INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT.
F 2023(514)

CSJ 0729-02-032

NET LENGTH OF BRIDGE = 380 FT = 0.07 MI

NET LENGTH OF ROADWAY = 56,376 FT = 10.68 MI

NET LENGTH OF PROJECT = 56,756 FT = 10.75 MI

FM 121
GRAYSON COUNTY

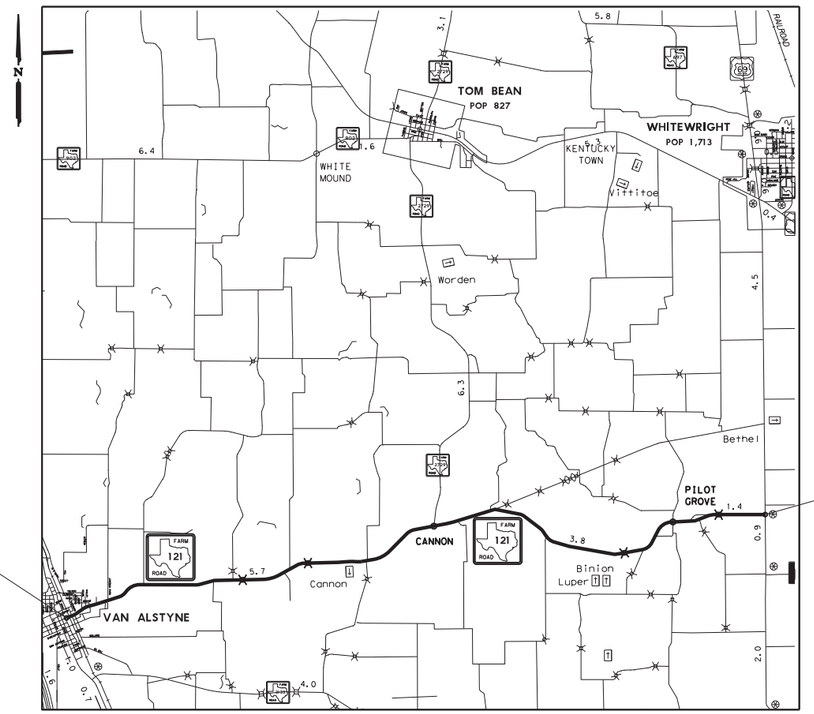
LIMITS: FROM VAN ALSTYNE TO SH 160

FOR THE CONSTRUCTION OF: REHABILITATION OF EXISTING ROADWAY

CONSISTING OF WIDENING EXISTING ROADWAY, GEOGRID REINFORCEMENT, NEW FLEX BASE, PRIME AND TWO COURSE SURFACE TREATMENT

FHWA TEXAS DIVISION			SHEET NO. 1
STATE	DISTRICT	COUNTY	
TEXAS	PAR	GRAYSON	
CONTROL	SECTION	JOB	HIGHWAY NO.
0729	02	032	FM 121

DESIGN SPEED= 50 MPH MAIN LANES
A.D.T.(2021)= 6,800
A.D.T.(2041)= 7,750



BEGIN PROJECT
BEGIN CONSTRUCTION
CSJ 0729-02-032
STA 7+07
REF MRK 602.883

END PROJECT
END CONSTRUCTION
CSJ 0729-02-032
STA 573+36
REF MRK 610+1.163

SCALE (MILE):

0 1/2 1 2

EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS:
DALLAS GARLAND NORTHEASTERN

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 5, 2022)

FINAL PLANS

LETTING DATE:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS COMPLETED:
DATE WORK WAS ACCEPTED:
ORIGINAL CONTRACT WORKING DAYS:
USED OF WORKING DAYS
NO. OF CHANGE ORDERS:
FINAL CONTRACT COST:
PERCENT OVER/UNDER RUN:
CONTRACTOR:

I CERTIFY THAT THIS PROJECT WAS BUILT IN ACCORDANCE WITH PLANS AND SPECIFICATIONS.

AREA ENGINEER DATE

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

SUBMITTED FOR LETTING: 01.17.23
Monte R. Pater P.E.
DESIGN ENGINEER

RECOMMENDED FOR LETTING: 1/17/2023
DocuSigned by:
Aaron R Bloom
2F03D019E58F45F...
AREA ENGINEER

APPROVED FOR LETTING: 1/19/2023
DocuSigned by:
Karl Paramanantham
AF7AF41AFE6049E...
DISTRICT ENGINEER

FILE: T:\PARTPDD\FM*121*0729-02-032*2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\001 TITLE SHEET.dgn
DATE: 1/13/2023 8:56:25 AM

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STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A ## HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

Monte R. Rater P.E. Jan. 18, 2023

NAME DATE

FM 121
INDEX OF SHEETS

Texas Department of Transportation

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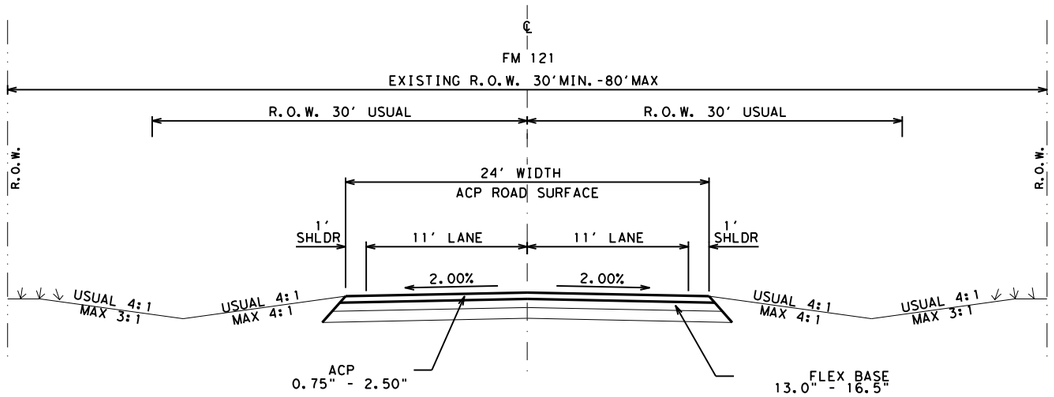
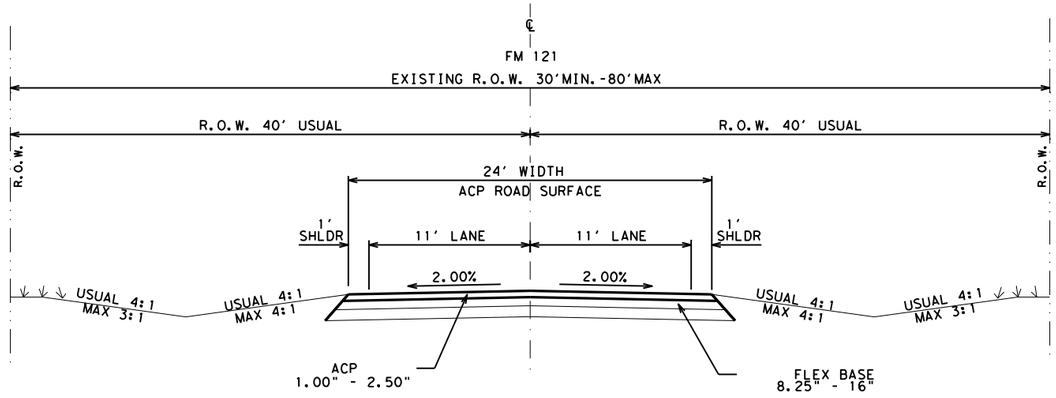
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		2



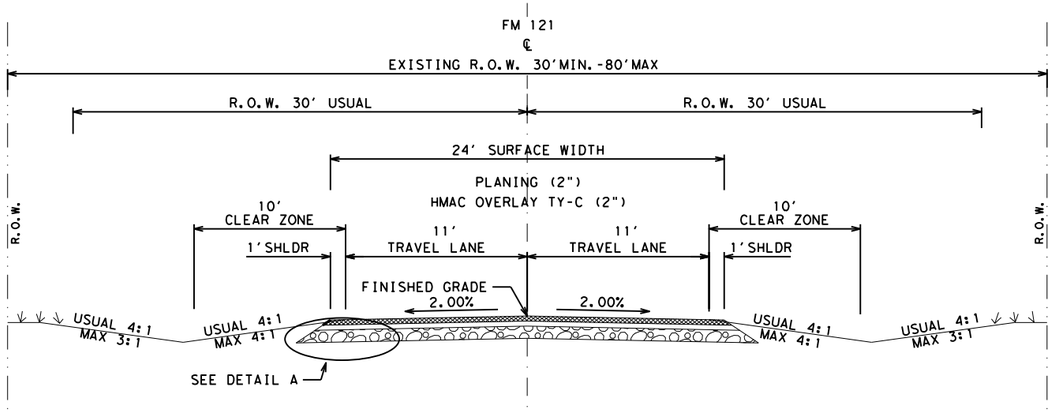
EXISTING TYPICAL SECTION

STATION 7+07 TO 42+00



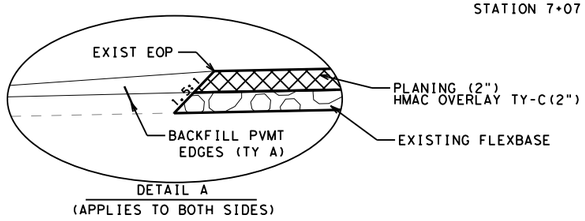
EXISTING TYPICAL SECTION

STATION 42+00 TO 573+45.8



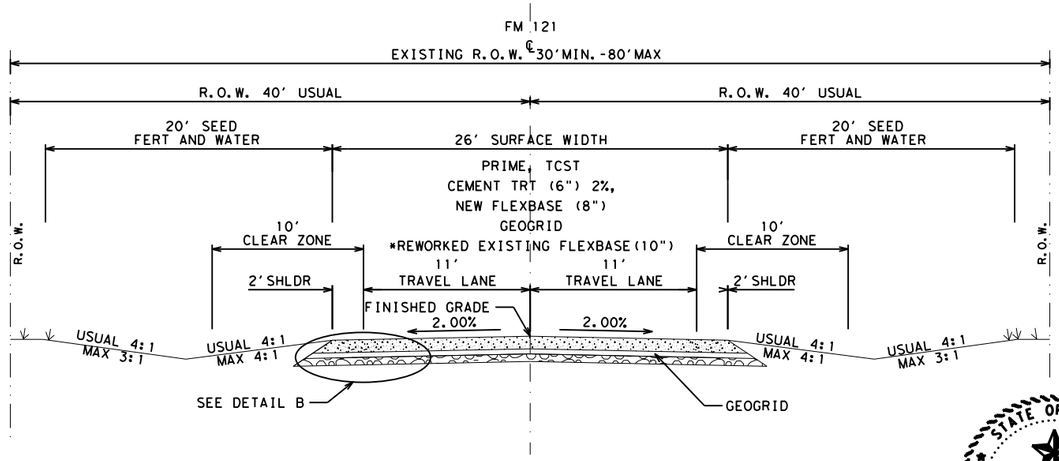
PROPOSED TYPICAL SECTION

STATION 7+07 TO 42+00



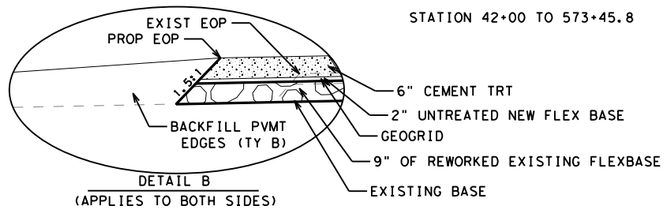
DETAIL A

(APPLIES TO BOTH SIDES)



PROPOSED TYPICAL SECTION

STATION 42+00 TO 573+45.8



DETAIL B

(APPLIES TO BOTH SIDES)

* SCARIFY AND REWORK EXISTING ACP SURFACING AND FLEXBASE FROM A 10" DEPTH @ 24' WIDTH TO A BASE OF 9" DEPTH @ 26' WIDTH.

NOTE: GEOGRID TO BE PLACED AT A 26' WIDTH

EXISTING & PROPOSED BRIDGE SECTIONS

W SISTER GROVE CREEK STA 145+02 - STA 146+53

E SISTER GROVE CREEK STA 196+95 - STA 197+90

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
TYPICAL SECTIONS

0 1 3 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		3

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

Pavement Core Data

CSJ: 0729-02-032

PAVEMENT CORE DATA PROVIDED BY: EST, INC.

P-01	0.75" ACP 16.50" Flex Base Subgrade	FM 121 EB MAIN LANE 485 FT WEST OF PARK RD 33.4251075°, -96.5671454°	PI=38 Sulfate = <100 ppm
P-02	1.75" ACP 13.00" Flex Base Subgrade	FM 121 WB MAIN LANE 0.42 MI EAST OF CATES ROAD 33.4285059°, -96.5488708°	PI=15 Sulfate = <100 ppm
P-03	2.50" ACP 8.25" Flex Base Subgrade	FM 121 MAIN LANE 325 FT WEST OF HYNDES RANCH ROAD 33.4289874°, -96.5349830°	PI=21 Sulfate = <100 ppm
P-04	1.00" ACP 13.25" Flex Base Subgrade	FM 121 WB MAIN LANE 0.43 MI EAST OF EDWARDS ROAD 33.4320323°, -96.5126556°	PI=36 Sulfate = <100 ppm
P-05	1.13" ACP 7.00" Flex Base Subgrade	FM 121 EB MAIN LANE 0.12 MI WEST OF OAK HILL ROAD 33.4319363°, -96.5023871°	PI=23 Sulfate = <100 ppm
P-06	1.00" ACP 13.00" Flex Base Subgrade	FM 121 WB MAIN LANE 0.21 MI WEST OF FM 2729 33.4383237°, -96.4874449°	PI=37 Sulfate = <100 ppm
P-07	1.00" ACP 13.00" Flex Base Subgrade	FM 121 EB MAIN LANE 470 FT WEST OF WILD ROAD 33.4412023°, -96.4713345°	PI=30 Sulfate = <100 ppm
P-08	1.00" ACP 16.00" Flex Base Subgrade	FM 121 WB MAIN LANE 0.13 MI WEST OF BUCKSNORT ROAD 33.4373402°, -96.4573468°	PI=32 Sulfate = <100 ppm
P-09	1.50" ACP 12.00" Flex Base Subgrade	FM 121 EB MAIN LANE 0.57 MI WEST OF BINION ROAD 33.4321358°, -96.4424977°	PI=36 Sulfate = <100 ppm
P-10	1.50" ACP 13.50" Flex Base Subgrade	FM 121 WB MAIN LANE 130 FT EAST OF PILOT GROVE ROAD 33.4381253°, -96.4244767°	PI=33 Sulfate = <100 ppm
P-11	1.25" ACP 11.75" Flex Base Subgrade	FM 121 EB MAIN LANE 0.52 MI WEST OF SH 160 33.4391658°, -96.4110726°	PI=30 Sulfate = <100 ppm

FM 121
PAVEMENT CORE DATA

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		4

DATE: 1/18/2023 10:29:37 PM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\004 PAVEMENT CORE.dgn

GENERAL NOTES

General:

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

Sherman Area Office
Aaron Bloom, P.E. - Aaron.Bloom@txdot.gov
Melese Norcha, P.E. – Melese.Norcha@txdot.gov

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

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

The Letting Pre-Bid Q&A web page for each project can be accessed by using the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project you want to view the Q&A for and click on the link in the window that pops up.

On Contractor request, earthwork cross sections and construction timelines will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/
The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Dispose of waste materials at an approved site. Furnish written approval from the property owner before disposal of waste materials.

Locate equipment a minimum of 30 feet from roadway when possible. Place signs and barricades as approved.

Stockpile sites for construction materials must be approved. Give at least 48 hours notification prior to stockpiling material.

Item 5 Control of the Work:

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.3, Method C.

Working days will be computed and charged in accordance with Article 8.3.1.4 Standard Work Week.

Right and left are determined based upon the forward direction of stationing in the specific control section.

Item 6 Control of Materials:

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

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

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

Item 7 Legal Relations and Responsibilities:

No significant traffic generator events identified.

Item 8 Prosecution and Progress:

Before beginning work on this project submit in writing, for approval, a plan of construction operations outlining in detail a sequence of work to be followed.

Provide a Bar Chart progress schedule for this project.

This project includes SP 008---003 which allows up to a 90-day delay to begin work on the project to allow for Contractor Mobilization.

SP 008-003 is required to allow for TxDOT to properly staff this project either with in-house or contract forces. This SP also allows the contractor ample time to obtain and schedule resources, material and manpower to ensure continuous prosecution of the work.

Roadway widening operations shall only be allowed on one side of the roadway at a time.

Item 9 Measurement and Payment:

Items of work for the Monthly Estimate will be cut off on the 25th of each month. Items of work performed after the 25th will be processed and paid on the following month's estimate. Material On Hand (MOH) will cut off on the 20th of each month. Special circumstances will be considered on a case-by-case basis.

Item 100 Preparing Right of Way:

Remove all trees 40 foot from centerline on both sides of roadway. At cross structures, remove trees to ROW line and within 100' of the structure, parallel to the roadway. Remove underbrush and neatly trim trees and overhanging branches to produce a 60' vertical clear area within the limits of Prep ROW. Remove any trees or underbrush that interferes with any construction operation, including relocation of ditches or other drainage elements. Receive approval of equipment used to trim limbs. A boom axe will not be allowed. Remove all trimmed debris from the ROW or mulch all debris and incorporate into the topsoil on State ROW to the satisfaction of the Engineer. Any drift that is under bridges and culverts will be removed.

Item 110 Excavation:

Material below finished subgrade elevation suspected of containing sulfates will be tested in accordance with Tex -145-E by the Department. Treat subgrade material to the required depth and width in accordance with the Soil Sulfates Mitigation General Notes.

Before excavation operations the existing topsoil shall be salvaged in a manner to preserve the vigor of the existing Bermuda grass sod per Item 160.

Item 112 Subgrade Widening:

Limit daily subgrade widening operations to the amount of base widening (proposed depth) that can be completed daily.

All pavement edge drop-offs, at end of day, shall be backfilled in accordance with Edge Treatment Condition I on the "Treatment for Various Edge Conditions" sheet. Backfill material shall be approved by the Engineer.

Item 132 Embankment:

Test potential embankment sources using Tex-145-E to determine the presence and concentration of sulfates. Do not bring soil with greater than 3000 ppm sulfates into project.

Embankment sources containing sulfates that meet specification requirements may be used as fill material provided it is placed with at least one foot of separation from materials to be treated with lime, cement, or other calcium-based stabilizers. When soils are to be placed with less than one foot

County: Grayson **Control:** 0729-02-032

of separation from material to be treated with lime, cement, or other calcium-based stabilizers, process and treat such soils according to the Soil Sulfates Mitigation General Notes.

Excavation pits for project embankment made within 250 feet of State Right of Way must be approved.

Before embankment operations the existing topsoil shall be salvaged in a manner to preserve the vigor of the existing Bermuda grass sod per Item 160.

Item 134 Backfilling Pavement Edges:

Use Type A backfill Material for final backfill. Provide material free of vegetation and other objectionable material with a Plasticity Index between 15 and 30. Use material with a Plasticity Index between 5 and 12 adjacent to PFC surfaces.

The backfill material source shall be approved.

Place backfill with a road widener.

Dirt driveway shaping/construction will be subsidiary to Item 134.

Item 152 Road Grader Work:

Use road grader work to windrow sod (6" depth), construct slopes, construct/repair dirt driveways, prepare driveways for surfacing, grade ditches as necessary to establish drainage and redistribute sod on finished slopes.

Cut ditches to proposed grade in the immediate vicinity of cross drain structures prior to placing Storm Water BMP devices at the early stages of the project.

If excess material is generated under this item, it may be utilized to construct slopes, or wasted as approved.

Item 164 Seeding for Erosion Control, 166 Fertilizer:

Apply fertilizer with a ratio of 3-1-2 (N-P-K) over the areas to be seeded. This work will not be paid for directly, but will be considered subsidiary.

Item 168 Vegetative Watering:

Use water trucks equipped with a sprinkler system adequate to permit coverage of the entire seeded area from the roadbed. This equipment must be available to perform watering throughout the duration of vegetative establishment.
Water all seeded areas the day seed is applied. Thereafter, maintain the seeded areas in a well-watered condition throughout the duration of vegetative establishment.

Item 247 Flexible Base:

Grading requirements
Tests to be in accordance with TxDOT Standard Test Methods

Soil Constants

Item Desc.	Linear Shrinkage	LL	Wet Ball	WBMV(incr. passing #40 sieve)
Item 247 Flex Base	6.0 max.	40 max.	40 max.	20% max.

PERCENT RETAINED ON SIEVE:

1-3/4"	7/8"	3/8"	No. 4	No. 40
0	10-35	30-50	45-65	70-85

Flexible Base will not contain more than 1% by weight of clay balls.

Place blue top hubs for alignment and elevations of new base at centerline and edge of pavement.

Measure roadway profile smoothness prior to the cover prime or prime course application.

Provide all profile measurements to the Engineer in electronic data files prior to the placement of the prime/cover prime coat using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi. sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less. The average IRI for the left and right wheel paths will be used to determine acceptance for each 0.1-mi. section. However, the Engineer reserves the right to have the contractor correct isolated imperfections even if the 0.1-mi. section has a passing IRI. This work will be performed at the contractor's expense. Once all corrections have been made, the prime/cover prime coat may be applied.

Re-profile and correct sections that fail to maintain ride quality until placement of the first seal coat, as directed. Correct re-profiled sections until specification requirements are met, as approved. In the spirit of partnering, the department will participate in 50% of an agreed upon cost of repair for any section that has to be subjected to traffic throughout the winter with only a cover prime coat.

Item 251 Reworking Base Courses:

Full depth HMAC patching and stabilized areas of various depths are to be expected and are to be reworked into existing base. Stabilized areas may include but are not limited to cement, fly ash, or asphalt treated base.

Use a milling machine or saw to produce a smooth vertical cut in existing pavement.

Areas with deep asphaltic patching or widening will require processing and relocation operations to incorporate additional flex base to reduce the asphaltic material ratio to a 50% maximum by volume. This work will be subsidiary to this Item.
The finished roadway must match existing grades at project limits, highway intersections and

bridges. In these areas, salvage existing base and remove sufficient subgrade material to construct the full-depth proposed pavement section, according to the transition details shown in the plans. This removal will not be paid for directly but will be considered subsidiary to the various bid items. Excess subgrade material generated by these transitions may be utilized to construct slopes or wasted as approved by the Engineer.

Item 275 Cement Treatment (Road Mixed):

Microcracking is required where flexible base widths accept full roller width. When temperatures during curing period average below 60 degrees F, perform microcracking operations between 48 and 72 hours.

In narrow widening areas where road mixing equipment cannot be operated in an effective manner, mix flexible base and cement off site, then place in widening area.

Subgrade, embankment or backfill suspected of containing sulfates will be tested in accordance with Tex-145-E by the Department. Subgrade, embankment or backfill material within one foot of any area to be treated using cement is subject to the following restriction:

Greater than 7,000 ppm sulfates – Do not treat with any cement or other calcium-based stabilizers. Material within one foot of any area to be treated with cement or other calcium-based stabilizers must be removed or processed as directed.

Item 302 Aggregates for Surface Treatments:

Grade 5 Modified Grading Requirements
CUMULATIVE PERCENT RETAINED ON SIEVE:

1/2"	3/8"	No. 4	No. 8	No. 200
0	0-5	30-80	85-100	95-100

The decantation requirement for Grade 5 Modified aggregate is 4% maximum.

The requirements for Flakiness Index, Magnesium Sulfate Soundness, and Los Angeles Abrasion are waived for the Grade 5 Modified aggregate.

Use unmodified AC or PG for pre-coating aggregate. Emulsion pre-coating will not be allowed.

Use liquid antistrip or other approved antistrip agent complying with the requirements of Item 301 Asphalt Antistripping Agents. The aggregate will be evaluated for moisture susceptibility using test method TEX-530-C.

Item 316 Surface Treatments:

Unless otherwise permitted by the Engineer in writing, the open season for asphalt placement will be:

May 15- August 31 for AC

Permission to place asphalt outside of the open season may require the contractor to place a fog seal at the contractor's expense.

***Rates For Construction Projects**

First Course

ITEM	APPLICATION	
	Cover Prime	1st Course
*Asphalt Type	RC-250	AC-20-5TR or AC-20XP
*Asph. Rate (Gal/SY)	0.28	0.46
Aggregate Type	B	B
Aggregate Grade	5 or Mod 5	3
Aggr. Rate (CY/SY)	1:140	1:105
Min. Cure Time	14 days **	

Second Course

ITEM	APPLICATION
	2nd Course
*Asphalt Type	AC-20-5TR or AC-20XP
*Asph. Rate (Gal/SY)	0.36
Aggregate Type	PB
Aggregate Grade	4
Aggr. Rate (CY/SY)	1:120

* The information above is intended to provide general guidance and as a basis of estimate. Based on the season and weather conditions at the time, the engineer will determine the asphalt type and rates to be used at the time of application.
** Or as approved by the Engineer

Item 351 Flexible Pavement Structure Repair:

Perform flexible pavement structure repair before the final HMAC placement**.**

Item 354 Planing and Texturing Pavement:

Planing will be performed with a 12' milling machine.

RAP generated from this project can be used in the HMAC for this project

During the planing operation, maintain the existing centerline stripe for overnight traffic operations unless full width planing is accomplished in one day. Plane all vertical longitudinal faces with a 3:1 slope to meet Edge Condition I as shown on sheet "Worksheet for Edge Condition Treatment Types".

The planing operation will be followed closely by the hot-mix asphalt (HMA) overlay operation. If inclement weather or other unexpected factors do not allow planed areas to be overlaid, warning signs per Standard Sheet WZ(UL) will be maintained until the hot-mix asphalt overlay operation is completed.

In curb and gutter sections, vacuum loose fines immediately after the milling operation and prior to overlaying with HMA.

RAP that is not to be used on this project will become the property of the Contractor.

Item 400 Excavation and Backfill for Structures:

Excavation and backfill for bridge, culvert and Safety End Treatment construction/installation will be subsidiary to Item 462, 464, 466, 467 and 472.

Pavement markings and RPM replacement will be subsidiary to "Cut and Restore Pavement".

Cut and Restore Pavement: Backfill to top of pipe using HES flowable fill. Use an accelerator that produces a minimum strength of 250 psi in 4 hours. Provide rheofill or equivalent to ensure flowability. Anchor pipes to ensure no movement or displacement by the flowable fill. Furnish paper type cylinder test molds. Place flowable fill from the top of the pipe to within 10" of the existing pavement surface. Place Type B or C HMAC from the top of the flowable fill to the existing roadway surface. These items will be subsidiary to this item and will not be paid for directly.

Item 402 Trench Excavation Protection

Submit a Trench Excavation Protection Plan to the Engineer a minimum of three weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Item 403 Temporary Special Shoring

Submit a Temporary Special Shoring Plan to the Engineer a minimum of three weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Item 420 Concrete Structures:

Do not use membrane curing for structural elements.

Item 432 Riprap:

The Engineer may adjust placement of riprap in the field.

Filter fabric is required for stone riprap.

Item 462 Concrete Box Culverts and Drains

Required excavation and backfill will be subsidiary to this Item.

Item 464 Reinforced Concrete Pipe:

Required excavation and backfill will be subsidiary to this Item.

Item 466 Headwalls and Wingwalls:

Unless shown in plans to obtain from offsite source, obtain headwall and wingwall backfill from ROW and perform grading to shape ditch to headwall/wingwall, per Engineers directions. This work will be subsidiary to this Item.

Riprap apron, between wingwalls, will be subsidiary to this Item.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Removed headwalls and wingwalls may be broken into riprap size pieces (12” average diameter) for use as stone riprap on the project. Cut protruding steel reinforcement flush with concrete pieces. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on the BC standards.

Item 467 Safety End Treatment:

Parallel pipe culverts ~ 30" diameter and smaller require precast SET unless directed by the Engineer to use cast-in-place SETs when precast SETs would project over 3" above surrounding ground surface or when otherwise indicated in the plans. Additional work to install cast in place SETs will be subsidiary to this Item

Cross pipe culverts ~ 30" diameter and smaller require precast SET unless indicated otherwise in the plans.

Repair damage culvert ends prior to SET installation. Straighten CMP ends by straightening or cutting off damaged ends. Paint cut off ends with zinc paint. Repair minor damaged RCP ends with epoxy mortar. This work will be subsidiary to this Item.

When necessary to close connection gaps, grout precast SETs to culvert ends. Materials, labor and equipment will be subsidiary to this item.

On existing CMP parallel culverts with mitered metal ends, construct concrete cast in place SETs or remove the mitered ends and install precast or cast-in-place SETs. Replace/remove existing mitered metal ends that are not 6:1 or flatter.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Unless shown in the plans to obtain backfill from offsite source, obtain SET backfill from the Right-of-Way. This work will be subsidiary to this Item.

Placement of concrete Riprap between multiple SETs on multiple barrel culverts will be subsidiary to this Item.
During SET installation, unless indicated otherwise in the plans, match SET flow line grade with the culvert flow line grade.

Removal and disposal of existing headwalls for parallel culverts will be subsidiary to this Item. Removed concrete headwalls and wingwalls may be broken into riprap size pieces (12” average diameter) for use as stone riprap. Cut protruding steel reinforcement. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on BC(10)-21.

Item 472 Removing and Re-Laying Culvert:

Seal reinforced concrete pipe joints with either the original manufacturers seal or cementitious mortar per DMS-4675.

Required excavation and backfilling will be subsidiary to this Item. Obtain backfill from Right-of-way unless indicated otherwise in the plans.

Item 496 Removing Structure:

Seal reinforced concrete pipe joints with either the original manufacturers seals or cementitious mortar per DMS-4675

The Contractor shall coordinate with the county commissioner for transferring salvageable materials such as beams, piling, and concrete riprap. The Contractor shall dispose of remaining materials.

Require excavation and backfilling will be subsidiary to this item. Obtain backfill from Right-of-way unless indicated otherwise in the plans.

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.

The following items will be required for flagger on this project:

1. Flaggers are required to wear a white hard hat while performing flagging operations.
2. Flaggers will be required at the intersection of all State maintained roadways.
3. Flaggers may be required at other high traffic generating intersections as deemed necessary by the Area Engineer.

The traffic control plan for this contract consists of the installation and maintenance of warning signs and other traffic control devices shown in the plans, specification data which may be included in the general notes, applicable provisions of the Texas Manual on Uniform Traffic Control Devices (TMUTCD), traffic control plan sheets included in the plans, standard BC sheets and Item 502 of the Standard Specifications.

Do not begin Item 502, Barricades, Signs, and Traffic Handling, on the roadway until both of the following conditions are met:

1. The work schedule is approved.
2. No more than 5 workdays will pass between the beginning of Item 502 and the actual commencement of roadway work bid items.

The final estimate will be withheld until all disturbed areas are covered with at least 70% perennial vegetative cover.

Correct all deficiencies within the time frame noted on the Traffic Control Device Inspection Form 599. Failure to make corrections within time frame specified may result in no payment for this Item for the month of the noted deficiency.

Provide shadow vehicles equipped with Truck Mounted Attenuators (TMA) as shown on Traffic Control Plan (TCP) standards.

Ensure that all travel lanes are open at night.

Provide pilot car during one lane/two-way traffic operations.

Road closures must be approved by the Engineer. Provide a two-week advance notice to the Engineer prior to desired roadway closure period. Begin display of closure information on PCMBs ten days prior to roadway closure.

The total months of barricades includes the number of working days plus the winterization period.

The regulatory speed limit will be reduced for this project to a maximum of 45 MPH in construction areas. Signs, materials, equipment and labor shall be subsidiary to Item 502.

Item 506 Temporary Erosion, Sedimentation & Environmental Controls:

The Temporary Erosion Control measures for this project will consist of using the following items, as directed:

1. Temporary Silt Fence
2. Rock Filter Dams: All rock filter dams shall be installed with 6:1 slopes regardless of their location on the project. Failure to do so will result in no payment for the dam.

Silt fences will remain the property of the Contractor upon completion of the project. The final estimate will not be released until all silt fences have been properly removed, or as directed and 70% establishment of vegetative cover is obtained.

Acquire approval for any change to the location of temporary sediment fence, as shown in the plans, prior to installation. Placement of erosion protection devices may be altered, as directed, to satisfy the requirements of the SW3P.

The pay item to remove rock filter dams will require only a partial removal after 70 percent perennial vegetation has been established and approved. When removing the rock filter dams, leave the lower layer of rock adjacent to the ground in place so as not to disturb the soil.

Refer to the SW3P sheet for the total disturbed area for the project.

The disturbed area in this project, all project locations in the Contract, and Contractor project specific locations (PSLs) within one mile of the project limits 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. Obtain any required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off ROW. When the total area disturbed for all projects in the Contract and PSLs within one mile of the project limits exceeds five acres, provide a copy of the Contractors NOI for PSLs on the ROW (to the appropriate MS4 operator when on an off-system route).

Item 540 Metal Beam Guard Fence:

Reinstall removed MBGF and SGT's on the same day.

MBGF delineation shall be installed within ten (10) working days of the completion of each MBGF section. Concrete mow strip is not considered to be a part of this work.

Item 542 Removing Metal Beam Guard Fence:

Removed MBGF rail shall be retained by the Contractor.

Removed re-usable MBGF rail shall be stockpiled at the TXDOT Area Office located at 3001 IH 30 East, Greenville TX; 3600 SW Loop 286, Paris TX; 3904 US 75 South, Sherman TX; 1100 Hillcrest Drive on SH 19, Sulphur Springs TX.

Item 560 Mailbox Assemblies:

Install new mailboxes unless the property owner chooses to have an existing, compliant mailbox reinstalled. Return all custom non-compliant mailboxes to the property owner.

All new mailboxes furnished and installed by the contractor will display the address number using one inch (1") adhesive back numbering. The color, type, and style of numbering shall be consistent throughout the project.

Install Type 2 Mailbox foundations. Set the mailbox foundations in 12" diameter by 30" deep concrete (Class B) foundations.

Item 585 Ride Quality for Pavement Surfaces:

For HMAC surface use Surface Test Type B Pay Adjustment Schedule 3 to evaluate ride quality of the final pavement surface on travel lanes and shoulders in accordance with Item 585, "Ride Quality for Pavement Surfaces." A localized roughness penalty of $500 per occurrence will be assessed.

Item 644 Small Roadside Sign Support and Assemblies:

Upon removal of sign assemblies, deliver sign faces to TxDOT office at 3904 US 75 South, Sherman TX. Dispose of foundations, posts, and hardware.

Use the Southern Plains style triangular slip base for all post types.

Once the cover prime is completed, the Paris District Traffic Operations office will field verify the need and spacing of chevrons. If this verification results in fewer materials, the Paris District will purchase the excess signs at invoice price.

Remove the existing city street and county road topper from city and county signs and install on the new city street and county road stop sign assemblies. This work will be subsidiary to Item 644.

Stake proposed sign locations and obtain Engineer's approval of locations prior to placing foundations.

Contact the Engineer to obtain updated curve travel speeds before manufacture of curve speed warning signs.

Item 662 Work Zone Pavement Markings:

Non-removable markings may be paint and beads.

Place flexible reflective roadway tabs in accordance with the current WZ (STPM) prior to seal coat operations. Place tabs to indicate the beginning and ending of no passing zones.

Cut, remove and properly dispose of the upright portions of all work zone tabs prior to acceptance of any roadway. Remove entire tab when located on HMAC or concrete surfaces.

Item 666 Reflectorized Pavement Markings:

No stripe will be placed unless the inspector is present and at least 24 hours advance notice has been given by the Contractor.

Lay out pilot lines for approval 24 hours prior to all final pavement marking applications.

Use equipment with footage counters capable of measuring the linear footage placed. Calibrate counters prior to the beginning of striping operations.

Reduce truck speed enough to ensure that the beads drop onto the stripe and do not roll in the paint film.

Due to problems in traffic handling, do not place a dash center stripe and edge line at the same time.

Contact the Engineer 7 days before pavement marking placement for re-establishment of no-pass zones.

Item 3076 Dense-Graded Hot-Mix Asphalt:

All surface mixes are to be SAC A.

The use of PG 64-22 asphalt is required.

Use a self-propelled wheel mounted MTV capable of receiving mix from the haul trucks, separate from the paver. It shall have a minimum storage capacity of approximately 25 tons. It shall be equipped with a pivoting discharge conveyor and shall completely and thoroughly remix the material prior to placement. The effectiveness of the MTV's remixing ability is subject to the approval of the Engineer. In addition, the paver shall have a surge storage insert with a minimum capacity of 20 tons.

Specify Hot Mix Asphalt Concrete (HMAC) or Warm Mix Asphalt (WMA) at the time of design submittal. After design submittal, continue producing the chosen design unless otherwise approved.

RAP from contractor owned sources may be used if the RAP is fractionated. The course fraction of contractor owned RAP will not be allowed if it consists primarily of siliceous aggregates.

A tack coat is required for all overlay areas and for all longitudinal joints unless otherwise directed.

Evaluation of the mixture for moisture susceptibility will be performed by using test method TEX 530-C (boil test) and there shall be no evidence of stripping during design verification or at any time during production.

The maximum nighttime paved surface vertical differential will be limited to two inches. Prevent ponding of water on any travel ways that are exposed to traffic.

Perform all sampling for aggregate quality testing on stockpiles at the HMAC plant. Mixture sampling for QC/QA testing will typically be taken from the truck at the plant; however, the Engineer may direct that a sample be taken at any point or location of mixture during production, delivery or placement.

Preparation and construction of permanent / temporary transitions, terminations of mix courses and transitions to driveways and intersecting roadways is subsidiary to Item 341. This includes all labor, machinery, materials and incidentals to complete the work including planing, removal, hauling and stockpiling of materials and necessary clean-up.

Item 3096 Asphalts, Oils, and Emulsions:

Provide 1L (1qt.) clean and dry screw top or friction-lid sampling cans as directed.

Furnish at least one sample of each type of asphalt used on the project for QA/QC purposes.

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Item 5001 Geogrid Base Reinforcement:

Install Geogrid with at least a 1 ft. overlap along the longest joint when construction sequencing allows as determined by the Engineer.

Install Geogrid per manufacturer's specifications as well with the following exceptions / inclusions:

1. Cascade Base onto Geogrid using a bulldozer to a depth of at least six inches so that no equipment has direct contact with Geogrid. Raise dozer blade gradually as each lift is pushed out over the Geogrid.

2. Do not operate rubber-tired equipment directly on Geogrid unless allowed by the Engineer. Should operating rubber-tired equipment directly on Geogrid be allowed, operate at no more than 5 mph, do not turn tires on the Geogrid or make sudden stops and starts which causes excessive deformation waves. Keep Geogrid taut and flat. Adjustments to Geogrid installation or construction methods may be directed by the Engineer to minimize deformation waves.

3. Sufficiently compact unbound buffer layer directly above Geogrid to achieve the required density in all subsequently constructed pavement layers.

Item 6001 Portable Changeable Message Board:

Two (2) portable changeable message boards are required for advance warning.

Item 6185 Truck Mounted Attenuators:

Shadow vehicles with truck mounted attenuator (TMA) are required on the traffic control plan and TCP standards for this project. The contractor will be responsible for determining if one or more of these traffic control operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0729-02-032 **DISTRICT** Paris **COUNTY** Grayson
HIGHWAY FM 121

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	100-6002	PREPARING ROW	STA	35.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	10.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	600.000	
	104-6067	REMOVING CONC (SAWCUT)	LF	25.000	
	110-6002	EXCAVATION (CHANNEL)	CY	224.000	
	110-6003	EXCAVATION (SPECIAL)	CY	30.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	530.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	618.000	
	134-6001	BACKFILL (TY A)	STA	35.000	
	134-6002	BACKFILL (TY B)	STA	530.000	
	152-6001	ROAD GRADER WORK (ORD COMP)	STA	530.000	
	156-6001	BULLDOZER WORK	HR	16.000	
	158-6003	SPEC EXCAV WORK (HYD EXCAVATOR)	HR	16.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	125,866.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	125,866.000	
	164-6015	STRAW/HAY MLCH SEED(PERM)(RURAL)(CLAY)	SY	251,730.000	
	168-6001	VEGETATIVE WATERING	MG	1,512.000	
	169-6005	SOIL RETENTION BLANKETS (CL 2) (TY E)	SY	850.000	
	247-6248	FL BS (CMP IN PL)(TY D GR 4)(8")	SY	155,126.000	
	251-6073	REWRKING BS MATL (TY C)(10")(ORD COMP)	SY	143,626.000	
	275-6001	CEMENT	TON	941.000	
	275-6003	CEMENT TREAT (NEW BASE) (6")	SY	155,126.000	
	316-6029	ASPH (RC-250)	GAL	43,434.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	CY	1,110.000	
	316-6404	AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	CY	1,293.000	
	316-6405	ASPH (AC-20-5TR OR AC-20XP)	GAL	127,202.000	
	316-6440	AGGR (TY-B GR-3 OR TY-L GR-3)(SAC-B)	CY	1,478.000	
	351-6006	FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	SY	250.000	
	354-6003	PLAN & TEXT ASPH CONC PAV(0" TO 3")	SY	9,315.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	338.000	
	401-6001	FLOWABLE BACKFILL	CY	276.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	787.000	
	403-6001	TEMPORARY SPL SHORING	SF	886.000	
	429-6007	CONC STR REPAIR (VERTICAL & OVERHEAD)	SF	62.000	
	429-6011	CONC STR REPR(REMOV AND REPL WINGWALL)	CY	3.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	99.000	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	103.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	122.000	
	462-6002	CONC BOX CULV (3 FT X 3 FT)	LF	70.000	
	462-6012	CONC BOX CULV (6 FT X 5 FT)	LF	61.000	
	464-6001	RC PIPE (CL III)(12 IN)	LF	836.000	

Estimate & Quantity Sheet

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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	464-6002	RC PIPE (CL III)(15 IN)	LF	465.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	3,063.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	846.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	290.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	368.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	55.000	
	464-6012	RC PIPE (CL III)(60 IN)	LF	6.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	1.000	
	466-6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	EA	2.000	
	466-6134	HEADWALL (CH - PW - S) (DIA= 36 IN)	EA	1.000	
	466-6137	HEADWALL (CH - PW - S) (DIA= 54 IN)	EA	2.000	
	466-6138	HEADWALL (CH - PW - S) (DIA= 60 IN)	EA	4.000	
	466-6196	WINGWALL (PW - 2) (HW=7 FT)	EA	2.000	
	466-6197	WINGWALL (PW - 2) (HW=8 FT)	EA	2.000	
	467-6326	SET (TY II) (12 IN) (RCP) (6: 1) (P)	EA	80.000	
	467-6341	SET (TY II) (15 IN) (RCP) (6: 1) (P)	EA	48.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA	8.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	200.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	16.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	48.000	
	467-6417	SET (TY II) (30 IN) (RCP) (3: 1) (C)	EA	2.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	9.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	2.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	7.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	3.000	
	467-6463	SET (TY II) (42 IN) (RCP) (4: 1) (C)	EA	1.000	
	472-6006	REMOV & RE - LAY PIPE (24 IN)	LF	8.000	
	472-6008	REMOV & RE - LAY PIPE (30 IN)	LF	4.000	
	472-6014	REMOV & RE - LAY PIPE (54 IN)	LF	12.000	
	496-6007	REMOV STR (PIPE)	LF	3,919.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	72.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	30.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	1,400.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,400.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	2,430.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	2,430.000	
	530-6004	DRIVEWAYS (CONC)	SY	62.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,970.000	

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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	530-6008	TURNOUTS (ACP)	SY	2,340.000	
	530-6016	DRIVEWAYS (BASE)	SY	5,519.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	1,100.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	8.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,100.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	12.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	8.000	
	560-6003	MAILBOX INSTALL-M (TWG-POST) TY 1	EA	7.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	78.000	
	560-6008	MAILBOX INSTALL-D (WC-POST) TY 3	EA	14.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	121.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	42.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	2.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	3.000	
	644-6073	RELOCATE SM RD SN SUP&AM(HIST MRKR)	EA	1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	168.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	12.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	84.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	24.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	133,226.000	
	662-6023	WK ZN PAV MRK NON-REMOV (W)(RR XING)	EA	1.000	
	662-6035	WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	LF	8,720.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	94,819.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	16,185.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	446.000	
	666-6093	REFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	2.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	446.000	
	666-6224	PAVEMENT SEALER 4"	LF	380.000	
	666-6225	PAVEMENT SEALER 6"	LF	772.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	133,226.000	
	666-6346	REF PROF PAV MRK TY I(Y)6"(BRK)(100MIL)	LF	9,390.000	
	666-6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	LF	94,819.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,666.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	772.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	1,544.000	
	3076-6016	D-GR HMA TY-C SAC-A PG64-22	TON	1,025.000	
	3084-6001	BONDING COURSE	GAL	2,236.000	
	5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	155,125.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000	
	6185-6002	TMA (STATIONARY)	DAY	360.000	

Estimate & Quantity Sheet

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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	6185-6003	TMA (MOBILE OPERATION)	HR	240.000	
	7000-6002	REML & DISPL DRIFTWOOD & DEBRIS	LS	1.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	

CK:
DW:
CK:
DN:

SUMMARY OF ROADWAY ITEMS

LOCATION		LENGTH	AREA	EXIST WIDTH	PROPOSED WIDTH	112 6001 SUBGRADE WIDENING (ORD COMP)	134 6002 BACKFILL (TY B)	152 6001 ROAD GRADER WORK (ORD COMP)	247 6248 FL BS (CMP IN PL)(TY D GR 4)(8")	251 6073 REWRKING BS MATL (TY C)(10")(ORD COMP)	275 6001 CEMENT	275 6003 CEMENT TREAT (NEW BASE) (6")	PRIME COURSE 316 6029 ASPH (RC-250)	PRIME COURSE 316 6403 AGGR (TY-B GR-5 OR TY-L GR-5)	FIRST COURSE 316 6405 ASPH (AC-20-5 TR OR AC-20XP)	FIRST COURSE 316 6440 AGGR (TY-B GR-3 OR TY-L GR-3)(SAC-B)	SECOND COURSE 316 6405 ASPH (AC-20-5 TR OR AC-20XP)	SECOND COURSE 316 6404 AGGR (TY-PB GR-4 OR TY-PL GR-4 SAC-A)	5001 6002 GEOGRID BASE REINFORCEMENT (TY II)	7000 6002 REML & DISPL DRIFTWOOD & DEBRIS
FROM	TO		SY			STA	STA	STA	SY	SY	TON	SY	GAL	CY	GAL	CY	GAL	CY	SY	LS
7+07	42+00	3,493		24	24															
42+00	143+54	10,154		24	26	102	102	102	29,334	27,077	178	29,334	8,213	210	13,494	279	10,560	244	29,334	
143+54	145+12	158	1,264	**BRIDGE TRANSISTION		2	2	2	1,264	1,249	8	1,264	354	9	581	12	455	11	1,264	
145+12	146+53	141		BRIDGE: W SISTER GROVE CREEK																1
146+53	149+25	272	1,216	**BRIDGE TRANSISTION		3	3	3	1,216	1,203	7	1,216	340	9	559	12	438	10	1,216	
149+25	193+77	4,452		24	26	45	45	45	12,861	11,872	78	12,861	3,601	92	5,916	122	4,630	107	12,861	
193+77	196+95	318	1,393	**BRIDGE TRANSISTION		3	3	3	1,393	1,375	8	1,393	390	10	641	13	501	12	1,393	
196+95	197+90	95		BRIDGE: E SISTER GROVE CREEK																
197+90	201+01	311	1,365	**BRIDGE TRANSISTION		3	3	3	1,365	1,348	8	1,365	382	10	628	13	492	11	1,365	
201+01	453+29	25,228		24	26	252	252	252	72,881	67,275	443	72,881	20,407	521	33,525	694	26,237	607	72,881	
453+29	454+79	150	683	**BRIDGE TRANSISTION		2	2	2	683	678	4	683	191	5	314	7	246	6	683	
454+79	456+19	140		BRIDGE: W FORK PILOT GROVE CK																
456+19	457+69	150	683	**BRIDGE TRANSISTION		2	2	2	683	678	4	683	191	5	314	7	246	6	683	
457+69	573+46	11,577		24	26	116	116	116	33,445	30,872	203	33,445	9,365	239	15,385	319	12,040	279	33,445	
PROJECT TOTALS						530	530	530	155,126	143,626	941	155,126	43,434	1,110	71,357	1,478	55,845	1,293	155,125	1

PRIME COURSE:
ASPH: RC-250 @ 0.28 GAL/SY
AGGR: GR 5 OR MOD 5 B OR L @ 1:140 CY/SY
FIRST COURSE:
ASPH: AC-20-5TR or AC-20XP @ 0.46 GAL/SY
AGGR: GR 3 B OR L @ 1:105 CY/SY
SECOND COURSE:
ASPH: AC-20-5TR or AC-20XP @ 0.36 GAL/SY
AGGR: GR 4 PB OR PL @ 1:120 CY/SY
FLEX BASE:
BASED ON AN ASSUMED WEIGHT OF 135 LBS/CF

BRIDGES:
STA 145+02 - 146+53
STA 196+95 - 197+90
STA 454+79 - 456+19

CEMENT BASE TREATMENT
BASED ON AN ASSUMED DRY COMPACTED UNIT WEIGHT OF 135 LBS/CF @ 2% BY WEIGHT.

** BRIDGE TRANSITION EXISTING ROADWAY: 24' TO 44'
BRIDGE TRANSITION PROPOSED ROADWAY: 26' TO 44'

SUMMARY OF ROADWAY TIEMS - CONTINUED

LOCATION		LENGTH	100 6002 PREPARING ROW	354 6003 PLAN & TEXT ASPH CONC PAV(0" TO 3")	3076 6016 D-GR HMA TY-C SAC-A PG64-22	351 6006 FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	3084 6001 BONDING COURSE	134 6001 BACKFILL (TY A)
FROM	TO	LF		SY	TON	SY	GAL	STA
7+07	42+00	3,493	35	9,315	1,025	250	2,236	35
PROJECT TOTALS			35	9,315	1,025	250	2.236	35

HMA:
BASED ON AN ASSUMED WEIGHT OF 146.68 LBS/CF = 110 LBS/SY/IN
BONDING COURSE BASED ON 0.24 GAL/SY

MISCELLANOUS ITEMS

LOCATION		110 6003 EXCAVATION (SPECIAL)
FROM	TO	CY
23+00	26+00	30
PROJECT TOTALS		30

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

FM 121
QUANTITY SUMMARIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		7

CK:
DW:
CK:
DN:

SUMMARY OF ROADWAY ITEMS - CONTINUED

LOCATION	104 6054 REMOVING CONCRETE(MOW STRIP) LF	110 6002 EXCAVATION (CHANNEL) CY	432 6045 RIPRAP (MOW STRIP)(4 IN) CY	540 6002 MTL W-BEAM GD FEN (STEEL POST) LF	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM) EA	542 6001 REMOVE METAL BEAM GUARD FENCE LF	544 6001 GUARDRAIL END TREATMENT (INSTALL) EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA	658 6014 INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI) EA	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI) EA	429 6007 CONC STR REPAIR (VERTICAL & OVERHEAD) SF	429 6011 CONC STR REPR(REMOV AND REPL WINGWALL) CY	432 6033 RIPRAP (STONE PROTECTION)(18 IN) CY
BRIDGE													
NBI: #010920072902183													
W SISTER GROVE CREEK (STA. 145+12 TO 146+53)	300	24	39	300	4	300	4	4	4	6			28
E SISTER GROVE CREEK (STA. 196+95 TO 197+90)	300	24	39	300	4	300	4	4	4	6			28
NBI: # 010920072902185													
W FORK PILOT GROVE CREEK (STA. 454+79 TO 456+19)										6			
BRIDGE CLASS CULVERT													
NBI: #010920072902017													
CONNERS CREEK (STA. 538+42)			44	500		500	4		4	6	62	3	47
PROJECT TOTALS	600	48	122	1,100	8	1,100	12	8	12	24	62	3	103

SUMMARY OF LANDSCAPE ITEMS

LOCATION FROM	LOCATION TO	LENGTH LF	WIDTH LT	WIDTH RT	164 6009 BROADCAST SEED (TEMP) (WARM) SY	164 6011 BROADCAST SEED (TEMP) (COOL) SY	164 6015 STRAW/HAY MLCH SEED(PER M)(RURAL) (CLAY) SY	168 6001 VEGETATIVE WATERING MG	169 6005 SOIL RETENTION BLANKETS (CL 2) (TY E) SY	FERTILIZER 3-1-2 *
7+07	42+00	3,493	20	20	7,763	7,763	15,525	94	425	1,528
42+00	573+46	53,146	20	20	118,103	118,103	236,205	1,418	425	23,243
PROJECT TOTALS					125,866	125,866	251,730	1,512	850	24,771

* FOR CONTRACTORS INFORMATION ONLY; 2 CYCLES AT 50 LBS. NITROGEN PER ACRE AT 3-1-2 (NPK) ANALYSIS = 0.0492 LBS/SY/CYCLE
WATERING: BASED ON 2 APPLICATIONS, 0.5" RAINFALL EQUIVALENT = 0.003 MG/SY/CYCLE

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN EA	6185 6002 TMA (STATIONARY) DAY	6185 6003 TMA (MOBILE OPERATION) HR
FM 121	2	360	240
PROJECT TOTALS	2	360	240

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 6007 IN SM RD SN SUP&AM TY10BWG(1)SA (U) EA	644 6076 REMOVE SM RD SN SUP&AM EA	644 6033 IN SM RD SN SUP&AM TYS80(1)SA(U) EA	644 6030 IN SM RD SN SUP&AM TYS80(1)SA(T) EA	644 6073 RELOCATE SM RD SN SUP&AM (HIST MRKR) EA
FM 121	121	42	1	168	3	2	1
PROJECT TOTALS	121	42	1	168	3	2	1

FM 121
QUANTITY SUMMARIES

SHEET 2 OF 14

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		8

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

CK:
DW:
CK:
DN:

SUMMARY OF DRIVEWAY ITEMS

STATION	RT/LT	EXIST SURFACE	EXIST PIPE	DIA.	LENGTH	WIDTH	R1	R2	104 6017 REMOVING CONC (DRIVEWAYS) SY	464 6001 RC PIPE (CL III)(12 IN) LF	464 6002 RC PIPE (CL III)(15 IN) LF	464 6003 RC PIPE (CL III)(18 IN) LF	464 6005 RC PIPE (CL III)(24 IN) LF	464 6008 RC PIPE (CL III)(36 IN) LF	467 6326 SET (TY II) (12 IN) (RCP) (6:1) (P) EA	467 6341 SET (TY II) (15 IN) (RCP) (6:1) (P) EA	467 6363 SET (TY II) (18 IN) (RCP) (6:1) (P) EA	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P) EA	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P) EA	496 6007 REMOV STR (PIPE) LF	530 6004 DRIVEWAYS (CONC) SY	530 6016 DRIVEWAYS (BASE) SY	530 6005 DRIVEWAYS (ACP) SY
9+11	RT	ASPH			12	20	15	15															35
9+11	LT	ASPH			12	20	16	25															39
10+26	LT	GRVL		12	12	12	10	6														19	
11+07	RT	DIRT		12	12	15	5	5														21	
11+43	LT	GRVL		12	12	16	8	8														24	
12+59	LT	GRVL		18	12	12	8	8														19	
12+59	RT	ASPH			12	12	32	22														34	
12+88	LT	GRASS/DIRT		24	12															24			
12+97	LT	GRVL			12	10	5	5														15	
13+28	LT	GRVL		18	12	10	5	4														14	
13+50	LT	GRVL		18	12	8	4	4														11	
13+81	RT	GRVL		12	12	18	4	4														25	
14+13	LT	GRVL		18	12	10	6	6														15	
14+47	RT	GRVL/CNC		12	12	20	4	4														27	
14+97	LT	GRVL		18	12	15	8	8														23	
15+71	RT	GRVL		12	12	12	4	4														17	
15+85	LT	ASPH		18	12	12	7	7															18
16+28	RT	GRVL		12	12	20	4	4														27	
16+52	LT	ASPH		18	12	10	9	9															17
16+80	RT	ASPH		12	12	23	12	12															36
17+96	RT	CNC		12	12	18	4	4													25		
18+41	RT	GRVL		12	12	15	4	4														21	
18+98	RT	GRVL		12	12	15	5	5														21	
19+23	LT	ASPH			12	20	28	18															41
19+86	RT	GRVL			12	14	6	6														20	
20+20	RT	ASPH/GRVL			12																		
21+70	RT	ASPH			12	22	6	6															31
22+63	LT	GRVL/CNC			12	50	28	10														78	
24+05	LT	ASPH			12	18	8	8				23					2						27
25+17	RT	ASPH			12	18	20	18															35
25+61	LT	GRVL			12	18	12	12														30	
28+79	RT	GRVL		12	12	18	8	8														27	
28+79	LT	GRVL		12	12	15	10	10														24	
29+11	LT	GRVL		12	12	14	10	10														23	
31+21	RT	CNC		12	12	22	4	4														30	
31+37	LT	GRVL		15	12	1	4	4														2	
31+65	RT	CNC		12	12	16	3	3														22	
32+38	LT	ASPH/CNC		18	12	18	12	12														30	
32+38	RT	ASPH/CNC		18	12																		
33+09	LT	ASPH		24	12	18	7	7															26
34+07	LT			24	12	18	10	10														28	
34+71	LT	ASPH		24	12	17	10	10															27
35+39	LT	GRVL		24	12	20	6	6														28	
36+01	LT	ASPH/CNC		24	12	15	8	8														23	
36+75	LT	ASPH		24	12	15	8	8															23
37+23	LT	ASPH		24	12	14	8	8															22
38+07	LT	ASPH		24	12	18	8	8															27
38+51	RT	ASPH			12	22	26	20															44
40+36	LT	ASPH			12	20	18	22		35					2								39
44+58	RT	GRVL	CMP	12	12	12	8	8														19	
53+13	RT	CNC	CMP	12	12	10	6	6		20					2							15	
53+80	RT	GRVL			12	30	15	15		38					2							48	
54+17	LT	ASPH	CMP	15	12	12	18	12			23					2							24
57+22	RT	GRVL	CMP	12	12	18	8	8		23					2							27	
58+29	LT	GRVL	RCP	15	12	16	16	12			22					2						29	
59+24	RT	GRVL	CMP	15	12	14	10	16			22					2						25	
59+95	LT	GRVL	CMP	12	12	14	16	14		20					2							27	
60+60	LT	GRVL		12	12	8	15	10		20						2						17	
61+95	LT	GRVL	RCP	12	12	12	12	12							2							22	
65+12	LT	ASPH	CMP	15	12	18	18	14			22					2				22			33
66+67	LT	GRVL	CMP	15	12	12	8	8			22					2				22		19	
68+72	LT	GRVL	CMP	15	12	12	13	13			18					2				18		23	
70+67	LT	ASPH			12	18	20	20				23					2						36
72+06	LT	GRVL	RCP	18	12	10	11	11									2					18	
74+77	RT	ASPH	CMP	12	12	14	20	24															33
75+25	LT	GRVL			12	12	9	9														20	
75+55	RT	ASPH			12	12	10	10							2								20
								SUBTOTAL	0	156	129	46	0	0	14	14	6	0	0	86	25	1,007	633

FM 121
QUANTITY SUMMARIES

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		9

DATE: $DATE$ $TIME$
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CK:
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SUMMARY OF DRIVEWAY ITEMS (CONTINUED)

STATION	RT/LT	EXIST SURFACE	EXIST PIPE	DIA.	LENGTH	WIDTH	R1	R2	104 6017 REMOVING CONC (DRIVEWAYS)	464 6001 RC PIPE (CL III)(12 IN)	464 6002 RC PIPE (CL III)(15 IN)	464 6003 RC PIPE (CL III)(18 IN)	464 6005 RC PIPE (CL III)(24 IN)	464 6008 RC PIPE (CL III)(36 IN)	467 6326 SET (TY II) (12 IN) (RCP) (6:1) (P)	467 6341 SET (TY II) (15 IN) (RCP) (6:1) (P)	467 6363 SET (TY II) (18 IN) (RCP) (6:1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P)	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P)	496 6007 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6016 DRIVEWAYS (BASE)	530 6005 DRIVEWAYS (ACP)
									SY	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	LF	SY	SY	SY
76+40	RT	ASPH			12	12	10	10		18					2					18			21
82+50	LT	GRVL	CMP	18	12	12	10	10				22					2			22		21	
85+02	LT	GRVL	CMP	18	12	12	10	10				22					2			22		21	
87+17	LT	DIRT	CMP	18	12	14	8	8				18					2					22	
90+35	RT	DIRT	CMP		12	22	24	18					28					2				49	
100+89	RT	CNCN	CMP	18	12	24	10	10				26					2			26	37		
100+89	LT	GRVL	CMP	18	12	11	10	10				44					2			26		19	
105+04	RT	GRVL	CMP	12	12	14	10	10		20					2					20		23	
108+82	RT	GRVL/CNC	RCP	12 X2	12	42	20	20							4							74	
110+60	RT	GRVL	RCP	12	12	52	10	10		10					2							74	
110+60	LT	GRVL			12	20	20	20				40					2					45	
115+32	RT	DIRT	PLASTIC	18	12	12	10	8				35					2			18		20	
115+50	LT	DIRT			12	15	10	8				22					2					24	
117+82	RT	GRVL	CMP	18	12	12	12	12				35					2			20		23	
123+76	RT	ASPH			12	20	30	24				25					2						57
124+21	LT	ASPH/GRVL	RCP	18	12	12	12	12				4				2						23	
124+99	LT	ASPH	RCP	18	12	12	10	10								2							21
128+84	LT	ASPH	RCP	18	12	10	12	12								2							20
133+39	LT	GRVL	CMP	24	12	14	12	12					22					2		22		26	
133+59	RT	GRVL	CMP	18	12	11	10	10				38					2			22		19	
138+70	LT	ASPH	CMP	36	12	22	20	20						34					2	34			47
143+10	RT	DIRT			12	15	5	5				20					2					22	
148+65	RT	DIRT			12	20	6	8				24					2					30	
152+03	RT	DIRT			12	20	10	10				25					2					31	
155+94	RT	GRVL	CMP	18	12	12	10	10				15					2			15		21	
161+77	LT	GRVL	CMP	18	12	11	5	8				22					2			22		18	
163+75	RT	GRVL	RCP	12	12	11	10	10							2							19	
165+53	LT	ASPH/GRVL	RCP	18	12	12	8	8									2					19	
168+41	LT	DIRT	CMP	12	12	12	8	5		20					2					20		19	
178+15	LT	GRVL	RCP		12	12	16	16					18					2				28	
178+15	RT	ASPH/GRVL	CMP	18	12	20	24	24				38					2			38		51	
179+34	LT	GRVL	CMP	18	12	12	10	10				32					2			24		21	
182+00	LT	GRVL	CMP	12	12	11	11	11		18					2					18		20	
182+00	RT	GRVL			12	36	24	24														73	
183+37	LT	ASPH			12	14	14	14				54					2						28
184+41	RT	GRVL			12	18	13	12				23					2					31	
192+40	LT	GRVL	CMP	24	12	16	12	15					22					2		22		30	
200+05	RT	GRVL	CMP	18	12	12	10	10				38					2			20		21	
201+03	RT	DIRT	CMP	18	12	21	8	8				28					2			28		31	
*203+89	RT	GRVL	CMP	24	12	21	11	11					80					2		60		64	
*204+37	RT	GRVL	CMP	24	12	18	11	11															
207+63	RT	GRVL	CMP	24	12	15	13	13					25					2		25		28	
212+50	LT	GRVL	RCP	12	12	12	14	12							2							24	
213+29	RT	ASPH	CMP	18	12	12	10	10				38					2			38			21
217+00	RT	GRVL			12	12	15	15														27	
218+06	RT	GRVL			12	12	14	6														21	
220+12	RT	GRVL			12	20	12	12				25					2					34	
222+88	RT	GRVL	CMP	18	12	12	18	8				25					2			25		24	
224+55	LT	GRVL	RCP	12	12	14	14	16				20					2			18		29	
225+79	RT	GRVL	CMP	15	12	15	14	12				20					2			18		28	
227+06	RT	GRVL	RCP	12	12	17	12	12				22					2			20		30	
228+87	RT	ASPH/GRVL	CMP	12	12	18	12	12		24					2					24		31	
229+86	LT	GRVL	CMP	15	12	15	10	12			22					2				22		26	
230+76	LT	GRVL			12	16	15	12			22					2						30	
231+18	RT	GRVL			12	20	10	10				25					2					31	
231+49	LT	GRVL	CMP	12	12	13	8	12				22					2			22		22	
239+90	RT	GRVL			12	18	8	12				22					2					29	
240+47	LT	ASPH/GRVL	CMP	12	12	16	16	15		20					2					20		33	
240+90	RT	ASPH			12	24	44	28				50					2						78
243+90	LT	ASPH			12	26	30	30				50					2						70
246+63	RT	ASPH/GRVL			12	15	15	15				30					2					31	
251+29	LT	GRVL	CMP	12	12	20	8	13		28					2					28		32	
251+29	RT	GRVL	PLASTIC	12	12	220	8	13		28					2							299	
254+44	LT	GRVL	CMP	12	12	14	5	12		20					2					20		22	
255+04	RT	GRVL			12	16	21	19		22					2							39	
255+46	LT	GRVL	CMP	15	12	34	12	12			50					2				50		52	
256+80	RT	GRVL	RCP	12	12	12	12	10				24					2			22		22	
260+98	RT	GRVL	CMP	12	12	20	14	14				40					2					36	
260+98	LT	ASPH			12	22	34	18															57
264+40	RT	GRVL	CMP	12	12	12	8	8		20					2					20		19	
268+00	RT	DIRT	RCP		12	15	5	5				20					2					22	
271+51	LT	GRVL			12	15	4	14				20					2					24	
272+10	RT	GRVL			12	23	38	23				50					2					67	
278+62	LT	ASPH	CMP	24	12	20	13	15					32					2		32			36
280+42	LT	GRVL	CMP	15	12	18	14	12				46						2		30		32	
280+42	RT	GRVL	CMP	18	12	14	17	12				22						2		22		29	
284+32	RT	GRVL	CMP	15	12	15	12	10				20					2			20		26	
284+32	LT	ASPH/GRVL	CMP	18	12	15	18	16				20					2			20		34	
285+82	LT	GRVL	CMP	12	12	16	20	22		60					2					52		41	
								SUBTOTAL	0	308	94	1,261	227	34	34	12	84	18	2	1,065	37	2,306	456

FM 121
QUANTITY SUMMARIES

SHEET 4 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		10

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

SUMMARY OF DRIVEWAY ITEMS (CONTINUED)

STATION	RT/LT	EXIST SURFACE	EXIST PIPE	DIA.	LENGTH	WIDTH	R1	R2	104 6017 REMOVING CONC (DRIVEWAYS) SY	464 6001 RC PIPE (CL III)(12 IN) LF	464 6002 RC PIPE (CL III)(15 IN) LF	464 6003 RC PIPE (CL III)(18 IN) LF	464 6005 RC PIPE (CL III)(24 IN) LF	464 6008 RC PIPE (CL III)(36 IN) LF	467 6326 SET (TY II) (12 IN) (RCP) (6:1) (P) EA	467 6341 SET (TY II) (15 IN) (RCP) (6:1) (P) EA	467 6363 SET (TY II) (18 IN) (RCP) (6:1) (P) EA	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P) EA	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P) EA	496 6007 REMOV STR (PIPE) LF	530 6004 DRIVEWAYS (CONC) SY	530 6016 DRIVEWAYS (BASE) SY	530 6005 DRIVEWAYS (ACP) SY
289+27	RT	GRVL	CMP	12	12	12	13	12		20					2			2		20		22	
292+85	LT	GRVL	CMP	15	12	15	13	13			32					2				52		28	
293+07	RT	GRVL	CMP	12	12	14	22	10		20					2					20		31	
297+63	LT	GRVL	CMP	18	12	21	13	13				25					2			25		36	
299+37	LT	GRVL/DIRT			12	23	48	35				58					2					88	
301+58	LT	ASPH	RCP	18	12	28	52	49				100					2			100			112
304+32	LT	ASPH	RCP	18	12	10	8	8				20					2			20			17
304+60	LT	DIRT	RCP	18	12	13	8	10				18					2			15		21	
305+20	RT	GRVL	RCP	24	12	15	10	12					50					2		22		26	
305+38	LT	GRVL	CMP	24	12	15	10	10										2				25	
306+20	LT	GRVL	CMP	24	12	25	8	13				33					2			33		39	
319+11	LT	GRVL	CMP	18	12	14	8	8				23					2			23		22	
319+50	RT	GRVL	CMP	24	12	30	20	32					58					2		58		68	
322+37	RT	ASPH	RCP	24	12	14	14	15										2					29
323+73	LT	GRVL	CMP	18	12	15	10	10				20					2			20		25	
328+05	RT	GRVL	RCP	18	12	10	6	16				26					4					19	
328+42	LT	GRVL/DIRT	CMP	15	12	10	11	10			24					2				24		19	
330+05	RT	GRVL	POLLY PIPE	18	12	11	7	10				36					4			36		18	
334+30	RT	DIRT	CMP	24	12	12	12	8				48					2			33		21	
335+67	LT	GRVL	CMP	12	12	13	15	15		28					2					28		28	
337+30	RT	GRVL	RCP	18	12	13	15	10									2					25	
338+97	LT	GRVL			12	15	20	23				30					2					41	
342+97	LT	ASPH	CMP	18	12	11	10	10				20					2			20			19
345+60	LT	GRVL	CMP	18	12	18	19	16				30					2			30		38	
348+25	LT	ASPH			12	21	10	10															33
349+50	LT	ASPH			12	25	19	13				42					2						45
352+30	RT	ASPH	RCP	12	12	9	6	6					20					2		15			15
360+30	RT	GRVL/ASPH	RCP	24	12	16	15	10										2				29	
363+38	lt	GRVL	RCP	18	12	11	10	9				20					2			20		19	
365+50	RT	ASPH	RCP	18	12	16	10	10								2							26
369+40	LT	GRVL			12	17	12	12				22					2					30	
371+40	RT	GRVL	CMP	15	12	13	10	14								2						24	
377+16	LT	ASPH/GRVL	CMP	18	12	22	15	15				40					2			40		40	
381+20	RT	GRVL	CMP	18	12	17	18	20				30					2			30		39	
383+00	LT	GRVL	CMP	24	12	15	12	12					22					2		22		27	
389+00	LT	DIRT			12	15	10	10				25						2				25	
389+00	RT	DIRT			12	15	10	10				25						2				25	
395+00	RT	GRVL	CMP	24	12	21	31	33					32					2		32		67	
396+06	LT	ASPH	CMP	12	12	14	13	15		20					2					20			28
402+00	LT	GRVL	CMP	12	12	14	6	10		22					2					22		22	
402+84	LT	GRVL	CMP	15	12	15	5	5				32					2			32		22	
407+00	LT	DIRT	CMP	15	12	15	8	8				22					2			22		23	
409+80	LT	GRVL			12	17	9	15				24					2					30	
415+82	LT	GRVL	CMP	15	12	14	8	10			24					2				24		23	
420+15	LT	GRVL	CMP	15	12	18	10	10			32					2				32		29	
422+85	RT	CNC	CMP	12	12	16	9	9		36					2					36		25	
424+51	LT	ASP			12	12	16	20		20		20					2					31	
431+38	LT	GRVL	CMP	18	12	20	10	15				32					2			32		34	
436+10	LT	GRVL		12	12	15	5	5		20	20				2					20		22	
440+58	LT	DIRT	CMP	15	12	17	12	13			38					2				32		30	
440+58	RT	GRVL	CMP	15	12	16	15	15			32					2				32		32	
445+60	LT	ASPH	CMP	12	12	13	8	8		32					2					32			21
451+96	RT	GRVL	RCP	24	12	12	6	6														19	
460+55	LT	GRVL	CMP	18	12	11	11	11				32					2			32		20	
464+02	LT	ASPH	CMP	12	12	12	15	12		20					2					20			25
468+77	LT	ASPH			12	13	16	16				60					2						29
469+20	RT	GRVL			12	23	46	60														111	
469+85	RT	ASPH			12	23	46	60														11	
472+92	LT	ASPH	CMP	18	12	15	15	15				24					2			25			31
473+55	RT	GRVL			12	9	16	15				30					2					23	
474+22	LT	GRVL	CMP	18	12	15	15	15				22					2			22		31	
477+30	RT	GRVL			12	27	27	26				56					2					65	
477+30	LT	ASPH			12	23	35	25				72					2						66
481+56	LT	ASPH	CMP	12	12	15	15	10				20					2			20			27
484+27	LT	GRVL			12	20	27	20				50					2					51	
484+27	RT	ASPH			12	21	16	18				42					2						42
485+63	LT	ASPH		18	12	16	10	10				26					2			22			26
489+28	LT	GRVL	CMP	18	12	15	10	15				24					2			24		27	
								SUBTOTAL	0	238	202	1,279	182	0	18	16	78	20	0	1,239	0	1,646	591

FM 121
QUANTITY SUMMARIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		11

CK1: DW1: CK2: DN1:

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

SUMMARY OF DRIVEWAY ITEMS (CONTINUED)

STATION	RT/LT	EXIST SURFACE	EXIST PIPE	DIA.	LENGTH	WIDTH	R1	R2	104 6017 REMOVING CONC (DRIVEWAYS) SY	464 6001 RC PIPE (CL III)(12 IN) LF	464 6002 RC PIPE (CL III)(15 IN) LF	464 6003 RC PIPE (CL III)(18 IN) LF	464 6005 RC PIPE (CL III)(24 IN) LF	464 6008 RC PIPE (CL III)(36 IN) LF	467 6326 SET (TY II) (12 IN) (RCP) (6:1) (P) EA	467 6341 SET (TY II) (15 IN) (RCP) (6:1) (P) EA	467 6363 SET (TY II) (18 IN) (RCP) (6:1) (P) EA	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P) EA	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P) EA	496 6007 REMOV STR (PIPE) LF	530 6004 DRIVEWAYS (CONC) SY	530 6016 DRIVEWAYS (BASE) SY	530 6005 DRIVEWAYS (ACP) SY
489+50	LT	GRVL	CMP	18	12	15	10	15				24					2			24		27	
494+95	LT	GRVL			12	16	17	15				30					2					33	
497+75	LT	GRVL	CMP	18	12	12	10	8				50					2			24		20	
498+00	LT	GRVL	RCP	18	12	12	7	7				35					2			35		19	
499+62	LT	GRVL	RCP	12	12	10	5	5		32					2					32		16	
500+63	LT	ASPH	CMP	12	12	10	10	10		25					2					25			18
503+06	LT	ASPH			12	20	35	18				30					2						56
503+06	RT	GRVL			12	20	14	20				30					2					40	
504+33	RT	DIRT	RCP	12	12	12	12	12		20					2					20		23	
505+72	LT	DIRT	CMP	24	12	12	3	3												15		18	
506+45	LT	ASPH	RCP	12	12	10	8	9							2								17
506+90	LT	DIRT	RCP	12	12	10	5	5							2							16	
508+55	LT	GRVL	CMP	18	12	15	20	15				38					2			38		34	
509+56	RT	GRVL	CMP	18	12	22	7	7				32					2			32		32	
510+07	LT	GRVL	RCP	18	12	12	8	10				24					2			20		20	
514+52	RT	GRVL	PVC	18	12	20	9	9		32					2					32		31	
515+25	LT	GRVL			12	25	20	20														51	
515+71	RT	CNC WLK	RCP	12	12	6	5	5	10											10		9	
516+18	RT	ASPH/GRVL	RCP	18	12	12	8	8				20					2			20		19	
517+01	LT	RCP	CMP	24	12	12	10	10					22					2		22		21	
518+31	RT	GRVL	METAL	24	12	31	27	15					40					2		40		61	
520+64	RT	ASPH			12	20	20	12				40					2						39
522+58	RT	ASPH			12	17	20	20				22					2						40
525+50	LT	ASPH			12	12	10	10															21
532+25	LT	ASPH			12	16	0	12		25					2								25
545+35	RT	ASPH	CMP	15	12	12	10	12			20					2	2			20			22
549+19	RT	ASPH	CMP	15	12	15	10	10			20					2	2			20			25
553+70	RT	ASPH	RCP	15	12	15	15	10								2							27
556+22	RT	GRVL	CMP	12	12	12	6	6				22					2			22		19	
565+95	RT	GRVL	CMP	18	12	15	11	11				20					2			20		26	
570+00	RT	GRVL	METAL	24	12	15	8	12					35					2		35		25	
SUBTOTAL									10	134	40	417	97	0	14	6	32	6	0	506	0	560	290
TOTAL									10	836	465	3,003	506	34	80	48	200	44	2	2,896	62	5,519	1,970

FM 121
QUANTITY SUMMARIES

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		12

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

CK: DW: CK: DN:

DATE: 1/17/2023 3:39:26 PM
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DN: | CK: | DW: | CK:

SUMMARY OF MAILBOX ITEMS

STA.	LT/RT	530 6008 TURNOUTS (ACP) SY	560 6007 MAILBOX INSTALL-S (WC-POST) TY 3 EA	560 6008 MAILBOX INSTALL-D (WC-POST) TY 3 EA	560 6003 MAILBOX INSTALL-M (TWG-POST) TY 1 EA
12+17	RT		1		
13+30	RT		1		
15+59	RT			1	
16+55	RT		1		
19+40	RT				1
21+30	RT		1		
24+40	RT			1	
25+65	RT				1
28+10	RT				1
29+11	RT		1		
31+38	RT			1	
34+47	LT				
36+20	RT		1		
37+98	RT		1		
55+10	RT	30	1		
62+02	RT	30	1		
66+83	RT	30	1		
75+24	RT	30	1		
101+45	RT	30	1		
111+08	RT	30	1		
115+20	RT	30	1		
117+96	RT	30	1		
124+79	RT	30	1		
129+44	RT	30	1		
133+25	RT	30	1		
134+00	RT	30	1		
177+86	LT	30	1		
179+07	LT	30		1	
182+00	RT		1		
199+86	RT	30	1		
203+64	RT	30	1		
204+58	RT	30	1		
207+80	RT	30	1		
212+35	LT	30	1		
213+54	RT	30	1		
216+72	RT	30	1		
217+88	RT	30	1		
220+38	RT	30	1		
223+07	RT	30	1		
224+92	LT	30		1	
226+90	RT	30	1		
229+47	LT	30	1		
230+92	LT	30	1		
239+67	RT	30	1		
240+25	LT	30	1		
246+27	RT	30	1		
251+54	LT	30	1		
254+86	LT	30		1	
256+95	RT	30	1		
260+70	LT	30	1		
264+06	RT	30	1		
271+17	LT	30	1		
278+31	LT	30		1	
280+02	LT	30		1	
280+64	RT	30	1		
284+65	RT	30	1		
285+50	LT	30	1		
289+00	RT	30	1		
292+55	LT	30		1	
293+30	RT	30	1		
299+15	RT	30	1		
SUBTOTAL		1,380	48	9	3

SUMMARY OF MAILBOX ITEMS (CONTINUED)

STA.	LT/RT	530 6008 TURNOUTS (ACP) SY	560 6007 MAILBOX INSTALL-S (WC-POST) TY 3 EA	560 6008 MAILBOX INSTALL-D (WC-POST) TY 3 EA	560 6003 MAILBOX INSTALL-M (TWG-POST) TY 1 EA
304+85	RT	30			1
318+00	RT	30		1	
327+77	RT	30	1		
334+49	LT	30	1		
337+43	RT	30		1	
338+55	RT	30	1		
342+62	LT	30	1		
346+68	LT	30		1	
350+74	RT	30	1		
354+81	LT	30	1		
358+87	RT	30	1		
360+50	RT				1
363+80	RT		1		
371+30	RT				1
377+25	RT		1		
383+70	RT	30	1		
396+54	RT	30	1		
399+95	RT	30		1	
410+08	RT				1
424+51	RT	30	1		
431+30	RT	30	1		
441+00	RT	30	1		
460+55	RT	30	1		
464+02	RT		1		
468+95	LT	30	1		
473+20	LT	30	1		
485+70	RT	30		1	
489+20	RT	30	1		
497+76	LT	30	1		
499+50	LT	30	1		
505+00	LT	30	1		
508+70	LT	30	1		
546+20	LT	30	1		
553+70	LT	30	1		
556+22	LT	30	1		
565+95	LT	30	1		
SUBTOTAL		960	27	5	4
PROJECT TOTAL		2,340	78	14	7

FM 121
QUANTITY SUMMARIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		13

SUMMARY OF DRAINAGE ITEMS

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	104 6067 REMOVING CONC (SAWCUT) LF	110 6002 EXCAVATION (CHANNEL) CY	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B) CY	156 6001 BULLDOZER WORK HR	158 6003 SPEC EXCAV WORK (HYD EXCAVATOR) HR	400 6008 CUT & RESTORE ASPH PAVING SY	401 6001 FLOWABLE BACKFILL CY	402 6001 TRENCH EXCAVATION PROTECTION LF	403 6001 TEMPORARY SPL SHORING SF
20+72	8' x 4' BOX	10X10 SRR			37				71		
26+46	18" CMP PIPE	18" RCP						9	5	48	20
39+62	2 - 48" CMP PIPE	6' x5' BOX			28	16	16	29	20	61	72
63+68	36" CMP PIPE	36" RCP		8	8			13	7	31	15
93+41	36" CMP PIPE	36" RCP			8			18	7	40	18
169+40	36" CMP PIPE	36" RCP			37			13	7	49	56
175+42	36" CMP PIPE	36" RCP		8	37			11		38	35
221+66	24" CMP PIPE	24" RCP			37			11	5	29	30
233+39	24" CMP PIPE	24" RCP			21			11		31	36
243+46	36" CMP PIPE	24" RCP			8			13	5	36	35
250+49	44" CMP PIPE	42" RCP			21			15	20	45	53
258+01	30" CMP PIPE	30" RCP			37			12	12	35	35
265+31	2 - 30" CMP PIPE	2 - 30" RCP			37			21	14	32	33
274+81	36" CMP PIPE	36" RCP		20	13			13	11	34	35
276+48	36" CMP PIPE	36" RCP			12			26	17	42	35
296+65	30" CMP PIPE	30" RCP			7			13		38	26
307+50	60" RCP PIPE	60" RCP		20	34					15	
315+08	36" CMP PIPE	36" RCP		20	34			13	26	65	215
332+41	60" RCP PIPE				14					14	8
345+00	18" RCP PIPE				16						40
356+80	2 - 7' X 5' BOX				21				15		
386+49	60" RCP PIPE	60" RCP			23					15	
418+62	24" RCP PIPE				6						
430+70	30" RCP PIPE				9						
436+90	24" RCP PIPE				7			13	5		
478+40	18" RCP PIPE				9						
485+00	24" RCP PIPE				9						
498+08	24" RCP PIPE				10						
502+87	18" RCP PIPE				11						
511+60	9' X 5' BOX		25		28						
515+52	24" CMP PIPE	24" RCP			10			72	8	45	24
523+27	24" RCP PIPE				24						
560+06	30" CMP PIPE	30" RCP		100	5			12	21	44	65
		PROJECT TOTAL	25	176	618	16	16	338	276	787	886

FM 121
QUANTITY SUMMARIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		14

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SUMMARY OF DRAINAGE ITEMS (CONTINUED)

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	432 6031 RIPRAP (STONE PROTECTION)(12 IN) CY	462 6002 CONC BOX CULV (3 FT X 3 FT) LF	462 6012 CONC BOX CULV (6 FT X 5 FT) LF	464 6003 RC PIPE (CL III)(18 IN) LF	464 6005 RC PIPE (CL III)(24 IN) LF	464 6007 RC PIPE (CL III)(30 IN) LF	464 6008 RC PIPE (CL III)(36 IN) LF	464 6009 RC PIPE (CL III)(42 IN) LF	464 6012 RC PIPE (CL III)(60 IN) LF	466 6099 HEADWALL (CH - PW - Ø) (DIA= 30 IN) EA	466 6101 HEADWALL (CH - PW - Ø) (DIA= 36 IN) EA	466 6102 HEADWALL (CH - PW - Ø) (DIA= 42 IN) EA
20+72	8' x 4' BOX	10X10 SRR	6											
26+46	18" CMP PIPE	18" RCP				48								
39+62	2 - 48" CMP PIPE	6' x5' BOX			61									
63+68	36" CMP PIPE	36" RCP	10						52					
93+41	36" CMP PIPE	36" RCP							68					
169+40	36" CMP PIPE	36" RCP							62				2	
175+42	36" CMP PIPE	36" RCP							48					
221+66	24" CMP PIPE	24" RCP	6				56							
233+39	24" CMP PIPE	24" RCP	6				64							
243+46	36" CMP PIPE	24" RCP					42							
250+49	44" CMP PIPE	42" RCP								55				1
258+01	30" CMP PIPE	30" RCP						52						
265+31	2 - 30" CMP PIPE	2 - 30" RCP						104				1		
274+81	36" CMP PIPE	36" RCP							52					
276+48	36" CMP PIPE	36" RCP							52					
296+65	30" CMP PIPE	30" RCP	5					52						
307+50	60" RCP PIPE	60" RCP	13											
315+08	36" CMP PIPE	36" RCP	13	70										
332+41	60" RCP PIPE		7											
345+00	18" RCP PIPE					8								
356+80	2 - 7' X 5' BOX													
386+49	60" RCP PIPE	60" RCP	8								6			
418+62	24" RCP PIPE		8											
430+70	30" RCP PIPE													
436+90	24" RCP PIPE						40							
478+40	18" RCP PIPE					4								
485+00	24" RCP PIPE													
498+08	24" RCP PIPE						46							
502+87	18" RCP PIPE													
511+60	9' X 5' BOX		17											
515+52	24" CMP PIPE	24" RCP					72							
523+27	24" RCP PIPE						20							
560+06	30" CMP PIPE	30" RCP						82						
PROJECT TOTAL			99	70	61	60	340	290	334	55	6	1	2	1

FM 121
QUANTITY SUMMARIES

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		15

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

SUMMARY OF DRAINAGE ITEMS (CONTINUED)

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	466 6132 HEADWALL (CH - PW - S) (DIA= 30 IN)	466 6134 HEADWALL (CH - PW - S) (DIA= 36 IN)	466 6137 HEADWALL (CH - PW - S) (DIA= 54 IN)	466 6138 HEADWALL (CH - PW - S) (DIA= 60 IN)	466 6196 WINGWALL (PW - 2) (HW=7 FT)	466 6197 WINGWALL (PW - 2) (HW=8 FT)	467 6358 SET (TY II) (18 IN) (RCP) (4:1) (C)	467 6390 SET (TY II) (24 IN) (RCP) (4:1) (C)	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P)
			EA	EA	EA	EA	EA	EA	EA	EA	EA
20+72	8' x 4' BOX	10X10 SRR									
26+46	18" CMP PIPE	18" RCP							2		
39+62	2 - 48" CMP PIPE	6' x5' BOX					2				
63+68	36" CMP PIPE	36" RCP									
93+41	36" CMP PIPE	36" RCP									
169+40	36" CMP PIPE	36" RCP									
175+42	36" CMP PIPE	36" RCP									
221+66	24" CMP PIPE	24" RCP								2	
233+39	24" CMP PIPE	24" RCP								2	
243+46	36" CMP PIPE	24" RCP								2	
250+49	44" CMP PIPE	42" RCP									
258+01	30" CMP PIPE	30" RCP	1								
265+31	2 - 30" CMP PIPE	2 - 30" RCP									
274+81	36" CMP PIPE	36" RCP									
276+48	36" CMP PIPE	36" RCP	1								
296+65	30" CMP PIPE	30" RCP		1							
307+50	60" RCP PIPE	60" RCP				2					
315+08	36" CMP PIPE	36" RCP						2			
332+41	60" RCP PIPE				2						
345+00	18" RCP PIPE								2		
356+80	2 - 7' X 5' BOX										
386+49	60" RCP PIPE	60" RCP				2					
418+62	24" RCP PIPE									2	
430+70	30" RCP PIPE										
436+90	24" RCP PIPE									2	
478+40	18" RCP PIPE								2		
485+00	24" RCP PIPE									2	
498+08	24" RCP PIPE									1	2
502+87	18" RCP PIPE								2		
511+60	9' X 5' BOX										
515+52	24" CMP PIPE	24" RCP								2	
523+27	24" RCP PIPE									1	2
560+06	30" CMP PIPE	30" RCP									
		PROJECT TOTAL	2	1	2	4	2	2	8	16	4

FM 121
QUANTITY SUMMARIES

SHEET 10 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		16

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DN: | CK: | DW: | CK:

SUMMARY OF DRAINAGE ITEMS (CONTINUED)

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	467 6417 SET (TY II) (30 IN) (RCP) (3:1) (C)	467 6419 SET (TY II) (30 IN) (RCP) (4:1) (C)	467 6423 SET (TY II) (30 IN) (RCP) (6:1) (P)	467 6450 SET (TY II) (36 IN) (RCP) (4:1) (C)	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P)	467 6463 SET (TY II) (42 IN) (RCP) (4:1) (C)	472 6006 REMOV & RE-LAY PIPE (24 IN)	472 6008 REMOV & RE-LAY PIPE (30 IN)	472 6014 REMOV & RE-LAY PIPE (54 IN)	496 6007 REMOV STR (PIPE)	496 6008 REMOV STR (BOX CULVERT)	658 6047 INSTL OM ASSM (OM-2Y)(WC)GND
			EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	LF	EA
20+72	8' x 4' BOX	10X10 SRR												2
26+46	18" CMP PIPE	18" RCP										48		2
39+62	2 - 48" CMP PIPE	6' x5' BOX										122		4
63+68	36" CMP PIPE	36" RCP				2						52		2
93+41	36" CMP PIPE	36" RCP				2	1						60	2
169+40	36" CMP PIPE	36" RCP										62		4
175+42	36" CMP PIPE	36" RCP		2								44		2
221+66	24" CMP PIPE	24" RCP										45		2
233+39	24" CMP PIPE	24" RCP										56		2
243+46	36" CMP PIPE	24" RCP										42		2
250+49	44" CMP PIPE	42" RCP						1				55		4
258+01	30" CMP PIPE	30" RCP	1									46		4
265+31	2 - 30" CMP PIPE	2 - 30" RCP		4								104		4
274+81	36" CMP PIPE	36" RCP				2						48		2
276+48	36" CMP PIPE	36" RCP				1						46		4
296+65	30" CMP PIPE	30" RCP	1									47		2
307+50	60" RCP PIPE	60" RCP										12		2
315+08	36" CMP PIPE	36" RCP										67		4
332+41	60" RCP PIPE										12			4
345+00	18" RCP PIPE	0+00										6		2
356+80	2 - 7' X 5' BOX													2
386+49	60" RCP PIPE	60" RCP										6		4
418+62	24" RCP PIPE								8					2
430+70	30" RCP PIPE			2						4				2
436+90	24" RCP PIPE											40		2
478+40	18" RCP PIPE											8		2
485+00	24" RCP PIPE													2
498+08	24" RCP PIPE											6		2
502+87	18" RCP PIPE													2
511+60	9' X 5' BOX													2
515+52	24" CMP PIPE	24" RCP											12	2
523+27	24" RCP PIPE											6		2
560+06	30" CMP PIPE	30" RCP		1	2							55		2
		SUBTOTAL	2	9	2	7	1	1	8	4	12	1023	72	84

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QUANTITY SUMMARIES

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CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		17

DATE: $DATE$ $TIME$
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CK:
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SUMMARY OF EROSION CONTROL ITEMS

STATION	LT/RT		506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)
	LT	RT	LF	LF	LF	LF
12+00	20	20			40	40
17+50	20	20			30	30
20+72	20	20	40	40		
30+00	20	20			40	40
39+62	20	20	40	40		
45+00	20	20			40	40
50+00	20	20			40	40
55+00	20	20			40	40
63+68	20	20	40	40		
70+00	20	20			40	40
75+00	20	20			40	40
80+00	20	20			40	40
85+00	20	20			40	40
90+00	20	20			40	40
93+41	20	20	40	40		
100+00	20	20			40	40
110+00	20	20			40	40
115+00	20	20			40	40
120+00	20	20			40	40
125+00	20	20			40	40
135+00	20	20			40	40
140+00	20	20			40	40
145+02 - 146+53	20	20	40	40		
150+00	20	20			40	40
155+00	20	20			40	40
160+00	20	20			40	40
169+40	20	20	40	40		
175+42	20	20	40	40		
180+00	20	20			40	40
185+00	20	20			40	40
190+00	20	20			40	40
196+95 197+90	20	20	40	40		
205+00	20	20			40	40
210+00	20	20			40	40
215+00	20	20			40	40
221+60	20	20	40	40		
225+50	20	20			40	40
230+00	20	20			40	40
233+39	20	20	40	40		
243+46	20	20	40	40		
247+00	20	20			40	40
250+49	20	20	40	40		
258+15	20	20	40	40		
265+31	20	20	40	40		
274+92	20	20	40	40		
276+48	20	20	40	40		
281+00	20	20			40	40
285+00	20	20			40	40
290+00	20	20			40	40
296+36	20	20	40	40		
300+00	20	20			40	40
		SUBTOTAL	680	680	1,310	1,310

SUMMARY OF EROSION CONTROL ITEMS CONTUNIED

STATION	LT/RT		506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)
	LT	RT	LF	LF	LF	LF
305+00	20	20			40	40
307+50	20	20	40	40		
310+00	20	20			40	40
315+29	20	20	40	40		
320+00	20	20			40	40
325+00	20	20			40	40
332+79	20	20	40	40		
340+00	20	20			40	40
345+08	20	20	40	40		
356+80	20	20	40	40		
360+00	20	20			40	40
365+00	20	20			40	40
375+00	20	20			40	40
380+00	20	20			40	40
386+49 - 386+72	20	20	40	40		
393+00	20	20			40	40
405+00	20	20			40	40
411+00	20	20			40	40
415+00	20	20			40	40
418+62	20	20	40	40		
422+00	20	20			40	40
430+72	20	20	40	40		
434+00	20	20			40	40
442+00	20	20			40	40
450+00	20	20			40	40
454+79 - 456+19	20	20	40	40		
460+00	20	20			40	40
475+00	20	20			40	40
478+40	20	20	40	40		
482+00	20	20			40	40
485+14	20	20	40	40		
490+00	20	20			40	40
498+10 - 498+32	20	20	40	40		
502+87	20	20	40	40		
505+00	20	20			40	40
511+68	20	20	40	40		
516+02	20	20	40	40		
523+43	20	20	40	40		
530+00	20	20			40	40
538+42	20	20	40	40		
545+00	20	20			40	40
550+00	20	20			40	40
555+00	20	20			40	40
560+28	20	20	40	40		
565+00	20	20			40	40
570+00	20	20			40	40
		SUBTOTAL	720	720	1120	1120
		PROJECT TOTAL	1,400	1,400	2,430	2,430

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FM 121
QUANTITY SUMMARIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		18

SUMMARY OF PAVEMENT MARKING ITEMS - WORKZONE

STA.		LENGTH	662 6008 WK ZN PAV MRK NON-REMOV (W)6"(SLD)	662 6035 WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	662 6037 WK ZN PAV MRK NON-REMOV (Y)6"(SLD)		662 6111 WK ZN PAV MRK SHT TERM (TAB)TY Y-2	666 6182 REFL PAV MRK TY II (W) 24" (SLD)	662 6023 WK ZN PAV MRK NON-REMOV (W)(RR XING)
FROM	TO	LF	LF	LF	LF		EA	LF	EA
					LT	RT			
7+07	7+95	88	176		88	88	26		
7+95	8+54	59	118				0	20	1
8+54	25+74	1,720	3,440		1,720	1,720	516	53	
25+74	36+28	1,054	2,108	260	1,054		217		
36+28	38+00	172	344	40			9		
38+00	50+35	1,235	2,470	310		1,235	255	22	
50+35	77+23	2,688	5,376		2,688	2,688	806	11	
77+23	88+85	1,162	2,324	290	1,162		240		
88+85	93+17	432	864	110			25	13	
93+17	100+53	736	1,472	180		736	151		
100+53	124+51	2,398	4,796		2,398	2,398	719	13	
124+51	134+17	966	1,932	240	966		199		
134+17	137+95	378	756	90			20		
137+95	145+00	705	1,410	180		705	146	12	
145+00	146+93	193	386		193	193	58		
146+93	154+12	719	1,438	180	719		148		
154+12	156+77	265	530	70			16		
156+77	165+70	893	1,786	220		893	183		
165+70	198+39	3,269	6,538		3,269	3,269	981	24	
198+39	209+53	1,114	2,228	280	1,114		230		
209+53	218+41	888	1,776	220			50		
218+41	230+20	1,179	2,358	290		1,179	242		
230+20	316+76	8,656	17,312		8,656	8,656	2,597	56	
316+76	329+20	1,244	2,488	310	1,244		256	15	
329+20	335+52	632	1,264	160			36		
335+52	348+92	1,340	2,680	340		1,340	278	34	
348+92	350+63	171	342		171	171	51		
350+63	357+46	683	1,366	170	683		141	15	
357+46	362+74	528	1,056		528	528	158		
362+74	369+34	660	1,320	170		660	137		
369+34	371+98	264	528		264	264	79		
371+98	378+90	692	1,384	170	692		142		
378+90	383+80	490	980		490	490	147		
383+80	390+75	695	1,390	170		695	143		
390+75	401+62	1,087	2,174		1,087	1,087	326		
401+62	413+03	1,141	2,282	290	1,141		236		
413+03	414+56	153	306	40			9		
414+56	421+58	702	1,404	180		702	146		
421+58	426+70	512	1,024	130			29		
426+70	429+52	282	564	70	282		58		
429+52	435+03	551	1,102		551	551	165		
435+03	441+28	625	1,250	160		625	130		
441+28	461+92	2,064	4,128		2,064	2,064	619		
461+92	470+41	849	1,698	210		849	175	24	
470+41	531+93	6,152	12,304		6,152	6,152	1,846	104	
531+93	535+90	397	794	100	397		82		
535+90	542+94	704	1,408		704	704	211		
542+94	554+48	1,154	2,308	290		1,154	238		
554+48	558+90	442	884	110	442		91		
558+90	565+64	674	1,348		674	674	202		
565+64	673+20	10,756	21,512	2,690		10,756	2,219	30	
PROJECT TOTAL			133,226	8,720	94,819		16,185	446	1

* WORK ZONE TAB MARKINGS CALCULATED BASE ON 3 TAB APPLICATIONS

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

FM 121
QUANTITY SUMMARIES

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		19

CK1: DW1: CK2: DN1:
DATE: $DATE$ $TIME$
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CK:
DW:
CK:
DN:

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION		LENGTH	666 6343	666 6346	666 6347		666 6048	672 6009	666 6093	666 6224
			REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	REF PROF PAV MRK TY I(Y)6"(BRK)(100MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)		REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A	REFL PAV MRK TY I (W)(RR XING)(100MIL)	PAVEMENT SEALER 4"
FROM	TO	LF	LF	LF	LF		LF	EA	EA	LF
					LT	RT				
7+07	7+95	88	176		88	88		2		
7+95	8+54	59	118				20	1	2	
8+54	25+74	1,720	3,440		1,720	1,720	53	43		
25+74	36+28	1,054	2,108	260	1,054			26		
36+28	38+00	172	344	40				4		
38+00	50+35	1,235	2,470	310		1,235	22	31		
50+35	77+23	2,688	5,376	670	2,688	2,688	11	67		
77+23	88+85	1,162	2,324	290	1,162			29		
88+85	93+17	432	864	110			13	11		
93+17	100+53	736	1,472	180		736		18		
100+53	124+51	2,398	4,796		2,398	2,398	13	60		
124+51	134+17	966	1,932	240	966			24		
134+17	137+95	378	756	90				9		
137+95	145+00	705	1,410	180		705	12	18		
145+00	146+93	193	386		193	193		5		150
146+93	154+12	719	1,438	180	719			18		
154+12	156+77	265	530	70				7		
156+77	165+70	893	1,786	220		893		22		
165+70	198+39	3,269	6,538		3,269	3,269	24	82		
198+39	209+53	1,114	2,228	280	1,114			28		90
209+53	218+41	888	1,776	220				22		
218+41	230+20	1,179	2,358	290		1,179		29		
230+20	316+76	8,656	17,312		8,656	8,656	56	216		
316+76	329+20	1,244	2,488	310	1,244		15	31		
329+20	335+52	632	1,264	160				16		
335+52	348+92	1,340	2,680	340		1,340	34	34		
348+92	350+63	171	342		171	171		4		
350+63	357+46	683	1,366	170	683		15	17		
357+46	362+74	528	1,056		528	528		13		
362+74	369+34	660	1,320	170		660		17		
369+34	371+98	264	528		264	264		7		
371+98	378+90	692	1,384	170	692			17		
378+90	383+80	490	980		490	490		12		
383+80	390+75	695	1,390	170		695		17		
390+75	401+62	1,087	2,174		1,087	1,087		27		
401+62	413+03	1,141	2,282	290	1,141			29		
413+03	414+56	153	306	40				4		
414+56	421+58	702	1,404	180		702		18		
421+58	426+70	512	1,024	130				13		
426+70	429+52	282	564	70	282			7		
429+52	435+03	551	1,102		551	551		14		
435+03	441+28	625	1,250	160		625		16		
441+28	461+92	2,064	4,128		2,064	2,064		52		140
461+92	470+41	849	1,698	210		849	24	21		
470+41	531+93	6,152	12,304		6,152	6,152	104	154		
531+93	535+90	397	794	100	397			10		
535+90	542+94	704	1,408		704	704		18		
542+94	554+48	1,154	2,308	290		1,154		29		
554+48	558+90	442	884	110	442			11		
558+90	565+64	674	1,348		674	674		17		
565+64	673+20	10,756	21,512	2,690		10,756	30	269		
PROJECT TOTAL			133,226	9,390	94,819		446	1,666	2	380

SUMMARY OF PAVEMENT MARKING ITEMS - BRIDGES

LOCATION		678 6002	666 6225	677 6001
		PAV SURF PREP FOR MRK (6")	PAVEMENT SEALER 6"	ELIM EXT PAV MRK & MRKS (4")
FROM	TO	LF	LF	LF
BRIDGES				
W SISTER GROVE CREEK				
145+02	146+53	302	302	302
E SISTER GROVE CREEK				
196+95	197+90	190	190	190
W FORK PILOT GROVE CREEK				
454+79	456+19	280	280	280
PROJECT TOTAL		772	772	772

* WORK ZONE TAB MARKINGS CALCULATED BASE ON 3 TAB APPLICATIONS

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

DATE: $DATE$ $TIME$
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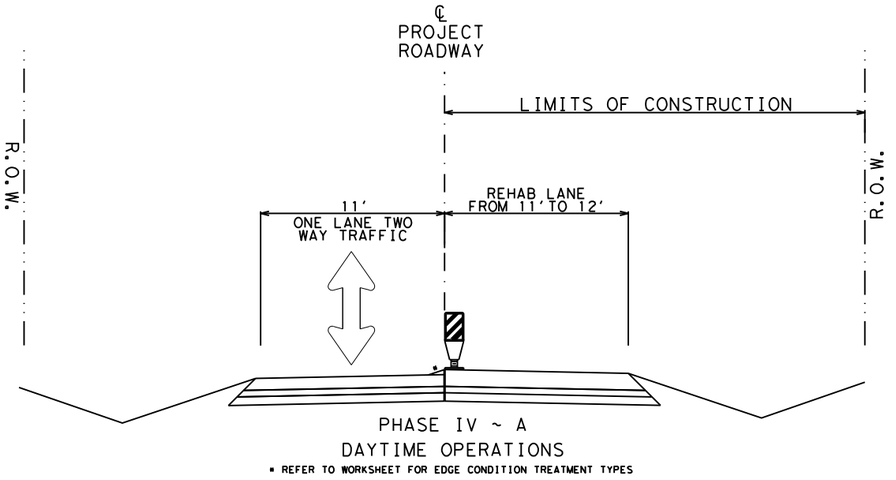
QUANTITY SUMMARIES

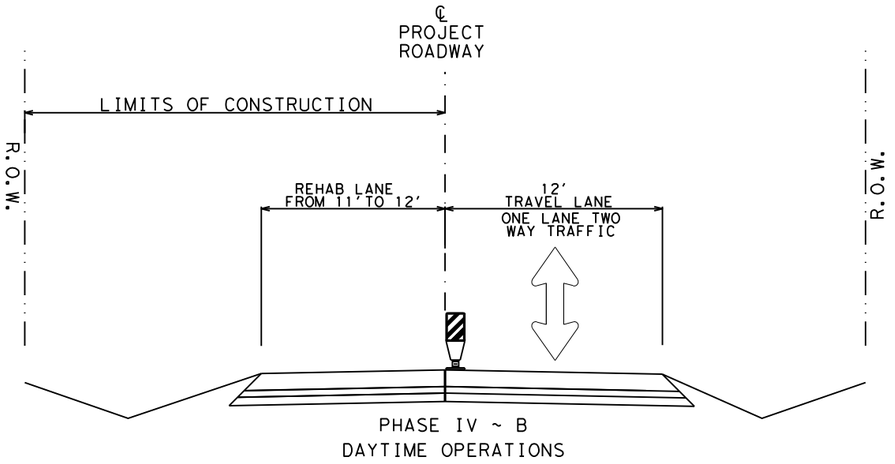
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		20

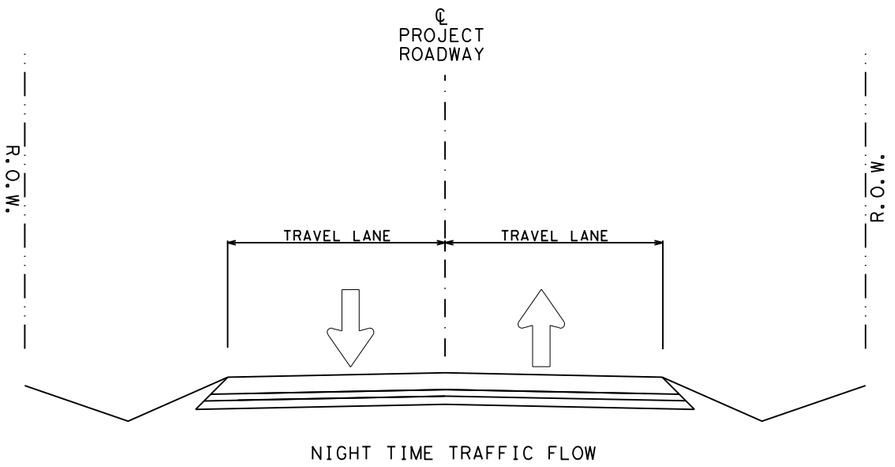


PHASE IV ~ A
DAYTIME OPERATIONS

▪ REFER TO WORKSHEET FOR EDGE CONDITION TREATMENT TYPES



PHASE IV ~ B
DAYTIME OPERATIONS



NIGHT TIME TRAFFIC FLOW

Phase I ~ Initial Traffic Control

Install project limit traffic control devices (TCD) per the BC standard sheets. Utilize the applicable TCP (2-1)-18 or TCP (2-2b)-18 layout for TCD installation.

Phase II ~ Erosion Control

Install erosion control devices utilizing the applicable TCP (2-1)-18 layout or TCP (2-2b)-18.

Phase III ~ Culvert Work (Cross and Parallel Culverts)

Perform off-pavement culvert operations utilizing the applicable TCP (2-1)-18 layout.

Perform on-pavement culvert operations utilizing TCP(2-2b)-18.

Culvert work may proceed in advance of roadway rehabilitation when approved by the Engineer. Adhere to the Worksheet for Edge Condition Treatment Types.

Phase IV ~ Roadway Rehabilitation

Refer to the Traffic Control Plan (TCP) Typical Sections for construction work area and traffic flow.

Perform planing and HMAC overlay operations and install work zone pavement markings utilizing TCP (2-2b-18) with piliot car.

Limit roadway rehabilitation operations to 2.0 mile sections. Prior to advancement to the next section, all backfilling and temporary seeding must be completed and the section be approved by the Engineer. Adhere to the Worksheet for Edge Condition Treatment Types. Submit a Trench Excavation Protection and Temporary Shoring plan to the Engineer to protect workers and prevent roadway excacation collapse.

Phase V ~ Final Pavement Markings

Install final pavement markings using TCP(3-1)-13 and TCP(3-3)-14.

Phase VI ~ Backfill, Sign and Seeding Operations

Perform pavement backfill operations, sign installation and seeding utilizing TCP(2-1)-18 or TCP (2-2b-08) as required.

Phase VII ~ Project Clean Up

Remove erosion control devices, construction debris and waste material utilizing TCP (2-1)-18.

Notes: Prior to a specific construction operation, the traffic control standard specified for the construction phase in this narrative must be evaluated thoroughly for appropriateness. All traffic control operations must adhere to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and the applicable Traffic Control Standards. Construction phase order may be varied when approved by the Engineer. Submit a Work and Traffic Control Sequence plan to the Engineer for approval. Ensure that both travel lanes are open at night. Provide access to private property and Public Roads at all times. Provide pilot car during one lane/two way traffic operations. Road closures must be approved by the Engineer.

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.17.23

Monte R. Rater P.E.

FM 121
SEQUENCE OF WORK

NOT TO SCALE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		21

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

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

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	PAR	GRAYSON		22
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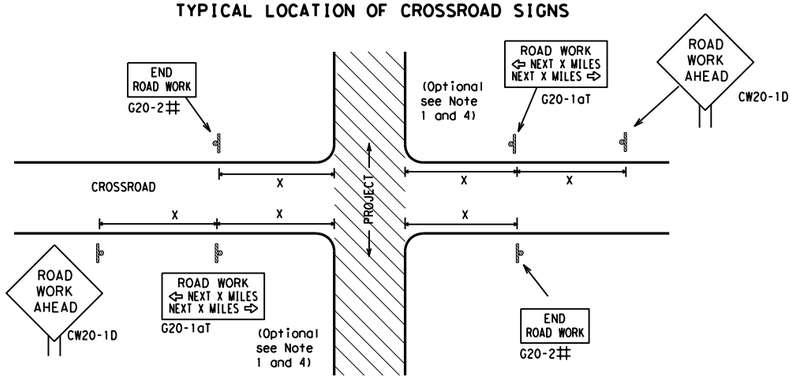
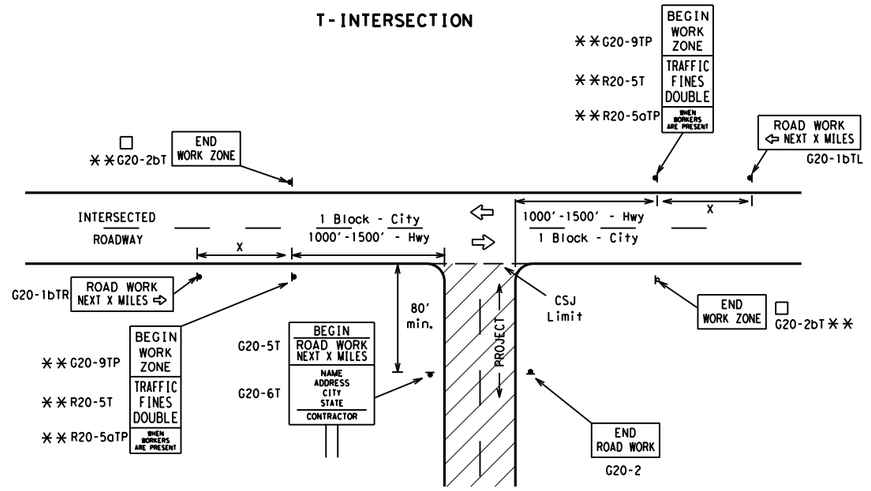
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

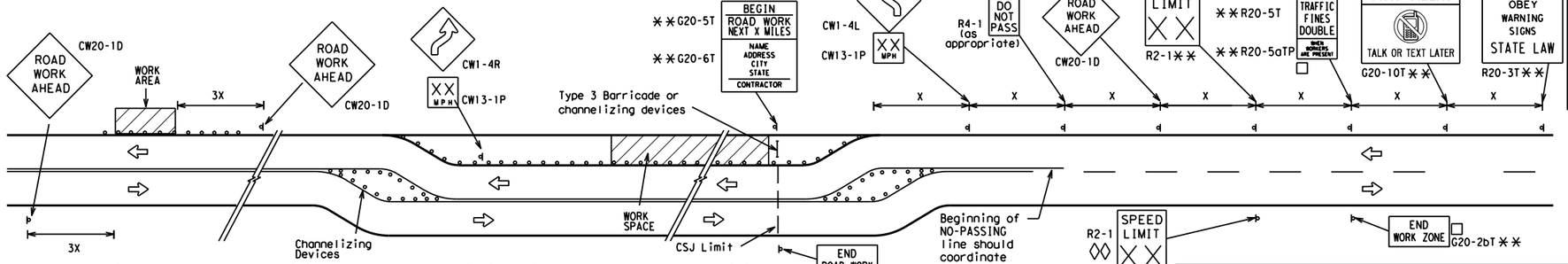
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

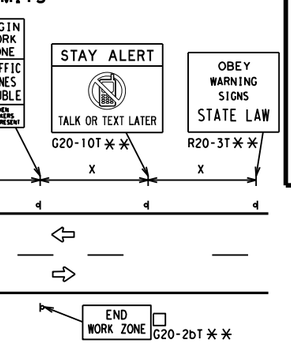
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

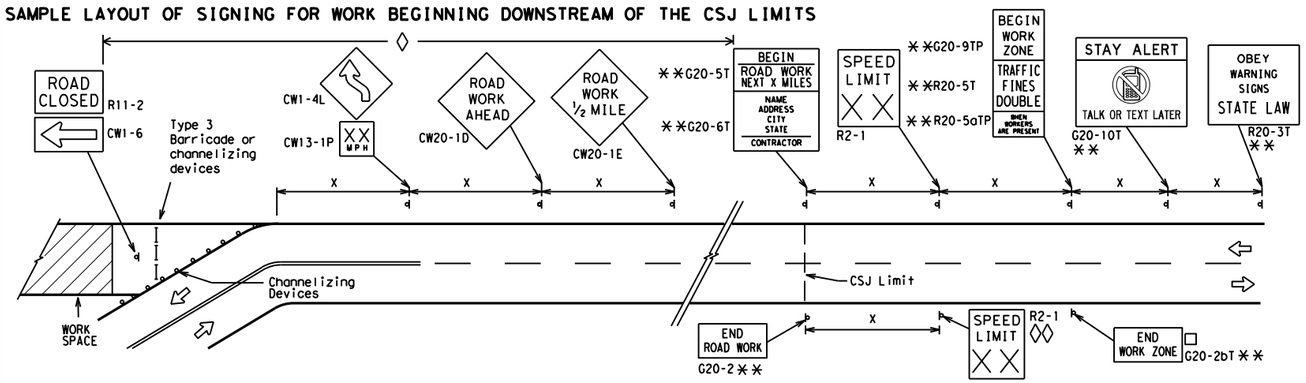


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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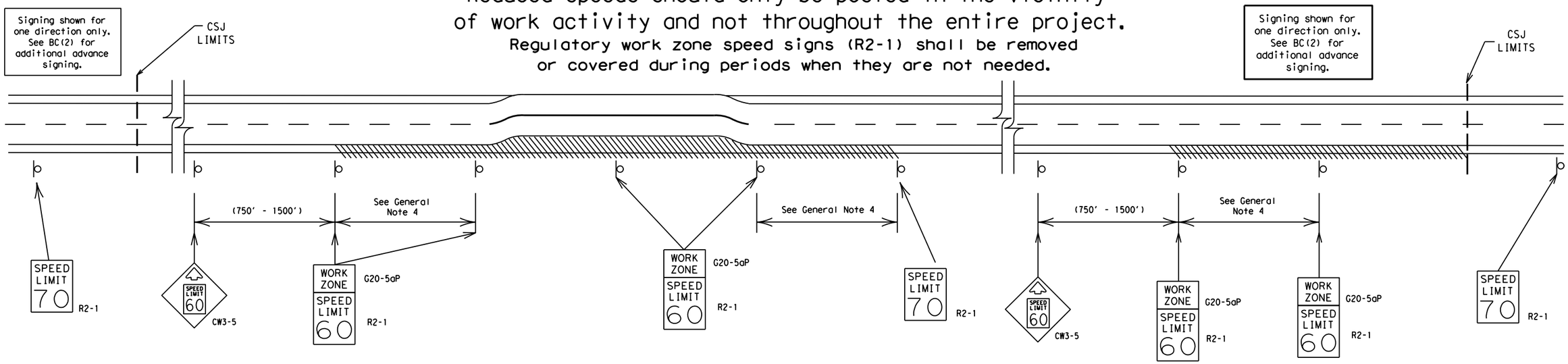
7-13 5-21	PAR	GRAYSON		23

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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7-13 5-21	PAR	GRAYSON		24

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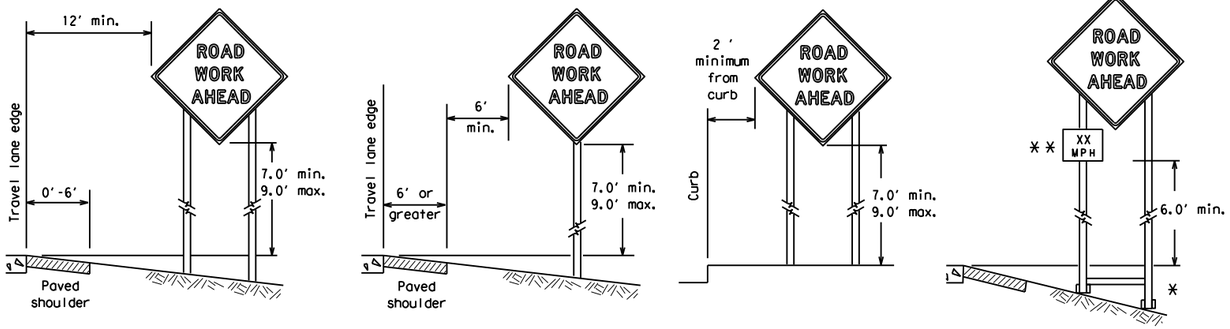
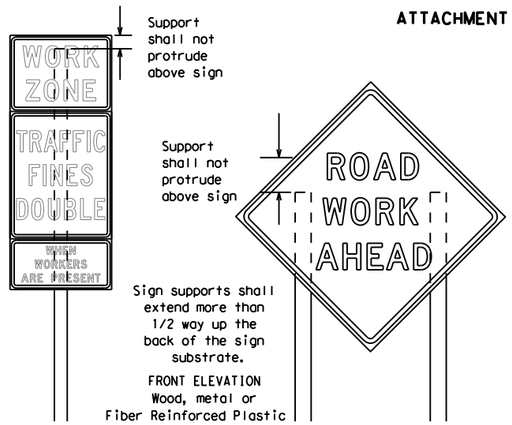
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

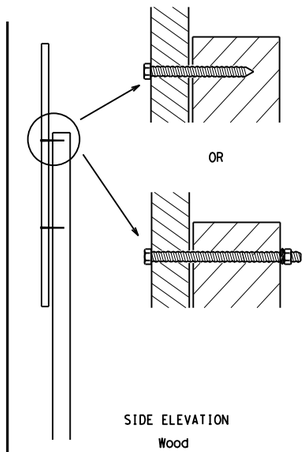


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





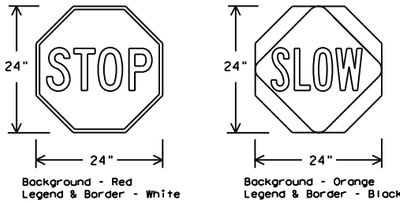
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		25

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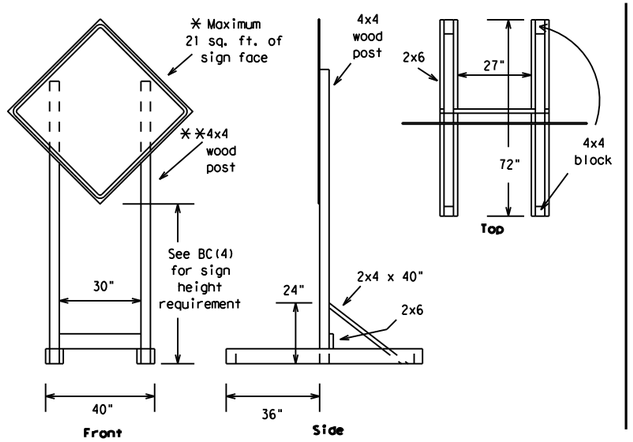
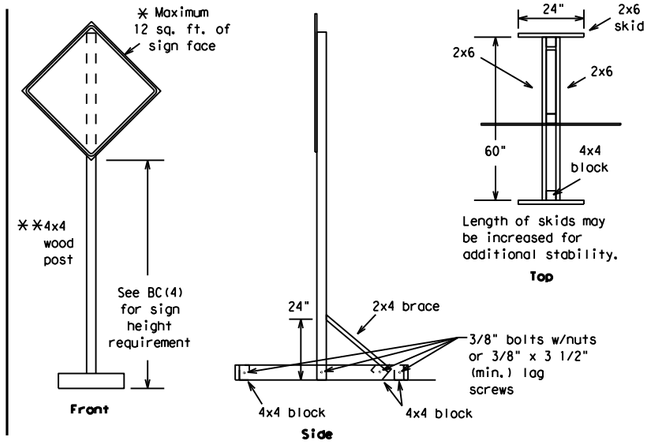
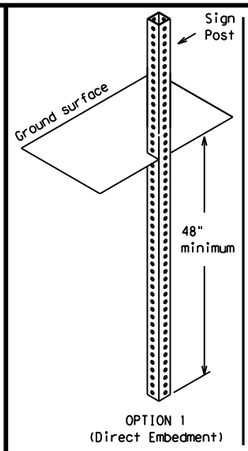
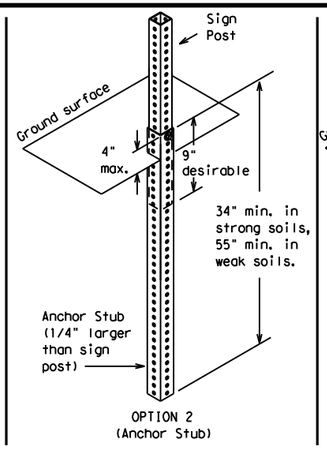


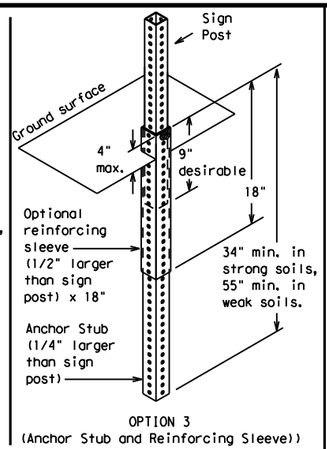


SKID MOUNTED WOOD SIGN SUPPORTS

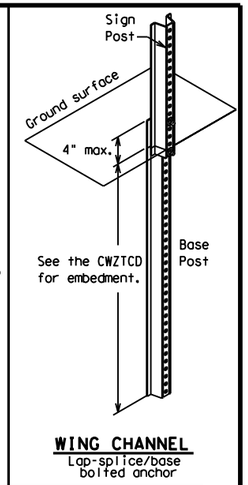
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS





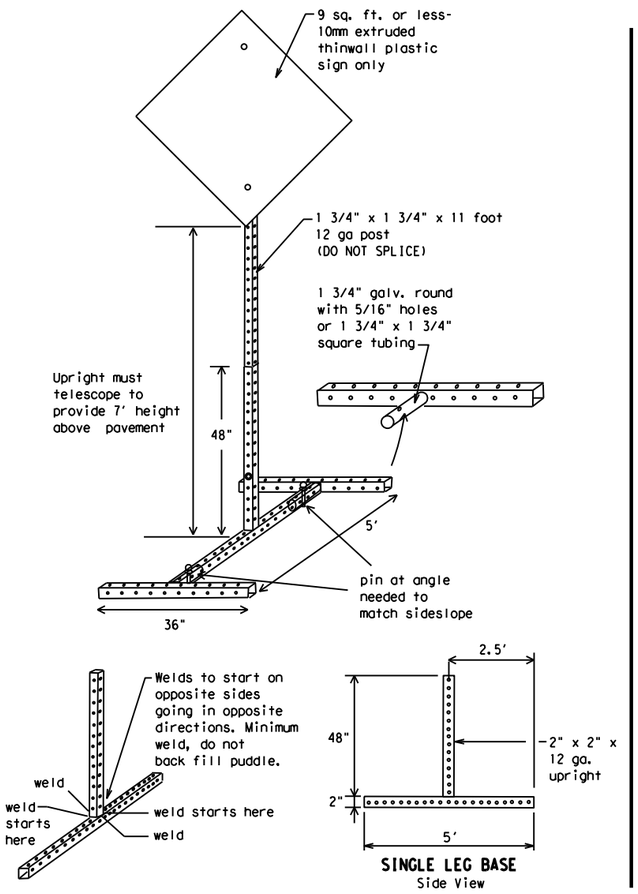


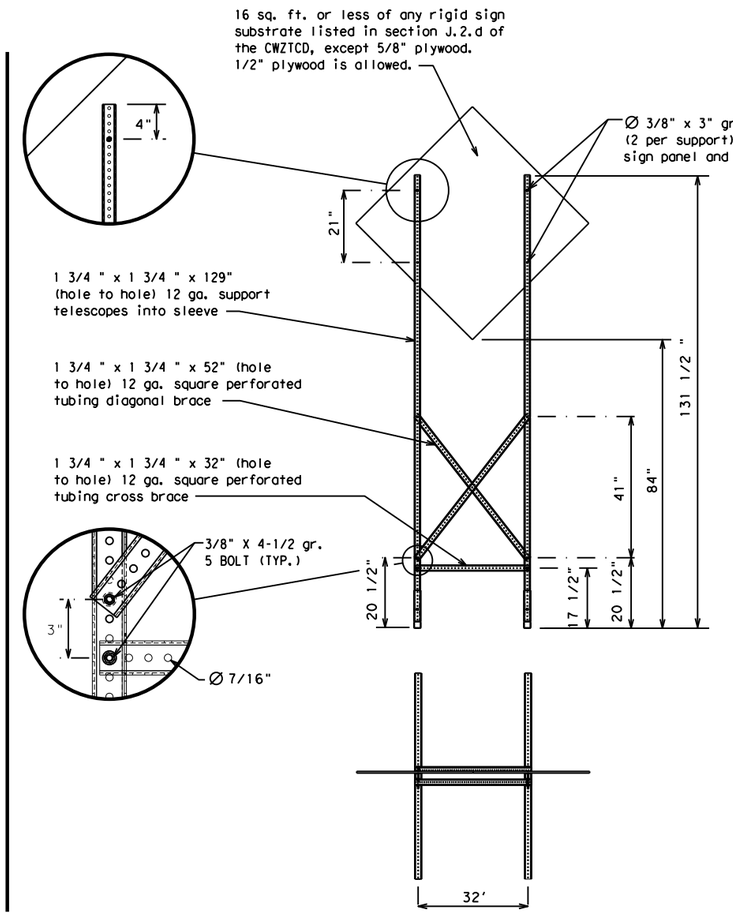
PERFORATED SQUARE METAL TUBING

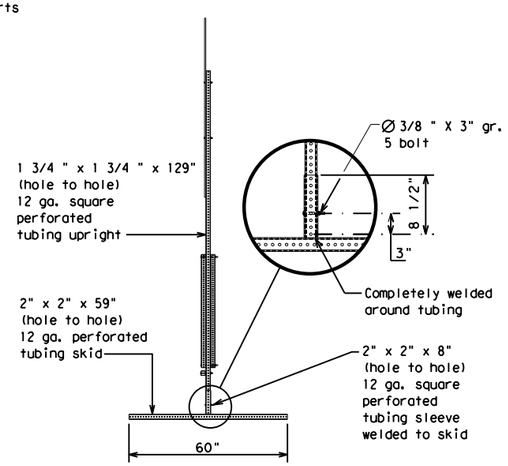


GROUND MOUNTED SIGN SUPPORTS

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.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		26

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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 *	

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		27

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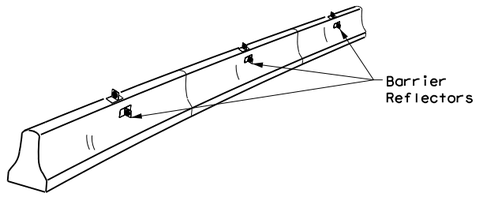
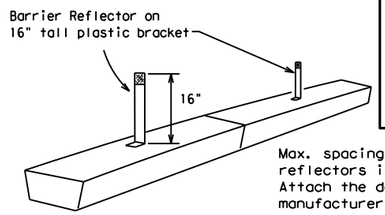
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

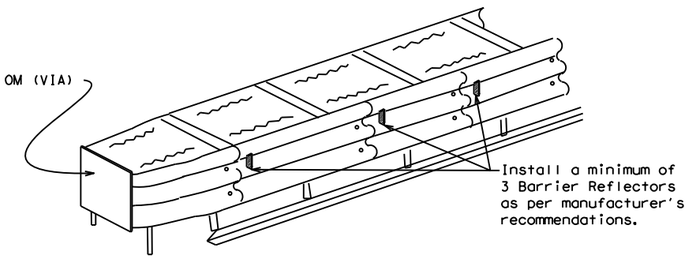


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

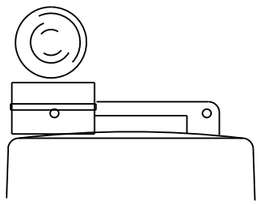


DELINEATION OF END TREATMENTS

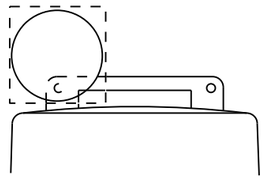
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

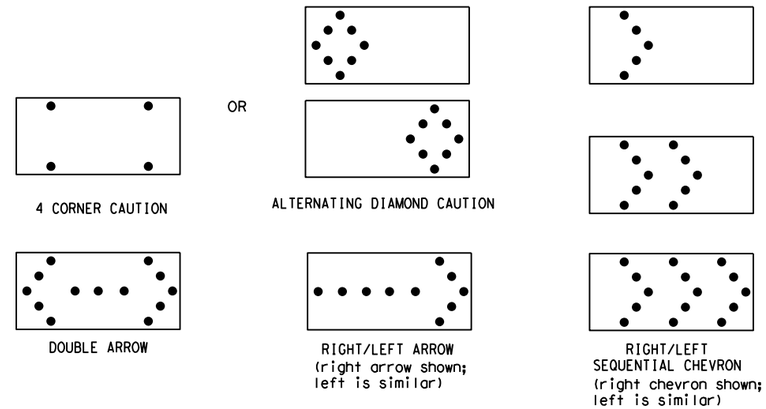
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		28

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

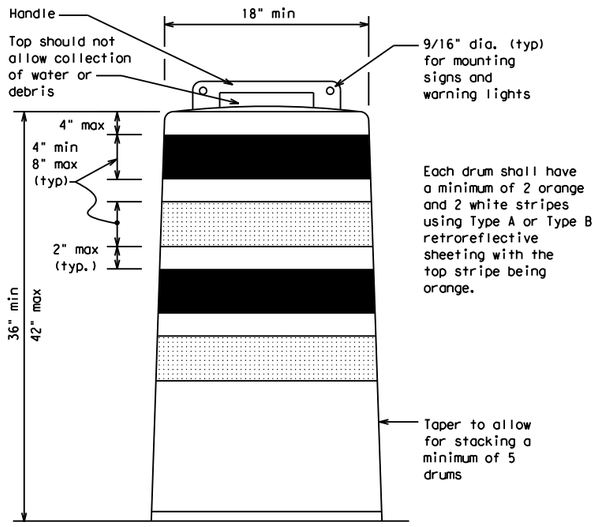
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

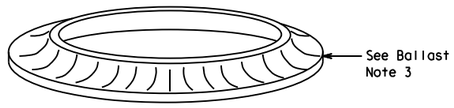
RETROREFLECTIVE SHEETING

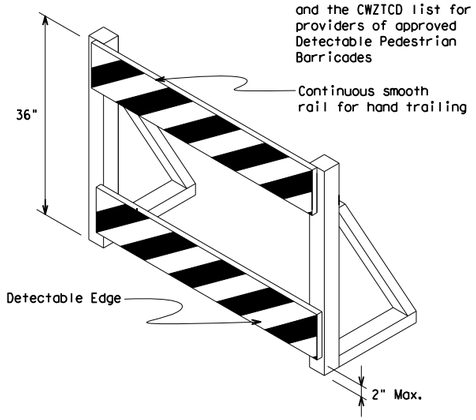
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

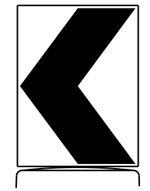




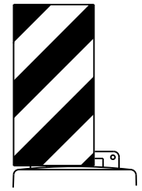


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	PAR	GRAYSON		29
7-13				

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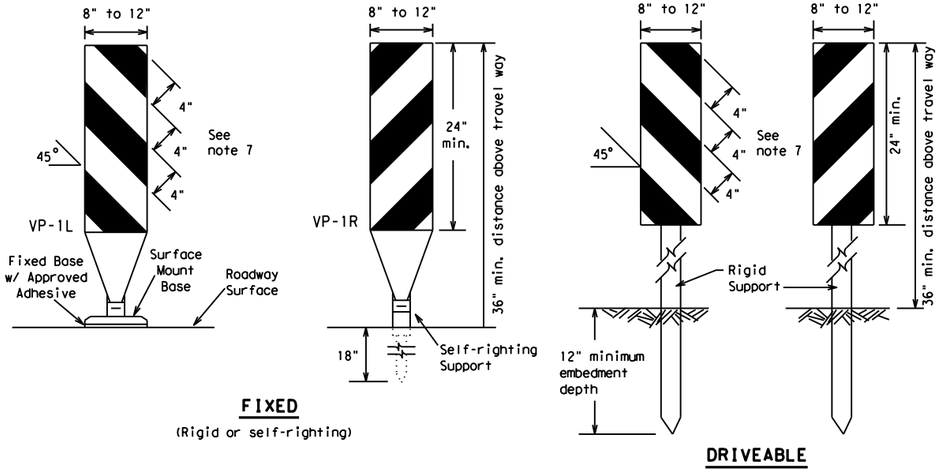
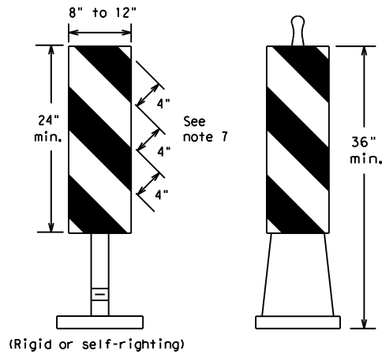


FIXED
(Rigid or self-righting)

DRIVEABLE

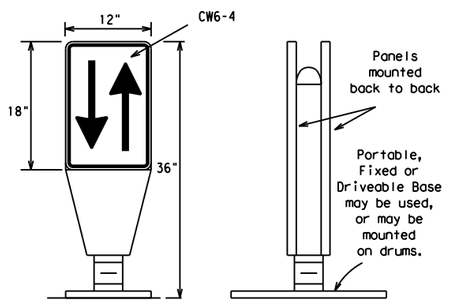


(Rigid or self-righting)

PORTABLE

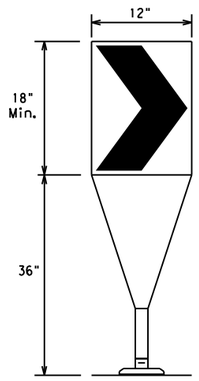
VERTICAL PANELS (VPs)

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



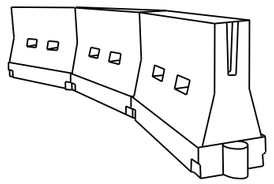
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		30

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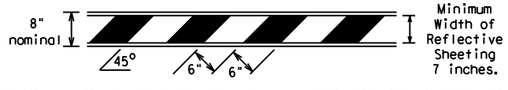
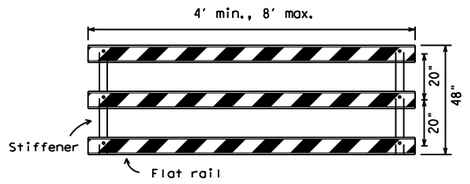
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



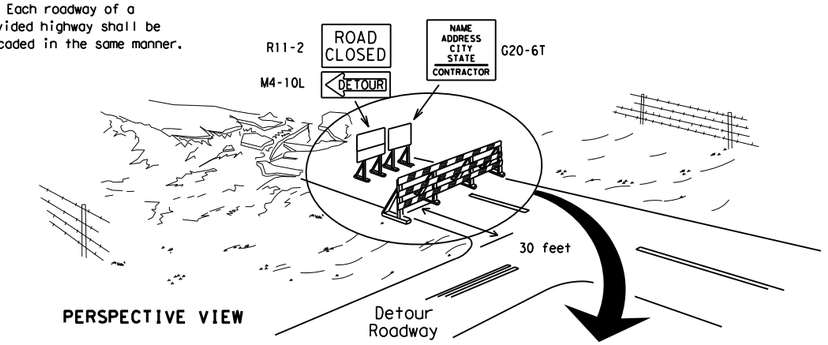
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

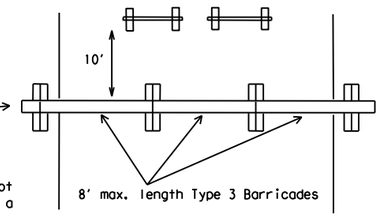
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

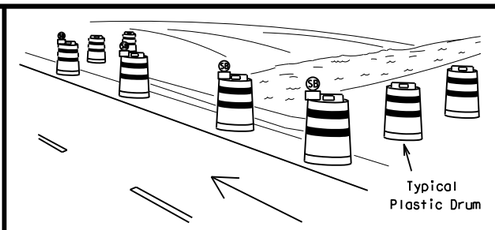
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

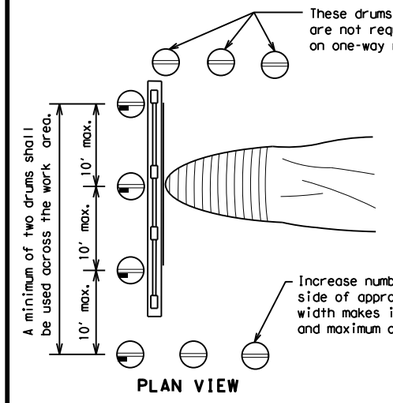
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

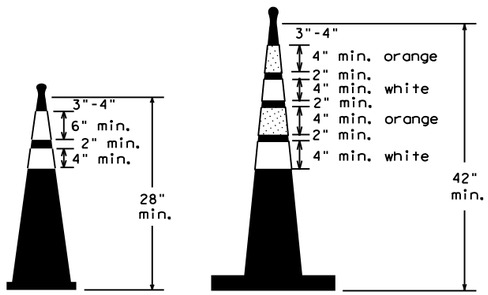
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

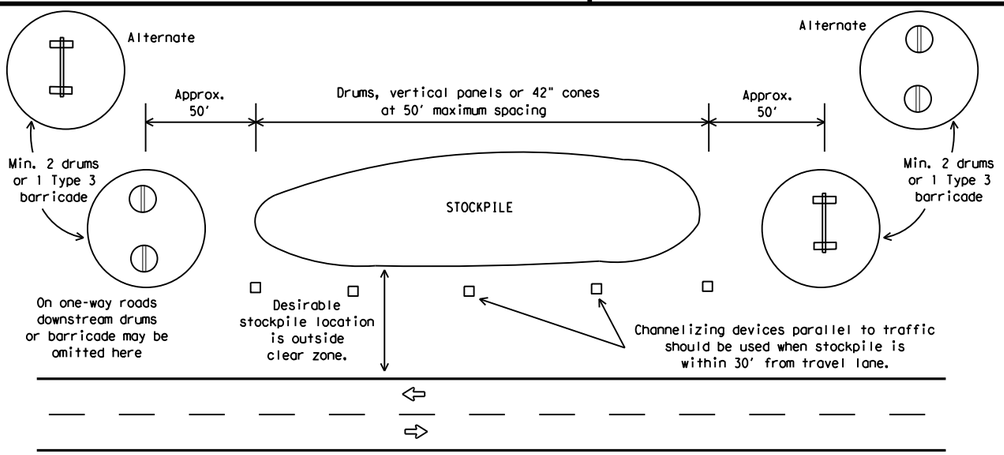
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		31

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

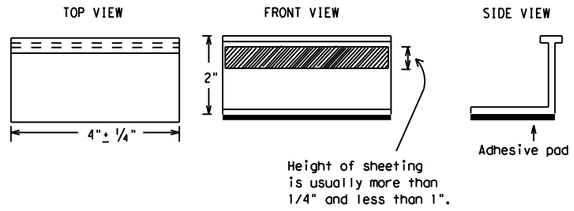
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0729	02	032	FM 121
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	PAR	GRAYSON		32
11-02 8-14				

105

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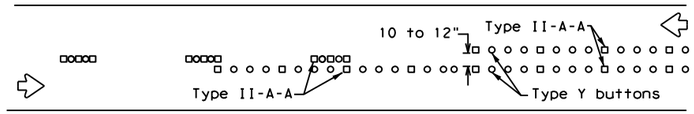
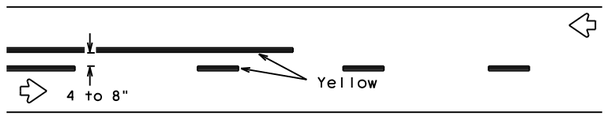
FILE: $FILE$

PAVEMENT MARKING PATTERNS

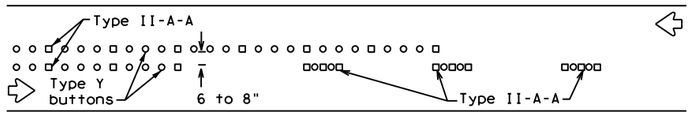
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



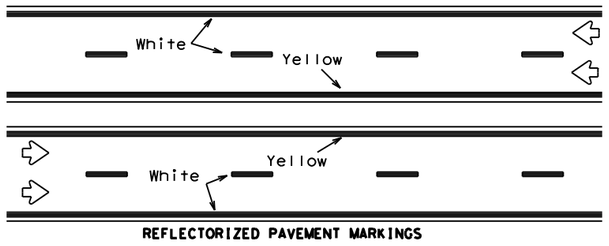
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



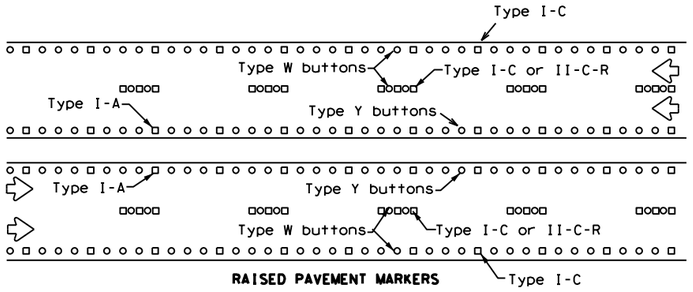
RAISED PAVEMENT MARKERS - PATTERN B

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

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



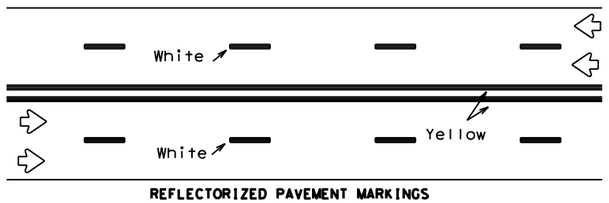
REFLECTORIZED PAVEMENT MARKINGS



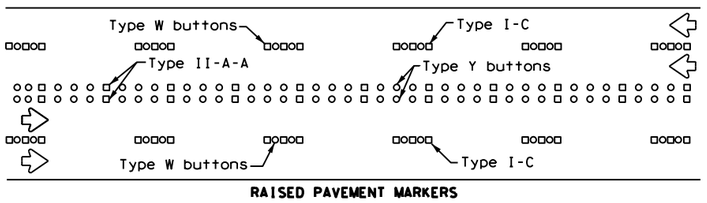
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



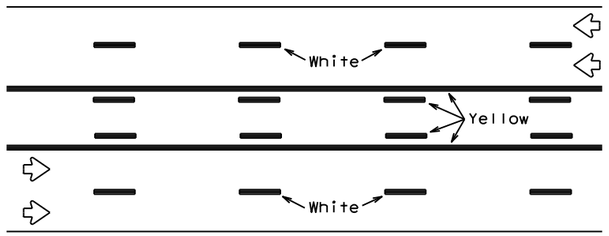
REFLECTORIZED PAVEMENT MARKINGS



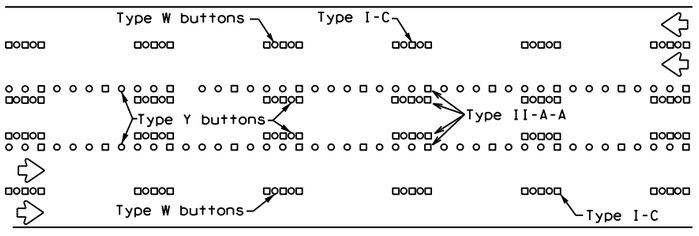
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

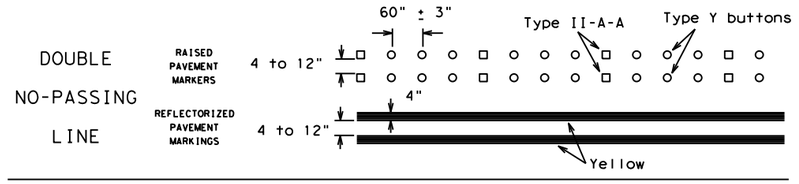
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

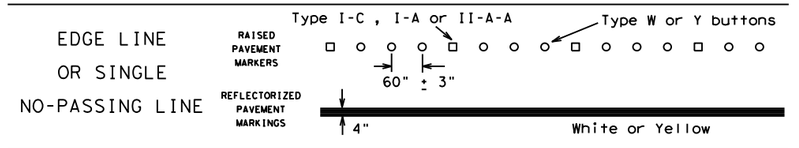
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

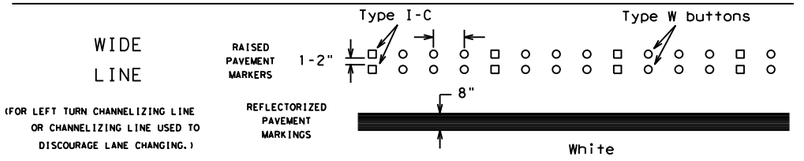


EDGE LINE OR SINGLE NO-PASSING LINE



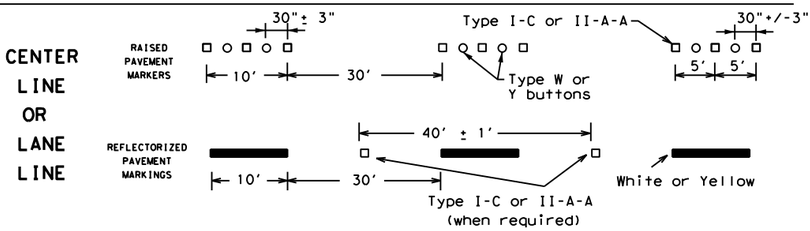
WIDE LINE

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

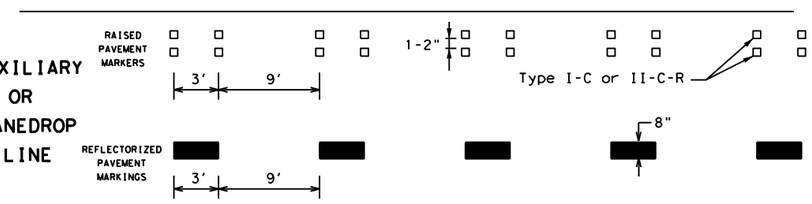


BROKEN LINES

CENTER LINE OR LANE LINE

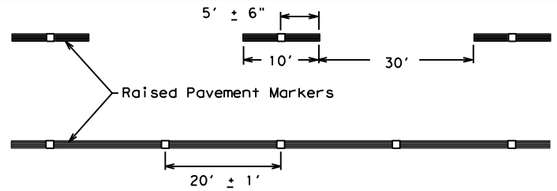


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		33

DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

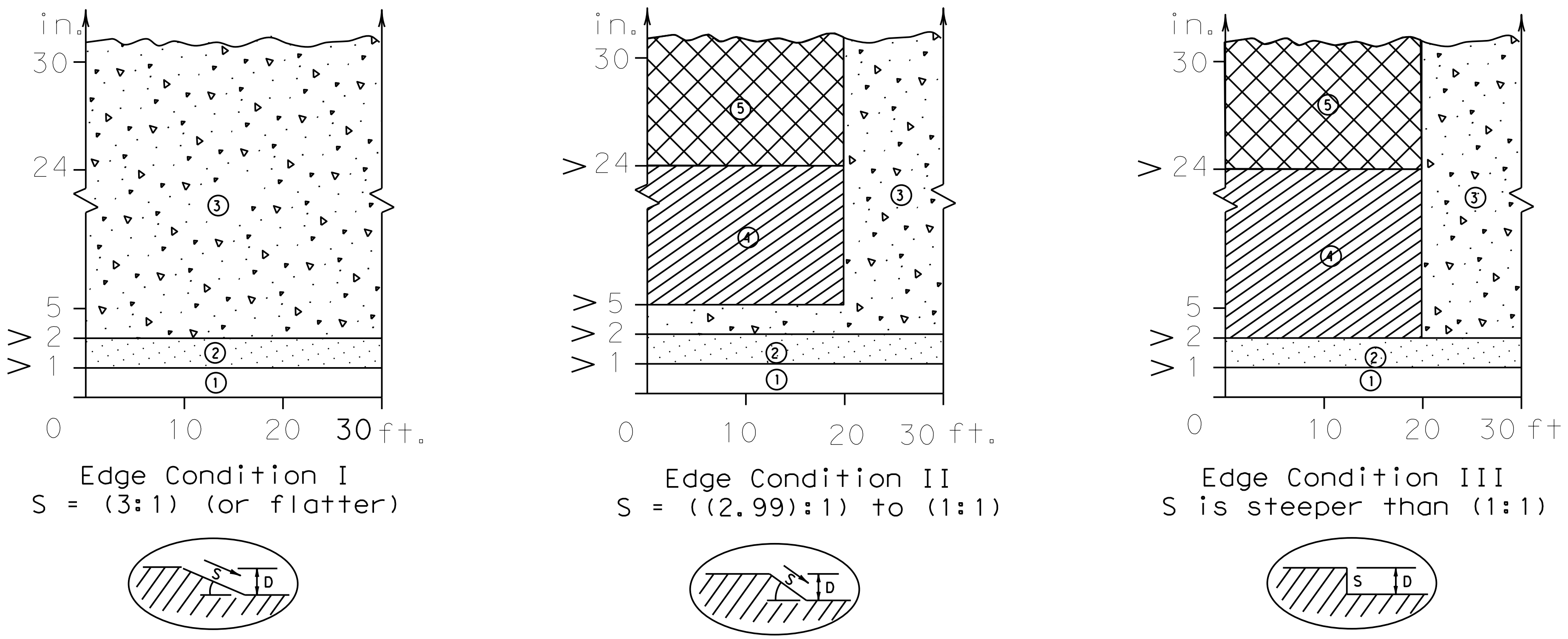
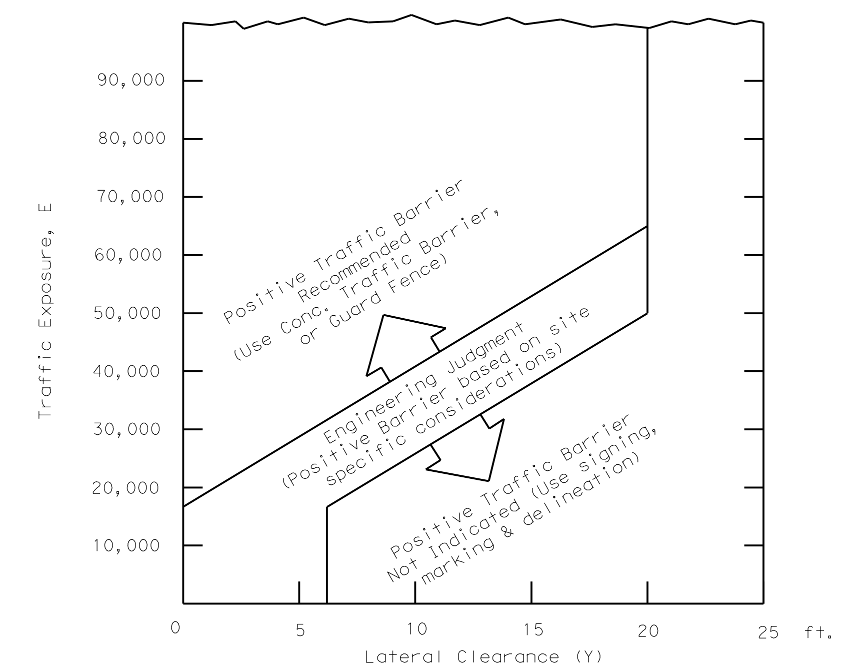
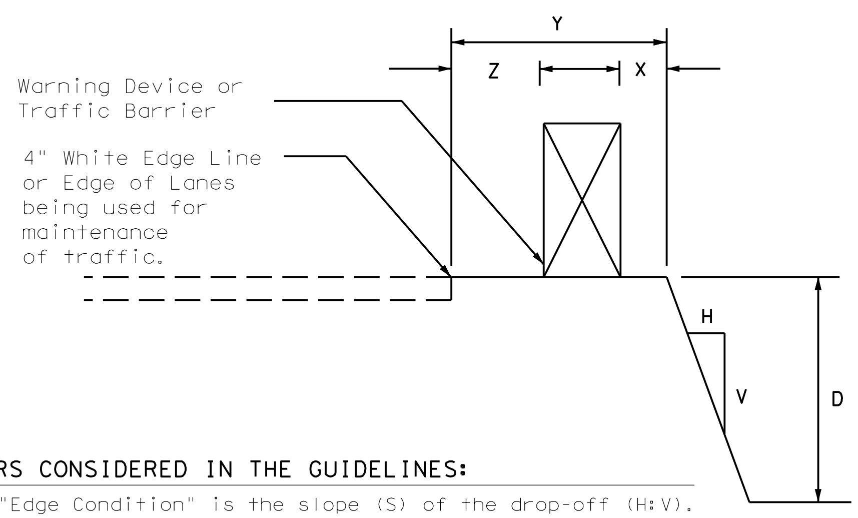


FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▩)



1. E = ADT x T
   Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
2. Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
3. An approved end treatment should be provided for any positive barrier end located within the clear zone.



Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
⑤	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

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

FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".
2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Edge Condition Notes:

1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.
3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

Engineer's Seal

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.17.23

Monte R. Rater P.E.

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

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© TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS 03-01 08-01 9-21	0729	02	032	FM 121
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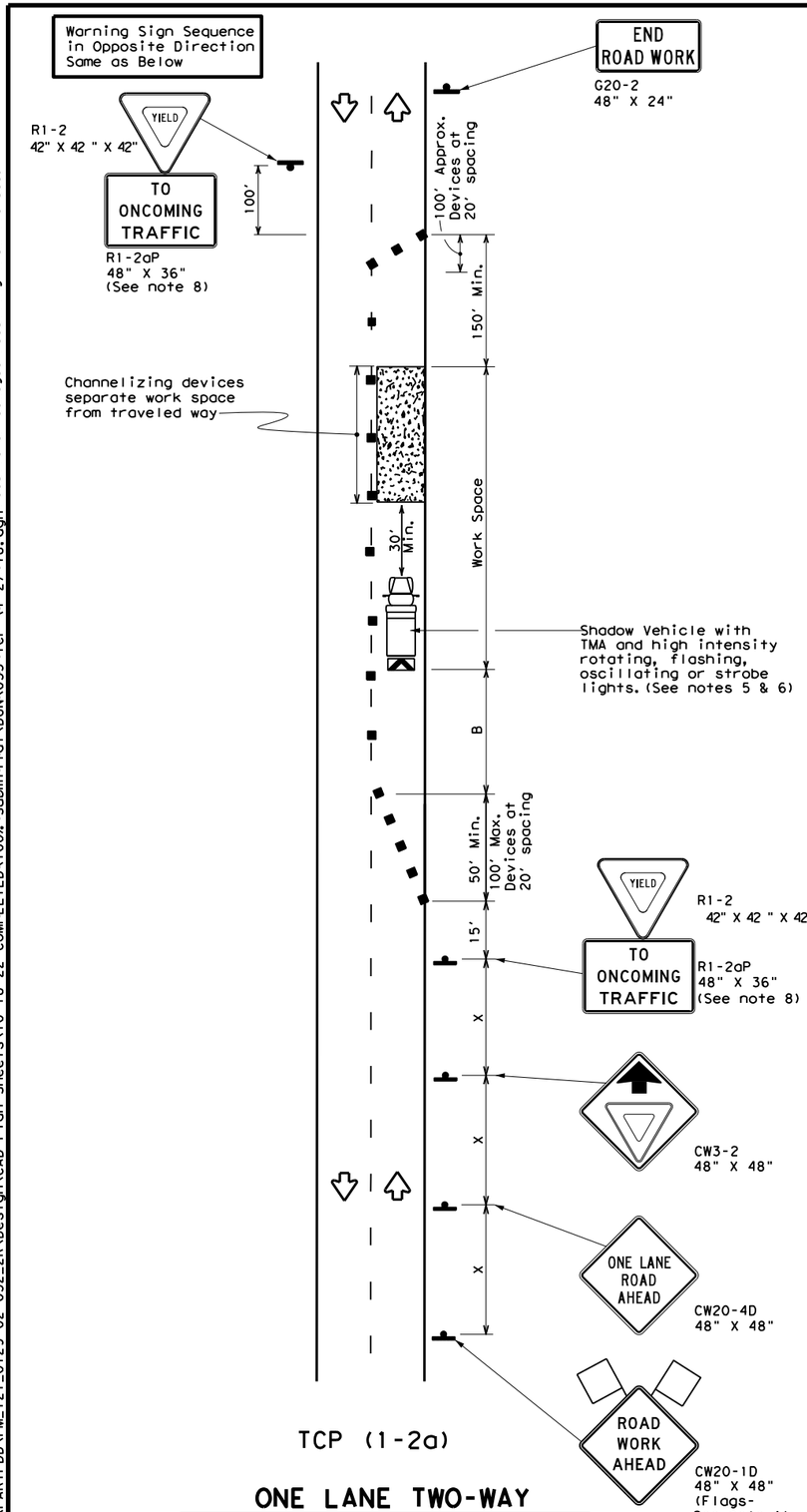
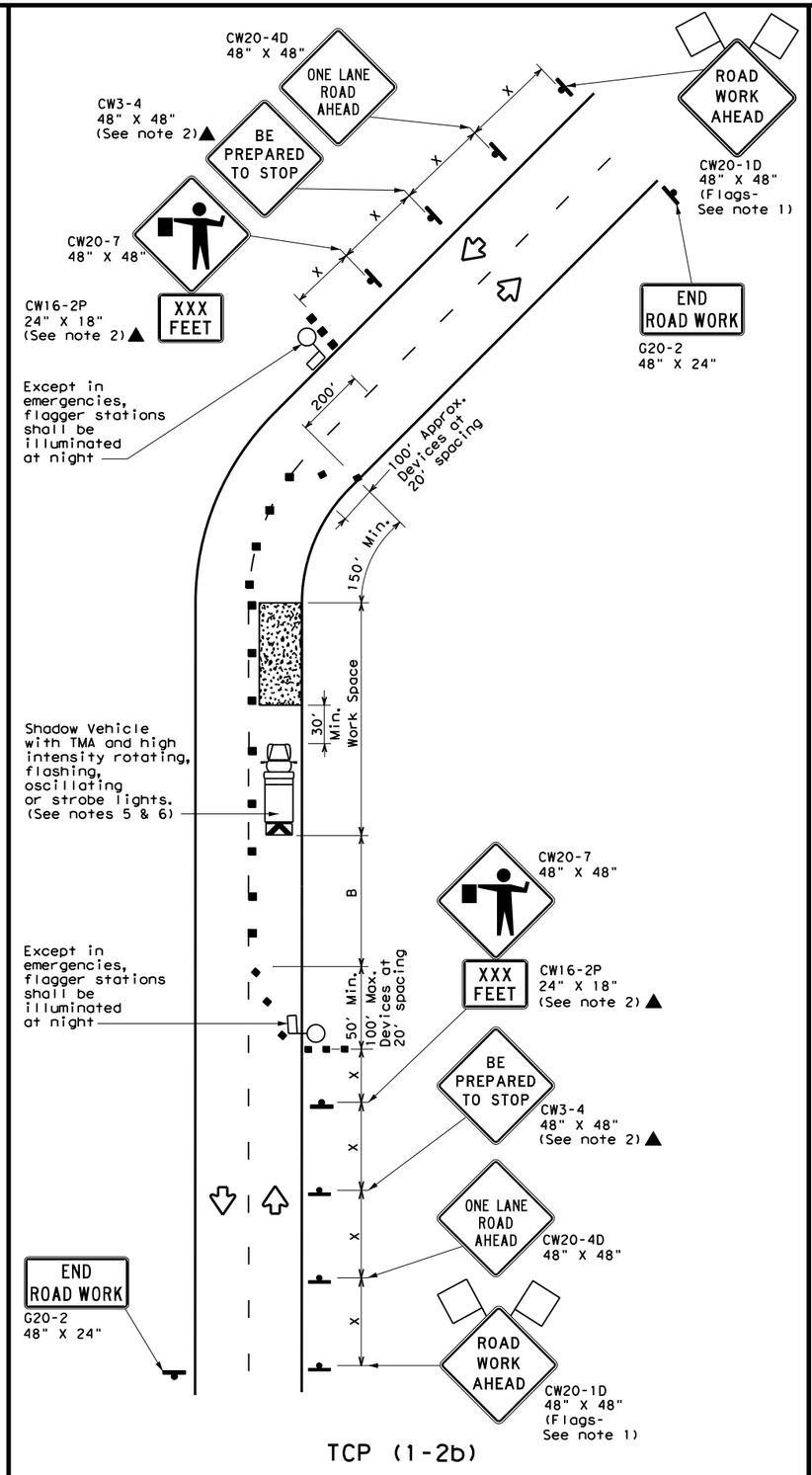


TCP (1-2a)

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	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		35

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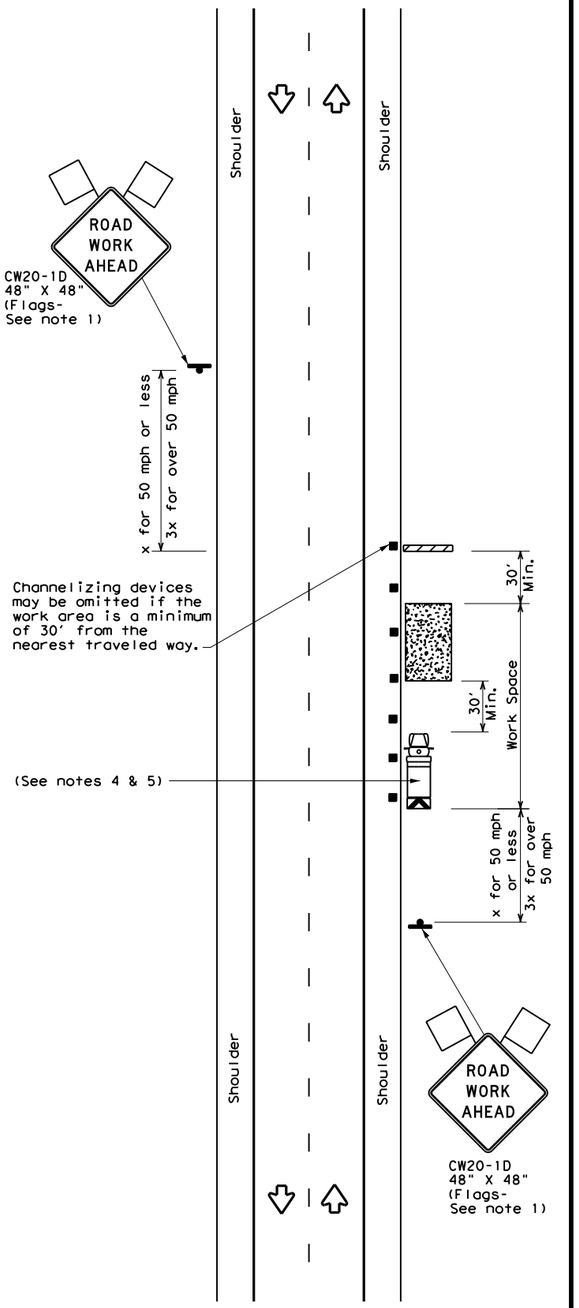
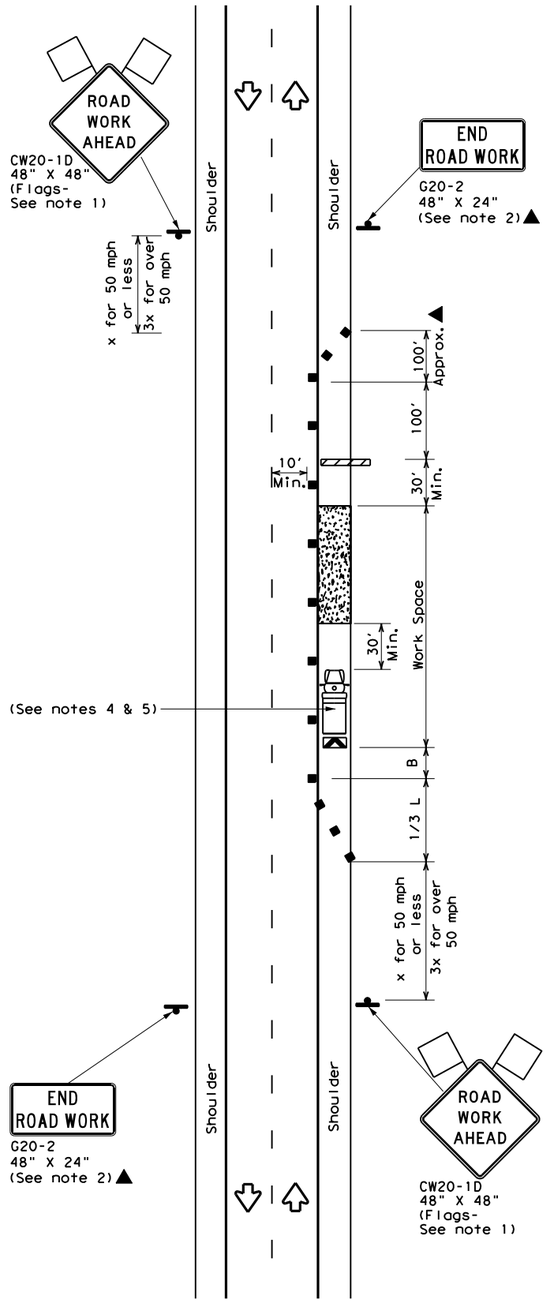


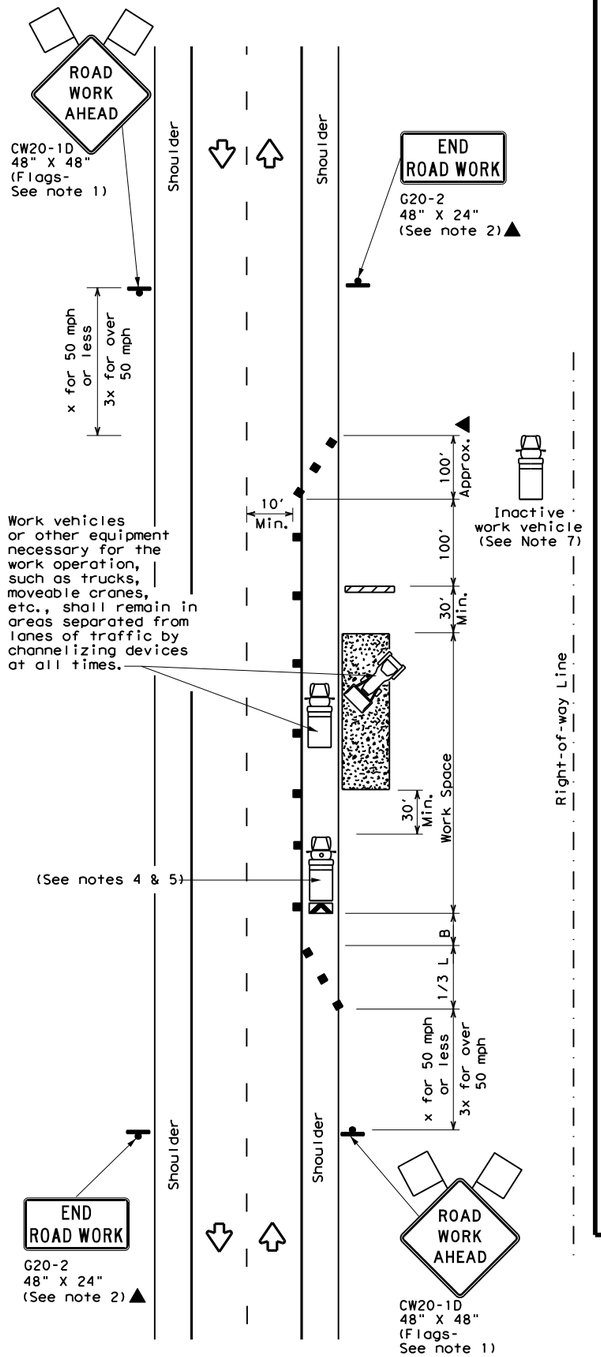
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	PAR	GRAYSON		36
1-97 2-18				

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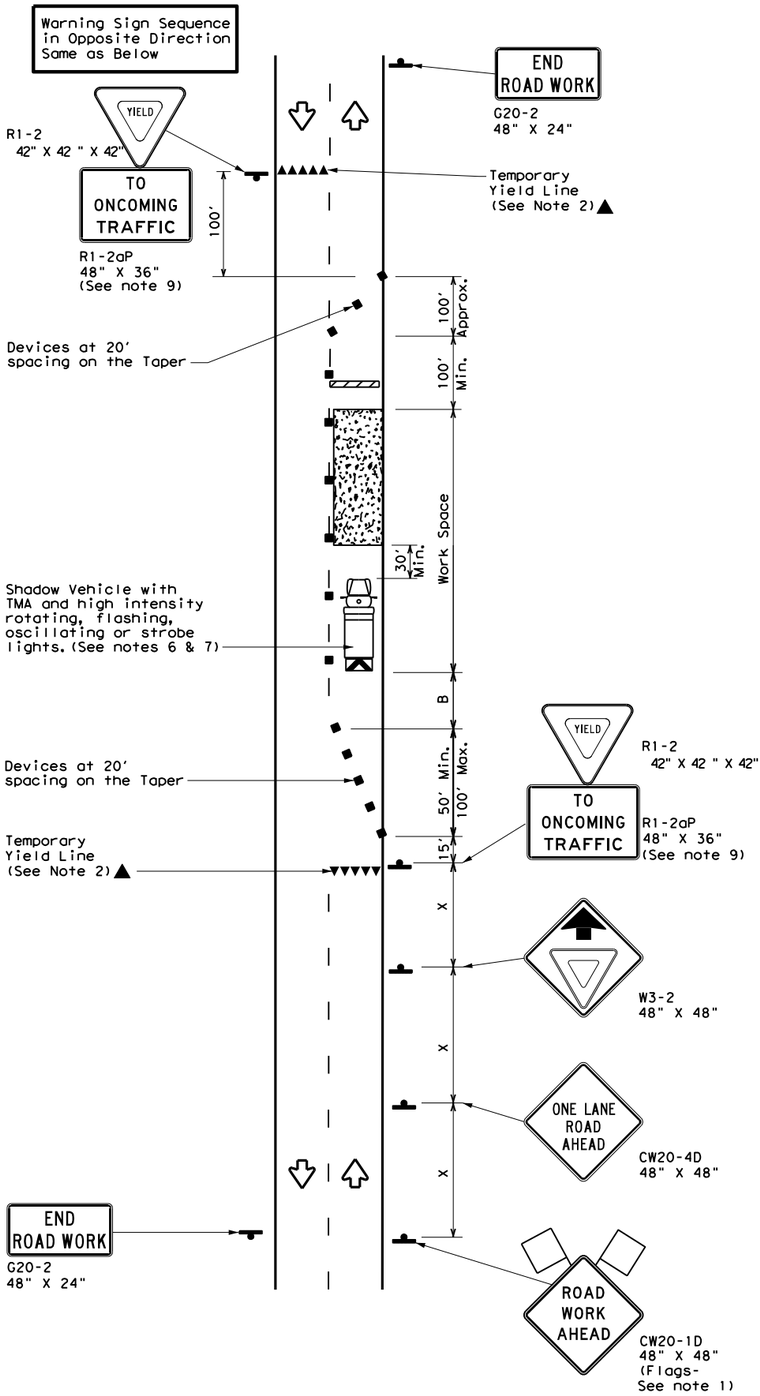
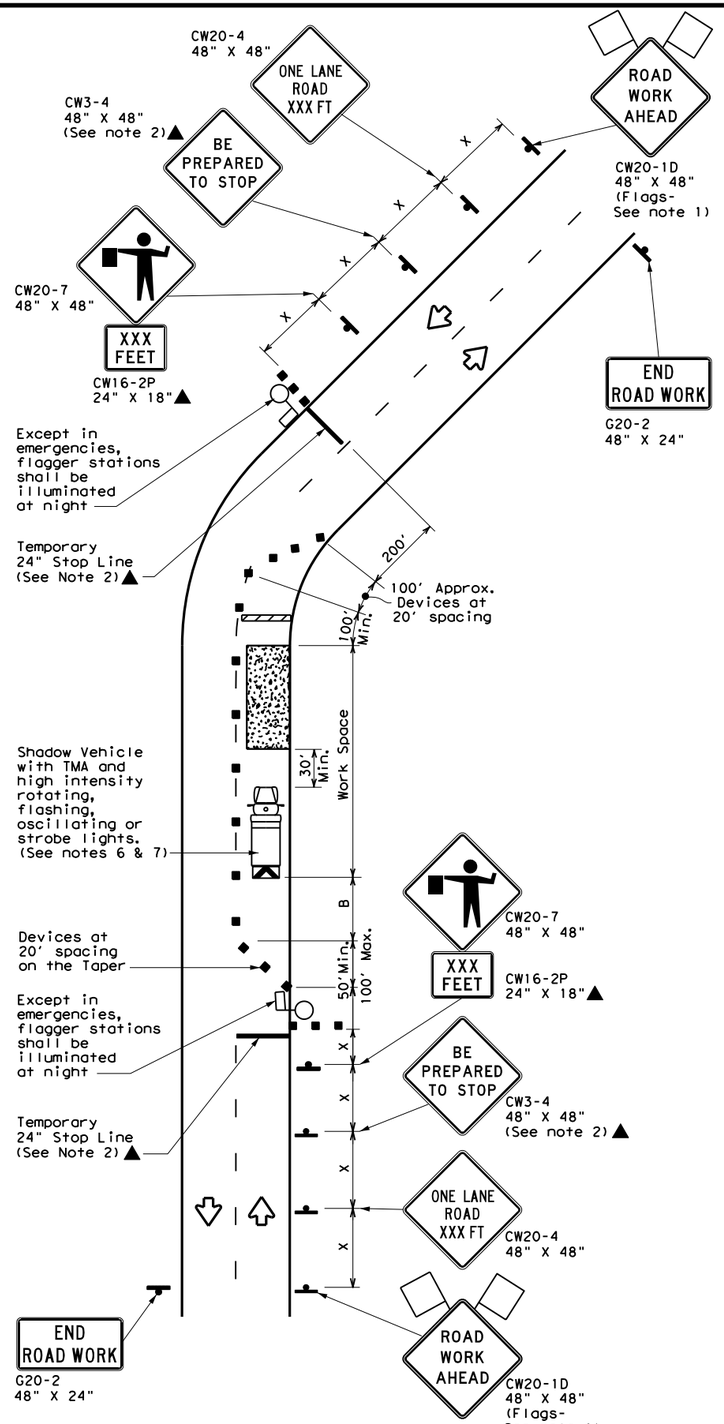


TCP (2-2a)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See Note 9)



TCP (2-2b)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

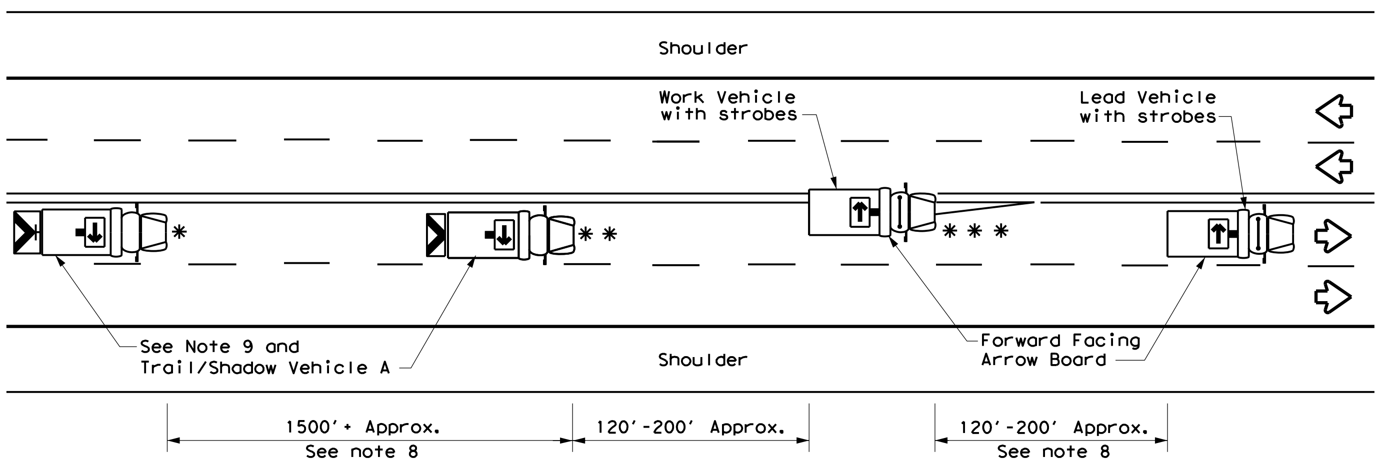
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

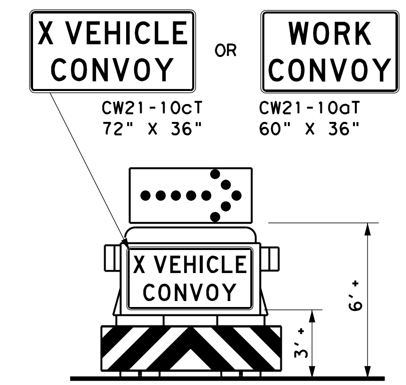
TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		37



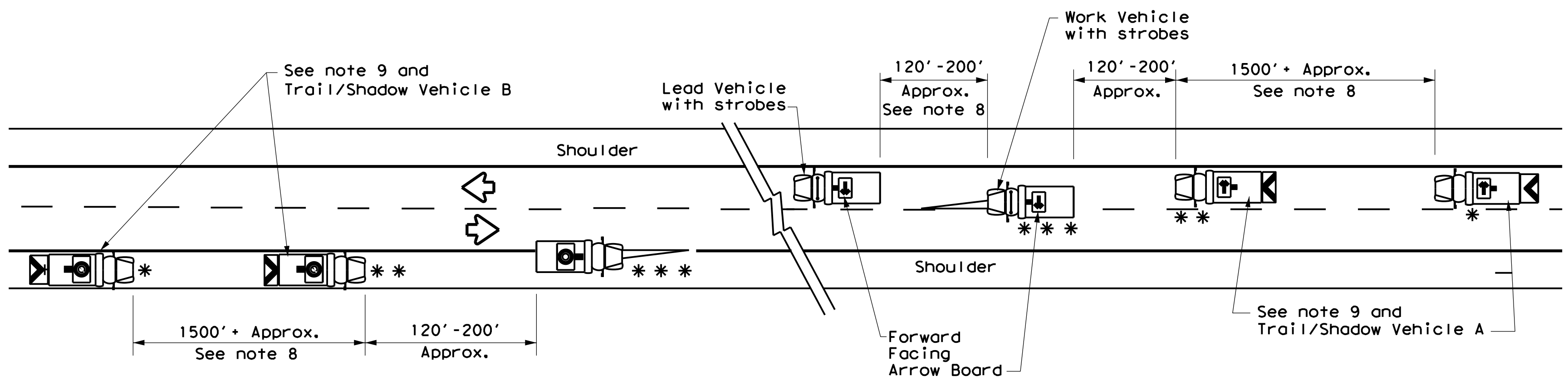
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



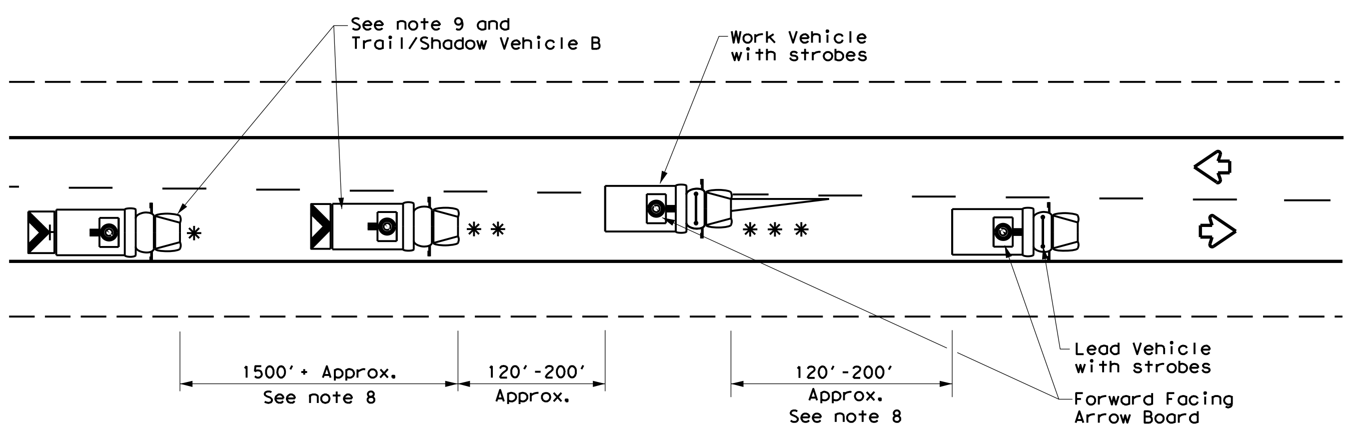
TRAIL/SHADOW VEHICLE A

with RIGHT Directional
display Flashing Arrow Board



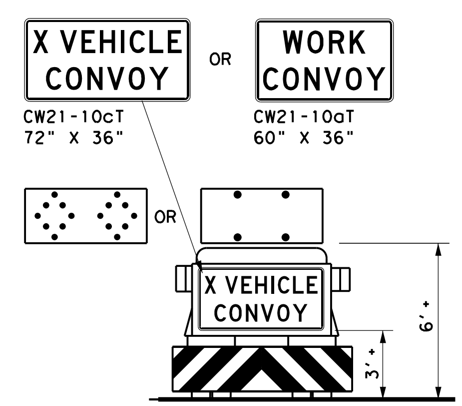
TCP (3-1b)

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	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.

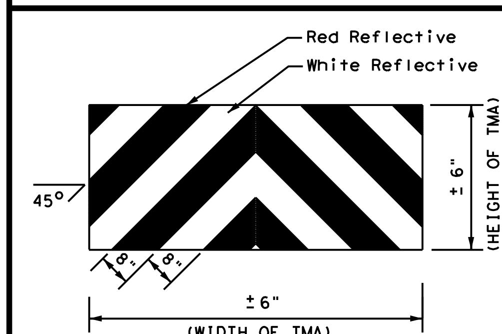
6. Each vehicle shall have two-way radio communication capability.

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

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0729	02	032	FM 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	38

175

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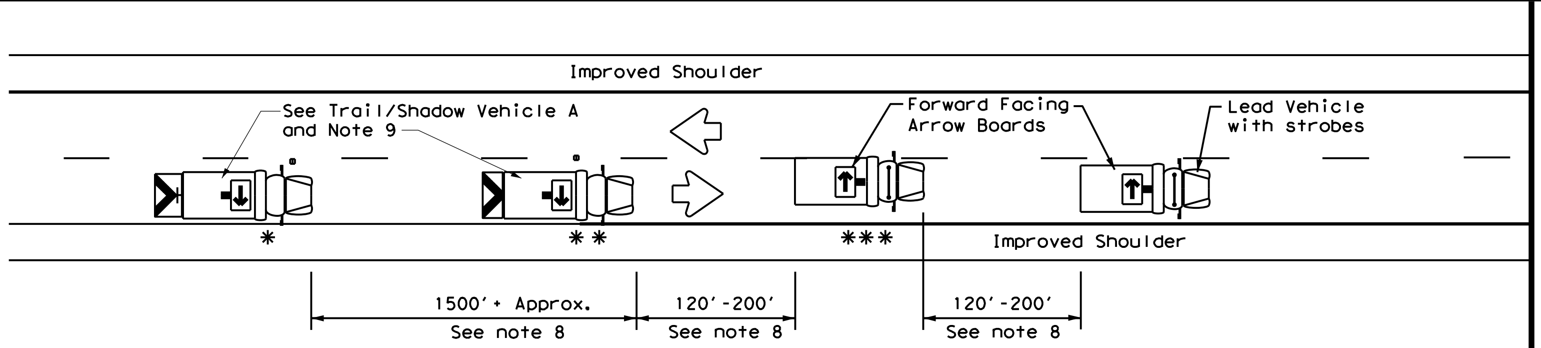
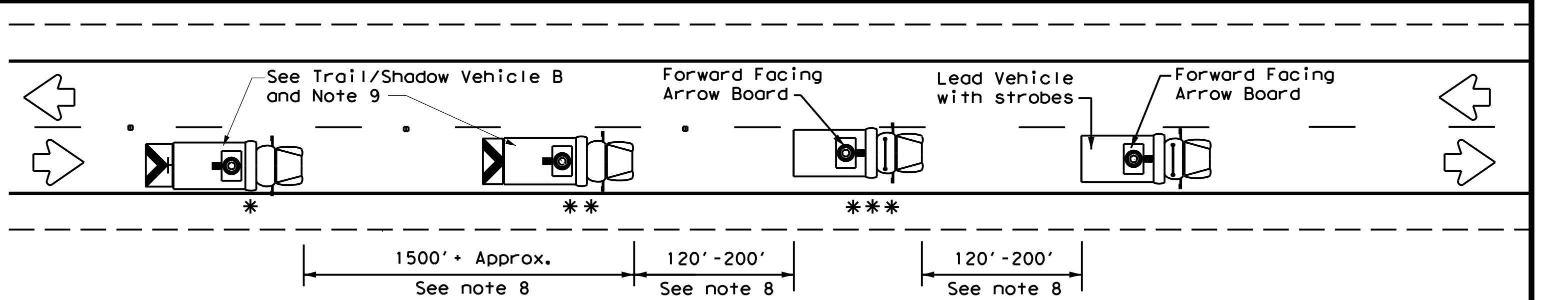


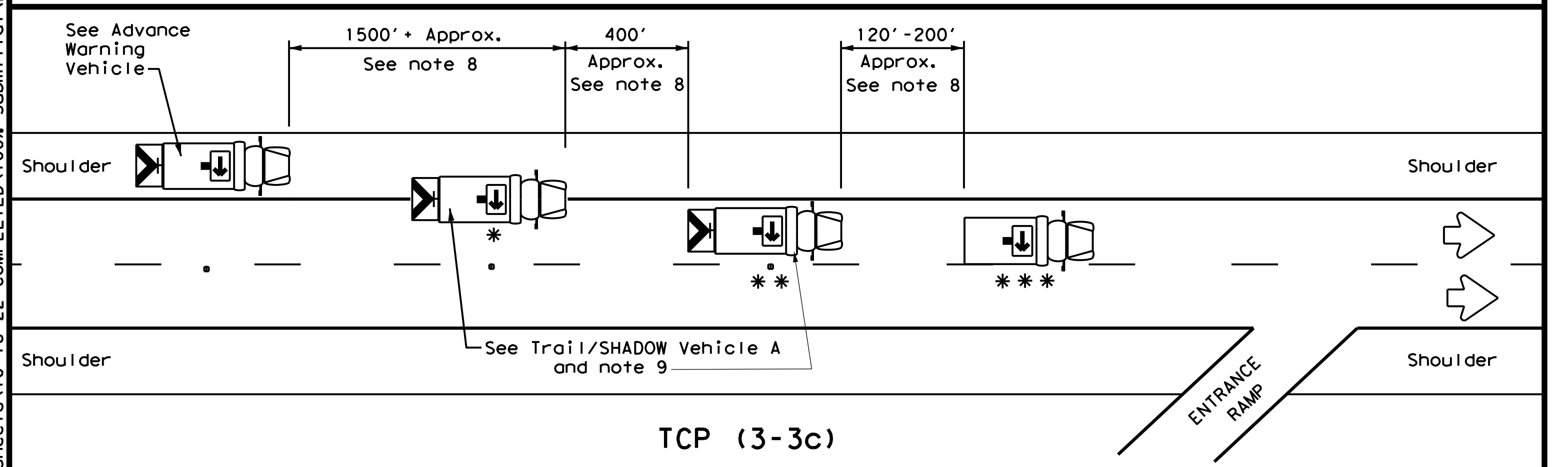
TCP (3-3a)

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



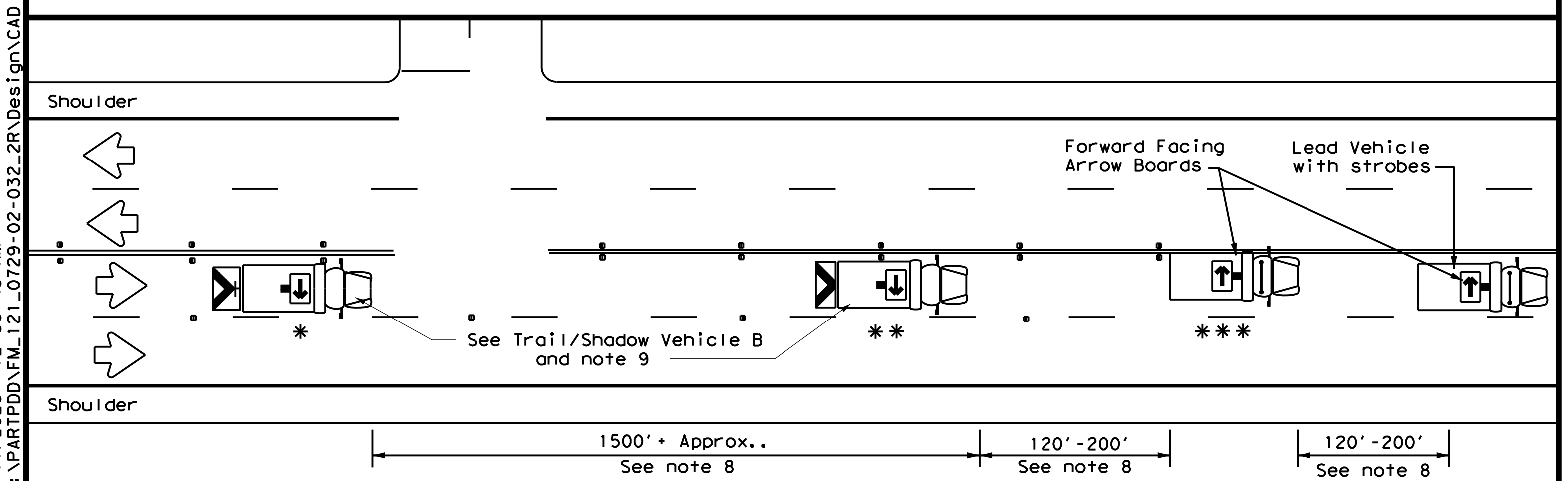
TCP (3-3b)

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



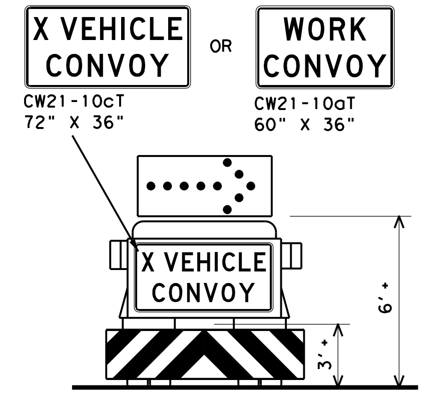
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



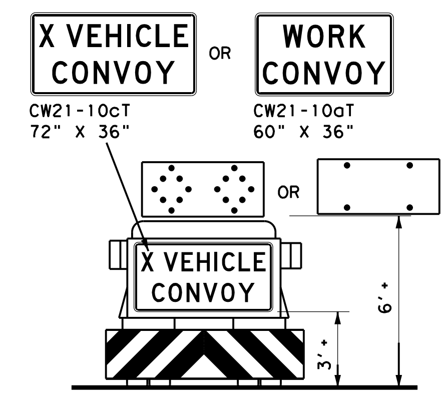
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



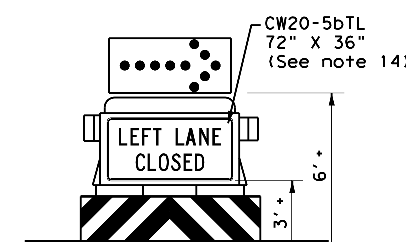
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

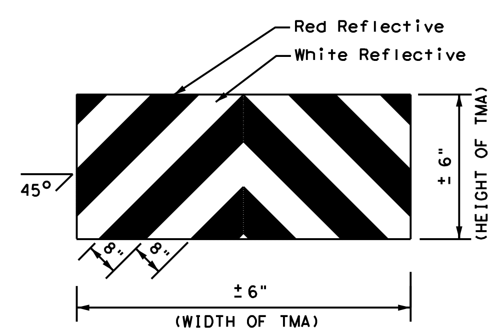


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY	
REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	0729	02	032	FM 121	
	DIST		COUNTY	SHEET NO.	
	PAR		GRAYSON	39	

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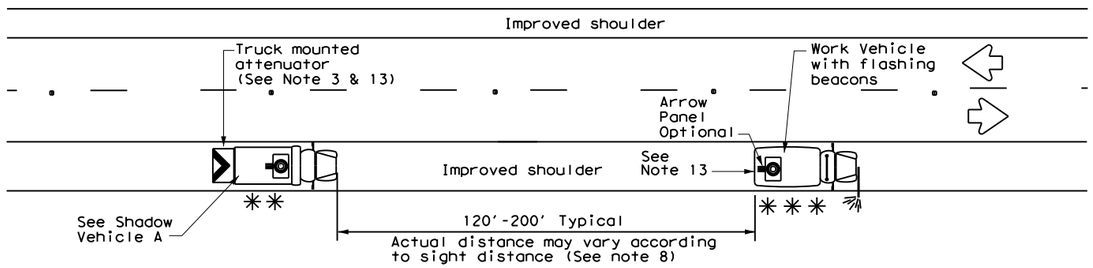
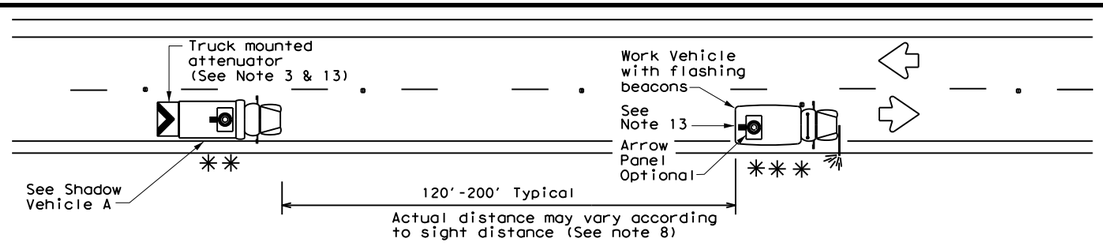
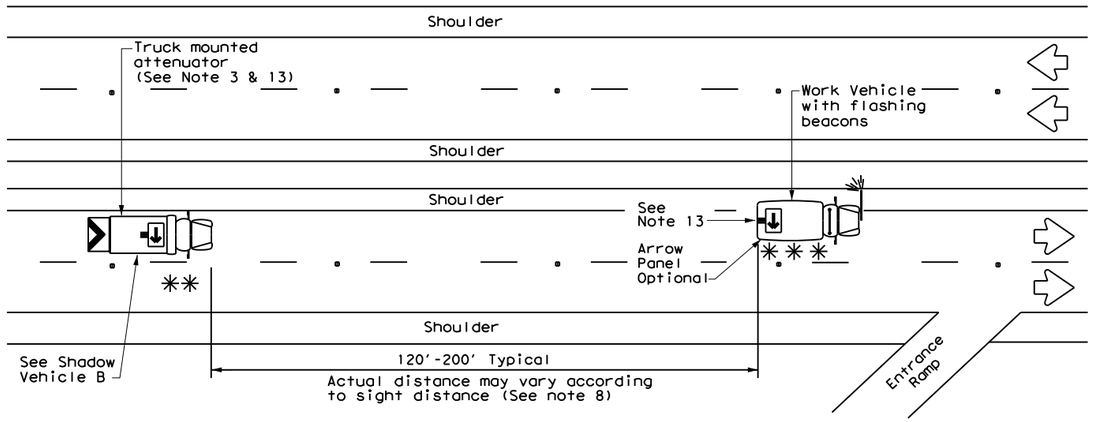


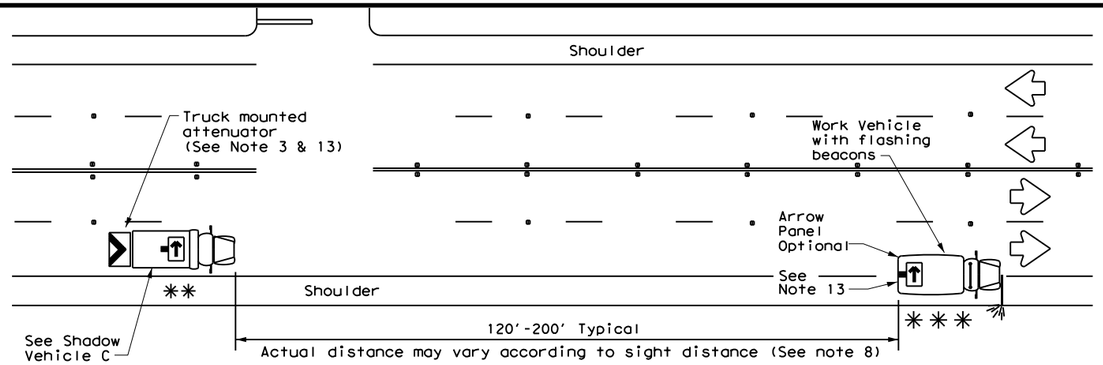
TWO LANE HIGHWAY WITH PAVED SHOULDERS MINIMUM 8'



TWO LANE HIGHWAY WITH NO SHOULDER OR NARROW SHOULDER



MULTILANE HIGHWAY



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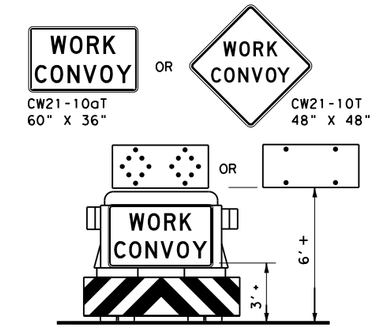
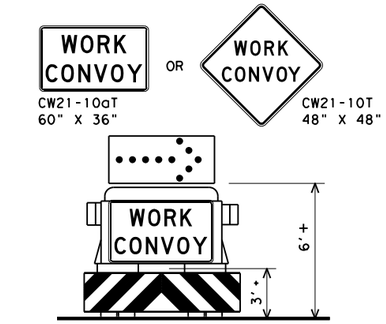


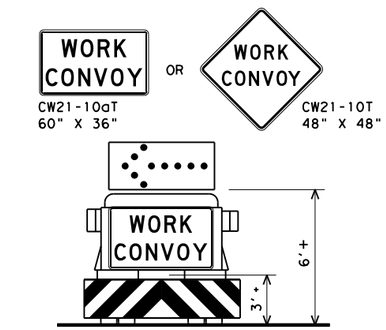
SHADOW VEHICLE A

with Flashing Arrow Board in Caution Mode



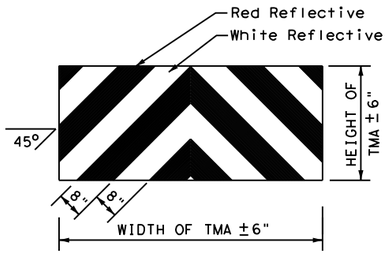
TYPICAL SHADOW VEHICLE B

with RIGHT Directional display Flashing Arrow Board



TYPICAL SHADOW VEHICLE C

with LEFT Directional display Flashing Arrow Board



STRIPING FOR TMA

LEGEND

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

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

GENERAL NOTES

1. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
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 is required.
4. Striping on the back panel of all TMAs shall be 8" red reflective sheeting with white background, 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.
5. Flashing Arrow Panels shall be Type B or Type C as per BC Standards. The panel operation shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When the work convoy must change lanes, the Shadow Vehicle should change lanes first to protect the Work Vehicle.
8. Spacing between Shadow and Work Vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the Shadow Vehicle in time to slow down and/or change lanes as they approach the Work Convoy.
9. Use of an arrow panel on the Work Vehicle is optional except as provided in note 13, but may be required by the Engineer. If an arrow panel is not used, dual flashing beacons, mounted as high and as widely separated as practicable at the rear of the Work Vehicle shall be required.
10. On two-lane two-way roadways, the Work and Shadow Vehicles should pull over periodically to allow motor vehicle traffic to pass.
11. Work and Shadow Vehicles should stay on the shoulder of highways having 8' or wider shoulders when possible.
12. A Trail Vehicle may be added to the operation when approved by the Engineer. See TCP(3) series standards.
13. The shadow vehicle may be omitted on conventional roadways when a TMA or TA and arrow panel is mounted to the herbicide vehicle. A separate shadow vehicle will be required on expressways and Freeways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS HERBICIDE TRUCK OPERATIONS

TCP(3-5)-18

FILE: tcp3-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
4-18	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		39A

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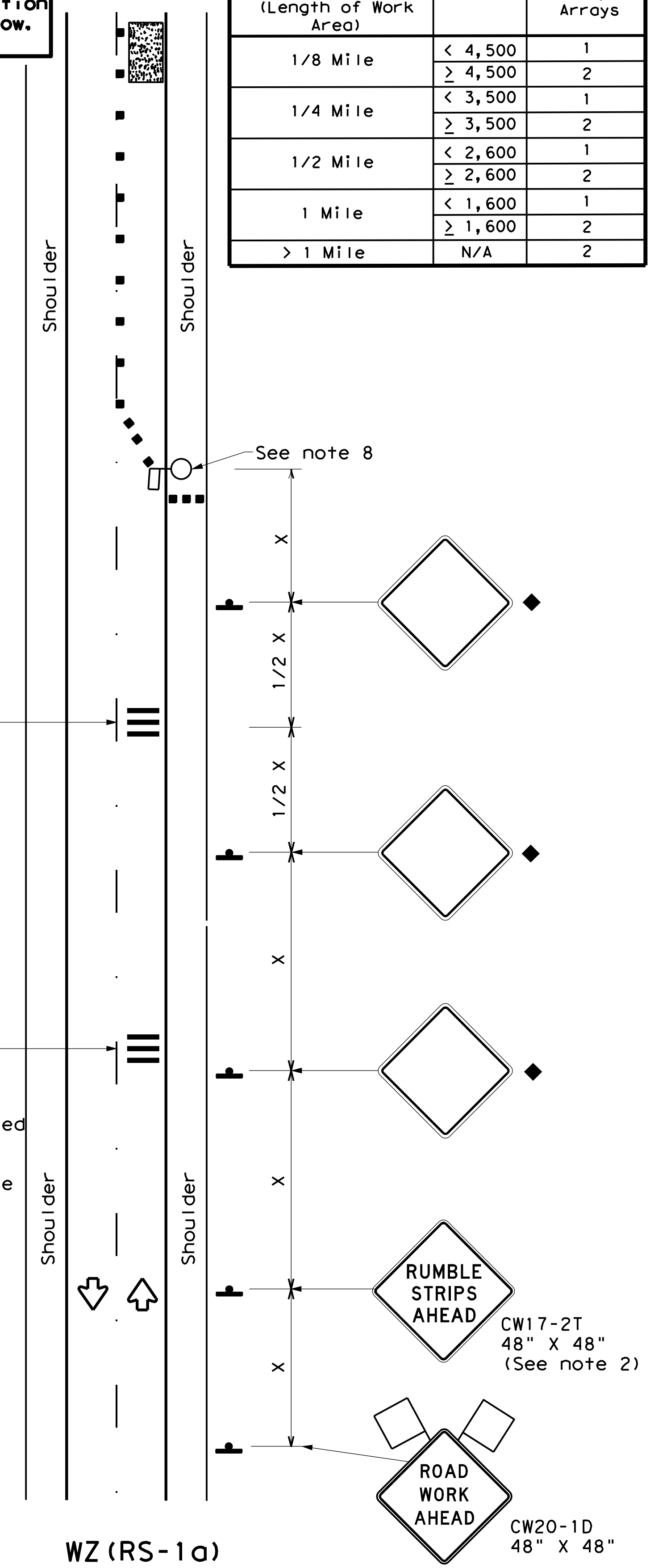
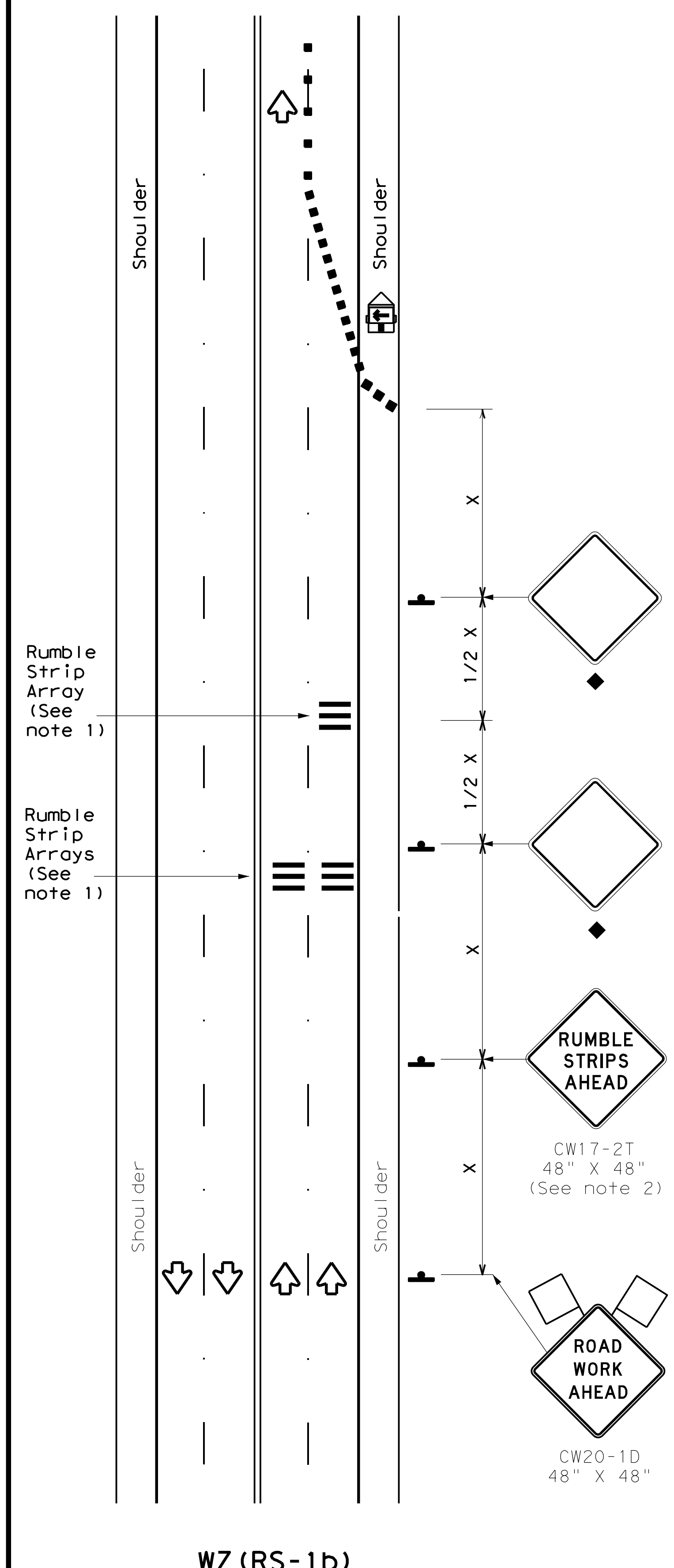
Warning sign and rumble strip sequence in opposite direction is same as below.

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



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 2-14 1-22 4-16	0729	02	032	FM 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	40

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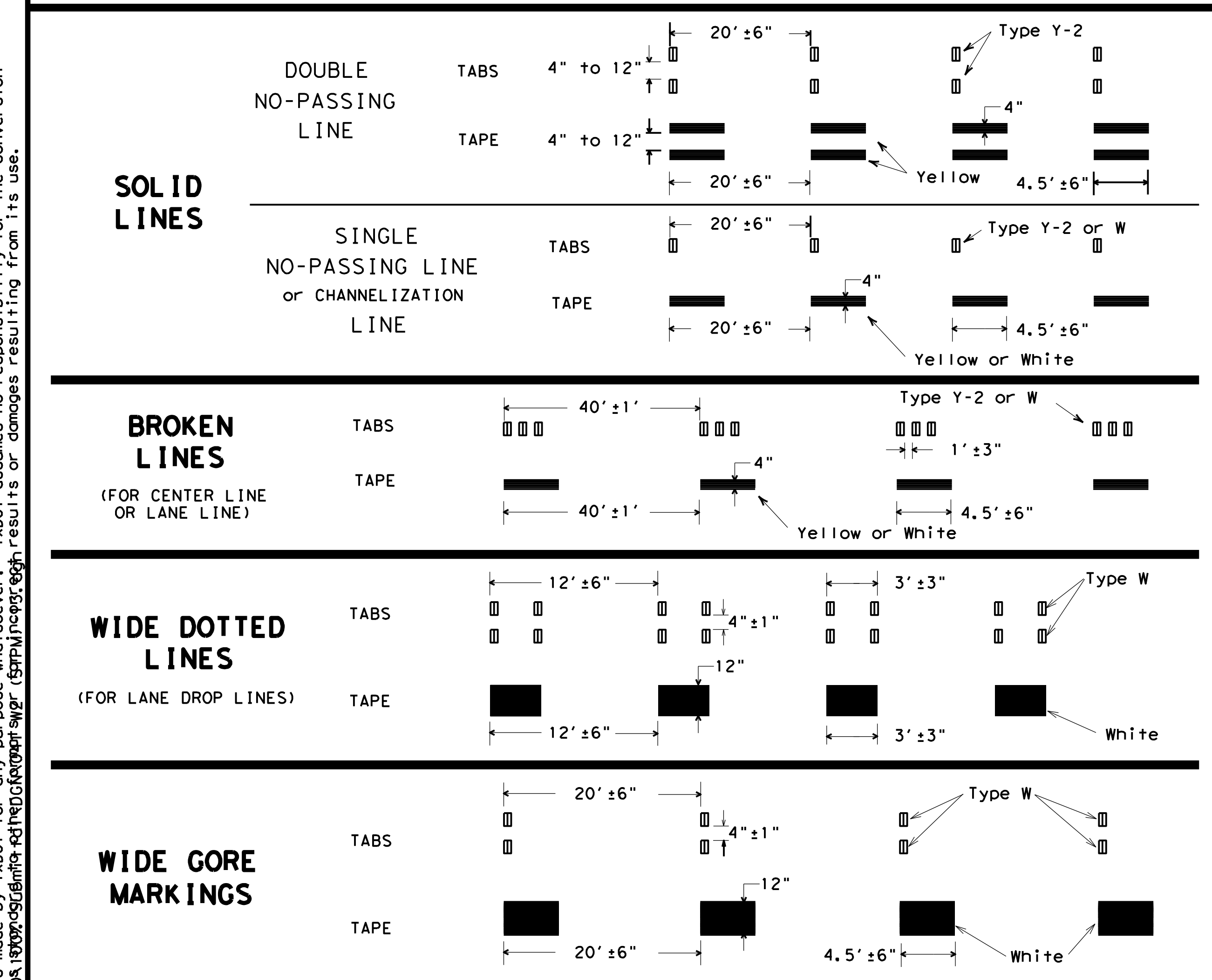
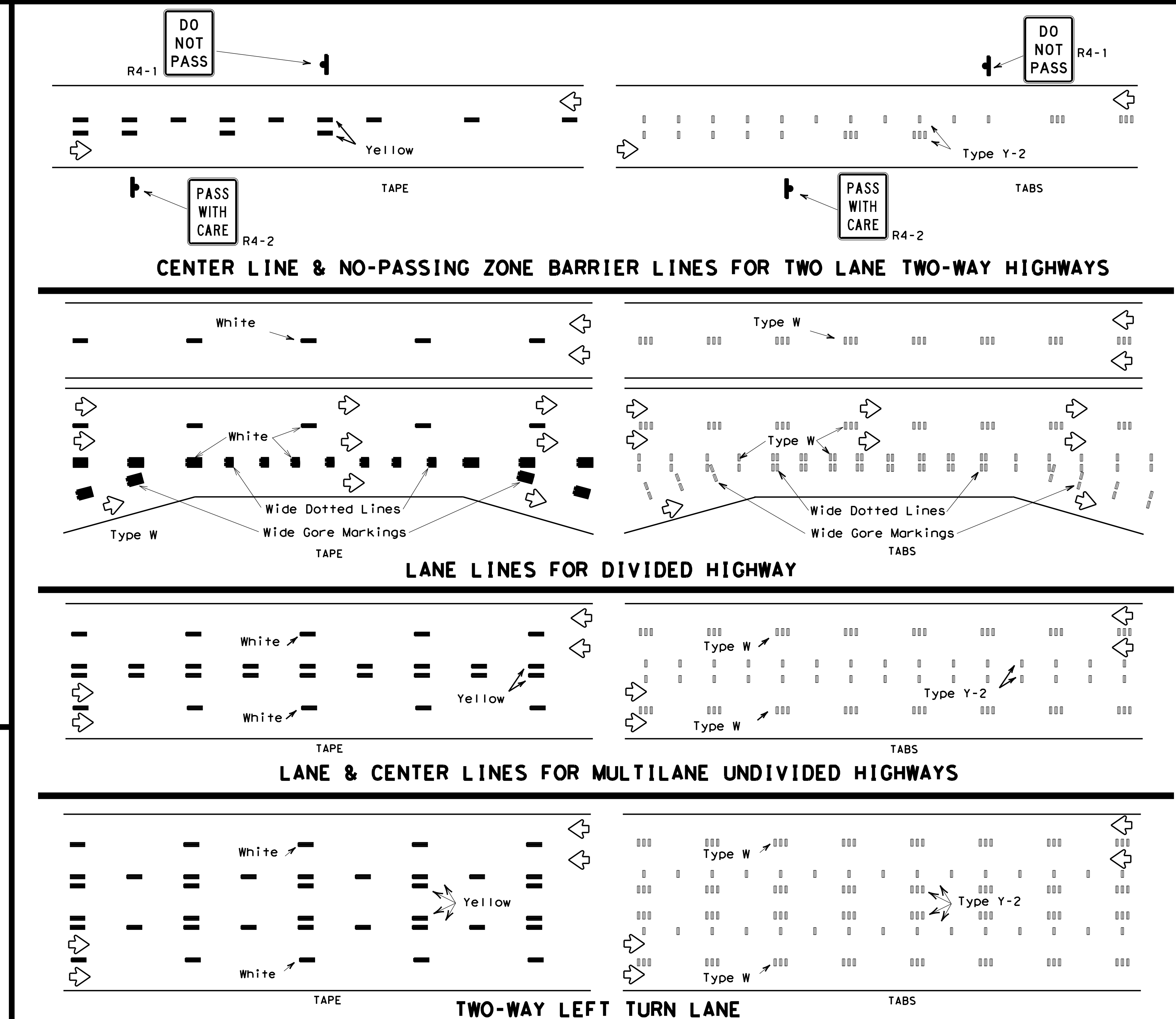
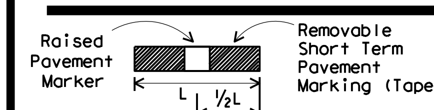
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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

NOTES:

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

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

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Texas Department of Transportation | Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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© TxDOT April 1992	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
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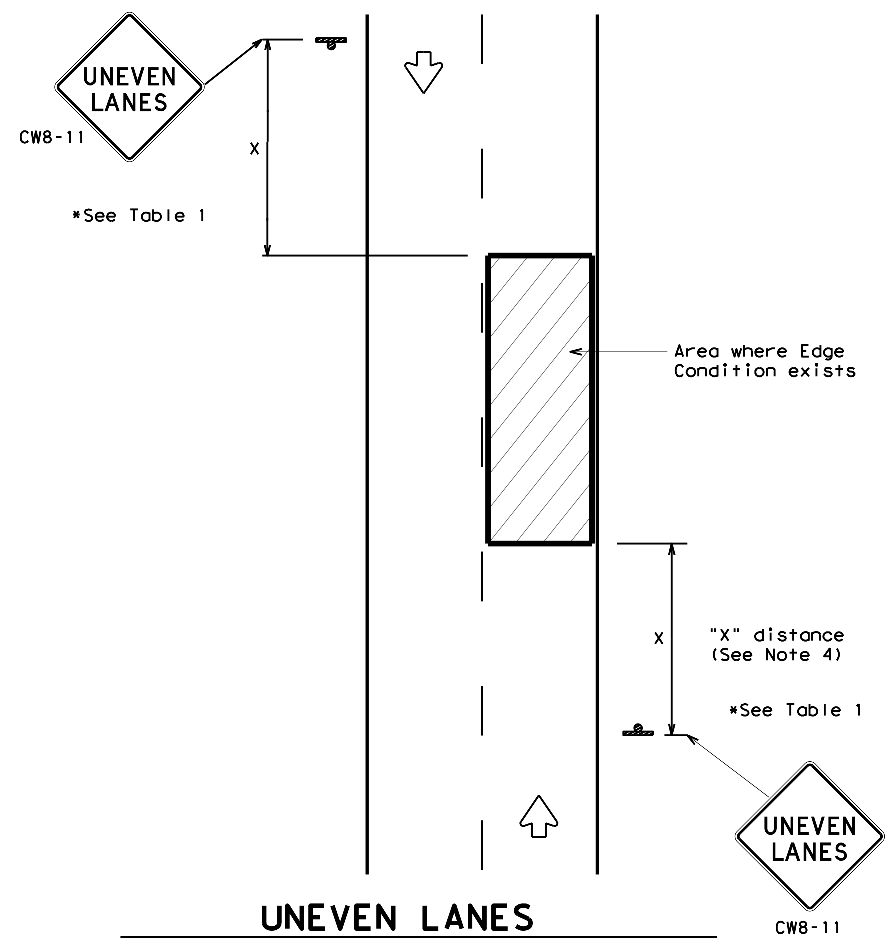
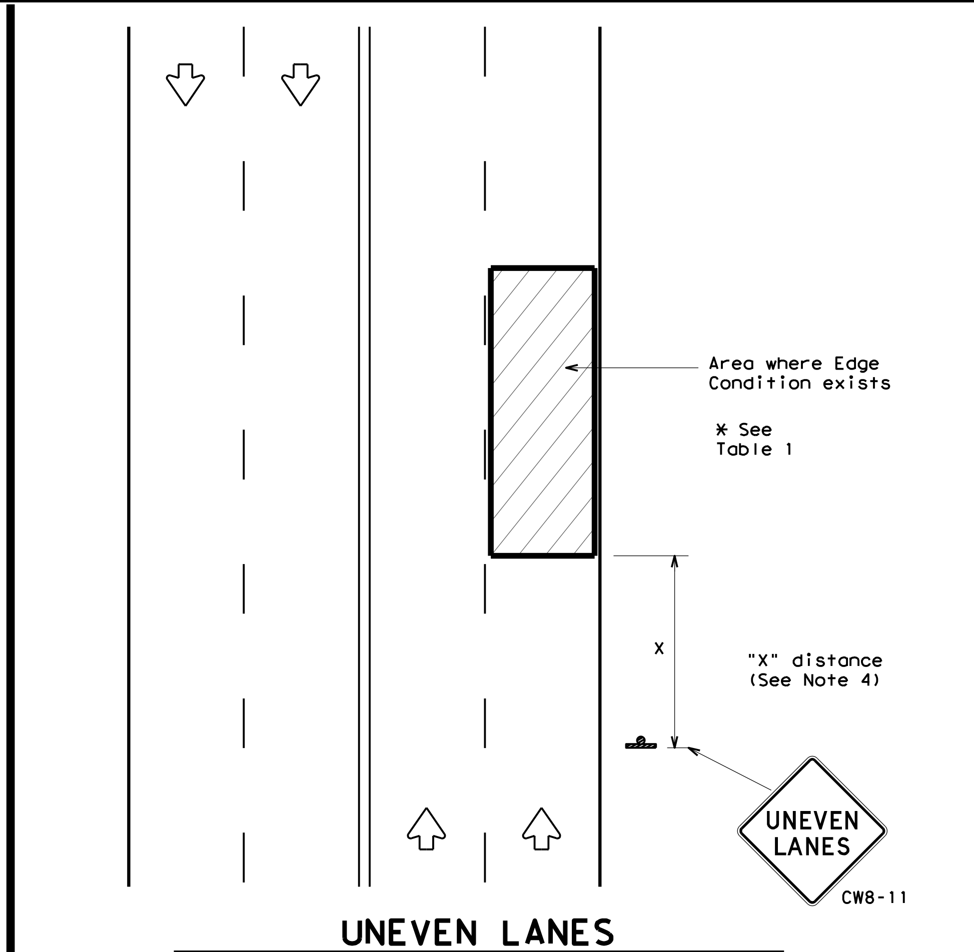
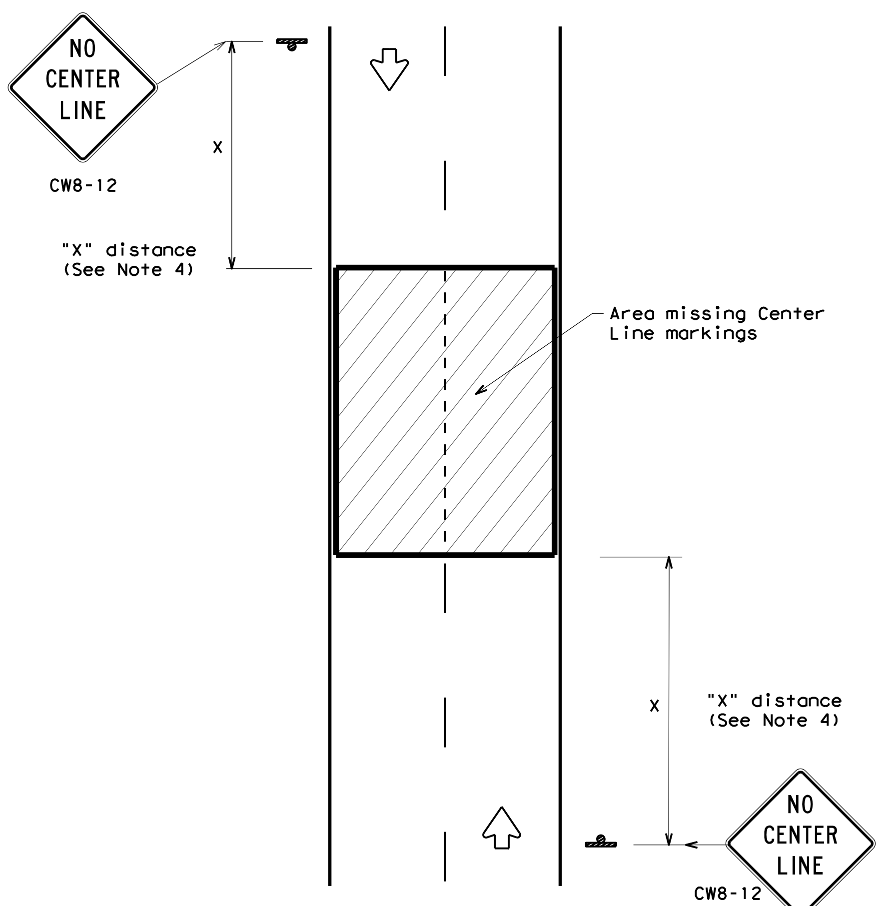


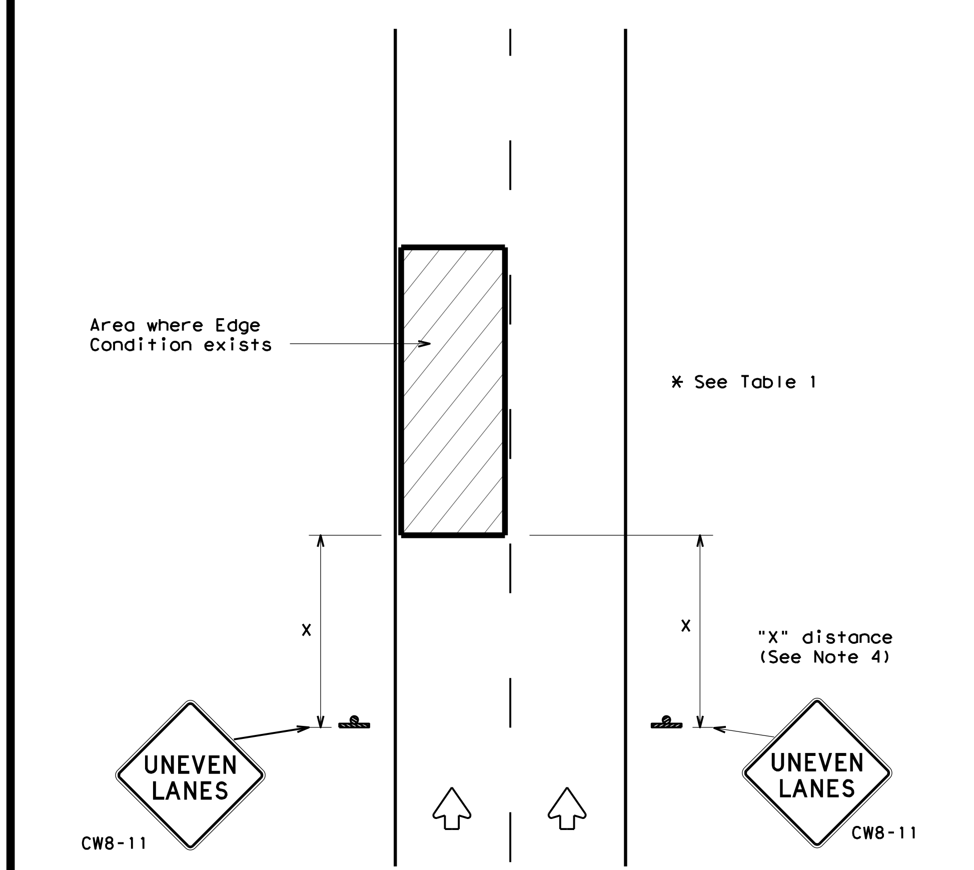
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

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

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

GENERAL NOTES

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

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① (D)	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

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

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

Texas Department of Transportation
Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 8-95 2-98 7-13 1-97 3-03	DIST PAR		COUNTY GRAYSON	SHEET NO. 42

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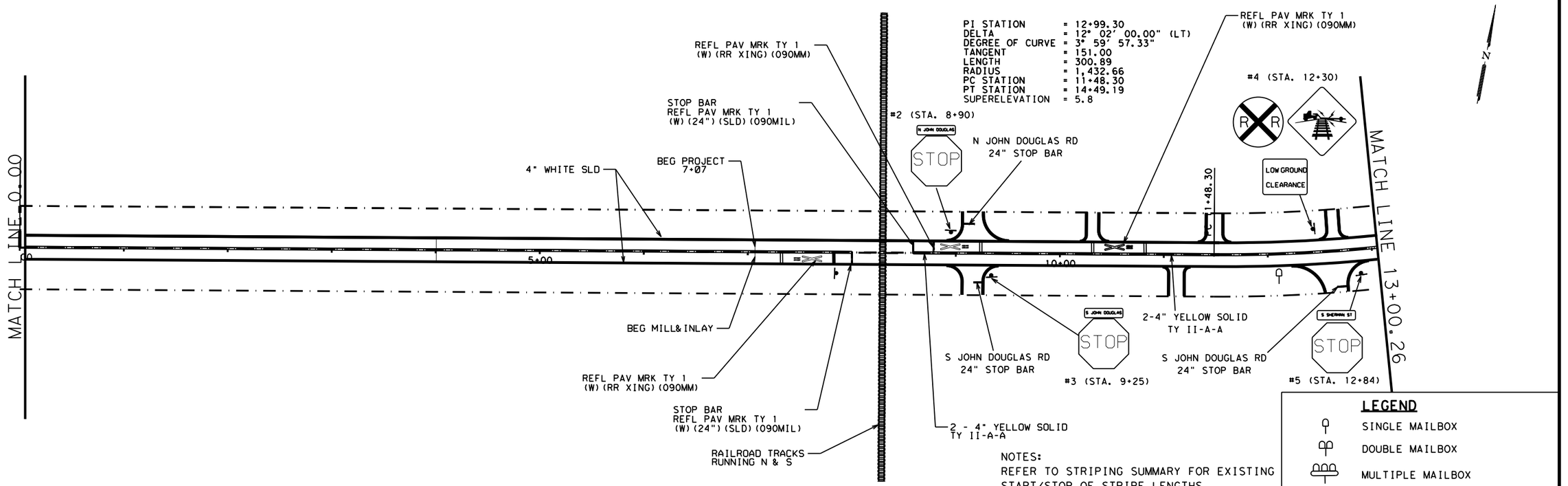

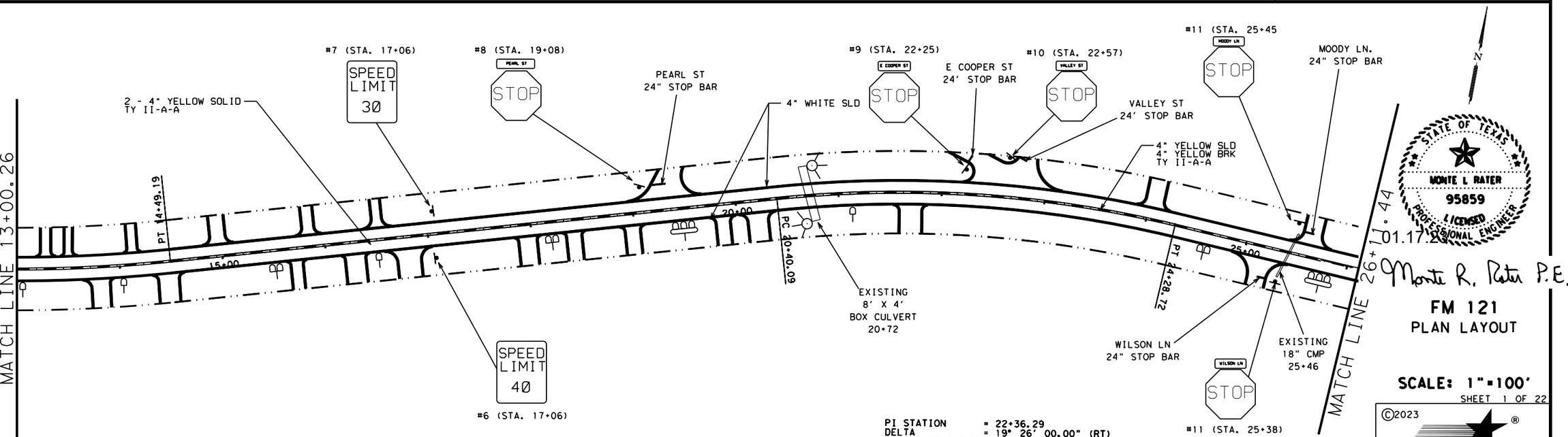

FM 121
PLAN LAYOUT

SCALE: 1"=100'

SHEET 1 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		43

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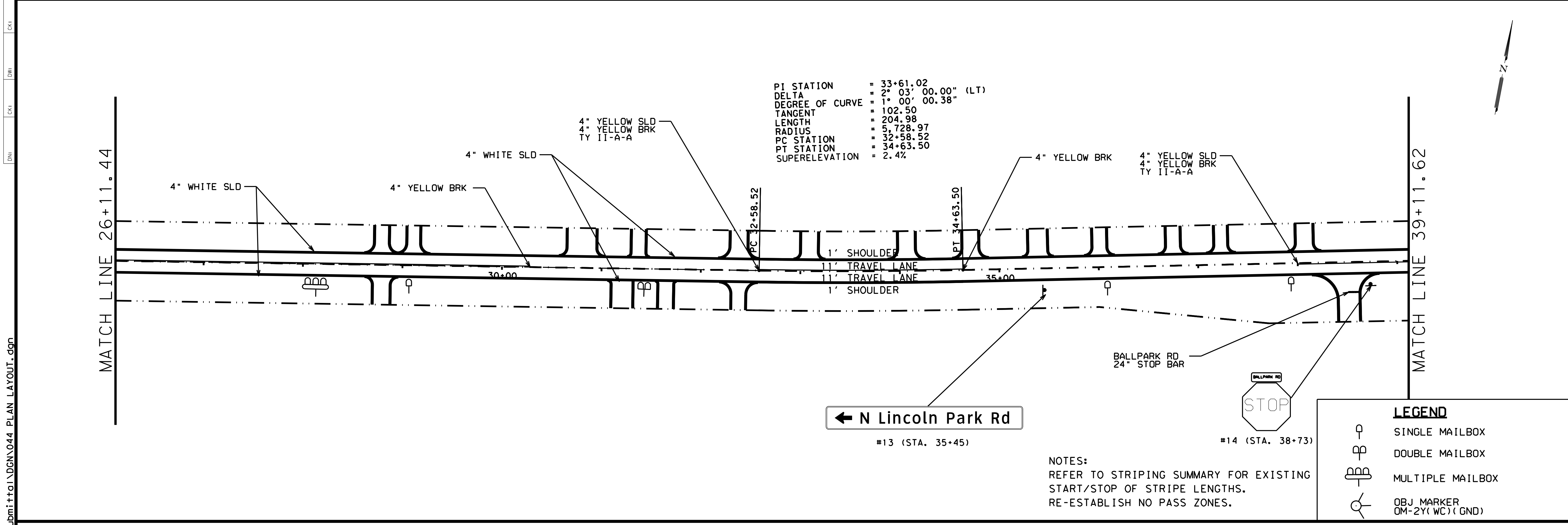

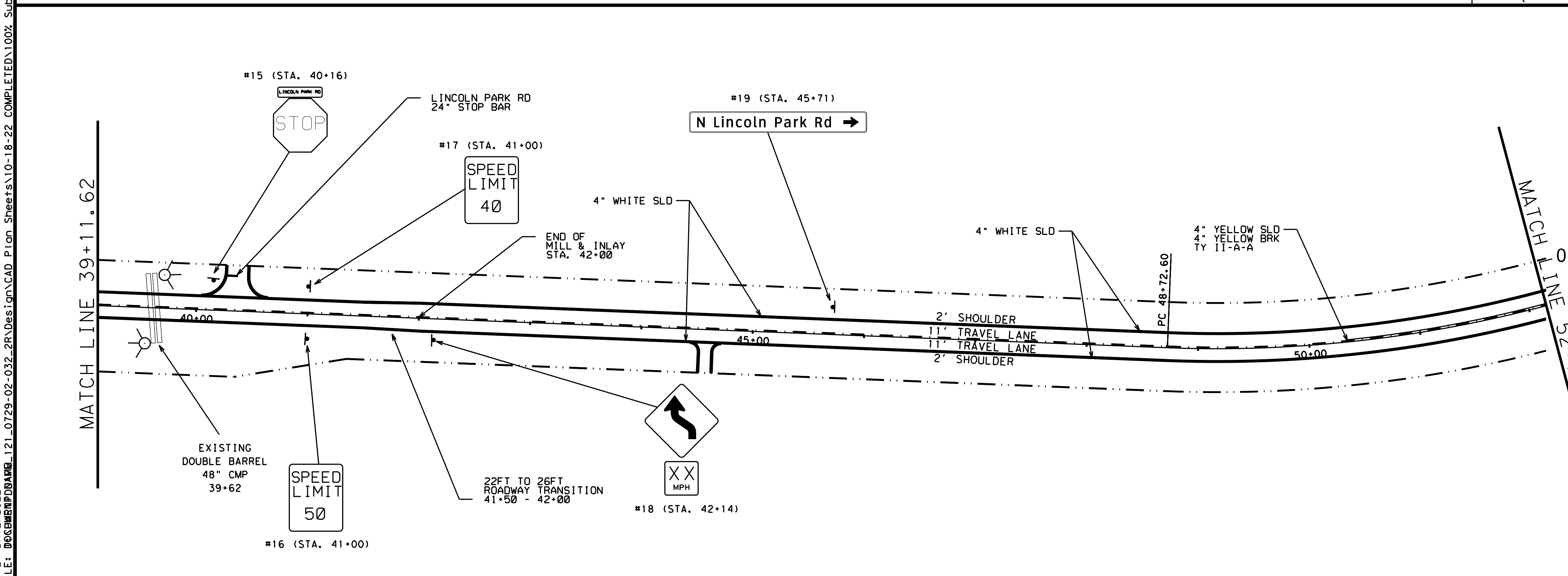

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.17.23

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

SCALE 1"=100"
SHEET 2 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	44

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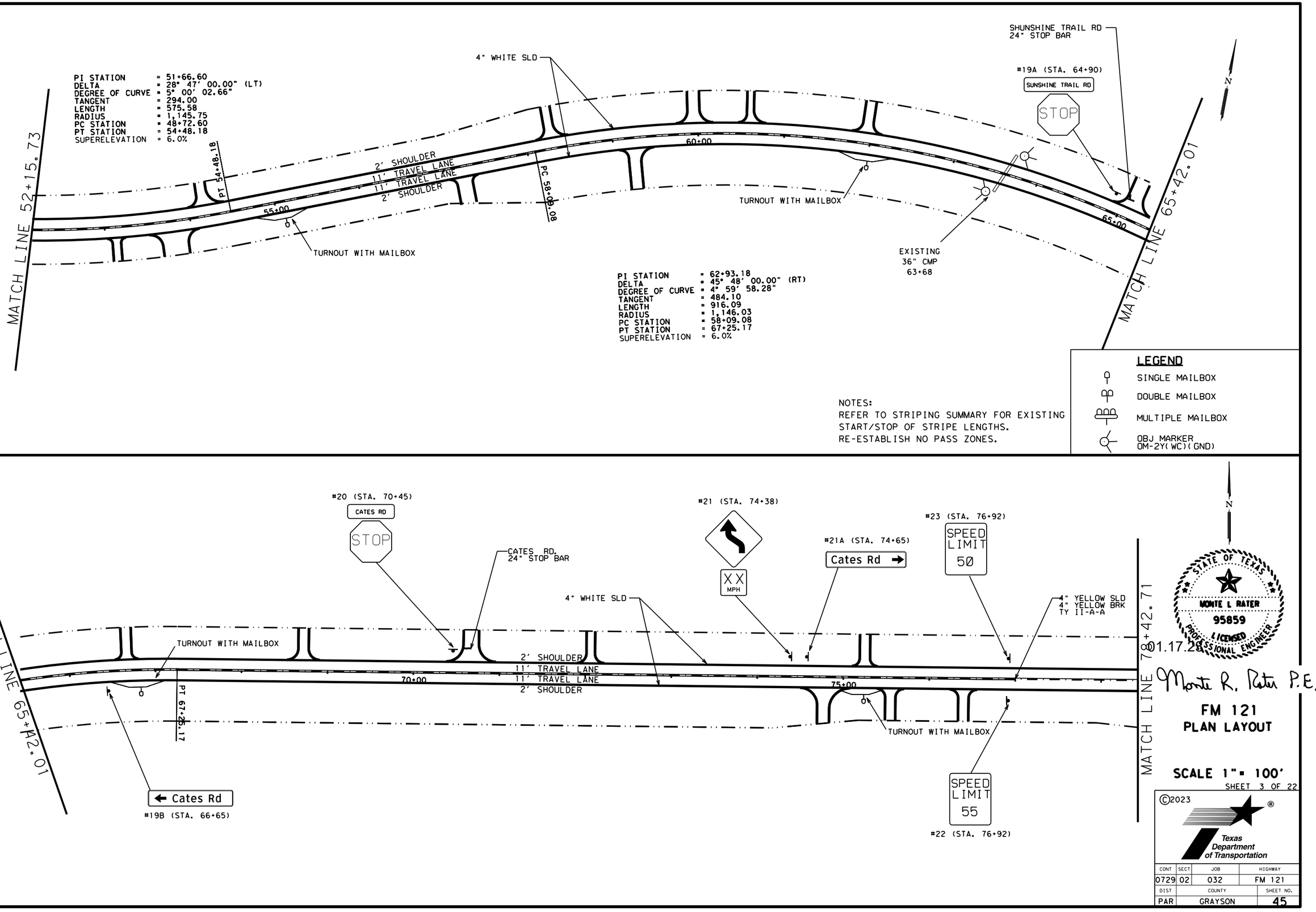
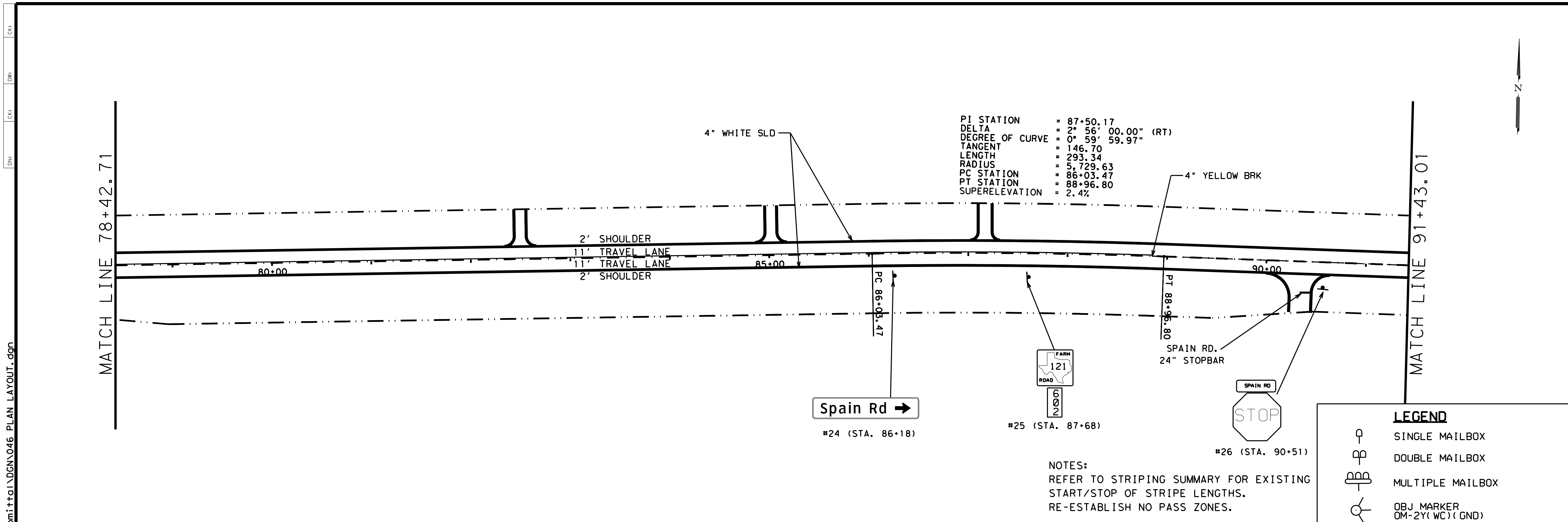
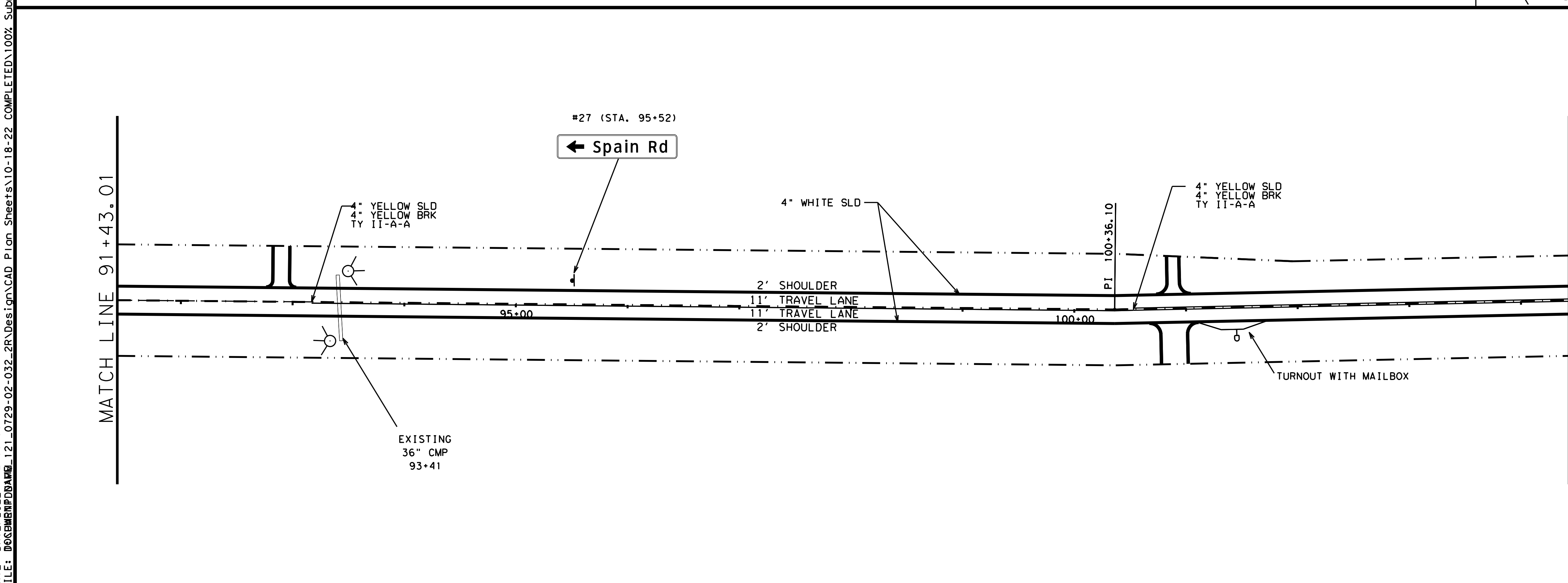

PI STATION = 51+66.60
DELTA = 28° 47' 00.00" (LT)
DEGREE OF CURVE = 5° 00' 02.66"
TANGENT = 294.00
LENGTH = 575.58
RADIUS = 1,145.75
PC STATION = 48+72.60
PT STATION = 54+48.18
SUPERELEVATION = 6.0%
MATCH LINE 52+15.73
4" WHITE SLD
SHUNSHINE TRAIL RD
24" STOP BAR
#19A (STA. 64+90)
SUNSHINE TRAIL RD
STOP
N
PT 54+48.18
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER
PC 58+09.08
55+00
60+00
65+00
TURNOUT WITH MAILBOX
TURNOUT WITH MAILBOX
EXISTING
36" CMP
63+68
MATCH LINE 65+42.01
PI STATION = 62+93.18
DELTA = 45° 48' 00.00" (RT)
DEGREE OF CURVE = 4° 59' 58.28"
TANGENT = 484.10
LENGTH = 916.09
RADIUS = 1,146.03
PC STATION = 58+09.08
PT STATION = 67+25.17
SUPERELEVATION = 6.0%
NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.
LEGEND
SINGLE MAILBOX
DOUBLE MAILBOX
MULTIPLE MAILBOX
OBJ MARKER
OM-2Y(WC)(GND)
#20 (STA. 70+45)
CATES RD
STOP
CATES RD.
24" STOP BAR
#21 (STA. 74+38)
XX
MPH
#21A (STA. 74+65)
Cates Rd
#23 (STA. 76+92)
SPEED LIMIT
50
4" WHITE SLD
4" YELLOW SLD
4" YELLOW BRK
TY II-A-A
MATCH LINE 65+42.71
TURNOUT WITH MAILBOX
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER
70+00
75+00
PT 67+25.17
Cates Rd
#19B (STA. 66+65)
SPEED LIMIT
55
#22 (STA. 76+92)
MATCH LINE 78+42.71
STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.17.23
Monte R. Rater P.E.
FM 121
PLAN LAYOUT
SCALE 1"= 100'
SHEET 3 OF 22
©2023
Texas Department of Transportation
CONT 0729
SECT 02
JOB 032
HIGHWAY FM 121
DIST PAR
COUNTY GRAYSON
SHEET NO. 45
DATE: DATE/TIME 12:00:47 PM
FILE: DOCUMENTNAME 121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\045 PLAN LAYOUT.dgn





STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.17.23
Monte R. Rater P.E.

FM 121
PLAN LAYOUT

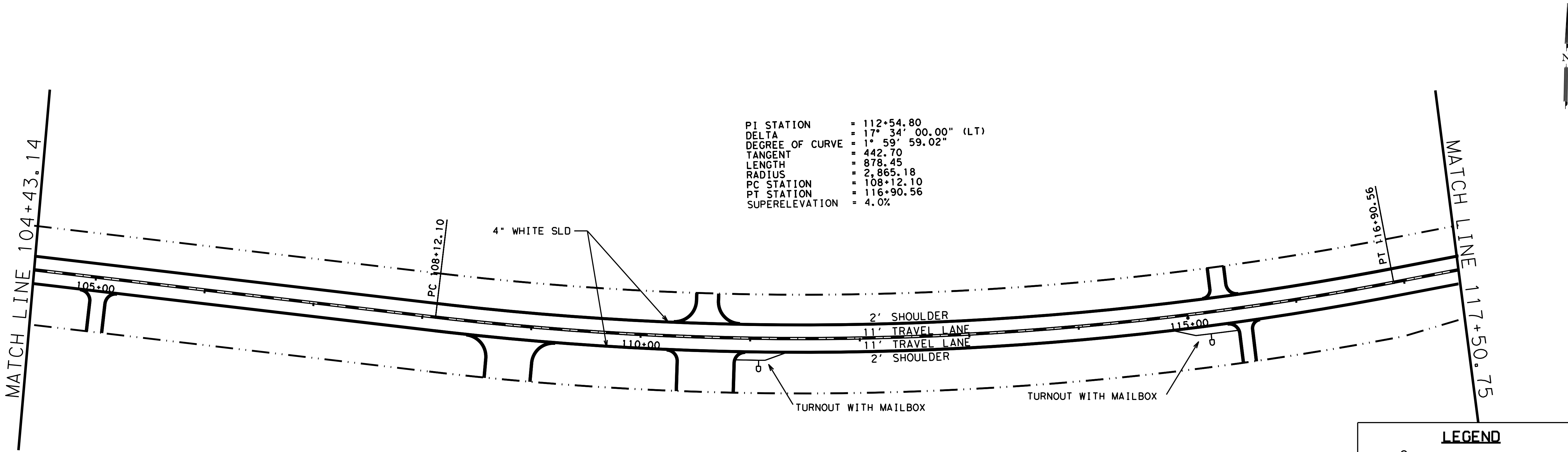
SCALE 1"= 100'

SHEET 4 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	46

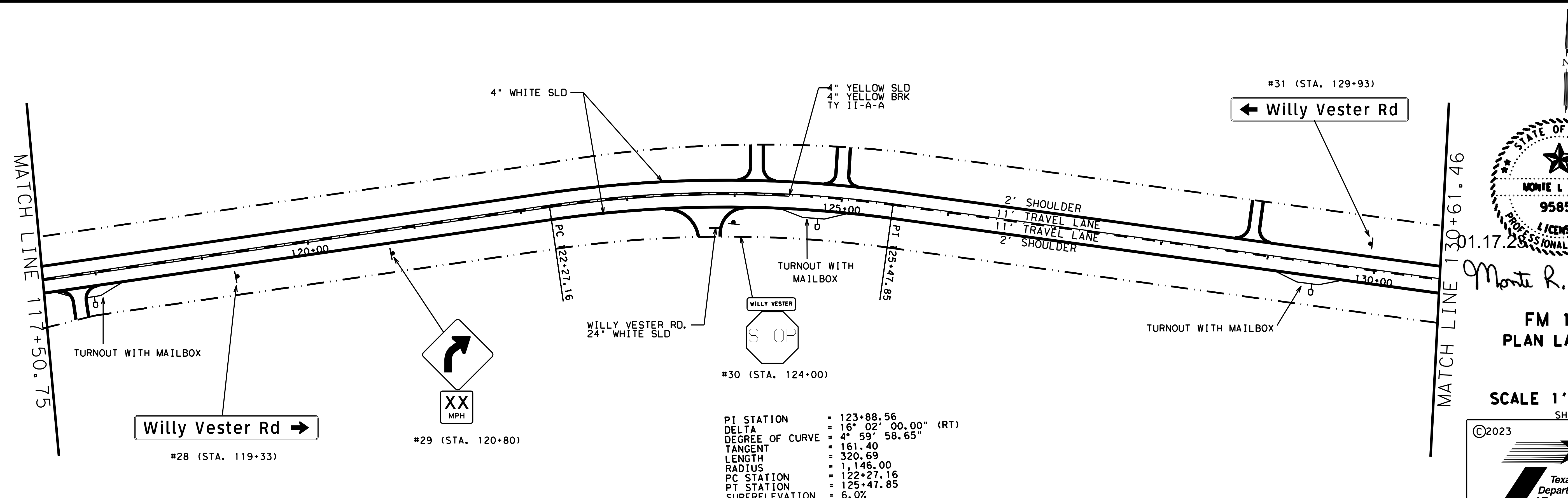
DATE: DATE/2023 12:00:50 PM
FILE: DOCUMENT/DATA_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\046 PLAN LAYOUT.dgn



NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX
- DOUBLE MAILBOX
- MULTIPLE MAILBOX
- OBJ MARKER OM-2Y(WC)(GND)



STATE OF TEXAS
MONTE L RATER
95859
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01.17.23
Monte R. Rater P.E.

FM 121
PLAN LAYOUT

SCALE 1' = 100'

SHEET 5 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	47

DATE: 1/17/2023 12:00:56 PM
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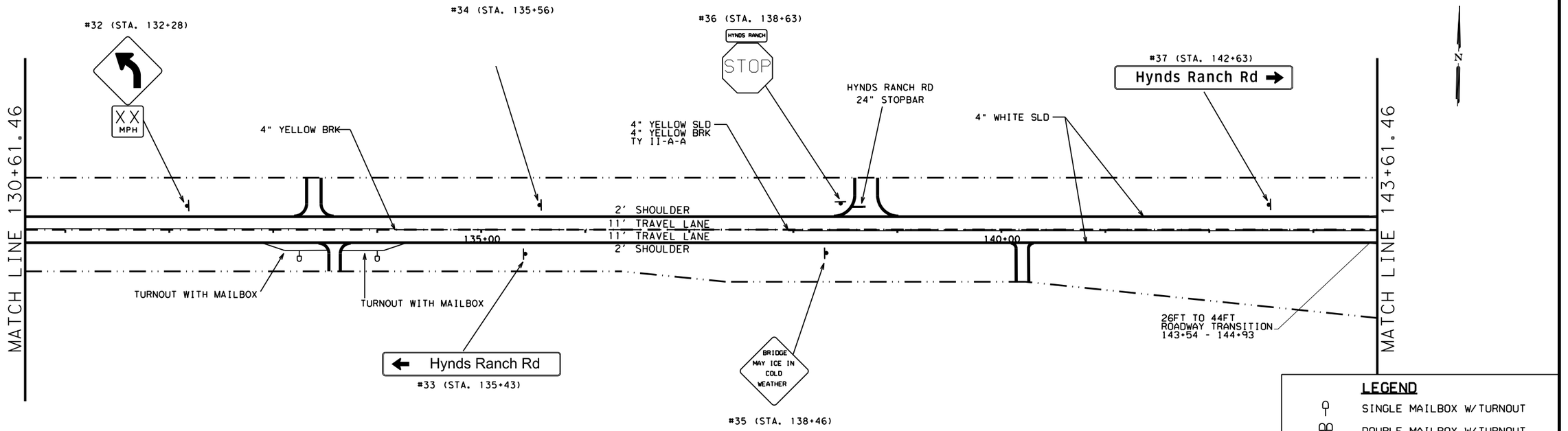
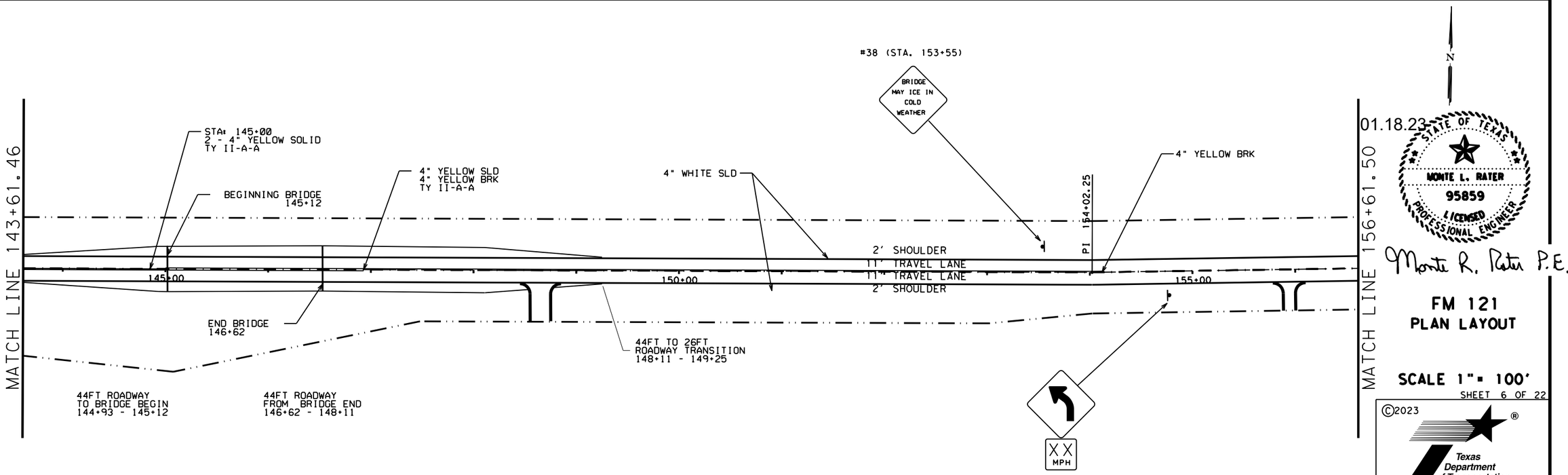


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.



01.18.23

STATE OF TEXAS
MONTE L. RATER
95859
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

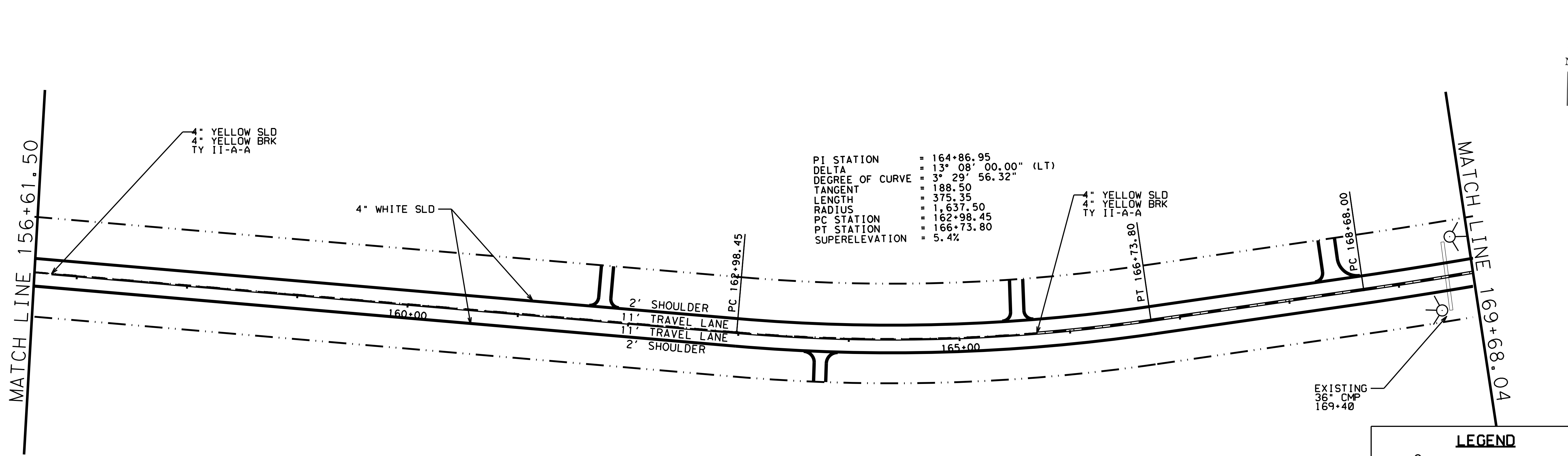
SCALE 1" = 100'

SHEET 6 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		48

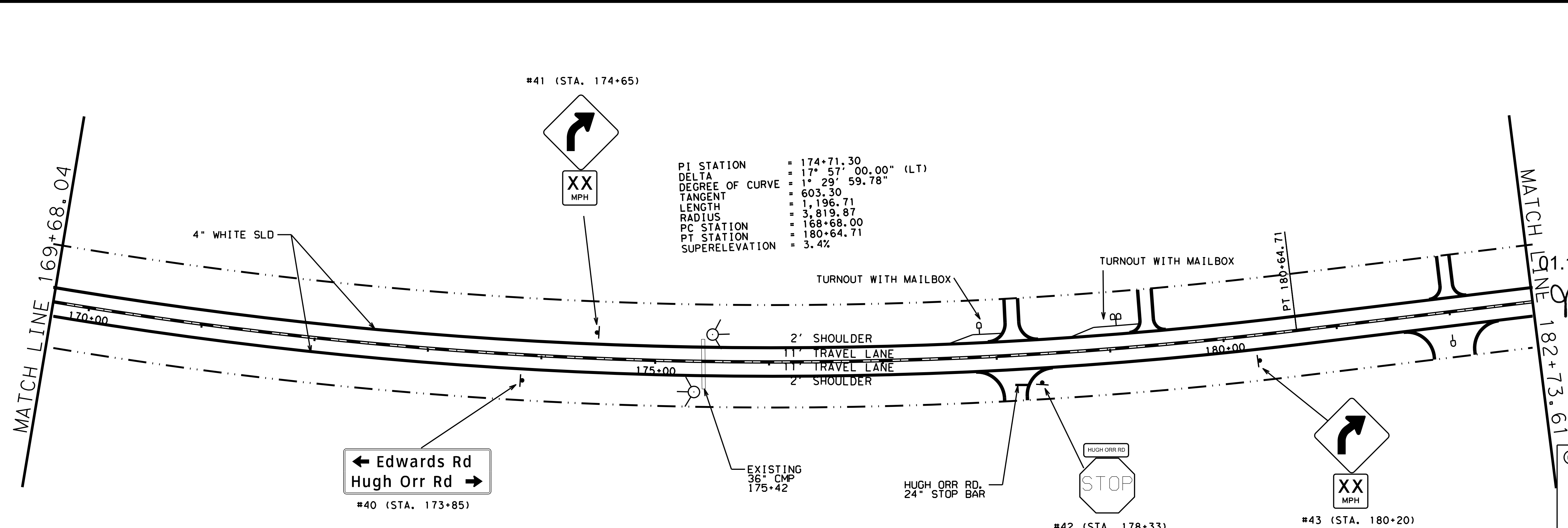
DATE: $DATE$ $TIME$
FILE: $DOCUMENT NAME



NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



STATE OF TEXAS
MONTE L. RATER
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01.17.23
Monte R. Rater P.E.

FM 121
PLAN LAYOUT

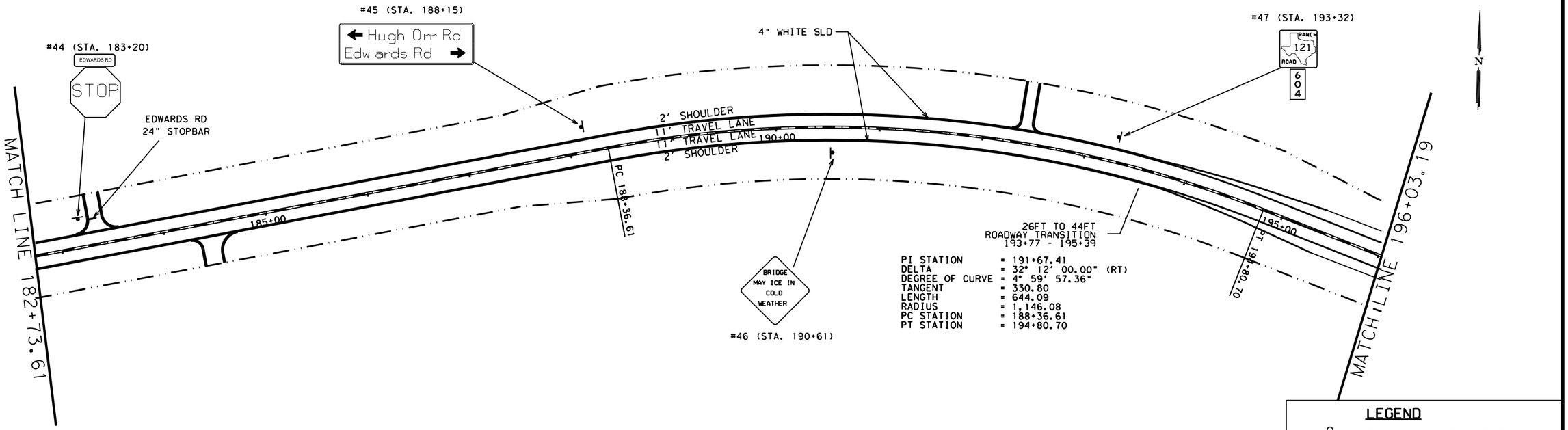
SCALE 1"= 100'

SHEET 7 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		49

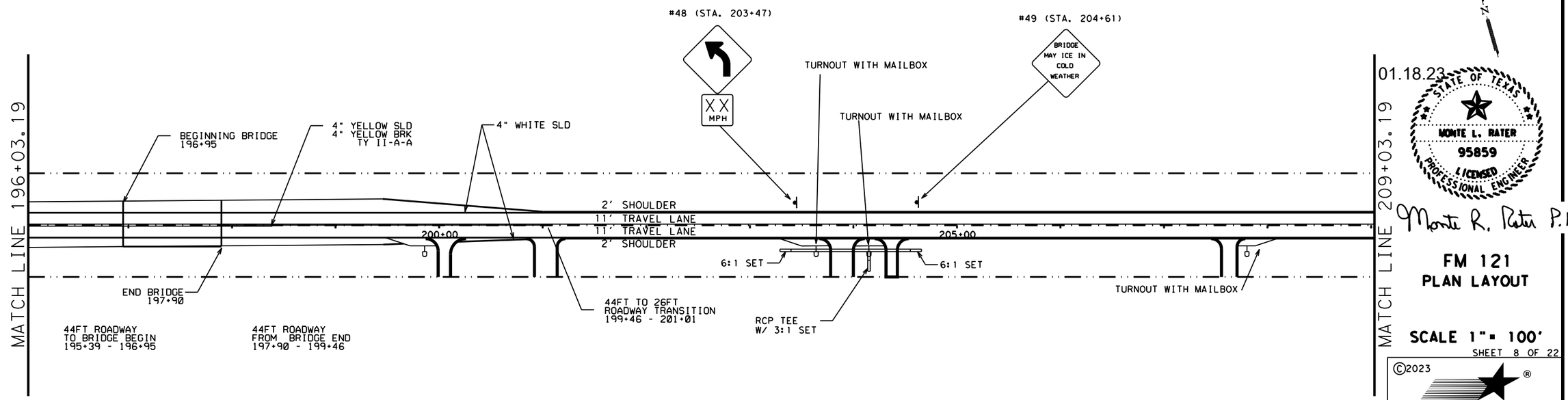
DATE: 1/17/2023 12:01:06 PM
FILE: ...FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\049 PLAN LAYOUT.dgn



NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



01.18.23

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

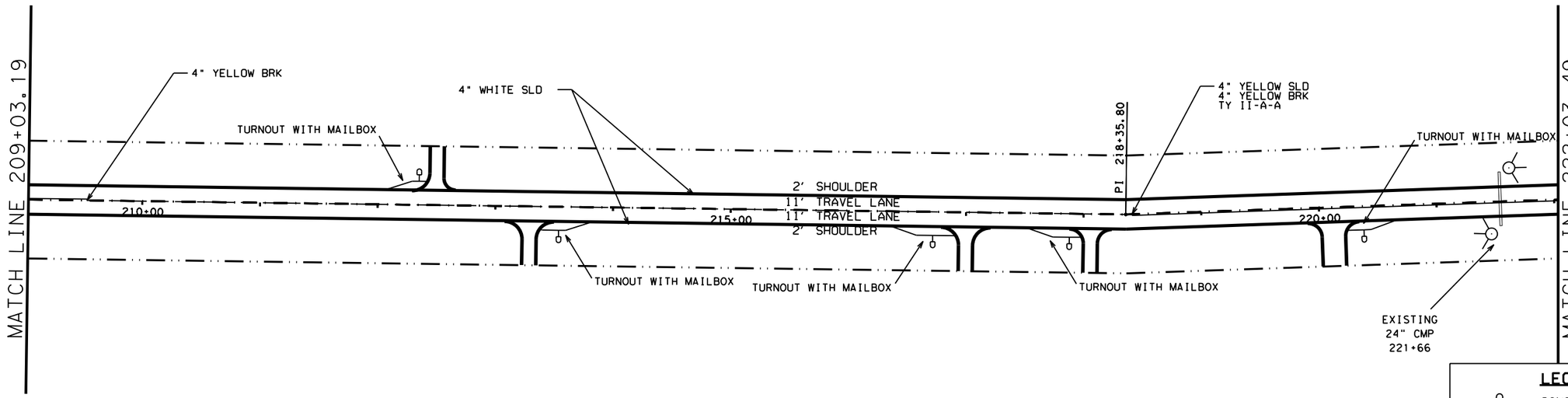
SCALE 1" = 100'

SHEET 8 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		50

DATE: $DATE$ $TIME$
FILE: $DOCUMENT NAME

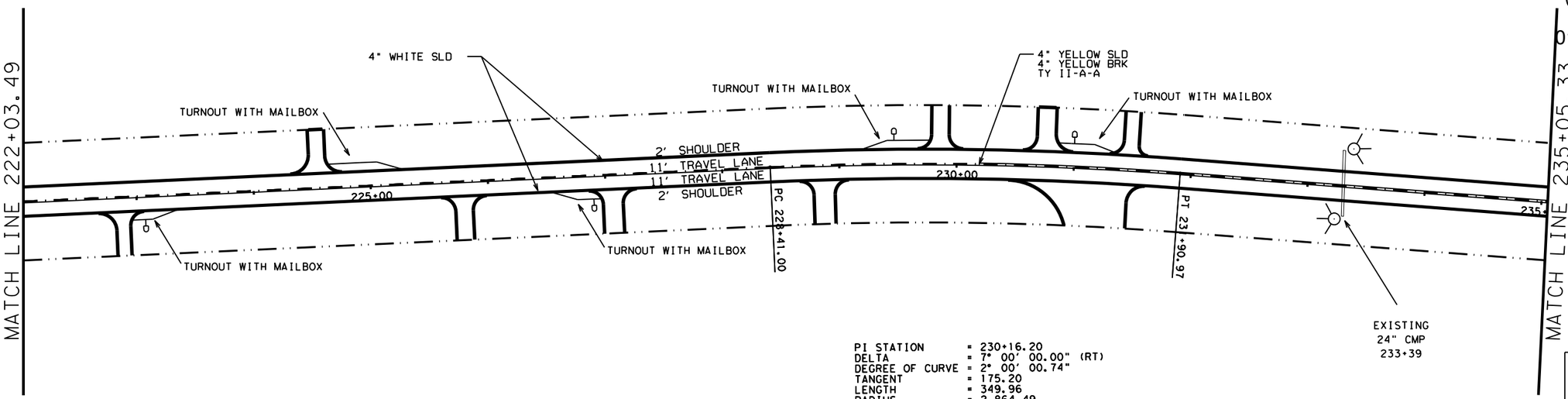


N

LEGEND

- SINGLE MAILBOX W/ TURNOUT
- DOUBLE MAILBOX W/ TURNOUT
- MULTIPLE MAILBOX W/ TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.



N

PI STATION	= 230+16.20
DELTA	= 7° 00' 00.00" (RT)
DEGREE OF CURVE	= 2° 00' 00.74"
TANGENT	= 175.20
LENGTH	= 349.96
RADIUS	= 2,864.49
PC STATION	= 228+41.00
PT STATION	= 231+90.97
SUPERELEVATION	= 4.0%

Monte R. Rater P.E.
01.17.23

STATE OF TEXAS
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FM 121
PLAN LAYOUT

SCALE 1" = 100'

SHEET 9 OF 22

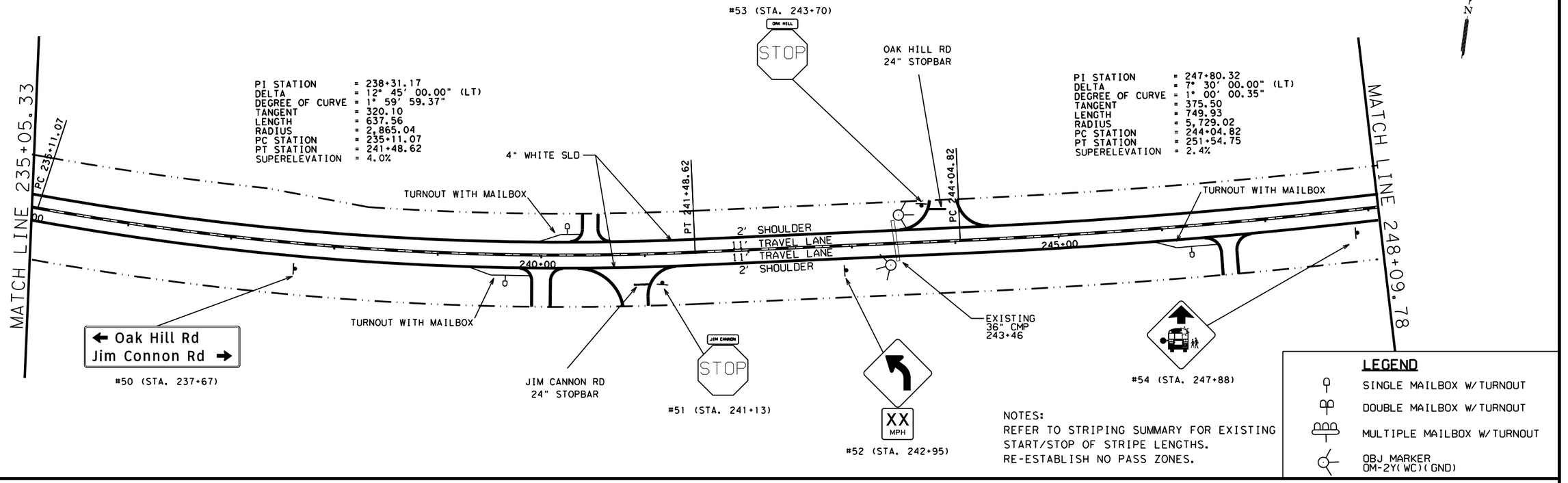
Texas Department of Transportation

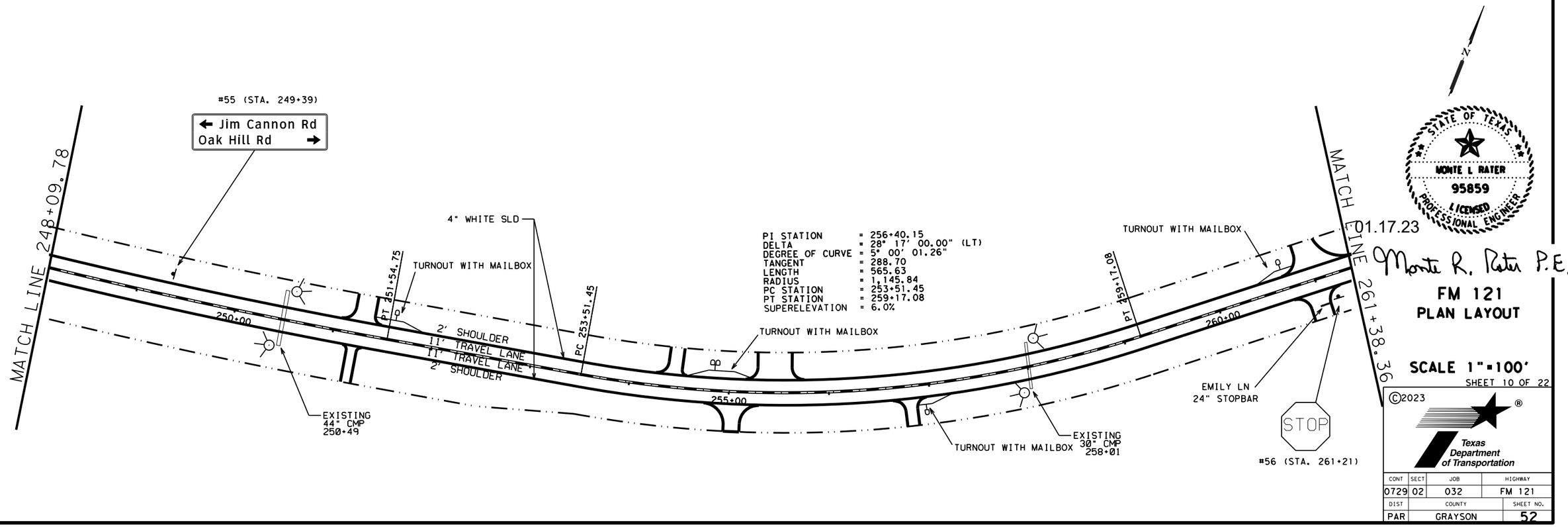
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		51

DATE: DATE/TIME
FILE: DOCUMENT NAME

CK:
DW:
CK:
DN:

100% Submittal\DGN\051 PLAN LAYOUT.dgn





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01.17.23

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

SCALE 1"=100'

SHEET 10 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		52

DATE: DATE/TIME 12:07:36 PM
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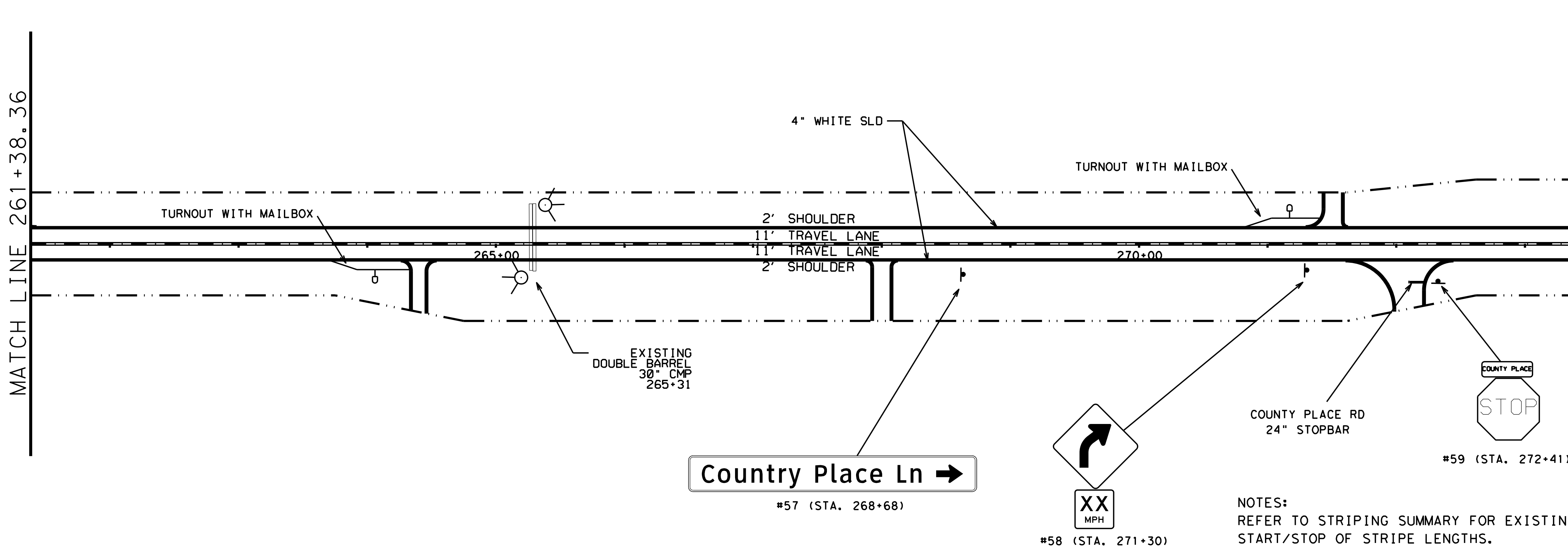
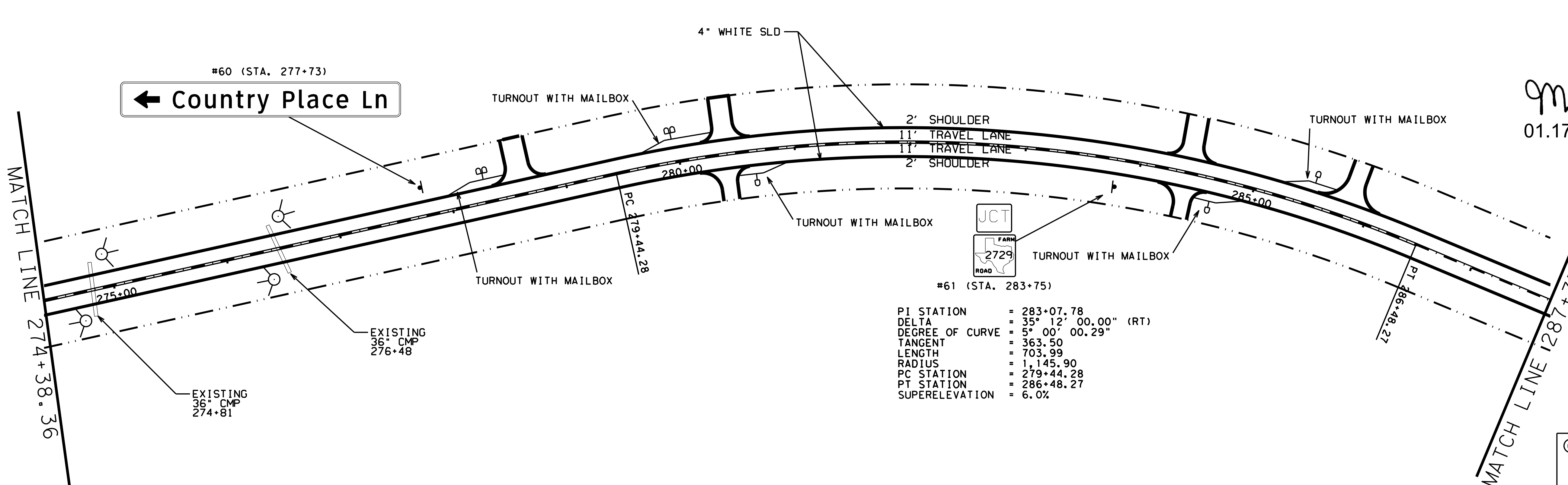


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING
START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

SINGLE MAILBOX W/TURNOUT
DOUBLE MAILBOX W/TURNOUT
MULTIPLE MAILBOX W/TURNOUT
OBJ MARKER
OM-2Y(WC)(GND)



PI STATION = 283+07.78
DELTA = 35° 12' 00.00" (RT)
DEGREE OF CURVE = 5° 00' 00.29"
TANGENT = 363.50
LENGTH = 703.99
RADIUS = 1,145.90
PC STATION = 279+44.28
PT STATION = 286+48.27
SUPERELEVATION = 6.0%

Monte R. Rater P.E.
01.17.23

STATE OF TEXAS
MONTE L RATER
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PROFESSIONAL ENGINEER

FM 121
PLAN LAYOUT

SCALE 1"=100'

SHEET 11 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	53

DATE: 1/17/2023 12:07:39 PM
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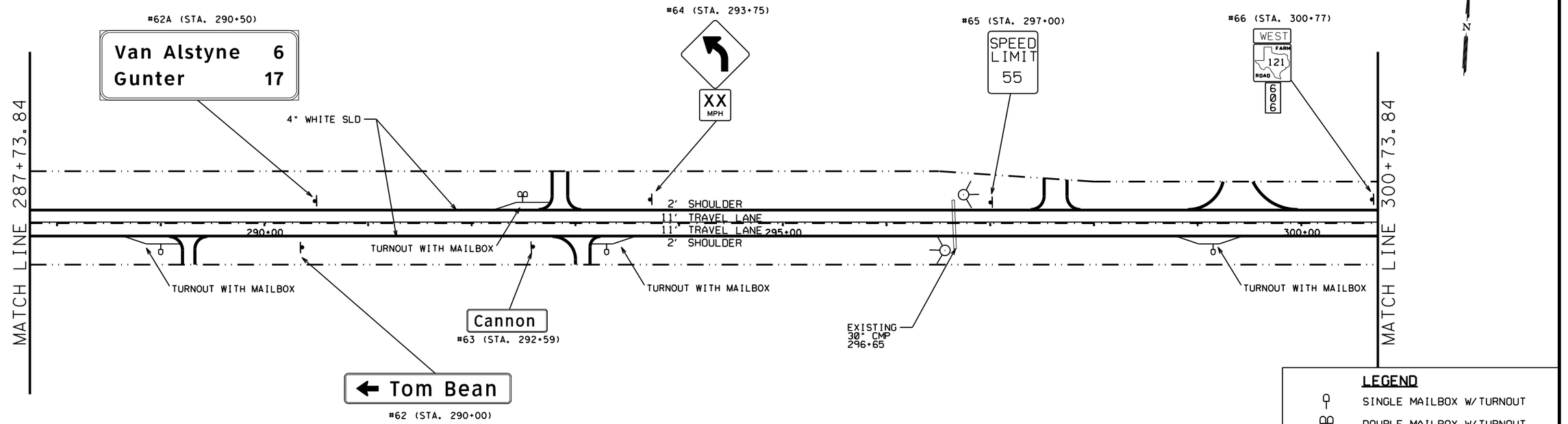

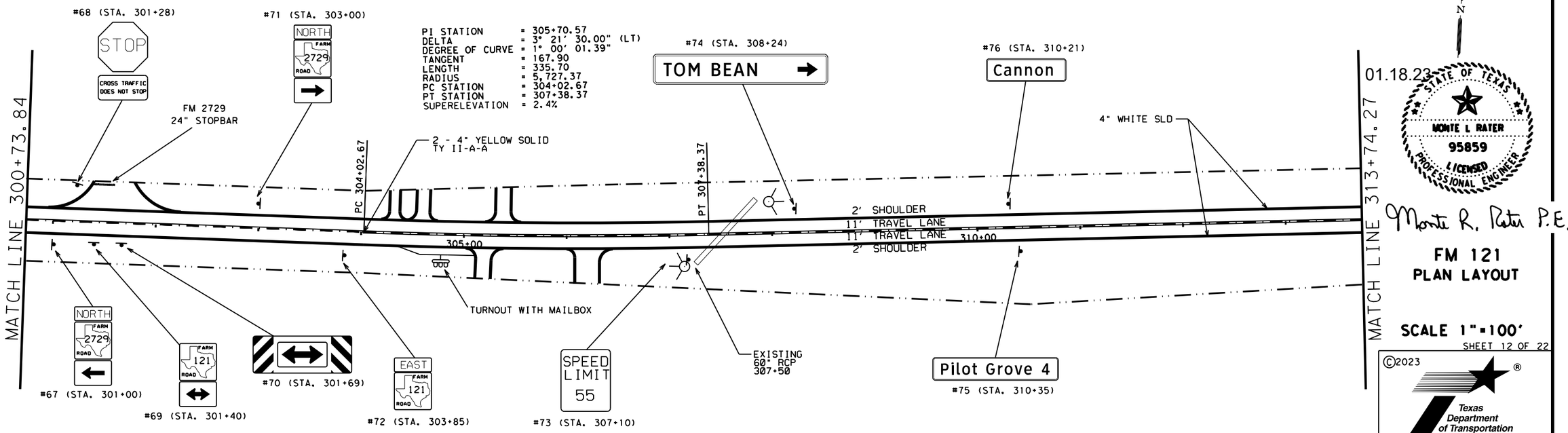

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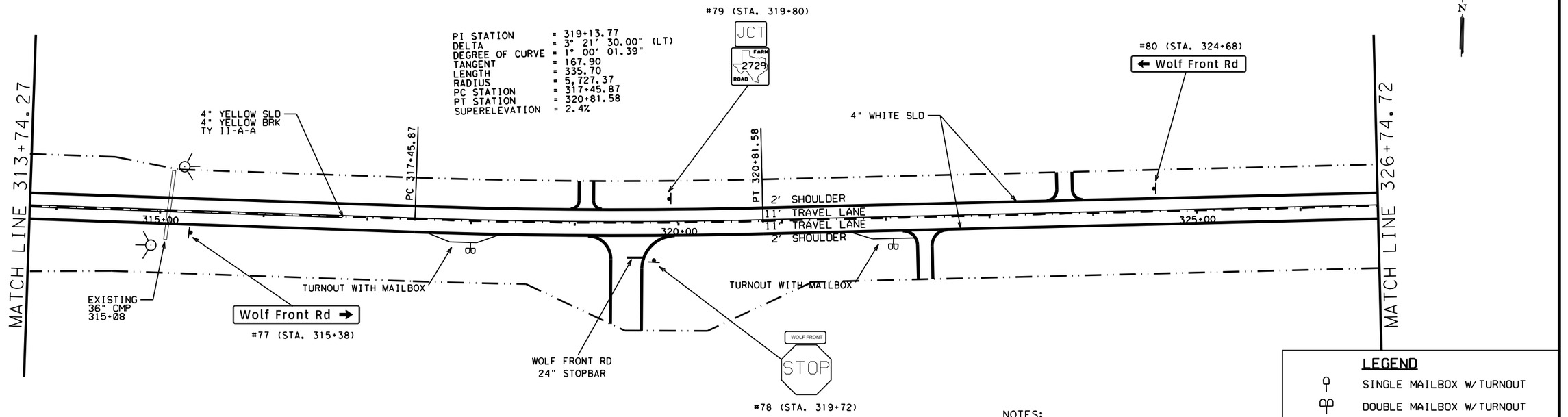

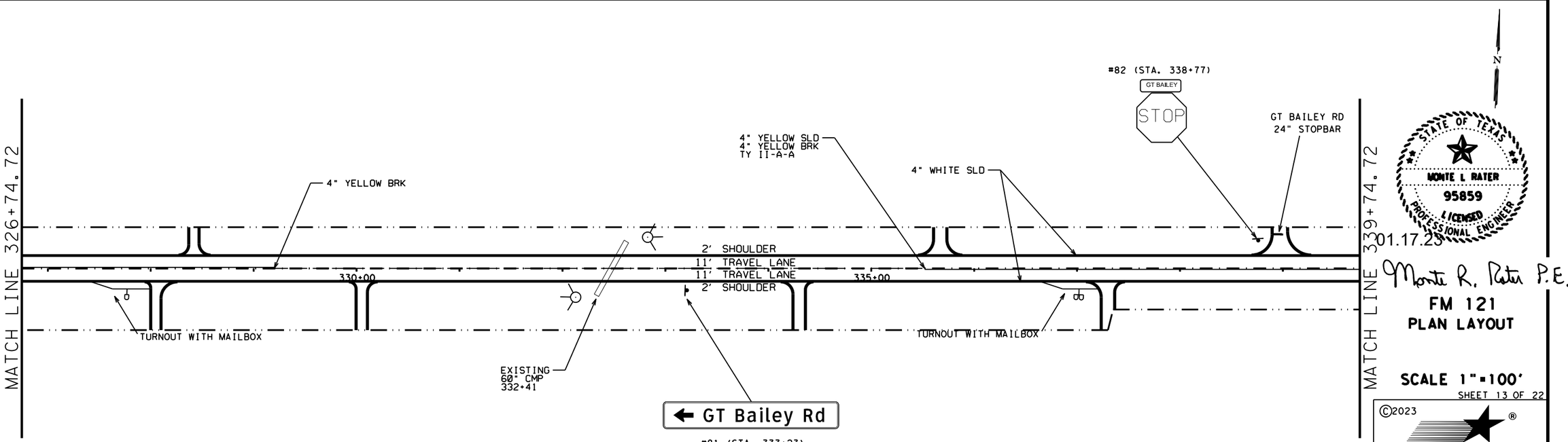

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		55

DATE: DATE TIME
FILE: DOCUMENT NAME

CK:
DW:
CK:
DN:

#84 (STA. 343+65)

GT Bailey Rd →

#85 (STA. 345+45)

WILD RD

STOP

WILD RD
24" STOPBAR

#86 (STA. 348+20)

BETHAL CANNON

STOP

BETHAL CANNON RD
24" STOPBAR

#89 (STA. 352+74)

Bethal Cannon Rd →
Wild Rd →

TURNOUT WITH MAILBOX

TURNOUT WITH MAILBOX

4" YELLOW SLD
4" YELLOW BRK
TY II-A-A

TURNOUT WITH MAILBOX

MATCH LINE 339+74.72

340+00

2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER

345+00

PC 345+89.78

EXISTING
18" RCP
145+00

2 - 4" YELLOW SOLID
TY II-A-A

4" WHITE SLD

350+00

BETHAL CANNON

STOP

#87 (STA. 349+25)

STOP

#88 (STA. 349+80)

MATCH LINE 352+91.49

N

PI STATION = 349+55.78
DELTA = 28° 40' 00.00" (RT)
DEGREE OF CURVE = 4° 00' 00.02"
TANGENT = 366.00
LENGTH = 716.67
RADIUS = 1,432.39
PC STATION = 345+89.78
PT STATION = 353+06.44
SUPERELEVATION = 5.8%

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)

← Wild Rd
← Bethal Cannon Rd

#83 (STA. 341+55)

MATCH LINE 352+91.49

2 - 4" YELLOW SOLID
TY II-A-A

TURNOUT WITH MAILBOX

4" WHITE SLD

4" YELLOW SLD
4" YELLOW BRK
TY II-A-A

355+00

TURNOUT WITH MAILBOX

360+00

2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER

365+00

MATCH LINE 365+91.49

EXISTING
DOUBLE
7' X 5' BOX
356+80

TURNOUT WITH MAILBOX

TURNOUT WITH MAILBOX

XX
MPH

#90 (STA. 359+12)

N

STATE OF TEXAS
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95859
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PROFESSIONAL ENGINEER

01.17.23

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

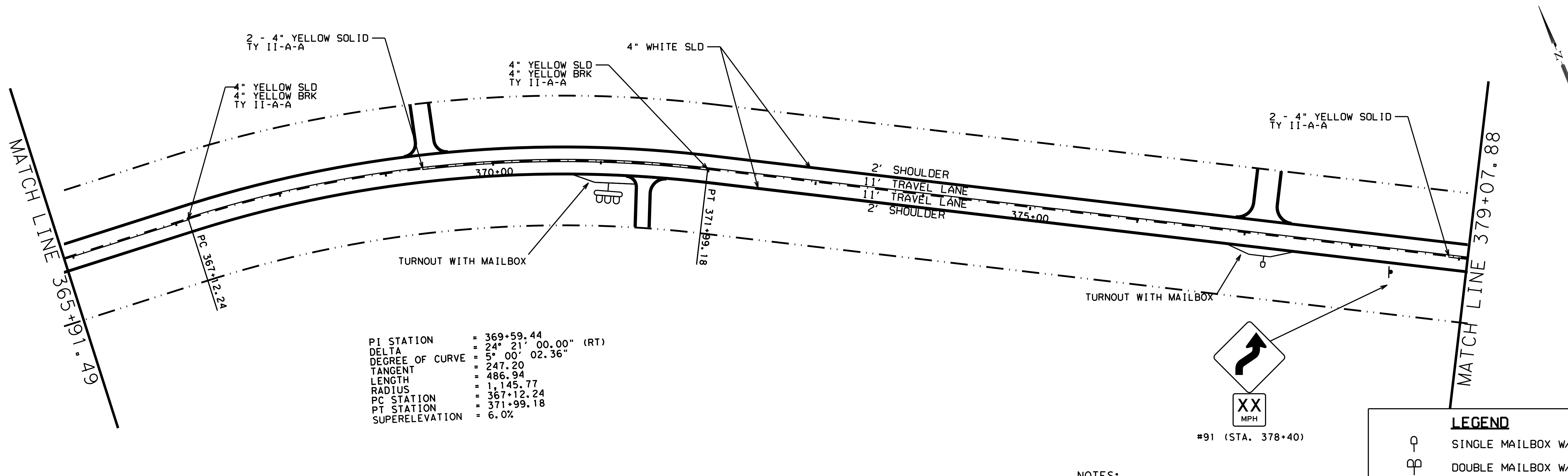
SCALE 1"=100'

SHEET 14 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		56

DATE: DATE TIME
FILE: DOCUMENT NAME

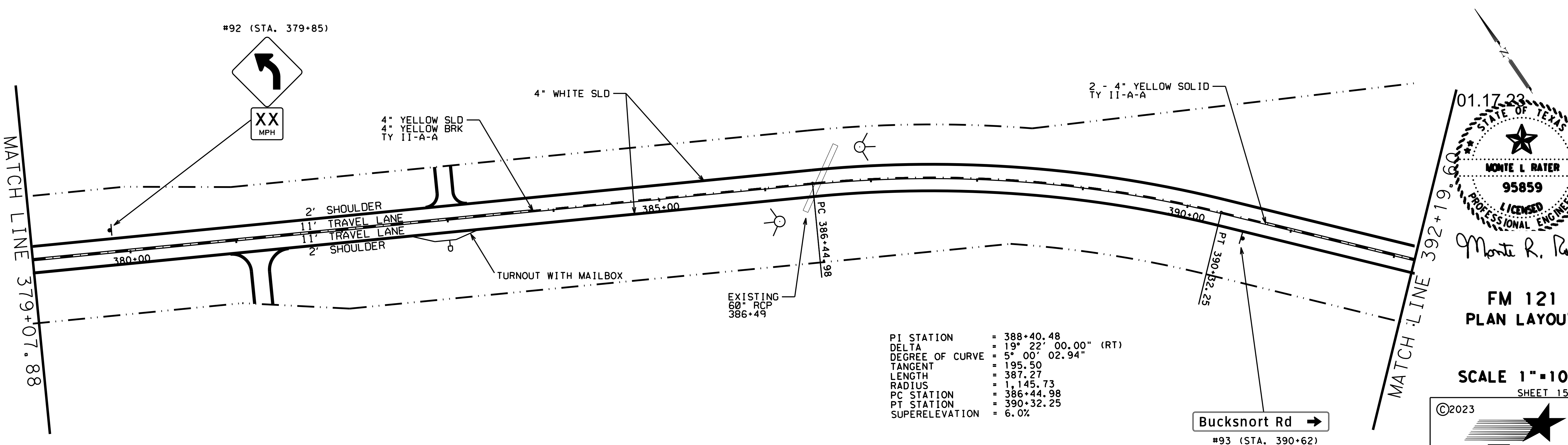


PI STATION	= 369+59.44
DELTA	= 24° 21' 00.00" (RT)
DEGREE OF CURVE	= 5° 00' 02.36"
TANGENT	= 247.20
LENGTH	= 486.94
RADIUS	= 1,145.77
PC STATION	= 367+12.24
PT STATION	= 371+99.18
SUPERELEVATION	= 6.0%

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



PI STATION	= 388+40.48
DELTA	= 19° 22' 00.00" (RT)
DEGREE OF CURVE	= 5° 00' 02.94"
TANGENT	= 195.50
LENGTH	= 387.27
RADIUS	= 1,145.73
PC STATION	= 386+44.98
PT STATION	= 390+32.25
SUPERELEVATION	= 6.0%

01.17.23
STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
Monte R. Rater P.E.

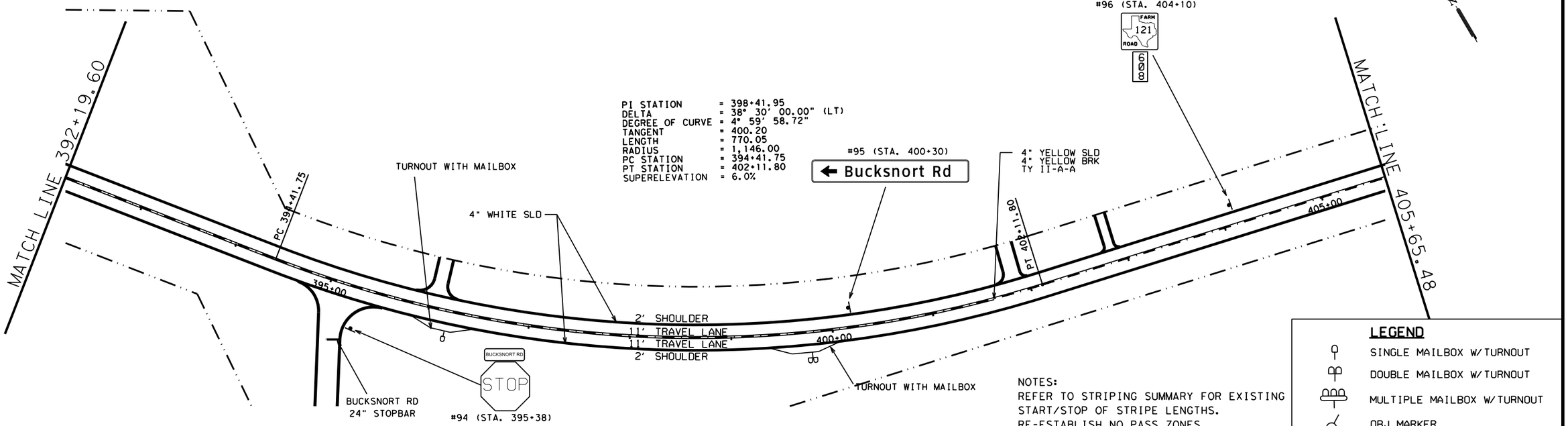
FM 121
PLAN LAYOUT

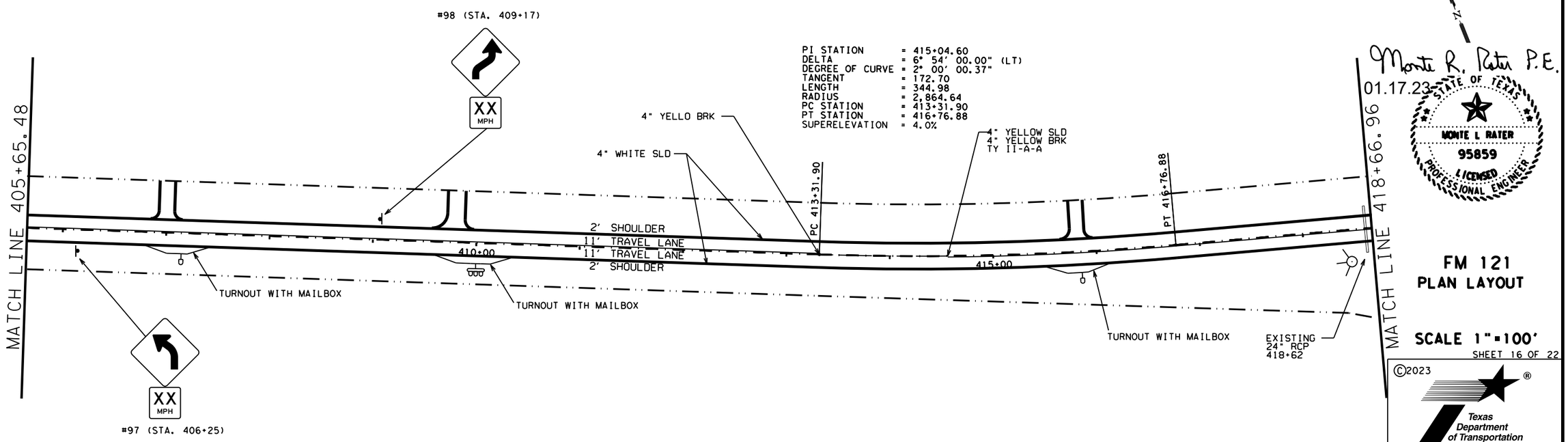
SCALE 1"=100'
SHEET 15 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	57

DATE: 1/17/2023 12:07:51 PM
FILE: ...FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\057 PLAN LAYOUT.dgn





LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

Monte R. Rater P.E.
01.17.23

STATE OF TEXAS
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FM 121
PLAN LAYOUT

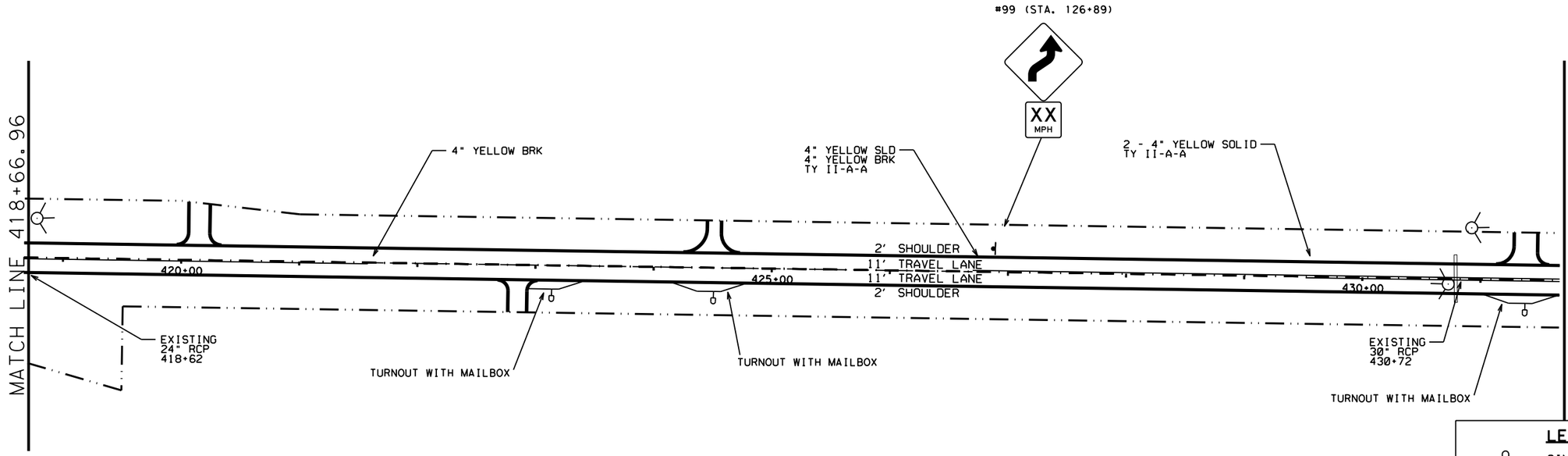
SCALE 1"=100'

SHEET 16 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		58

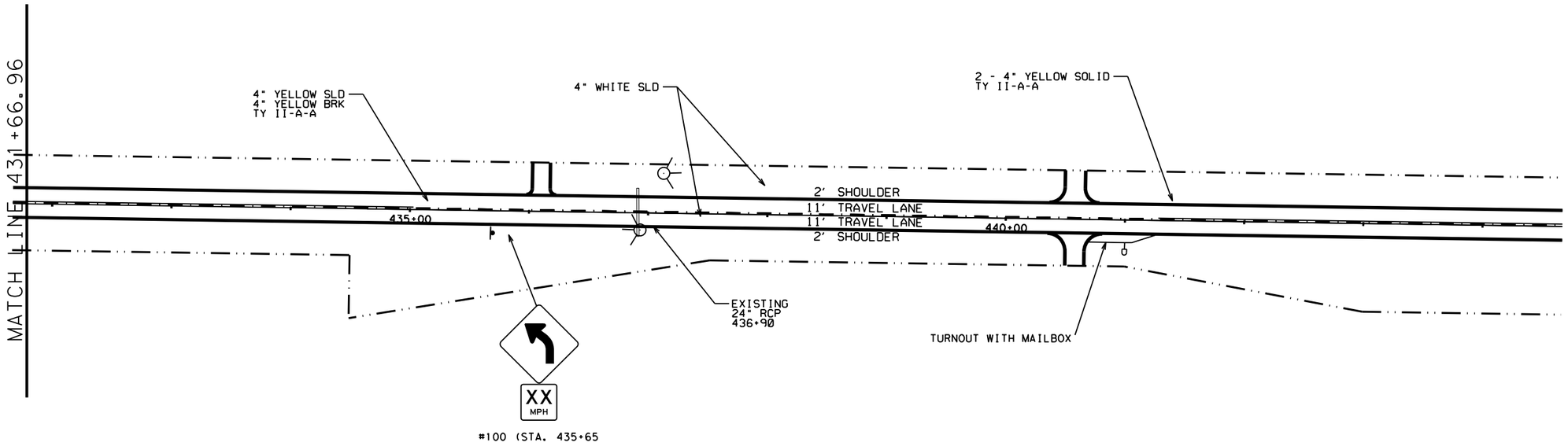
DATE: DATE TIME
FILE: DOCUMENT NAME



NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



01.17.25

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

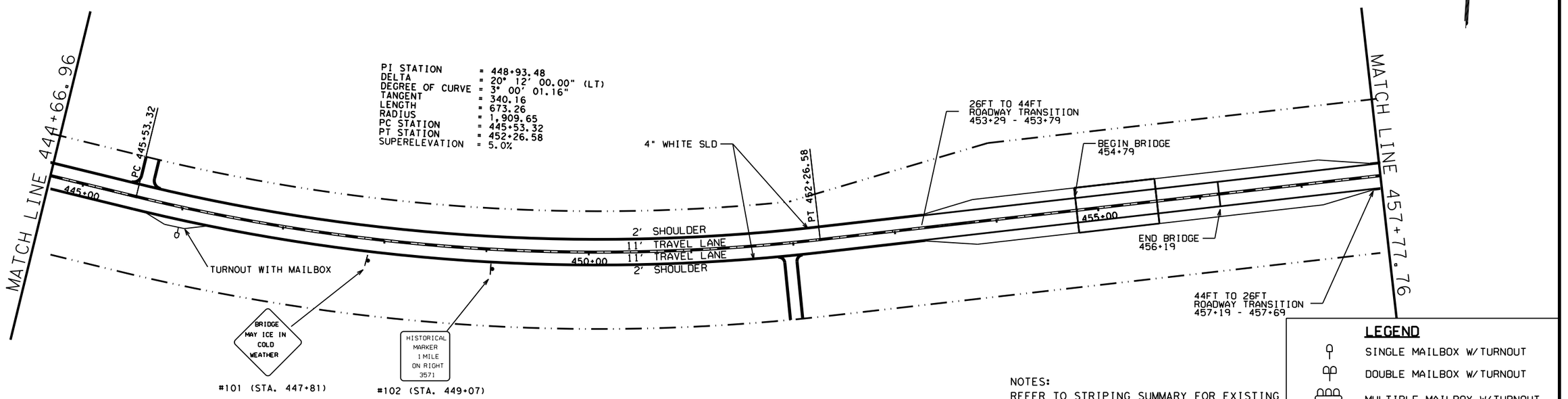
SCALE 1"=100'

SHEET 17 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		59

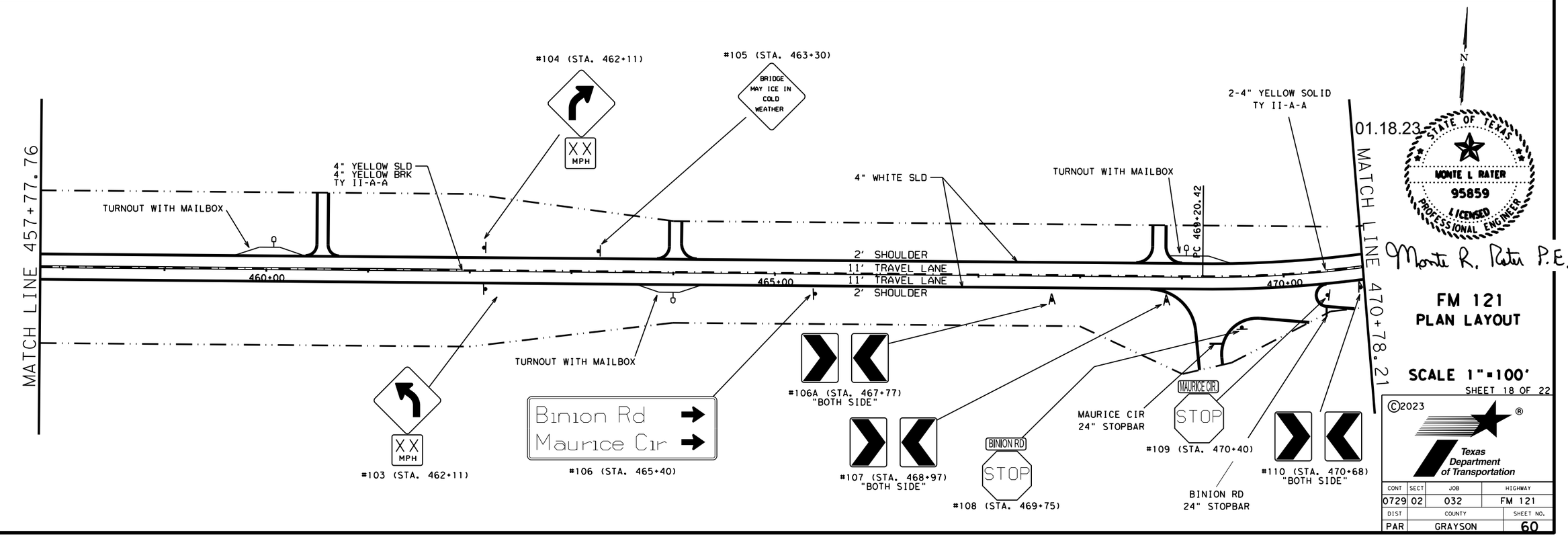
DATE: DATE TIME
FILE: DOCUMENT NAME



NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

SCALE 1"=100'

SHEET 18 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		60

DATE: DATE TIME
FILE: DOCUMENT NAME

CK:
DW:
CK:
DN:

#114 (STA. 473+97)

Maurice Cir
Binion Rd

PI STATION = 474+81.42
DELTA = 52° 10' 00.00" (LT)
DEGREE OF CURVE = 4° 59' 58.88"
TANGENT = 561.00
LENGTH = 1,043.40
RADIUS = 1,145.99
PC STATION = 469+20.42
PT STATION = 479+63.82
SUPERELEVATION = 6.0%

#116 (STA. 475+48) "BOTH SIDES"
#117 (STA. 476+68) "BOTH SIDES"
#115 (STA. 474+28) "BOTH SIDES"
#118 (STA. 477+48)
#119 (STA. 477+48)
#123 (STA. 483+80)

TINSLEY LN 24" STOPBAR
MATCH LINE 484+22.35
MATCH LINE 470+78.21
TURNOUT WITH MAILBOX
MAURICE CIR. 24" STOPBAR
TINSLEY LN 24" STOPBAR
EXISTING 18" RCP 478+40
PT 479+63.82
4" WHITE SLD
475+00
480+00
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER

#111 (STA. 471+88) "BOTH SIDES"
#112 (STA. 472+50)
Tinsley Ln
#113 (STA. 473+08) "BOTH SIDES"
#120 (STA. 477+88) "BOTH SIDES"
#120A (STA. 479+08) "BOTH SIDES"
#120B (STA. 480+28) "BOTH SIDES"
Pilot Grove Rd
#121 (STA. 480+95)
#122 (STA. 482+50)
XX MPH

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND
- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)

#125 (STA. 486+85)
XX MPH
#126 (STA. 487+80)
Tinsley Ln
#126A (STA. 488+90) "BOTH SIDES"
#127 (STA. 490+10) "BOTH SIDES"
#128 (STA. 491+30) "BOTH SIDES"
#128A (STA. 492+50) "BOTH SIDES"
#130 (STA. 493+70) "BOTH SIDES"
#131 (STA. 494+90) "BOTH SIDES"
#132A (STA. 496+10) "BOTH SIDES"
#133 (STA. 497+30) "BOTH SIDES"

MATCH LINE 484+22.35
485+00
490+00
PC 490+08.22
495+00
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER
4" WHITE SLD
EXISTING 24" RCP 485+14
TURNOUT WITH MAILBOX
TURNOUT WITH MAILBOX
PILOT GROVE RD 24" STOPBAR
#124 (STA. 484+75)
#129 (STA. 492+89)
MATCH LINE 497+52.48

PI STATION = 496+69.32
DELTA = 59° 58' 00.00" (RT)
DEGREE OF CURVE = 5° 00' 01.37"
TANGENT = 661.10
LENGTH = 1,199.24
RADIUS = 1,145.83
PC STATION = 490+08.22
PT STATION = 502+07.46
SUPERELEVATION = 6.0%

Pilot Grove Rd
#132 (STA. 495+50)

01.17.23
STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
Monte R. Rater P.E.

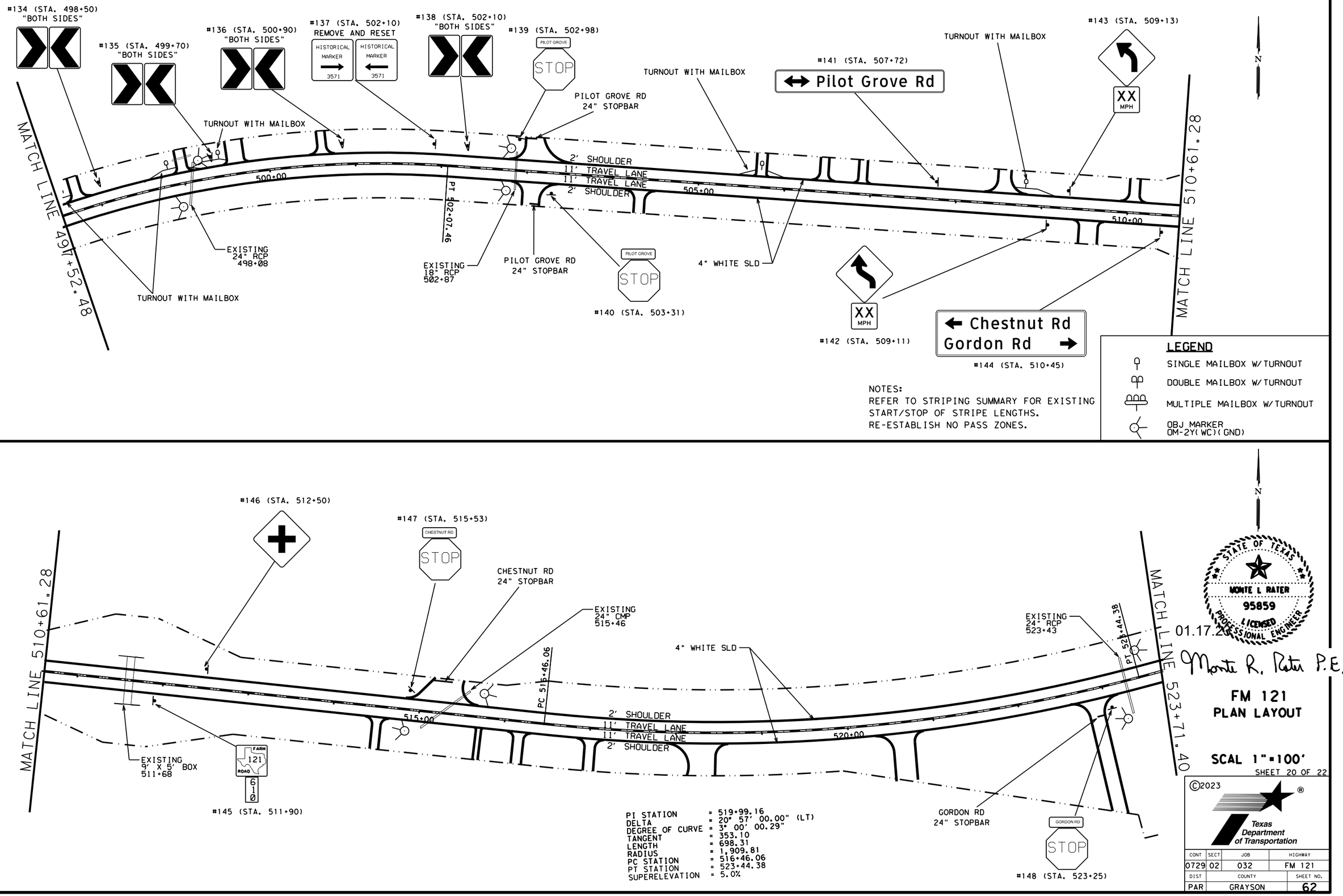
FM 121
PLAN LAYOUT

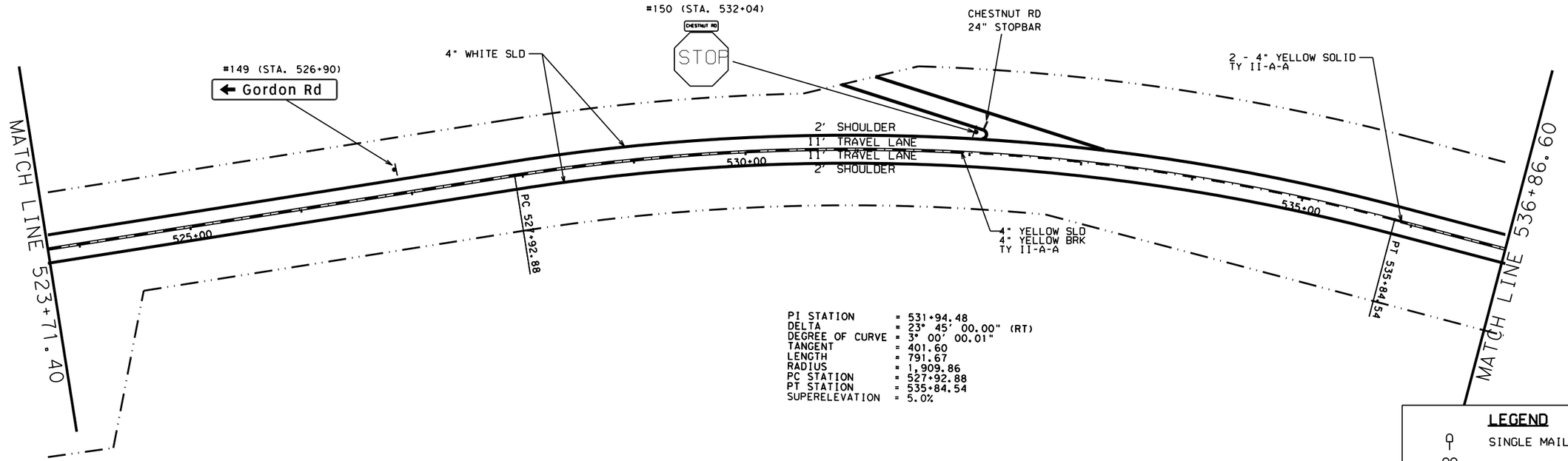
SCALE 1"=100'
SHEET 19 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		61

DATE: DATE TIME
FILE: DOCUMENT NAME


#134 (STA. 498+50)
"BOTH SIDES"
#135 (STA. 499+70)
"BOTH SIDES"
#136 (STA. 500+90)
"BOTH SIDES"
#137 (STA. 502+10)
REMOVE AND RESET
HISTORICAL MARKER
3571
HISTORICAL MARKER
3571
#138 (STA. 502+10)
"BOTH SIDES"
#139 (STA. 502+98)
PILOT GROVE
STOP
PILOT GROVE RD
24" STOPBAR
TURNOUT WITH MAILBOX
#141 (STA. 507+72)
Pilot Grove Rd
TURNOUT WITH MAILBOX
#143 (STA. 509+13)
XX
MPH
N
MATCH LINE 497+52.48
TURNOUT WITH MAILBOX
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER
500+00
505+00
510+00
PT 502+07.46
EXISTING
24" RCP
498+08
EXISTING
18" RCP
502+87
PILOT GROVE RD
24" STOPBAR
PILOT GROVE
STOP
#140 (STA. 503+31)
4" WHITE SLD
XX
MPH
#142 (STA. 509+11)
Chestnut Rd
Gordon Rd
#144 (STA. 510+45)
MATCH LINE 510+61.28
LEGEND
SINGLE MAILBOX W/TURNOUT
DOUBLE MAILBOX W/TURNOUT
MULTIPLE MAILBOX W/TURNOUT
OBJ MARKER
OM-2Y(WC)(GND)
NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.
#146 (STA. 512+50)
#147 (STA. 515+53)
CHESTNUT RD
STOP
CHESTNUT RD
24" STOPBAR
EXISTING
24" CMP
515+46
PC 515+46.06
4" WHITE SLD
EXISTING
24" RCP
523+43
PT 523+44.38
MATCH LINE 510+61.28
MATCH LINE 523+71.40
515+00
520+00
2' SHOULDER
11' TRAVEL LANE
11' TRAVEL LANE
2' SHOULDER
EXISTING
9' X 5' BOX
511+68
FARM ROAD 121
610
#145 (STA. 511+90)
PI STATION = 519+99.16
DELTA = 20° 57' 00.00" (LT)
DEGREE OF CURVE = 3° 00' 00.29"
TANGENT = 353.10
LENGTH = 698.31
RADIUS = 1,909.81
PC STATION = 516+46.06
PT STATION = 523+44.38
SUPERELEVATION = 5.0%
GORDON RD
24" STOPBAR
GORDON RD
STOP
#148 (STA. 523+25)
N
STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.17.23
Monte R. Rater P.E.
FM 121
PLAN LAYOUT
SCAL 1"=100'
SHEET 20 OF 22
©2023
Texas Department of Transportation
CONT 0729
SECT 02
JOB 032
HIGHWAY FM 121
DIST PAR
COUNTY GRAYSON
SHEET NO. 62
DATE: DATE TIME
FILE: DOCUMENT NAME

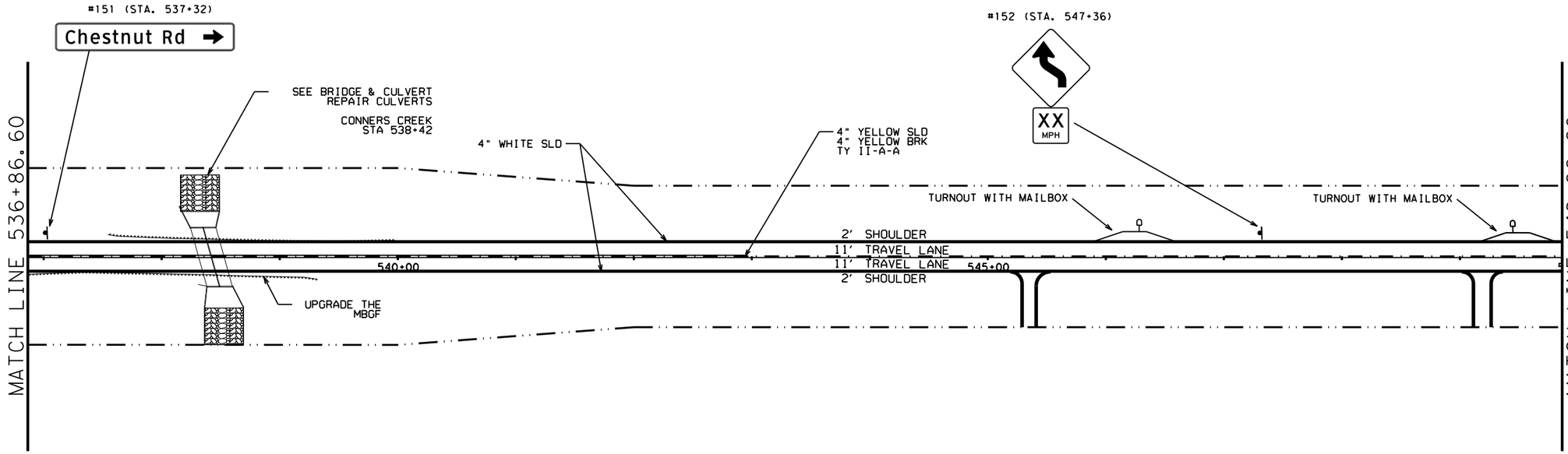


PI STATION	= 531+94.48
DELTA	= 23° 45' 00.00" (RT)
DEGREE OF CURVE	= 3° 00' 00.01"
TANGENT	= 401.60
LENGTH	= 791.67
RADIUS	= 1,909.86
PC STATION	= 527+92.88
PT STATION	= 535+84.54
SUPERELEVATION	= 5.0%

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- DOUBLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Y(WC)(GND)



STATE OF TEXAS
MONTE L. RATER
95859
LICENSED PROFESSIONAL ENGINEER
01.17.23

Monte R. Rater P.E.

FM 121
PLAN LAYOUT

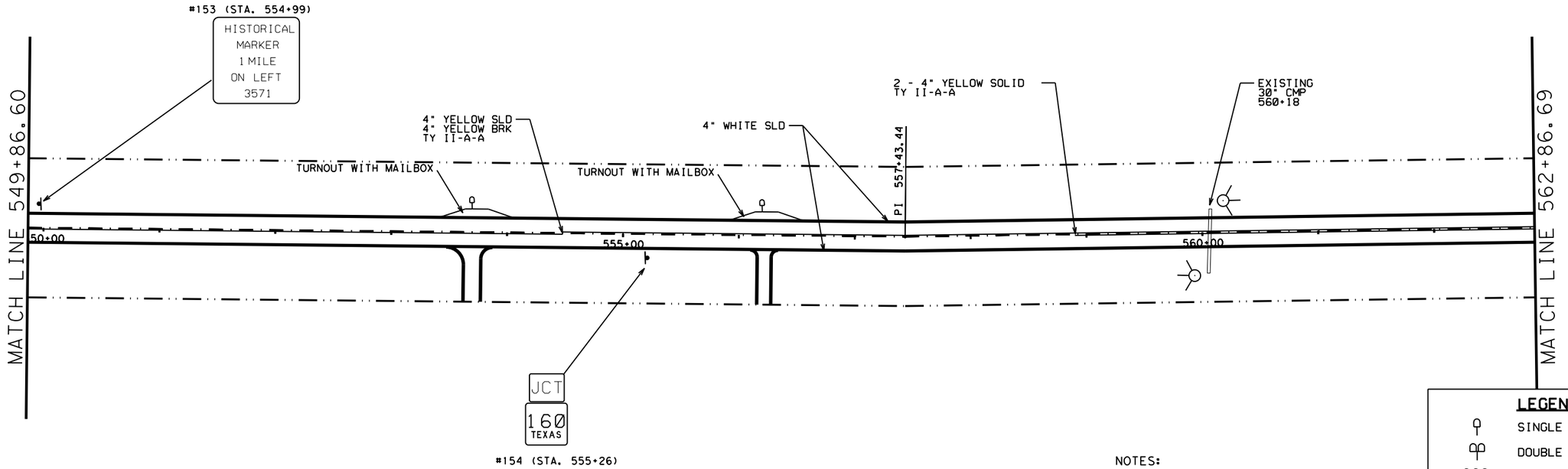
SCALE 1"=100'

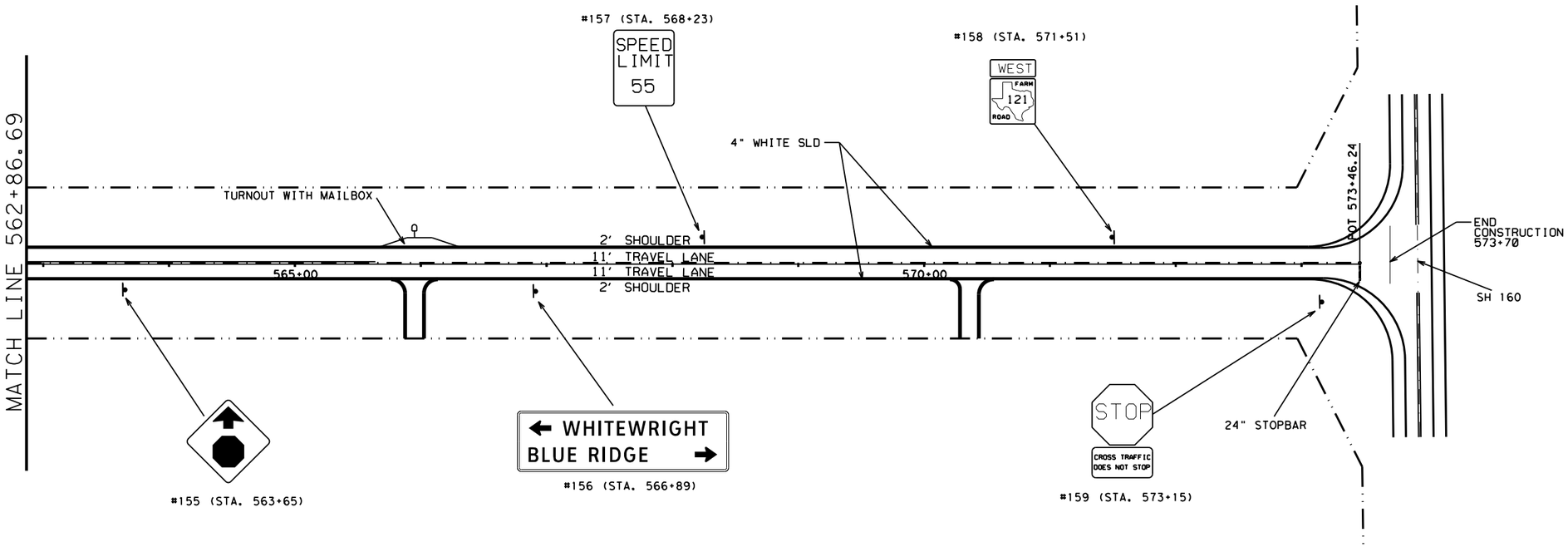
SHEET 21 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		63

DATE: DATE TIME
FILE: DOCUMENT NAME





STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.17.23
Monte R. Rater P.E.

FM 121
PLAN LAYOUT

SCALE 1"=100'

SHEET 22 OF 22

Texas Department of Transportation

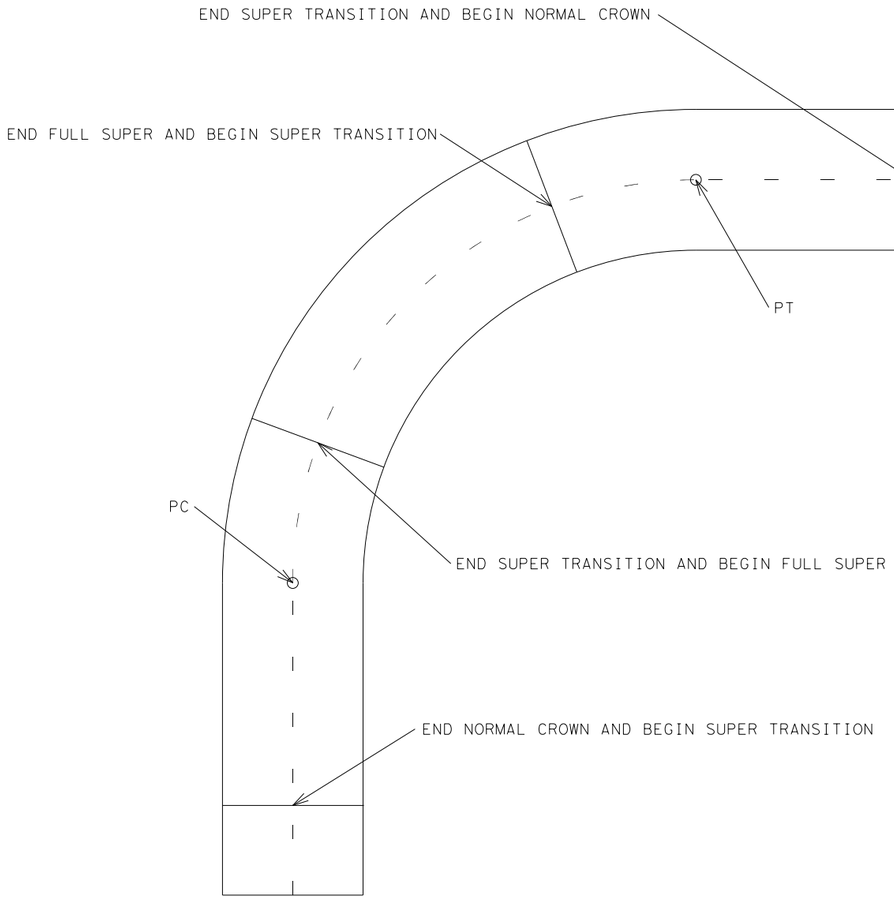
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		64

DATE: DATE TIME
FILE: DOCUMENT NAME

NOTES: CONTRACTOR IS TO CONFIRM EXISTING SUPERELEVATION SLOPE AND NOTIFY AREA ENGINEER BEFORE ROADWAY REHABILITATION STARTS.

EXCESS MATERIAL GENERATED IS PROPERTY OF CONTRACTOR.

DESIGN SPEED = 55 MPH



FM 121 SUPERELEVATION TABLE

STATION		SHOULDER CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	SHOULDER CROSS SLOPE RIGHT (%)
BEGIN PROJECT					
10+20	END NC	-2.00	-2.00	-2.00	-2.00
SUPERELEVATION TRANSITION					
12+03	BEGIN FS	-5.80	-5.80	5.80	5.80
13+94	END FS				
SUPERELEVATION TRANSITION					
15+77	BEGIN NC	-2.00	-2.00	-2.00	-2.00
18+97	END NC				
SUPERELEVATION TRANSITION					
21+01	BEGIN FS	6.00	6.00	-6.00	-6.00
23+68	END FS				
SUPERELEVATION TRANSITION					
25+72	BEGIN NC	-2.00	-2.00	-2.00	-2.00
31+87	END NC				
SUPERELEVATION TRANSITION					
32+90	BEGIN FS	-2.40	-2.40	2.40	2.40
34+33	END FS				
SUPERELEVATION TRANSITION					
35+36	BEGIN NC	-2.00	-2.00	-2.00	-2.00
47+42	END NC				
SUPERELEVATION TRANSITION					
49+29	BEGIN FS	-6.00	-6.00	6.00	6.00
53+92	END FS				
SUPERELEVATION TRANSITION					
55+79	BEGIN NC	-2.00	-2.00	-2.00	-2.00
56+66	END NC				
SUPERELEVATION TRANSITION					
58+70	BEGIN FS	6.00	6.00	-6.00	-6.00
66+64	END FS				
SUPERELEVATION TRANSITION					
68+68	BEGIN NC	-2.00	-2.00	-2.00	-2.00
85+25	END NC				
SUPERELEVATION TRANSITION					
86+38	BEGIN FS	2.40	2.40	-2.40	-2.40
88+63	END FS				
SUPERELEVATION TRANSITION					
89+76	BEGIN NC	-2.00	-2.00	-2.00	-2.00
107+14	END NC				
SUPERELEVATION TRANSITION					
108+54	BEGIN FS	-4.00	-4.00	4.00	4.00
116+49	END FS				
SUPERELEVATION TRANSITION					
117+89	BEGIN NC	-2.00	-2.00	-2.00	-2.00
120+84	END NC				
SUPERELEVATION TRANSITION					
122+88	BEGIN FS	6.00	6.00	-6.00	-6.00
124+87	END FS				
SUPERELEVATION TRANSITION					
126+91	BEGIN NC	-2.00	-2.00	-2.00	-2.00
162+38	END NC				
SUPERELEVATION TRANSITION					
163+25	BEGIN FS	-5.40	-5.40	5.40	5.40
166+48	END FS				
SUPERELEVATION TRANSITION					
167+35	BEGIN NC	-2.00	-2.00	-2.00	-2.00
167+80	END NC				

TABLE LEGEND

NC = NORMAL CROWN

FS = FULL SUPERELEVATION

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
SUPERELEVATION TABLE

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		65

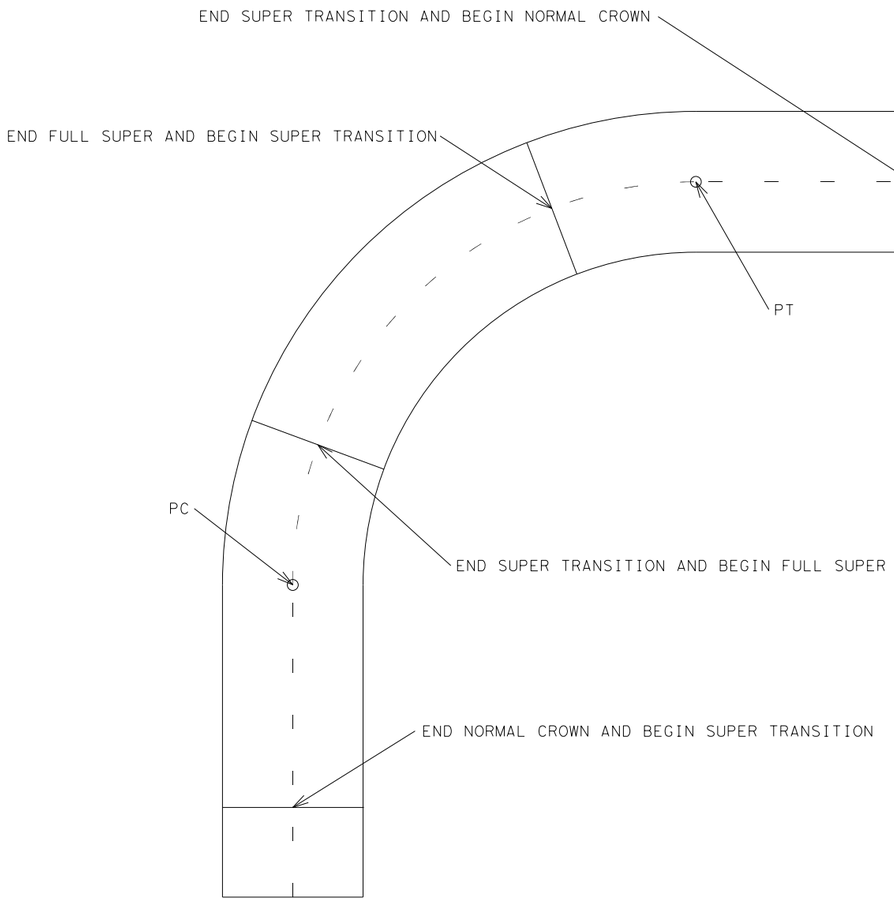
CK: DW: CK: DN:

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

NOTES: CONTRACTOR IS TO CONFIRM EXISTING SUPERELEVATION SLOPE AND NOTIFY AREA ENGINEER BEFORE ROADWAY REHABILITATION STARTS.

EXCESS MATERIAL GENERATED IS PROPERTY OF CONTRACTOR.

DESIGN SPEED = 55 MPH



FM 121 SUPERELEVATION TABLE

STATION		SHOULDER CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	SHOULDER CROSS SLOPE RIGHT (%)
169+06	BEGIN FS	-3.40	-3.40	3.40	3.40
180+27	END FS				
SUPERELEVATION TRANSITION					
181+53	BEGIN NC	-2.00	-2.00	-2.00	-2.00
187+13	END NC				
SUPERELEVATION TRANSITION					
188+90	BEGIN FS	6.00	6.00	-6.00	-6.00
194+28	END FS				
SUPERELEVATION TRANSITION					
196+05	BEGIN NC	-2.00	-2.00	-2.00	-2.00
227+48	END NC				
SUPERELEVATION TRANSITION					
228+81	BEGIN FS	4.00	4.00	-4.00	-4.00
231+51	END FS				
SUPERELEVATION TRANSITION					
232+84	BEGIN NC	-2.00	-2.00	-2.00	-2.00
234+25	END NC				
SUPERELEVATION TRANSITION					
235+48	BEGIN FS	-4.00	-4.00	4.00	4.00
241+12	END FS				
SUPERELEVATION TRANSITION					
242+35	BEGIN NC	-2.00	-2.00	-2.00	-2.00
243+42	END NC				
SUPERELEVATION TRANSITION					
244+32	BEGIN FS	-2.40	-2.40	2.40	2.40
251+28	END FS				
SUPERELEVATION TRANSITION					
252+18	BEGIN NC	-2.00	-2.00	-2.00	-2.00
252+21	END NC				
SUPERELEVATION TRANSITION					
254+08	BEGIN FS	-6.00	-6.00	6.00	6.00
258+61	END FS				
SUPERELEVATION TRANSITION					
260+48	BEGIN NC	-2.00	-2.00	-2.00	-2.00
278+01	END NC				
SUPERELEVATION TRANSITION					
280+05	BEGIN FS	6.00	6.00	-6.00	-6.00
285+87	END FS				
SUPERELEVATION TRANSITION					
287+91	BEGIN NC	-2.00	-2.00	-2.00	-2.00
303+31	END NC				
SUPERELEVATION TRANSITION					
304+34	BEGIN FS	-2.40	-2.40	2.40	2.40
307+08	END FS				
SUPERELEVATION TRANSITION					
308+11	BEGIN NC	-2.00	-2.00	-2.00	-2.00
316+74	END NC				
SUPERELEVATION TRANSITION					
317+77	BEGIN FS	-2.40	-2.40	2.40	2.40
320+51	END FS				
SUPERELEVATION TRANSITION					
321+54	BEGIN NC	-2.00	-2.00	-2.00	-2.00
344+51	END NC				
SUPERELEVATION TRANSITION					
346+50	BEGIN FS	5.80	5.80	-5.80	-5.80
352+46	END FS				

TABLE LEGEND

NC = NORMAL CROWN

FS = FULL SUPERELEVATION

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
SUPERELEVATION TABLE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		66

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

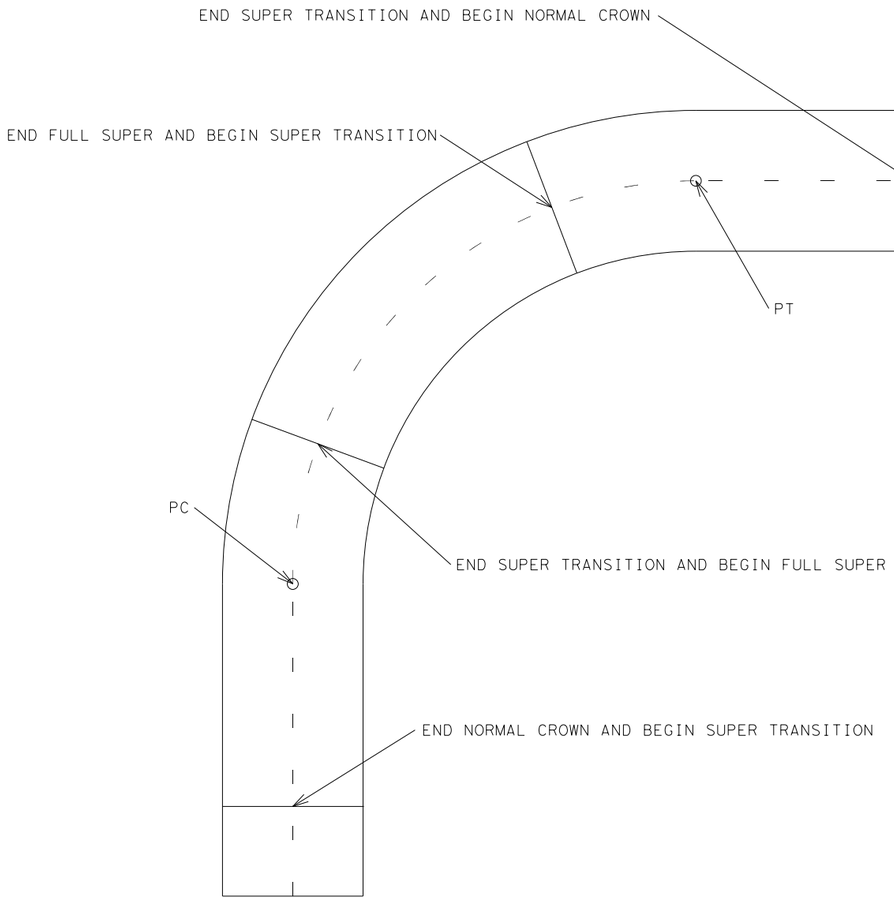
CK:
DW:
CK:
DN:

CK:
DW:
CK:
DN:

NOTES: CONTRACTOR IS TO CONFIRM EXISTING SUPERELEVATION SLOPE AND NOTIFY AREA ENGINEER BEFORE ROADWAY REHABILITATION STARTS.

EXCESS MATERIAL GENERATED IS PROPERTY OF CONTRACTOR.

DESIGN SPEED = 55 MPH



FM 121 SUPERELEVATION TABLE

STATION		SHOULDER CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	SHOULDER CROSS SLOPE RIGHT (%)
354+45	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
365+69	END NC				
SUPERELEVATION TRANSITION					
367+73	BEGIN FS				
	>	6.00	6.00	-6.00	-6.00
371+38	END FS				
SUPERELEVATION TRANSITION					
373+42	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
385+02	END NC				
SUPERELEVATION TRANSITION					
387+06	BEGIN FS				
	>	6.00	6.00	-6.00	-6.00
389+71	END FS				
SUPERELEVATION TRANSITION					
391+75	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
393+01	END NC				
SUPERELEVATION TRANSITION					
394+88	BEGIN FS				
	>	-6.00	-6.00	6.00	6.00
401+56	END FS				
SUPERELEVATION TRANSITION					
403+43	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
412+96	END NC				
SUPERELEVATION TRANSITION					
413+47	BEGIN FS				
	>	-4.00	-4.00	4.00	4.00
416+62	END FS				
SUPERELEVATION TRANSITION					
417+13	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
444+38	END NC				
SUPERELEVATION TRANSITION					
446+02	BEGIN FS				
	>	-5.00	-5.00	5.00	5.00
451+78	END FS				
SUPERELEVATION TRANSITION					
453+42	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
468+07	END NC				
SUPERELEVATION TRANSITION					
469+70	BEGIN FS				
	>	-6.00	-6.00	6.00	6.00
479+15	END FS				
SUPERELEVATION TRANSITION					
480+78	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
488+84	END NC				
SUPERELEVATION TRANSITION					
490+61	BEGIN FS				
	>	6.00	6.00	-6.00	-6.00
501+55	END FS				
SUPERELEVATION TRANSITION					
503+32	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
515+46	END NC				
SUPERELEVATION TRANSITION					
516+89	BEGIN FS				
	>	-5.00	-5.00	5.00	5.00
523+01	END FS				
SUPERELEVATION TRANSITION					
524+44	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
526+84	END NC				
SUPERELEVATION TRANSITION					
528+40	BEGIN FS				
	>	5.00	5.00	-5.00	-5.00
535+38	END FS				
SUPERELEVATION TRANSITION					
536+94	BEGIN NC				
	>	-2.00	-2.00	-2.00	-2.00
END PROJECT					

TABLE LEGEND

NC = NORMAL CROWN

FS = FULL SUPERELEVATION

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

1.18.23

Monte R. Rater P.E.

FM 121
SUPERELEVATION TABLE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		67

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

DATE: 1/13/2023 8:57:47 AM
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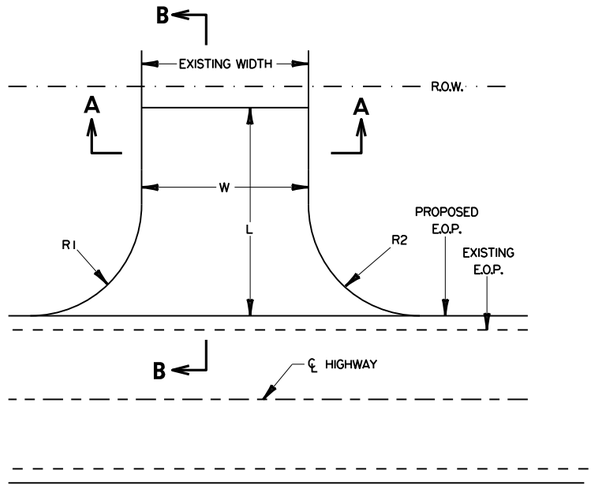
DN: | CK: | DW: | CK:

PLAN:



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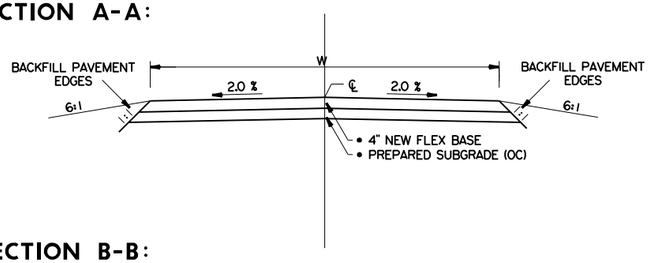

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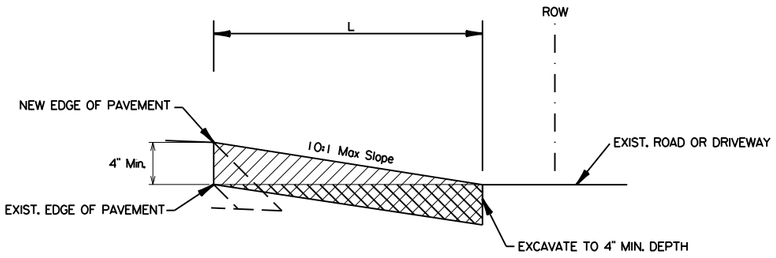
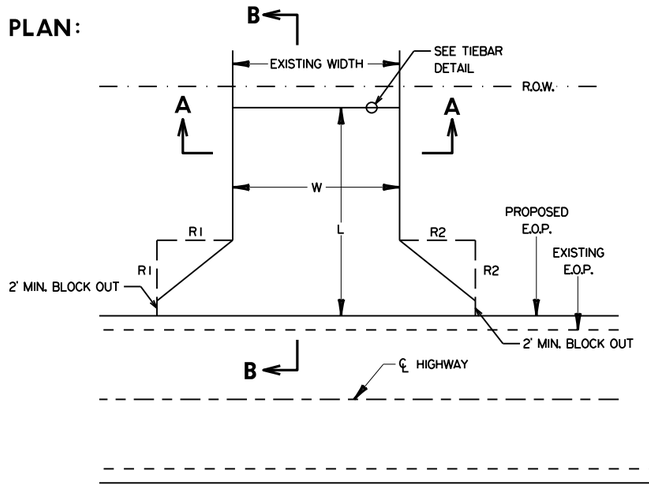


NOTES:
1. THIS WORK WILL BE MEASURED AND PAID FOR AS: "DRIVEWAYS (BASE)"
2. DIMENSIONS W, L, R1 AND R2 ARE PROVIDED IN THE QUANTITY SUMMARY FOR DRIVEWAYS.

BASE SURFACE DRIVEWAY
NTS

NOTE: EXCAVATION FOR ALL DRIVEWAY TYPES WILL BE CONSIDERED SUBSIDIARY TO DRIVEWAY BID ITEMS.

PLAN:



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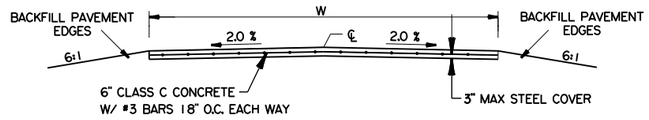

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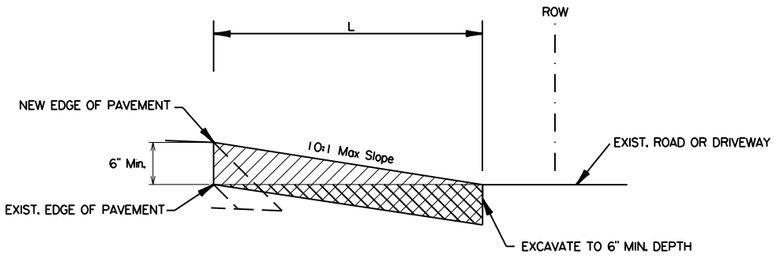
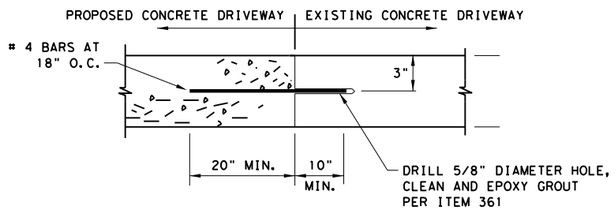


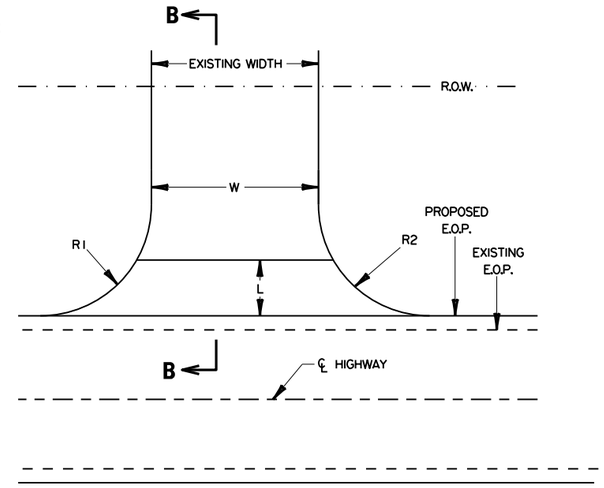


TIE - BAR DETAIL
NTS

NOTES:
1. THIS WORK WILL BE MEASURED AND PAID FOR AS: DRIVEWAYS (CONC)
2. DIMENSIONS W, L, R1 AND R2 ARE PROVIDED IN THE QUANTITY SUMMARY FOR DRIVEWAYS.

CONCRETE DRIVEWAY
NTS

PLAN:



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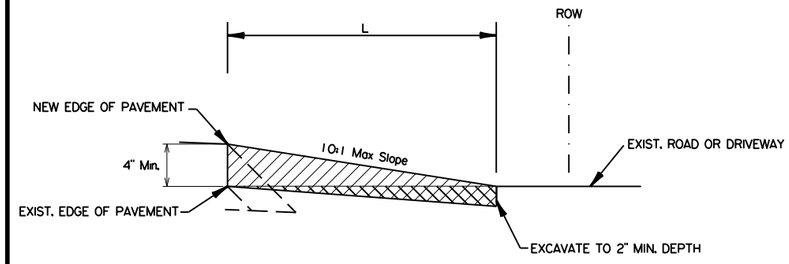


HOT MIX WEDGE
NTS

NOTES:
1. THIS WORK WILL BE MEASURED AND PAID FOR AS: DRIVEWAYS ACP
2. DIMENSIONS W, L, R1 AND R2 ARE PROVIDED IN THE QUANTITY SUMMARY FOR DRIVEWAYS.
3. DIMENSION W DOES NOT REPRESENT THE AVERAGE WIDTH OF WEDGE AREA TO BE PAVED.
4. HMA WILL BE TY C UNLESS OTHERWISE APPROVED BY THE ENGINEER.

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED
PROFESSIONAL ENGINEER

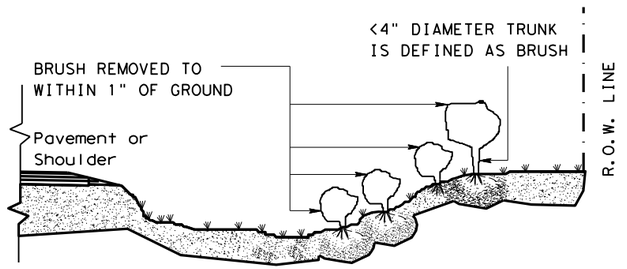
1.18.23

Monte R. Rater P.E.

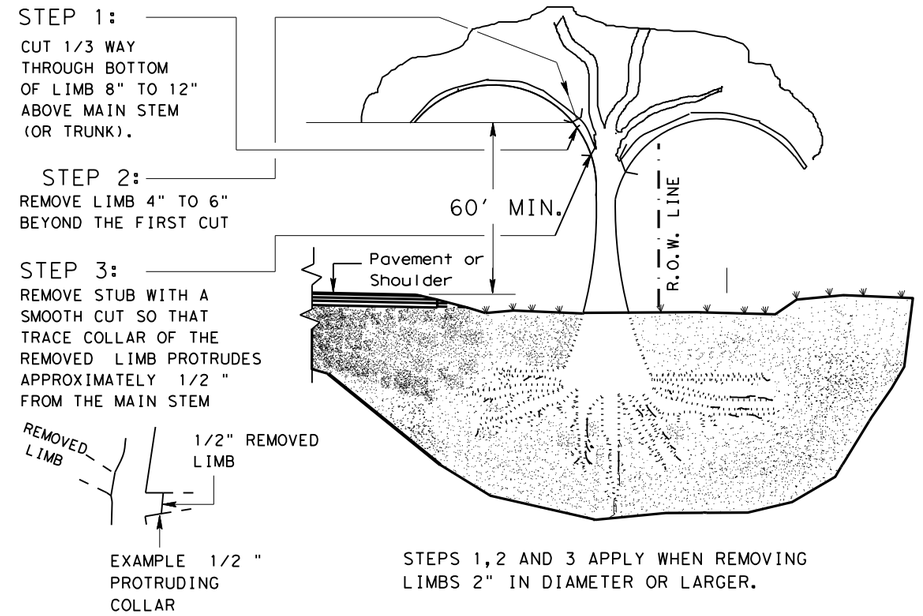
FM 121
DRIVEWAY DETAILS

Texas Department of Transportation

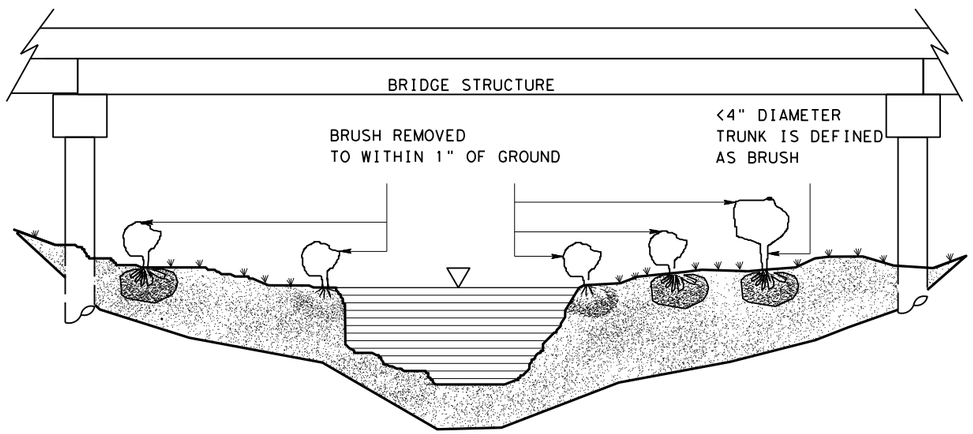
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		68



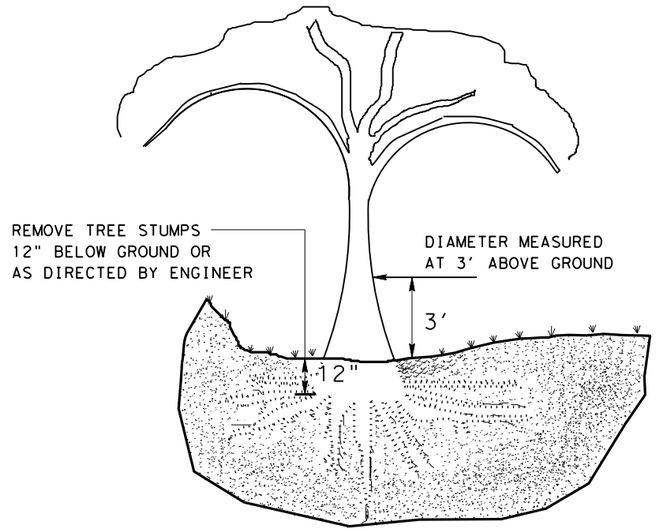
BRUSH REMOVAL



TREE TRIMMING



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL



TREE REMOVAL

SPECIFIC LOCATION SPECIFIED IN PLANS

STATE OF TEXAS
MONTE L. RATER
95859
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PROFESSIONAL ENGINEER

01.18.23

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FM 121

TREE TRIMMING &
BRUSH REMOVAL

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		69

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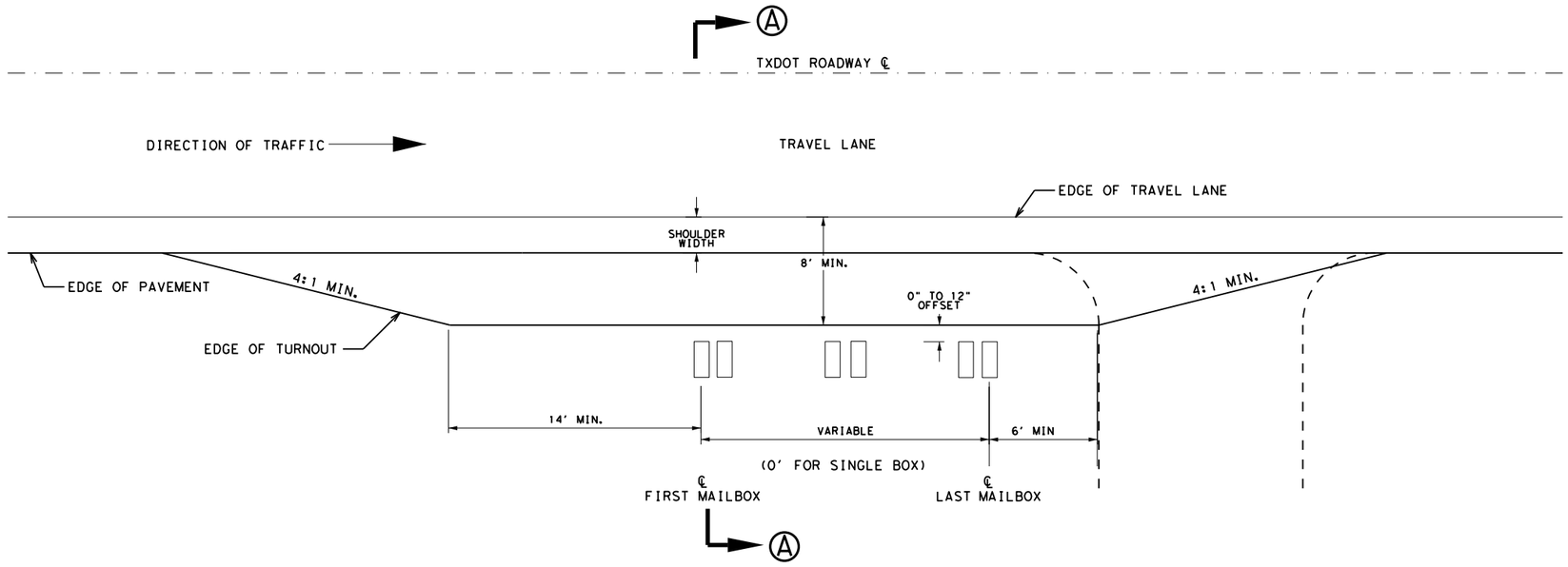
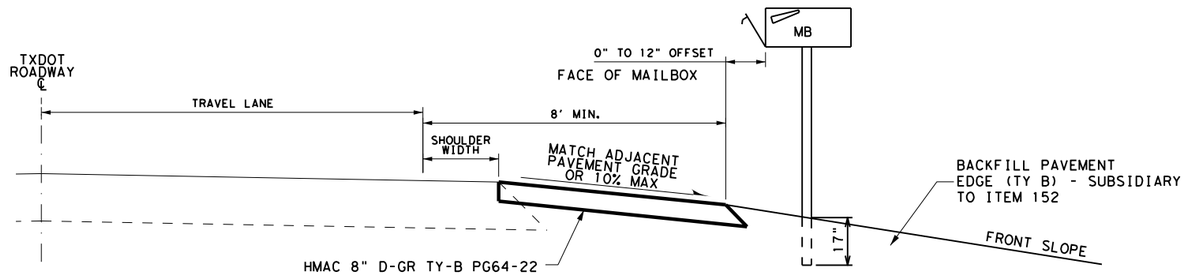


MAILBOX TURNOUT
PLAN



MAILBOX TURNOUT
SECTION A-A

STATE OF TEXAS
MONTE L. RATER
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PROFESSIONAL ENGINEER

01.18.23

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FM 121
MAILBOX TURNOUT DETAILS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		70

DATE: 1/13/2023 8:57:49 AM
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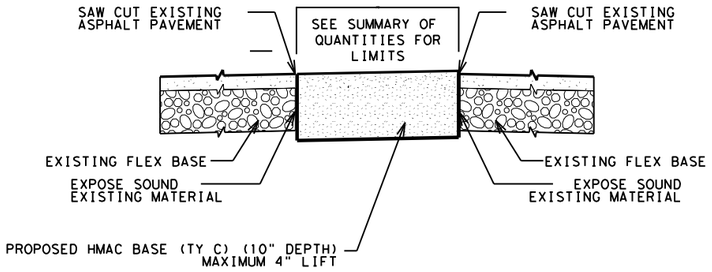
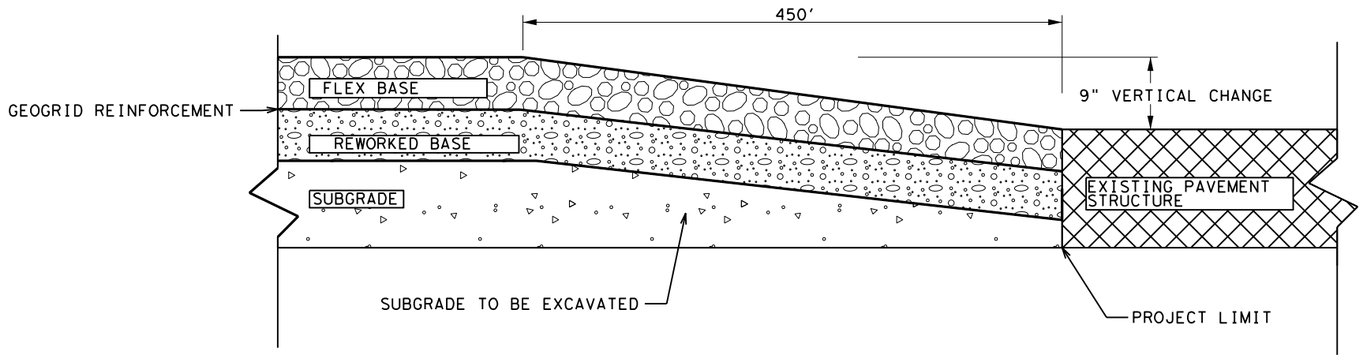


PAVEMENT REPAIR DETAILS

SECTIONAL VIEW
NOT TO SCALE



TRANSITION TO BRIDGE, & PROJECT LIMITS

TRANSITION RATIO IS 1":50'

STATE OF TEXAS
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PROFESSIONAL ENGINEER

01.19.23

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FM 121
MISCELLANEOUS DETAILS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		71

DATE: 1/19/2023 9:09:30 AM
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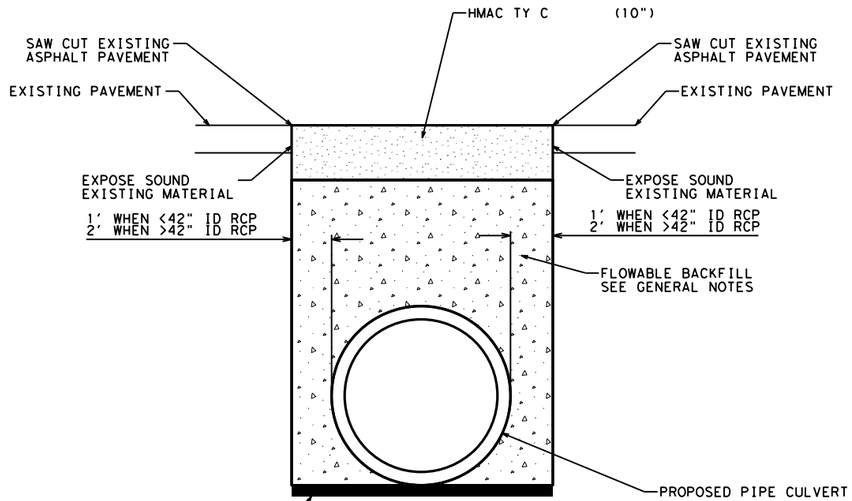
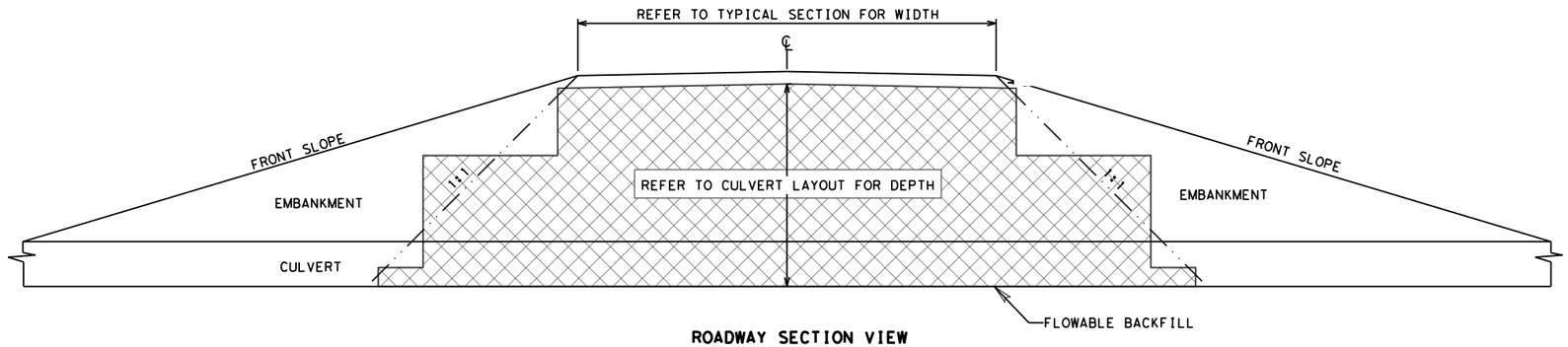


CROSS CULVERT RCP CUT AND RESTORE PAVEMENT DETAIL

SECTIONAL VIEW - NOT TO SCALE



ROADWAY SECTION VIEW
CROSS CULVERT FLOWABLE FILL CALCULATION

ROADWAY SECTION - NOT TO SCALE

STATE OF TEXAS
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FM 121
MISCELLANEOUS DETAILS

NOT TO SCALE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		71A

DATE: 1/17/2023 2:43:34 PM
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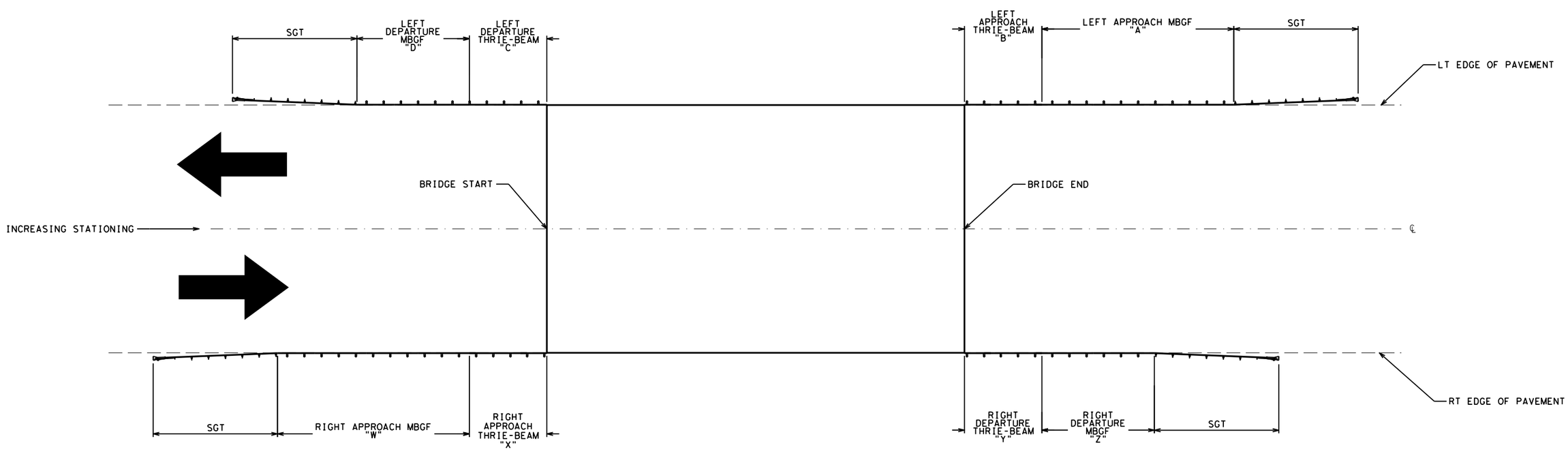

BRIDGE CROSSING	BRIDGE START	BRIDGE END	A	B	C	D	W	X	Y	Z
W SISTER GROVE CREEK	145+02	146+53	100	18.75	18.75	50	100	18.75	18.75	50
E SISTER GROVE CREEK	196+95	197+90	100	18.75	18.75	50	100	18.75	18.75	50

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01.18.23

Monte R. Rater P.E.

FM 121
MBGF LAYOUTS

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		72

DATE: 1/13/2023 8:57:52 AM
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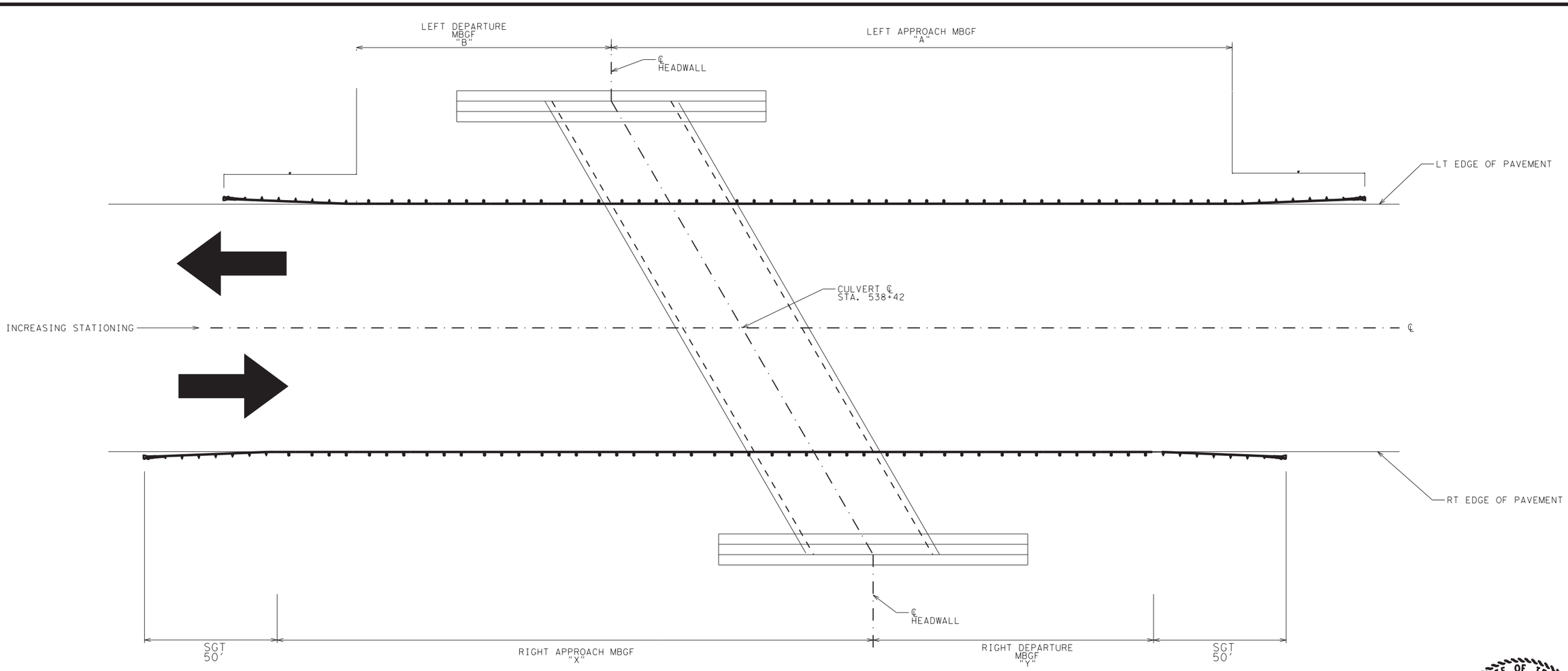

BRIDGE CULVERTS	CULVERT START	CULVERT END	A	B	X	Y
CSJ 0729-02-032						
CONNER CREEK	STA. 538+42	STA. 538+42	200	50	200	50

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01.18.23

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FM 121
MBGF LAYOUTS

NOT TO SCALE
SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		73

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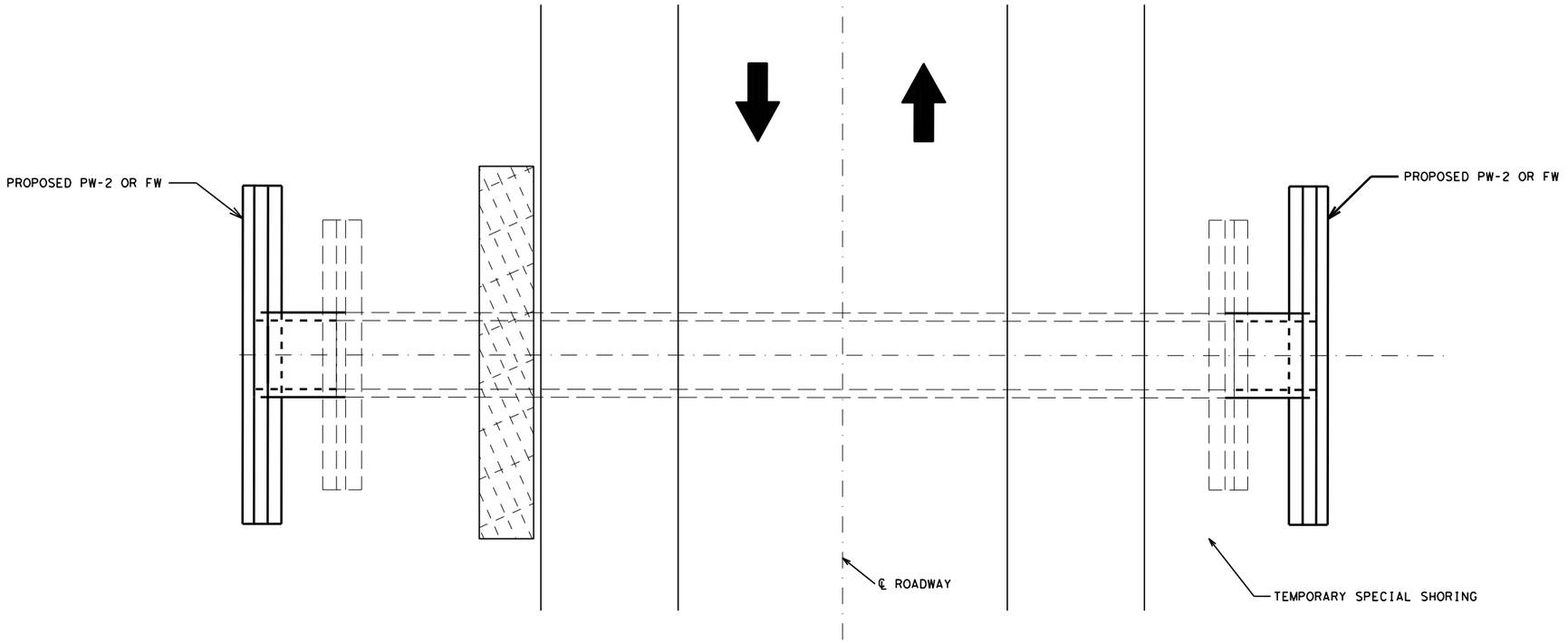
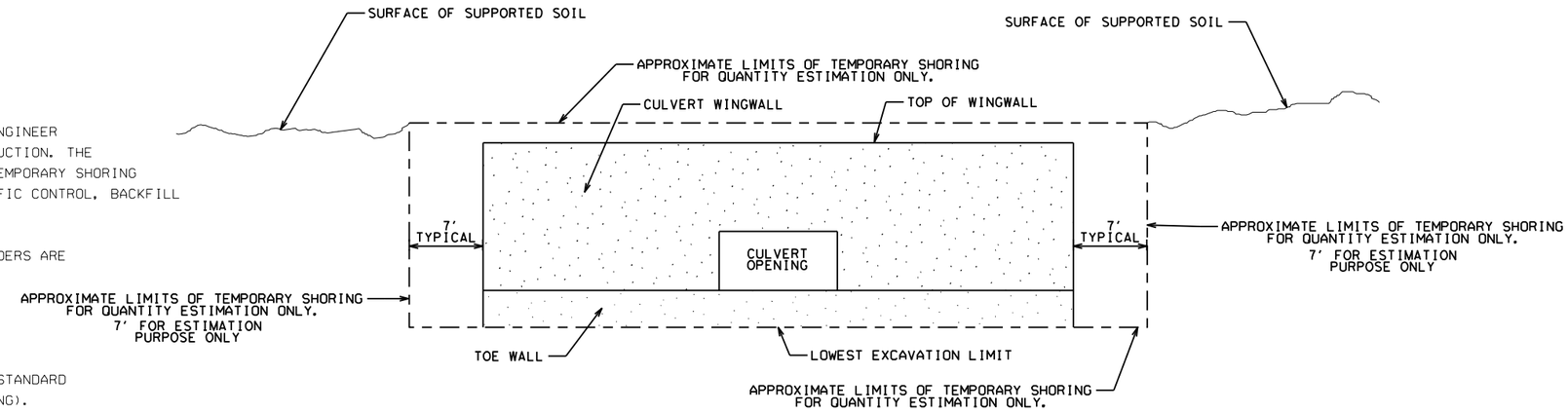


PLAN VIEW



PROFILE VIEW OF WINGWALL
DEPICTING APPROXIMATE AREA FOR TEMPORARY SHORING

NOTES:

SUBMIT A TEMPORARY SHORING PLAN TO THE ENGINEER A MINIMUM OF THREE WEEKS PRIOR TO CONSTRUCTION. THE EXCAVATION SUPPORT PLAN SHOULD INCLUDE TEMPORARY SHORING DETAILED DRAWINGS, WORK SEQUENCING, TRAFFIC CONTROL, BACKFILL OPERATIONS, ETC.

ENSURE THAT OPEN ROADWAY LANES AND SHOULDERS ARE PROTECTED/SUPPORTED.

REFER TO THE "TREATMENT FOR VARIOUS EDGE CONDITIONS" SHEET.

ADHERE TO ALL REQUIREMENTS STATED UNDER STANDARD SPECICATION 403 (TEMPORARY SPECIAL SHORING).

REQUIRED SHORING AREA SHALL BE BASED UPON FIELD CONDITIONS AT EACH CULVERT LOCATION.

THIS DETAIL SHEET SHALL NOT BE USED AS TEMPORAY SHORING PLANS. SHORING AREA SHALL BE DETERMINED BY A LICENSED GEOTECH ENGINEER THAT PREPARES SEALED TEMPORARY SHORING PLANS.

DRAWINGS NOT TO SCALE

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01.18.23

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FM 121
TEMPORARY SHORING AREA ESTIMATION

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		74

DATE: 1/13/2023 8:57:58 AM
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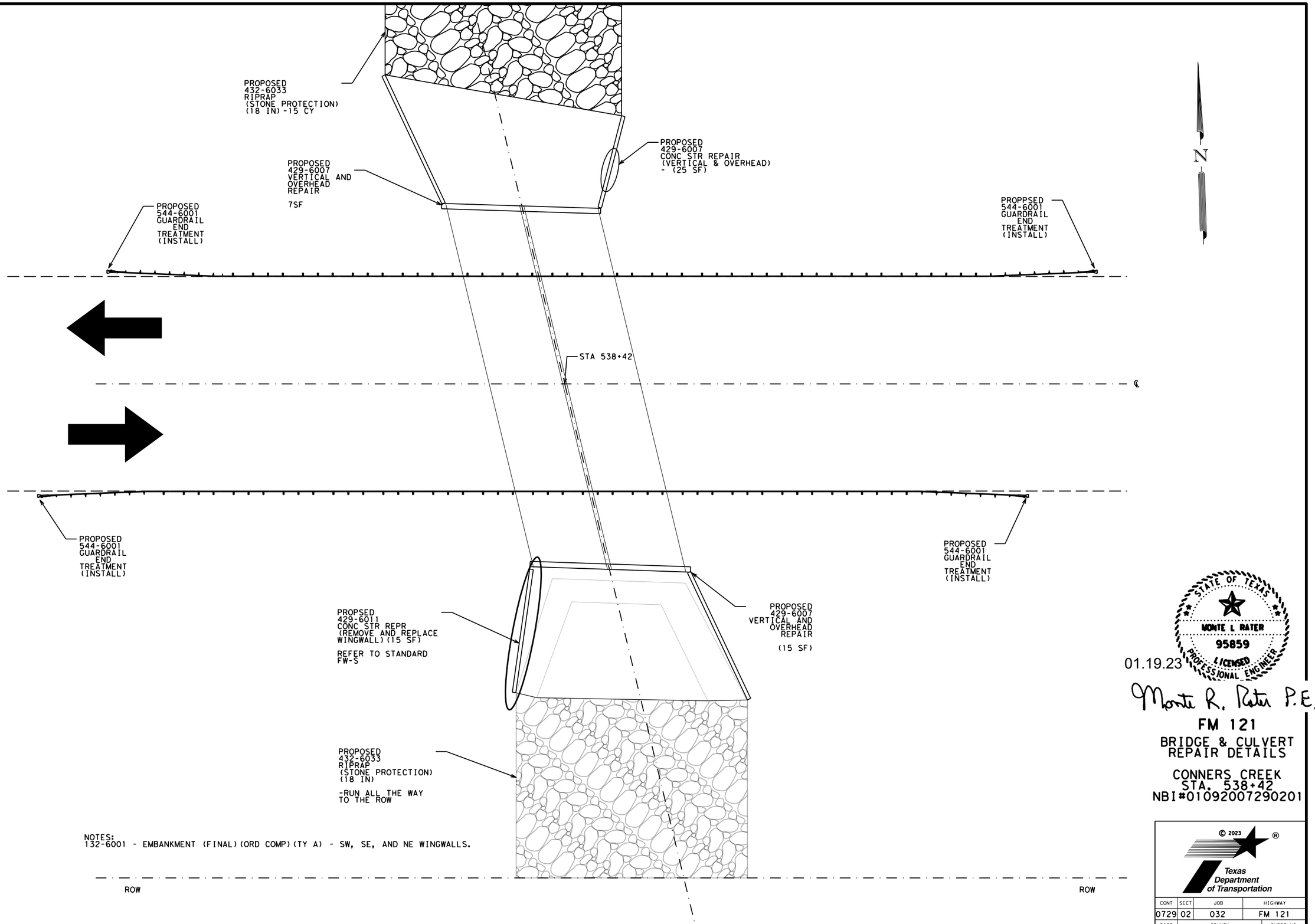

NOTES:
132-6001 - EMBANKMENT (FINAL)(ORD COMP)(TY A) - SW, SE, AND NE WINGWALLS.

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

STATE OF TEXAS
MONTE L RATER
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PROFESSIONAL ENGINEER

01.19.23

Monte R. Rater P.E.

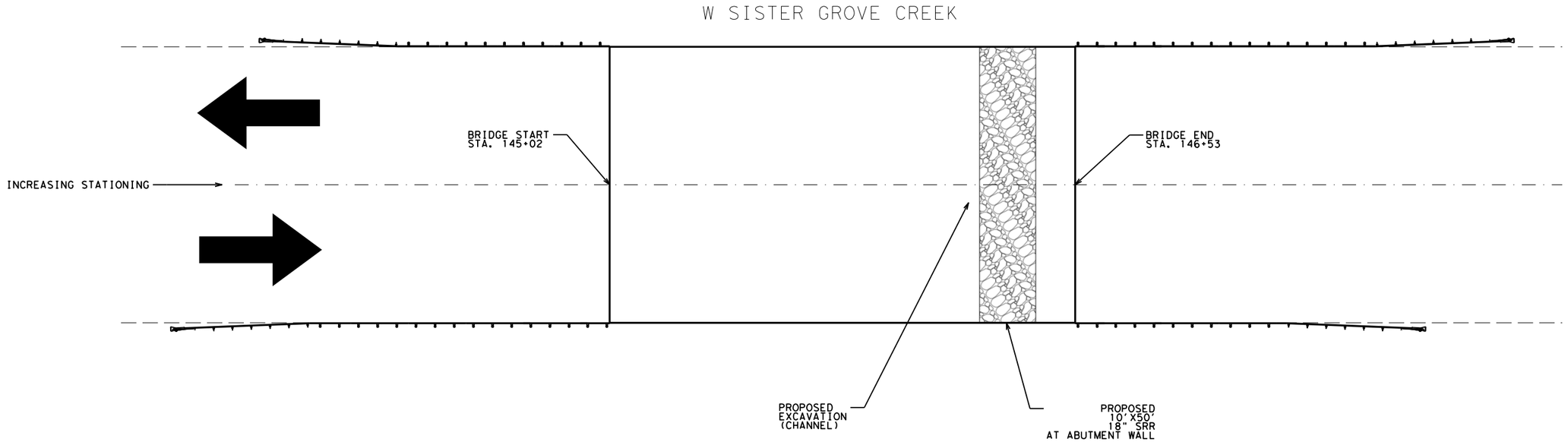
FM 121
BRIDGE & CULVERT REPAIR DETAILS

CONNERS CREEK
STA. 538+42
NBI#01092007290201

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		75

CK:
DW:
CK:
DN:



NOTES:
432/6033 - RIPRAP (STONE PROTECTION)(18 IN) - ON EAST SIDE UNDER BRIDGE BANK SLOPE.
110 6002 - EXCAVATION (CHANNEL)

STATE OF TEXAS
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PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121

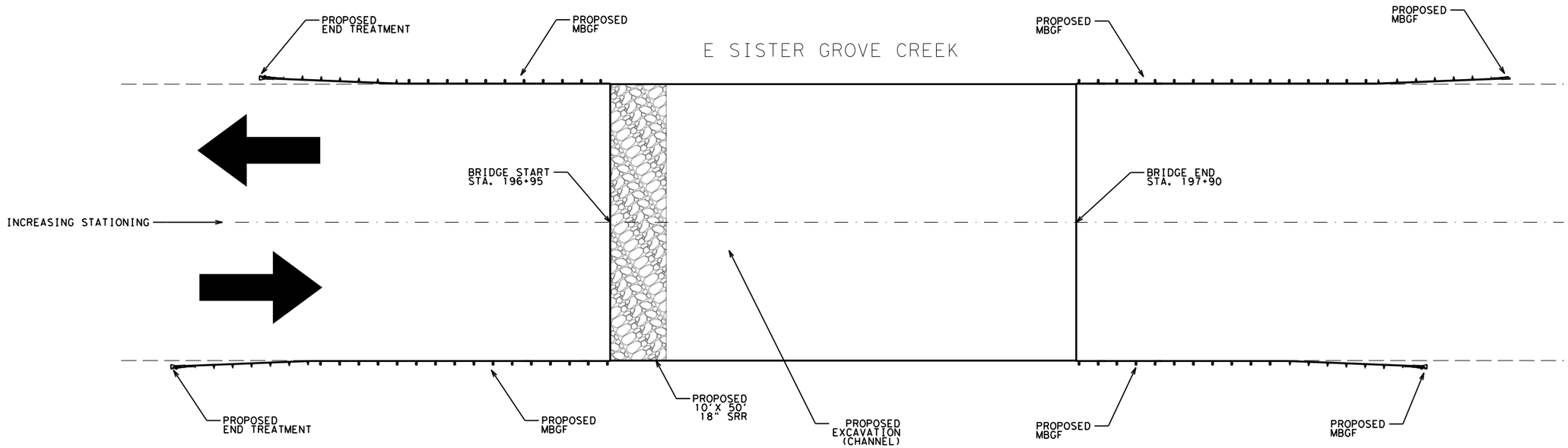
BRIDGE & CULVERT
REPAIR DETAILS

W SISTER GROVE CREEK
STA. 145+02 - 146+53
NBI#010920072902183

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		76

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



N

NOTES:

432-6033 - RIPRAP (STONE PROTECTION)(18 IN) - UNDER BRIDGE BANK SLOPE.

100-6002 - EXCAVATION (CHANNEL)

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

01.19.23

Monte R. Rater P.E.

FM 121
BRIDGE & CULVERT REPAIR DETAILS

E SISTER GROVE CREEK
STA. 196+95 - 197+90
NBI#010920072902182

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		77

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

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 765365V
Crossing Type: ** AT GRADE
RR Company Owning Track at Crossing: DALLAS GARLAND NORTHEASTERN
Operating RR Company at Track: DGNO
RR MP: 312.90
RR Subdivision: PLANO
City: VAN ALSTYNE
County: GRAYSON
CSJ at this Crossing: 0729-02-032
Highway/Roadway name crossing the railroad: FM 121
# of regularly scheduled trains per day at this crossing: 4
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: <1%

Scope of Work at this Crossing to Be Performed by State Contractor:

OVERLAY

Scope of Work at this Crossing to Be Performed by Railroad Company:

FLAGGING

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 3

On this project, night or weekend flagging is:

☐ Expected
☒ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices
☒ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☐ UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☒ OTHERS NATIONAL RAILROAD SAFTEY SERVICES
(817) 275-6777

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required

☐ Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

☐ Required
☒ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit
Railroad Protective Liability	
☐ Not Required	
☒ Non - Bridge Projects	$2,000,000 / $6,000,000
☐ Bridge Projects	$5,000,000 / $10,000,000
☐ Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

☐ Not Required
☐ Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)
☒ Required: Contractor to obtain (see Item 5, Article 8.4)
With the following railroad companies: DGNO

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

☒ Not Required
☐ Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call DGNO
Railroad Emergency Line at 800-979-4958
Location: DOT 765365V
RR Milepost 312.90
Subdivision PLANO

Texas Department of Transportation | Rail Division

RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:		
©TxDOT June 2014	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0729	02	032	FM 121		
3/2020	DIST	COUNTY		SHEET NO.		
	PAR	GRAYSON		78		

PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

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3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

Texas Department of Transportation — Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

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REVISIONS March 2020	0729	02	032	FM 121
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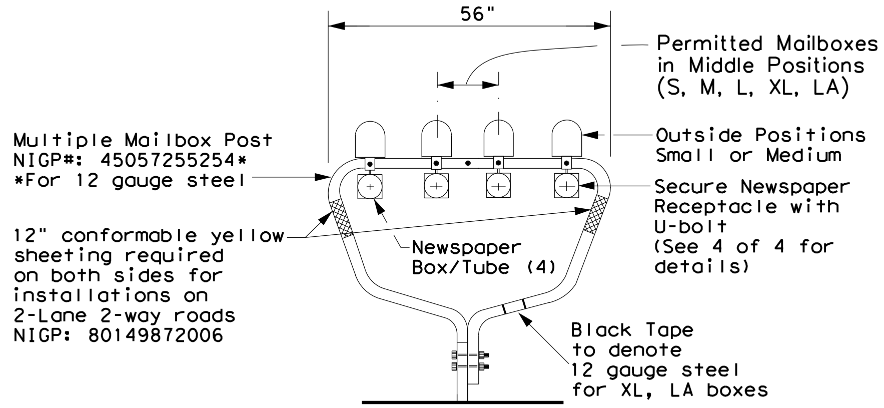
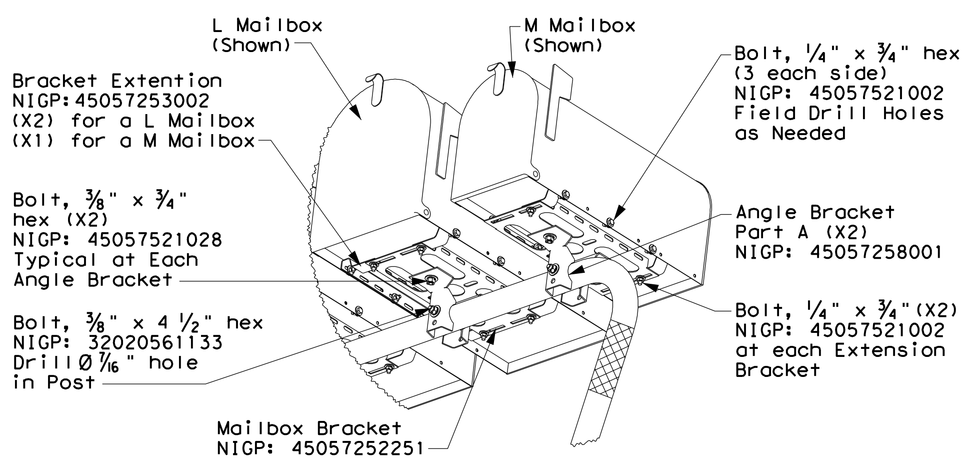
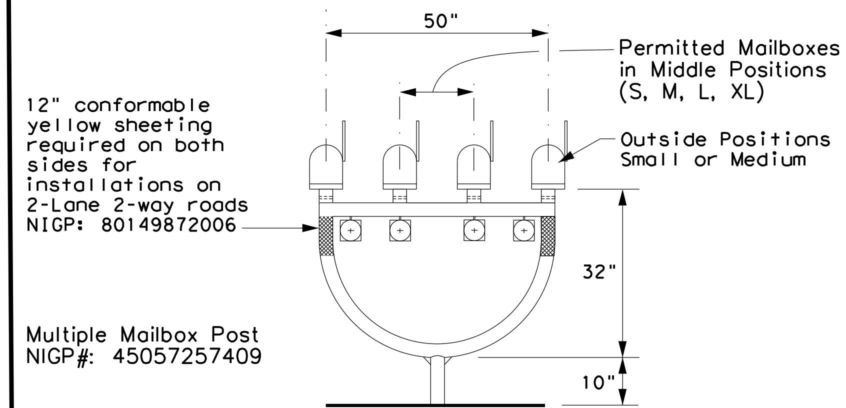
	PAR	GRAYSON		80

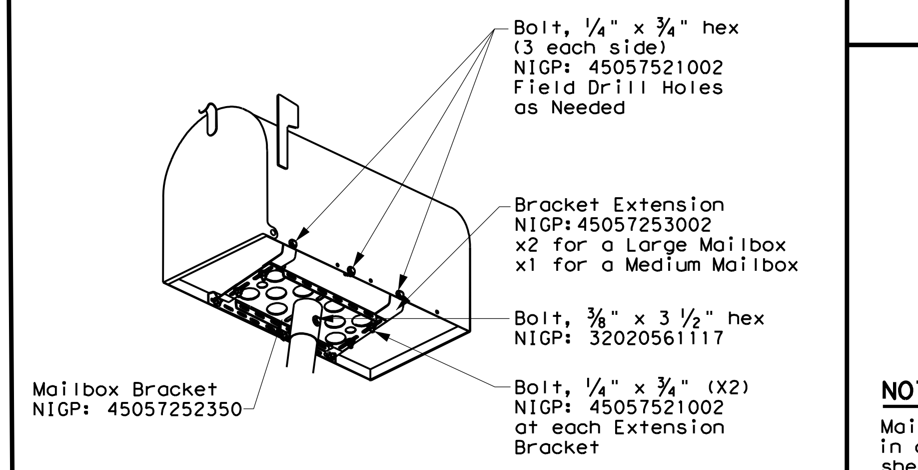
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

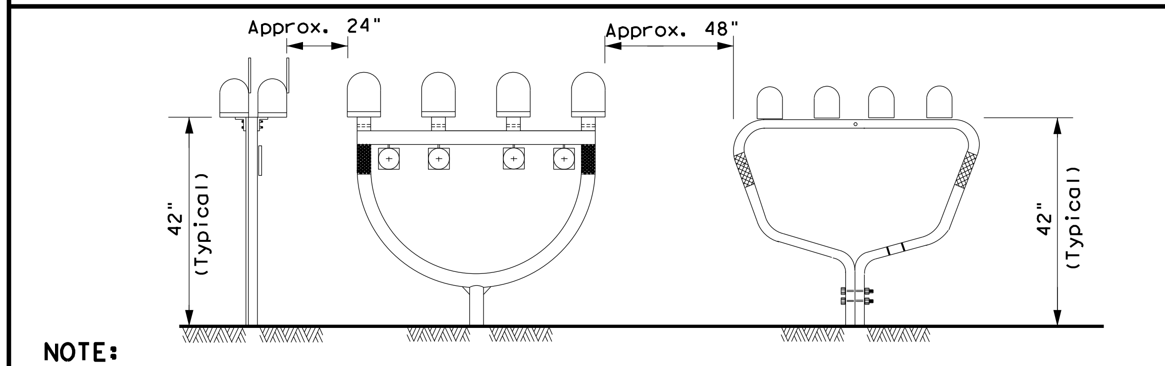
MAILBOX SIZE	TYPICAL DIMENSIONS LENGTH	WIDTH	HEIGHT	MAX ** WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

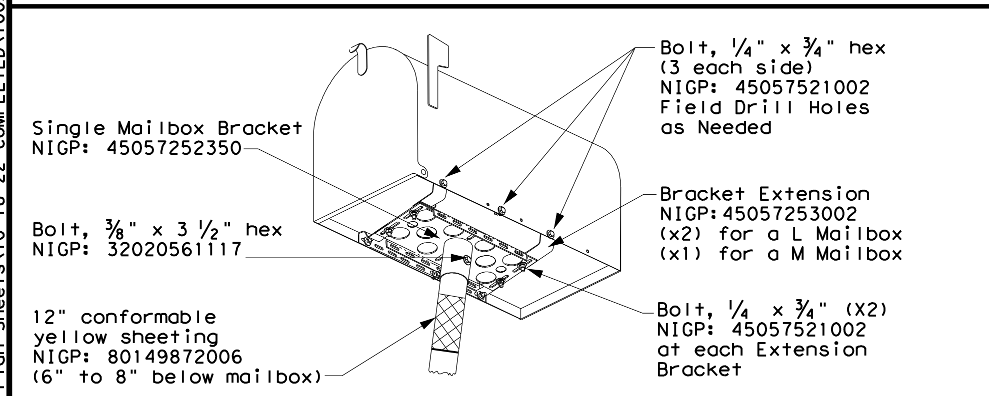
1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

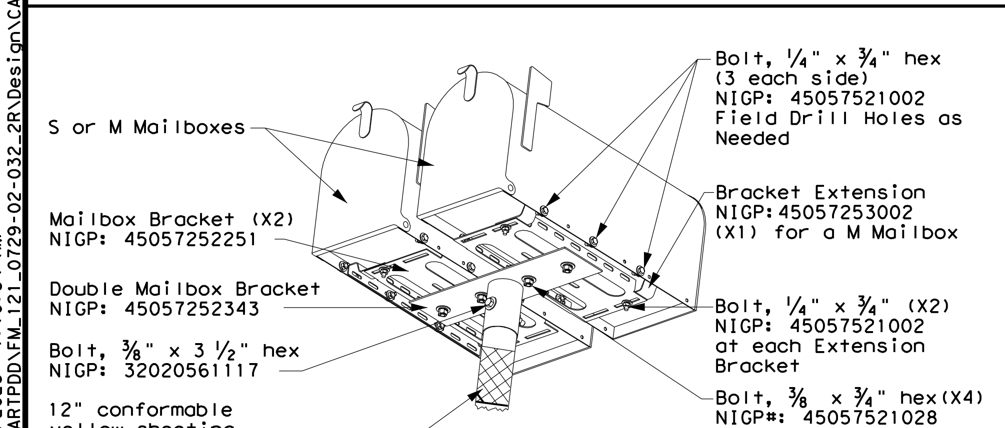
TYPICAL INSTALLATION MEASUREMENTS



NOTE:
Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

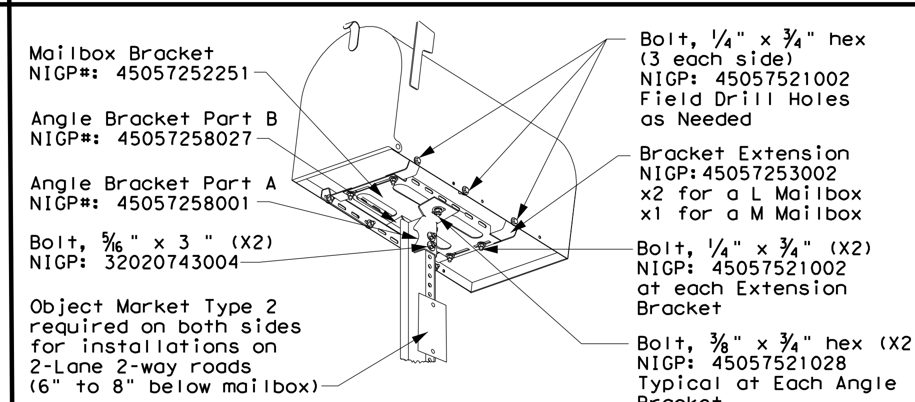
TYPE 2 and 4 - SINGLE/DOUBLE

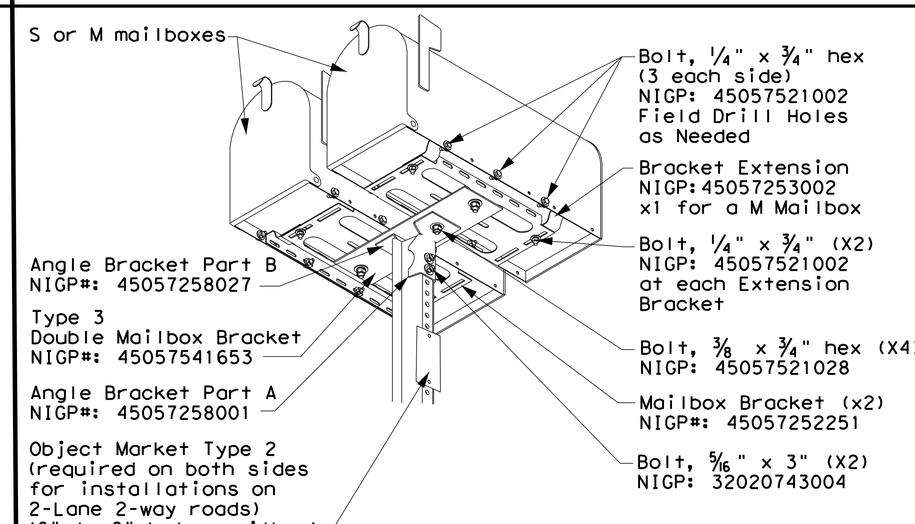




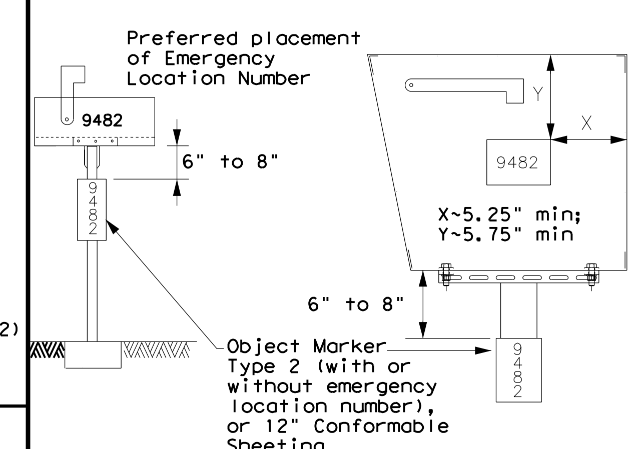
NOTE:
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

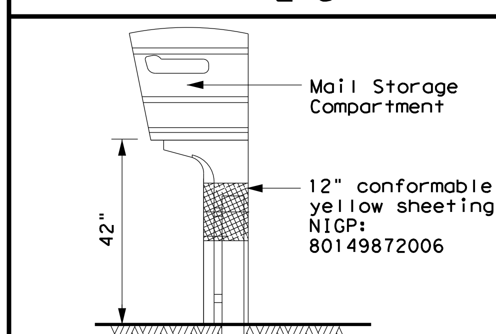


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

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	PAR		GRAYSON	81

DATE: 1/17/2023 1:10:54 AM
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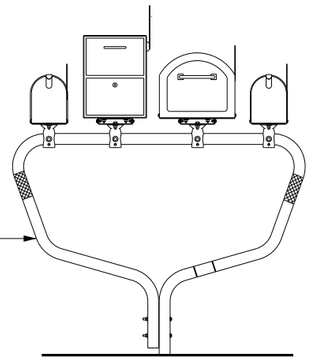
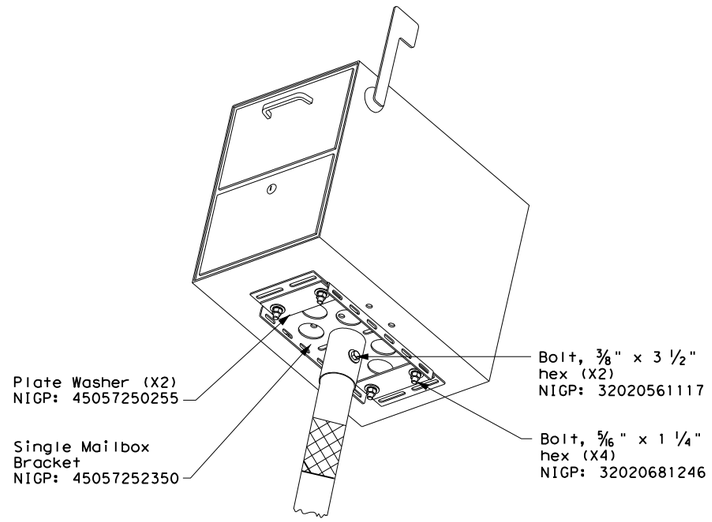
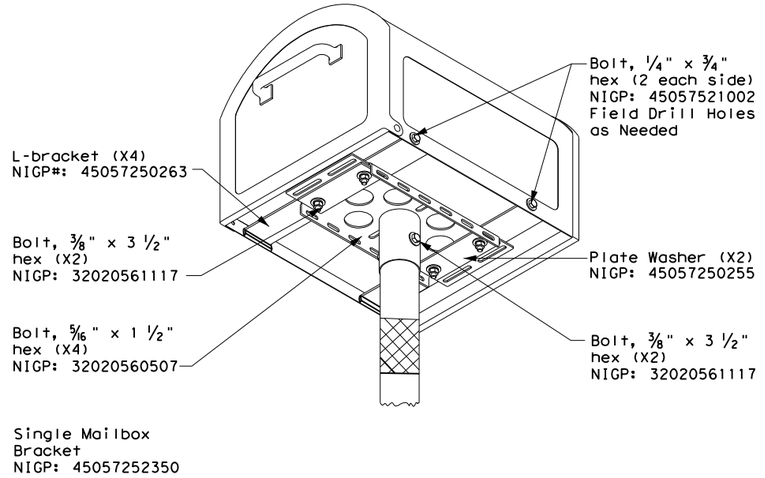
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

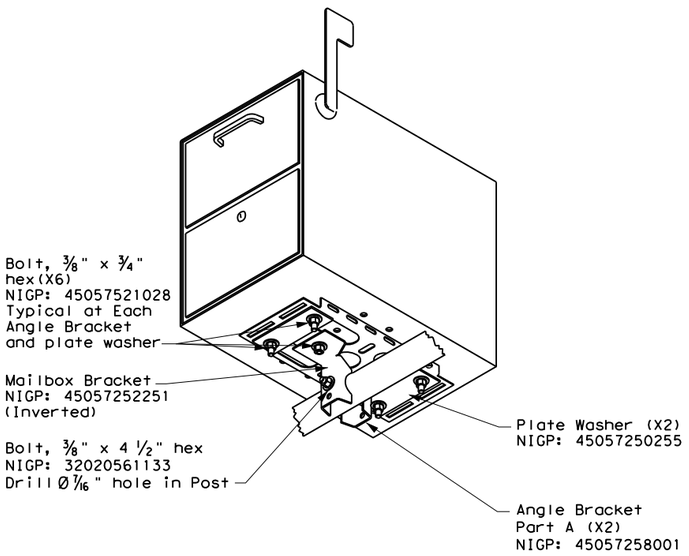


TYPE 2/4 - SINGLE XL MAILBOX

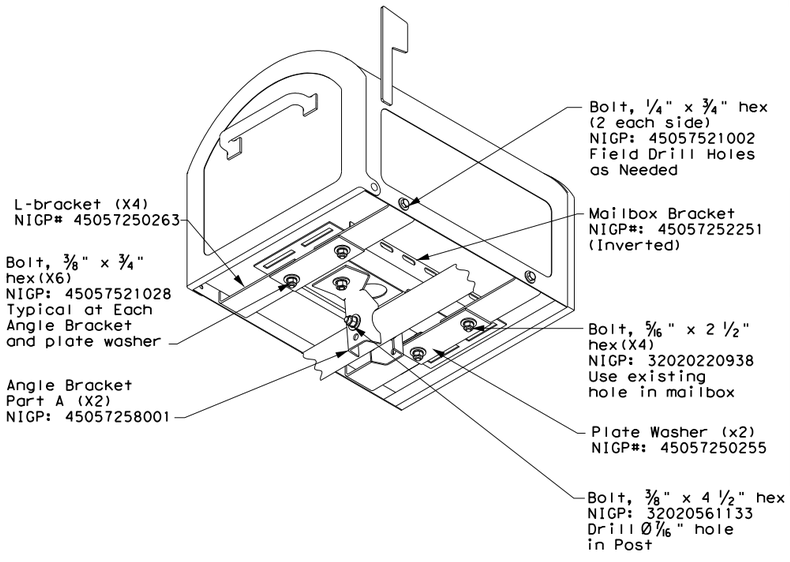


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

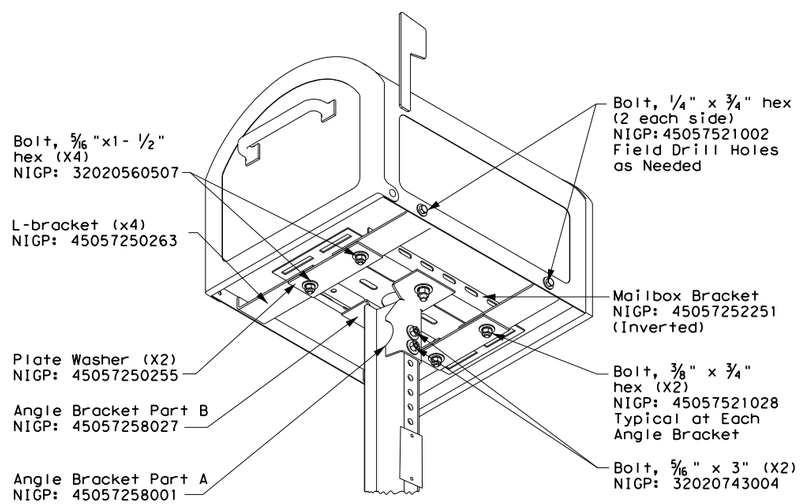
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation | Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

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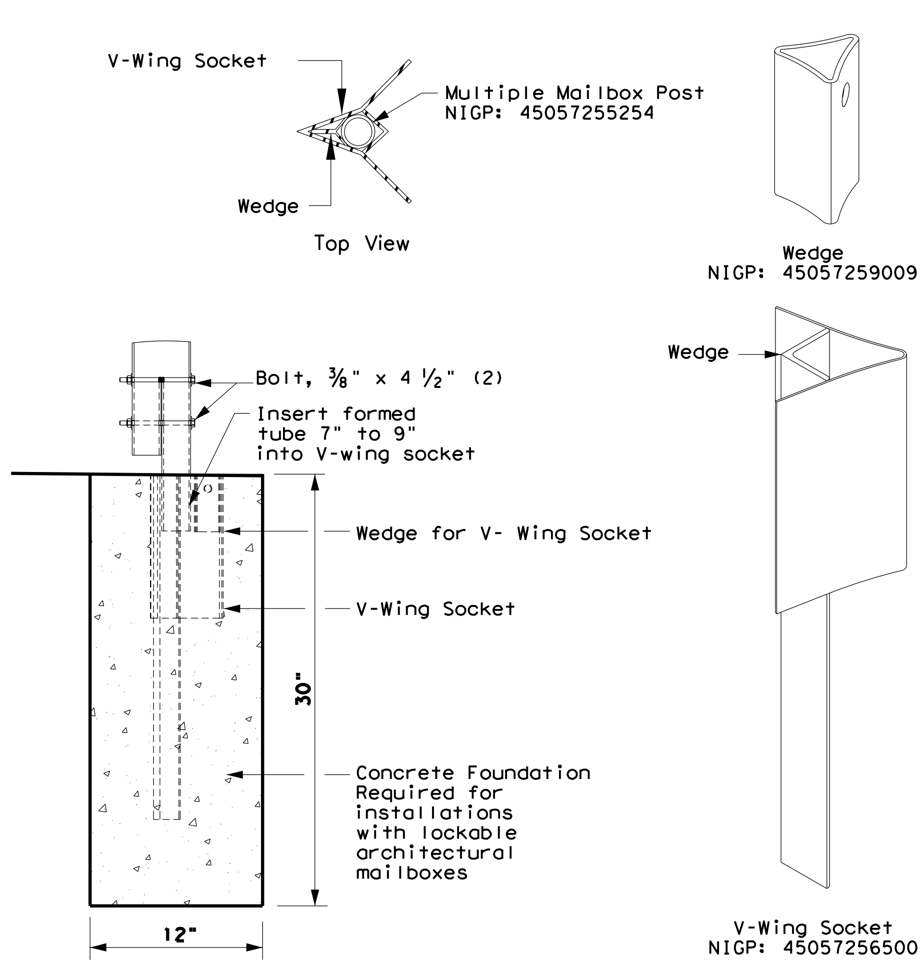
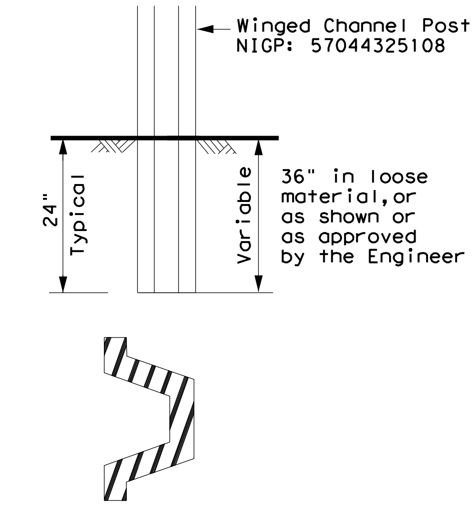
	PAR	GRAYSON		82

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage



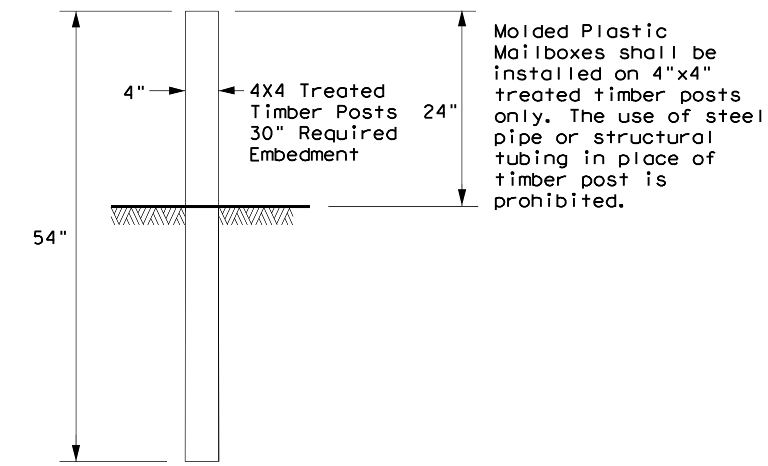
TYPE 3 - SUPPORT/FOUNDATION



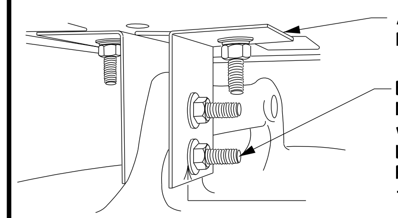
NOTES:

1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

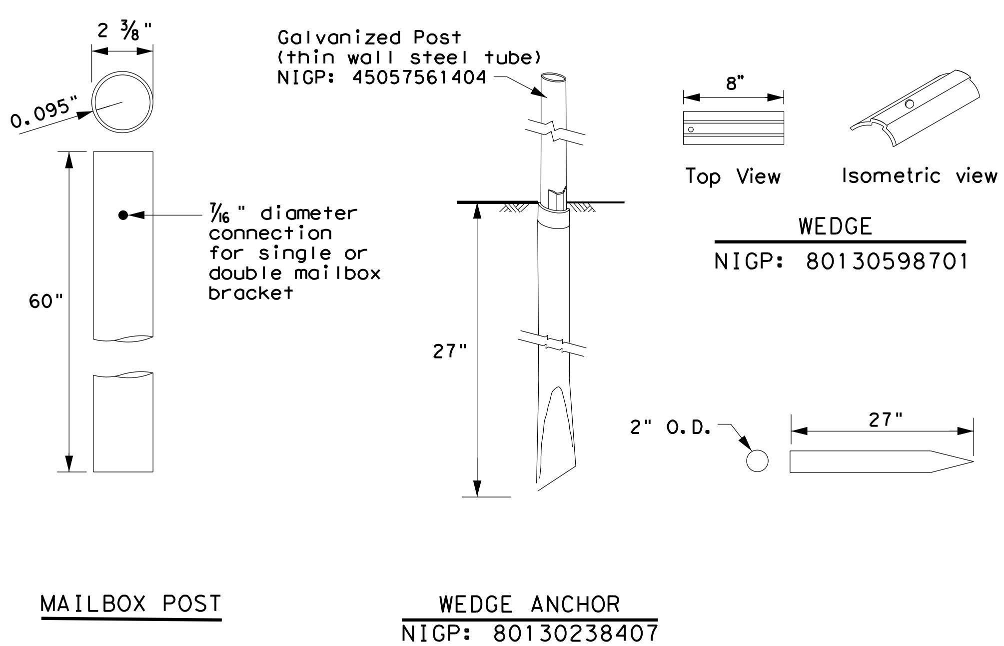
NOTES:

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

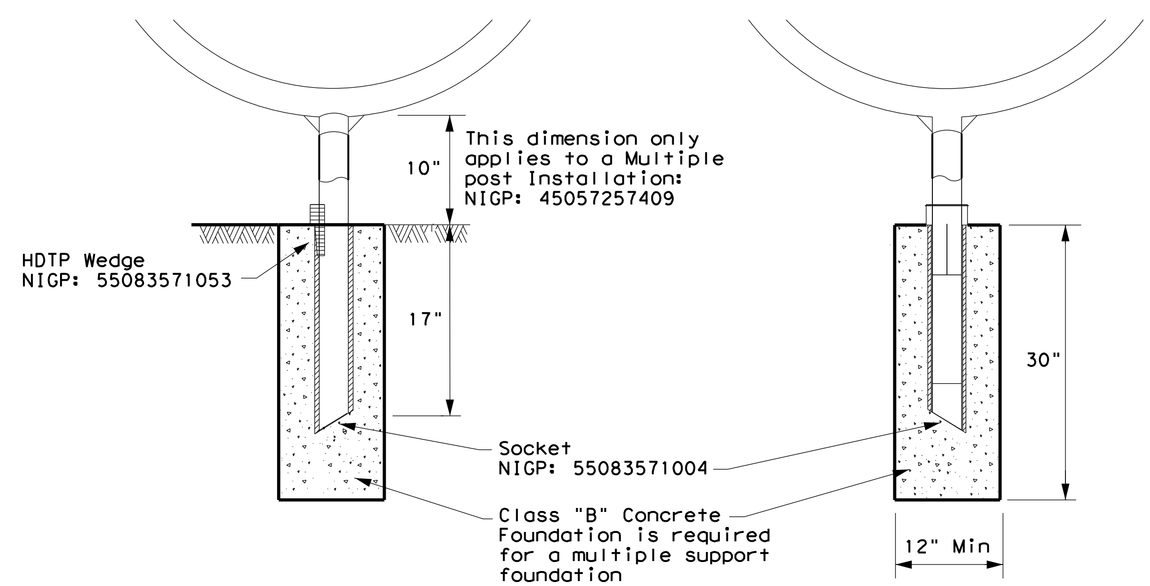
GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

Texas Department of Transportation — Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

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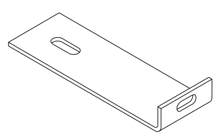
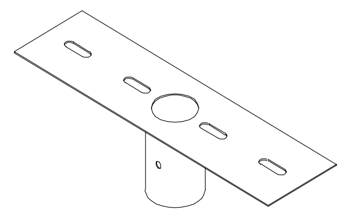
FILE: MB-21.dgn	DN:	CK:	DW:	CK:
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015	0729	02	032	FM 121
6/2005 1/2011	DIST		COUNTY	SHEET NO.
11/2006 7/2014	PAR		GRAYSON	83

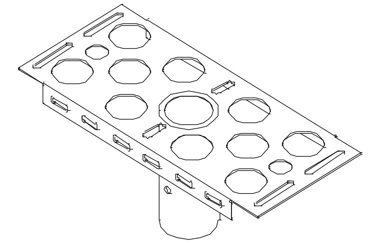
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



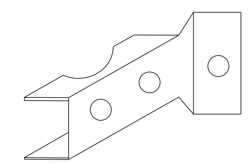
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



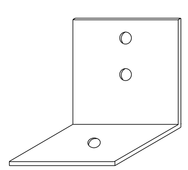
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



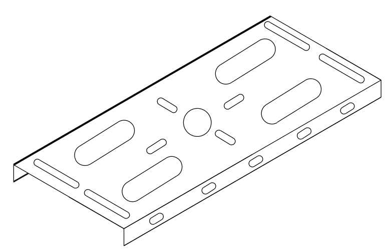
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



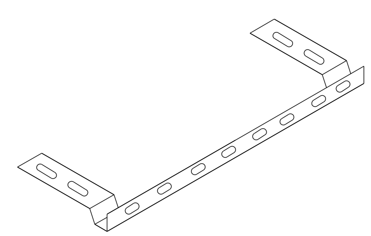
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



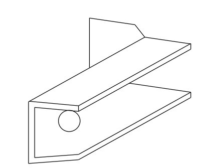
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



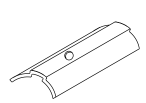
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



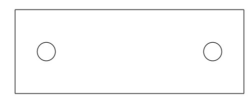
NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



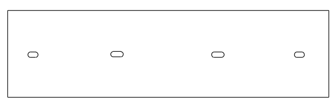
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



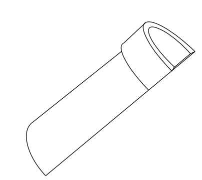
NIGP: 80130598701
Wedge for Type 2



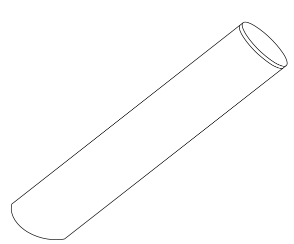
NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes



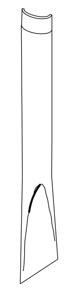
NIGP: 45057541653
Type 3 double mailbox bracket



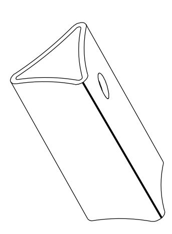
NIGP: 55083571053
Type 4 Mailbox Wedge



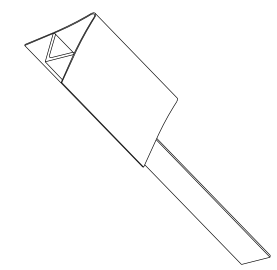
NIGP: 55083571004
Type 4 Mailbox Socket



NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

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

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation

Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	DIST PAR		COUNTY GRAYSON	SHEET NO. 84

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DATE: 1/17/2023
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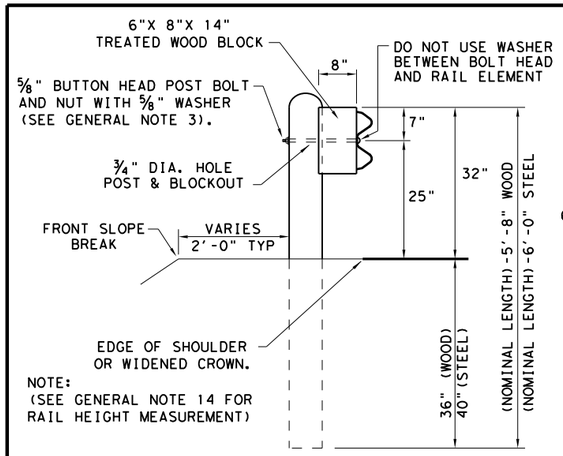
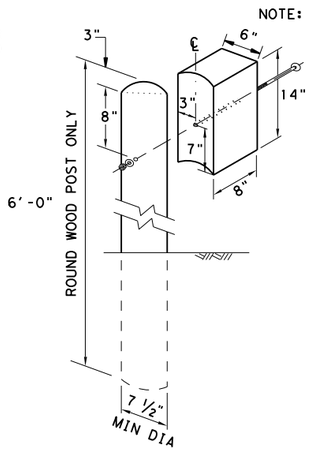
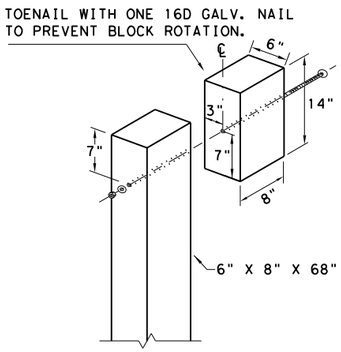


TYPICAL POST PLACEMENT

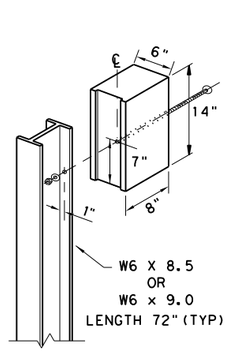


WOOD BLOCK TO ROUND WOOD POST

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

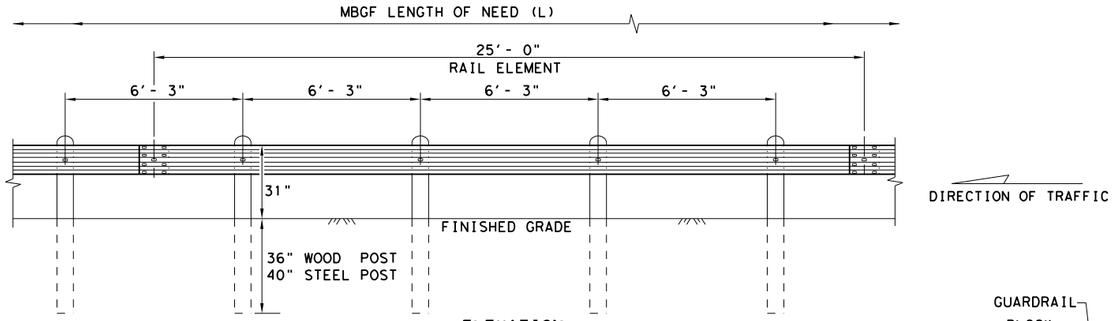


WOOD BLOCK TO RECTANGULAR WOOD POST



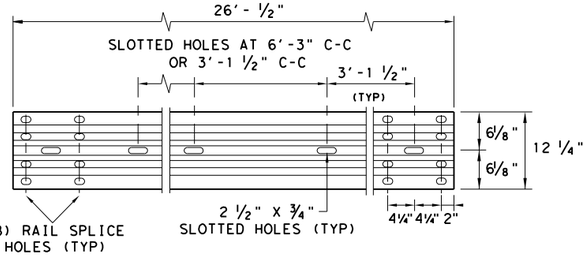
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION MID-SPAN RAIL SPLICE

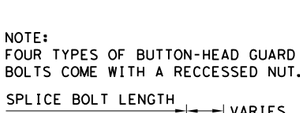
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

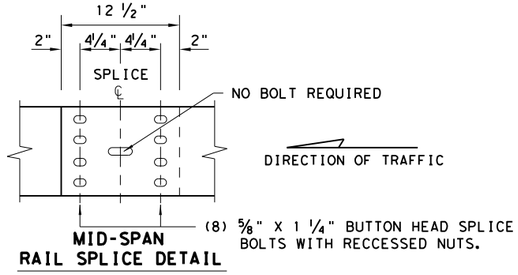
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



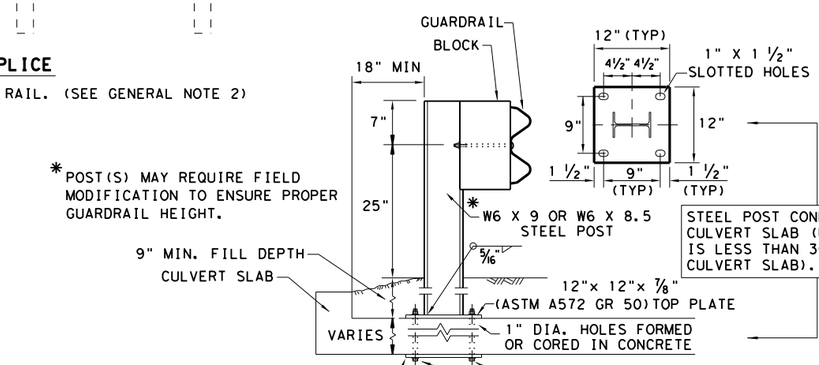
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



*POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

12" X 12" X ¼" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		85

DATE: 1/17/2023
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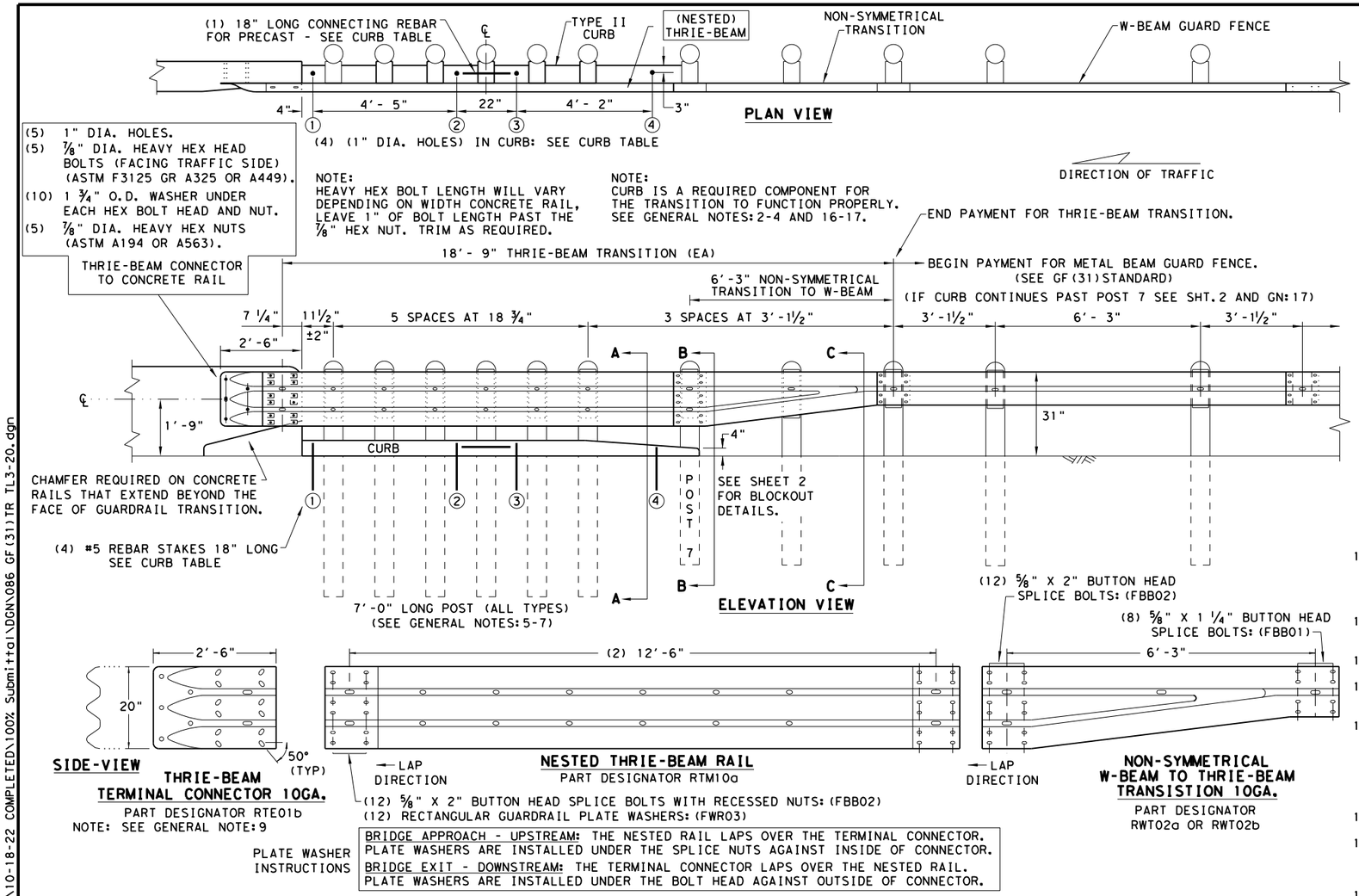


GENERAL NOTES

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

THRIE-BEAM TERMINAL - CURB TABLE

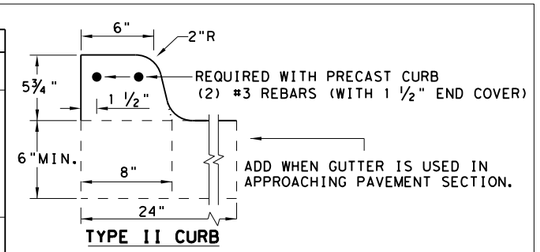
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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

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

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

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



TYPE II CURB

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

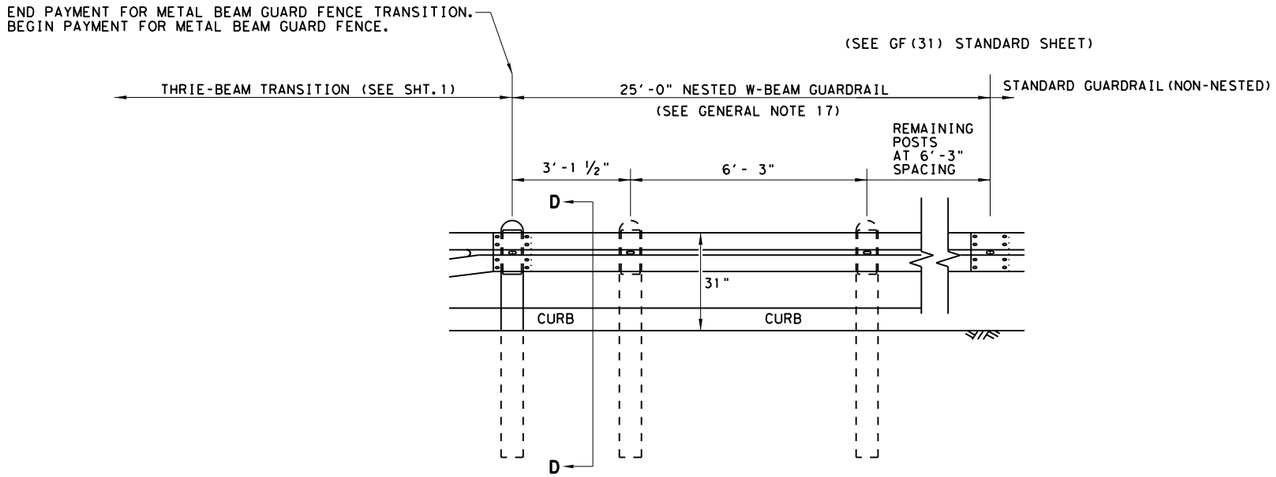
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

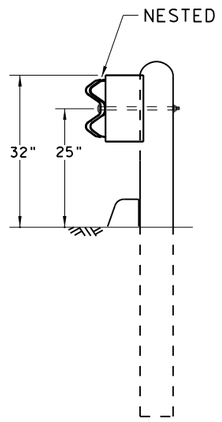
FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0729	02	032	FM 121		
	DIST	COUNTY		SHEET NO.		
	PAR	GRAYSON		86		

DATE: 1/17/2023
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\087 GF(31)TR TL3-20.dgn

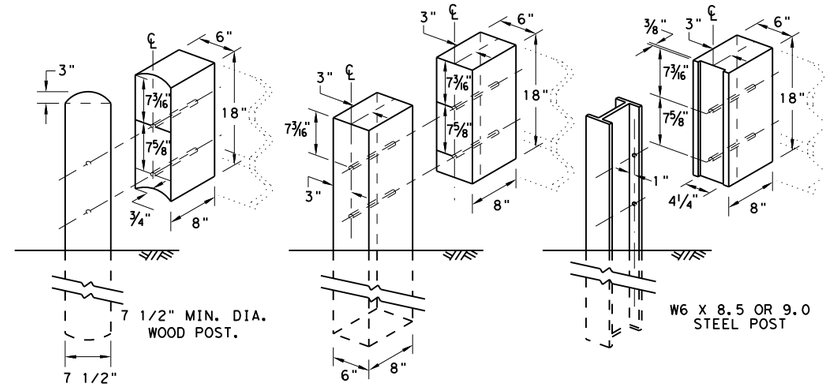
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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	PAR	GRAYSON		87	

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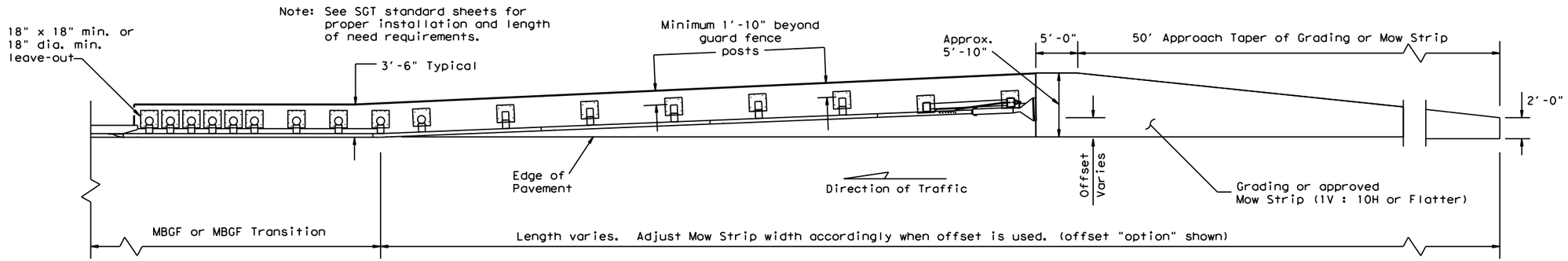
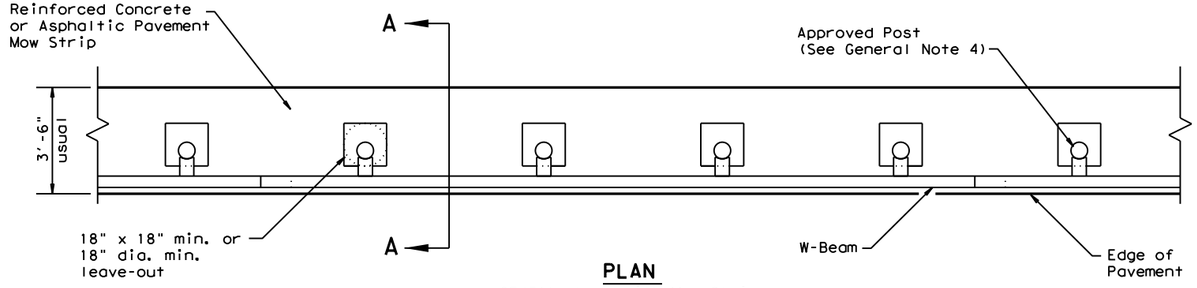
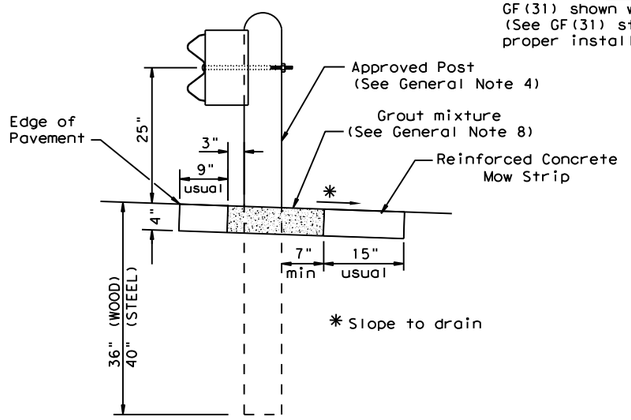


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



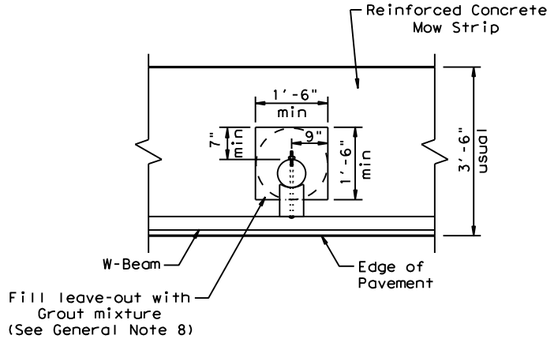
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



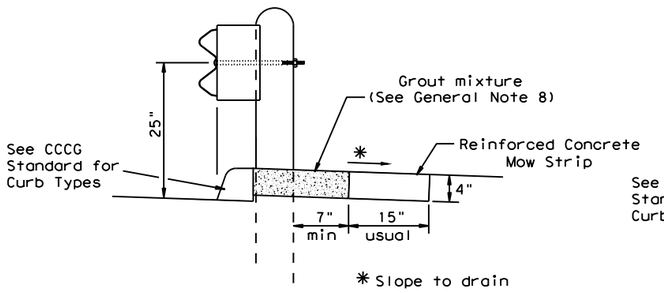
SECTION A-A

Typical



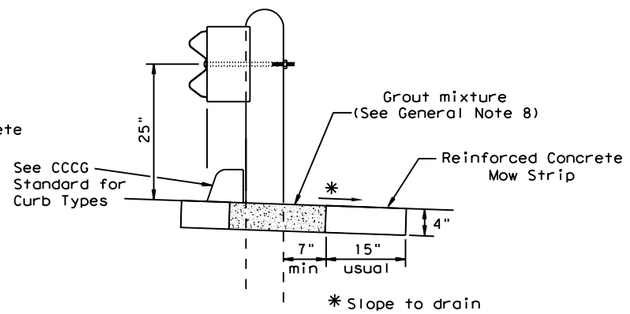
MOW STRIP DETAIL

Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.



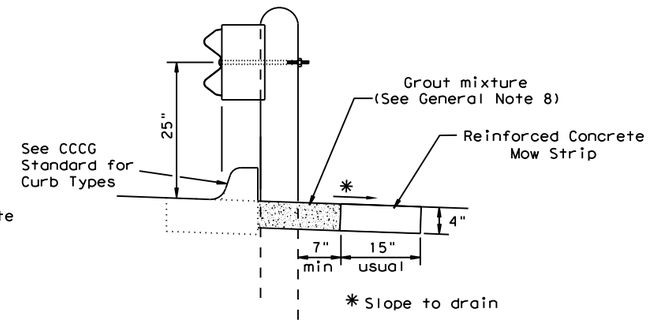
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0729	02	032		FM 121	
	DIST	COUNTY			SHEET NO.	
	PAR	GRAYSON			88	

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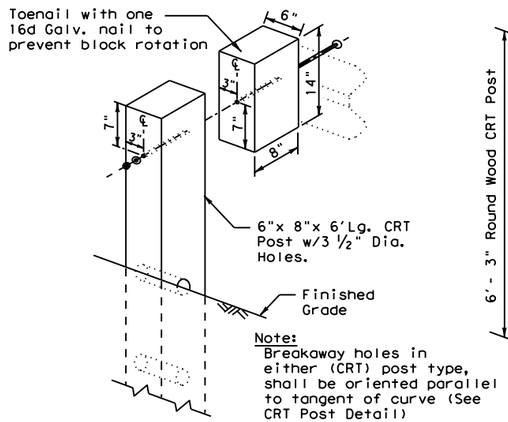
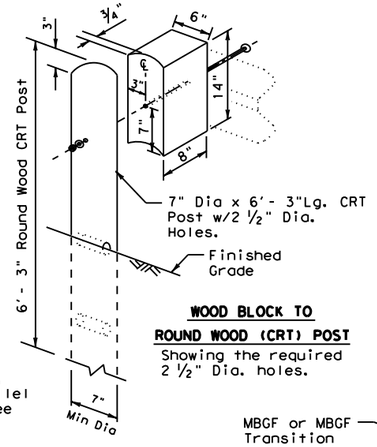
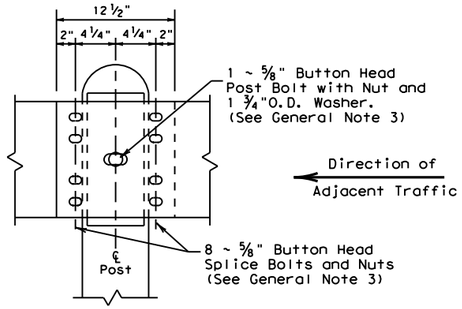


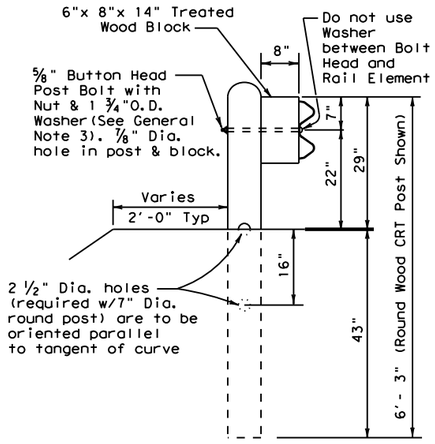
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
Showing the required 3 ½" Dia. holes.



WOOD BLOCK TO ROUND WOOD (CRT) POST
Showing the required 2 ½" Dia. holes.

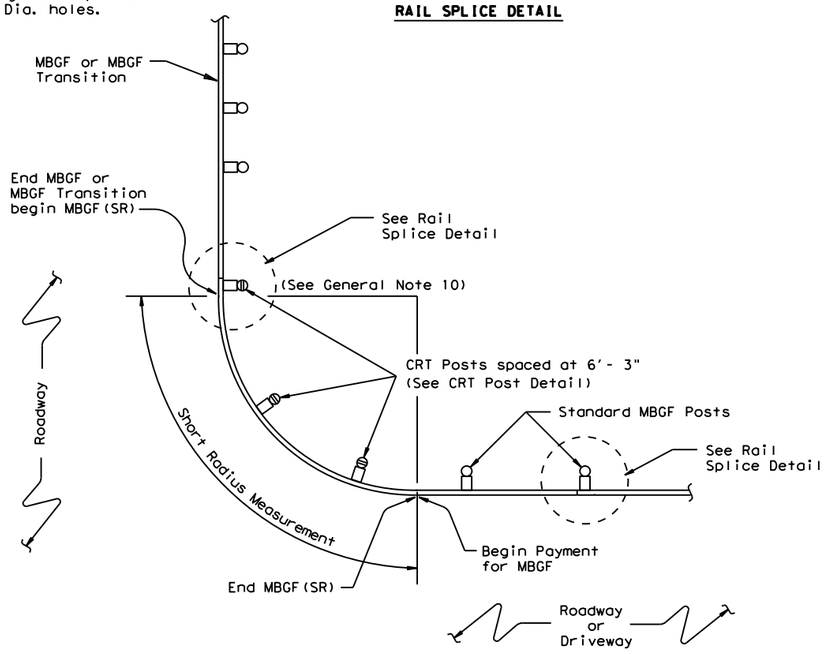


RAIL SPLICE DETAIL



(CRT) POST DETAIL
CONTROLLED RELEASE TERMINAL POST

Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



PLAN VIEW
SHOWING TYPICAL RADIUS

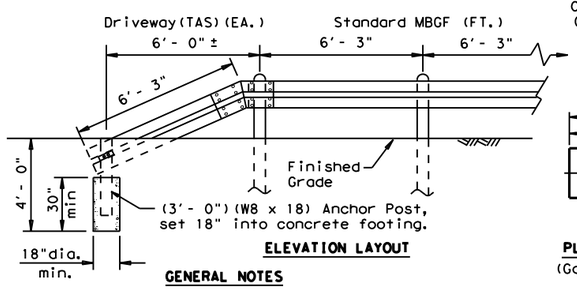
The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 ½ or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
8. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18",drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.



ELEVATION LAYOUT

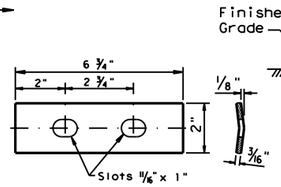
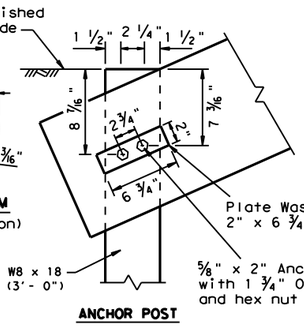
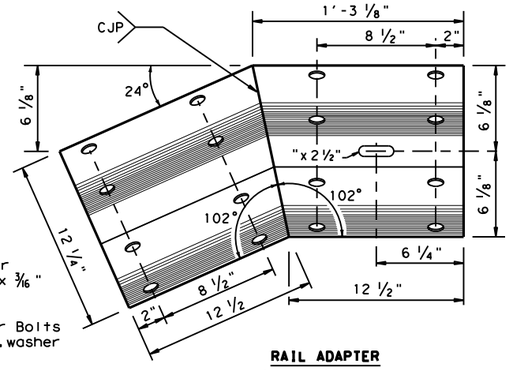


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)



ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

GENERAL NOTES

1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft. (TAS)Terminal Anchor Section, is too long.
2. Terminal anchor post shall be set in Class A concrete.
3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE
(SHORT RADIUS)
MBGF(SR)-19

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	CONT	SECT	JOB	HIGHWAY
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	PAR	GRAYSON		89

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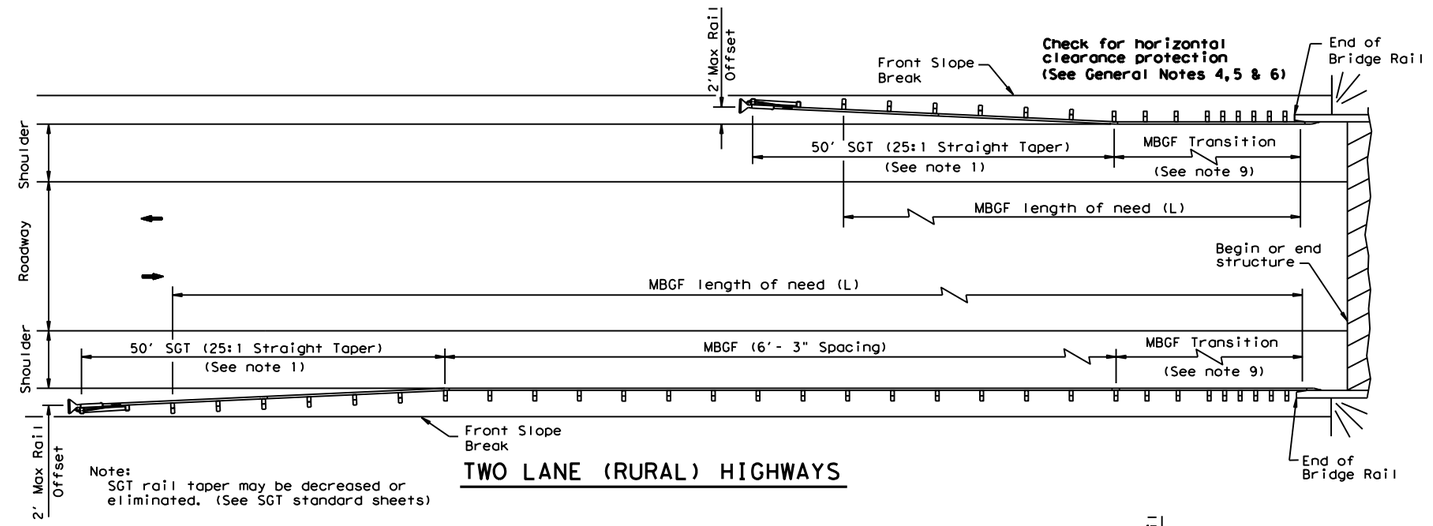
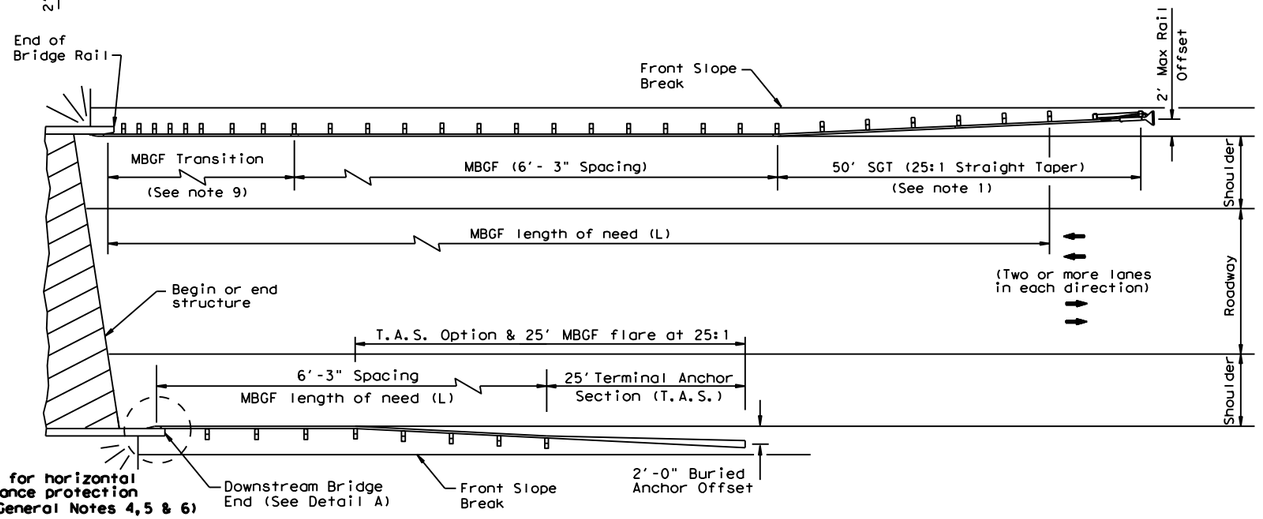
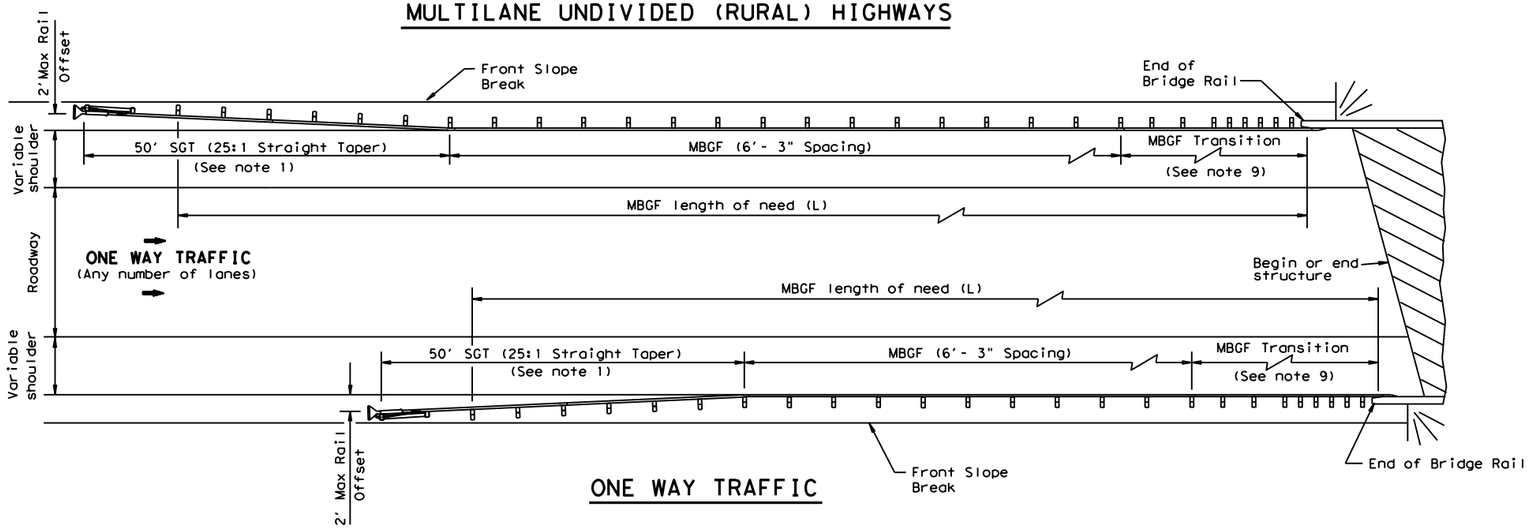


Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)

TWO LANE (RURAL) HIGHWAYS



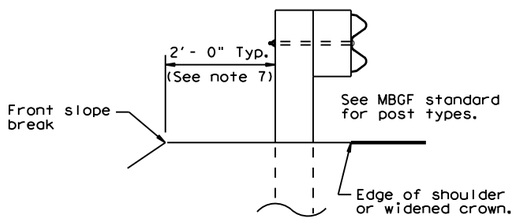
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



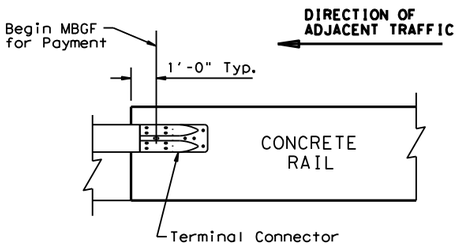
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF Transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Terminal anchor sections (TAS) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF (at 6'-3" post spacing without transition) to concrete rail are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft."maximum" offset from the shoulder edge.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



TYPICAL CROSS SECTION AT MBGF



DETAIL A

All rail elements shall be lapped in the direction of adjacent traffic.

ONLY FOR USE IN MAINTENANCE REPAIRS.

Texas Department of Transportation — Design Division Standard

BRIDGE END DETAILS
(28" METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)
BED(28)-19

FILE: bed2819.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
© TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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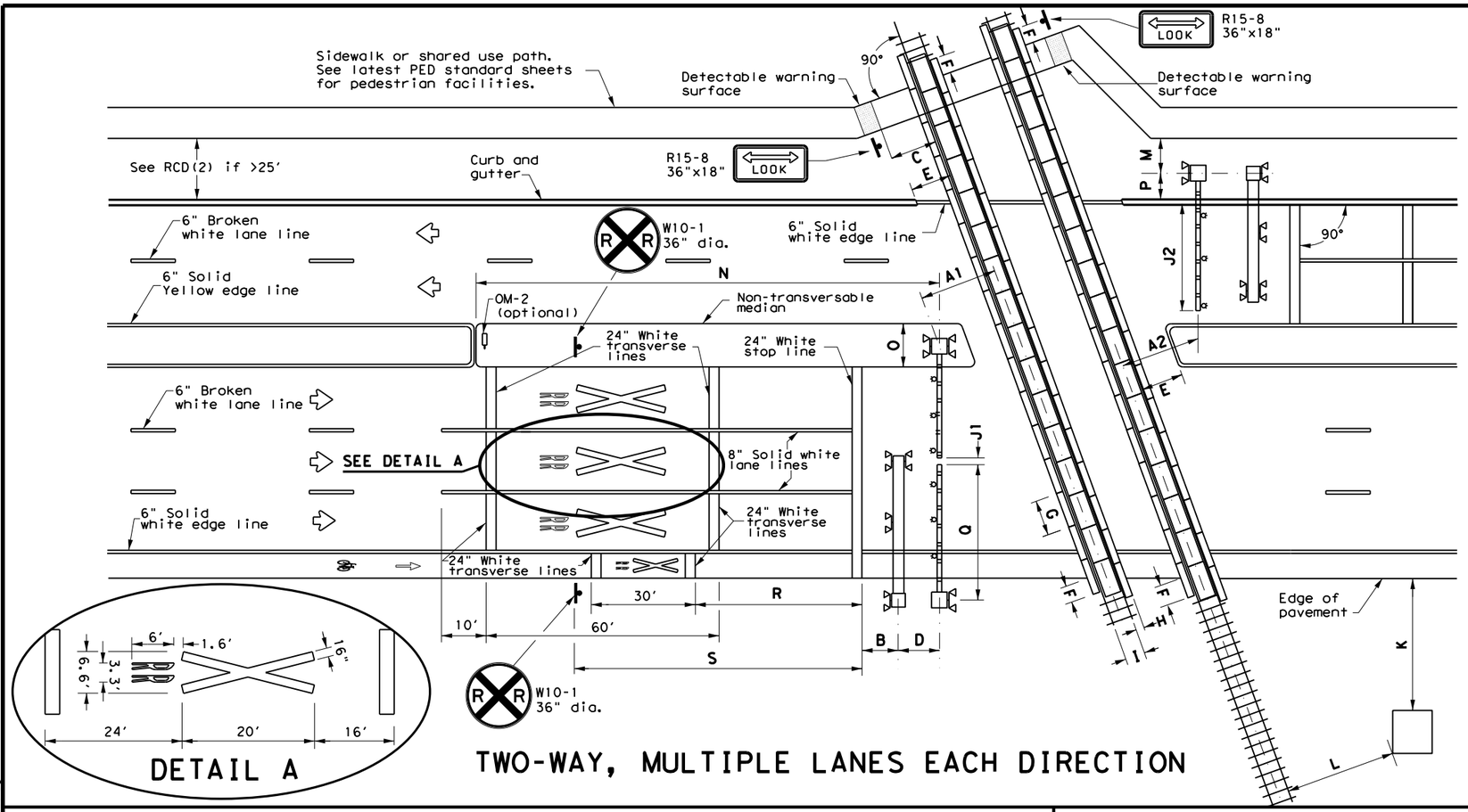
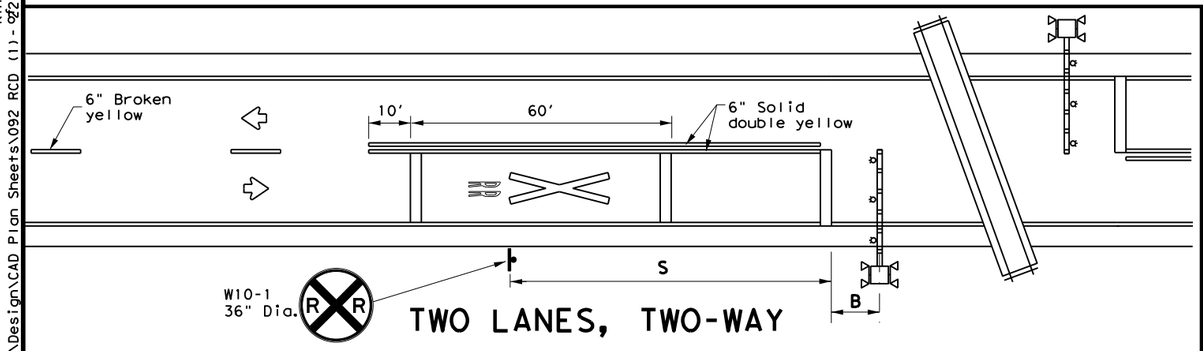
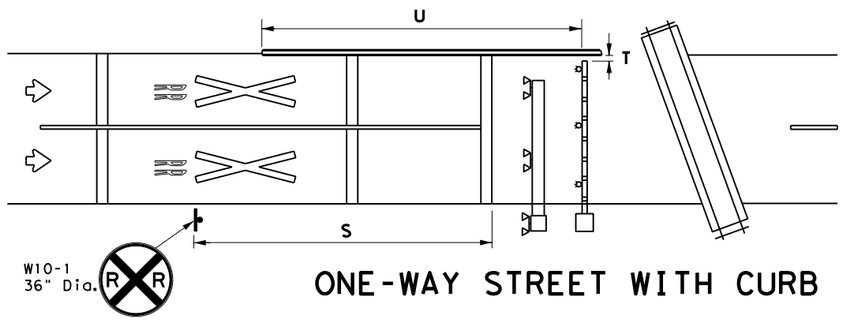
	PAR	GRAYSON		90







NOTES

T: Tip of gate to edge of curb: 1' maximum for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations.

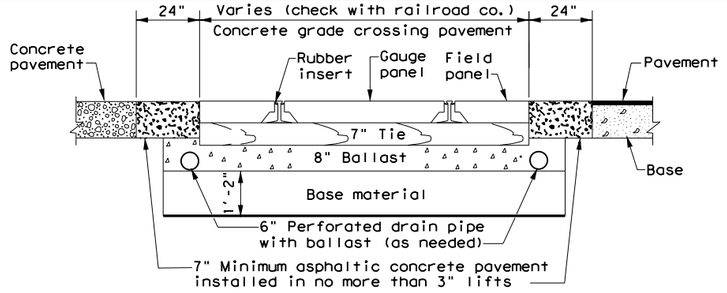
U: Non-traversable curb length from gate: 100' minimum for a Quiet Zone SSM, 10' minimum for all other locations.

TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

LEGEND	
	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	Mast Flasher Pair

GENERAL NOTES

1. Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
2. Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
3. Medians preferred whenever possible to prevent vehicles from driving around gates.
4. Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
5. See SMD standard sheets for sign mounting details.
6. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.



NOTES

A1: Center of RR mast to center of rail: 12' minimum, 15' typical.

A2: Tip of gate to center of rail: 12' minimum, 15' typical.

B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).

C: Near edge of detectable warning surface to nearest rail: 12' minimum.

D: Center of gate mast to center of cantilever mast: 6' typical. NOTE: Cantilever may be located in front or behind gates.

E: Edge of median or curb to nearest rail: 10' typical. NOTE: Design median edge to be parallel with rail.

F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum. NOTE: Field panels need not be in line with gauge panels.

G: Length of panels along rail: 8' typical.

H: Width of field panel: 2' typical (check with railroad company).

I: Distance between rails: 4'- 8'1/2".

J1: Tip of gate to tip of gate: 2' maximum.

J2: 90% of traveled roadway to be covered by gate.

K: Nearest edge of RR cabinet from edge of pavement: 30' typical. NOTE: Cabinet not required to be parallel to edge of pavement.

L: Nearest edge of RR cabinet from nearest rail: 25' typical.

M: Center of RR mast to edge of sidewalk: 6' minimum.

N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60'will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.

O: Width of median for RR gate assembly: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

P: Center of RR mast to face of curb: 5'-3" minimum. Center of RR mast to edge of pavement (with shoulder): 7' minimum. Center of RR mast to edge of pavement (no shoulder): 9'-3" minimum. NOTE: Final location determined by the railroad company.

Q: Gate length: 28' or less typical, but railroad company may allow up to 32' under special circumstances.

R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.

S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.

Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT RCD(1)-22

FILE: rcd1-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
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2-16	DIST	COUNTY		SHEET NO.
11-22	PAR	GRAYSON		91

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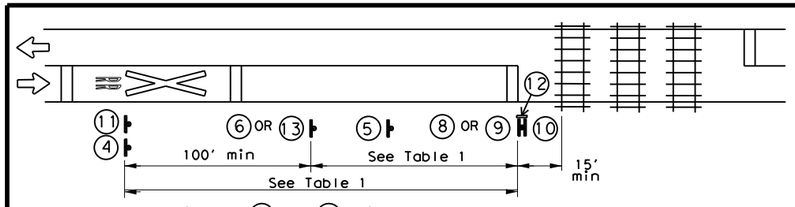
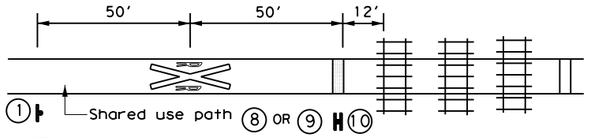


(if no (6) or (13) sign used)

PASSIVE CROSSING

NOTES

1. STOP or YIELD sign may also be installed to the left of the crossbuck sign, rather than below it.
2. A 2" white retroreflective strip shall be installed on front and back of crossbuck sign post.
3. See the Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings section of the TMUTCD for further details about sign mounting arrangements.



NOTES

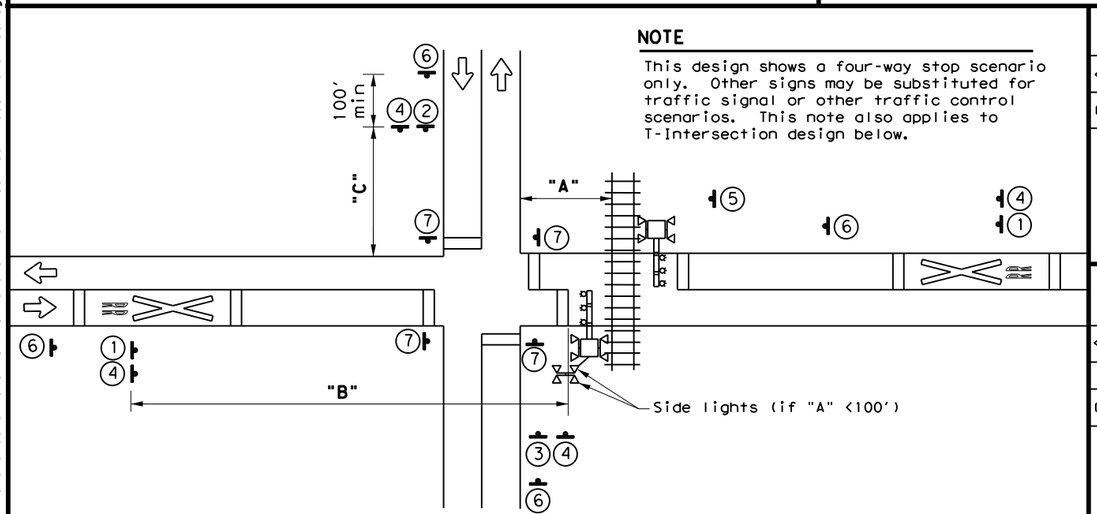
1. A shared use path is considered a separate pathway crossing when more than 25' from traveled way of adjacent roadway.
2. Detectable warning used at stop bar.
3. Smaller signs preferred. See the Design of Bicycle Signs section within the TMUTCD for sizing details.

PATHWAY CROSSING

TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

GENERAL NOTES

1. Railroad company to provide active traffic control devices, CROSSBUCK (R15-1), NUMBER OF TRACKS (R15-2P) plaque (if more than 1 track), and EMERGENCY NOTIFICATION (I-13) signs.
2. LOW GROUND CLEARANCE (W10-5) signs may be relocated further upstream of crossing to provide advance warning of alternate route.
3. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2) signs may be modified as needed to fit roadway geometry.
4. Table 1 placement distances may vary per the Placement of Warning Signs section of the TMUTCD.
5. See Table 1 to determine placement of STOP AHEAD (W3-1) and YIELD AHEAD (W3-2) signs unless shown otherwise.
6. DO NOT STOP ON TRACKS (R8-8) signs installed when potential for vehicles stopping on tracks is significant as determined by sealing engineer. Install so sign does not block view of RR mast.
7. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

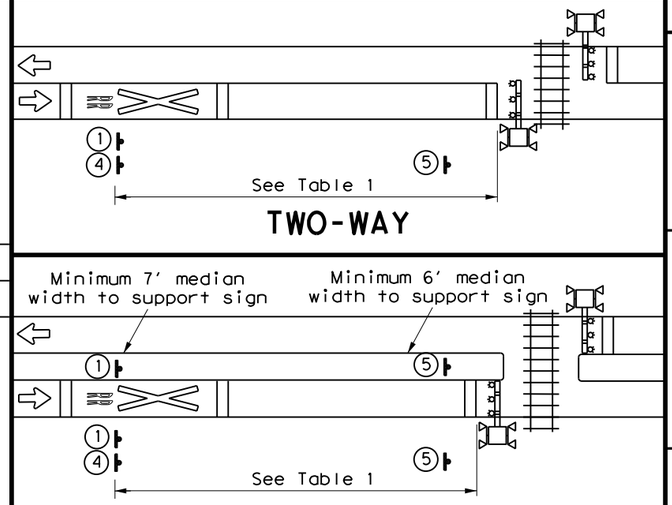


NOTE

This design shows a four-way stop scenario only. Other signs may be substituted for traffic signal or other traffic control scenarios. This note also applies to T-Intersection design below.

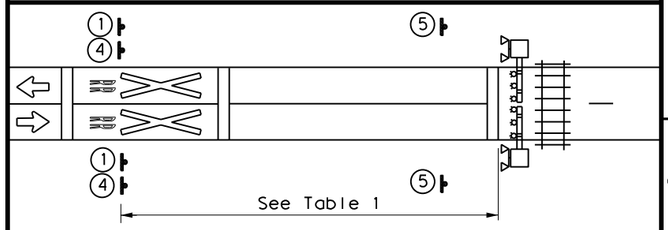
	"A" <100'	"A" ≥100'
"B"	See Table 1. Place pavement markings and signs on opposite side of intersection from rail if spacing from Table 1 would put markings within intersection.	See Table 1. Place pavement markings and signs between rail and intersection if spacing from Table 1 would put markings within intersection.
"C"	See Table 1.	GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2, W10-3, W10-4) signs should only be installed if W10-1 sign is not between intersection and railroad crossing. If needed, see Table 1.

GRADE CROSSING NEAR A PARALLEL STREET



TWO-WAY

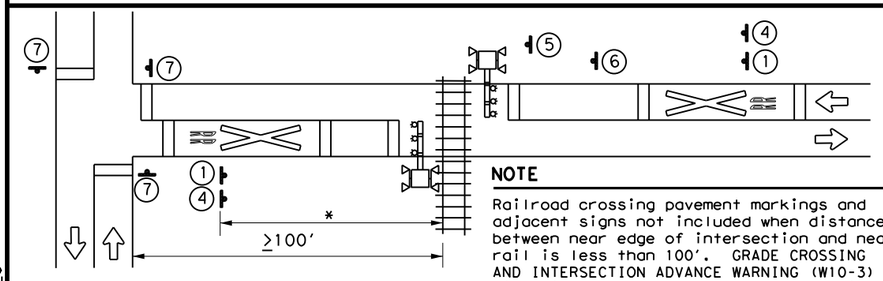
TWO-WAY WITH MEDIAN



ONE-WAY

SIGNS

**	**	**	IF NEEDED	
(1) W10-1 36" Dia.	(2) W10-2L 36" X 36"	(3) W10-2R 36" X 36"	(4) W10-5 36" X 36" / LOW GROUND CLEARANCE W10-5P 30" X 24"	
IF NEEDED	IF NEEDED			
DO NOT STOP ON TRACKS (5) R8-8 24" X 30"	(6) W3-1 30" X 30"	STOP R1-1 36" X 36" / ALL WAY R1-3P 18" X 6" (7)	RAIL CROSSING ROAD 3 TRACKS R15-1 48" X 9" / R15-2P 27" X 18" / STOP R1-1 36" X 36" (8)	
RAIL CROSSING ROAD 3 TRACKS R15-1 48" X 9" / R15-2P 27" X 18" / YIELD (9) R1-2 48" X 48" X 48"	RAIL CROSSING ROAD 3 TRACKS R15-1 48" X 9" / R15-2P 27" X 18" (10)	R R W10-1 36" Dia. / NO GATES OR LIGHTS W10-13P 30" X 24" (11) **	REPORT EMERGENCY OR PROBLEM 1-800-555-5555 CROSSING 836 597 H — Sign may be placed perpend. to travel lanes. (12) I-13 15" X 9"	
IF NEEDED (13) W3-2 30" X 30"	** Includes a NO TRAIN HORN (W10-9P) plaque if crossing is in a Quiet Zone. If needed, is mounted below W10-2/W10-3/W10-4 signs.			
NO TRAIN HORN W10-9P 30" X 24"				

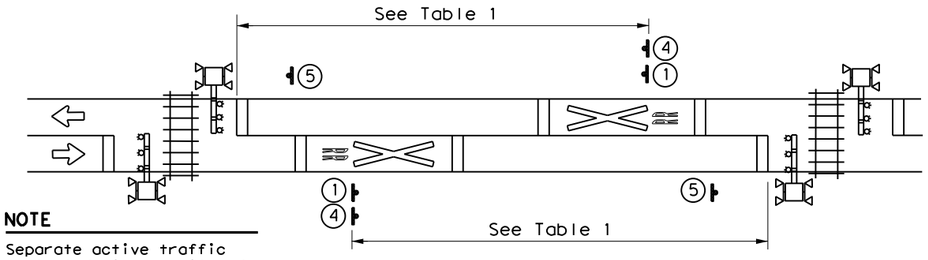


*Use Table 1 if sufficient space exists.

NOTE

Railroad crossing pavement markings and adjacent signs not included when distance between near edge of intersection and near rail is less than 100'. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-3) signs installed on roadway parallel with rail in this case.

T-INTERSECTION



NOTE

Separate active traffic control devices, railroad crossing pavement markings, and adjacent signs required when tracks are more than 100' apart.

TWO ADJACENT CROSSINGS

Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING & STRIPING

RCD(2)-22

FILE: rcd2-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
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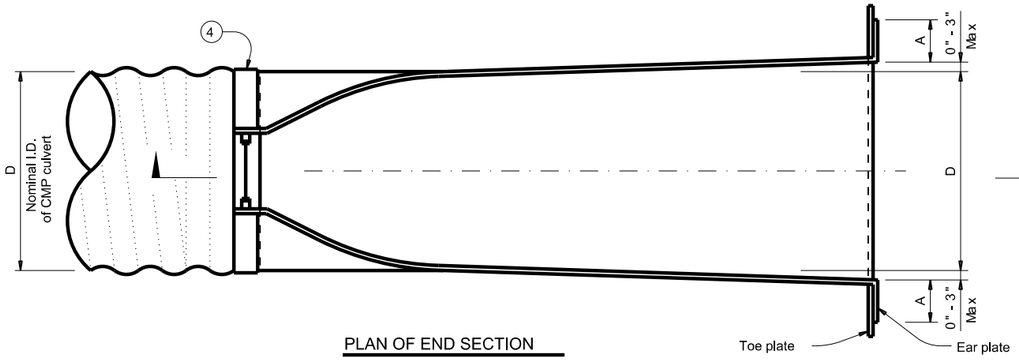
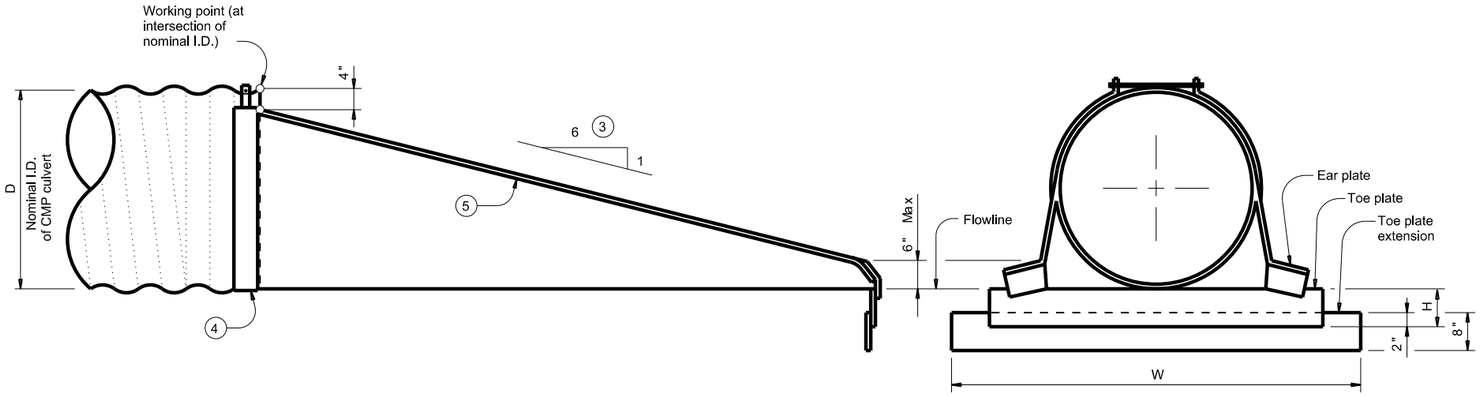


PLAN OF END SECTION



SIDE ELEVATION OF END SECTION

END ELEVATION OF END SECTION

1. Provide size and lengths of cross pipes as shown in the tables, except the first cross pipe from the bottom and the saddle pipe must be 3 b".
2. Provide all 3-piece apron sections with 12 gage sides and 10 gage center panels.
3. Match cross slope as shown elsewhere in the plans. All quantities, calculations, and dimensions shown herein are based on the 6:1 Slope. 6:1 slope or flatter is required for vehicle safety.
4. Connection between corrugated metal pipe (CMP) culvert and galvanized prefabricated end section may be with strap and bolt as shown or other combinations of threaded rods and/or coupling bands.
5. Reinforce upper edge of prefabricated end section with minimum b" dia smooth or deformed bar (pre-galvanized).
6. Values shown are minimum requirements.
7. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap".

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES (1)

D (Nominal) Culvert I.D.)	Cross Pipe Length	Cross Pipes Required	Cross Pipe Size
≤ 30"	N/A	No	N/A
36"	4' - 5"	Yes	4.500 x 0.237
42"	4' - 11"		
48"	5' - 5"	Yes	5.563 x 0.258
54"	5' - 11"		
60"	6' - 5"		

PREFABRICATED END SECTION INFORMATION

D (Nominal) (Culvert I.D.)	H (6)	A (6)	W (6)	Gage (6)
≤ 24"	6"	9"	D + 24"	16
30"	9"	12"	D + 32"	14
36"	9"	12"	D + 32"	14
≥ 42	12"	16"	D + 40"	12/10 (2)

STANDARD PIPE SIZES (1)

HSS Size	STD Size
4.000 x 0.154	2"
4.500 x 0.216	3"
5.563 x 0.237	4"

MATERIAL NOTES:

Provide cross pipes and saddle pipes conforming to ASTM A1085, A500 Gr B, A53 (Type E or S, Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except reinforcement, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specification.

Toe plate extensions are required only when shown elsewhere in the plans.

Concrete riprap is required only when cross pipes are required, unless otherwise shown in the plans. Provide concrete riprap in accordance with Item 432, "Riprap". Bolted anchor toewall may be omitted when an alternate end section with pre-attached cross pipes is supplied.

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

GENERAL NOTES:

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

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

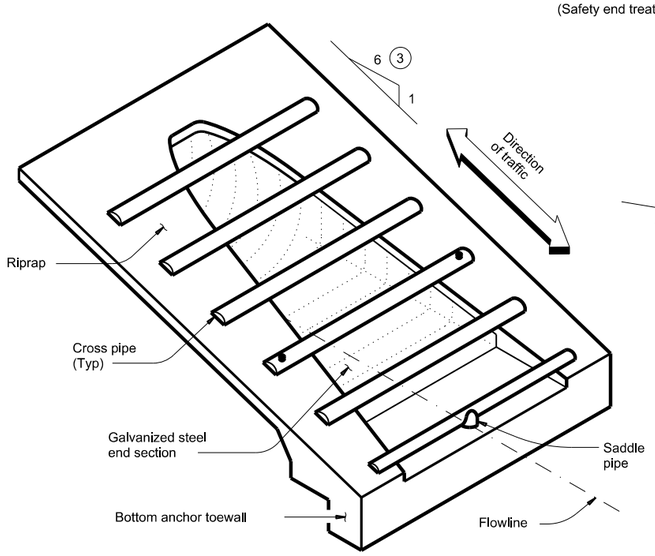
Alternate styles of end sections, including those with pre-attached cross pipes, may be supplied. Alternate styles must meet all of the following: design values shown in tables for cross pipe size; spacing of cross pipes and location of first cross pipe; H, A, W, and gage for end section; and material requirements noted.

All cross pipes, calculations, and dimensions are based on the end section shown on this standard. Alternate styles of end sections will require that appropriate adjustments be made to the values presented on this standard.

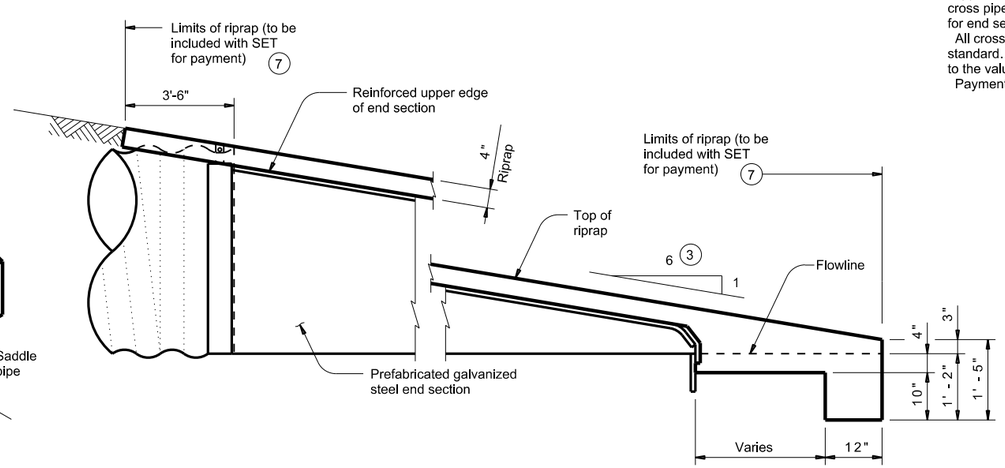
Payment for riprap and toewall is included in price bid for each safety end treatment.

PREFABRICATED GALVANIZED STEEL END SECTION DETAILS

(Safety end treatment and riprap are not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Cross pipes are not shown for clarity.)

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA CMP CULVERTS
TYPE II ~ PARALLEL DRAINAGE

GS-ES-PD

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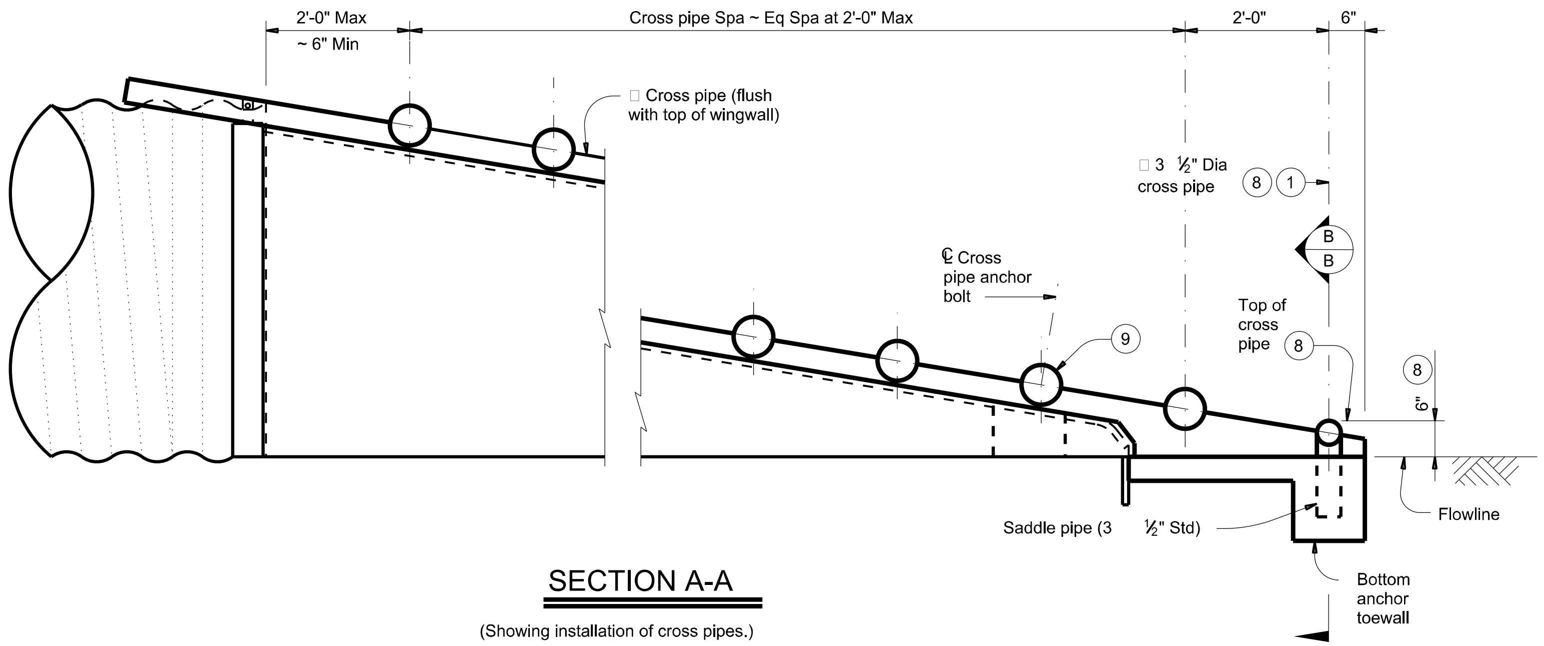
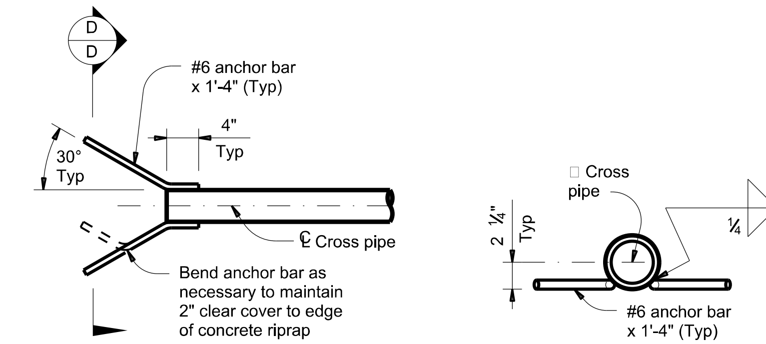


SECTION A-A

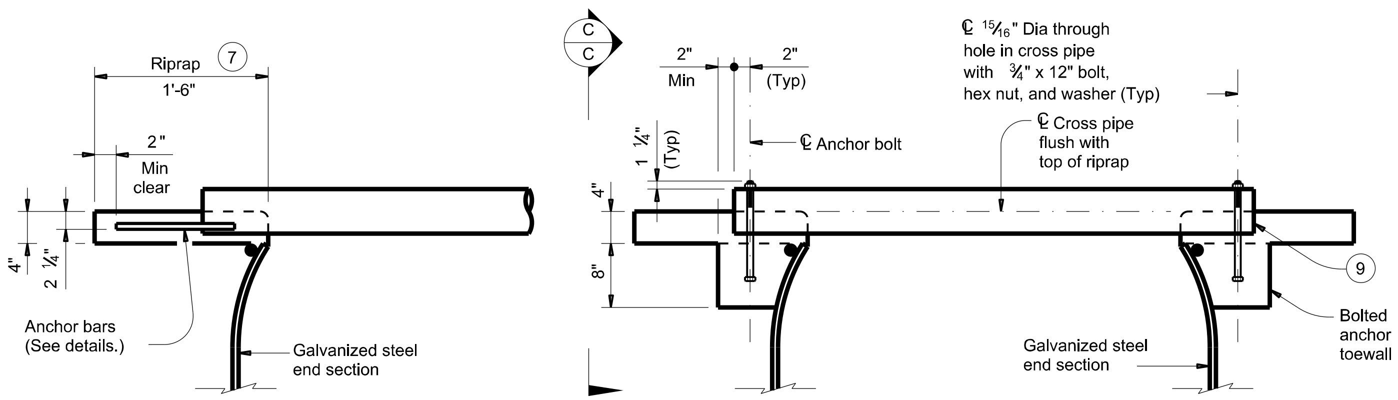
(Showing installation of cross pipes.)



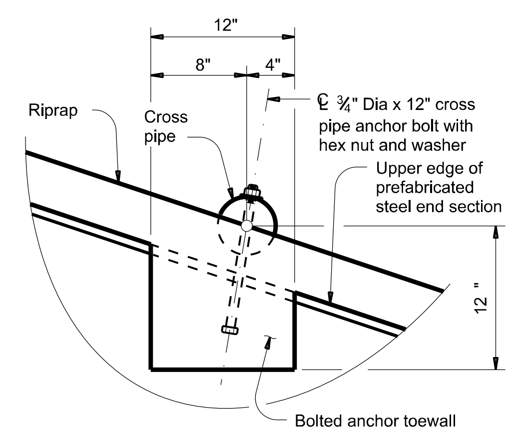
ANCHOR BAR DETAILS

D (Nominal Culvert I.D.)	Concrete (CY)
12"	0.8
15"	0.9
18"	1.0
21"	1.1
24"	1.2
27"	1.3
30"	1.4
33"	1.5
36"	1.6
42"	1.8
48"	2.0
54"	2.2
60"	2.4

ESTIMATED CONCRETE RIPRAP QUANTITIES



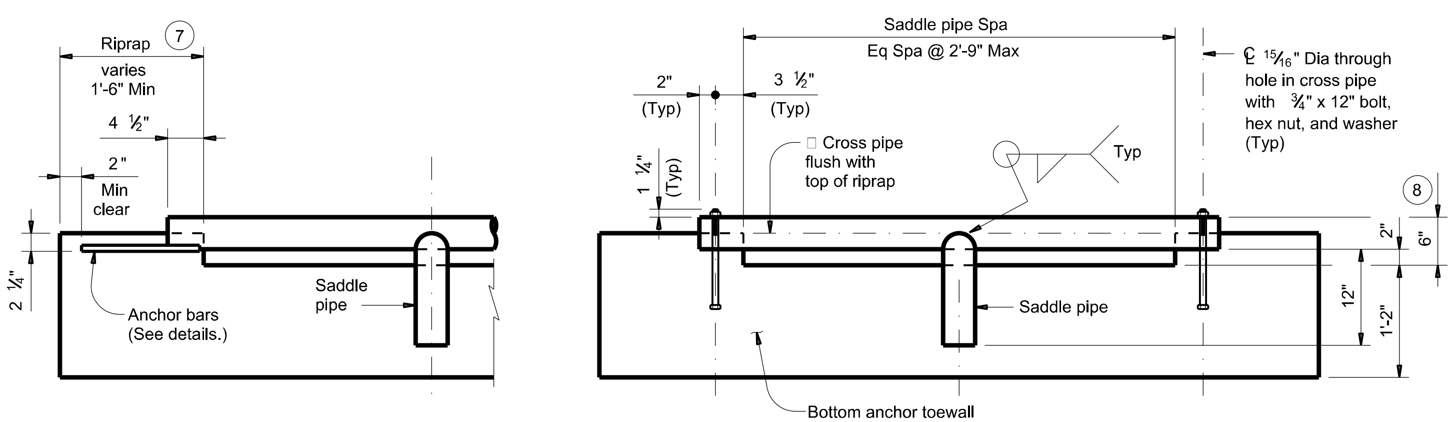
SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE



SECTION C-C

(Showing bolted anchor details.)

1. Provide size and lengths of cross pipes as shown in the tables, except the first cross pipe from the bottom and the saddle pipe must be 3 ½". All other values shown are minimum requirements.
5. Reinforce upper edge of prefabricated end section with minimum ⅜" diameter smooth or deformed bar (pre-galvanized).
7. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap".
8. The proper installation of the first cross pipe is critical for vehicle safety. The top of the first cross pipe must be placed at no more than 6" above the flow line.
9. The third cross pipe from the bottom of the culvert must always be installed using a bolted connection. Ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.
10. Riprap quantities shown are for one end of one culvert only. For multiple culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.



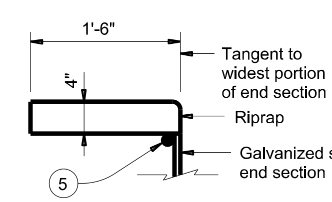
SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

WITH ANCHOR BARS & RIPRAP

WITH BOLTED ANCHOR

SECTION B-B

(Showing installation of cross pipes.)



CROSS SECTION OF TYPICAL RIPRAP

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA C.M.P. CULVERTS
TYPE II ~ PARALLEL DRAINAGE

GS-ES-PD

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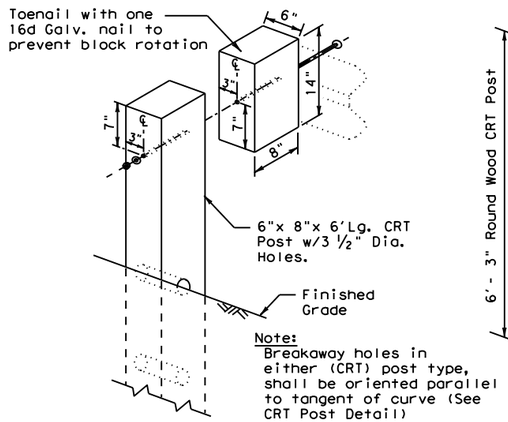
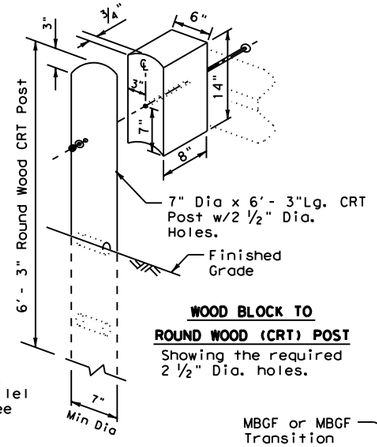
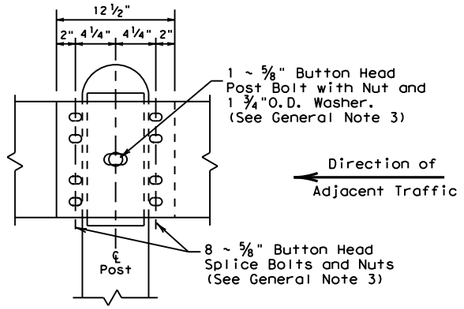


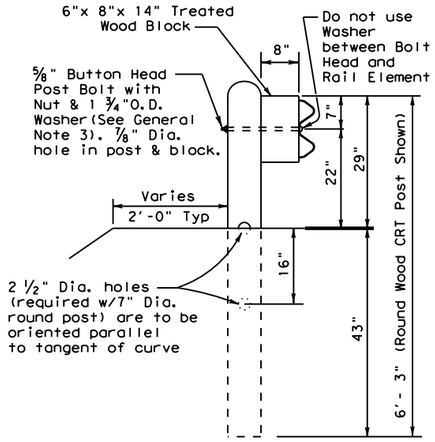
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
Showing the required 3 ½" Dia. holes.



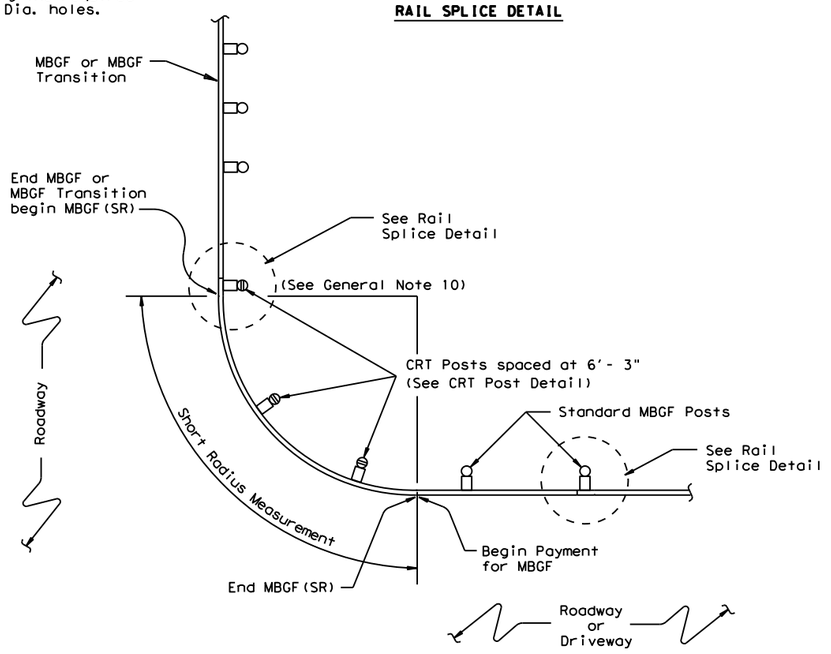
WOOD BLOCK TO ROUND WOOD (CRT) POST
Showing the required 2 ½" Dia. holes.



RAIL SPLICE DETAIL



(CRT) POST DETAIL
CONTROLLED RELEASE TERMINAL POST
Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



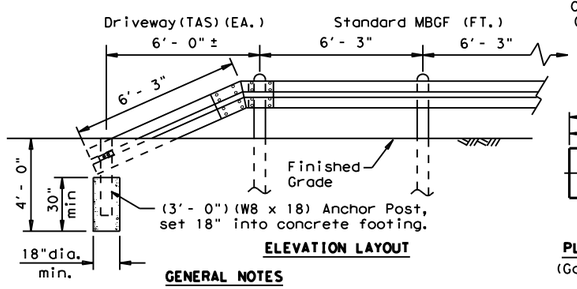
PLAN VIEW
SHOWING TYPICAL RADIUS
The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 ½ or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
8. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18",drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.



ELEVATION LAYOUT

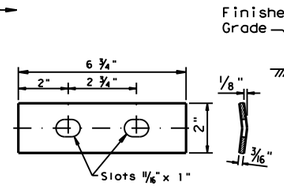
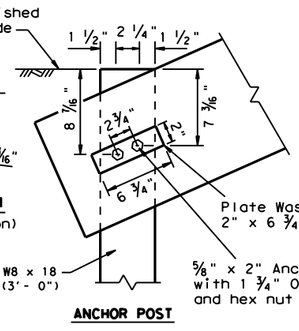
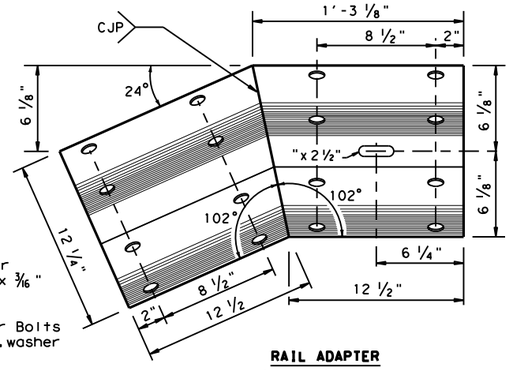


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)



ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

GENERAL NOTES

1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft.(TAS)Terminal Anchor Section, is too long.
2. Terminal anchor post shall be set in Class A concrete.
3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

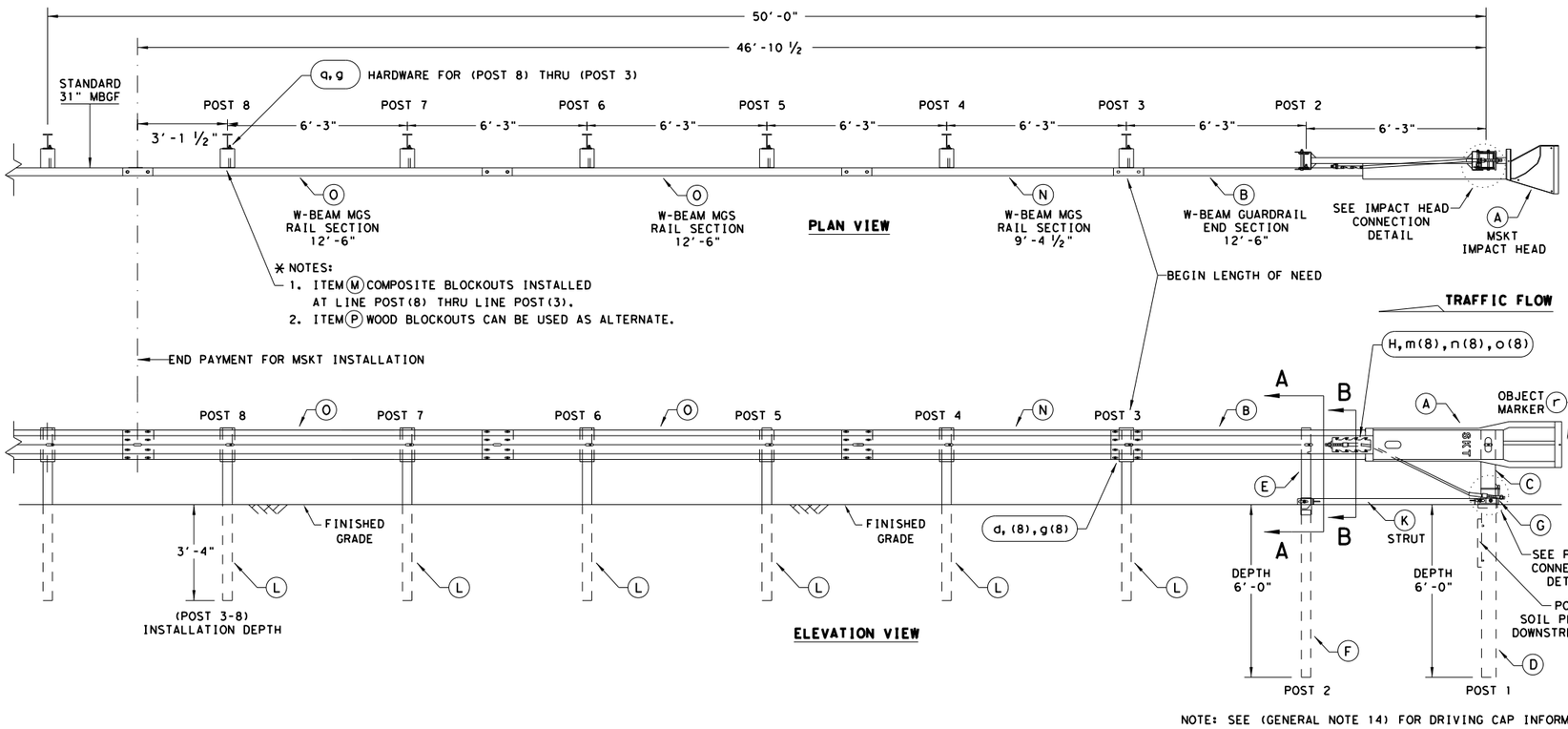
ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

Texas Department of Transportation — Design Division Standard

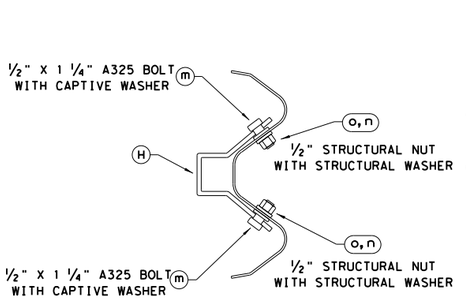
METAL BEAM GUARD FENCE
(SHORT RADIUS)
MBGF(SR)-19

FILE: mbgfsr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		92C

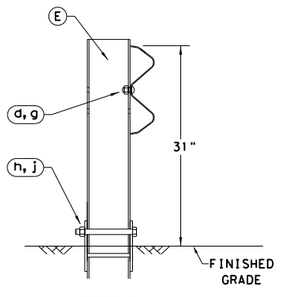
DATE: 1/17/2023
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\092D SGT(12S)31-18.dgn



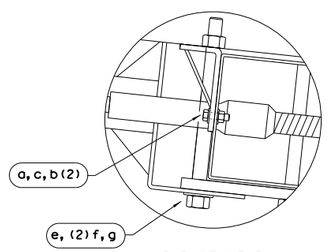
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



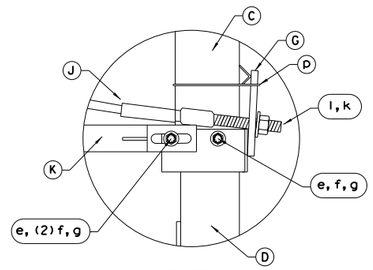
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

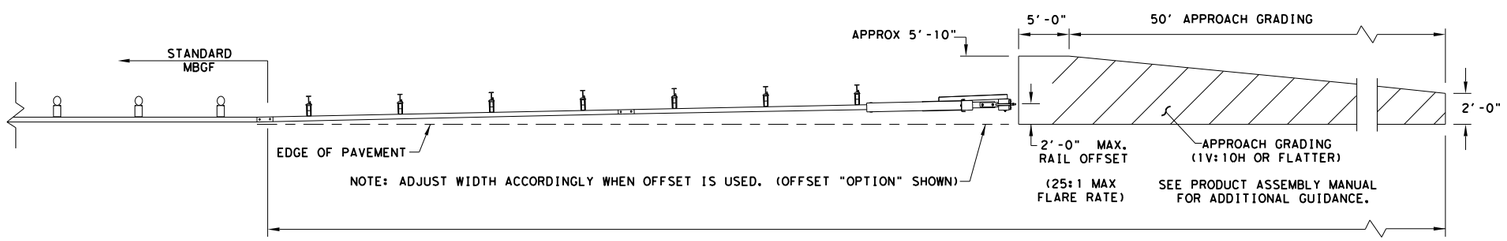
GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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



TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0729	02	032	FM 121	
	DIST	COUNTY		SHEET NO.	
	PAR	GRAYSON		92D	

DATE: 1/17/2023
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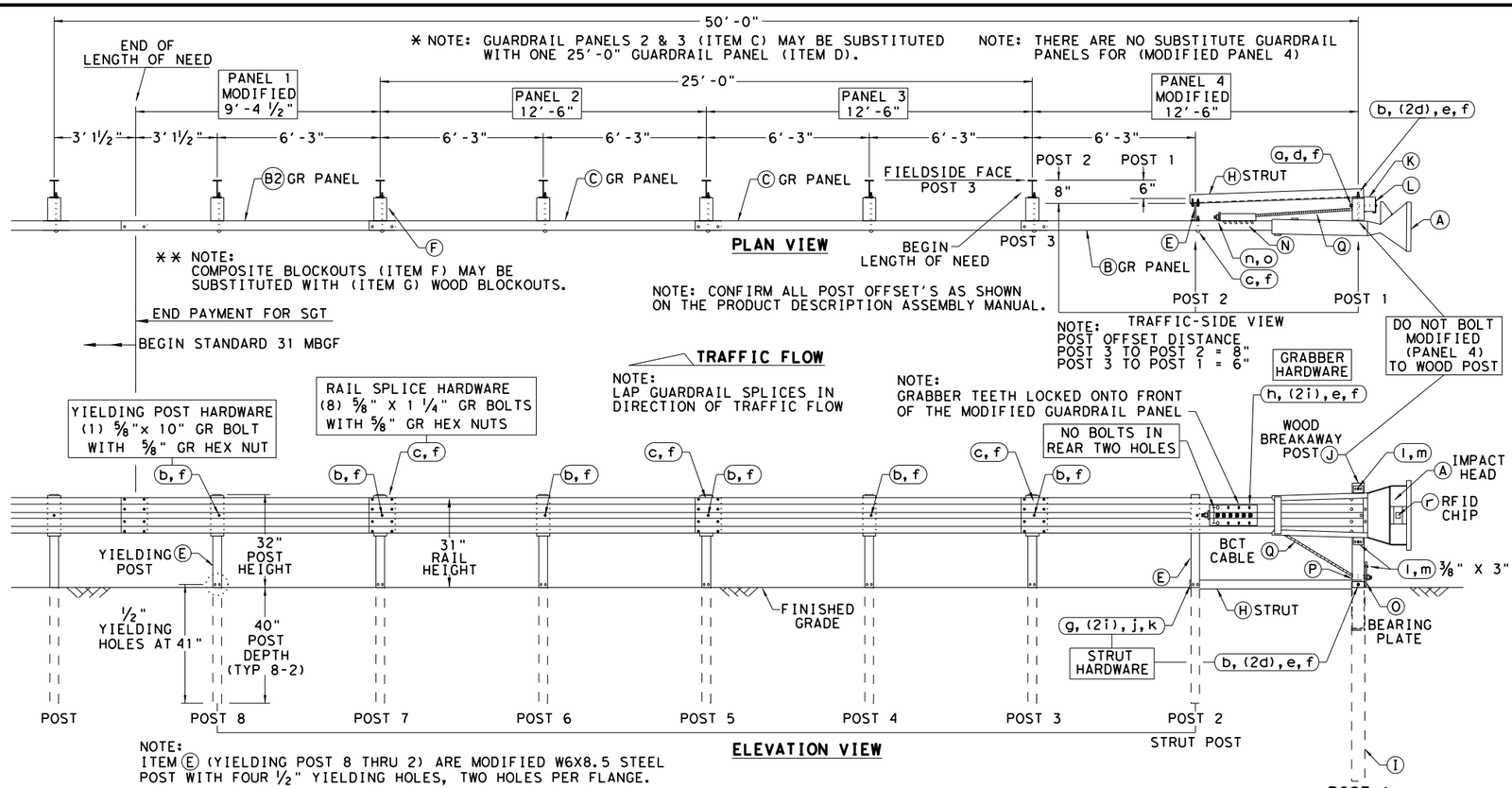
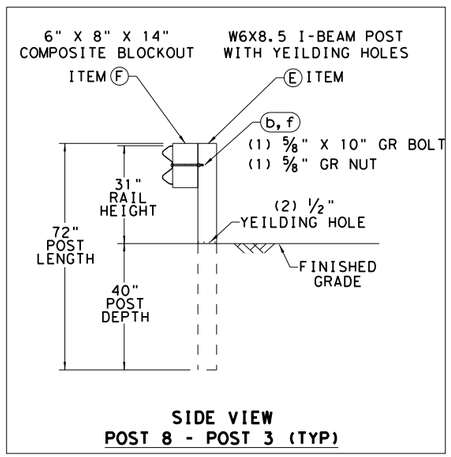


GENERAL NOTES

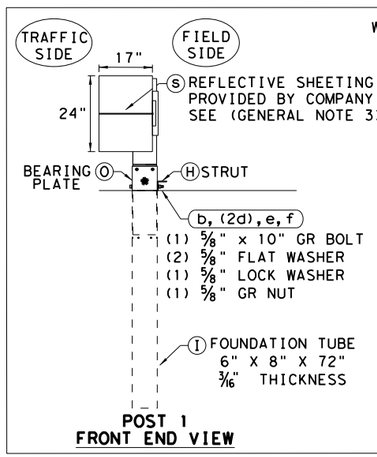
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D *	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G **	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

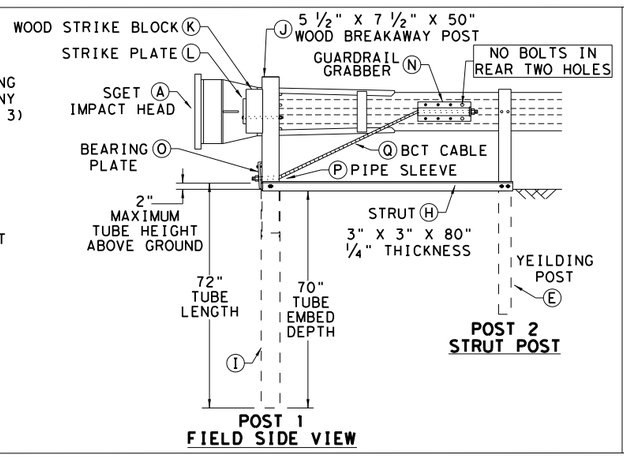
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



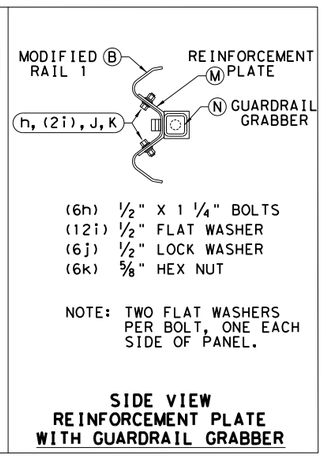
SIDE VIEW
POST 8 - POST 3 (TYP)



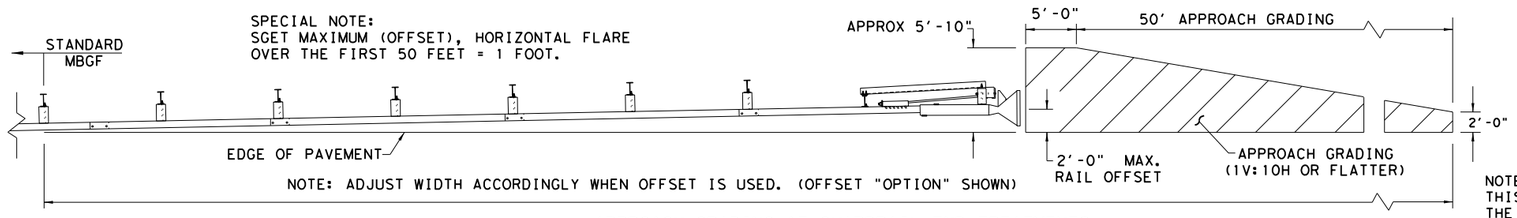
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation
Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		92E

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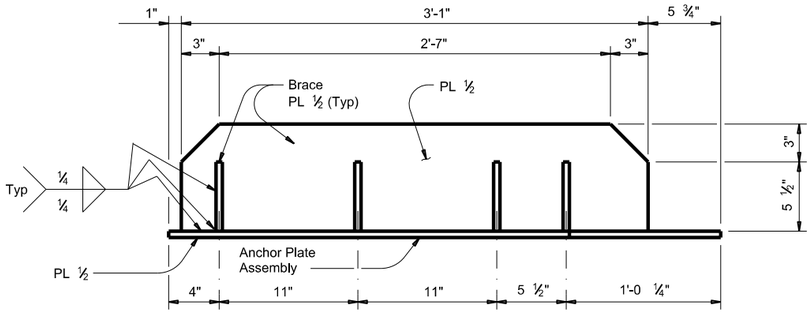
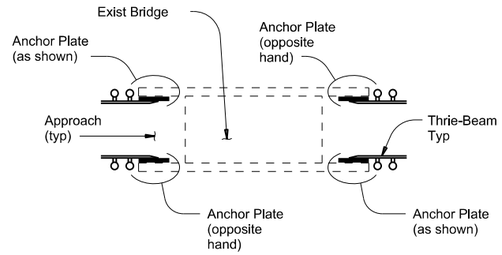
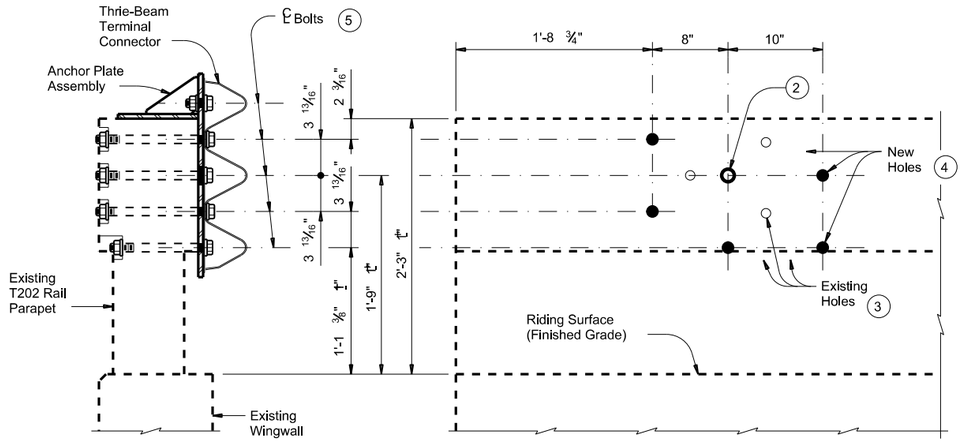


PLAN



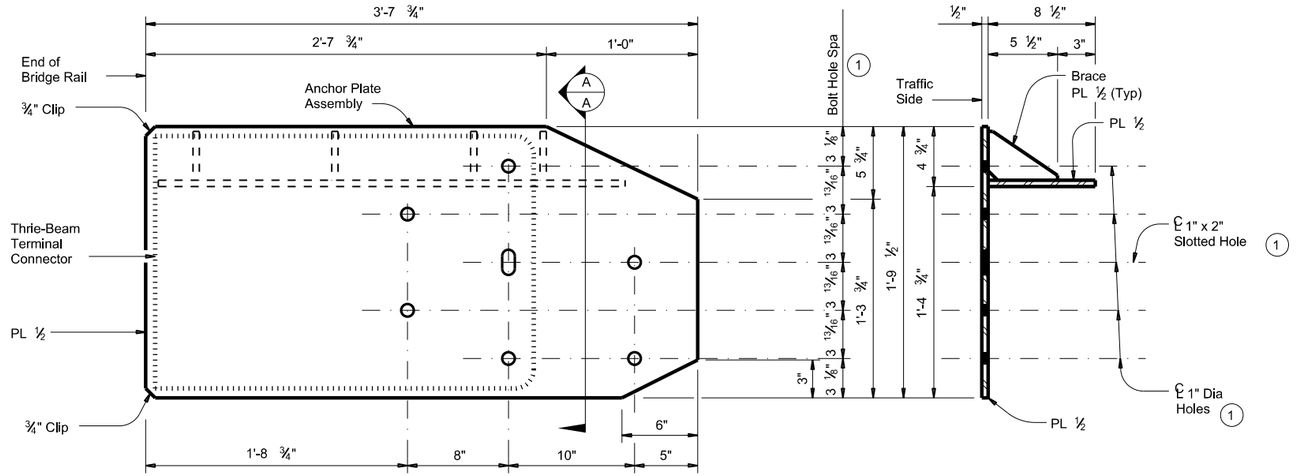
LOCATION DETAILS



SECTION
Showing completed installation

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

DETAILS OF BOLTS AND HOLES (1)

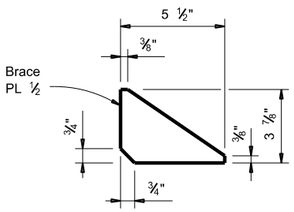


ROADSIDE ELEVATION

SECTION A-A

ANCHOR PLATE DETAILS

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



BRACE PLATE DETAILS

CONSTRUCTION NOTES:

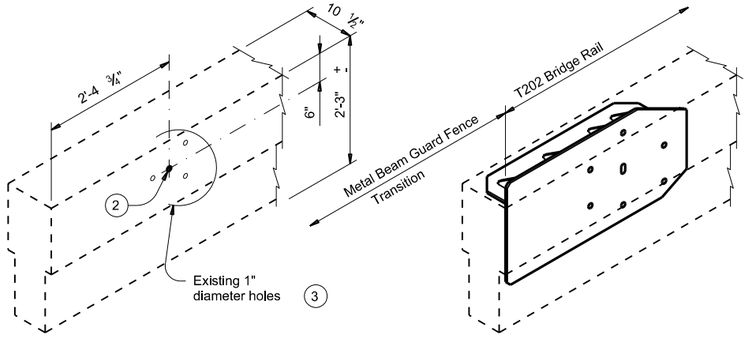
Field verify dimensions before commencing work and ordering materials.
Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.
Attach the MBGF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connection. Splice the Thrie-Beam Terminal Connection to the Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

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

GENERAL NOTES:

These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection.
Shop drawings are not required for this installation.
Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 540 "Mtl Bm Gd Fen Trans (Anchor Plate)".
Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 Lbs.



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

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS

This sheet is intended as a guide in preparing job-specific details to retrofit existing T202 rails with a Thrie-Beam terminal connector. This sheet may not be used without modification. The details shown may need to be amended if the exact existing conditions are not covered. In all cases, details and notes not required are to be removed or crossed out, "(MOD)" added, and the phrase "(Not to be used as a standard)" removed from the title block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.
The effective height of the existing rail (at the Anchor Plate location) above the finished riding surface, as seen by an errant vehicle, must be between 2'-2" and 2'-4". Alternate methods of retrofit must be used for effective heights beyond these limits. Dimensions of existing rail height (traffic side) should be shown. Particular care should be taken in identifying existing rail conditions and providing for proper Anchorage Plate and MBGF transition positioning.

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

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

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

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

(5) 7 ~ ⅞" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1 ¾" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of ½" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

Monte R. Rater P.E.
01.18.23

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Texas Department of Transportation

Bridge Division Standard

T202 TRANSITION RETROFIT GUIDE

(NOT TO BE USED AS A STANDARD)

T202TR

FILE:	rlstd026-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		0729	02	032	FM 121
		DIST	COUNTY		SHEET NO.
		PAR	GRAYSON		92F

BOX CULVERT SUPPLEMENT SHEET ~ WINGS AND END TREATMENTS

9/11 TxDOT September 2000
Revision: 2/3/2020, Bridge Division

Culvert Station and/or Creek Name	Description of Box Culert No. Spans ~ Span X Height	Max Fill Height (ft)	Applicable Box Culvert Standard	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope (SL:1)	T Culvert Top Slab Thick's (in)	U Culvert Wall Thick's (in)	C Estimated Curb Height (ft)	Hw Height of Wing (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 (C.Y.)	Class "C" Conc. (Curb) (CY)	Class "C" Conc. (Wing.) (CY)	Total Wingwall Area (SF)
39+62 (Both)	1 ~ 6' X 5'	'	SCP-6	PW-2	15	3:1	8"	7"	0.500	6.167	N/A	N/A	16.047	7.419	N/A	0.0	0.2	25.4	384
315+08 (Lt)	1 ~ 3' X 3'	'	SCC-3&4	PW-2	15	3:1	8"	7"	5.000	8.667	N/A	N/A	23.811	4.314	N/A	0.0	0.8	27.3	407
315+08 (Rt)	1 ~ 3' X 3'	'	SCC-3&4	PW-2	15	3:1	8"	7"	1.000	4.667	N/A	N/A	11.388	4.314	N/A	0.0	0.2	7.3	100

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BCS

BOX CULVERT SUPPLEMENT SHEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		92G

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

DA #1

STA. 39+62

DETERMINATION OF PEAK DISCHARGES

ID No.	AREA (acres)	COEFFICIENT C	Tc (Min)		5-year	10-year	100-year
1~39+62	199	0.39	57	Intensity (in/hr)	2.22	2.61	3.95
				Discharges (cfs)	168	198	299

NOTES:

DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.

DRAINAGE AREAS DETERMINED BY SURVEY DATA, USGS TOPOGRAPHIC MAPS, DIGITAL ELEVATION MODELS, AS-BUILT PLANS AND FIELD OBSERVATIONS. THE RATIONAL METHOD WAS USED FOR HYDROLOGIC ANALYSIS OF DRAINAGE AREAS.

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FM 121
DRAINAGE AREA MAP

SHEET 1 OF 4

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		92H

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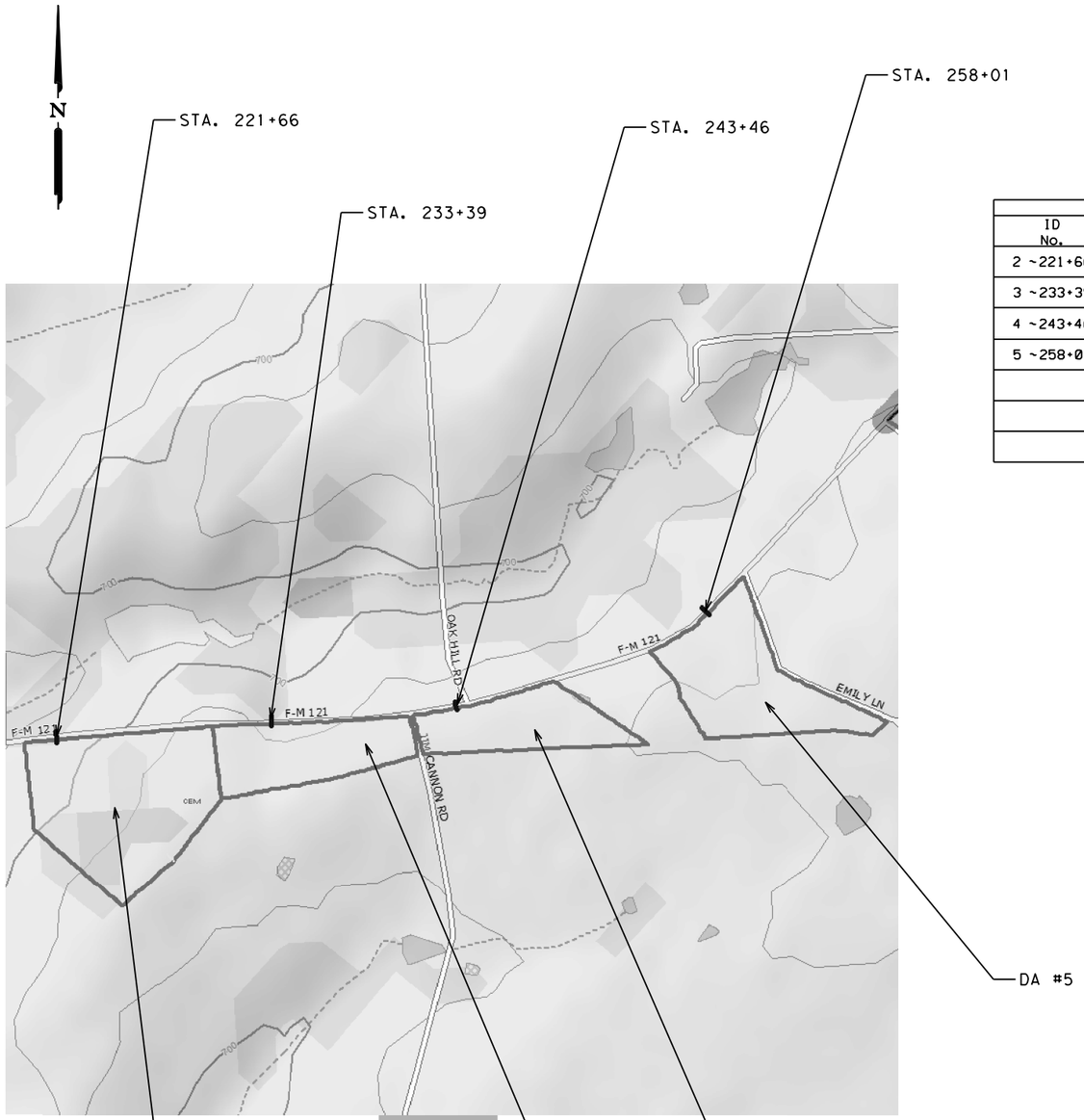

DETERMINATION OF PEAK DISCHARGES

ID No.	AREA (acres)	COEFFICIENT C	Tc (Min)		5-year	10-year	100-year
2 ~221+66	13.87	0.38	27	Intensity (in/hr)	3.50	4.09	6.11
				Discharges (cfs)	19	22	33
3 ~233+39	7.84	0.38	24	Intensity (in/hr)	3.73	4.36	6.50
				Discharges (cfs)	11	13	20
4 ~243+46	6.89	0.38	34	Intensity (in/hr)	3.06	3.59	5.39
				Discharges (cfs)	8	10	18
5 ~258+01	11.01	0.38	35	Intensity (in/hr)	3.01	3.53	5.3
				Discharges (cfs)	12.69	14.89	22.35

NOTES:

DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.

DRAINAGE AREAS DETERMINED BY SURVEY DATA, USGS TOPOGRAPHIC MAPS, DIGITAL ELEVATION MODELS, AS-BUILT PLANS AND FIELD OBSERVATIONS. THE RATIONAL METHOD WAS USED FOR HYDROLOGIC ANALYSIS OF DRAINAGE AREAS.

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FM 121
DRAINAGE AREA MAP

SHEET 2 OF 4

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CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		921

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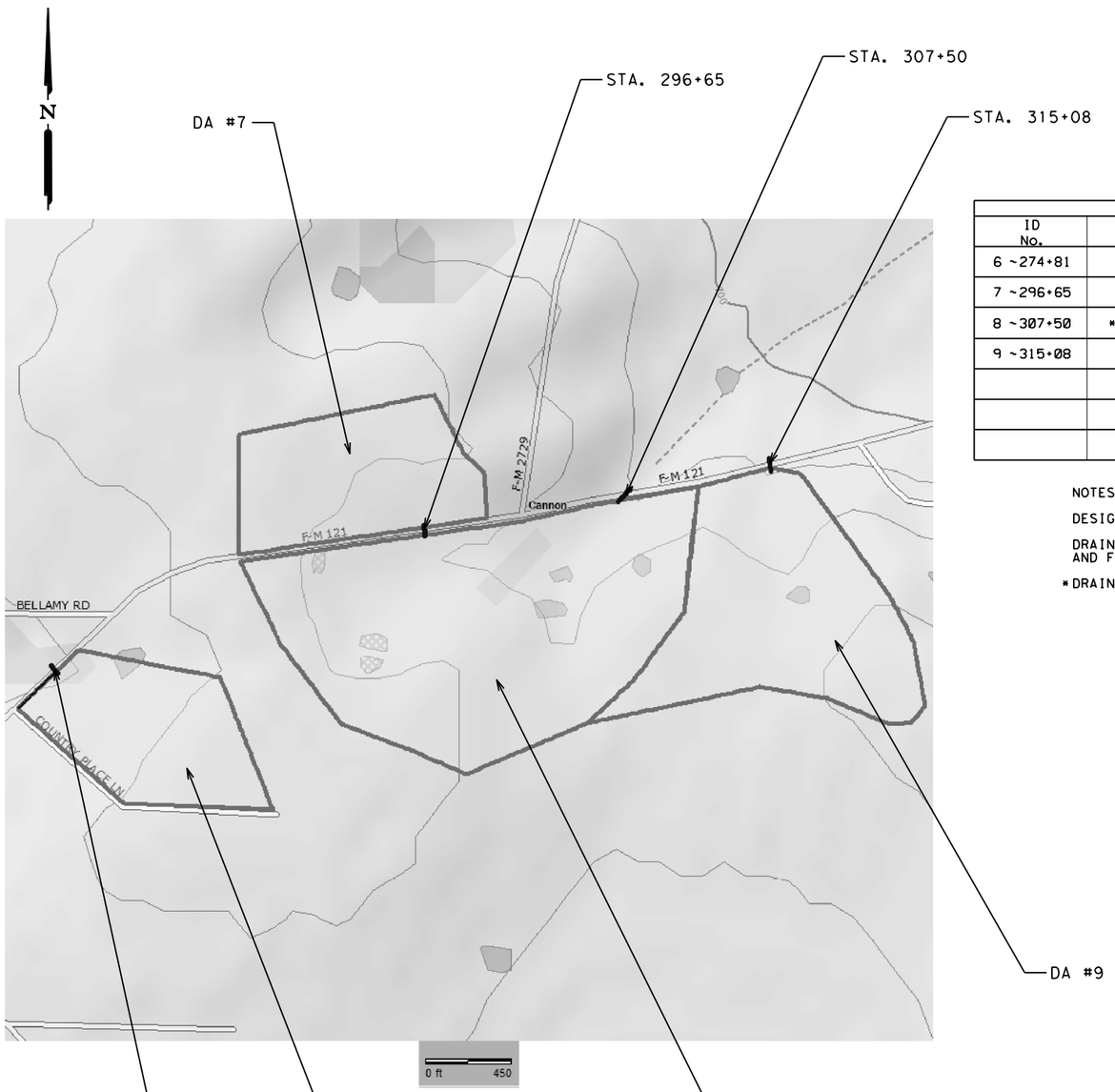

DETERMINATION OF PEAK DISCHARGES

ID No.	AREA (acres)	COEFFICIENT C	Tc (Min)		5-year	10-year	100-year
6 ~274+81	15.9	0.38	42	Intensity (in/hr)	2.69	3.16	4.76
				Discharges (cfs)	16	19	29
7 ~296+65	17.7	0.38	29	Intensity (in/hr)	3.36	3.93	5.88
				Discharges (cfs)	23	27	50
8 ~307+50	* 67.9	0.38	39	Intensity (in/hr)	2.82	3.31	4.98
				Discharges (cfs)	73	86	129
9 ~315+08	28.59	0.38	33	Intensity (in/hr)	3.12	3.65	5.48
				Discharges (cfs)	40	46	70

NOTES:

DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.

DRAINAGE AREAS DETERMINED BY SURVEY DATA, USGS TOPOGRAPHIC MAPS, DIGITAL ELEVATION MODELS, AS-BUILT PLANS AND FIELD OBSERVATIONS. THE RATIONAL METHOD WAS USED FOR HYDROLOGIC ANALYSIS OF DRAINAGE AREAS.

*DRAINAGE AREA #8 INCLUDES AREA FROM DA#7

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FM 121
DRAINAGE
AREA MAP

SHEET 3 OF 4

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CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		92J

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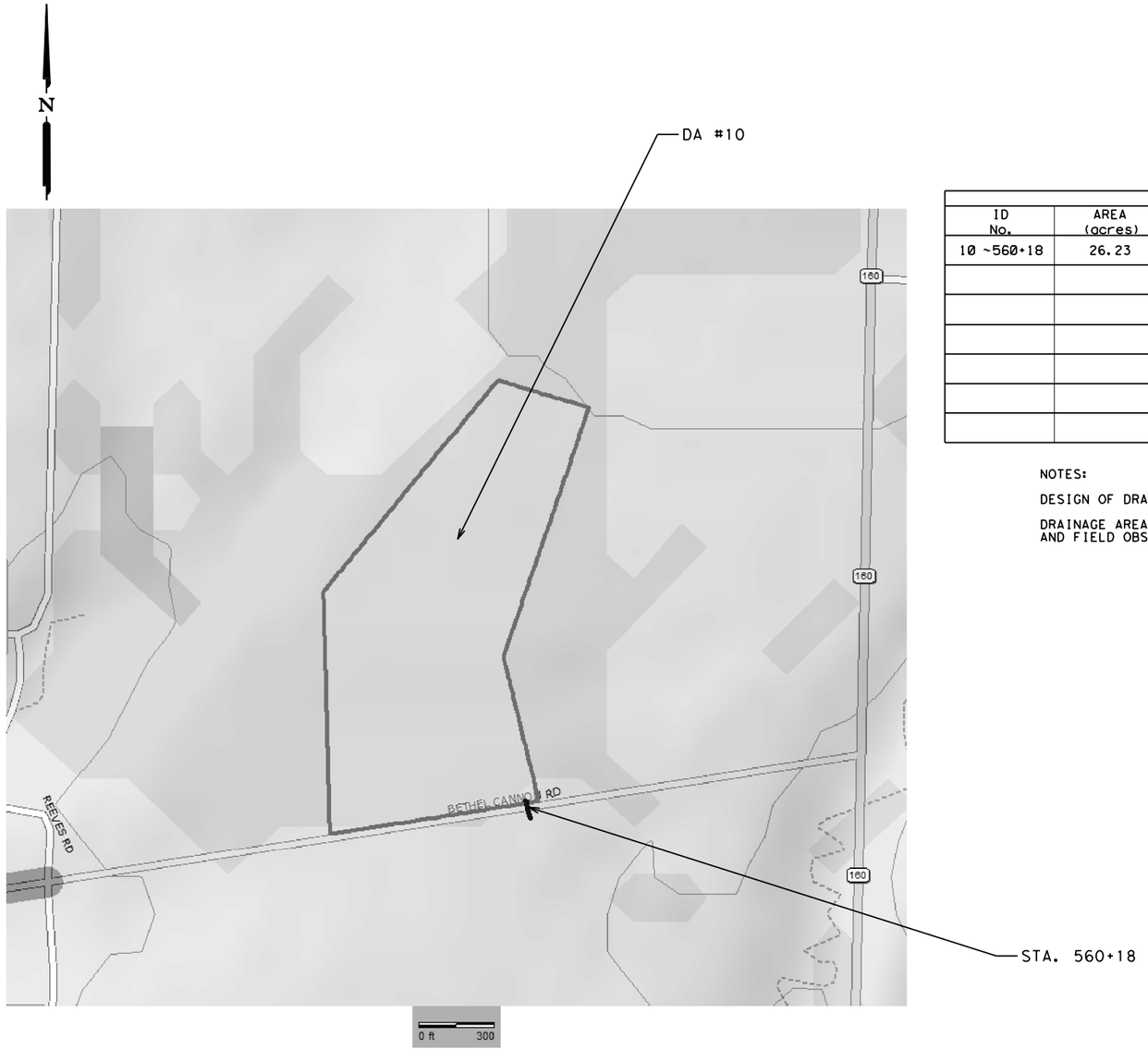

DETERMINATION OF PEAK DISCHARGES							
ID No.	AREA (acres)	COEFFICIENT C	Tc (Min)		5-year	10-year	100-year
10 ~560+18	26.23	0.38	49	Intensity (in/hr)	2.44	2.87	4.34
				Discharges (cfs)	25	29	44

NOTES:

DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.

DRAINAGE AREAS DETERMINED BY SURVEY DATA, USGS TOPOGRAPHIC MAPS, DIGITAL ELEVATION MODELS, AS-BUILT PLANS AND FIELD OBSERVATIONS. THE RATIONAL METHOD WAS USED FOR HYDROLOGIC ANALYSIS OF DRAINAGE AREAS.

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FM 121
DRAINAGE
AREA MAP

SHEET 4 OF 4

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		92K

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CROSS CULVERT HYDROLOGIC AND HYDRAULIC DATA (RATIONAL METHOD)

STRUCTURE INLET STA.	DRAINAGE AREA IDENTIFIER	AREA (AC)	CHANNEL SLOPE (FT/FT)	CHANNEL n	CHANNEL TYPE	HYDRAULIC CONDITION	STRUCTURE DESCRIPTION	STRUCTURE MANNINGS n	STRUCTURE SLOPE (FT/FT)	ENTRANCE / EXIT TYPE		RUNOFF COEFFICIENT	Tc (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVER ROADWAY (FT)	ROADWAY ELEV OVERTOP (FT)
39+62	1	199	0.0020	0.030	TRAPEZOIDAL	EXISTING	2-48" x 61' RCP	0.012	0.0352	LEFT	PROJ	0.38	57	10 YEAR	198	695.70	690.93	3.72	0.00	698.74
										RIGHT	PROJ			100 YEAR	299	698.83	691.69	4.16	21.80	
						PROPOSED	1- 6' X 5' BOX	0.012	0.0025	LEFT	PW	0.38	57	10 YEAR	198	695.41	692.70	3.66	0.00	699.32
										RIGHT	PW			100 YEAR	299	697.74	693.43	4.12	0.00	
221+66	2	16.3	0.0022	0.030	TRAPEZOIDAL	EXISTING	1-24" x 46' CMP	0.024	0.0697	LEFT	PROJ	0.38	27	10 YEAR	22	688.98	683.57	2.11	0.69	688.97
										RIGHT	PROJ			100 YEAR	33	689.03	683.86	2.34	11.60	
						PROPOSED	1-24" x 56' RCP BROKEN BACK	0.012	0.0051/ 0.5826/ 0.0049	LEFT	SET	0.38	27	10 YEAR	22	688.22	682.73	2.11	0.00	689.55
										RIGHT	SET			100 YEAR	33	689.56	683.02	2.34	0.78	
233+39	3	7.9	0.0190	0.035	TRAPEZOIDAL	EXISTING	1-24" x 56' CMP	0.024	0.0575	LEFT	PROJ	0.38	24	10 YEAR	13	712.72	707.94	3.51	0.00	715.70
										RIGHT	PROJ			100 YEAR	20	713.94	708.10	3.97	0.00	
						PROPOSED	1-24" x 64' RCP BROKEN BACK	0.012	0.0057/ 0.5760/ 0.0061	LEFT	SET	0.38	24	10 YEAR	13	712.39	707.94	3.51	0.00	716.28
										RIGHT	SET			100 YEAR	20	713.16	708.10	3.97	0.00	
243+46	4	6.9	0.0223	0.030	TRAPEZOIDAL	EXISTING	1-36" x 40' CMP	0.024	0.0300	LEFT	PROJ	0.38	34	10 YEAR	10	728.31	726.08	3.82	0.00	730.88
										RIGHT	PROJ			100 YEAR	18	728.91	726.26	4.55	0.00	
						PROPOSED	1-24" x 42' RCP	0.012	0.0300	LEFT	SET	0.38	34	10 YEAR	10	729.47	726.08	3.82	0.00	731.46
										RIGHT	SET			100 YEAR	18	730.23	726.26	4.55	0.00	
258+01	5	11.1	0.0021	0.032	TRAPEZOIDAL	EXISTING	1-30" x 46' CMP	0.024	0.0569	LEFT	PROJ	0.38	35	10 YEAR	15	731.87	728.61	1.92	0.00	734.13
										RIGHT	PROJ			100 YEAR	23	732.62	728.93	2.15	0.00	
						PROPOSED	1-30" x 52' RCP	0.012	0.0256	LEFT	SET	0.38	35	10 YEAR	15	731.71	731.00	2.03	0.00	734.71
										RIGHT	SET			100 YEAR	23	732.58	732.03	2.20	0.00	
274+81	5	15.9	0.0170	0.032	TRAPEZOIDAL	EXISTING	1-36" x 47' CMP	0.024	0.0076	LEFT	PROJ	30	42	10 YEAR	19	739.65	736.51	4.01	0.00	742.38
										RIGHT	PROJ			100 YEAR	29	740.34	736.69	4.52	0.00	
						PROPOSED	1-36" x 52' RCP	0.012	0.0073	LEFT	SET	0.38	42	10 YEAR	19	739.48	736.62	4.01	0.00	742.96
										RIGHT	CH-PW			100 YEAR	29	740.03	736.80	4.52	0.00	
296+65	5	17.7	0.0320	0.030	TRAPEZOIDAL	EXISTING	1-30" x 47' CMP	0.024	0.0306	LEFT	PROJ	0.38	29	10 YEAR	27	742.35	738.45	5.82	0.00	743.21
										RIGHT	PROJ			100 YEAR	50	743.28	738.73	6.92	15.76	
						PROPOSED	1-30" x 52' RCP BROKEN BACK	0.012	0.0053/ 0.5787/ 0.0400	LEFT	SET	0.38	29	10 YEAR	27	741.72	736.11	5.82	0.00	743.79
										RIGHT	CH-PW			100 YEAR	50	743.73	736.39	6.92	0.00	
307+50	5	67.9	0.0450	0.035	TRAPEZOIDAL	EXISTING	1-60" x 85' RCP BROKEN BACK	0.012	0.0550	LEFT	PROJ	0.38	39	10 YEAR	86	715.52	707.81	7.63	0.00	718.77
										RIGHT	PROJ			100 YEAR	129	716.54	708.06	8.61	0.00	
						PROPOSED	1-60" x 74' RCP BROKEN BACK	0.012	0.0550	LEFT	CH-PW	0.38	39	10 YEAR	86	715.17	708.12	7.63	0.00	719.35
										RIGHT	CH-PW			100 YEAR	129	716.18	708.37	8.61	0.00	
315+08	5	28.6	0.0470	0.035	TRAPEZOIDAL	EXISTING	1-36" x 66' RCP	0.012	0.0974	LEFT	PROJ	0.38	33	10 YEAR	46	716.76	708.07	7.11	0.00	721.46
										RIGHT	PROJ			100 YEAR	70	718.45	708.29	7.90	0.00	
						PROPOSED	1-70" X 3' X 3' BOX BROKEN BACK	0.012	0.0080/ 0.5777/ 0.0070	LEFT	PW	0.38	33	10 YEAR	46	716.37	708.07	7.11	0.00	722.04
										RIGHT	PW			100 YEAR	70	717.40	708.29	7.90	0.00	
560+06	5	26.2	0.0230	0.035	TRAPEZOIDAL	EXISTING	1-30" x 55' CMP	0.024	0.0841	LEFT	PROJ	0.38	49	10 YEAR	29	712.24	703.88	4.72	0.00	713.97
										RIGHT	PROJ			100 YEAR	44	713.99	704.10	5.30	3.20	
						PROPOSED	1-30" x 70' RCP BROKEN BACK	0.012	0.0025/ 0.5871/ 0.0153	LEFT	SET	0.38	49	10 YEAR	29	711.74	703.88	4.72	0.00	714.55
										RIGHT	SET			100 YEAR	44	712.83	704.10	5.30	0.00	

DESIGN OF DRAINAGE FACILITIES BASED UPON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
PEAK FLOWS WERE DETERMINED USING THE RATIONAL METHOD.
CULVERTS ANALYZED FOR NO PONDING ON ROADWAY PAVEMENT DURING A 10 YEAR FLOOD EVENT.
SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HY-8 (VER.7.50 FHWA).
PER CUSTOMARY TXDOT ENGINEERING PROCEDURE, CULVERTS EXTENDED LESS THAN TEN PERCENT ARE NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

PROJ = PROJECTING END
FW = FLARED WING
SW = STRAIGHT WINGS
PW = PARALLEL WING
JB = JUNCTION BOX

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FM 121
CULVERT HYDRAULIC DATA

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		92L

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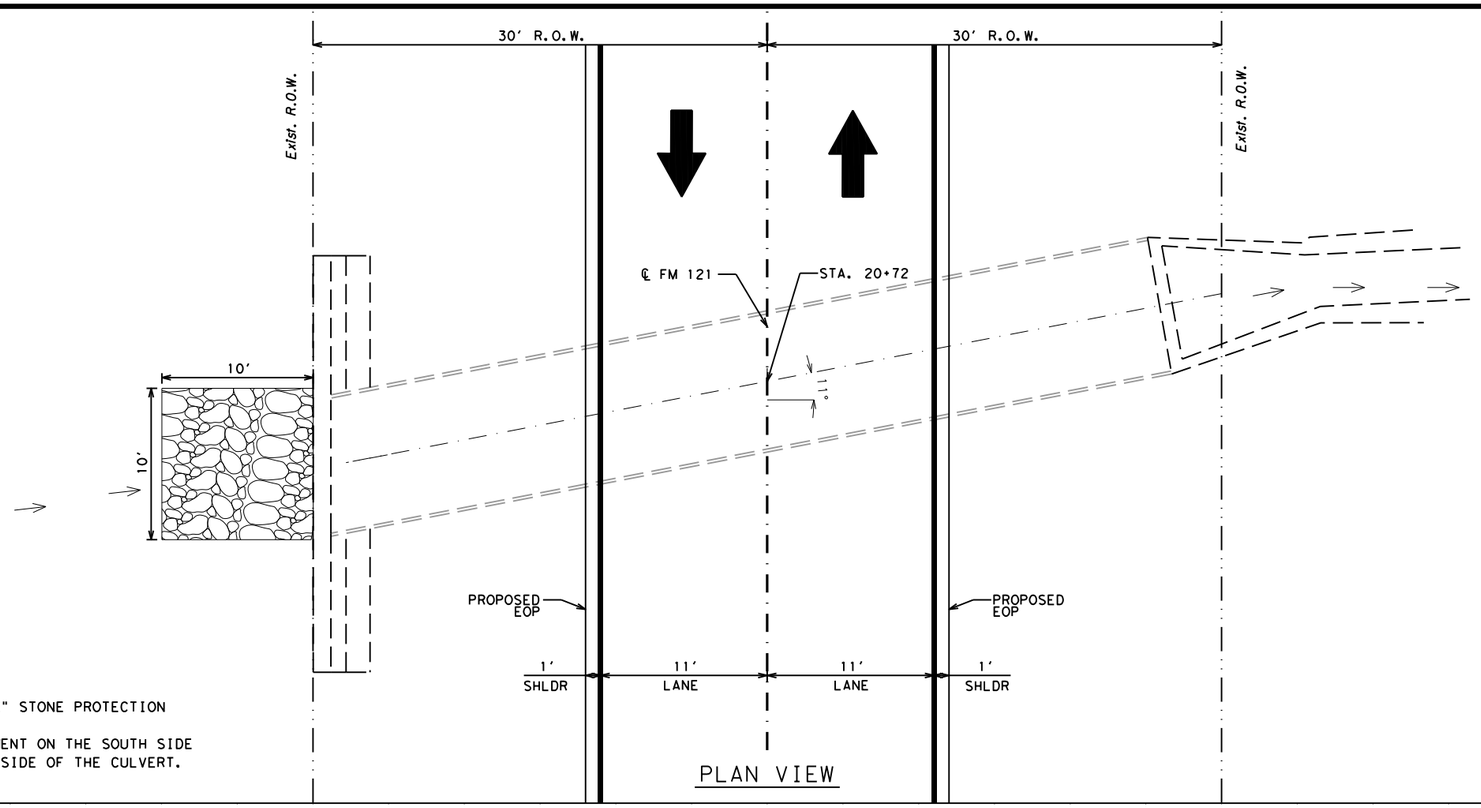


PLAN VIEW

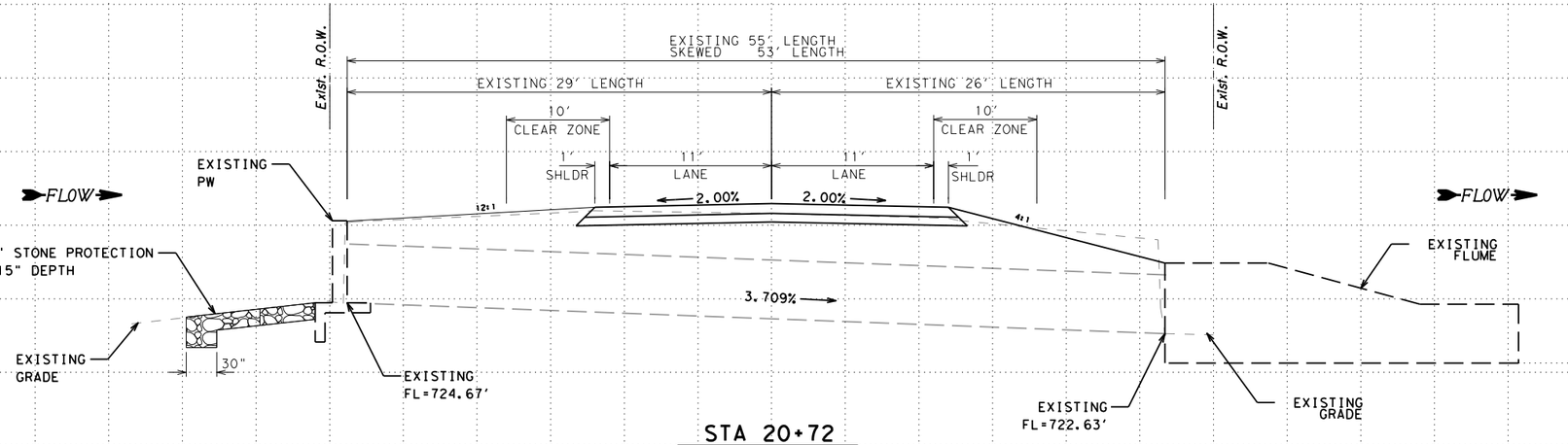
NOTES:
-US SIDE 10' X 10' - 12" STONE PROTECTION

-DS SIDE 90' OF EMBANKMENT ON THE SOUTH SIDE OF ROAD AND SOUTH WEST SIDE OF THE CULVERT.

ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	37 CY
0401 6001	FLOWABLE BACKFILL	71 CY
0432 6031	RIPAP (STONE PROTECTION)(12 IN)	6 CY

STANDARDS: SRR



STA 20+72

EXISTING
55' - 8' X 4' CONC BOX CULVERT 11° RF

PROPOSED
10' X 10' SRR

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM X-CUT IN NWC
OF CNC PAD
N: 7207431.70
E: 2557288.64
ELEC: 729.65

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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FM 121
CULVERT LAYOUT
STA. 20+72

SHEET 1 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		93

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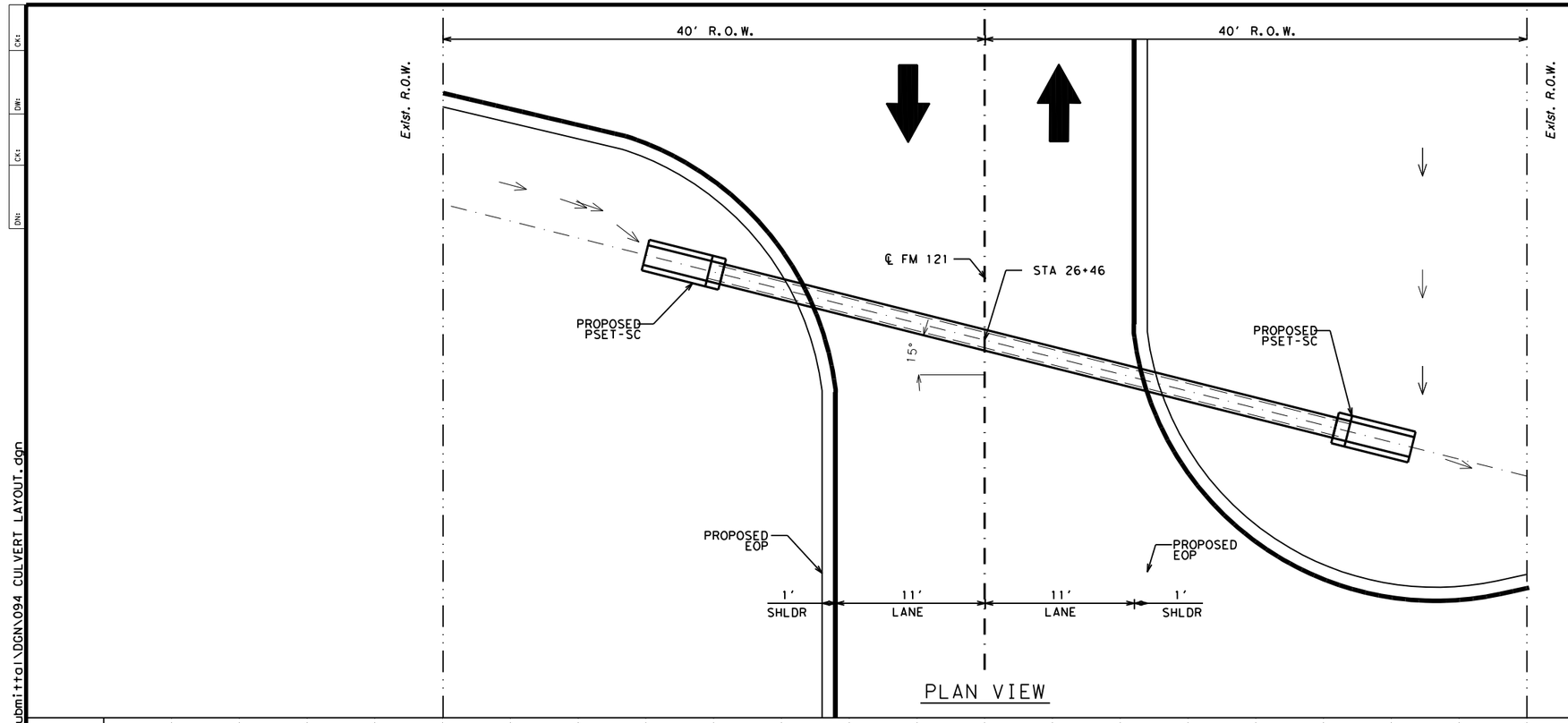
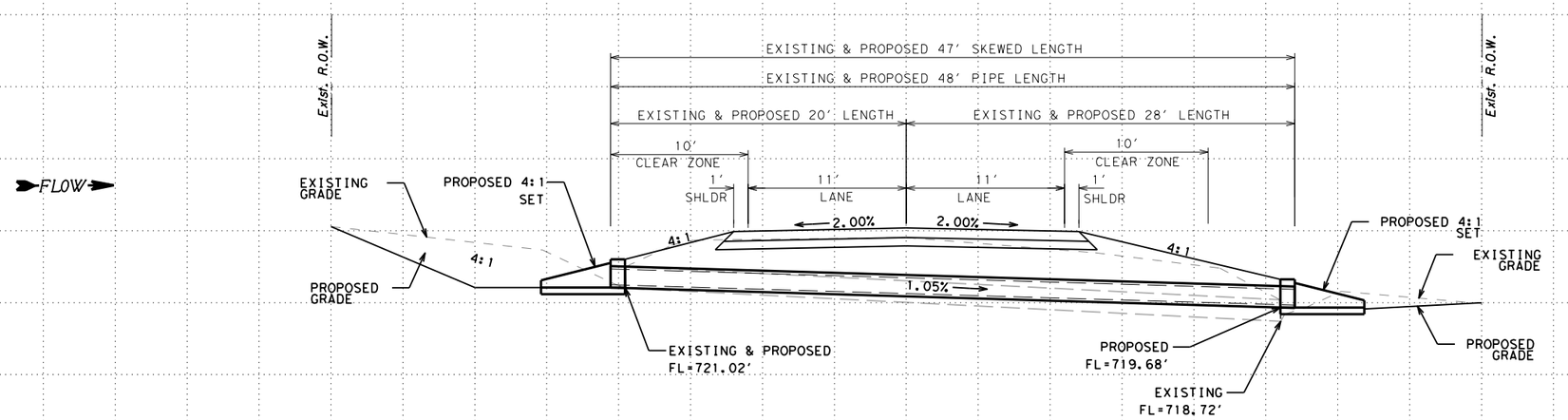


PLAN VIEW

ESTIMATED QUANTITIES		
0400 6008	CUT & RESTORE ASPH PAVING	9 SY
0401 6001	FLOWABLE BACKFILL	5 CY
0402 6001	TRENCH EXCAVATION PROTECTION	48 LF
0403 6001	TEMPORARY SPL SHORING	20 SF
0464 6003	RC PIPE (CL III)(18 IN)	48 SY
0467 6358	SET (TY II)(18 IN)(RCP)(4:1)(C)	2 EA
0496 6007	REMOVE STR (PIPE)	48 SY

STANDARDS: PSET-SC



STA. 26+46

EXISTING
48' X 18" CMP SKEW @ 15°LF

PROPOSED
REPLACE 48' X 18" RCP SKEW @ 15° LF
W/ PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP"ESTTRAVPNT"
N: 7172569.58
E: 2890875.48
ELEV: 495.83

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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FM 121
CULVERT LAYOUT
STA. 26+46

SHEET 2 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		94

DATE: 1/17/2023 2:31:49 AM
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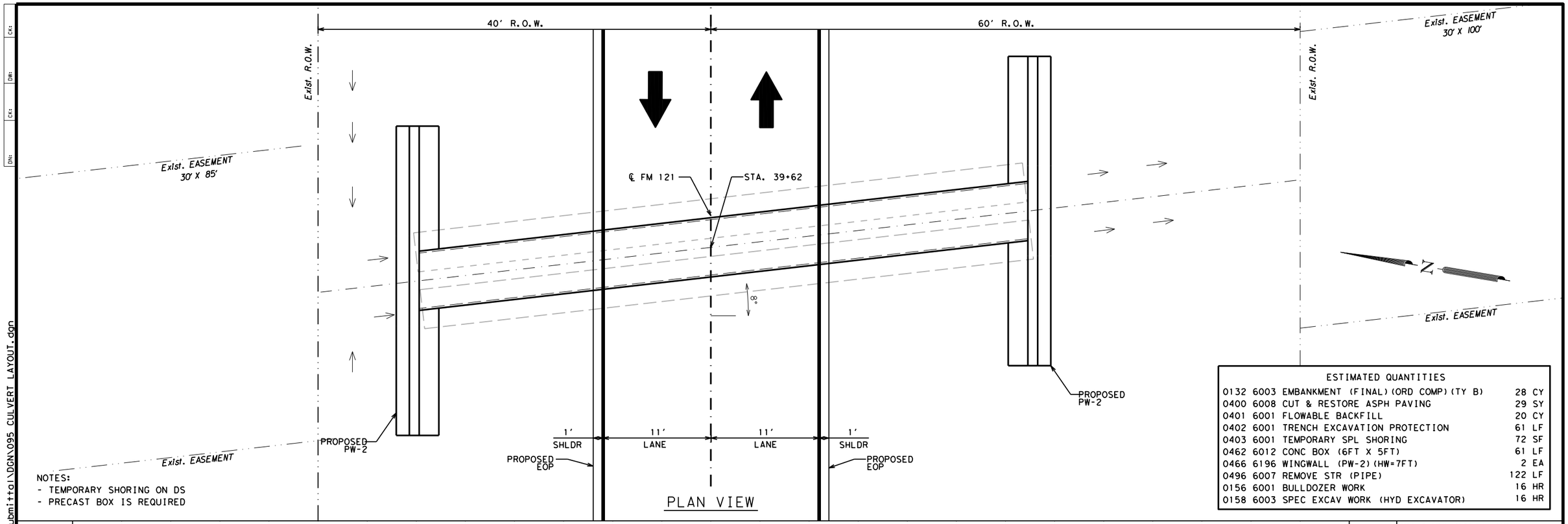
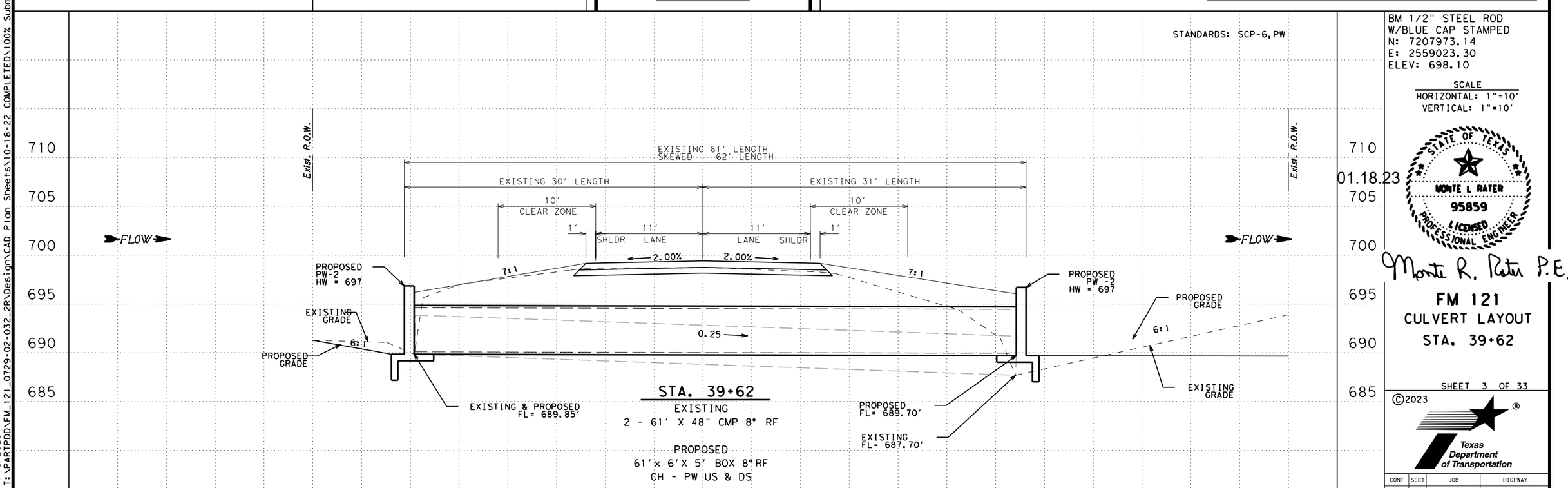


NOTES:
- TEMPORARY SHORING ON DS
- PRECAST BOX IS REQUIRED

ESTIMATED QUANTITIES

0132	6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	28 CY
0400	6008	CUT & RESTORE ASPH PAVING	29 SY
0401	6001	FLOWABLE BACKFILL	20 CY
0402	6001	TRENCH EXCAVATION PROTECTION	61 LF
0403	6001	TEMPORARY SPL SHORING	72 SF
0462	6012	CONC BOX (6FT X 5FT)	61 LF
0466	6196	WINGWALL (PW-2)(HW=7FT)	2 EA
0496	6007	REMOVE STR (PIPE)	122 LF
0156	6001	BULLDOZER WORK	16 HR
0158	6003	SPEC EXCAV WORK (HYD EXCAVATOR)	16 HR

STANDARDS: SCP-6, PW



STA. 39+62

EXISTING
2 - 61' X 48" CMP 8° RF

PROPOSED
61'x 6'X 5' BOX 8°RF
CH - PW US & DS

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7207973.14
E: 2559023.30
ELEV: 698.10

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 39+62

SHEET 3 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		95

DATE: 1/16/2023 1:25:09 AM
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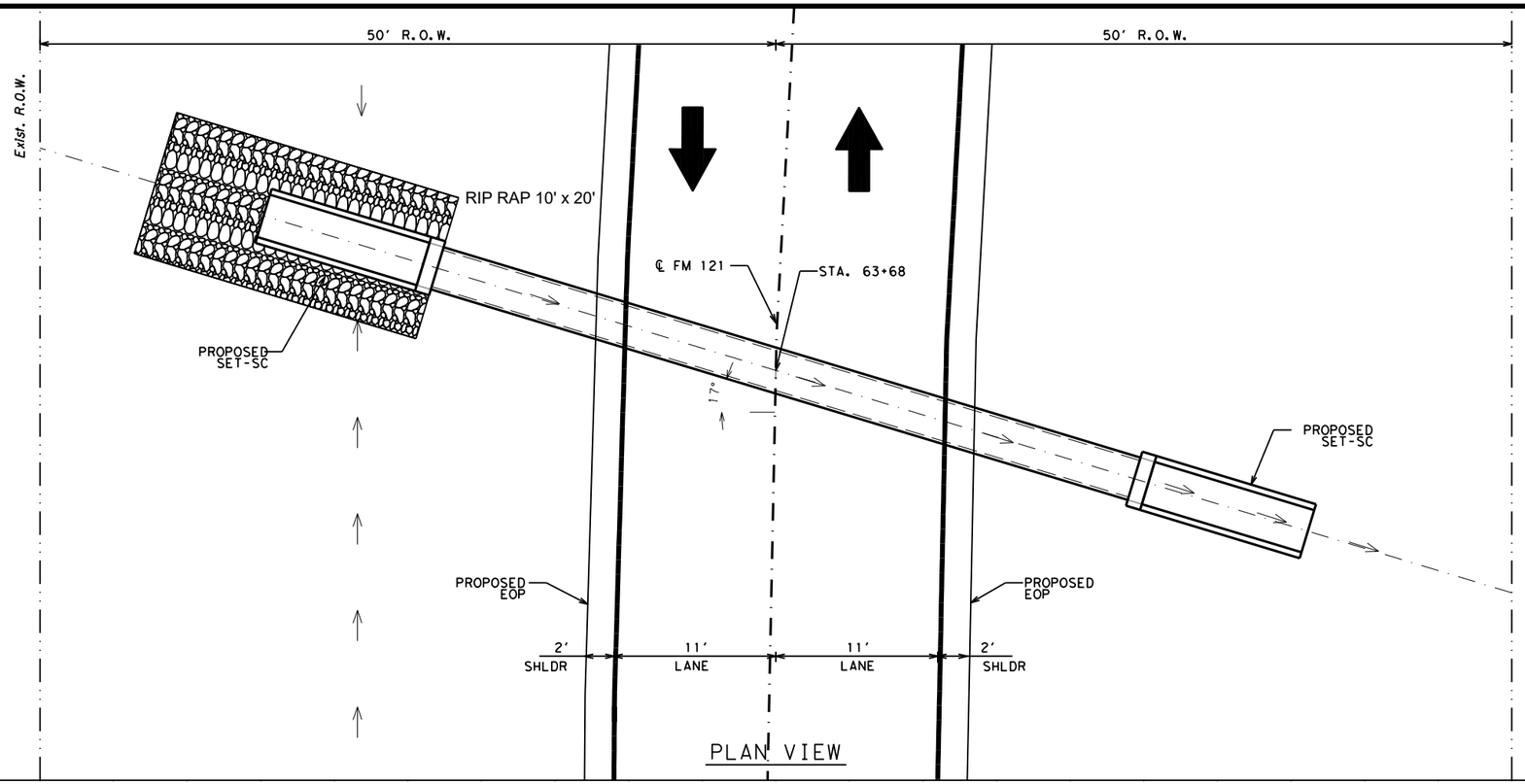
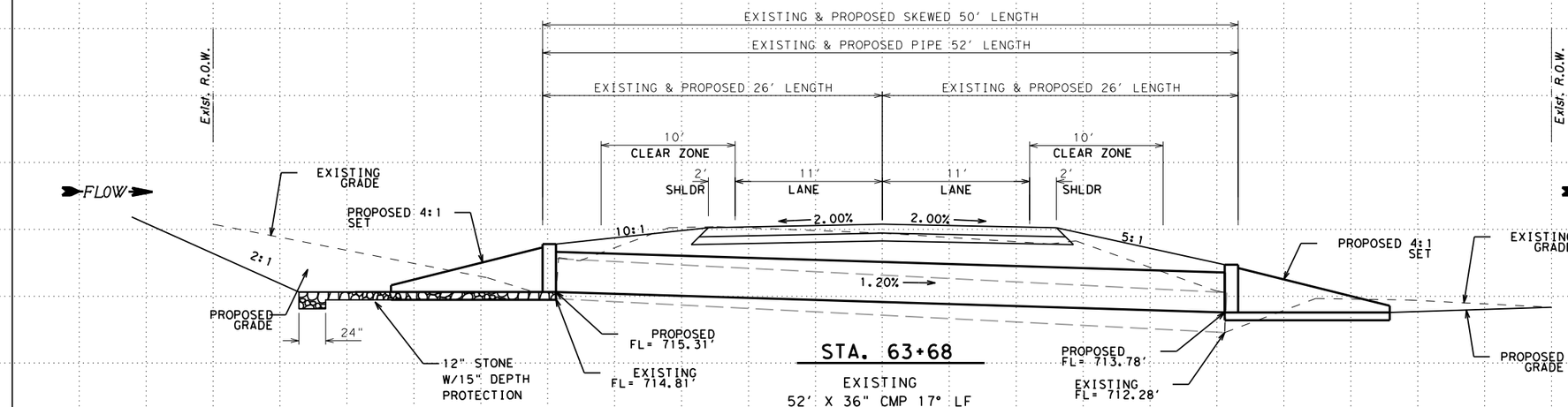


PLAN VIEW

ESTIMATED QUANTITIES		
0110 6002	EXCAVATION (CHANNEL)	8 CY
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	8 CY
0400 6008	CUT & RESTORE ASPH PAVIN	13 SY
0401 6001	FLOWBALE BACKFILL	7 CY
0402 6001	TRENCH EXCAVATION PROTECTION	31 LF
0403 6001	TEMPORARY SPL SHORING	15 SF
0464 6008	RC PIPE (CL III)(36 IN)	52 LF
0467 6450	SET (TY II)(36 IN)(RCP)(4:1)(C)	2 EA
0496 6007	REMOVE STR (PIPE)	52 LF
0432 6031	RIPRAP (STONE PROTECTION)(12 IN)	10 CY



STA. 63+68

EXISTING
52' X 36" CMP 17° LF

PROPOSED
52' X 36" RCP 17°LF
WITH SET-SC
US & DS

STANDARDS: PSET-SC,

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7209175.60
E: 2561124.44
ELEV: 720.39

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.19.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 63+68

SHEET 4 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		96

DATE: 1/16/2023 1:25:14 AM
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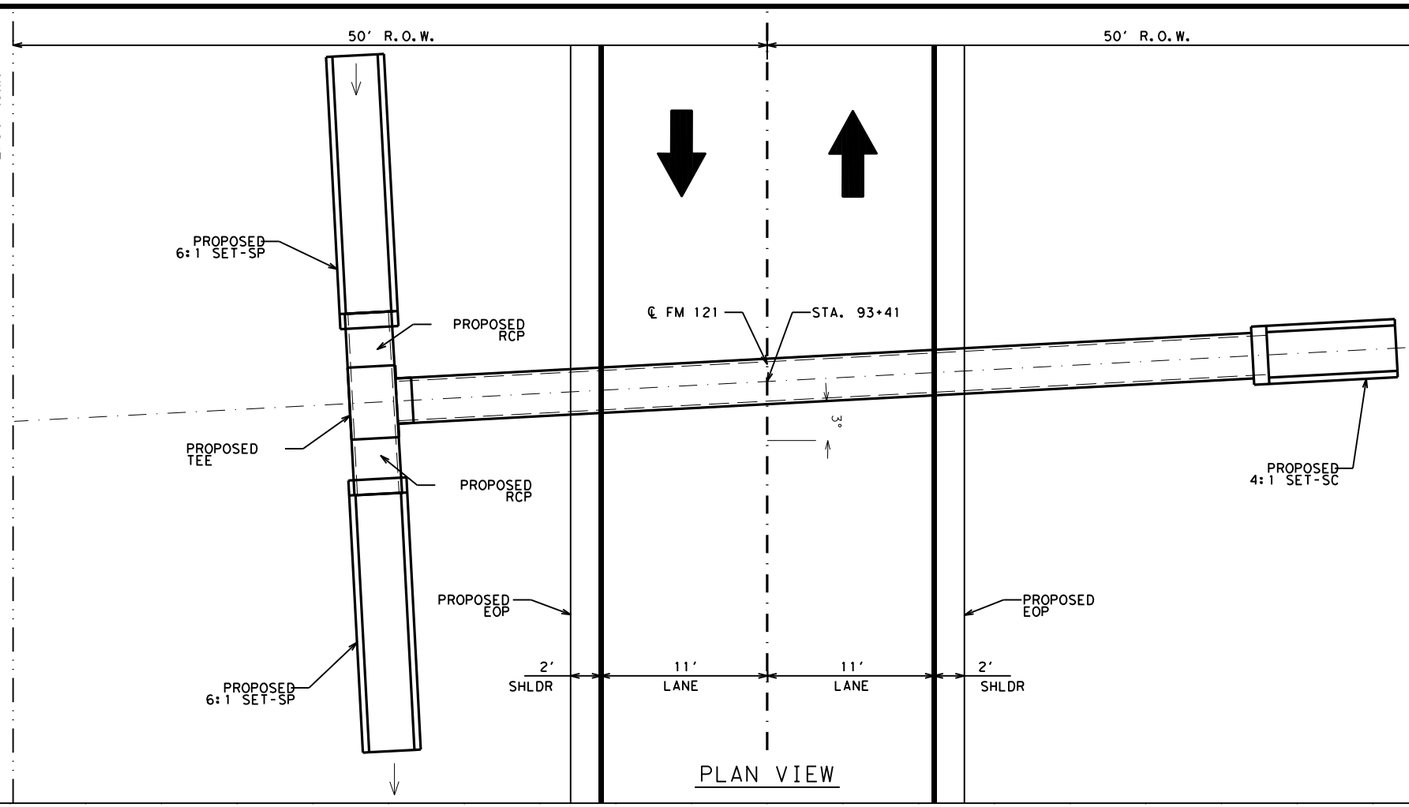
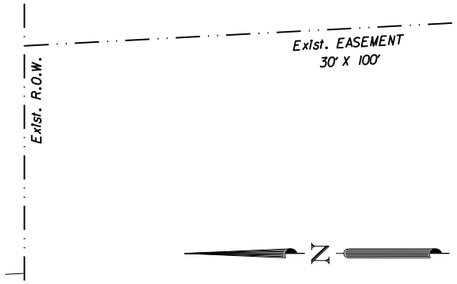


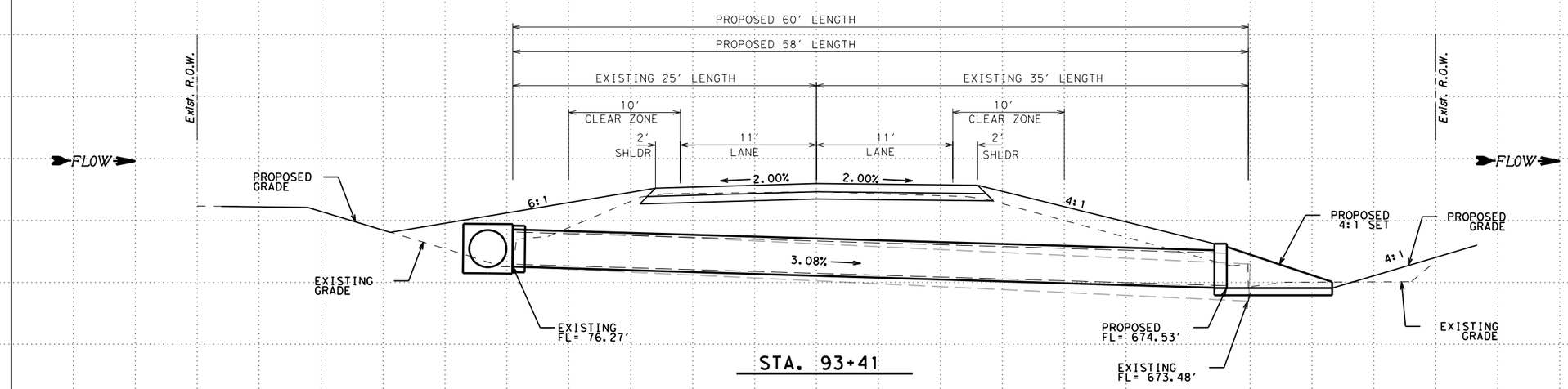
PLAN VIEW



ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	8 CY
0400 6008	CUT & RESTORE ASPH PAVING	18 SY
0401 6001	FLOWABLE BACKFILL	7 CY
0402 6001	TRENCH EXCAVATION PROTECTION	40 LF
0403 6001	TEMORARY SPL SHORING	18 SF
0464 6008	RC PIPE(CL III)(36 IN)	68 LF
0467 6450	SET (TY II)(36 IN)(RCP)(6:1)(P)	2 EA
0467 6454	SET (TY II)(36 IN)(RCP)(4:1)(C)	1 EA
0496 6008	REMOVE STR (PIPE)	60 LF

STANDARDS: PSET-SC, PSET-SP



STA. 93+41

EXISTING
60' x 36" CMP SKEWED 3° RF

PROPOSED
72' x 36" RCP SKEWED 3° RF
W/ 2 ea PSET-SP US & 1 PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP "EST TRAV PNT
N: 7209224.38
E: 2564187.18
ELEV: 682.70

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 93+41

SHEET 5 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		97

DATE: 1/16/2023 1:25:21 AM
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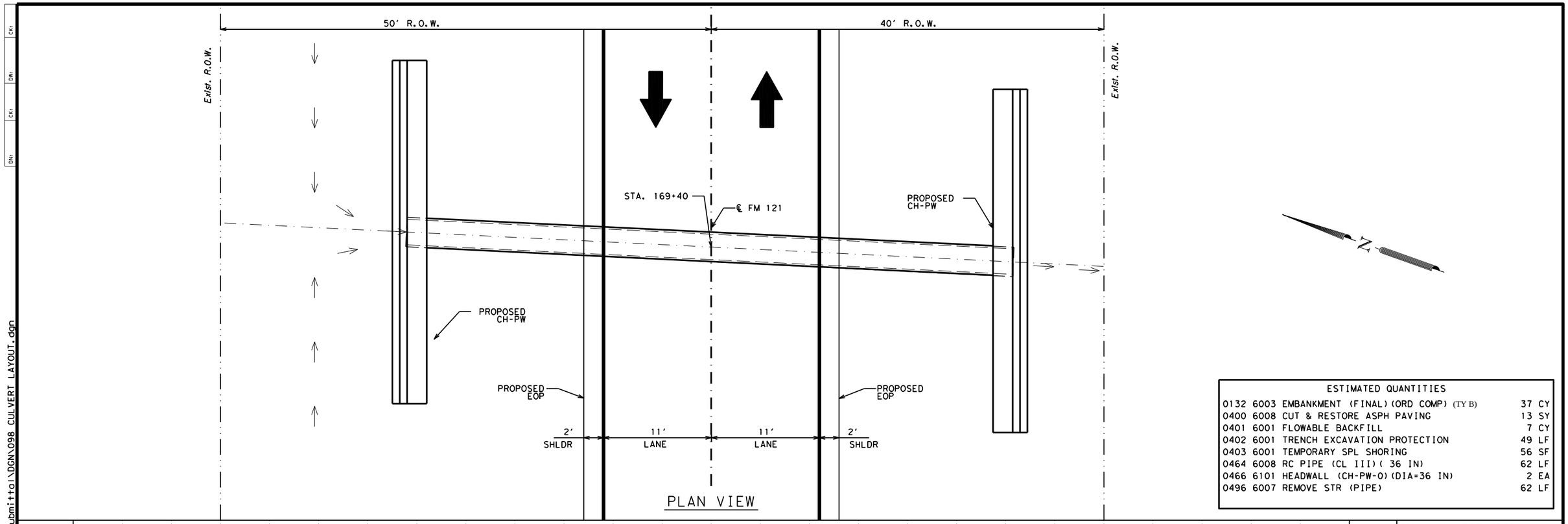

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP) (TY B)	37 CY
0400 6008	CUT & RESTORE ASPH PAVING	13 SY
0401 6001	FLOWABLE BACKFILL	7 CY
0402 6001	TRENCH EXCAVATION PROTECTION	49 LF
0403 6001	TEMPORARY SPL SHORING	56 SF
0464 6008	RC PIPE (CL III)(36 IN)	62 LF
0466 6101	HEADWALL (CH-PW-O)(DIA=36 IN)	2 EA
0496 6007	REMOVE STR (PIPE)	62 LF

STANDARDS: CH-PW-O

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7209613.52
E: 2571590.30
ELEV: 674.40

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 169+40

SHEET 6 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		98

DATE: 1/16/2023 1:25:27 AM
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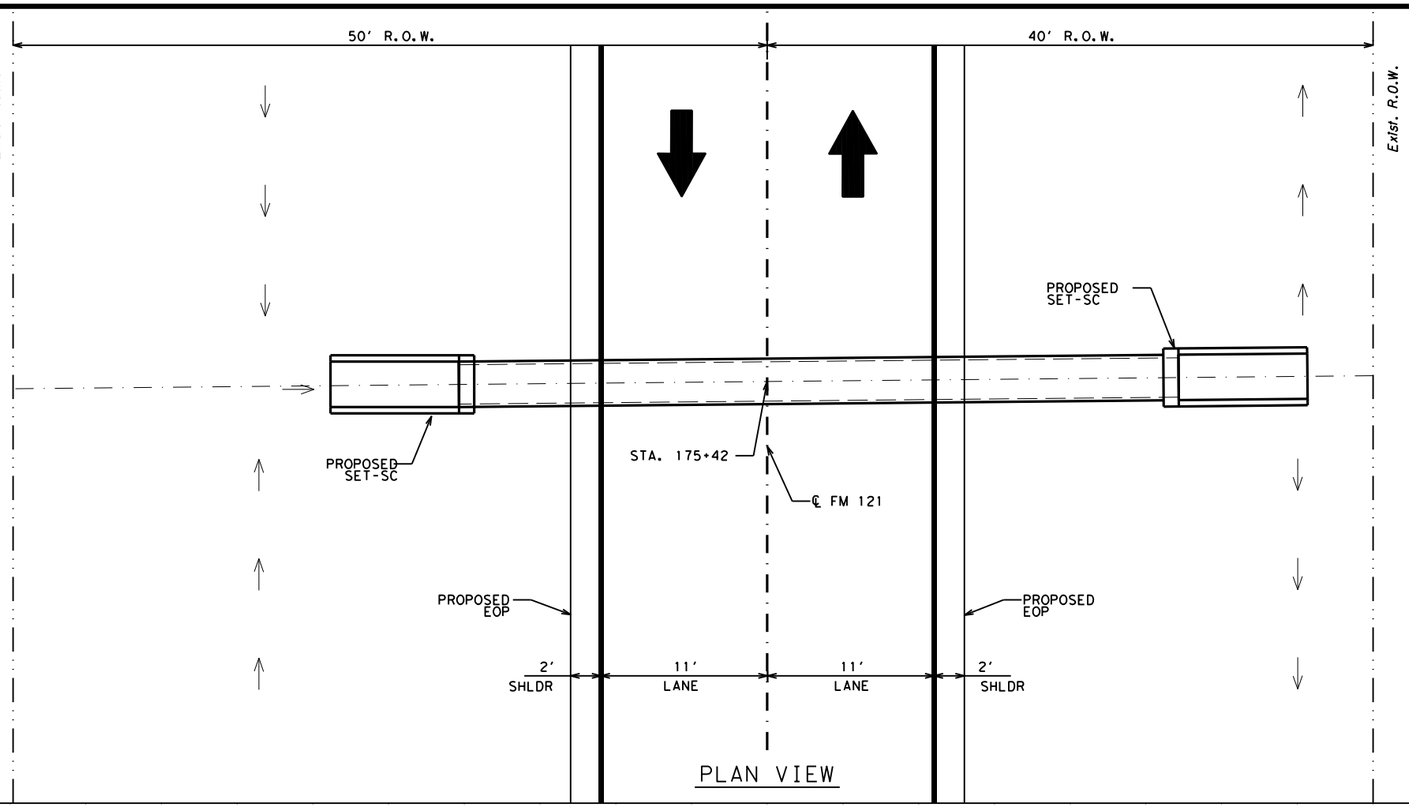
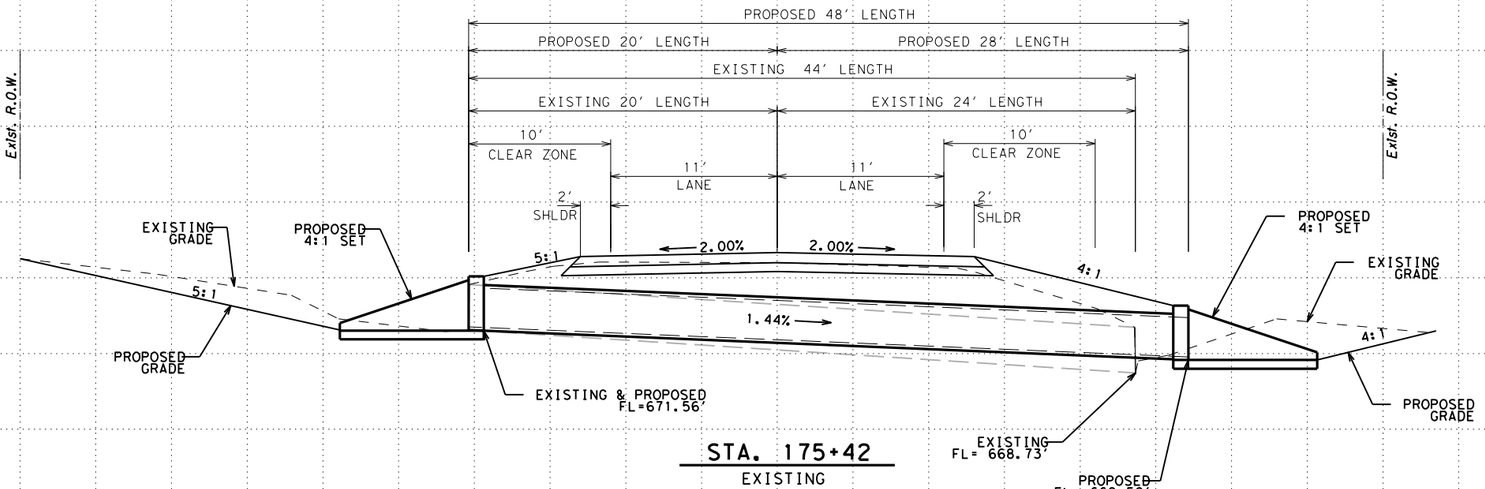


PLAN VIEW

ESTIMATED QUANTITIES		
0110 6002	EXCAVATION (CKHANNEL)	8 CY
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	37 CY
0400 6008	CUT & RESTORE ASPH PAVING	11 SY
0402 6001	TRENCH EXCAVATION PROTECTION	38 LF
0403 6001	TEMPORARY SPL SHORING	35 SF
0464 6008	RC PIPE (CL III)(36 IN)	48 LF
0467 6419	SET (TY II)(RCP)(36 IN)(4:1)(C)	2 EA
0496 6007	REMOVE STR (PIPE)	44 LF

STANDARDS: PSET-SC



STA. 175+42

EXISTING
44' x 36" CMP

PROPOSED
48' x 36" RCP
PSET-SC UP & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7209827.91
E: 2572347.57
ELEV: 676.93

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 175+42

SHEET 7 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		99

DATE: 1/16/2023 1:25:33 AM
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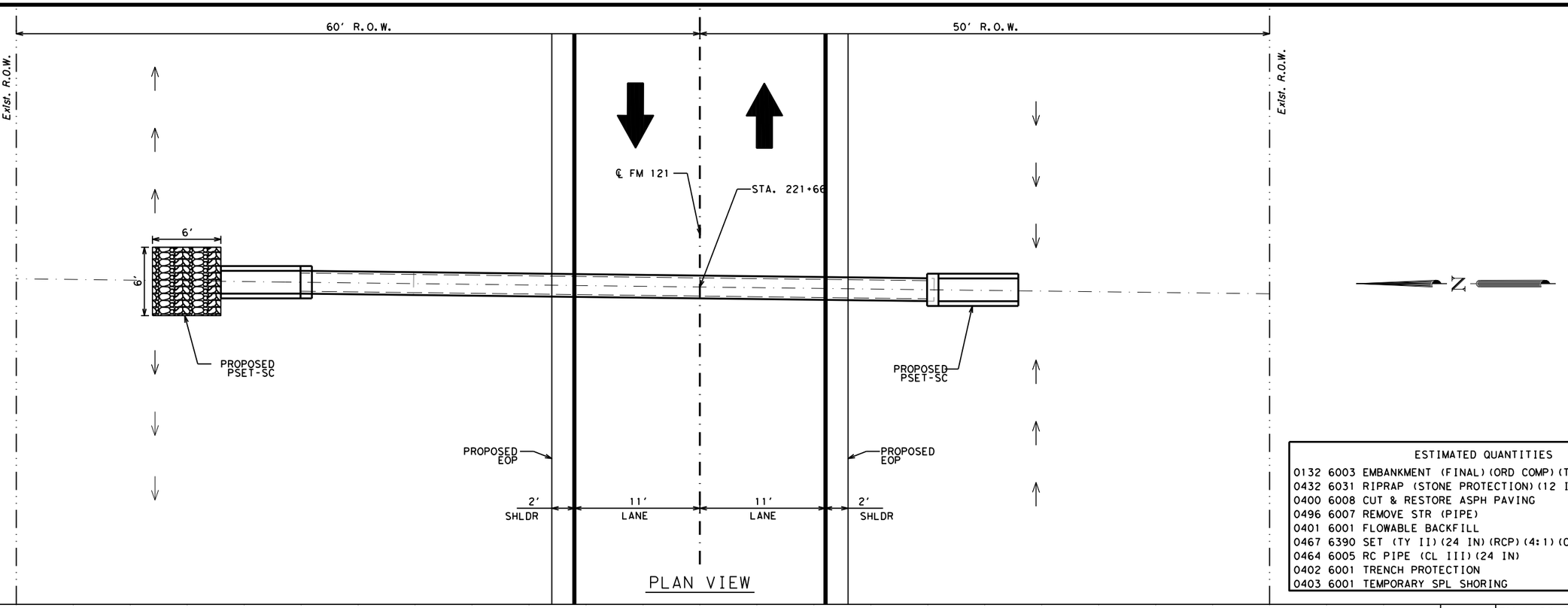
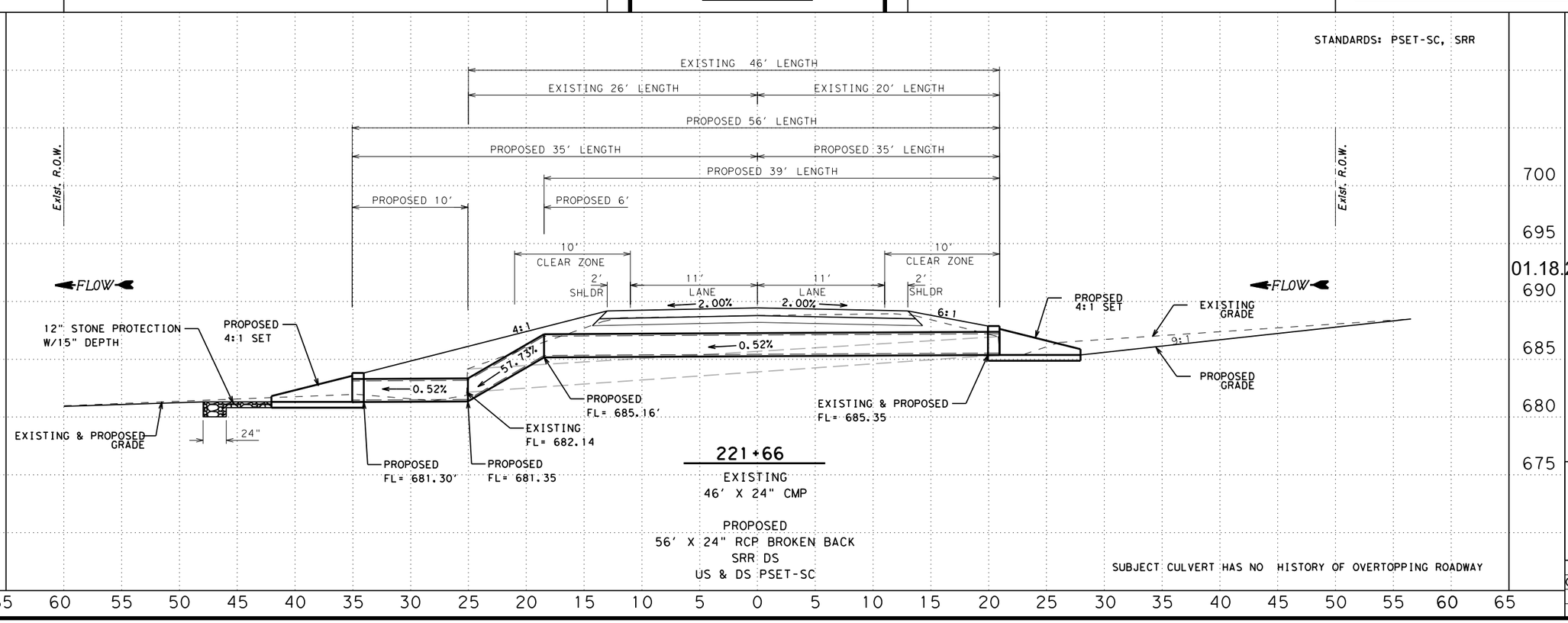


ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	37 CY
0432 6031	RIPRAP (STONE PROTECTION) (12 IN)	6 CY
0400 6008	CUT & RESTORE ASPH PAVING	11 SY
0496 6007	REMOVE STR (PIPE)	45 LF
0401 6001	FLOWABLE BACKFILL	5 CY
0467 6390	SET (TY II) (24 IN) (RCP) (4:1) (C)	2 EA
0464 6005	RC PIPE (CL III) (24 IN)	56 LF
0402 6001	TRENCH PROTECTION	29 LF
0403 6001	TEMPORARY SPL SHORING	30 SF



BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7210649.47
E: 2576641.07
ELEV: 687.82

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 221+66

SHEET 8 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		100

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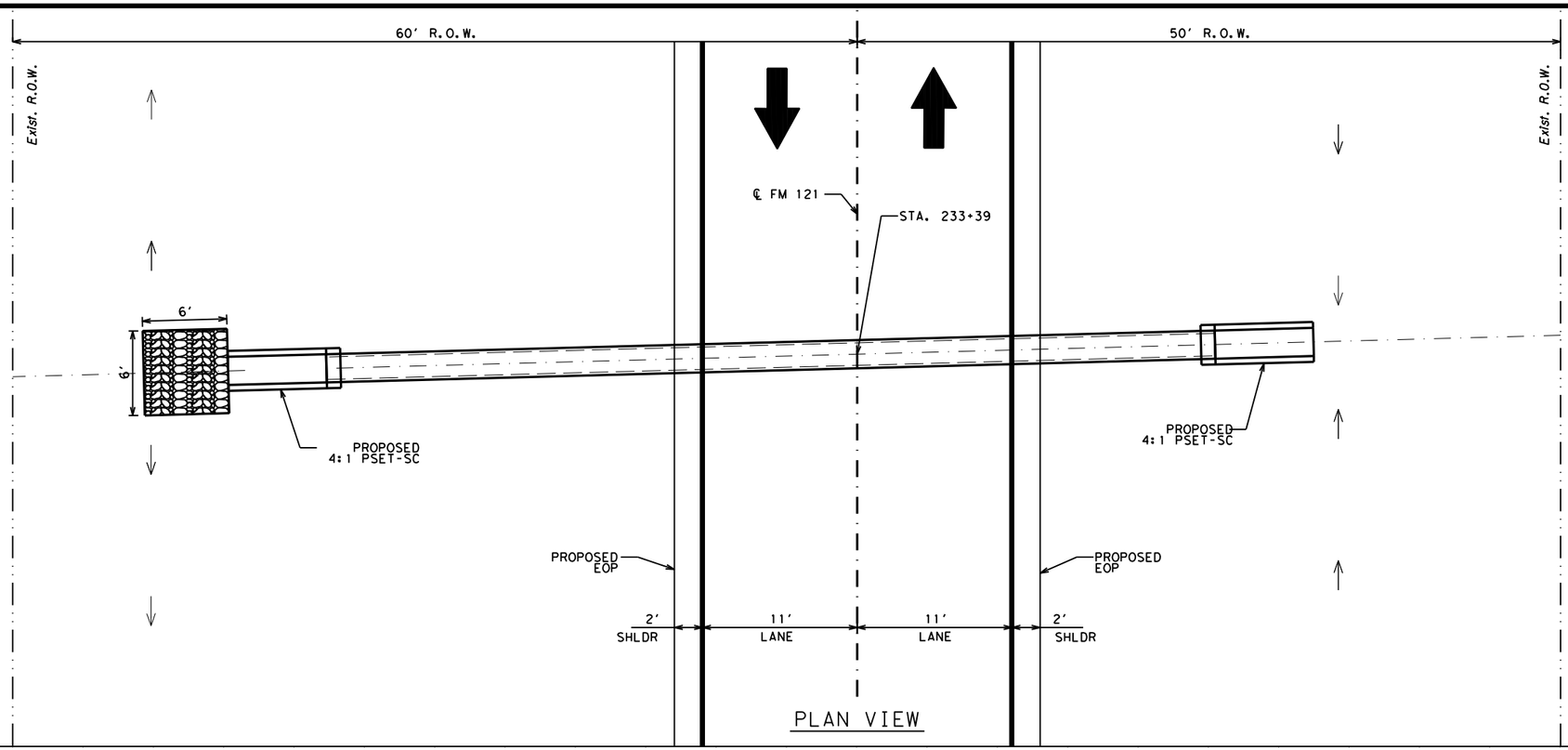
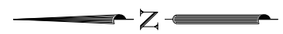
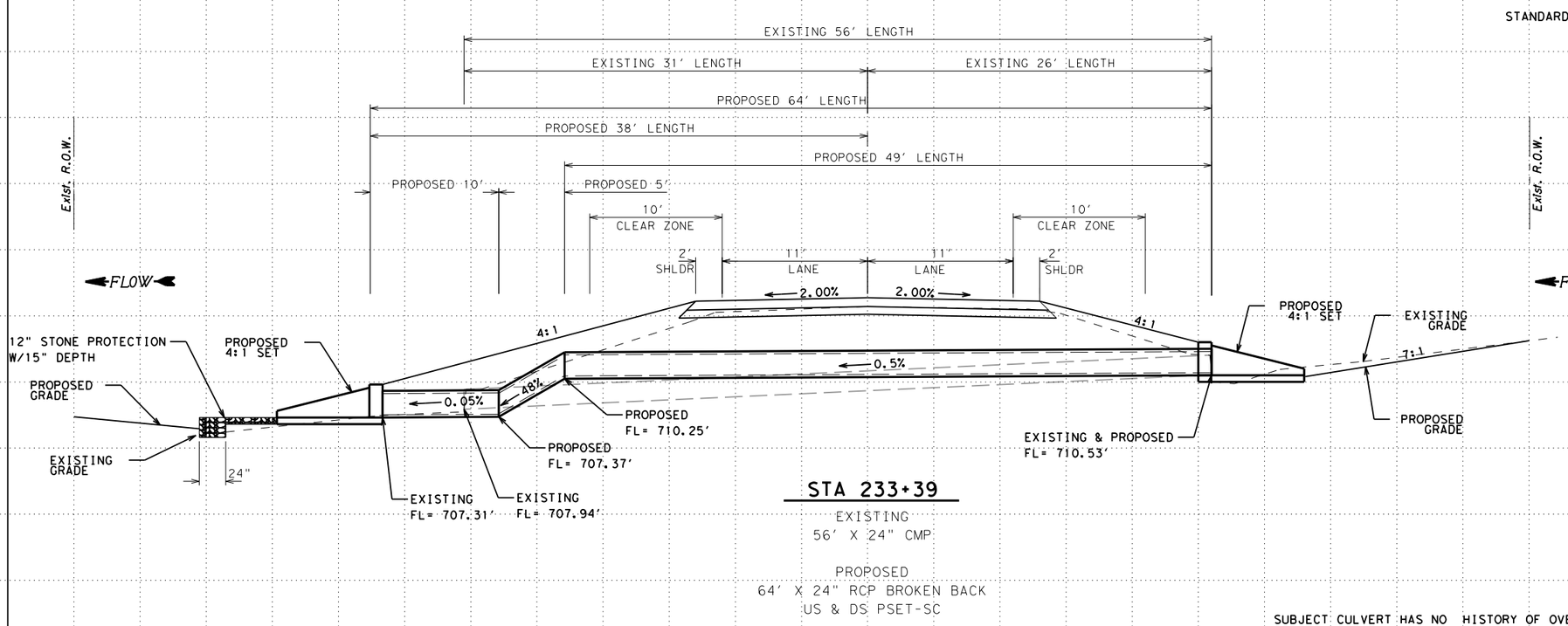




ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	21 CY
0432 6031	RIPRAP (STONE PROTECTION) (12 IN)	6 CY
0400 6008	CUT & RESTORE ASPH PAVING	11 SY
0496 6007	REMOVE STR (PIPE)	56 LF
0467 6390	SET (TY II) (24 IN) (RCP) (4:1) (C)	2 EA
0464 6005	RC PIPE (CL III) (24 IN)	64 LF
0402 6001	TRENCH EXCAVATION	31 LF
0403 6001	TEMPORARY SPL SHORING	36 SF



STA 233+39

EXISTING
56' X 24" CMP

PROPOSED
64' X 24" RCP BROKEN BACK
US & DS PSET-SC

STANDARDS: PSET-SC, SRR

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STELL ROD
W/BLUE CAP STAMPED
N: 7210671.07
E: 2577910.84
ELEV:" 714.83

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 233+39

SHEET 9 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		101

DATE: 1/16/2023 1:25:46 AM
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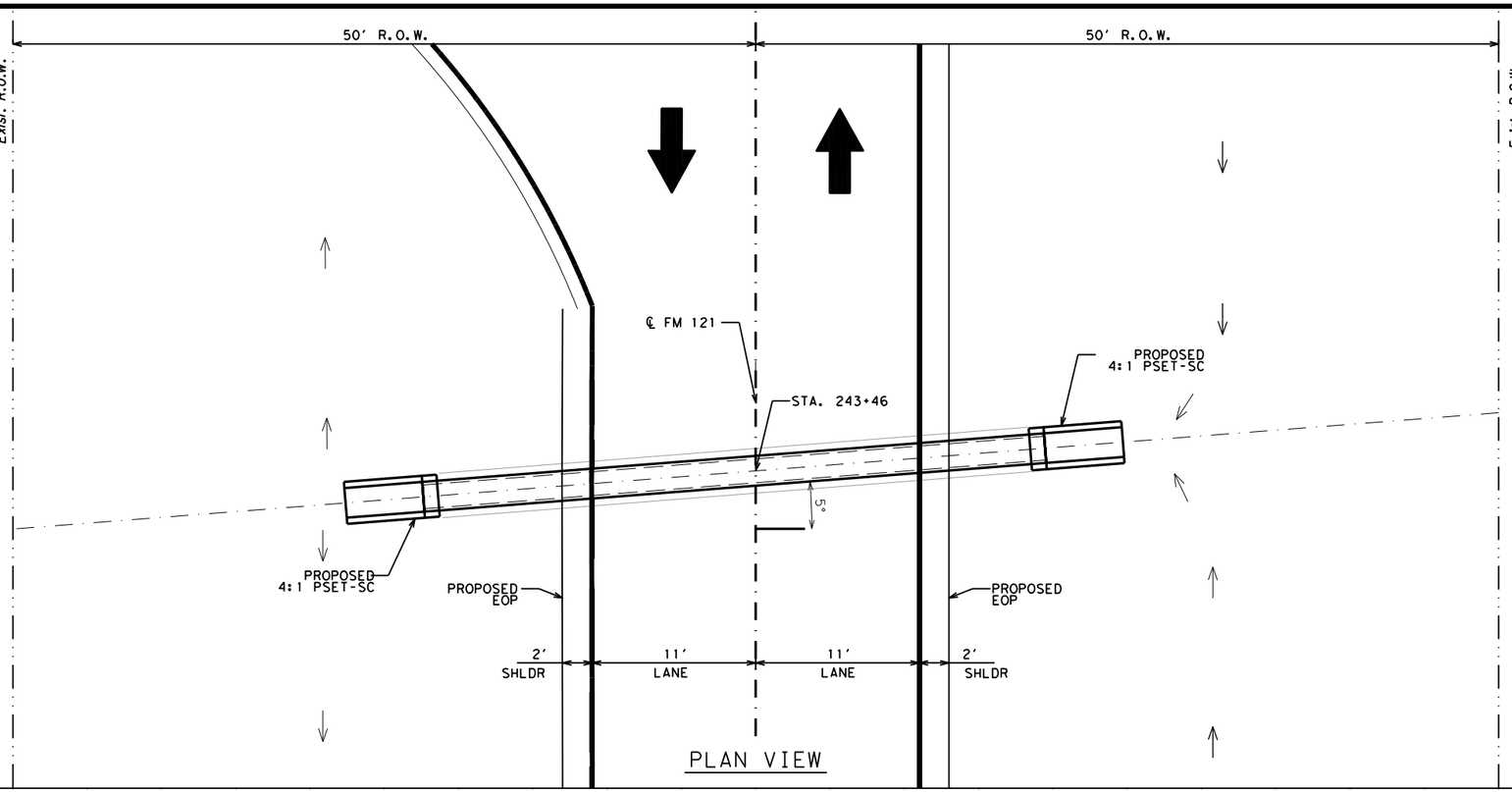
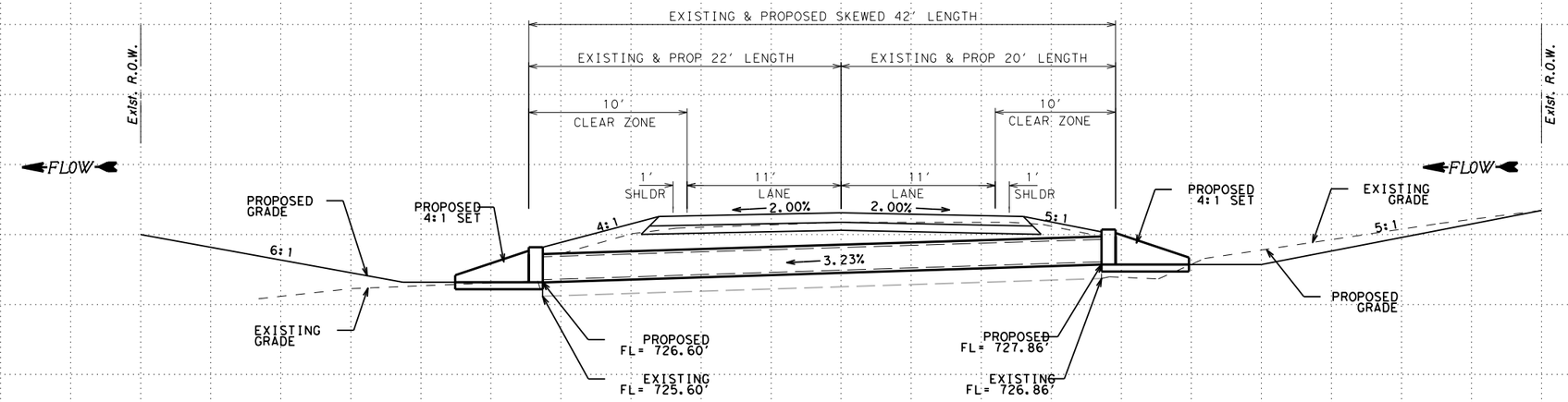


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	8 CY
0400 6008	CUT & RESTORE ASPH PAVING	13 CY
0496 6007	REMOVE STR (PIPE)	42 LF
0464 6005	RC PIPE (CL III)(24 IN)	42 LF
0401 6001	FLOWABLE BACKFILL	5 CY
0467 6390	SET (TY II)(24 IN)(RCP)(4:1)(C)	2 EA
0402 6001	TRENCH EXCAVATION PROTECTION	36 LF
0403 6001	TEMPORARY SPL SHORING	35 SF

STANDARDS: PSET-SC



STA 243+46

EXISTING
42' X 36" CMP

PROPOSED
42' X 24" RCP
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7210719.68
E: 2578789.87
ELEV: 731.89

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 243+46

SHEET 10 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		102

DATE: 1/16/2023 1:25:53 AM
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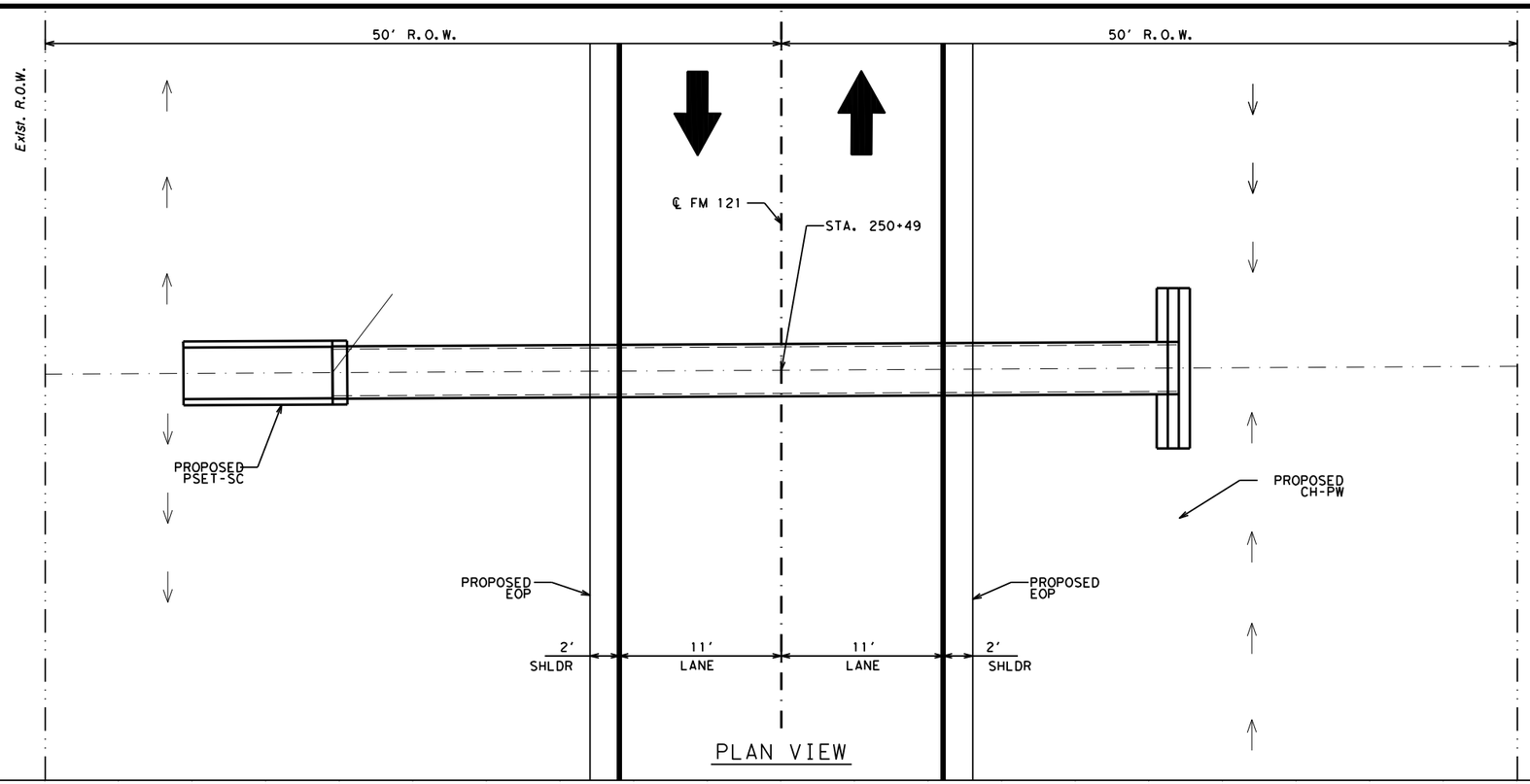
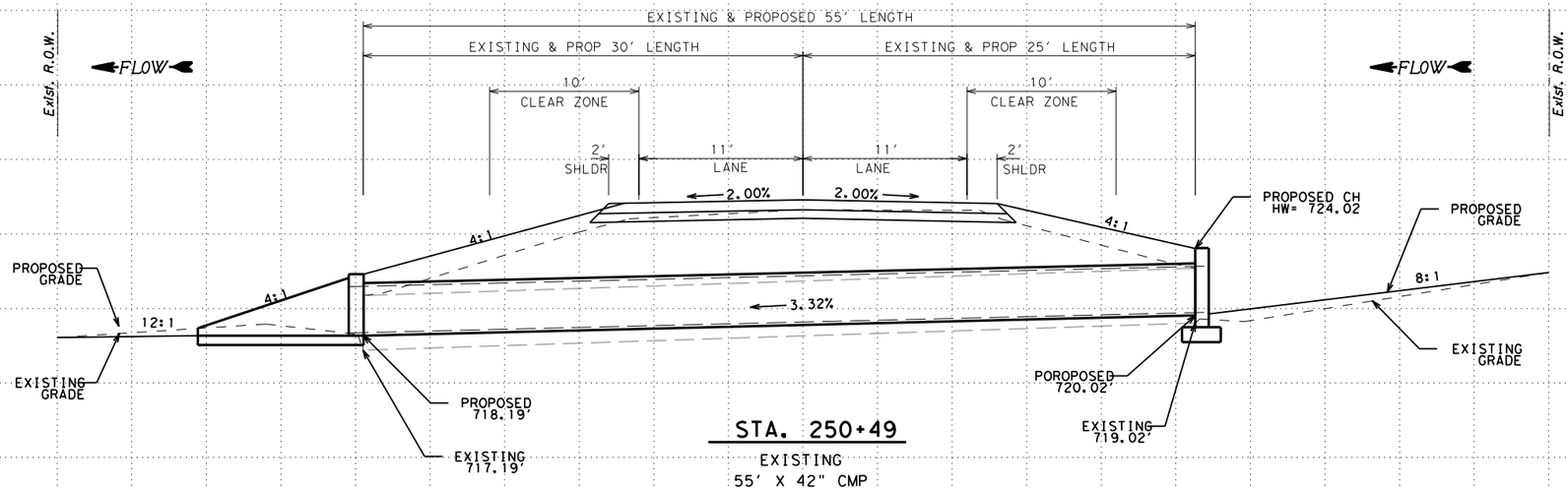


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	21 CY
0400 6008	CUT & RESTORE ASPH PAVING	15 SY
0496 6007	REMOVE STR (PIPE)	55 LF
0464 6009	RC PIPE (CL III)(42 IN)	55 LF
0467 6463	SET (TY II)(42 IN)(RCP)(4:1)(C)	1 EA
0466 6102	HEADWALL (CH-PW-0)(DIA=42 IN)	1 EA
0401 6001	FLOWABLE BACKFILL	20 CY
0403 6001	TEMPORARY SPL SHORING	53 SF
0402 6001	TRENCH EXAVATION PROTECTION	45 LF

STANDARDS: PSET-SC, CH-PW-0



STA. 250+49

EXISTING
55' X 42" CMP

PROPOSED
55' X 42" RCP
CH-PW US & PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7210939.39
E: 2579404.17
ELEV: 723.01

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 250+49

SHEET 11 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		103

DATE: 1/16/2023 1:26:00 AM
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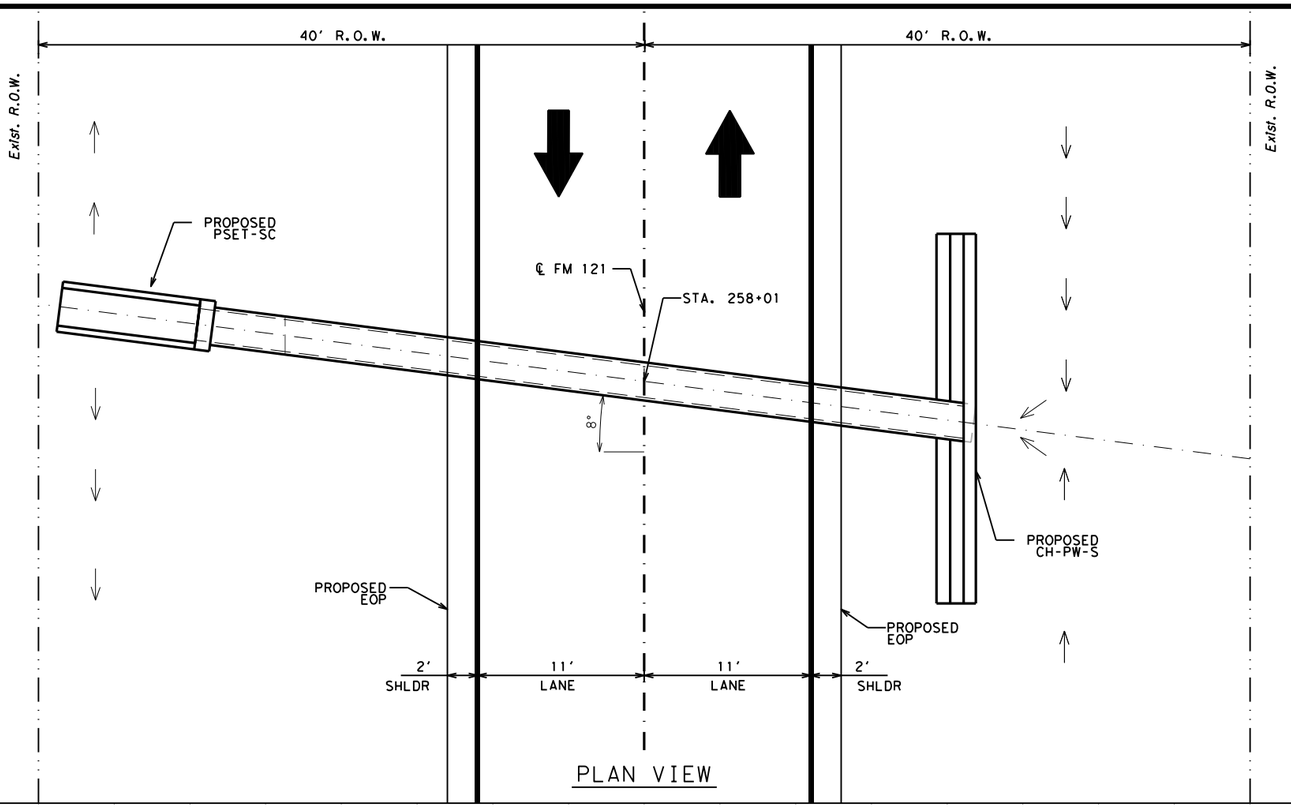
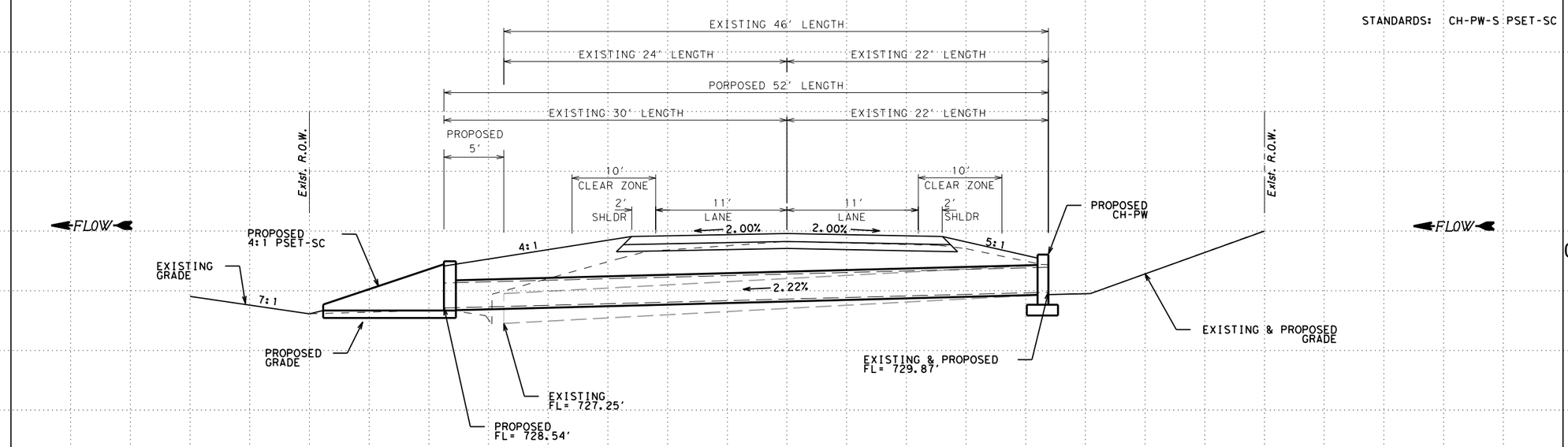


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	37 CY
0400 6008	CUT & RESTORE ASPH PAVING	12 CY
0496 6007	REMOVE STR (PIPE)	46 LF
0464 6007	RC PIPE (CL III)(30 IN)	52 LF
0402 6001	TRENCH EXACATION PROTECTION	35 LF
0403 6001	TEMPORARY SOL SHORING	35 SF
0401 6001	FLOWABLE BACKFILL	12 CY
0466 6132	HEADWALL (CH-PW-S)(DIA=30 IN)	1 EA
0467 6417	SET (TY 11)(30 IN)(RCP)(3:1)(C)	1 EA



STA 258+01

EXISTING
46' X 30" CMP

PROPOSED
52' X 30" RCP
US CH-PW-S & DS PSET-SC

STANDARDS: CH-PW-S PSET-SC

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7211146.53
E: 2580130.98
ELEV: 734.16

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 258+01

SHEET 12 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		104

DATE: 1/16/2023 1:26:06 AM
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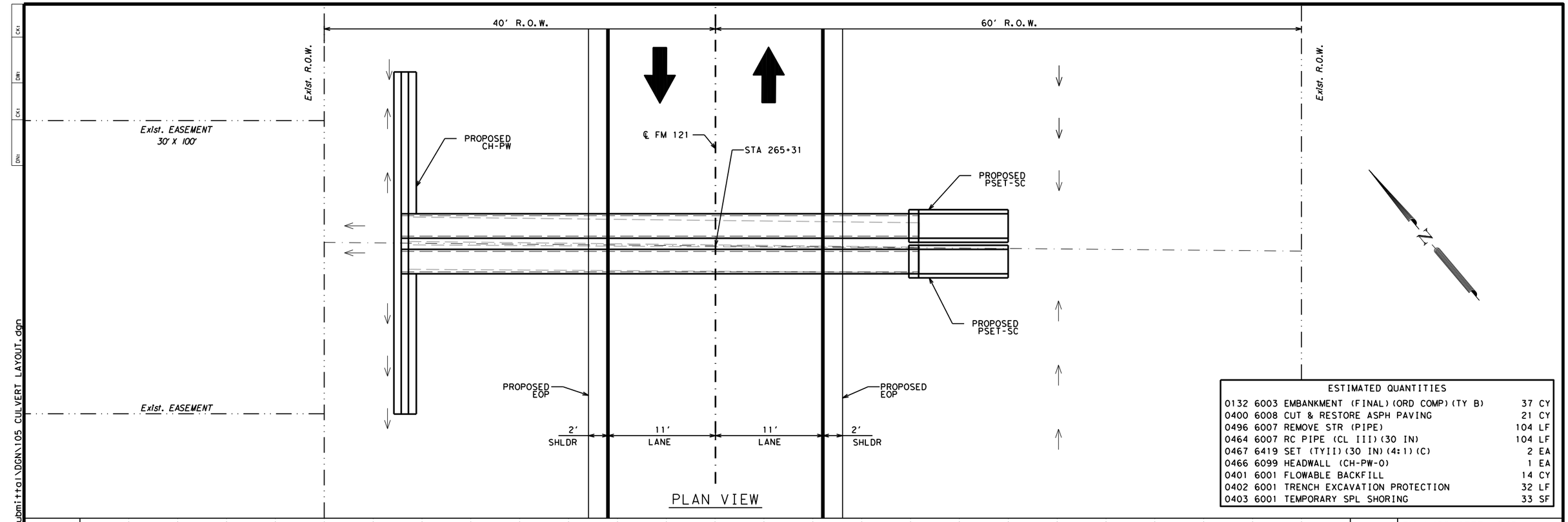
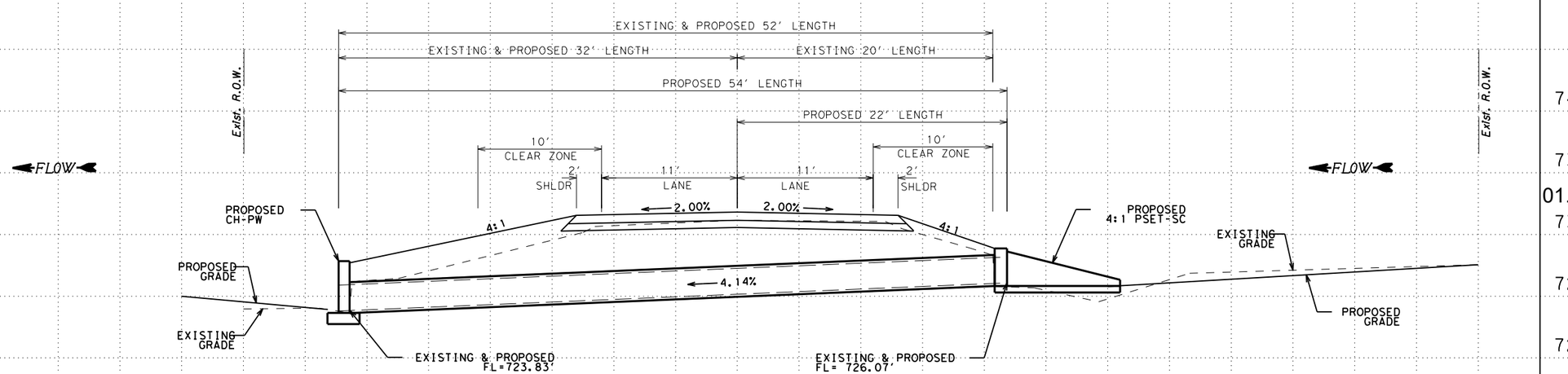


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	37 CY
0400 6008	CUT & RESTORE ASPH PAVING	21 CY
0496 6007	REMOVE STR (PIPE)	104 LF
0464 6007	RC PIPE (CL III)(30 IN)	104 LF
0467 6419	SET (TYII)(30 IN)(4:1)(C)	2 EA
0466 6099	HEADWALL (CH-PW-0)	1 EA
0401 6001	FLOWABLE BACKFILL	14 CY
0402 6001	TRENCH EXCAVATION PROTECTION	32 LF
0403 6001	TEMPORARY SPL SHORING	33 SF



STA. 265+31

EXISTING
2 - 52' X 30" CMP

PROPOSED
2 - 52' X 30" RCP
US PSET-SC & DS CH-PW-0

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7211615.33
E: 2580672.31
ELEV: 734.37

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 265+31

SHEET 13 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		105

DATE: 1/16/2023 1:26:12 AM
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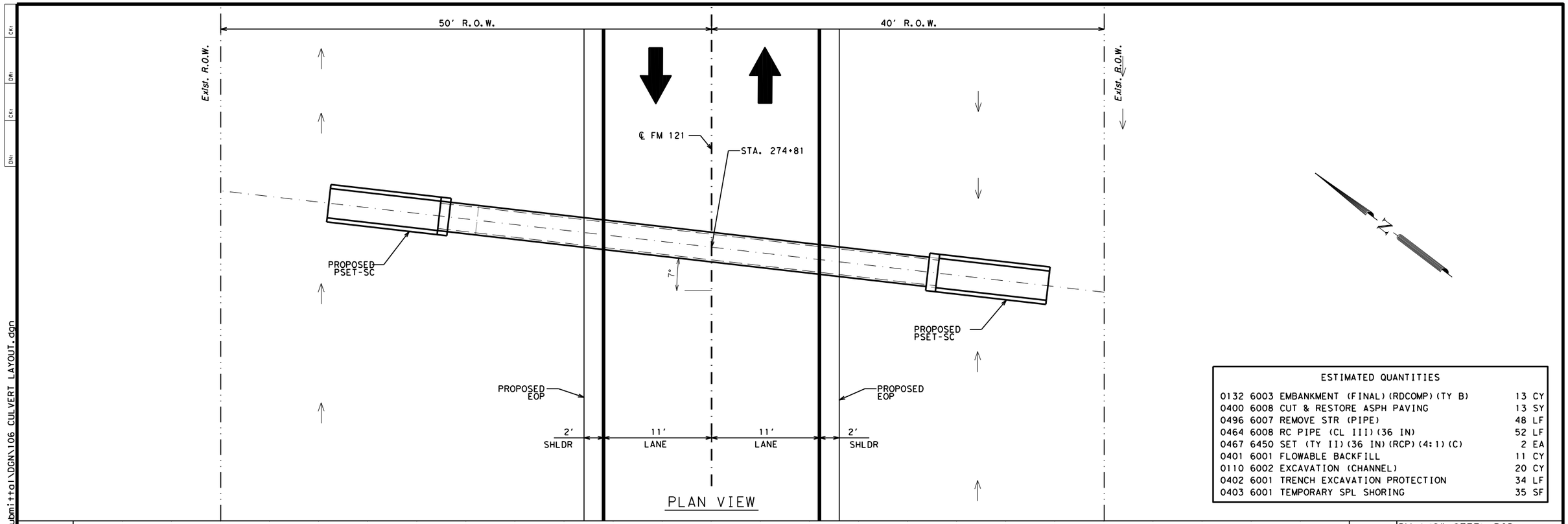
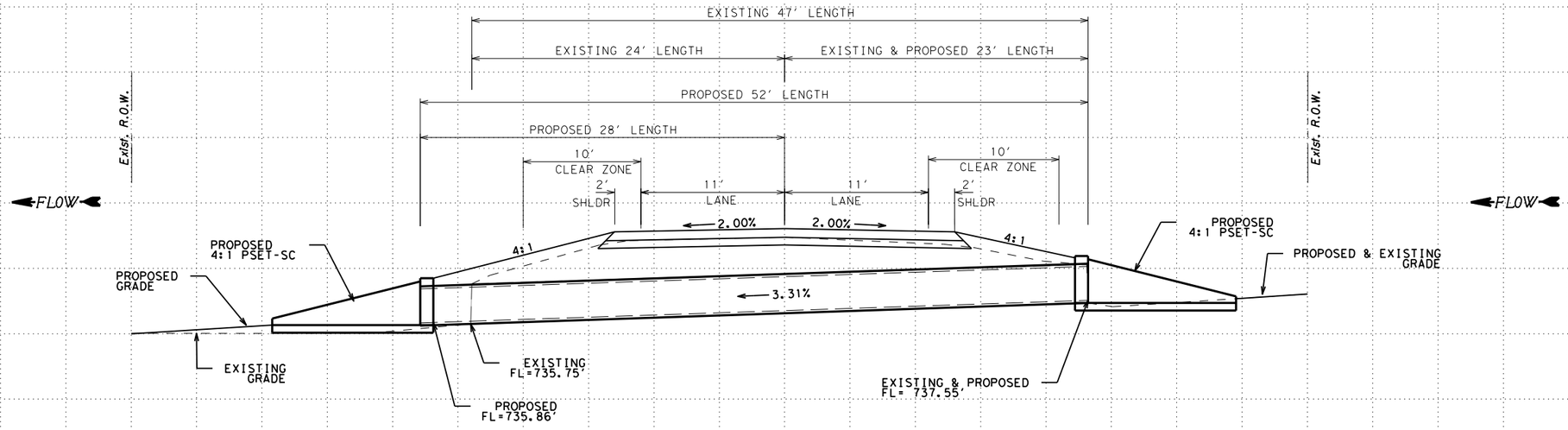


ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(RDCOMP)(TY B)	13 CY
0400 6008	CUT & RESTORE ASPH PAVING	13 SY
0496 6007	REMOVE STR (PIPE)	48 LF
0464 6008	RC PIPE (CL III)(36 IN)	52 LF
0467 6450	SET (TY II)(36 IN)(RCP)(4:1)(C)	2 EA
0401 6001	FLOWABLE BACKFILL	11 CY
0110 6002	EXCAVATION (CHANNEL)	20 CY
0402 6001	TRENCH EXCAVATION PROTECTION	34 LF
0403 6001	TEMPORARY SPL SHORING	35 SF

STANDARDS: PSET-SC



STA. 274+81

EXISTING
47' X 36" CMP

PROPOSED
52' X 36" RCP
CH-PW US & PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7212405.05
E: 2581449.83
ELEV: 743.00

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 274+81

SHEET 14 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		106

DATE: 1/17/2023 2:31:51 AM
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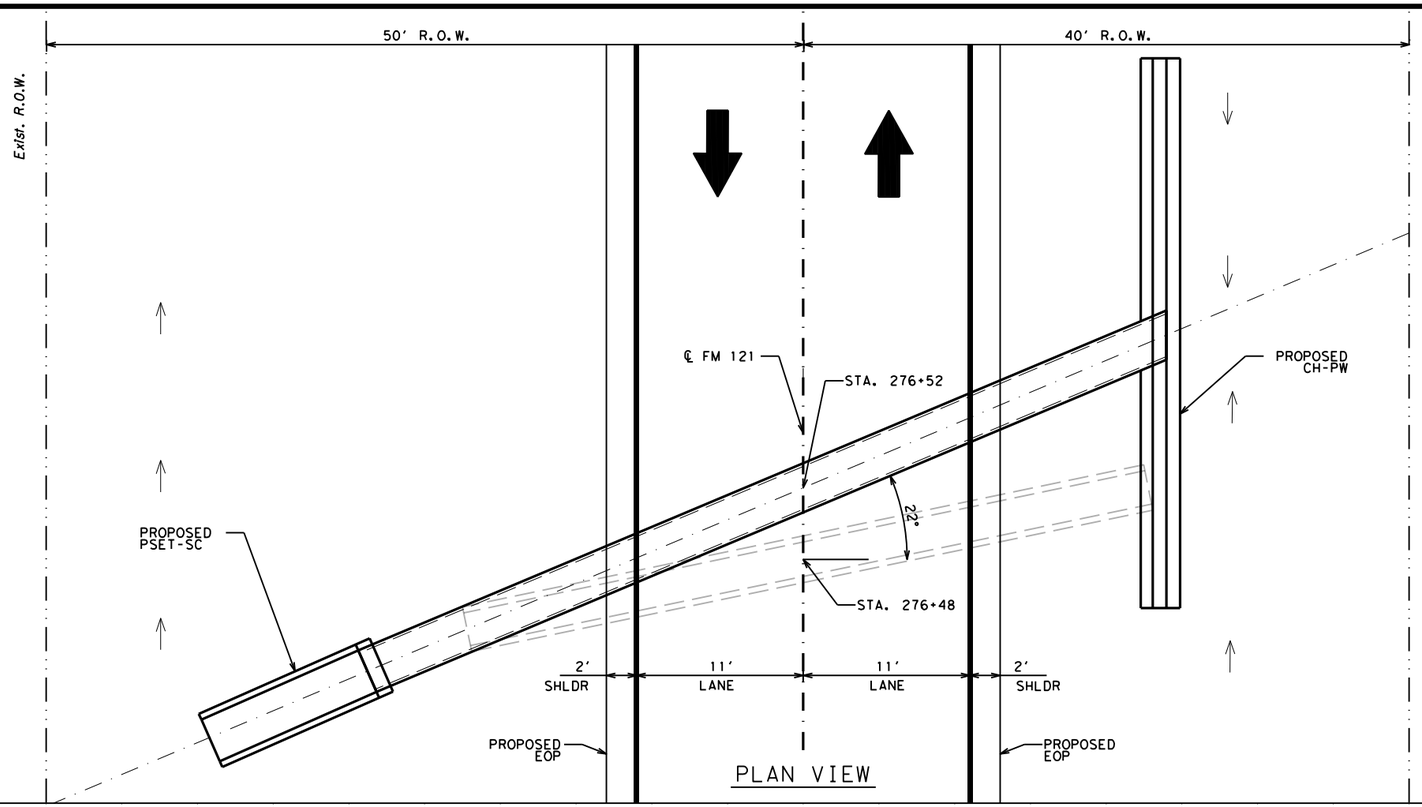
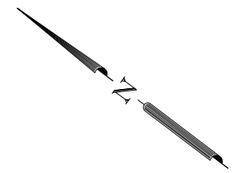
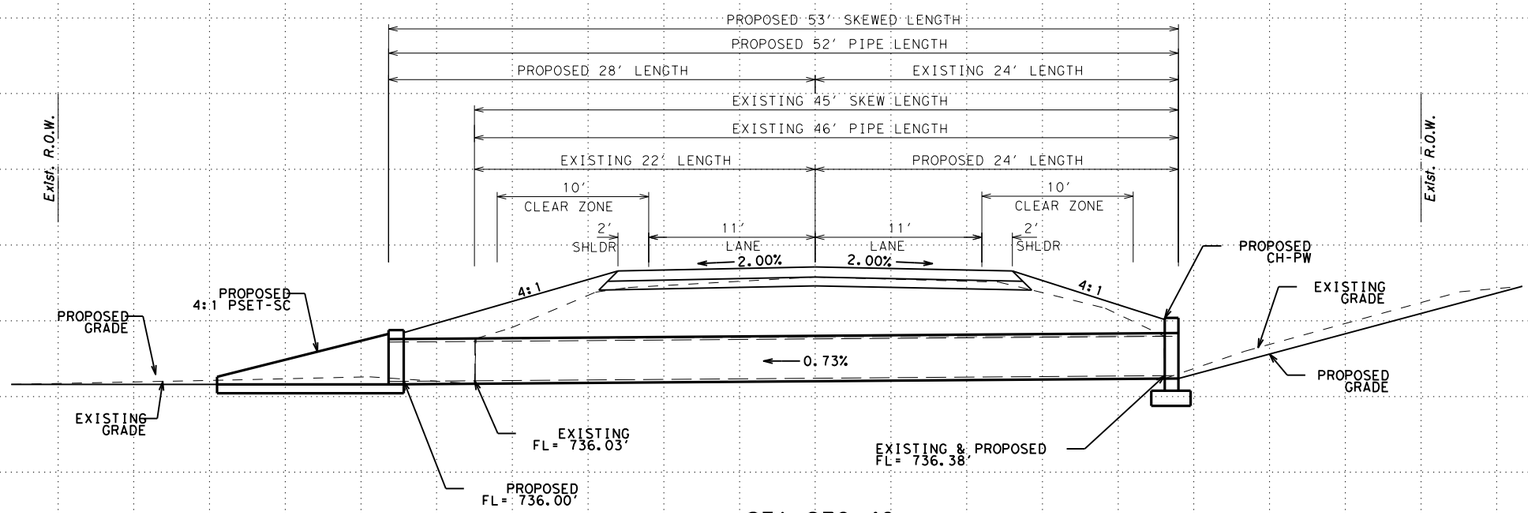


PLAN VIEW



ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	12 CY
0400 6008	CUT & RESTORE ASPH PAVING	26 SY
0496 6007	REMOVE STR (PIPE)	46 LF
0464 6008	RC PIPE (CL III)(36 IN)	52 LF
0467 6441	SET (TY II)(36 IN)(RCP)(4:1)(C)	1 EA
0466 6132	HEADWALL (CH-PW-S)(DIA=30 IN)	1 EA
0402 6001	TRENCH EXCAVATION PROTECTION	42 SF
0403 6001	TEMPORARY SPL SHORING	35 LF
0401 6001	FLOWABLE BACKFILL	17 CY

STANDARDS: PSET-SC, CH-PW-0



STA 276+48

EXISTING
46' X 36" CMP 12°RF

PROPOSED
52' X 36" RCP 22°RF
CH-PW US & PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7212405.05
E: 2581449.83
ELEV: 743.00

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 276+48

SHEET 15 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		107

DATE: 1/17/2023 2:31:52 AM
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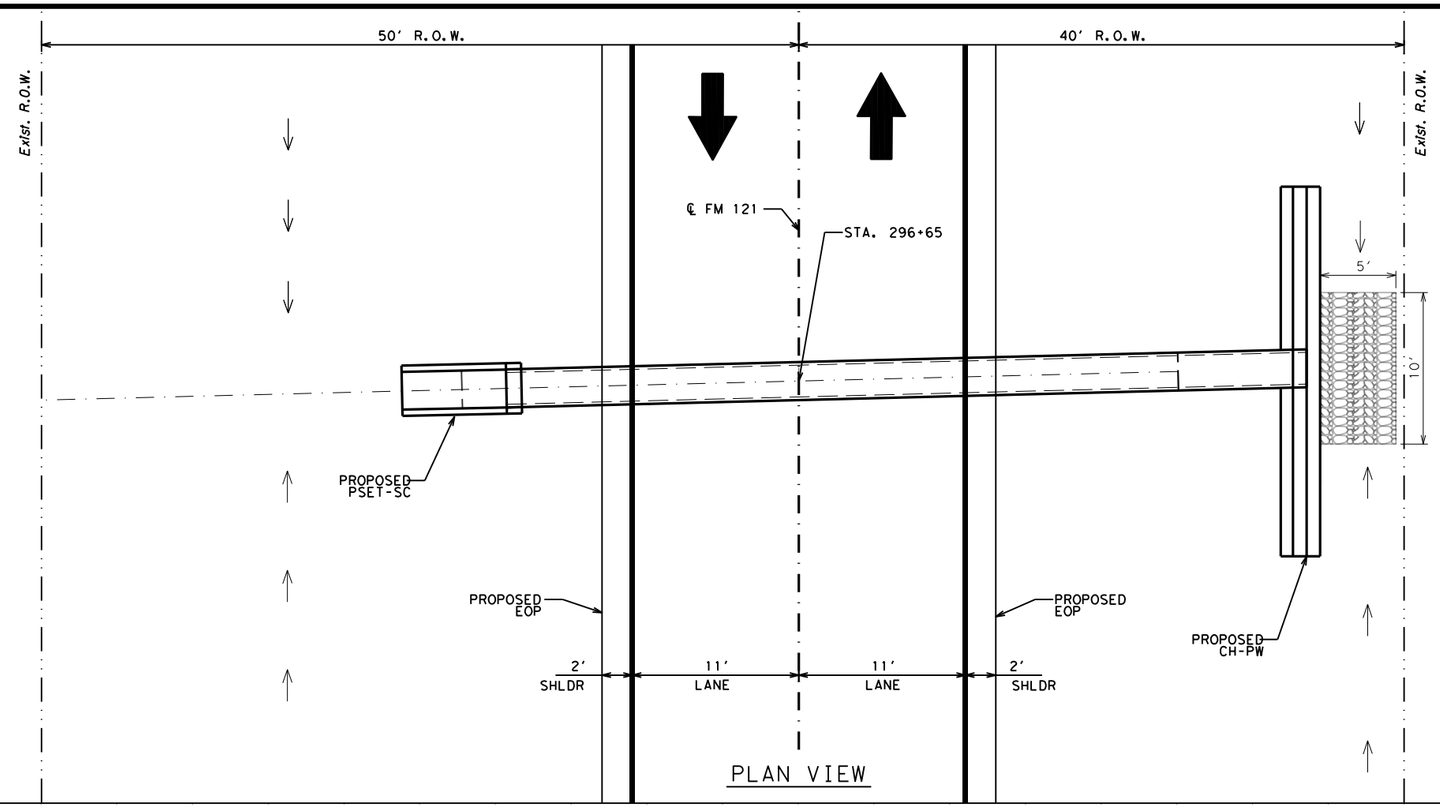
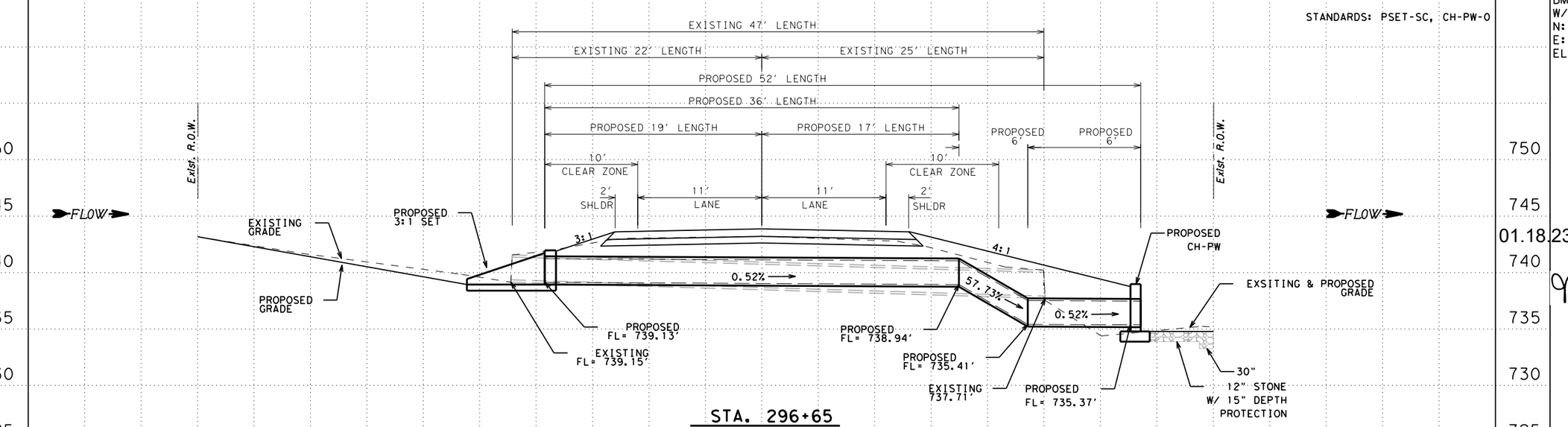


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	7 CY
0400 6008	CUT & RESTORE ASPH PAVING	13 SY
0496 6007	REMOVE STR (PIPE)	47 LF
0464 6007	RC PIPE (CL III) (30 IN)	52 LF
0467 6417	SET (TY II) (30 IN) (RCP) (3:1) (C)	1 EA
0466 6134	HEADWALL (CH-PW-S) (DIA=30 IN)	1 EA
0432 6031	RIPRAP (STONE PROTECTION) (12 IN)	5 CY
0402 6001	TRENCH EXCAVATION PROTECTION	38 LF
0403 6001	TEMPORARY SPL SHORING	26 SF



STA. 296+65

EXISTING
47' X 30" CMP

PROPOSED
52' X 30" RCP
PSET-SC US & CH-PW DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: PSET-SC, CH-PW-0

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213226.07
E: 2583341.51
ELEV: 741.35

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 296+65

SHEET 16 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		108

DATE: 1/16/2023 1:26:29 AM
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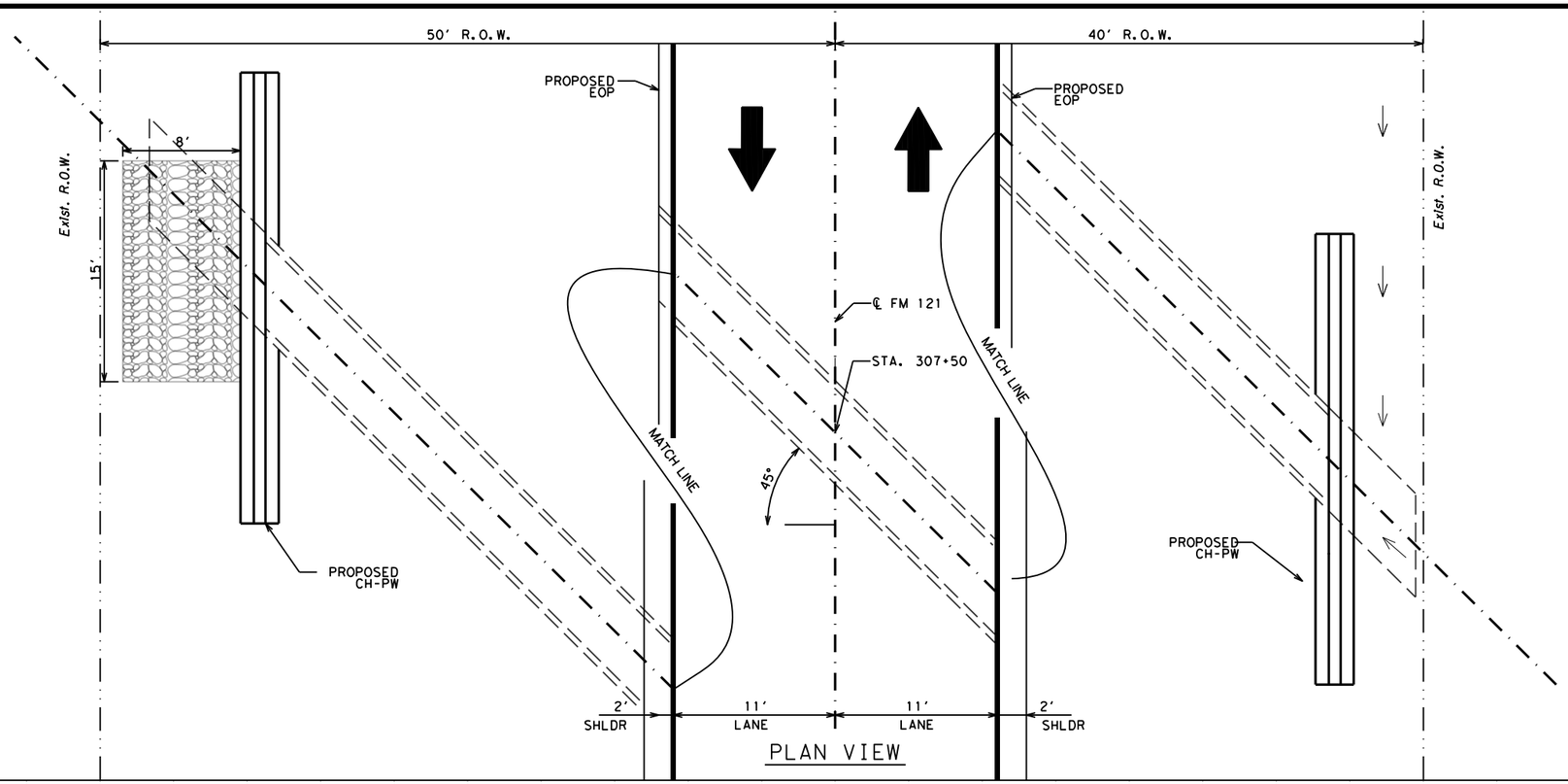
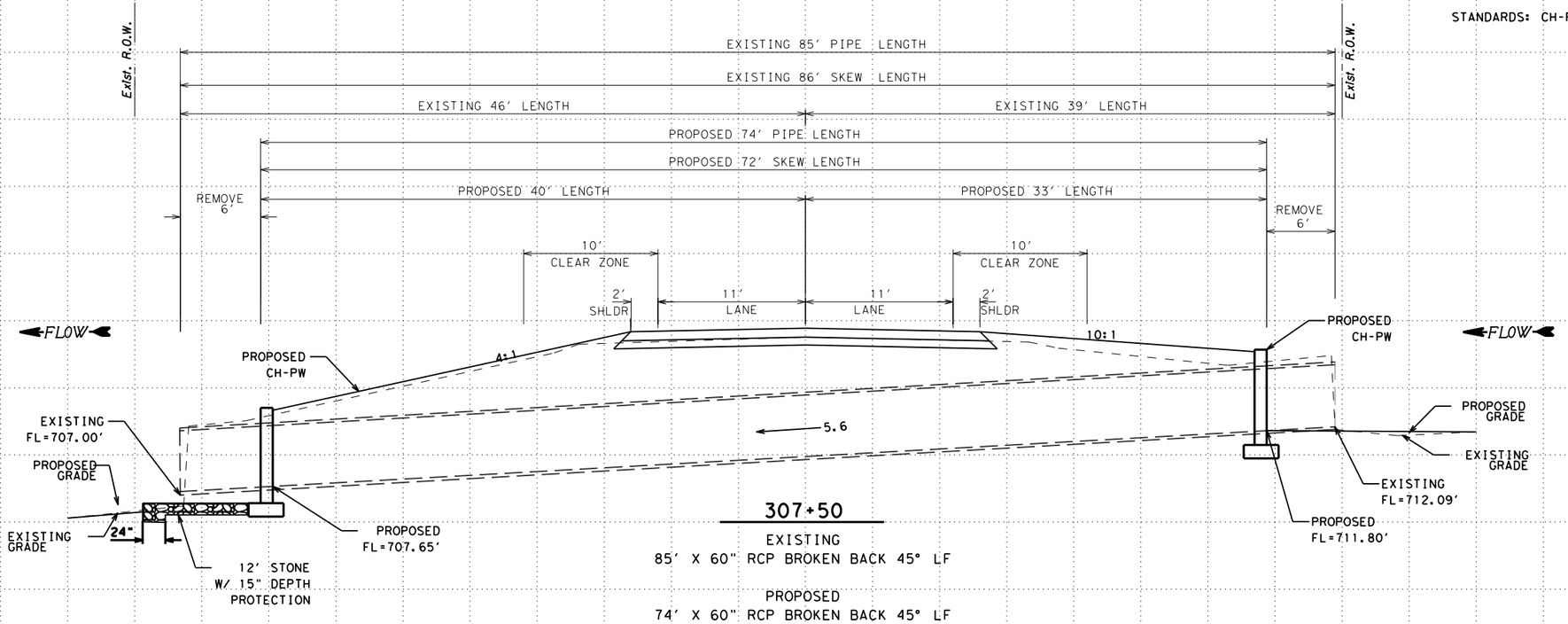


ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	34 CY
0496 6007 REMOVE STR (PIPE)	12 LF
0466 6138 HEADWALL (CH-PW-S)(DIA=60 IN)	2 EA
0110 6002 EXCAVATION (CHANNEL)	20 CY
0432 6031 RIP RAP (STONE PROTECTION)(12 IN)	13 CY
0402 6001 TRENCH EXCAVATION PROTECTION	15 LF



307+50

EXISTING
85' X 60" RCP BROKEN BACK 45° LF

PROPOSED
74' X 60" RCP BROKEN BACK 45° LF
CH-PW US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STELL ROD
W/BLUE CAP STAMPED
N: 7213419.37
E: 2584303.29
ELEV: 720.18

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 307+50

SHEET 17 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		109

DATE: 1/16/2023 1:26:35 AM
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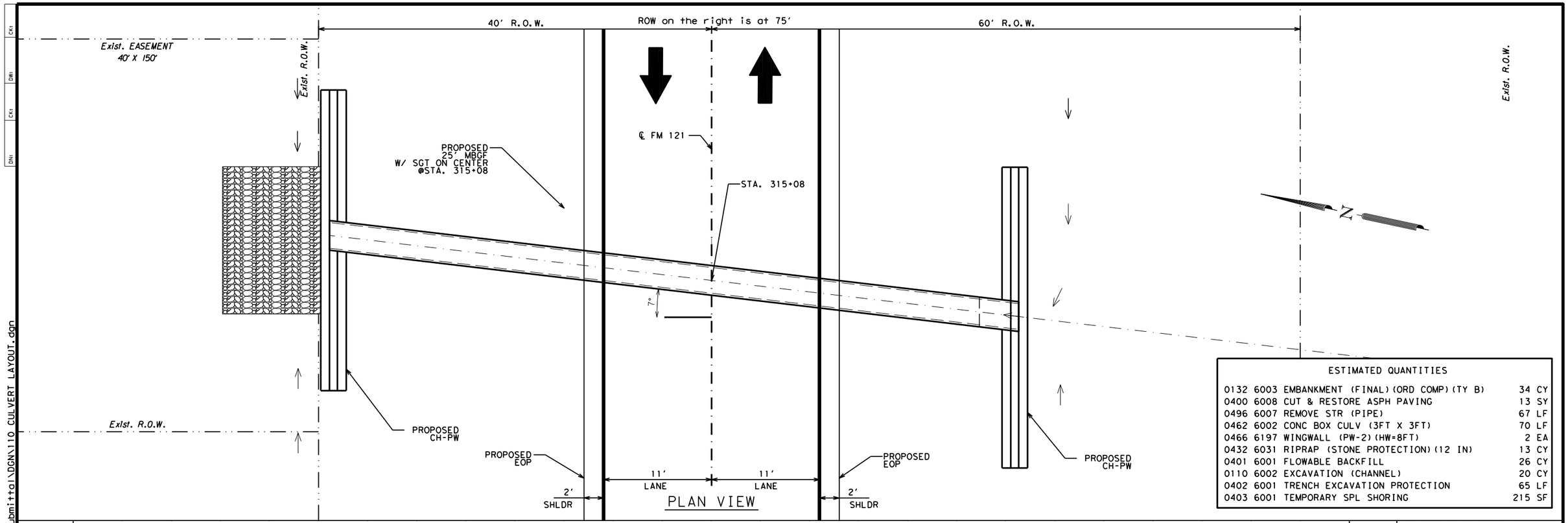

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213608.46
E: 2585181.01
ELEV: 714.76

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 315+08

SHEET 18 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		110

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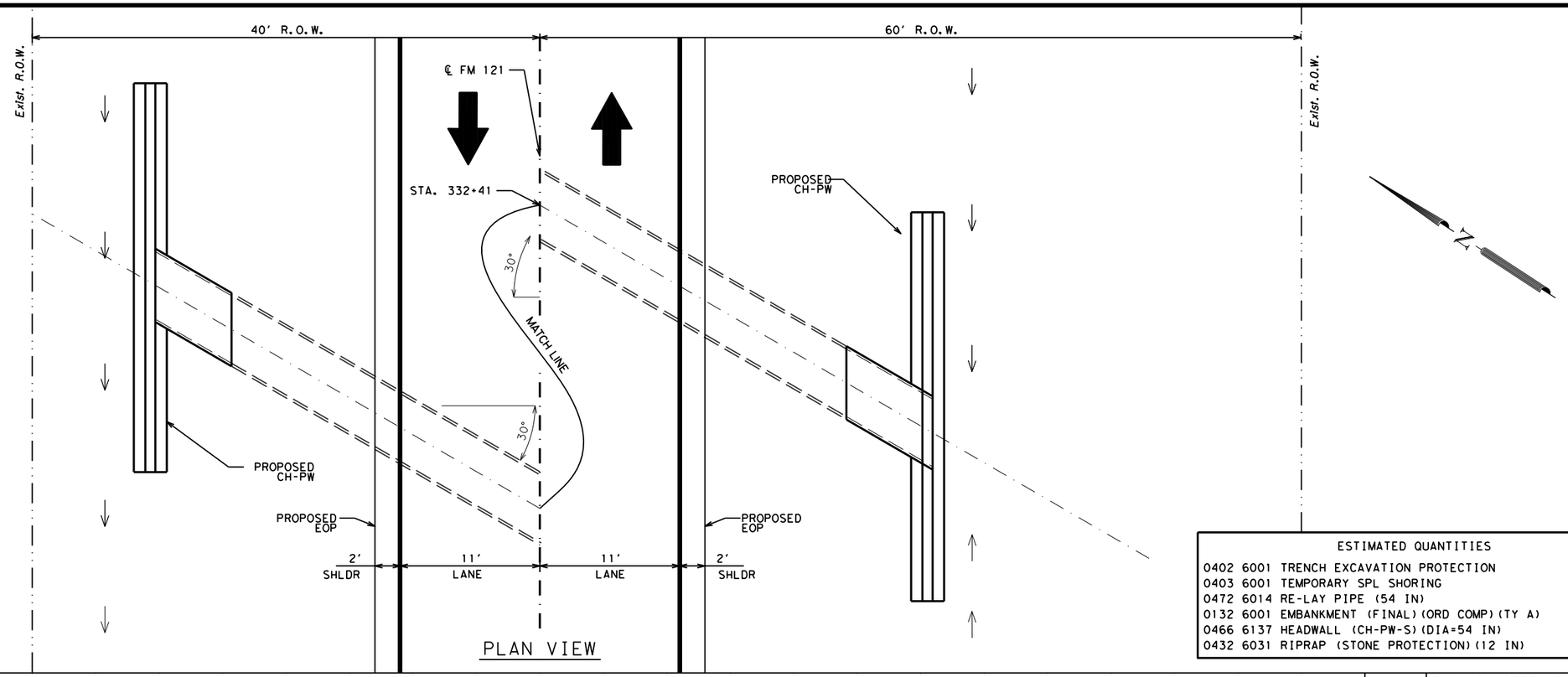
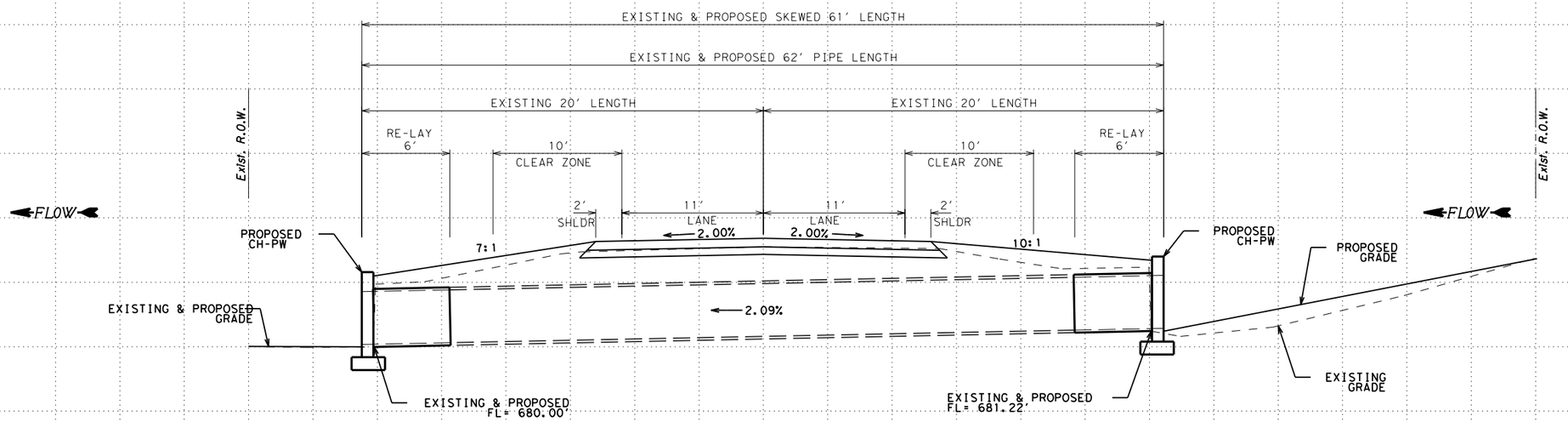


PLAN VIEW

ESTIMATED QUANTITIES		
0402 6001	TRENCH EXCAVATION PROTECTION	14 LF
0403 6001	TEMPORARY SPL SHORING	8 SF
0472 6014	RE-LAY PIPE (54 IN)	12 LF
0132 6001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	14 CY
0466 6137	HEADWALL (CH-PW-S)(DIA=54 IN)	2 EA
0432 6031	RIPRAP (STONE PROTECTION)(12 IN)	7 CY

STANDARDS: CH-PW-S



STA 332+41

EXISTING
62' X 54" RCP FL 30° LF

PROPOSED
RELAYING 12' X 54" RCP FL 30° LF
CH-PW US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2: STEEL ROD
W/BLUE CAP STAMPED
N: 7214079.08
E: 2586869.51
ELEV: 684.63

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 332+41

SHEET 19 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		111

DATE: 1/16/2023 1:26:44 AM
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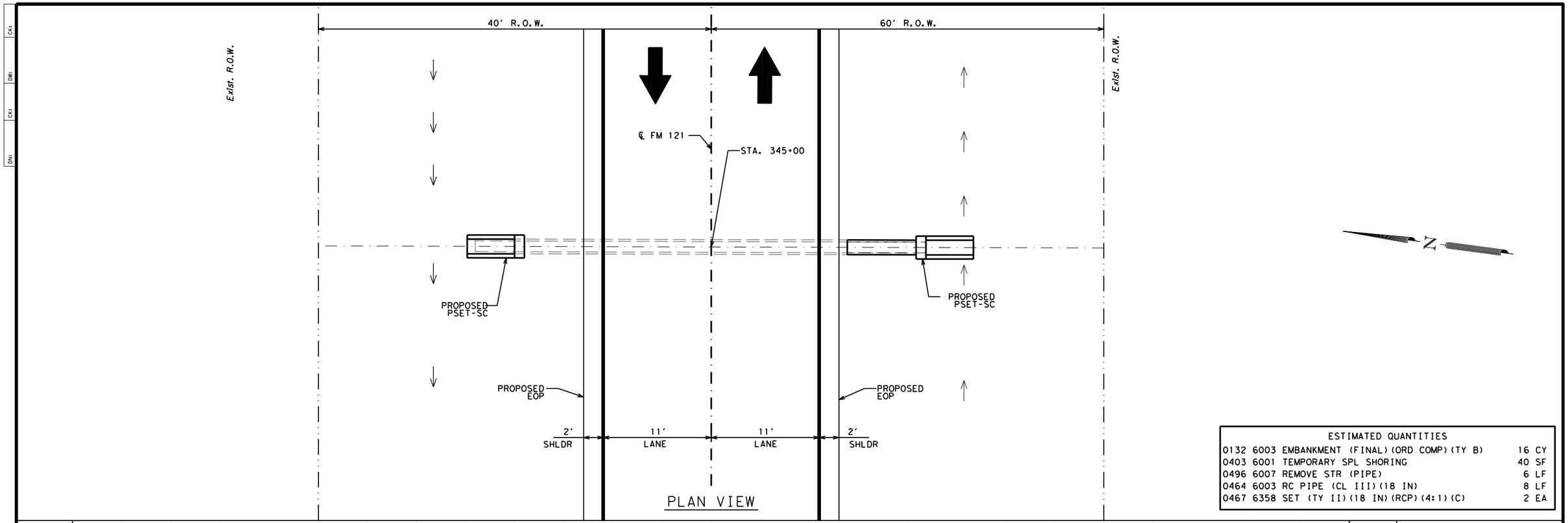
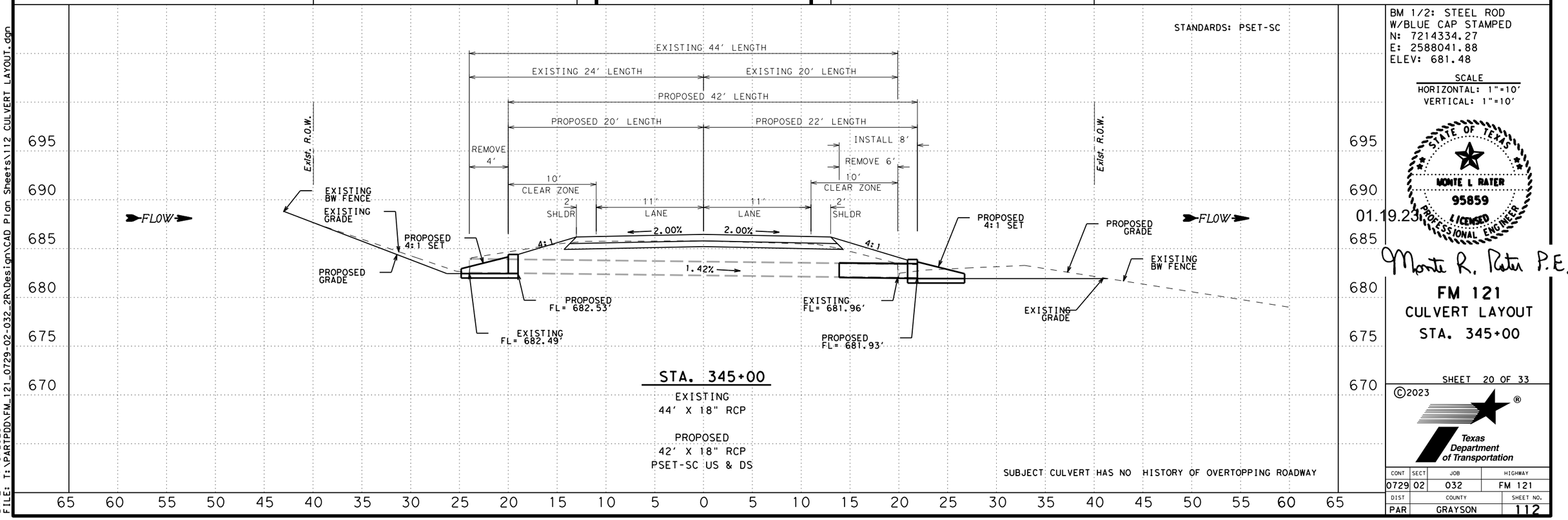
CK:
DW:
CK:
DN:



PLAN VIEW

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	16 CY
0403 6001 TEMPORARY SPL SHORING	40 SF
0496 6007 REMOVE STR (PIPE)	6 LF
0464 6003 RC PIPE (CL III)(18 IN)	8 LF
0467 6358 SET (TY II)(18 IN)(RCP)(4:1)(C)	2 EA



STA. 345+00

EXISTING
44' X 18" RCP

PROPOSED
42' X 18" RCP
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2: STEEL ROD
W/BLUE CAP STAMPED
N: 7214334.27
E: 2588041.88
ELEV: 681.48

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.19.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 345+00

SHEET 20 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		112

DATE: 1/19/2023 12:30:17 AM
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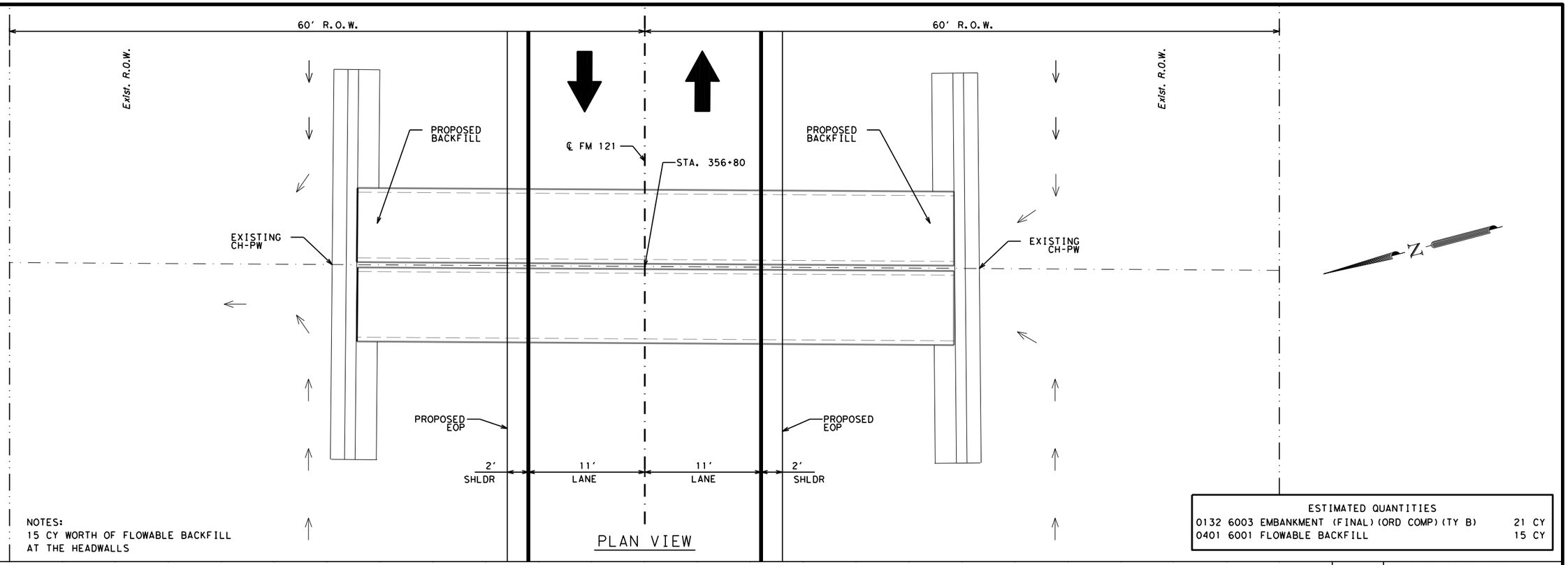
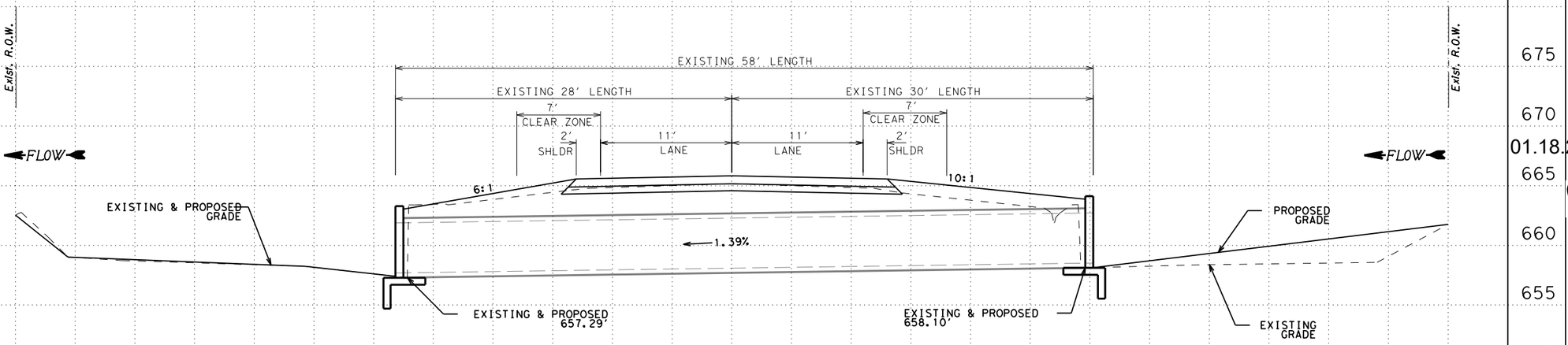


ESTIMATED QUANTITIES

0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	21 CY
0401 6001 FLOWABLE BACKFILL	15 CY



STA. 356+80

EXISTING
2 - 7' X 5' BOX CULVERT

PROPOSED
FLOWABLE BACKFILL

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7214405.19
E: 2589154.15
ELEV: 662.99

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 356+80

SHEET 21 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		113

DATE: 1/16/2023 1:26:56 AM
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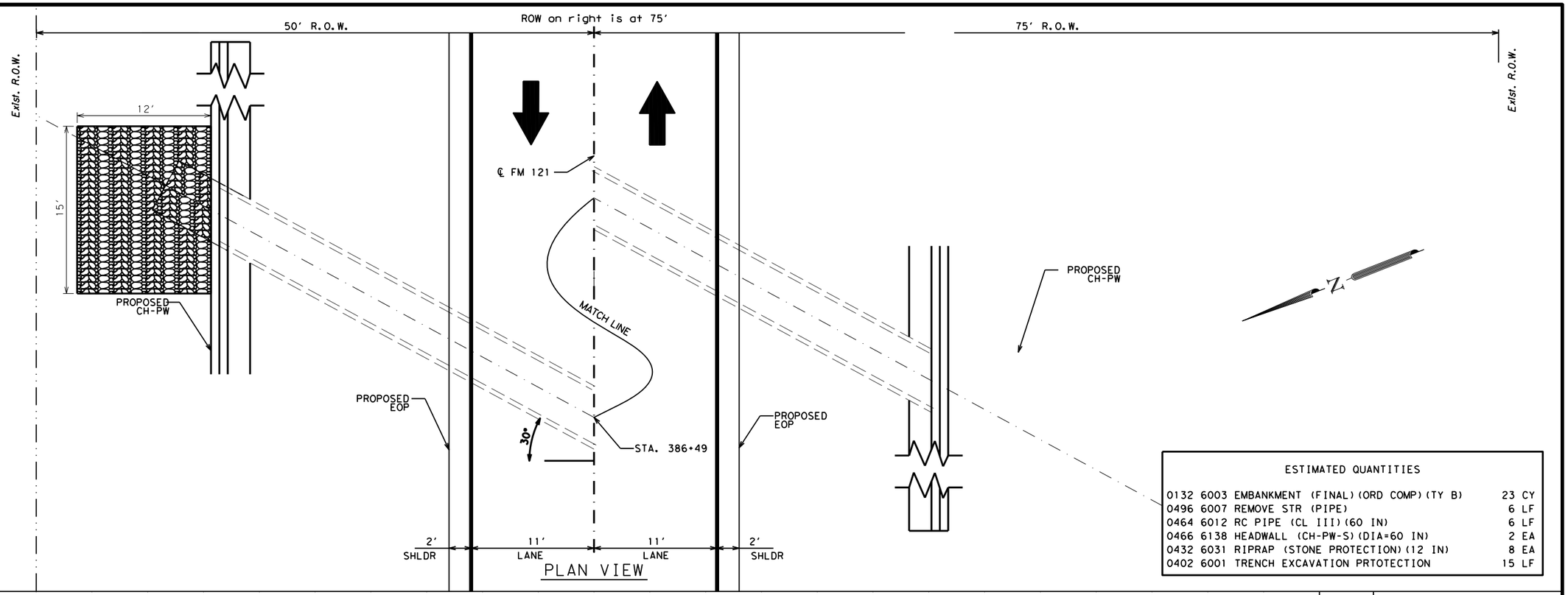
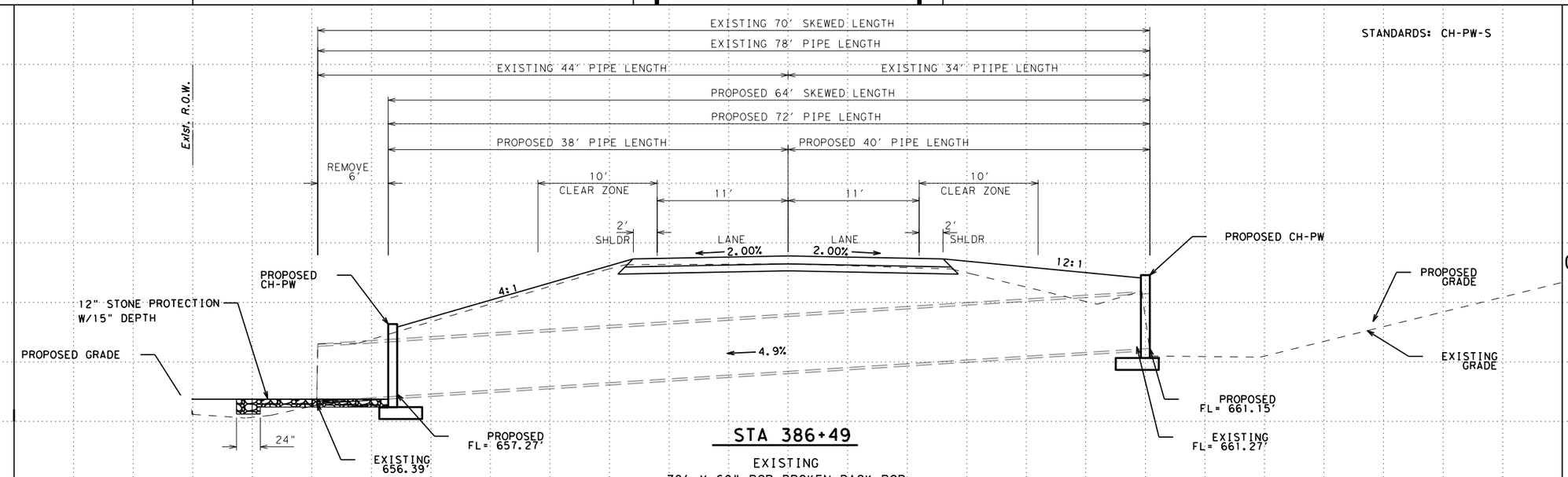


ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	23 CY
0496 6007	REMOVE STR (PIPE)	6 LF
0464 6012	RC PIPE (CL III)(60 IN)	6 LF
0466 6138	HEADWALL (CH-PW-S)(DIA=60 IN)	2 EA
0432 6031	RIPRAP (STONE PROTECTION)(12 IN)	8 EA
0402 6001	TRENCH EXCAVATION PRTOTECTION	15 LF



STA 386+49

EXISTING
78' X 60" RCP BROKEN BACK RCP

PROPOSED
72' X 60" RCP
INSTALL 8'RCP US REMOVE 6'RCP DS
CH-PW US & DS

STANDARDS: CH-PW-S

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7212988.51
e. 2591786.64

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 386+49

SHEET 22 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		114

DATE: 1/16/2023 9:10:25 AM
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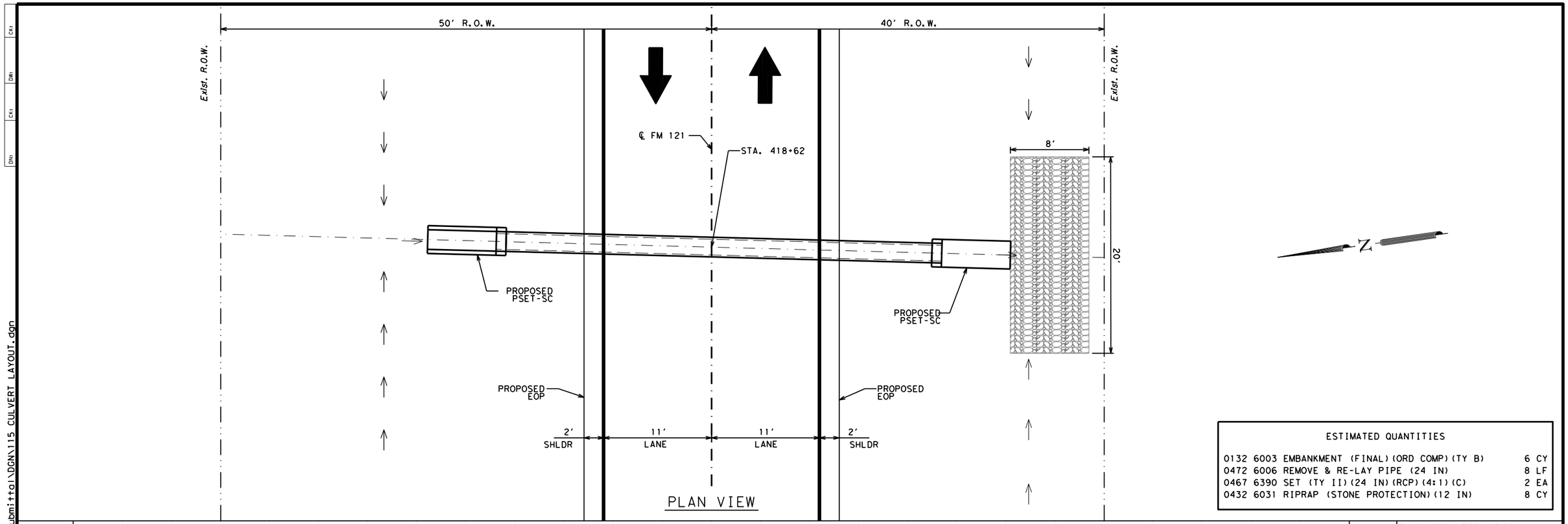
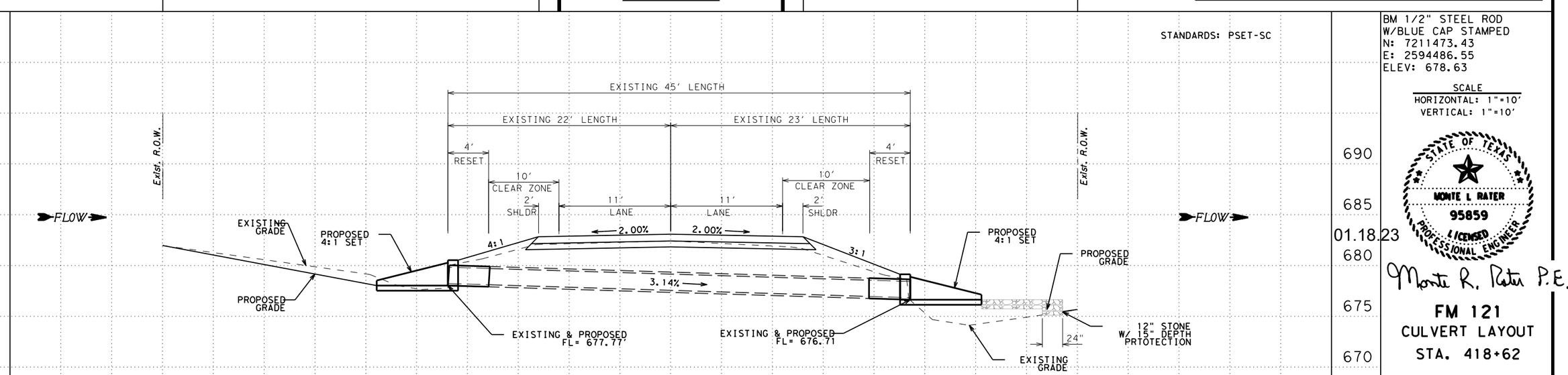


ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	6 CY
0472 6006 REMOVE & RE-LAY PIPE (24 IN)	8 LF
0467 6390 SET (TY II) (24 IN) (RCP) (4:1) (C)	2 EA
0432 6031 RIPRAP (STONE PROTECTION) (12 IN)	8 CY



STA. 418+62

EXISTING
45' X 24" RCP

PROPOSED
RE-LAY 45' X 24" RCP US & DS
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7211473.43
E: 2594486.55
ELEV: 678.63

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 418+62

SHEET 23 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		115

DATE: 1/17/2023 2:31:53 AM
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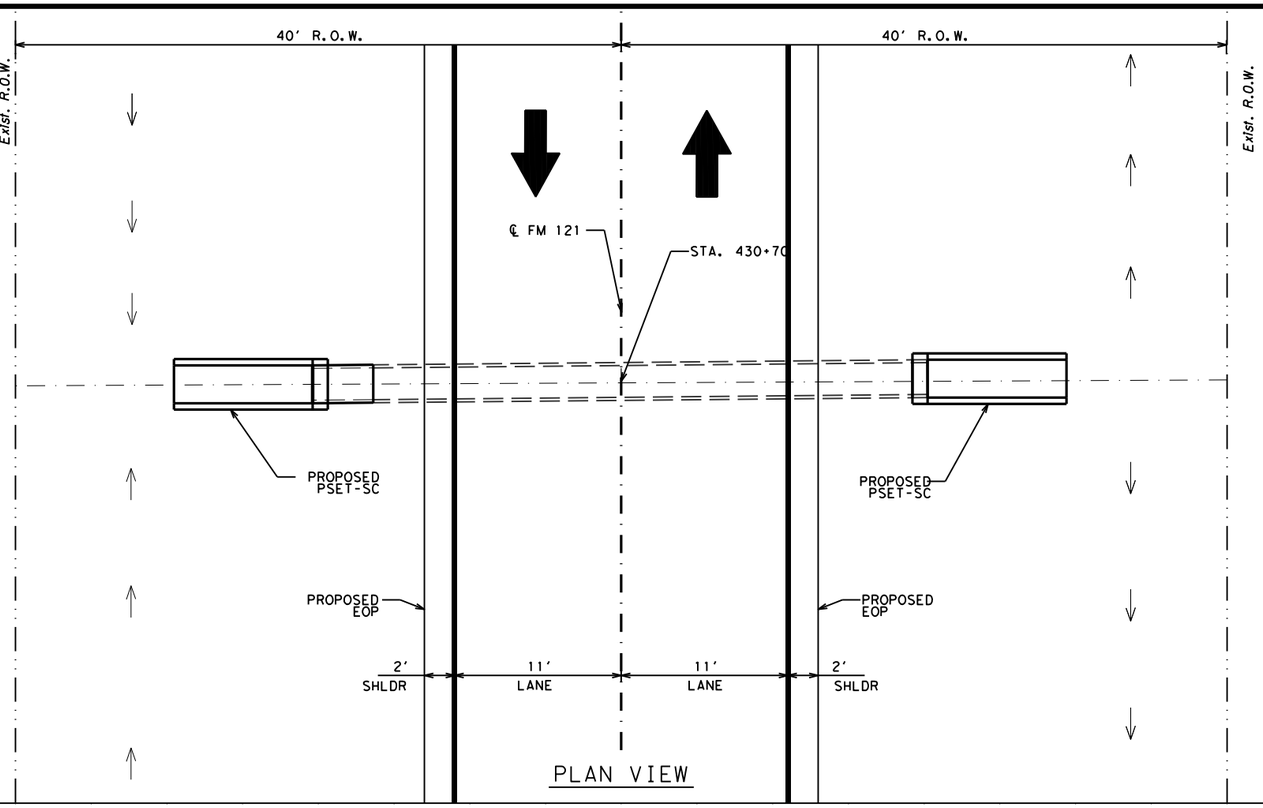
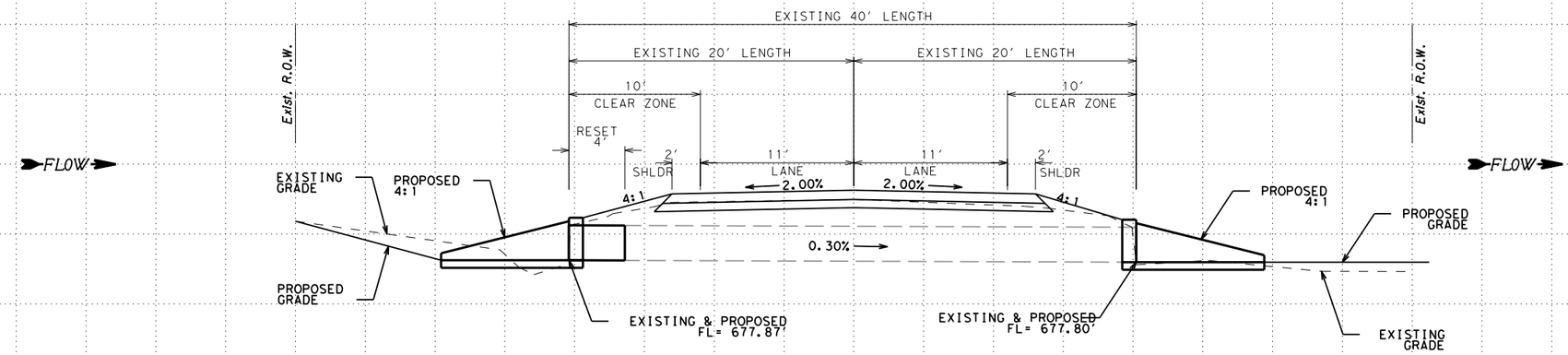


PLAN VIEW

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	9 CY
0472 6008 REMOVE & RE-LAY PIPE (30 IN)	4 LF
0467 6419 SET (TY II)(30 IN)(RCP)(4:1)(C)	2 EA

STANDARDS: PSET-SC



STA 430+70

EXISTING
40' X 30" RCP

PROPOSED
40 X 30" RCP US
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7211262.62
E: 2595600.52
ELEV: 680.16

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 430+70

SHEET 24 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		116

DATE: 1/17/2023 2:31:55 AM
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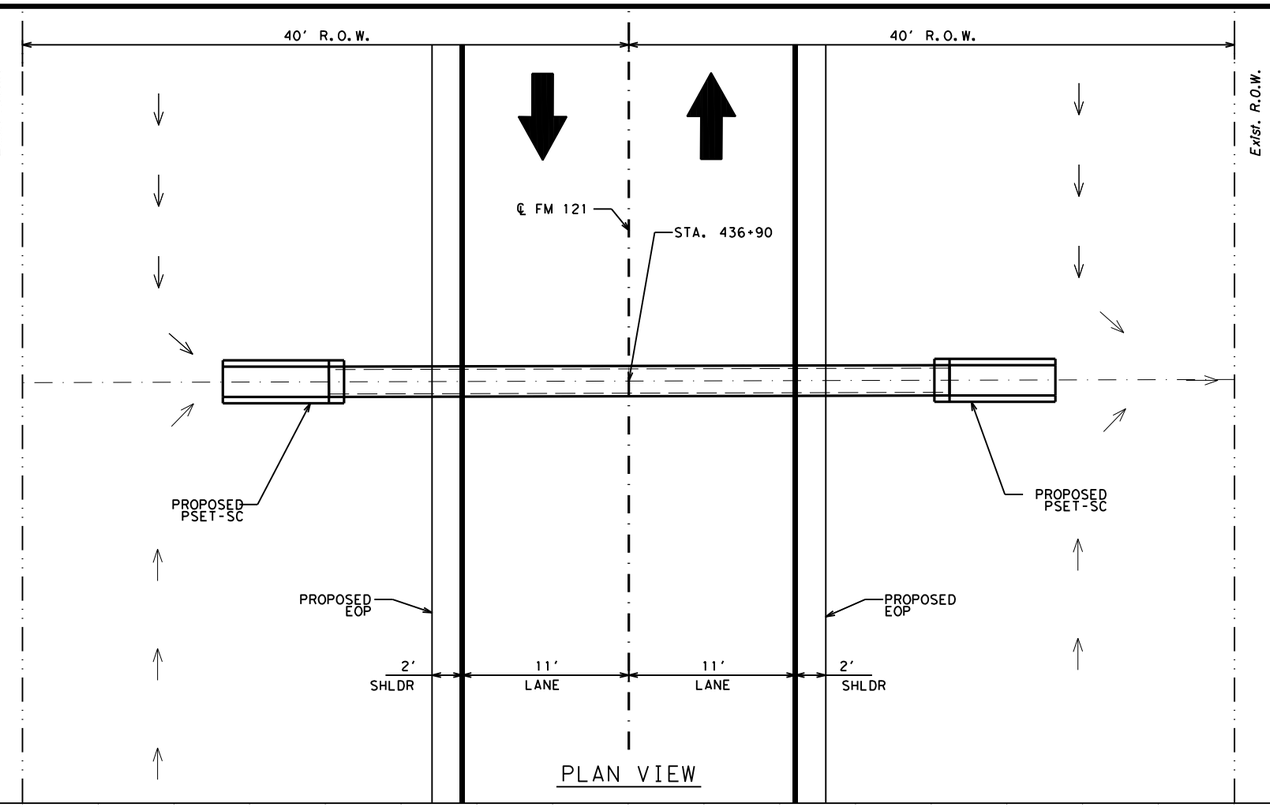
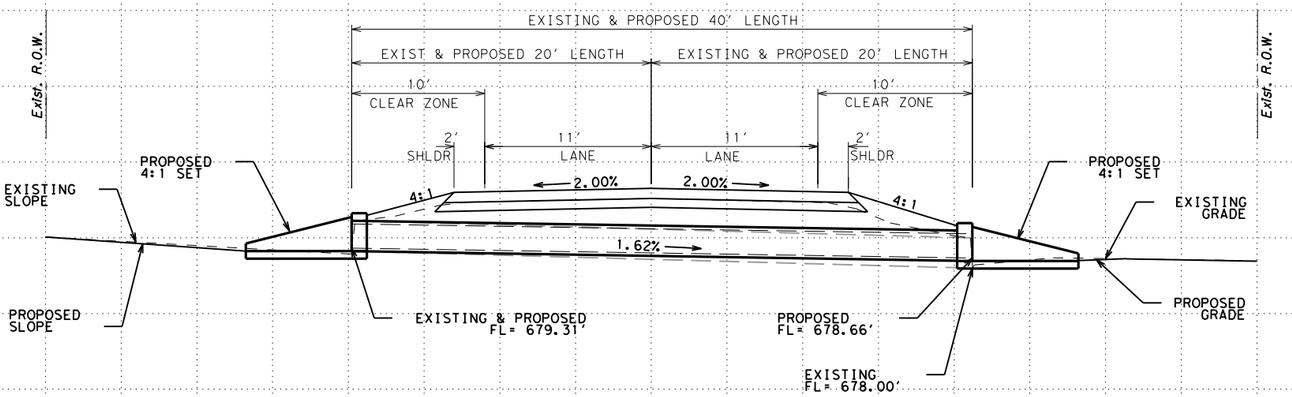


PLAN VIEW

N

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	7 CY
0400 6008 CUT & RESTORE ASPH PAVING	13 SY
0496 6007 REMOVE STR (PIPE)	40 LF
0464 6005 RC PIPE (CL III)(24 IN)	40 LF
0467 6390 SET (TY II)(24 IN)(RCP)(4:1)(C)	2 EA
0401 6001 FLOWABLE BACKFILL	5 CY



STA. 436+90

EXISTING
40' X 24" RCP

PROPOSED
40' X 24" RCP
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: PSET-SC

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM RAILROAD SPIKE
IN W SIDE OF PP
N: 7211216.91
E: 2596276.29
ELEV: 682.21

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 436+90

SHEET 25 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		117

DATE: 1/16/2023 1:27:20 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\117 CULVERT LAYOUT.dgn

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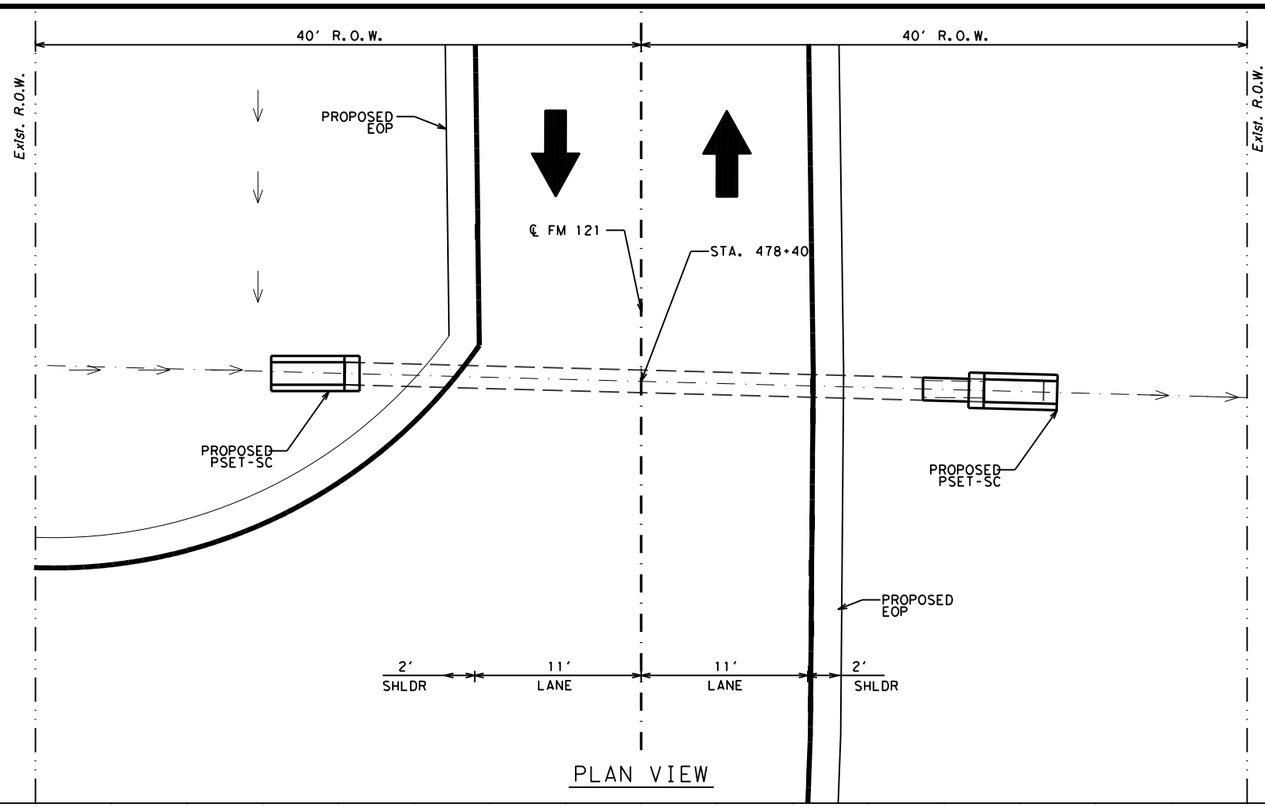
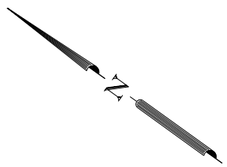


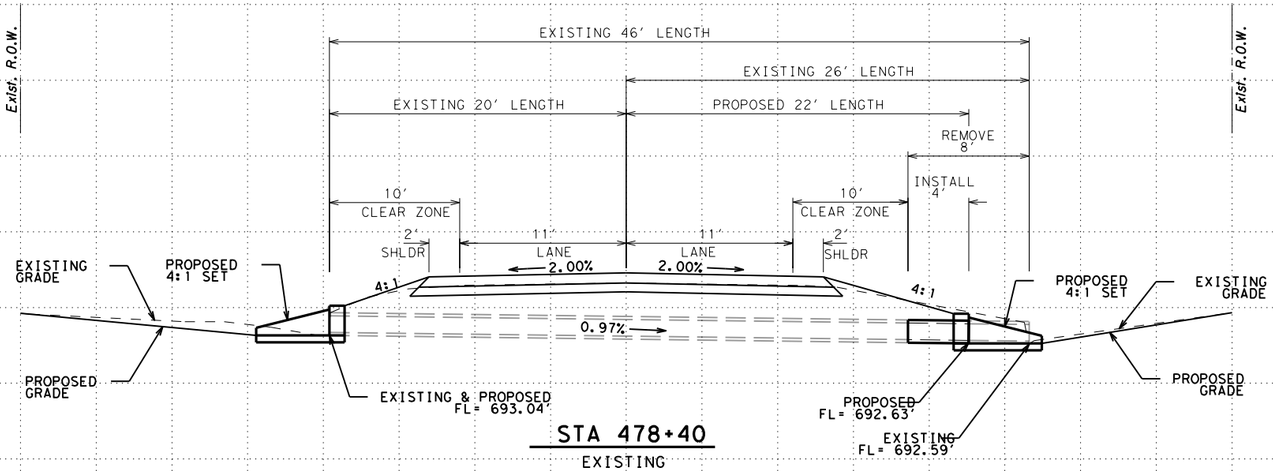
PLAN VIEW



ESTIMATED QUANTITIES

0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	9 CY
0496 6007 REMOVE STR (PIPE)	8 LF
0464 6003 RC PIPE (CL III)(18 IN)	4 LF
0467 6358 SET (TY II)(18 IN)(RCP)(4:1)(C)	2 EA

STANDARDS: PSET-SC



STA 478+40

EXISTING
46' X 18" RCP

PROPOSED
42' X 18" RCP DS
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7211774.49
E: 2600239.01
ELEV: 694.46

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 478+40

SHEET 26 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		118

DATE: 1/16/2023 1:27:26 AM
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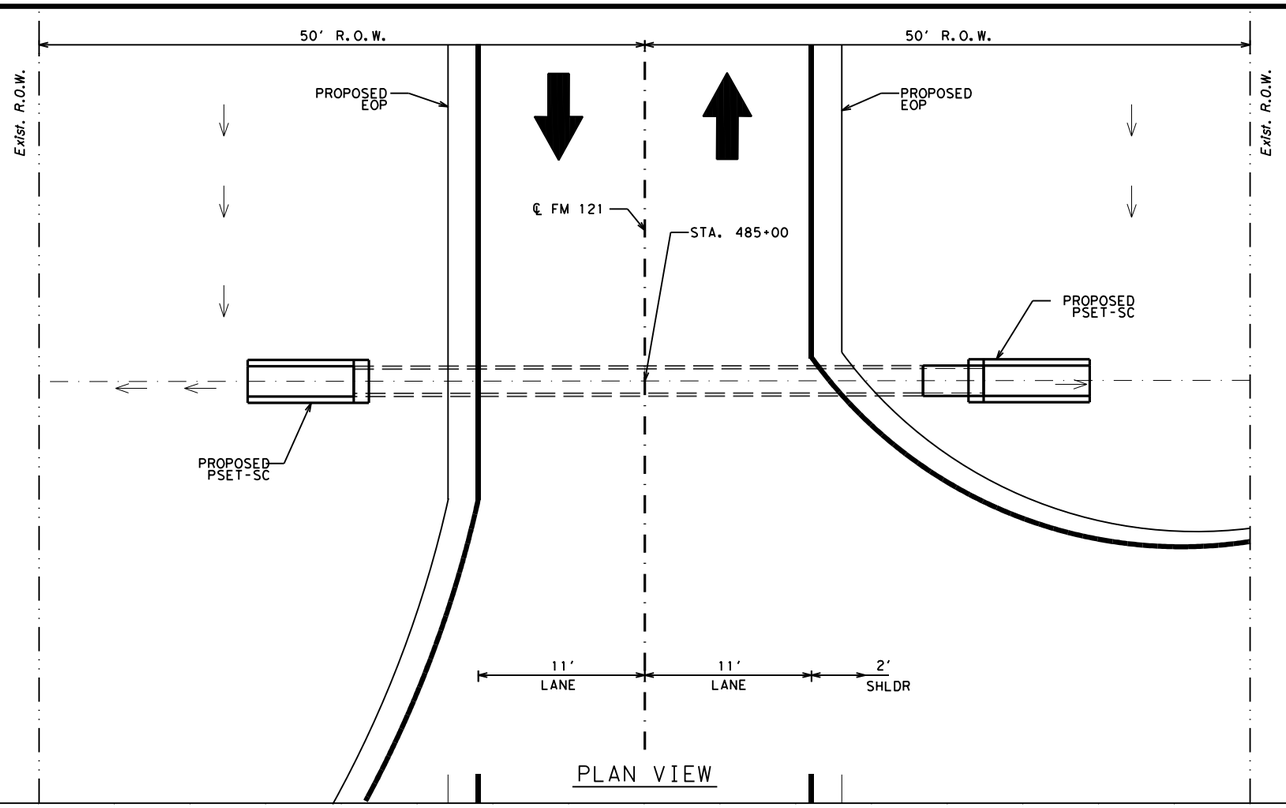
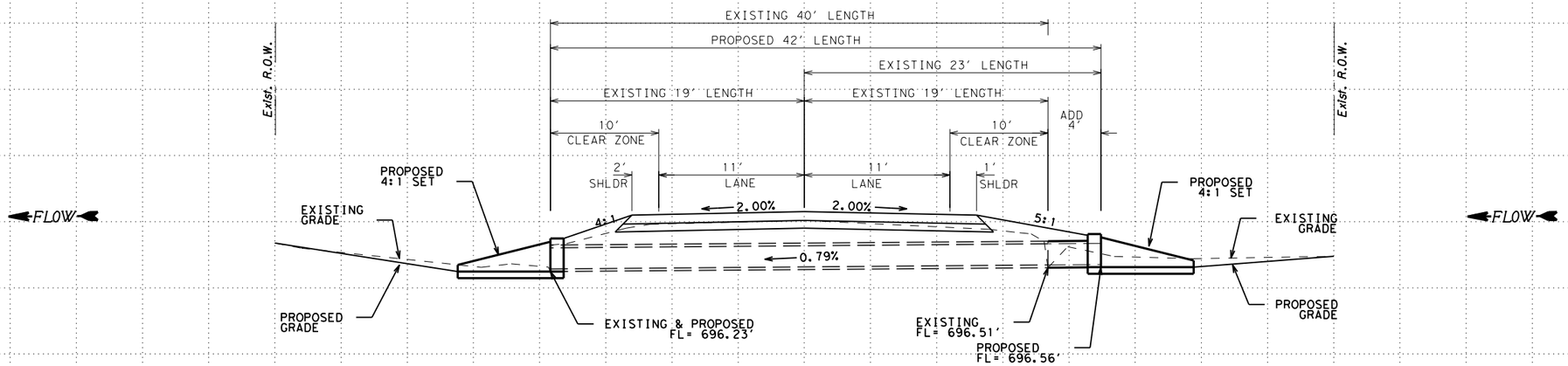


PLAN VIEW

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	9 CY
0467 6390 SET (TY II) (24 IN) (RCP) (4:1) (C)	2 EA

STANDARDS: PSET-SC



STA. 485+00

EXISTING
40' X 24" RCP

PROPOSED
44' X 24" RCP
PSET-SC US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7212285.51
E: 2600449.78
ELEV: 698.24

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 485+00

SHEET 27 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		119

DATE: 1/17/2023 2:31:56 AM
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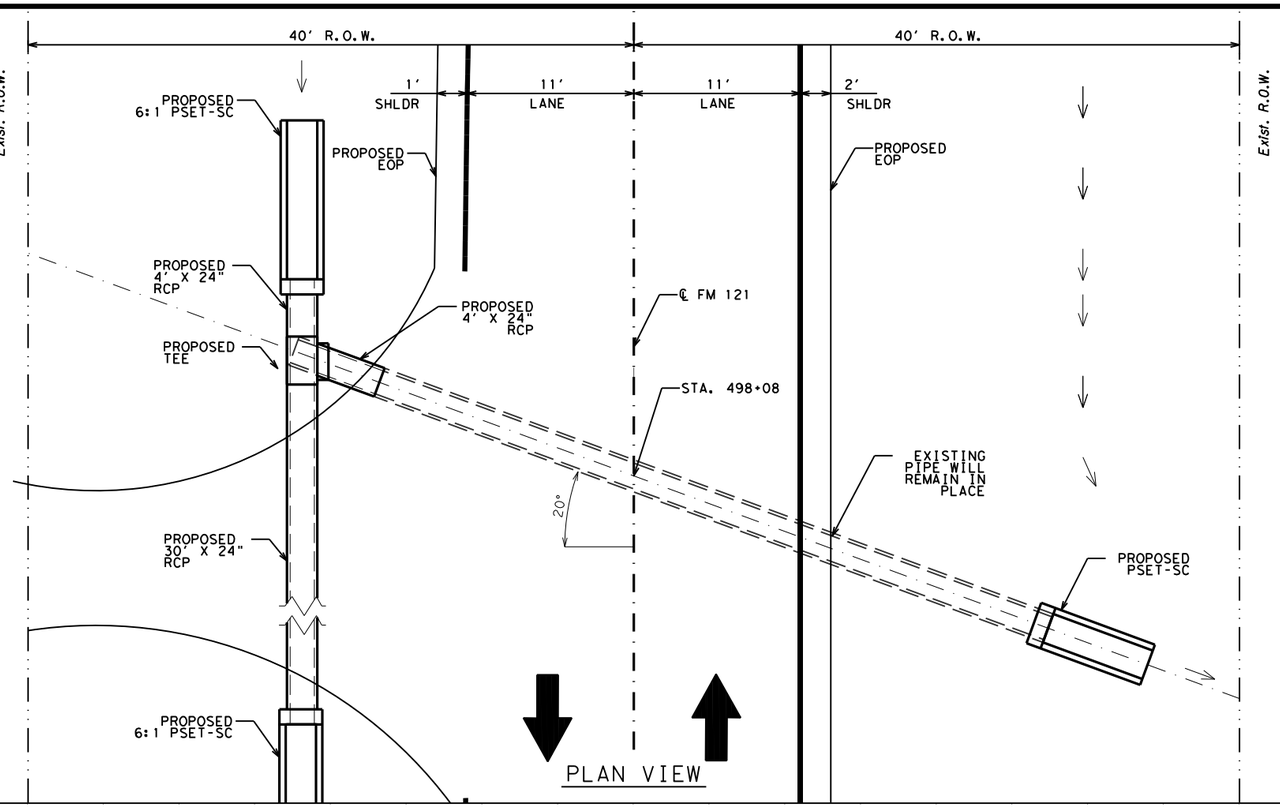
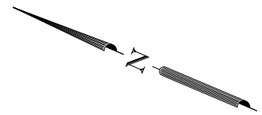
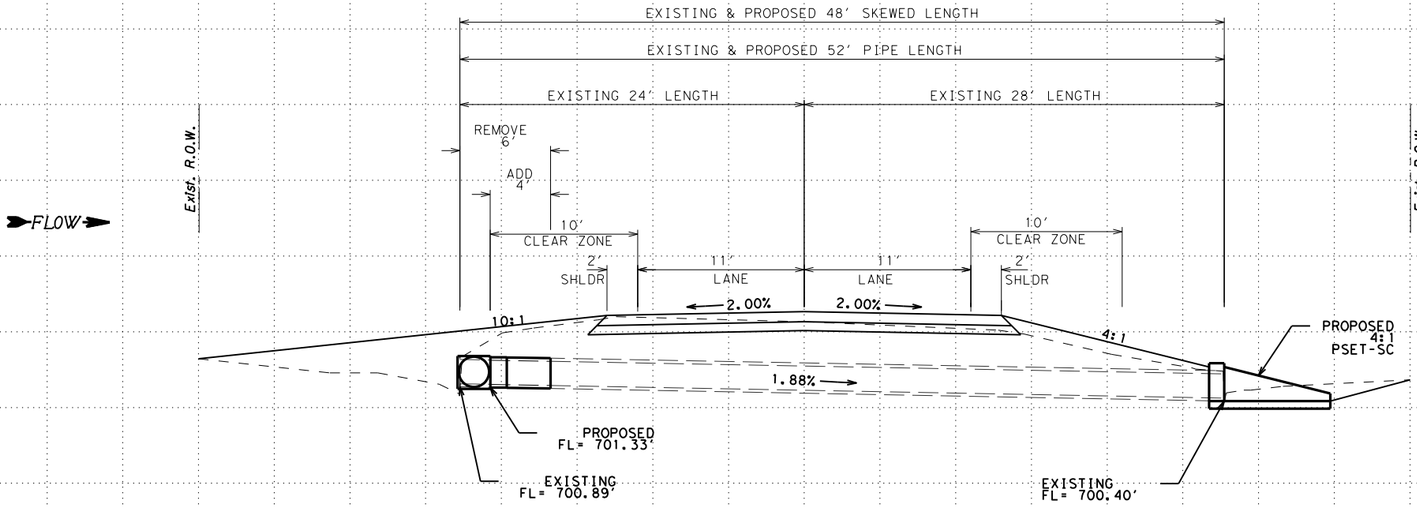




ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL) (ORD COMP) (TY B)	10 CY
0496 6007	REMOVE STR (PIPE)	6 LF
0464 6005	RC PIPE (CL III) (24 IN)	46 LF
0467 6390	SET (TY II) (24 IN) (RCP) (4:1) (C)	1 EA
0467 6395	SET (TY II) (24 IN) (RCP) (6:1) (P)	2 EA

STANDARDS: PSET-SC



STA. 498+08

EXISTING
52' X 24" RCP

PROPOSED
PSET-SC US & DS
INSTALL 46' CONNECTED TEE

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213344.67
E: 2601298.76
ELEV: 705.03

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 498+08

SHEET 28 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		120

DATE: 1/17/2023 2:31:57 AM
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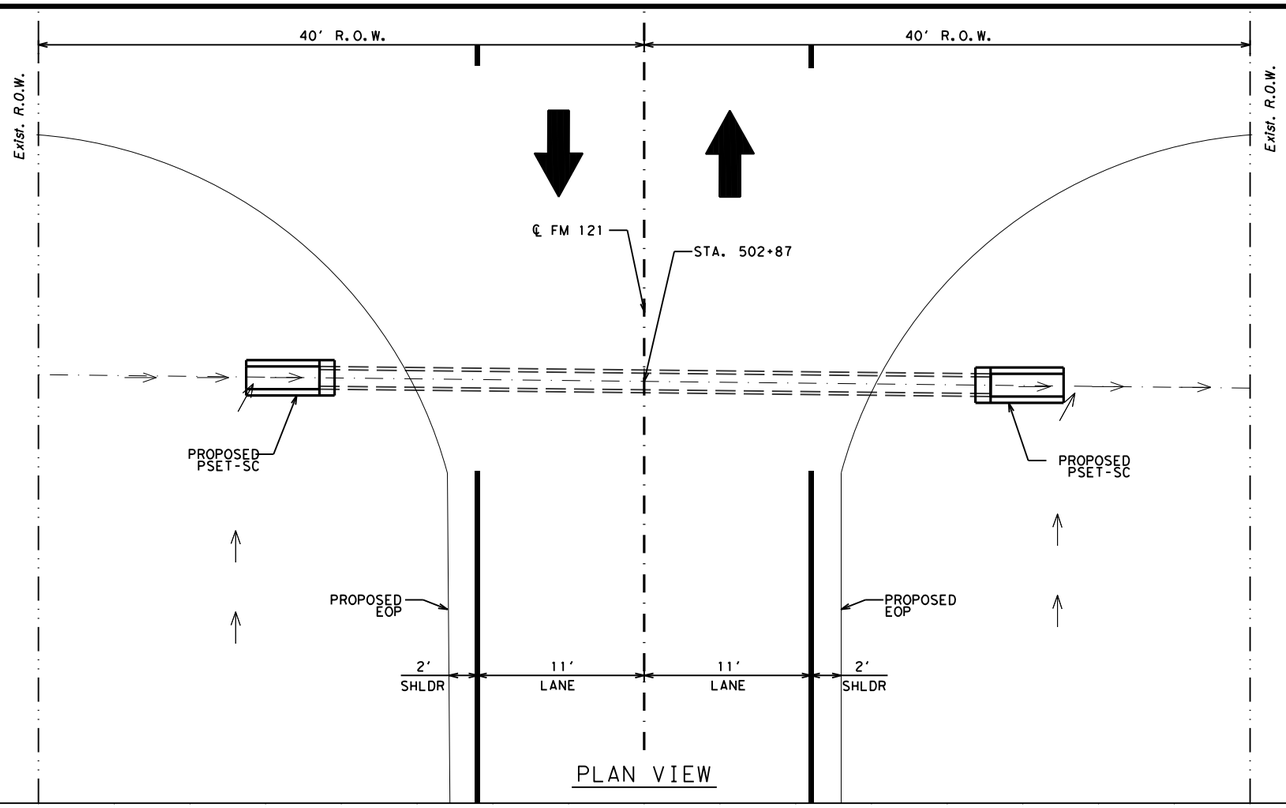
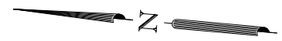
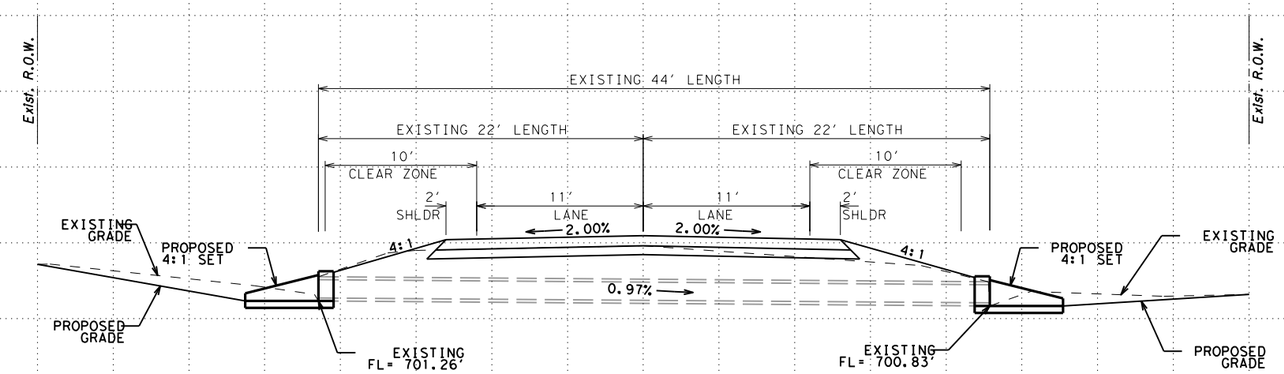


PLAN VIEW



ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	11 CY
0467 6358 SET (TY II) (18 IN) (RCP) (4:1) (C)	2 EA



STA 502+87

EXISTING
44' X 18" RCP

PROPOSED
44' x 18" rcp PSET-SC US & DS

STANDARDS: PSET-SC

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213359.58
E: 2601779.69
ELEV: 702.83

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 502+87

SHEET 29 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		121

DATE: 1/16/2023 1:27:43 AM
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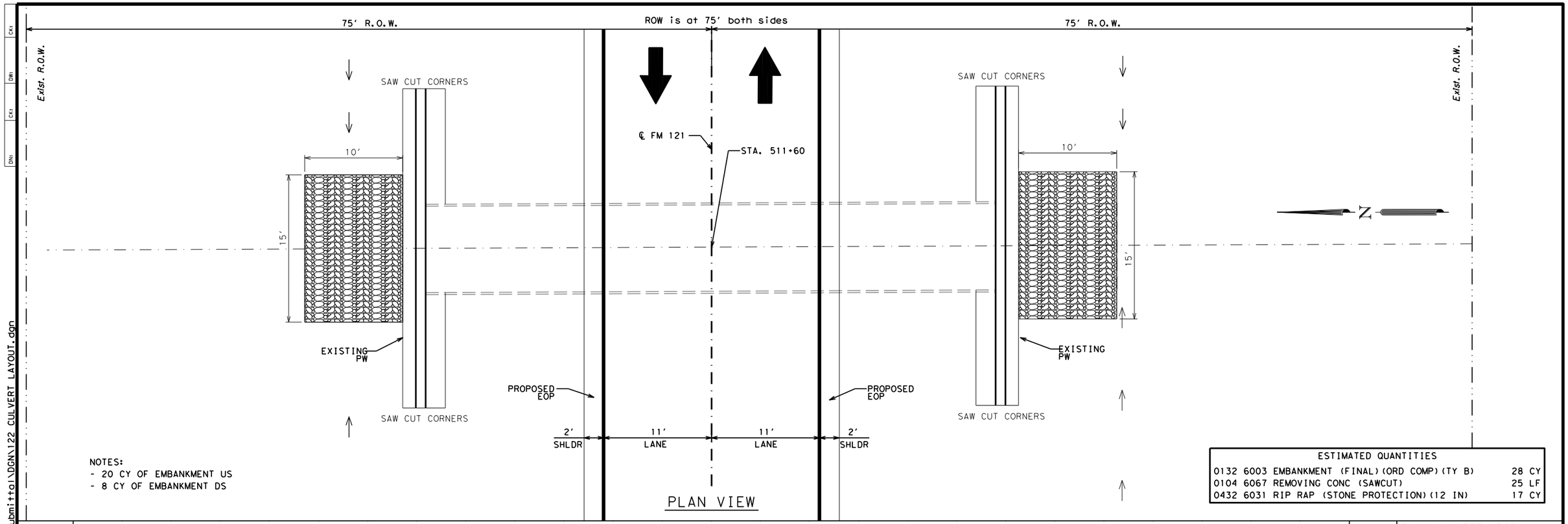

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213449.19
E: 2602765.77
ELEV: 668.06

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 511+60

SHEET 30 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		122

DATE: 1/16/2023 1:27:48 AM
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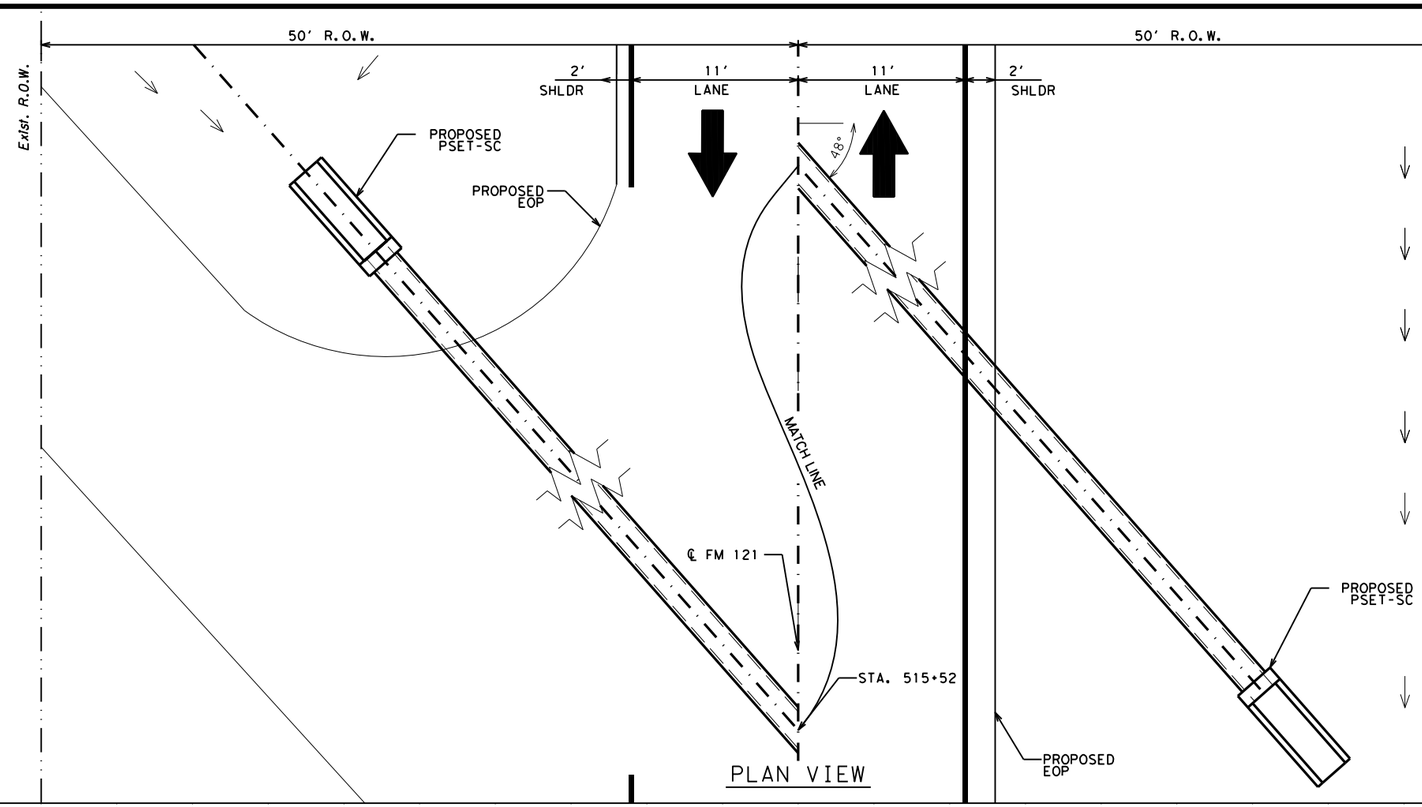
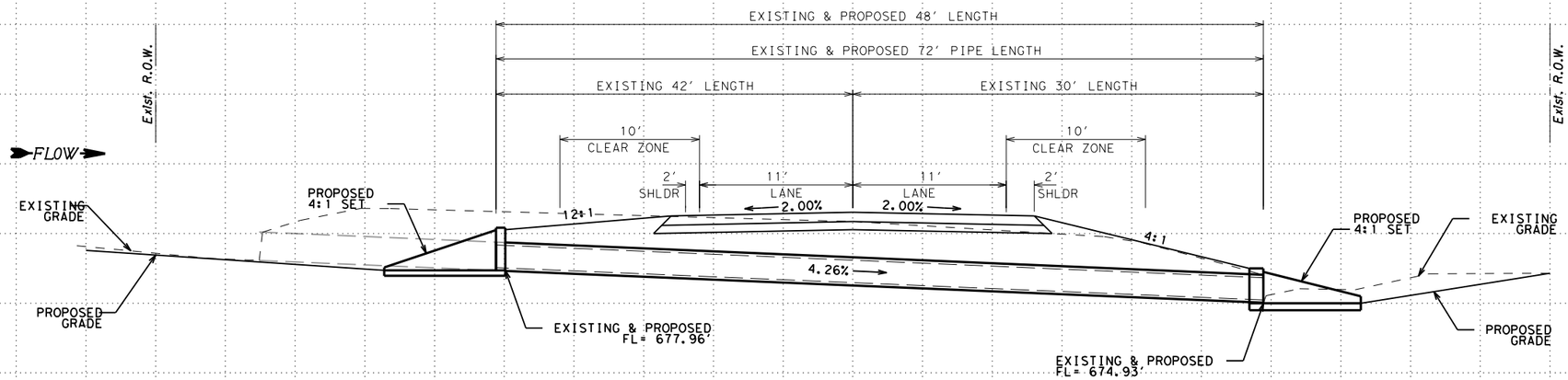


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	10 CY
0496 6008	CUT & RESTORE ASPH PAVING	12 SY
0400 6008	REMOVE STR (PIPE)	72 LF
0464 6005	RC PIPE (CL III)(24 IN)	72 LF
0467 6390	SET (TY II)(24 IN)(RCP)(4:1)(C)	2 EA
0401 6001	FLOWABLE BACKFILL	8 CY
0402 6001	TRENCH EXCAVATION PROTECTION	45 LF
0403 6001	TEMPORARY SPL SHORING	24 SF

STANDARDS: PSET-SC, CH-FW-S



STA 515+52

EXISTING
71' X 24" CMP

PROPOSED
71' X 24' RCP
CH-FW-S US & PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213460.79
E: 2603063.43
ELEV: 679.08

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 515+52

SHEET 31 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		123

DATE: 1/17/2023 2:31:58 AM
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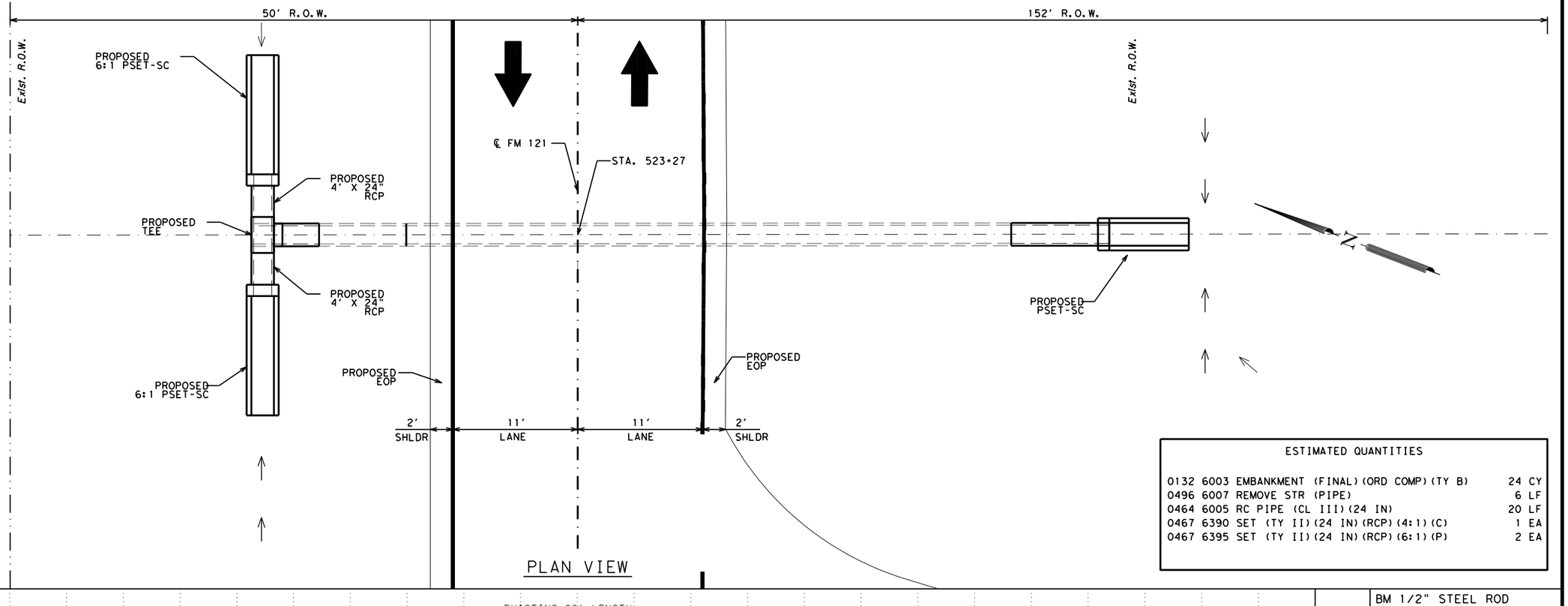
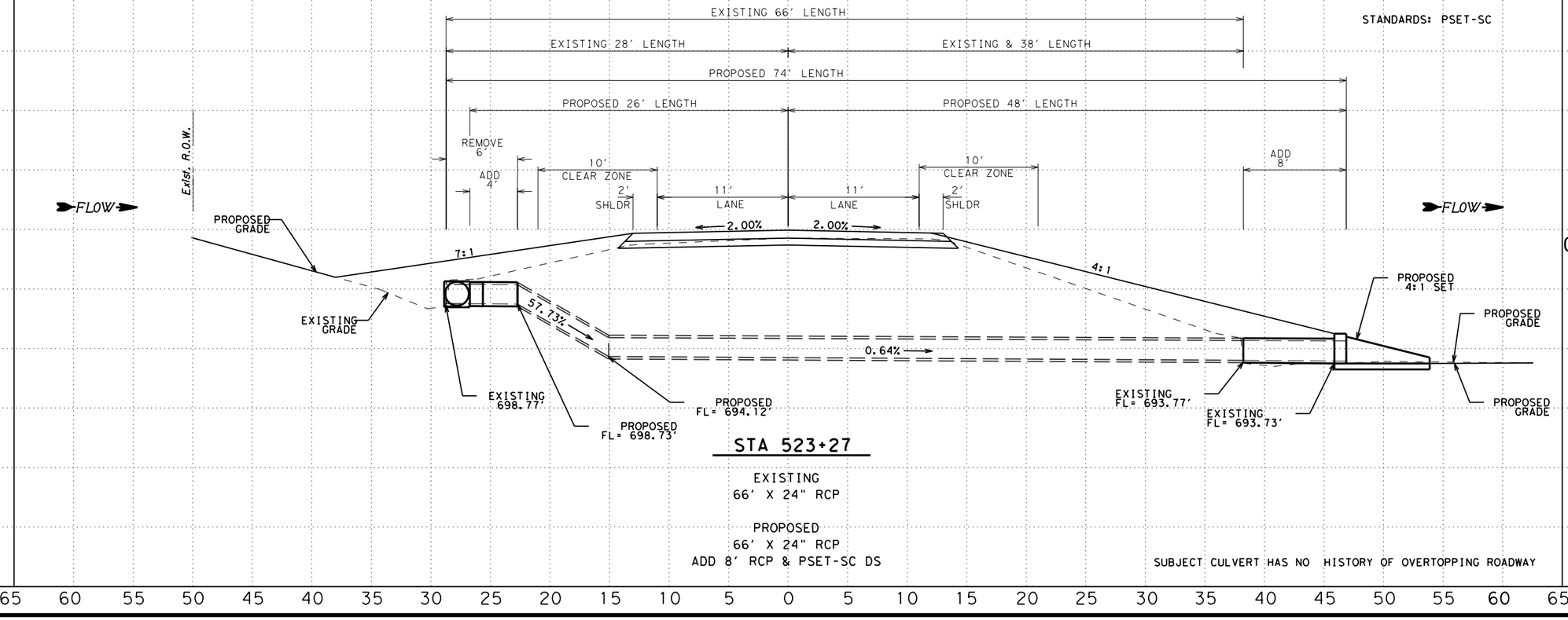


PLAN VIEW

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	24 CY
0496 6007 REMOVE STR (PIPE)	6 LF
0464 6005 RC PIPE (CL III) (24 IN)	20 LF
0467 6390 SET (TY II) (24 IN) (RCP) (4:1) (C)	1 EA
0467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P)	2 EA



STA 523+27

EXISTING
66' X 24" RCP

PROPOSED
66' X 24" RCP
ADD 8' RCP & PSET-SC DS

STANDARDS: PSET-SC

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213544.96
E: 2603822.41
ELEV: 703.31

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 523+27

SHEET 32 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		124

DATE: 1/17/2023 2:32:00 AM
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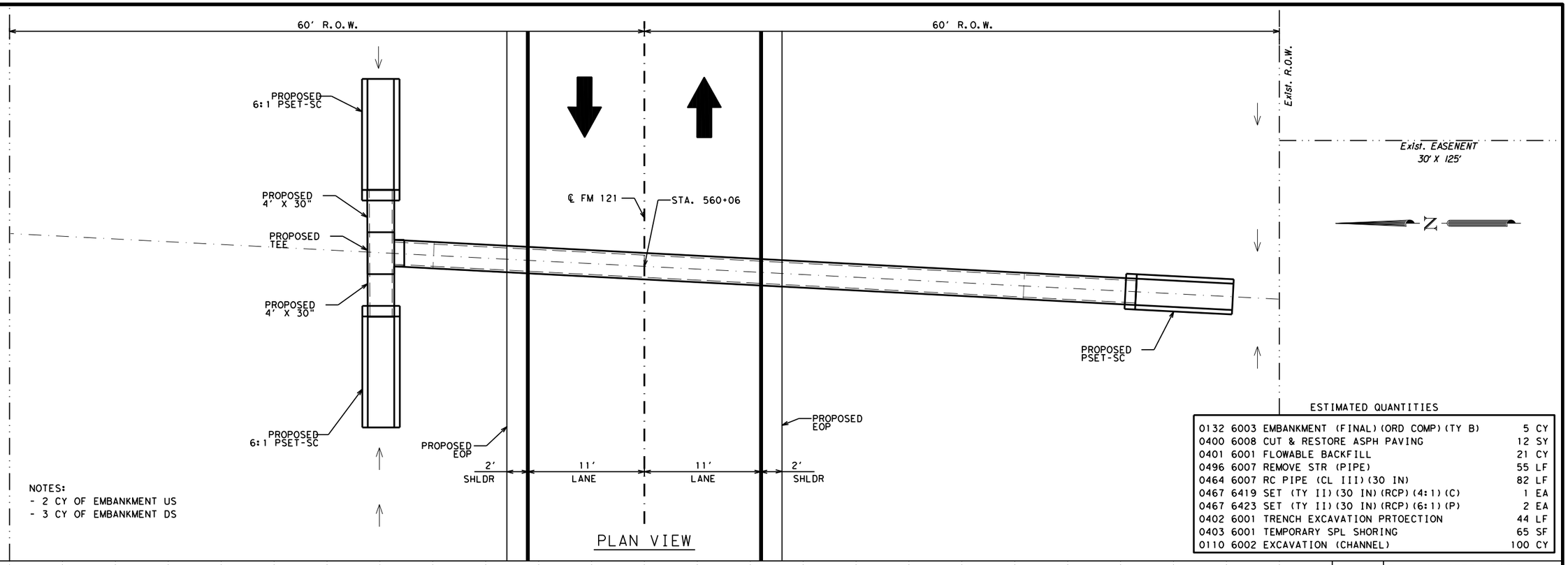
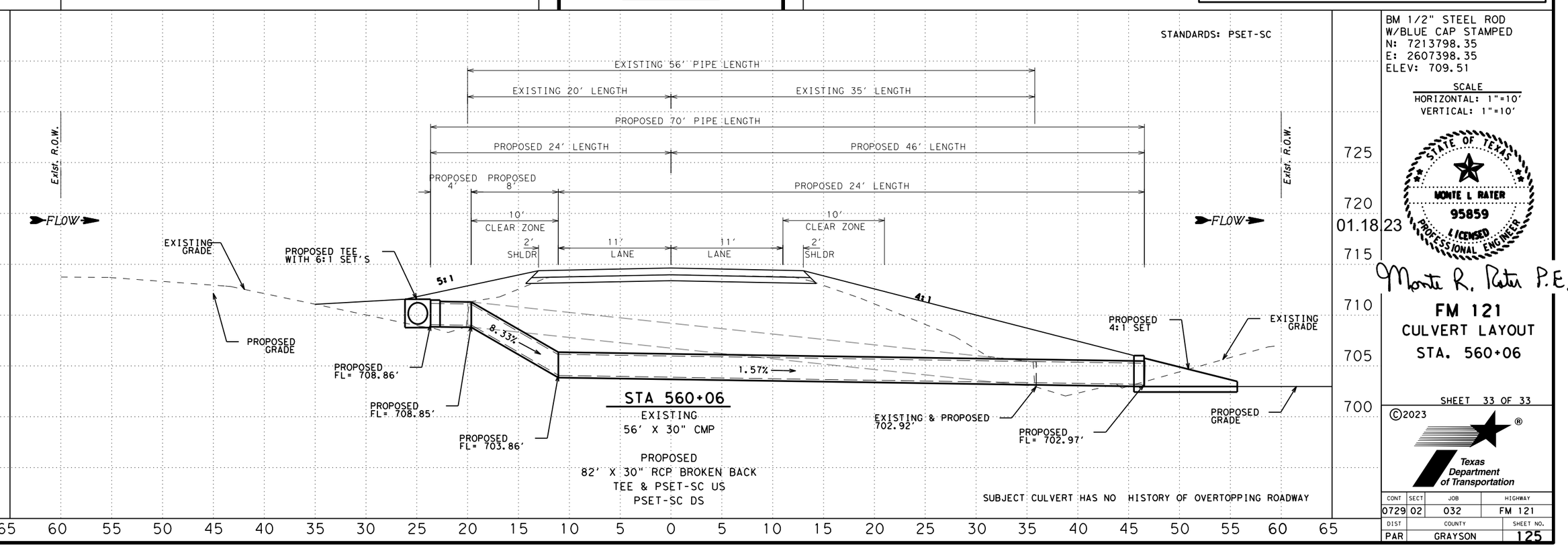


ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	5 CY
0400 6008	CUT & RESTORE ASPH PAVING	12 SY
0401 6001	FLOWABLE BACKFILL	21 CY
0496 6007	REMOVE STR (PIPE)	55 LF
0464 6007	RC PIPE (CL III)(30 IN)	82 LF
0467 6419	SET (TY II)(30 IN)(RCP)(4:1)(C)	1 EA
0467 6423	SET (TY II)(30 IN)(RCP)(6:1)(P)	2 EA
0402 6001	TRENCH EXCAVATION PRTOECTION	44 LF
0403 6001	TEMPORARY SPL SHORING	65 SF
0110 6002	EXCAVATION (CHANNEL)	100 CY



STA 560+06
EXISTING
56' X 30" CMP

PROPOSED
82' X 30" RCP BROKEN BACK
TEE & PSET-SC US
PSET-SC DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM 1/2" STEEL ROD
W/BLUE CAP STAMPED
N: 7213798.35
E: 2607398.35
ELEV: 709.51

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER
01.18.23

Monte R. Rater P.E.

FM 121
CULVERT LAYOUT
STA. 560+06

SHEET 33 OF 33

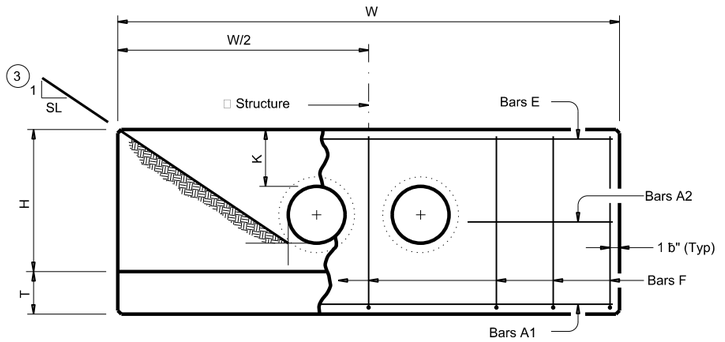
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		125

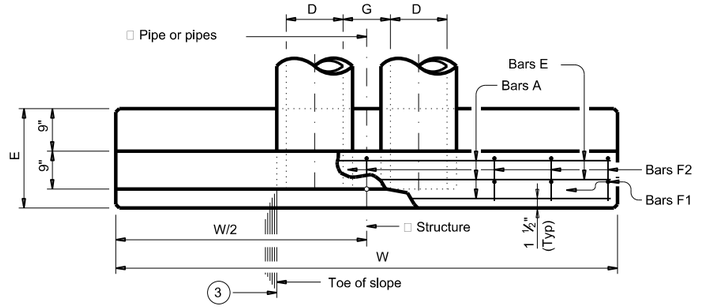
DATE: 1/16/2023 1:28:03 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\125 CULVERT LAYOUT.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

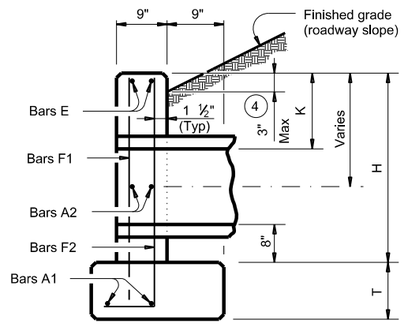
Slope	Dia of Pipe (D)	Values for One Pipe W	Values for One Pipe Reinf (Lbs) (1)	Values for One Pipe Conc (CY) (2)	Values To Be Added for Each Addt'l Pipe W	Values To Be Added for Each Addt'l Pipe Reinf (Lbs) (1)	Values To Be Added for Each Addt'l Pipe Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	0.2
	15"	10' - 3"	136	1.3	2' - 2"	16	0.2
	18"	11' - 6"	163	1.5	2' - 8"	19	0.3
	21"	12' - 9"	200	1.8	3' - 1"	31	0.4
	24"	14' - 0"	217	2.1	3' - 7"	34	0.4
	27"	15' - 3"	254	2.4	3' - 11"	37	0.5
	30"	16' - 6"	272	2.7	4' - 4"	40	0.6
	33"	17' - 9"	314	3.1	4' - 8"	43	0.6
	36"	19' - 0"	371	3.9	5' - 1"	46	0.8
	42"	21' - 6"	442	4.9	5' - 10"	52	1.0
	48"	25' - 0"	569	6.4	6' - 7"	59	1.3
	54"	27' - 6"	701	7.5	7' - 6"	82	1.6
	60"	30' - 0"	794	8.8	8' - 3"	90	1.8
	66"	32' - 6"	894	10.2	8' - 9"	96	2.0
	72"	35' - 0"	1,055	11.7	9' - 4"	103	2.3
3:1	12"	13' - 0"	175	1.6	1' - 9"	14	0.2
	15"	14' - 9"	193	1.9	2' - 2"	17	0.2
	18"	16' - 6"	228	2.2	2' - 8"	19	0.3
	21"	18' - 3"	299	2.6	3' - 1"	31	0.4
	24"	20' - 0"	323	3.0	3' - 7"	33	0.4
	27"	21' - 9"	371	3.5	3' - 11"	37	0.5
	30"	23' - 6"	415	4.0	4' - 4"	40	0.5
	33"	25' - 3"	469	4.6	4' - 8"	43	0.6
	36"	27' - 0"	556	5.7	5' - 1"	46	0.8
	42"	30' - 6"	675	7.1	5' - 10"	52	1.0
	48"	35' - 6"	837	9.2	6' - 7"	59	1.3
	54"	39' - 0"	1,015	11.0	7' - 6"	84	1.6
	60"	42' - 6"	1,171	12.9	8' - 3"	91	1.8
	66"	46' - 0"	1,298	14.9	8' - 9"	98	2.0
	72"	49' - 6"	1,561	17.1	9' - 4"	103	2.3
4:1	12"	17' - 0"	229	2.0	1' - 9"	15	0.2
	15"	19' - 3"	266	2.4	2' - 2"	17	0.2
	18"	21' - 6"	308	2.9	2' - 8"	19	0.3
	21"	23' - 9"	382	3.5	3' - 1"	31	0.3
	24"	26' - 0"	430	3.9	3' - 7"	34	0.4
	27"	28' - 3"	486	4.7	3' - 11"	37	0.5
	30"	30' - 6"	539	5.2	4' - 4"	40	0.6
	33"	32' - 9"	603	6.0	4' - 8"	42	0.6
	36"	35' - 0"	738	7.5	5' - 1"	47	0.8
	42"	39' - 6"	881	9.3	5' - 10"	52	1.0
	48"	46' - 0"	1,102	12.1	6' - 7"	61	1.3
	54"	50' - 6"	1,364	14.4	7' - 6"	84	1.6
	60"	55' - 0"	1,547	16.9	8' - 3"	91	1.8
	66"	59' - 6"	1,741	19.5	8' - 9"	98	2.0
	72"	64' - 0"	2,077	22.4	9' - 4"	102	2.3
6:1	12"	25' - 0"	336	3.0	1' - 9"	14	0.2
	15"	28' - 3"	384	3.6	2' - 2"	17	0.2
	18"	31' - 6"	452	4.2	2' - 8"	19	0.3
	21"	34' - 9"	581	5.1	3' - 1"	31	0.4
	24"	38' - 0"	644	5.8	3' - 7"	34	0.4
	27"	41' - 3"	737	6.9	3' - 11"	37	0.5
	30"	44' - 6"	807	7.7	4' - 4"	39	0.6
	33"	47' - 9"	912	8.9	4' - 8"	44	0.6
	36"	51' - 0"	1,108	11.0	5' - 1"	48	0.8
	42"	57' - 6"	1,318	13.7	5' - 10"	54	1.0
	48"	67' - 0"	1,682	17.9	6' - 7"	59	1.3
	54"	73' - 6"	2,072	21.3	7' - 6"	83	1.6
	60"	80' - 0"	2,351	24.9	8' - 3"	89	1.8
	66"	86' - 6"	2,643	28.9	8' - 9"	96	2.0
	72"	93' - 0"	3,121	33.1	9' - 4"	101	2.3



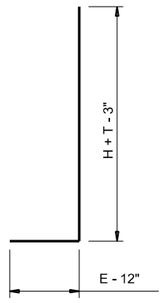
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

1. Total quantities include one 3'-1" lap for bars over 60' in length.
2. Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
3. Indicated slope is perpendicular to centerline pipe or pipes.
4. For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
5. Dimensions shown are usual and maximum.
6. Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

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

Texas Department of Transportation — Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

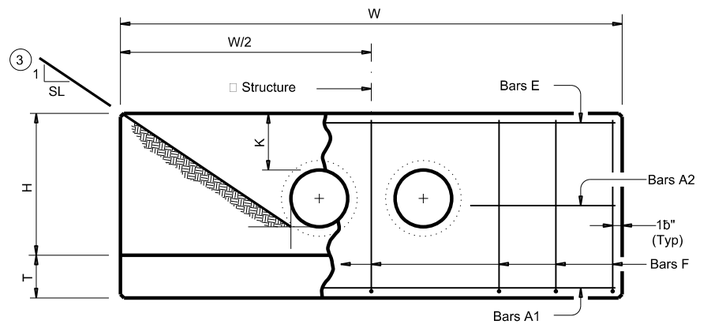
CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		126

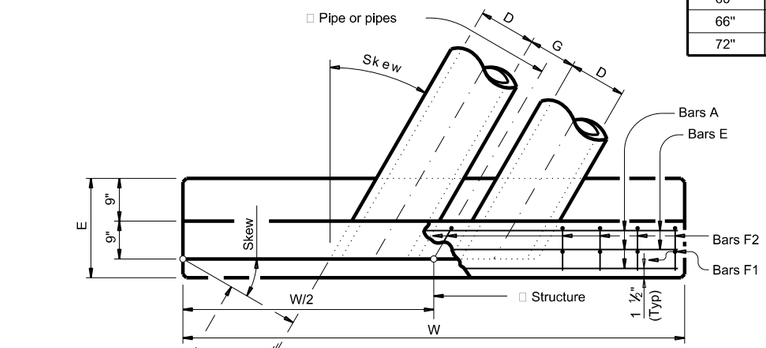
DATE: 1/17/2023 1:42:54 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETE REVISION\CH-PW-S.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 4"	124	1.1	1' - 9 ¾"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 ¾"	17	0.3
	15"	10' - 7"	136	1.3	2' - 3"	17	0.2	11' - 10"	159	1.5	2' - 6"	18	0.2	14' - 6"	191	1.8	3' - 0 ¾"	20	0.3
	18"	11' - 11"	165	1.5	2' - 9"	19	0.3	13' - 3"	174	1.7	3' - 1"	29	0.3	16' - 3"	207	2.1	3' - 9 ¼"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 ¼"	31	0.4	14' - 9"	233	2.1	3' - 6 ¾"	33	0.4	18' - 0"	276	2.6	4' - 4 ¼"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 ¼"	34	0.4	16' - 2"	251	2.4	4' - 1 ¾"	36	0.5	19' - 10"	318	2.9	5' - 0 ¾"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 ¾"	38	0.5	17' - 7"	292	2.8	4' - 6 ¼"	39	0.6	21' - 7"	342	3.4	5' - 6 ¼"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 ¾"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 ¾"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 ¾"	43	0.6	20' - 6"	358	3.6	5' - 4 ¾"	46	0.7	25' - 1"	439	4.4	6' - 7 ¼"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 ¾"	50	0.9	26' - 10"	517	5.5	7' - 2 ¼"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 ¾"	53	1.1	24' - 10"	528	5.6	6' - 8 ¾"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 ¾"	60	1.3	28' - 10"	637	7.3	7' - 7 ¼"	79	1.5	35' - 4"	791	9.0	9' - 3 ¾"	88	1.8
	54"	28' - 6"	711	7.8	7' - 9"	83	1.6	31' - 9"	781	8.7	8' - 8"	81	1.8	38' - 11"	958	10.7	10' - 7 ¼"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 ¼"	91	1.9	34' - 8"	881	10.2	9' - 6 ¼"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 ¾"	98	2.1	37' - 6"	1,028	11.8	10' - 1 ¼"	102	2.4	46' - 0"	1,235	14.5	12' - 4 ¼"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 ¼"	110	2.6	49' - 6"	1,446	16.6	13' - 2 ¼"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 ¾"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 ¾"	17	0.2
	15"	15' - 3"	212	1.9	2' - 3"	17	0.2	17' - 0"	223	2.1	2' - 6"	17	0.3	20' - 10"	276	2.6	3' - 0 ¾"	20	0.3
	18"	17' - 1"	231	2.3	2' - 9"	19	0.3	19' - 1"	259	2.5	3' - 1"	29	0.3	23' - 4"	318	3.1	3' - 9 ¼"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 ¼"	31	0.4	21' - 1"	339	3.0	3' - 6 ¾"	33	0.4	25' - 10"	413	3.7	4' - 4 ¼"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 ¾"	35	0.4	23' - 1"	384	3.5	4' - 1 ¾"	36	0.5	28' - 3"	462	4.2	5' - 0 ¾"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 ¾"	38	0.5	25' - 1"	438	4.1	4' - 6 ¼"	39	0.6	30' - 9"	522	5.0	5' - 6 ¼"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 ¾"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 ¾"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 ¾"	46	0.7	35' - 9"	644	6.5	6' - 7 ¼"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 ¾"	50	0.9	38' - 2"	787	8.0	7' - 2 ¼"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 ¼"	53	1.1	35' - 3"	776	8.2	6' - 8 ¾"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 ¾"	61	1.3	41' - 0"	953	10.7	7' - 7 ¼"	81	1.5	50' - 2"	1,166	13.1	9' - 3 ¾"	88	1.8
	54"	40' - 5"	1,065	11.4	7' - 9"	85	1.6	45' - 0"	1,185	12.7	8' - 8"	89	1.8	55' - 2"	1,435	15.5	10' - 7 ¼"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 ¼"	93	1.9	49' - 1"	1,356	14.8	9' - 6 ¼"	96	2.1	60' - 1"	1,635	18.2	11' - 8"	124	2.6
	66"	47' - 7"	1,357	15.4	9' - 1"	98	2.1	53' - 1"	1,497	17.2	10' - 1 ¼"	103	2.3	65' - 1"	1,892	21.1	12' - 4 ¼"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 ¼"	109	2.6	70' - 0"	2,218	24.1	13' - 2 ¼"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 ¾"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 ¾"	18	0.2
	15"	19' - 11"	272	2.5	2' - 3"	17	0.2	22' - 3"	301	2.8	2' - 6"	18	0.3	27' - 3"	361	3.5	3' - 0 ¾"	21	0.3
	18"	22' - 3"	313	3.0	2' - 9"	19	0.3	24' - 10"	344	3.3	3' - 1"	29	0.3	30' - 5"	427	4.0	3' - 9 ¼"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 ¼"	31	0.4	27' - 5"	446	4.0	3' - 6 ¾"	33	0.4	33' - 7"	549	4.9	4' - 4 ¼"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 ¾"	35	0.4	30' - 0"	499	4.5	4' - 1 ¾"	36	0.5	36' - 9"	609	5.6	5' - 0 ¾"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 ¾"	38	0.5	32' - 7"	562	5.4	4' - 6 ¼"	40	0.6	39' - 11"	703	6.6	5' - 6 ¼"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 ¾"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 ¾"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 ¾"	46	0.7	46' - 4"	848	8.5	6' - 7 ¼"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 ¾"	49	0.9	49' - 6"	1,058	10.6	7' - 2 ¼"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 ¼"	53	1.0	45' - 7"	1,022	10.7	6' - 8 ¾"	57	1.2	55' - 10"	1,262	13.1	8' - 3"	78	1.4
	48"	47' - 7"	1,152	12.6	6' - 10"	61	1.3	53' - 1"	1,268	14.0	7' - 7 ¼"	80	1.5	65' - 1"	1,587	17.2	9' - 3 ¾"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 ¼"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 ¼"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 ¾"	92	1.9	63' - 6"	1,806	19.5	9' - 6 ¼"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 ¾"	97	2.1	68' - 8"	2,019	22.5	10' - 1 ¼"	101	2.4	84' - 2"	2,472	27.6	12' - 4 ¼"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 ¼"	108	2.6	90' - 6"	2,937	31.7	13' - 2 ¼"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 ¾"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 ¾"	17	0.2
	15"	29' - 3"	390	3.7	2' - 3"	17	0.2	32' - 7"	442	4.2	2' - 6"	18	0.2	39' - 11"	549	5.1	3' - 0 ¾"	20	0.3
	18"	32' - 7"	459	4.4	2' - 9"	20	0.3	36' - 4"	515	4.9	3' - 1"	29	0.3	44' - 7"	629	6.0	3' - 9 ¼"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 ¼"	31	0.4	40' - 2"	660	5.9	3' - 6 ¾"	33	0.4	49' - 2"	823	7.2	4' - 4 ¼"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 ¾"	35	0.4	43' - 11"	748	6.7	4' - 1 ¾"	36	0.5	53' - 9"	920	8.2	5' - 0 ¾"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 ¾"	38	0.5	47' - 8"	852	8.0	4' - 6 ¼"	41	0.5	58' - 4"	1,039	9.7	5' - 6 ¼"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 ¾"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 ¾"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 ¾"	48	0.7	67' - 6"	1,292	12.6	6' - 7 ¼"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 ¾"	51	1.0	72' - 1"	1,583	15.6	7' - 2 ¼"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 ¼"	55	1.0	66' - 5"	1,530	15.8	6' - 8 ¾"	57	1.2	81' - 4"	1,875	19.4	8' - 3"	76	1.4
	48"	69' - 4"	1,737	18.5	6' - 10"	59	1.3	77' - 4"	1,942	20.7	7' - 7 ¼"	79	1.5	94' - 9"	2,368	25.3	9' - 3 ¾"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 ¼"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 ¼"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 ¾"	90	1.9	92' - 5"	2,681	28.8	9' - 6 ¼"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 ¾"	96	2.1	99' - 11"	3,038	33.3	10' - 1 ¼"	101	2.4	122' - 4"	3,697	40.8	12' - 4 ¼"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 ¼"	108	2.6	131' - 6"	4,372	46.8	13' - 2 ¼"	139	3.2



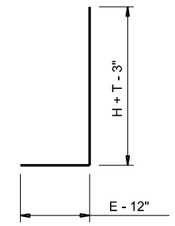
ELEVATION



PLAN OF SKEWED PIPES

Showing 30° skew.

SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantites include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS
WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		126A

DATE: 1/17/2023 1:42:56 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETE\fw-sside-20.dgn
DGN: fw-sside-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Maximum Wingwall Height Hw	Dimensions W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing length (2~wings) ③ Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C - 0.250'
A = (Hw - 0.333')(SL)
B = (A) [tanget (θ + 15°)]
Lw = (A) ÷ [cosine (θ + 15°)]

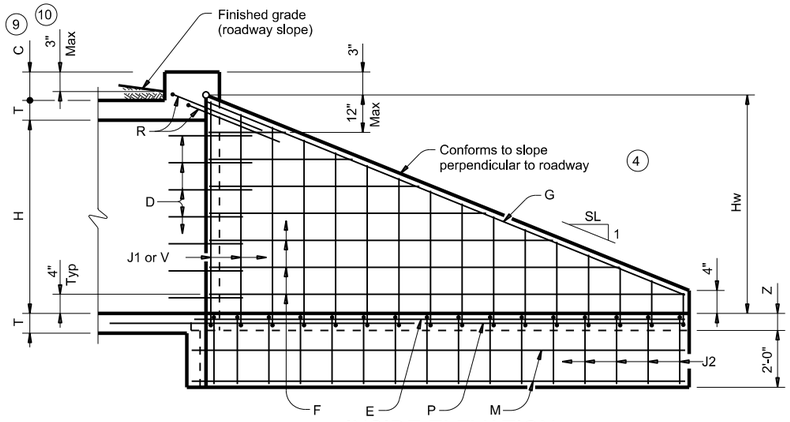
For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine θ

For precast culverts:
Ltw = [(N) (2U + S) + (N - 1) (0.5')] ÷ cosine θ

Total wingwall area (two wings ~ SF) = 0.5 (Hw + 0.333') (Lw + A)

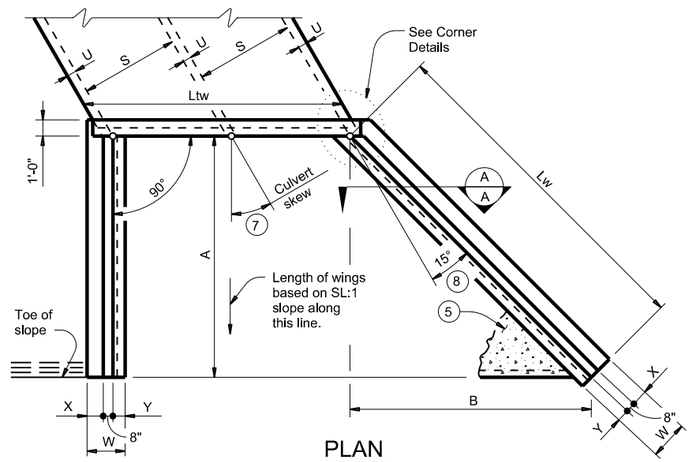
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
A = Length of short wingwalls
Lw = Length of long wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
θ = Culvert skew

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



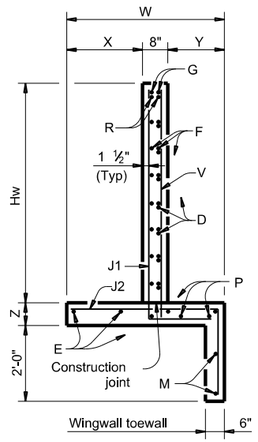
INSIDE ELEVATION

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

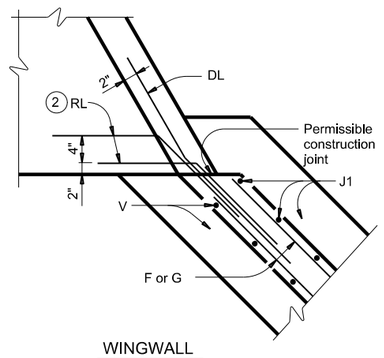


PLAN

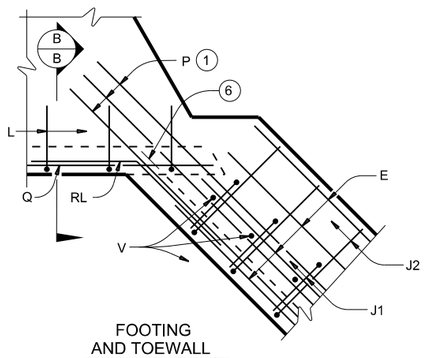
(Showing dimensions and 30° skew.)



SECTION A-A



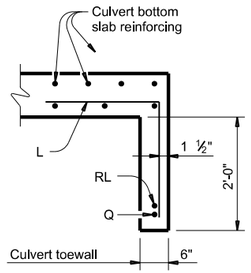
WINGWALL



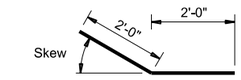
FOOTING AND TOEWALL

CORNER DETAILS

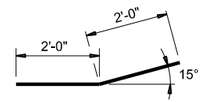
(Culvert and culvert toewall reinforcing not shown for clarity.)



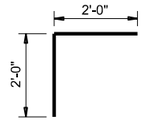
SECTION B-B ⑤



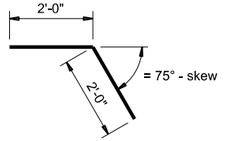
BARS DS
(Short wing)



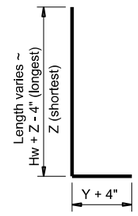
BARS DL
(Long wing)



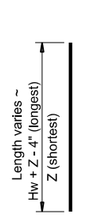
BARS RS
(Short wing)



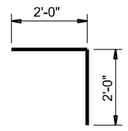
BARS RL
(Long wing)



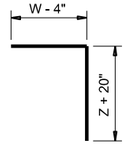
BARS J 1



BARS V



BARS L



BARS J2

1. Extend Bars P 3'-0" minimum into bottom slab of box culvert.
2. Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).
4. Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
5. When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
7. Applicable values of skew are: 15°, 30°, and 45°.
8. Typical wingwall angle for all skews.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

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

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete, 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.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

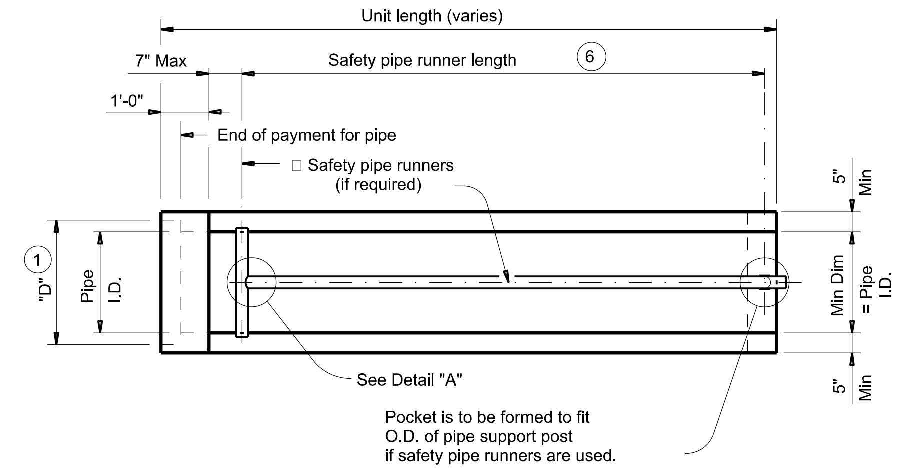
FILE: fw-sside-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		126B

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 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"	> 0°	Yes		
				6:1	17' - 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				

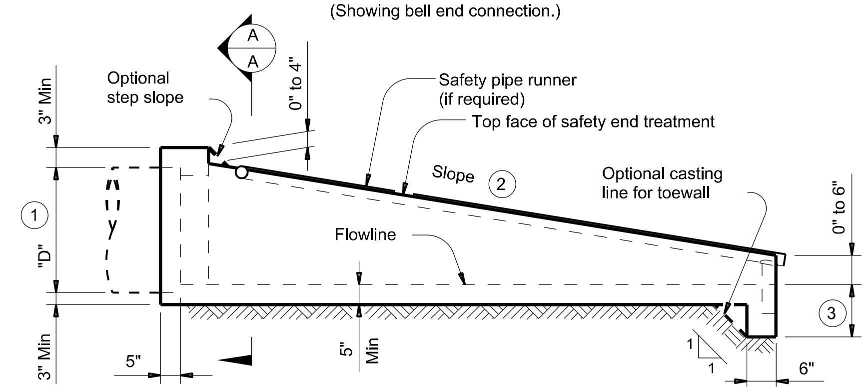
SAFETY PIPE RUNNER DIMENSIONS

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



PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

(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.

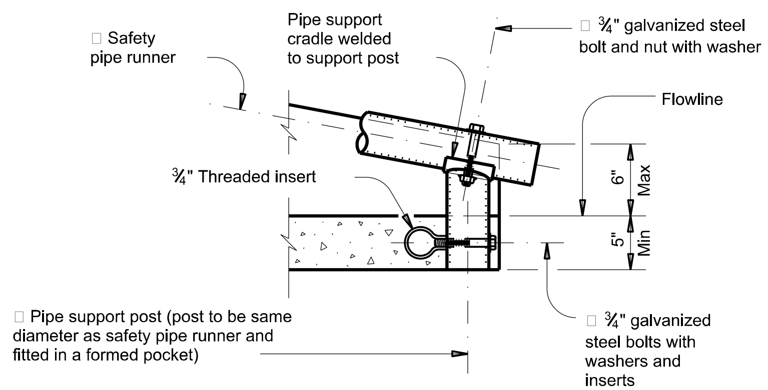
(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

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

(6) Measured along slope.

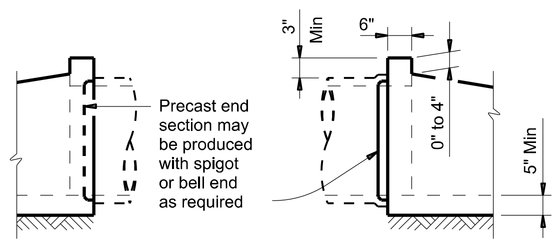
(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed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



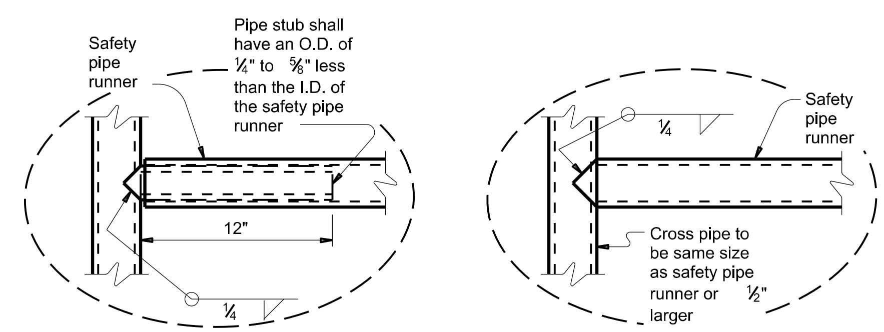
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



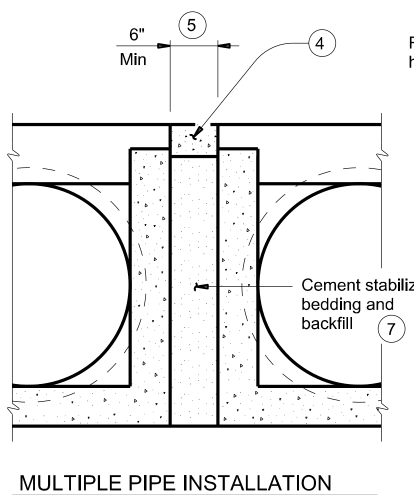
OPTIONAL JOINT FOR RCP

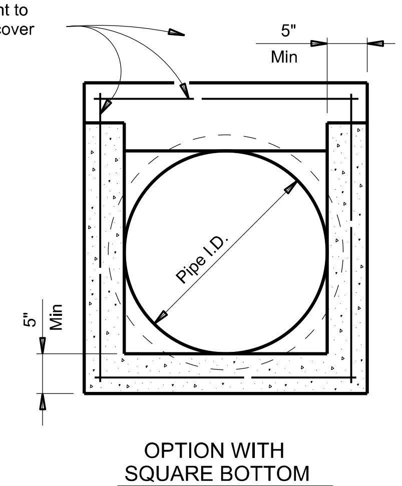
(Showing joint between RCP and precast safety end treatment)

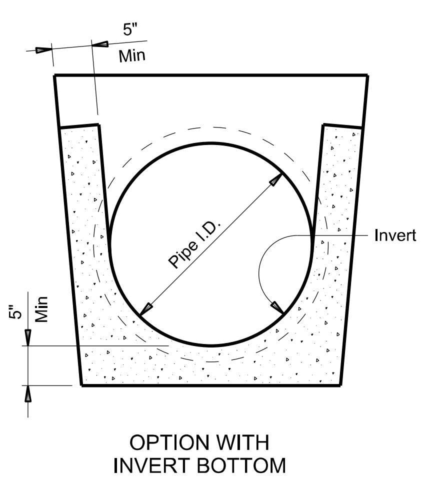


DETAIL A

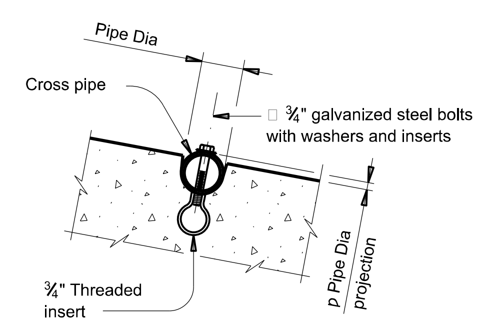
(If required)







SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 12-21: Added 42" TP	DIST PAR		COUNTY GRAYSON	SHEET NO. 127

DATE: 1/17/2023 1:42:58 AM
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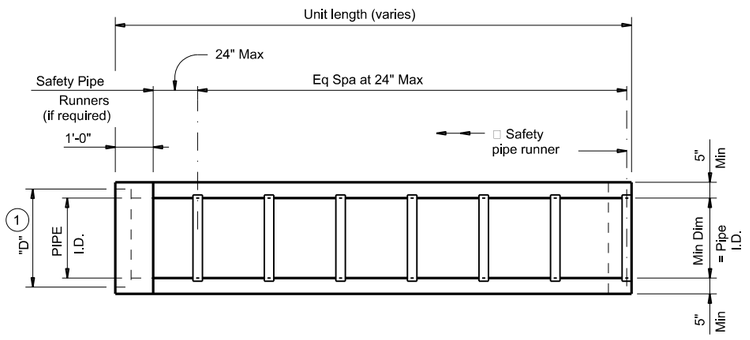
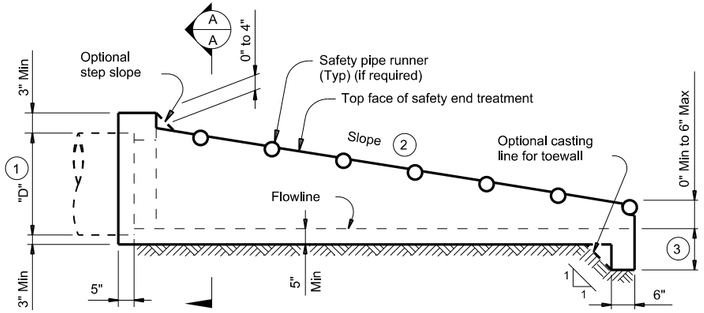


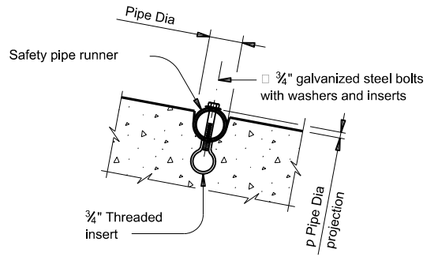
PLAN

(Showing bell end connection.)



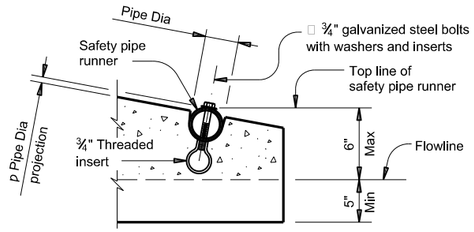
LONGITUDINAL ELEVATION

(Showing bell end connection.)

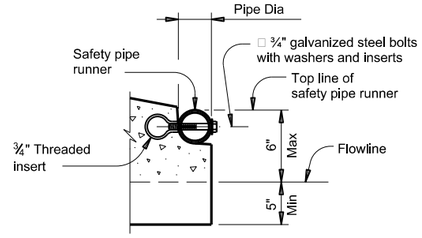


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



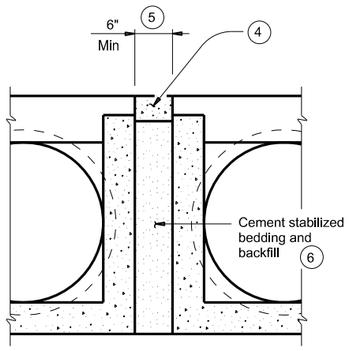
OPTION A



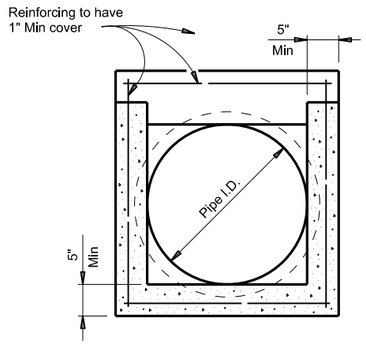
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

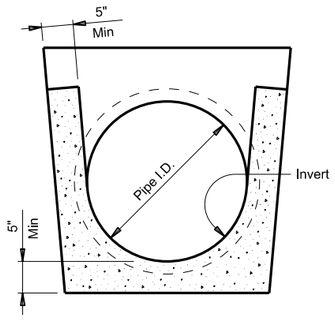
(If required)



MULTIPLE PIPE INSTALLATION

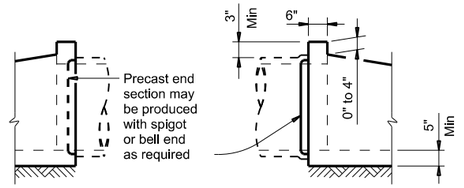


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

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

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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

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

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

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

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

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

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

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

GENERAL NOTES:

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

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

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

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

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

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

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

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		128

DATE: 1/17/2023 1:43:01 AM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

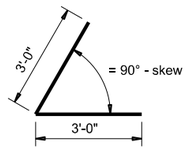
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

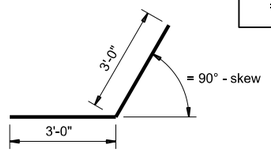
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

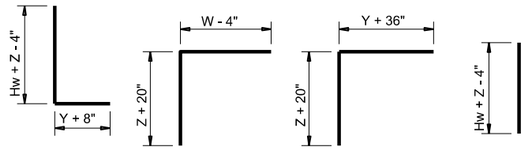
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

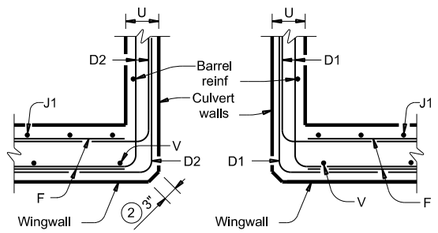
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≤ Hw < 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥ Hw

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

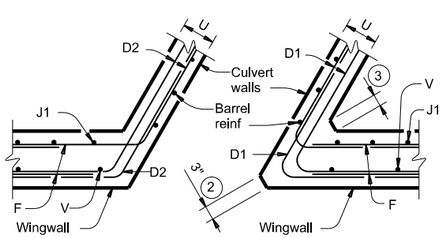
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw 4' ≤ Hw < 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' ≥ Hw

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

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



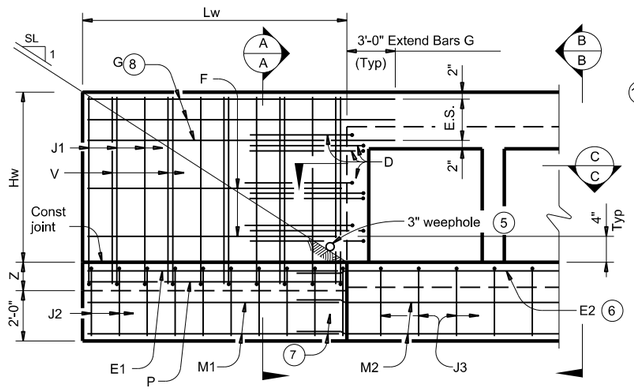
SECTION C-C - PW-1



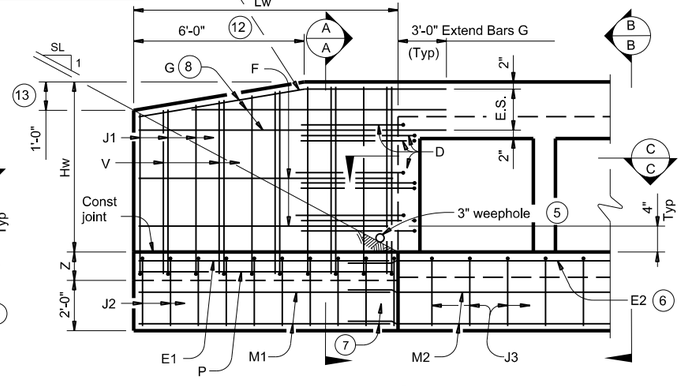
SECTION C-C - PW-2

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

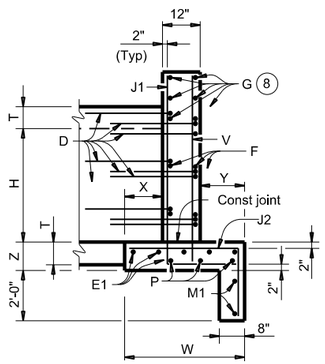
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.



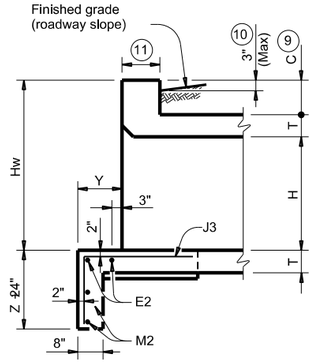
PARTIAL ELEVATION - PW-1



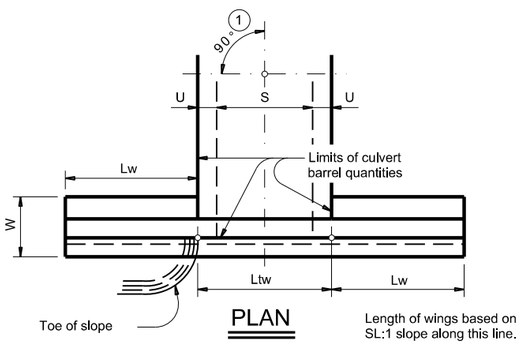
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)



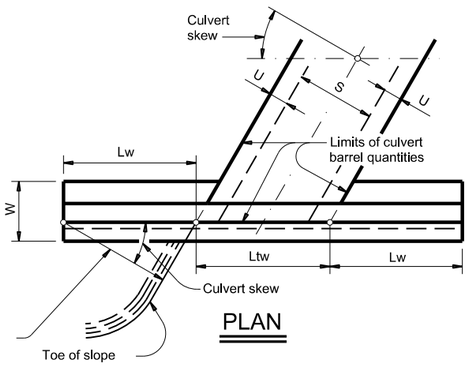
SECTION B-B
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

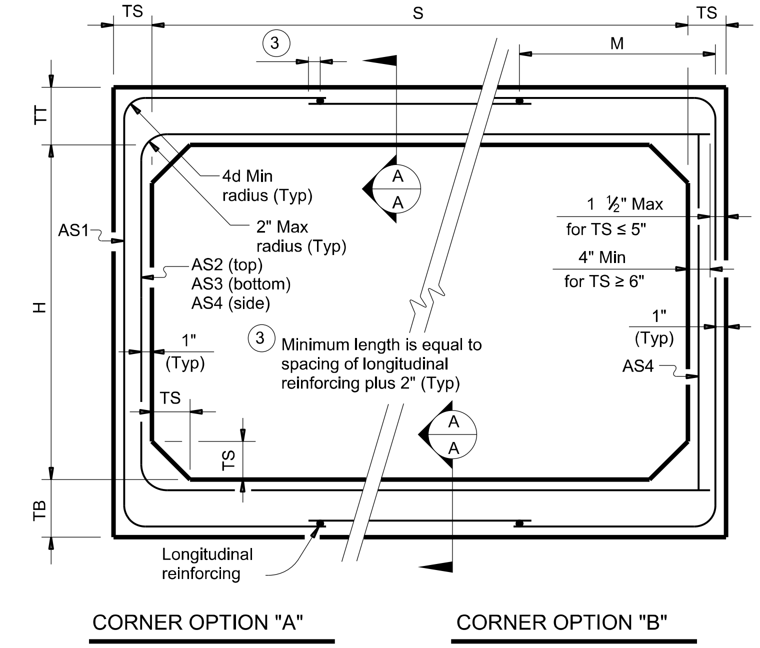
FILE:	pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0729	02	032	FM 121
		DIST	COUNTY		SHEET NO.
		PAR	GRAYSON		128A

BOX DATA

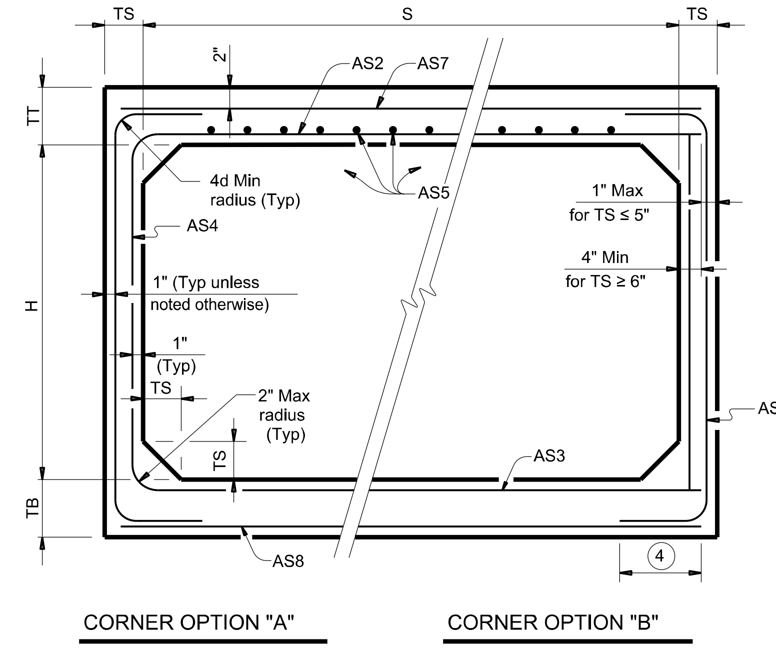
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S	H	TT	TB	TS			AS1	AS2	AS3	AS4	AS5	AS7	AS8	
(ft.)	(ft.)	(in.)	(in.)	(in.)	(ft.)	(in.)								(tons)
6	2	8	7	7	< 2	-	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	-	-	-	6.8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

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

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

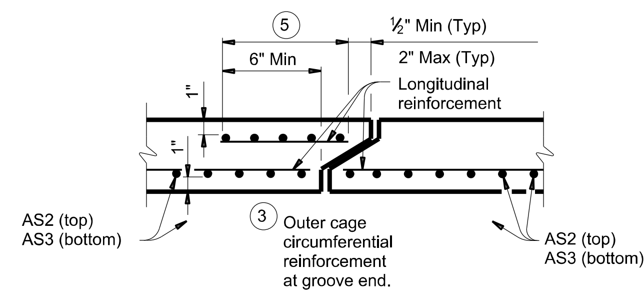


FILL HEIGHT 2 FT AND GREATER



FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

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

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

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST
6'-0" SPAN

SCP-6

FILE: scp06sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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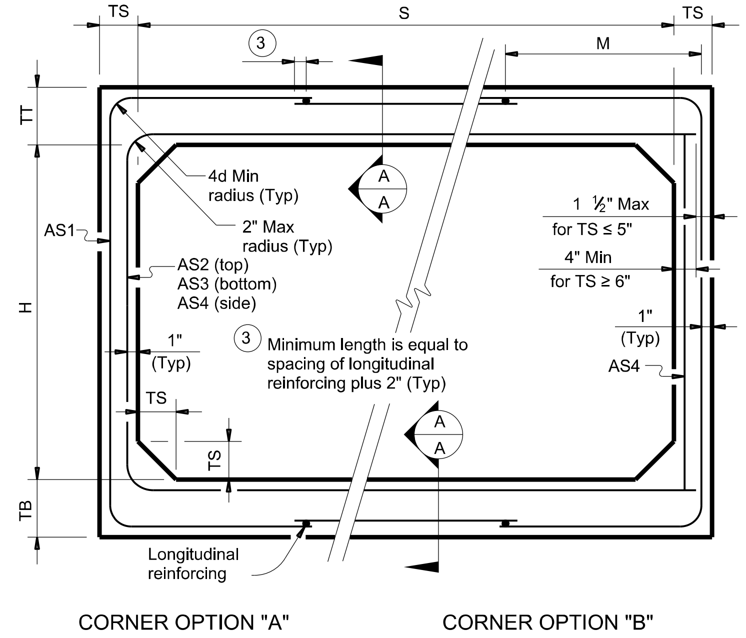
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 128B

BOX DATA

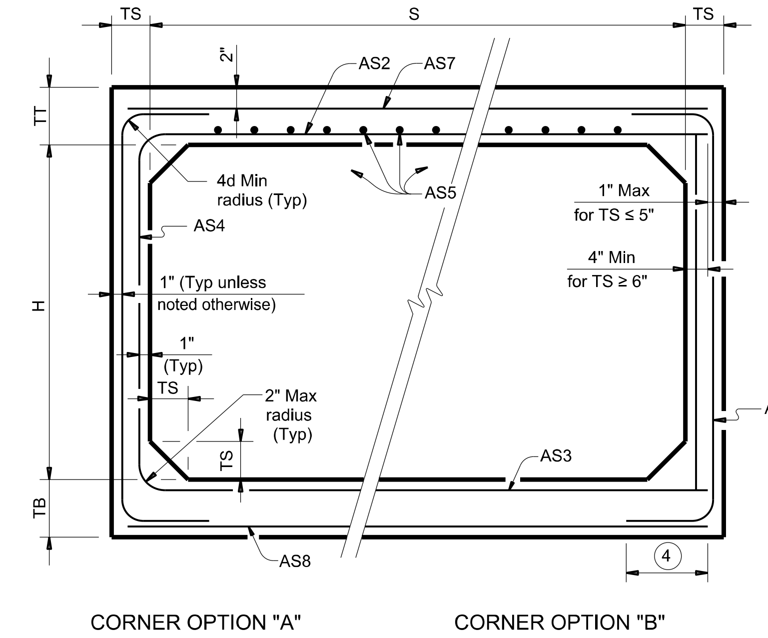
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S	H	TT	TB	TS			AS1	AS2	AS3	AS4	AS5	AS7	AS8	
(ft.)	(ft.)	(in.)	(in.)	(in.)	(ft.)	(in.)								(tons)
3	2	7	6	4	< 2	-	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	-	-	-	2.4
3	2	4	4	4	3 - 5	31	0.10	0.11	0.12	0.10	-	-	-	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	-	-	-	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	-	-	-	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	-	-	-	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	-	-	-	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	-	-	-	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	-	-	-	2.4
3	3	7	6	4	< 2	-	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	-	-	-	2.8
3	3	4	4	4	3 - 5	31	0.10	0.14	0.14	0.10	-	-	-	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	-	-	-	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	-	-	-	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	-	-	-	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	-	-	-	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	-	-	-	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	-	-	-	2.8

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

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

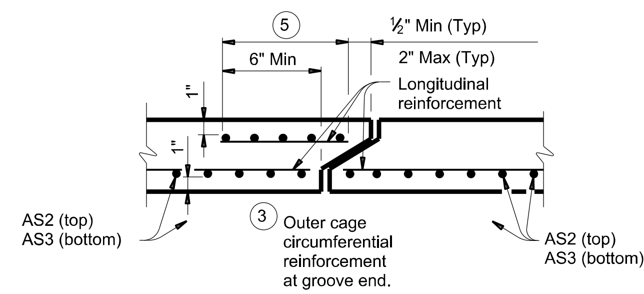


FILL HEIGHT 2 FT AND GREATER



FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

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

HL93 LOADING

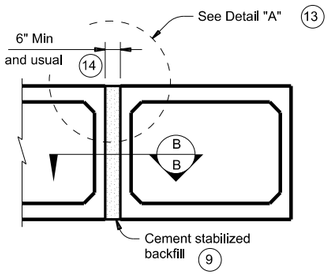
Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

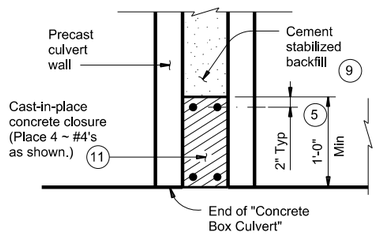
3'-0" SPAN

SCP-3

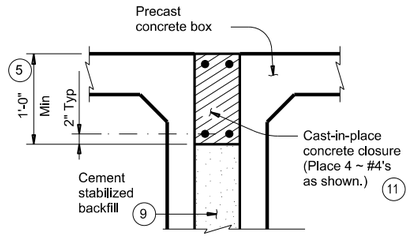
FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	128C



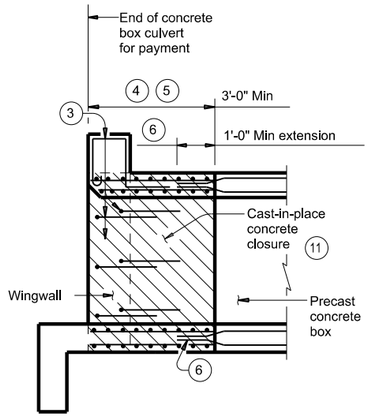
MULTIPLE UNIT PLACEMENT



SECTION B-B

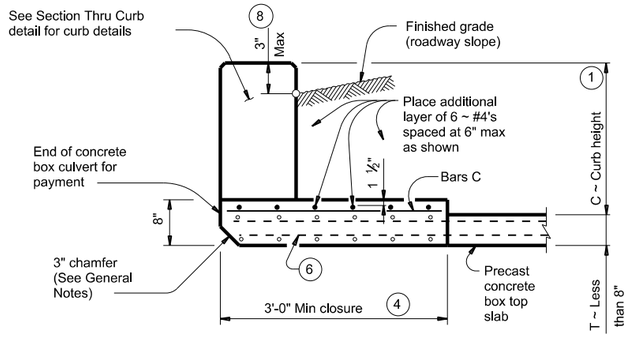


DETAIL "A" (13)

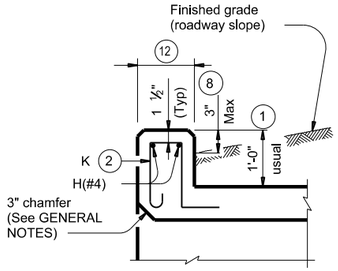


WINGWALL CONNECTION

(Also applies to safety end treatment.)

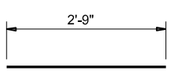


SECTION THRU TOP SLABS LESS THAN 8"

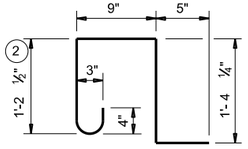


SECTION THRU CURB

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



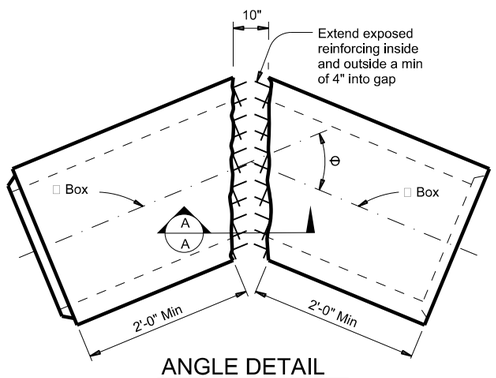
BARS C (#4)
(Spa = 1'-0" Max)



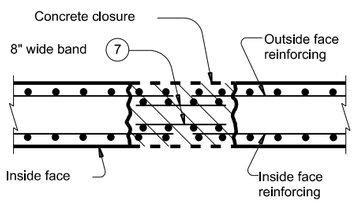
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

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

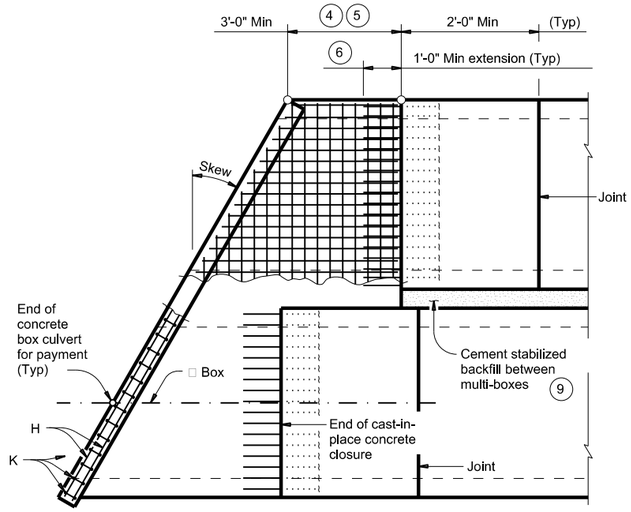
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is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



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

MATERIAL NOTES:

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

GENERAL NOTES:

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		128D

DATE: 1/17/2023 1:43:05 AM
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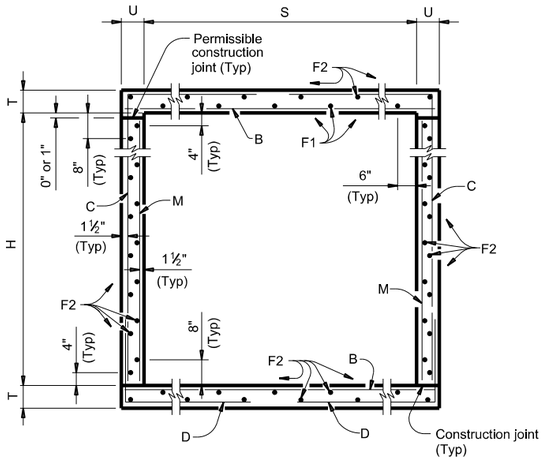
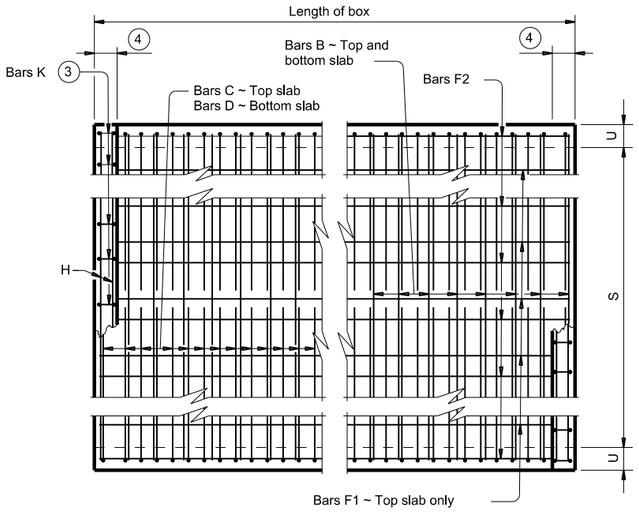
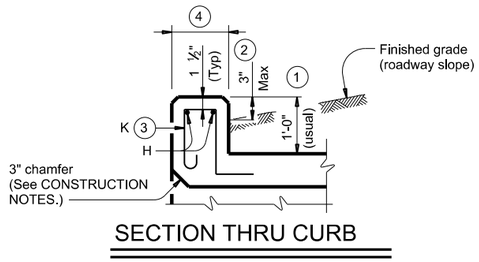


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

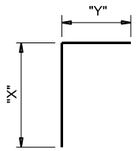
MATERIAL NOTES:

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

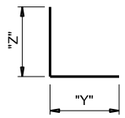
GENERAL NOTES:

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

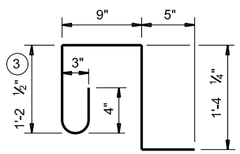
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-3 & 4

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REVISIONS	0729	02	032	FM 121
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		128E

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

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

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-3 & 4

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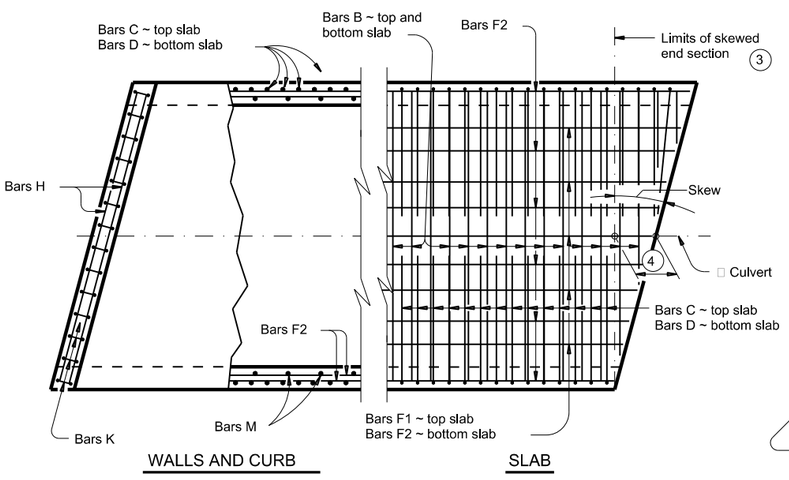
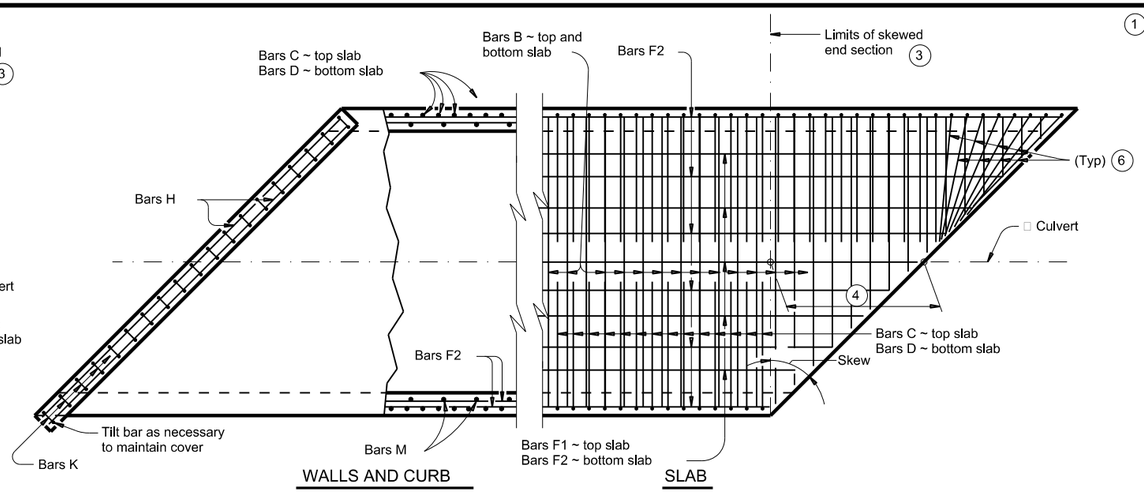
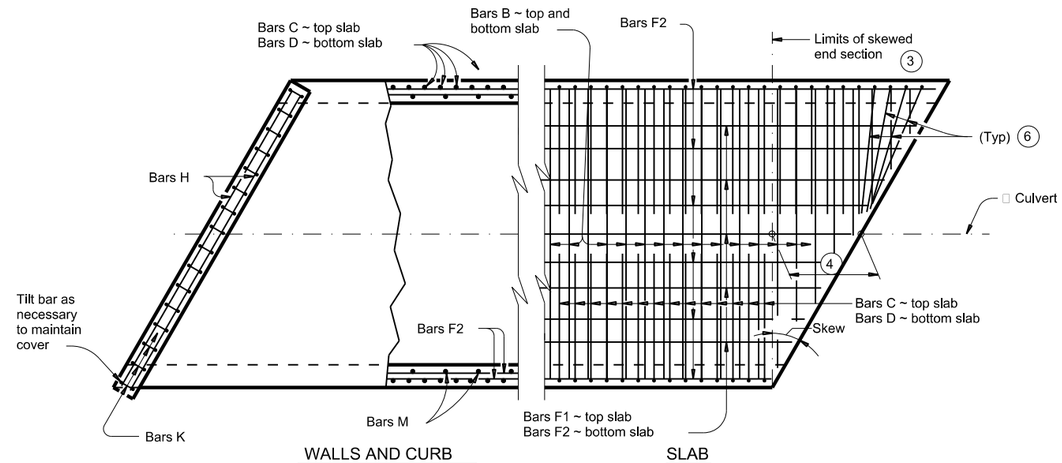
REVISIONS	0729	02	032	FM 121
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		128F



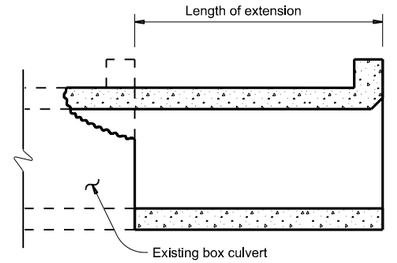
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



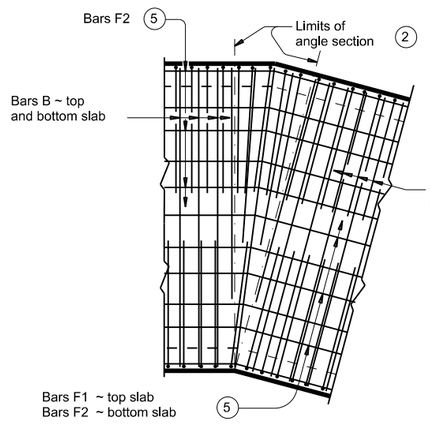
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



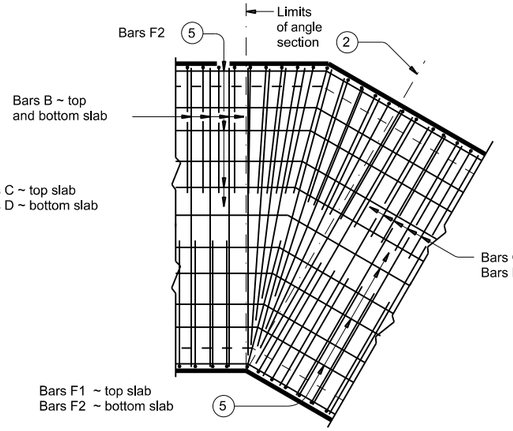
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



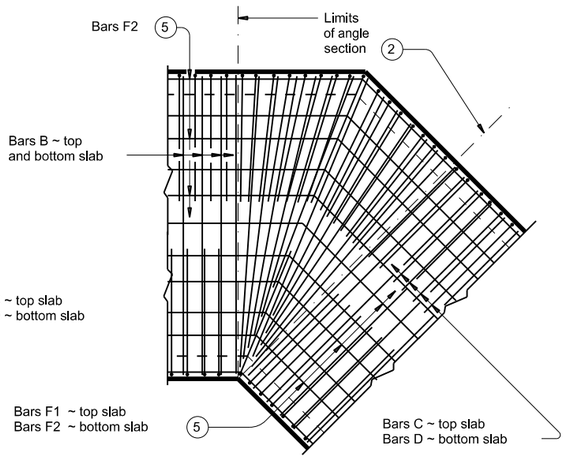
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

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

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

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

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

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

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		128G

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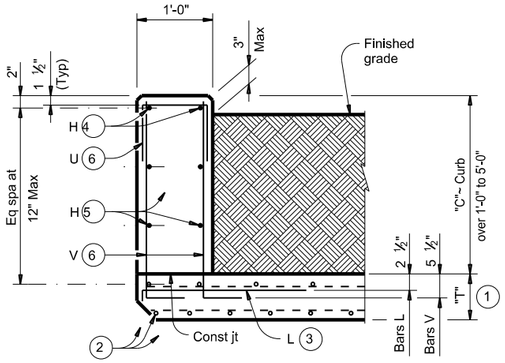
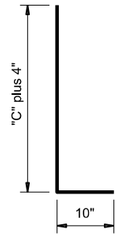


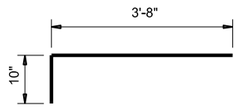
TYPICAL SECTION

Used for curbs over 1'-0" to 5'-0"



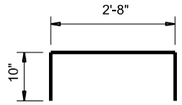
BARS V (#5) 6

Spaced at 12" Max



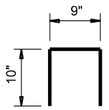
BARS L (#5) 3

Spaced at 12" Max



OPTIONAL BARS L (#5) 3 7

Spaced at 12" Max



BARS U (#4) 6

Spaced at 12" Max

1. "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
2. Adjust normal culvert slab bars as necessary to clear obstructions.
3. Place bars L as shown. Tilt hook as necessary to maintain cover.
4. Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
5. Additional bars H(#4) as required to maintain 12" Max spacing.
6. Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
7. Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
8. Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class "C" concrete (f'_c = 3,600 psi) minimum for curbs.

Provide bar laps, where required, as follows:

· Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
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	PAR	GRAYSON		128H

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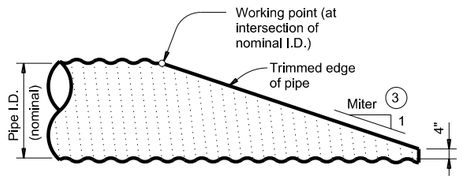
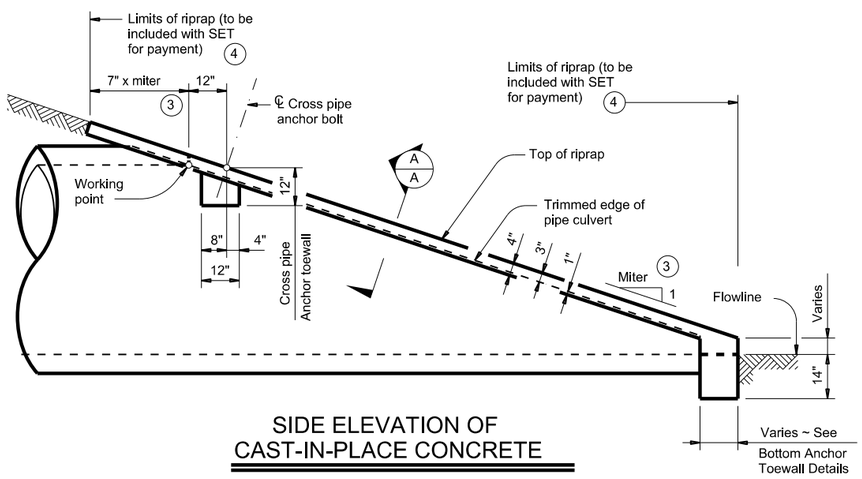


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

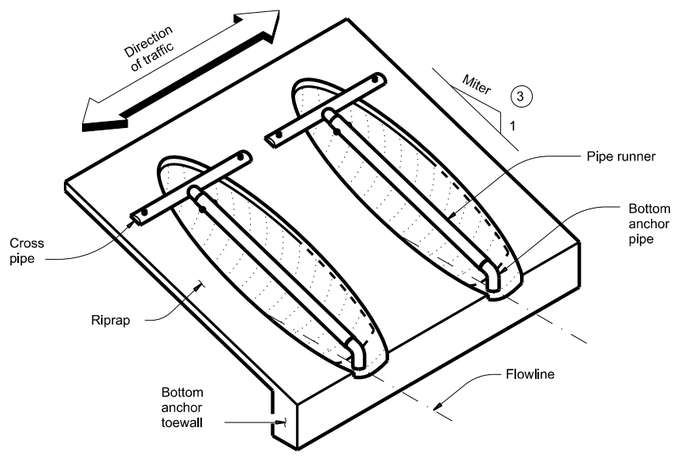
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

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

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

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

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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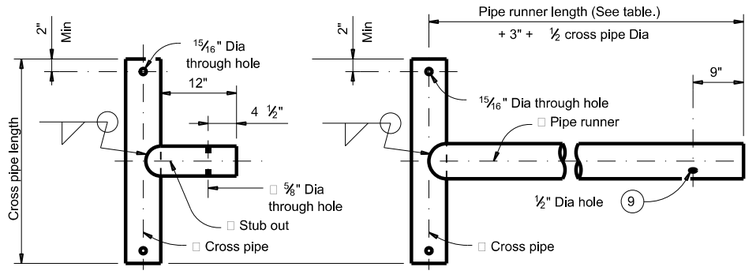
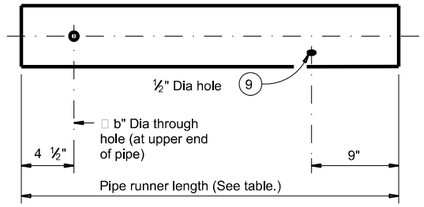
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		129



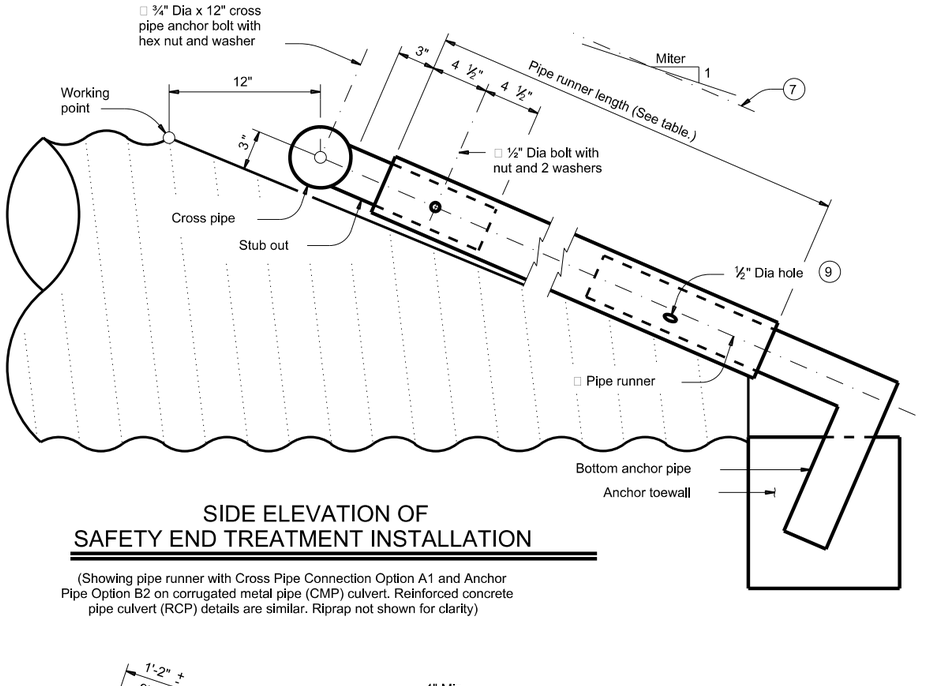
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



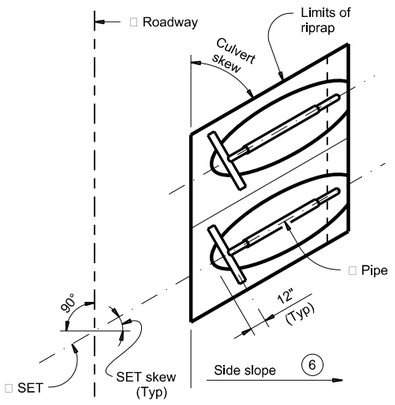
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

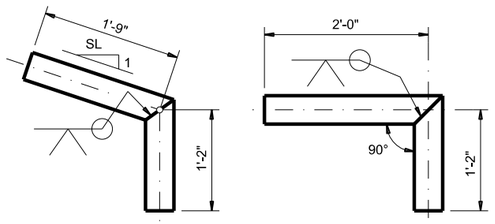


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

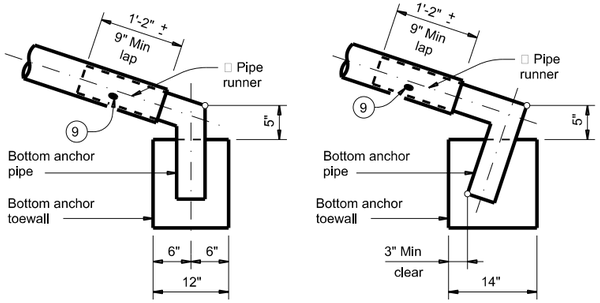


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

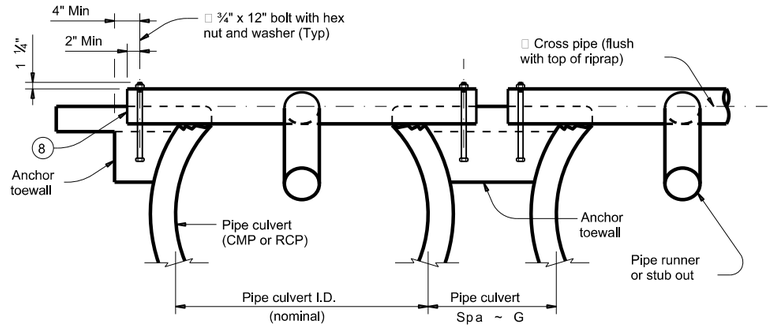
BOTTOM ANCHOR PIPE DETAILS (10)



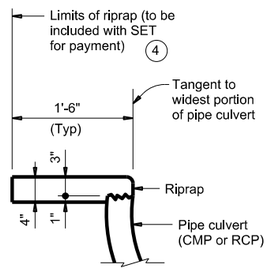
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

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

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

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

(9) After installation, inspect the ½" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

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

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

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

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

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

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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
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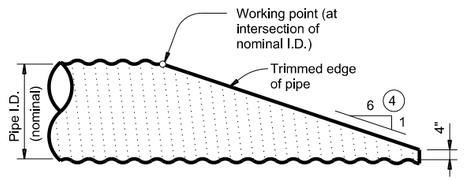
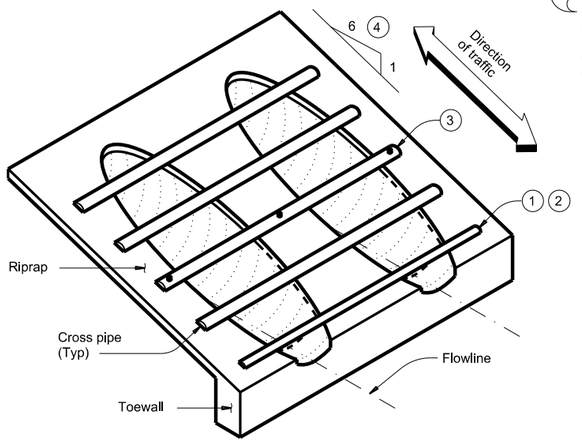
	PAR	GRAYSON		130



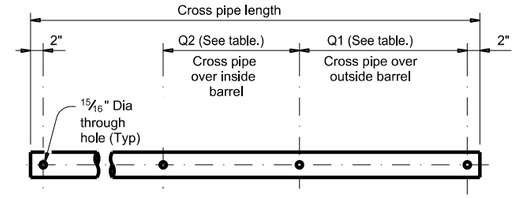
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

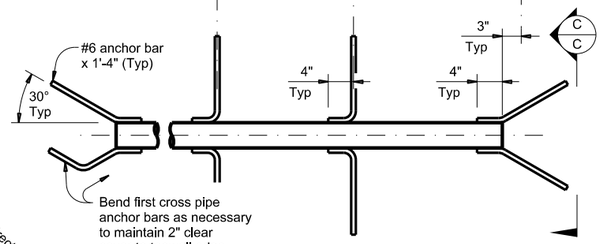
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



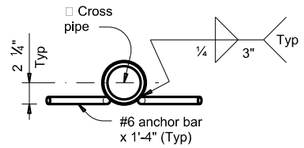
ISOMETRIC VIEW OF TYPICAL INSTALLATION



PIPE WITH BOLTED ANCHOR

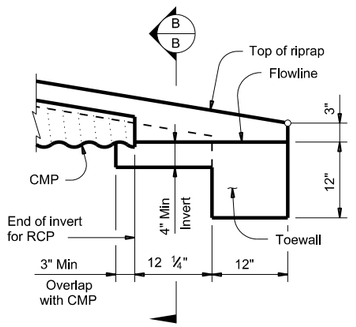


PIPE WITH ANCHOR BARS



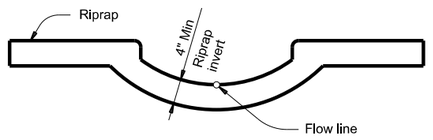
SECTION C-C

CROSS PIPE DETAILS



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

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

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

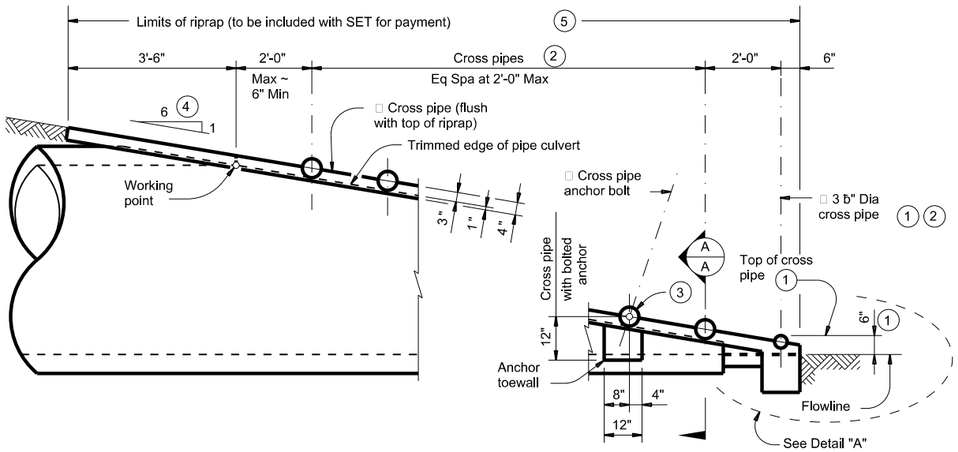
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

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

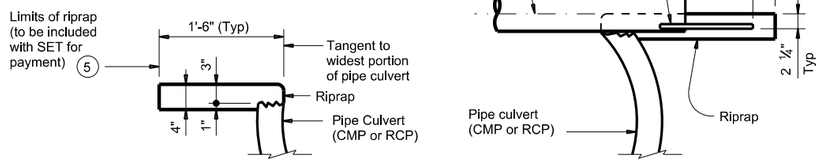
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



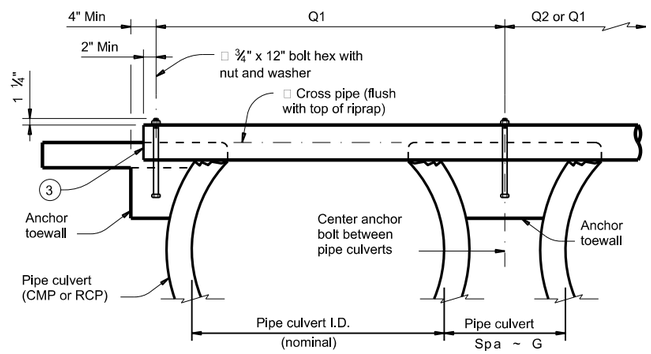
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

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

SETP-PD

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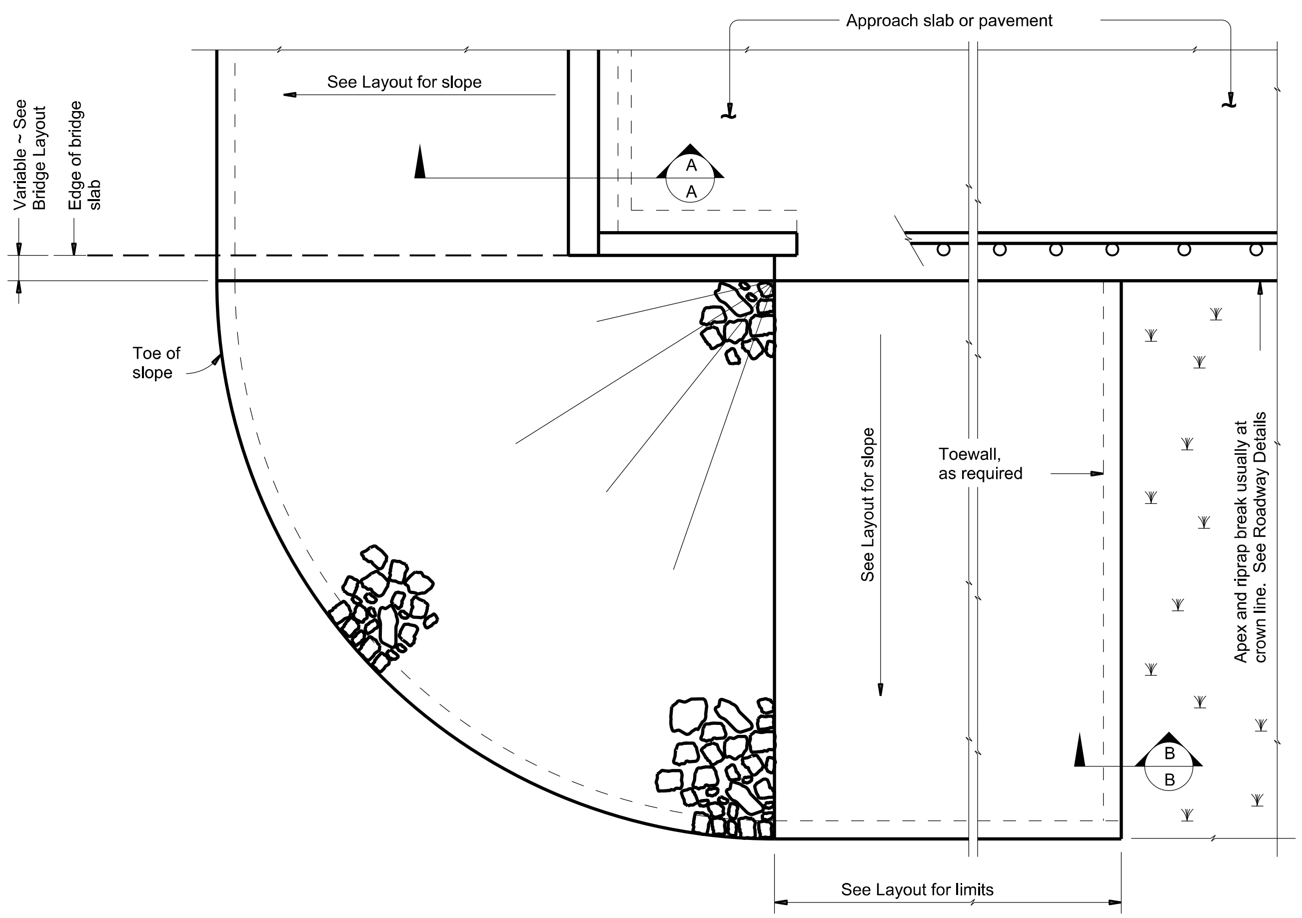
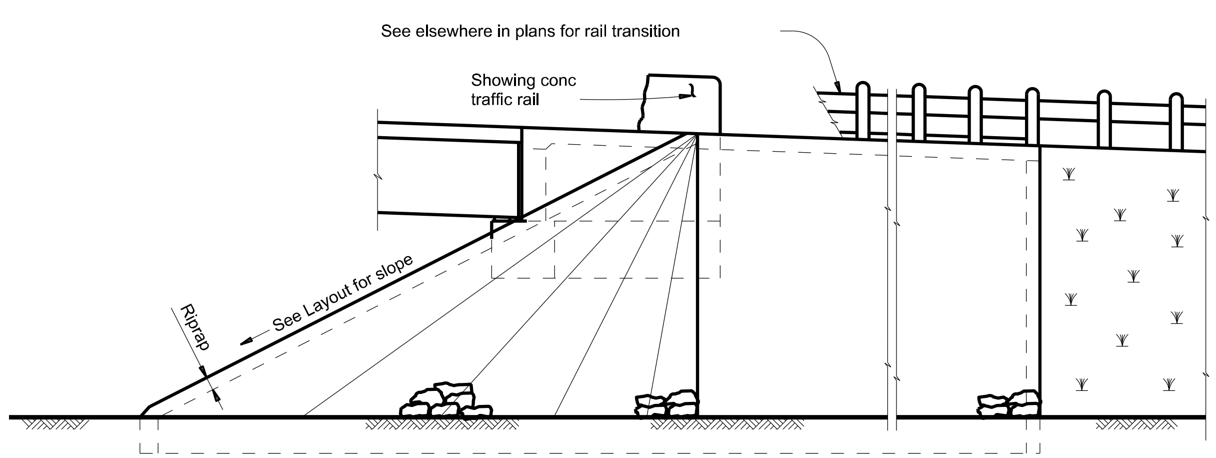
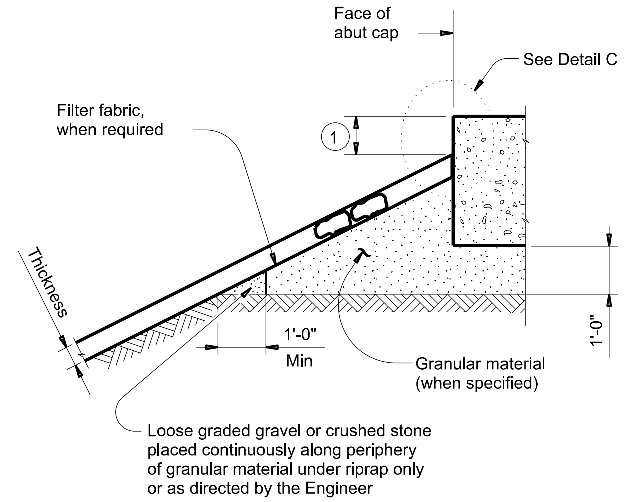


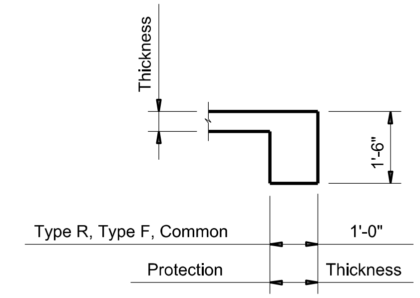
PLAN



ELEVATION

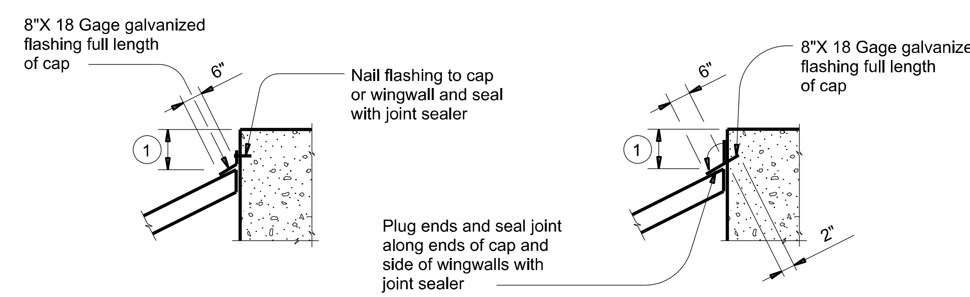


SECTION A-A AT CAP



SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C

GENERAL NOTES:

Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.

See elsewhere in plans for locations and details of shoulder drains.

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	PAR		GRAYSON	132

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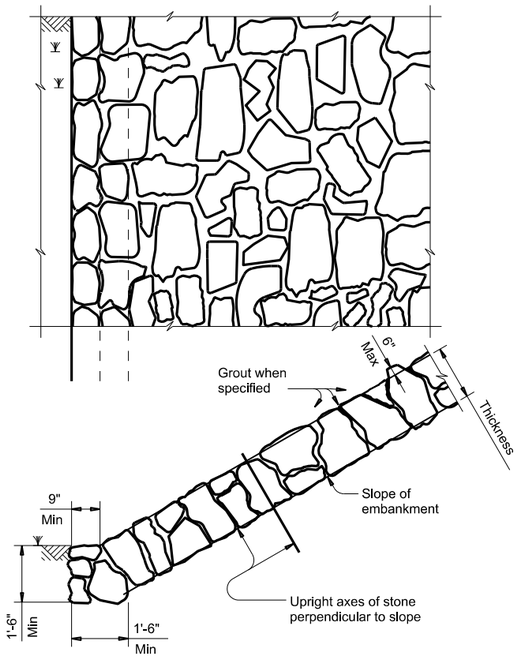


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

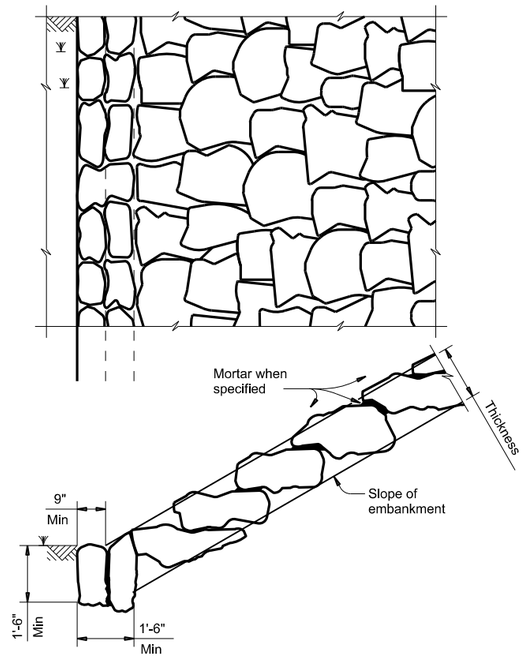


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

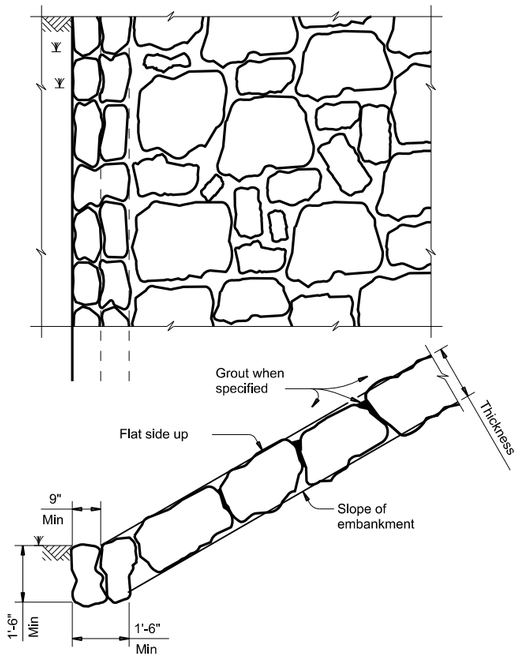


FIGURE 3 ~ TYPE F STONE RIPRAP

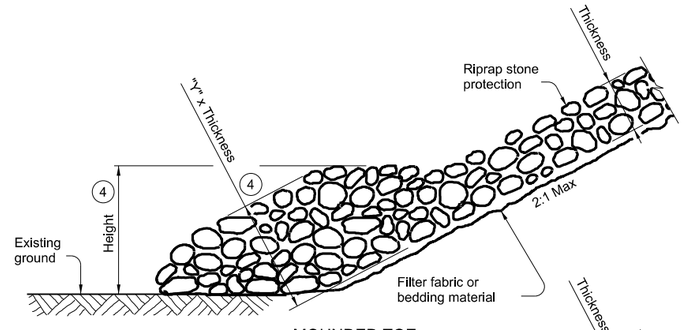
grouted

2 Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

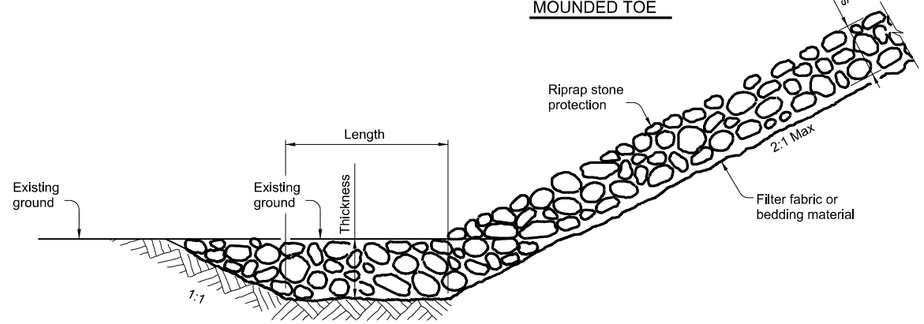
3 Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

4 "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

5 List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

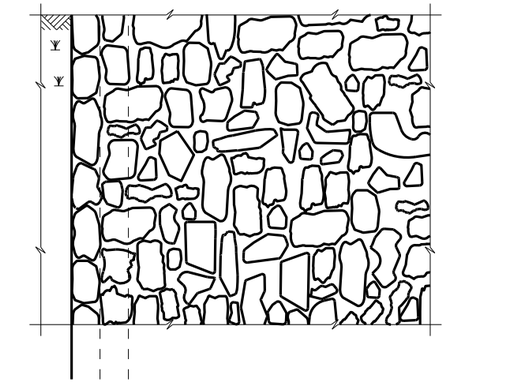


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

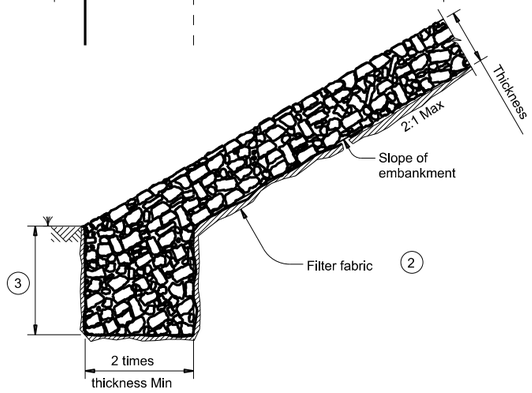


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		133

DATE: 1/17/2023 1:43:18 AM
FILE: T:\PAR\PDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\0729-02-032-SURRTDE1-19.dgn

SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX): Post Type (FRP = Fiberglass, TWT = Thin-wall, 10BWG = 10 BWG, S80 = Sched)	Posts (1 or 2)	Anchor Type (UA = Univer-Conc, UB = Univer-Bolt, SA = Slip-Conc, SB = Slip-Bolt, WS = Wedge)	Mounting Designation (P = Prefb."Plain", T = Prefab."T", U = Prefab."U")	Mounting Designation (1EXT or 2EXT = # of Ext., BM = Extruded Beam, WC = 1.12 #/ft Wing Chan., EXAL = Extruded Alum. Signs)	BRIDGE MOUNT CLEARANCE SIGNS (TY N = Type N, TY S = Type S)
8+90	2	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			N John Douglas Rd (relocate)									
9+25	3	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			S John Douglas Rd (relocate)									
12+39	4	W10-1	RR	36 diameter	x		10BWG	1	SA	U		
		W10-5	High Center Truck	30 x 24								
		W10-5P	Low Ground Clearance	30 x 24								
12+84	5	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Sherman Dr (relocate)									
17+06	6	R2-1	Speed Limit 40	30 x 36	x		10BWG	1	SA	P		
17+06	7	R2-1	Speed Limit 30	30 x 36	x		10BWG	1	SA	P		
19+08	8	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Pearl St (relocate)									
22+25	9	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Cooper St (relocate)									
22+57	10	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Valley St (relocate)									
25+38	11	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Wilson St (relocate)									
25+45	12	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Moody St (relocate)									
35+45	13	D21-1TL	<--- N Lincoln Park Rd	102 x 12	x		10BWG	1	SA	T		
38+73	14	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Ball Park Rd (relocate)									
40+16	15	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			N Lincoln Park Rd (relocate)									
41+00	16	R2-1	Speed Limit 50	30 x 36	x		10BWG	1	SA	P		
41+00	17	R2-1	Speed Limit 40	30 x 36	x		10BWG	1	SA	P		
42+14	18		**ADVANCED WARNING**									
		W1-4L	Reverse S Curve	36 x 36	x		10BWG	1	SA	P		
		W13-1P	XX MPH	18 x 18								
45+71	19	D21-1TR	N Lincoln Park Rd --->	102 x 12	x		10BWG	1	SA	T		
64+90	19A	R1-1	STOP	36 x 36	x		10BWG	1	SA	T		
			SUNSHINE TRAIL RD									
66+65	19B	D21-1TL	<--- Cates Rd	60 x 12	x		10BWG	1	SA	P		
70+45	20	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Cates Rd (relocate)									

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
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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 4-16 8-16	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		134

18

DATE: 1/17/2023 12:08:19 PM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED 100% Submittal\DGN\134 SOSS.dgn

DATE: 1/17/2023 12:08:22 PM

SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX) Post Type: FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	Mounting Designation: P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	BRIDGE MOUNT CLEARANCE SIGNS: TY N = Type N TY S = Type S
74+38	21		**ADVANCED WARNING**									
		W1-4L	Reverse S Curve	36 x 36	x		10BWG	1	SA	P		
		W13-1P	XX MPH	18 x 18								
74+65	21A	D21-1TR	Cates Rd --->	60 x 12	x		10BWG	1	SA	T		
75+92	22	R2-1	Speed Limit 55	30 x 36	x		10BWG	1	SA	P		
76+92	23	R2-1	Speed Limit 50	30 x 36	x		10BWG	1	SA	P		
86+18	24	D21-1TR	Spain Rd --->	60 x 12	x		10BWG	1	SA	T		
87+68	25	M1-6F	FM 121	24 x 24	x		10BWG	1	SA	P		
		D10-7aT	TRM 602	3 x 10								
90+51	26	R1-1	Stop	36 x 36	x		10BWG	1	SA	P		
			Spain Rd (relocate)									
95+52	27	D21-1TL	<--- Spain Rd	60 x 12	x		10BWG	1	SA	T		
119+33	28	D21-1TR	Willy Vester Rd --->	90 x 12	x		10BWG	1	SA	T		
120+80	29		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
124+00	30	R1-1	Stop	36 x 36	x		10BWG	1	SA	P		
			Willy Vester Rd (relocate)									
129+93	31	D21-1TL	<--- Willy Vester Rd	90 x 12	x		10BWG	1	SA	T		
132+28	32		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
135+43	33	D21-1TL	<--- Hynds Ranch Rd	96 x 12	x		10BWG	1	SA	T		
135+56	34	I-2AT	Van Alstyne city limits pop 4369 x2	66 x 24	x		10BWG	1	SA	T		
138+31	35	W8-13AT	Bridge may ice in cold weather	#N/A	x		10BWG	1	SA	P		
138+46	36	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Hynds Ranch Rd (relocate)									
142+63	37	D21-1TR	Hynds Ranch Rd --->	96 x 12	x		10BWG	1	SA	T		
153+55	38	W8-13AT	Bridge may ice in cold weather	#N/A	x		10BWG	1	SA	P		
154+80	39		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
173+85	40	D1-2	<--- Edwards Rd	78 x 24	x		10BWG	1	SA	P		
			Hugh Orr Rd --->									
174+65	41		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18	x		10BWG					

ALUMINUM SIGN BLANKS THICKNESS	
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Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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Texas Department of Transportation | Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0729	02	032	FM 121
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		135

DATE: $DATE$ $TIME$

SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX) Post Type: FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	Mounting Designation: P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	BRIDGE MOUNT CLEARANCE SIGNS: TY N = Type N TY S = Type S
178+33	42	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Hugh Orr Rd (relocate)									
180+20	43		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
183+20	44	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Edwards Rd (relocate)									
188+15	45	D1-2	<--- Hugh Orr Rd	78 x 24	X		10BWG	1	SA	T		
			Edwards Rd --->									
190+61	46	W8-13aT	Bridge may ice in cold weather	#N/A	X		10BWG	1	SA	P		
193+32	47	M1-6F	FM 121	24 x 24	X		10BWG	1	SA	P		
		D10-7aT	TRM 604	3 x 10								
203+47	48		**ADVANCED WARNING**		X		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
204+61	49	W8-13aT	Bridge may ice in cold weather	#N/A	X		10BWG	1	SA	P		
237+57	50	D1-2	<--- Oak Hill Rd	90 x 24	X		10BWG	1	SA	T		
			Jim Cannon Rd --->									
241+13	51	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Jim Cannon Rd (relocate)									
242+95	52		**ADVANCED WARNING**		X		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
243+70	53	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Oak Hill Rd (relocate)									
247+88	54	S3-1	BUS STOP	36 x 36	X		10BWG	1	SA	P		
249+39	55	D1-2	<--- Jim Cannon Rd	90 x 24	X		10BWG	1	SA	T		
			Oak Hill Rd --->									
261+21	56	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
268+68	57	D21-2T	Country Place Ln --->	96 X 12	X		10BWG	1	SA	T		
271+30	58		**ADVANCED WARNING**		X		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
272+41	59	R1-1	Stop	36 x 36	X		10BWG	1	SA	P		
			Country Place Ln (relocate)									
277+73	60	D21-1TL	<--- Country Place Ln	96 X 12	X		10BWG	1	SA	T		
283+75	61	M2-1	JCT	21 x 15	X		10BWG	1	SA	P		
		M1-6F	FM 2729	24 x 24								
290+00	62	D21-1TL	<--- Tom Bean Rd	84 X 12	X		10BWG	1	SA	T		

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

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SHEETS 3 OF 8

Texas Department of Transportation

Traffic Operations Division Standard

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SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
4-16	DIST	COUNTY		SHEET NO.
8-16	PAR	GRAYSON		136

DATE: 1/17/2023 12:08:28 PM

SUMMARY OF SMALL SIGNS

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

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type: FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	Mounting Designation: P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	BRIDGE MOUNT CLEARANCE SIGNS: TY N = Type N TY S = Type S
292+59	62A	E7-2T	Van Alstyne 6	96 X 30	X		S80	1	SA	U		
			Gunter 17	#N/A								
290+50	63	D2-1	Cannon	54 X 18	X		10BWG	1	SA	T		
293+75	64		**ADVANCED WARNING**		X		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18	X		10BWG	1	SA			
297+00	65	R2-1	Speed Limt 55	30 x 36	X		10BWG	1	SA	P		
300+77	66	M3-1	WEST	24 x 12	x		10BWG	1	SA	P		
		M1-6F	FM 121	24 x 24								
		D10-7AT	TRM 606	3 x 10								
301+00	67	M3-1	NORTH	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2729	24 x 24								
		D10-7AT	<---	3 x 10								
301+28	68	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		R2-5BP	CROSS TRAFFIC DOES NOT STOP	24 x 6								
301+40	69	M3-1	FM 121	24 x 12	X		10BWG	1	SA	P		
		D10-7AT	<--->	3 x 10								
301+69	70	W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36	X		S80	1	SA	U		
303+00	71	M3-1	NORTH	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 2729	24 x 24								
		D10-7AT	---->	3 x 10								
303+85	72	M3-1	EAST	24 x 12	X		10BWG	1	SA	P		
		M1-6F	FM 121	24 x 24								
307+10	73	R2-1	Speed Limit 55	30 x 36	X		10BWG	1	SA	P		
308+24	74	D1-1R	Tom Bean --->	84 X 12	X		10BWG	1	SA	T		
310+35	75	D2-1	Pilot Grove 4	90 x 18	X		10BWG	1	SA	T		
310+21	76	D2-1	Cannon	60 x 18	X		10BWG	1	SA	T		
315+38	77	D21-1TR	Wolf Front Rd --->	84 X 12	X		10BWG	1	SA	T		
319+72	78	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Wolf Front Rd (relocate)									
319+80	79	M2-1	JCT	21 x 15	X		10BWG	1	SA	P		
		M1-6F	FM 2729	24 x 24								
324+68	80	D21-1TL	<--- Wolf Front Rd	84 X 12	X		10BWG	1	SA	T		
333+23	81	D21-1TL	<--- GT Bailey Ln	78 X 12	X		10BWG	1	SA	T		
			D21-1T 2%/64									
338+77	82	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			GT Bailey Ln (relocate)									
341+55	83	D1-2	<--- Wild Rd	102 X 24	X		S80	1	SA	T		
			<--- Bethel Cannon Rd									

ALUMINUM SIGN BLANKS THICKNESS	
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SHEETS 4 OF 8

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		0729	02	032	FM 121
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		137

18

SUMMARY OF SMALL SIGNS

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343+65	84	D21-2T	GT Bailey Rd --->	78 X 12	X		10BWG	1	SA	T		
345+45	85	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Wild Rd (relocate)									
348+20	86	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
			Bethel Cannon Rd (relocate)									
349+25	87	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
349+80	88	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
352+74	89	D1-2	Bethel Cannon Rd --->	102 x 24	x		S80	1	SA	T		
			Wild Rd --->									
359+12	90		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
378+40	91		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-4R	S Curve	36 x 36								
		W13-1P	XX MPH	18 x 18								
379+85	92		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
390+62	93	D21-1T 29/64	Bucksnort Rd --->	84 X 12	x		10BWG	1	SA	T		
395+38	94	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
		R2-5BP	Bucksnort Rd (relocate)	24 x 6								
400+30	95	D21-1T(L)	<--- Bucksnort Rd	84 X 12	x		10BWG	1	SA	T		
404+10	96	M1-6F	FM 121	24 x 24	x		10BWG	1	SA	T		
		D10-7AT	TRM 608	3 x 10								
406+25	97		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
409+17	98		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-4R	S Curve	36 x 36								
		W13-1P	XX MPH	18 x 18								
426+87	99		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	S CURVE	36 x 36								
		W13-1P	XX MPH	18 x 18								
435+65	100		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
447+81	101	W8-13AT	#N/A	#N/A	x		10BWG	1	SA	P		
449+07	102	D7-6ATR	HISTORICAL MARKER 1 MILE ON RIGHT	48 x 48	x		10BWG	1	SA	T		
462+11	103		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0729	02	032	FM 121
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		138

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DATE: 1/17/2023 12:08:33 PM

SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX) Post Type: FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	Mounting Designation: P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	BRIDGE MOUNT CLEARANCE SIGNS: TY N = Type N TY S = Type S
462+11	104		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
463+30	105	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	x		10BWG	1	SA	P		
465+40	106	D1-2	Binion Rd. --->	72 X 24	x		10BWG	1	SA	T		
			Maurice Cir --->									
467+77	106A	W1-8R	<CHEVRON RIGTH> X 2	30 X 36	x		10BWG	1	SA	P		
468+97	107	W1-8R	<CHEVRON RIGTH> X 2	30 X 36	x		10BWG	1	SA	P		
469+75	108	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Binion Rd (relocate)									
470+40	109	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Maurice Cir (relocate)									
470+68	110	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
471+88	111	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
472+50	112	D21-2T	<--- Tinsley Ln	66 x 12	x		10BWG	1	SA	T		
473+08	113	W1-8L	<CHEVRON LEFT> X 2	18 x 24	x		10BWG	1	SA	P		
479+97	114	D1-2	<--- Maurice Cir	72 X 24	x		10BWG	1	SA	T		
			<--- Binion Rd									
474+28	115	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
475+48	116	W1-8L	<CHEVRON LEFT> X 2	30 + 36	x		10BWG	1	SA	P		
476+68	117	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
477+48	118	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Tinsley Ln (relocate)									
477+48	119	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Maurice Cir. (relocate)									
477+88	120	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
479+08	120A	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
480+28	120B	W1-8L	<CHEVRON LEFT> X 2	30 X 36	x		10BWG	1	SA	P		
480+95	121	D21-1T2%/64	Pilot Grove Rd --->	90 X 12	x		10BWG	1	SA	T		
482+50	122		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
484+28	123	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Tinsley Ln (relocate)									
485+10	124	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Pilot Grove Rd (relocate)									

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

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SHEETS 6 OF 8

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS		0729	02	032	FM 121
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		139

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SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX)					BRIDGE MOUNT CLEARANCE SIGNS
					Post Type		Anchor Type Mounting Designation			
					ALUMINUM TYPE A	ALUMINUM TYPE G	FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	TY N = Type N TY S = Type S
486+85	125		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2R	Curve to Right	36 x 36								
		W13-1P	XX MPH	18 x 18								
487+80	126	D21-1T 29/64	Tinsley Ln --->	66 X 12	x		10BWG	1	SA	T		
488+90	126A	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
490+10	127	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
491+30	128	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
492+50	128A	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
492+89	129		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W2-1	4 way stop ahead	30 x 30								
493+70	130	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
494+90	131	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
495+50	132	D1-1	<----> Pilot Grove Rd	90 X 12	x		10BWG	1	SA	T		
496+10	132A	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
497+30	133	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
498+50	134	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
499+70	135	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
500+90	136	W1-8R	<CHEVRON RIGHT> X 2	30 X 36	x		10BWG	1	SA	P		
502+10	137	D7-7ATL	Historical Marker - RELOCATE	48 x 48	x		10BWG	1	SA	T		
		D7-7ATR	Historical Marker - RELOCATE	48 x 48								
502+10	138	W1-8R	<CHEVRON RIGHT> X 2	30 X36	x		10BWG	1	SA	P		
502+98	139	R1-1	STOP Pilot Grove Rd (relocate)	36 x 36	x		10BWG	1	SA	P		
503+31	140	R1-1	STOP Pilot Grove Rd (relocate)	36 x 36	x		10BWG	1	SA	P		
507+72	141	D21-1T	<----> Pilot Grove	90 X 12	x		10BWG	1	SA	T		
509+11	142		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-4L	S Curve	36 x 36								
		W13-1P	XX MPH	18 x 18								
509+31	143		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-2L	Curve to Left	36 x 36								
		W13-1P	XX MPH	18 x 18								
510+45	144	D1-2	<--- Chestnut Rd Gordon Rd --->	78 x 24	x		10BWG	1	SA	P		
511+90	145	M1-6F	FM 121	24 x 24	x		10BWG	1	SA	T		
		D10-7AT	TRM 610	3 x 10								

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SHEETS 7 OF 8

Texas Department of Transportation | Traffic Operations Division Standard

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SOSS

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©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
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4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		140

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DATE: 1/17/2023 12:08:37 PM

SUMMARY OF SMALL SIGNS

STATIONS	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	SMA RD SGN ASSM TY XXXXX (X) XX (X-XXXX) Post Type: FRP = Fiberglass TWT = Thin-wall 10BWG = 10 BWG S80 = Sched	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge	Mounting Designation: P = Prefb. "Plain" T = Prefab. "T" U = Prefab. "U"	1EXT or 2EXT = # of Ext. BM = Extruded Beam WC = 1.12 #/ft Wing Chan. EXAL = Extruded Alum. Signs	BRIDGE MOUNT CLEARANCE SIGNS TY N = Type N TY S = Type S
512+50	146		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W2-1	For way ahead	30 x 30								
515+53	147	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Chestnut Rd (relocate)									
523+25	148	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Gordon Rd (relocate)									
526+90	149	D21-1T(L)	<---Gordon Rd	72 x 12	x		10BWG	1	SA	T		
532+04	150	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
			Chestnut Rd (relocate)									
537+32	151	D21-1T 29/64	Chestnut Rd --->	78 x 12	x		10BWG	1	SA	T		
547+36	152		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W1-4L	S Curve	36 x 36								
		W13-1P	XX MPH	18 x 18	x							
554+99	153	D7-6ATL	Historical Marker 1 mi. <---	48 x 48	x		10BWG	1	SA	T		
555+26	154	M2-1	JCT	21 x 15	x		10BWG		SA	P		
		M1-6F	SH 160	24 x 24								
563+65	155		**ADVANCED WARNING**		x		10BWG	1	SA	P		
		W3-1	STOP AHEAD	30 x 30								
566+89	156	D1-2	<--- WHITEWRIGHT	102 X 30	x		S80	1	SA	U		
			BLUE RIDGE --->									
568+23	157	R2-1	Speed Limit 55	30 x 36	x		10BWG	1	SA	P		
571+51	158	M3-1	WEST	24 x 12	x		10BWG	1	SA	P		
		M1-6F	FM 121	24 x 24								
573+15	159	R1-1	STOP	36 x 36	x		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24 x 12								

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SHEETS 8 OF 8

Texas Department of Transportation

Traffic Operations Division Standard

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SOSS

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REVISIONS		0729	02	032	FM 121
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	GRAYSON		141

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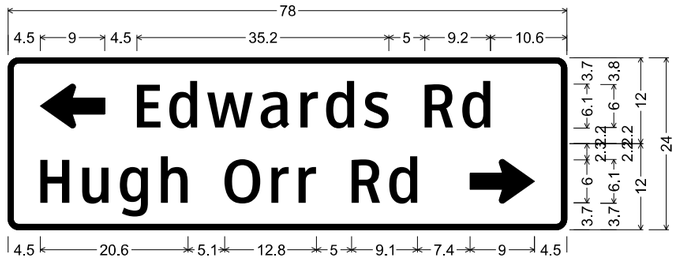

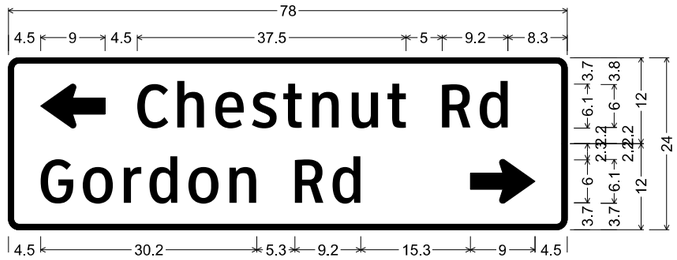

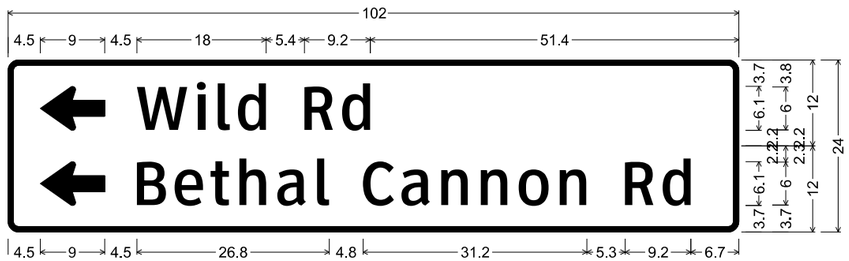

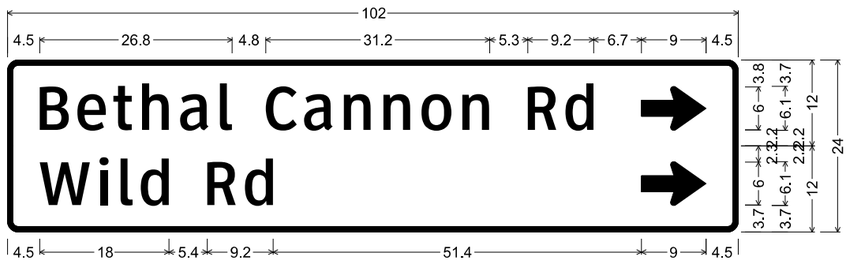

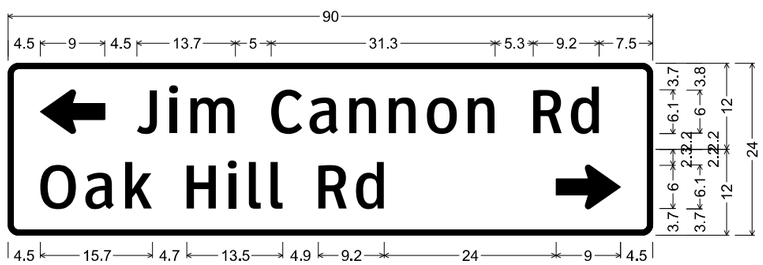

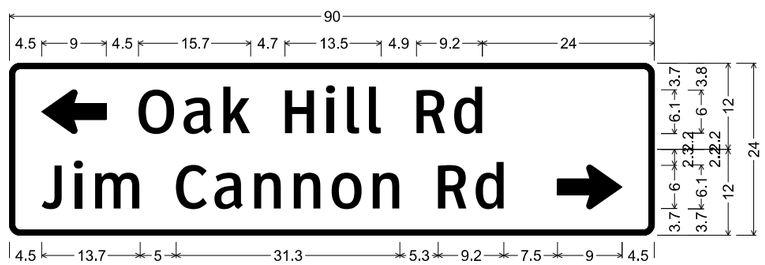

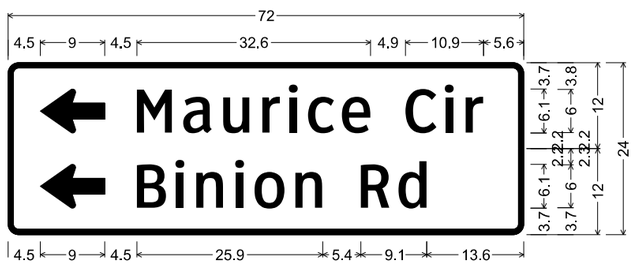

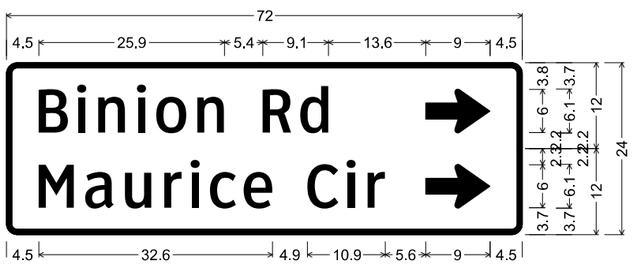

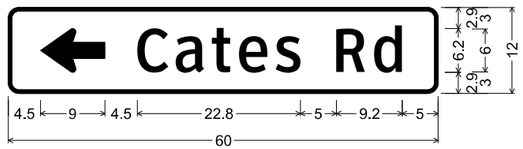

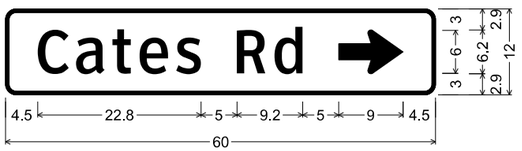

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121

SIGN DETAILS

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		142

DATE: 1/17/2023 5:18:04 PM
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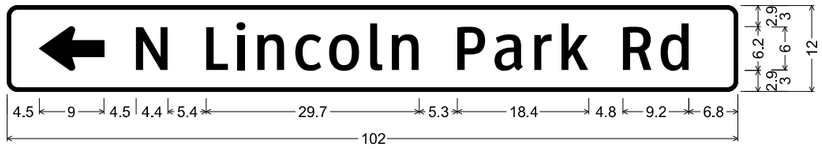

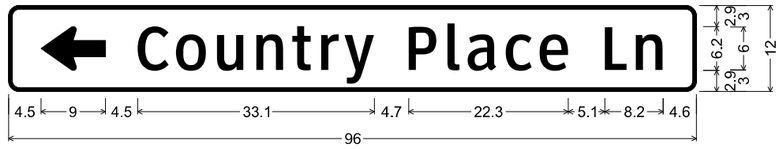

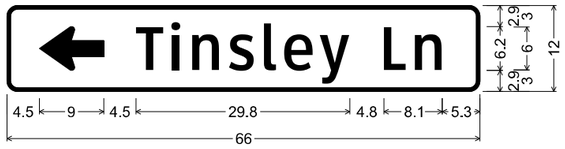

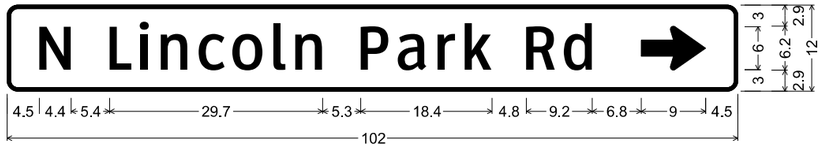

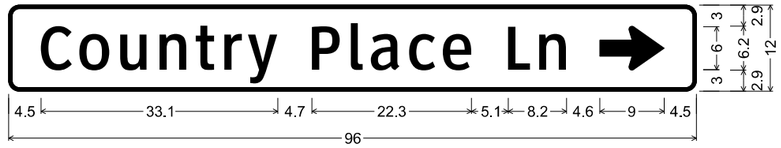

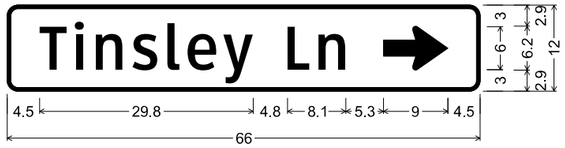

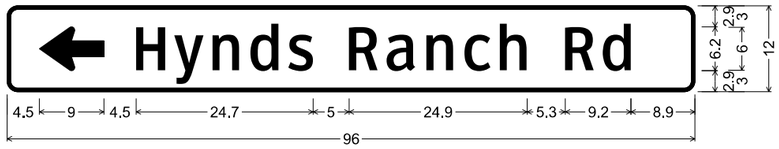

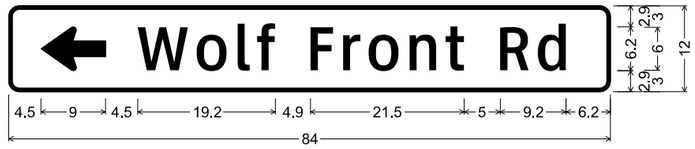

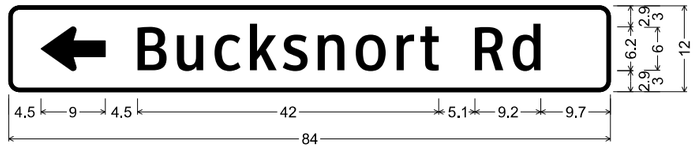

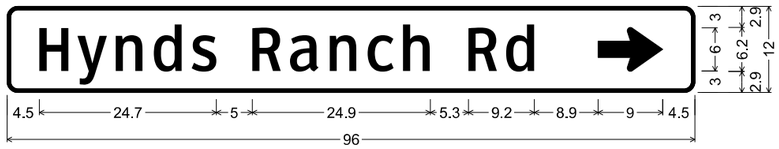

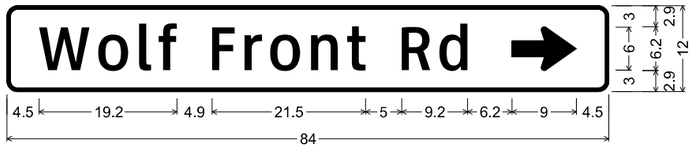

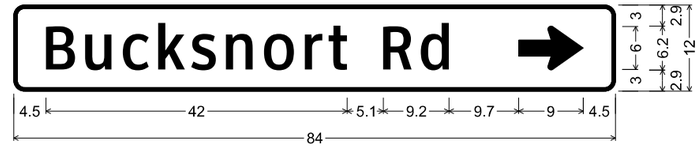

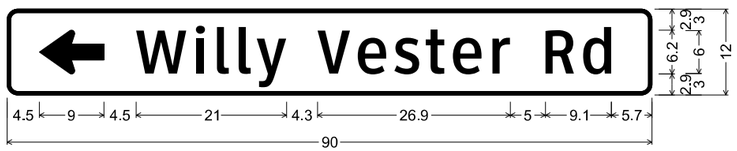

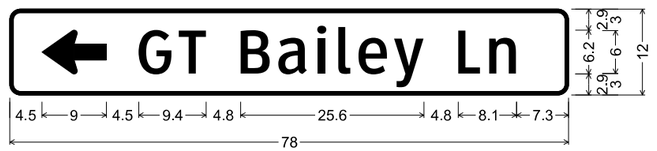

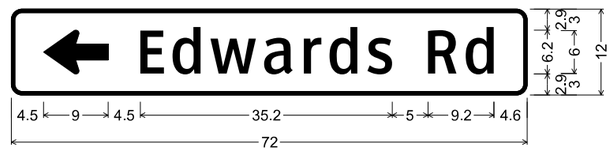

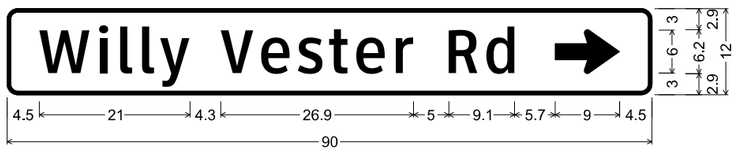

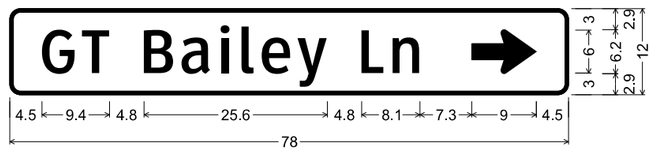

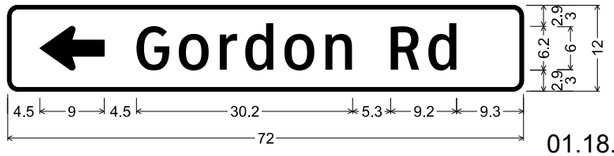

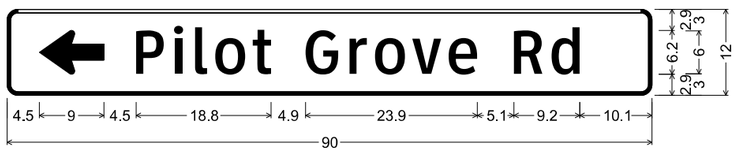

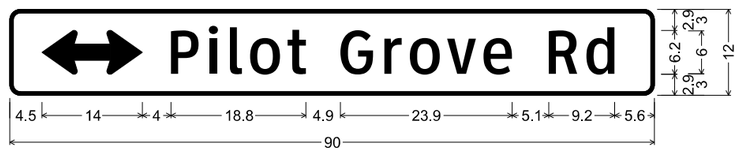

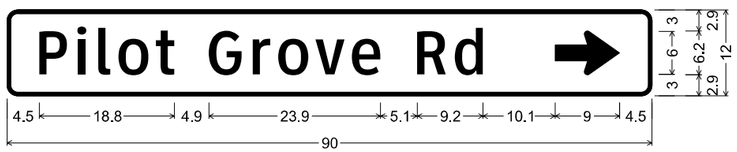

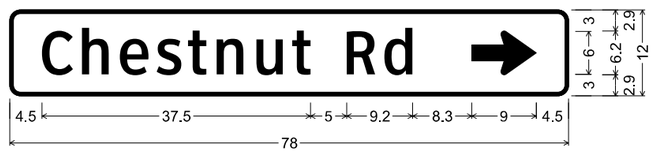

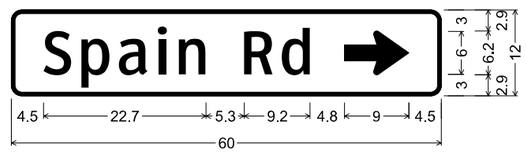

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.18.23

Monte R. Rater P.E.

FM 121
SIGN DETAILS

SHEET 2 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		143

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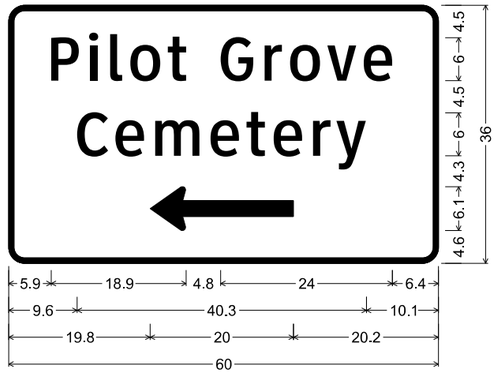

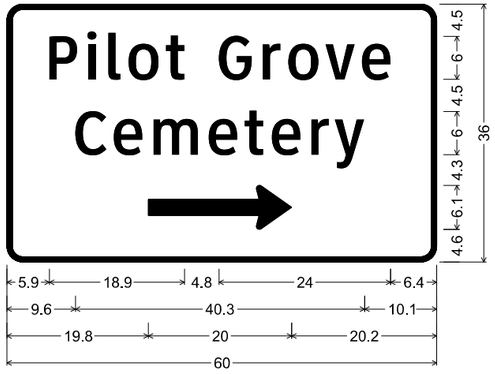

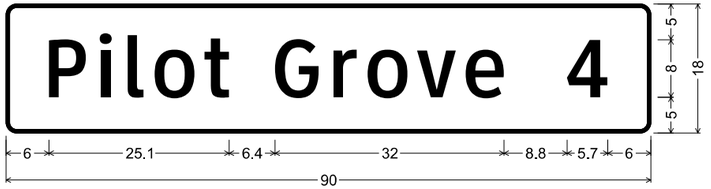

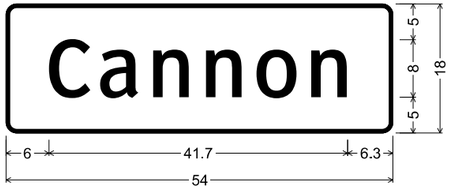

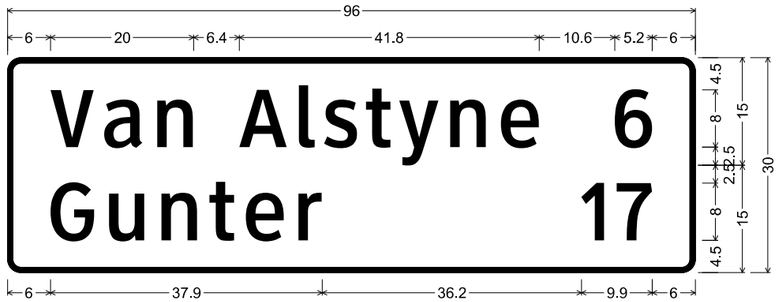

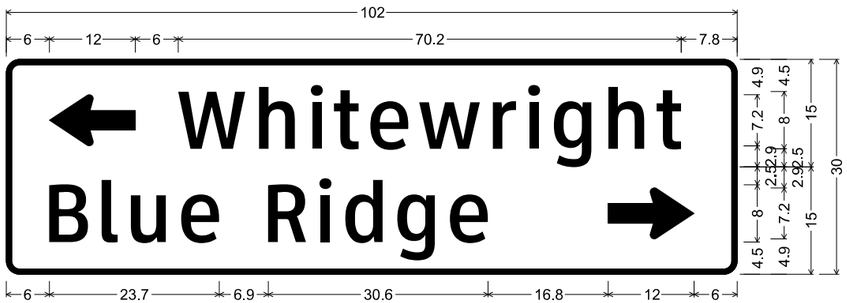

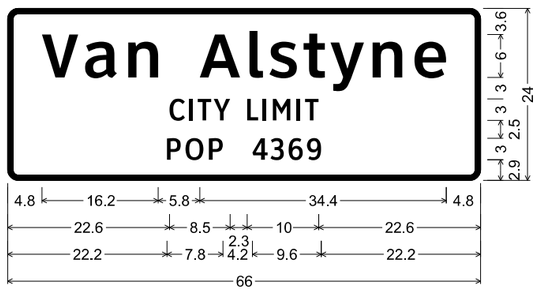

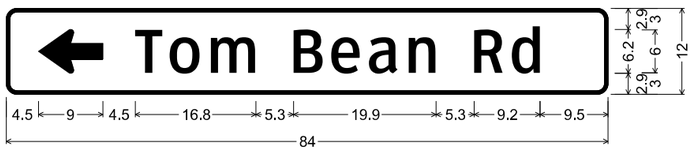

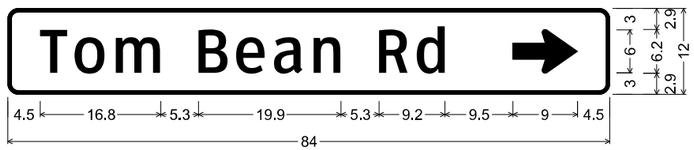

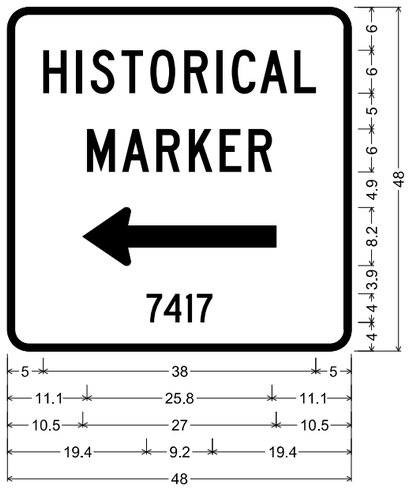

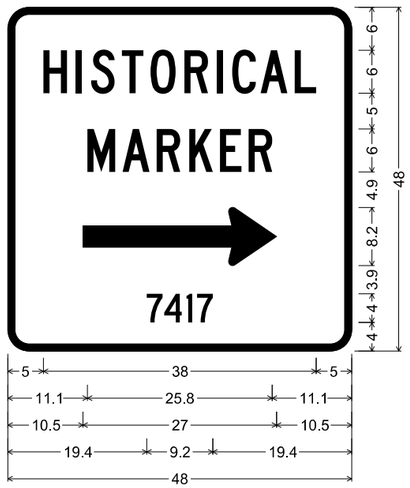

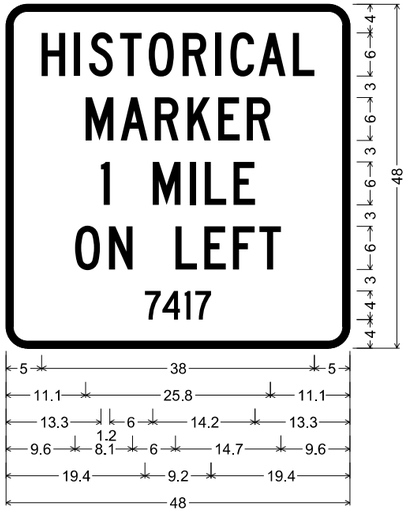

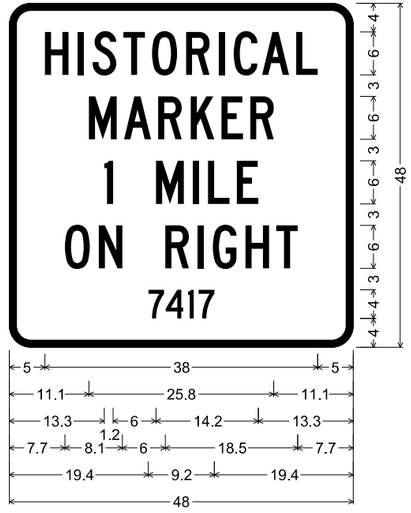

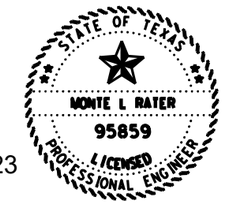

01.18.23

Monte R. Rater P.E.

FM 121

SIGN DETAILS

SHEET 3 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		144

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

Anchor Type

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

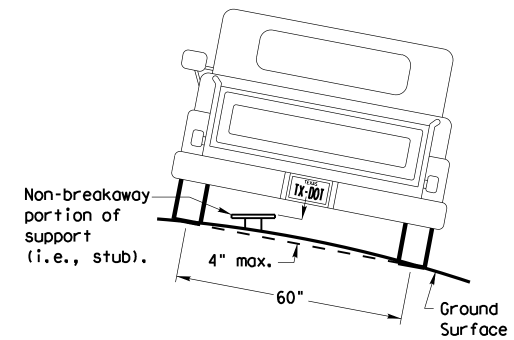
Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

IF REQUIRED

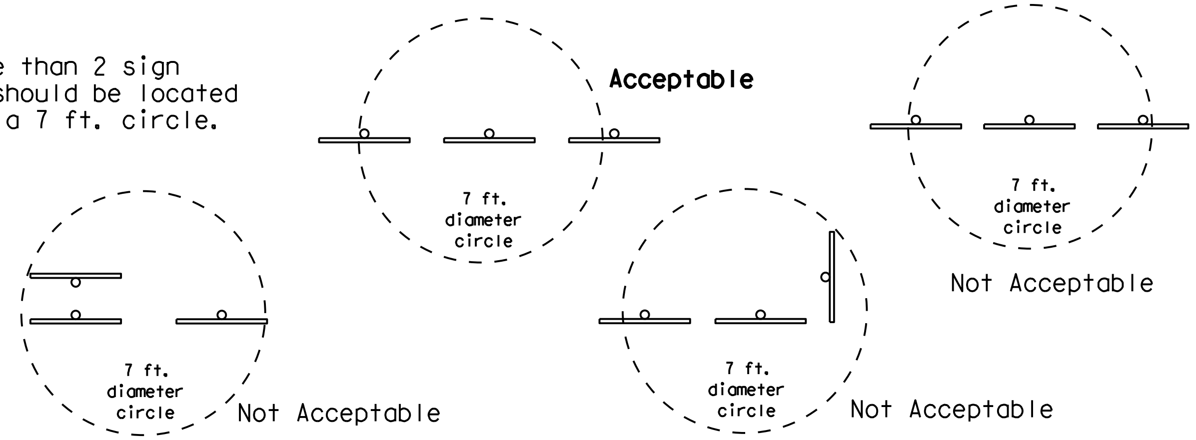
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



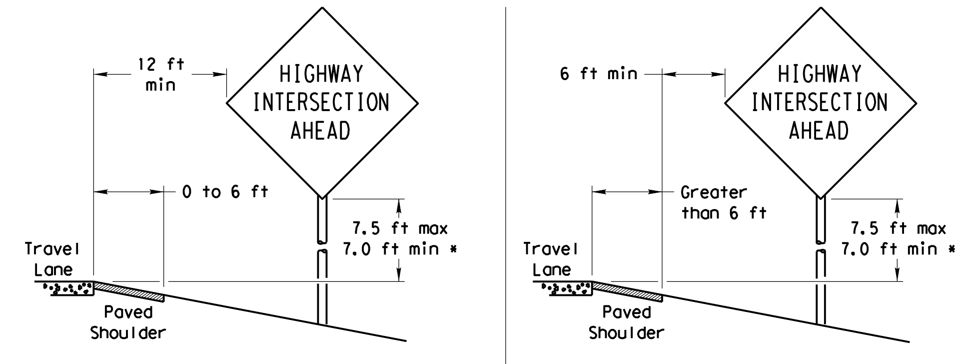
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



SIGN LOCATION

PAVED SHOULDERS



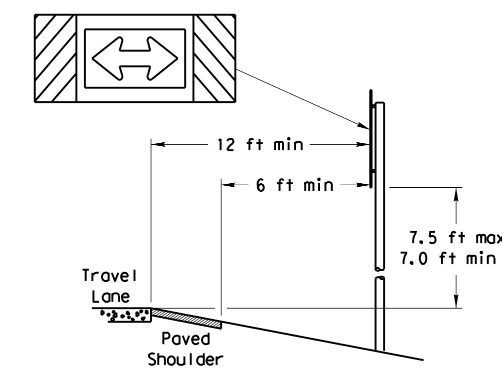
LESS THAN 6 FT. WIDE

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

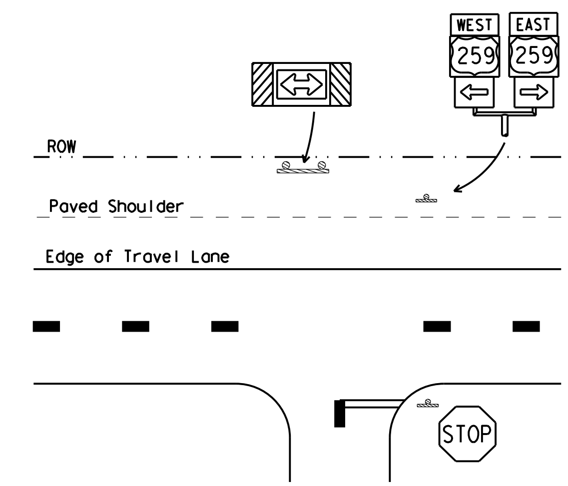
GREATER THAN 6 FT. WIDE

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

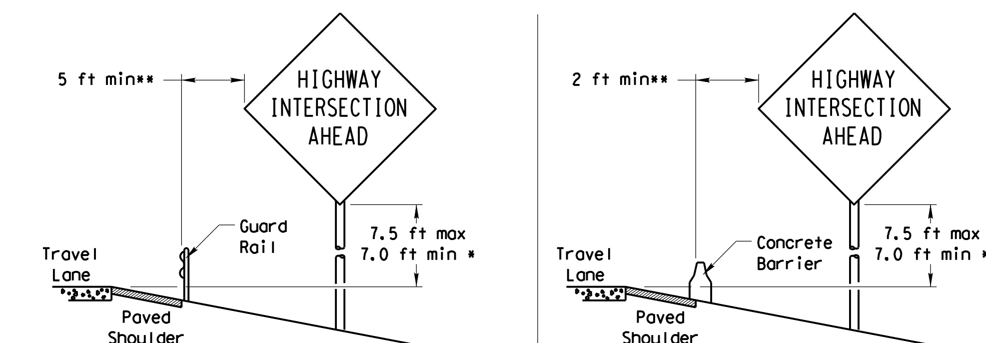
T-INTERSECTION



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

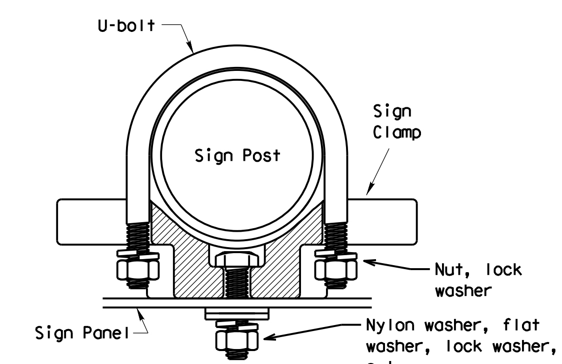
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

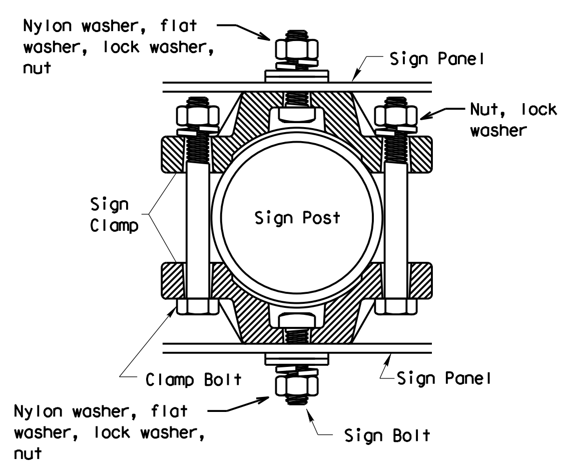
The maximum values may be increased when directed by the Engineer.

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

TYPICAL SIGN ATTACHMENT DETAIL





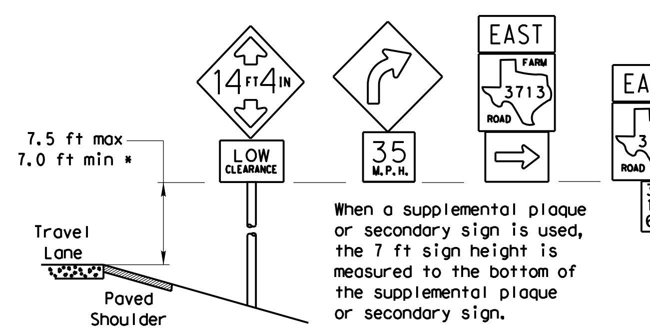
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

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

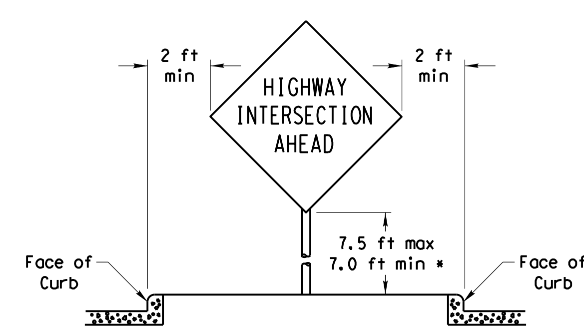
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



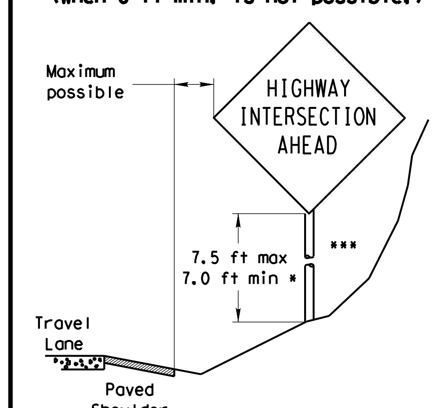
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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REVISIONS	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
9-08	DIST PAR	COUNTY GRAYSON		SHEET NO. 145

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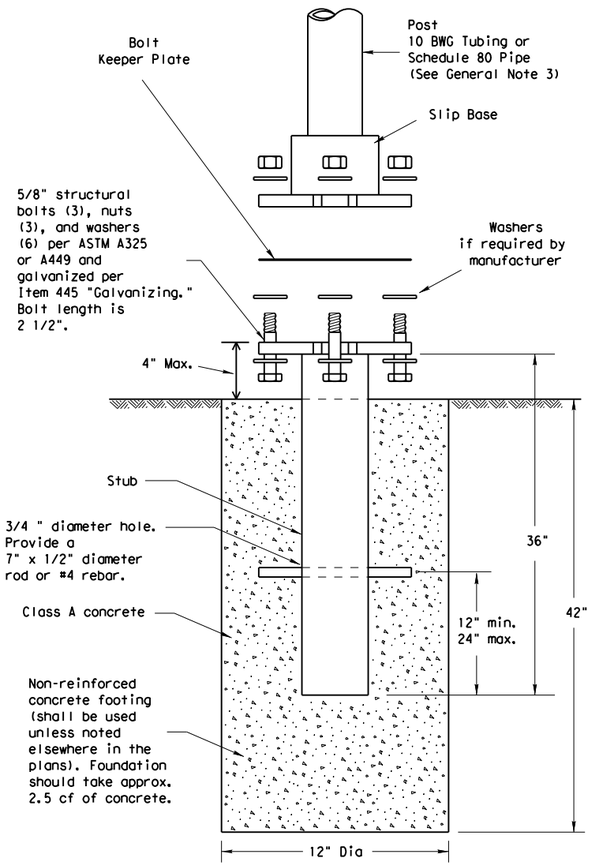
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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.

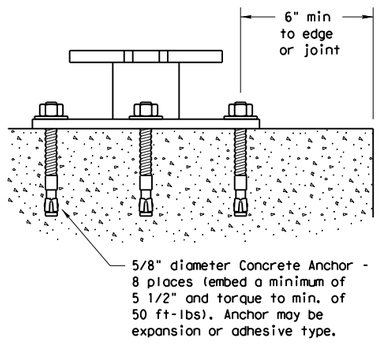
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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.

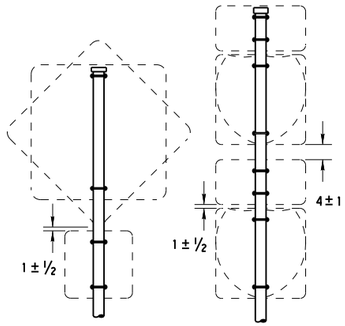
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

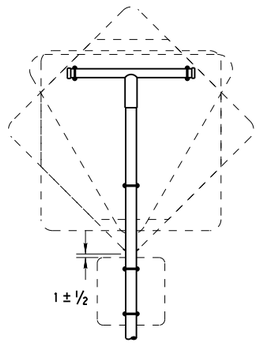
SMD(SLIP-1)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		146

DATE: 1/17/2023 2:11:03 AM
FILE: T:\PARIPDD\FM*121*0729-02-032*2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\147 SMD(SLIP-2)-08.dgn



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



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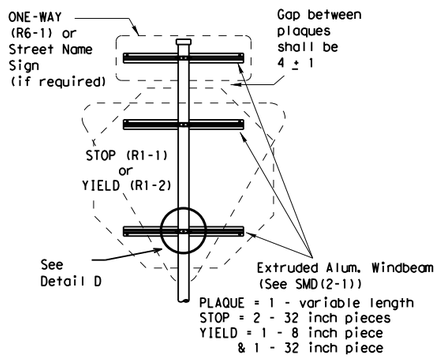
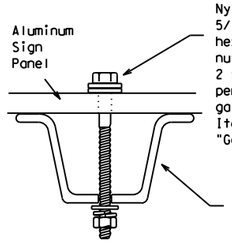
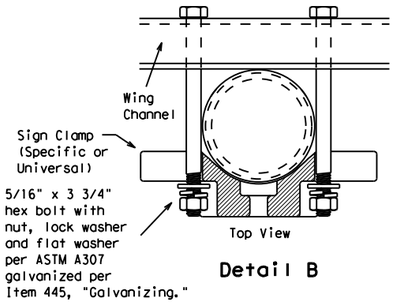


SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



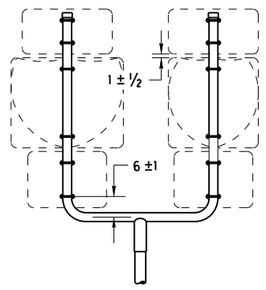
Detail B

GENERAL NOTES:

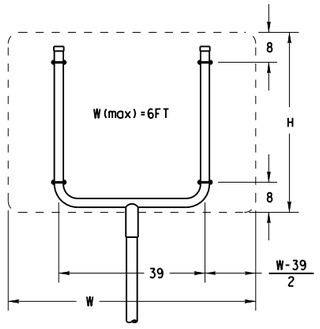
1.

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.



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



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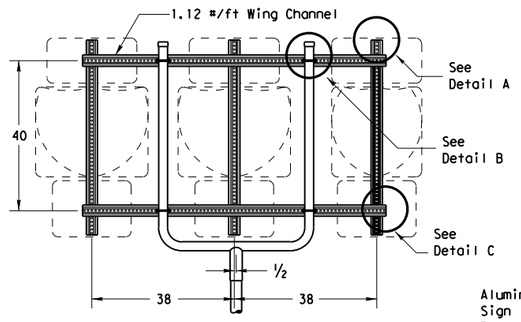
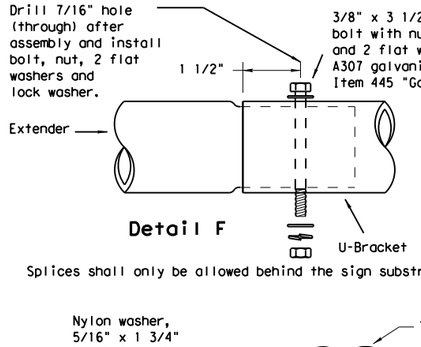
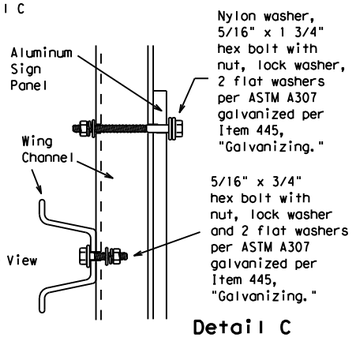


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

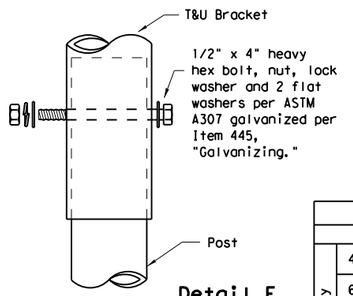


Detail F

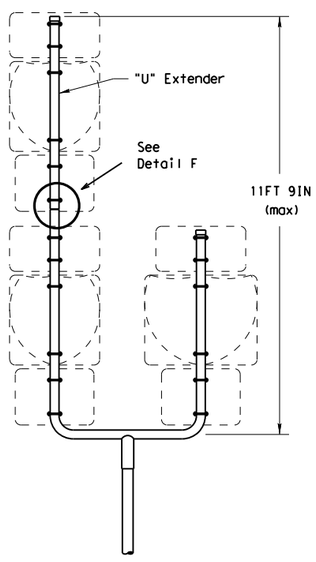
Splices shall only be allowed behind the sign substrate.



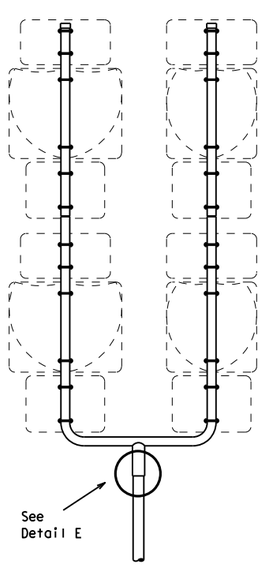
Detail C



Detail E



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



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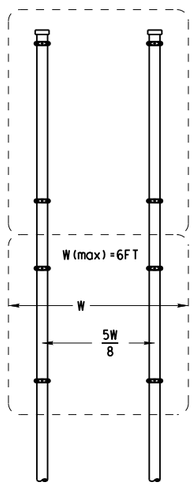
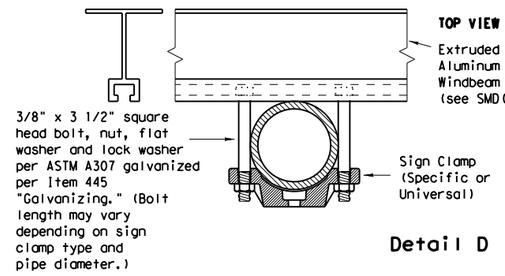
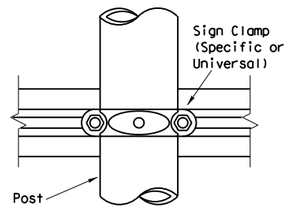


SM RD SGN ASSYM TY XXXXX(2)XX(P)

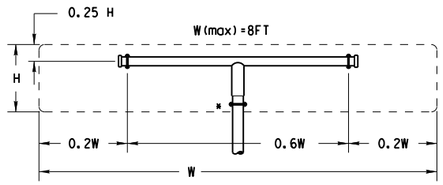
SIDE VIEW



Detail D



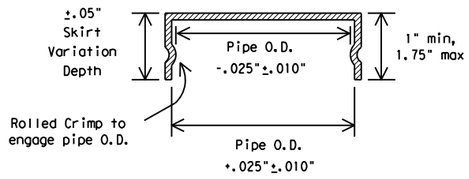
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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)



All dimensions are in english unless detailed otherwise.

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

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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		147

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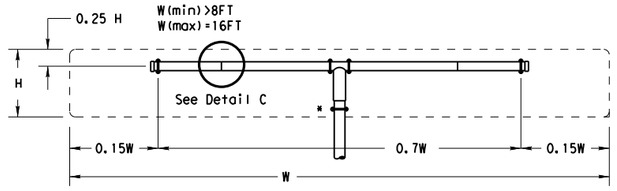
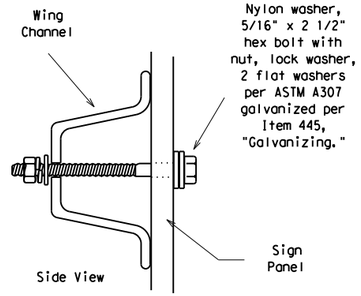
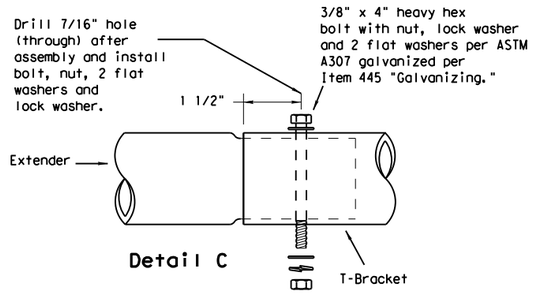


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



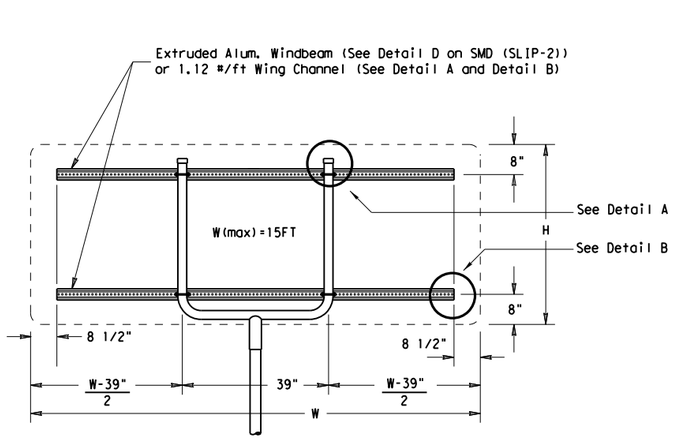
Detail C

Splices shall only be allowed behind the sign substrate.

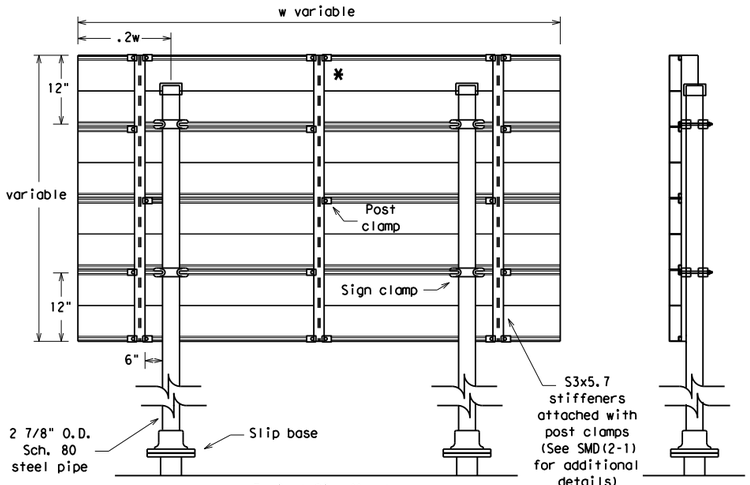
GENERAL NOTES:

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

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



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

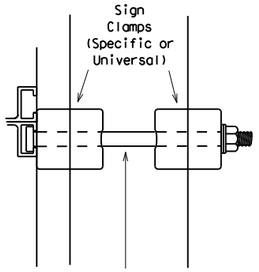


Typical Sign Mount

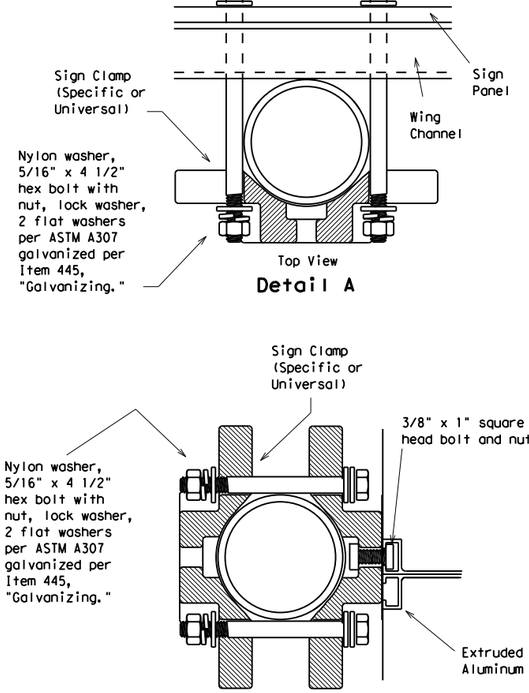
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

See Detail E
for clamp installation

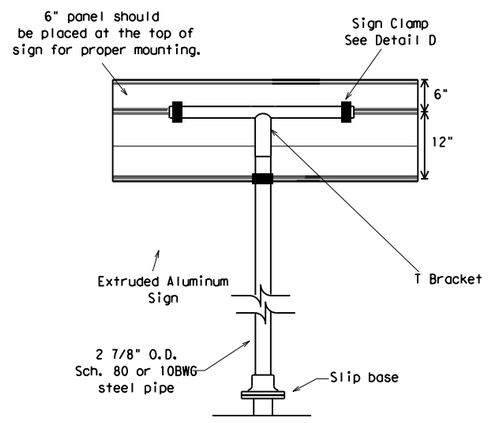


Detail E

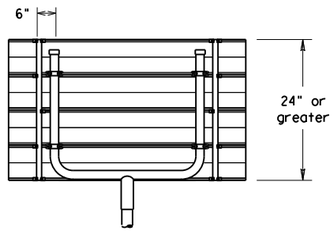


Detail A

Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

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

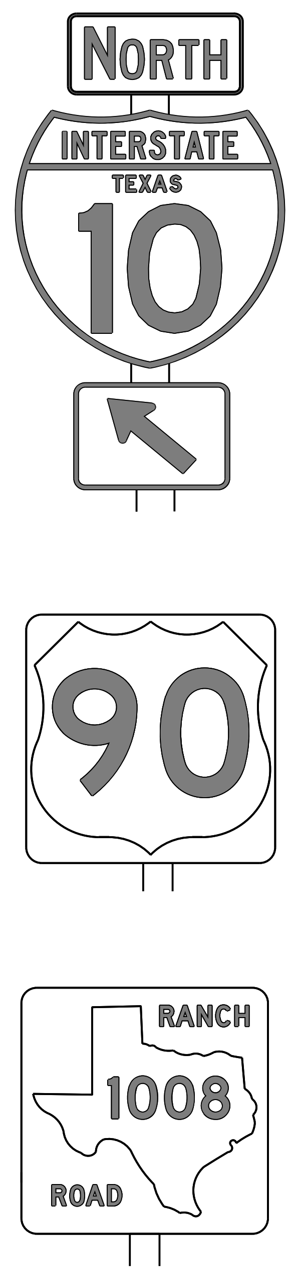
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121

DIST	COUNTY	SHEET NO.
PAR	GRAYSON	148

DATE: 1/17/2023 2:11:06 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

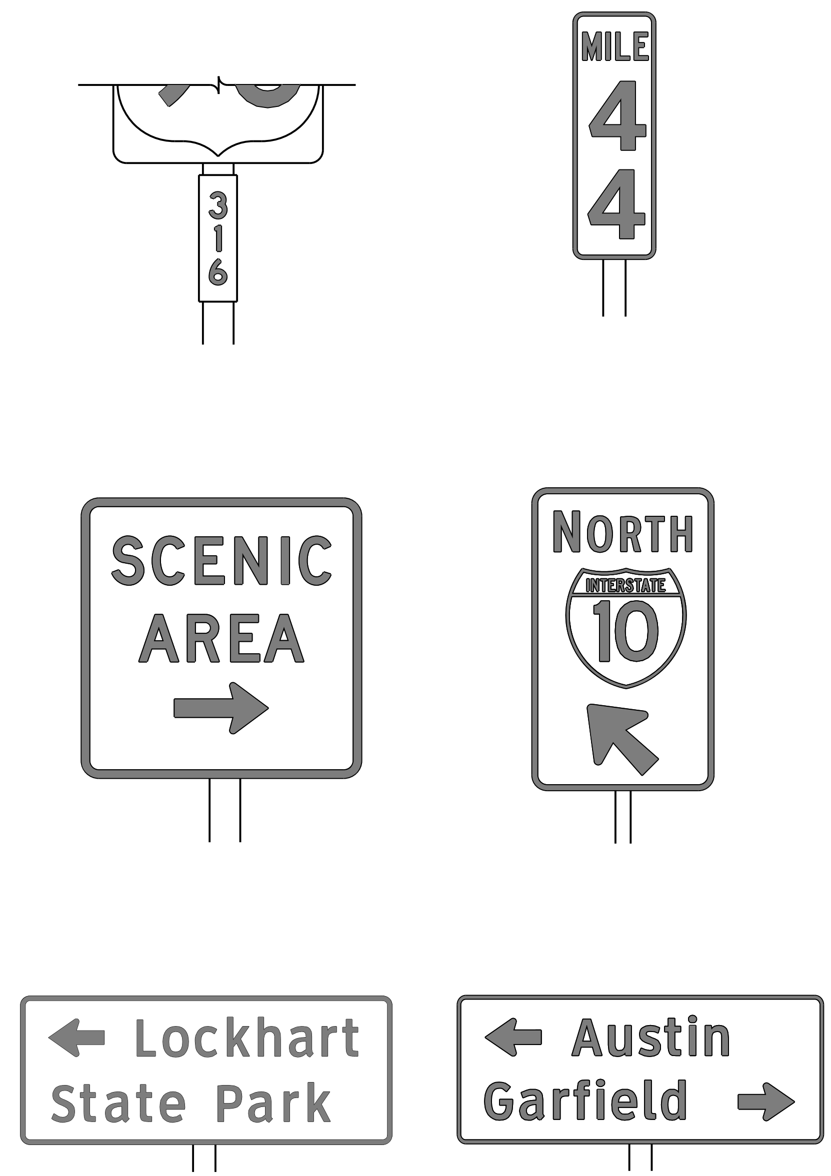
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

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

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

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

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

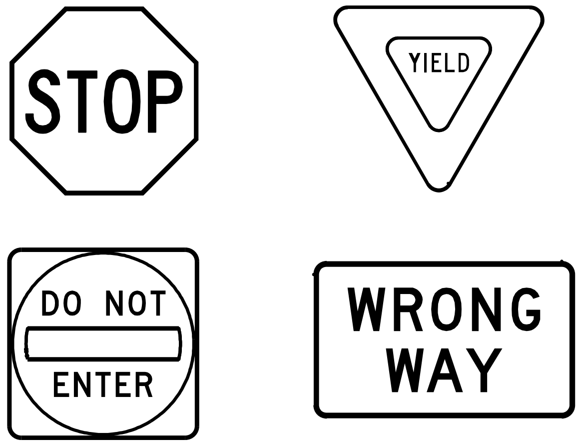
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	149

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

GENERAL NOTES

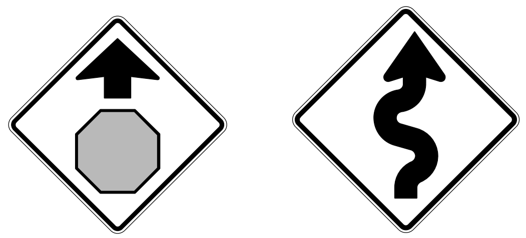
1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

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

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

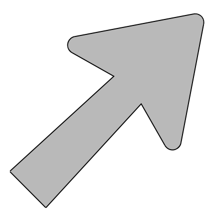
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 12-03 7-13 9-08	DIST PAR		COUNTY GRAYSON	SHEET NO. 150

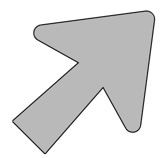
DATE: 1/17/2023 2:11:07 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED SUBMITTAL\

ARROW DETAILS

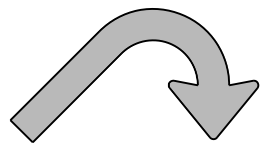
for Large Ground-Mounted and Overhead Guide Signs



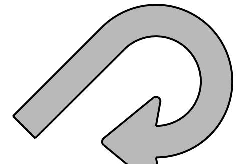
Type A



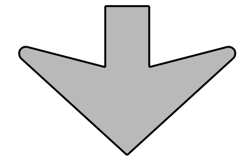
Type B



E-3



E-4



Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

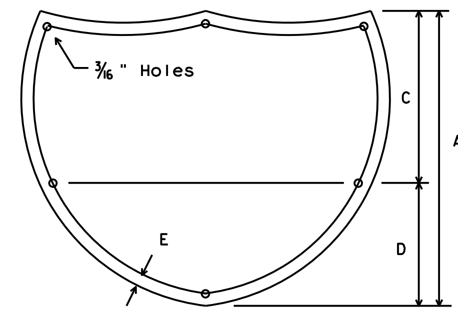
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

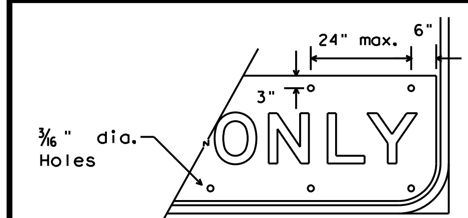
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

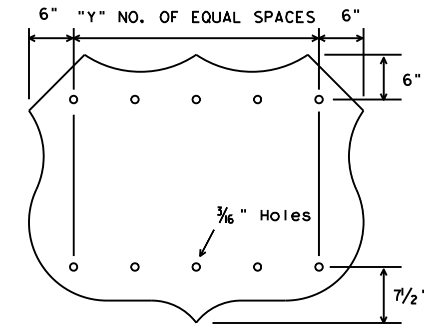


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

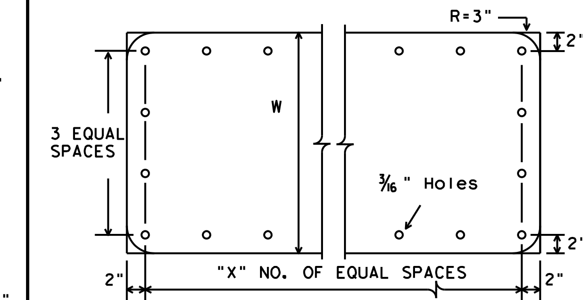


EXIT ONLY PANEL



U.S. ROUTE MARKERS

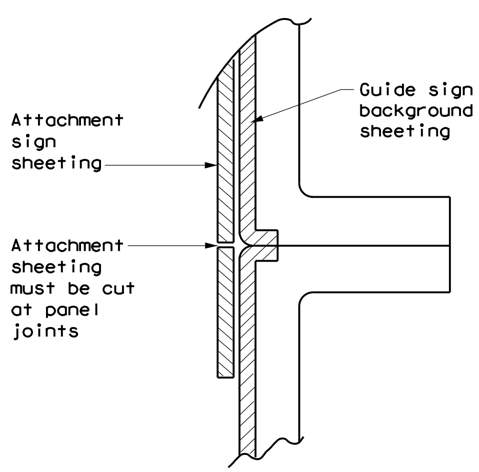
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



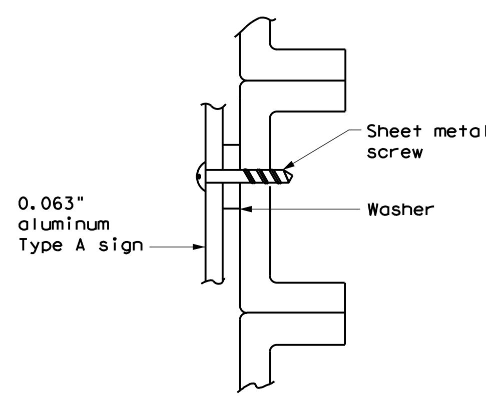
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

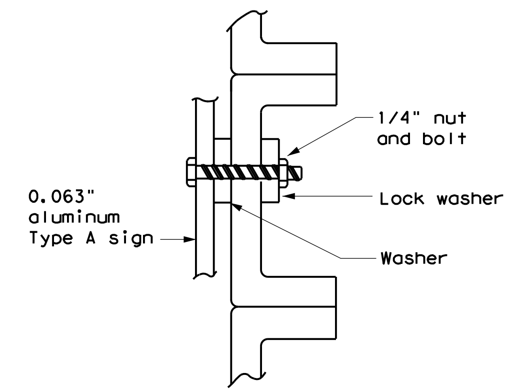
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

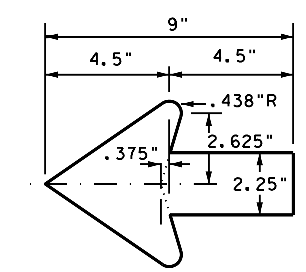
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

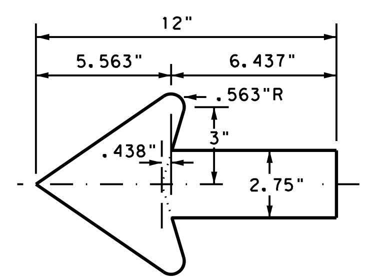
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

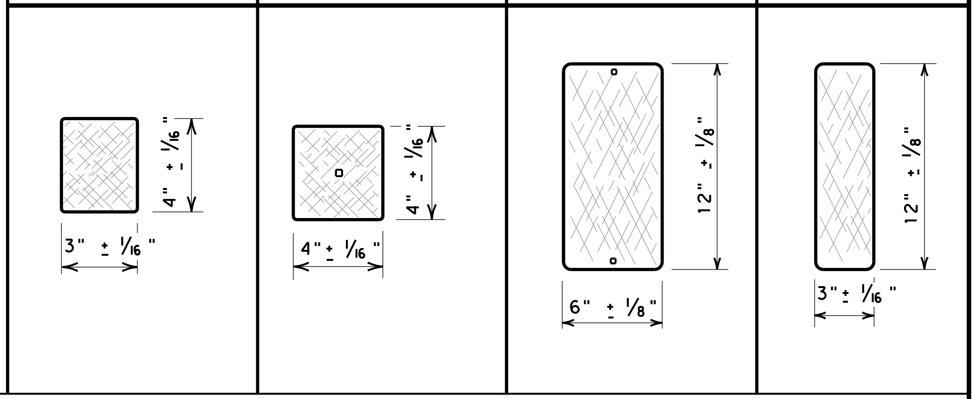
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	151

5

DATE: 1/17/2023 2:11:08 AM
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\

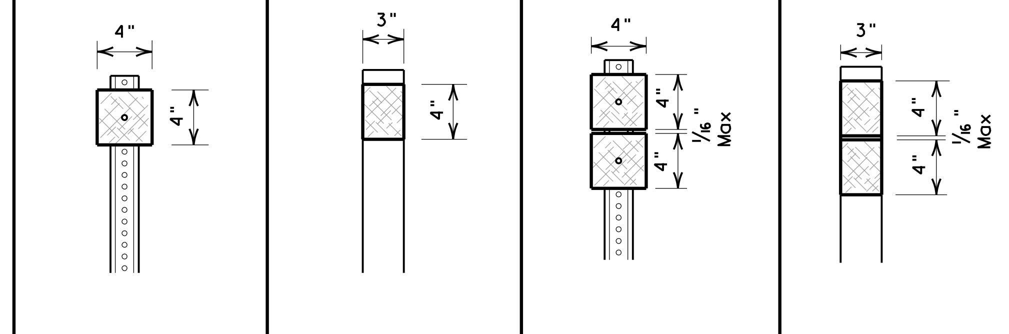
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" x 4" ± 1/16"	4" ± 1/16" x 4" ± 1/16"	6" ± 1/8" x 12" ± 1/8"	3" ± 1/16" x 12" ± 1/8"
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)

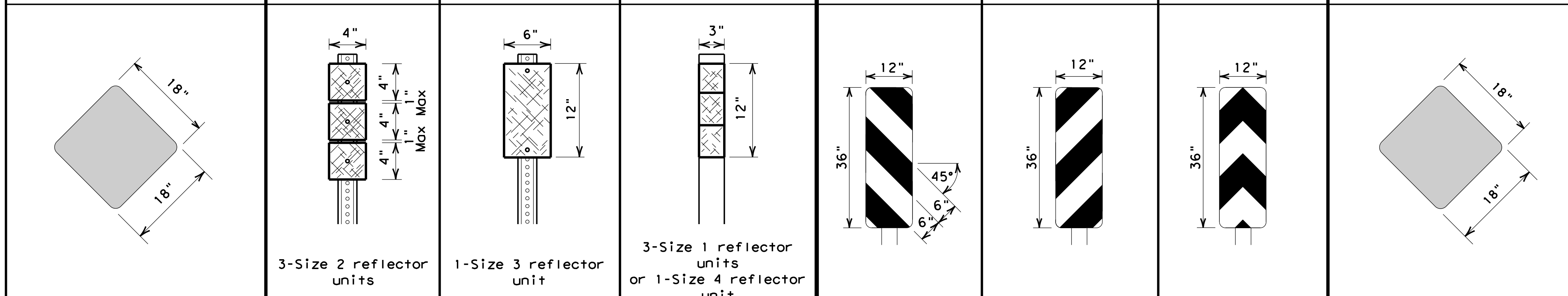
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

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

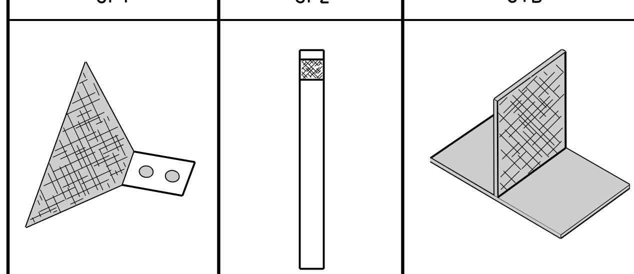


DEPARTMENTAL MATERIAL SPECIFICATIONS

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

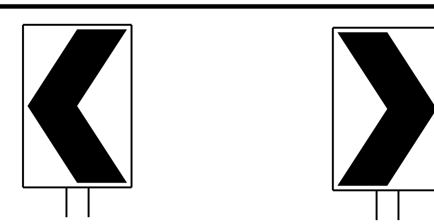
BARRIER REFLECTORS (BRF)

	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.		



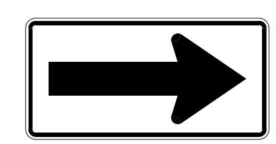
CHEVRONS

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

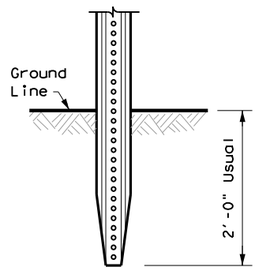
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 10-09 3-15, 4-10 7-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 152

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

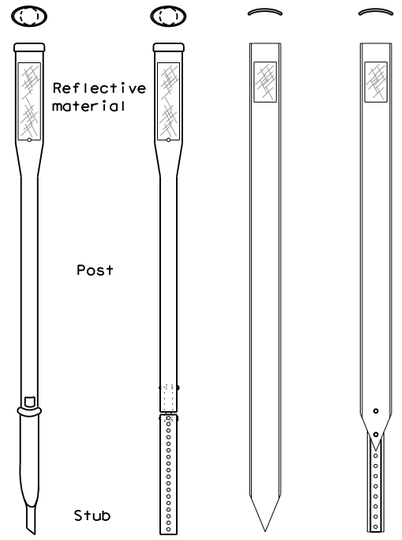


NOTES

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

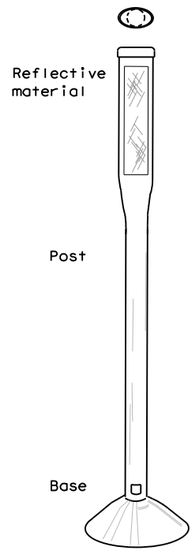
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



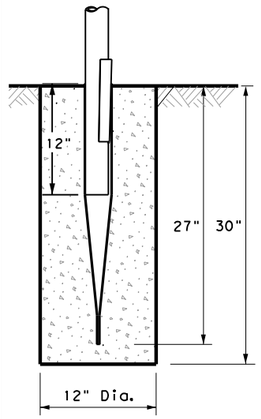
SURFACE MOUNT

NOTES

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

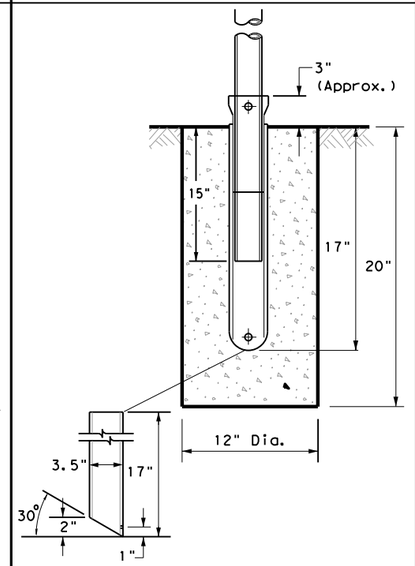
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

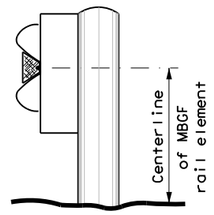
NOTE

1. Install per manufacturer's recommendations.

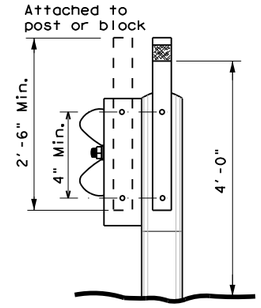
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

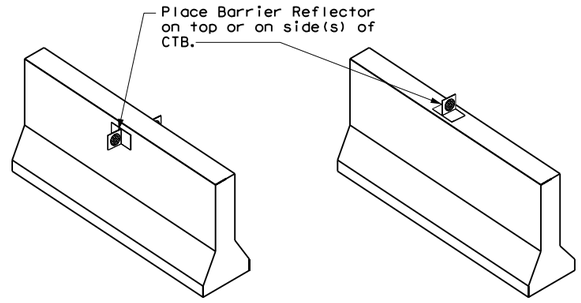
GF1



GF2



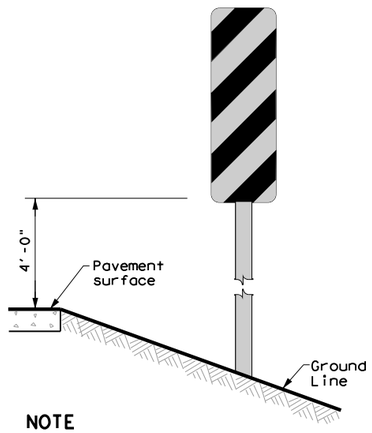
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

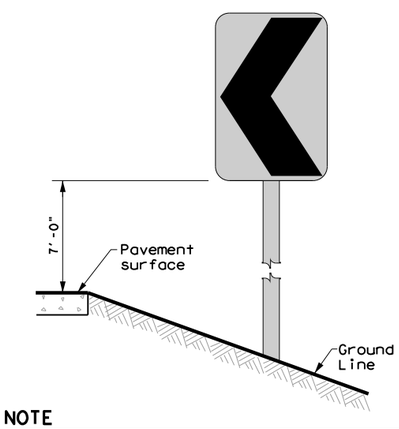
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

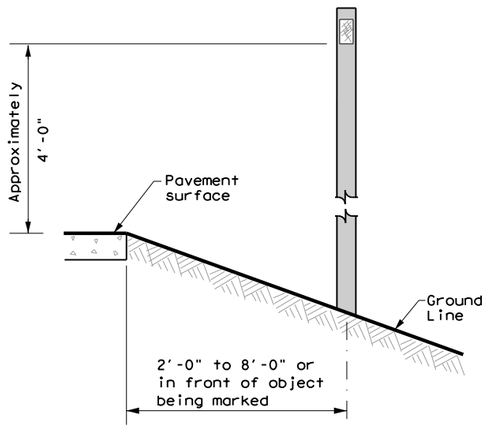
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	PAR	GRAYSON		153

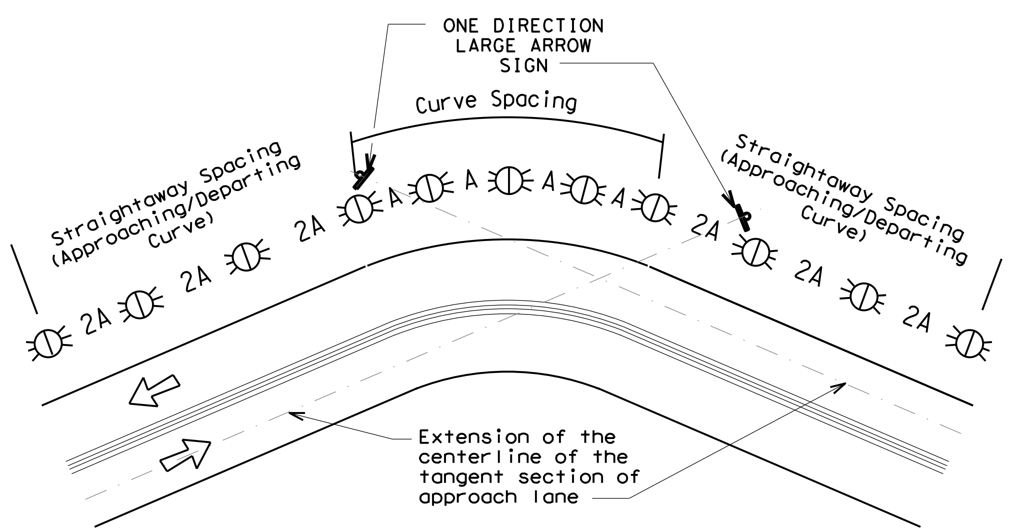
20B

DATE: 1/17/2023 2:11:11 AM
FILE: T:\PARIPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\DOM2-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed: Turn (30 MPH or less)	Curve Advisory Speed: 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

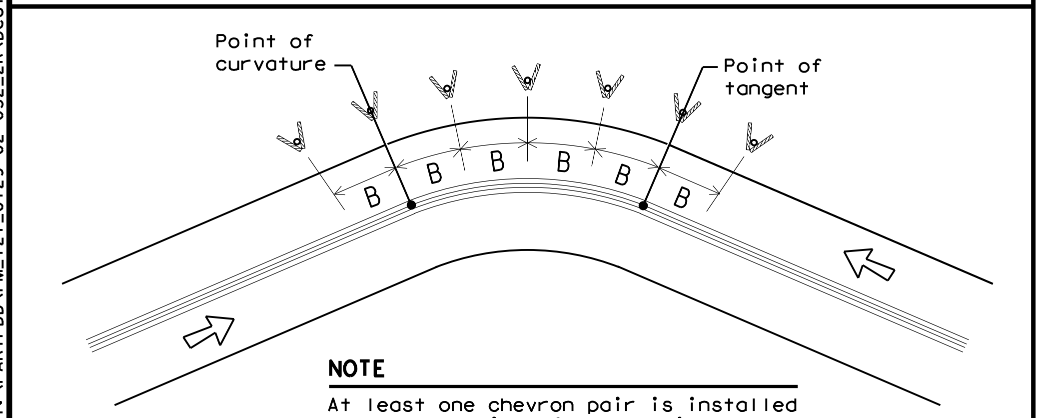
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

Symbol	Meaning
	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 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 3-15 8-15 8-15 7-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 154

20C

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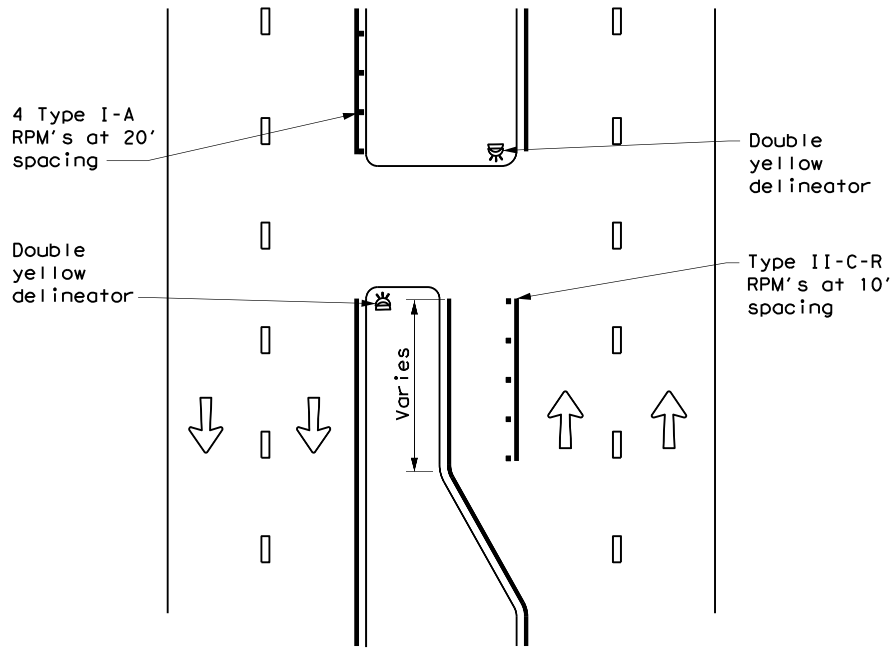
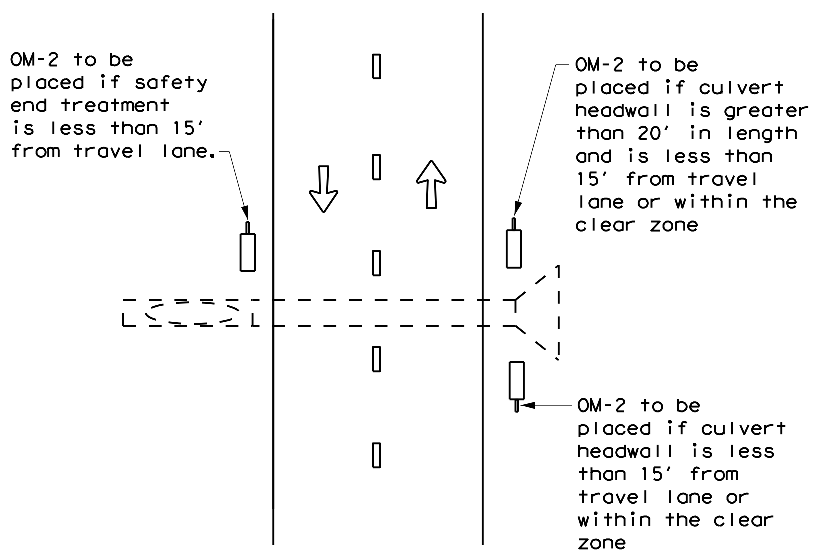
CROSSOVERS



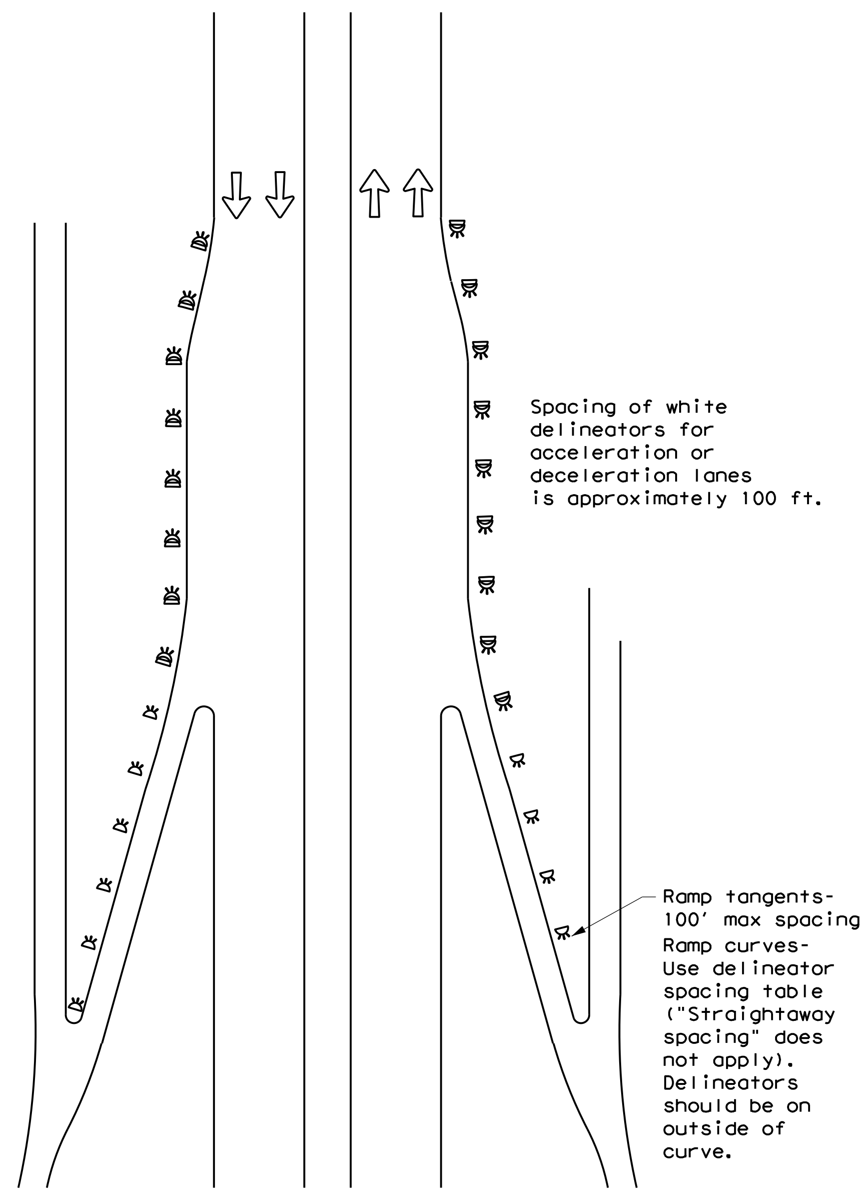
DETAIL 1

FOR CULVERTS WITHOUT MBGF



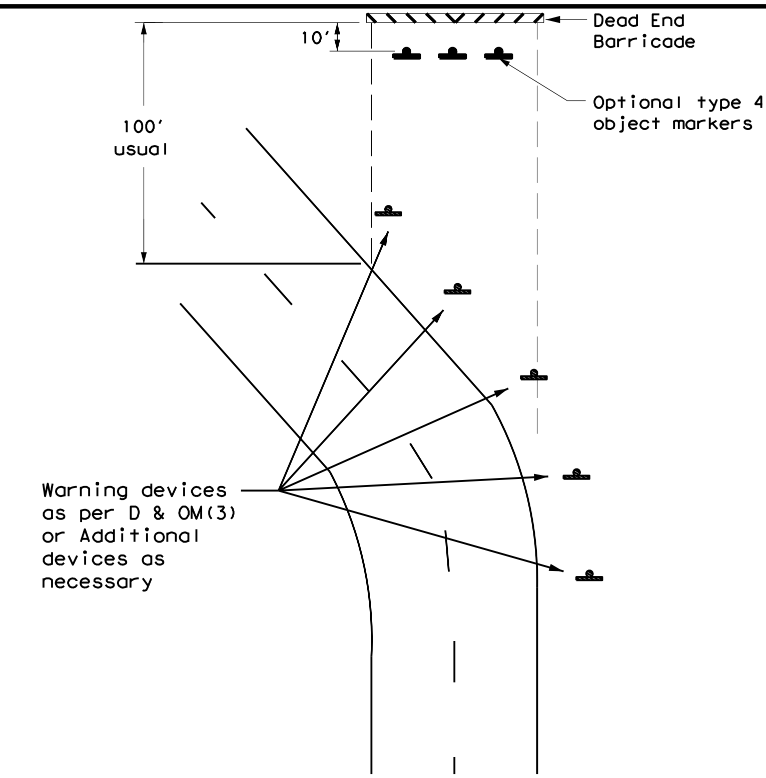
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



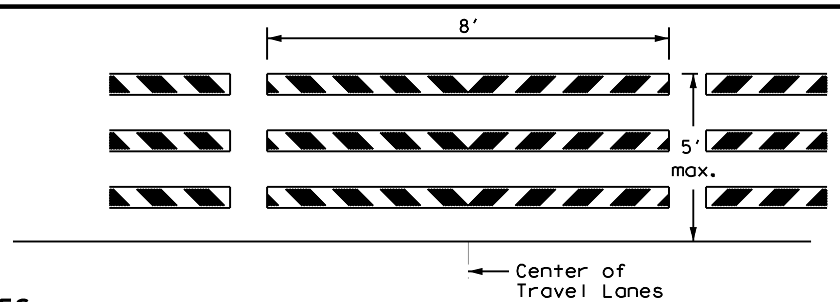
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND

Symbol	Description
(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	Barricade
(symbol)	Sign
(symbol)	OM-2
(symbol)	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

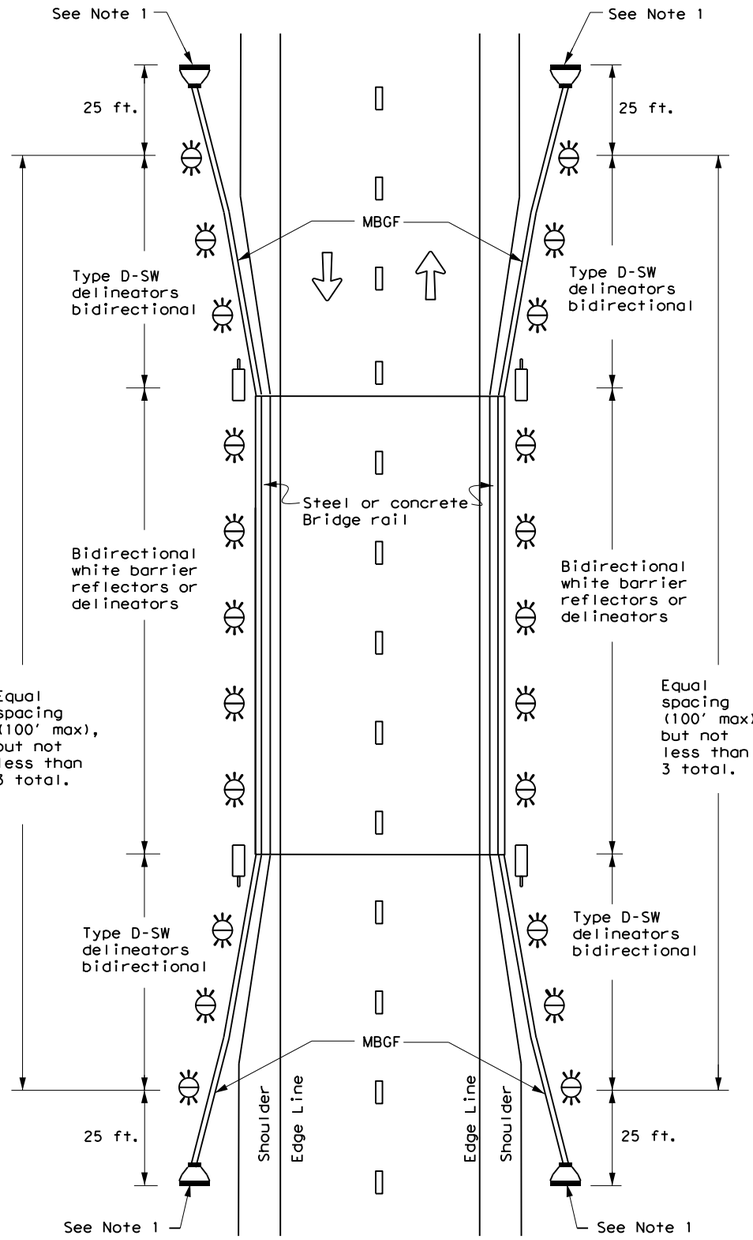
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 3-15 7-20	DIST PAR	COUNTY GRAYSON		SHEET NO. 155

20D

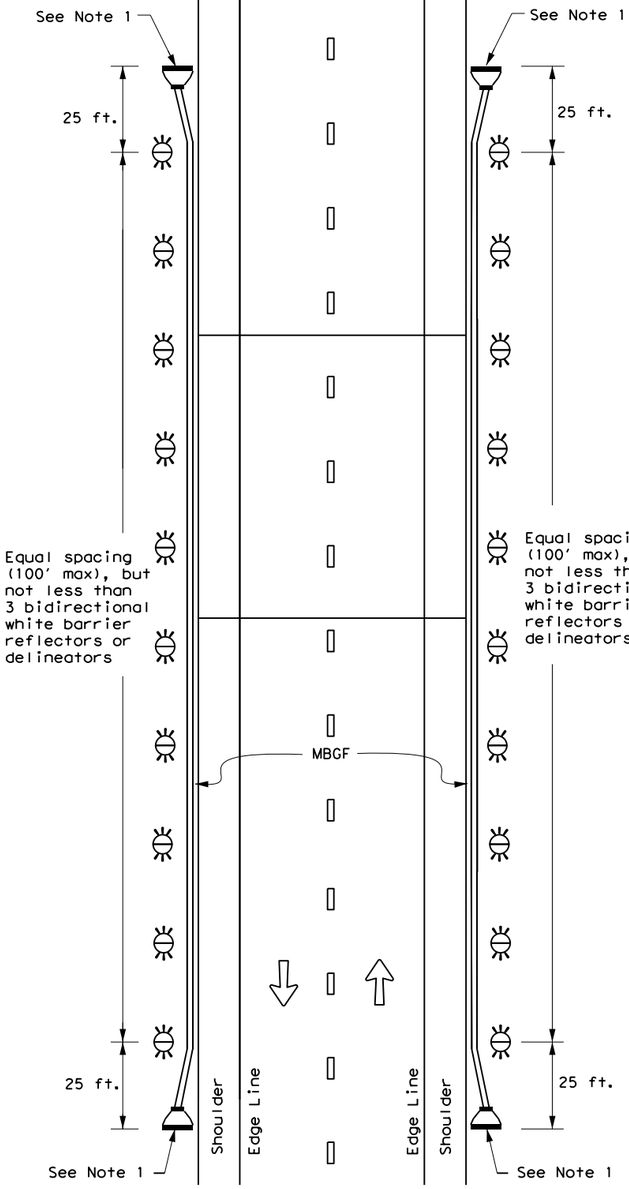
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

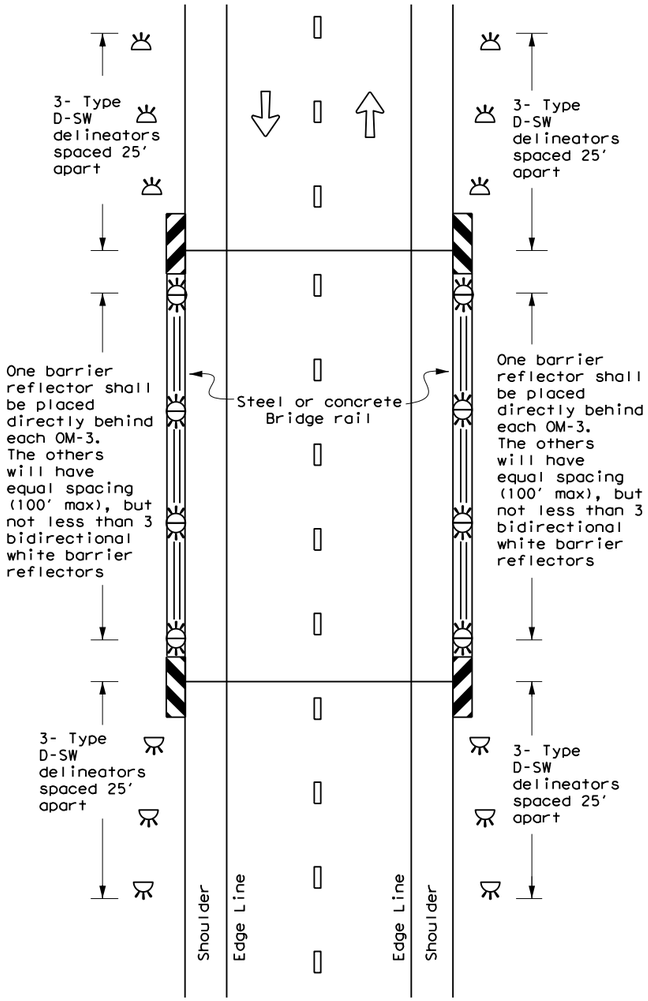
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

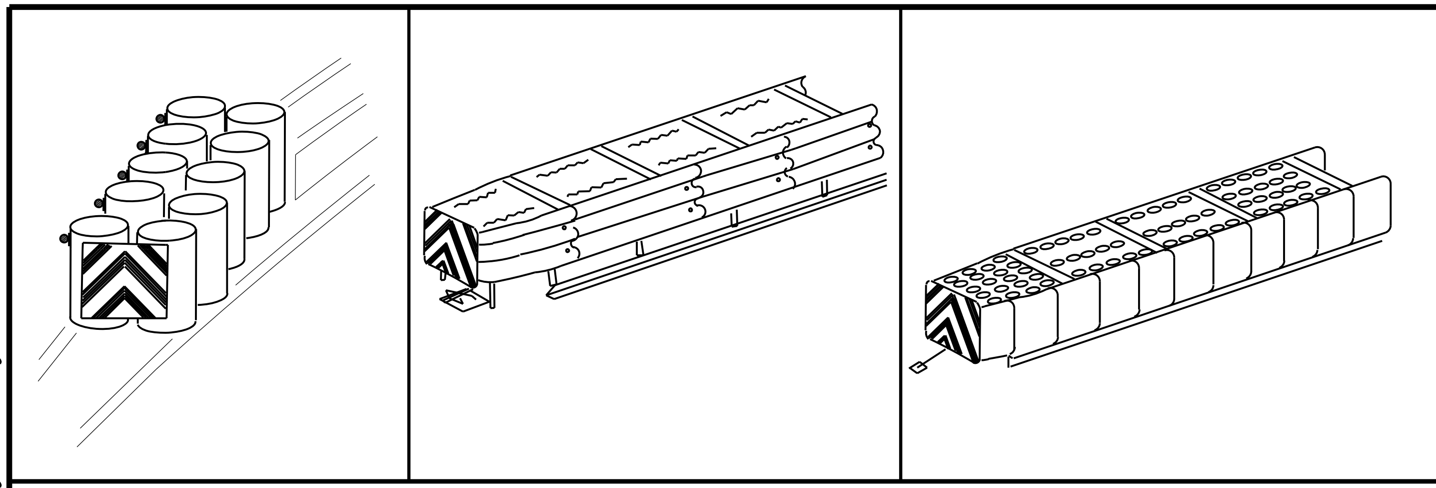
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

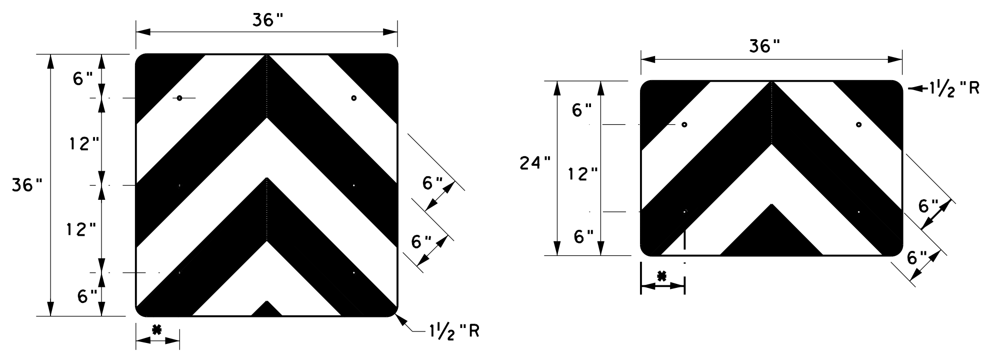
D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
7-20	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		156

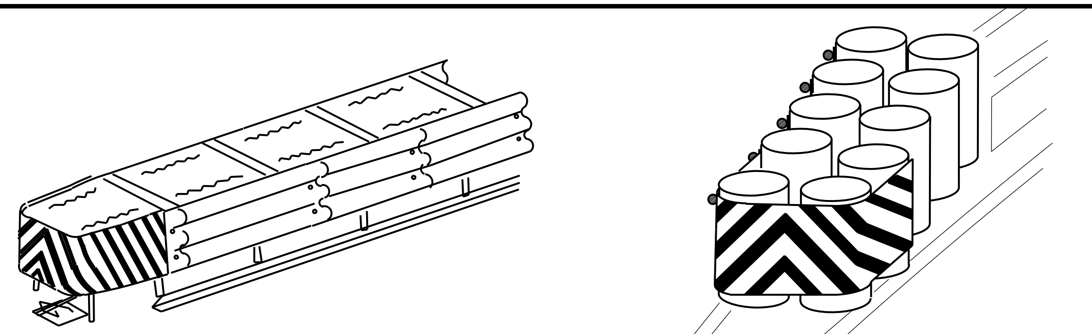
20E

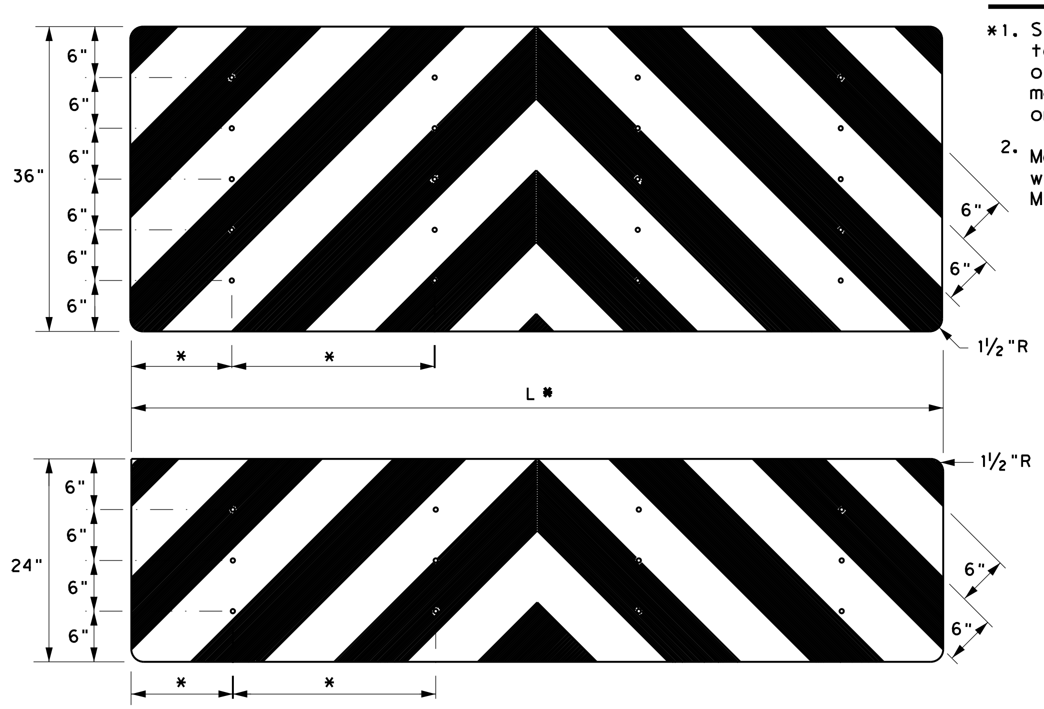
DATE: DATE TIME
FILE: DOCUMENT NAME





* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

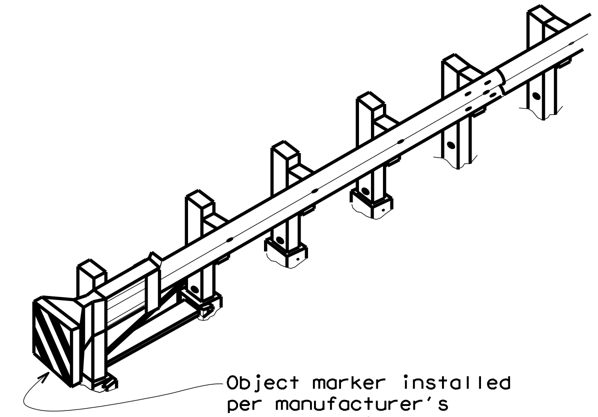


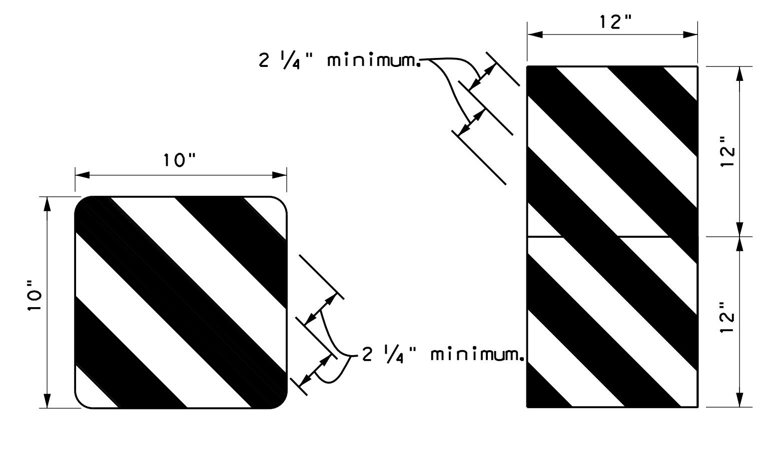


NOTES

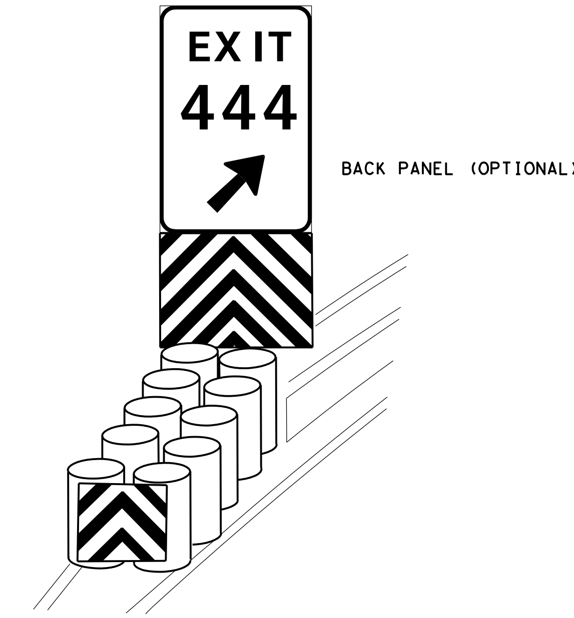
*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

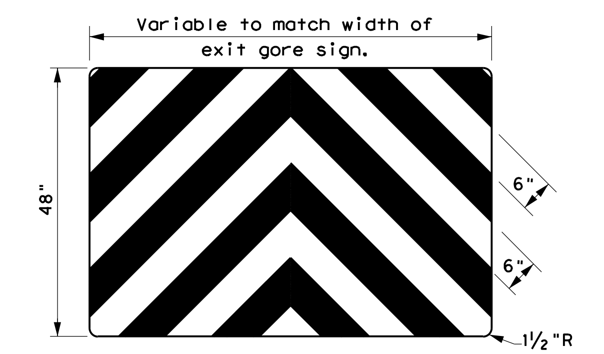
2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".





OBJECT MARKERS SMALLER THAN 3 FT²





NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS 4-92 8-04, 8-95 3-15, 4-98 7-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 157

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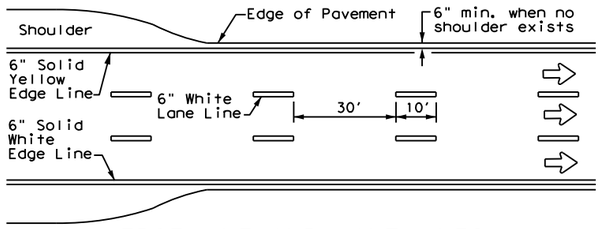
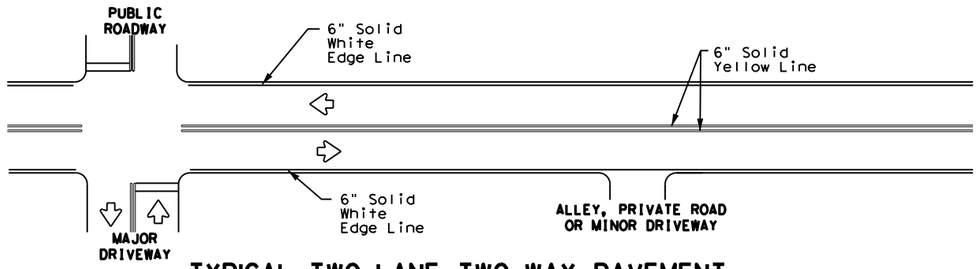
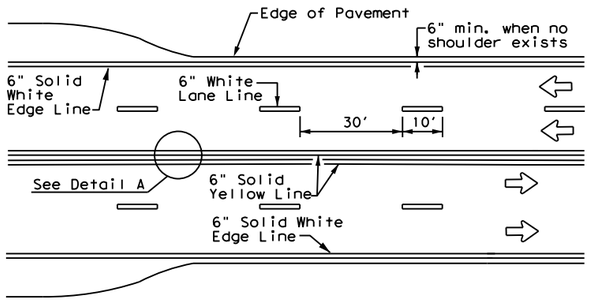
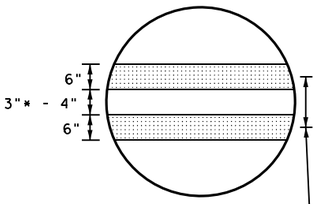


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

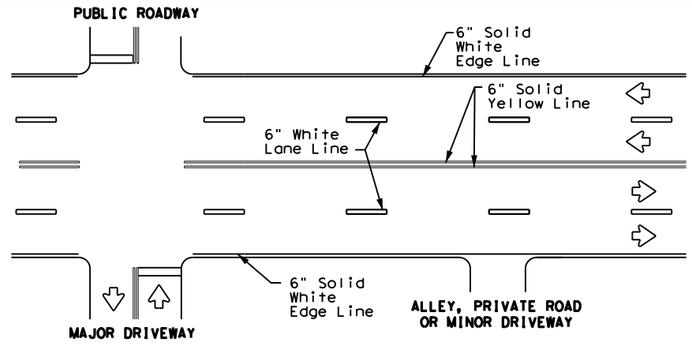




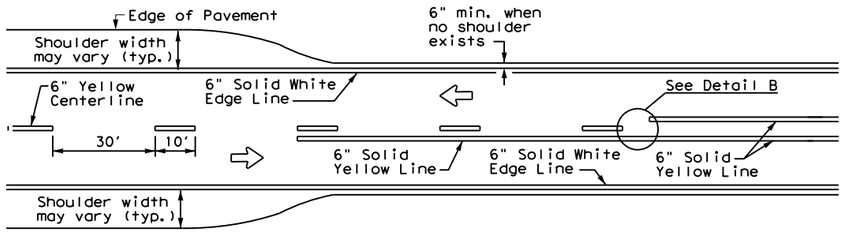
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

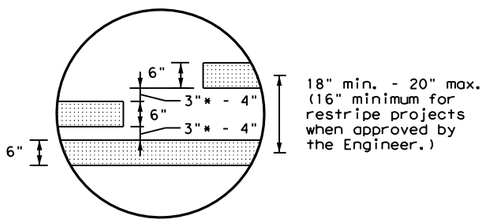
** 8" minimum for restripe projects when approved by the Engineer.



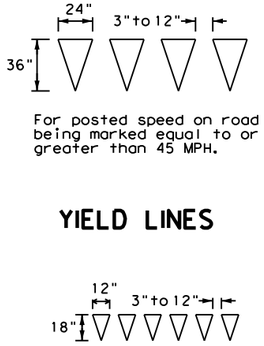
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

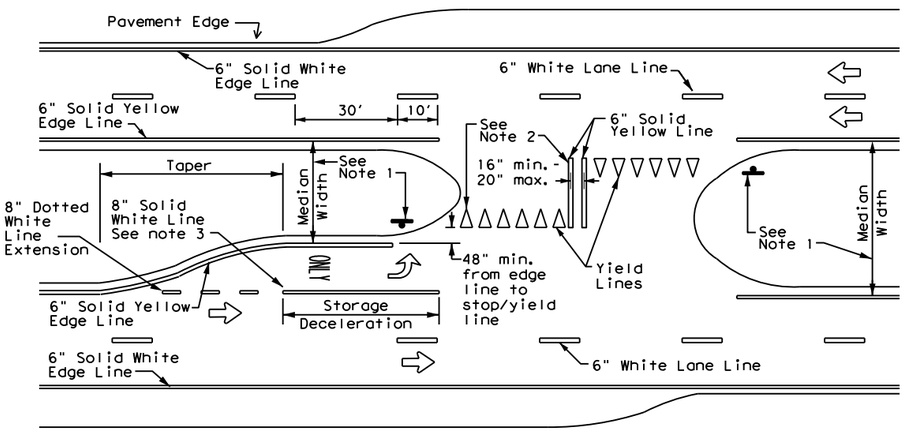


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

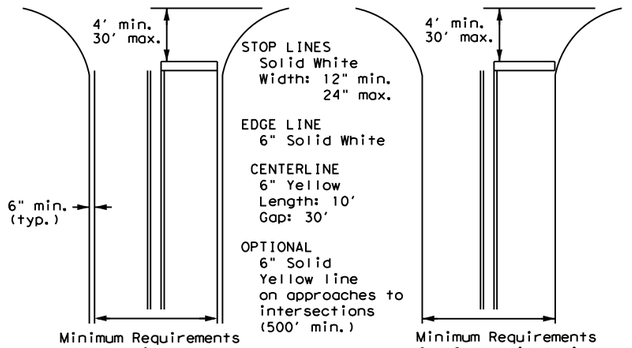
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

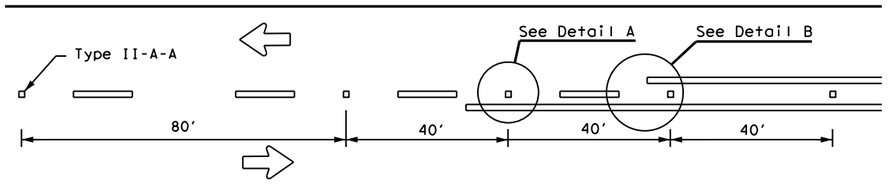
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

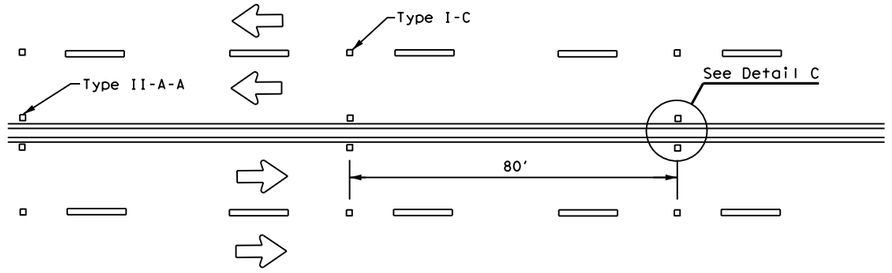
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	0729	02	032	FM 121
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	PAR	GRAYSON		158

22A

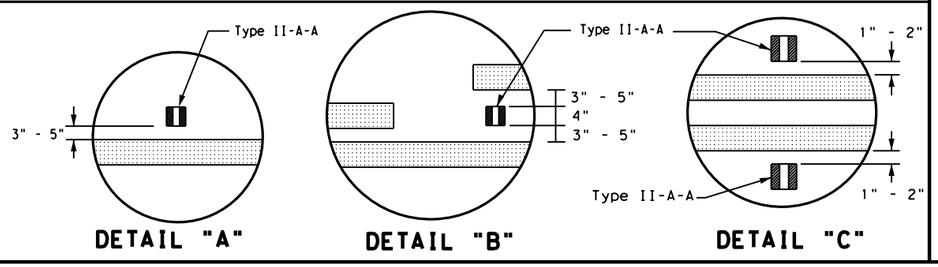
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

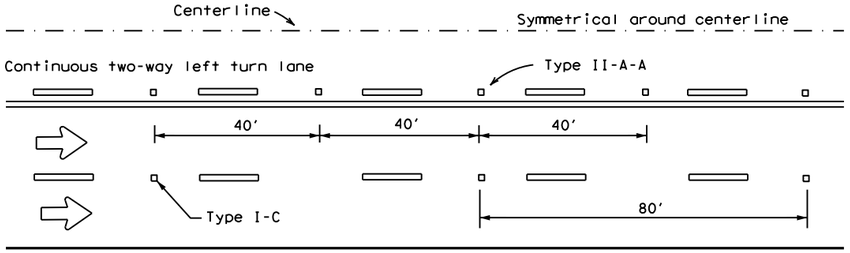


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

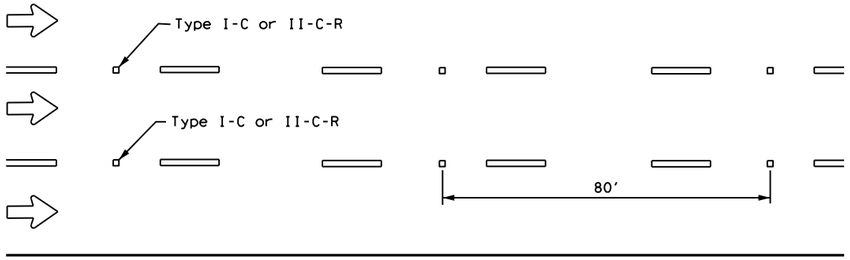


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



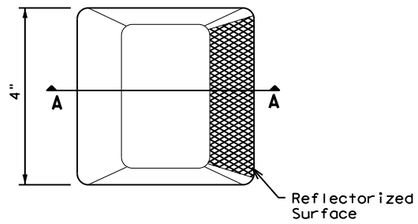
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

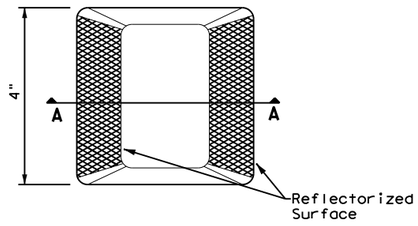
See Note 3.

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)



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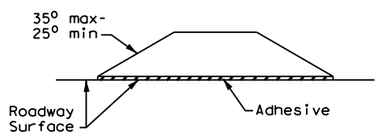
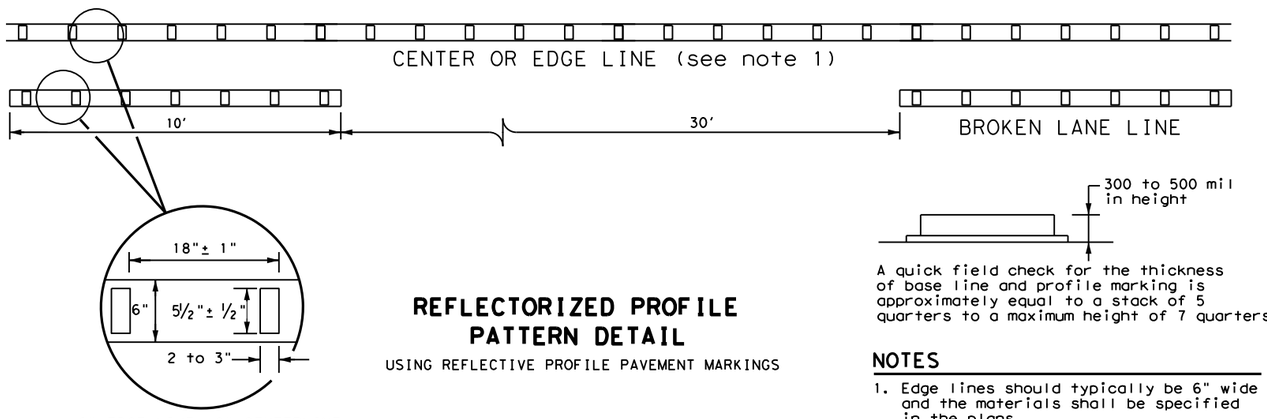


SECTION A

RAISED PAVEMENT MARKERS



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

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

NOTES

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		159

22B

DATE: 1/19/2023 8:43:32 AM
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STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0729-02-032

1.2 PROJECT LIMITS:
From: FM 121 VAN ALSTYNE STA. 7+07

To: SH 160 STA. 573+45

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 33°25'20,45°N ,(Long) 96°34'30,45°W

END: (Lat) 33°26'30,39"N ,(Long) 96°24'7,48"W

1.4 TOTAL PROJECT AREA (Acres): 102 ACRES

1.5 TOTAL AREA TO BE DISTURBED (Acres): 26.00 (25%)

1.6 NATURE OF CONSTRUCTION ACTIVITY:
BACKFIL AT EDGE OF PROPOSED HMAC OVERLAY
OF EXISTING PAVEMENT.
DITCH GRADING FOR ROAD REHABILITATION.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
FAIRLIE-DALCO (1-3% SLOPES)	DEEP LOAMY, CLAY MODERATELY WELL DRAINED VERY SLOWLY PERMEABLE SOILS
HOUSTON BLACK CLAY (3%-SLOPES)	DEP LOAMY MODERATELY WELL DRAINED SLOWLY PERMABLE SILS

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s
N/A	N/A

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☒ Remove existing culverts, safety end treatments (SETs)
☒ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☒ Other: TEMPORARY AND PERMANET SEEDING.
☐ Other:
☐ Other:

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☐ Construction debris and waste from various construction activities
☒ Contaminated water from excavation or dewatering pump-out water
☐ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☒ Long-term stockpiles of material and waste
☐ Other:
☐ Other:
☐ Other:

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
WEST GROVE CREEK	LAKE LEVON
EAST GROVE CREEK	LAKE LEVON
PILOT GROVE CREEK	LAKE LEVON
CONNERS CREEK	LAKE LEVON

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other:
☐ Other:
☐ Other:

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other:
☐ Other:
☐ Other:

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
N/A

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

01.19.23

Monte R. Rater P.E.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.			SHEET NO.
			160
STATE	STATE DIST.	COUNTY	
TEXAS	PAR	GRAYSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0729	02	032	FM 121

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ X Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ X Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ X Mulching/ Hydromulching
- ☐ X Soil Surface Treatments
- ☐ X Temporary Seeding
- X X Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ X Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ X Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- X ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- X ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- X Excess dirt/mud on road removed daily
- X Haul roads dampened for dust control
- X Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- X Concrete and Materials Waste Management
- X Debris and Trash Management
- X Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

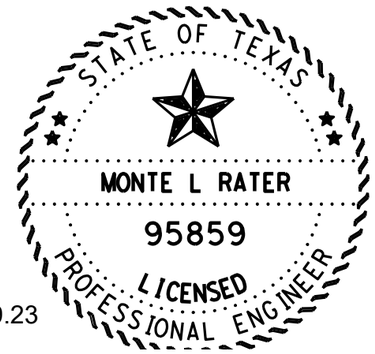
- X Fire hydrant flushings
- X Irrigation drainage
- X Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- X Potable water sources
- X Springs
- X Uncontaminated groundwater
- X Water used to wash vehicles or control dust
- X Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.



01.19.23

Monte R. Rater P.E.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.			SHEET NO.
			160A
STATE	STATE DIST.	COUNTY	
TEXAS	PAR	GRAYSON	
CONT.	SECT.	JOB	HIGHWAY NO.
0729	02	032	FM 121

DATE: 1/17/2023
FILE: T:\PARTPDD\FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\161 ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☒ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. If any of the species listed below are observed during construction, stop work in the immediate area, do not disturb the animal, and contact the engineer.
   1. Plains Spotted Skunk
   2. Eastern Spotted Skunk
   3. Mink
   4. Black Bear

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

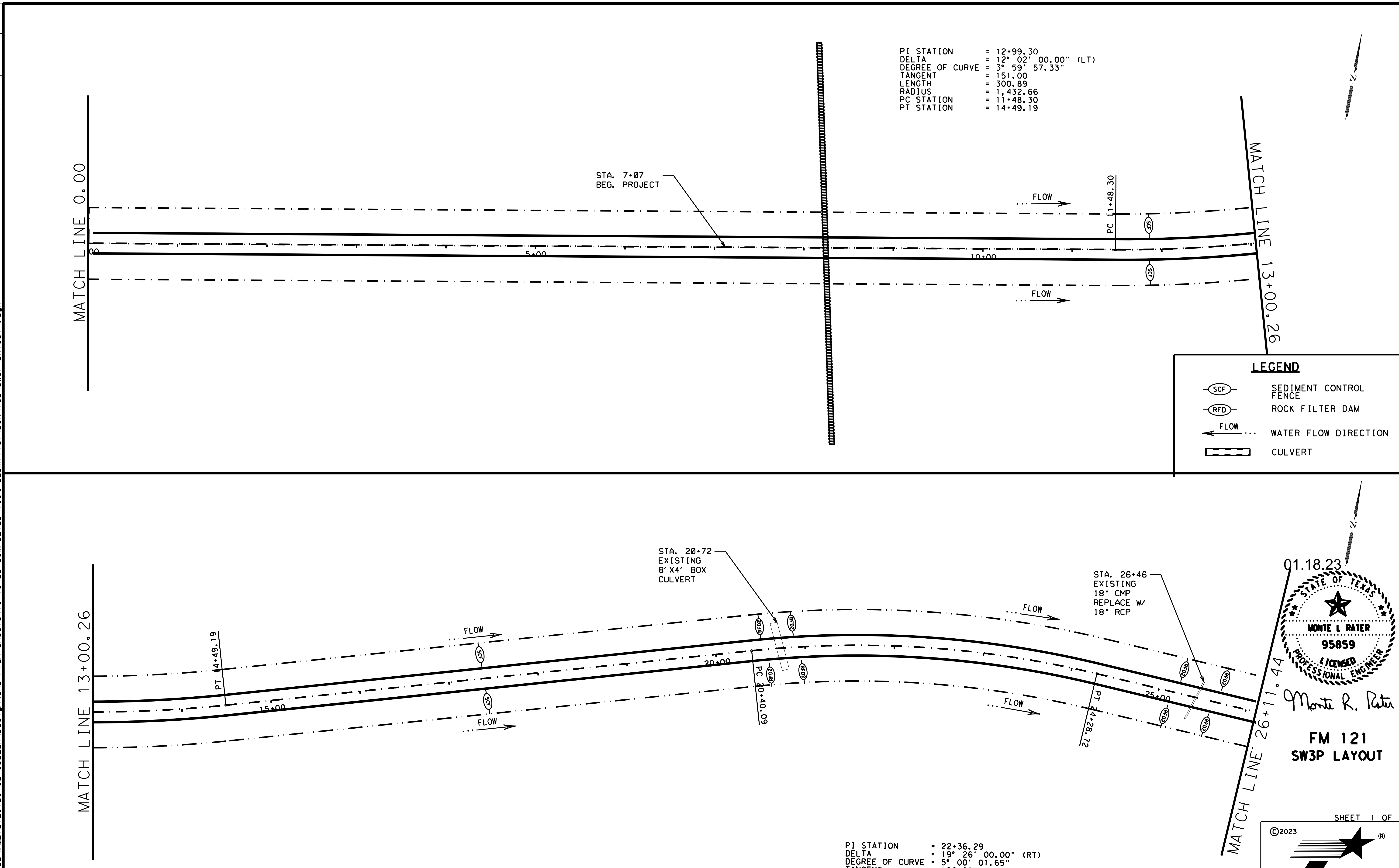
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR		
©TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0729	02	032		FM 121	
12-12-2011 (DS)	DIST	COUNTY			SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	PAR	GRAYSON			161	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.						



01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
SW3P LAYOUT

SHEET 1 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		162

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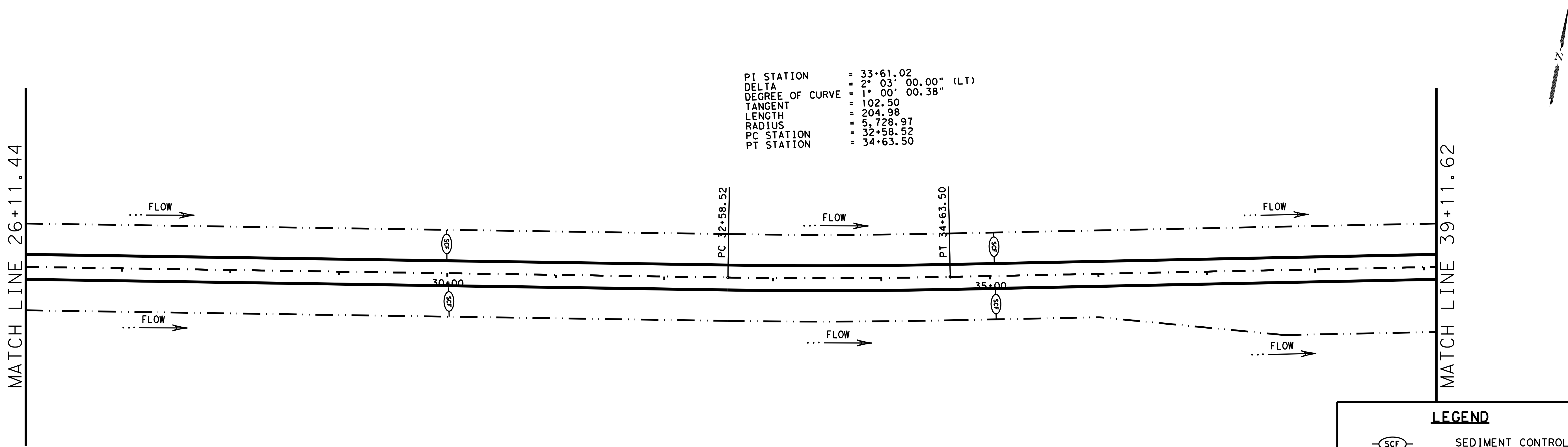
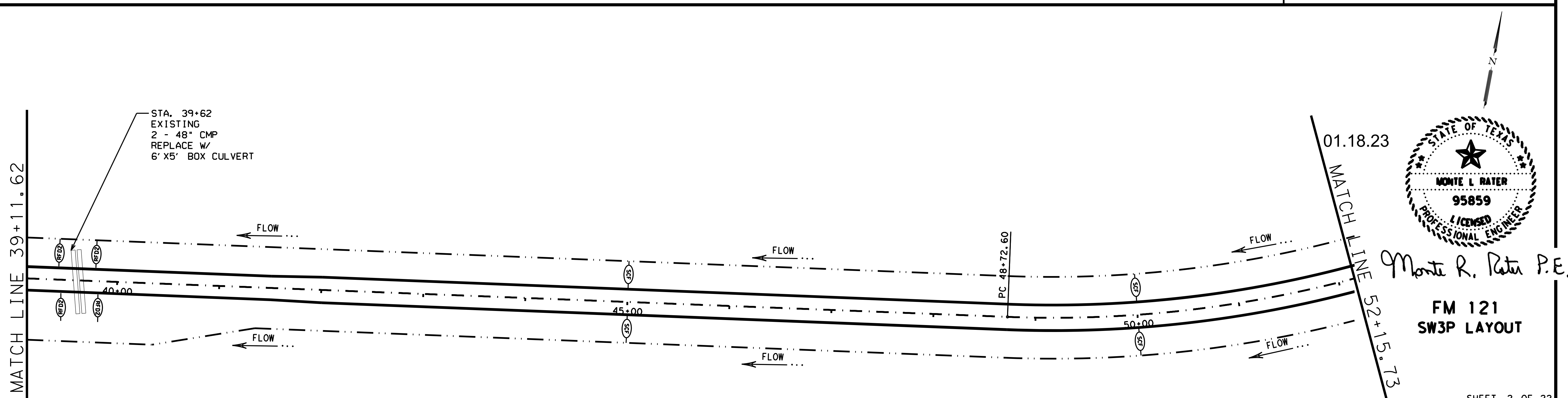


LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
FLOW	WATER FLOW DIRECTION
	CULVERT



FM 121
SW3P LAYOUT

SHEET 2 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		163

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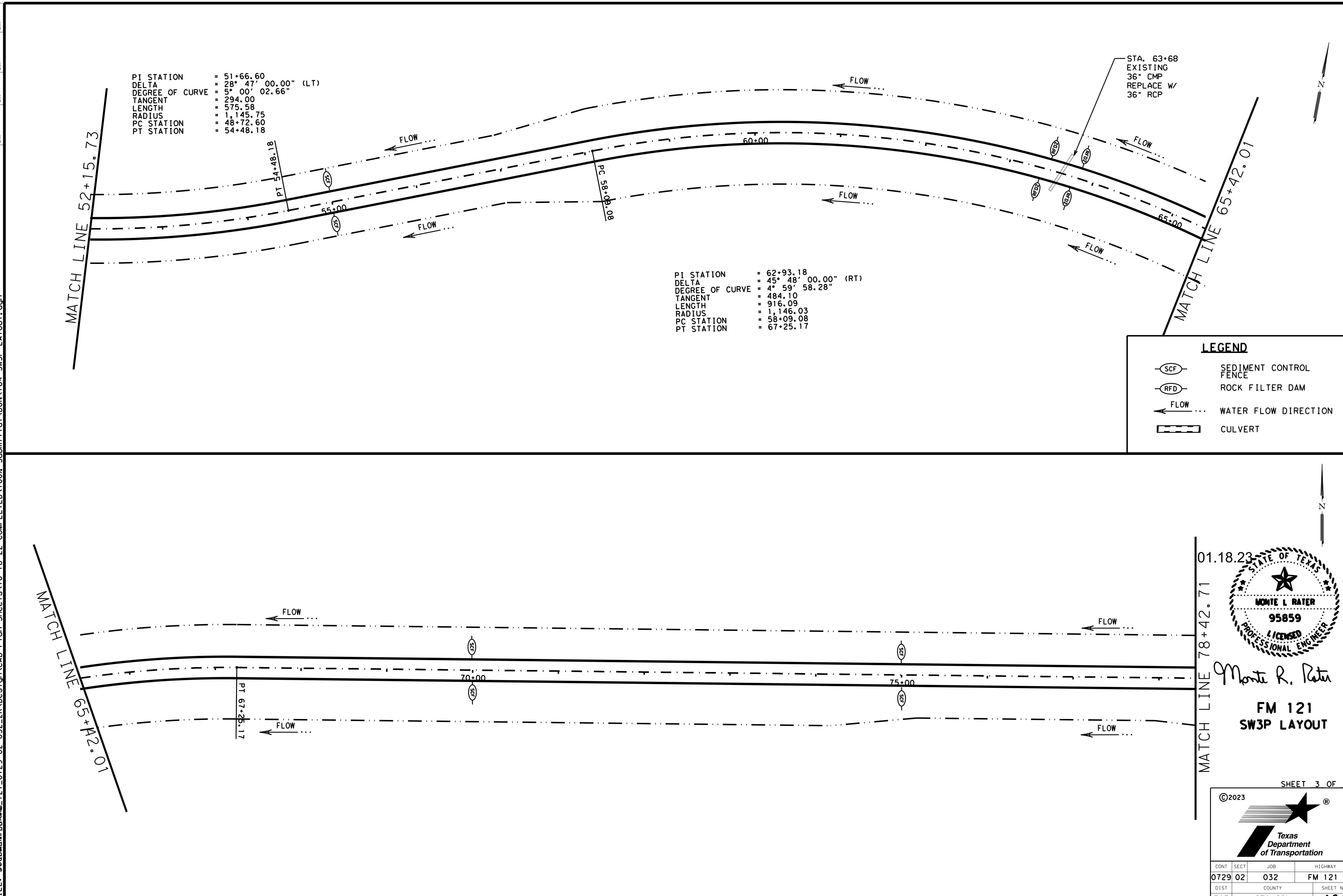

FM 121
SW3P LAYOUT

SHEET 3 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		164

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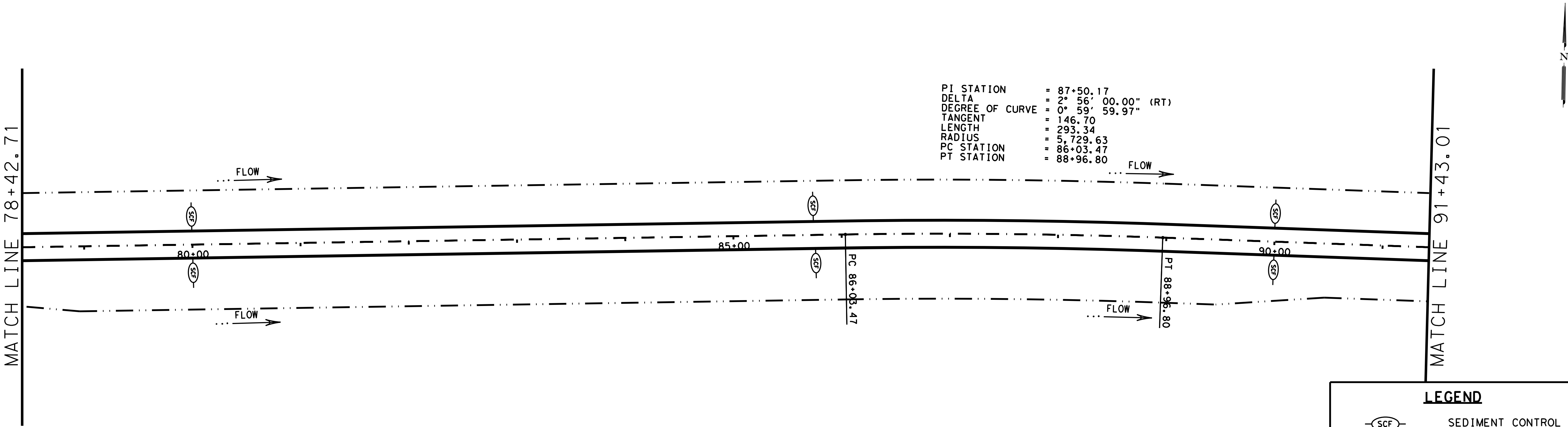
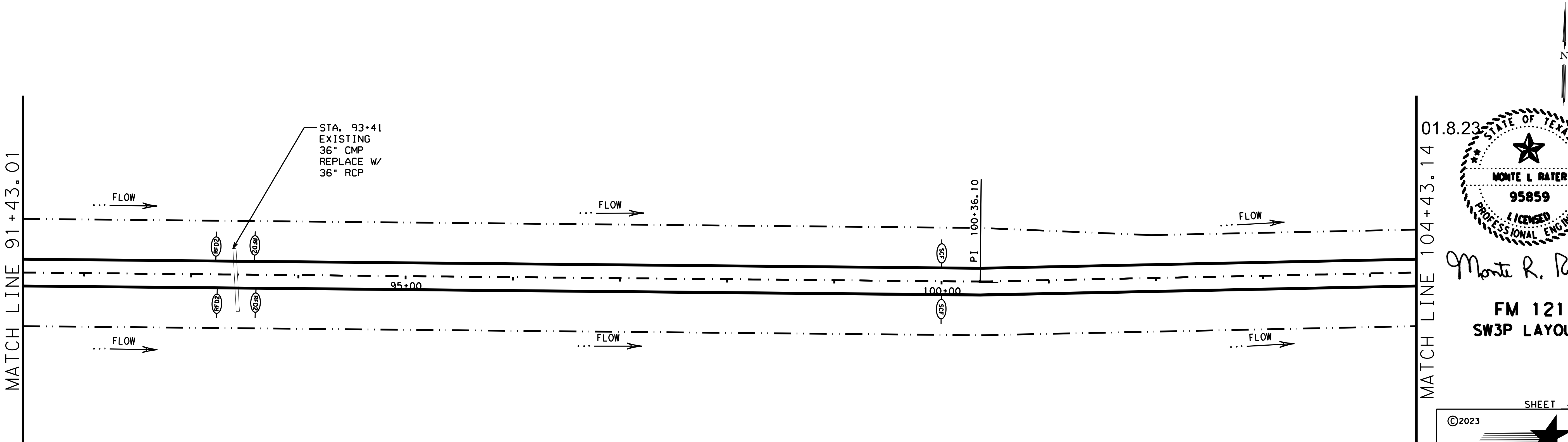


LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
FLOW	WATER FLOW DIRECTION
	CULVERT



01.8.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
SW3P LAYOUT

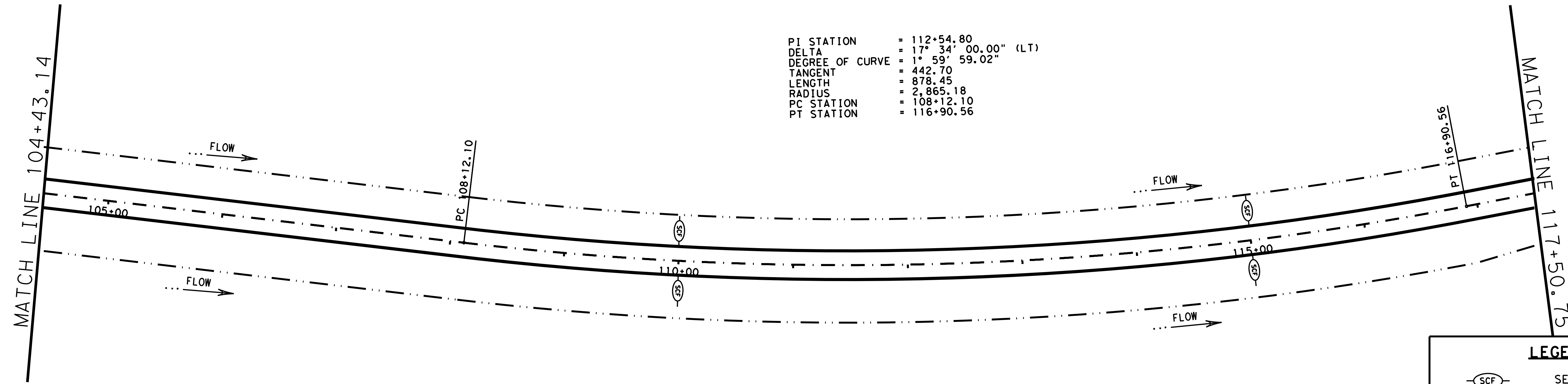
SHEET 4 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	165

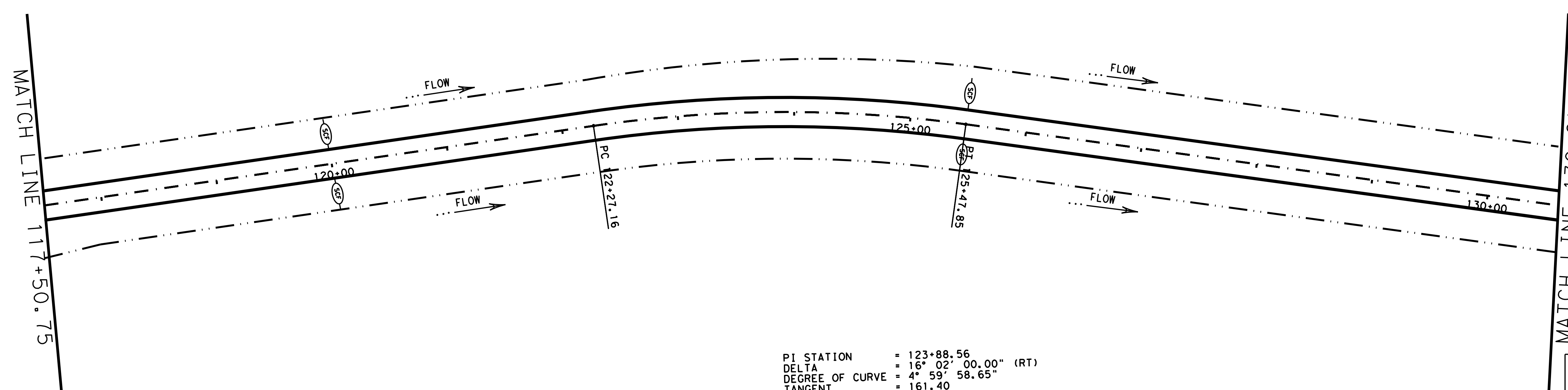
DATE: 9:00:37 AM
FILE: ...121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\165 SW3P LAYOUT.dgn

PI STATION = 112+54.80
DELTA = 17° 34' 00.00" (LT)
DEGREE OF CURVE = 1° 59' 59.02"
TANGENT = 442.70
LENGTH = 878.45
RADIUS = 2,865.18
PC STATION = 108+12.10
PT STATION = 116+90.56



LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
FLOW	WATER FLOW DIRECTION



PI STATION = 123+88.56
DELTA = 16° 02' 00.00" (RT)
DEGREE OF CURVE = 4° 59' 58.65"
TANGENT = 161.40
LENGTH = 320.69
RADIUS = 1,146.00
PC STATION = 122+27.16
PT STATION = 125+47.85

01.18.23

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

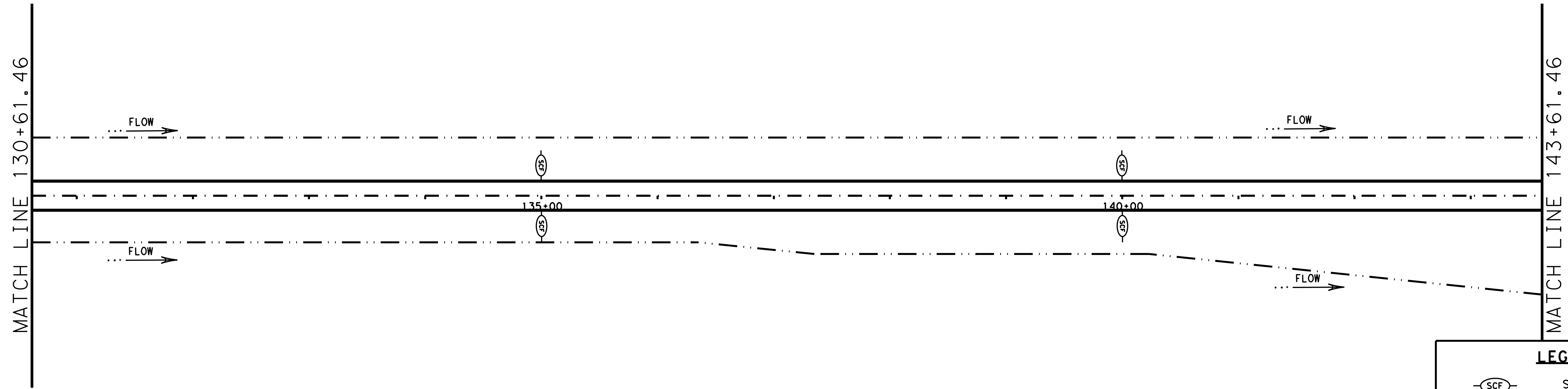
FM 121
SW3P LAYOUT

SHEET 5 OF 22

Texas Department of Transportation

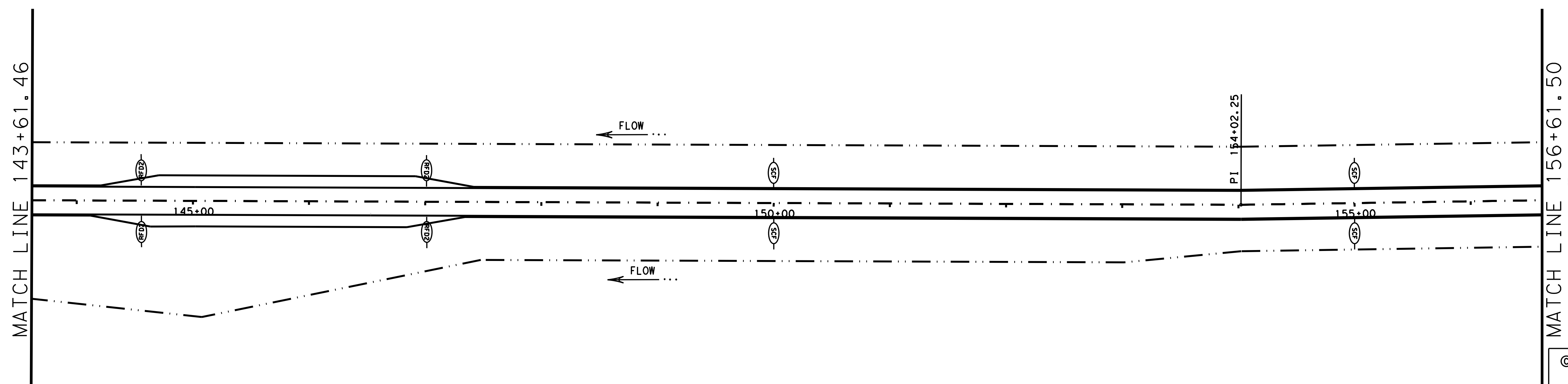
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	166

DATE: 9:00:39 AM
FILE: ...FM_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\166 SW3P LAYOUT.dgn



LEGEND

- (SCF) SEDIMENT CONTROL FENCE
- (RFD) ROCK FILTER DAM
- ← FLOW ··· WATER FLOW DIRECTION



01.18.23

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

Monte R. Rater P.E.

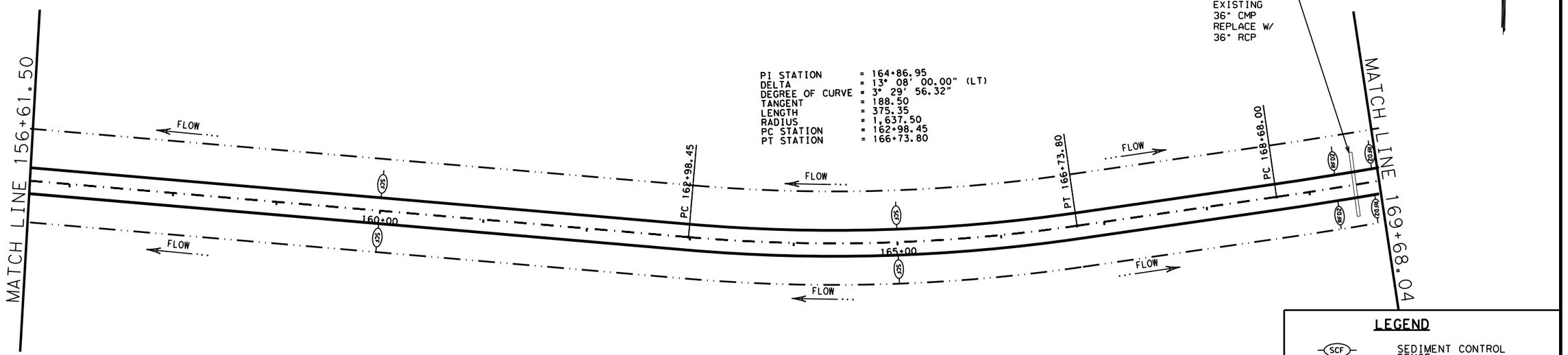
FM 121
SW3P LAYOUT

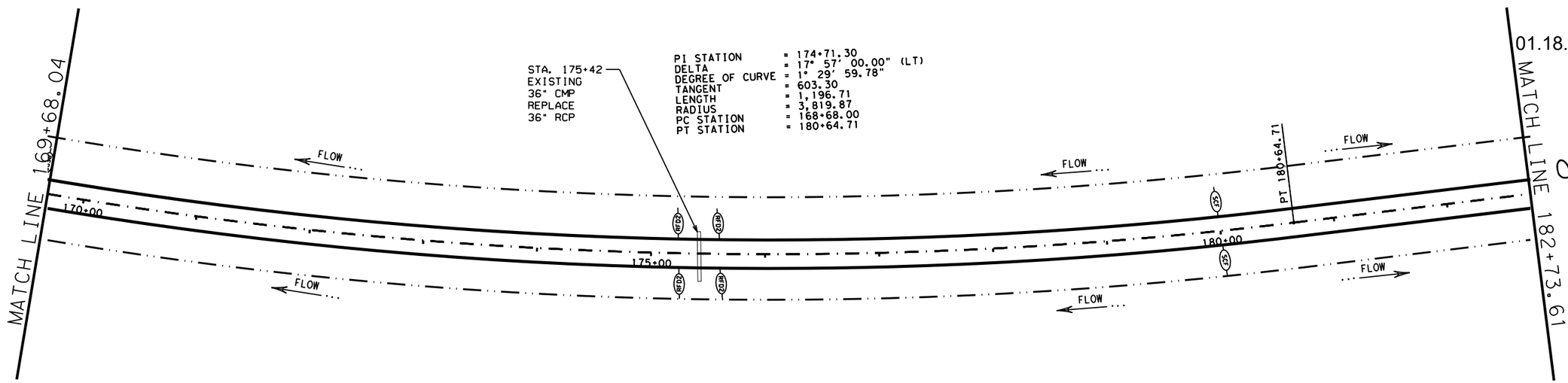
SHEET 6 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	167

DATE: DATE/2025 9:00:40 AM
FILE: DOCUMENT_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\167 SW3P LAYOUT.dgn





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT

01.18.23

STATE OF TEXAS
MONTE L RATER
95859
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

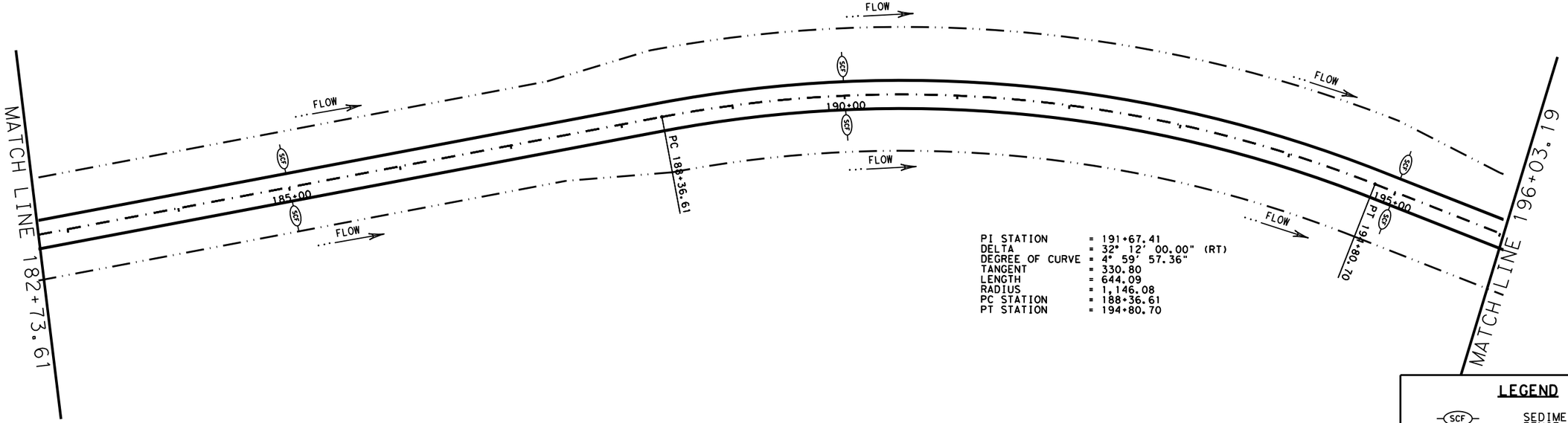
FM 121
SW3P LAYOUT

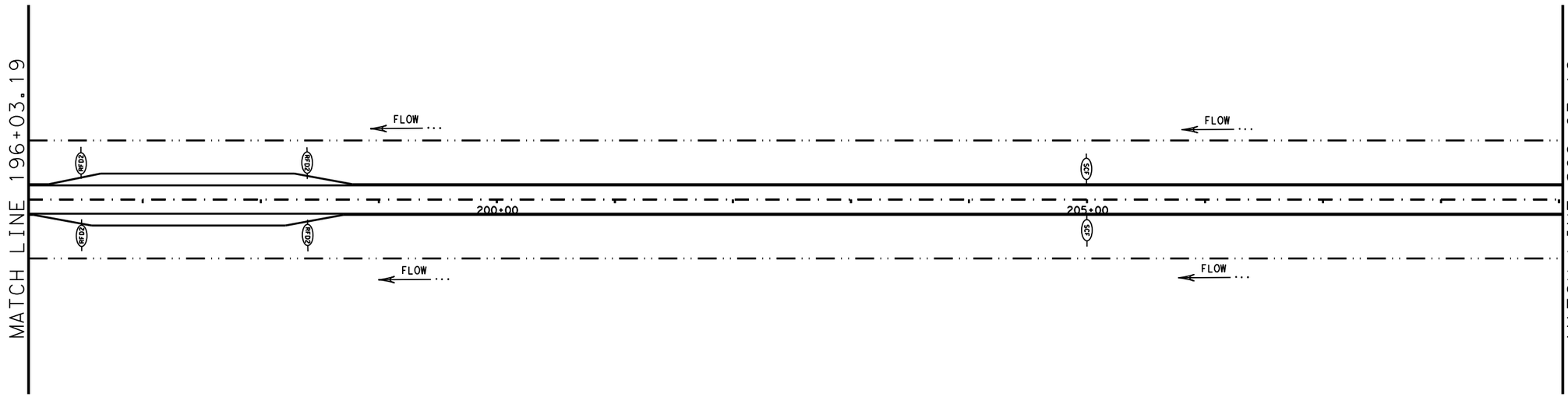
SHEET 7 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		168

DATE: DATE TIME
FILE: DOCUMENT NAME





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STATE OF TEXAS
MONTE L RATER
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

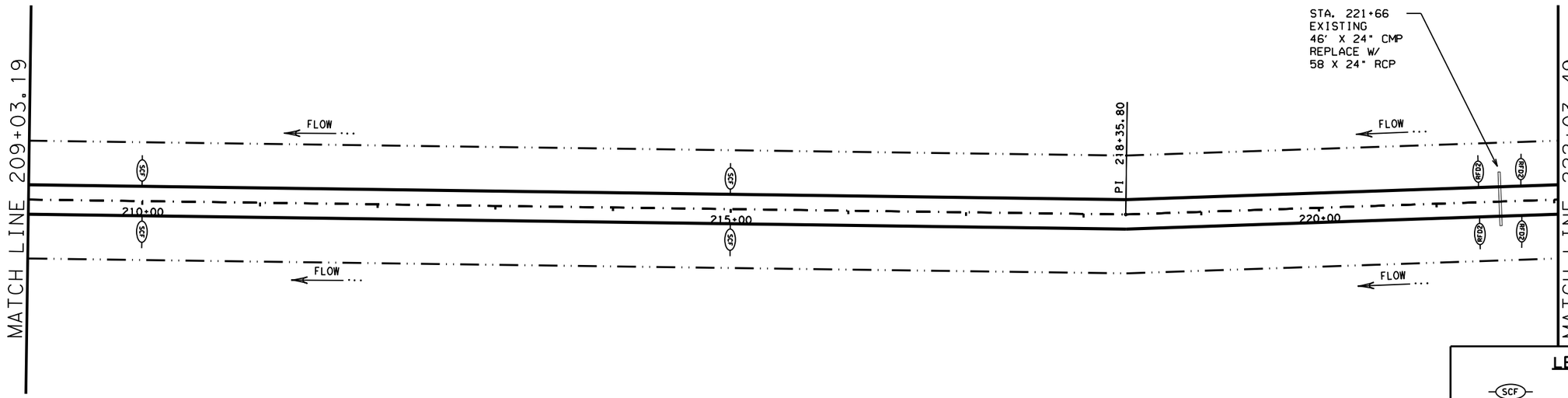
FM 121
SW3P LAYOUT

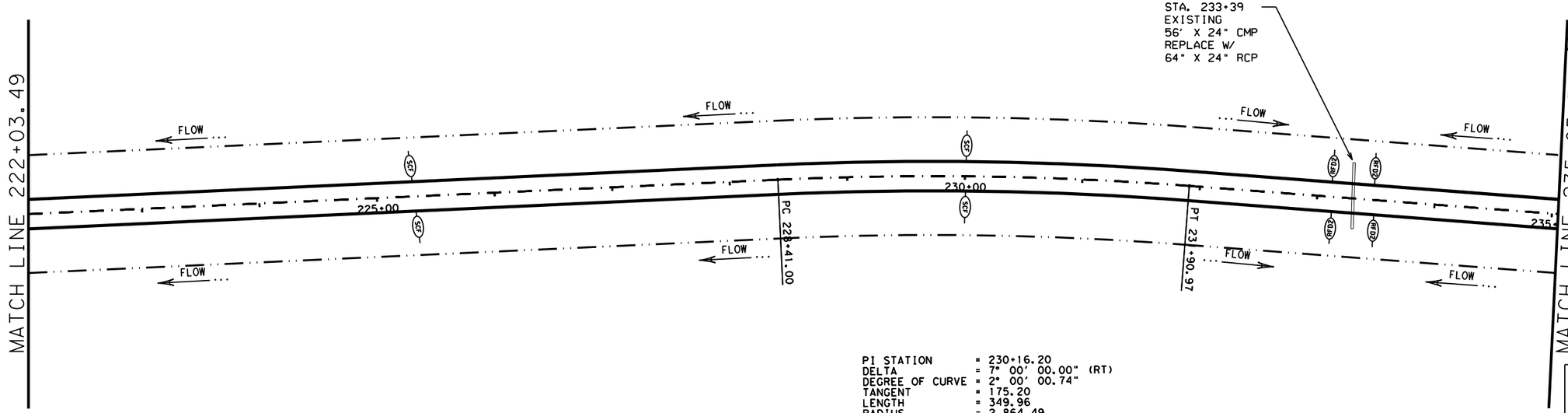
SHEET 8 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		169

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW ··· — WATER FLOW DIRECTION
- CULVERT

PI STATION	= 230+16.20
DELTA	= 7° 00' 00.00" (RT)
DEGREE OF CURVE	= 2° 00' 00.74"
TANGENT	= 175.20
LENGTH	= 349.96
RADIUS	= 2,864.49
PC STATION	= 228+41.00
PT STATION	= 231+90.97

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LICENSED
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SW3P LAYOUT

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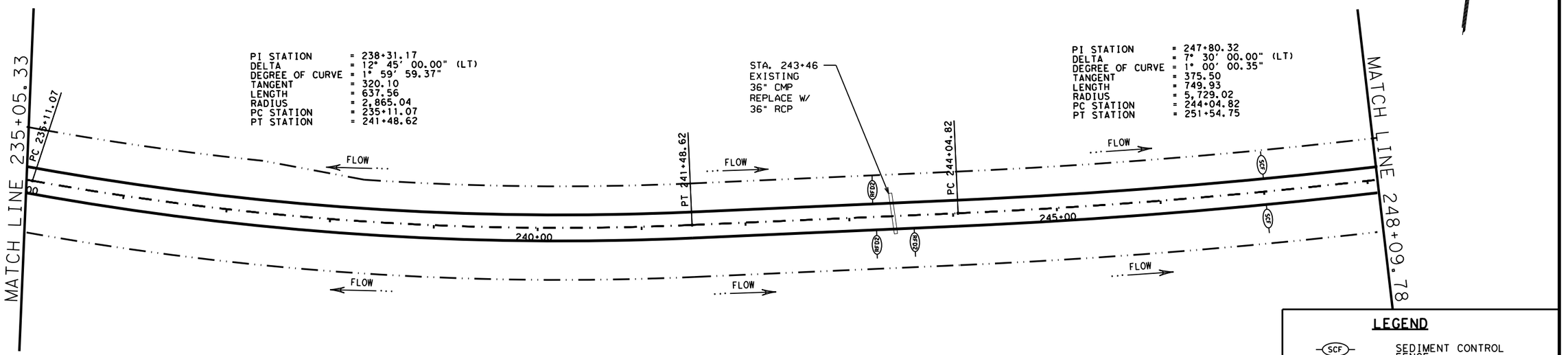
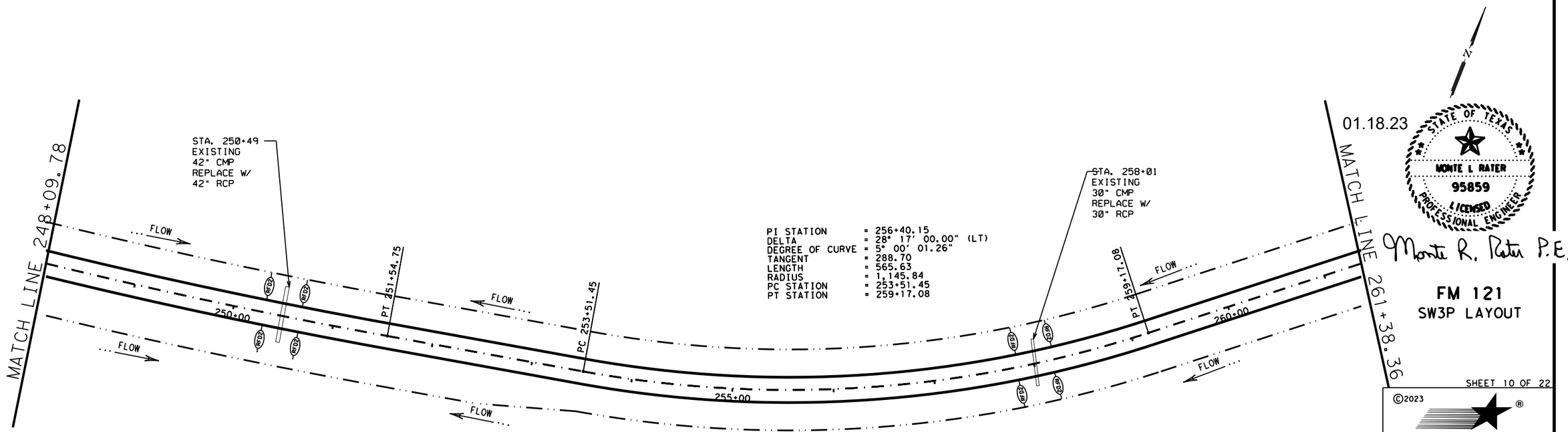
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		170

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT

01.18.23

STATE OF TEXAS
MONTE L RATER
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LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

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SW3P LAYOUT

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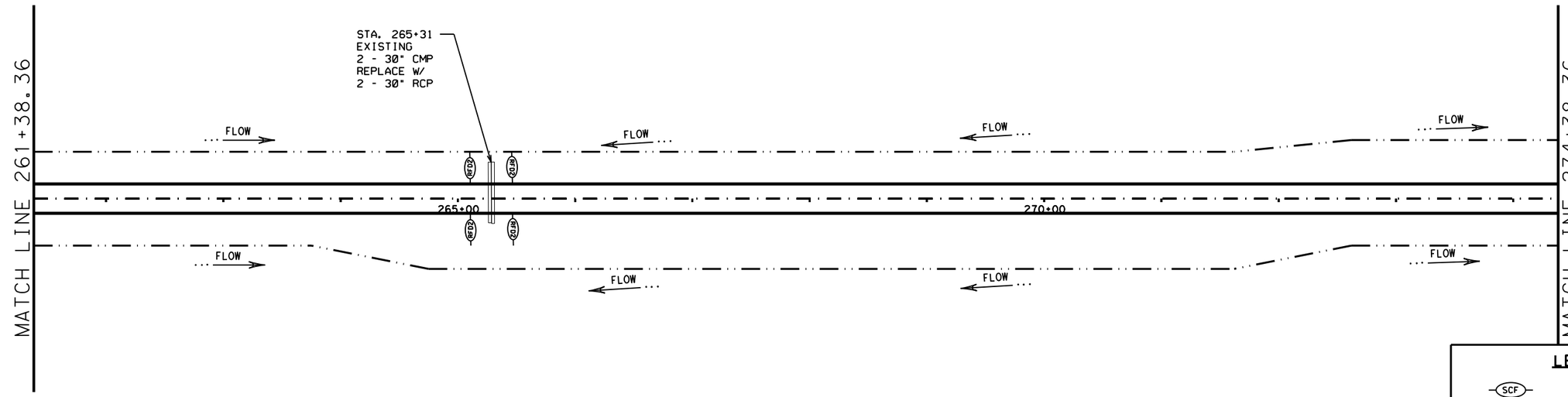
Texas Department of Transportation

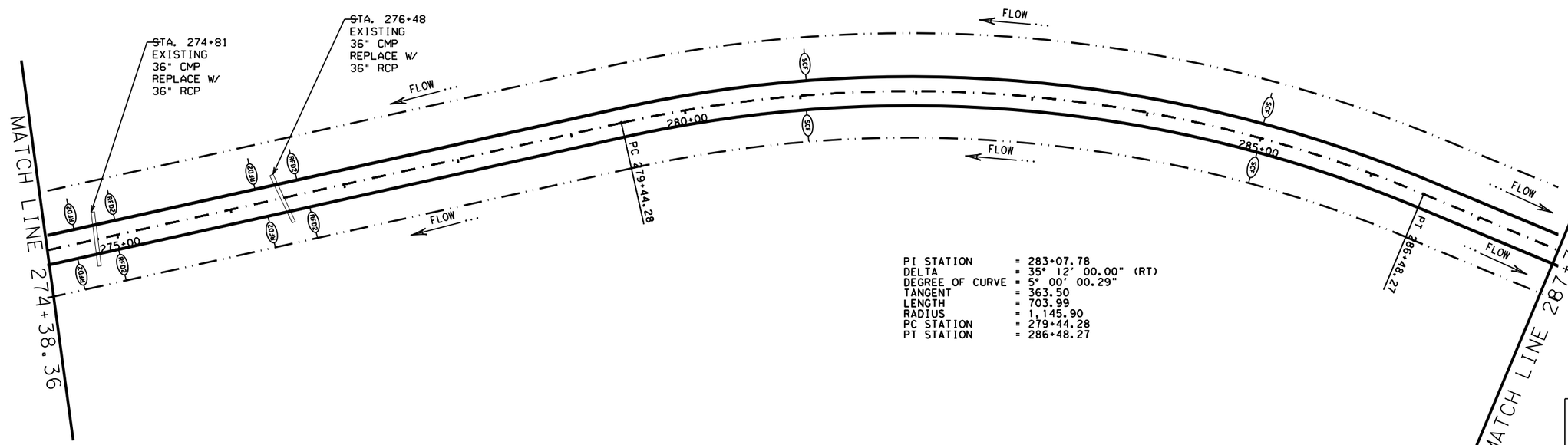
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		171

DATE: DATE/2023
FILE: DOCUMENT_NAME_121_0729-02-032_2R\Design\CAD Plan Sheets\10-18-22 COMPLETED\100% Submittal\DGN\171 SW3P LAYOUT.dgn



LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT



PI STATION	= 283+07.78
DELTA	= 35° 12' 00.00" (RT)
DEGREE OF CURVE	= 5° 00' 00.29"
TANGENT	= 363.50
LENGTH	= 703.99
RADIUS	= 1,145.90
PC STATION	= 279+44.28
PT STATION	= 286+48.27

01.18.23

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FM 121
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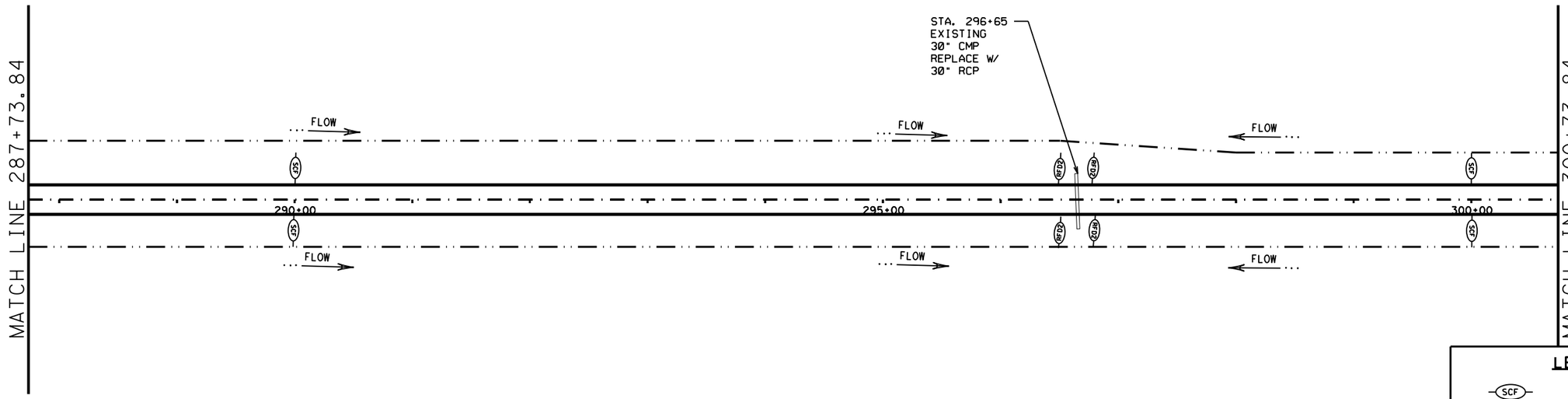
Texas Department of Transportation

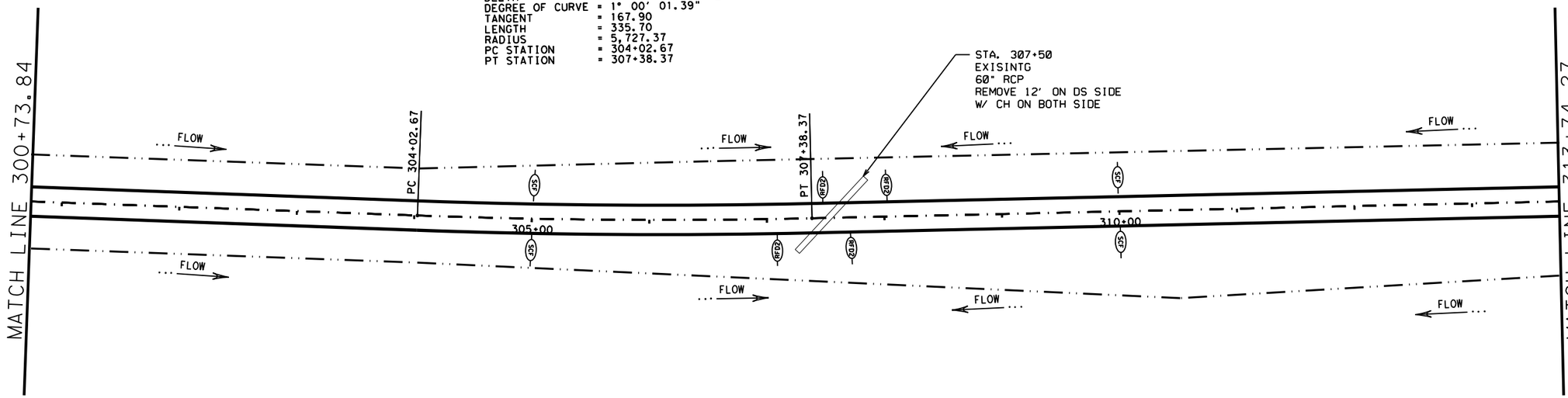
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		172

DATE: DATE TIME
FILE: DOCUMENT NAME



LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT



01.18.23

STATE OF TEXAS
MONTE L RATER
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

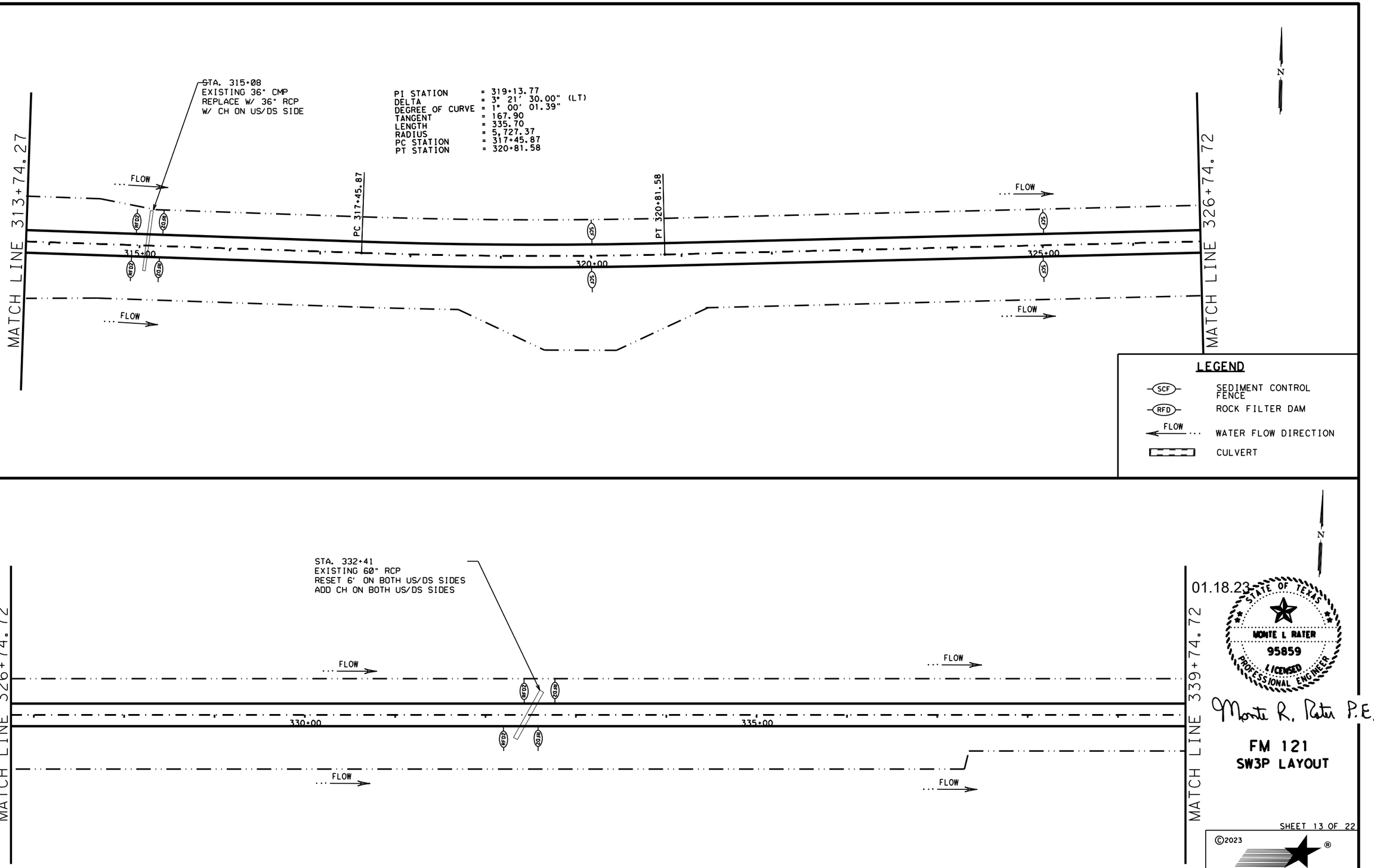
FM 121
SW3P LAYOUT

SHEET 12 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		173

DATE: DATE TIME
FILE: DOCUMENT NAME



01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

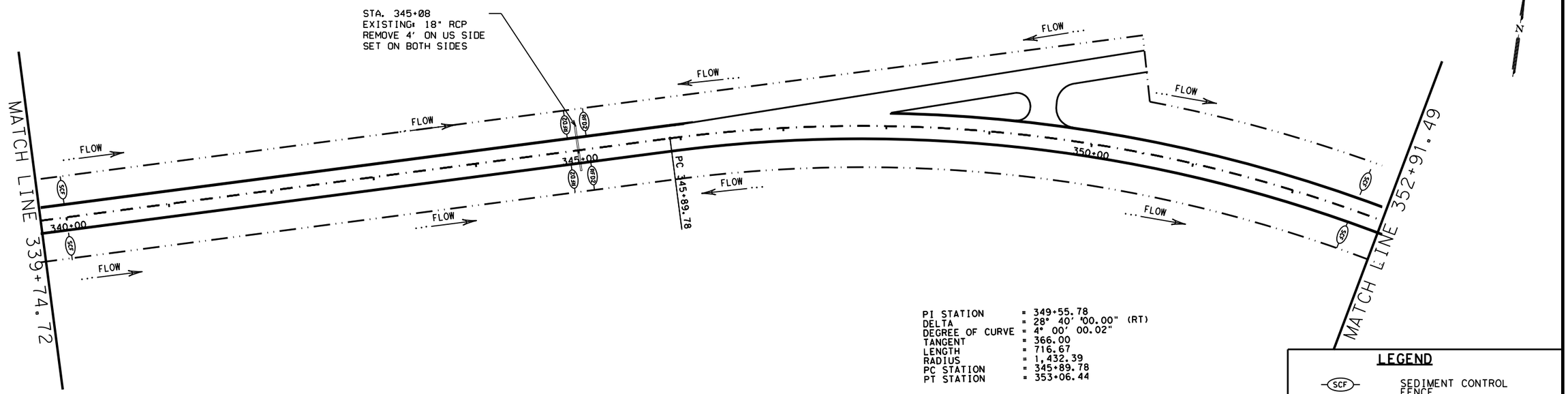
FM 121
SW3P LAYOUT

SHEET 13 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		174

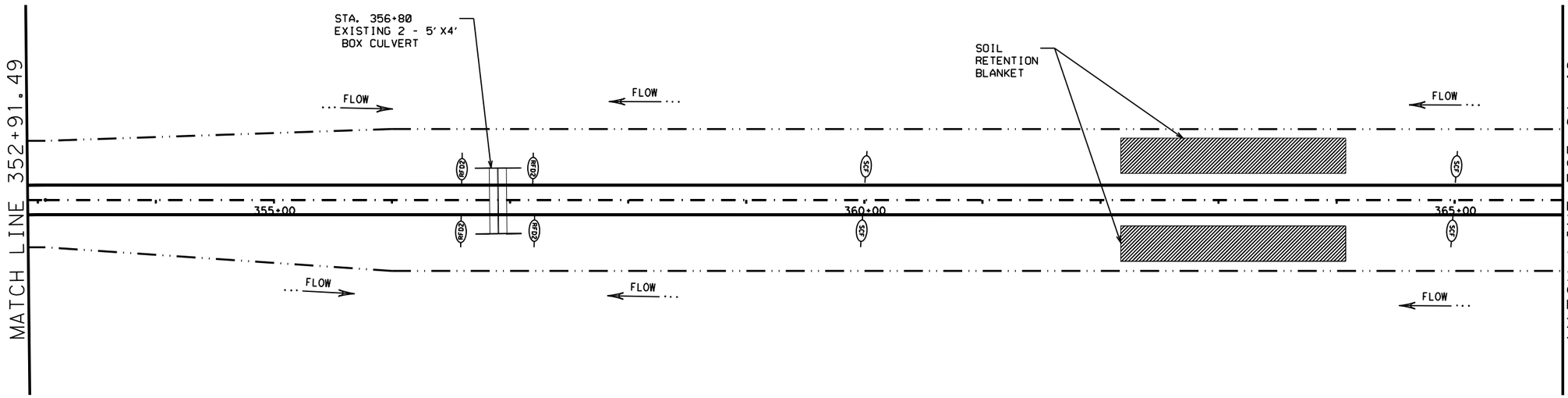
DATE: DATE/TIME 9:00:48 AM
FILE: DOCUMENT NAME



PI STATION	= 349+55.78
DELTA	= 28° 40' 00.00" (RT)
DEGREE OF CURVE	= 4° 00' 00.02"
TANGENT	= 366.00
LENGTH	= 716.67
RADIUS	= 1,432.39
PC STATION	= 345+89.78
PT STATION	= 353+06.44

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW ··· — WATER FLOW DIRECTION
- CULVERT
- SOIL RETENTION BLANKET



01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
SW3P LAYOUT

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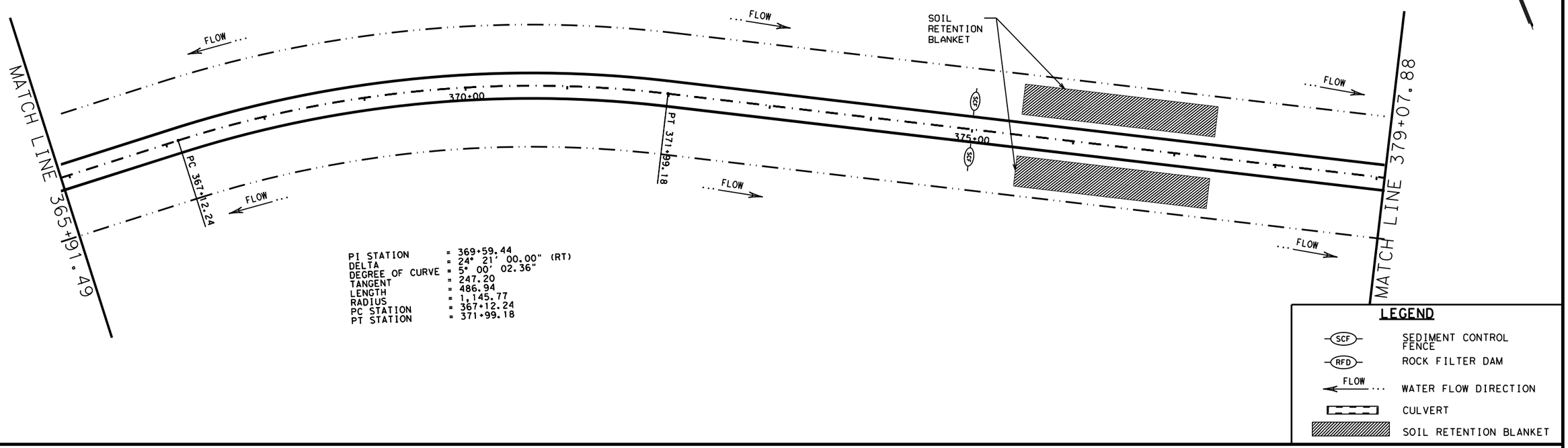
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		175

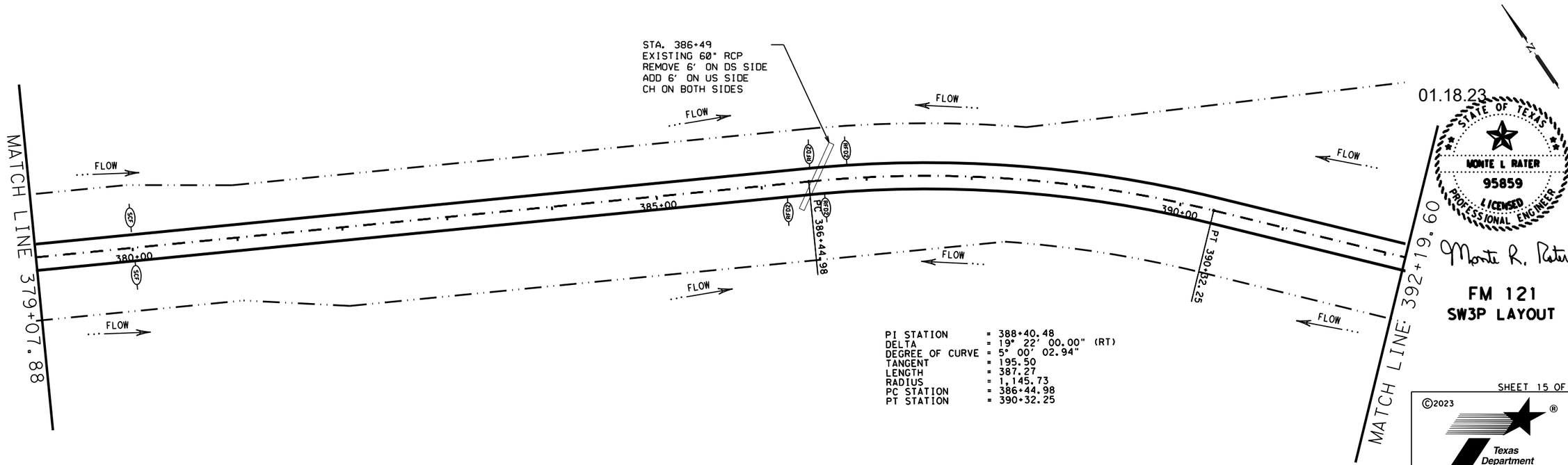
DATE: DATE TIME
FILE: DOCUMENT NAME



PI STATION = 369+59.44
DELTA = 24° 21' 00.00" (RT)
DEGREE OF CURVE = 5° 00' 02.36"
TANGENT = 247.20
LENGTH = 486.94
RADIUS = 1,145.77
PC STATION = 367+12.24
PT STATION = 371+99.18

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT
- SOIL RETENTION BLANKET



PI STATION = 388+40.48
DELTA = 19° 22' 00.00" (RT)
DEGREE OF CURVE = 5° 00' 02.94"
TANGENT = 195.50
LENGTH = 387.27
RADIUS = 1,145.73
PC STATION = 386+44.98
PT STATION = 390+32.25

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STATE OF TEXAS
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Monte R. Rater P.E.

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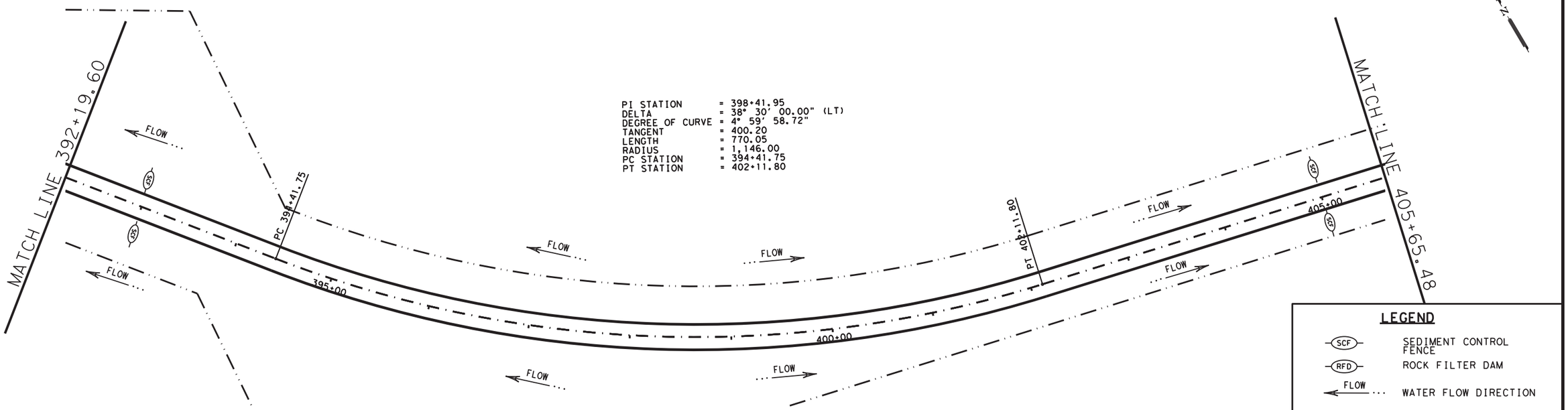
SW3P LAYOUT

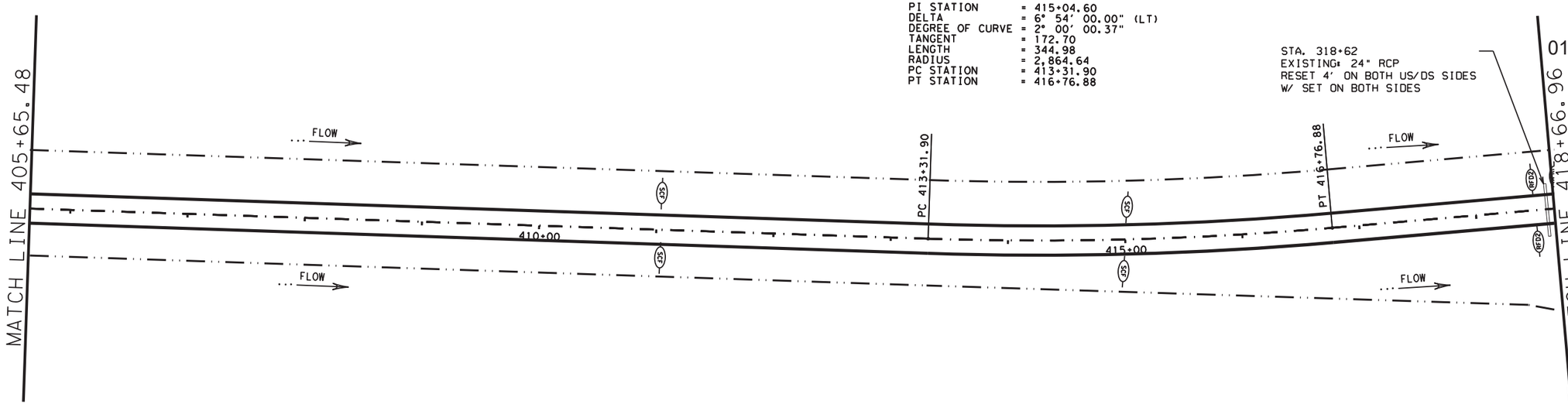
SHEET 15 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		176

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
FLOW	WATER FLOW DIRECTION

01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

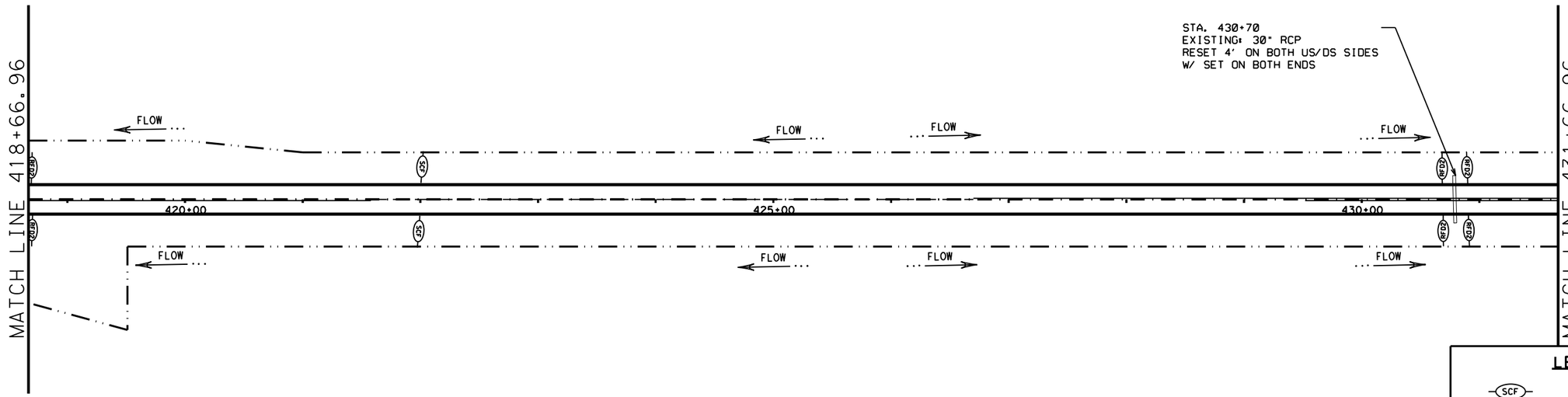
FM 121
SW3P LAYOUT

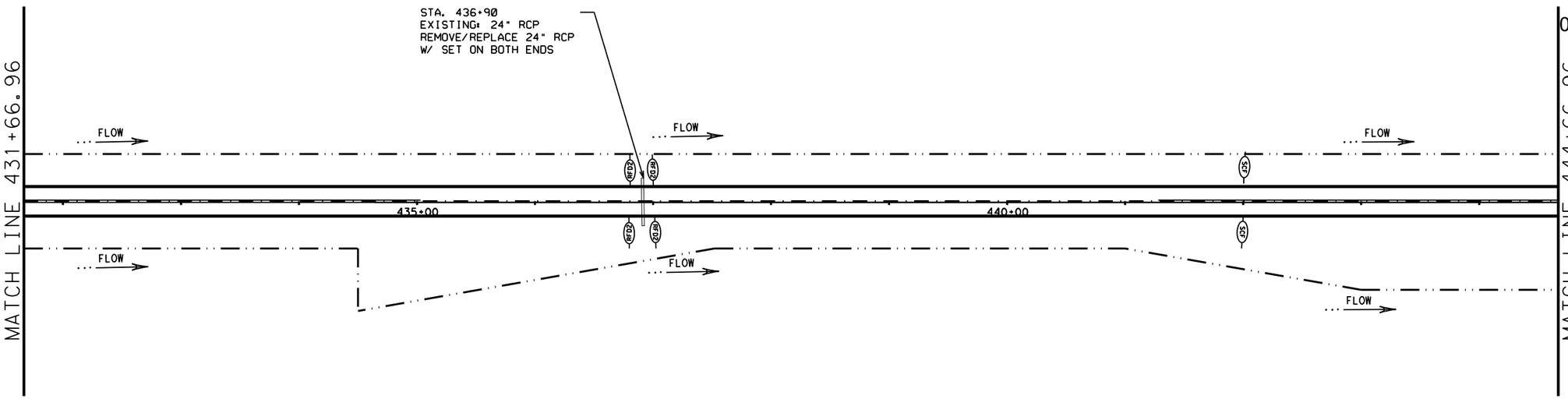
SHEET 16 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		177

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT

01.18.23

STATE OF TEXAS
MONTE L RATER
95859
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

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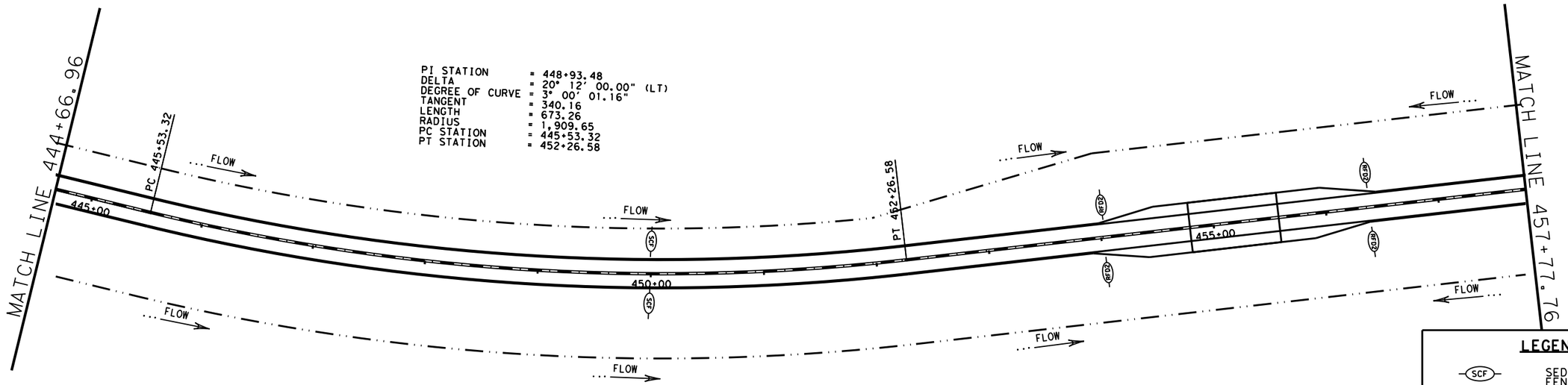
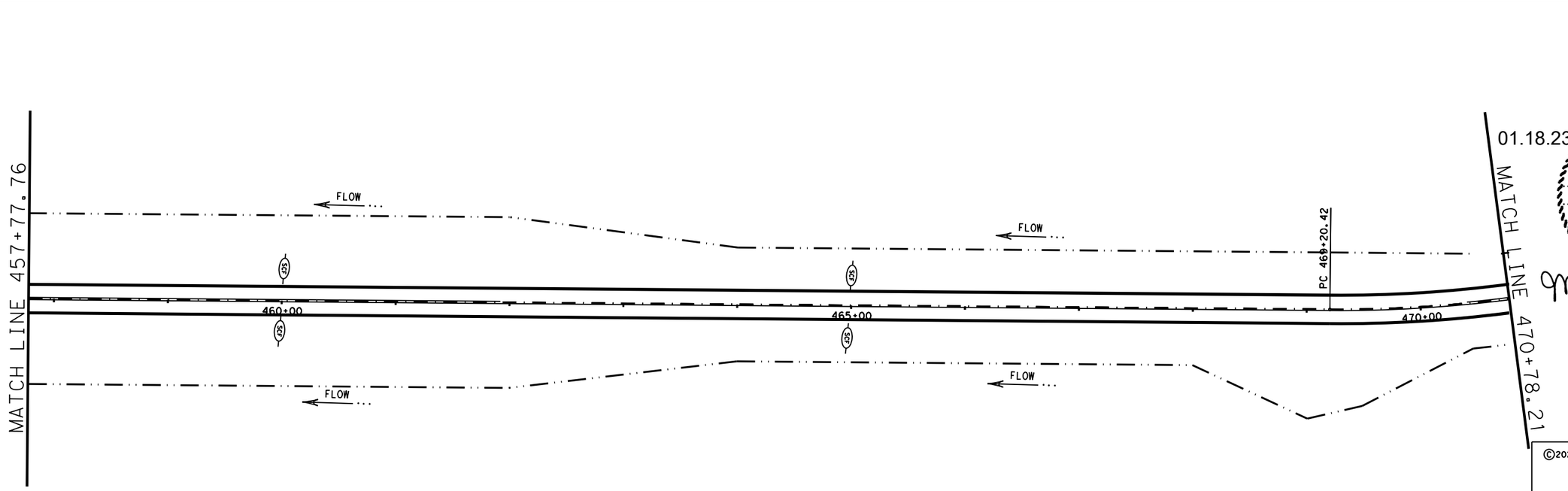
SHEET 17 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		178

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION
- CULVERT

01.18.23

STATE OF TEXAS
MONTE L RATER
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PROFESSIONAL ENGINEER

Monte R. Rater P.E.

FM 121
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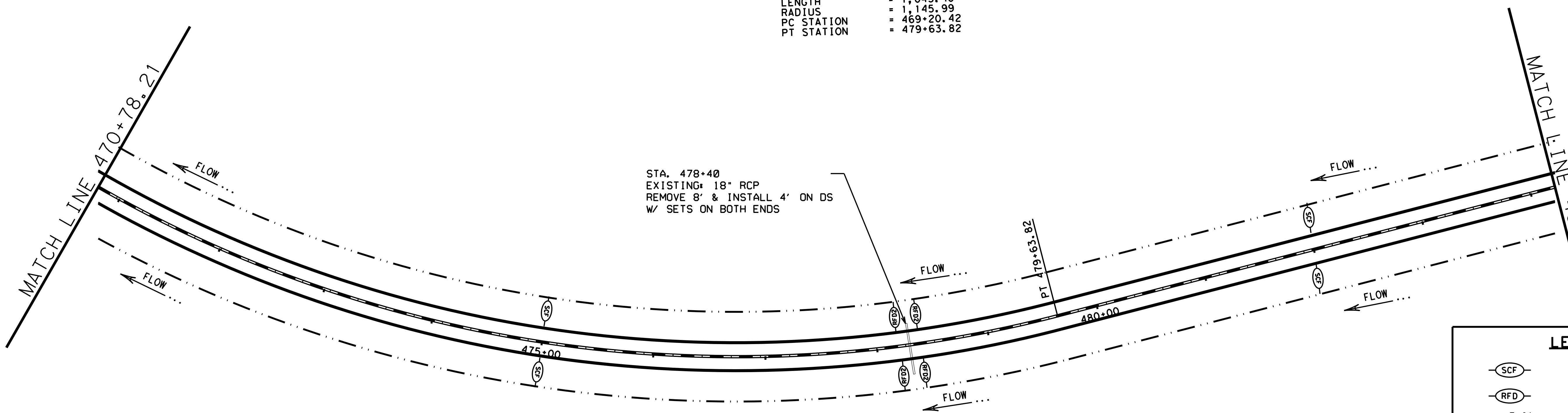
SHEET 18 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		179

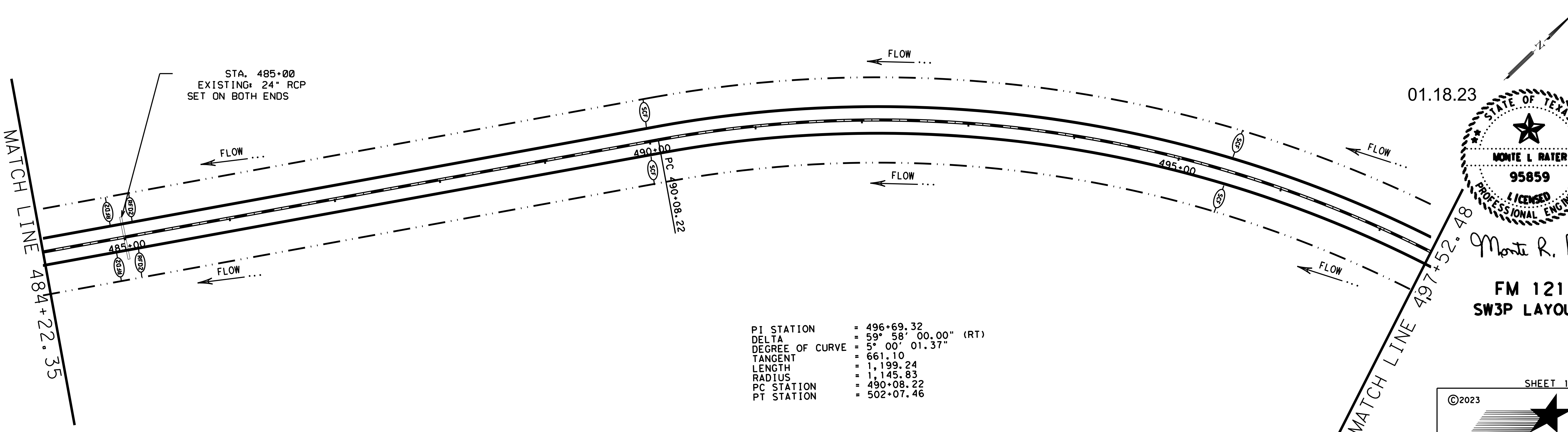
DATE: DATE TIME
FILE: DOCUMENT NAME

PI STATION = 474+81.42
DELTA = 52° 10' 00.00" (LT)
DEGREE OF CURVE = 4° 59' 58.88"
TANGENT = 561.00
LENGTH = 1,043.40
RADIUS = 1,145.99
PC STATION = 469+20.42
PT STATION = 479+63.82



LEGEND

SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
FLOW	WATER FLOW DIRECTION
	CULVERT



PI STATION = 496+69.32
DELTA = 59° 58' 00.00" (RT)
DEGREE OF CURVE = 5° 00' 01.37"
TANGENT = 661.10
LENGTH = 1,199.24
RADIUS = 1,145.83
PC STATION = 490+08.22
PT STATION = 502+07.46

01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

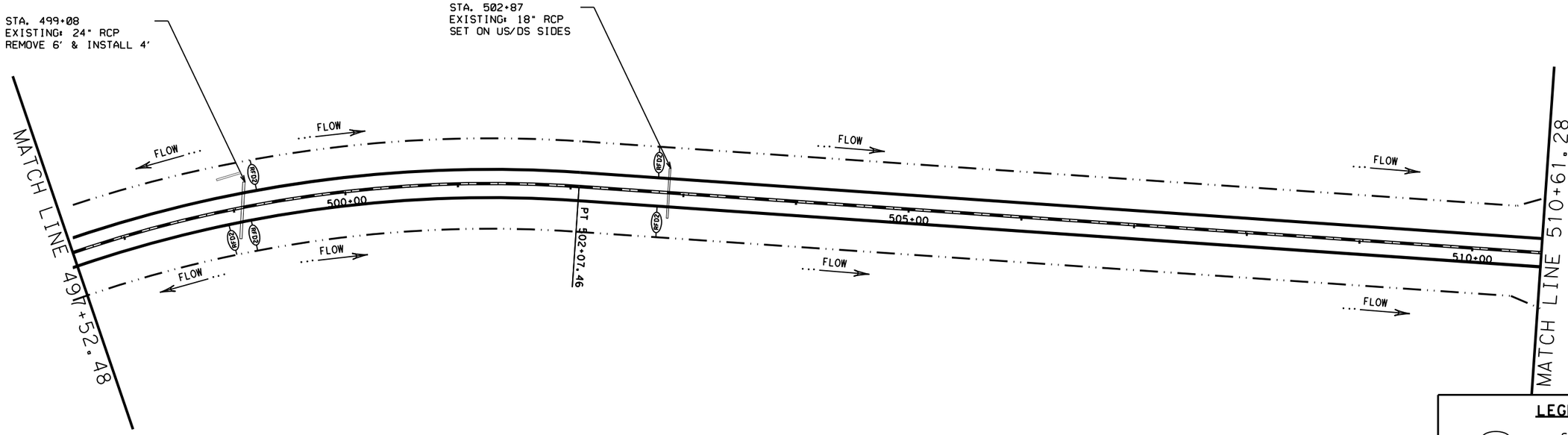
FM 121
SW3P LAYOUT

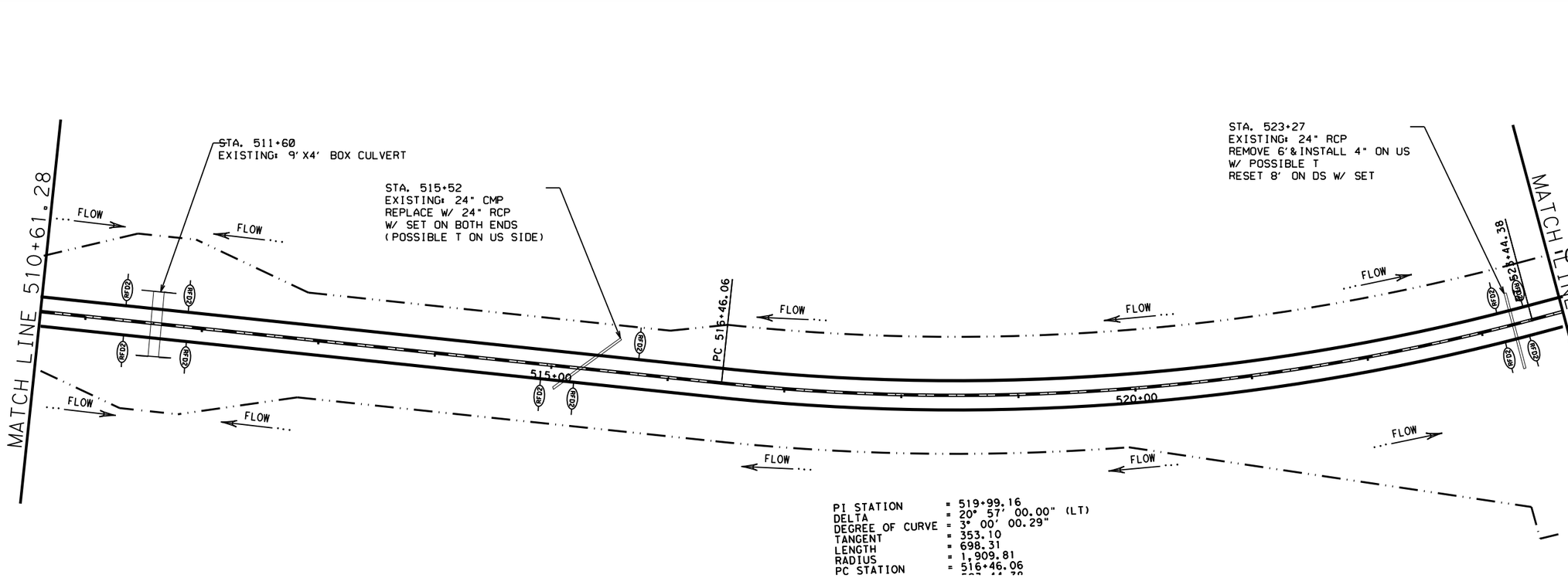
SHEET 19 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	180

DATE: DATE TIME
FILE: DOCUMENT NAME





LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW ··· WATER FLOW DIRECTION
- CULVERT

PI STATION	= 519+99.16
DELTA	= 20° 57' 00.00" (LT)
DEGREE OF CURVE	= 3° 00' 00.29"
TANGENT	= 353.10
LENGTH	= 698.31
RADIUS	= 1,909.81
PC STATION	= 516+46.06

STATE OF TEXAS
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01.19.23
Monte R. Rater P.E.

FM 121
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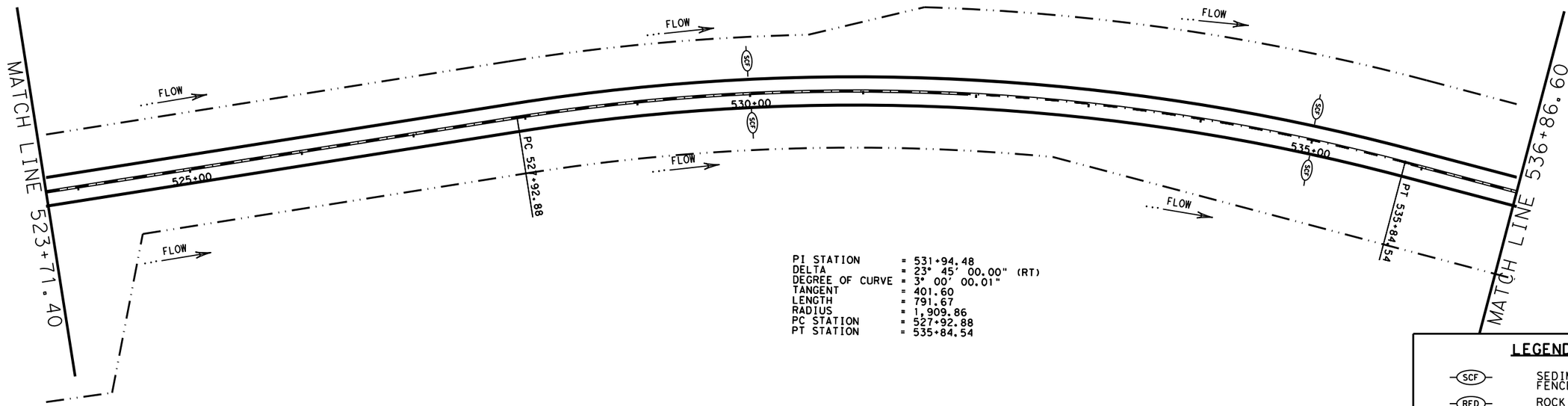
SHEET 20 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		181

DATE: DATE TIME
FILE: DOCUMENT NAME



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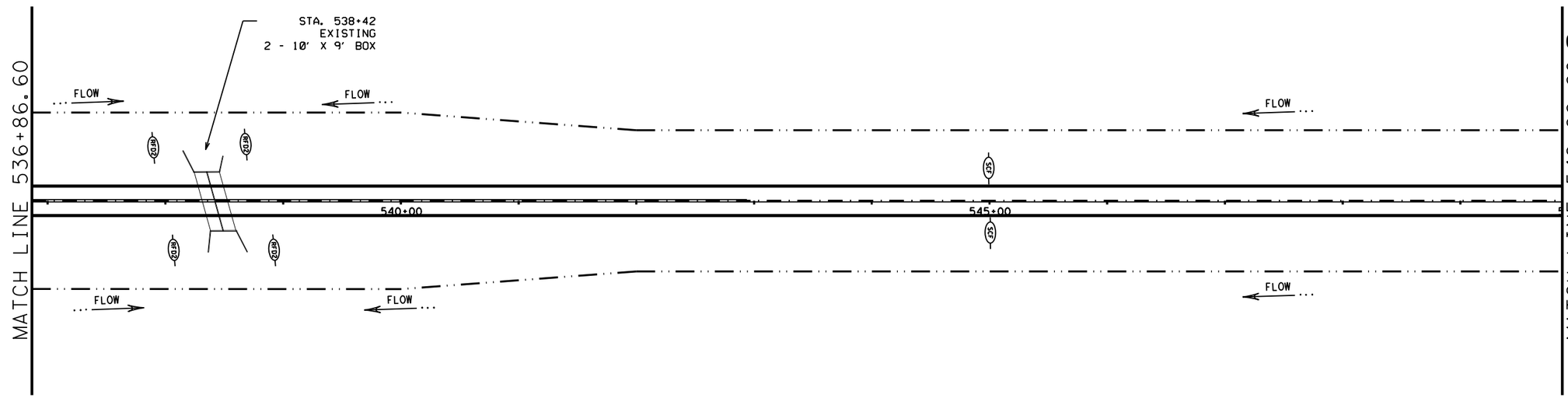
LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW — WATER FLOW DIRECTION



Monte R. Rater P.E.
01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

FM 121
SW3P LAYOUT

SHEET 21 OF 22

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		182

DATE: DATE TIME
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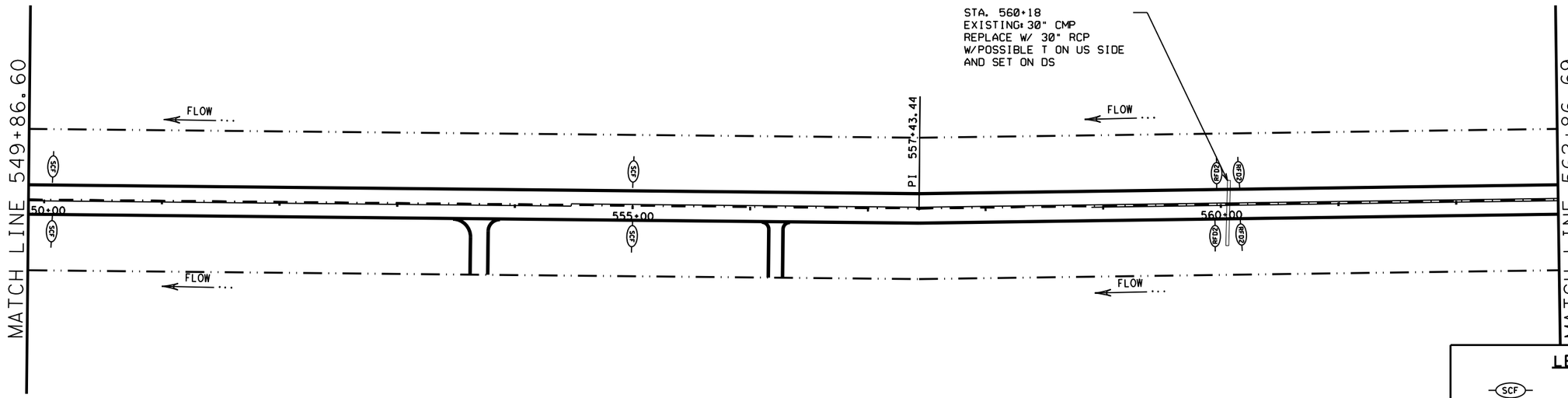
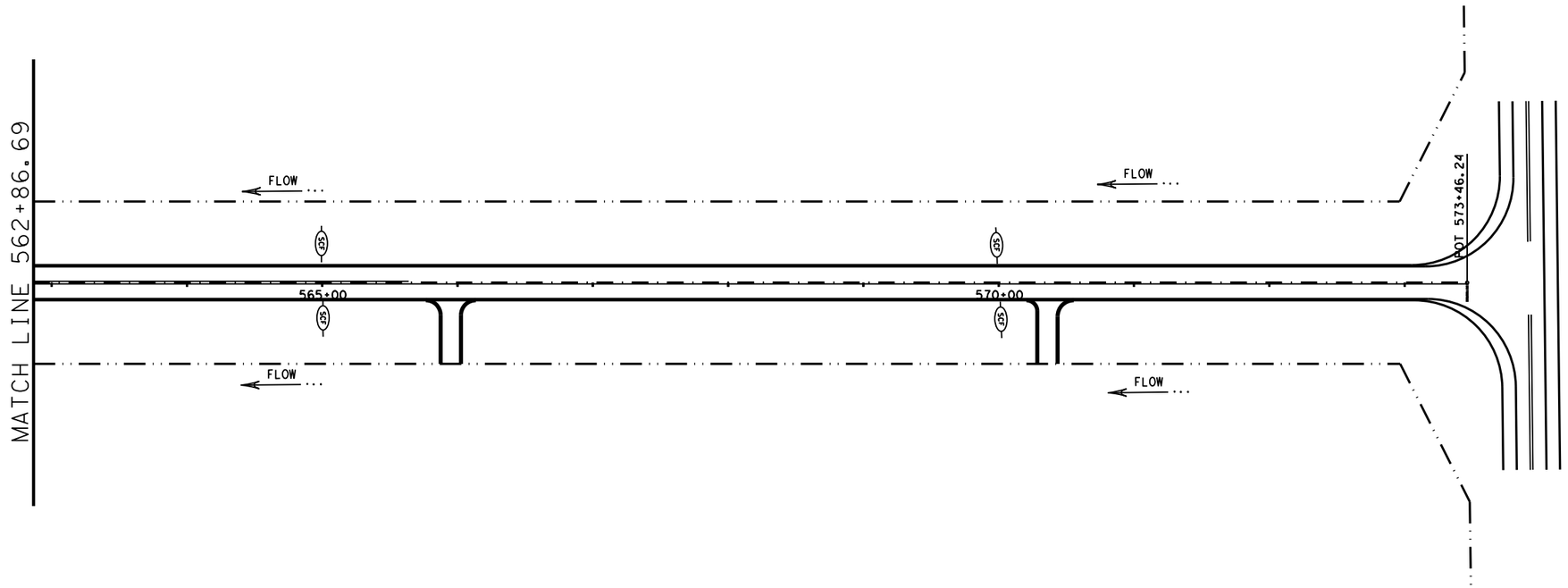




LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD — ROCK FILTER DAM
- FLOW ... — WATER FLOW DIRECTION
- CULVERT

N

01.18.23

STATE OF TEXAS
MONTE L RATER
95859
LICENSED
PROFESSIONAL ENGINEER

Monte R. Rater P.E.

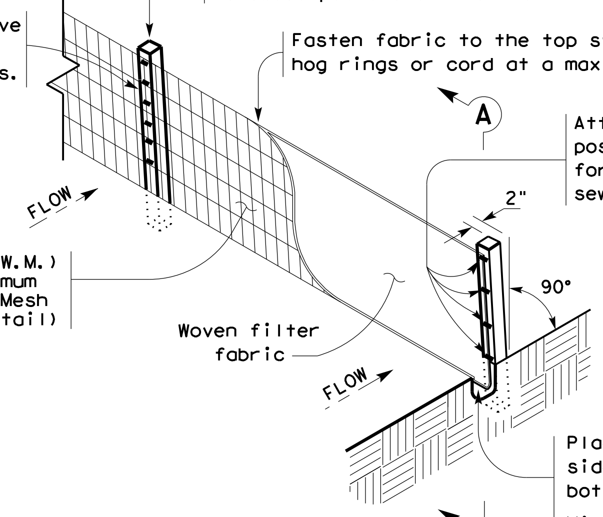
FM 121
SW3P LAYOUT

SHEET 22 OF 22

Texas Department of Transportation

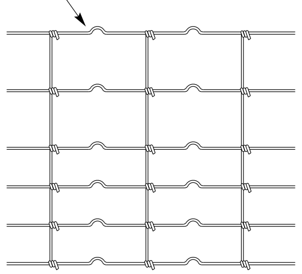
CONT	SECT	JOB	HIGHWAY
0729	02	032	FM 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		183

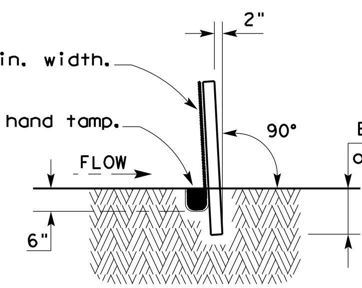
DATE: DATE TIME
FILE: DOCUMENT NAME



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

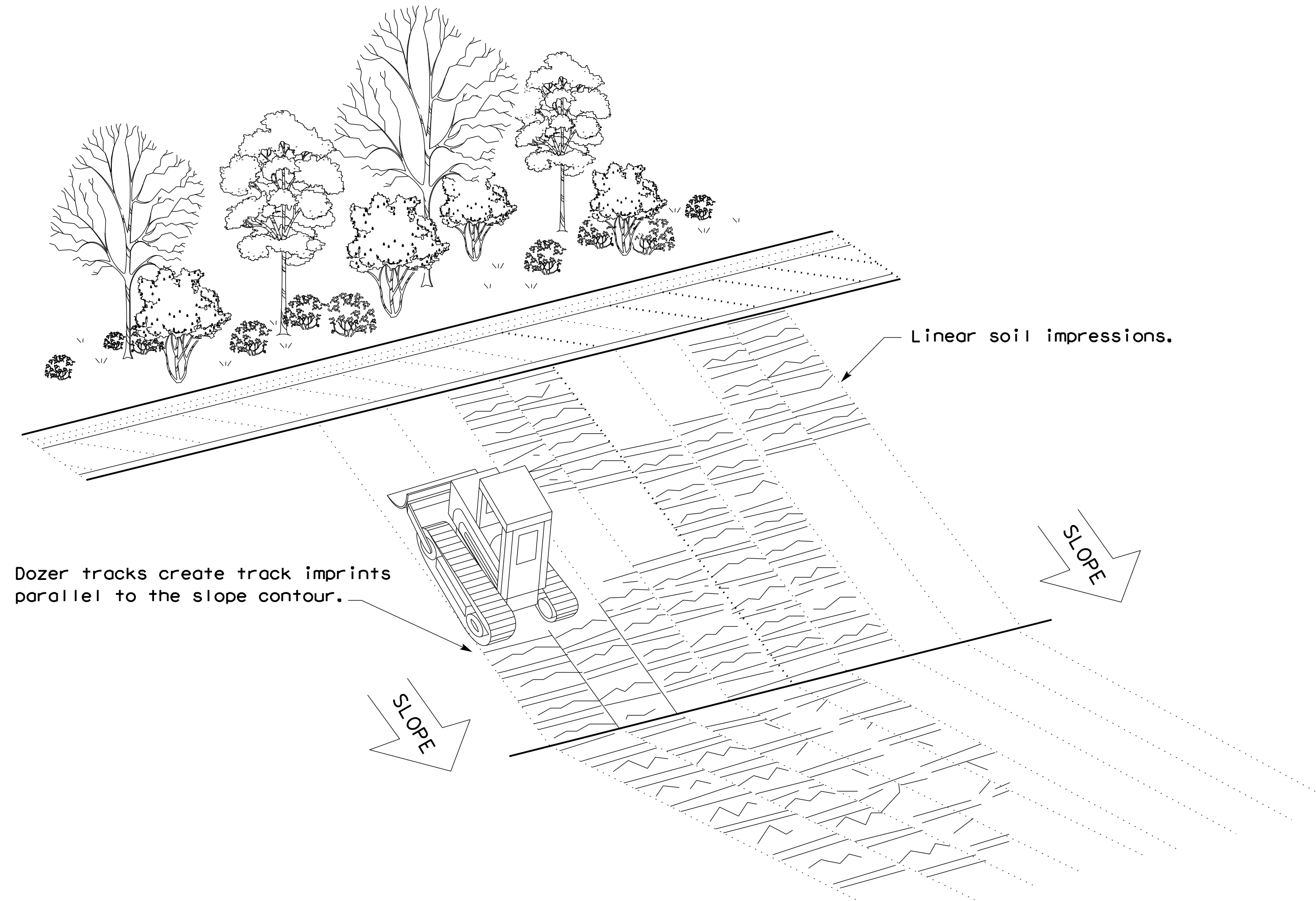
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT 0729	SECT 02	JOB 032	HIGHWAY FM 121
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 184

DATE: 1/17/2023
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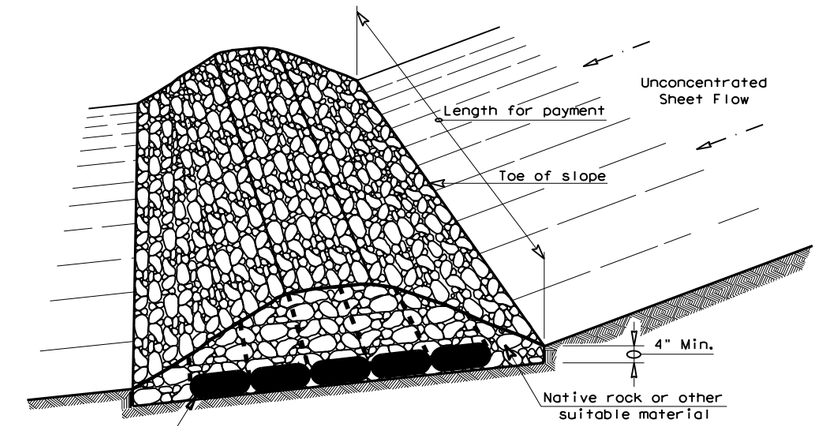
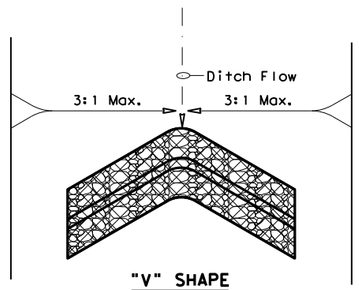
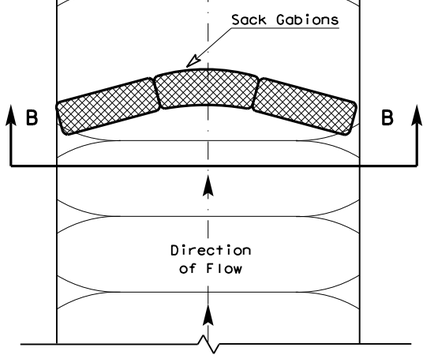


FILTER DAM AT TOE OF SLOPE

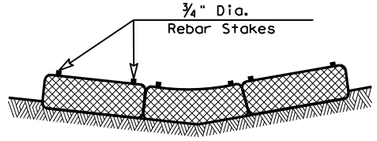
RFD1



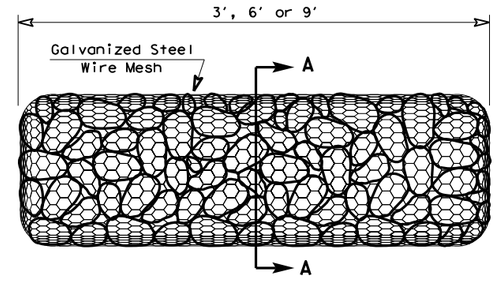
"V" SHAPE PLAN VIEW



PLAN VIEW

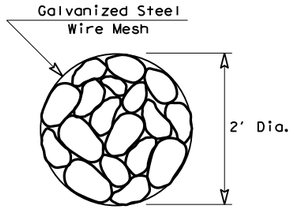


SECTION B-B

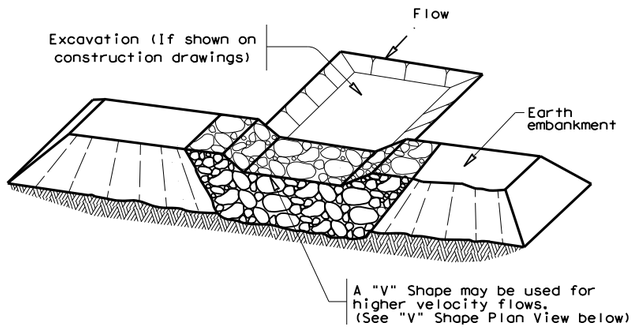


TYPE 4 (SACK GABIONS)

RFD4

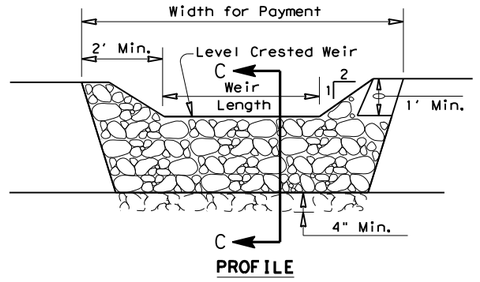


SECTION A-A

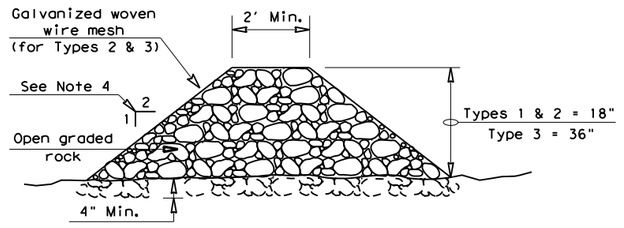


FILTER DAM AT SEDIMENT TRAP

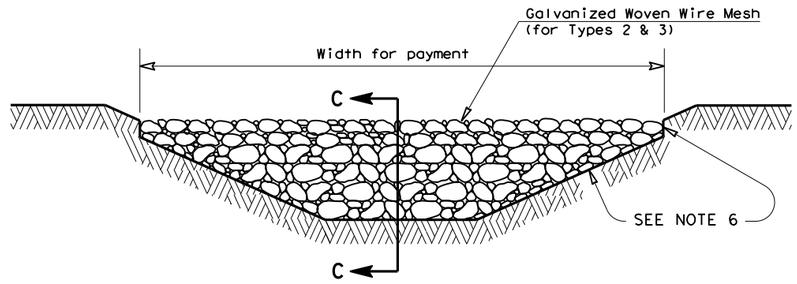
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0729	02	032	FM 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		185