46 PM
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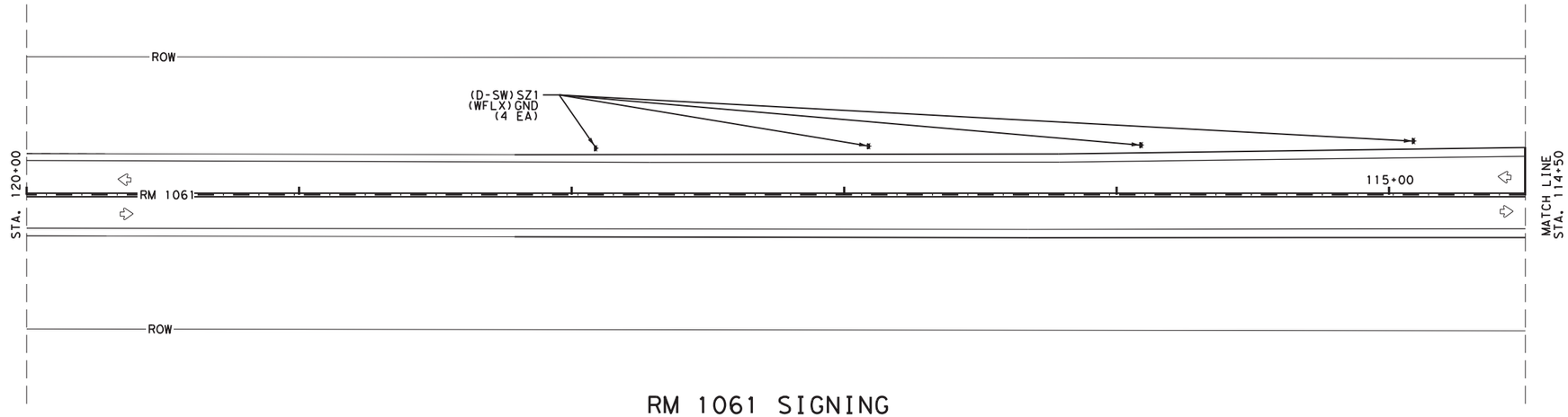
Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES (AASHTO 2001-2013 LTS DESIGN SPEC) WV & IZ(LTS2013)-14

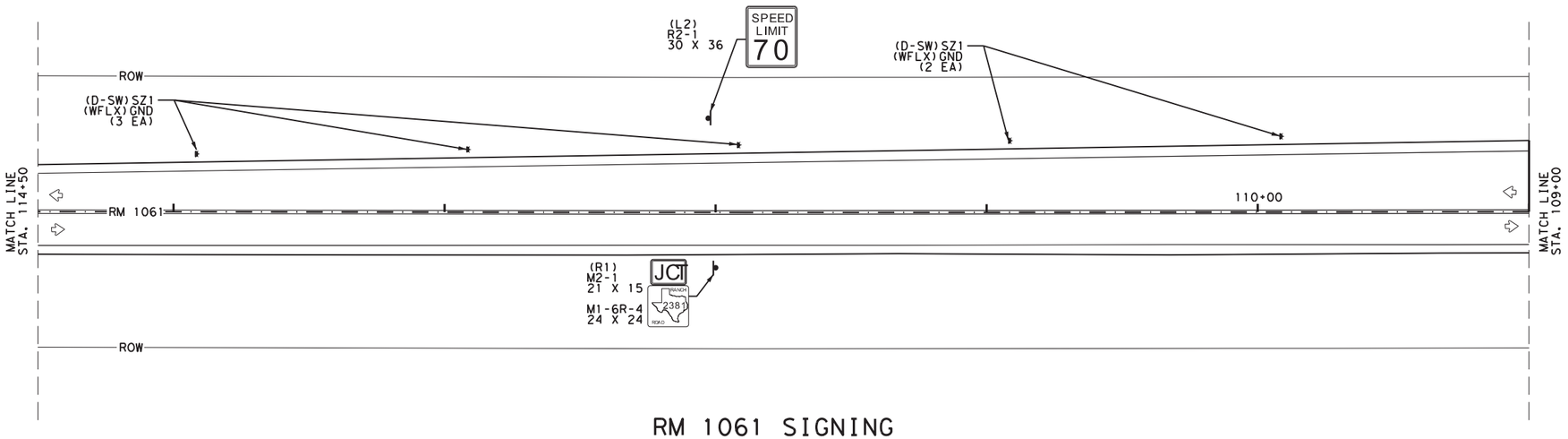
FILE: lts2013.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST		COUNTY	SHEET NO.
	AMA		POTTER	105

30B



RM 1061 SIGNING

STA. 120+00 TO STA. 114+50



RM 1061 SIGNING

STA. 114+50 TO STA. 109+00

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS			
LOCATION	0644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P)	0644 6004 IN SM RD SN SUP&AM TY10BWG (1)SA(T)	0658 6080 INSTL DEL ASSM (D-SW)SZ1 (WFLX)GND
	EA	EA	EA
CSJ: 2494-01-015			
STA. 120+00 TO STA. 114+50			4
STA. 114+50 TO STA. 109+00	1	1	5
CSJ: 2494-01-015 TOTALS	**1**	**1**	**9**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 1 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		106

DATE: 3/9/2021 11:12:33 AM
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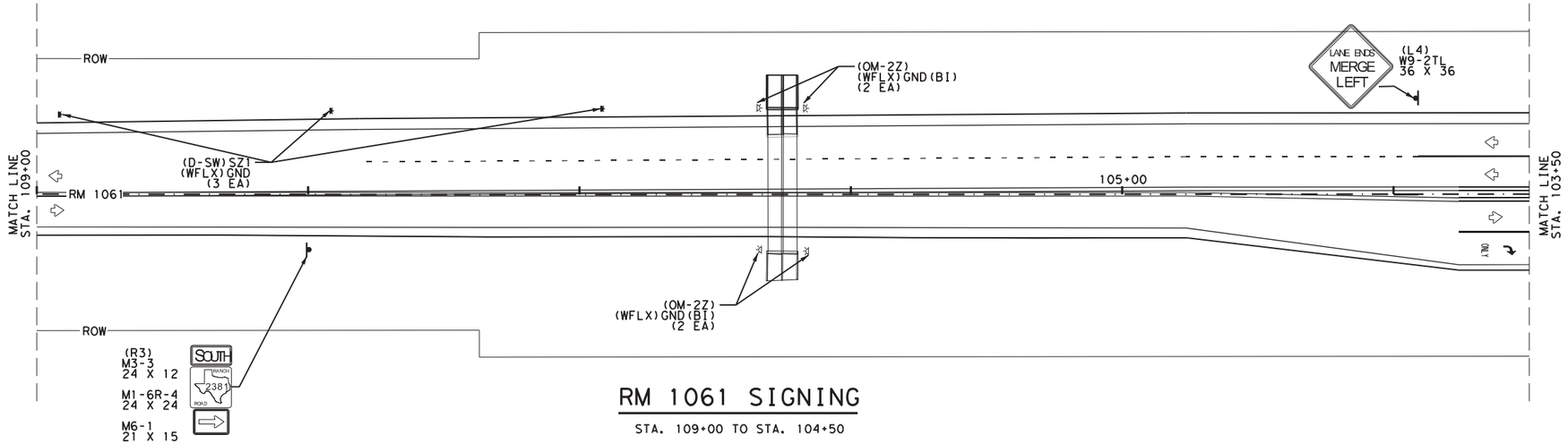
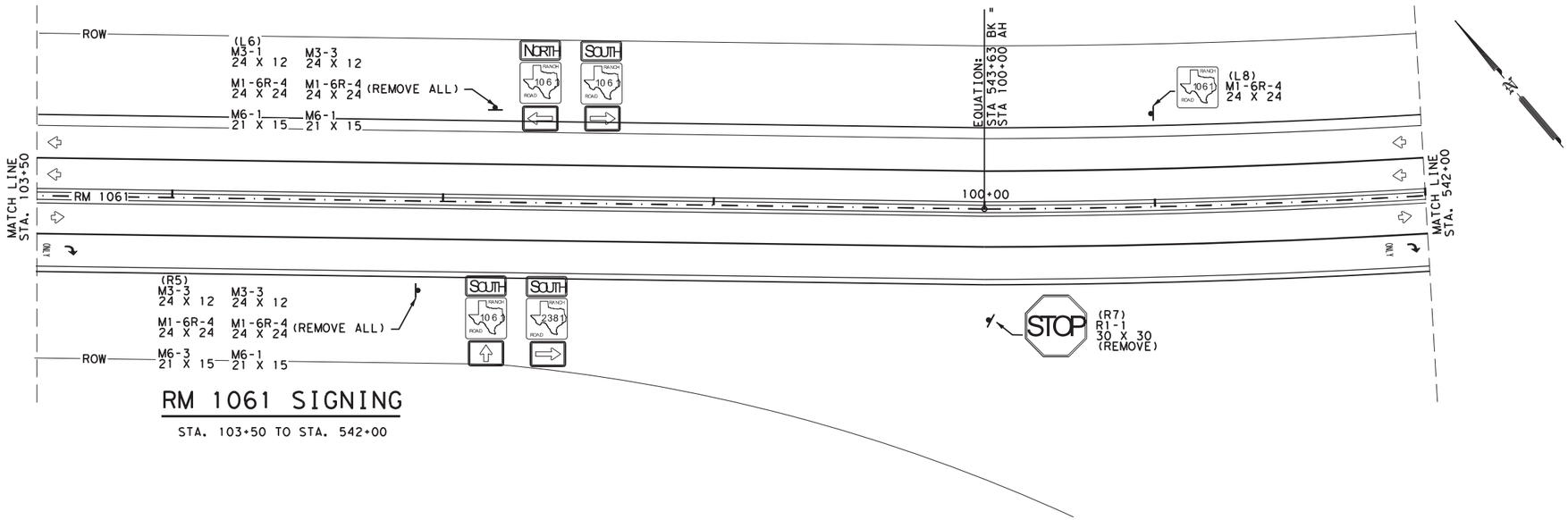


RM 1061 SIGNING

STA. 109+00 TO STA. 104+50



RM 1061 SIGNING

STA. 103+50 TO STA. 542+00

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS

LOCATION	0644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P) EA	0644 6004 IN SM RD SN SUP&AM TY10BWG (1)SA(T) EA	0644 6076 REMOVE SM RD SN SUP&AM EA	0658 6080 INSTL DEL ASSM (D-SW)SZ1 (WFLX)GND EA	0658 6100 INSTL OM ASSM (OM-2Z) (WFLX)GND(BI) EA
CSJ: 2494-01-015					
STA. 109+00 TO STA. 104+50	1	1		3	4
STA. 104+50 TO STA. 542+00	1		3		
CSJ: 2494-01-015 TOTALS	**2**	**1**	**3**	**3**	**4**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 2 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		107

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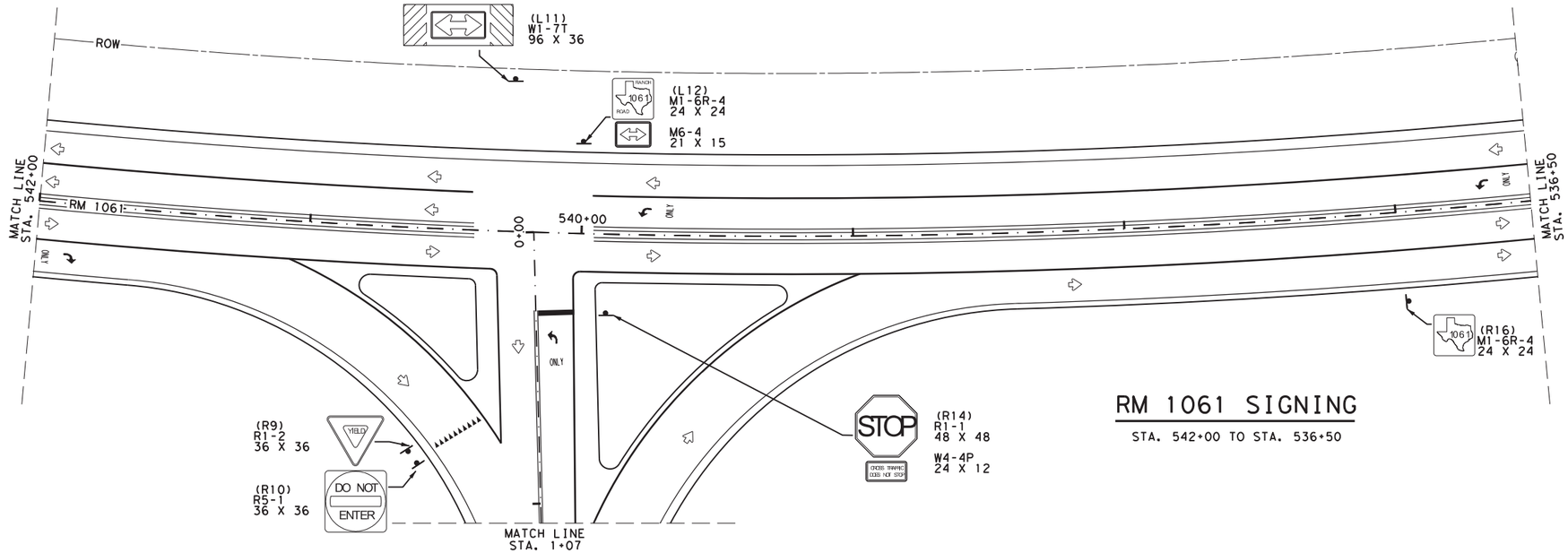
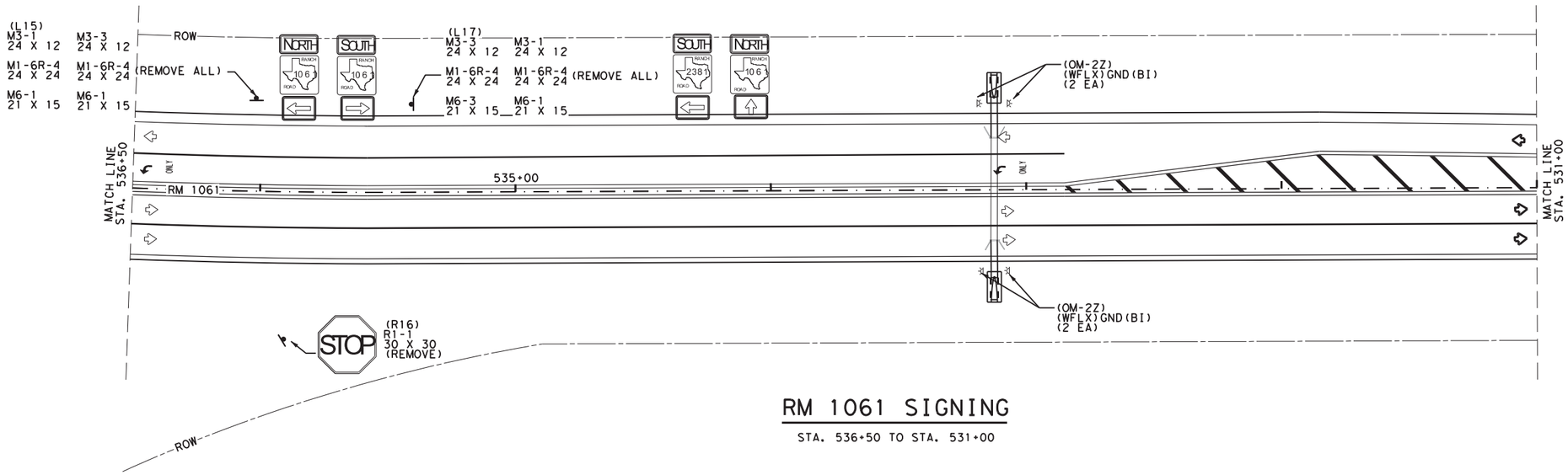


RM 1061 SIGNING

STA. 542+00 TO STA. 536+50



RM 1061 SIGNING

STA. 536+50 TO STA. 531+00

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS

LOCATION	0644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P) EA	0644 6004 IN SM RD SN SUP&AM 10BWG (1)SA(T) EA	0644 6033 IN SM RD SN SUP&AM TYS80 (1)SA(U) EA	0644 6076 REMOVE SM RD SN SUP&AM EA	0658 6100 INSTL OM ASSM (OM-2Z) (WFLX)GND(BI) EA
CSJ: 2494-01-015					
STA. 542+00 TO STA. 536+50	2	3	1	① 20	
STA. 536+50 TO STA. 531+00				3	4
CSJ: 2494-01-015 TOTALS	**2**	**3**	**1**	**23**	**4**

① QUANTITY NOT SHOWN IN PLANS.
VERIFY SIGN REMOVAL LOCATIONS WITH ENGINEER.
QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms
03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 3 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		108

DATE: 3/23/2021 11:07:02 AM
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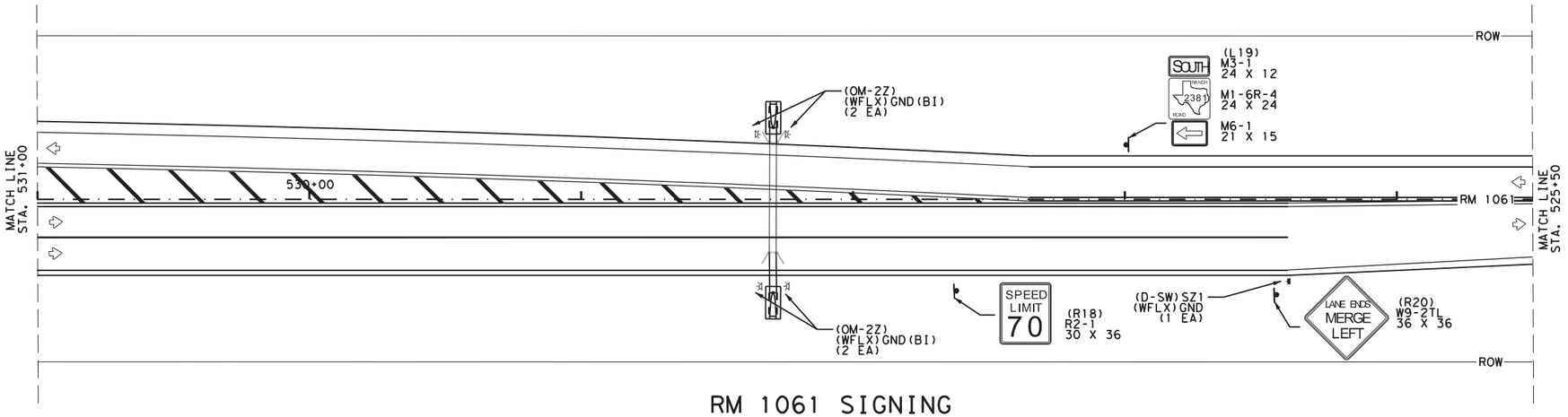
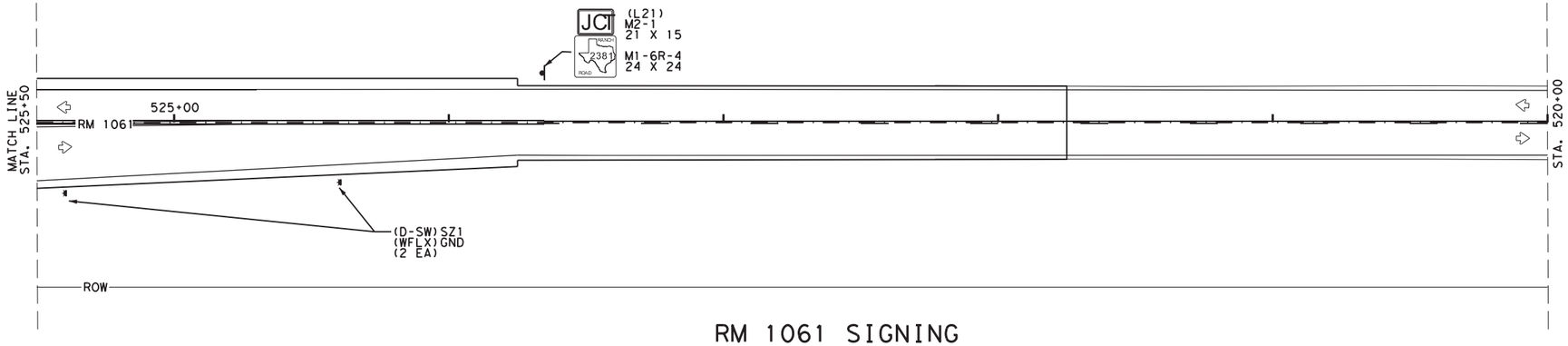


RM 1061 SIGNING

STA. 531+00 TO STA. 525+50



RM 1061 SIGNING

STA. 525+50 TO STA. 520+00

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS

LOCATION	0644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P) EA	0644 6004 IN SM RD SN SUP&AM TY10BWG (1)SA(T) EA	0658 6080 INSTL DEL ASSM (D-SW)SZ1 (WFLX)GND EA	0658 6100 INSTL OM ASSM (OM-2Z) (WFLX)GND(BI) EA
CSJ: 2494-01-015				
STA. 531+00 TO STA. 525+50	1	2	1	4
STA. 525+50 TO STA. 520+00	1		2	
CSJ: 2494-01-015 TOTALS	**2**	**2**	**3**	**4**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 4 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		109

DATE: 3/9/2021 11:12:38 AM
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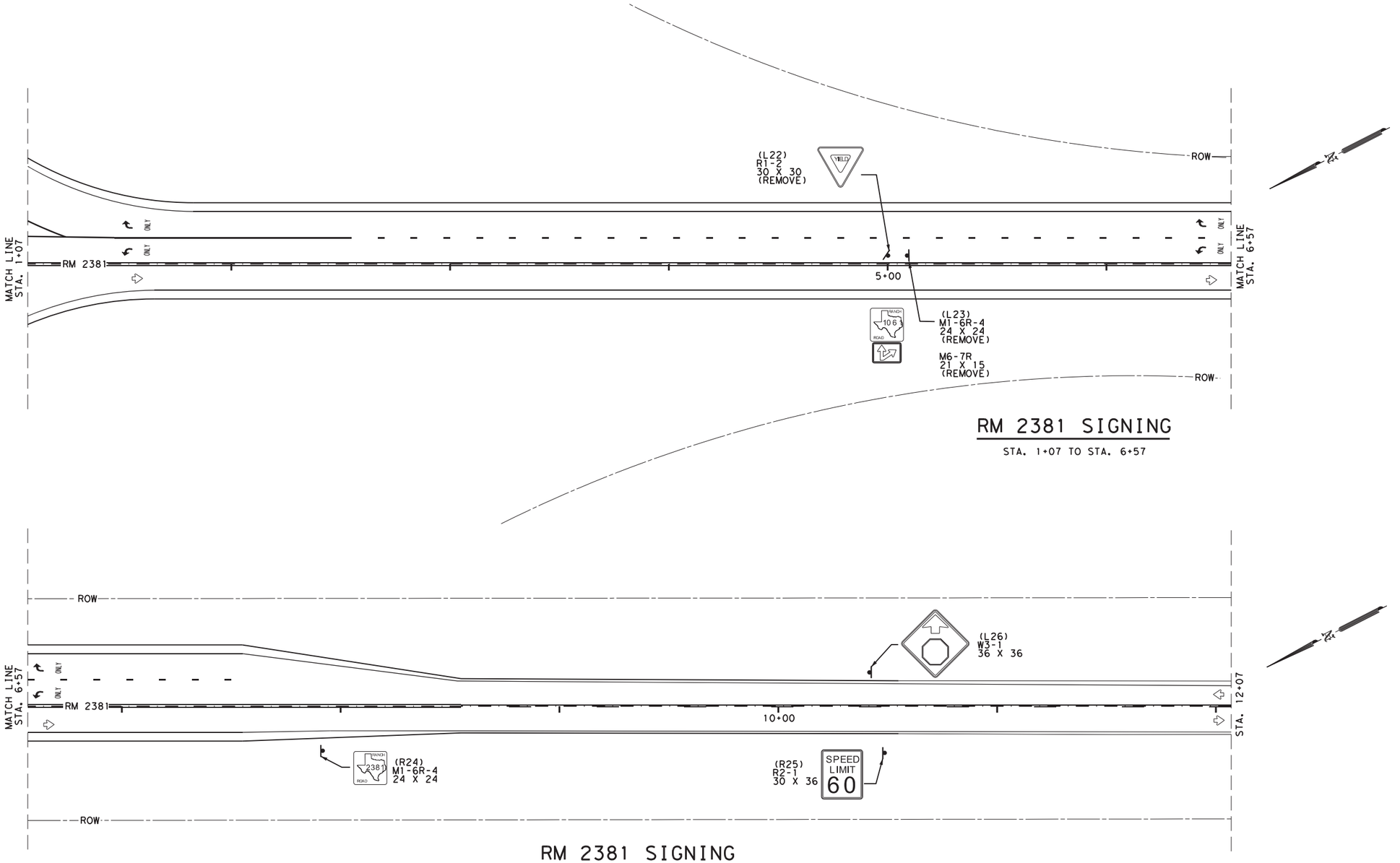

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS			
LOCATION	0644 6001 IN SM RD SN SUP&AM TY10BWG (1)SA(P)	0644 6004 IN SM RD SN SUP&AM TY10BWG (1)SA(T)	0644 6076 REMOVE SM RD SN SUP&AM
	EA	EA	EA
CSJ: 2494-01-015			
STA. 1+07 TO STA. 6+57			2
STA. 6+57 TO STA. 12+07	1	2	
CSJ: 2494-01-015 TOTALS	**1**	**2**	**2**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 5 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		110

DATE: 2/10/2021 4:55:45 PM
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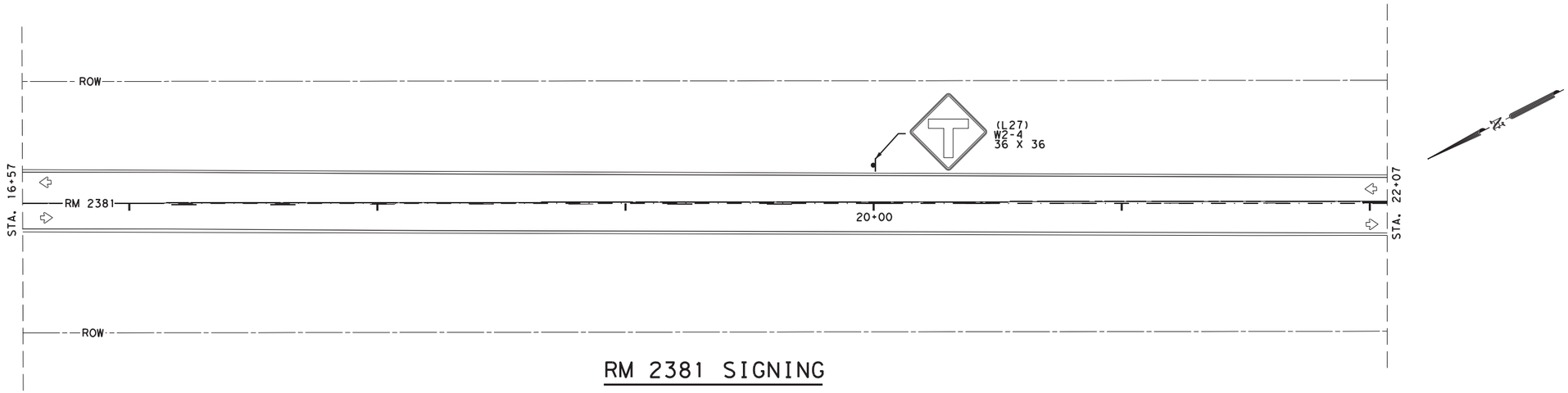

RM 2381 SIGNING

STA. 16+57 TO STA. 22+07

RM 1061/RM 2381 SUMMARY OF SIGNING ITEMS	
	0644 6004
LOCATION	IN SM RD SN SUP&AM TY10BWG (1)SA(T)
	EA
CSJ: 2494-01-015	
STA. 20+00	1
CSJ: 2494-01-015 TOTALS	**1**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SIGN LAYOUT

SCALE: 1" = 50'

2021 Texas Department of Transportation

SHEET 6 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		111

DATE: 2/10/2021 4:55:47 PM
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SUMMARY OF SMALL SIGNS (RM 1061)

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

PLAN SHEET NO.	SIGN NO.	SIGN CODE	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
113+00	R1	M2-1 M1-6R-4	JCT RANCH ROAD (2381)	21 X 15 24 X 24	X		10BWG	1	SA	P		
113+00	L2	R2-1	SPEED LIMIT (70)	30 X 36	X		10BWG	1	SA	T		
108+00	R3	M3-3 M1-6R-4 M6-1	SOUTH RANCH ROAD (2381) ARROW (RIGHT)	24 X 12 24 X 24 21 X 15	X		10BWG	1	SA	P		
103+91	L4	W9-2TL	LANE ENDS MERGE LEFT	36 X 36	X		10BWG	1	SA	T		
103+10	R5	M3-3 M1-6R M6-3 M3-3 M1-6R M6-1	SOUTH RANCH ROAD (1061) ARROW (UP) (REMOVE) SOUTH RANCH ROAD (2381) ARROW (RIGHT) (REMOVE)									
102+80	L6	M3-1 M1-6R M6-1 M3-3 M1-6R M6-1	NORTH RANCH ROAD (1061) ARROW (LEFT) (REMOVE) SOUTH RANCH ROAD (1061) ARROW (RIGHT) (REMOVE)									
100+00	R7	R1-1	STOP (REMOVE)									
543+00	L8	M1-6R-4	RANCH ROAD (1061)	24 X 24	X		10BWG	1	SA	P		
540+61	R9	R1-2	YIELD	36 X 36	X		10BWG	1	SA	T		
540+61	R10	R5-1	DO NOT ENTER	36 X 36	X		10BWG	1	SA	T		
540+24	L11	W1-7T	LARGE ARROW BOARD SIGN (DOUBLE)	96 X 36	X		S80	1	SA	U	BM	
540+00	L12	M1-6R-4 M6-4	RANCH ROAD (1061) ARROW (DOUBLE)	24 X 24 21 X 15	X		10BWG	1	SA	P		

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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

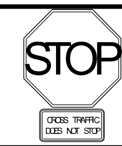
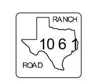
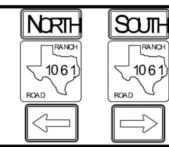
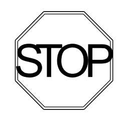
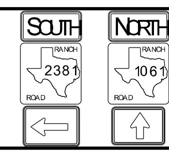
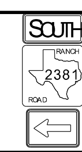
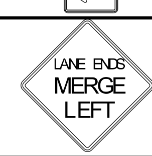
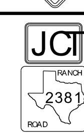
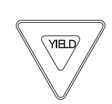
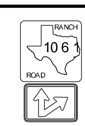
SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		2494	01	015	RM 2381
4-16		DIST	COUNTY		SHEET NO.
8-16		AMA	POTTER		112

DATE: 2/10/2021 4:56:12 PM
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\SHEETS\SOSS16.dgn

SUMMARY OF SMALL SIGNS (RM 1061)

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

PLAN SHEET NO.	SIGN NO.	SIGN CODE	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"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
540+00	R13	R1-1 W4-4P	STOP CROSS TRAFFIC DOES NOT STOP		48 X 48 24 X 12	X		10BWG	1	SA	T		
537+00	R14	M1-6R-4	RANCH ROAD (1061)		24 X 24	X		10BWG	1	SA	P		
536+01	L15	M3-1 M1-6R M6-1 M3-3 M1-6R M6-1	NORTH RANCH ROAD (1061) ARROW (LEFT) (REMOVE) SOUTH RANCH ROAD (1061) ARROW (RIGHT) (REMOVE)										
535+95	R16	R1-1	STOP (REMOVE)										
535+39	L17	M3-3 M1-6R M6-1 M3-1 M1-6R M6-3	SOUTH RANCH ROAD (2381) ARROW (LEFT) (REMOVE) NORTH RANCH ROAD (1061) ARROW (UP) (REMOVE)										
527+63	R18	R2-1	SPEED LIMIT (70)		30 X 36	X		10BWG	1	SA	T		
527+00	L19	M3-3 M1-6R-4 M6-1	SOUTH RANCH ROAD (2381) ARROW (LEFT)		24 X 12 24 X 24 21 X 15	X		10BWG	1	SA	P		
526+45	R20	W9-2TL	LANE ENDS MERGE LEFT		36 X 36	X		10BWG	1	SA	T		
523+50	L21	M2-1 M1-6R-4	JCT RANCH ROAD (2381)		21 X 15 24 X 24	X		10BWG	1	SA	P		
5+00	L22	R1-2	YIELD (REMOVE)										
5+10	L23	M1-6R-4 M6-7R	RANCH ROAD (1061) ARROW (UP;RIGHT) (REMOVE)										
7+90	R24	M1-6R-4	RANCH ROAD (2381)		24 X 24	X		10BWG	1	SA	P		

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).

DATE: 2/10/2021 4:56:15 PM
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - design\...

Texas Department of Transportation — Traffic Operations Division Standard

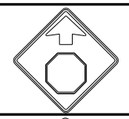
SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS 4-16 8-16	DIST AMA		COUNTY POTTER	SHEET NO. 113

18

SUMMARY OF SMALL SIGNS (RM 2381)

PLAN SHEET NO.	SIGN NO.	SIGN CODE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
10+50	R25	R2-1	SPEED LIMIT (60) 	30 X 36	X		10BWG	1	SA	T		
10+50	L26	W3-1	STOP SIGN AHEAD 	36 X 36	X		10BWG	1	SA	T		
20+00	L27	W2-4	T-INTERSECTION AHEAD 	36 X 36	X		10BWG	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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
4-16	DIST	COUNTY		SHEET NO.
8-16	AMA	POTTER		114

18

DATE: 2/10/2021 4:56:17 PM
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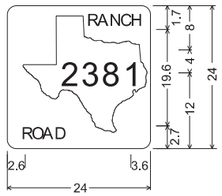
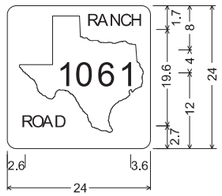
R1, R3,
L8, L19
L21, R24



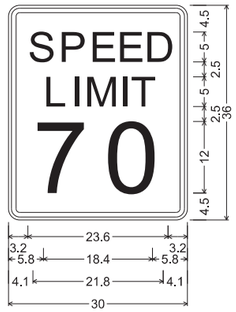
M1-6R-4_24X24;
1.5" Radius, No border, Black;
"2381" Black, D;

L12, R14



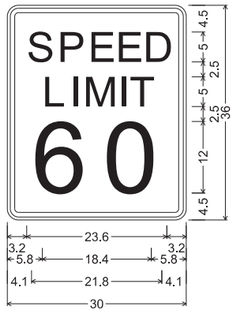
M1-6R-4_24X24;
1.5" Radius, No border, Black;
"1061" Black, D;

L2, R18



R2-1_30x36;
1.9" Radius, 0.8" Border, 0.5" Indent, Black on, White;
"SPEED", E specified length;
"LIMIT", E specified length;
"75", E specified length;

R25



R2-1_30x36;
1.9" Radius, 0.8" Border, 0.5" Indent, Black on, White;
"SPEED", E specified length;
"LIMIT", E specified length;
"60", E specified length;

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

SMALL SIGN DETAILS

SCALE: N/A

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		115

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FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\8. Traffic\Standards\smdgen.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

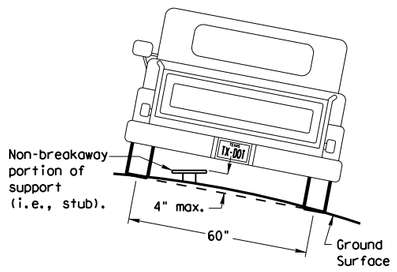
Anchor Type

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

Sign Mounting Designation

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

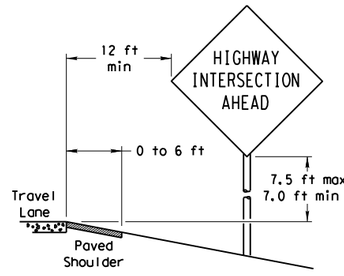
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

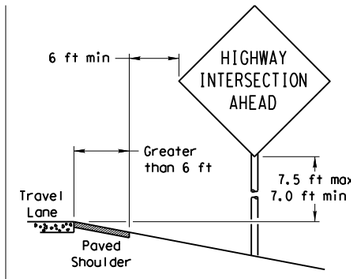
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

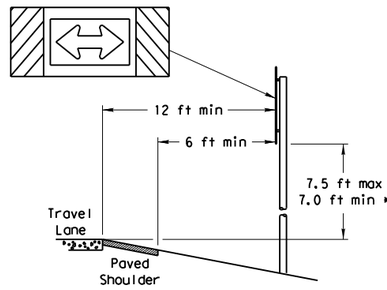
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



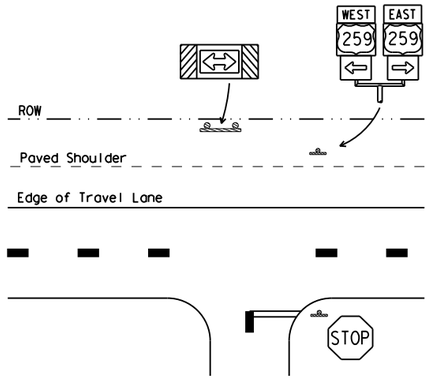
GREATER THAN 6 FT. WIDE

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.

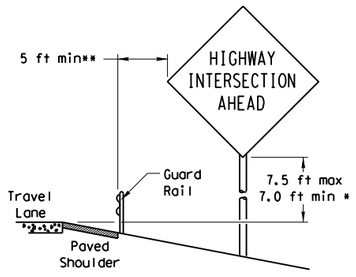
T-INTERSECTION



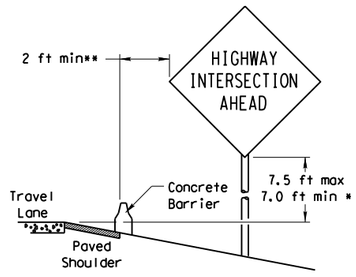
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

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

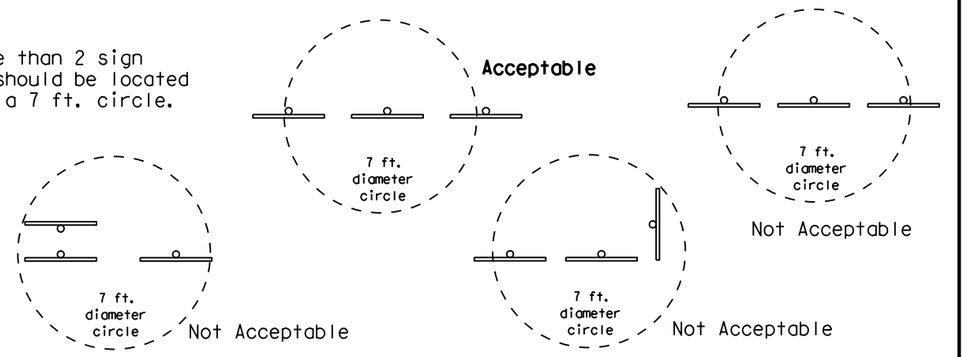
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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

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

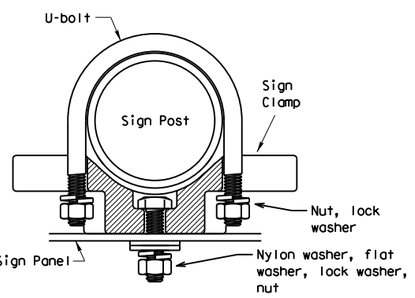
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

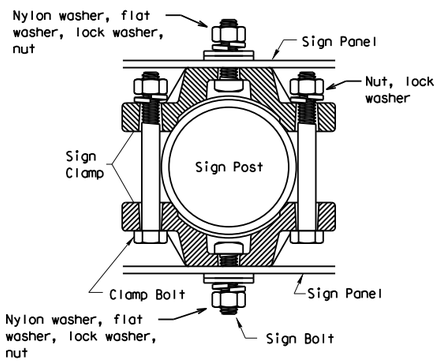


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

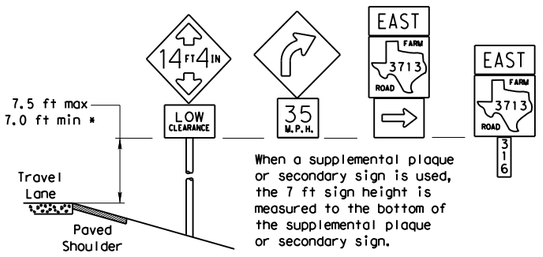
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



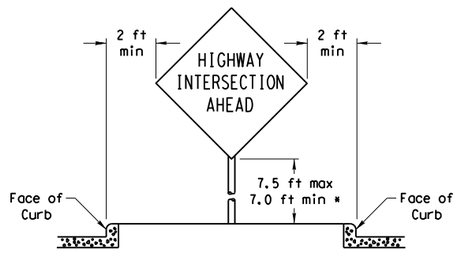
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



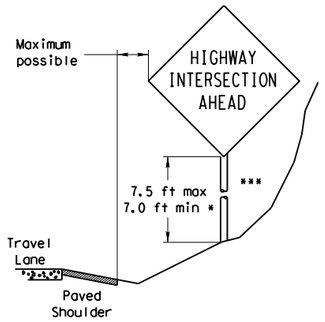
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		116

DATE: 2/10/2021 4:56:35 PM
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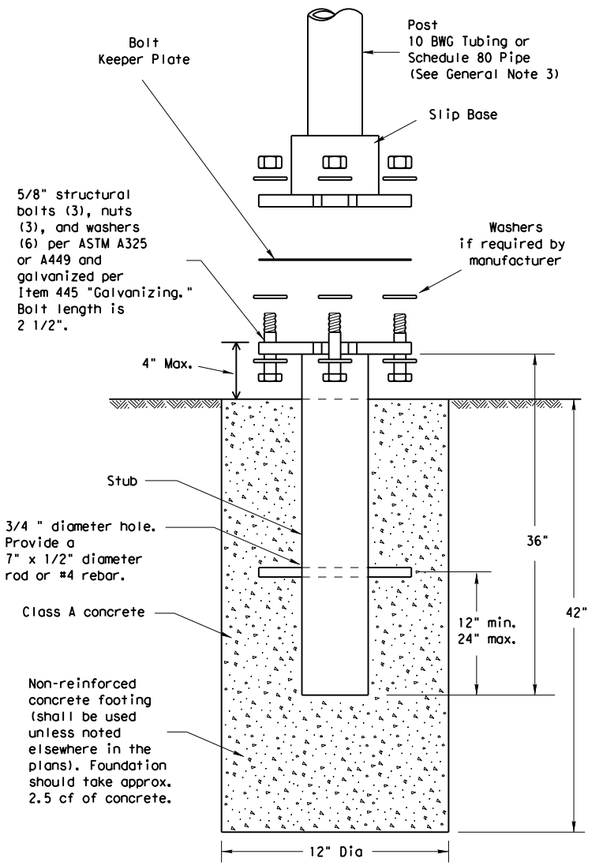
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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.

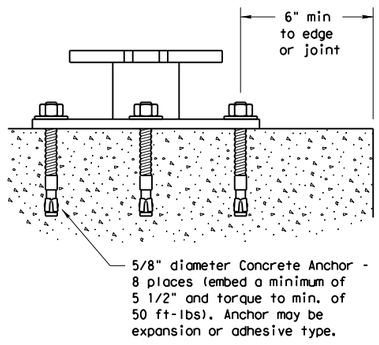
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		117

DATE: 2/10/2021 4:56:39 PM
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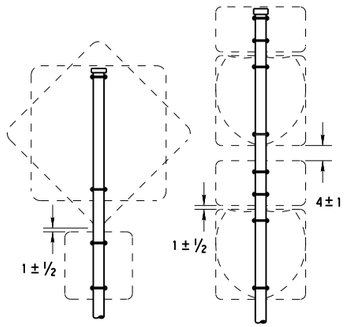
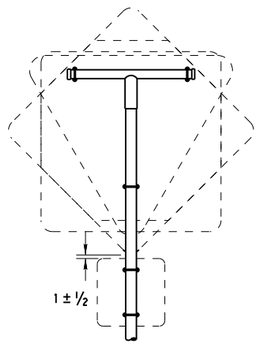
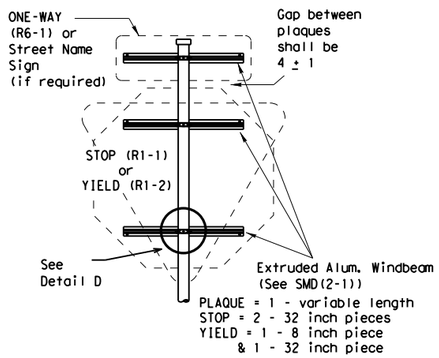


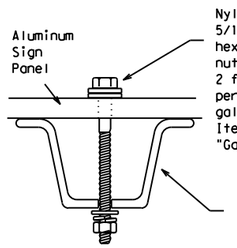
SM RD SGN ASSM TY XXXXX(1)XX(P)



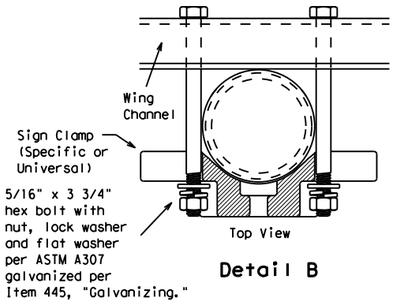
SM RD SGN ASSM TY XXXXX(1)XX(T)



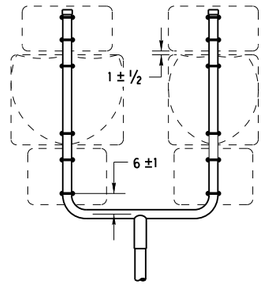
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



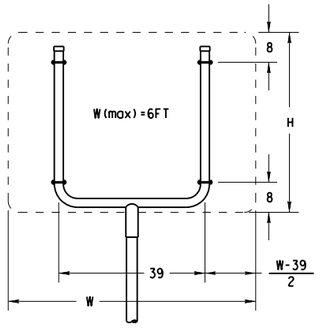
Detail A



Detail B



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



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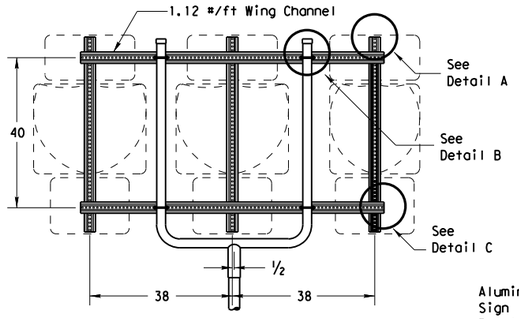
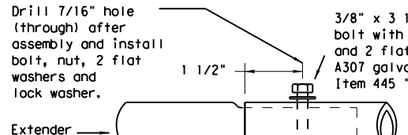
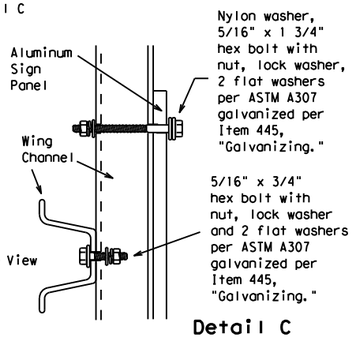


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

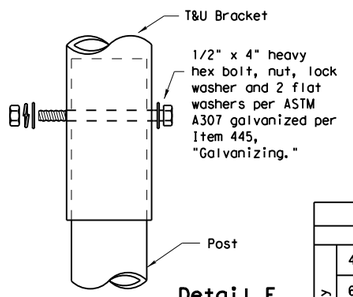


Detail F

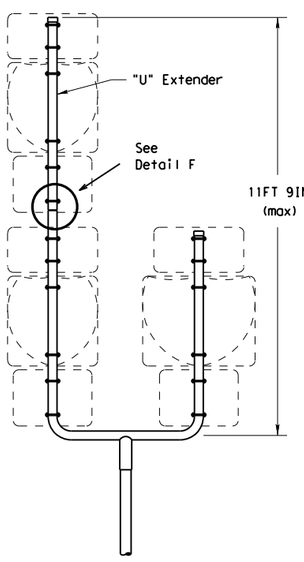
Splices shall only be allowed behind the sign substrate.



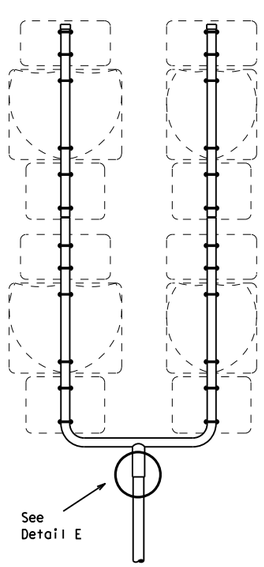
Detail C



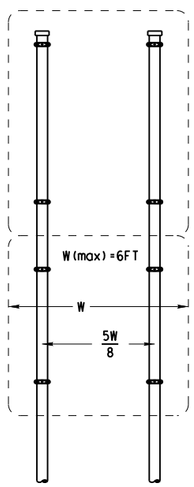
Detail E



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

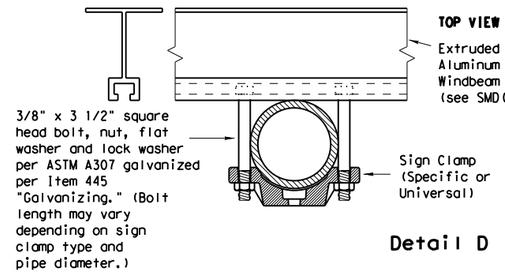


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

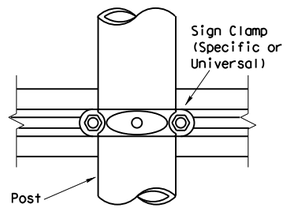


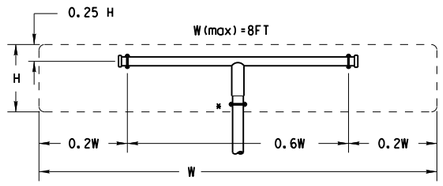
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

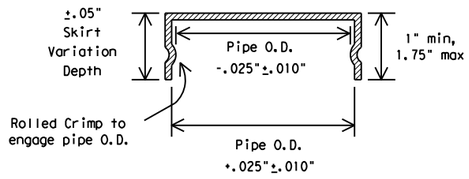




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
2494	01	015	RM 2381

DIST	COUNTY	SHEET NO.
AMA	POTTER	118

DATE: 2/10/2021 4:56:43 PM
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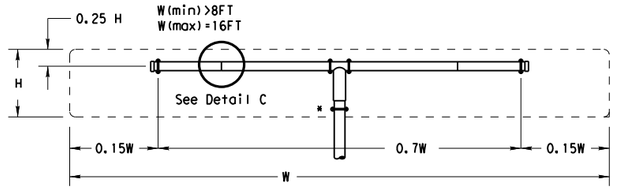
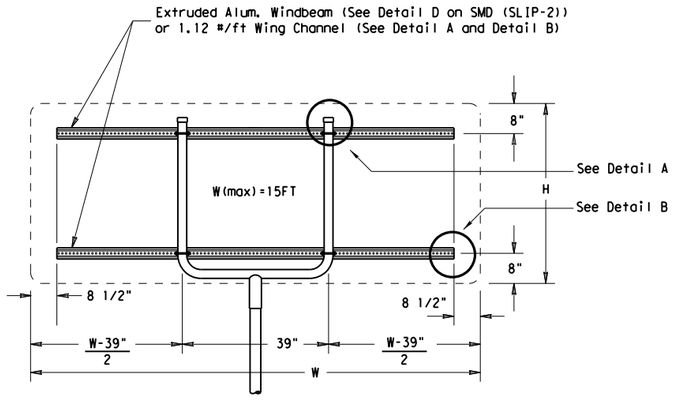
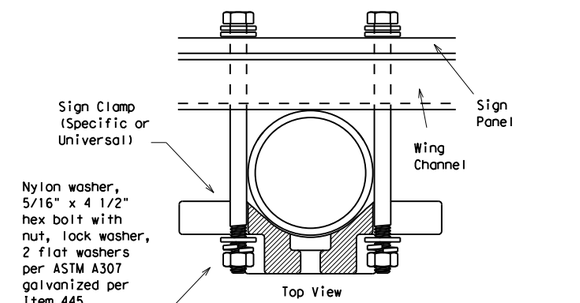


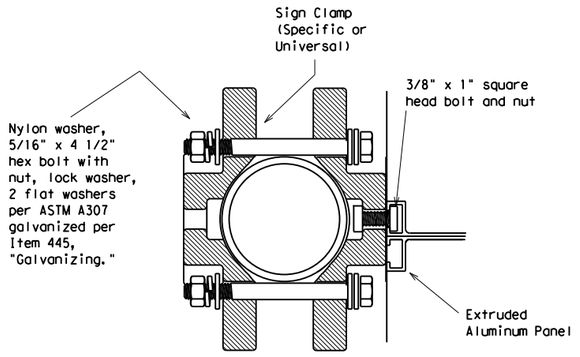
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



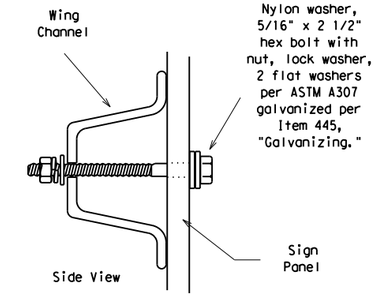
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



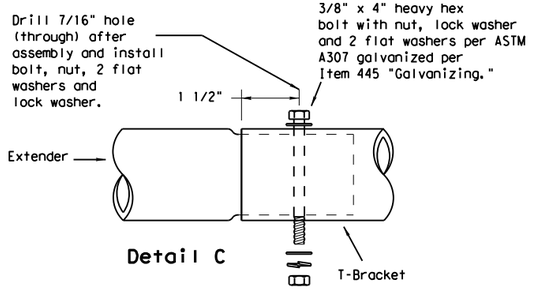
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

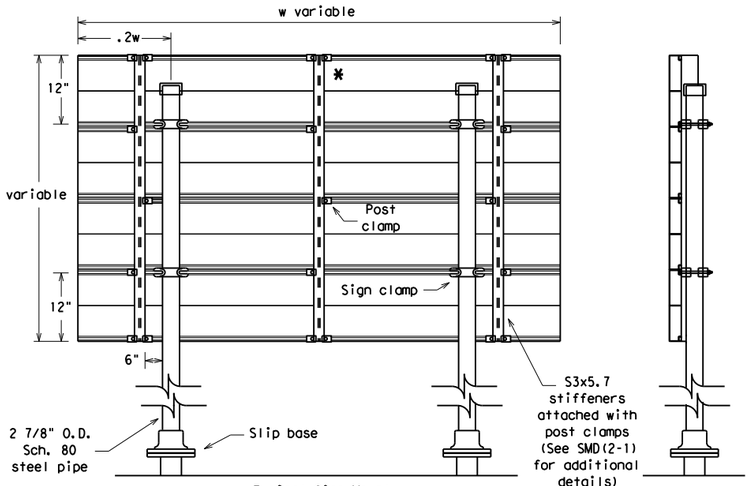


Detail B



Detail C

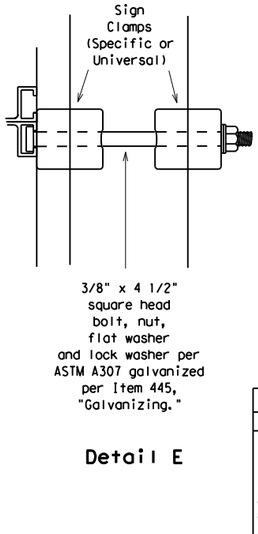
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

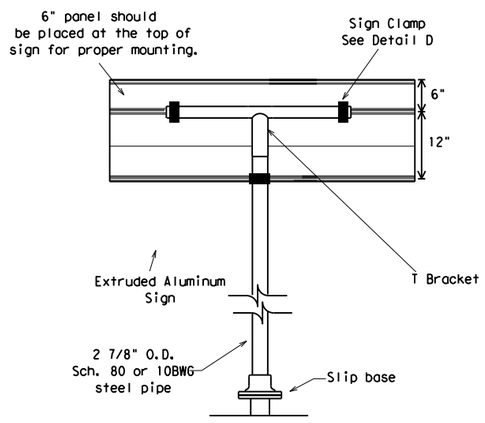
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

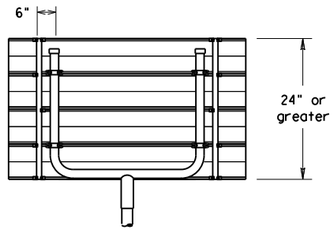


Detail E

See Detail E
for clamp installation



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

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

CONT	SECT	JOB	HIGHWAY
2494	01	015	RM 2381

DIST	COUNTY	SHEET NO.
AMA	POTTER	119

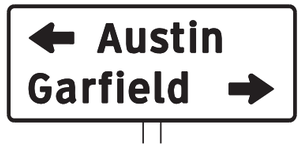
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

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~~ 0.100
~~7.5 to 15~~	~~0.100~~
~~7.5 or Greater~~ ~~Greater than 15~~	0.125

1

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

http://www.txdot.gov/

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

TYPICAL SIGN REQUIREMENTS

TSR(3)-13 (MOD)

1 REVISED MINIMUM SIGN BLANK THICKNESS

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		120

DATE: 2/10/2021 4:56:52 PM
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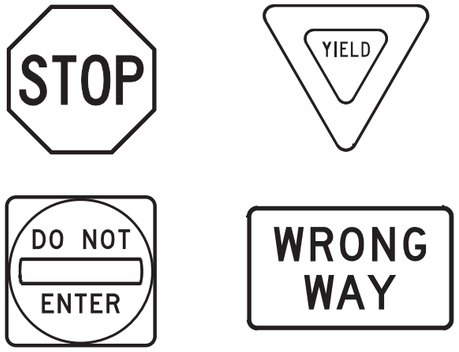
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(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

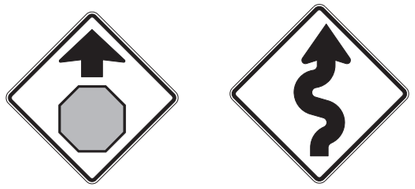
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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~~ 0.100
~~7.5 to 15~~	~~0.100~~
~~7.5 or Greater Greater than 15~~	0.125

1

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/

03/31/2021

TYPICAL SIGN REQUIREMENTS

TSR(4)-13 (MOD)

2021 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		121

1 REVISED MINIMUM SIGN BLANK THICKNESS

DATE: 2/10/2021 4:56:57 PM
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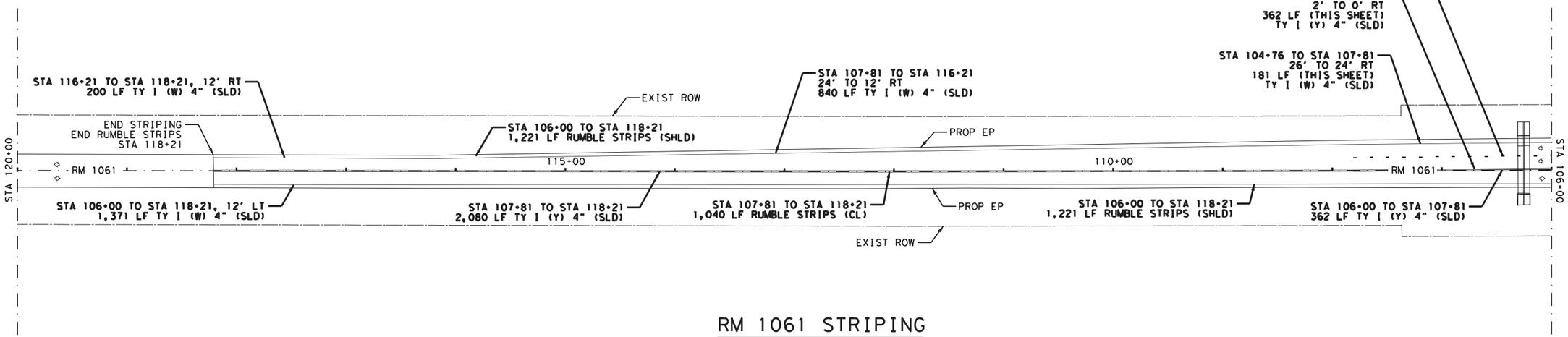

RM 1061 STRIPING

STA. 106+00 TO STA. 120+00

NOTES:

INSTALL ACCORDING TO LATEST MUTCD AND TXDOT STANDARDS.

PLACE RUMBLE STRIPS ACCORDING TO RS(3)-13, RS(4)-13, AND RS(5)-13.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

STRIPING LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		122

DATE: 2/10/2021 4:58:14 PM
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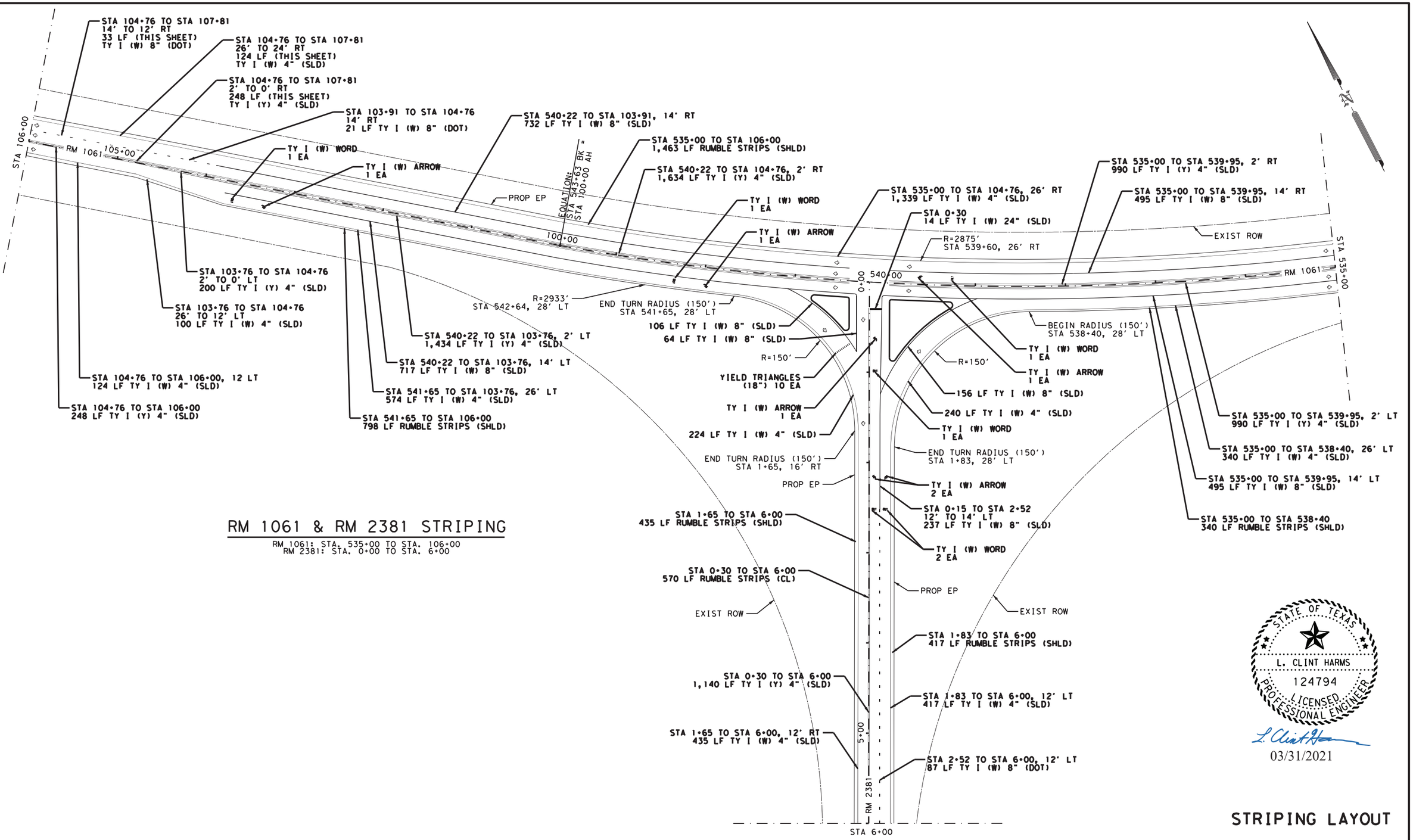

RM 1061 & RM 2381 STRIPING

RM 1061: STA. 535+00 TO STA. 106+00
RM 2381: STA. 0+00 TO STA. 6+00

NOTES:

INSTALL ACCORDING TO LATEST MUTCD AND TXDOT STANDARDS.

PLACE RUMBLE STRIPS ACCORDING TO RS(3)-13, RS(4)-13, AND RS(5)-13.

L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

L. Clint Harms
03/31/2021

STRIPING LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 2 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		123

DATE: 3/9/2021 4:53:50 PM
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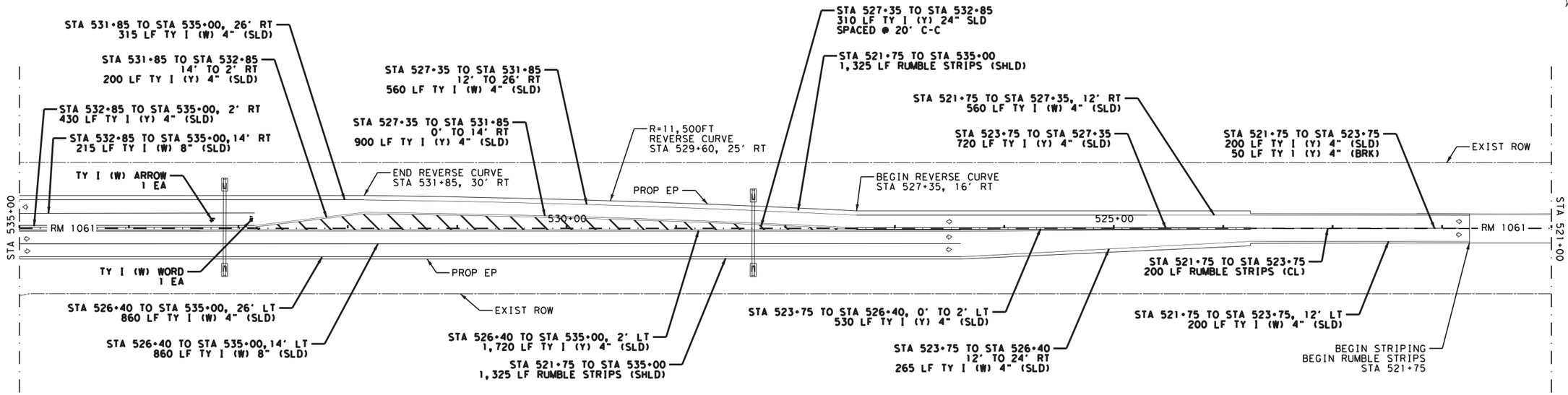

RM 1061 STRIPING

STA. 521+00 TO STA. 535+00

NOTES:

INSTALL ACCORDING TO LATEST MUTCD AND TXDOT STANDARDS.

PLACE RUMBLE STRIPS ACCORDING TO RS(3)-13, RS(4)-13, AND RS(5)-13.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

STRIPING LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 3 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		124

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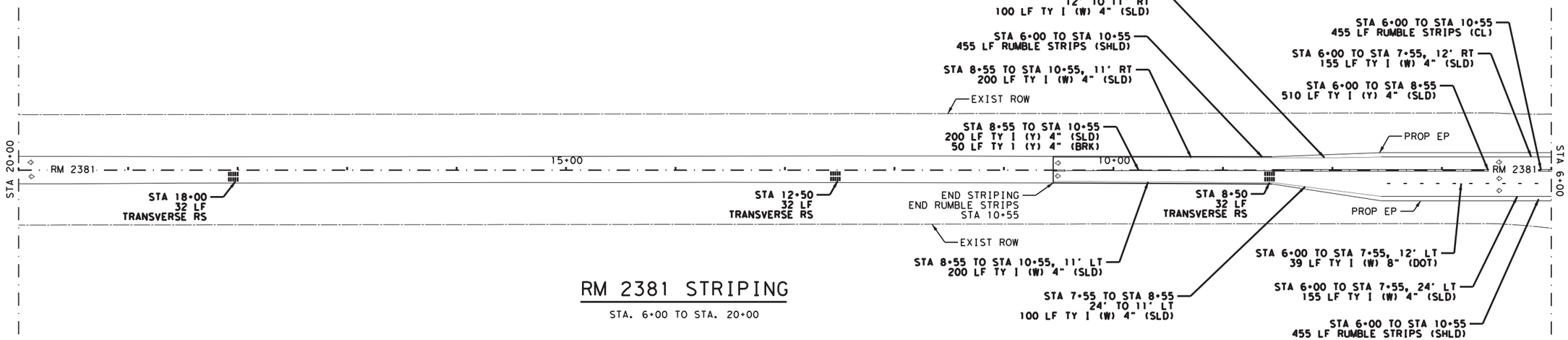
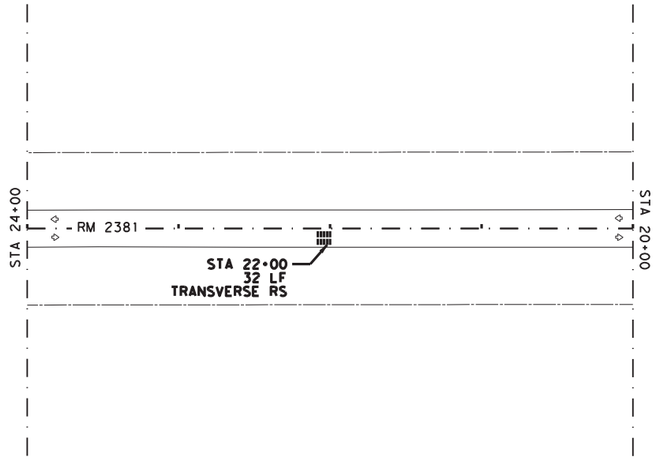


RM 2381 STRIPING

STA. 6+00 TO STA. 20+00



RM 2381 STRIPING

STA. 20+00 TO STA. 24+00

NOTES:

INSTALL ACCORDING TO LATEST MUTCD AND TXDOT STANDARDS.

PLACE RUMBLE STRIPS ACCORDING TO RS(3)-13, RS(4)-13, AND RS(5)-13.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

STRIPING LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 4 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		125

DATE: 2/10/2021 4:58:19 PM
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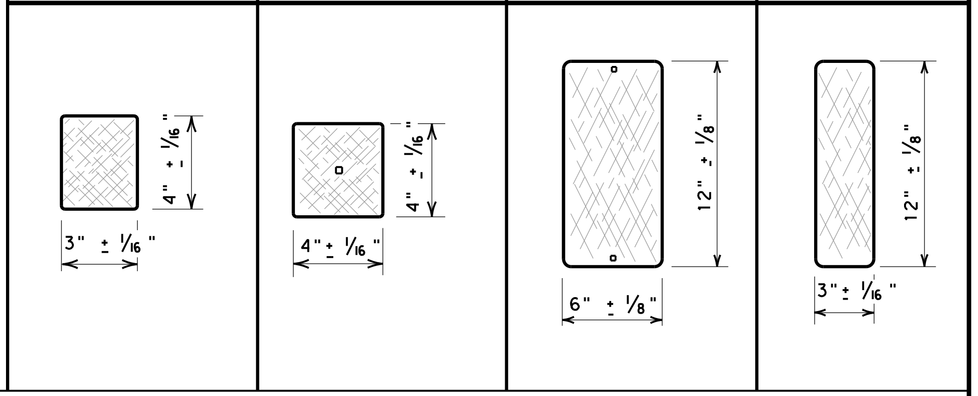
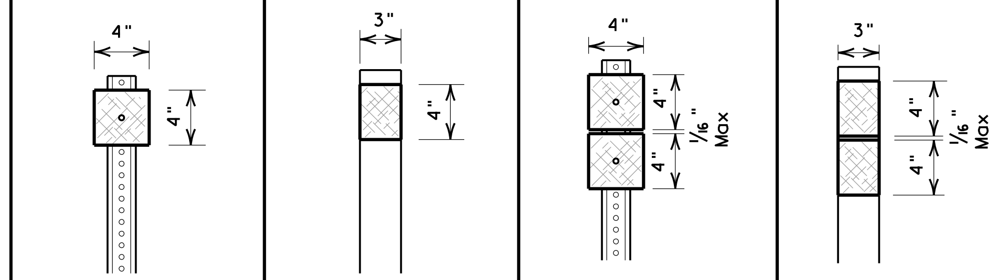
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

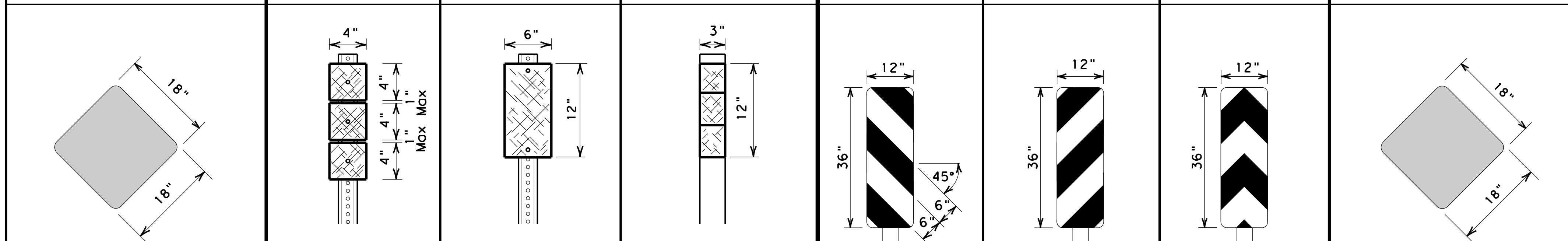
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

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

DIRECTION
If Required
BI = Bi-Directional

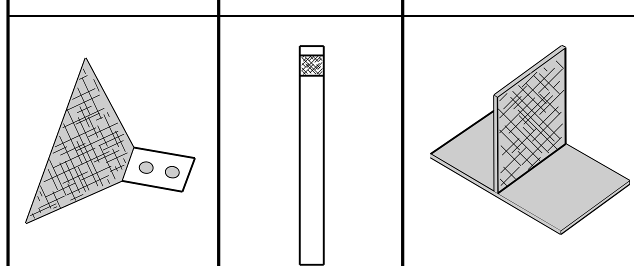
OBJECT MARKERS

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

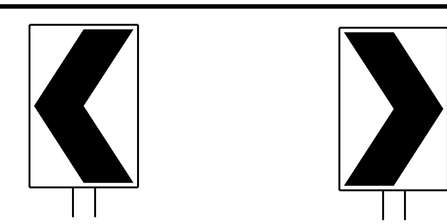
DEPARTMENTAL MATERIAL SPECIFICATIONS

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

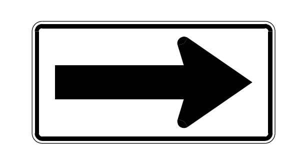
BARRIER REFLECTORS (BRF)

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

CHEVRONS

DEVICE	 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: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	AMA		POTTER	126

20A

DATE: 2/10/2021 4:58:24 PM
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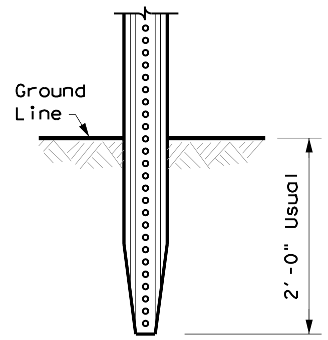
DATE: 2/10/2021 4:58:28 PM
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\08 Traffic\Standards\dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

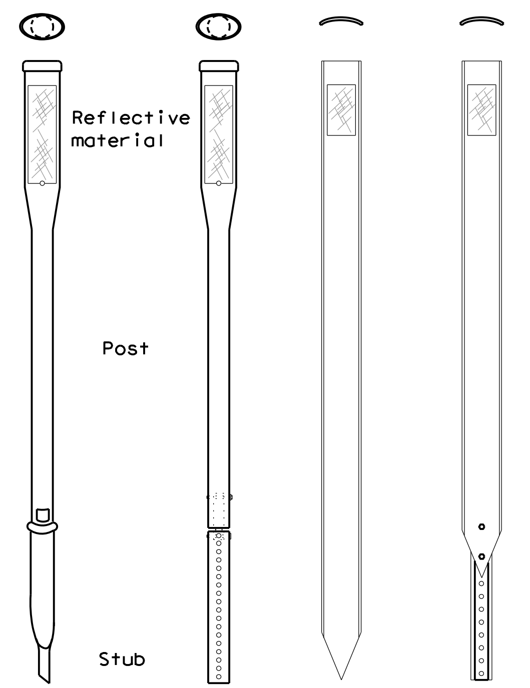


NOTES

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

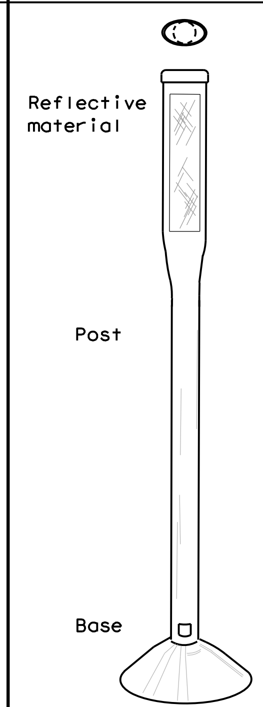
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



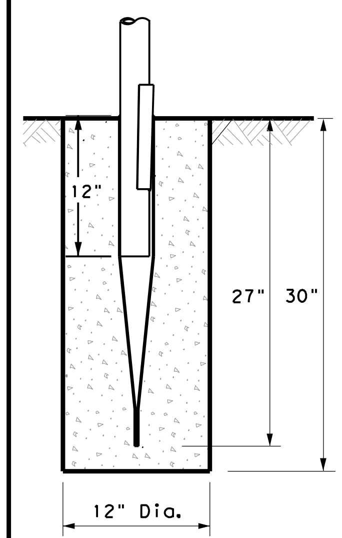
SURFACE MOUNT

NOTES

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

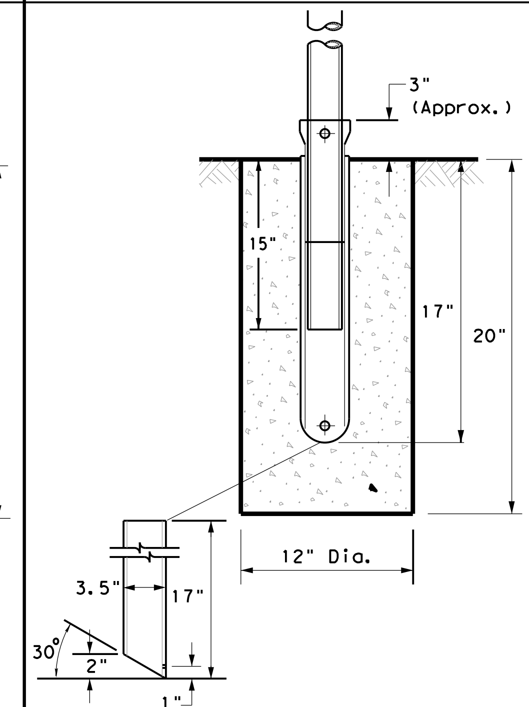
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

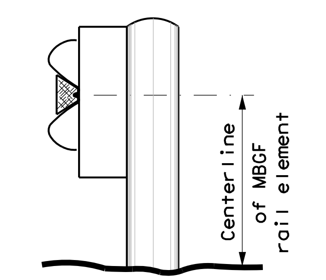
NOTE

1. Install per manufacturer's recommendations.

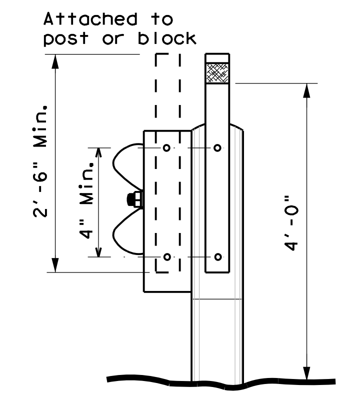
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

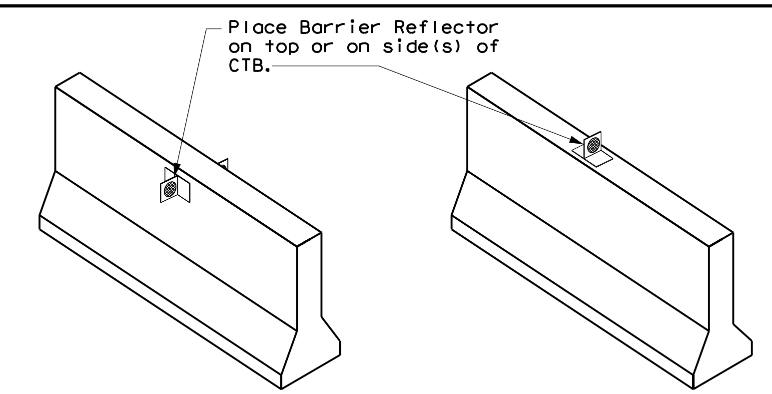
GF1



GF2



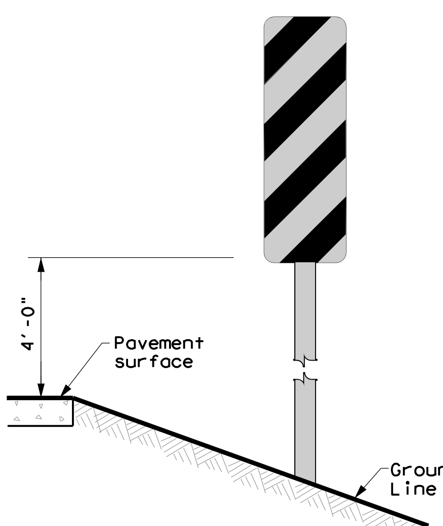
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

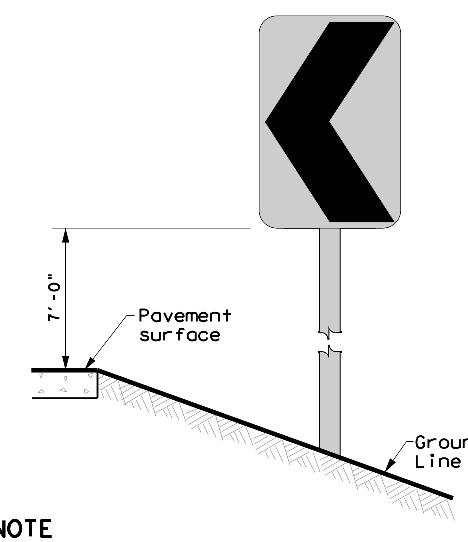
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

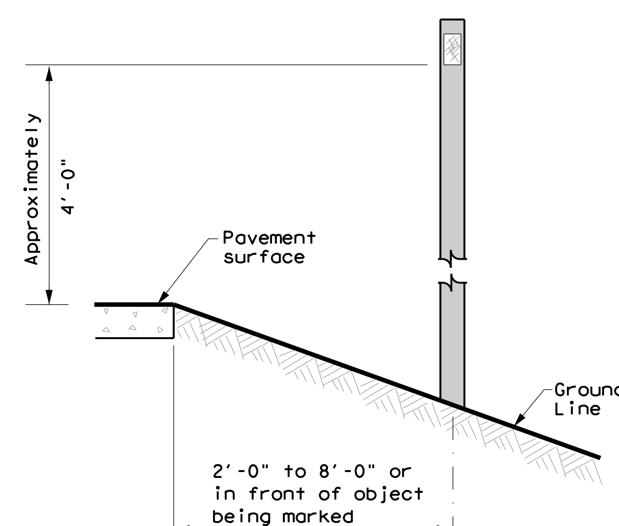
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

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 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS 10-09 3-15 4-10 7-20	DIST AMA		COUNTY POTTER	SHEET NO. 127

20B

DATE: 2/10/2021 4:58:32 PM
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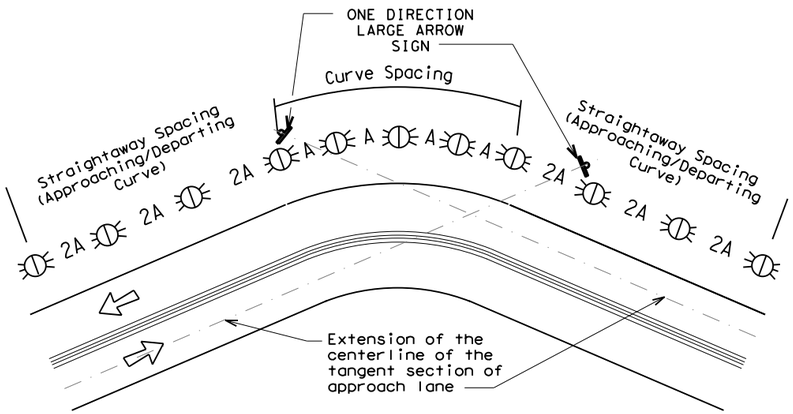
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

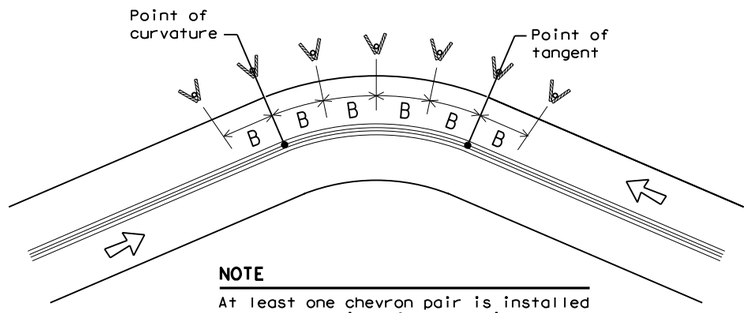
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	AMA	POTTER		128

20C

DATE: 2/10/2021 4:58:36 PM
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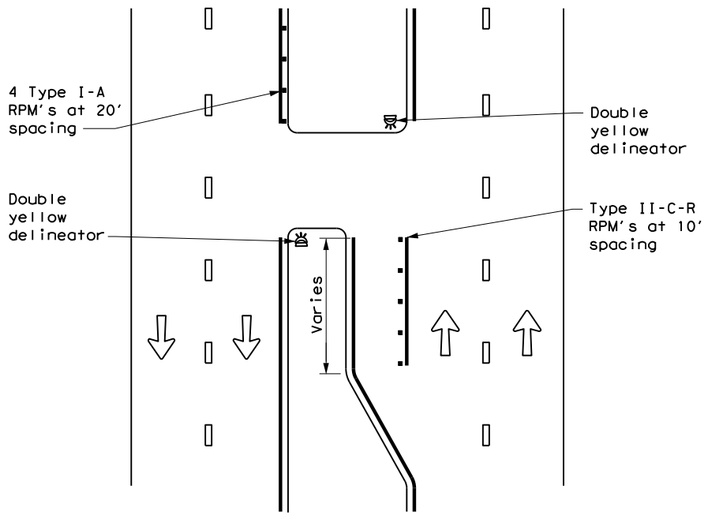
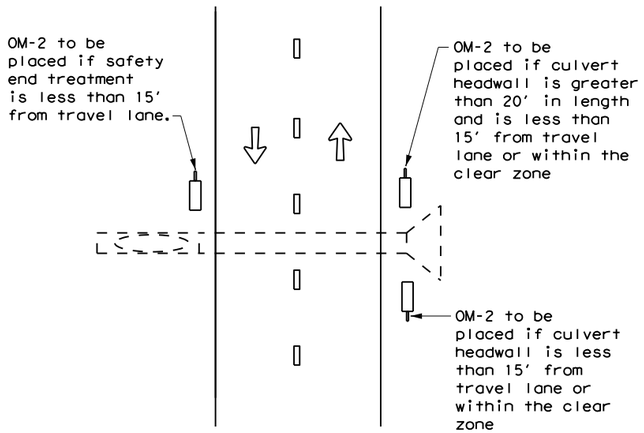
CROSSOVERS



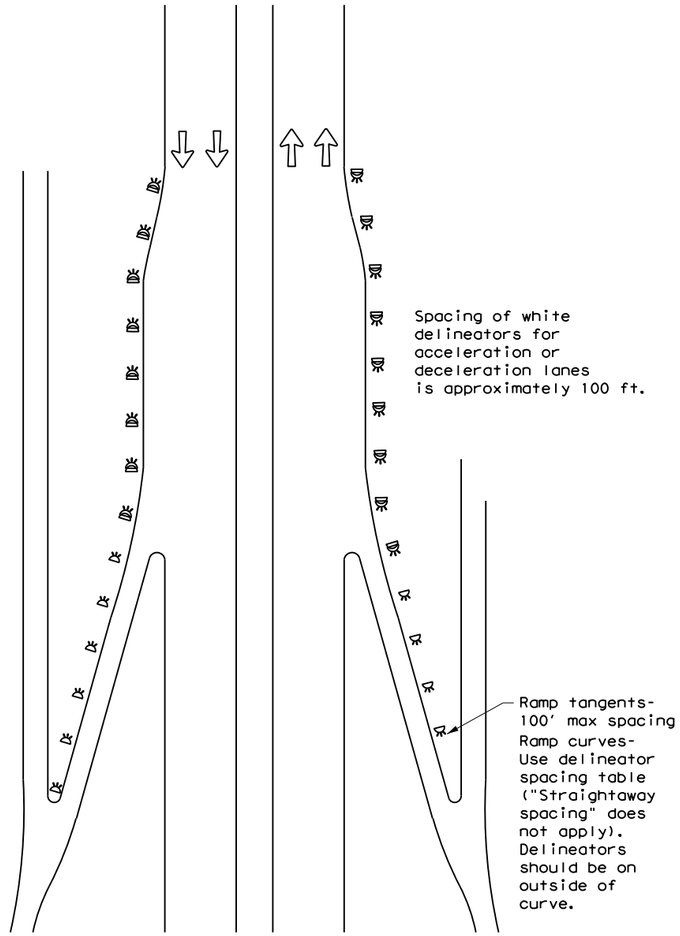
DETAIL 1

FOR CULVERTS WITHOUT MBGF



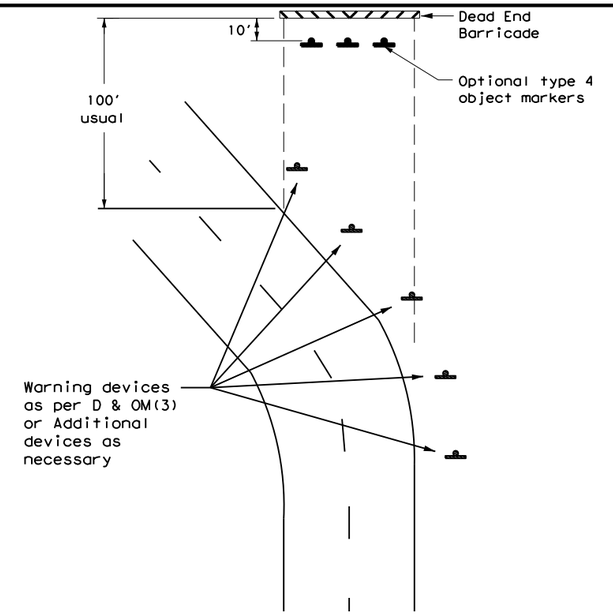
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



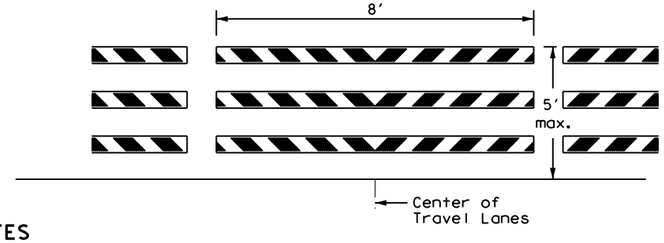
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
3-15 7-20	DIST	COUNTY		SHEET NO.
	AMA	POTTER		129

20D

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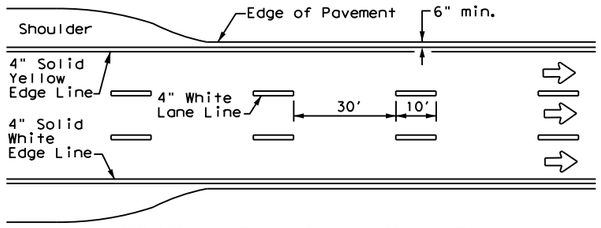
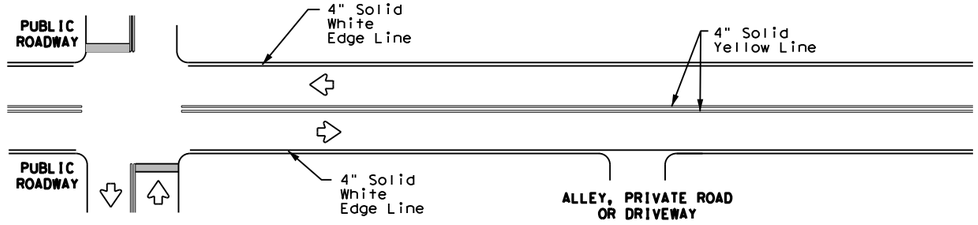
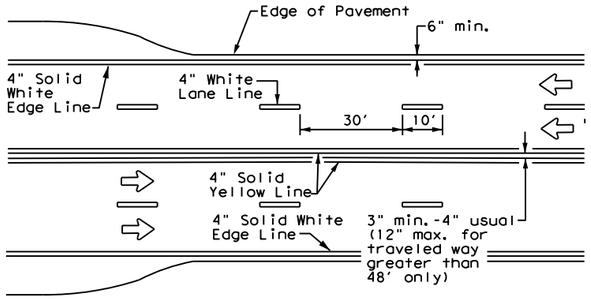


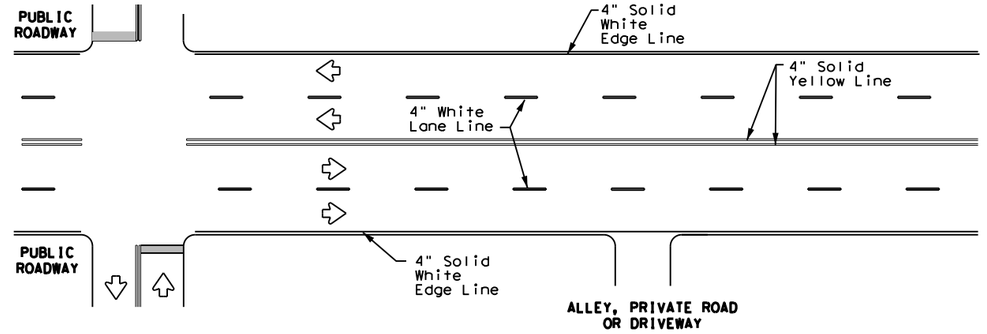
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



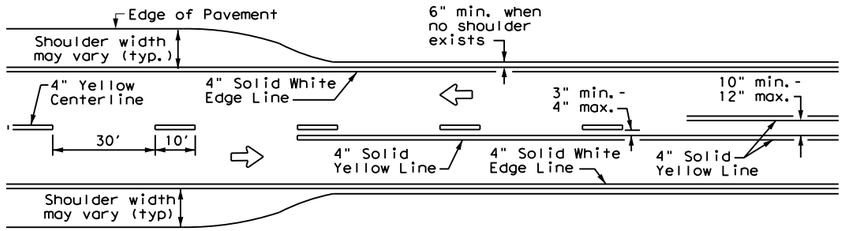
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



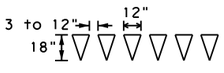
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



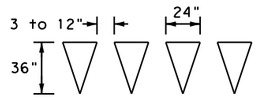
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

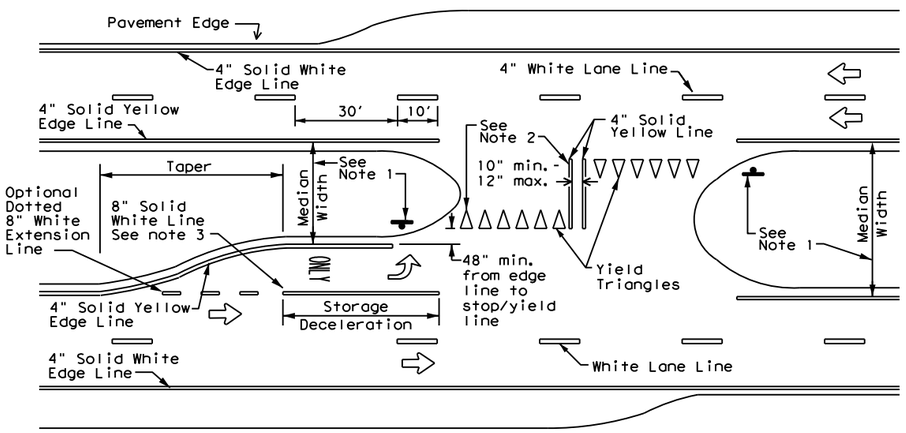


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

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

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

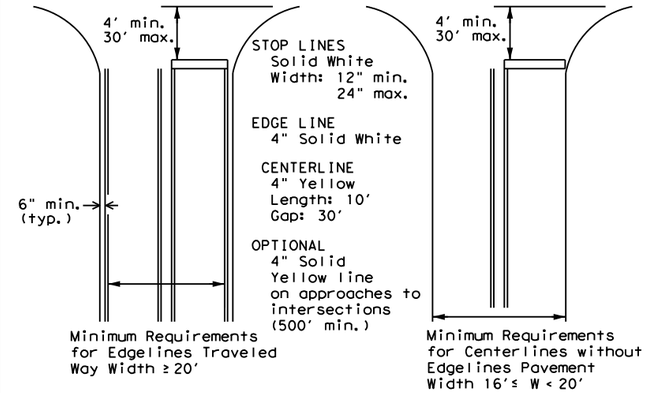
GENERAL NOTES

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

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

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	2494	01	015	RM 2381
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AMA	POTTER		130

22A

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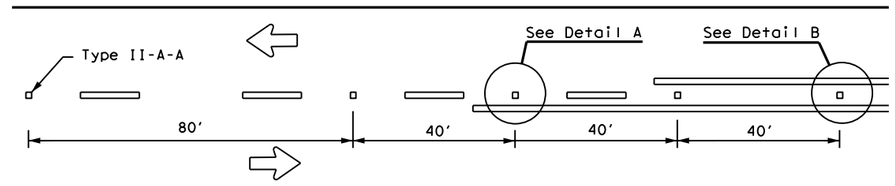
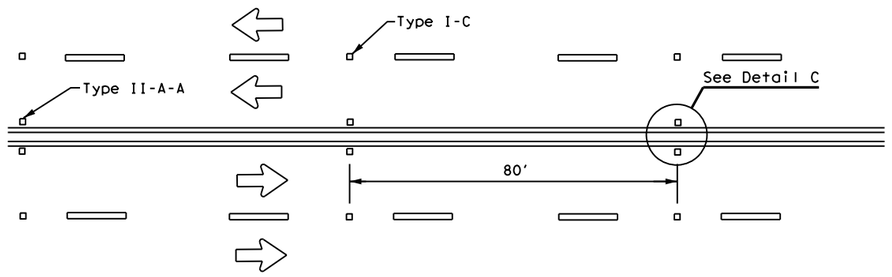
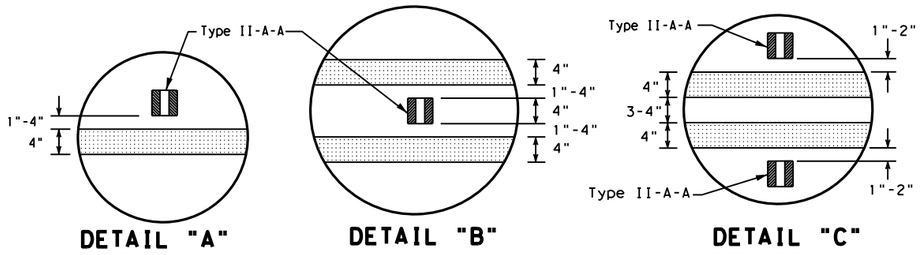
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



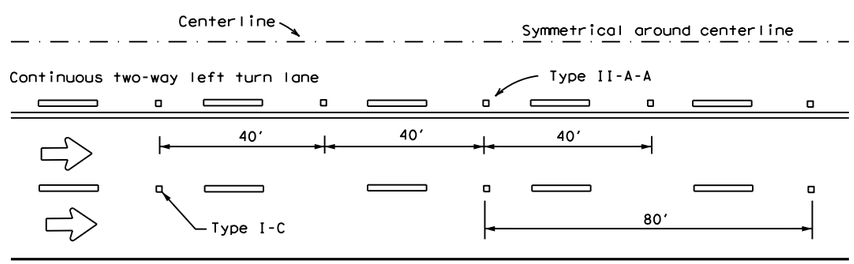
CENTERLINE FOR ALL TWO LANE ROADWAYS



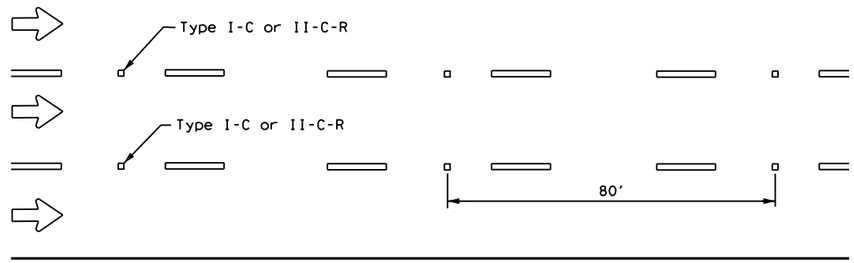
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

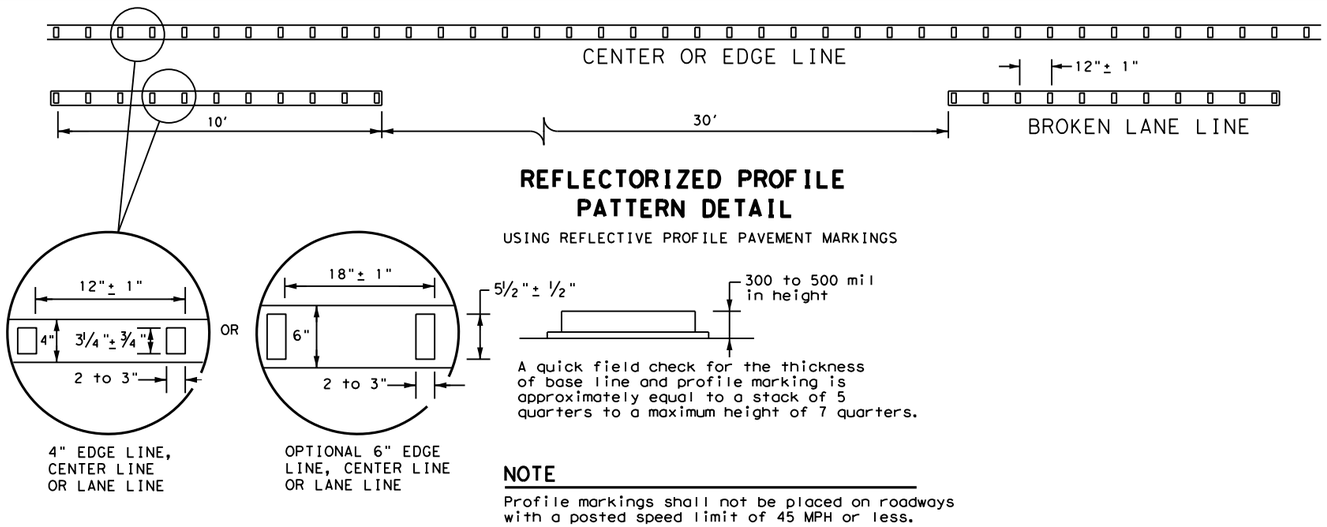


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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

NOTE

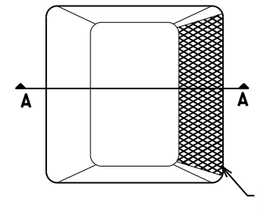
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

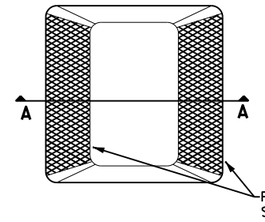
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

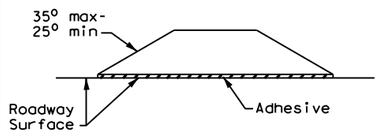
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	2494	01	015	RM 2381
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8-00 6-20	AMA	POTTER		131

22B

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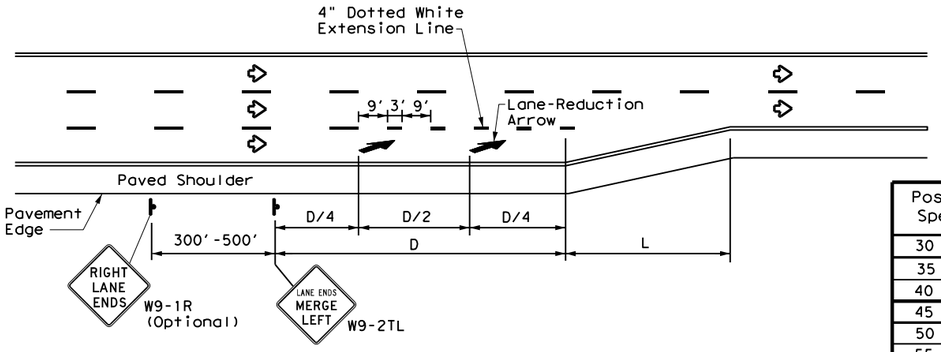


LANE REDUCTION

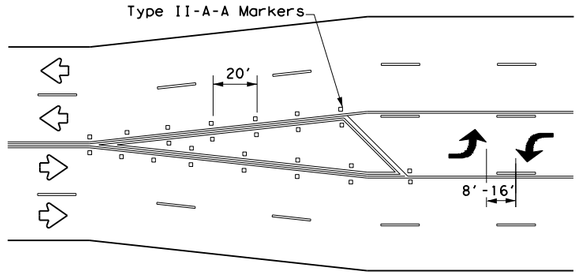
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

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.

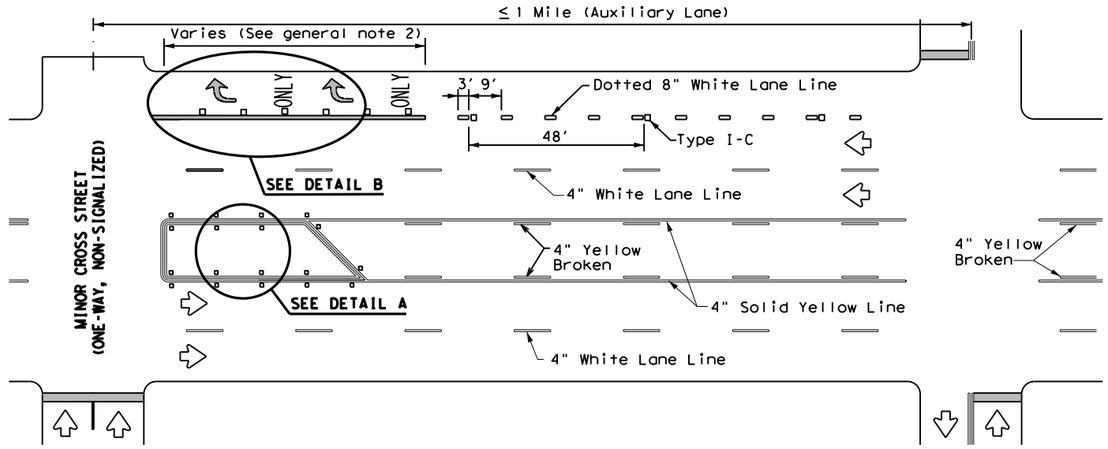


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

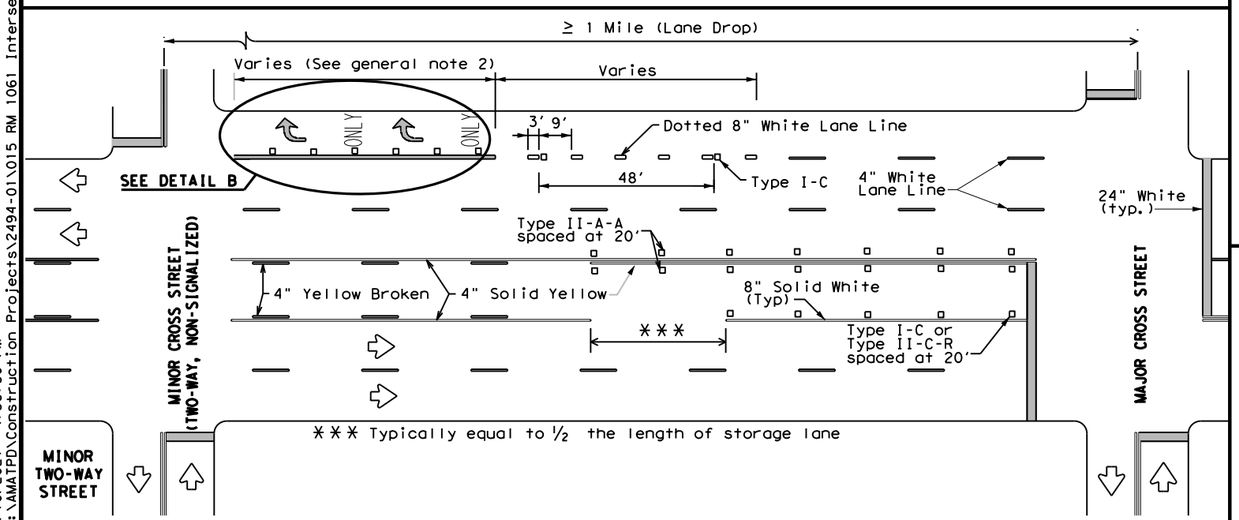
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

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

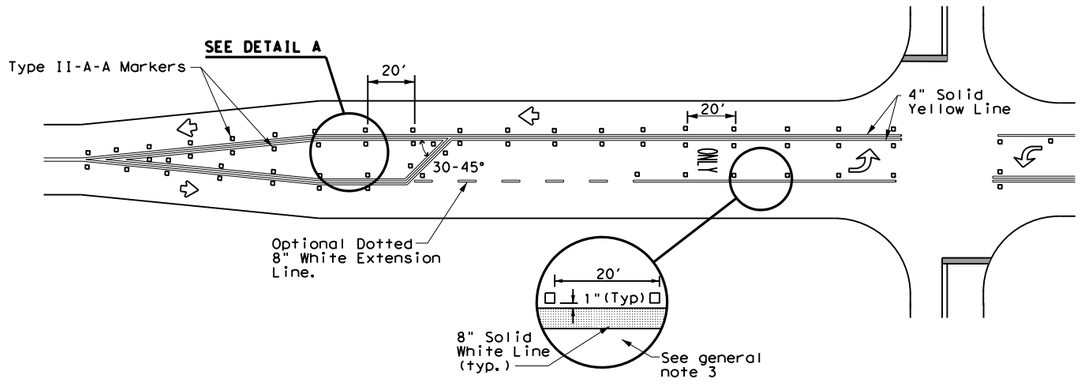
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



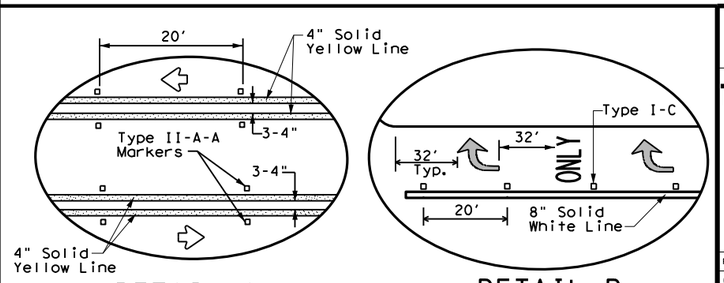
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A DETAIL B

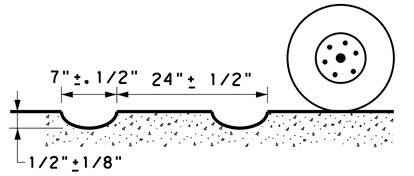
Texas Department of Transportation — Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS
PM(3)-20

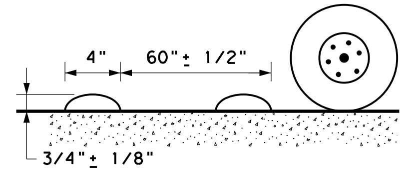
FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	AMA	POTTER		132
3-03 6-20				

220

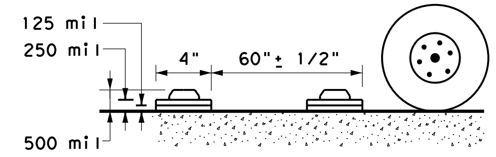
CENTERLINE RUMBLE STRIPS



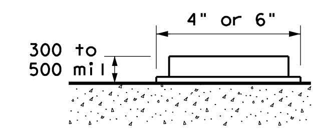
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

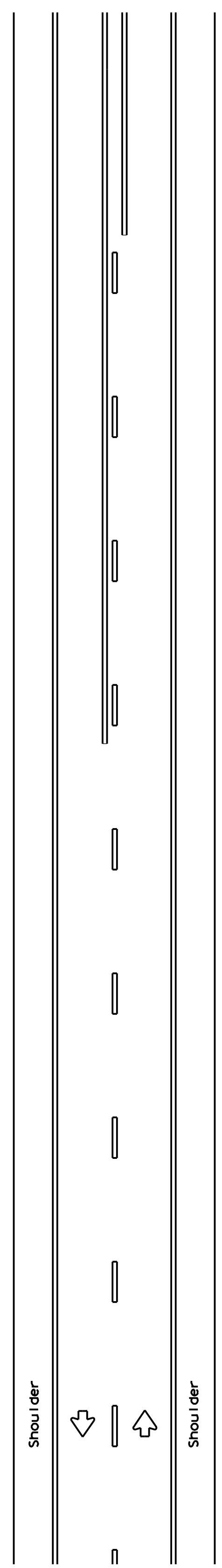


PREFORMED THERMOPLASTIC STRIPS

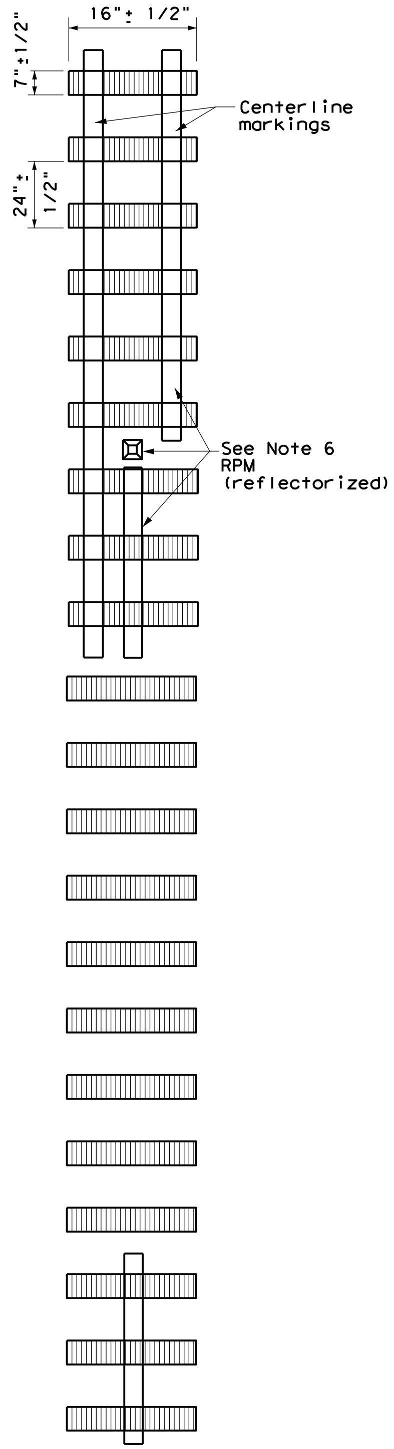


PROFILE MARKINGS

PROFILE VIEW



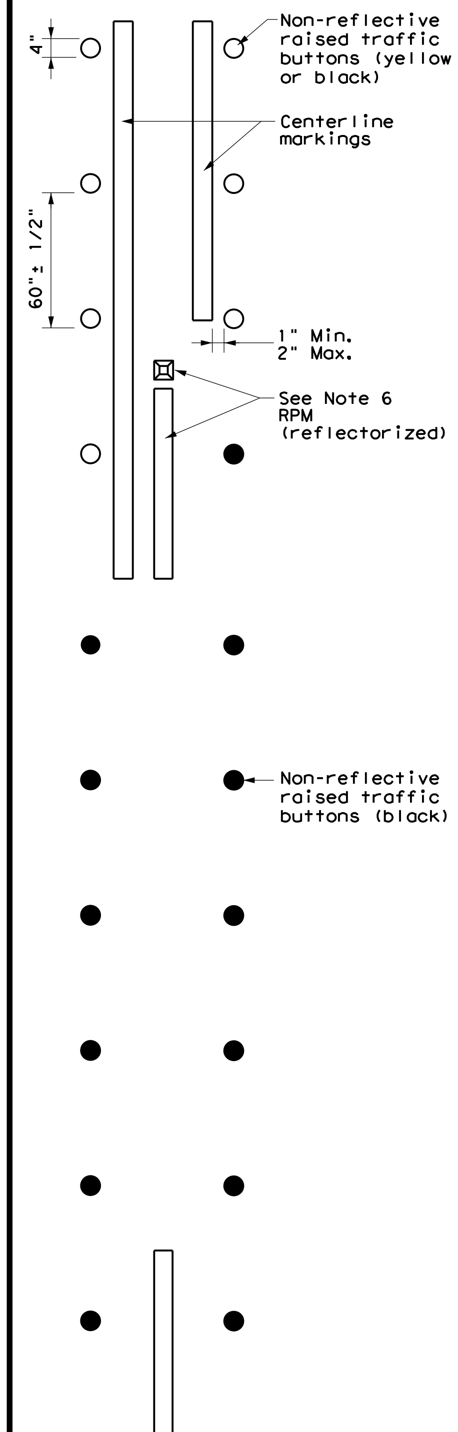
TWO LANE TWO-WAY ROADWAYS



PLAN VIEW

OPTION 1

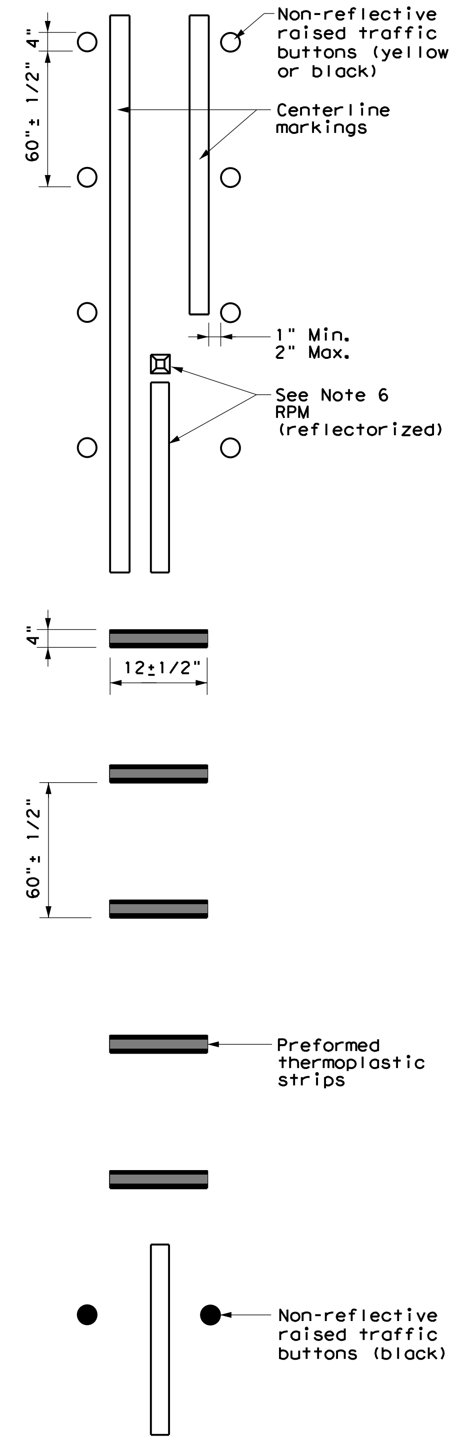
MILLED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 2

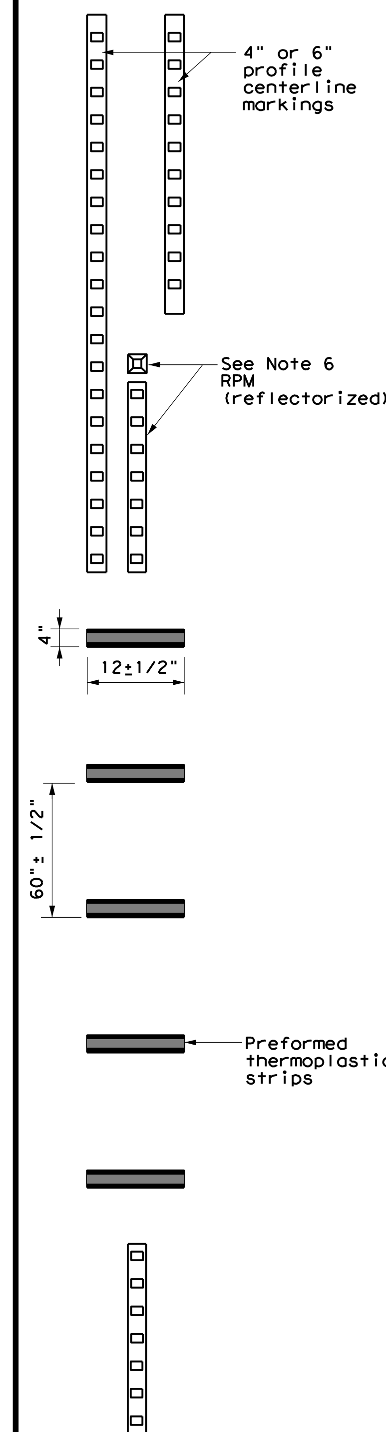
RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW

OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

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

12. See standard sheet RS(4).

Texas Department of Transportation®

Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST		COUNTY	SHEET NO.
	AMA		POTTER	133

DATE: 2/10/2021 4:58:54 PM
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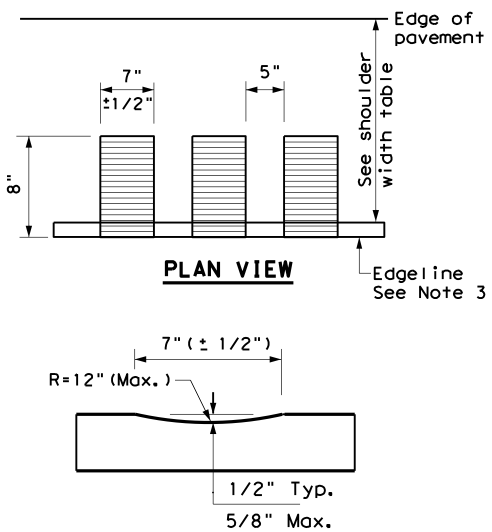
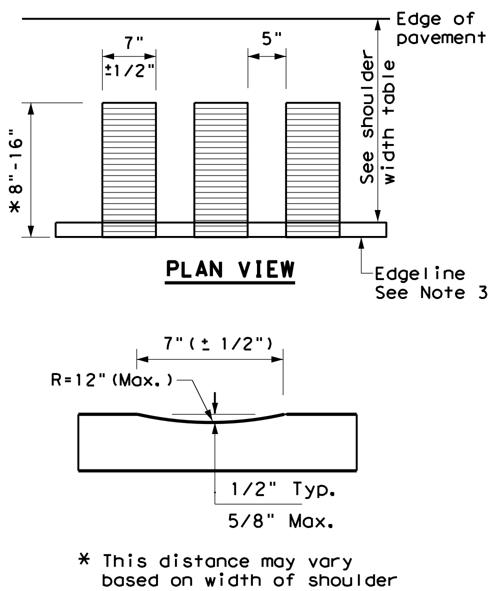


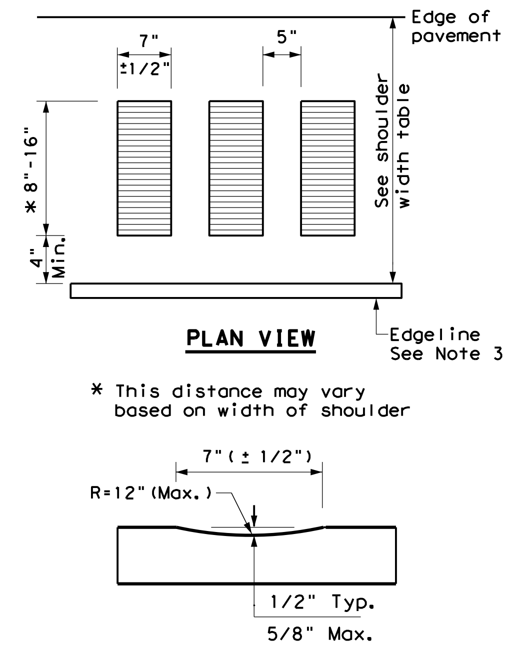
PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



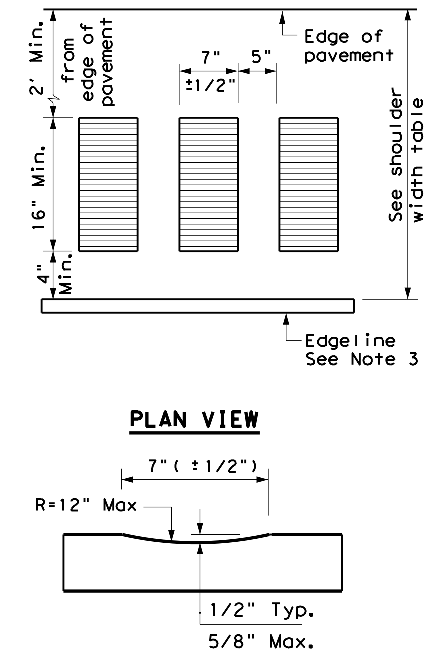
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



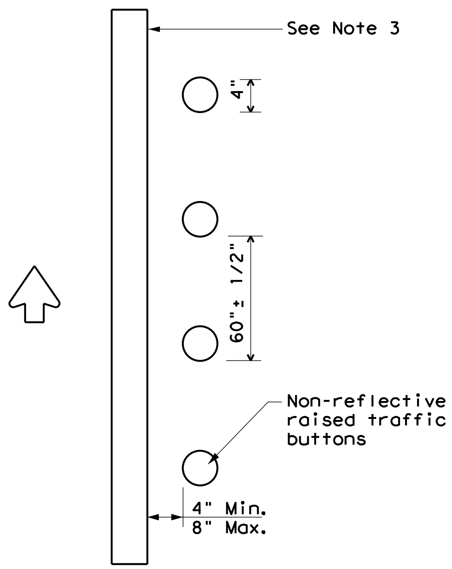
PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



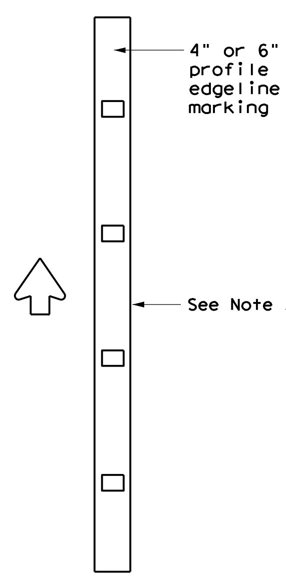
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

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Texas Department of Transportation
Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT 2494	SECT 01	JOB 015	HIGHWAY RM 2381
REVISIONS	DIST AMA		COUNTY POTTER	SHEET NO. 134

DATE: 2/10/2021 4:59:00 PM
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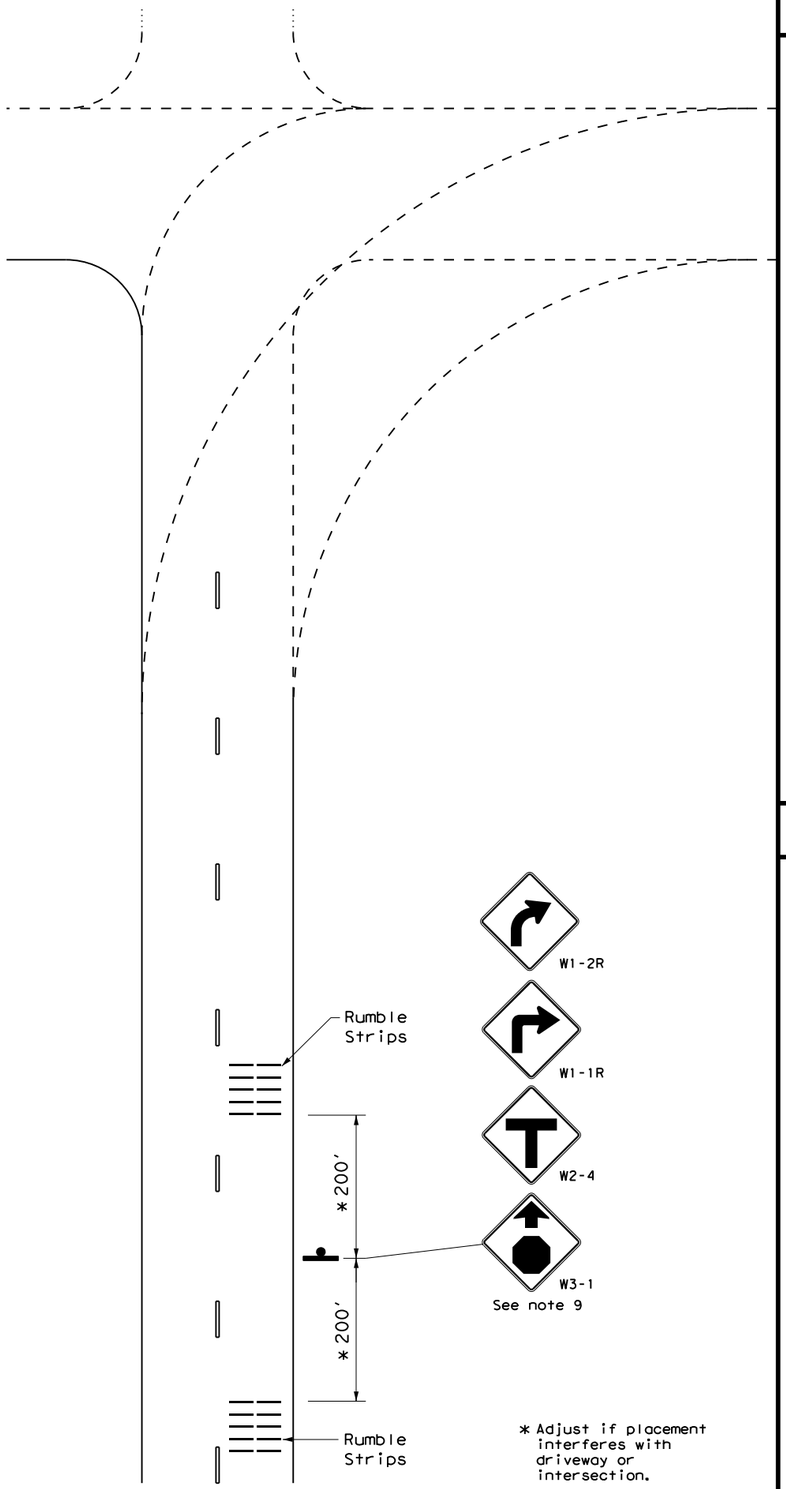
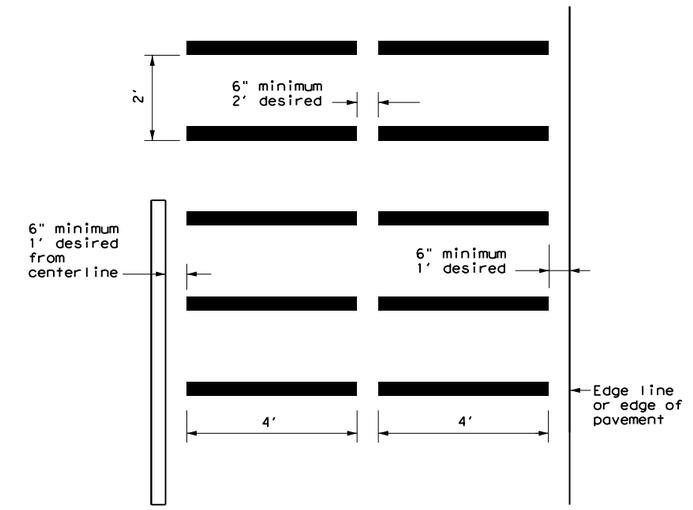
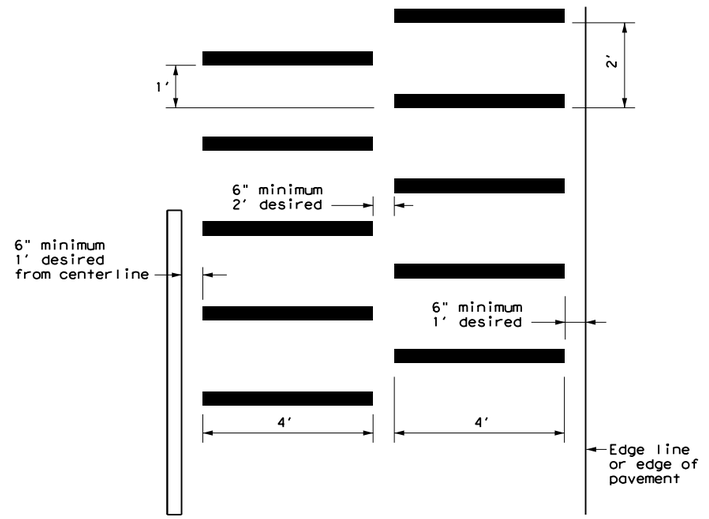


STANDARD PATTERN



ALTERNATIVE PATTERN



GENERAL NOTES

1. Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or Stop -controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed Stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.

2. When used, the rumble strips shall be placed 200 feet prior to and after the placement of the warning device.

3. The use of rumble strips should not be widespread or used indiscriminately.

4. Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.

5. A list of approved, preformed raised rumble strips can be obtained from the Traffic Operations Division.

6. Consideration should be given to noise levels when in -lane or transverse rumble strips are installed near residential areas, schools, churches, etc.

7. The use of the "Rumble Strips Ahead" sign may be used in advance of in -lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the guidelines for advance placement of warning sign included in the "Texas Manual on Uniform Traffic Control Devices".

W17-2T

8. Consideration should be given to bicyclists. A 12 inch gap from the edge line may be used to accommodate bicyclists when a usable shoulder is not available. Additional gaps in the in -lane or transverse rumble strips are not recommended since they could cause motorists to swerve to avoid the rumble strips.

9. Other signs can be used as conditions warrant.

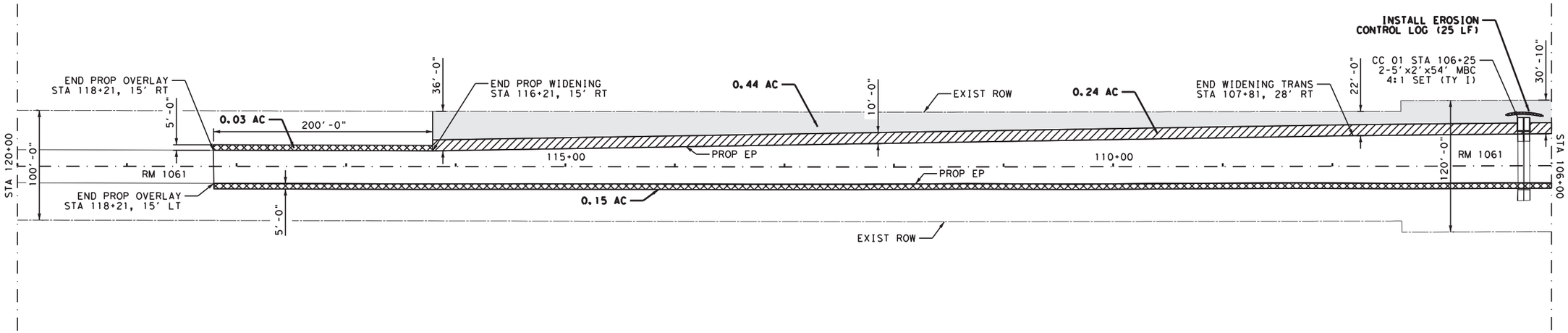
Texas Department of Transportation

Traffic Operations Division Standard

TRANSVERSE OR IN-LANE RUMBLE STRIPS

RS(5)-13

FILE: rs(5)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
2-10	DIST	COUNTY		SHEET NO.
10-13	AMA	POTTER		135



LEGEND

- DRILL SEEDING (TEMP) (WARM OR COOL) DRILL SEEDING (PERM) (RURAL) (CLAY) EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL) EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL) DRILL SEEDING (PERM) (RURAL) (CLAY)
- EROSION CONTROL LOG (25 LF EA)

NOTES:

INSTALL EROSION CONTROL LOGS ON DOWNSTREAM END OF CULVERTS

SUMMARY OF EROSION CONTROL LAYOUT SHEET 1 OF 3

LOCATION	164 6036 DRILL SEEDING (PERM) (RURAL) (CLAY) AC	164 6053 DRILL SEEDING (TEMP) (WARM OR COOL) AC	314 6014 EMULS ASPH (EROSN CONT) (MS-2) (0.1 GAL/SY) GAL	506 6040 BIODEG EROSN CONT LOGS (INSTL) (8")	506 6043 BIODEG EROSN CONT LOGS (REMOVE) LF
STA 106+00 to STA 120+00	0.68	0.86	193	25	25
SHEET TOTALS:	**0.68**	**0.86**	**193**	**25**	**25**

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

L. Clint Harms

03/31/2021

EROSION CONTROL LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 1 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		136

DATE: 2/10/2021 5:00:02 PM
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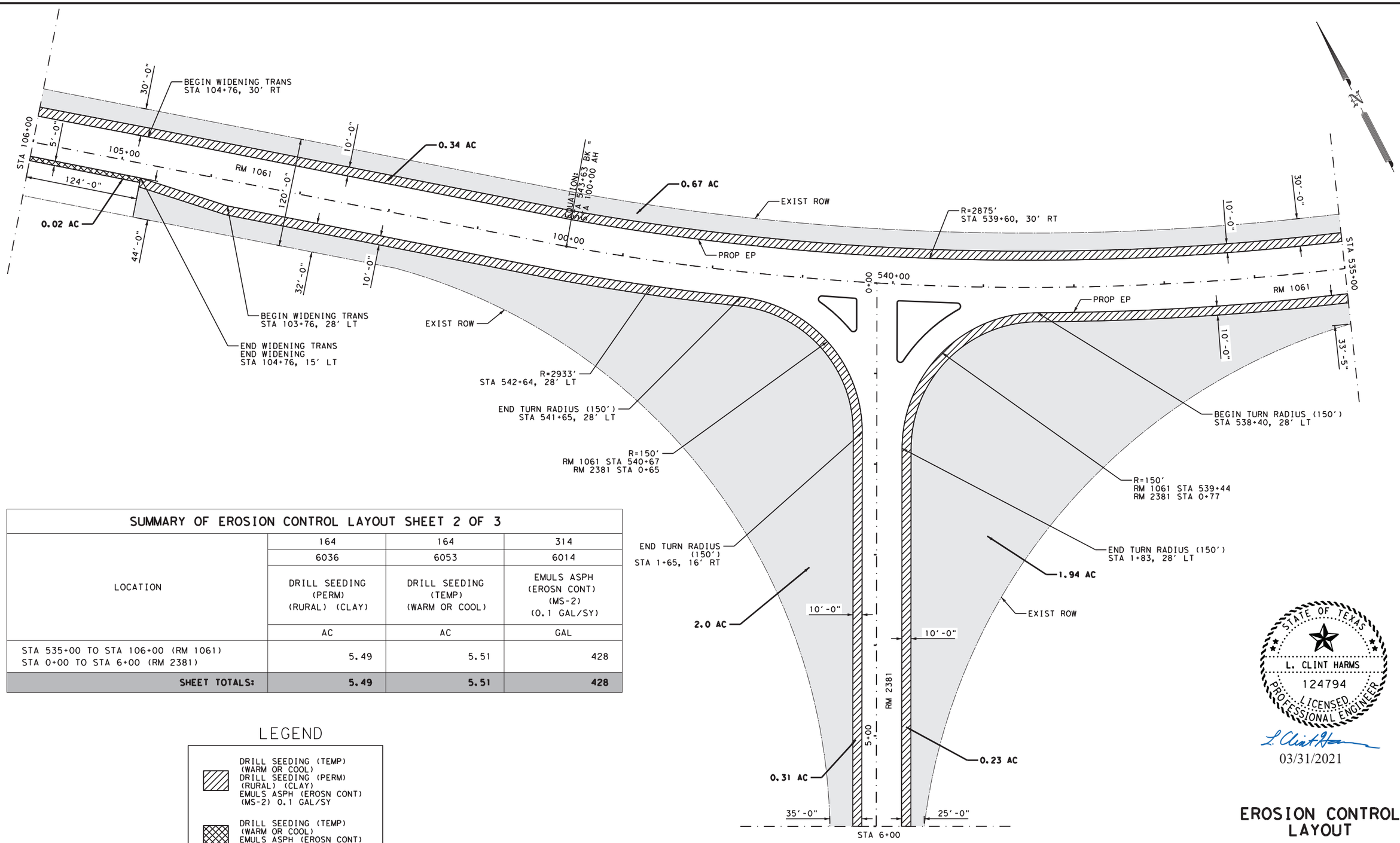

SUMMARY OF EROSION CONTROL LAYOUT SHEET 2 OF 3

LOCATION	164 6036 DRILL SEEDING (PERM) (RURAL) (CLAY) AC	164 6053 DRILL SEEDING (TEMP) (WARM OR COOL) AC	314 6014 EMULS ASPH (EROSN CONT) (MS-2) (0.1 GAL/SY) GAL
STA 535+00 TO STA 106+00 (RM 1061) STA 0+00 TO STA 6+00 (RM 2381)	5.49	5.51	428
SHEET TOTALS:	**5.49**	**5.51**	**428**

LEGEND

- DRILL SEEDING (TEMP) (WARM OR COOL)
  DRILL SEEDING (PERM) (RURAL) (CLAY)
  EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL)
  EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL)
  DRILL SEEDING (PERM) (RURAL) (CLAY)
- EROSION CONTROL LOG (25 LF EA)

NOTES:

INSTALL EROSION CONTROL LOGS ON DOWNSTREAM END OF CULVERTS

STATE OF TEXAS
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124794
LICENSED PROFESSIONAL ENGINEER

03/31/2021

EROSION CONTROL LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 2 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		137

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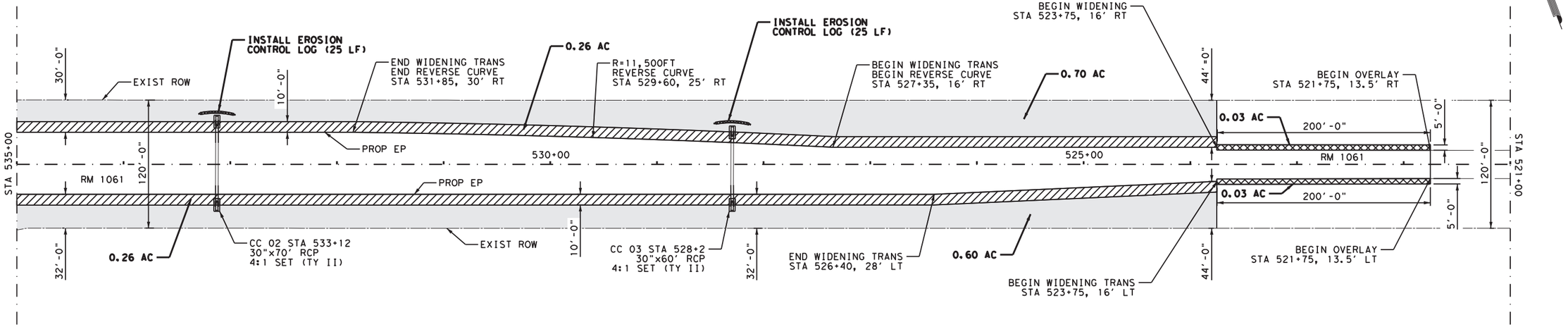

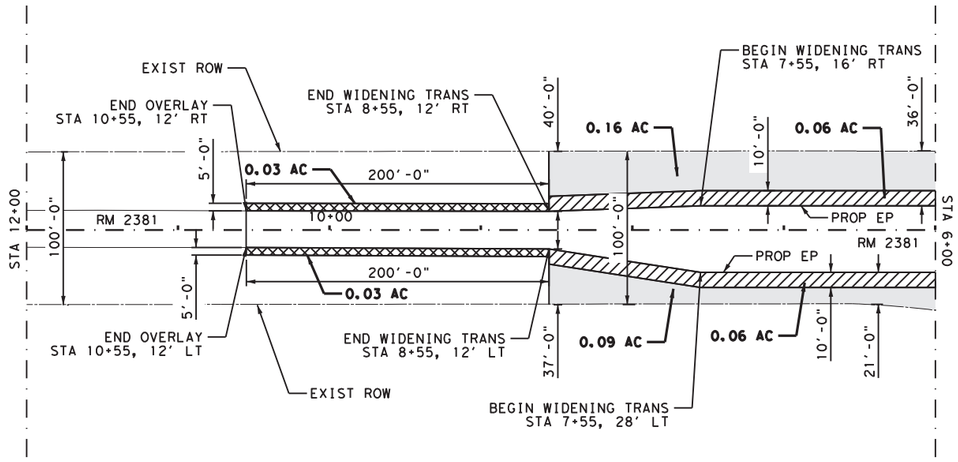

LEGEND

- DRILL SEEDING (TEMP) (WARM OR COOL) DRILL SEEDING (PERM) (RURAL) (CLAY) EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL) EMULS ASPH (EROSN CONT) (MS-2) 0.1 GAL/SY
- DRILL SEEDING (TEMP) (WARM OR COOL) DRILL SEEDING (PERM) (RURAL) (CLAY)
- EROSION CONTROL LOG (25 LF EA)

NOTES:

INSTALL EROSION CONTROL LOGS ON DOWNSTREAM END OF CULVERTS

SUMMARY OF EROSION CONTROL LAYOUT SHEET 3 OF 3

LOCATION	164 6036 DRILL SEEDING (PERM) (RURAL) (CLAY) AC	164 6053 DRILL SEEDING (TEMP) (WARM OR COOL) AC	314 6014 EMULS ASPH (EROSN CONT) (MS-2) (0.1 GAL/SY) GAL	506 6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF	506 6043 BIODEG EROSN CONT LOGS (REMOVE) LF
STA 521+00 to STA 535+00 (RM 1061)	1.82	1.90	281	50	50
STA 6+00 to STA 12+00 (RM 2381)	0.37	0.43	82		
SHEET TOTALS:	**2.19**	**2.33**	**363**	**50**	**50**

L. CLINT HARMS 124794 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

03/31/2021

EROSION CONTROL LAYOUT

SCALE: 1" = 100'

2021 Texas Department of Transportation

SHEET 3 OF 3

DSN	CK	CONT	SECT	JOB	HIGHWAY
BM	BM	2494	01	015	RM 2381
DRWN	CK	DIST	COUNTY		SHEET NO.
BM	BM	AMA	POTTER		138

DATE: 2/10/2021 5:00:05 PM
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SITE DESCRIPTION

PROJECT LIMITS: RM 2381 - RM 1061 INTERSECTION

PROJECT DESCRIPTION: SAFETY IMPROVEMENT PROJECT

MAJOR SOIL DISTURBING ACTIVITIES: ROADWAY WIDENING

TOTAL PROJECT AREA: 15.85 ACRES

TOTAL AREA TO BE DISTURBED: 8.25 ACRES

WEIGHTED RUNOFF COEFFICIENT
(BEFORE CONSTRUCTION):
(AFTER CONSTRUCTION):

EXPLANATION OF THE TECHNICAL BASIS USED TO SELECT THE PRACTICES TO CONTROL POLLUTION WHERE FLOWS EXCEED PRE-DEVELOPMENT LEVELS:

EXISTING CONDITION OF SOIL & VEGETATIVE
COVER AND % OF EXISTING VEGETATIVE COVER: 75% GRASS AND NATIVE VEGETATION

NAME OF RECEIVING WATERS: TECOVAS CREEK

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- [X] TEMPORARY SEEDING
- [X] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [ ] SOIL RETENTION BLANKET
- [ ] BUFFER ZONES
- [X] PRESERVATION OF NATURAL RESOURCES

OTHER:

STRUCTURAL PRACTICES:

Permanent	*Temporary*	
		SILT FENCES
		HAY BALES
		ROCK BERMS
		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
		DIVERSION DIKE AND SWALE COMBINATIONS
		PIPE SLOPE DRAINS
		PAVED FLUMES
		ROCK BEDDING AT CONSTRUCTION EXIT
		TIMBER MATTING AT CONSTRUCTION EXIT
		CHANNEL LINERS
		SEDIMENT TRAPS
		SEDIMENT BASINS
		STORM INLET SEDIMENT TRAP
		STONE OUTLET STRUCTURES
		CURBS AND GUTTERS
		STORM SEWERS
		VELOCITY CONTROL DEVICES
	X	EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:
THE ORDER OF ACTIVITIES ARE AS FOLLOWS:

1. INSTALL CONTROL DEVICES AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
2. MAINTAIN AND UPFRADE DEVICES AS NEEDED.
3. WHEN CONSTRUCTION ACTIVITY IS COMPLETED TEMPORARY CONTROLS SHALL BE REMOVED AS APPROVED BY THE ENGINEER.

STORM WATER MANAGEMENT:

CARE SHOULD BE TAKEN TO DISTURB AS LITTLE OF THE NATURAL AREA AS POSSIBLE

STORM WATER DRAINAGE WILL BE PROVIDED BY EXISTING DITCHES AND CULVERTS. STORM WATER SHALL BE FILTERED THROUGH SEDIMENT CONTROL DEVICES BEFORE LEAVING THE PROJECT.

DESCRIPTION OF ANY MEASURES INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL STORM WATER DISCHARGES AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED:

ALL DISTURBED AREA SHALL BE SEEDED BEFORE CONSTRUCTION COMPLETION

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT.

INSPECTION: AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR OF THE CONSTRUCTION SITE AT LEAST ONCE EVERY 7 CALENDAR DAYS REGARDLESS OF RAINFALL. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS: ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION, AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATAGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR, SHOULD BE CONTACTED IMMEDIATELY AT (806) 356-3200.

SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFF SITE VEHICLE TRACKING:

- [ ] HAUL ROADS DAMPENED FOR DUST CONTROL
- [X] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [X] EXCESS DIRT ON ROAD REMOVED DAILY
- [ ] STABILIZED CONSTRUCTION ENTRANCE

OTHER:

REMARKS: DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAMBED. CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS. ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK, PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

STATE OF TEXAS
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

03/31/2021

Texas Department of Transportation

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
6	2494	01	015	RM 2381
FEDERAL AID PROJECT NO.	DIST	COUNTY		SHEET NO.
SEE TITLE SHEET	AMA	POTTER		139

DATE: 2/10/2021 5:00:13 PM
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DATE: 2/10/2021 5:00:19 PM
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection Improvements\epic.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. NONE

2.

☐ No Action Required ☒ **Required Action**

Action No.

1. PREVENT STORMWATER POLLUTION BY CONTROLLING EROSION AND SEDIMENTATION IN ACCORDANCE WITH TPDES PERMIT TXR 150000
2. WHEN CONTRACTOR PROJECT SPECIFIC LOCATIONS (PSL'S) INCREASE DISTURBED SOIL AREA TO 5 ACRES OR MORE, SUBMIT NOI TO TCEQ AND THE ENGINEER.
3. COMPLY WITH CONSTRUCTION GENERAL PERMIT AND IMPLEMENT PROJECT SW3P'S. POST A CONSTRUCTION SITE NOTICE IN THE PROJECT AREA.
4. SUBMIT AN NOI TO TCEQ.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☒ **No Permit Required**

☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☐ Silt Fence	☒ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☒ Mulch Filter Berm and Socks
☒ Mulch Filter Berm and Socks	☒ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☒ **Required Action**

Action No.

1. IN THE EVENT THAT UNANTICIPATED ARCHAEOLOGICAL DEPOSITS ARE ENCOUNTERED DURING CONSTRUCTION, WORK IN THE IMMEDIATE AREA WILL CEASE AND TXDOT ARCHAEOLOGICAL STAFF WILL BE CONTACTED TO INITIATE POST-REVIEW DISCOVERY PROCEDURES.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ **Required Action**

Action No.

1. COMPLY WITH THE EXECUTIVE ORDER 13112 ON INVASIVE SPECIES AND THE INTENT OF THE EXECUTIVE ORDER MEMORANDUM ON BENEFICIAL LANSCAPES FOR RE-VEGETATING THE PROJECT AREA. THE PROPOSED SEED MIXTURE (BOTH GRASSES AND FORBS) WOULD BE IN ACCORDANCE WITH ITEM 164, SEEDING FOR EROSION CONTROL, CONTAINED WITHIN TXDOTS'S STANDARD SPECIFICATIONS FOR THE CONSTRUCTION & MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ **No Action Required** ☒ Required Action

Action No.

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. AMERICAN BADGER, EASTERN SPOTTED SKUNK, SWIFT FOX, THIRTEEN-LINED GROUND SQUIRREL: 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, WESTERN BOX TURTLE, TEXAS HORNED LIZARD, WESTERN HOGNOSE SNAKE, PRAIRIE RATTLESNAKE, MASSASAUGA:
   A. CONTRACTORS WILL BE ADVISED OF POTENTIAL OCCURRENCE IN THE PROJECT AREA, AND TO AVOID HARMING THE SPECIES IF ENCOUNTERED. IF REPTILES ARE FOUND ON THE PROJECT SITE, ALLOW THEM TO SAFELY LEAVE THE PROECT AREA. FOR THE TEXAS HORNED LIZARD, AVOIDANCE 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 PART 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 caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ **Yes** ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ **No**

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ **No Action Required** ☐ Required Action

Action No.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ **Required Action**

Action No.

1. TREE REMOVAL SHOULD BE PLANNED TO TAKE PLACE OUTSIDE THE BIRD NESTING SEASON (APRIL 1-AUG 31). IF THE TREE REMOVAL OCCURS BETWEEN APRIL 1 AND AUGUST 31, THE CONTRACTOR SHALL COMPLETE A SURVEY OF ACTIVE BIRD NESTS AND WILL COORDINATE WITH THE TXDOT AMARILLO DISTRICT ENVIRONMENTAL COORDINATOR TO DETERMINE APPROPRIATE SURVEY PROCEDURES IN ACCORDANCE WITH TXDOT REQUIREMENTS.

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn

REVISIONS
12-12-2011 (DS)
05-07-14 ADDED NOTE SECTION IV.
01-23-2015 SECTION I CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.

CONT	SECT	JOB	HIGHWAY
2494	01	015	RM 2381
DIST	COUNTY		SHEET NO.
AMA	POTTER		140

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 A 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
L. CLINT HARMS
124794
LICENSED
PROFESSIONAL ENGINEER

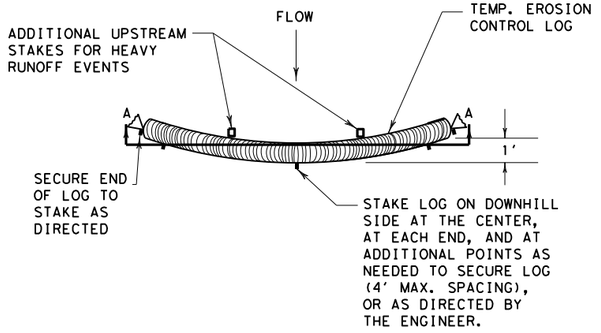
L. Clint Harms
03/31/2021

VEGETATION SPECIFICATION SHEET

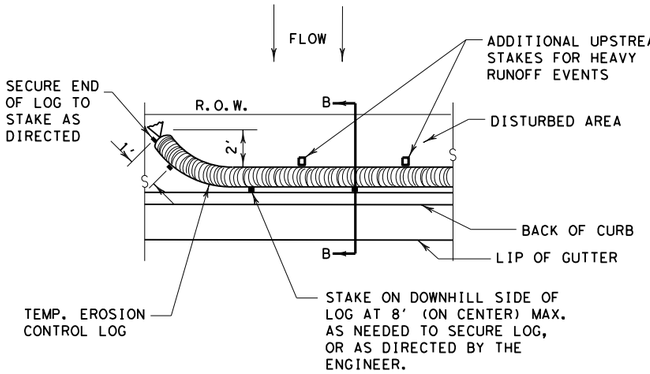
FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
6	2494	01	015	RM 2381
FEDERAL AID PROJECT NO.	DIST	COUNTY		SHEET NO.
SEE TITLE SHEET	AMA	POTTER		141

DATE: 2/10/2021 5:00:24 PM
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\9. Environmental\015_Vegetation Specs.dgn

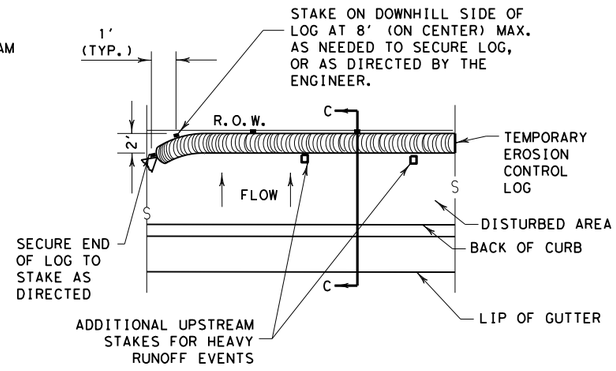
DATE: 2/10/2021
FILE: T:\AMA\TPD\Construction Projects\2494-01-015 RM 1061 Intersection\4 - Design\Plan Set\9. Environmental\Standards\ec916.dgn



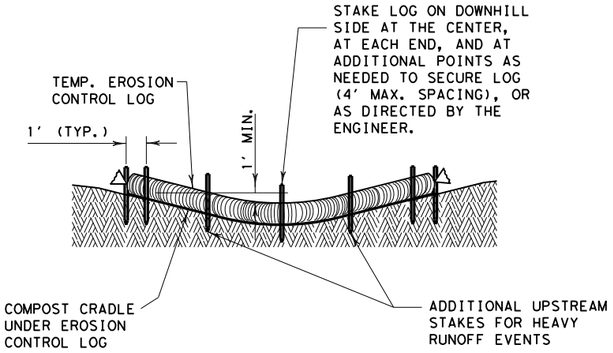
PLAN VIEW



PLAN VIEW



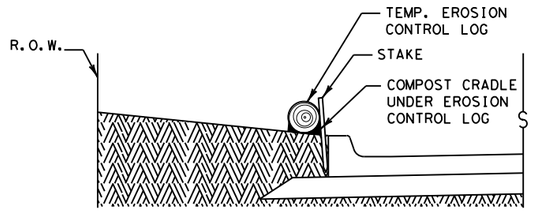
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

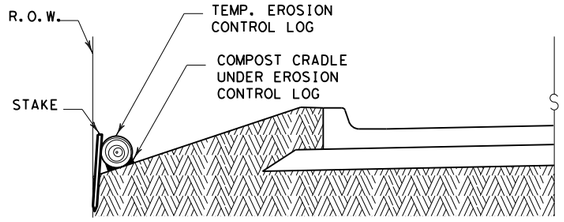
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

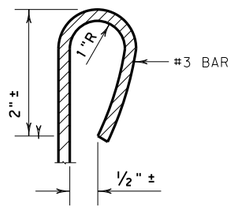
CL-BOC



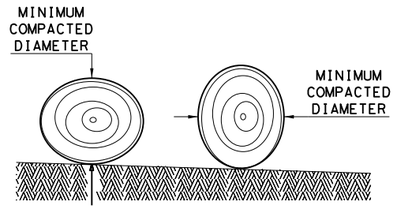
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

LEGEND

CL-D	EROSION CONTROL LOG DAM
CL-BOC	EROSION CONTROL LOG AT BACK OF CURB
CL-ROW	EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
CL-SST	EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
CL-SSL	EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
CL-DI	EROSION CONTROL LOG AT DROP INLET
CL-CI	EROSION CONTROL LOG AT CURB INLET
CL-GI	EROSION CONTROL LOG AT CURB & GRATE INLET

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.

SHEET 1 OF 3

Texas Department of Transportation

Design Division Standard

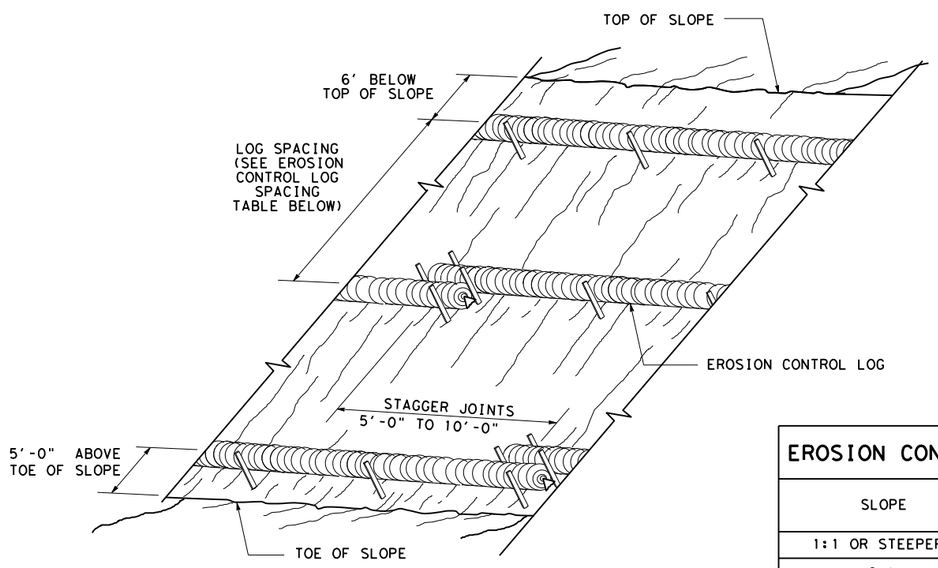
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

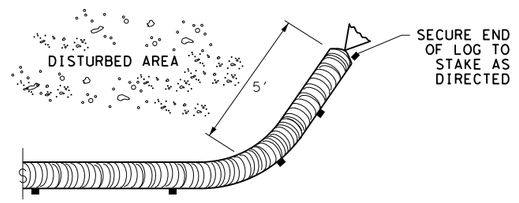
FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2494	01	015		RM 2381	
	DIST	COUNTY			SHEET NO.	
	AMA	POTTER			142	

DATE: 2/10/2021
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\9. Environmental\Standards\ec916.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

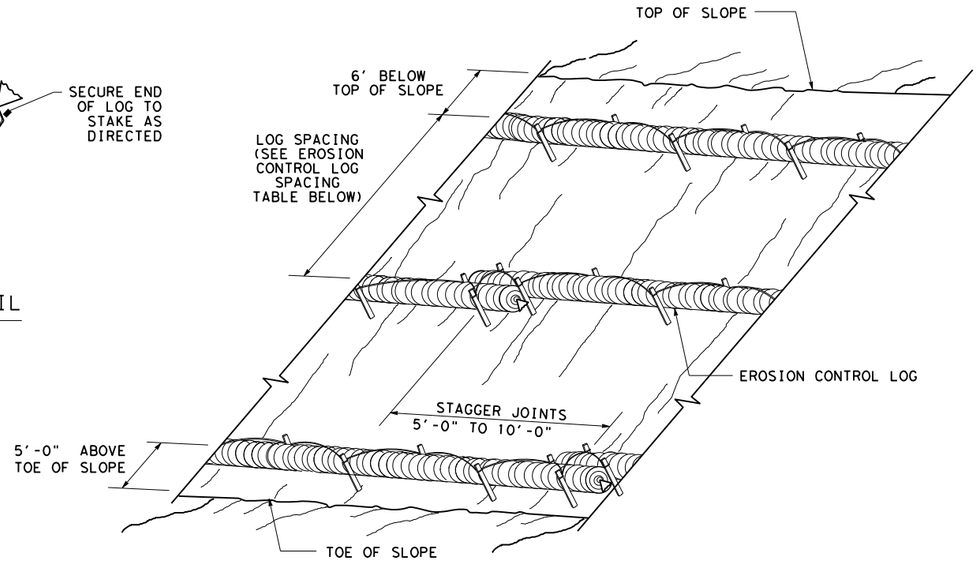
CL-SST



END SECTION RAP DETAIL

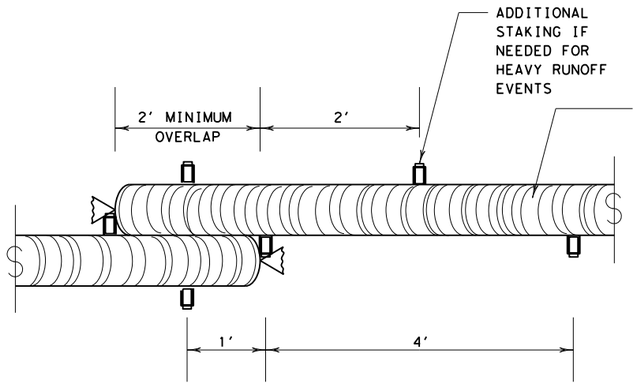
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

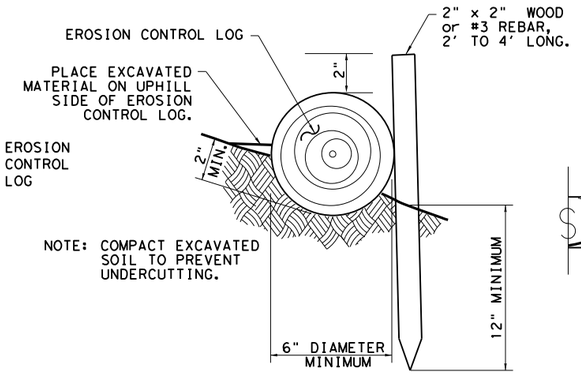
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

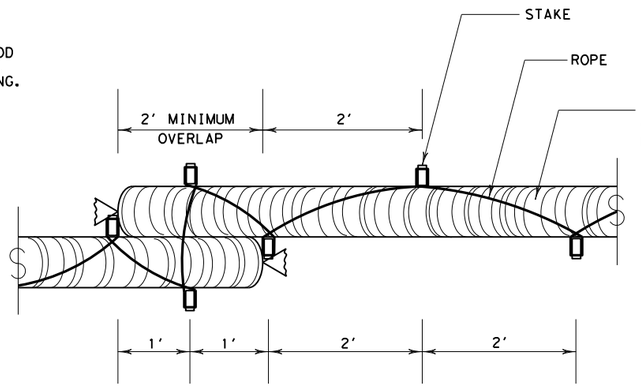


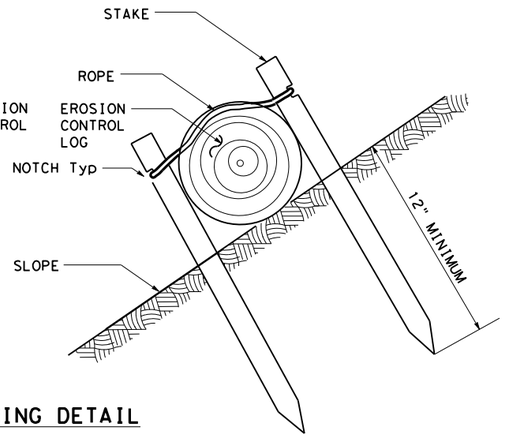


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

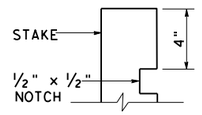
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

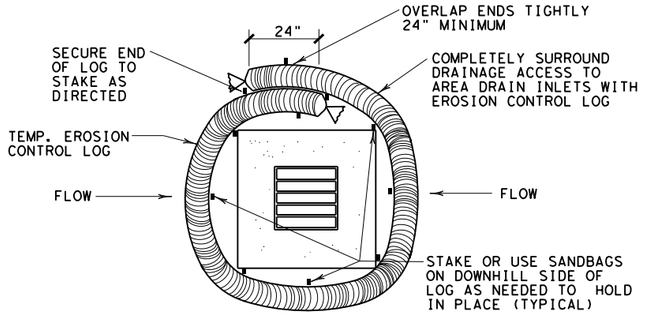
Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

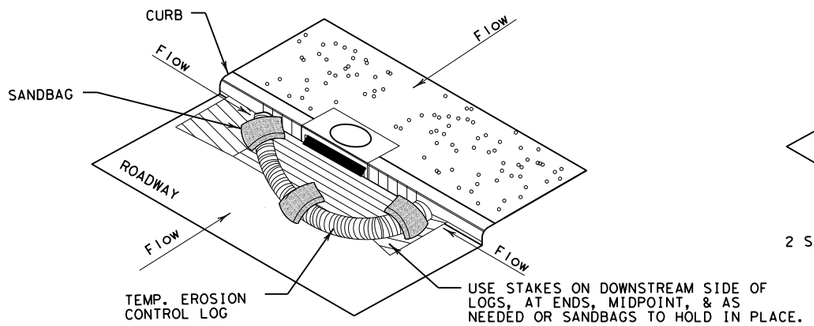
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2494	01	015	RM 2381
	DIST	COUNTY		SHEET NO.
	AMA	POTTER		143

DATE: 2/10/2021
FILE: T:\AMATPD\Construction Projects\2494-01\015 RM 1061 Intersection\4 - Design\Plan Set\9. Environmental\Standards\ec916.dgn



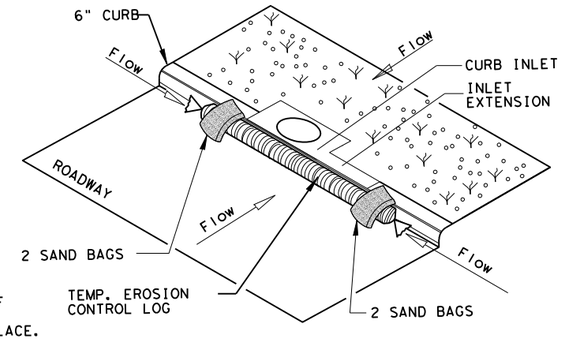
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

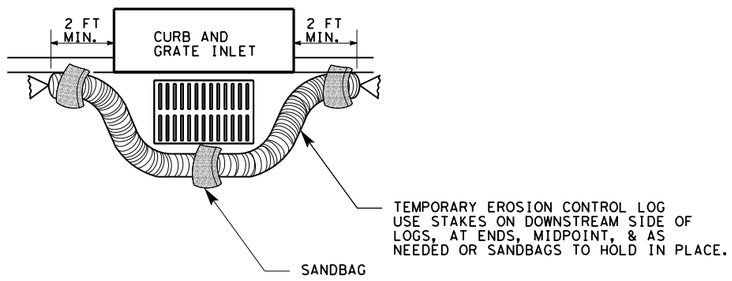
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

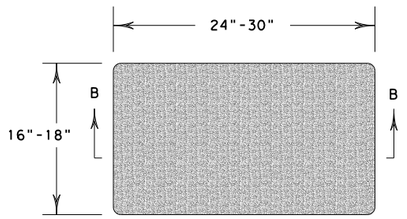
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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	2494	01	015		RM 2381	
	DIST	COUNTY				SHEET NO.
	AMA	POTTER				144