FHWA TEXAS DIVISION				SHEET NO.
				1
STATE	DISTRICT	COUNTY		
TEXAS	PAR	Delta		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0399	03	038	FM 64	

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE AID PROJECT.

C 399-3-38

NET LENGTH OF ROADWAY= 29,738 FT.= 5.632 MI.
NET LENGTH OF BRIDGE = 75 FT = 0.014 MI.
NET LENTH OF PROJECT = 29,813 FT = 5.646 MI.

DESIGN SPEED= 30 MPH MAIN LANES
A.D.T.(2018)= 150
A.D.T.(2038)= 210

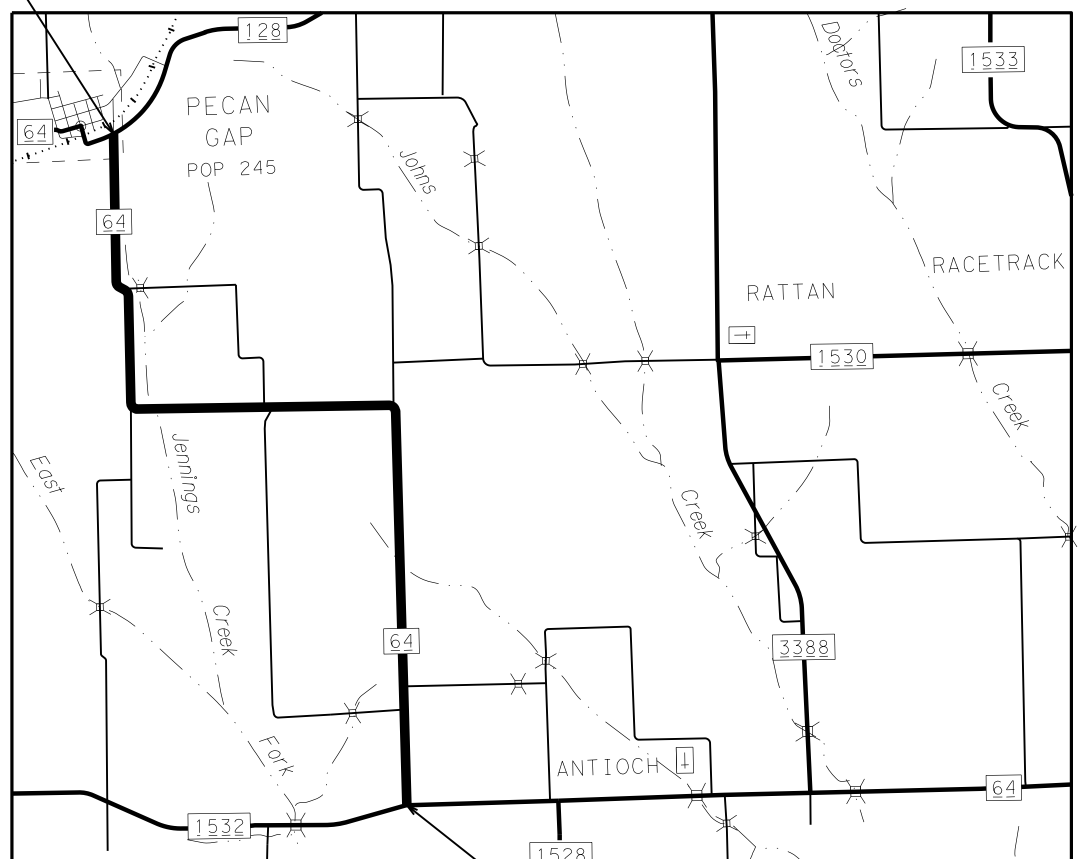
FM 64
DELTA COUNTY

LIMITS: FROM FM 128 TO SH 1532

FOR THE CONSTRUCTION OF: REHABILITATION OF EXISTING ROADWAY

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

END PROJECT
CSJ: 0399-03-038
STA: 681+13
TRM#: 640+0.946



BEGIN PROJECT
CSJ: 0399-03-038
STA: 383+00
TRM#: 646+0.475

EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS: N/A

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)- 14 THRU BC (12)- 14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

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SUBMITTED FOR LETTING: 05.04.21
Monte R. Peter P.E.
DESIGN ENGINEER

RECOMMENDED FOR LETTING: 5/6/2021
DocuSigned by: Daniel G. Taylor, P.E.
AREA ENGINEER

APPROVED FOR LETTING: 5/6/2021
DocuSigned by: Noel Paramanantham
DISTRICT ENGINEER

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 SPECIAL LABOR PROVISIONS FOR ALL STATE CONSTRUCTION PROJECTS. (SP 000---008)

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	6, 6A-6C	ESTIMATE & QUANTITY
	7-14	QUANTITY SUMMARY
		TRAFFIC CONTROL PLAN
	15	SEQUENCE OF WORK
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#	16-27	BC (1)-14 THRU BC (12)-14
	28	TREATMENT FOR VARIOUS EDGE CONDITIONS
#	29	TCP (1-1)-18
#	30	TCP (1-2)-18
#	31	TCP (2-1)-18
#	32	TCP (2-2)-18
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#	34	TCP (2-8)-20 (PAR)
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#	77-78	SRR
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STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH THE "#" SYMBOL ON THIS SHEET HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

Monte R. Rater P.E. — May 6.21

NAME — DATE

FM 64
INDEX OF SHEETS

Texas Department of Transportation

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0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		2

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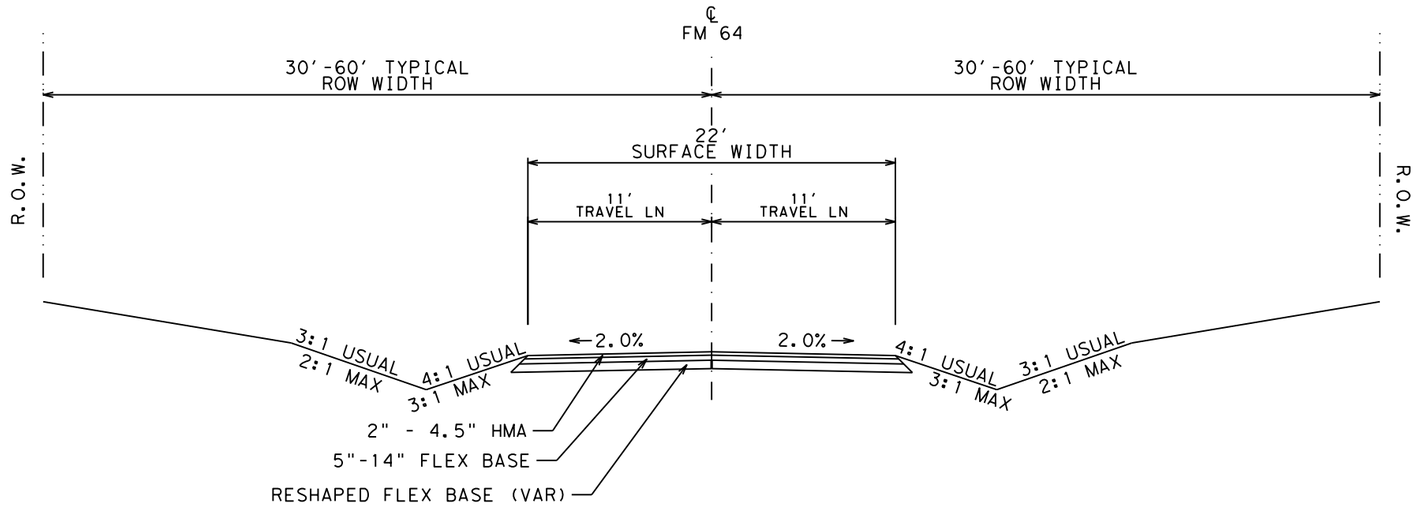
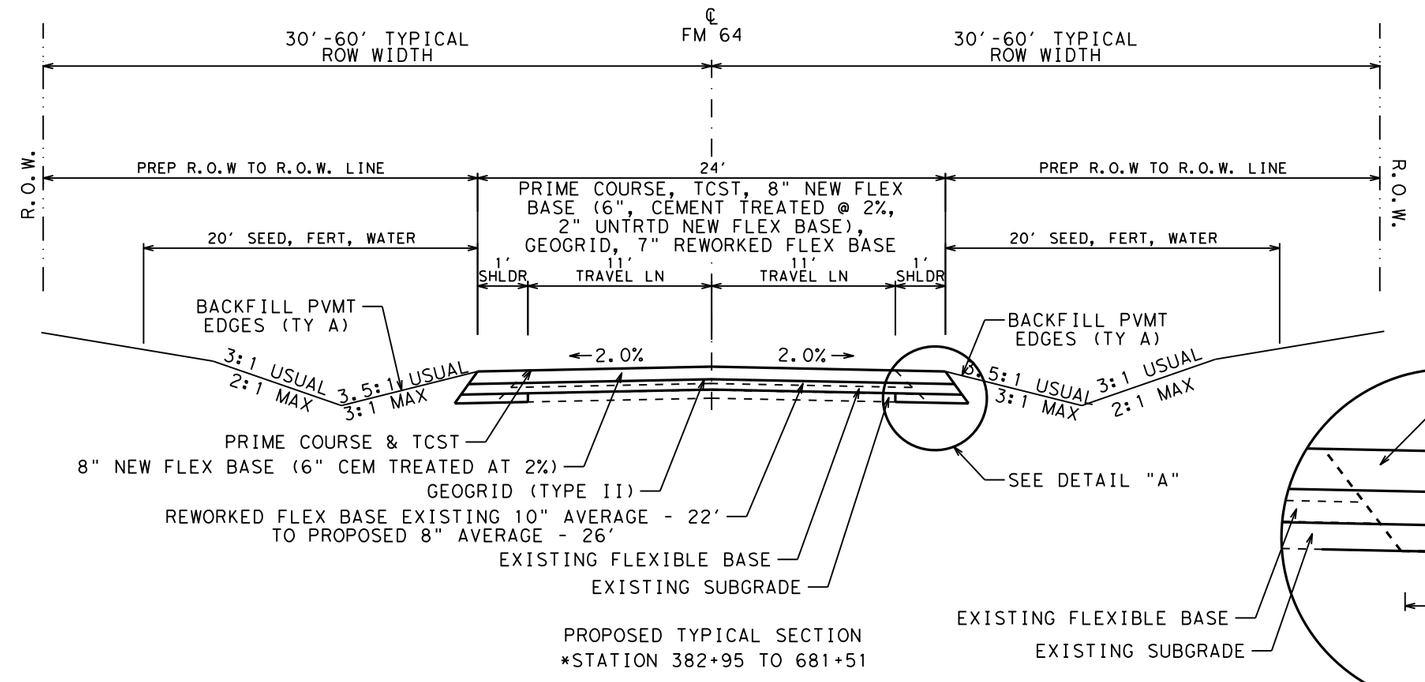
CK1: DW1: CK2: DN1:

*BRIDGE LOCATIONS:

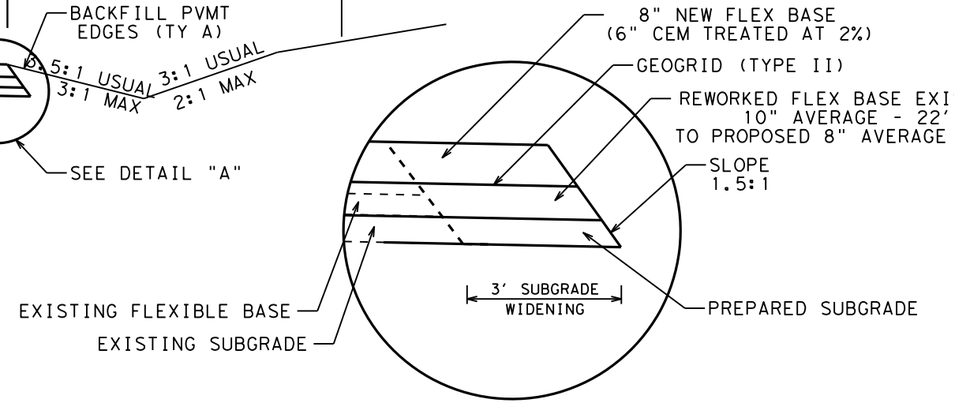
JENNINGS CREEK
BRIDGE: STA. 584+95 TO STA 585+70



EXISTING TYPICAL SECTION
*STATION 382+95 TO 681+51



PROPOSED TYPICAL SECTION
*STATION 382+95 TO 681+51



DETAIL "A"
(APPLIES TO BOTH SIDES)

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
TYPICAL SECTIONS

NOT TO SCALE

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
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PAR	Delta		3

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Pavement Core Data

28-1 (SB)	2" ACP 8" GRAVEL BASE	Approx. 280 FT SOUTH OF 3RD ST 33.43642,-95.84360	PI=14 Sulfate=<160ppm
28-2 (NB)	2.5" ACP 5" GRAVEL BASE	Approx. 285 FT SOUTH OF FM 3440 33.42288,-95.84257	PI=N/A Sulfate= Rate not provided
28-3 (EB)	3" ACP 14" GRAVEL BASE	Approx. .5 MILES EAST OF FM 3140 33.41308,-95.83405	PI=64 Sulfate=<160ppm
28-4 (NB)	4" ACP 8.5" GRAVEL BASE	Approx. 180 FT SOUTH OF FM 3430 33.41220,-95.81558	PI=61 Sulfate=<140ppm
28-5 (SB)	4.5" ACP 8" GRAVEL BASE	Approx. .7 MILES SOUTH OF FM 3420 33.39584,-95.81585	PI=51 Sulfate=<140ppm
28-6 (NB)	3.5" ACP 13" GRAVEL BASE	Approx. 194 FEET NORTH OF FM 1532 33.37874,-95.81599	PI=45 Sulfate=<100ppm

CORES PROVIDED BY INTERTEK - PSI

FM 64
PAVEMENT
CORE DATA

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		4

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CK:
DW:
CK:
DN:

GENERAL NOTES

General:

This project contains the following modified standard sheets:
TCP(2-8)-18 (MOD)
TYPE T131RC (MOD)

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

Paris Area Office
Daniel Taylor - Daniel.Taylor@txdot.gov
Ellen Perry - Ellen.Perry@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/
All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

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 2 Instructions to Bidders:

View plans on-line or download from the web at:
http://www.txdot.gov/business/letting-bids/plans-online.html

Order plans from any of the plan reproduction companies shown on the web at:
http://www.txdot.gov/business/letting-bids/repro-companies.html

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.

County: Delta **Control:** 0399-03-038

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

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Item 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 flexibility in material availability.

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.

Pipelines owned by Kinder Morgan and Atmos cross this project's Right-of-Way. Notify both companies when working in the vicinity of these pipelines. Pipeline Contact information is below:

Atmos Energy:

Contact Name: Ronald Smith
Phone Number: (903)-439-7220
Email: Ronald.Smith@atmosenergy.com

Kinder Morgan:

Contact Name: Ed MacEntire
Phone Number: (903)-249-8778
Email: Edwin.MacEntire@kindermorgan.com

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. When Right of Way width is less than 40 feet from centerline – remove all trees to the Right of Way line. At locations where the right of way is less than 40 feet, remove all trees to the right of way line. At cross structures, remove brush & debris 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.

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 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:

As directed, 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.

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.

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 300 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.

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 305 Salvaging, Hauling and Stockpiling Reclaimable Asphalt Pavement:

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".

RAP that is not to be used on this project will become the property of TXDOT. Transfer 2,000 CY of these millings directly into trucks, and transport directly to the stockpile site located at SH 24 across from BU 24, or as approved. At the end of the project, shape each stockpile for measurement as directed. Provide a RAP accountability plan that is acceptable to the Area Engineer. RAP that is not to be used on this project will become the property of the Contractor.

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 354 Planing and Texturing Pavement:

All bridges will be planed down to the existing concrete bridge deck. After planing the existing asphalt off the bridge decks, the bridge decks must be inspected by Justin Ferguson, Bridge Inspector at Paris District Headquarters, to evaluate the current condition of the bridge deck. The inspection must be done before the seal coat/tack coat operation on the bridge decks.

Justin Ferguson
Justin.Ferguson@txdot.gov
(903)-583-9523

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 451 Retrofit Railing:

Removed rail shall be retained by the Contractor.

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.

Concrete pipe collars shall be subsidiary 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.

Prior to SET installation, ensure the slope from the access surface to the top of the SET matches the slope of the SET. In addition, also ensure any proposed mailbox turnouts can be constructed without the need for additional pipe. If additional pipe is needed to obtain the desired SET slope or to construct the mailbox turnout, this will be compensated using the items in the contract. When establishing parallel pipe/SETs flowlines elevations, ensure front slope grade is no steeper than 3:1.

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)-14.

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 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.

All flaggers are required to wear a white hard hat while performing flagging operations.

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.

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 512 Portable Traffic Barrier:

F-shape PTB stockpiled at 3600 SW Loop 286, Paris, TX shall be used in this project. At project completion, all Portable Traffic Barriers shall be stockpiled at 3600 SW Loop 286, Paris, TX. All stockpiled Portable Traffic Barriers shall be cleaned to the extent that all loose and foreign material is removed. Any damaged PTB, as determined by the Engineer, and shall become the property of the Contractor.
Inspect PTB before bidding and provide necessary connection hardware as required.

Reflectors shall be placed on all PTB as shown on standard D&OM(2)-15, throughout stage construction. Expense for this work will be subsidiary to this Item.

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.

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 644 Small Roadside Sign Support and Assemblies:

Upon removal of sign assemblies, deliver sign faces to TxDOT office at
FM 64 & SH 24 Cooper, TX 75432. 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 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.

QUANTITY SHEET

CONTROLLING PROJECT ID 0399-03-038 **DISTRICT** Paris **COUNTY** Delta
HIGHWAY FM 64

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0399-03-038**			
		PROJECT ID		**A00125756**			
		COUNTY		**Delta**			
		HIGHWAY		**FM 64**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	299.530		299.530	
	104-6009	REMOVING CONC (RIPRAP)	SY	59.000		59.000	
	110-6002	EXCAVATION (CHANNEL)	CY	574.000		574.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	298.780		298.780	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	741.000		741.000	
	134-6001	BACKFILL (TY A)	STA	298.500		298.500	
	134-6002	BACKFILL (TY B)	STA	297.660		297.660	
	152-6001	ROAD GRADER WORK (ORD COMP)	STA	298.780		298.780	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	66,252.000		66,252.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	66,252.000		66,252.000	
	164-6015	STRAW/HAY MLCH SEED(PERM)(RURAL)(CLAY)	SY	132,503.000		132,503.000	
	168-6001	VEGETATIVE WATERING	MG	795.000		795.000	
	216-6001	PROOF ROLLING	HR	72.000		72.000	
	247-6124	FL BS (RDWY DEL) (TY A GR 4)	TON	33,696.000		33,696.000	
	251-6073	REWRKING BS MATL (TY C)(10")(ORD COMP)	SY	73,035.000		73,035.000	
	275-6001	CEMENT	TON	485.000		485.000	
	275-6003	CEMENT TREAT (NEW BASE) (6")	SY	79,674.000		79,674.000	
	316-6029	ASPH (RC-250)	GAL	22,260.000		22,260.000	
	316-6078	AGGR(TY-B GR-4 SAC-A)	CY	663.000		663.000	
	316-6173	AGGR(TY-B GR-3 SAC-B)	CY	757.000		757.000	
	316-6405	ASPH (AC-20-5TR OR AC-20XP)	GAL	65,191.000		65,191.000	
	316-6414	AGGR (TY-B GR-5)	CY	568.000		568.000	
	354-6011	PLAN & TEXT ASPH CONC PAV(0" TO 8")	SY	26,332.240		26,332.240	
	400-6008	CUT & RESTORE ASPH PAVING	SY	74.000		74.000	
	401-6001	FLOWABLE BACKFILL	CY	140.620		140.620	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	57.000		57.000	
	403-6001	TEMPORARY SPL SHORING	SF	5,969.000		5,969.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	745.000		745.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	49.200		49.200	
	451-6004	RETROFIT RAIL (TY T131RC)	LF	152.000		152.000	
	462-6052	CONC BOX CULV (5 FT X 4 FT)(EXTEND)	LF	28.000		28.000	
	462-6053	CONC BOX CULV (5 FT X 5 FT)(EXTEND)	LF	12.000		12.000	
	462-6054	CONC BOX CULV (6 FT X 3 FT)(EXTEND)	LF	40.000		40.000	
	462-6056	CONC BOX CULV (6 FT X 5 FT)(EXTEND)	LF	6.000		6.000	
	462-6057	CONC BOX CULV (6 FT X 6 FT)(EXTEND)	LF	36.000		36.000	
	462-6065	CONC BOX CULV (8 FT X 6 FT)(EXTEND)	LF	5.000		5.000	
	464-6001	RC PIPE (CL III)(12 IN)	LF	137.000		137.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0399-03-038 **DISTRICT** Paris **COUNTY** Delta
HIGHWAY FM 64

			CONTROL SECTION JOB		**0399-03-038**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00125756**		
			COUNTY		**Delta**		
			HIGHWAY		**FM 64**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	464-6002	RC PIPE (CL III)(15 IN)	LF	125.000		125.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	227.000		227.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	145.000		145.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	90.000		90.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	129.000		129.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	62.000		62.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	1.000		1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2.000		2.000	
	466-6151	WINGWALL (FW - 0) (HW=4 FT)	EA	2.000		2.000	
	466-6153	WINGWALL (FW - 0) (HW=6 FT)	EA	4.000		4.000	
	466-6154	WINGWALL (FW - 0) (HW=7 FT)	EA	3.000		3.000	
	466-6193	WINGWALL (PW - 2) (HW=4 FT)	EA	2.000		2.000	
	466-6194	WINGWALL (PW - 2) (HW=5 FT)	EA	1.000		1.000	
	466-6195	WINGWALL (PW - 2) (HW=6 FT)	EA	4.000		4.000	
	466-6197	WINGWALL (PW - 2) (HW=8 FT)	EA	2.000		2.000	
	467-6022	SET (TY I) (48 IN) (4: 1) (C)	EA	2.000		2.000	
	467-6326	SET (TY II) (12 IN) (RCP) (6: 1) (P)	EA	12.000		12.000	
	467-6341	SET (TY II) (15 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	20.000		20.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	8.000		8.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	4.000		4.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	12.000		12.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	8.000		8.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	EA	4.000		4.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	1.000		1.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	467-6580	SET (REMOV & REINSTALL)	EA	2.000		2.000	
	472-6006	REMOV & RE - LAY PIPE (24 IN)	LF	12.000		12.000	
	496-6004	REMOV STR (SET)	EA	12.000		12.000	
	496-6005	REMOV STR (WINGWALL)	EA	10.000		10.000	
	496-6007	REMOV STR (PIPE)	LF	748.000		748.000	
	496-6072	REMOVING ROCK RIPRAP	LF	20.000		20.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	14.000		14.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	1,200.000		1,200.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,200.000		1,200.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,170.000		1,170.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0399-03-038 **DISTRICT** Paris **COUNTY** Delta
HIGHWAY FM 64

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0399-03-038**			
		PROJECT ID		**A00125756**			
		COUNTY		**Delta**			
		HIGHWAY		**FM 64**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,170.000		1,170.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	2.000		2.000	
	512-6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	810.000		810.000	
	512-6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	LF	810.000		810.000	
	512-6041	PORT CTB (STKPL)(F-SHAPE)(TY 1)	LF	810.000		810.000	
	530-6008	TURNOUTS (ACP)	SY	517.000		517.000	
	530-6016	DRIVEWAYS (BASE)	SY	809.000		809.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	500.000		500.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,300.000		1,300.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	44.000		44.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA	14.000		14.000	
	560-6006	MAILBOX INSTALL-M (TWG-POST) TY 2	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	90.000		90.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	1.000		1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	92.000		92.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	38.000		38.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000		12.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	12,780.000		12,780.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	43,048.000		43,048.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	760.000		760.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	2,220.000		2,220.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	22.000		22.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	2,220.000		2,220.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	5,932.000		5,932.000	
	666-6178	REFL PAV MRK TY II (W) 8" (SLD)	LF	240.000		240.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	33.000		33.000	
	666-6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	59,676.000		59,676.000	
	666-6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	LF	6,390.000		6,390.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	21,524.000		21,524.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	760.000		760.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	2,220.000		2,220.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	22.000		22.000	
	5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	86,314.000		86,314.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0399-03-038 **DISTRICT** Paris **COUNTY** Delta
HIGHWAY FM 64

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0399-03-038**			
		PROJECT ID		**A00125756**			
		COUNTY		**Delta**			
		HIGHWAY		**FM 64**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	300.000		300.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	80.000		80.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

SUMMARY OF ROADWAY ITEMS							PRIME COURSE		FIRST COURSE		SECOND COURSE		
LOCATION		LENGTH	EXISTING WIDTH	PROPOSED SURFACE WIDTH	247 6124	251 6073	316 6029	316 6414	316 6405	316 6173	316 6405	316 6078	5001 6002
					FL BS (RDWY DEL) (TY A GR 4)	REWRKING BS MATL (TY C)(10")(ORD COMP)	ASPH (RC-250)	AGGR (TY-B GR-5)	ASPH (AC-20-5TR OR AC-20XP)	AGGR(TY-B GR-3 SAC-B)	ASPH (AC-20-5TR OR AC-20XP)	AGGR(TY-B GR-4 SAC-A)	GEOGRID BASE REINFORCEMENT (TY II)
FROM	TO	LF	LF	LF	TON	SY	GAL	CY	GAL	CY	GAL	CY	SY
383+00	681+13	29,813	22	24			22,260	568	36,571	757	28,620	663	
383+00	584+95	20,195	22	24	22,731	49,366							58,341
585+70	681+13	9,543	22	24	10,741	23,327							27,569
Curve Super Correction					66								
FM 64 / FM 128 CROSSOVER		140	22	24	158	342	105	3	172	4	134	3	404
PROJECT TOTALS					33,696	73,035	22,260	568	36,571	757	28,620	663	86,314

JENNINGS CREEK BRIDGE STA: 584+95 - 585+70

PRIME COURSE:
ASPHALT - RC-250 @ 0.28 GAL/SY
AGGREGATE - GR 5 OR MOD 5 B OR L @ 1:140

FIRST COURSE:
ASPHALT - AC-20-5TR or AC-20XP @ 0.46 GAL/SY
AGGREGATE - GR 3 B OR L @ 1:105

SECOND COURSE:
ASPHALT - AC-20-5TR or AC-20XP @ 0.36 GAL/SY
AGGREGATE - GR 4 PB OR PL @ 1:120

NEW FLEXBASE - 135 LBS/CF

SUMMARY OF ROADWAY ITEMS			100 6002	112 6001	134 6001	134 6002	152 6001
LOCATION		LENGTH	PREPARING ROW	SUBGRADE WIDENING (ORD COMP)	BACKFILL (TY A)	BACKFILL (TY B)	ROAD GRADER WORK (ORD COMP)
FROM	TO	LF	STA	STA	STA	STA	STA
383+00	681+13	29,813	298.13				
383+00	584+95	20,195		201.95	201.95	201.95	201.95
585+70	681+13	9,543		95.43	95.43	95.43	95.43
FM 64 / FM 128 CROSSOVER		140	1.40	1.40	1.12	0.28	1.40
PROJECT TOTALS			299.53	298.78	298.50	297.66	298.78

JENNINGS CREEK BRIDGE STA: 584+95 - 585+70

SUMMARY OF CEMENT TREATMENT ITEMS				275 6001	275 6003	216 6001
LOCATION		LENGTH	WIDTH	CEMENT	CEMENT TREAT (NEW BASE) (6")	PROOF ROLLING
FROM	TO	LF	LF	TON	SY	HR
383+00	584+95	20,195	24	327	53,853	35
585+70	681+13	9,543	24	155	25,448	36
FM 64 / FM 128 CROSSOVER		140	24	3	373	1
PROJECT TOTALS				485	79,674	72

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

JENNINGS CREEK BRIDGE
STA: 584+95 - 585+70

PROOF ROLLING BASED UPON 2,500 SY/HR

SUMMARY OF MAILBOX ITEMS			560 6004	560 6006	530 6008
LOCATION	LT/RT	NUMBER OF BOXES	MAILBOX INSTALL-S (TWG-POST) TY 2	MAILBOX INSTALL-M (TWG-POST) TY 2	TURNOUTS (ACP)
			EA	EA	SY
398+68	RT	1	1		38
400+71	RT	1	1		38
415+22	RT	1	1		38
450+57	RT	1	1		38
453+10	RT	1	1		27
454+73	RT	1	1		27
466+71	RT	1	1		38
529+22	RT	1	1		38
597+11	RT	1	1		38
634+00	RT	1	1		29
647+03	RT	1	1		27
649+26	RT	1	1		27
650+20	RT	1	1		38
651+41	RT	1	1		38
660+90	RT	3		1	38
PROJECT TOTALS		17	14	1	517

SUMMARY OF SIGNING ITEMS	644 6001	644 6007	644 6030	644 6076
LOCATION	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(T)	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA
383+00 - 681+13	90	1	1	92
PROJECT TOTALS	90	1	1	92

FM 64
QUANTITY SUMMARY

SHEET 1 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		7

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CK:
DW:
CK:
DN:

SUMMARY OF DRIVEWAY ITEMS

LOCATION	LT/RT	SURFACE	L (LENGTH)	W (WIDTH)	R1 (RADIUS)	R2 (RADIUS)	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	530 6016 DRIVEWAYS (BASE)	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 6007 RC PIPE (CL III)(30 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)
STATION			LF	LF	LF	LF	CY	SY	LF	LF	LF	LF	LF	LF	EA	EA
398+45	LT	GRAVEL	15	9	15	10		13								
400+50	LT	GRAVEL	15	9	11	6		9								
415+22 (CR 3400)	LT	GRAVEL	15	18	17	15		23								
420+35	LT	GRAVEL	15	12	15	9		14								
422+48 (CR 3410)	RT	GRAVEL/DIRT	15	18	13	17		21			30					
444+57	RT	GRAVEL	15	15	7	7		11			20					
447+98	RT	GRAVEL/DIRT	15	14	10	10		13								
450+82	RT	GRAVEL	15	20	10	10		16		60						2
452+84	RT	GRAVEL	15	12	5	8		9	36						2	
454+46	RT	GRAVEL	15	12	12	12		14			32					
461+56	LT	GRAVEL/DIRT	15	16	14	12		17			80					
465+83	RT	GRAVEL	15	12	5	5		8					20			
467+08	RT	GRAVEL/DIRT	15	12	5	5		8					22			
480+30	LT	GRAVEL	15	18	10	10		15	27						2	
481+55	LT	GRAVEL	15	18	10	10		15			20					
490+29 (CR 3420)	RT	GRAVEL	15	21	10	17		21	24						2	
508+25	RT	GRAVEL	15	10	5	5		7								
510+65 (CR3430)	RT	GRAVEL/DIRT	15	47	21	30		59								
527+86	LT	GRAVEL/DIRT	15	10	7	7		8			20					
528+89	LT	GRAVEL	15	50	5	5		29	50						2	
530+79	LT	GRAVEL	15	18	7	5		32								
550+63 (CR 3400)	LT	GRAVEL/DIRT	15	28	12	12	5	23						40		
552+10 (CR 3440)	RT	GRAVEL/DIRT	15	30	14	14		60								
560+79	LT	GRAVEL	15	18	10	10		15				25				
577+86	LT	GRASS	15	10	5	5		7								
593+60	RT	GRAVEL	15	15	5	5		10			25					
594+05 (CR 3140)	LT	GRAVEL	15	40	19	16		37								
596+51	RT	GRAVEL	15	16	8	8		12								
597+60	RT	GRAVEL	15	16	8	8		12								
631+11 (CR3440)	RT	GRAVEL	15	22	11	16		22								
634+00	LT	GRAVEL	15	15	5	10		12								
645+61	RT	GRAVEL	15	25	5	5		16							2	
646+76	RT	GRAVEL	15	25	5	5		16								
647+63	RT	GRAVEL	15	30	15	15		28								
648+91	LT	GRASS	15	5	5			4				20				
649+29	RT	GRAVEL	15	23	5	5		14								
649+95	LT	GRAVEL	15	20	5	5		13								
650+43	RT	GRAVEL	15	18	15	15		21								
650+68	LT	GRAVEL	15	15	10	10		14					20			
660+70	LT	GRAVEL	15	15	8	8	20	12				30				
661+36	LT	GRAVEL	15	10	10	10		11				18				
664+79	RT	GRAVEL	15	15	10	15	5	17						25		
670+12	LT	GRAVEL	15	15	5	5		10					20			
670+93	LT	GRAVEL	15	10	10	10		11				20				
675+85	RT	GRAVEL	15	15	5	5		10							2	
678+40	RT	GRAVEL	15	19	5	5		12				24				
681+03	RT	GRAVEL	15	30	15	15		28		65						2
						PROJECT TOTALS	30	809	137	125	227	137	82	65	12	4

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FM 64
QUANTITY SUMMARY

SHEET 2 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		8

SUMMARY OF DRIVEWAY ITEMS

LOCATION	LT/RT	SURFACE	L (LENGTH)	W (WIDTH)	R1 (RADIUS)	R2 (RADIUS)	467 6363 SET (TY II) (18 IN) (RCP) (6:1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6:1) (P)	467 6423 SET (TY II) (30 IN) (RCP) (6:1) (P)	467 6454 SET (TY II) (36 IN) (RCP) (6:1) (P)	496 6004 REMOV STR (SET)	496 6007 REMOV STR (PIPE)
STATION			LF	LF	LF	LF	EA	LF	EA	EA	EA	LF
398+45	LT	GRAVEL	15	9	15	10						
400+50	LT	GRAVEL	15	9	11	6						
415+22 (CR 3400)	LT	GRAVEL	15	18	17	15						
420+35	LT	GRAVEL	15	12	15	9						
422+48 (CR 3410)	RT	GRAVEL/DIRT	15	18	13	17	2					30
444+57	RT	GRAVEL	15	15	7	7	2				2	20
447+98	RT	GRAVEL/DIRT	15	14	10	10						
450+82	RT	GRAVEL	15	20	10	10						
452+84	RT	GRAVEL	15	12	5	8						20
454+46	RT	GRAVEL	15	12	12	12	2					20
461+56	LT	GRAVEL/DIRT	15	16	14	12	4					
465+83	RT	GRAVEL	15	12	5	5			2			20
467+08	RT	GRAVEL/DIRT	15	12	5	5			2			20
480+30	LT	GRAVEL	15	18	10	10						27
481+55	LT	GRAVEL	15	18	10	10	2					20
490+29 (CR 3420)	RT	GRAVEL	15	21	10	17						24
508+25	RT	GRAVEL	15	10	5	5	2					
510+65 (CR3430)	RT	GRAVEL/DIRT	15	47	21	30						
527+86	LT	GRAVEL/DIRT	15	10	7	7	2					20
528+89	LT	GRAVEL	15	50	5	5					2	50
530+79	LT	GRAVEL	15	18	7	5						
550+63 (CR 3400)	LT	GRAVEL/DIRT	15	28	12	12				2		40
552+10 (CR 3440)	RT	GRAVEL/DIRT	15	30	14	14						
560+79	LT	GRAVEL	15	18	10	10		2				25
577+86	LT	GRASS	15	10	5	5	2					
593+60	RT	GRAVEL	15	15	5	5	2					25
594+05 (CR 3140)	LT	GRAVEL	15	40	19	16						
596+51	RT	GRAVEL	15	16	8	8						
597+60	RT	GRAVEL	15	16	8	8						
631+11 (CR3440)	RT	GRAVEL	15	22	11	16						
634+00	LT	GRAVEL	15	15	5	10						
645+61	RT	GRAVEL	15	25	5	5						
646+76	RT	GRAVEL	15	25	5	5						
647+63	RT	GRAVEL	15	30	15	15						
648+91	LT	GRASS	15	5	5			2				20
649+29	RT	GRAVEL	15	23	5	5						
649+95	LT	GRAVEL	15	20	5	5						
650+43	RT	GRAVEL	15	18	15	15						
650+68	LT	GRAVEL	15	15	10	10			2			20
660+70	LT	GRAVEL	15	15	8	8		2				30
661+36	LT	GRAVEL	15	10	10	10		2				18
664+79	RT	GRAVEL	15	15	10	15				2		25
670+12	LT	GRAVEL	15	15	5	5			2			20
670+93	LT	GRAVEL	15	10	10	10		2				20
675+85	RT	GRAVEL	15	15	5	5						
678+40	RT	GRAVEL	15	19	5	5		2				24
681+03	RT	GRAVEL	15	30	15	15						65
						PROJECT TOTALS	20	12	8	4	4	603

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FM 64
QUANTITY SUMMARY

SHEET 3 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		9

CK:
DW:
CK:
DN:

SUMMARY OF CROSS CULVERT ITEMS

STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	104 6009	110 6002	132 6003	400 6008	401 6001	402 6001	403 6001	432 6031	462 6052	462 6053	462 6054	462 6056	462 6057
			REMOVING CONC (RIPRAP)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CUT & RESTORE ASPH PAVING	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	RIPRAP (STONE PROTECTION)(12 IN)	CONC BOX CULV (5 FT x 4 FT)(EXTEND)	CONC BOX CULV (5 FT x 5 FT)(EXTEND)	CONC BOX CULV (6 FT x 3 FT)(EXTEND)	CONC BOX CULV (6 FT x 5 FT)(EXTEND)	CONC BOX CULV (6 FT x 6 FT)(EXTEND)
			SY	CY	CY	SY	CY	LF	SF	CY	LF	LF	LF	LF	LF
385+77	1 - 48" x 72' CMP	1 - 48" x 72' RCP		5		58	91	30							
394+77	1 - 4' x 9' x 45' BOX	1 - 4' x 9' x 45' BOX		10						394					
427+29	1 - 36" x 61' CMP	1 - 36" x 61' RCP			88	16	29	27							
439+20	1 - 6' x 3' x 41' BOX	1 - 6' x 3' x 49' BOX		40									8		
463+14	2 - 6' x 3' x 35' BOX	2 - 6' x 3' x 43' BOX			80				492	36			20		
490+97	1 - 5' x 5' x 37' BOX	1 - 5' x 5' x 43' BOX		82	20				792	30		6			
510+95	1 - 8' x 2' x 37' BOX	1 - 8' x 2' x 37' BOX			47					108					
550+81	2 - 5' x 4' x 44' BOX	2 - 5' x 4' x 58' BOX		314	86				616		28				
554+23	1 - 6' x 5' x 37' BOX	1 - 6' x 5' x 43' BOX		53	10				640					6	
598+22	1 - 36" x 35' RCP	1 - 36" x 49' RCP		20	10					10					
603+20	1 - 6' x 3' x 40' BOX	1 - 6' x 3' x 52' BOX	25		98				528	8			12		
605+76	1 - 30" x 34' RCP	1 - 30" x 42' RCP			30										
612+73	2 - 6' x 6' x 48' BOX	2 - 6' x 6' x 54' BOX	34		171				1240	12					36
625+76	2 - 24" x 62' RCP	2 - 24" x 62' RCP		10						15					
636+01	1 - 8' x 6' x 34' BOX	1 - 8' x 6' x 39' BOX			51				816						
643+07	2 - 24" x 46' RCP	2 - 24" x 46' RCP		10											
651+00	2 - 36" x 60' RCP	2 - 36" x 48' RCP		10											
658+78	2 - 24" x 58' RCP	2 - 24" x 58' RCP		20											
661+93	2 - 5' x 5' X 35' BOX	2 - 5' x 5' X 48' BOX			20				845			6			
		PROJECT TOTALS	59	574	711	74	120	57	5969	613	28	12	40	6	36

SUMMARY OF CROSS CULVERT ITEMS

STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	462 6065	464 6005	464 6007	464 6008	464 6010	466 6099	466 6101	466 6151	466 6153	466 6154	466 6193
			CONC BOX CULV (8 FT X 6 FT)(EXTEND)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	RC PIPE (CL III)(48 IN)	HEADWALL (CH - PW - 0)(DIA= 30 IN)	HEADWALL (CH - PW - 0)(DIA= 36 IN)	WINGWALL (FW - 0)(HW=4 FT)	WINGWALL (FW - 0)(HW=6 FT)	WINGWALL (FW - 0)(HW=7 FT)	WINGWALL (PW - 2)(HW=4 FT)
			LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
385+77	1 - 48" x 72' CMP	1 - 48" x 72' RCP					62						
394+77	1 - 4' x 9' x 45' BOX	1 - 4' x 9' x 45' BOX											
427+29	1 - 36" x 61' CMP	1 - 36" x 61' RCP				50			1				
439+20	1 - 6' x 3' x 41' BOX	1 - 6' x 3' x 49' BOX											2
463+14	2 - 6' x 3' x 35' BOX	2 - 6' x 3' x 43' BOX								2			
490+97	1 - 5' x 5' x 37' BOX	1 - 5' x 5' x 43' BOX									2		
510+95	1 - 8' x 2' x 37' BOX	1 - 8' x 2' x 37' BOX											
550+81	2 - 5' x 4' x 44' BOX	2 - 5' x 4' x 58' BOX											
554+23	1 - 6' x 5' x 37' BOX	1 - 6' x 5' x 43' BOX									2		
598+22	1 - 36" x 35' RCP	1 - 36" x 49' RCP				14			1				
603+20	1 - 6' x 3' x 40' BOX	1 - 6' x 3' x 52' BOX											
605+76	1 - 30" x 34' RCP	1 - 30" x 42' RCP			8			1					
612+73	2 - 6' x 6' x 48' BOX	2 - 6' x 6' x 54' BOX											
625+76	2 - 24" x 62' RCP	2 - 24" x 62' RCP											
636+01	1 - 8' x 6' x 34' BOX	1 - 8' x 6' x 39' BOX	5									2	
643+07	2 - 24" x 46' RCP	2 - 24" x 46' RCP		8									
651+00	2 - 36" x 60' RCP	2 - 36" x 48' RCP											
658+78	2 - 24" x 58' RCP	2 - 24" x 58' RCP											
661+93	2 - 5' x 5' X 35' BOX	2 - 5' x 5' X 48' BOX										1	
		PROJECT TOTALS	5	8	8	64	62	1	2	2	4	3	2

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FM 64
QUANTITY SUMMARY

SHEET 4 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		10

CK:
DW:
CK:
DN:

SUMMARY OF CROSS CULVERT ITEMS

STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	466 6194	466 6195	466 6197	467 6022	467 6388	467 6390	467 6448	467 6450
			WINGWALL (PW - 2) (HW=5 FT)	WINGWALL (PW - 2) (HW=6 FT)	WINGWALL (PW - 2) (HW=8 FT)	SET (TY I) (48 IN) (4: 1) (C)	SET (TY II) (24 IN) (RCP) (3: 1) (C)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	SET (TY II) (36 IN) (RCP) (3: 1) (C)	SET (TY II) (36 IN) (RCP) (4: 1) (C)
			EA	EA	EA	EA	EA	EA	EA	EA
385+77	1 - 48" x 72' CMP	1 - 48" x 72' RCP				2				
394+77	1 - 4' x 9' x 45' BOX	1 - 4' x 9' x 45' BOX								
427+29	1 - 36" x 61' CMP	1 - 36" x 50' RCP								1
439+20	1 - 6' x 3' x 41' BOX	1 - 6' x 3' x 49' BOX								
463+14	2 - 6' x 3' x 35' BOX	2 - 6' x 3' x 45' BOX								
490+97	1 - 5' x 5' x 37' BOX	1 - 5' x 5' x 43' BOX								
510+95	1 - 8' x 2' x 37' BOX	1 - 8' x 2' x 37' BOX								
550+81	2 - 5' x 4' x 44' BOX	2 - 5' x 4' x 58' BOX		2						
554+23	1 - 6' x 5' x 37' BOX	1 - 6' x 5' x 43' BOX								
598+22	1 - 36" x 35' RCP	1 - 36" x 49' RCP								
603+20	1 - 6' x 3' x 40' BOX	1 - 6' x 3' x 52' BOX	1	1						
605+76	1 - 30" x 34' RCP	1 - 30" x 42' RCP								
612+73	2 - 6' x 6' x 48' BOX	2 - 6' x 6' x 66' BOX			2					
625+76	2 - 24" x 62' RCP	2 - 24" x 62' RCP					4			
636+01	1 - 8' x 6' x 34' BOX	1 - 8' x 6' x 39' BOX								
643+07	2 - 24" x 46' RCP	2 - 24" x 46' RCP						4		
651+00	2 - 36" x 60' RCP	2 - 36" x 48' RCP							4	
658+78	2 - 24" x 58' RCP	2 - 24" x 58' RCP					4			
661+93	2 - 5' x 5' X 35' BOX	2 - 5' x 5' X 41' BOX		1						
		PROJECT TOTALS	1	4	2	2	8	4	4	1

SUMMARY OF CROSS CULVERT ITEMS

STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	467 6580	472 6006	496 6004	496 6005	496 6007	496 6072	658 6047
			SET (REMOV & REINSTALL)	REMOV & RE - LAY PIPE (24 IN)	REMOV STR (SET)	REMOV STR (WINGWALL)	REMOV STR (PIPE)	REMOVING ROCK RIPRAP	INSTL OM ASSM (OM-2Y)(WC)GND
			EA	LF	EA	EA	LF	LF	EA
385+77	1 - 48" x 72' CMP	1 - 48" x 72' RCP					72		2
394+77	1 - 4' x 9' x 45' BOX	1 - 4' x 9' x 45' BOX							2
427+29	1 - 36" x 61' CMP	1 - 36" x 61' RCP					61		2
439+20	1 - 6' x 3' x 41' BOX	1 - 6' x 3' x 49' BOX				2			2
463+14	2 - 6' x 3' x 35' BOX	2 - 6' x 3' x 43' BOX				2			2
490+97	1 - 5' x 5' x 37' BOX	1 - 5' x 5' x 43' BOX				2			2
510+95	1 - 8' x 2' x 37' BOX	1 - 8' x 2' x 37' BOX							2
550+81	2 - 5' x 4' x 44' BOX	2 - 5' x 4' x 58' BOX				2			2
554+23	1 - 6' x 5' x 37' BOX	1 - 6' x 5' x 43' BOX			2				2
598+22	1 - 36" x 35' RCP	1 - 36" x 49' RCP	1						2
603+20	1 - 6' x 3' x 40' BOX	1 - 6' x 3' x 52' BOX			2				2
605+76	1 - 30" x 34' RCP	1 - 30" x 42' RCP	1						2
612+73	2 - 6' x 6' x 48' BOX	2 - 6' x 6' x 54' BOX			2			20	2
625+76	2 - 24" x 62' RCP	2 - 24" x 62' RCP							2
636+01	1 - 8' x 6' x 34' BOX	1 - 8' x 6' x 39' BOX			2				2
643+07	2 - 24" x 46' RCP	2 - 24" x 46' RCP		12					2
651+00	2 - 36" x 60' RCP	2 - 36" x 48' RCP					12		2
658+78	2 - 24" x 58' RCP	2 - 24" x 58' RCP							2
661+93	2 - 5' x 5' X 35' BOX	2 - 5' x 5' X 48' BOX				2			2
		PROJECT TOTALS	2	12	8	10	145	20	38

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FM 64
QUANTITY SUMMARY

SHEET 5 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		11

SUMMARY OF PAVEMENT MARKING ITEMS

STATION		LENGTH	662 6032	662 6034		662 6050	662 6111	666 6342	666 6344	666 6345		672 6009	666 6182	666 6178
			WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)		WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	REF PROF PAV MRK TY I(W)4"(SLD)(100ML)	REF PROF PAV MRK TY I(Y)4"(BRK)(100ML)	REF PROF PAV MRK TY I(Y)4"(SLD)(100ML)		REFL PAV MRKR TY II-A-A	REFL PAV MRK TY II (W) 24" (SLD)	REFL PAV MRK TY II (W) 8" (SLD)
FROM	TO	LF	LF	LT	RT	EA	EA	LF	LF	LT	RT	EA	LF	LF
50 LF WEST OF FM 1532 / FM 64		56		112	112	2	11	112		56	56	2	11	240
384+63	387+83	320		640	640	8	62	640		320	320	8		
387+83	396+77	894	460	1,788		23	225	1,788	230	894		23		
396+77	403+28	651	340			17	102	1,302	170			17		
403+28	413+16	988	500		1,976	25	246	1,976	250		988	25		
413+16	414+04	88		176	176	3	17	176		88	88	3		
414+04	423+97	993	500	1,986		25	247	1,986	250	993		25		
423+97	472+88	4,891	2460			123	738	9,782	1,230			123		
472+88	480+88	800	400		1,600	20	198	1,600	200		800	20		
480+88	482+43	155	80			4	24	310	40			4		
482+43	490+11	768	400	1,536		20	195	1,536	200	768		20		
490+11	495+94	583	300			15	90	1,166	150			15		
495+94	504+86	892	460		1,784	23	225	1,784	230		892	23		
504+86	532+40	2,754		5,508	5,508	69	537	5,508		2,754	2,754	69		
532+40	541+86	946	480	1,892		24	236	1,892	240	946		24		
541+86	558+14	1,628	820			41	246	3,256	410			41		
558+14	566+60	846	440		1,692	22	215	1,692	220		846	22		
566+60	576+02	942	480	1,884		24	236	1,884	240	942		24		
576+02	583+40	738	380			19	114	1,476	190			19		
583+40	592+98	958	480		1,916	24	237	1,916	240		958	24		
592+98	595+54	256		512	512	7	50	512		256	256	7		
595+54	604+85	931	480	1,862		24	235	1,862	240	931		24		
604+85	619+72	1,487	760			38	228	2,974	380			38		
619+72	629+11	939	480		1,878	24	236	1,878	240		939	24		
629+11	635+74	663		1,326	1,326	17	129	1,326		663	663	17		
635+74	644+62	888	460	1,776		23	225	1,776	230	888		23		
644+62	673+36	2,874	1440			72	432	5,748	720			72		
673+36	676+89	353	180		706	9	88	706	90		353	9		
676+89	681+78	489		978	978	13	95	978		489	489	13	11	
FM 64 / FM 128		67		134	134	2	13	134		67	67	2	11	
PROJECT TOTALS		12,780		43,048		760	5,932	59,676	6,390	21,524		760	33	240

WORK ZONE PAVEMENT MARKINGS BASED ON TWO APPLICATIONS

SUMMARY OF LANDSCAPE ITEMS

LOCATION		LENGTH	WIDTH		164 6009	164 6011	164 6015	168 6001	
					BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	STRAW/HAY MLCH SEED(PERM)(RURAL)(CLAY)	VEGETATIVE WATERING	FERTILIZER 3-1-2 *
FROM	TO	LF	LT	RT	SY	SY	SY	MG	LBS
383+00	681+13	29,813	20	20	66,252	66,252	132,503	795	13,039
PROJECT TOTALS					66,252	66,252	132,503	795	13,039

* 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	6185 6002	6185 6003
		PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
FROM	TO	EA	DAY	HR
383+00	681+13	2	300	80
PROJECT TOTALS		2	300	80

FM 64
QUANTITY SUMMARY

SHEET 6 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		12

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CK:
DW:
CK:
DN:

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	LT/RT	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF
385+52	LT	15	15		
385+52	RT	15	15		
386+02	LT	15	15		
386+02	RT	15	15		
390+00	LT			15	15
390+00	RT			15	15
394+77	LT	15	15		
394+77	RT	15	15		
395+02	LT	15	15		
395+02	RT	15	15		
400+00	LT			15	15
400+00	RT			15	15
405+00	LT			15	15
405+00	RT			15	15
410+00	LT			15	15
410+00	RT			15	15
415+00	LT			15	15
415+00	RT			15	15
420+00	LT			15	15
420+00	RT			15	15
427+04	LT	15	15		
427+04	RT	15	15		
427+54	LT	15	15		
427+54	RT	15	15		
435+00	LT			15	15
435+00	RT			15	15
438+95	LT	15	15		
438+95	RT	15	15		
439+45	LT	15	15		
439+45	RT	15	15		
445+00	LT			15	15
445+00	RT			15	15
450+00	LT			15	15
450+00	RT			15	15
455+00	LT			15	15
455+00	RT			15	15
460+00	LT			15	15
460+00	RT			15	15
462+89	LT	15	15		
462+89	RT	15	15		
463+39	LT	15	15		
463+39	RT	15	15		
470+00	LT			15	15
470+00	RT			15	15
475+00	LT			15	15
475+00	RT			15	15
480+00	LT			15	15
480+00	RT			15	15
485+00	LT			15	15
485+00	RT			15	15
490+72	LT	15	15		
490+72	RT	15	15		
491+22	LT	15	15		
491+22	RT	15	15		
495+00	LT			15	15
495+00	RT			15	15
500+00	LT			15	15
500+00	RT			15	15
505+00	LT			15	15
505+00	RT			15	15
	SUBTOTAL	360	360	540	540

SUMMARY OF EROSION CONTROL ITEMS CONT'D

LOCATION	LT/RT	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF
510+70	LT	15	15		
510+70	RT	15	15		
511+20	LT	15	15		
511+20	RT	15	15		
515+00	LT			15	15
515+00	RT			15	15
520+00	LT			15	15
520+00	RT			15	15
525+00	LT			15	15
525+00	RT			15	15
530+00	LT			15	15
530+00	RT			15	15
535+00	LT			15	15
535+00	RT			15	15
540+00	LT			15	15
540+00	RT			15	15
545+00	LT			15	15
545+00	RT			15	15
550+56	LT	15	15		
550+56	RT	15	15		
551+06	LT	15	15		
551+06	RT	15	15		
553+98	LT	15	15		
553+98	RT	15	15		
554+48	LT	15	15		
554+48	RT	15	15		
560+00	LT			15	15
560+00	RT			15	15
565+00	LT			15	15
565+00	RT			15	15
570+00	LT			15	15
570+00	RT			15	15
575+00	LT			15	15
575+00	RT			15	15
580+00	LT			15	15
580+00	RT			15	15
584+70	LT	15	15		
584+70	RT	15	15		
585+95	LT	15	15		
585+95	RT	15	15		
590+00	LT			15	15
590+00	RT			15	15
595+00	LT			15	15
595+00	RT			15	15
597+97	LT	15	15		
597+97	RT	15	15		
598+47	LT	15	15		
598+47	RT	15	15		
602+95	LT	15	15		
602+95	RT	15	15		
603+45	LT	15	15		
603+45	RT	15	15		
605+51	LT	15	15		
605+51	RT	15	15		
606+01	LT	15	15		
606+01	RT	15	15		
612+48	LT	15	15		
612+48	RT	15	15		
612+98	LT	15	15		
612+98	RT	15	15		
	SUBTOTAL	480	480	420	420

SUMMARY OF EROSION CONTROL ITEMS CONT'D

LOCATION	LT/RT	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF
620+00	LT			15	15
620+00	RT			15	15
625+51	LT	15	15		
625+51	RT	15	15		
626+01	LT	15	15		
626+01	RT	15	15		
630+00	LT			15	15
630+00	RT			15	15
635+76	LT	15	15		
635+76	RT	15	15		
636+26	LT	15	15		
636+26	RT	15	15		
642+82	LT	15	15		
642+82	RT	15	15		
643+32	LT	15	15		
643+32	RT	15	15		
650+75	LT	15	15		
650+75	RT	15	15		
651+25	LT	15	15		
651+25	RT	15	15		
655+00	LT			15	15
655+00	RT			15	15
658+53	LT	15	15		
658+53	RT	15	15		
659+03	LT	15	15		
659+03	RT	15	15		
661+68	LT	15	15		
661+68	RT	15	15		
662+18	LT	15	15		
662+18	RT	15	15		
665+00	LT			15	15
665+00	RT			15	15
670+00	LT			15	15
670+00	RT			15	15
675+00	LT			15	15
675+00	RT			15	15
680+00	LT			15	15
680+00	RT			15	15
	SUBTOTAL	360	360	210	210
	PROJECT TOTALS	1200	1200	1170	1170

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FM 64
QUANTITY SUMMARY

SHEET 7 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		13

SUMMARY OF MBGF ITEMS

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	401 6001 FLOWABLE BACKFILL	432 6031 RIPRAP (STONE PROTECTION)(12 IN)	542 6001 REMOVE METAL BEAM GUARD FENCE	544 6001 GUARDRAIL END TREATMENT (INSTALL)	542 6002 REMOVE TERMINAL ANCHOR SECTION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	451 6004 RETROFIT RAIL (TY T131RC)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	432 6045 RIPRAP (MOW STRIP)(4 IN)	510 6003 ONE-WAY TRAF CONT (PORT TRAF SIG)	512 6017 PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	512 6029 PORT CTB (MOVE)(F-SHAPE)(TY 1)	512 6041 PORT CTB (STKPL)(F-SHAPE)(TY 1)	545 6019 CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)
			CY	CY	LF	EA	EA	LF	LF	EA	CY	MO	LF	LF	LF	EA
385+77	4' X 9' X 45' BOX	NO CULVERT WORK			100		4									
439+20	6' X 3' X 41' BOX	6' X 3' X 49' BOX			100		4									
463+14	2 - 6' X 3' X 35' BOX	2 - 6' X 3' X 43' BOX			100		4									
490+97	5' X 5' X 37' BOX	5' X 5' X 43' BOX			100		4									
550+81	2 - 5' X 4' X 44' BOX	2 - 5' X 4' X 58' BOX			100		4									
554+23	6' X 5' X 37' BOX	6' X 5' X 43' BOX			100		4									
584+95 - 585+70	JENNINGS CREEK BRIDGE		20.62	132	300	4	4	500	152	4	49.2	2	810	810	810	2
603+20	6' X 3' X 40' BOX	6' X 3' X 52' BOX			100		4									
612+73	2 - 6' X 6' X 48' BOX	2 - 6' X 6' X 54' BOX			100		4									
636+01	8' X 6' X 34' BOX	8' X 6' X 39' BOX			100		4									
661+93	2 - 5' X 5' X 35' BOX	2 - 5' X 5' X 48' BOX			100		4									
PROJECT TOTALS			20.62	132	1300	4	44	500	152	4	49.2	2	810	810	810	2

SUMMARY OF MILLING ITEMS

LOCATION FROM	LOCATION TO	LENGTH	WIDTH	DIRECTION	354 6011 PLAN & TEXT ASPH CONC PAV(0" TO 8")
		LF	LF		SY
385+00	388+99	399	10	S	443.33
398+95	401+15	220	10	S	244.44
405+06	408+98	392	10	S	435.56
408+98	413+01	403	20	N & S	895.56
413+01	426+20	1,319	10	S	1465.56
448+89	453+05	416	20	N & S	924.44
461+38	462+84	146	10	S	162.22
498+39	502+51	412	20	N & S	915.56
506+31	514+19	788	10	N	875.56
514+19	516+00	181	10	S	201.11
516+00	519+72	372	20	N & S	826.67
520+85	529+48	863	10	S	958.89
539+99	544+37	438	10	S	486.67
557+16	565+16	800	20	N & S	1777.78
571+33	575+93	460	20	N & S	1022.22
588+34	592+07	373	20	N & S	828.89
594+40	596+26	186	20	N & S	413.33
596+74	637+07	4,033	20	N & S	8962.22
637+07	639+06	199	10	S	221.11
639+06	644+26	520	20	N & S	1155.56
638+24	652+26	1402	20	N & S	3115.56
				PROJECT TOTALS	26332.24

SUMMARY OF MBGF ITEMS

LOCATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF 2(BI)	662 6063 WK ZN PAV MRK REMOV (W)4"(SLD)	662 6075 WK ZN PAV MRK REMOV (W)24"(SLD)	662 6095 WK ZN PAV MRK REMOV (Y)4"(SLD)	677 6001 ELIM EXT PAV MRK & MRKS (4")	677 6007 ELIM EXT PAV MRK & MRKS (24")
			EA	LF	LF	LF	LF	LF
385+77	4' X 9' X 45' BOX	NO CULVERT WORK						
439+20	6' X 3' X 41' BOX	6' X 3' X 49' BOX						
463+14	2 - 6' X 3' X 35' BOX	2 - 6' X 3' X 43' BOX						
490+97	5' X 5' X 37' BOX	5' X 5' X 43' BOX						
550+81	2 - 5' X 4' X 44' BOX	2 - 5' X 4' X 58' BOX						
554+23	6' X 5' X 37' BOX	6' X 5' X 43' BOX						
584+95 - 585+70	JENNINGS CREEK BRIDGE		12	2220	22	2220	2220	22
603+20	6' X 3' X 40' BOX	6' X 3' X 52' BOX						
612+73	2 - 6' X 6' X 48' BOX	2 - 6' X 6' X 54' BOX						
636+01	8' X 6' X 34' BOX	8' X 6' X 39' BOX						
661+93	2 - 5' X 5' X 35' BOX	2 - 5' X 5' X 48' BOX						
PROJECT TOTALS			12	2,220	22	2,220	2,220	22

FM 64
QUANTITY SUMMARY

SHEET 8 OF 8

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		14

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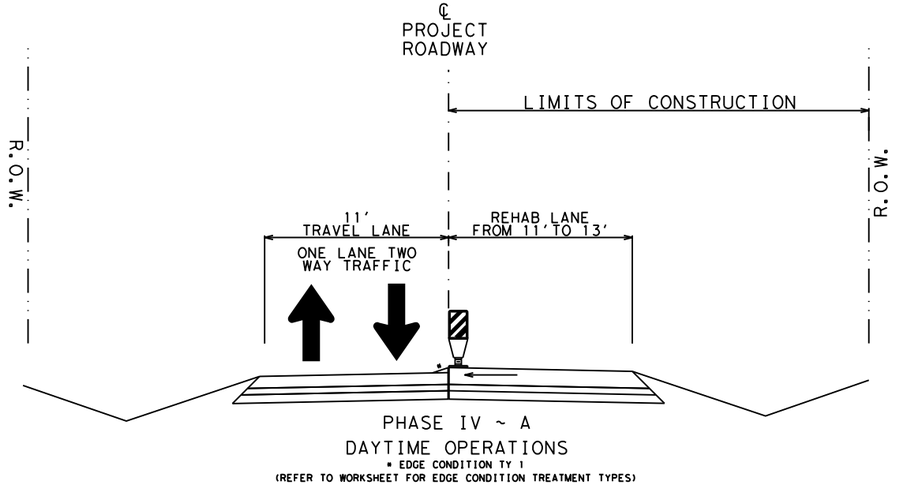
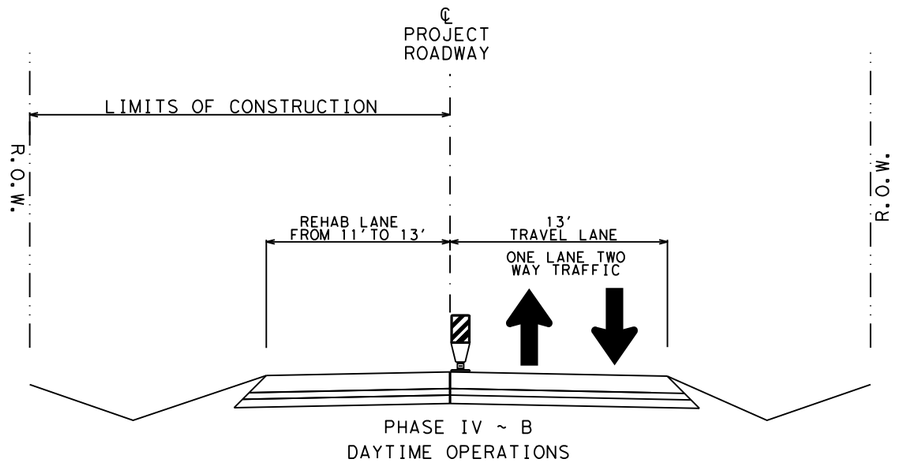
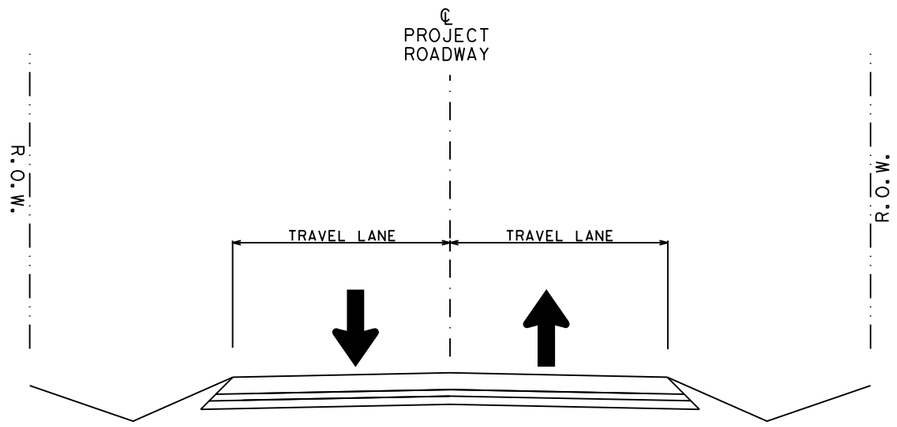


PHASE IV ~ A
DAYTIME OPERATIONS
* EDGE CONDITION TY 1
(REFER TO WORKSHEET FOR EDGE CONDITION TREATMENT TYPES)



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 ~ Planing

Perform planing operations to remove excess aspaltic materials from roadway per planing summarry.

Phase IV ~ 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 or TCP (2-8)-18 PAR.
Culvert work may proceed in advance of roadway rehabilitation when approved by the Engineer. Adhere to the Worksheet for Edge Condition Treatment Types.

Phase V ~ Roadway Rehabilitation

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

Perform pavement rehabilitation operations and install work zone pavement markings utilizing TCP(2-2b)-18 or TCP (2-8)-18 PAR.

Limit roadway rehabilitation operations to two 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.

Perform pavement edge backfill operations utilizing TCP (2-1)-18 or TCP (2-2b)-18 when working on pavement.

Phase VII ~ Bridge Rail Retrofit

Perform bridge rail retrofit utilizing TCP (2-8)-18 MOD.
Install MBGF connected to proposed bridge rail utilizing TCP (2-8b)-18.

Excavate bridge approaches and place flowable fill.
Grade underbridge creek bank slopes and place stone riprap.

Phase VII ~ Final Pavement Markings

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

Phase VIII ~ Sign and Seeding Operations

Perform sign installation and seeding utilizing TCP(2-1)-18.

Phase X ~ 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 RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
SEQUENCE OF WORK

NOT TO SCALE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		15

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

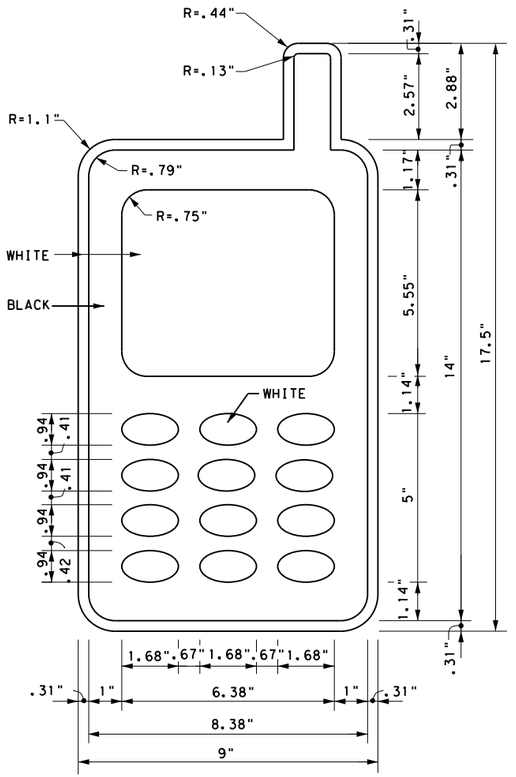
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

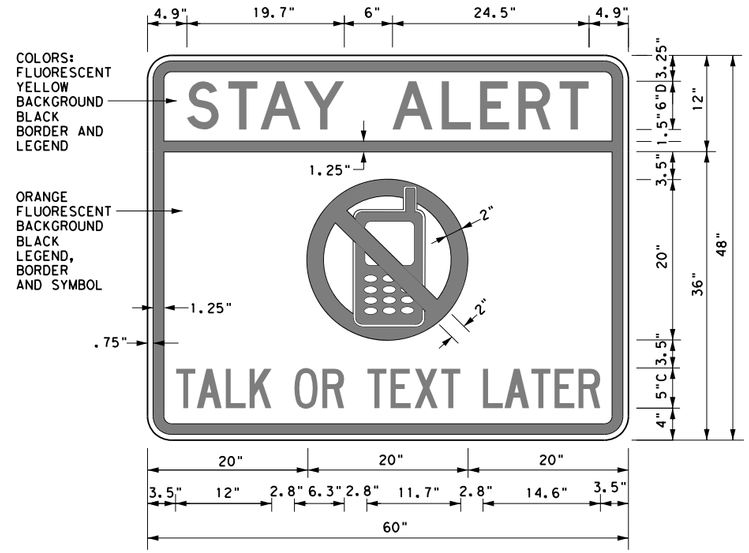
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

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REVISIONS	0399	03	038	FM 64
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	PAR	Delta		16

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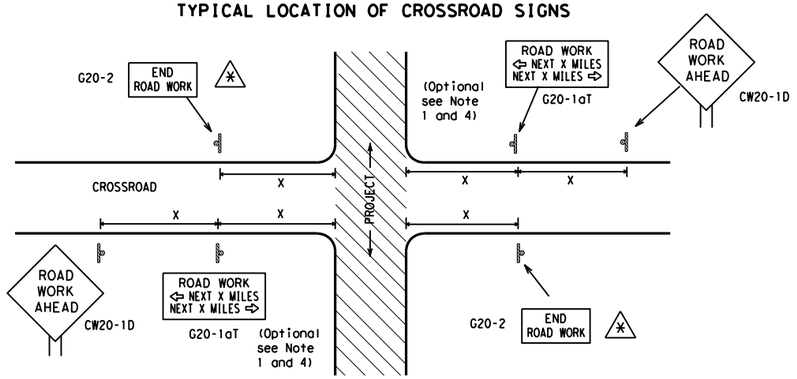
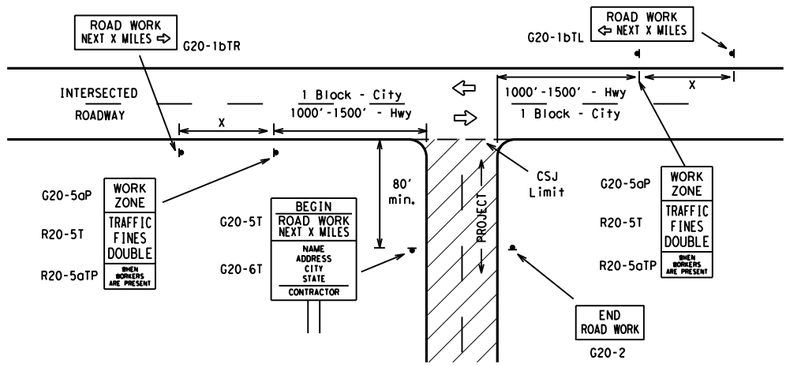
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

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

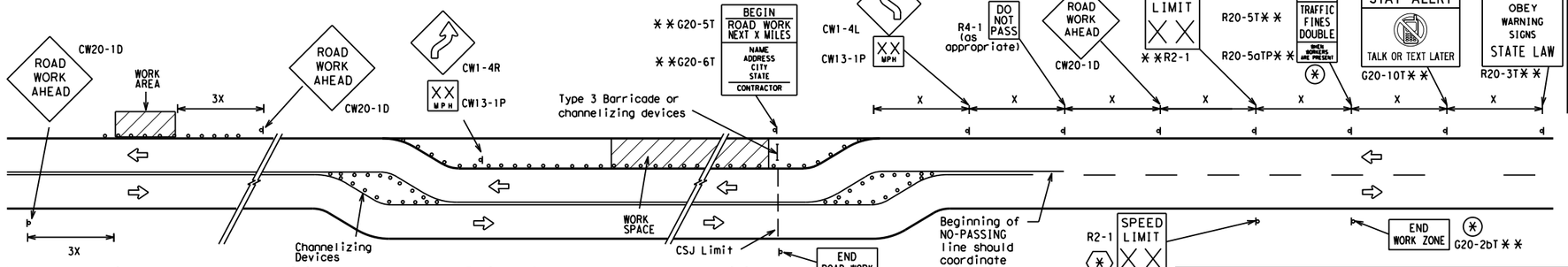
(*) For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

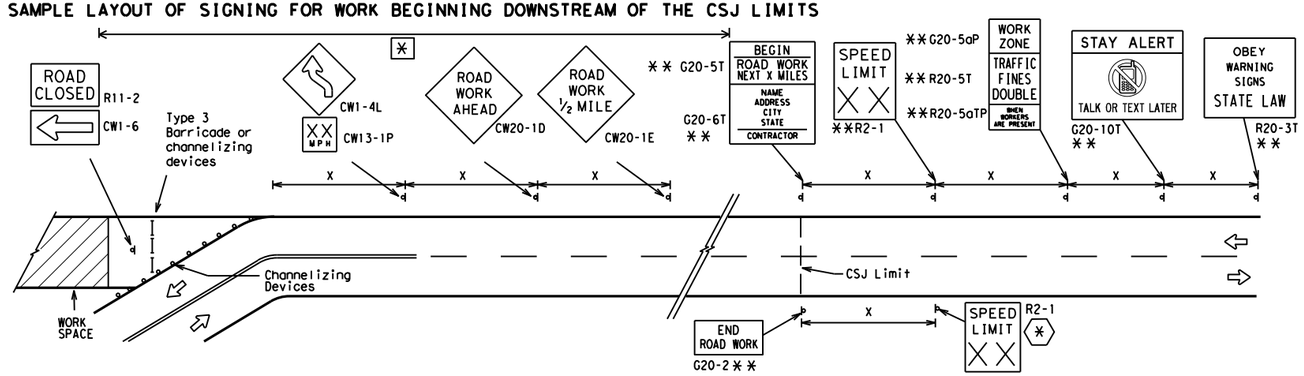
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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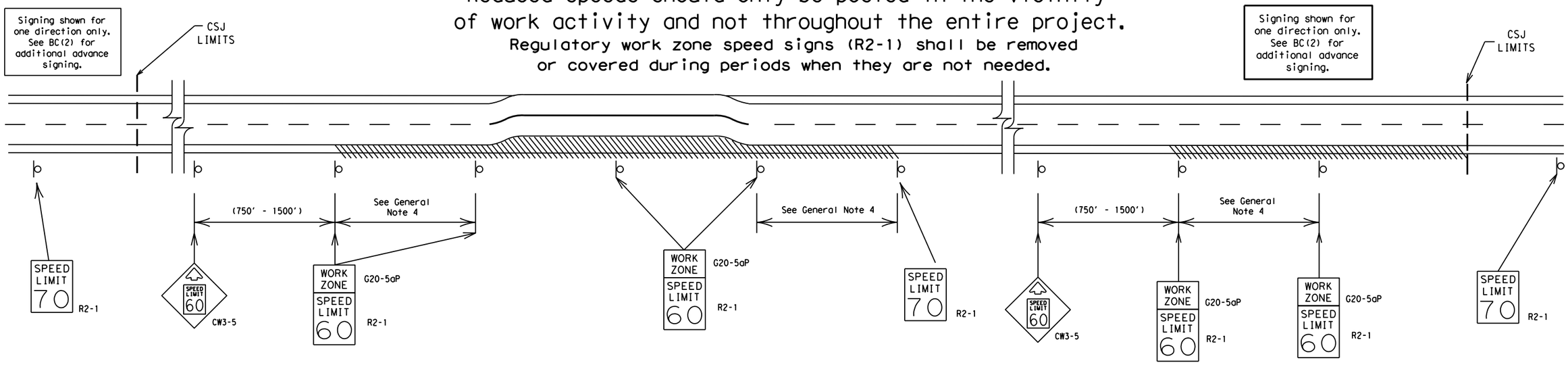
7-13	PAR	Delta		17

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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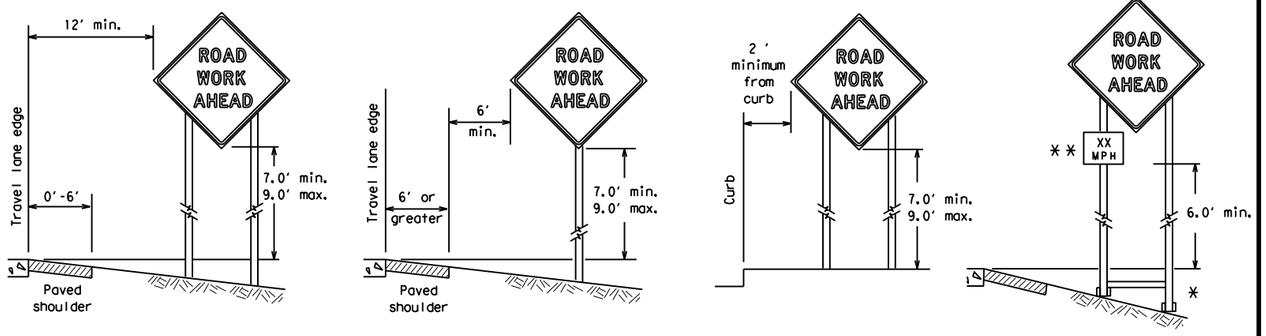
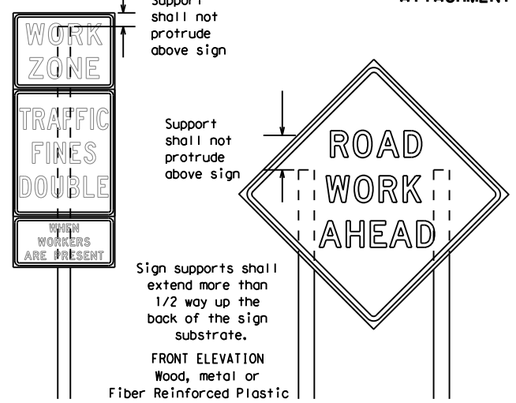
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



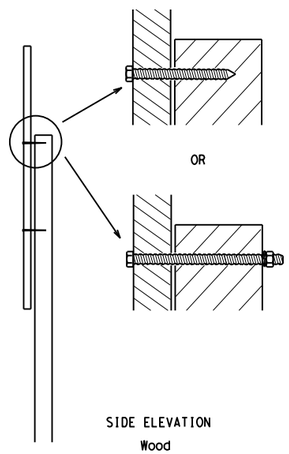
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

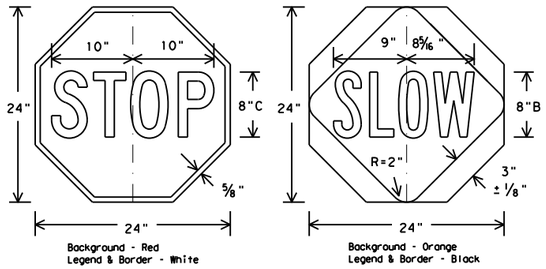


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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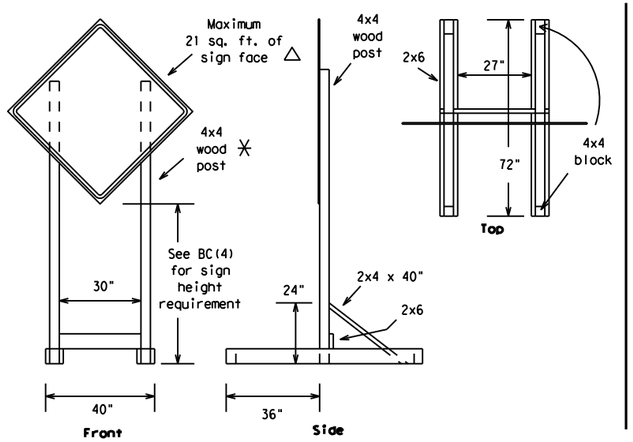
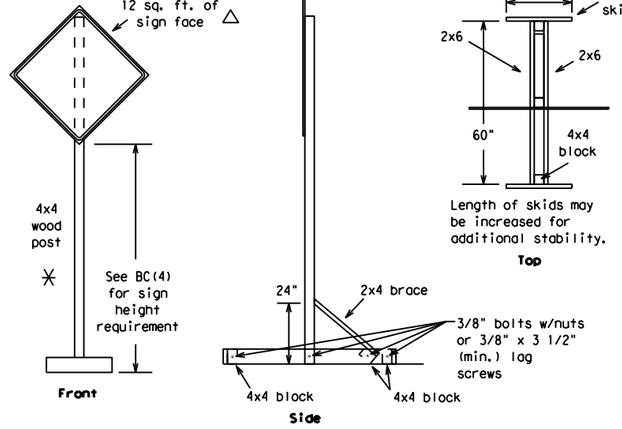
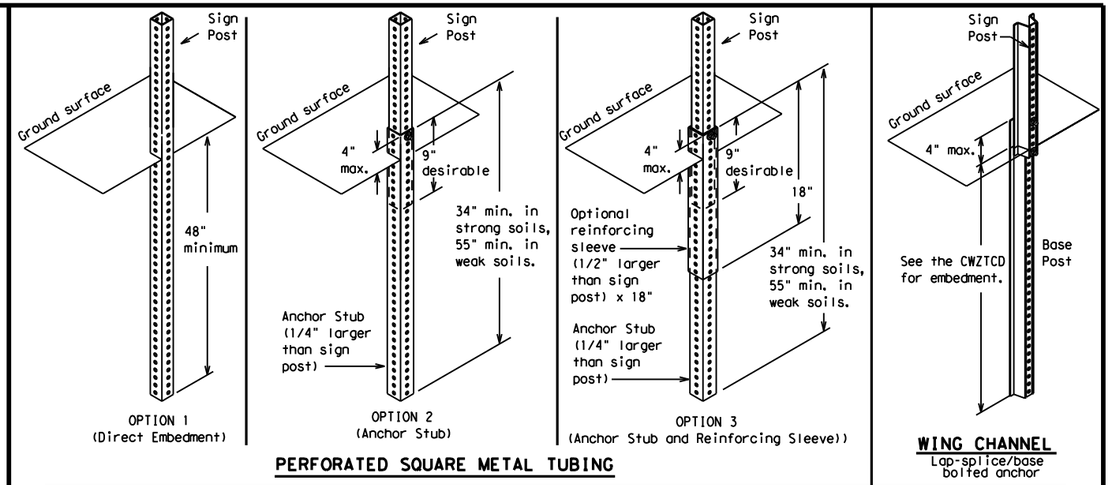




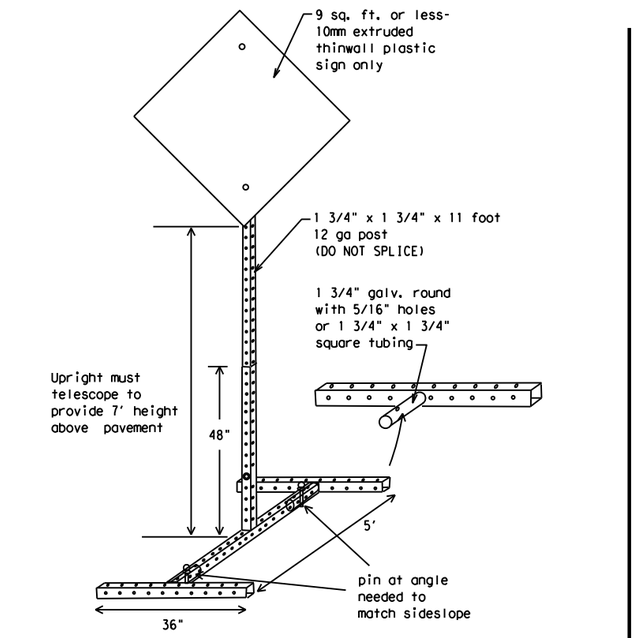
SKID MOUNTED WOOD SIGN SUPPORTS

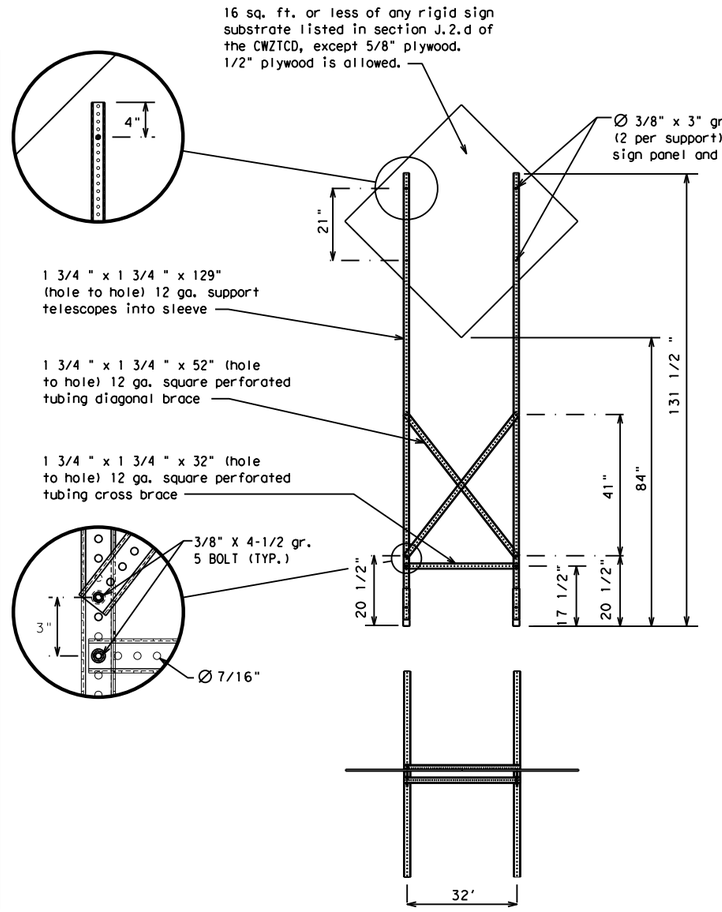
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

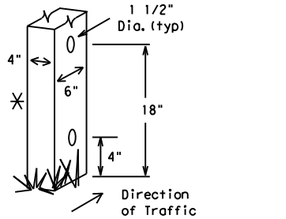


GROUND MOUNTED SIGN SUPPORTS

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

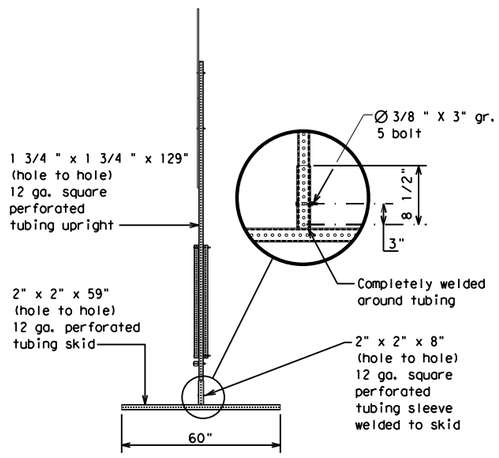






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	Delta		20

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

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

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

Phase 2: Possible Component Lists

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	Delta		21

100

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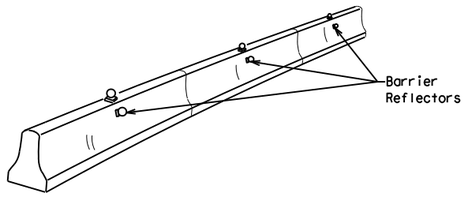
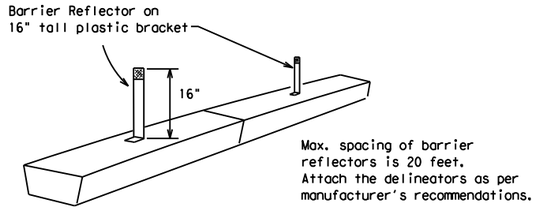
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

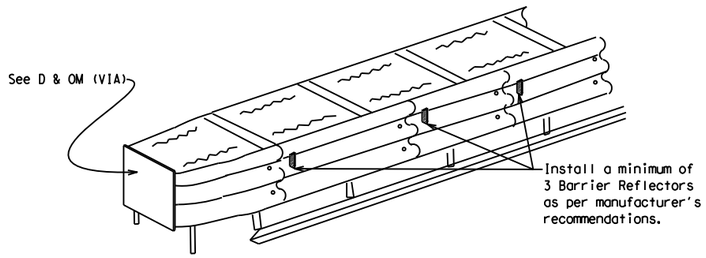


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

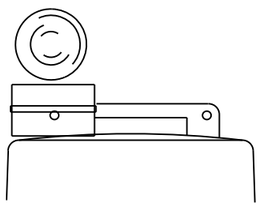


DELINEATION OF END TREATMENTS

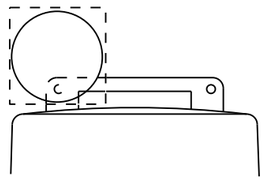
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

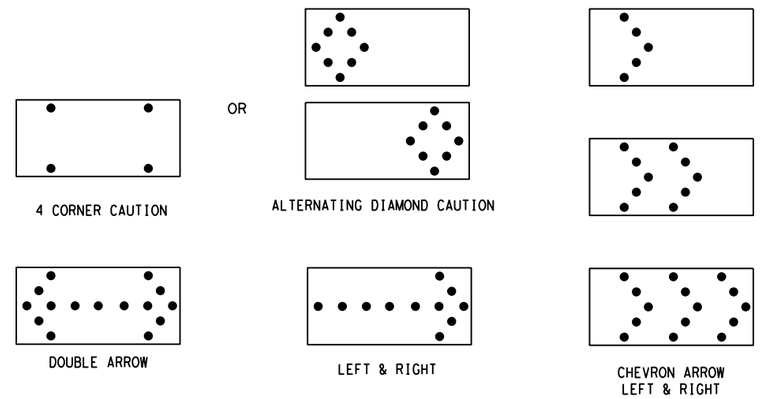
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	Delta		22

DATE: 5/5/2021 4:38:36 PM
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

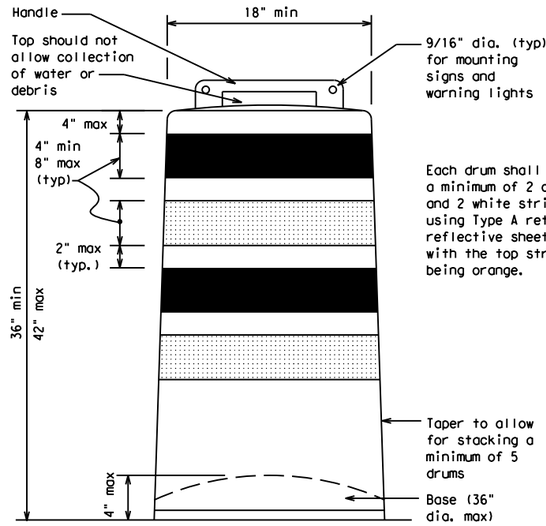
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

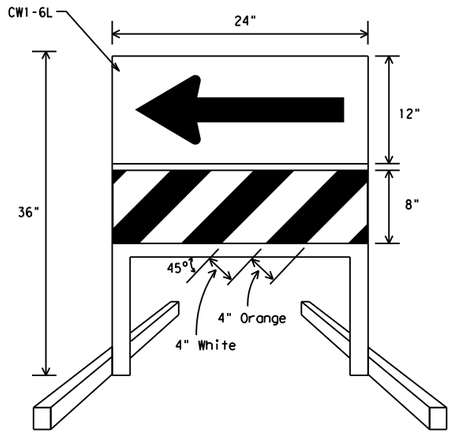
RETROREFLECTIVE SHEETING

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

BALLAST

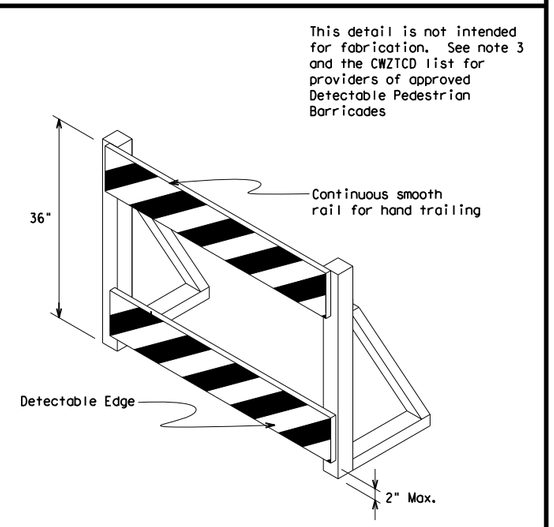
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





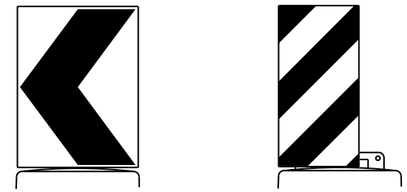
DIRECTION INDICATOR BARRICADE

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



DETECTABLE PEDESTRIAN BARRICADES

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



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

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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	PAR	Delta		23

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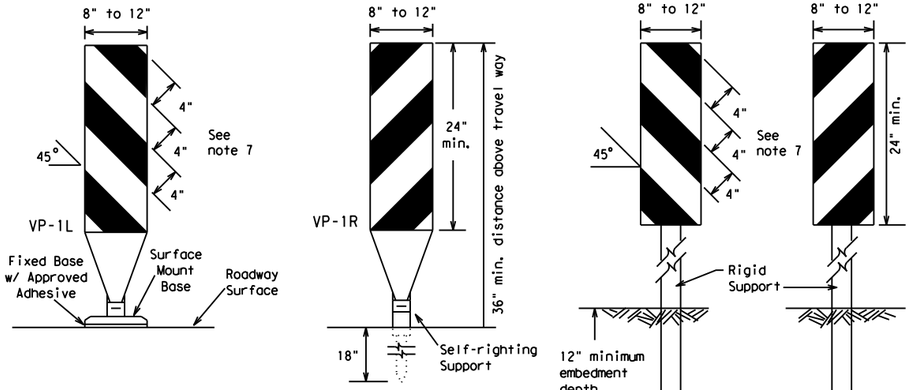
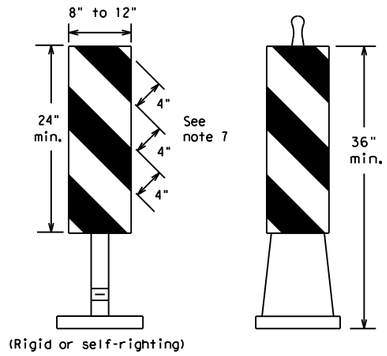


FIXED
(Rigid or self-righting)

DRIVEABLE

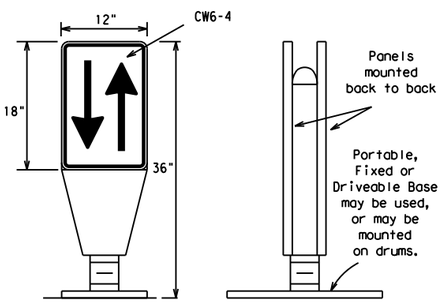


(Rigid or self-righting)

PORTABLE

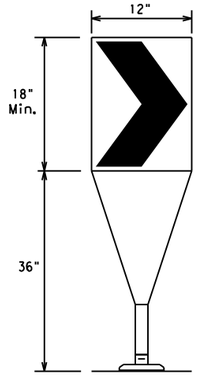
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



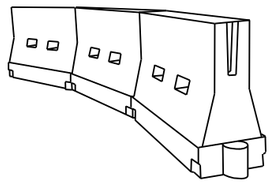
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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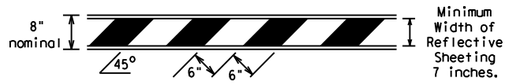
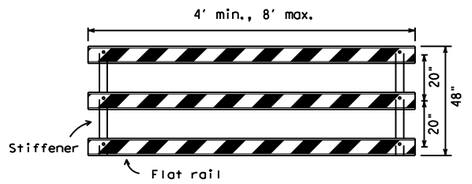
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



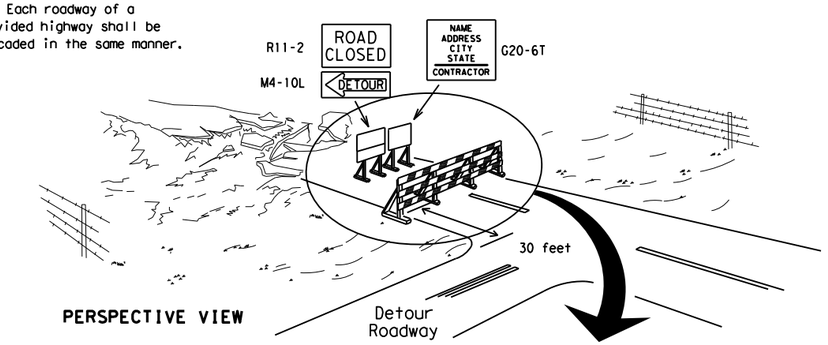
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

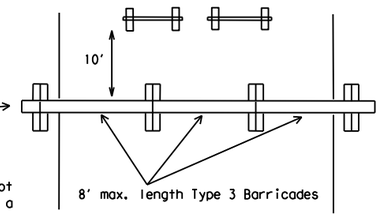
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

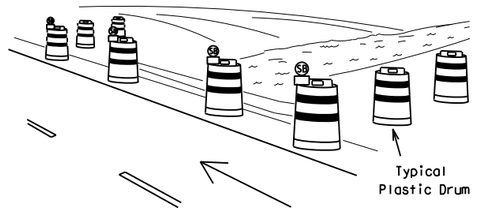
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

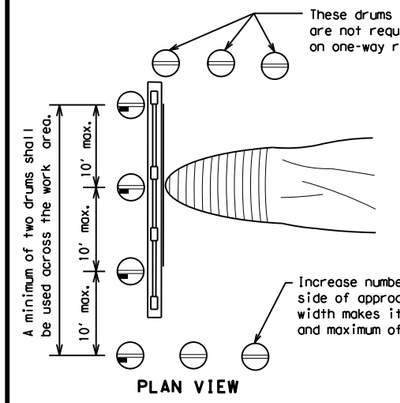
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

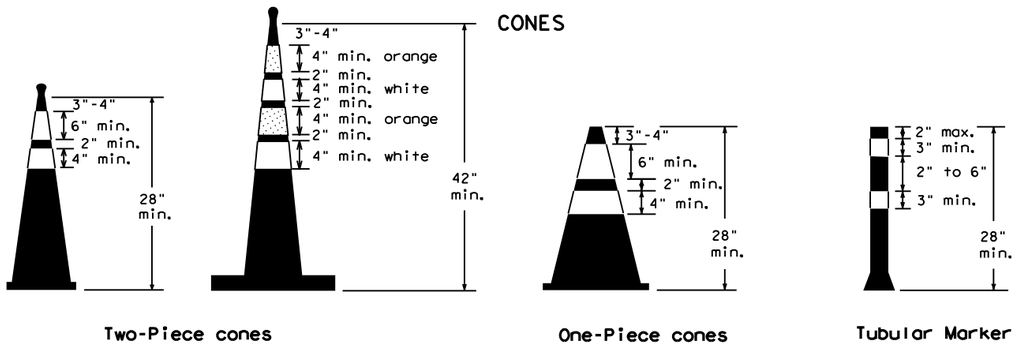
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

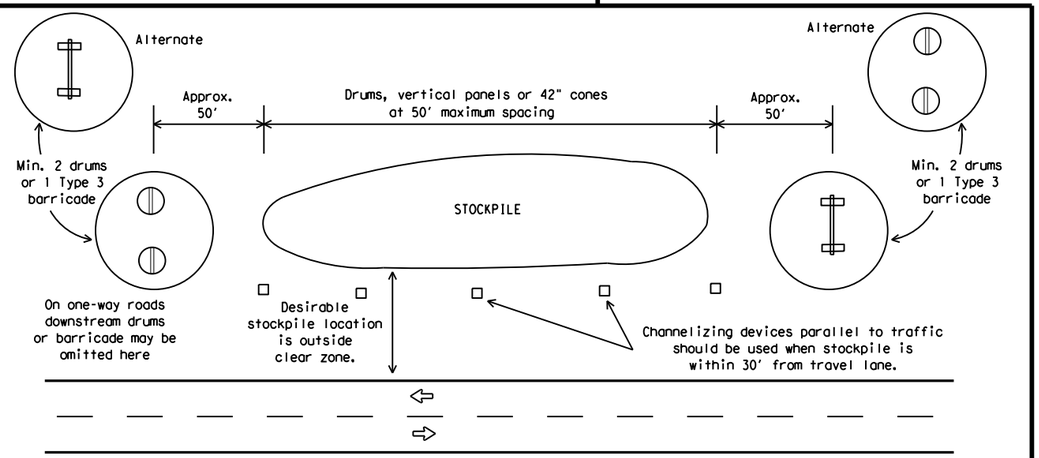
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

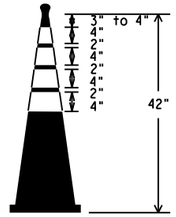
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	Delta		25

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

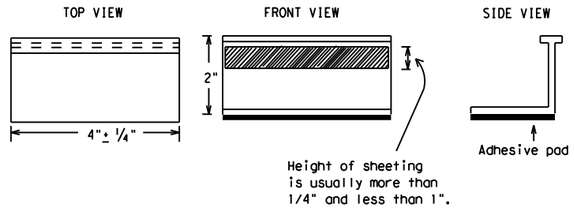
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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105

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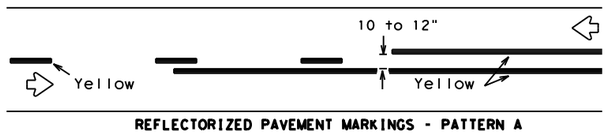
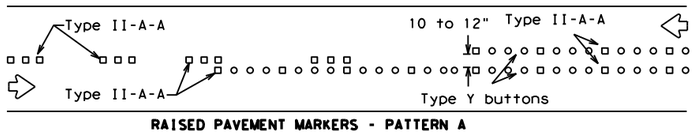
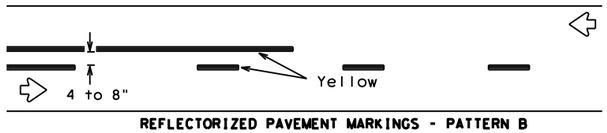
PAVEMENT MARKING PATTERNS



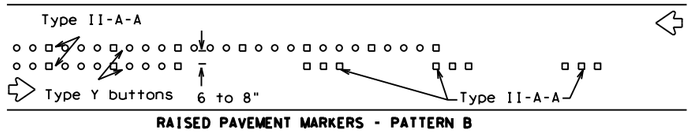
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



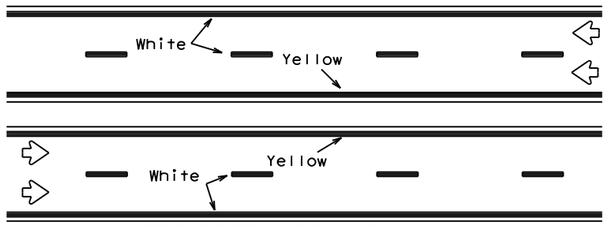
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



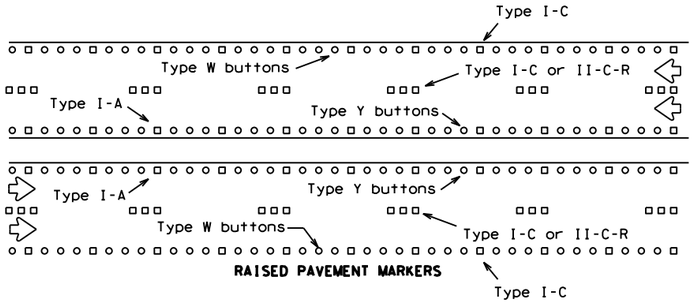
RAISED PAVEMENT MARKERS - PATTERN B

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

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



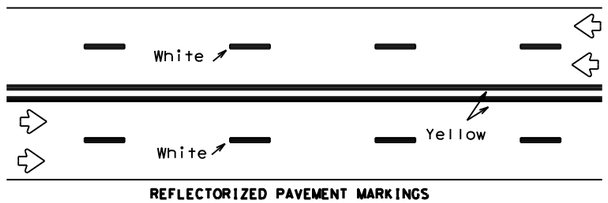
REFLECTORIZED PAVEMENT MARKINGS



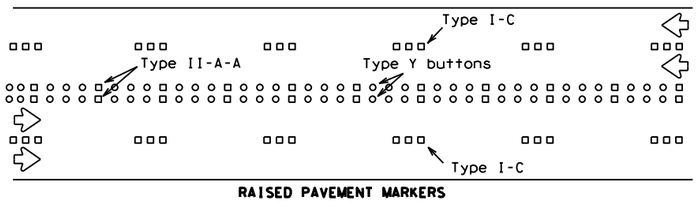
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



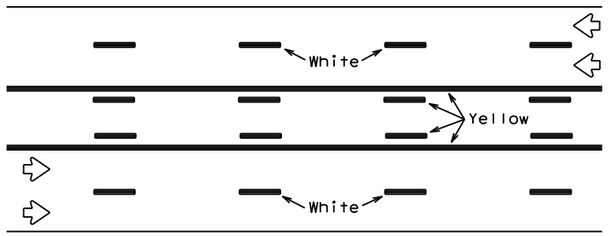
REFLECTORIZED PAVEMENT MARKINGS



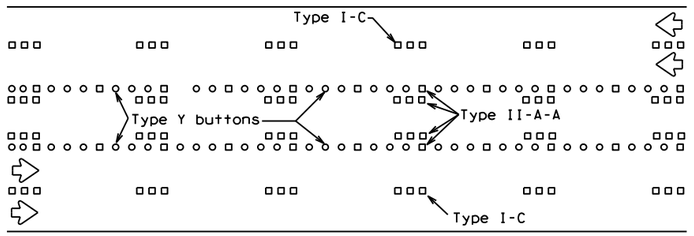
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

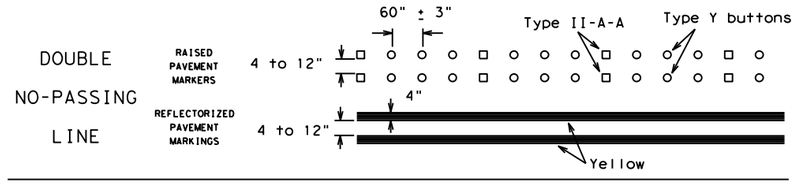
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

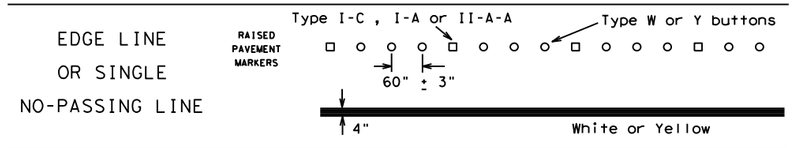
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

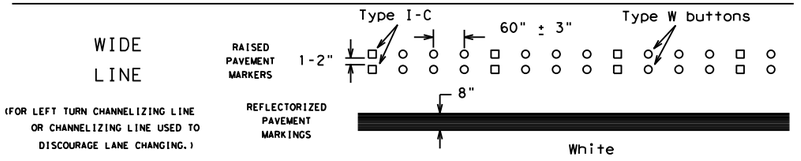


EDGE LINE OR SINGLE NO-PASSING LINE



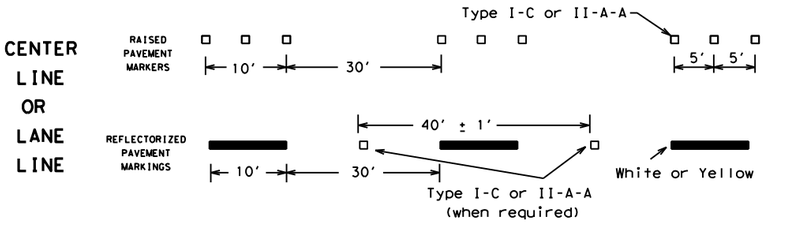
WIDE LINE

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

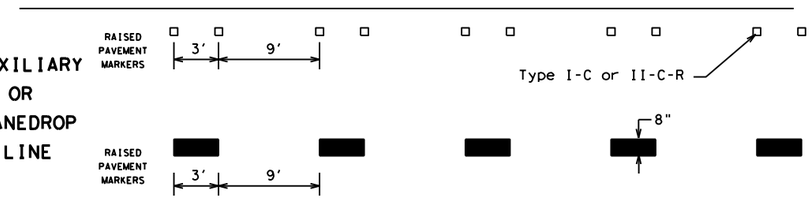


BROKEN LINES

CENTER LINE OR LANE LINE

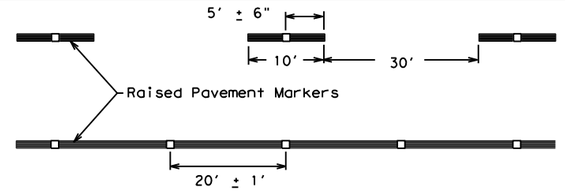


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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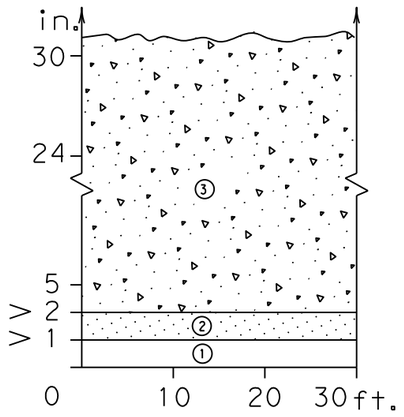
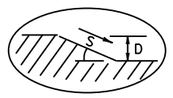
2-98 7-13	PAR	Delta		27
11-02 8-14				

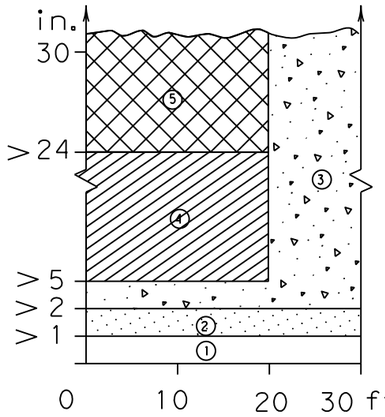
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

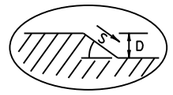


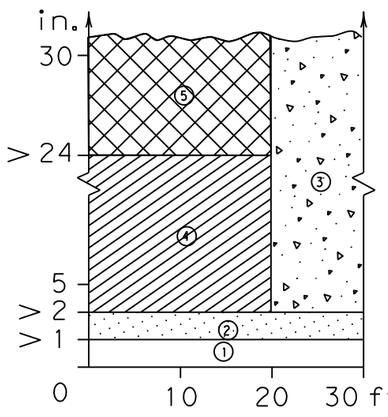
Edge Condition I
S = (3:1) (or flatter)



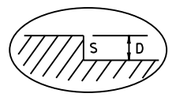


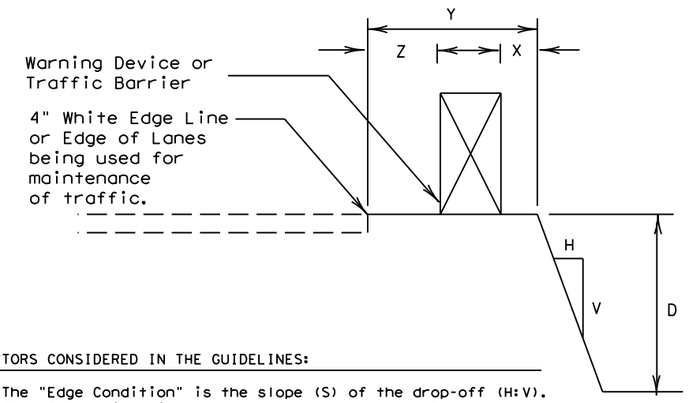
Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

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	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

Edge Condition Notes:

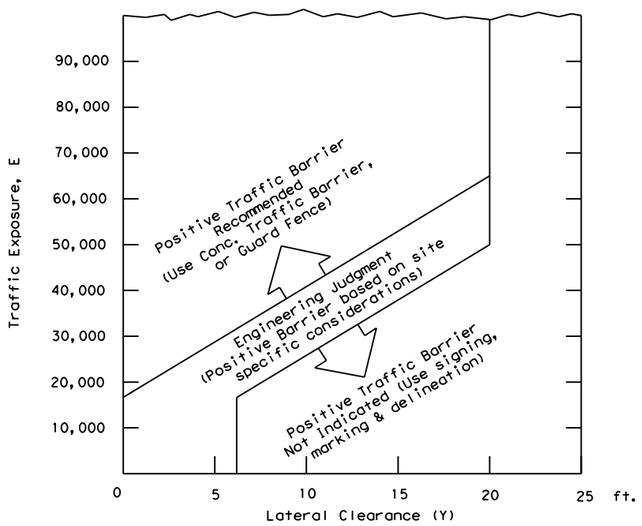
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" 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 differen-tial when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

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



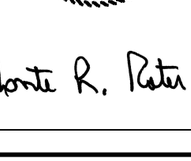
1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the dura-tion time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

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

Engineer's Seal



5.6.21

Monte R. Rater P.E.

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

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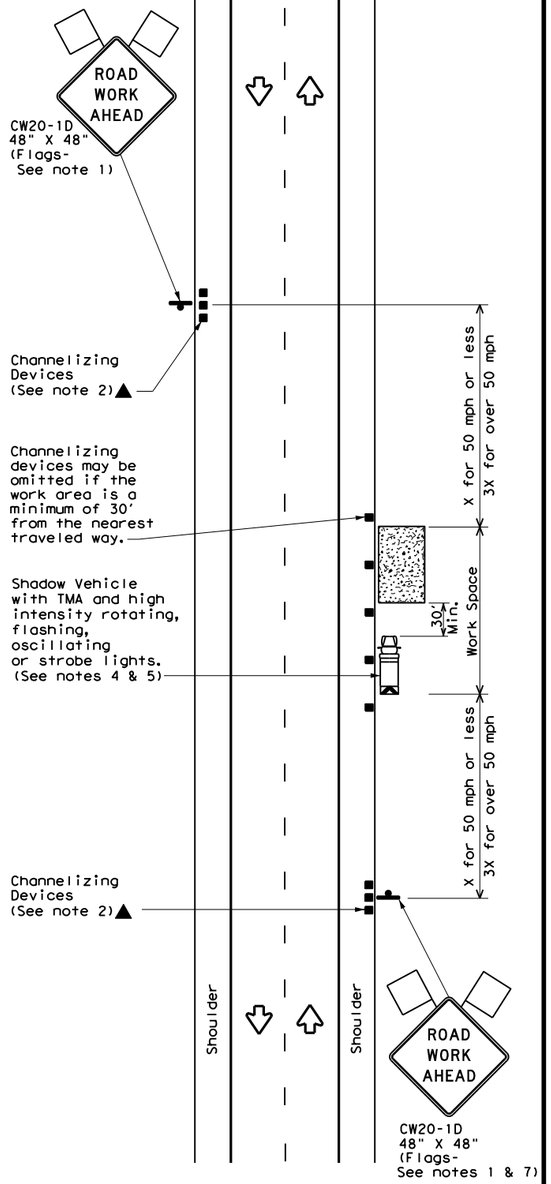
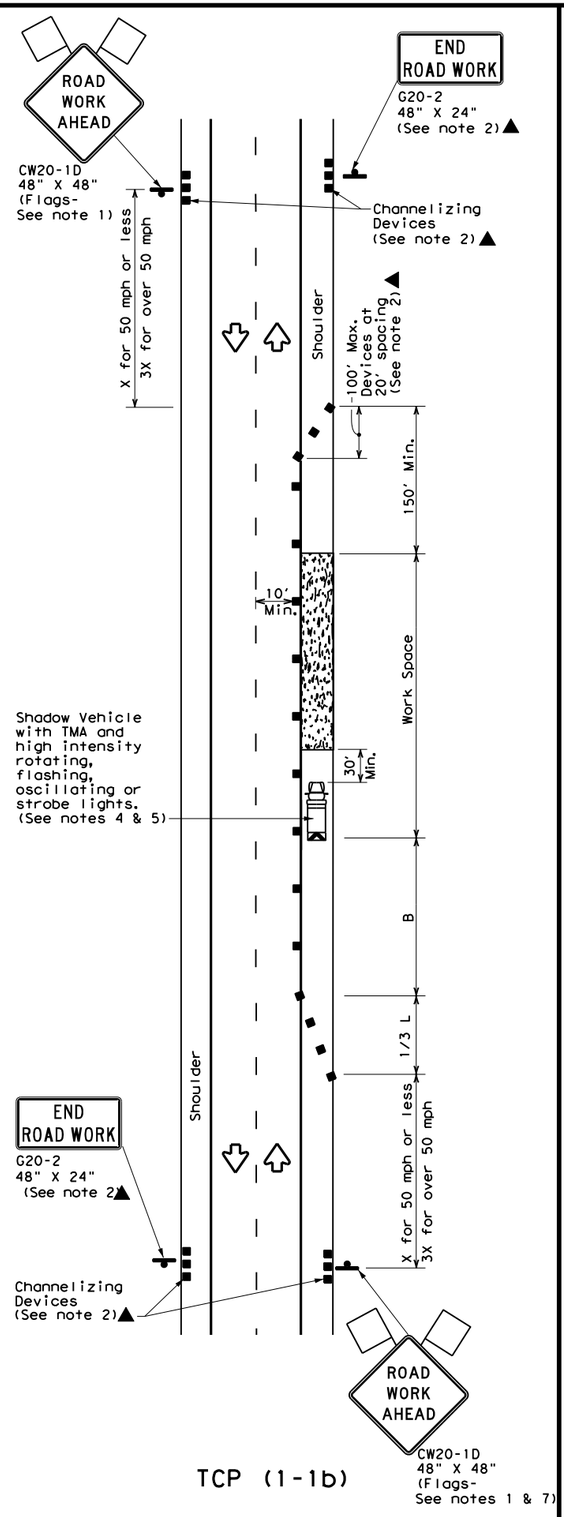


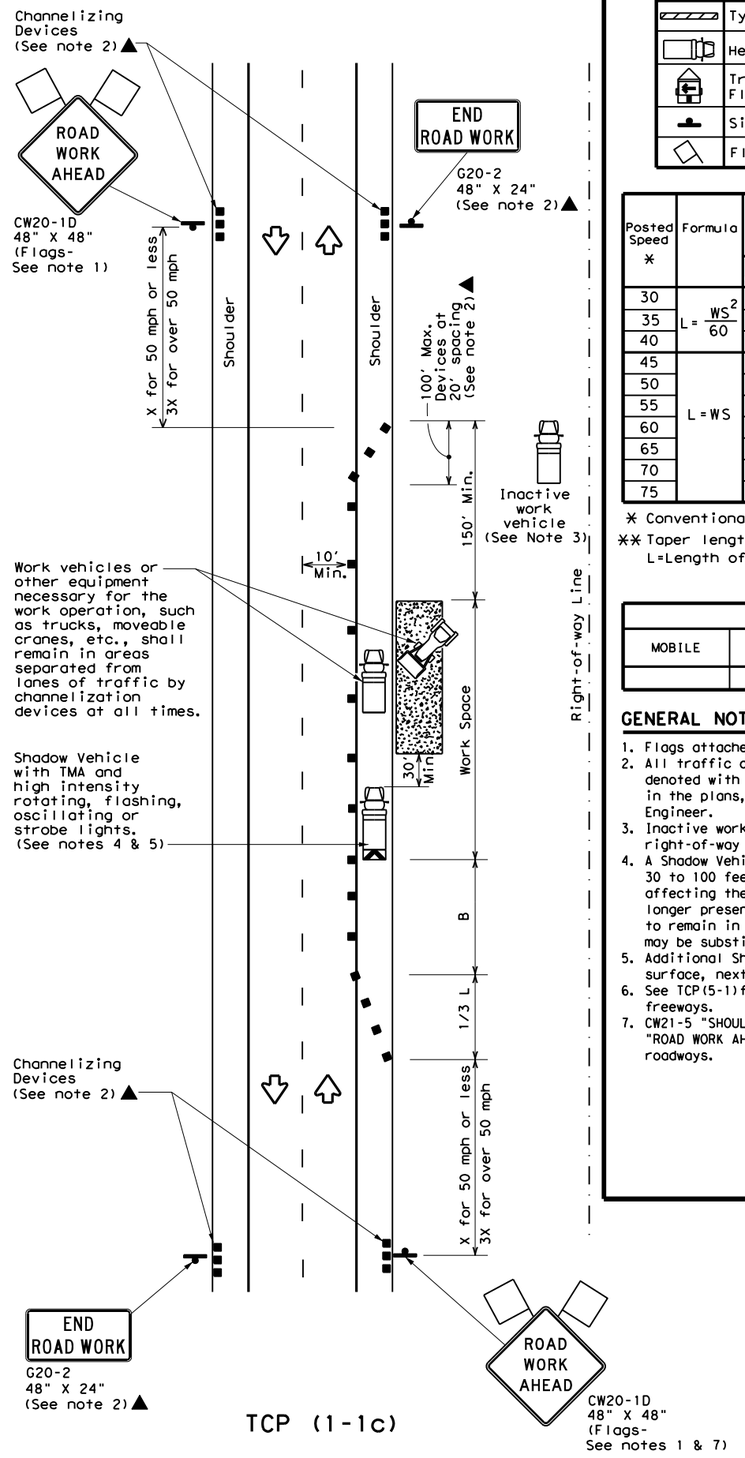
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	PAR	Delta		29
1-97 2-18				

DATE: 5/5/2021 4:39:00 PM
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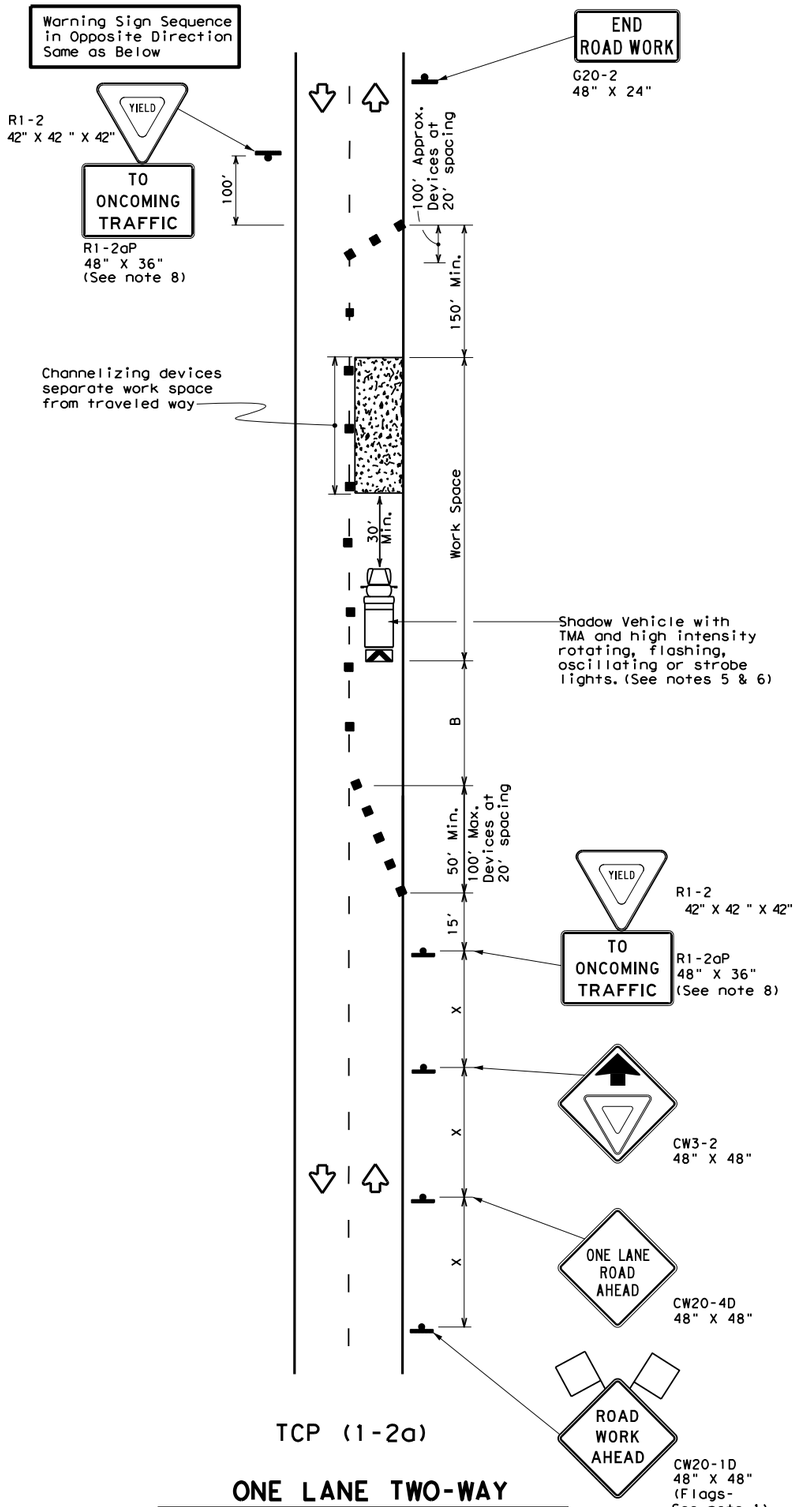
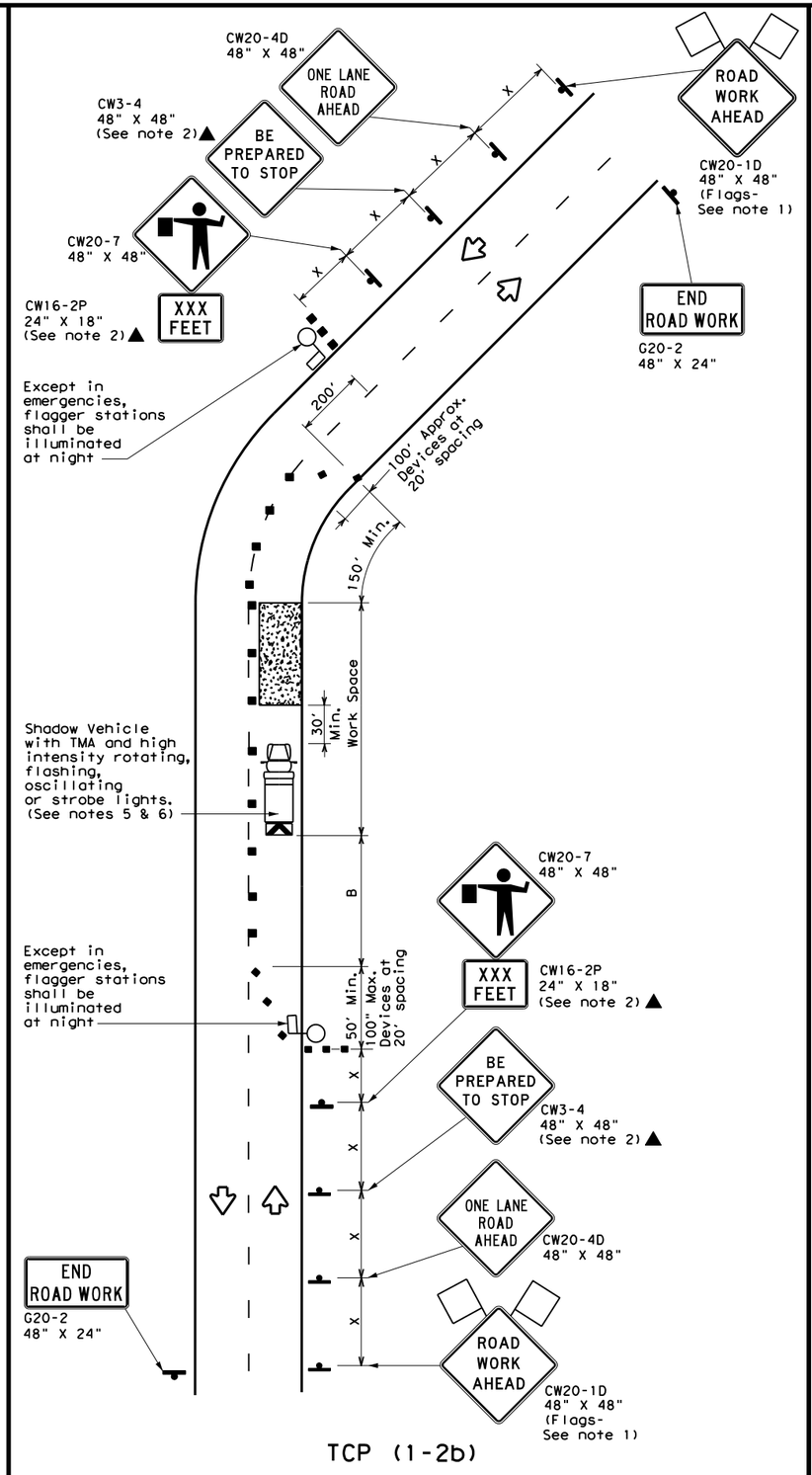


TCP (1-2a)

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	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		30

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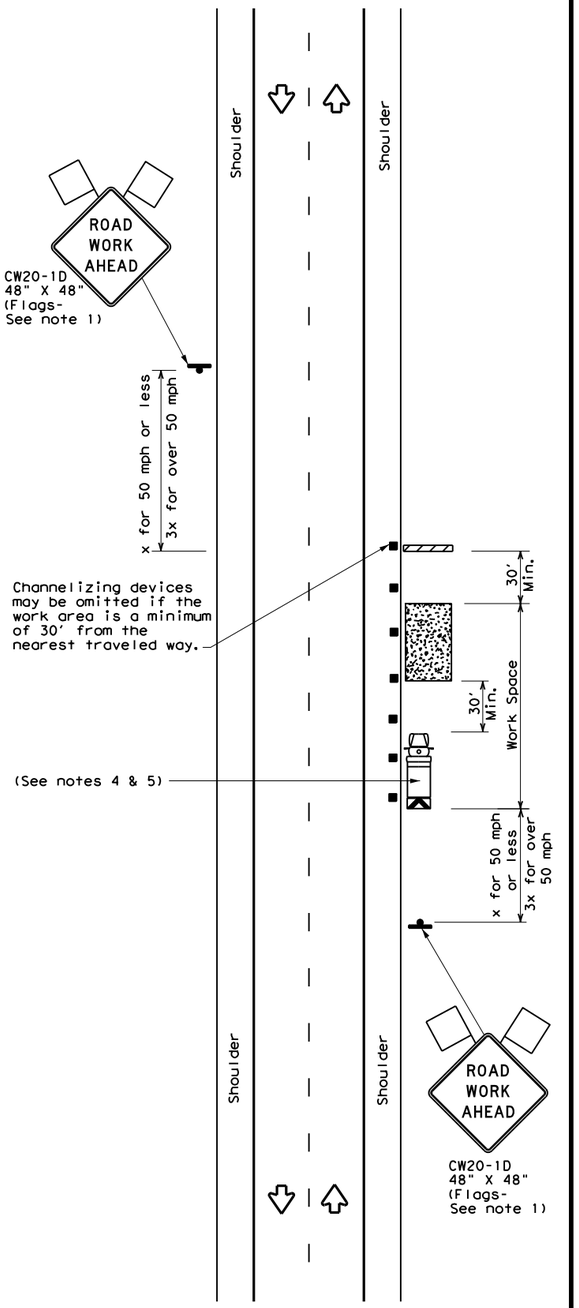
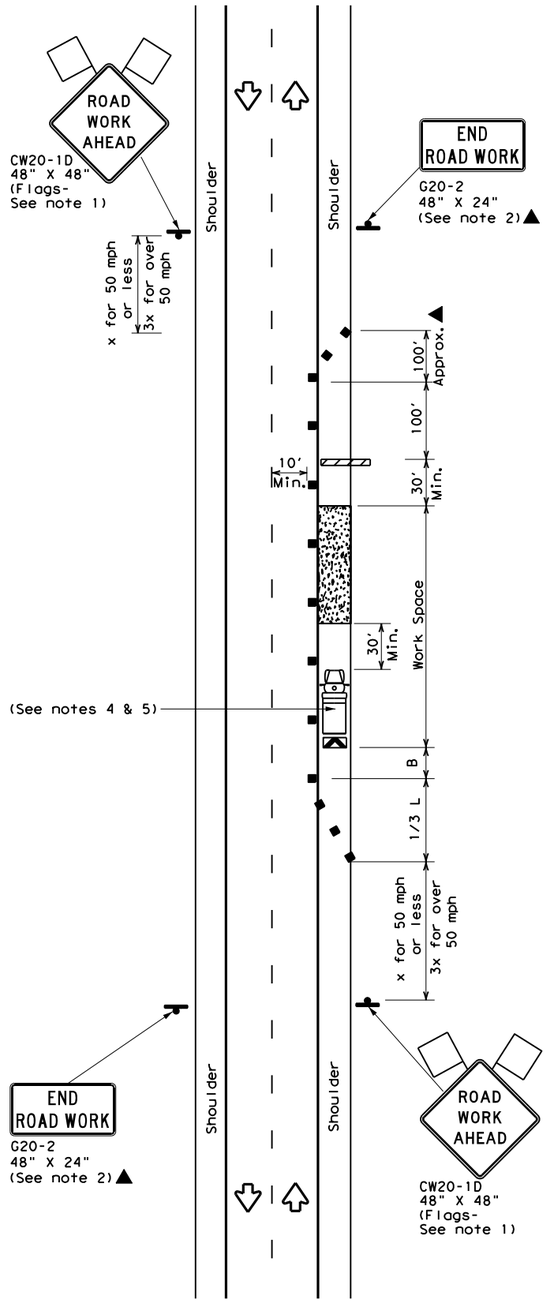


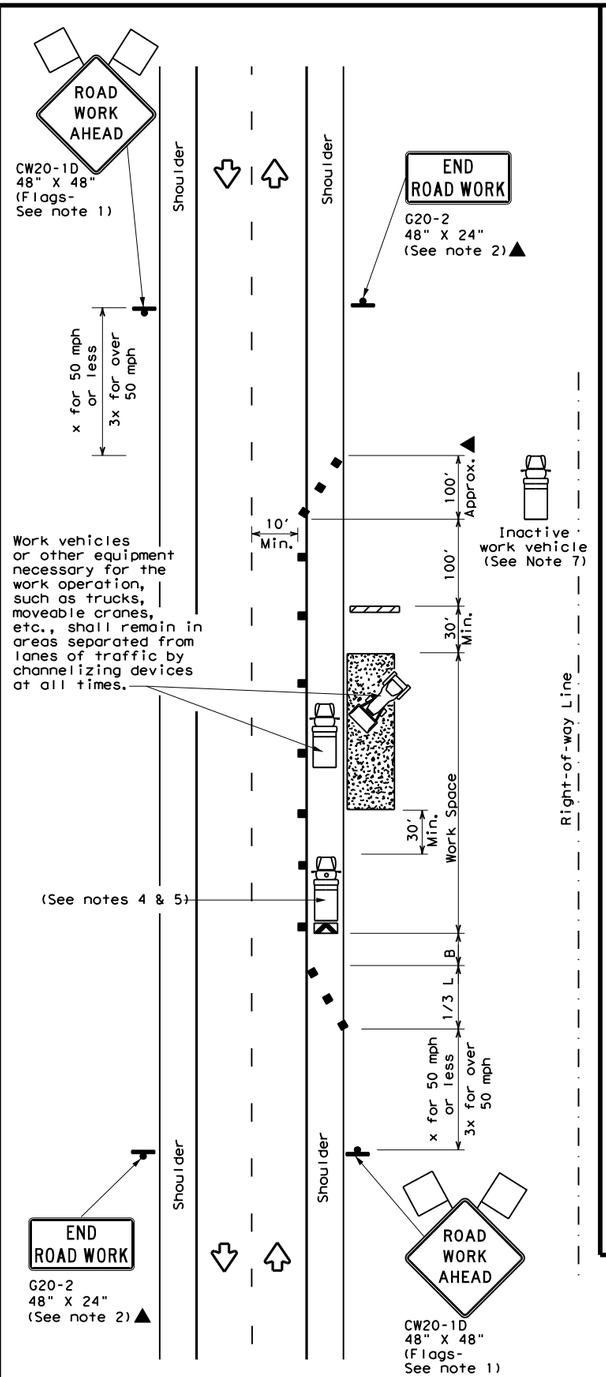
TCP (2-1a)

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 CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

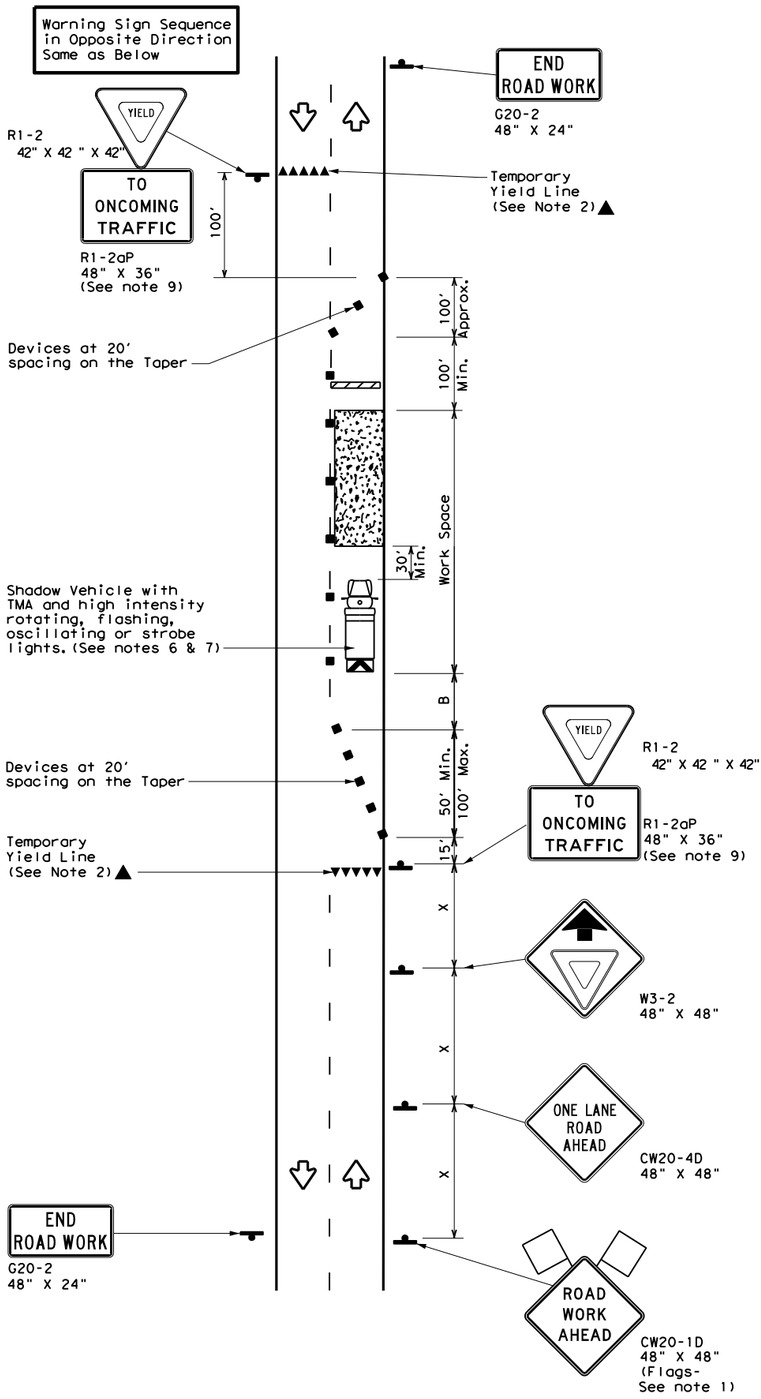
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	PAR	Delta		31
1-97 2-18				



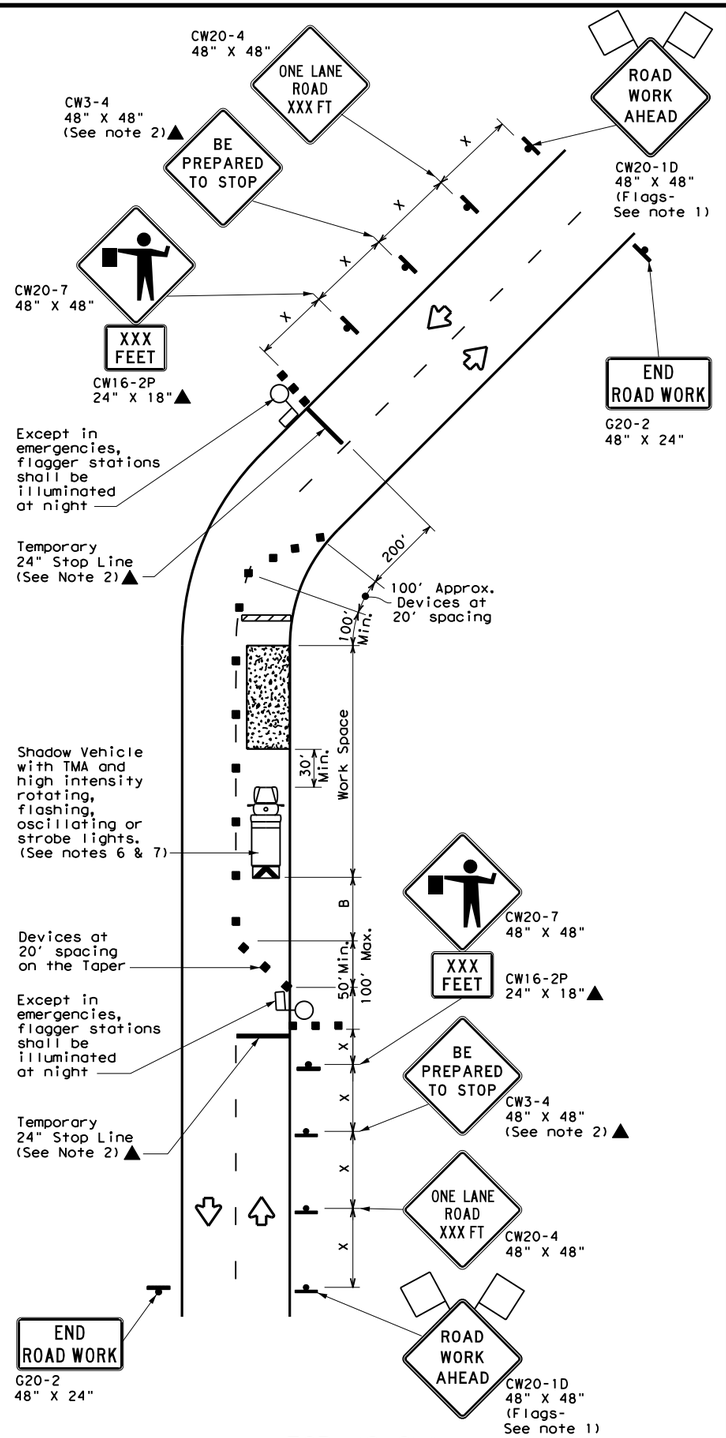
TCP (2-2a)

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	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		32

DATE: 5/5/2021 4:39:04 PM
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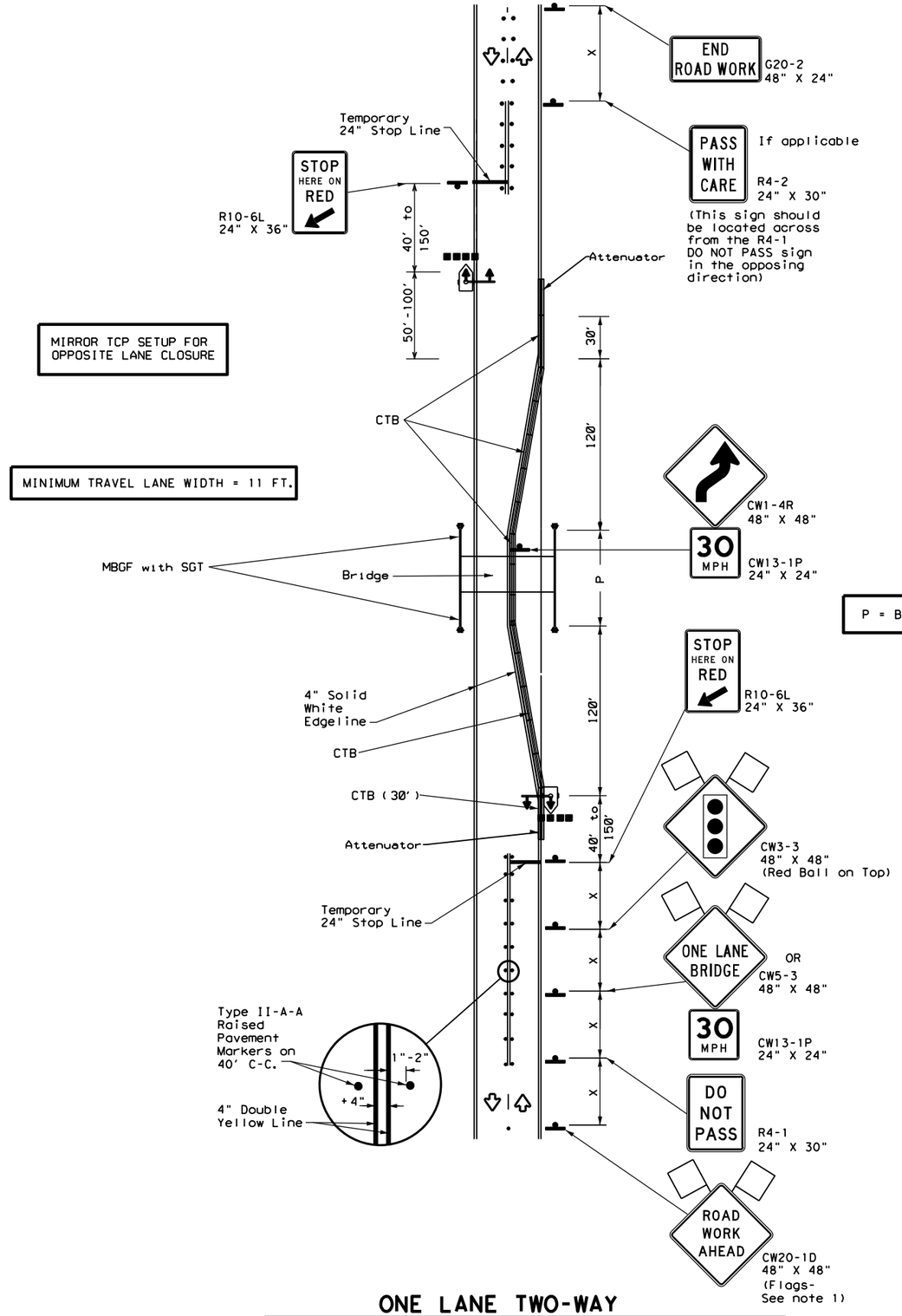
DATE: 5/6/2021 10:26:43 AM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\029.1 tcp2-8-18 s-MONTE.dgn

PROVIDE ADVANCE WARNING SIGN SEQUENCE SAME AS SHOWN FOR OPPOSITE TRAVEL DIRECTION.



P = Bridge rail + Transition + MBGF + SGTs

DRAWING NOT TO SCALE

ONE LANE TWO-WAY TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal

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. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.
5. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
6. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).
7. Traffic Barrier and attenuator object marker and delineator installation shall be subsidiary to Item 512 and Item 545.
8. Utilize this Traffic Control Plan prior to the last pavement surfacing operation for deletion of temporary work zone pavement markings used in this TCP.

STATE OF TEXAS
MONTE RATER
95859
LICENSED PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-18(MOD)

FILE: tcp2-8-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	PAR	Delta		33
4-98 2-18				

DATE: 5/5/2021 4:39:08 PM
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LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal
	Heavy Work Vehicle		Truck Mounted Attenuator

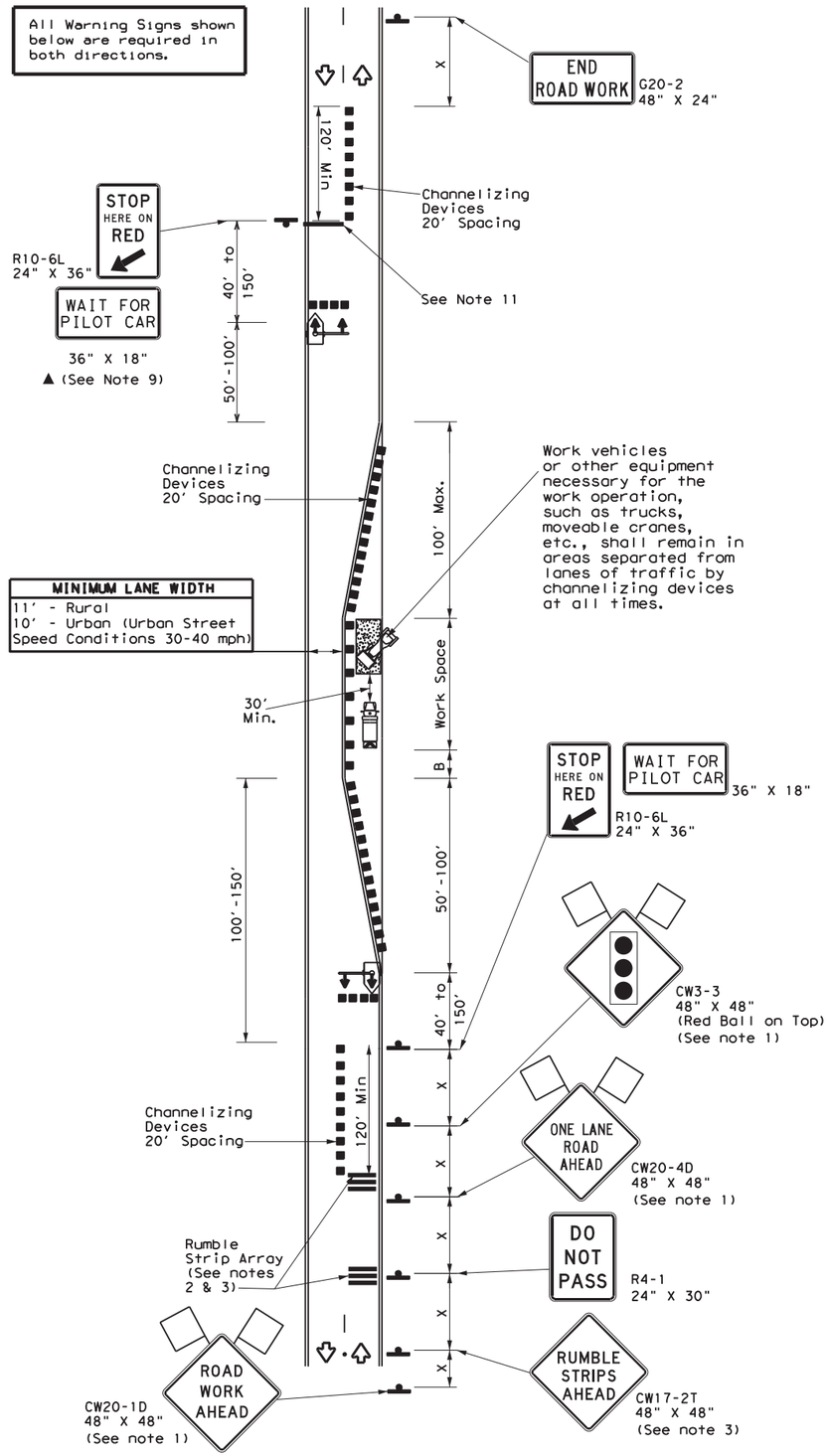
Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	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
		✓		

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



ONE LANE TWO-WAY (WITH NO SHOULDERS) TRAFFIC CONTROL WITH TRAFFIC SIGNAL

GENERAL NOTES

1. Flags attached to signs, where shown, are REQUIRED.
2. 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.
3. 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.
4. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
5. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
6. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
7. Temporary Rumble Strips shall be installed as per manufacturer's recommendations.
8. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
9. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
10. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table on left).
11. 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.
12. Channelizing devices on the center line may be omitted when approved by the Engineer.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
PARIS DISTRICT STANDARD

TRAFFIC CONTROL PLAN SHORT TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-20 (PAR)

REVISIONS

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

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64

DIST	COUNTY	SHEET NO.
PAR	Delta	34

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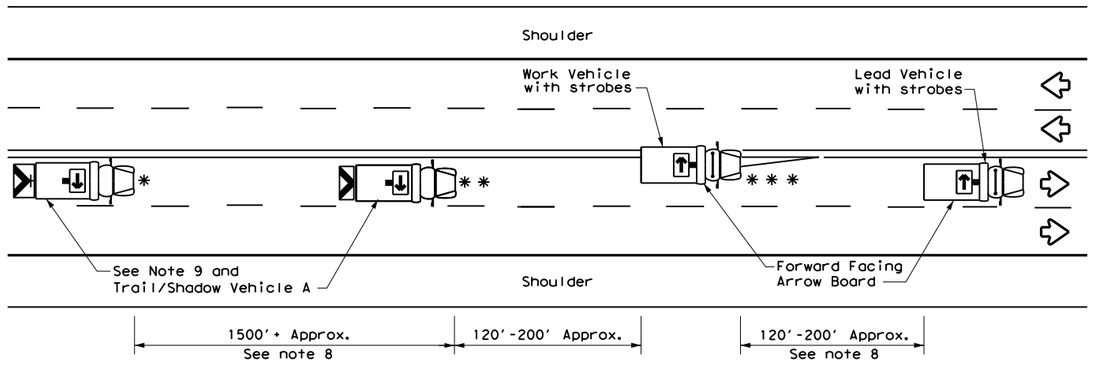
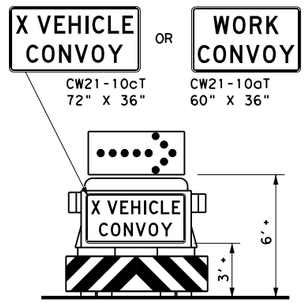


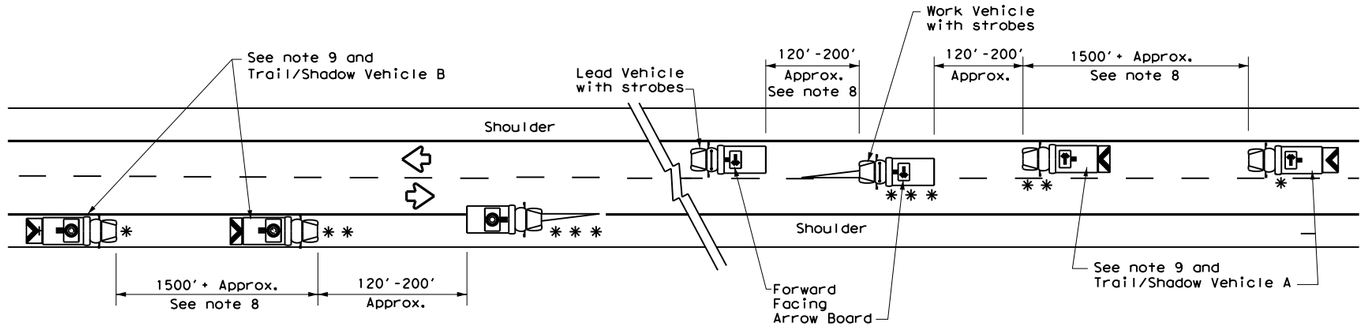
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

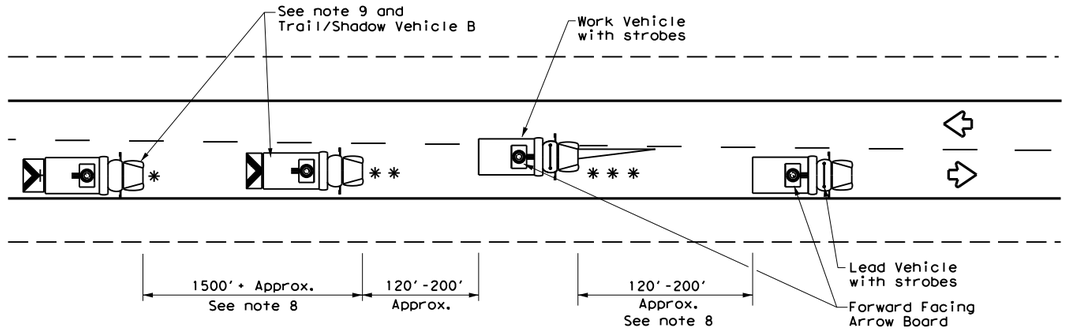


WORK ON SHOULDER

WORK ON TRAVEL LANE

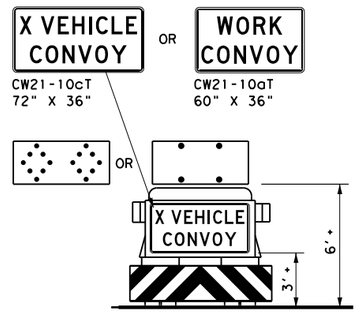
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

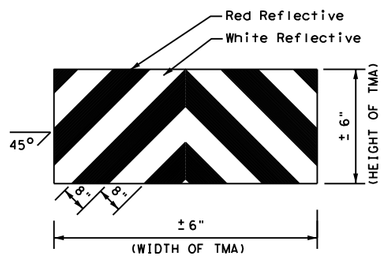
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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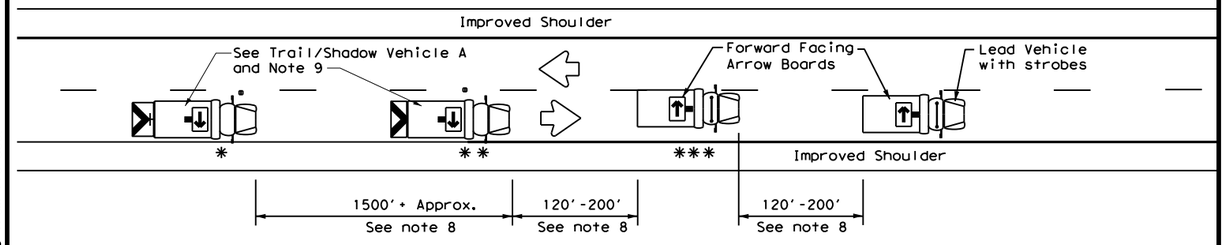
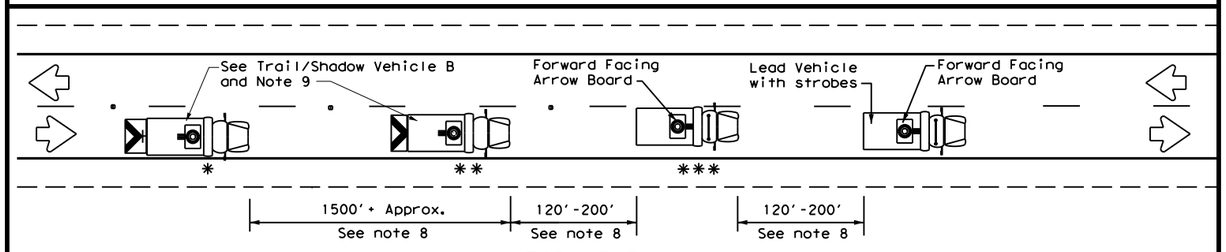
	PAR	Delta		35



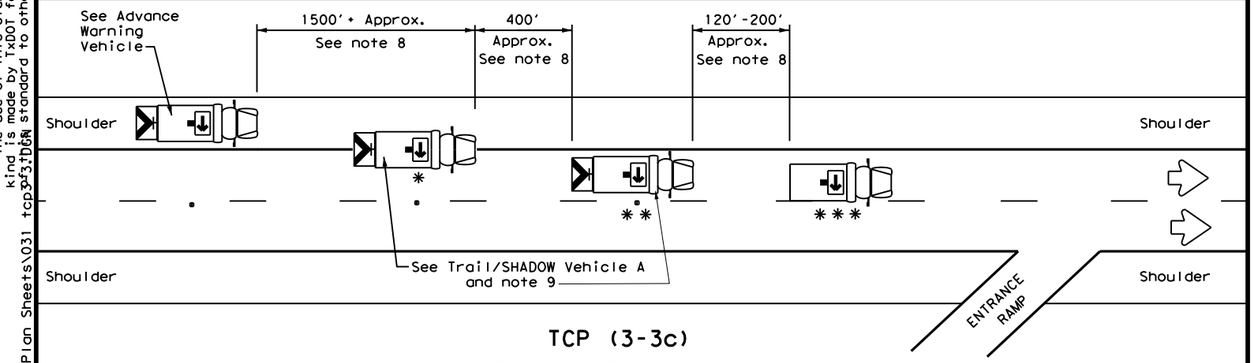
TCP (3-3a)

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



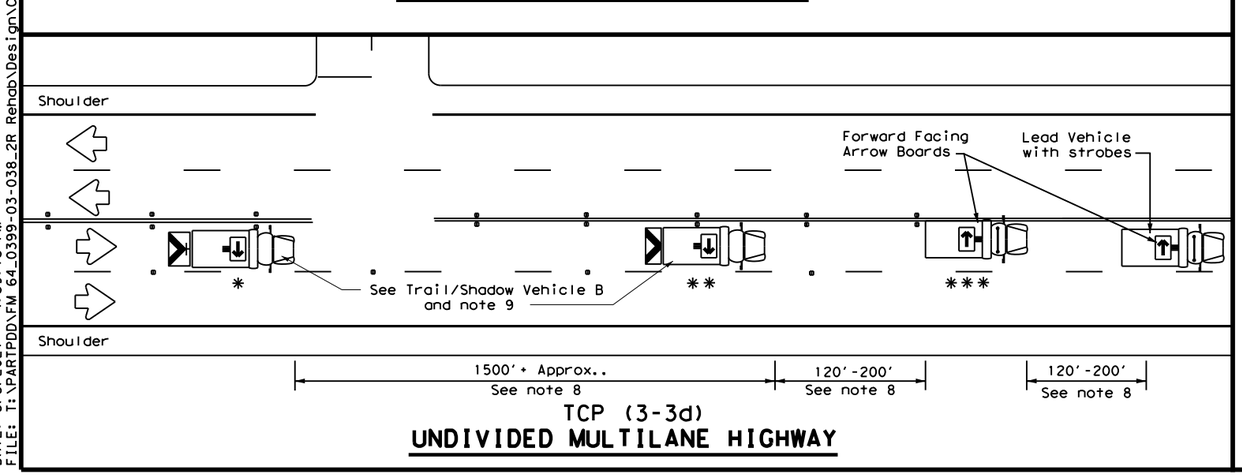
TCP (3-3b)

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



TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY

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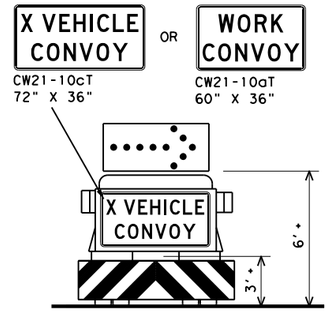
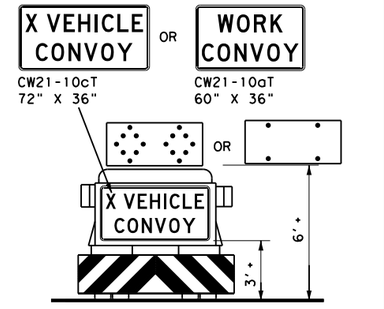


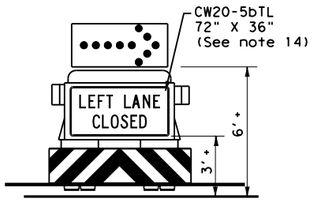
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

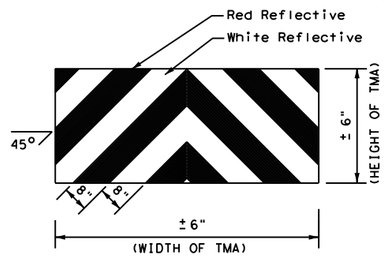


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	PAR	Delta		36
1-97 7-14				

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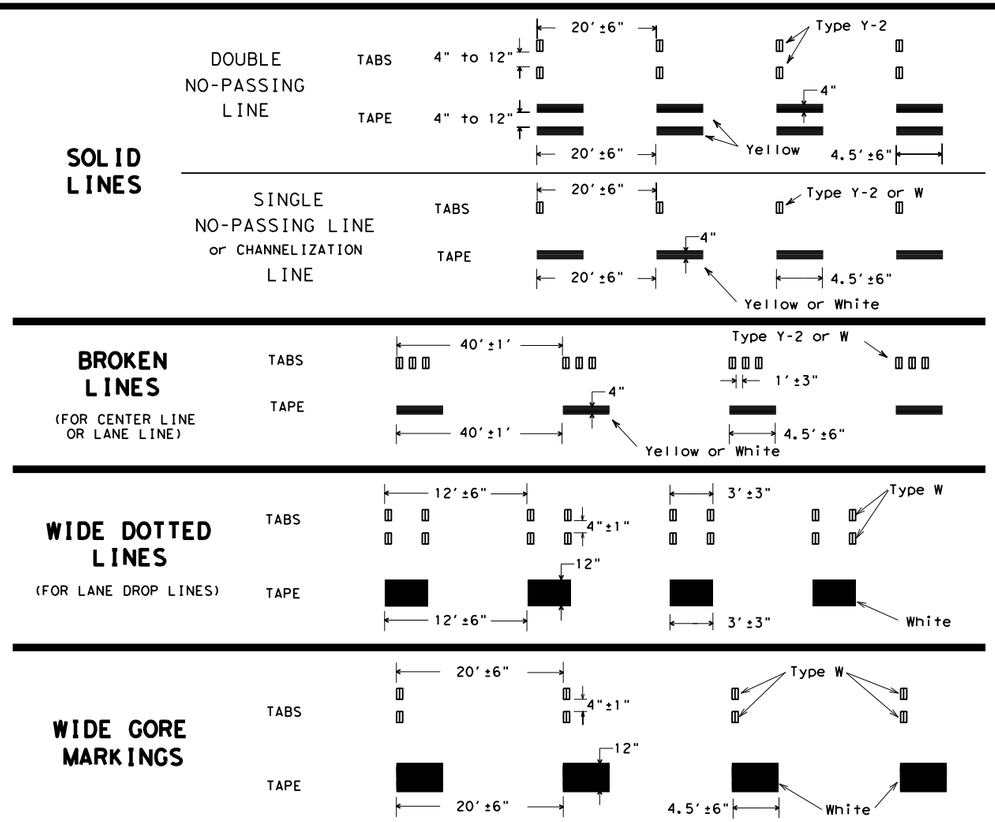
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



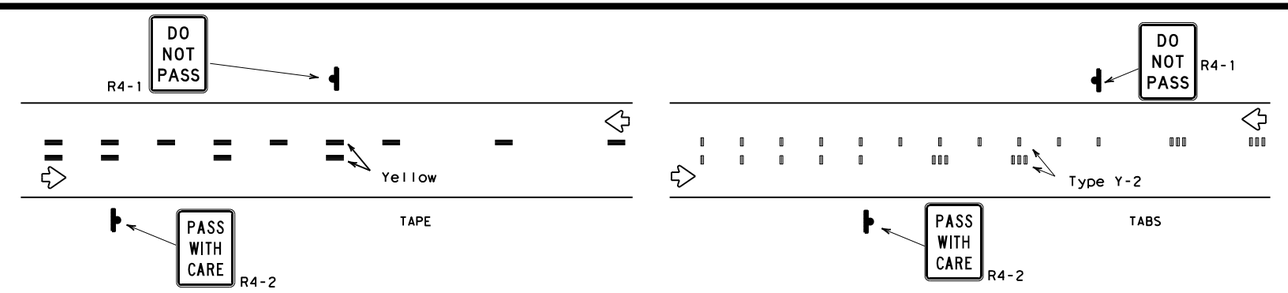
NOTES:

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

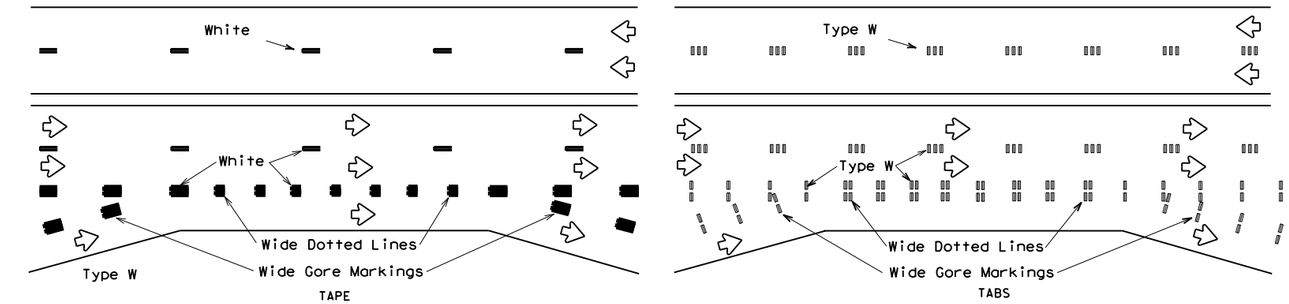
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

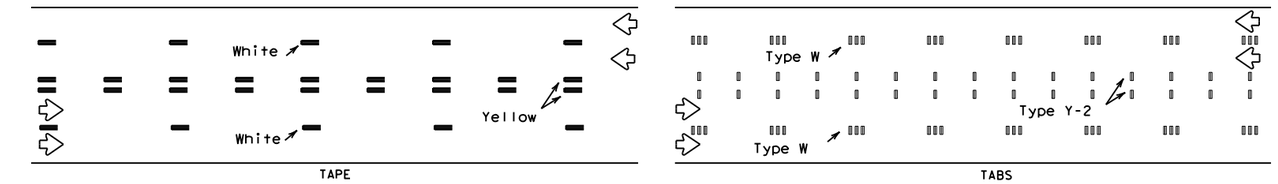
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



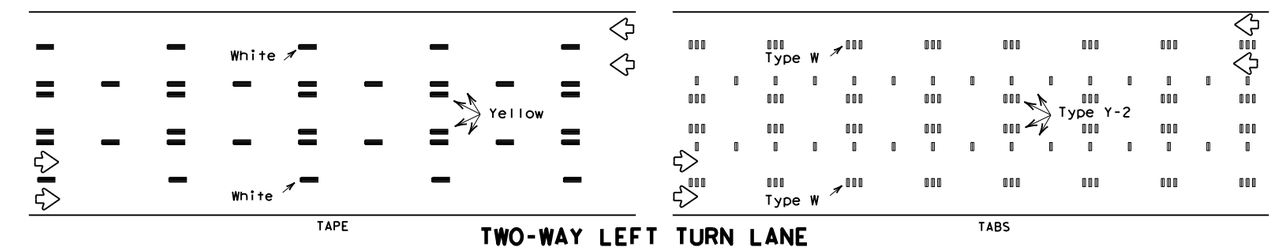
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



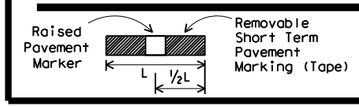
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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3-03		PAR	Delta		37
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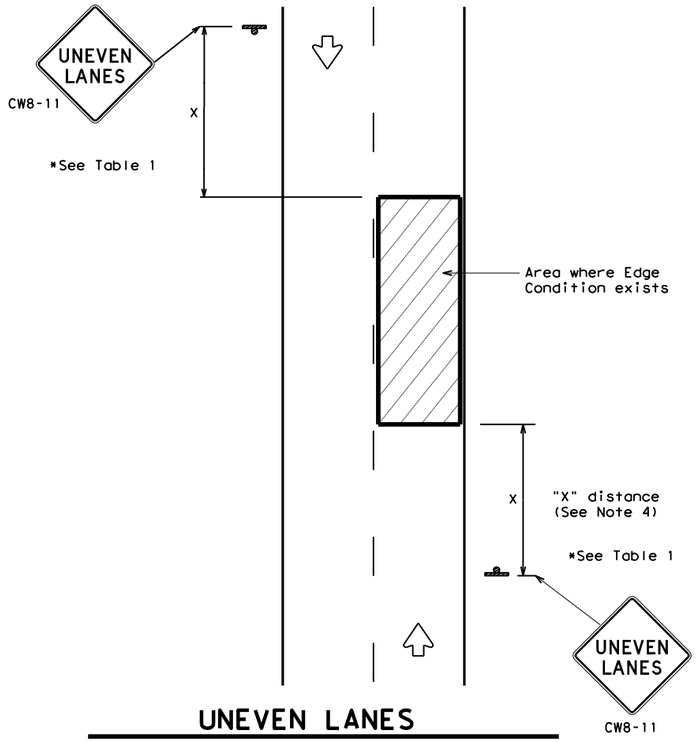
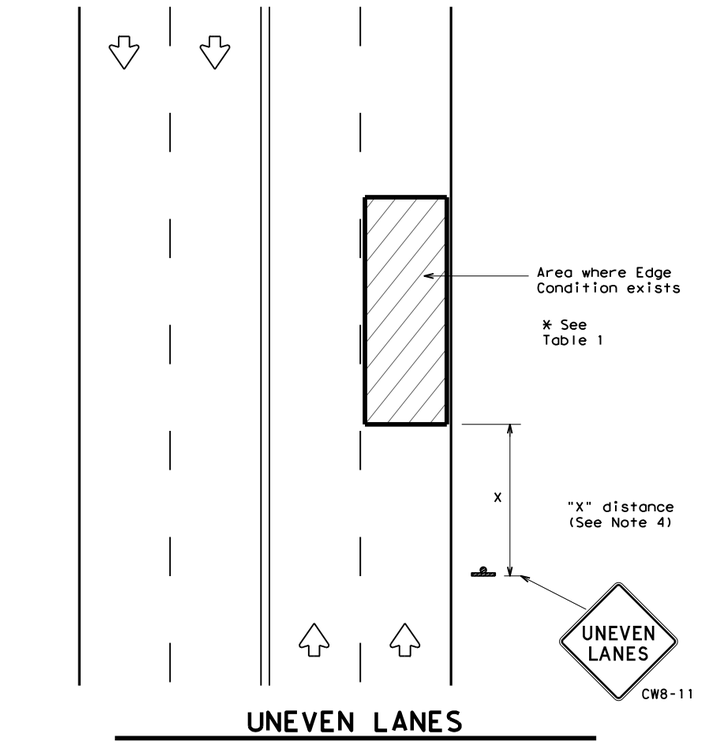
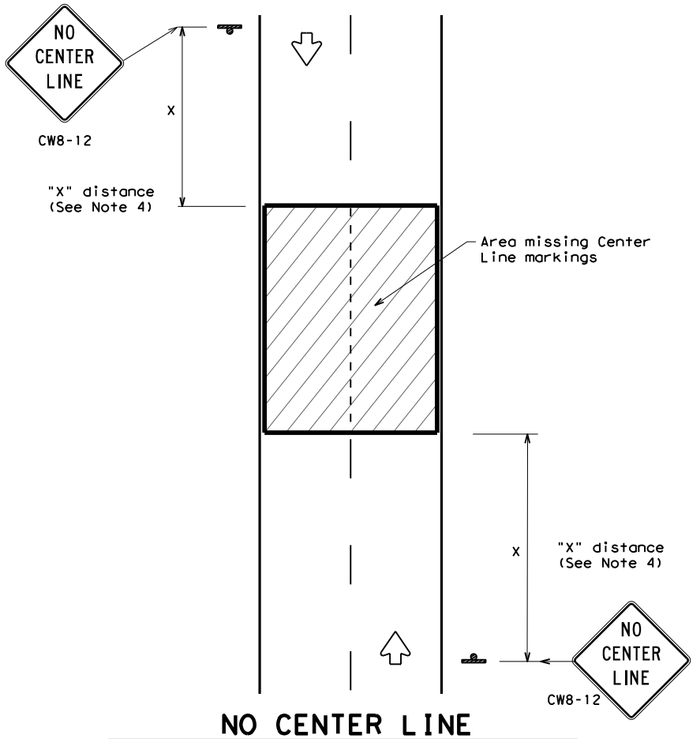


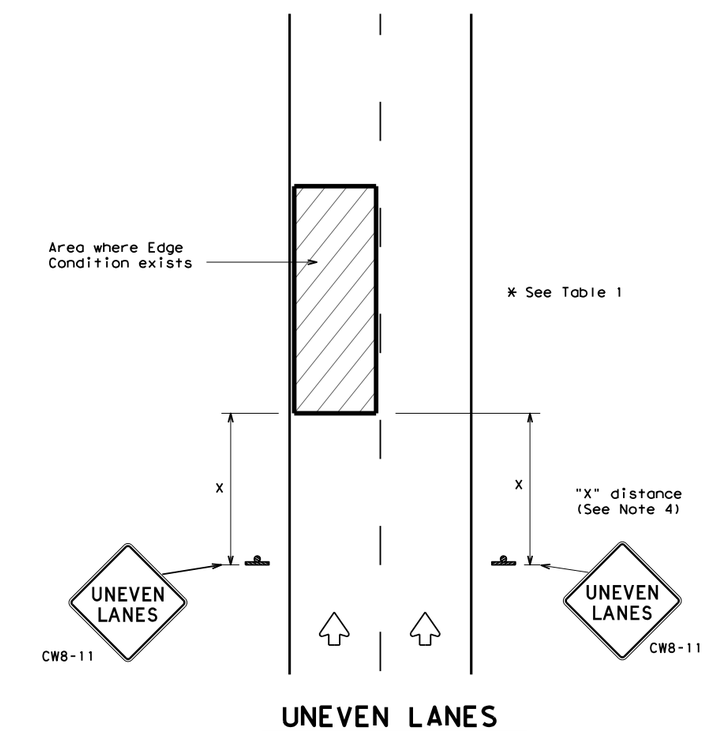
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

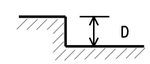
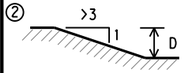
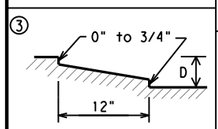
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

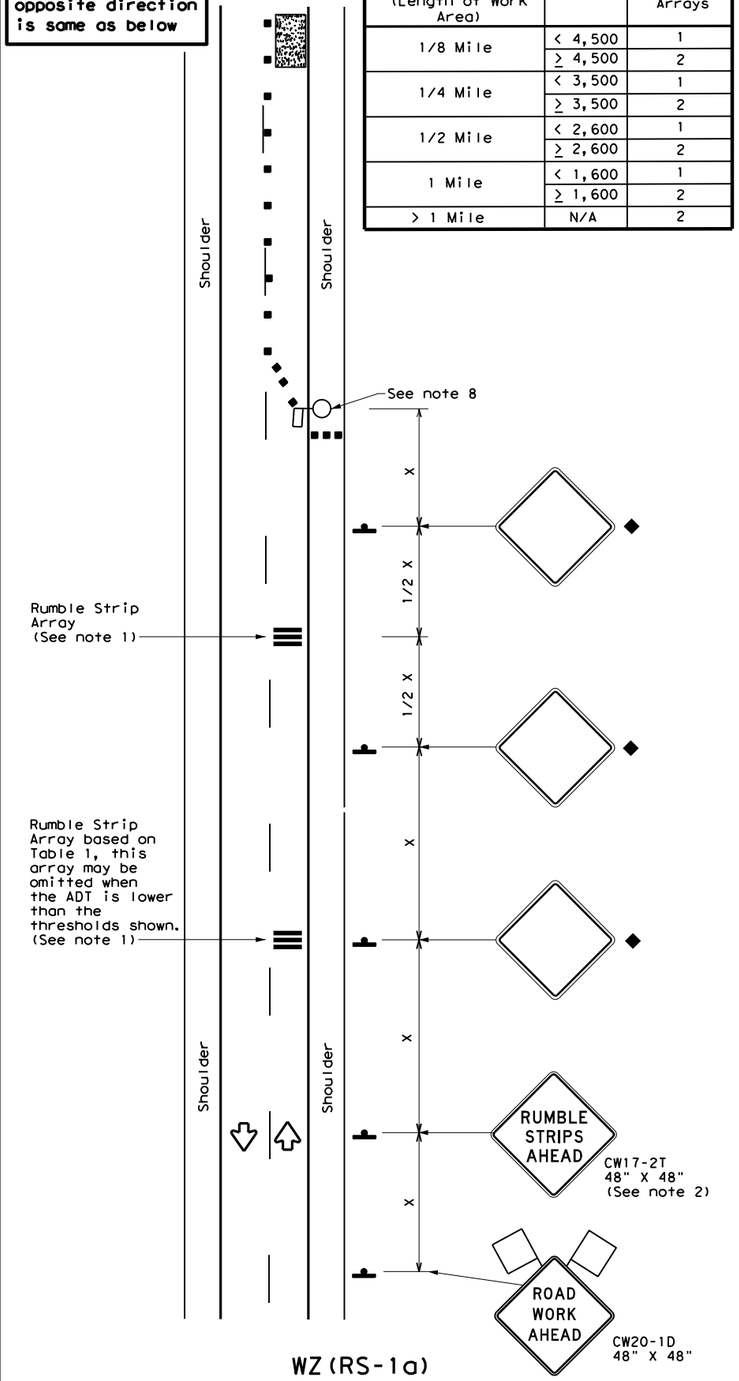
WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	PAR	Delta		38

DATE: 5/5/2021 4:39:19 PM
FILE: I:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\034 wzrs16.dgn standard

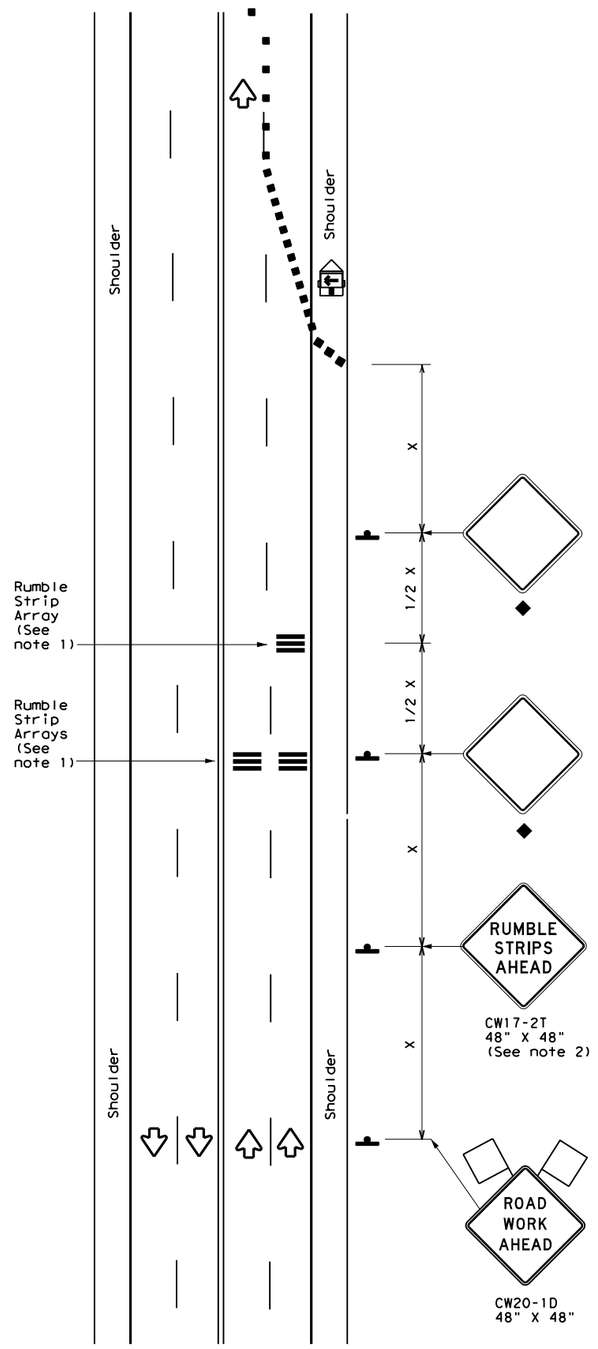
Warning sign and rumble strip sequence in opposite direction is same as below

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

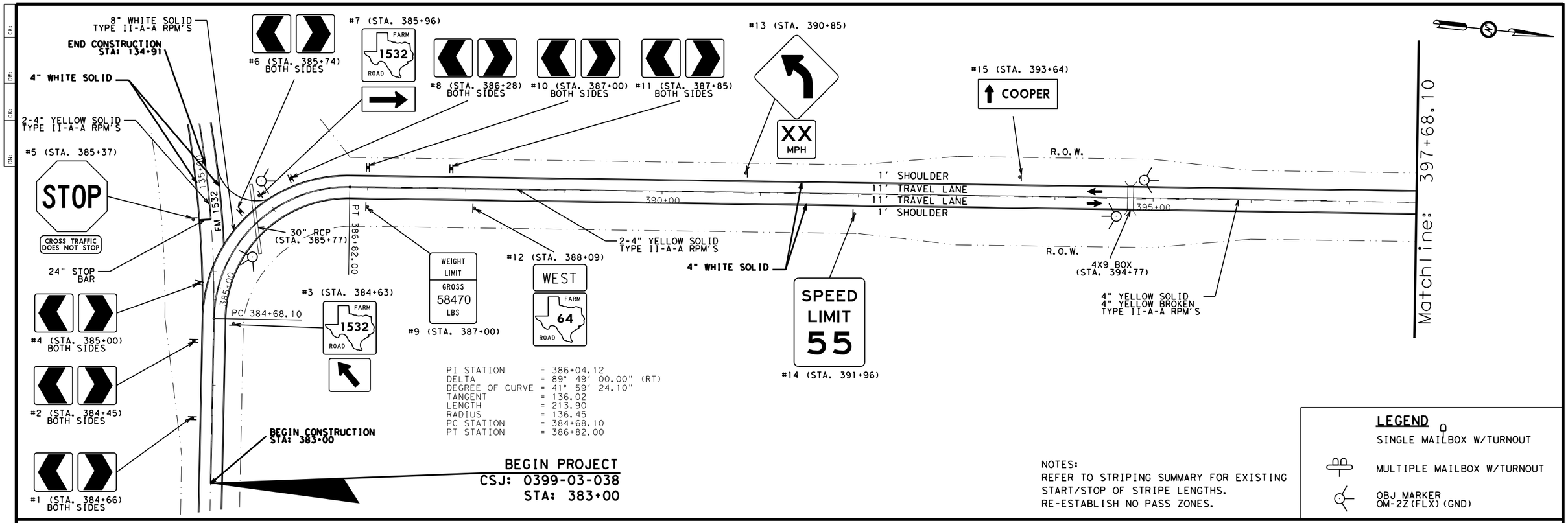
Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
2-14	DIST	COUNTY		SHEET NO.
4-16	PAR	Delta		39



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5.6.21

Monte R. Rater P.E.

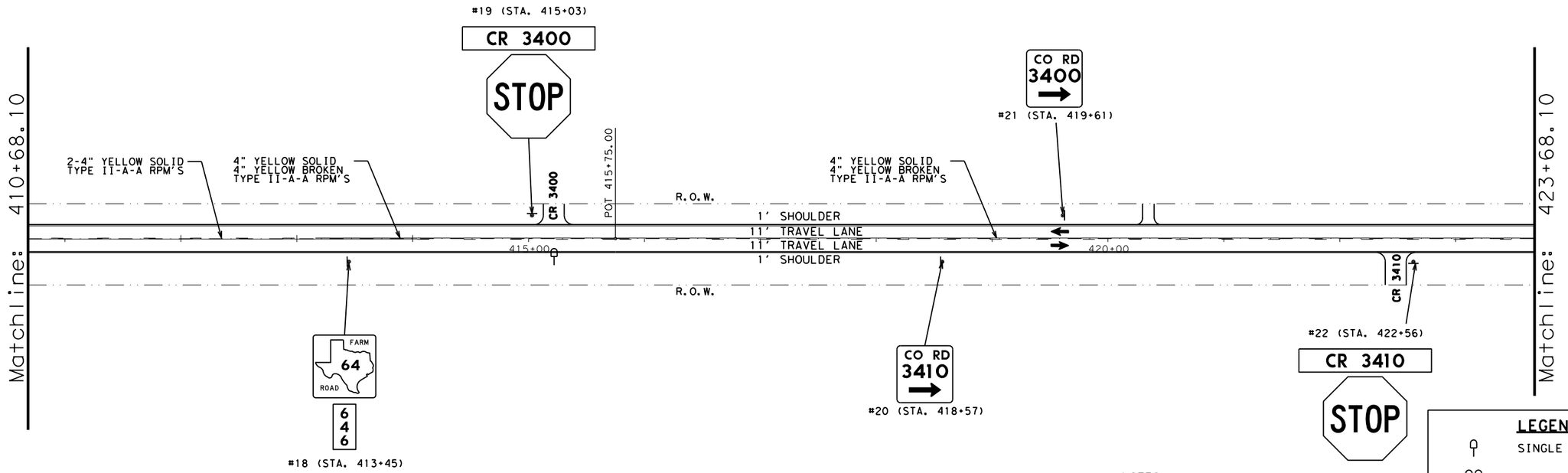
FM 64
PLAN LAYOUT

SCALE: 1"=100'

SHEET 1 OF 12

Texas Department of Transportation

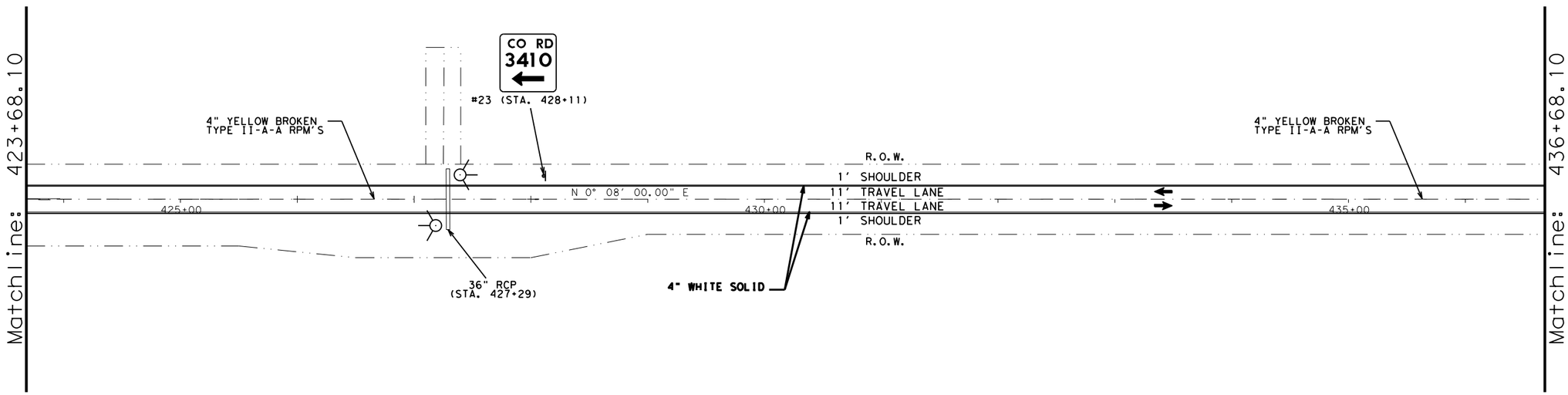
CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		40



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

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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PLAN LAYOUT

SCALE: 1"=100'

SHEET 2 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		41

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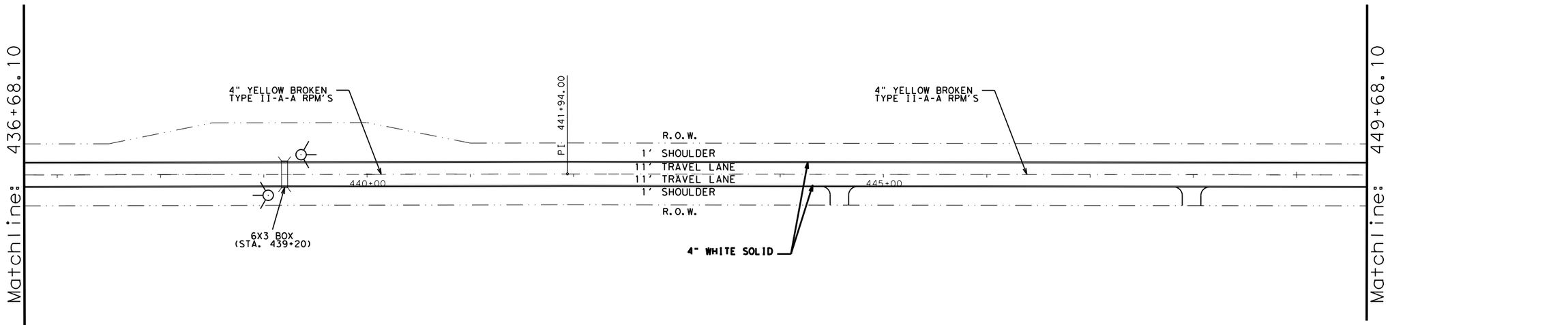
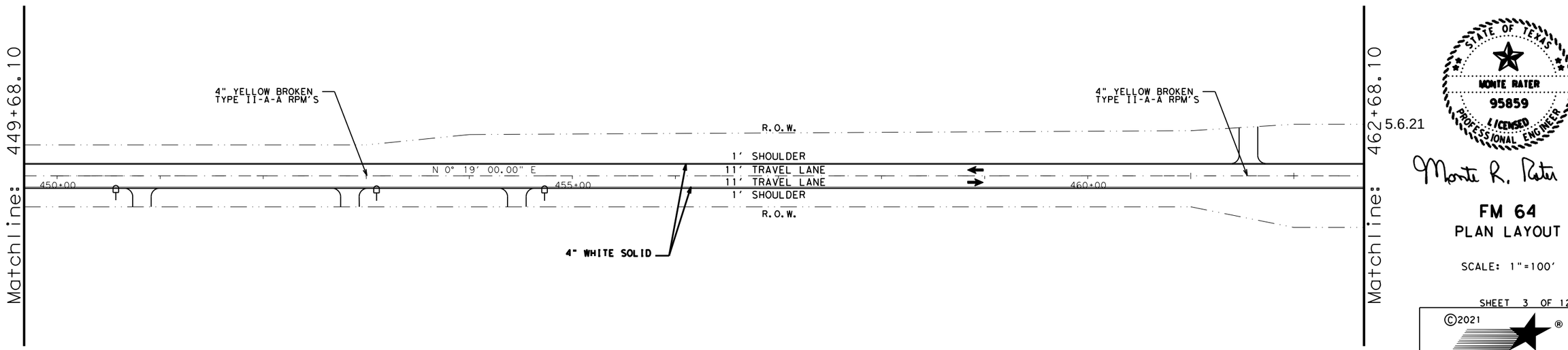


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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PLAN LAYOUT

SCALE: 1"=100'

SHEET 3 OF 12

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CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		42

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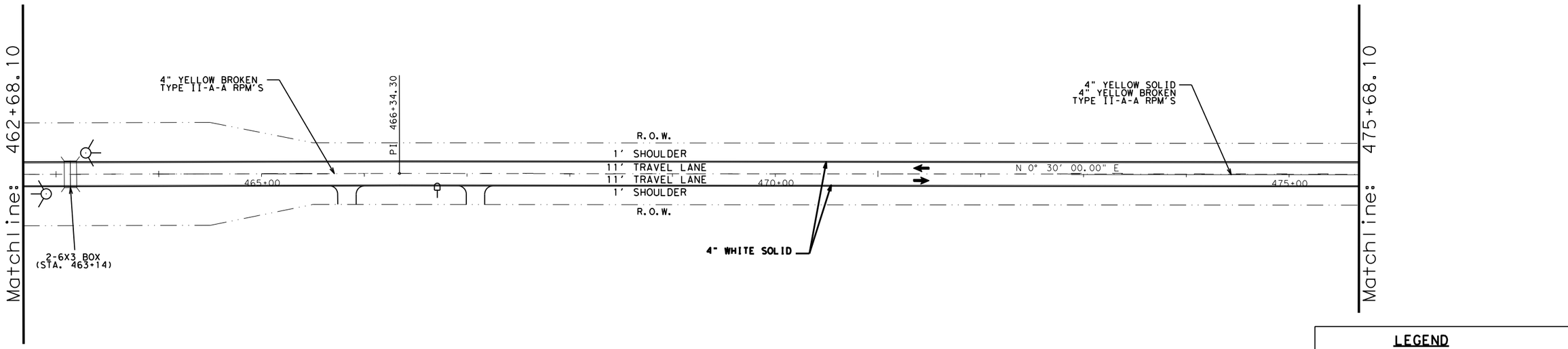
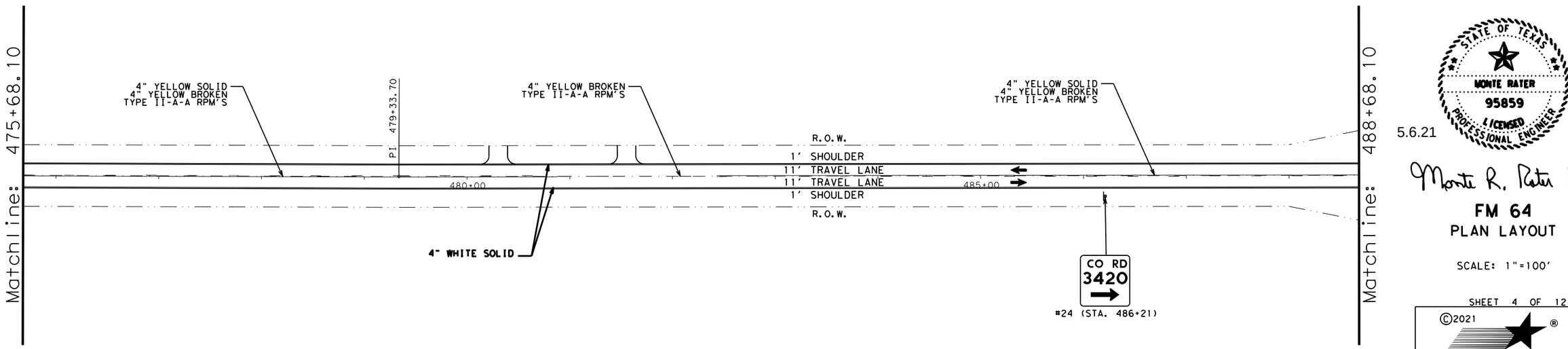


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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PLAN LAYOUT

SCALE: 1"=100'

SHEET 4 OF 12

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CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		43

DATE: 5/5/2021 4:39:29 PM
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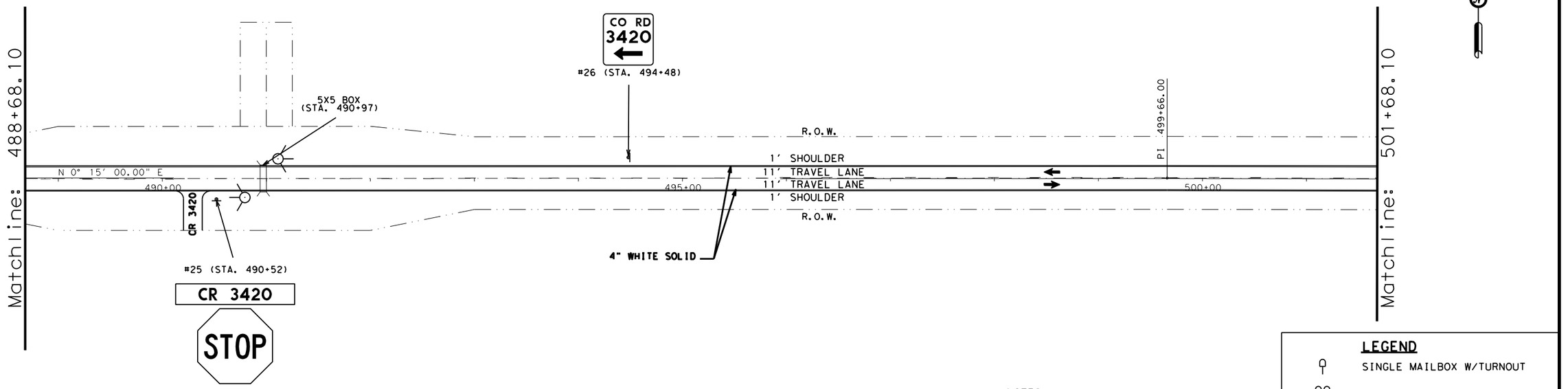
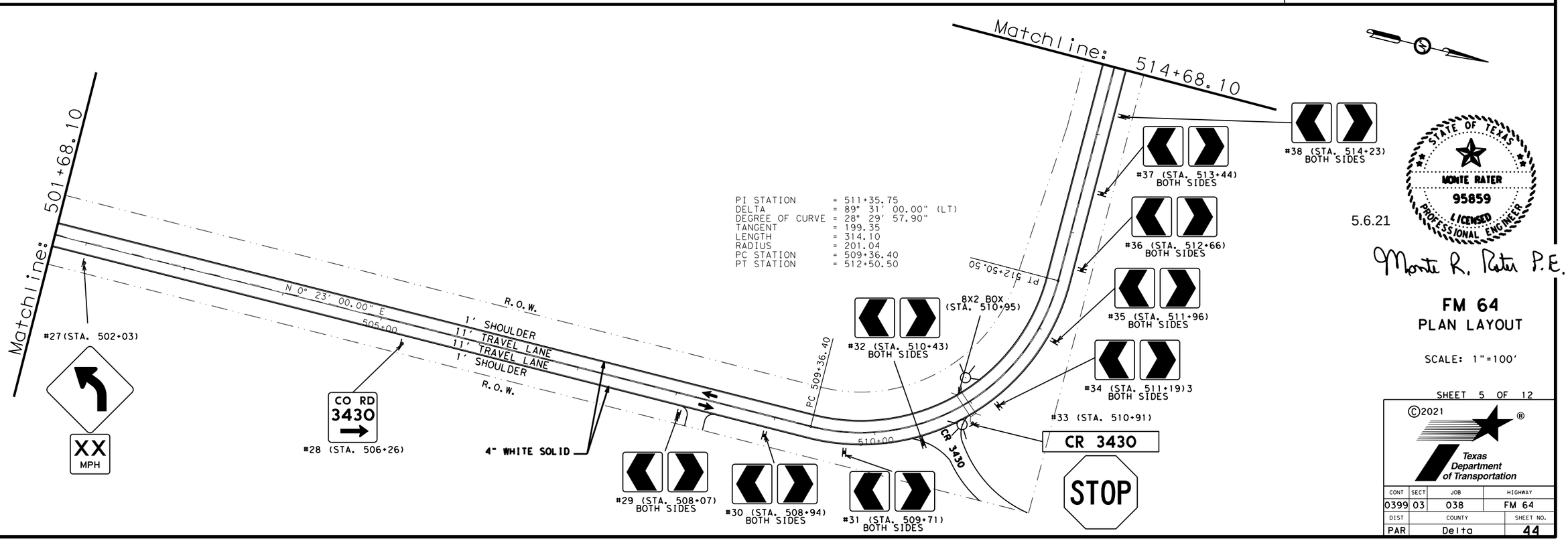


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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PLAN LAYOUT

SCALE: 1"=100'

SHEET 5 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		44

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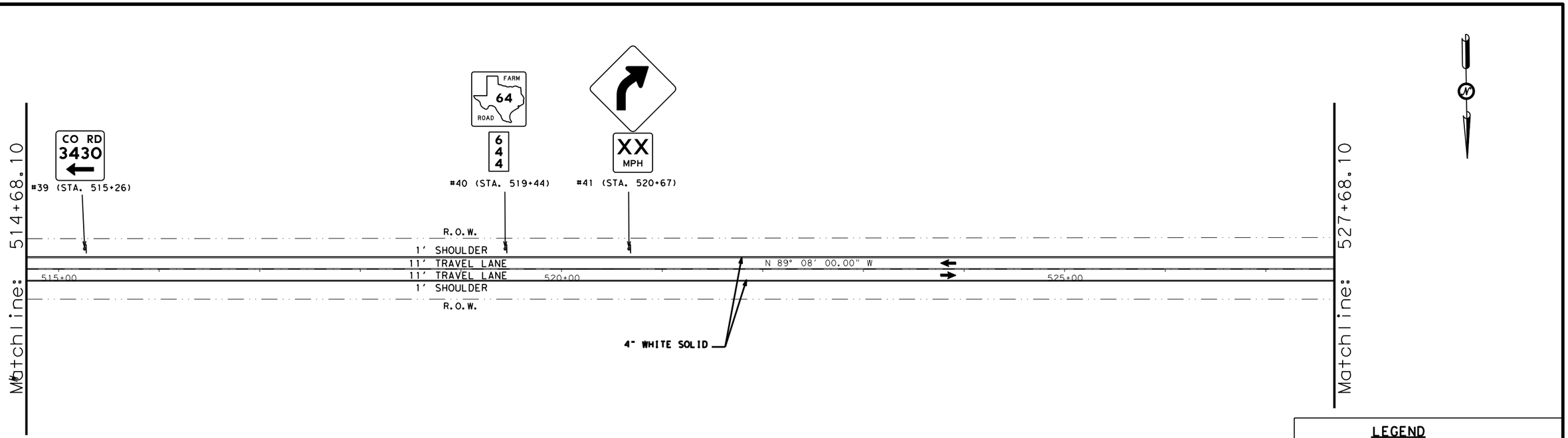
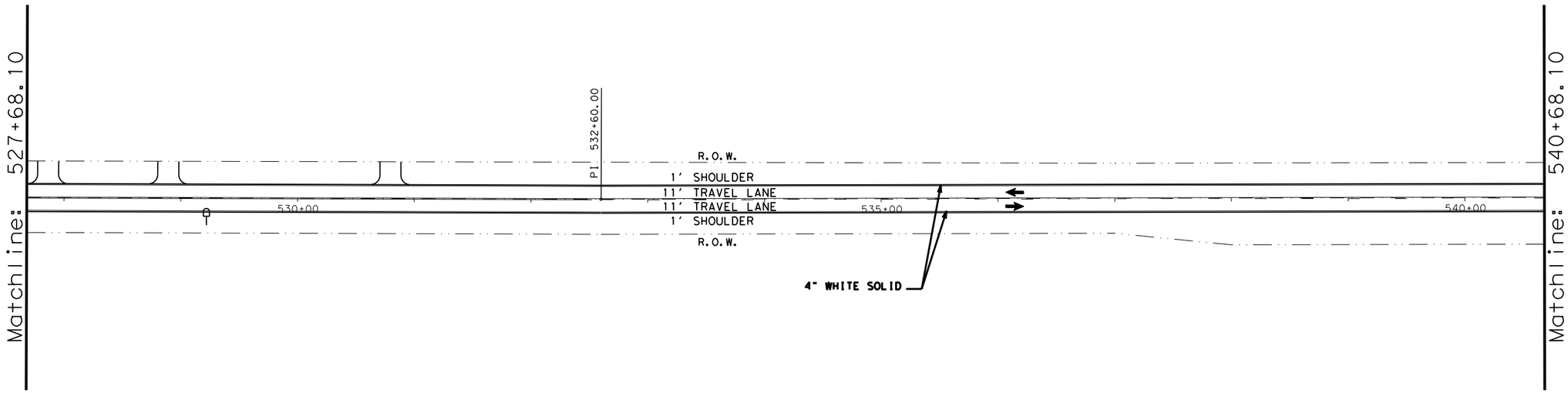


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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SHEET 6 OF 12

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CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		45

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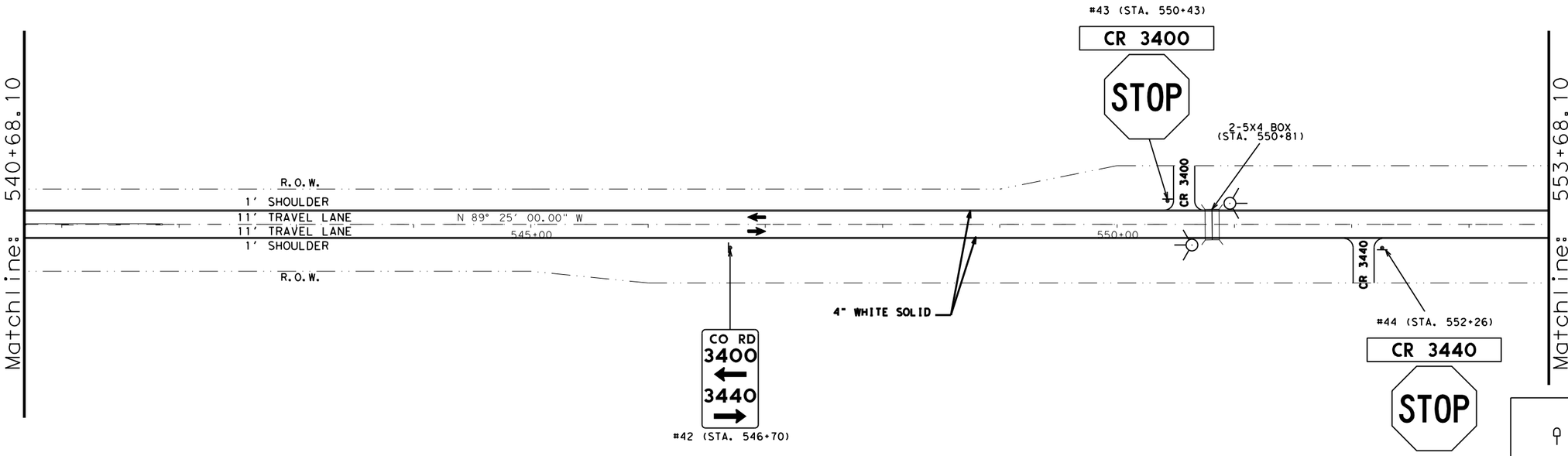
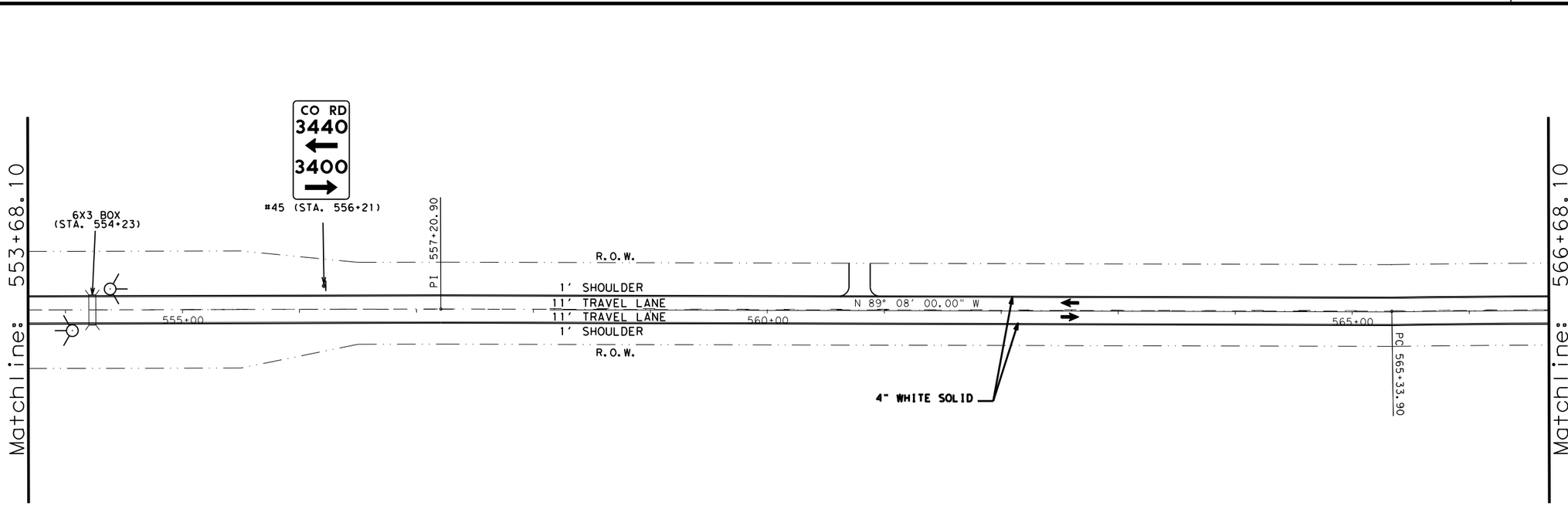


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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PLAN LAYOUT

SCALE: 1"=100'

SHEET 7 OF 12

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CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		46

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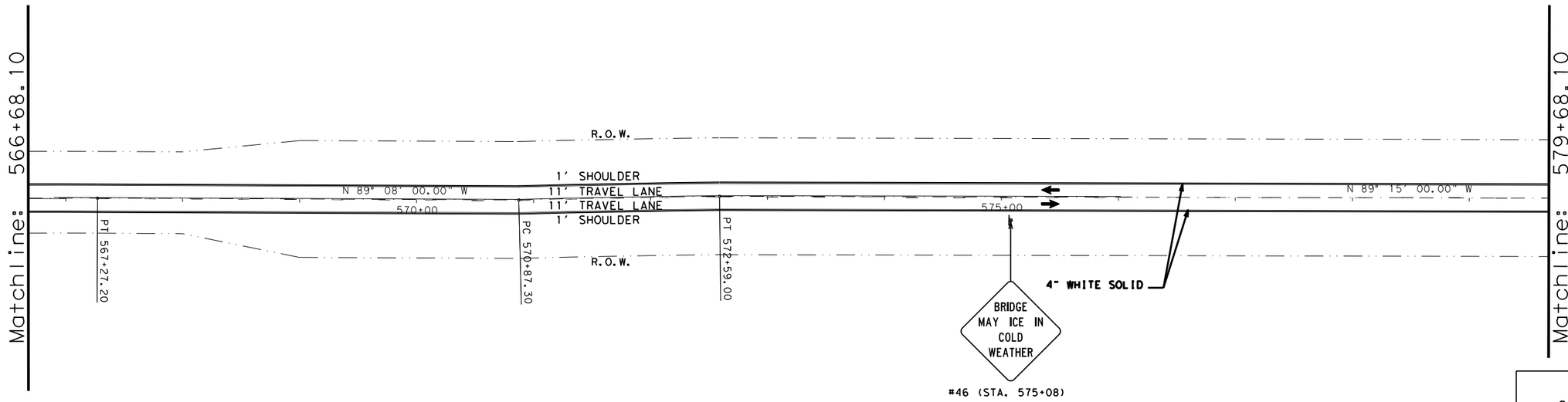
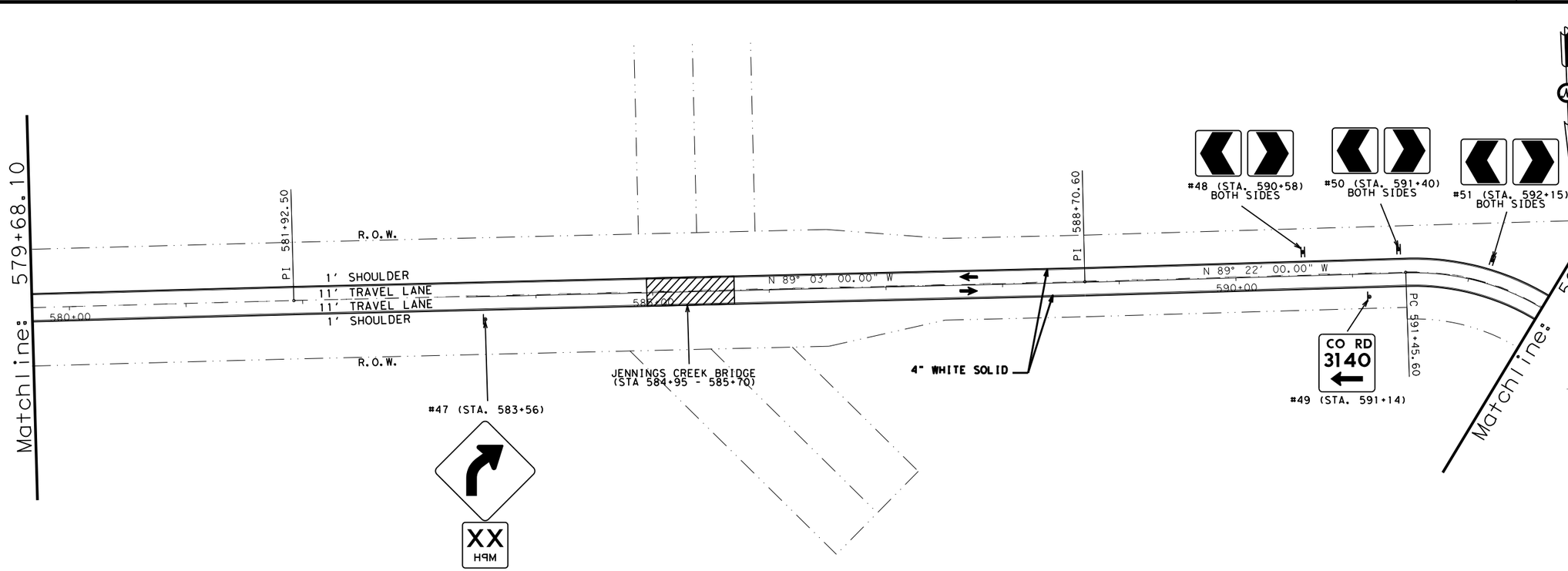


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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SCALE: 1"=100'

SHEET 8 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		47

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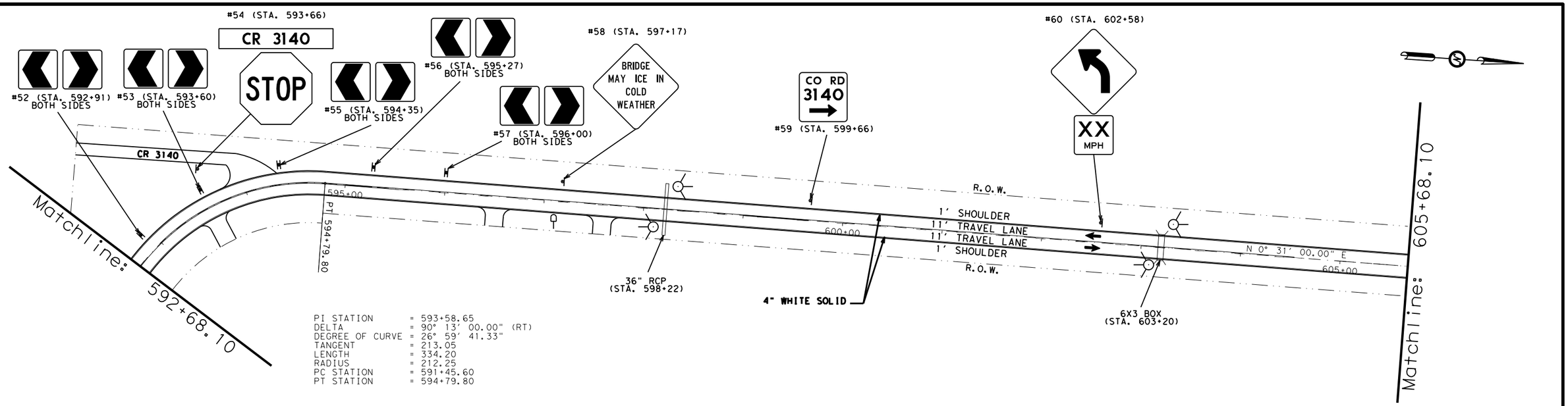

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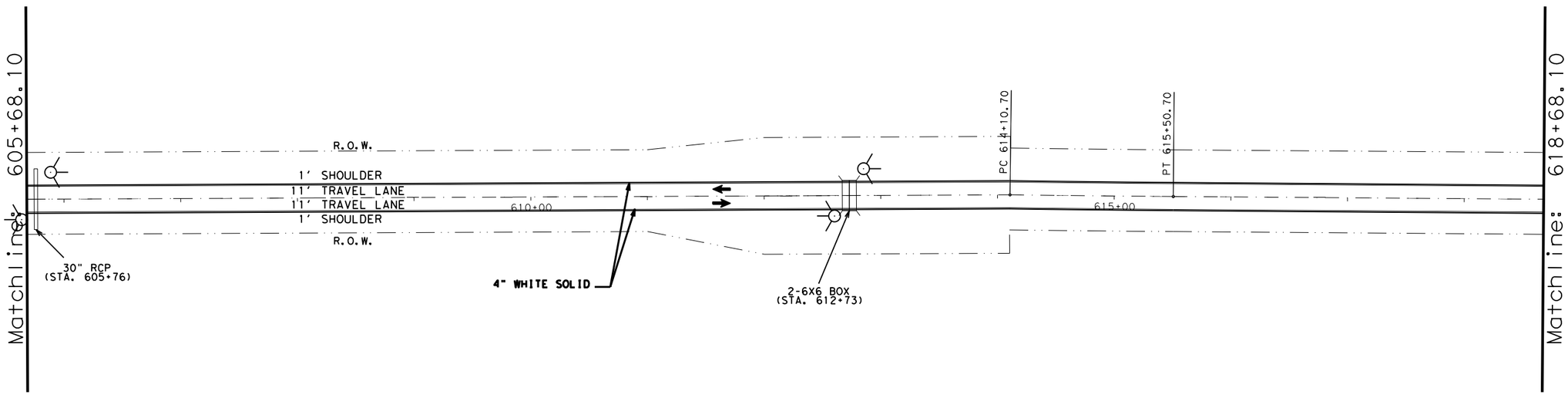
DELTA = 90° 13' 00.00" (RT)
DEGREE OF CURVE = 26° 59' 41.33"
TANGENT = 213.05
LENGTH = 334.20
RADIUS = 212.25
PC STATION = 591+45.60
PT STATION = 594+79.80

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

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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FM 64
PLAN LAYOUT

SCALE: 1"=100'

SHEET 9 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		48

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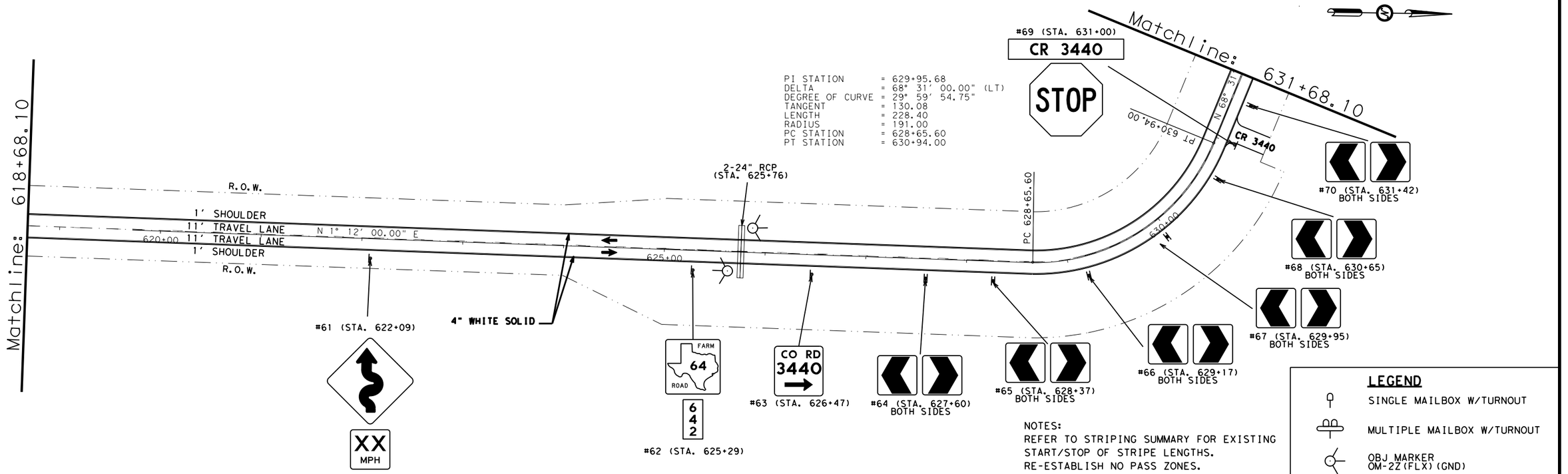

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FM 64
PLAN LAYOUT

SCALE: 1"=100'

SHEET 10 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		49

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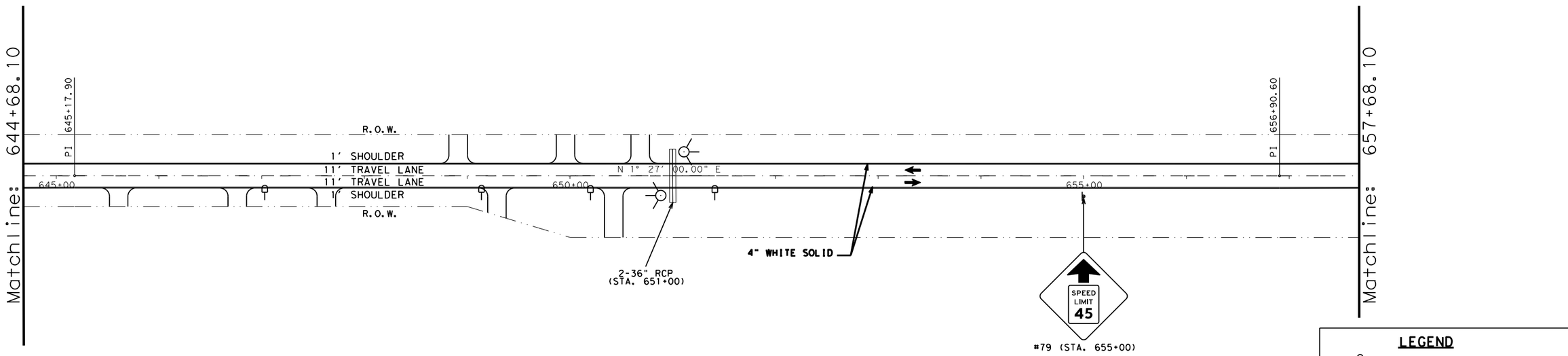
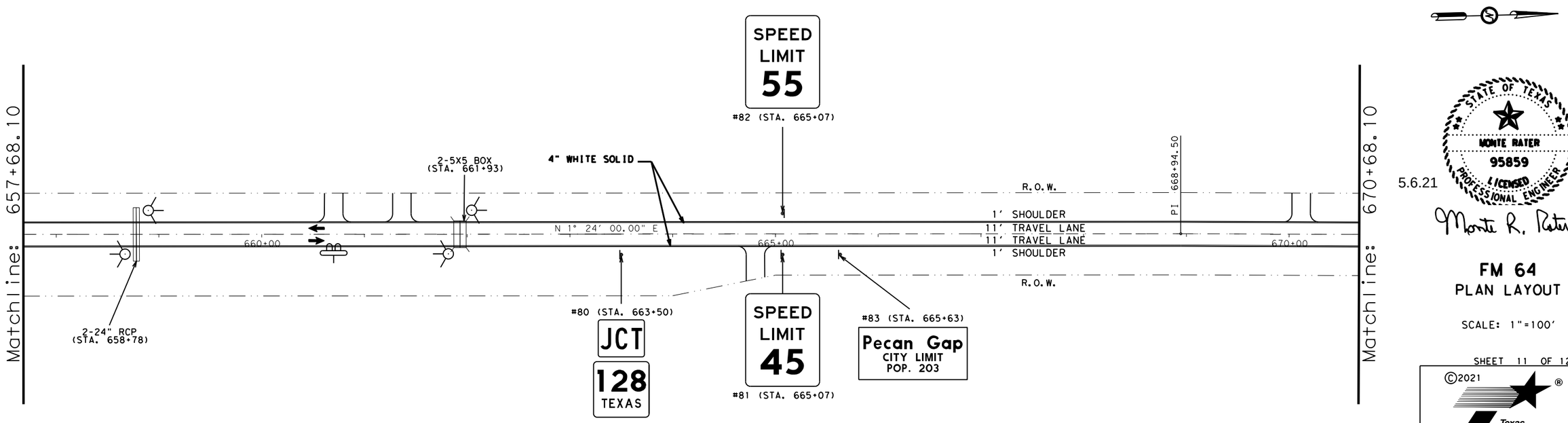


NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)



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Monte R. Rater P.E.

FM 64
PLAN LAYOUT

SCALE: 1"=100'

SHEET 11 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		50

DATE: 5/5/2021 4:39:44 PM
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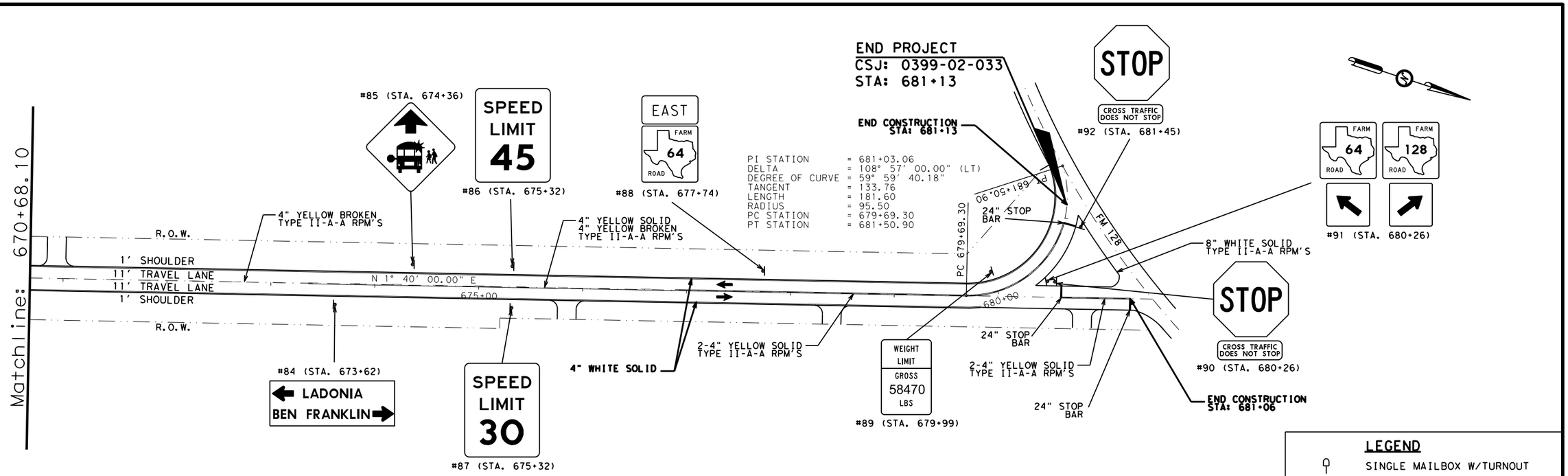

NOTES:
REFER TO STRIPING SUMMARY FOR EXISTING START/STOP OF STRIPE LENGTHS.
RE-ESTABLISH NO PASS ZONES.

LEGEND

- SINGLE MAILBOX W/TURNOUT
- MULTIPLE MAILBOX W/TURNOUT
- OBJ MARKER OM-2Z(FLX)(GND)

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FM 64
PLAN LAYOUT

SCALE: 1"=100'

SHEET 12 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		51

DATE: 5/5/2021 4:39:46 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\049 Plan Layout12.dgn

FM 64 SUPERELEVATION TABLE

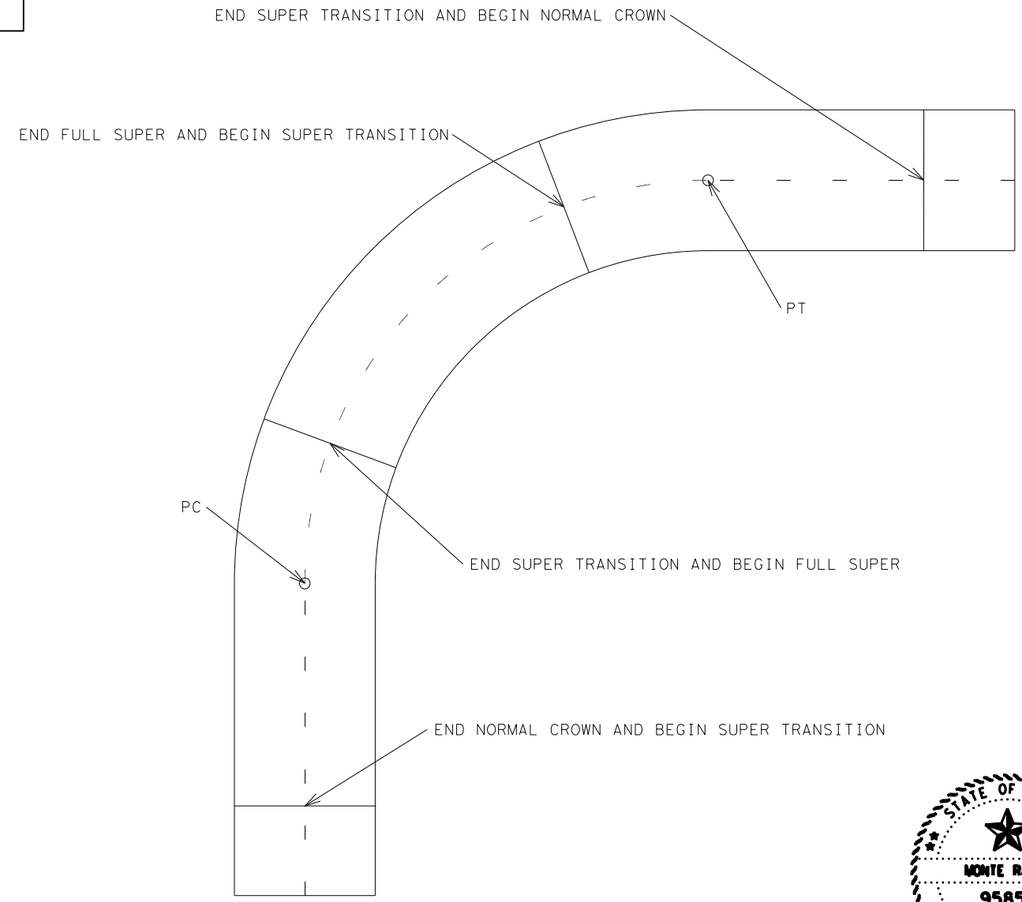
STATION		SHOULDER CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	SHOULDER CROSS SLOPE RIGHT (%)
BEGIN PROJECT		-2.00	-2.00	-2.00	-2.00
383+48	END NC				
SUPERELEVATION TRANSITION					
384+81	BEGIN FS	6.00	6.00	-6.00	-6.00
386+69	END FS				
SUPERELEVATION TRANSITION					
388+02	BEGIN NC	-2.00	-2.00	-2.00	-2.00
508+16	END NC				
SUPERELEVATION TRANSITION					
509+49	BEGIN FS	-6.00	-6.00	6.00	6.00
512+38	END FS				
SUPERELEVATION TRANSITION					
513+71	BEGIN NC	-2.00	-2.00	-2.00	-2.00
590+26	END NC				
SUPERELEVATION TRANSITION					
591+59	BEGIN FS	6.00	6.00	-6.00	-6.00
594+67	END FS				
SUPERELEVATION TRANSITION					
596+00	BEGIN NC	-2.00	-2.00	-2.00	-2.00
627+46	END NC				
SUPERELEVATION TRANSITION					
628+79	BEGIN FS	-6.00	-6.00	6.00	6.00
630+81	END FS				
SUPERELEVATION TRANSITION					
632+14	BEGIN NC	-2.00	-2.00	-2.00	-2.00
631+23	END NC				
SUPERELEVATION TRANSITION					
632+56	BEGIN FS	6.00	6.00	-6.00	-6.00
634+45	END FS				
SUPERELEVATION TRANSITION					
635+78	BEGIN NC	-2.00	-2.00	-2.00	-2.00
679+09	END NC				
SUPERELEVATION TRANSITION					
679+76	BEGIN FS	MATCH EXISTING	MATCH EXISTING	MATCH EXISTING	MATCH EXISTING
681+44	END FS				
SUPERELEVATION TRANSITION					
682+11	BEGIN NC	-2.00	-2.00	-2.00	-2.00
END PROJECT					

NOTE: ALL TRANSITIONS ARE PARABOLIC

TABLE LEGEND

NC = NORMAL CROWN

FS = FULL SUPERELEVATION



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

EXCESS MATERIAL GENERATED IS PROPERTY OF CONTRACTOR.

ADDITIONAL EMBANKMENT MATERIAL MAY BE NEEDED TO BACKFILL SUPERELEVATED SECTIONS. THIS WILL BE SUBSIDIARY TO TYPE "A" BACKFILL.

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
SUPERELEVATION TABLE

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		52

CK:
DW:
CK:
DN:

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DATE: 5/5/2021 4:39:50 PM
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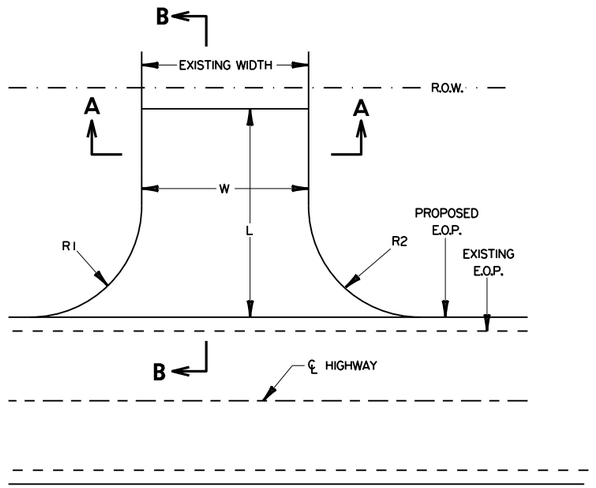
DN: | CK: | DW: | CK:

PLAN:



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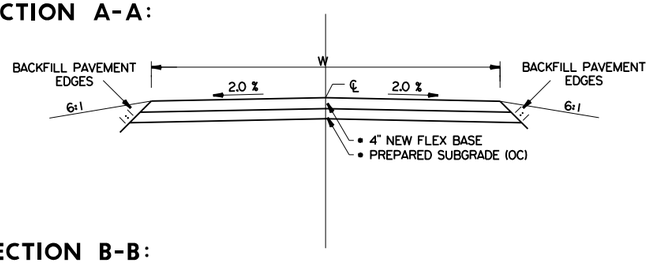

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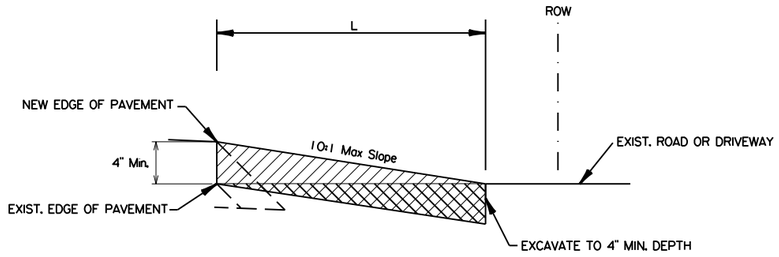


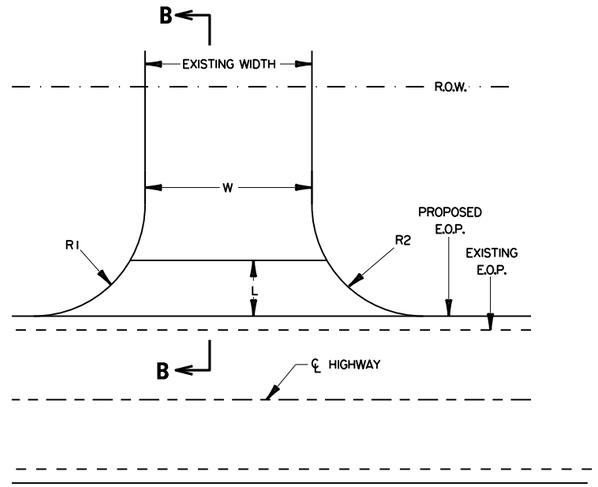
NOTES:
1. THIS WORK WILL BE MEASURED AND PAID FOR AS: "DRIVEWAYS (BASE)"
2. DIMENSIONS W, L, R1 AND R2 ARE PROVIDED IN THE QUANTITY SUMMARY FOR DRIVEWAYS.

BASE SURFACE DRIVEWAY

NTS

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

PLAN:



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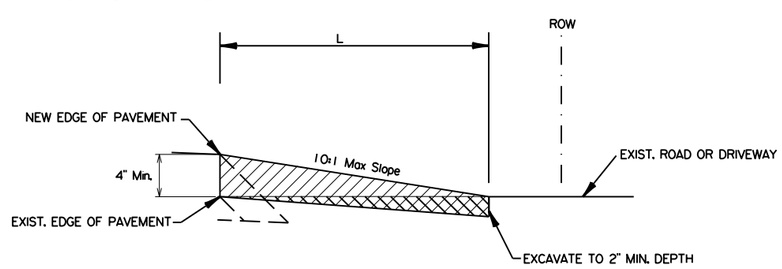

NOTES:
1. THIS WORK WILL BE MEASURED AND PAID FOR AS: DRIVEWAYS ACP (TYPE C HMAC, SAC-B, PG64-22).
2. DIMENSIONS W, L, R1 AND R2 ARE PROVIDED IN THE QUANTITY SUMMARY FOR DRIVEWAYS.
3. DIMENSION W DOES NOT REPRESENT THE AVERAGE WIDTH OF WEDGE AREA TO BE PAVED.

HOT MIX WEDGE

NTS

FM 64
DRIVEWAY DETAILS

5.6.21

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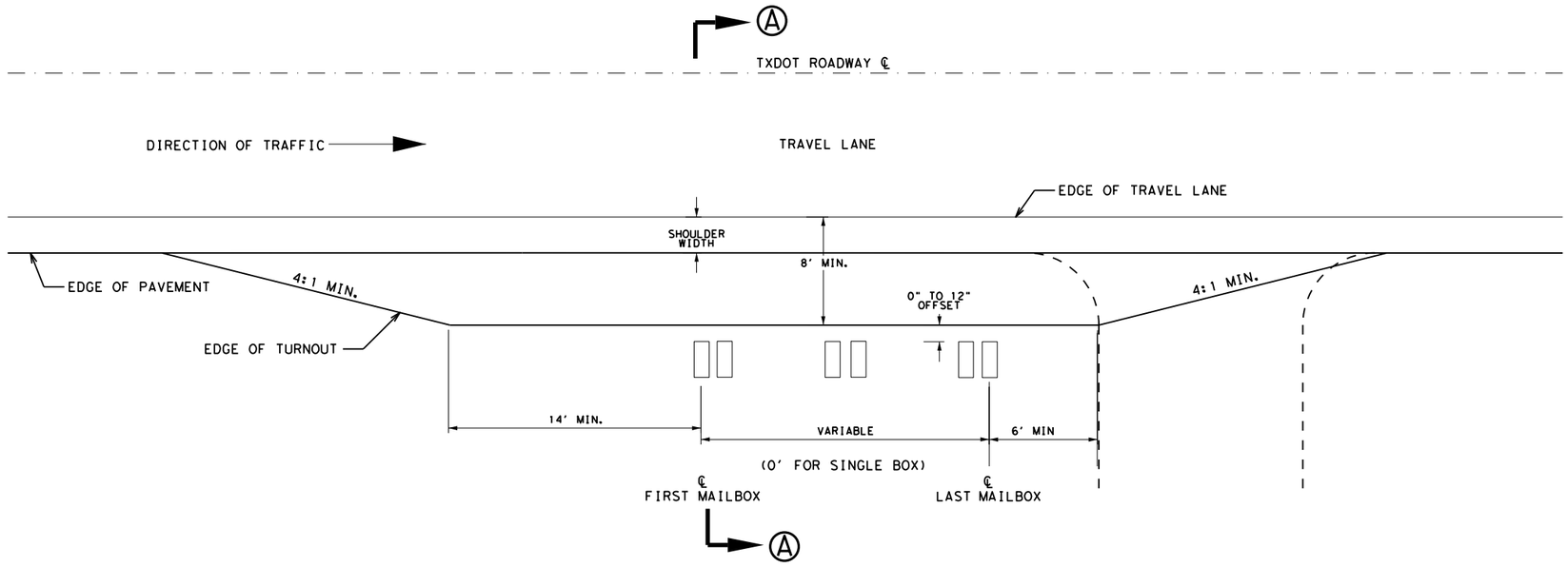
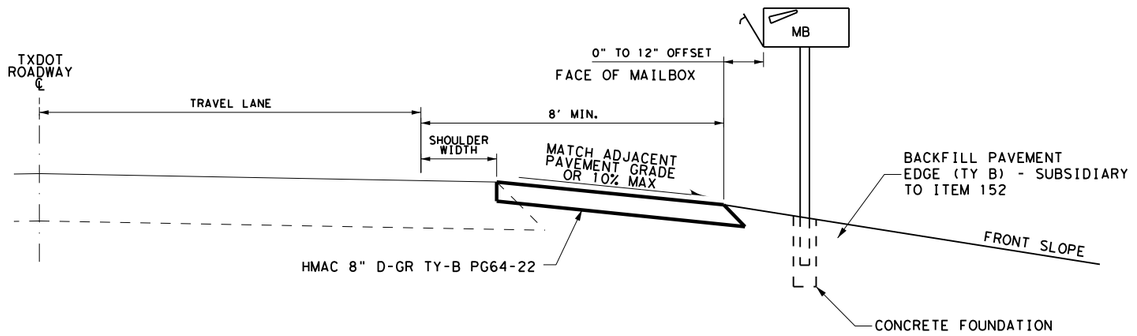
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		53



MAILBOX TURNOUT
PLAN



MAILBOX TURNOUT
SECTION A-A

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PROFESSIONAL ENGINEER

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FM 64
MAILBOX TURNOUT DETAILS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		54

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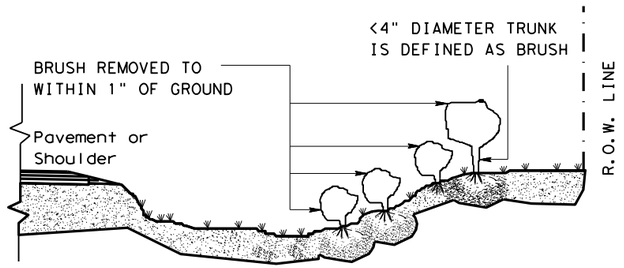
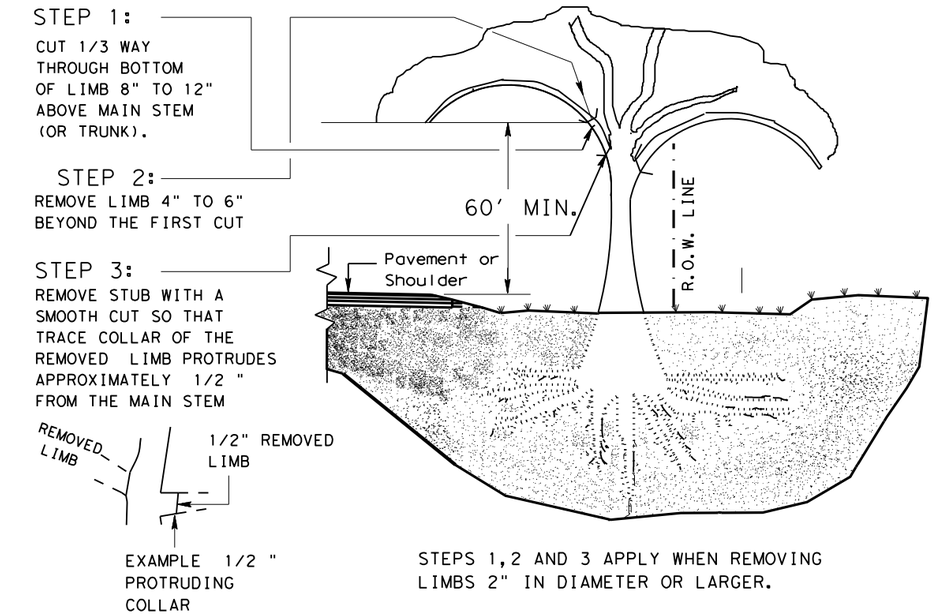
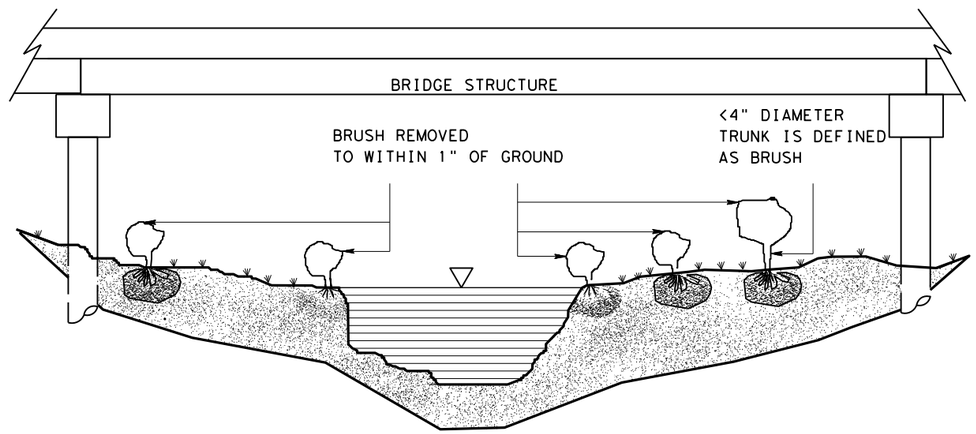


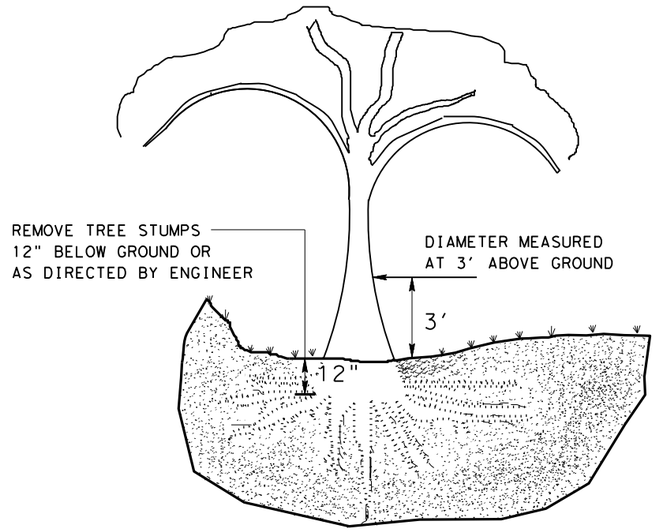
BRUSH REMOVAL



TREE TRIMMING



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL



TREE REMOVAL

SPECIFIC LOCATION SPECIFIED IN PLANS

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

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FM 64

TREE TRIMMING & BRUSH REMOVAL

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		55

DATE: 5/5/2021 4:39:55 PM
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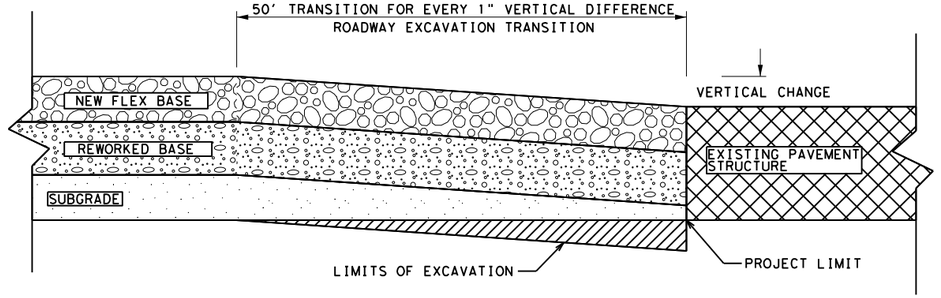
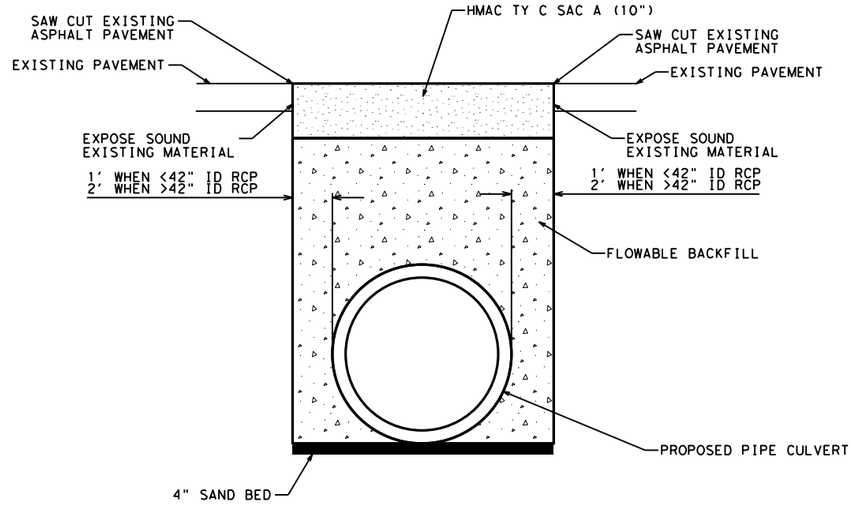
DN: | CK: | DW: | CK:



TRANSITION TO PROJECT LIMITS

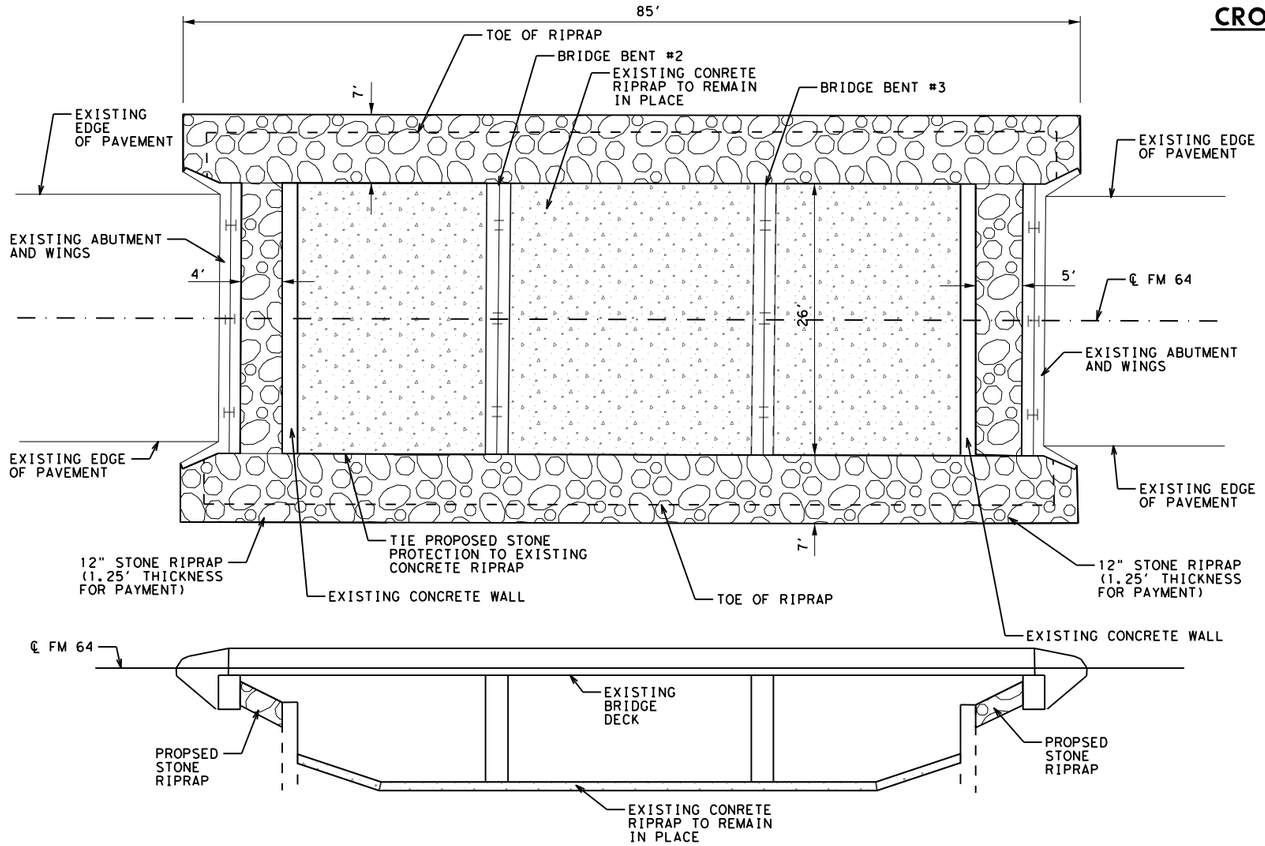
EXCAVATE MATERIAL TO ALLOW FOR PLACEMENT OF PROPOSED PAVEMENT STRUCTURE. TRANSITION WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY TO VARIOUS BID ITEMS.



CROSS CULVERT CUT & RESTORE DETAIL

NOTES:

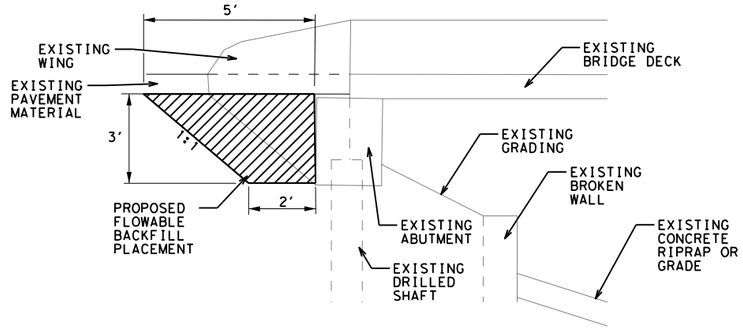
1. SEE ROADWAY TYPICAL SECTIONS FOR PAVEMENT REPLACEMENT SECTION. PAVEMENT USED TO RESTORE CUT AREAS SHALL BE PERMANENT PAVEMENT STRUCTURE.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE RIDING SURFACE OF THE REPLACED PAVEMENT. MAINTENANCE WILL BE SUBSIDIARY TO ITEM 400 CUT & RESTORING PAVEMENT (SY).
3. FLOWABLE BACKFILL PAID AS ITEM 401 FLOWABLE BACKFILL (CY). REFER TO CULVERT LAYOUT SHEETS FOR FLOWABLE BACKFILL QUANTITIES.



TRANSVERSE SECTION

STONE RIPRAP DETAIL AT JENNINGS CREEK BRIDGE

NOTE: GRADE AND EXCAVATE SOIL TO PLACE 3/4 OF STONE DEPTH BELOW SOIL SURFACE. THIS WORK WILL BE SUSIDIARY TO ITEN 432 RIPRAP



FLOWABLE BACKFILL AT BRIDGE ABUTMENTS

PLACEMENT TO BE THE SAME AT BOTH ABUTMENTS OF THE JENNINGS CREEK BRIDGE

STATE OF TEXAS
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95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
MISCELLANEOUS DETAILS

NOT TO SCALE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		56

DATE: 5/6/2021 4:05:55 PM
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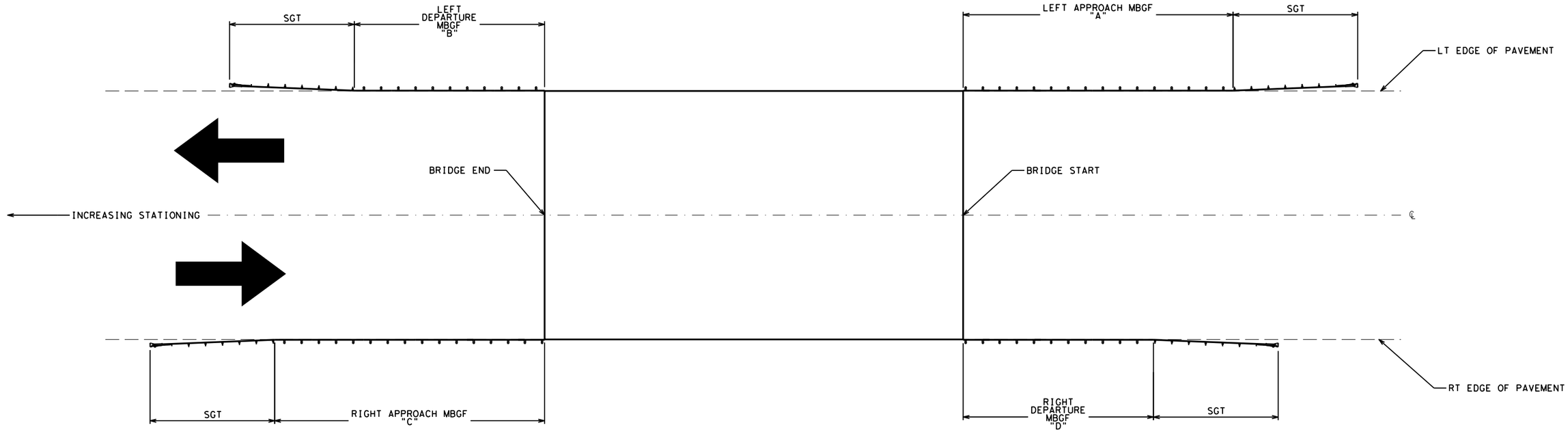

BRIDGE CROSSING	BRIDGE START	BRIDGE END	A	B	C	D
JENNINGS CREEK	584+95	585+70	200	50	200	50

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
MBGF AT
BRIDGE DETAIL

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		57

DATE: 5/5/2021 4:39:59 PM
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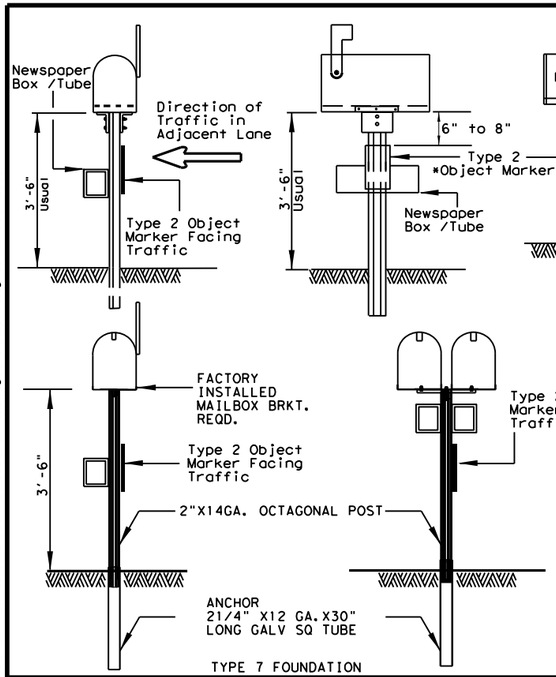


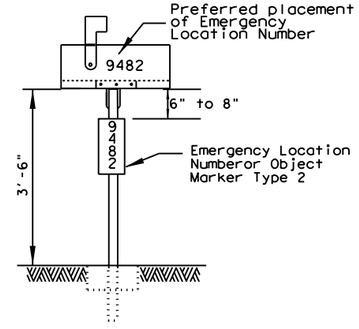
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

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

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

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



PLACEMENT OF EMERGENCY LOCATION NUMBER

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

MAILBOX SIZES

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH (INCHES)	WIDTH (INCHES)	HEIGHT (INCHES)	MAXIMUM WEIGHT (POUNDS)	
SMALL	19 ½	6	7	5	5
MEDIUM	22 ½	8	11 ½	7	7
LARGE	23 ½*	11 ½*	13 ½*	10	10

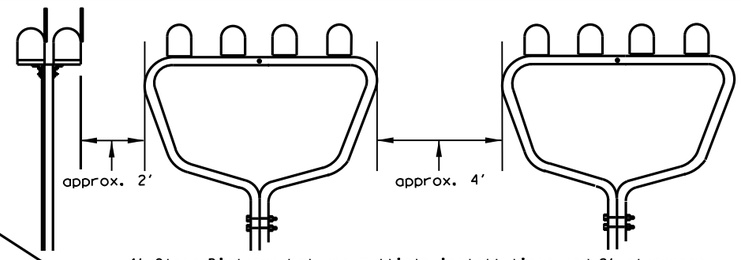
* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT (POUNDS)
SIDE	18	15	18.3	15	22.4
BACK	11 ½	11 ½		15	

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

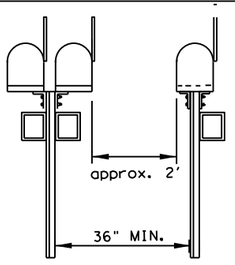
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

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



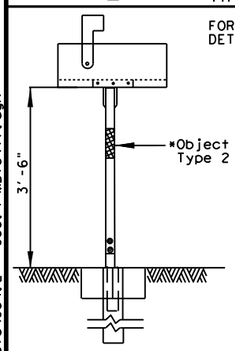
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

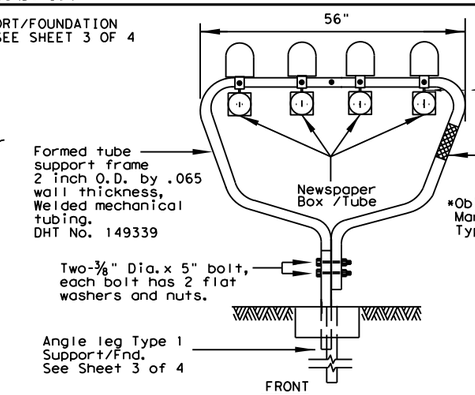
MULTIPLE MAILBOX PLACEMENT

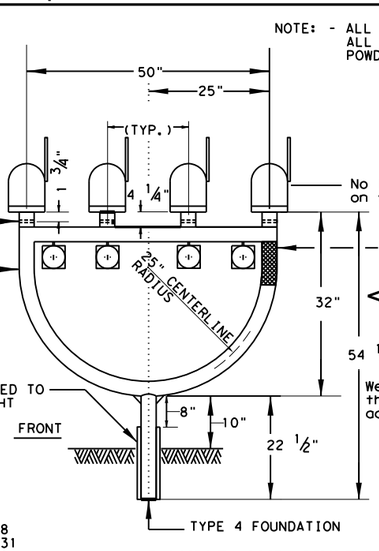


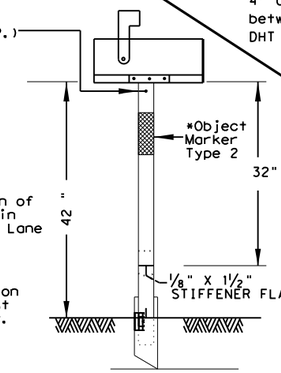
Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

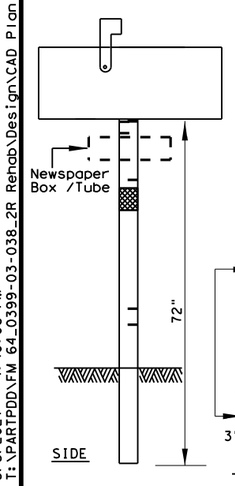
SINGLE & DOUBLE MAILBOX PLACEMENT

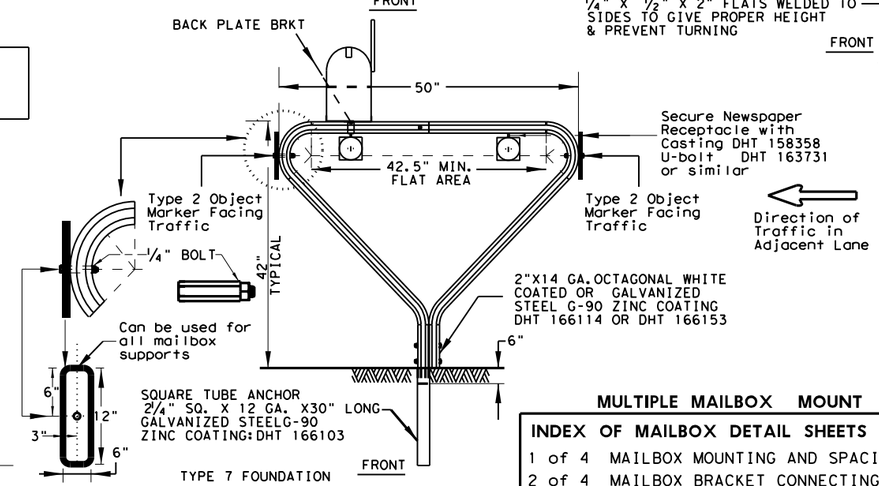












DOUBLE AND MULTIPLE MAILBOX MOUNT

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

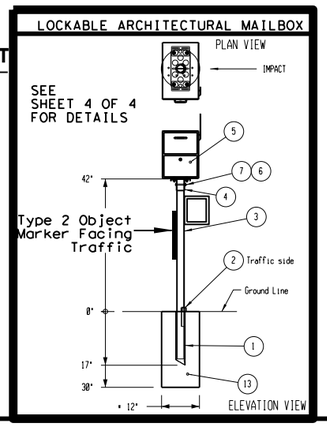
MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

NEWSPAPER RECEPTACLE

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

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



SHEET 1 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		58

5/5/2021 4:40:02 PM
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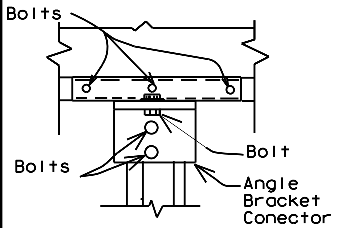
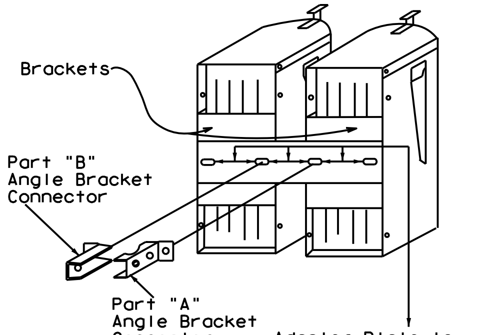


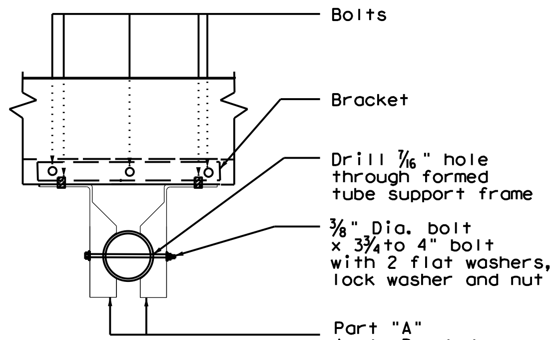
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

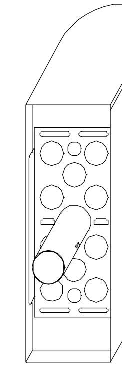


(Not permitted for Large Mailboxes)

DOUBLE MAILBOX

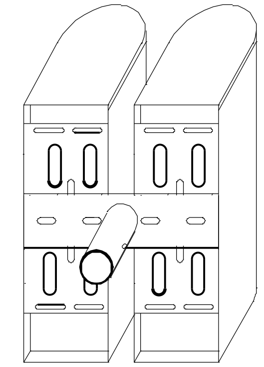


MULTIPLE MAILBOX



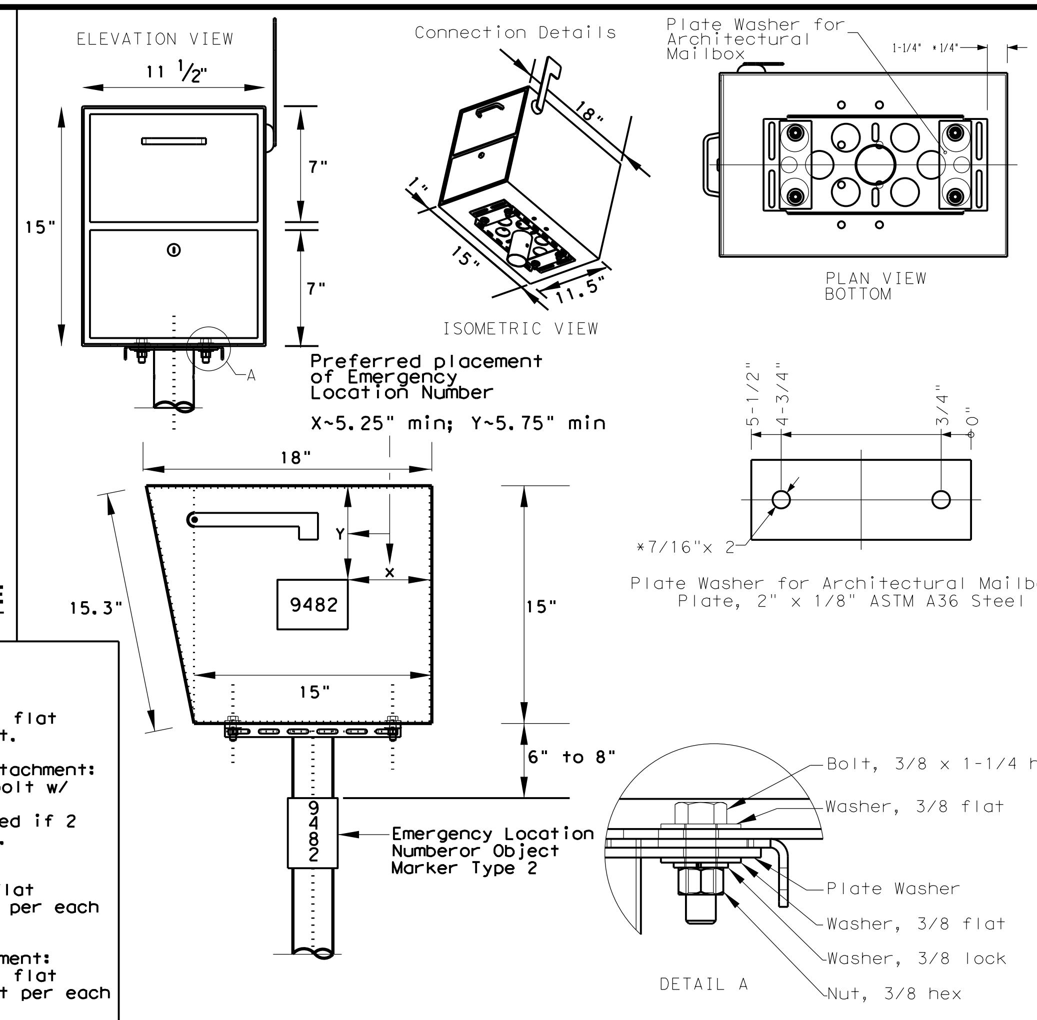
To be used with 2 3/8" OD RR or thinwall Steel posts.

WELDED SINGLE MAILBOXBRACKET

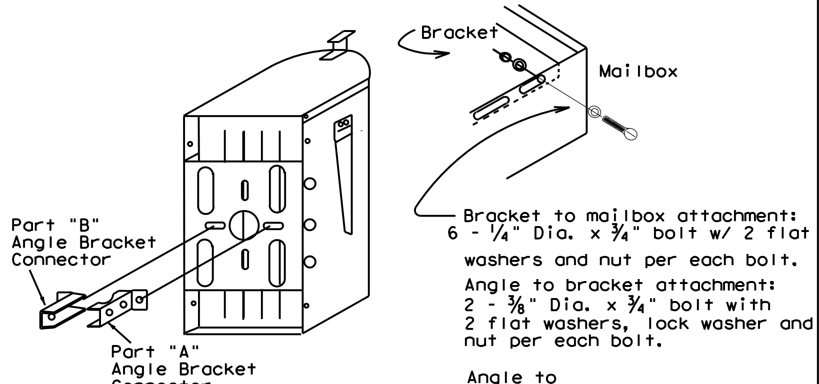


To be used with thinwall Steel posts. Not to be used with RR posts.

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS

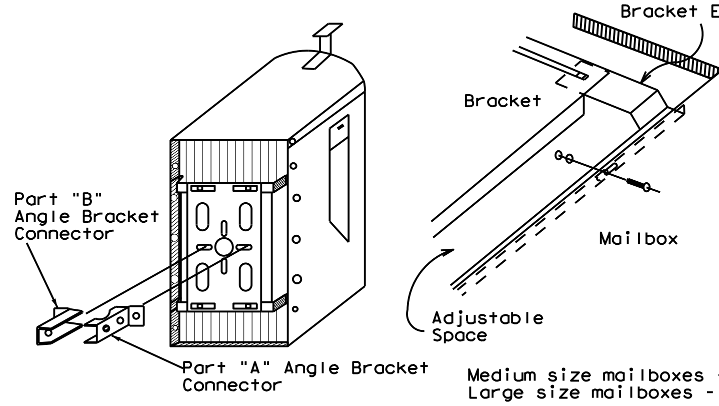


Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/ 2 flat washers and nut per each bolt.

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to
2 - 3/8" Dia. x 2 1/2" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



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

Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/2 flat washers and nut per each bolt.

Bracket to bracket extension attachment:
2 - 1/4" Dia. x 3/4" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt w/2 flat washers, lock washer and nut per each bolt.

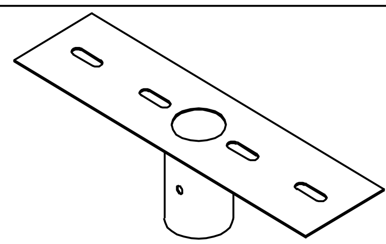
Angle to mailbox support attachment:
2 - 3/8" Dia. x 2 1/2" bolt w/2 flat washers, lock washer, and nut per each bolt.

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

MEDIUM AND LARGE MAILBOXES

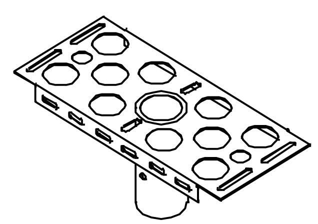
GENERAL NOTES

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



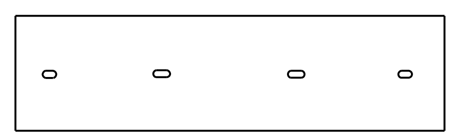
DHT 162323

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



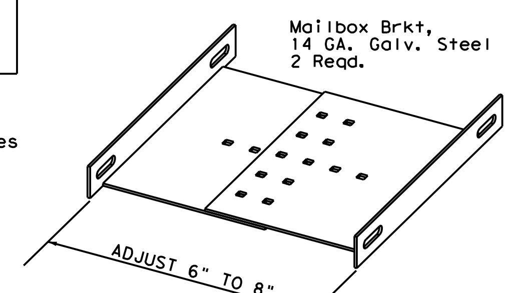
DHT 161443

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

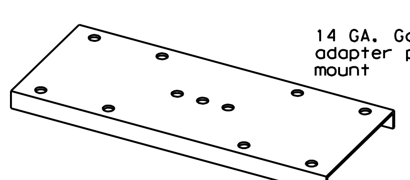


DHT #3789

Used for mounting two Mailboxes on the same post.



DHT 166105

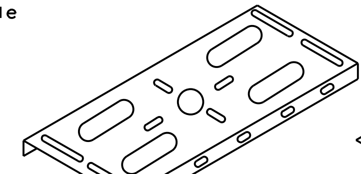


14 GA. Galv. Steel adapter plate for double mount

DHT 166108

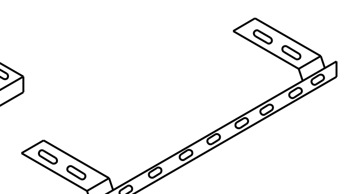
HARDWARE AT TXDOT REGIONAL WAREHOUSES

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



DHT 148939

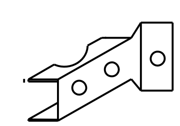
Mailbox Bracket



DHT 148938

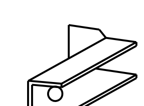
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



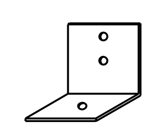
DHT 159489

Part "A"
Angle Bracket
Connector



DHT 159490

Part "B"
Angle Bracket
Connector



DHT 2917

Angle Bracket
For Temporary
Mailbox

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

Texas Department of Transportation — Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS ADDED DHT 163730	0399	03	038	FM 64
	DIST		COUNTY	SHEET NO.
	PAR		Delta	59

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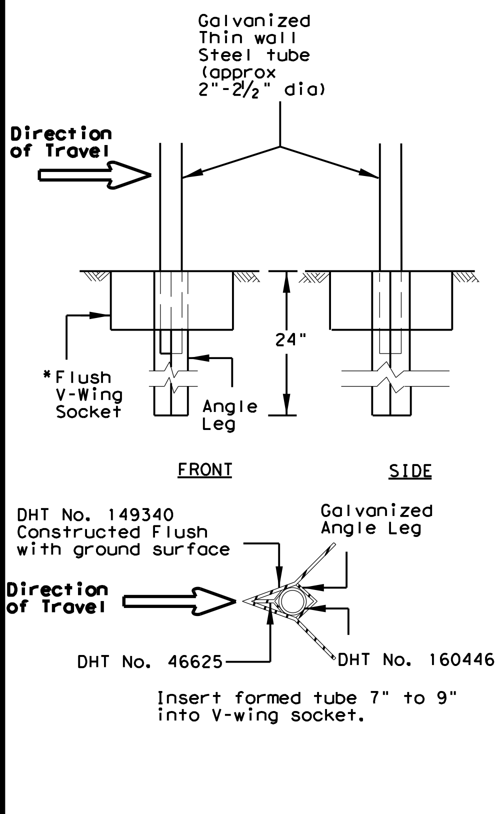
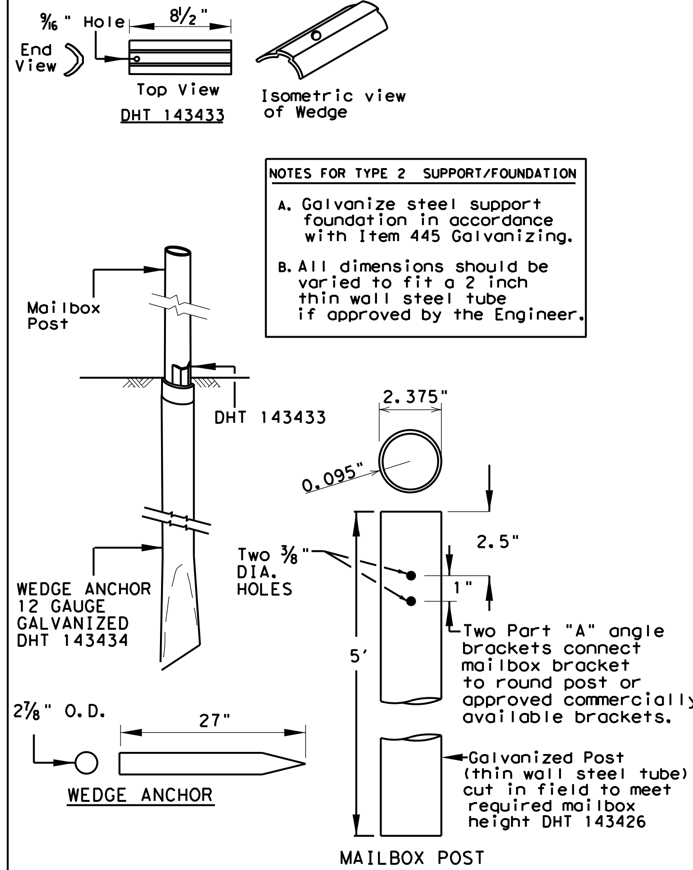


TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



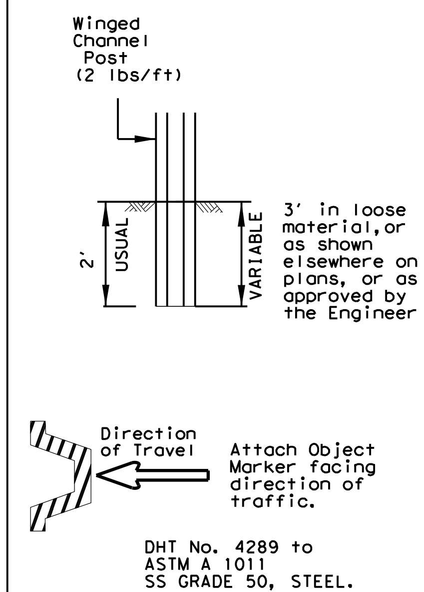
NOTES FOR TYPE 2 SUPPORT/FOUNDATION

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

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

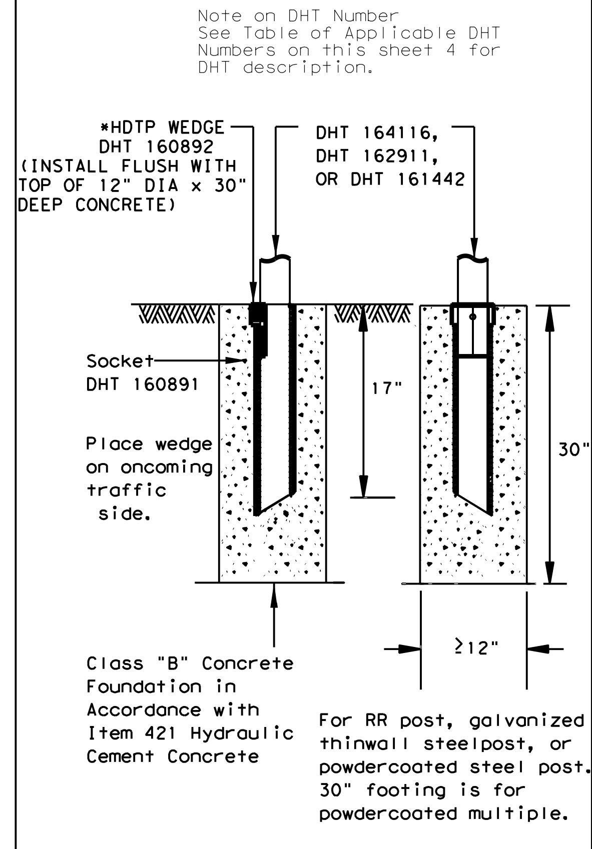
TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



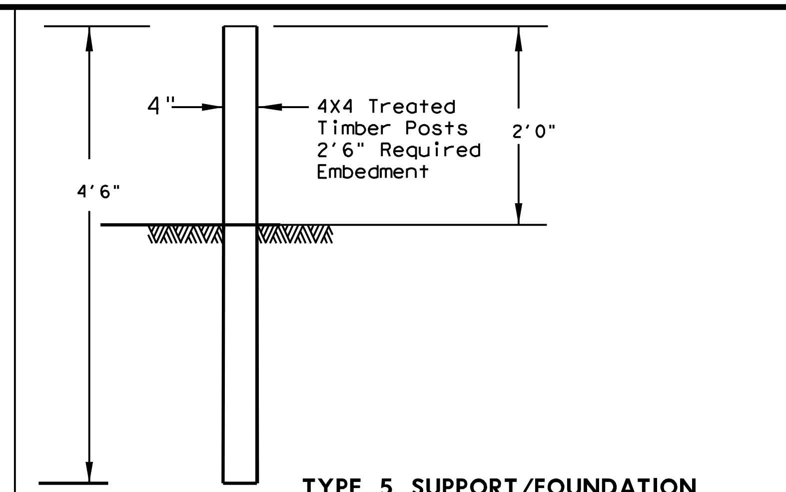
TYPE 3 SUPPORT/FOUNDATION

WINGED CHANNEL POST



TYPE 4 SUPPORT/FOUNDATION

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

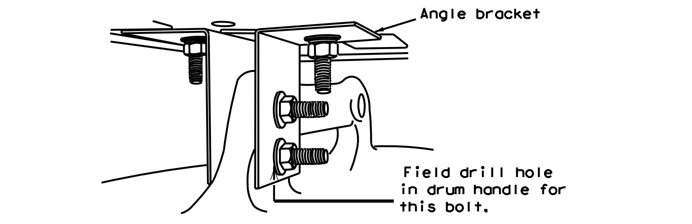


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

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



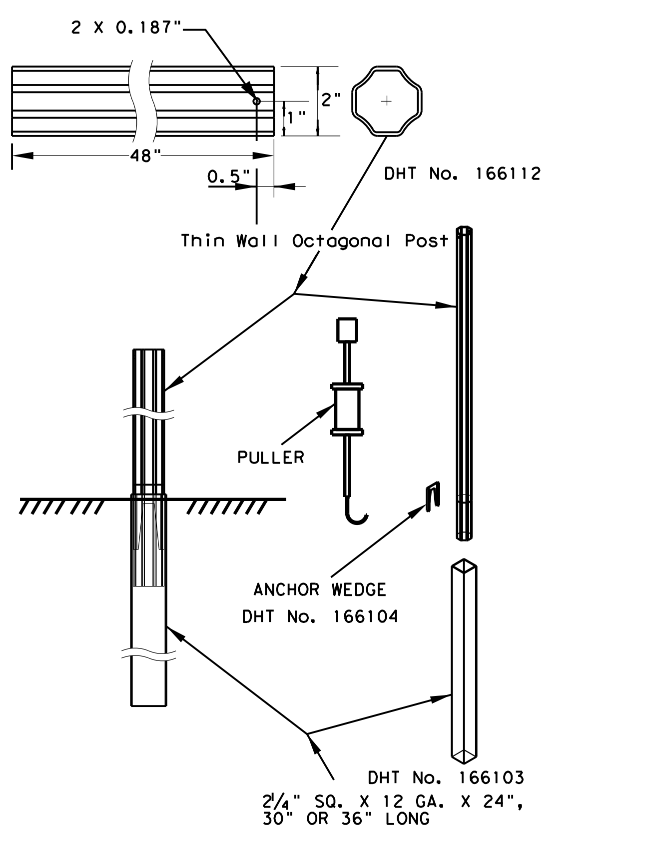
Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition.



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

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

Type of Mailbox
S = Single
D = Double
M = Multiple
SP = Single Plastic

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

Type of Foundation
Ty 1 = V-Loc
Ty 2 = Wedge Anchor Steel System
Ty 3 = Winged Channel post
Ty 4 = Wedge Anchor Plastic System
Ty 5 = 4 X 4 Post
Ty 7 = Wedge Anchor

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

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

SHEET 3 OF 4

Texas Department of Transportation
Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST		COUNTY	SHEET NO.
	PAR		Delta	60

LOCKABLE ARCHITECTURAL MAILBOX

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

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

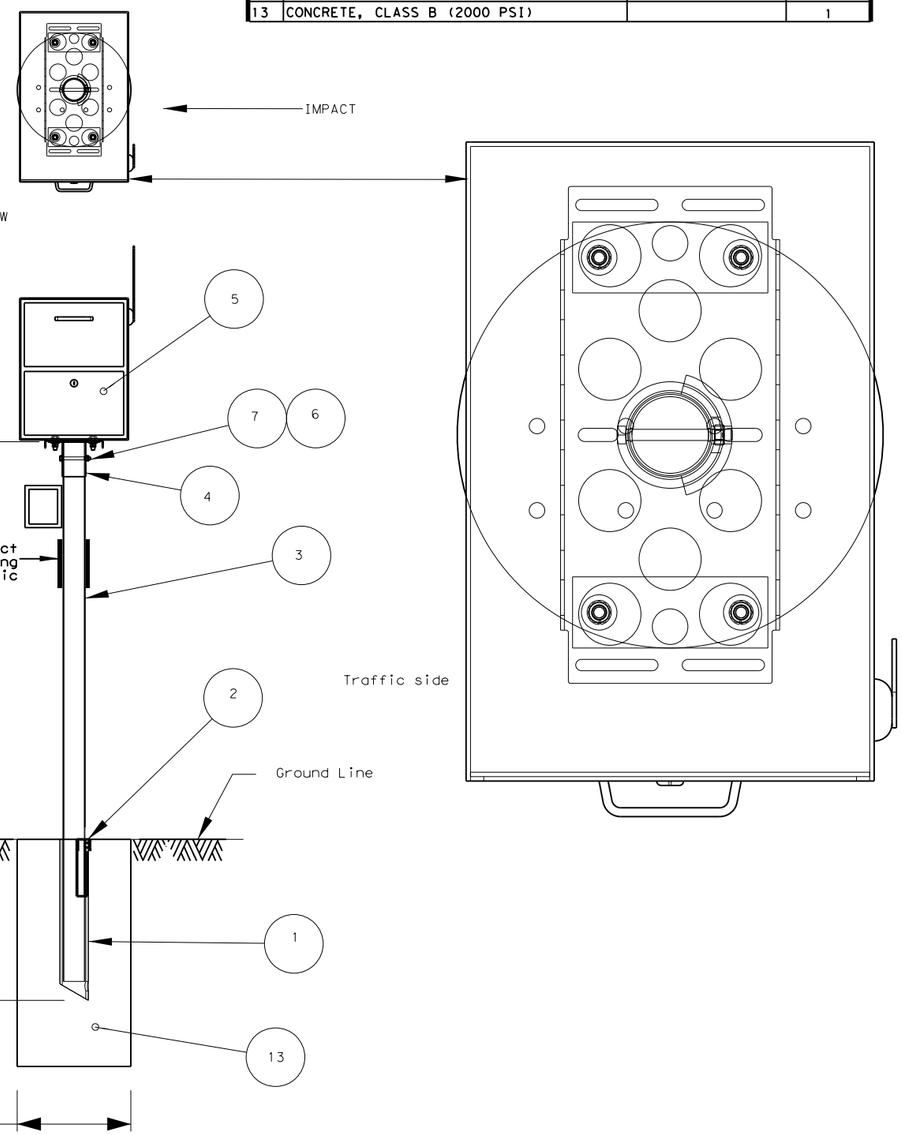


TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION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

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Texas Department of Transportation — Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	PAR	Delta		61

DATE: 5/5/2021
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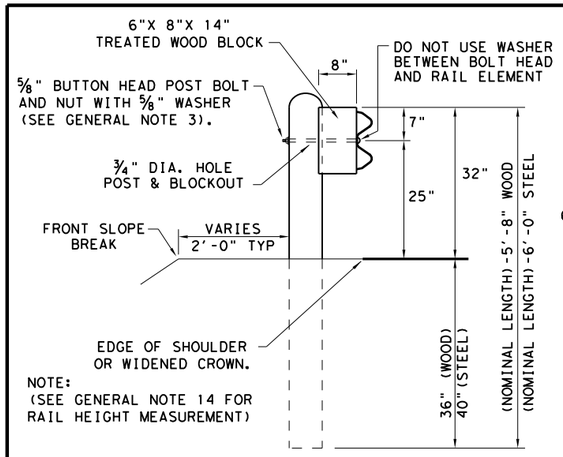
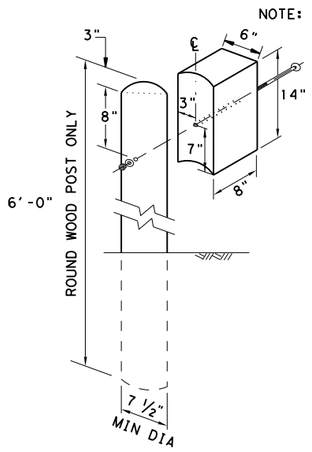
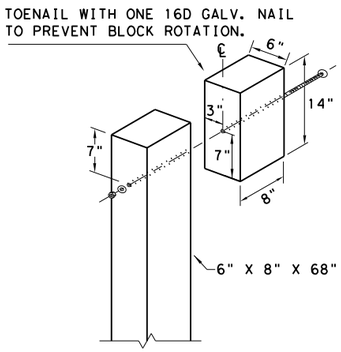


TYPICAL POST PLACEMENT

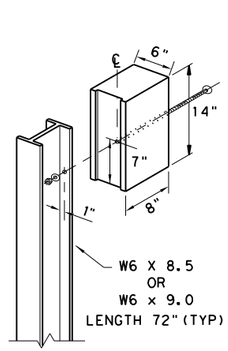


WOOD BLOCK TO ROUND WOOD POST

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

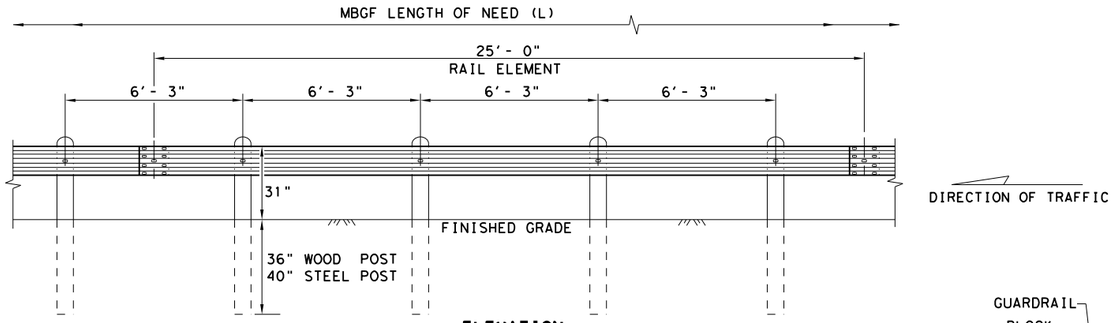


WOOD BLOCK TO RECTANGULAR WOOD POST



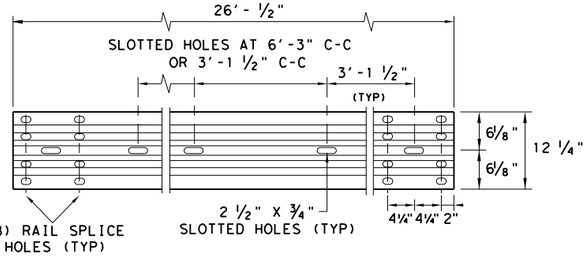
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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.

SPLICE BOLT LENGTH — VARIES

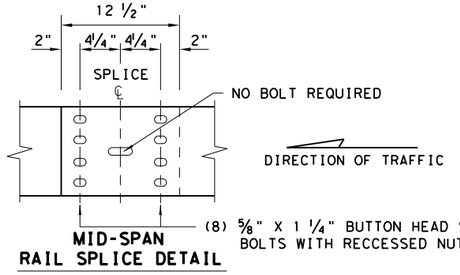
FBB01 = 1 ¼"
FBB02 = 2"

⅝"

POST & BLOCK LENGTH
FBB03 = 10"
FBB04 = 18"

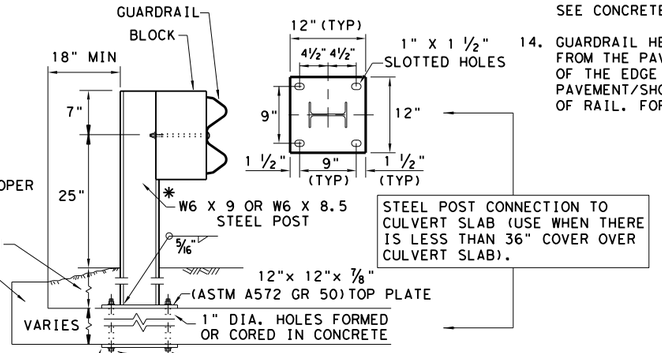
BUTTON HEAD BOLT

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.



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	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		62

DATE: 5/5/2021
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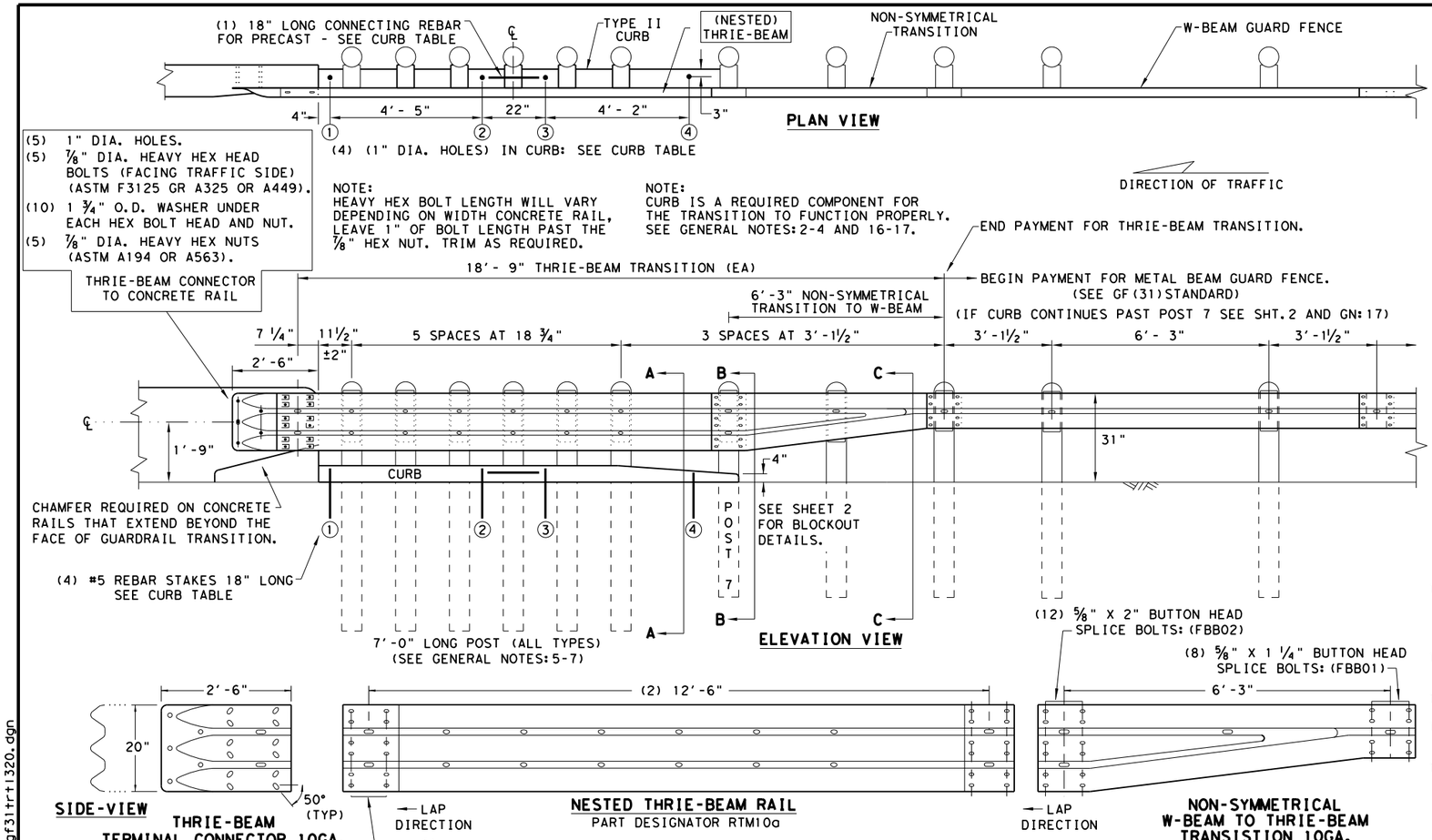
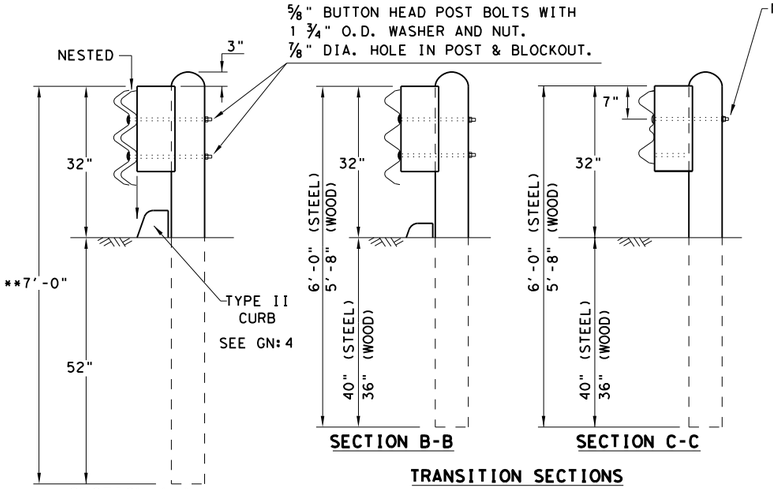
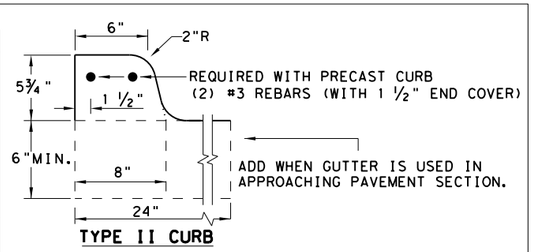




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB 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.



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

* 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 DETAILS

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.

HIGH-SPEED TRANSITION

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

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©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	PAR	Delta		63

DATE: 5/5/2021
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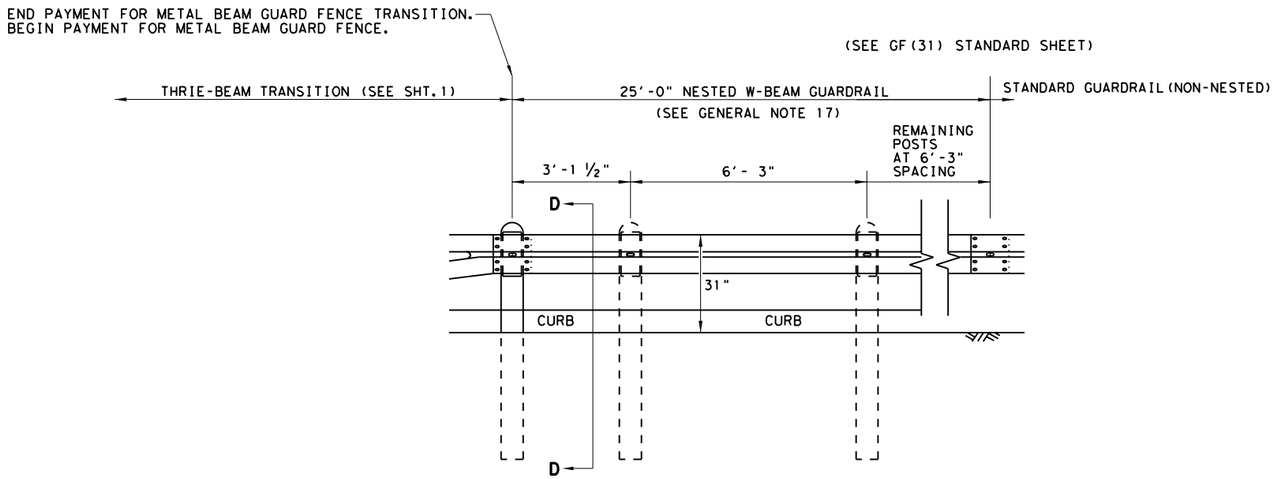
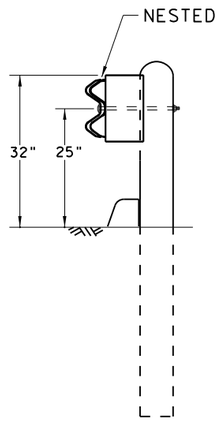
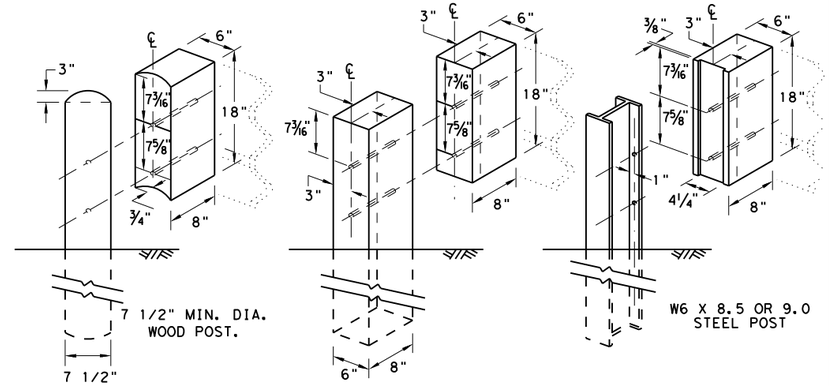
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

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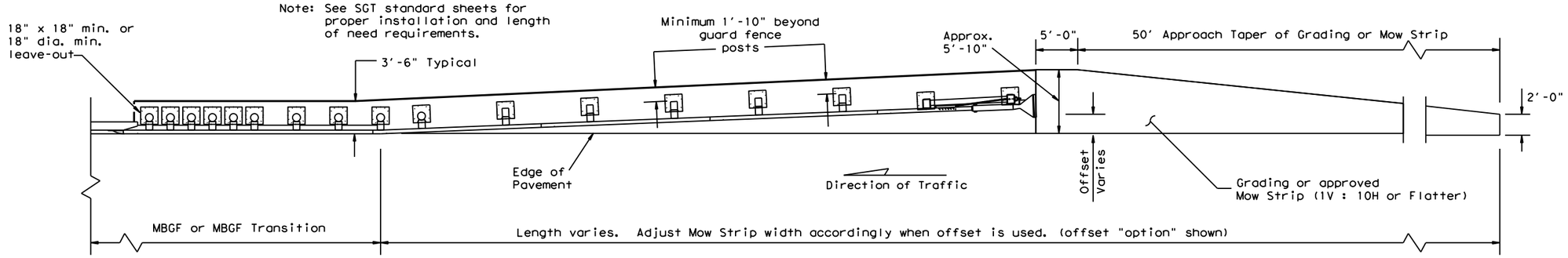
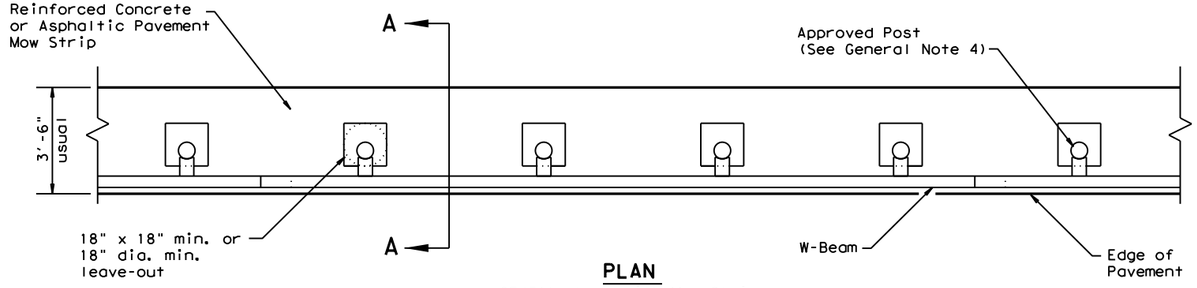
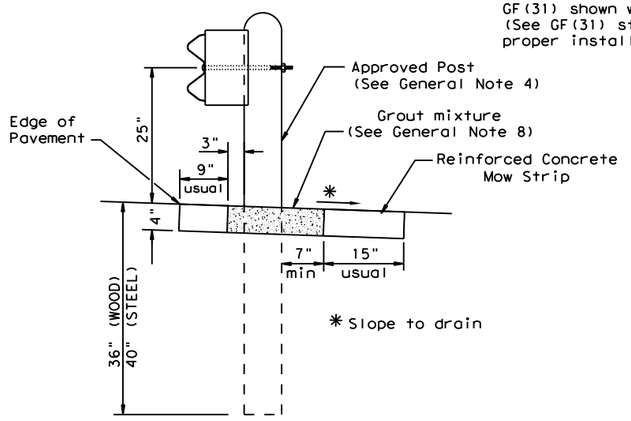


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



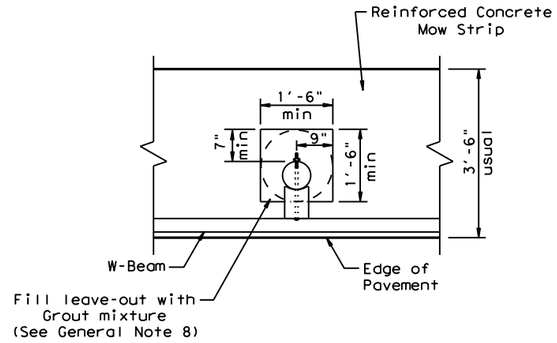
PLAN

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



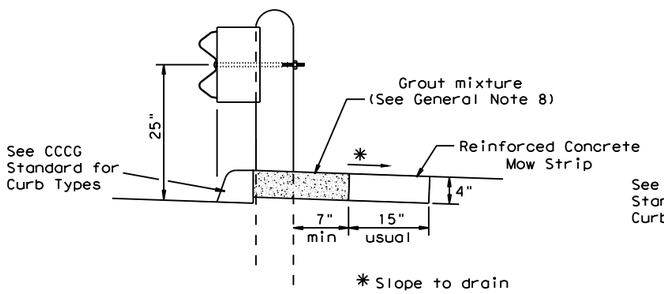
SECTION A-A

Typical



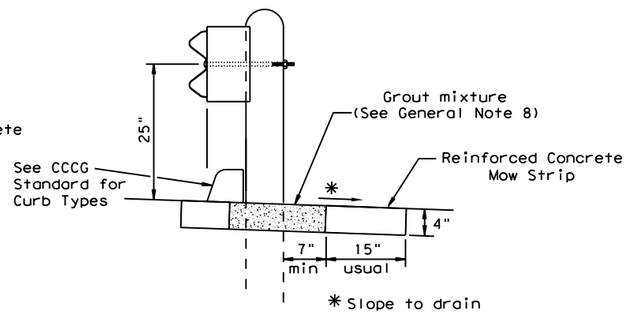
MOW STRIP DETAIL

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



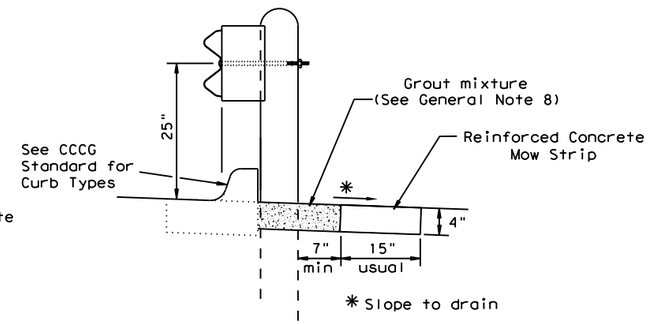
CURB OPTION (1)

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
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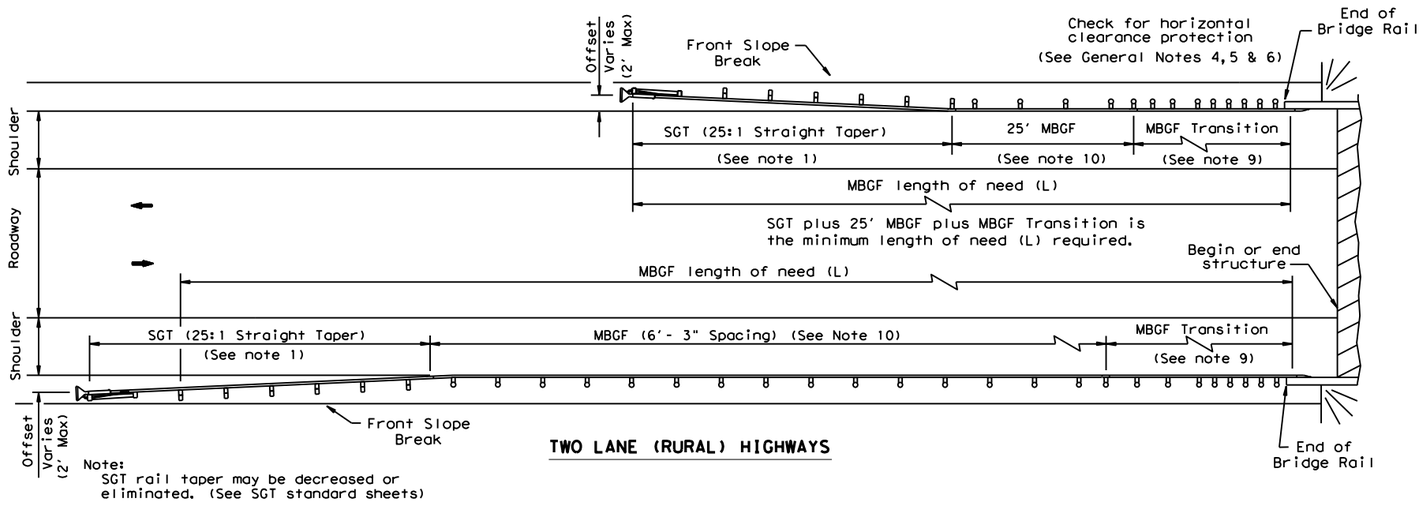
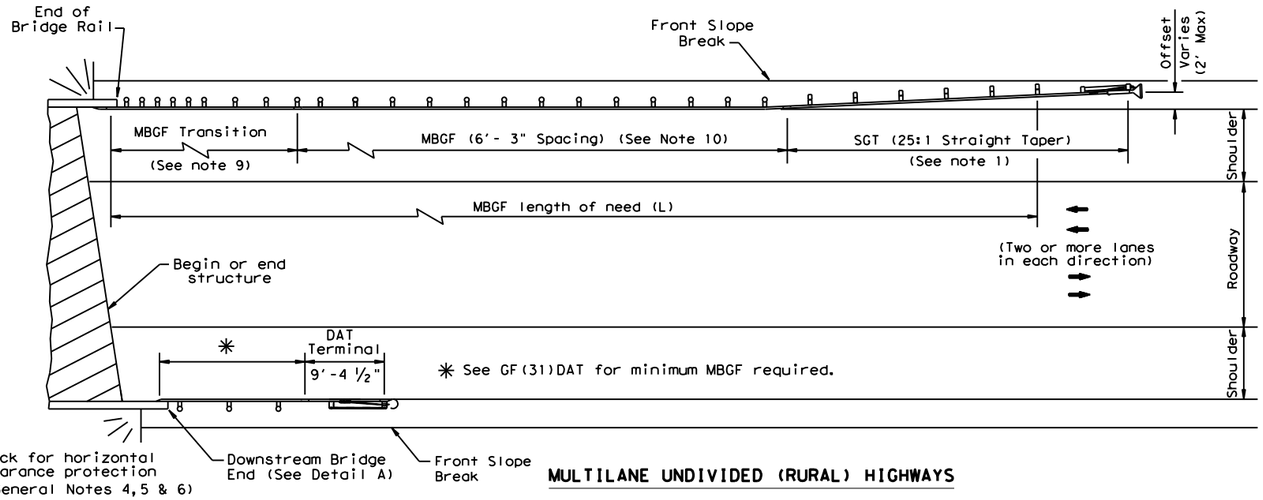
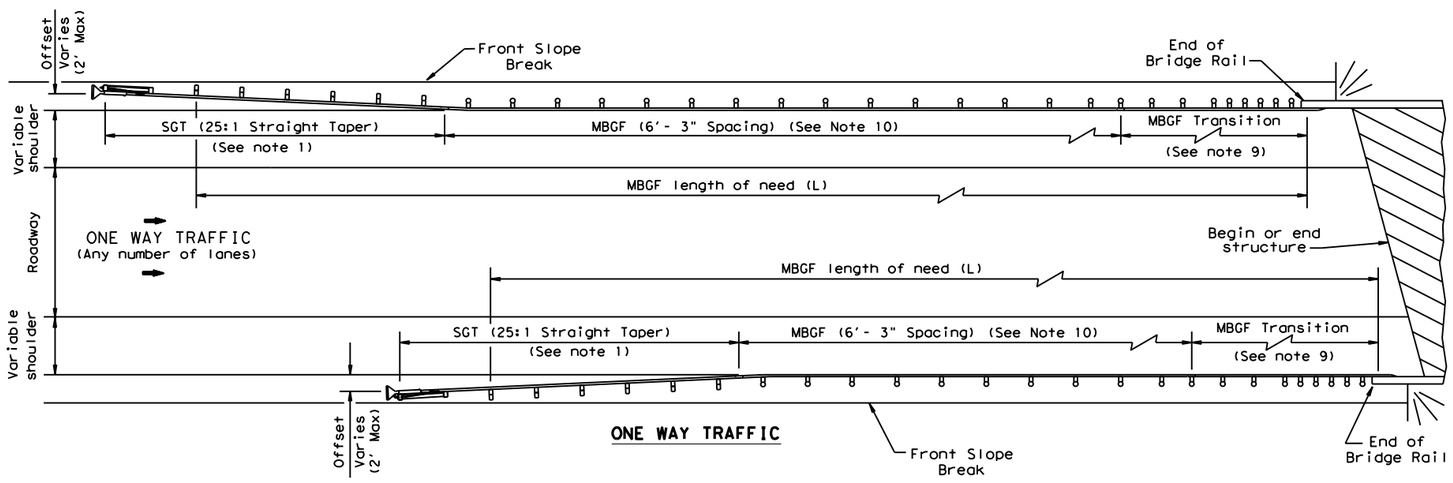


TWO LANE (RURAL) HIGHWAYS

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



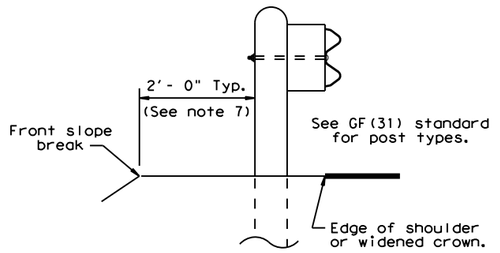
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



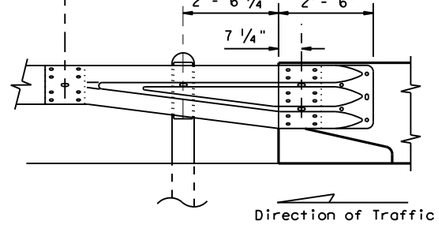
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the 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. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, 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 in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
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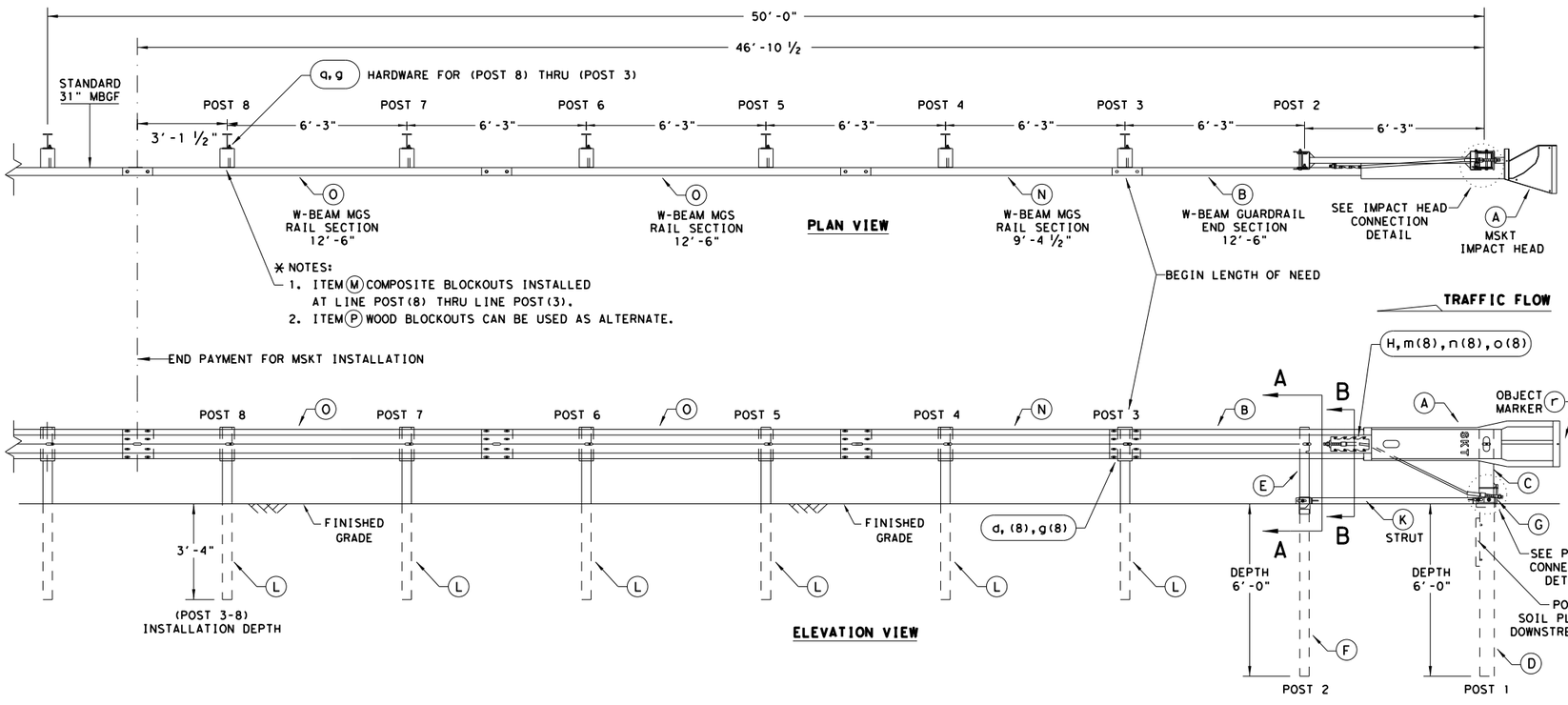


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

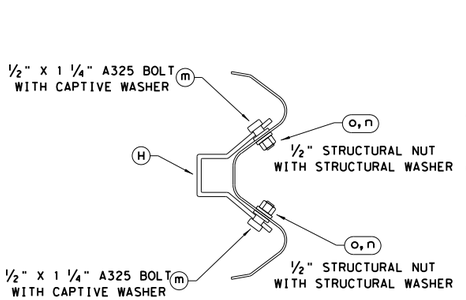
GENERAL NOTES

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

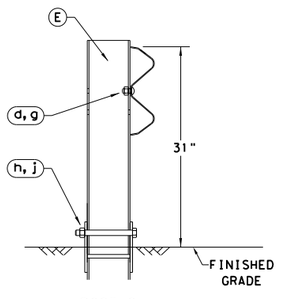
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
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: *

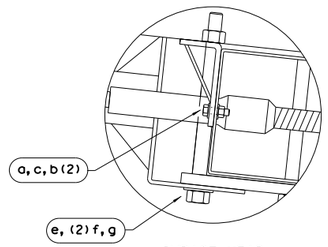
ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



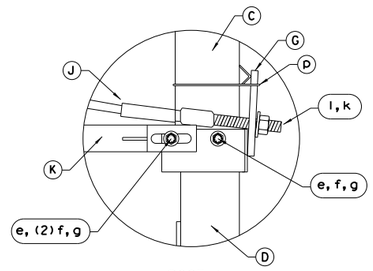
SECTION B-B
ANCHOR BRACKET



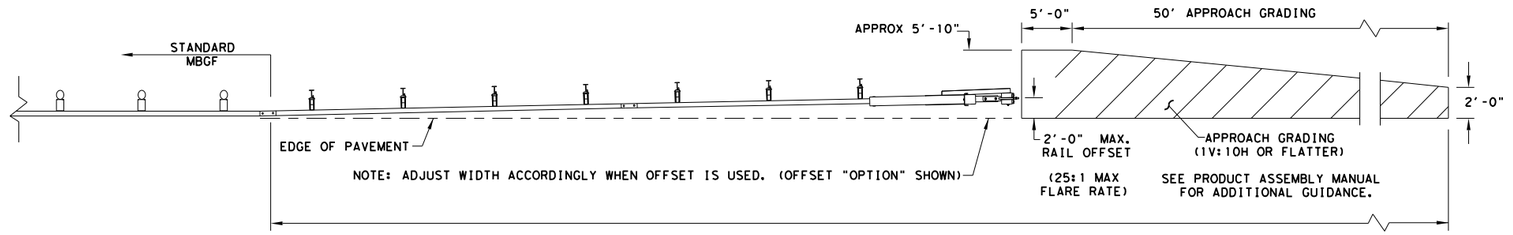
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



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

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

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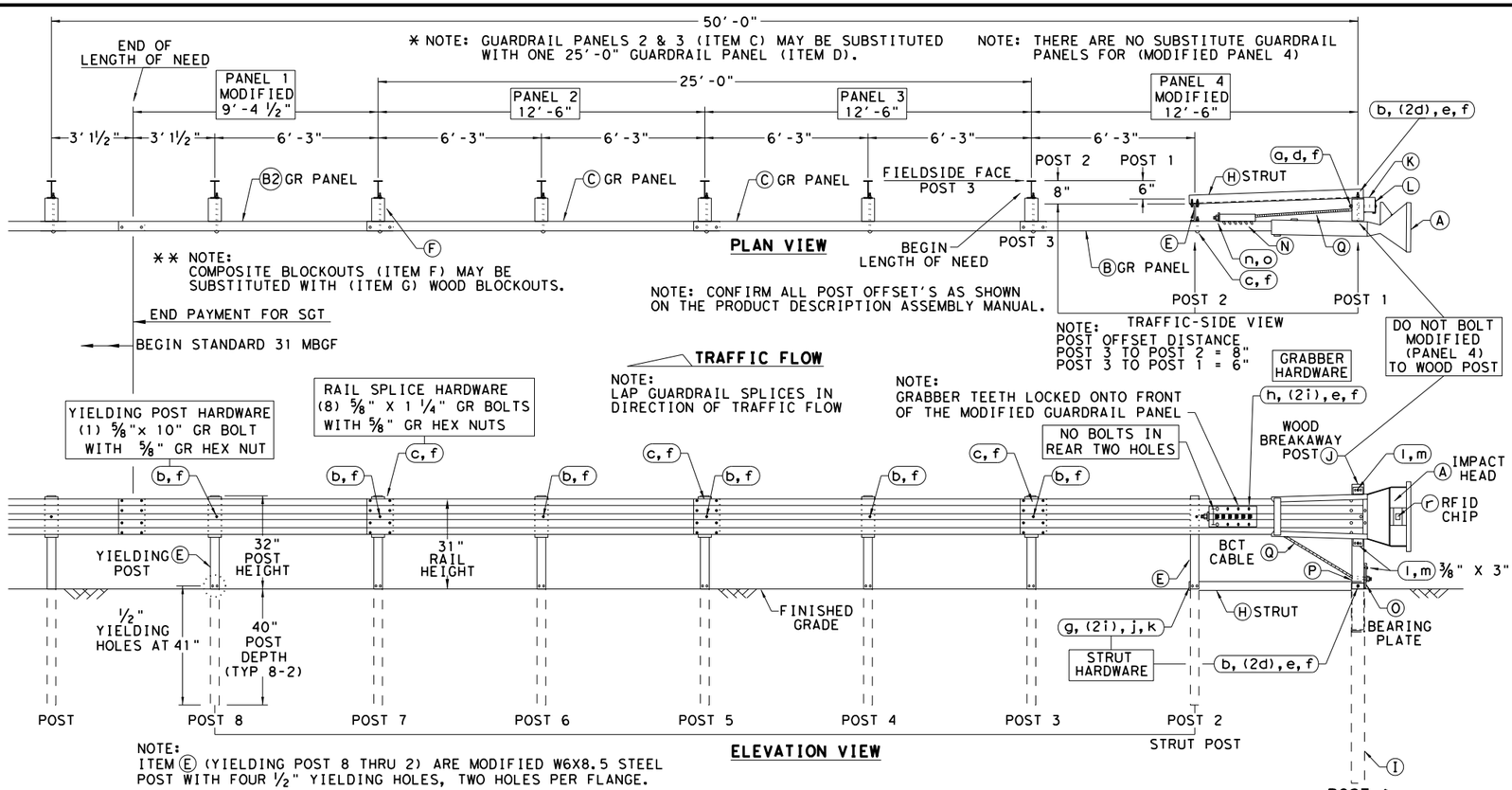
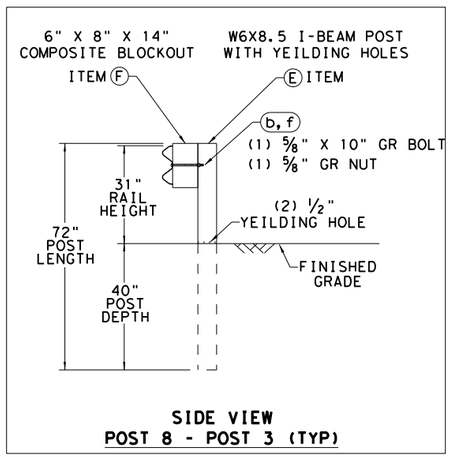


GENERAL NOTES

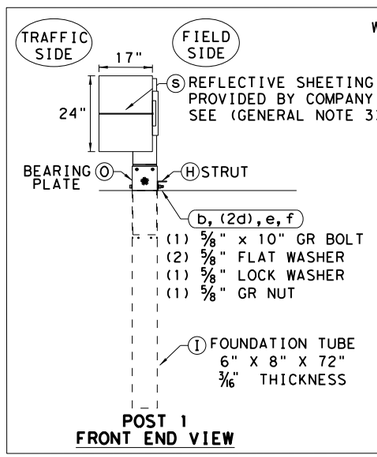
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

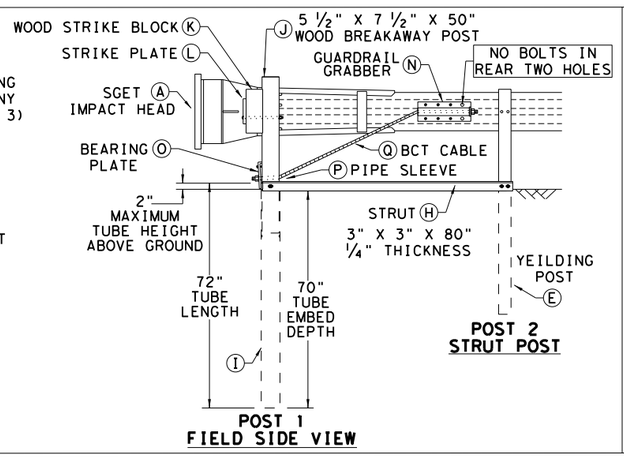
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



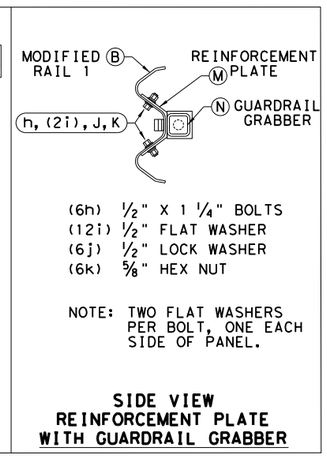
SIDE VIEW
POST 8 - POST 3 (TYP)



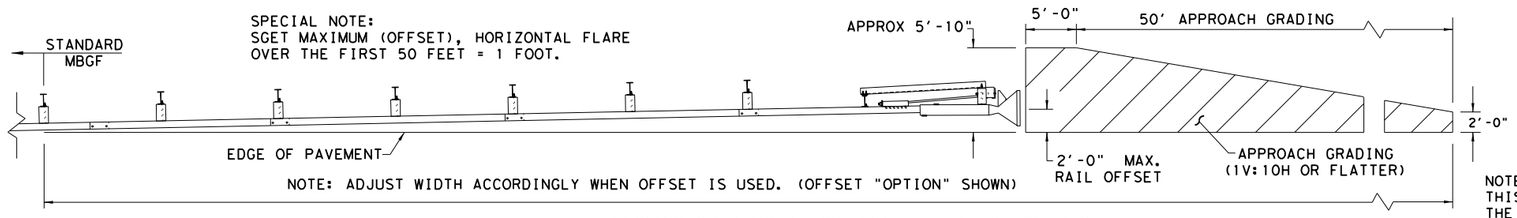
POST 1
FRONT END VIEW



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

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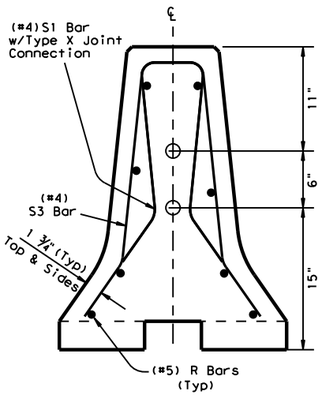
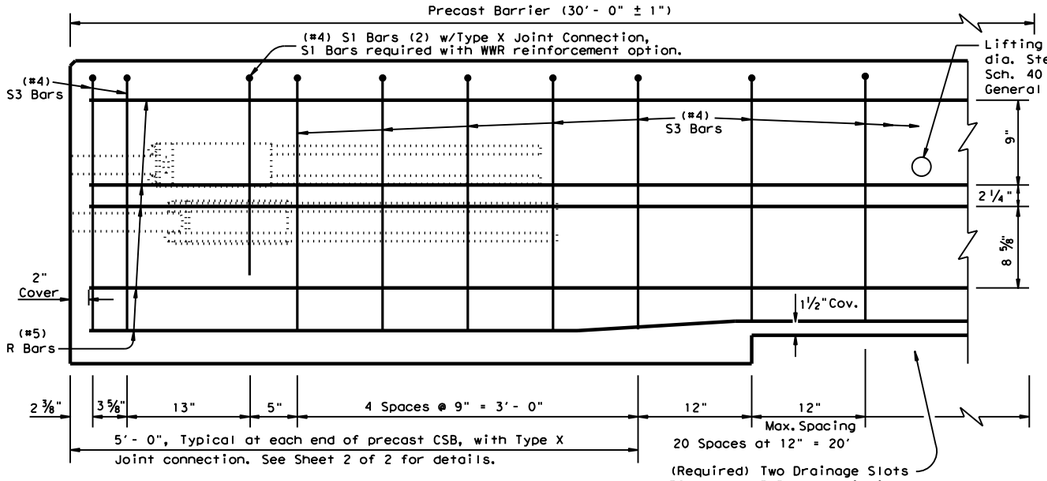


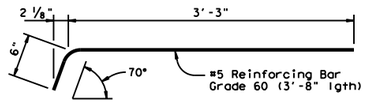
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



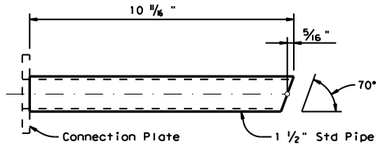
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



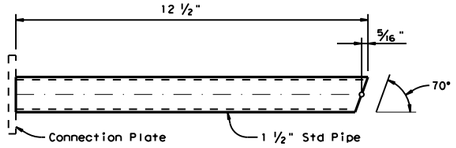
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



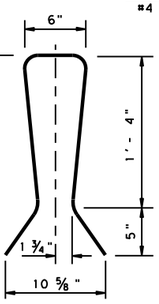
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



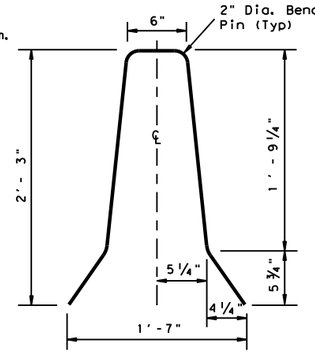
LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.



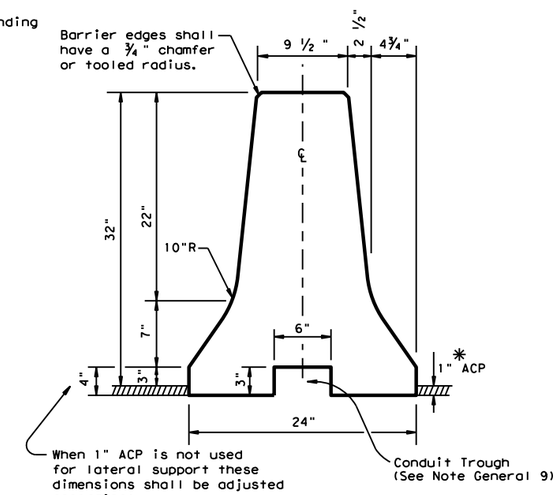
S1 Bar

#4 Bar (2)
(Joint Type X)



S3 Bar

#4 Bar

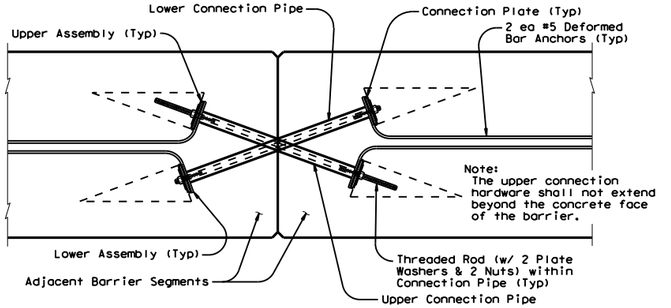


Concrete Safety Barrier

✱ When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.

GENERAL NOTES

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

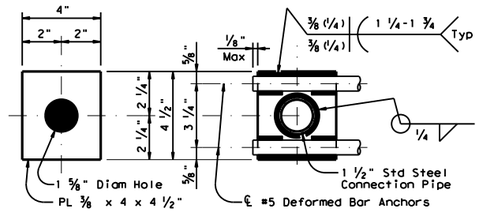
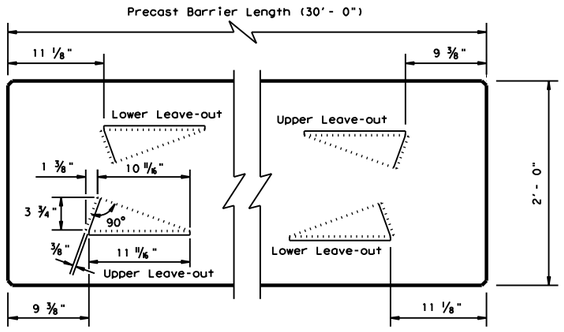


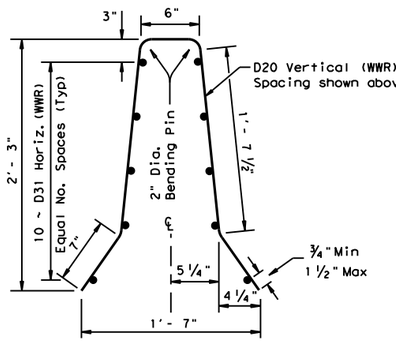
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



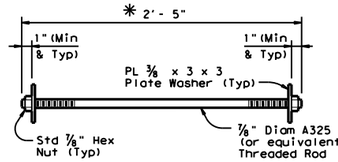
BARRIER PLAN AT END JOINTS



Welded Wire Reinforcement (WWR) Option for Bars R and S3

(WWR) General Notes

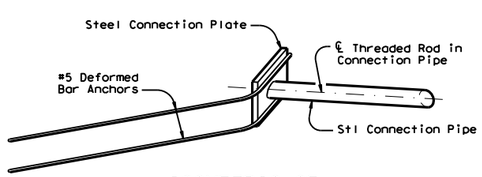
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts) (w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per Joint.

✱ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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	PAR	Delta		69

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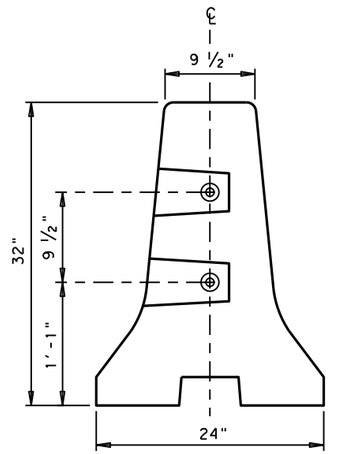
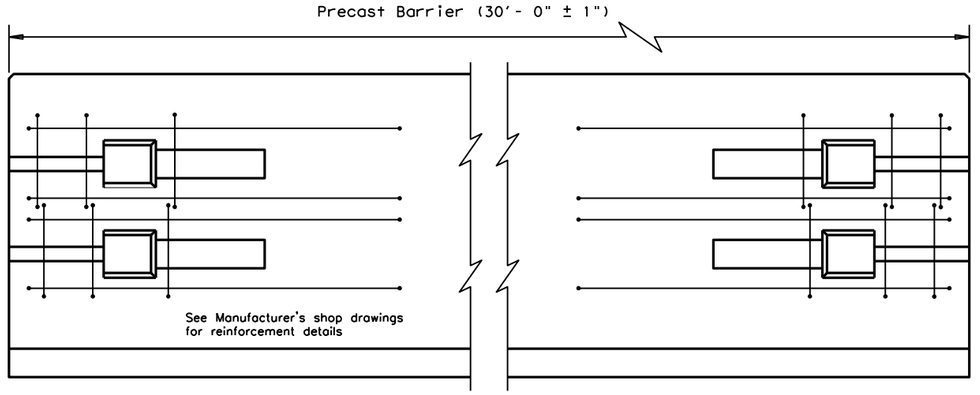
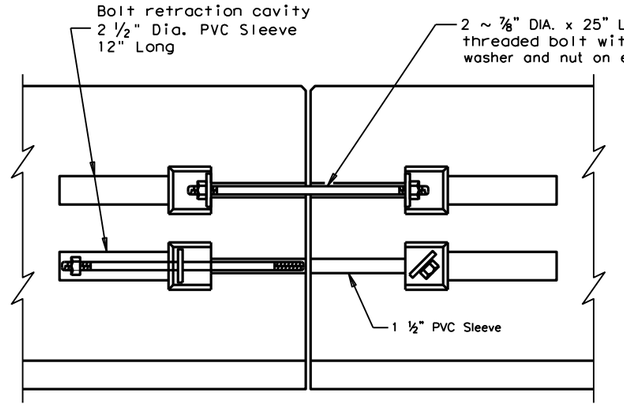


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

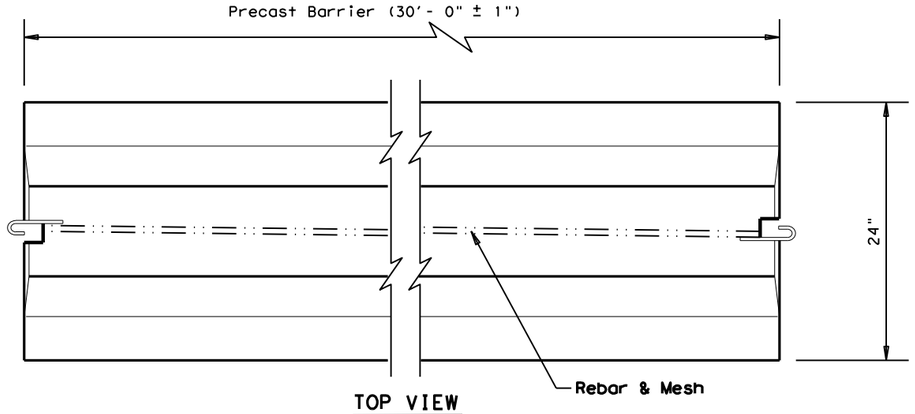


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

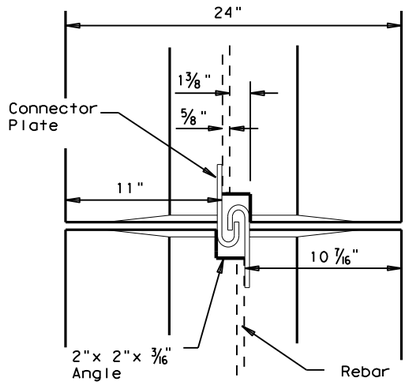


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

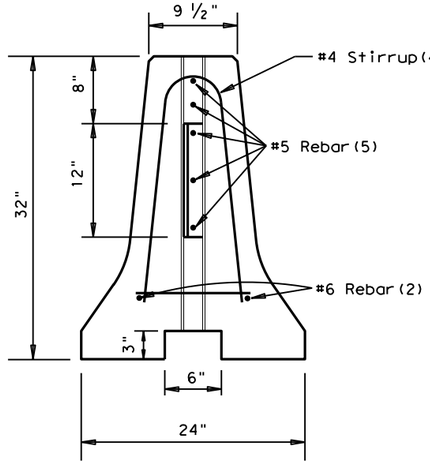
Joint Connection (Type Q)



TOP VIEW
PRECAST (CSB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

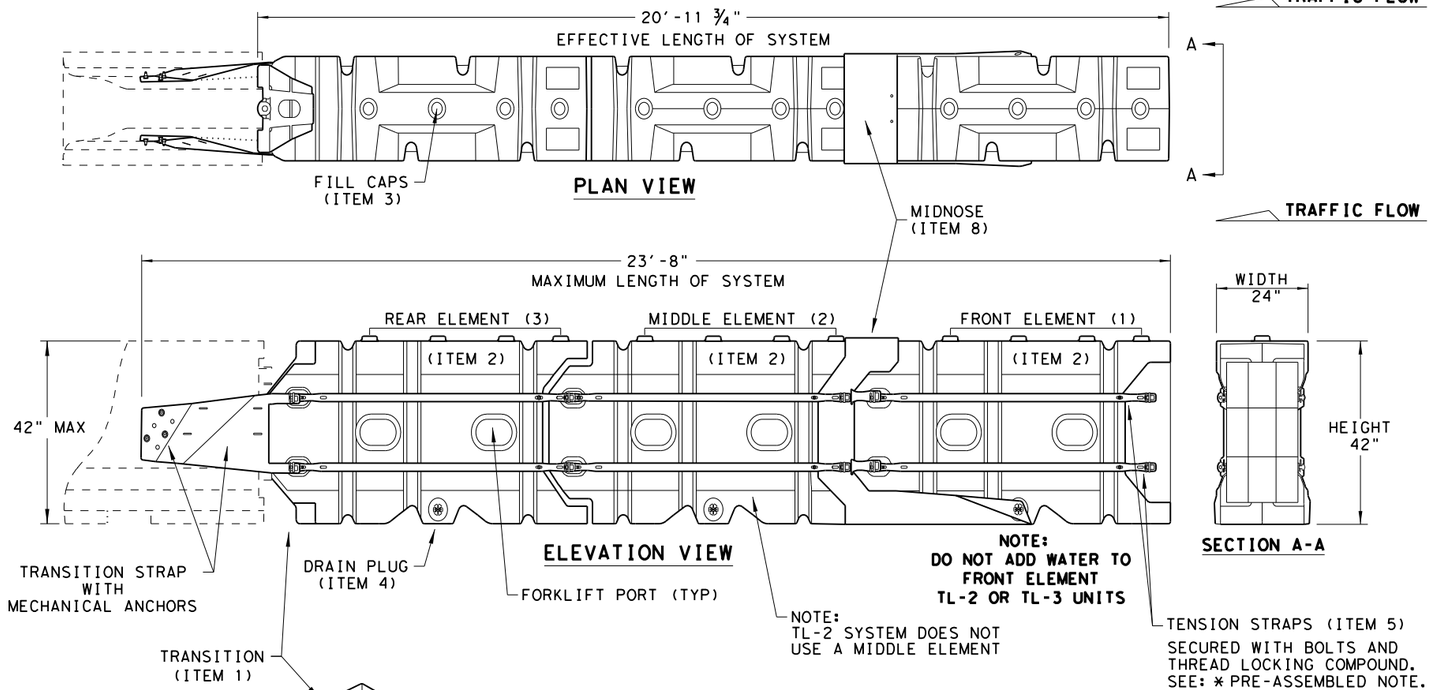
PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		70

DATE: 5/5/2021
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\054.5.7 absorbm19.dgn

SYSTEM SHOWN - ABSORB-M TL-3



THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

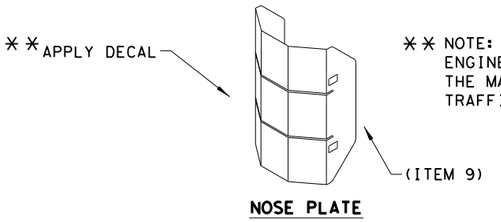
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
* 6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
* 7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



** NOTE: (PROVIDED BY OTHERS) ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALs ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE ABSORB-M, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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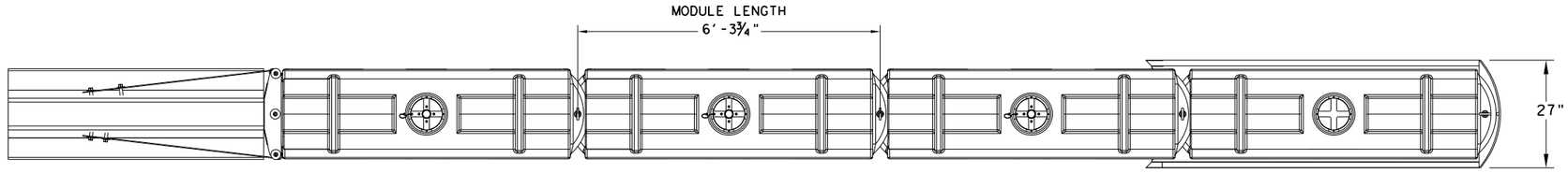
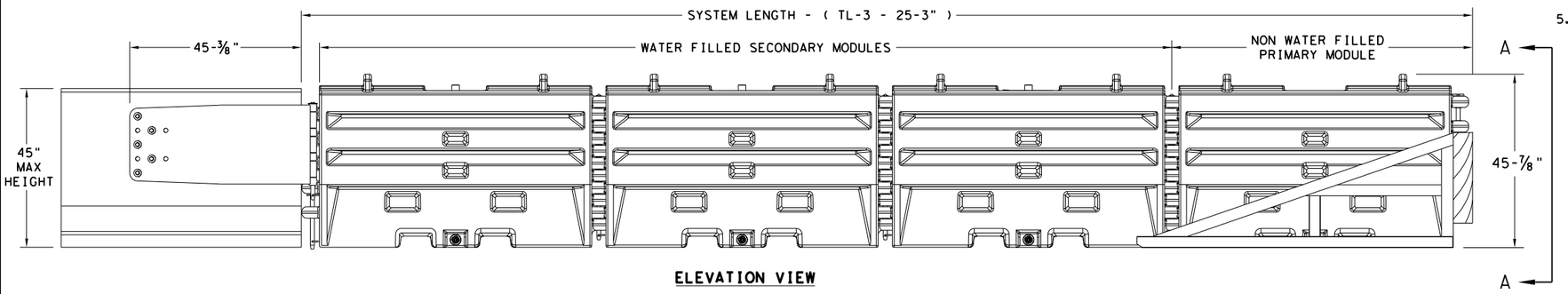


PLAN VIEW



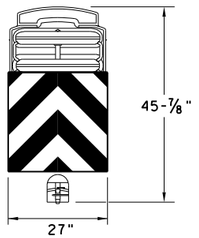
ELEVATION VIEW

GENERAL NOTES

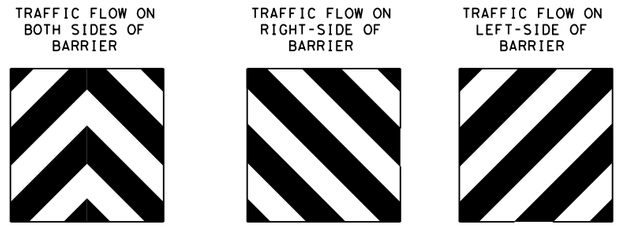
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"

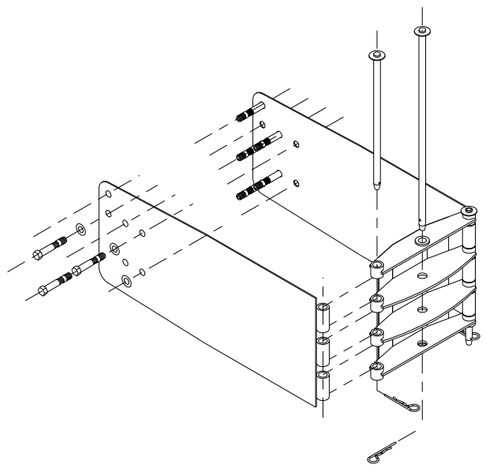


SECTION A-A



NOSE SHEETING PANEL DELINEATION

NOTE:
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

BILL OF MATERIAL

PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1

Texas Department of Transportation — Design Division Standard

SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	PAR	Delta		72

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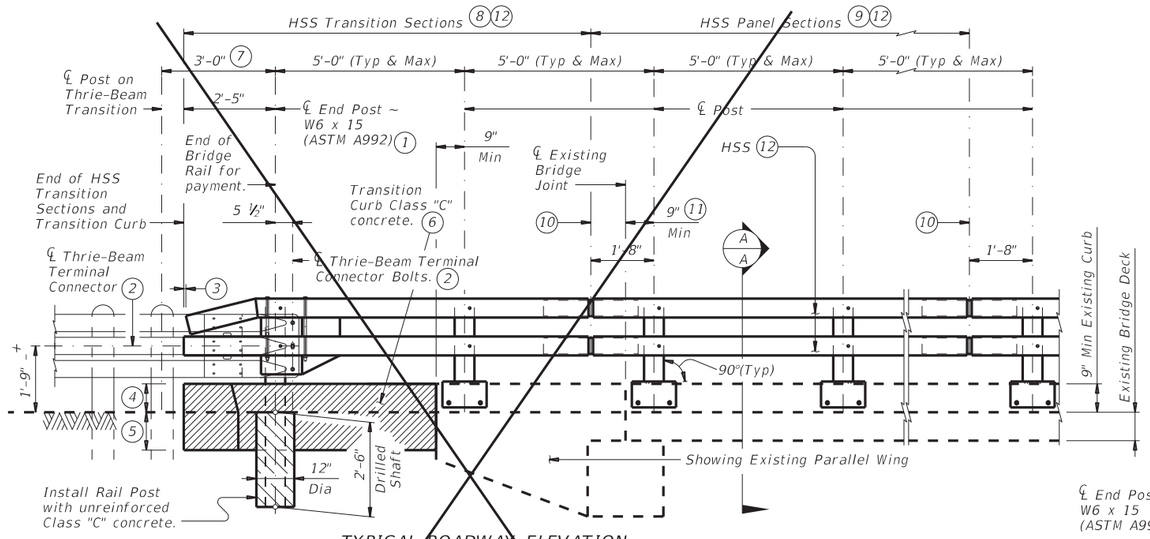
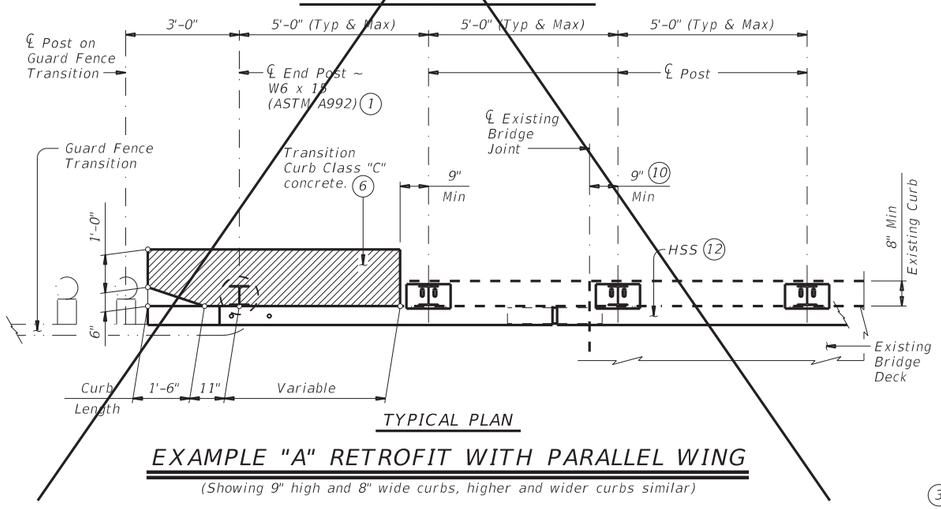


TYPICAL ROADWAY ELEVATION

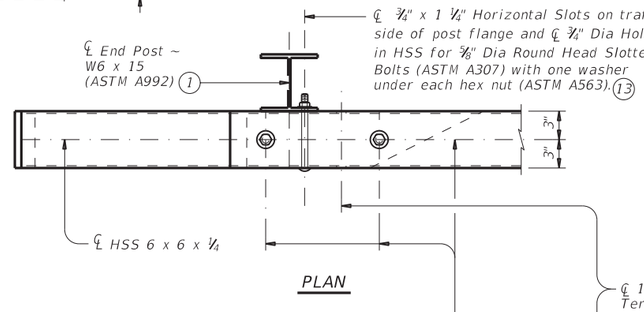


TYPICAL PLAN

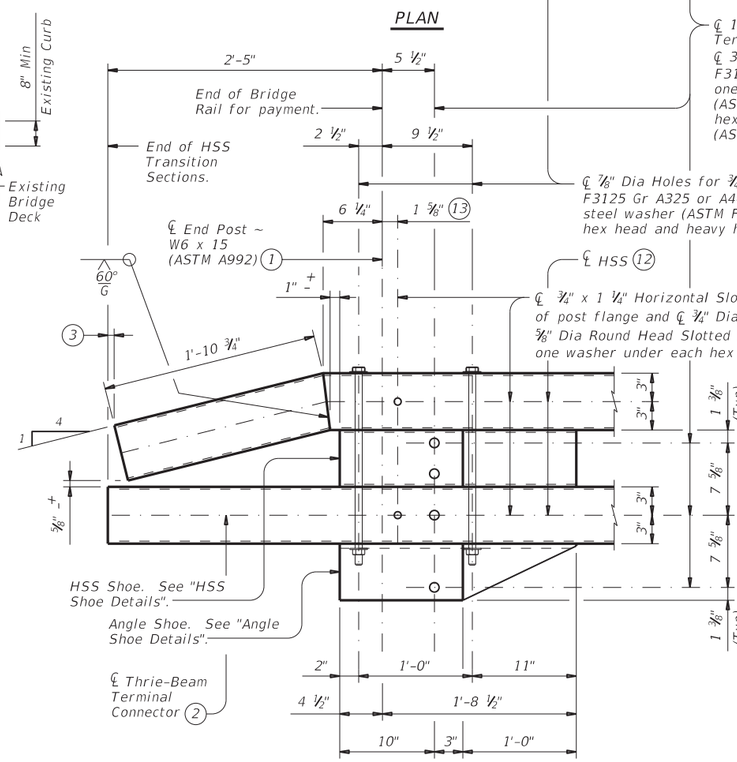
EXAMPLE "A" RETROFIT WITH PARALLEL WING

(Showing 9" high and 8" wide curbs, higher and wider curbs similar)

1. Post length = Top of rail elevation minus bottom of drilled shaft elevation.
2. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach the appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal to the bridge rail using 3 bolts as shown, and extend along the embankment.
3. Top HSS can be shorter than bottom HSS 5/8" plus or minus.
4. Match existing bridge curb height.
5. Cast transition curb 1'-0" into soil or top of concrete approach slab. Remove any asphaltic concrete or mow strip if present.
6. Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.
7. Showing first post for a TL-3 rated guard fence transition. First post for a TL-2 rated guard fence transition or a guard fence downstream anchor terminal is 4'-4 3/4".
8. HSS Transition Sections must have one soil mounted end post embedded in an unreinforced, Class "C" concrete drilled shaft as shown, and a minimum of one curb mounted post per transition section.
9. HSS Panel Sections must have a minimum of three posts and a maximum of eight posts per panel section.
10. ℄ HSS Expansion Joint or ℄ HSS Splice Joint as required.
11. Use 9" minimum for both expansion joints and construction/controlled joints.
12. HSS 6 x 6 x 1/4 (ASTM A1085 or A500 Gr C).
13. May be placed on either side of W6 x 15 web.



PLAN



ROADWAY ELEVATION

HSS TRANSITION SECTION END DETAILS

Thrie-Beam Terminal Connector not shown for clarity.

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Provide Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.

One shop splice per rail member section is permitted with minimum 85 percent penetration.
The weld may be square groove or single vee groove.

Round or chamfer exposed edges of HSS rail, rail post and plate to approximately 1/16" by grinding.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

Submit erection drawings showing panel lengths, splice locations, post placement, anchor bolt locations and adhesive anchor test data to demonstrate pullout strength to the Engineer for approval. Shop drawings are not required.

MATERIAL NOTES:

Galvanize all metal components of steel rail system.

Provide Grade 60 reinforcing steel.

Provide Class "C" concrete. As an alternate, provide Class "K" concrete, or a Type A-2 or Type C concrete repair material per DMS-4655 "Concrete Repair Materials". Do not use Type "B" (Ultra-Rapid) concrete repair materials.

Anchor bolts must be 3/4" Dia ASTM A193 Gr B7 or ASTM A449 fully threaded rods with one heavy hex nut and one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into concrete curb using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 6 3/4". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 30 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".

GENERAL NOTES:

This retrofit railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This retrofit railing can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Rail anchorage details shown on this guide may require modification for select structure types.

See "Section A-A" for limits on existing overlay/seal coats thickness based on existing curb height.

This rail is to be paid for as "Retrofit Rail (Ty T131RC)" under Item 451 "Retrofit Railing".

Average weight with no overlay: 55 plf (9", 11" & 12" Curbs)
53 plf (18" Curbs)

Cover dimensions are clear dimensions, unless noted otherwise.

This sheet is to be used as a guide for preparing project-specific details to retrofit existing curbed structures. Details with appropriate notes from this guide should be prepared for the specific application. Dimensions of existing slab thickness, curb widths, curb heights, curb slopes, and overlay/seal coats thickness, must be shown. Particular care should be taken in identifying the bridge abutment wingwall conditions and providing for proper reinforcement anchorage and approach guard fence post positioning. This sheet may not be used without modification. The details shown may need to be amended if the exact existing condition is not covered. In all cases, details and notes not required must be crossed out or eliminated, "(MOD)" added, the phrase "(Not to be used as a standard)" removed, and the sheet sealed and signed.

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED
PROFESSIONAL ENGINEER
5.6.21
Monte R. Rater P.E.

SHEET 1 OF 4

Texas Department of Transportation
Bridge Division Standard

RETROFIT GUIDE FOR T131RC RAIL ON CURBS

(NOT TO BE USED AS A STANDARD)

TYPE T131RC (MOD)

FILE: r1std034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
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	PAR	Delta		73

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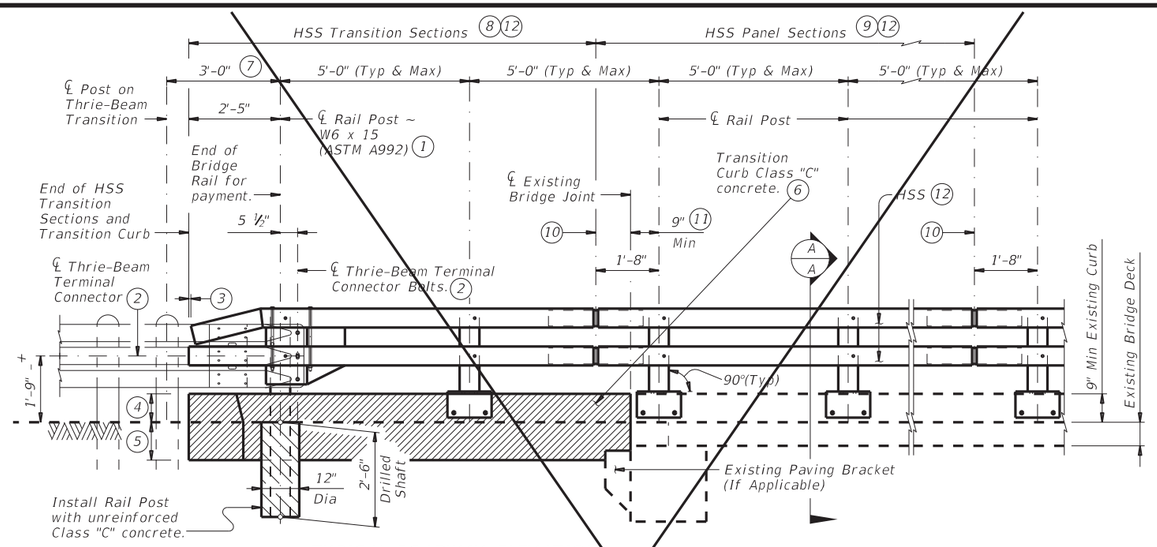
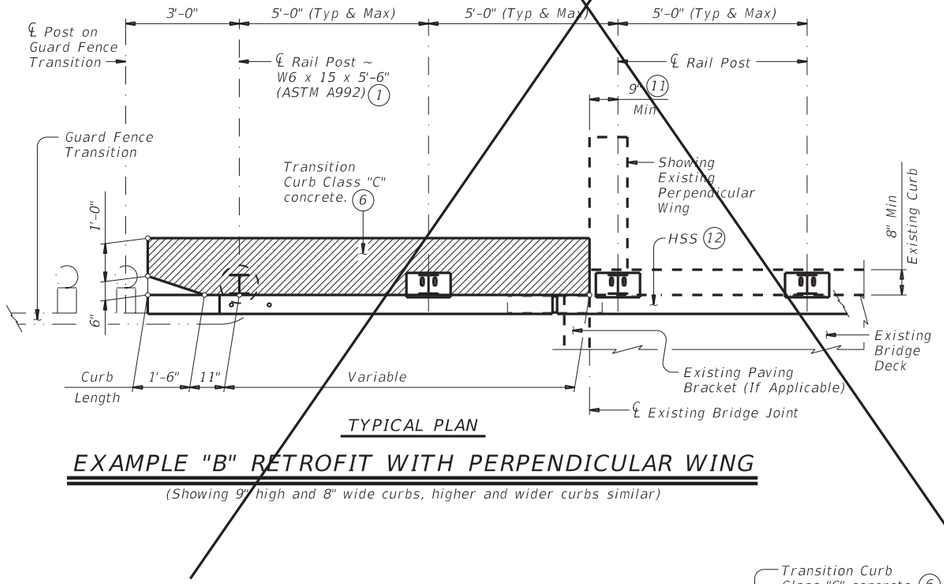


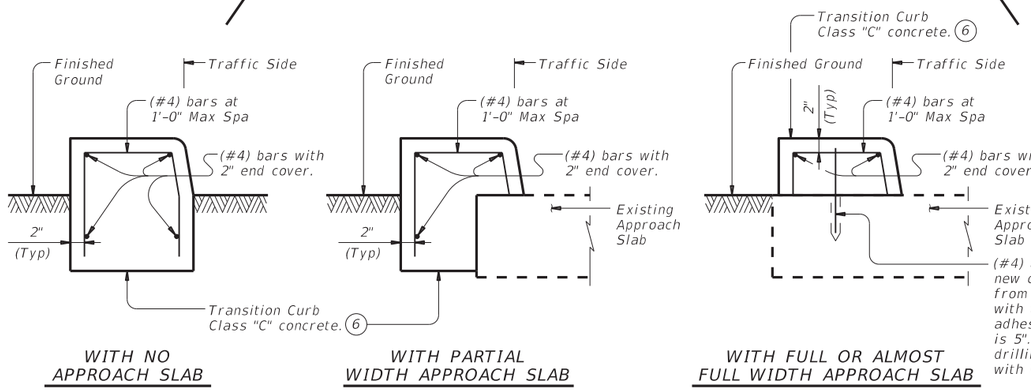
TYPICAL ROADWAY ELEVATION



TYPICAL PLAN

EXAMPLE "B" RETROFIT WITH PERPENDICULAR WING

(Showing 9" high and 8" wide curbs, higher and wider curbs similar)



WITH NO APPROACH SLAB

WITH PARTIAL WIDTH APPROACH SLAB

WITH FULL OR ALMOST FULL WIDTH APPROACH SLAB

(#4) anchor bars spaced longitudinally along new curb at 1'-6" Max (Spaced 3" longitudinally from outside edge). Embed (#4) anchor bars with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment is 5". Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

EXAMPLES OF TRANSITION CURB SECTIONS

(1) Post length = Top of rail elevation minus bottom of drilled shaft elevation.

(2) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach the appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal to the bridge rail using 3 bolts as shown, and extend along the embankment.

(3) Top HSS can be shorter than bottom HSS ⅝" plus or minus.

(4) Match existing bridge curb height.

(5) Cast transition curb 1'-0" into soil or top of concrete approach slab. Remove any asphaltic concrete or mow strip if present.

(6) Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.

(7) Showing first post for a TL-3 rated guard fence transition. First post for a TL-2 rated guard fence transition or a guard fence downstream anchor terminal is 4'-4 ¾".

(8) HSS Transition Sections must have one soil mounted end post embedded in an unreinforced, Class "C" concrete drilled shaft as shown, and a minimum of one curb mounted post per transition section.

(9) HSS Panel Sections must have a minimum of three posts and a maximum of eight posts per panel section.

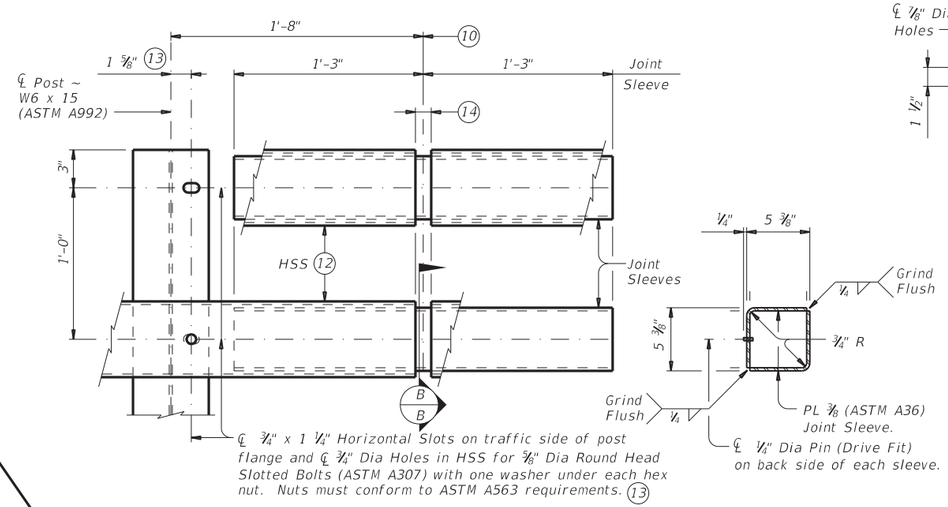
(10) ℄ HSS Expansion Joint or ℄ HSS Splice Joint as required.

(11) Use 9" minimum for both expansion joints and construction/controlled joints.

(12) HSS 6 x 6 x ¼ (ASTM A1085 or A500 Gr C).

(13) May be placed on either side of W6 x 15 web.

(14) Place HSS Expansion Joints in rail at every slab Expansion Joint. For Expansion and Splice Joints openings, use the greater of 1" or (slab opening plus ½").

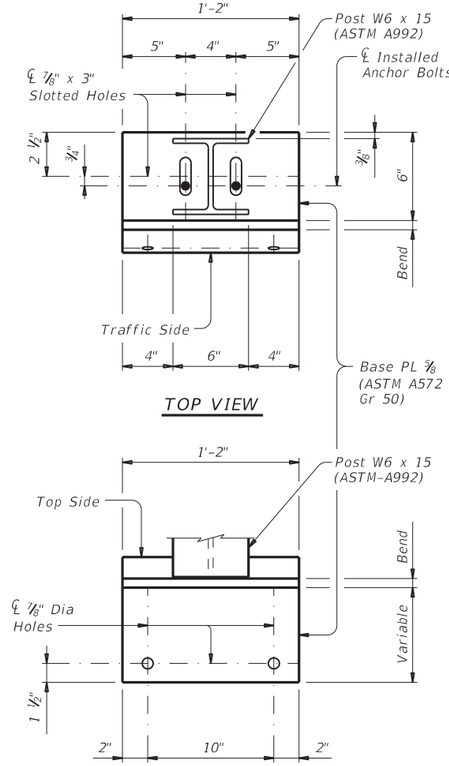


TYPICAL POST CONNECTION AND SPLICE DETAIL FOR HSS

Showing post with HSS and HSS splice.

SECTION B-B

Showing typical joint sleeve.



TOP VIEW

FRONT VIEW

BASE PLATE DETAILS

SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

RETROFIT GUIDE FOR T131RC RAIL ON CURBS

(NOT TO BE USED AS A STANDARD)

TYPE T131RC (MOD)

STATE OF TEXAS
MONTE L. RATER
95859
LICENSED PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FILE: r1std034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
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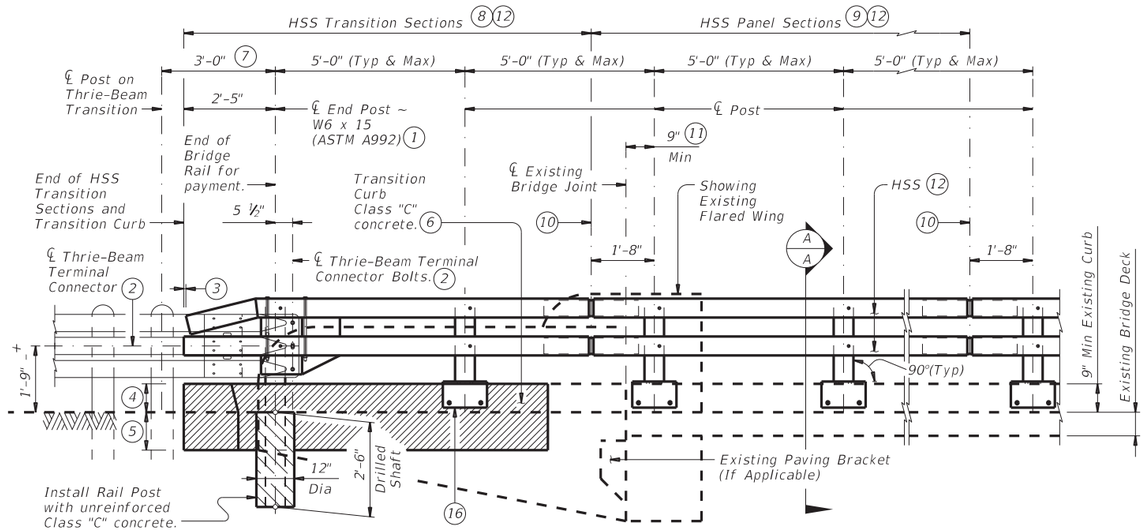
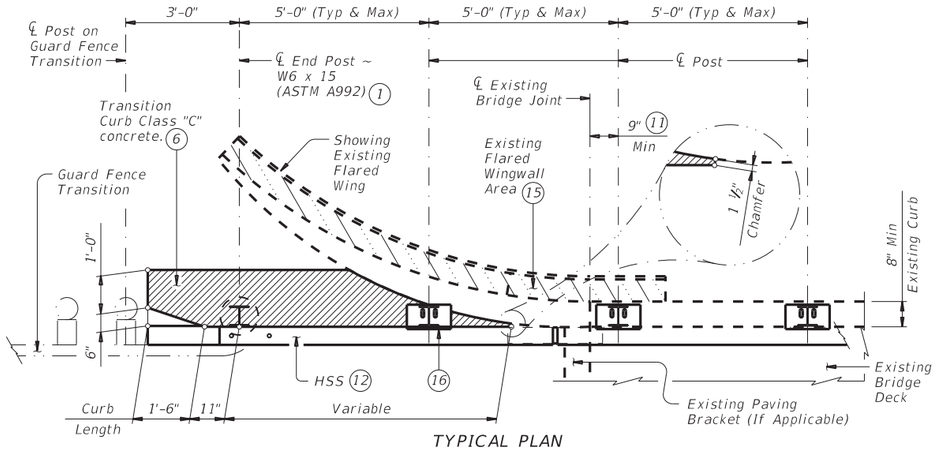


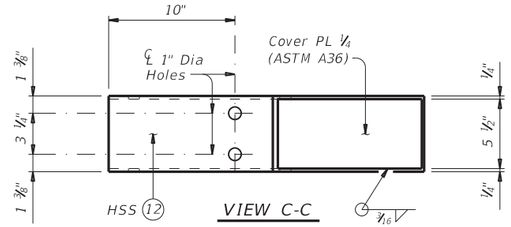
TYPICAL ROADWAY ELEVATION

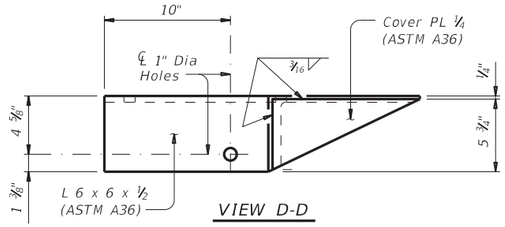


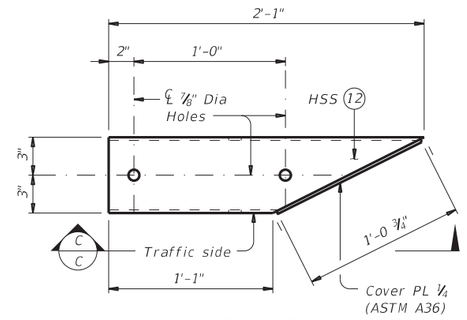
TYPICAL PLAN

EXAMPLE "C" RETROFIT WITH FLARED WING

(Showing 9" high and 8" wide curbs, higher and wider curbs similar)

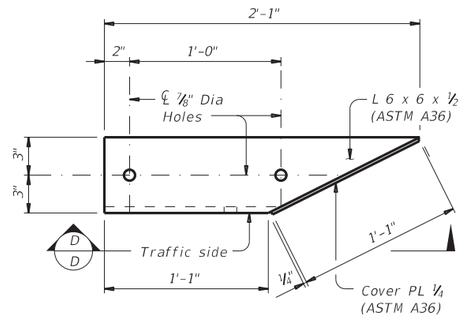






TOP VIEW

HSS SHOE DETAILS



TOP VIEW

ANGLE SHOE DETAILS

Angle Shoe shown is detailed for one side only, other side similar. For other side shoe must be built for opposite hand.

(1) *Post length = Top of rail elevation minus bottom of drilled shaft elevation.*

(2) *Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". The appropriate Metal Beam Guard Fence Transitions or Downstream Anchor Terminal must be attached to the bridge rail and extended along the embankment.*

(3) *Top HSS can be shorter than bottom HSS ⅜" plus or minus.*

(4) *Match existing bridge curb height.*

(5) *Cast transition curb 1'-0" into soil or top of concrete approach slab. Remove any asphaltic concrete or mow strip if present.*

(6) *Match existing bridge curb face on traffic side of transition curb. Transition curb 6" x 1'-6" taper will remain vertical.*

(7) *Showing first post for a TL-3 rated guard fence transition. First post for a TL-2 rated guard fence transition or a guard fence downstream anchor terminal is 4'-4 ¾".*

(8) *HSS Transition Sections must have one soil mounted end post embedded in an unreinforced, Class "C" concrete drilled shaft as shown, and a minimum of one curb mounted post per transition section.*

(9) *HSS Panel Sections must have a minimum of three posts and a maximum of eight posts per panel section.*

(10) *℄ HSS Expansion Joint or ℄ HSS Splice Joint as required.*

(11) *Use 9" minimum for both expansion joints and construction/controlled joints.*

(12) *HSS 6 x 6 x ¼ (ASTM A1085 or A500 Gr C).*

(15) *Remove all existing structure area from top of existing curb. Cut and grind flush all existing reinforcing extending from top of existing curb and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".*

(16) *When post is mounted to the transition curb on flared wings as shown, transition curb must be supported laterally by the existing wingwall/curb.*

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STATE OF TEXAS
MONTE L. RATER
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LICENSED PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

Texas Department of Transportation

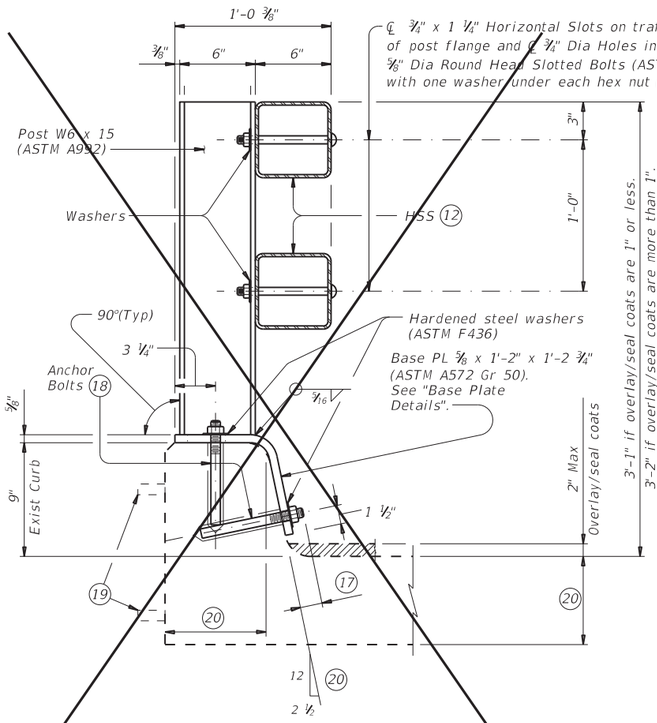
Bridge Division Standard

RETROFIT GUIDE FOR T131RC RAIL ON CURBS

(NOT TO BE USED AS A STANDARD)

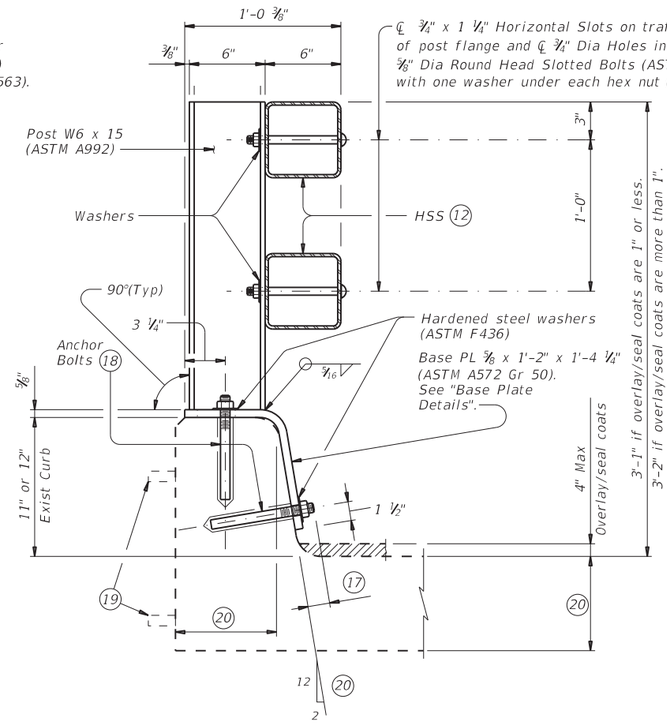
TYPE T131RC (MOD)

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		75



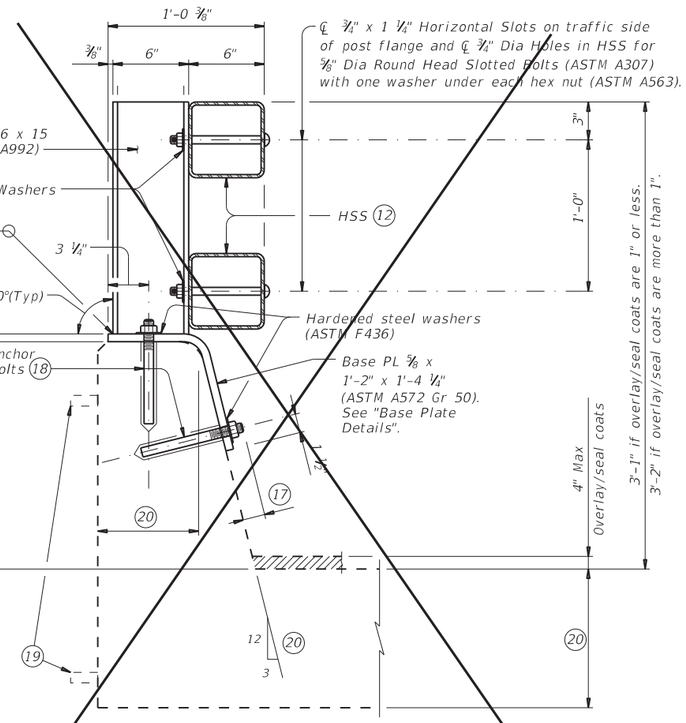
SECTION A-A OF 9" HIGH CURBS

(Showing example of 8" Min width curb, wider curbs similar)



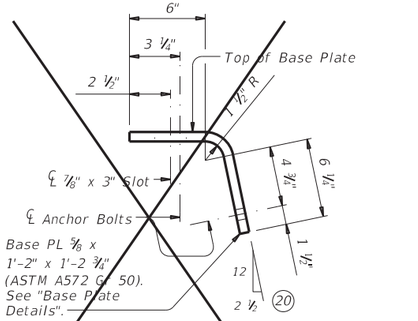
SECTION A-A OF 11" & 12" HIGH CURBS

(Showing example of 8" Min width curb, wider curbs similar)

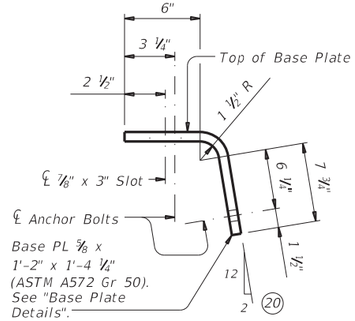


SECTION A-A OF 18" HIGH CURBS

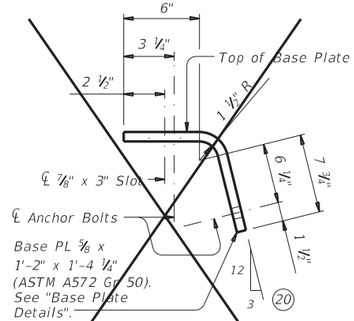
(Showing example of 8" Min width curb, wider curbs similar)



9" HIGH CURB BASE PLATE DETAIL



11" & 12" HIGH CURB BASE PLATE DETAIL



18" HIGH CURB BASE PLATE DETAIL

(12) HSS 6 x 6 x 1/4 (ASTM A1085 or A500 Gr C).

(17) 1 3/4" Bolt Projection (Typ).

(18) See "Material Notes" for anchor Bolt information.

(19) Remove existing railing (including posts), cut and grind anchor bolts flush and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".

(20) See elsewhere in plans for dimensions (curb width and height, slab and overlay thickness). Slope of curb may differ from what is shown. Adjust base plate as necessary to conform to curb face geometry.

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SHEET 4 OF 4

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Bridge Division Standard

RETROFIT GUIDE FOR T131RC RAIL ON CURBS

(NOT TO BE USED AS A STANDARD)

TYPE T131RC (MOD)

FILE: rlstd034-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: MAS
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		76

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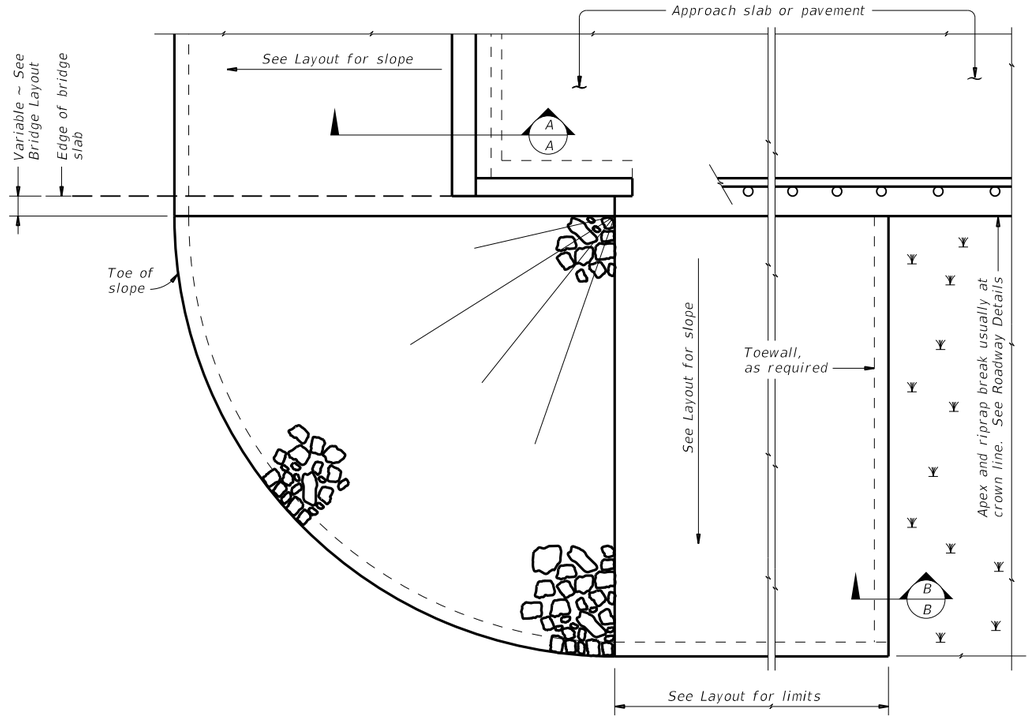
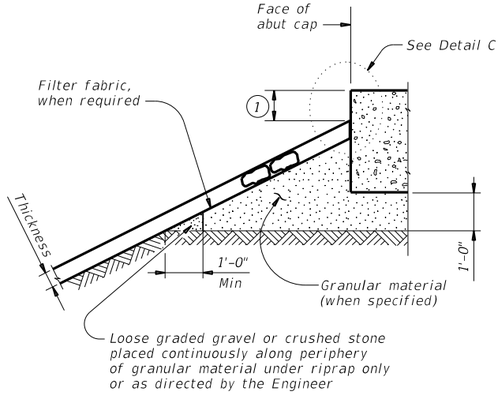
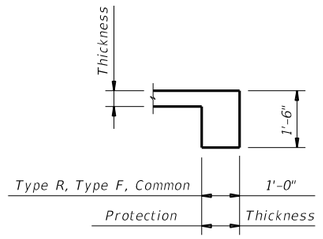


PLAN

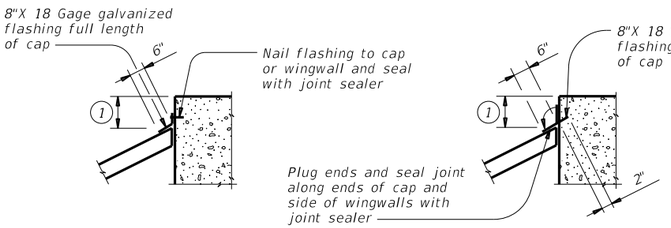


SECTION A-A AT CAP



SECTION B-B

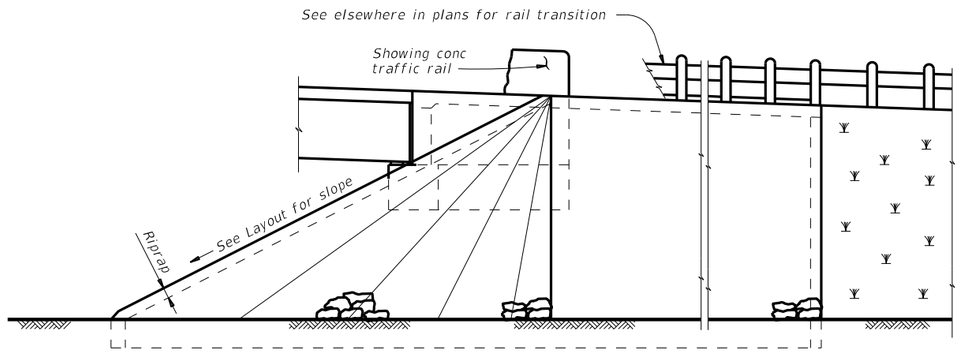
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

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.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY			
REVISIONS	0399	03	038	FM 64			
	DIST	COUNTY		SHEET NO.			
	PAR	Delta		77			

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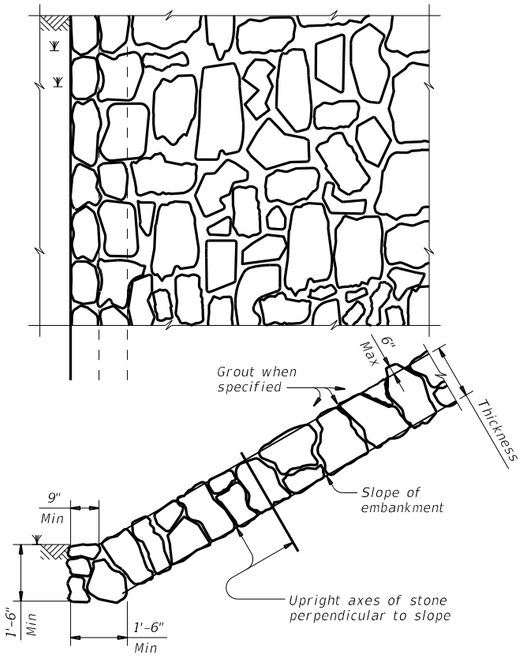


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

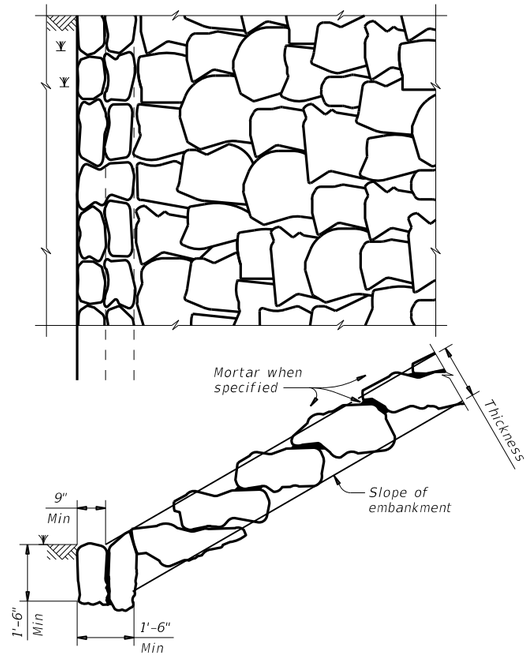


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

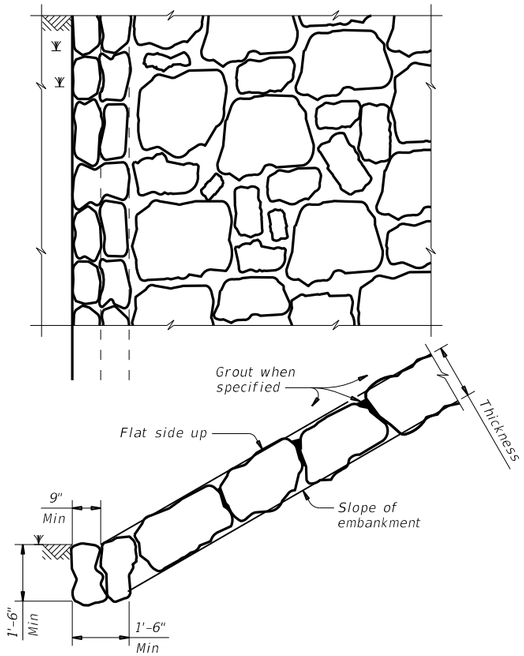


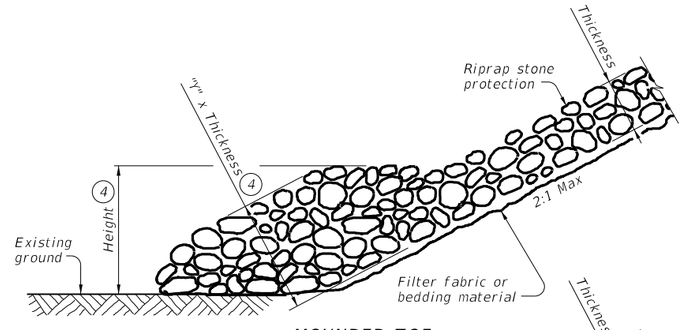
FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

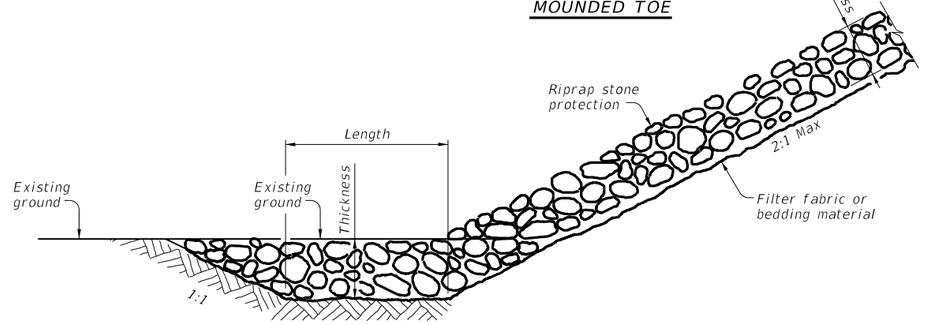
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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.

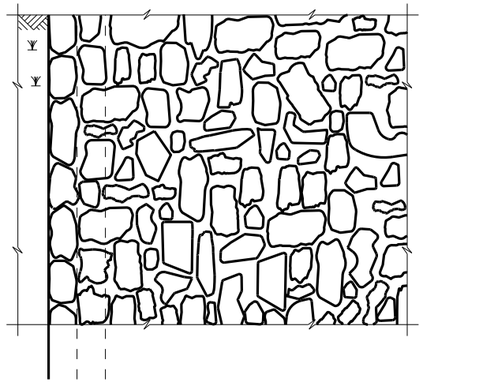


MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)



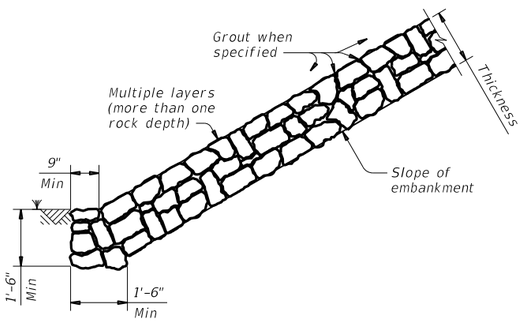
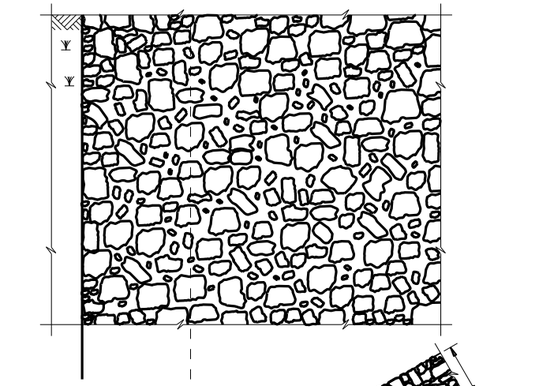


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted



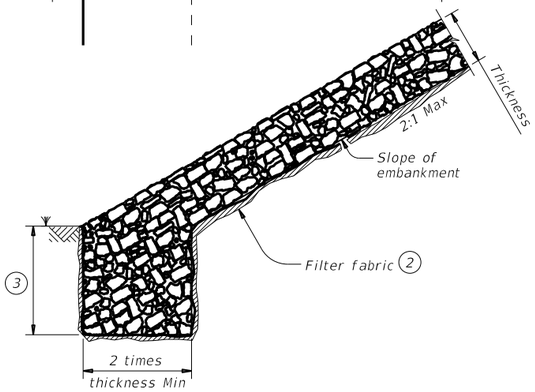


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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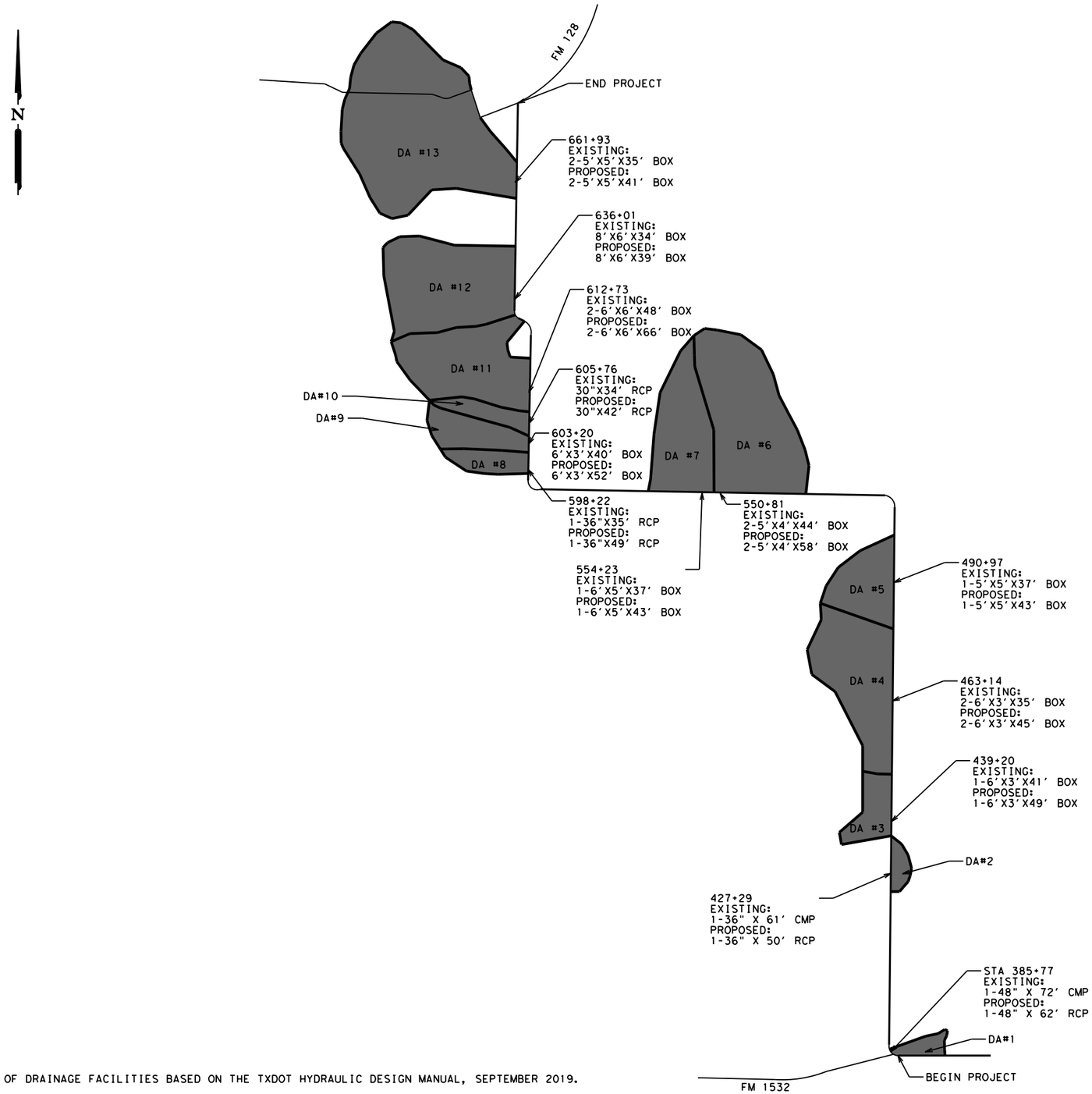
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		78



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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5.7.21

MONTE RATER
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PROFESSIONAL ENGINEER
STATE OF TEXAS

Monte R. Rater P.E.

FM 64
DRAINAGE AREA MAP

SCALE (FEET):

0 300 750 1500

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		79

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	INTENSITY (I) (IN/HR)	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVER ROADWAY (FT)	ROADWAY ELEV OVERTOP (FT)
385+77	DA #1	9.35	0.0180	0.030	TRAPEZOIDAL	EXISTING	1 - 48" X 72' CMP	0.024	0.0026	LEFT PROJ RIGHT PROJ	0.3	20.17	10 YEAR	4.88	14	507.84	506.50	5.52	0.00	511.58
													100 YEAR	6.92	20	508.20	506.61	6.06	0.00	
						PROPOSED	1-48" X 62' RCP	0.012	0.0026	LEFT SET RIGHT SET	0.3	20.17	10 YEAR	4.88	14	507.60	506.50	5.52	0.00	512.16
													100 YEAR	6.92	20	507.92	506.61	6.06	0.00	
427+29	DA #2	10.18	0.0040	0.030	TRAPEZOIDAL	EXISTING	1-36"X61' CMP	0.024	0.0740	LEFT PROJ RIGHT PROJ	0.34	14.59	10 YEAR	5.7	20	536.03	530.57	2.60	0.00	539.32
													100 YEAR	8.05	28	536.59	530.79	2.83	0.00	
						PROPOSED	1-36"X50' RCP	0.012	0.0298	LEFT PW RIGHT SET	0.34	14.59	10 YEAR	5.7	20	535.73	533.88	2.60	0.00	539.90
													100 YEAR	8.05	28	536.21	534.10	2.83	0.00	
439+20	DA #3	30.96	0.0030	0.030	TRAPEZOIDAL	EXISTING	1-6'X3'X41' BOX CULVERT	0.012	0.0054	LEFT SW RIGHT SW	0.34	37.51	10 YEAR	3.46	36	535.59	535.31	2.72	0.00	539.88
													100 YEAR	4.94	52	536.02	535.61	2.97	0.00	
						PROPOSED	1-6'X3'X49' BOX CULVERT	0.012	0.0054	LEFT PW RIGHT PW	0.34	37.51	10 YEAR	3.46	36	535.58	535.29	2.72	0.00	540.46
													100 YEAR	4.94	52	536.02	535.59	2.97	0.00	
463+14	DA #4	99.3	0.0080	0.030	TRAPEZOIDAL	EXISTING	2-6'X3'X35' BOX CULVERT	0.012	0.0094	LEFT SW RIGHT SW	0.34	29.08	10 YEAR	4.01	135	528.84	528.41	5.45	0.00	532.05
													100 YEAR	5.72	193	529.45	528.82	5.96	0.00	
						PROPOSED	2-6'X3'X45' BOX CULVERT	0.012	0.0094	LEFT PW RIGHT PW	0.34	29.08	10 YEAR	4.01	135	528.95	528.36	5.45	0.00	532.63
													100 YEAR	5.72	193	529.65	528.77	5.96	0.00	
490+97	DA #5	49.93	0.0240	0.030	TRAPEZOIDAL	EXISTING	1-5'X5'X37' BOX CULVERT	0.012	0.0126	LEFT SW RIGHT SW	0.34	21.09	10 YEAR	4.77	81	531.29	529.27	7.22	0.00	535.30
													100 YEAR	6.77	115	532.24	529.54	7.89	0.00	
						PROPOSED	1-5'X5'X43' BOX CULVERT	0.012	0.0126	LEFT FW RIGHT FW	0.34	21.09	10 YEAR	4.77	81	530.91	529.25	7.22	0.00	535.88
													100 YEAR	6.77	115	531.76	529.52	7.89	0.00	
550+81	DA #6	152.1	0.0120	0.030	TRAPEZOIDAL	EXISTING	2-5'X4'X44' BOX CULVERT	0.012	0.0156	LEFT FW RIGHT FW	0.34	27.68	10 YEAR	4.12	213	532.32	530.96	7.09	0.00	537.83
													100 YEAR	5.87	304	533.53	531.41	7.76	0.00	
						PROPOSED	2-5'X4'X58' BOX CULVERT	0.012	0.0156	LEFT PW RIGHT PW	0.34	27.68	10 YEAR	4.12	213	532.67	530.92	7.09	0.00	538.41
													100 YEAR	5.87	304	533.98	531.37	7.76	0.00	
554+23	DA #7	80.85	0.0110	0.030	TRAPEZOIDAL	EXISTING	1-6'X5'X37' BOX CULVERT	0.012	0.0061	LEFT FW RIGHT FW	0.34	37.2	10 YEAR	3.48	96	535.19	533.96	5.81	0.00	539.20
													100 YEAR	4.97	137	536.06	534.29	6.36	0.00	
						PROPOSED	1-6'X5'X43' BOX CULVERT	0.012	0.0061	LEFT FW RIGHT FW	0.34	37.2	10 YEAR	3.48	96	535.21	533.94	5.81	0.00	539.78
													100 YEAR	4.97	137	536.08	534.27	6.36	0.00	
598+22	DA #8	16.42	0.0280	0.030	TRAPEZOIDAL	EXISTING	1-36"X35' RCP	0.012	0.0485	LEFT SET RIGHT SET	0.34	10.00	10 YEAR	6.78	38	535.84	532.20	4.59	0.00	537.81
													100 YEAR	9.52	53	537.26	532.42	5.01	0.00	
						PROPOSED	1-36"X49' RCP	0.012	0.0485	LEFT SET RIGHT PW	0.34	10.00	10 YEAR	6.78	38	536.14	531.82	4.59	0.00	538.39
													100 YEAR	9.52	53	537.56	532.04	5.01	0.00	
603+20	DA #9	34.31	0.0360	0.030	TRAPEZOIDAL	EXISTING	1-6'X3'X40' BOX CULVERT	0.012	0.0040	LEFT SW RIGHT SW	0.34	25.15	10 YEAR	4.35	51	528.96	527.83	7.45	0.00	533.88
													100 YEAR	6.18	72	529.56	528.04	8.15	0.00	
						PROPOSED	1-6'X3'X52' BOX CULVERT	0.012	0.0040	LEFT PW RIGHT PW	0.34	25.15	10 YEAR	4.35	51	529.15	527.83	7.45	0.00	534.46
													100 YEAR	6.18	72	529.73	528.04	8.15	0.00	
605+76	DA #10	18.2	0.0230	0.030	TRAPEZOIDAL	EXISTING	1-30"X34' RCP	0.012	0.0238	LEFT SET RIGHT SET	0.34	23.51	10 YEAR	4.51	28	533.95	530.98	5.41	0.00	533.99
													100 YEAR	6.41	40	534.10	531.16	5.92	0.11	
						PROPOSED	1-30"X42' RCP	0.012	0.0238	LEFT SET RIGHT PW	0.34	23.51	10 YEAR	4.51	28	534.04	530.78	5.41	0.00	534.47
													100 YEAR	6.41	40	534.56	530.96	5.92	0.09	
612+73	DA #11	103.2	0.0280	0.030	TRAPEZOIDAL	EXISTING	2-6'X6'X48' BOX CULVERT	0.012	0.0076	LEFT FW RIGHT FW	0.34	32.72	10 YEAR	3.75	132	526.84	525.80	8.54	0.00	536.43
													100 YEAR	5.35	188	527.47	526.11	9.84	0.00	
						PROPOSED	2-6'X6'X66' BOX CULVERT	0.012	0.0076	LEFT PW RIGHT PW	0.34	32.72	10 YEAR	3.75	132	526.94	525.75	8.54	0.00	537.01
													100 YEAR	5.35	188	527.59	526.06	9.37	0.00	
636+01	DA #12	129.4	0.0180	0.030	TRAPEZOIDAL	EXISTING	1-8'X6'X34' BOX CULVERT	0.012	0.0152	LEFT FW RIGHT FW	0.34	25.94	10 YEAR	4.27	188	538.69	536.58	7.99	0.00	542.59
													100 YEAR	6.08	267	539.82	536.97	8.74	0.00	
						PROPOSED	1-8'X6'X39' BOX CULVERT	0.012	0.0152	LEFT FW RIGHT FW	0.34	25.94	10 YEAR	4.27	188	538.83	536.58	7.99	0.00	543.17
													100 YEAR	6.08	267	539.95	536.97	8.74	0.00	

PROJ = PROJECTING END
FW = FLARED WING
SW = STRAIGHT WINGS
PW = PARALLEL WING
SET = SAFETY END TREATMENT

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.

CROSS-CULVERT HYDROLOGIC AND HYDRAULIC DATA (NRCS UNIT HYDROGRAPH)

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	NRCS RUNOFF CURVE NUMBER	LAG (MIN)	INTERVAL (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVER ROADWAY (FT)	ROADWAY ELEV OVERTOP (FT)
661+93	DA #13	231	0.0070	0.030	TRAPEZOIDAL	EXISTING	2-5'X5'X35' BOX CULVERT	0.012	0.0100	LEFT FW RIGHT FW	85.9	38	10	10 YEAR	437	549.78	546.86	7.29	0	550.19
														100 YEAR	731	550.92	547.80	8.30	0.73	
						PROPOSED	2-5'X5'X41' BOX CULVERT	0.012	0.0100	LEFT PW RIGHT FW	85.9	38	10	10 YEAR	437	549.86	546.82	7.29	0	550.77
														100 YEAR	731	551.41	547.76	8.30	0.64	

DESIGN OF DRAINAGE FACILITIES BASED UPON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
NRCS CURVE NUMBER LOSS MODEL EMPLOYED IN HYDROLOGIC ANALYSIS.
PEAK FLOWS WERE DETERMINED USING A NRCS DIMENSIONLESS UNIT HYDROGRAPH MODELLED IN HEC-HMS.
CULVERTS ANALYZED FOR NO PONDING ON ROADWAY PAVEMENT DURING A 10 YEAR FLOOD EVENT.
SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HEC-HMS (VER 4.2, USACE), 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.

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
HYDROLOGY & HYDRAULIC DATA

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		80

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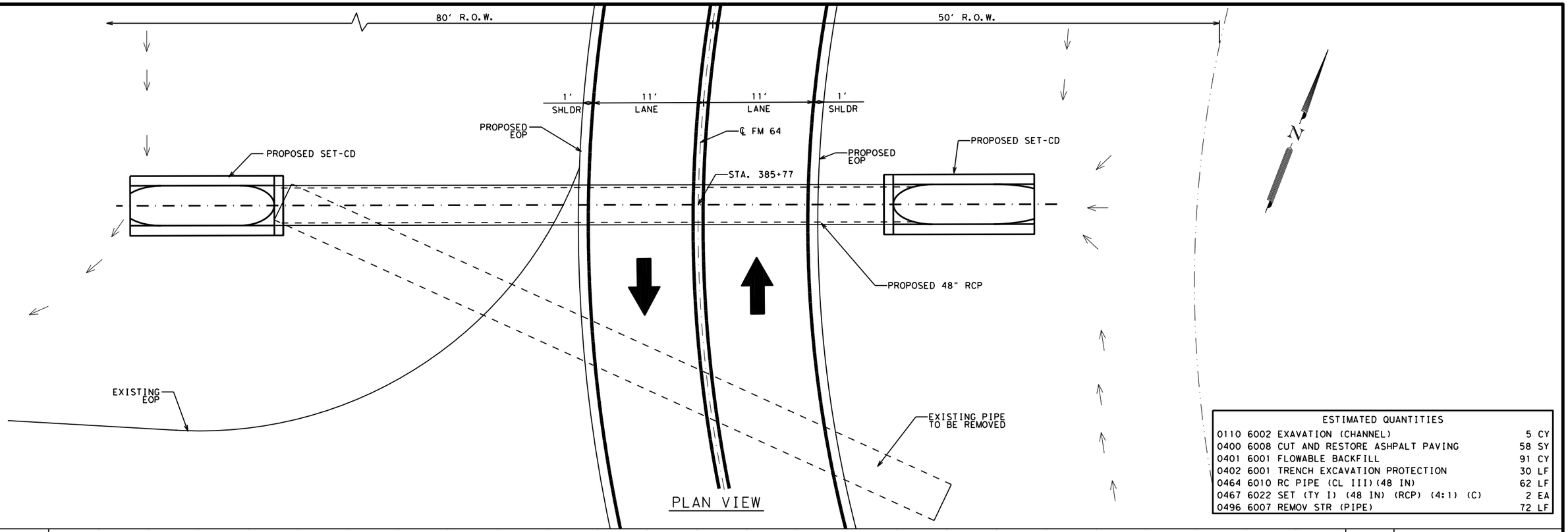
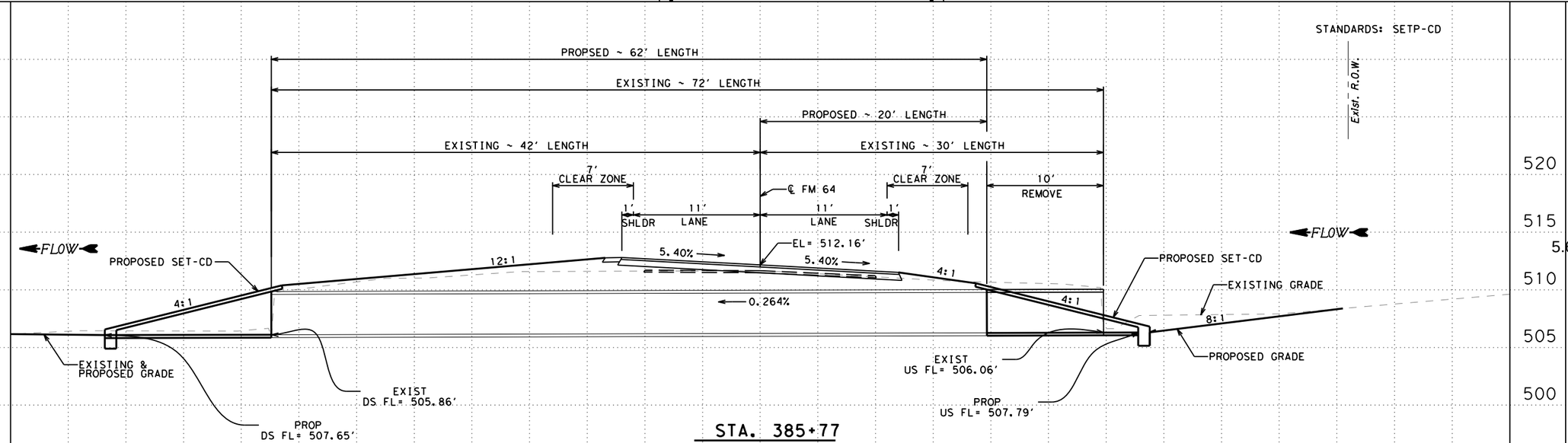


ESTIMATED QUANTITIES		
0110 6002	EXAVATION (CHANNEL)	5 CY
0400 6008	CUT AND RESTORE ASHPALT PAVING	58 SY
0401 6001	FLOWABLE BACKFILL	91 CY
0402 6001	TRENCH EXCAVATION PROTECTION	30 LF
0464 6010	RC PIPE (CL III)(48 IN)	62 LF
0467 6022	SET (TY I) (48 IN) (RCP) (4:1) (C)	2 EA
0496 6007	REMOV STR (PIPE)	72 LF



STA. 385+77

EXISTING ~ 1 - 48" x 72' CMP

PROPOSED ~ 1 - 48" x 62' RCP
WITH SETP-CD US & DS
REMOVE ~ 10'

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 385+77

SHEET 1 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		81

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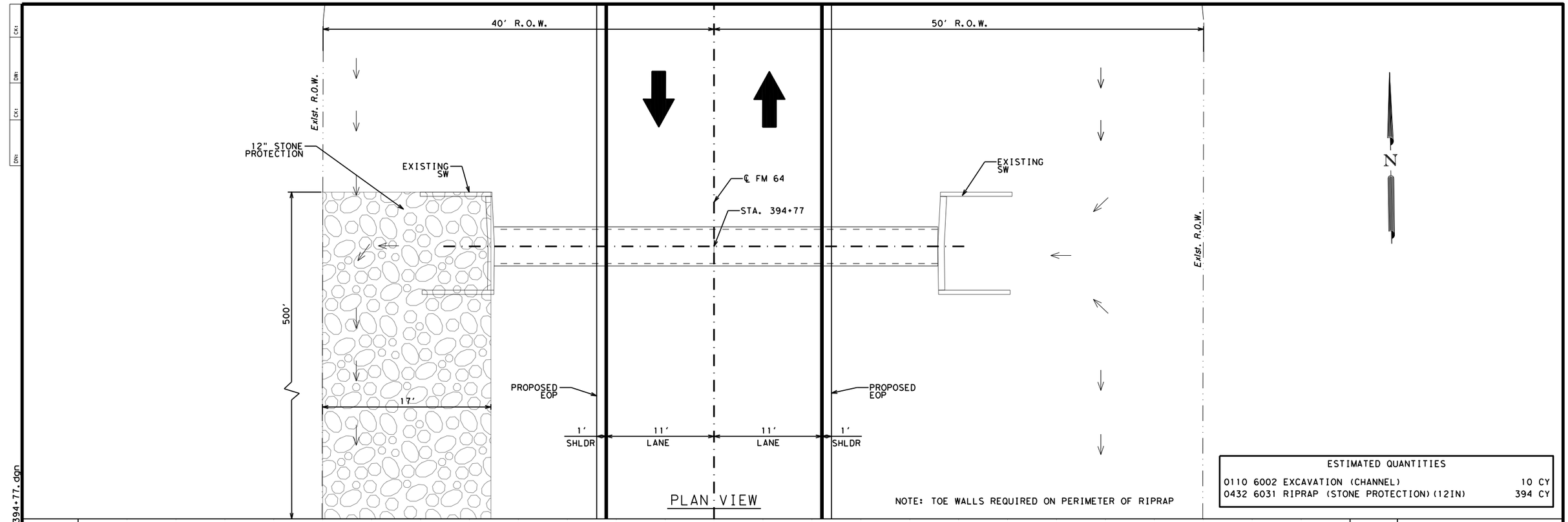
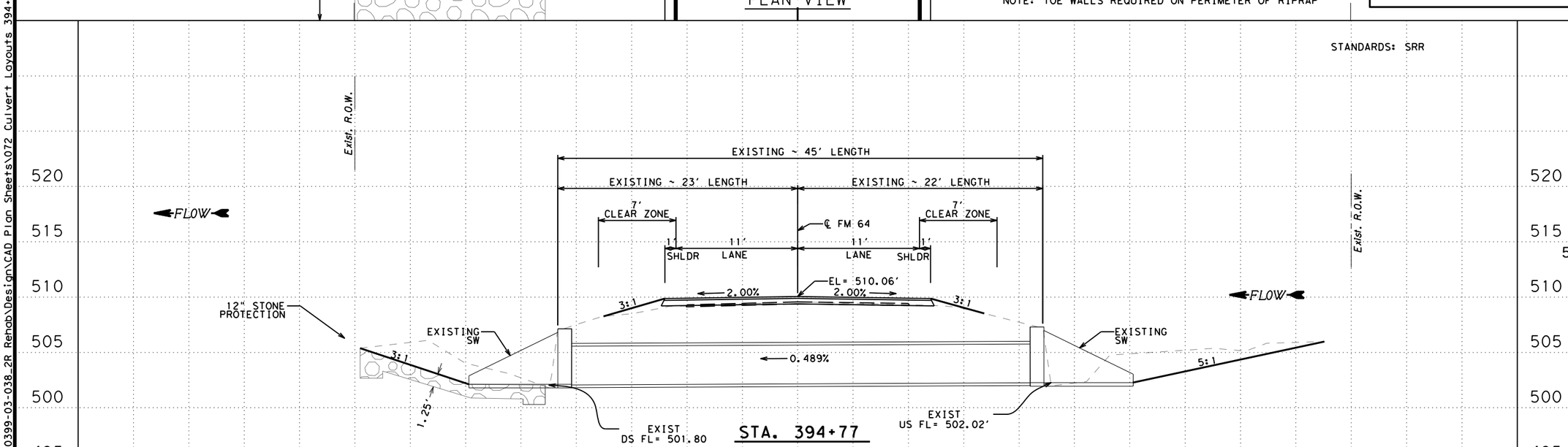


ESTIMATED QUANTITIES

0110 6002 EXCAVATION (CHANNEL)	10 CY
0432 6031 RIPRAP (STONE PROTECTION) (12IN)	394 CY



EXISTING ~ 1 - 4' x 9' X 45' BOX

PROPOSED ~ NO CULVERT WORK REQUIRED

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 394+77

SHEET 2 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		82

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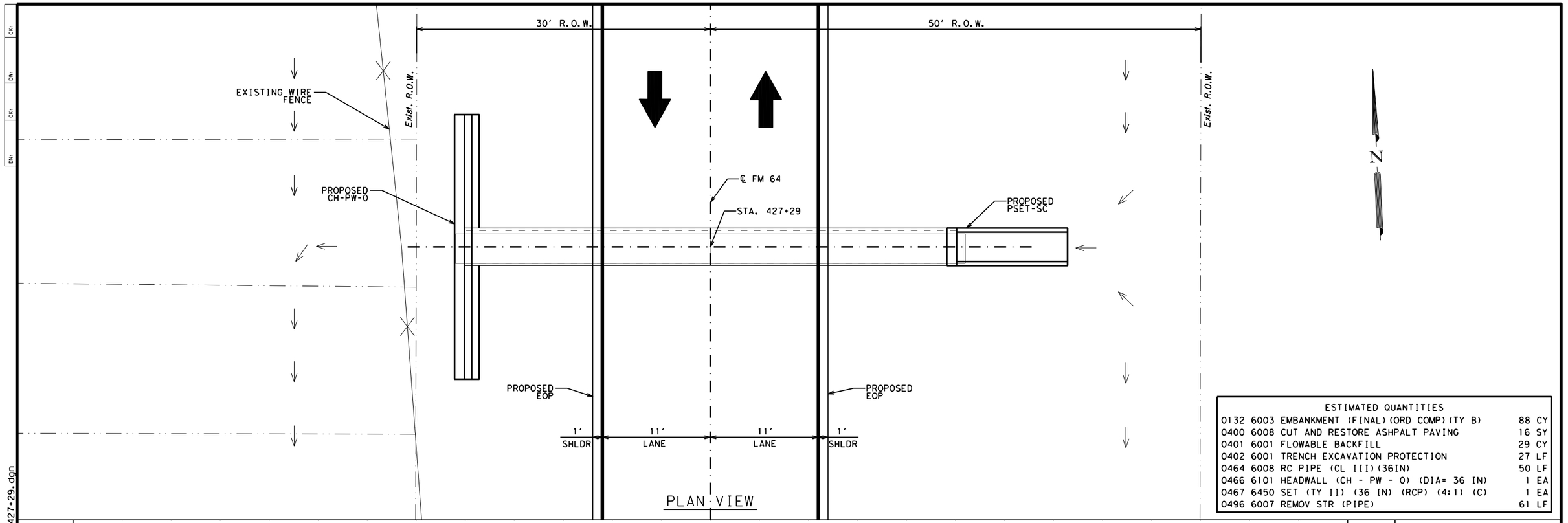
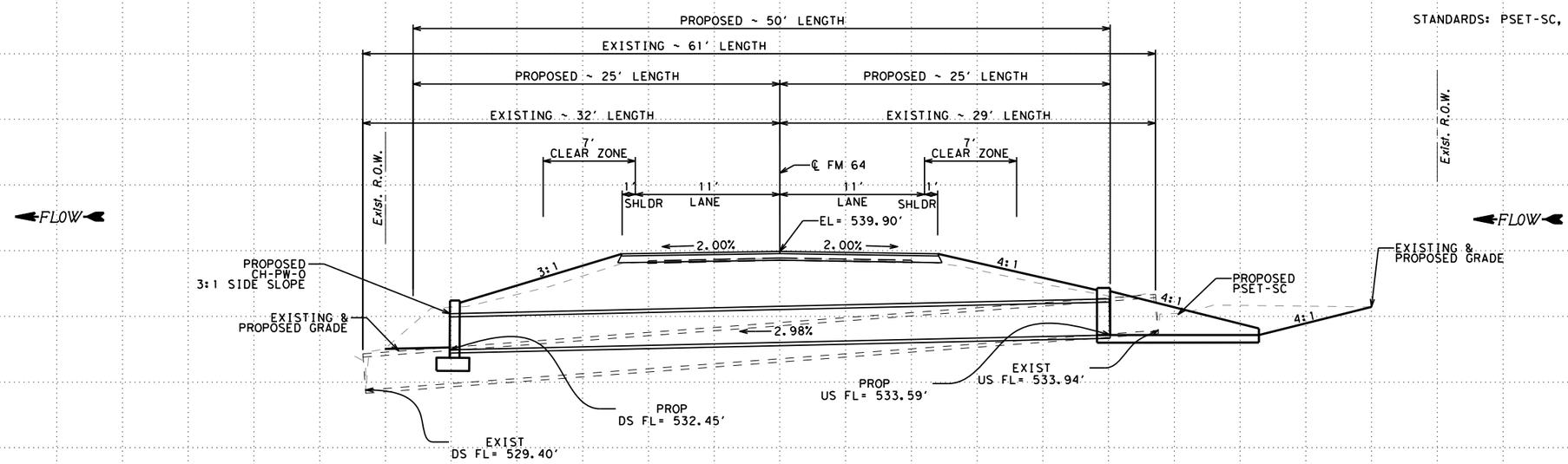


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	88 CY
0400 6008	CUT AND RESTORE ASHPALT PAVING	16 SY
0401 6001	FLOWABLE BACKFILL	29 CY
0402 6001	TRENCH EXCAVATION PROTECTION	27 LF
0464 6008	RC PIPE (CL III)(36IN)	50 LF
0466 6101	HEADWALL (CH - PW - O) (DIA= 36 IN)	1 EA
0467 6450	SET (TY II) (36 IN) (RCP) (4:1) (C)	1 EA
0496 6007	REMOV STR (PIPE)	61 LF



STA. 427+29

EXISTING ~ 1 - 36" X 61' CMP

PROPOSED ~ 1 - 36" X 50' RCP
WITH PSET-SC US & CH-PW-O DS

STANDARDS: PSET-SC, CH-PW-O

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD SET
22.74' LT @ STA. 428+97
ELEV= 535.53'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 427+29

SHEET 3 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		83

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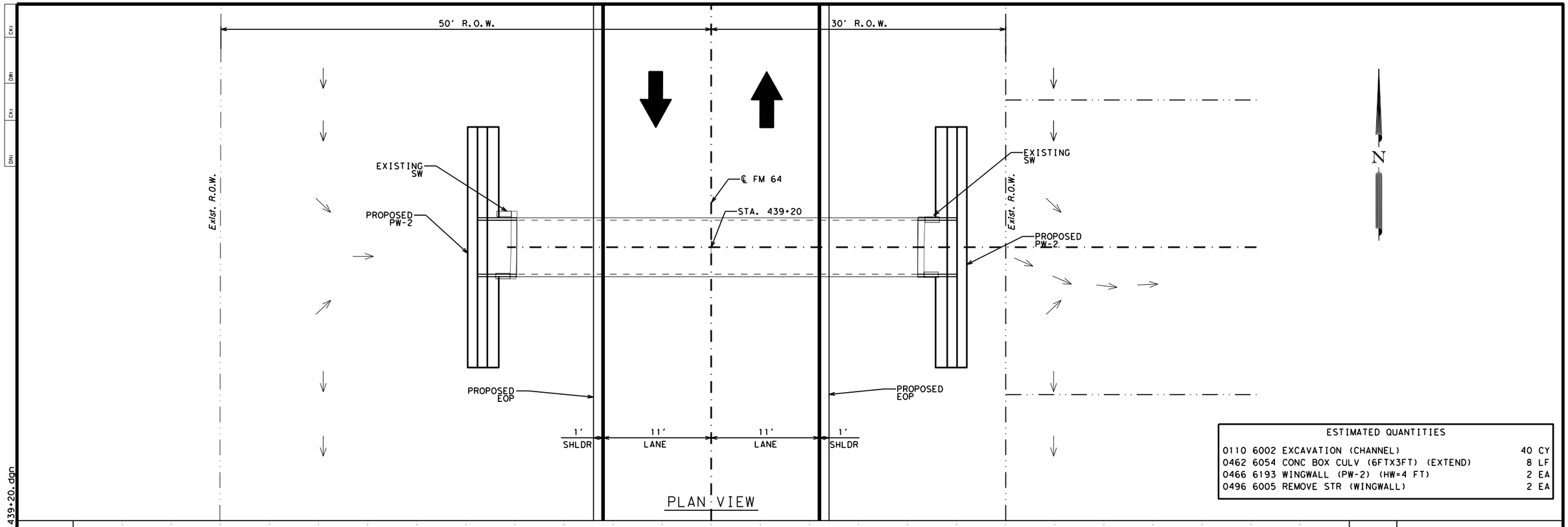
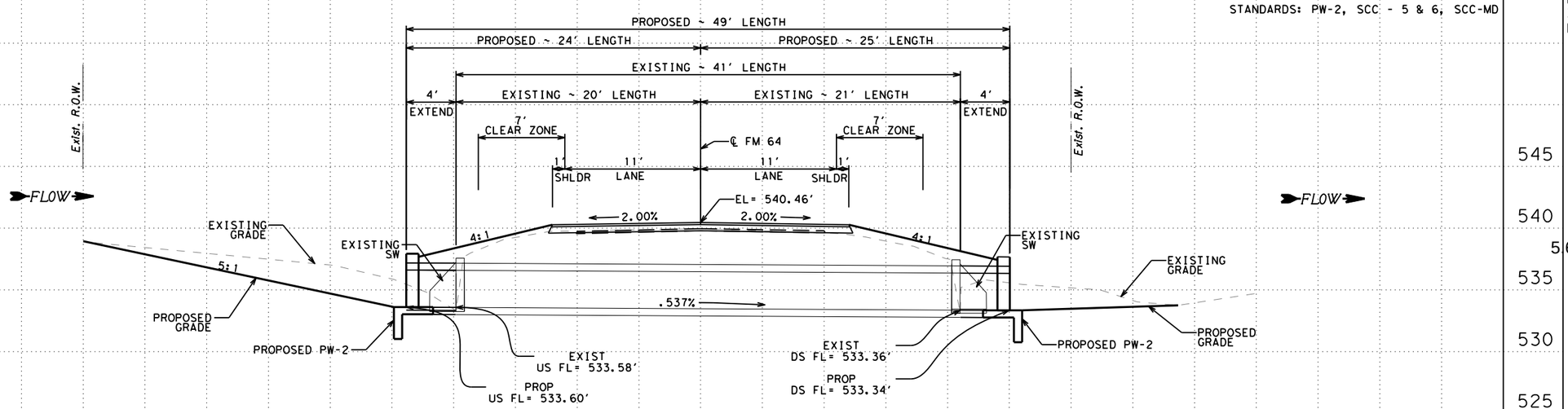


PLAN VIEW

ESTIMATED QUANTITIES	
0110 6002 EXCAVATION (CHANNEL)	40 CY
0462 6054 CONC BOX CULV (6FTX3FT) (EXTEND)	8 LF
0466 6193 WINGWALL (PW-2) (HW=4 FT)	2 EA
0496 6005 REMOVE STR (WINGWALL)	2 EA



STA. 439+20

EXISTING ~ 1 - 6' X 3' X 41' BOX

PROPOSED ~ 1 - 6' X 3' X 49' BOX
EXTENSION ~ 4' US & DS
WITH PW-2 US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: PW-2, SCC - 5 & 6, SCC-MD

BM RAIL ROAD SPIKE SET
31' RT @ STA. 439+83.35
ELEV= 537.58'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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FM 64
CULVERT LAYOUT
STA. 439+20

SHEET 4 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		84

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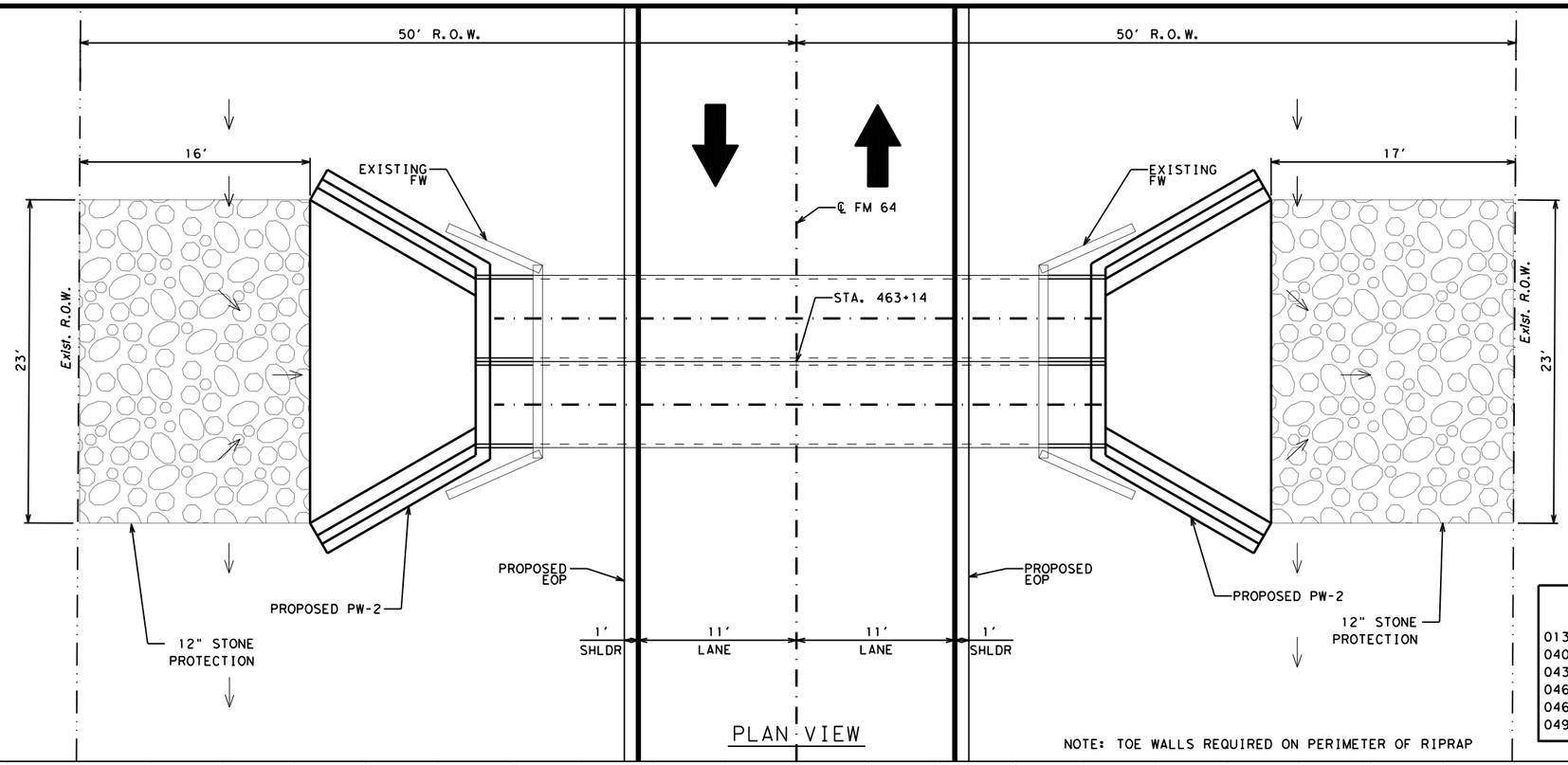


PLAN VIEW

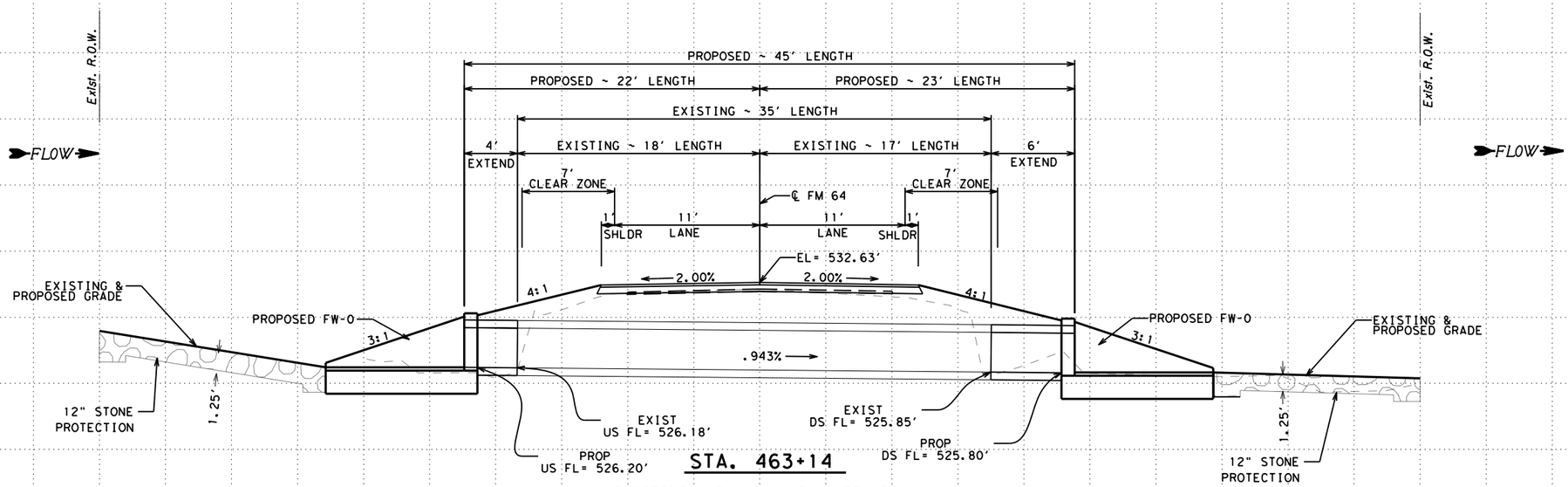
NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

N

ESTIMATED QUANTITIES

0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	80 CY
0403 6001	TEMPORARY SPL SHORING	492 SF
0432 6031	RIPRAP (STONE PROTECTION)(12 IN)	36 CY
0462 6054	CONC BOX CULV (6 FT X 3 FT)(EXTEND)	20 LF
0466 6151	WINGWALL (FW-0)(HW=4 FT)	2 EA
0496 6005	REMOV STR (WINGWALL)	2 EA

STANDARDS: SRR, FW-0, MC-6-16, MC-MD



STA. 463+14

EXISTING ~ 2 - 6' X 3' X 35' BOX

PROPOSED ~ 2 - 6' X 3' X 45' BOX
EXTENSION ~ 4' US & 6' DS
WITH FW-0 US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM RAIL ROAD SPIKE
47.94' RT @ STA. 464+23
ELEV= 530.68'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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FM 64
CULVERT LAYOUT
STA. 463+14

SHEET 5 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		85

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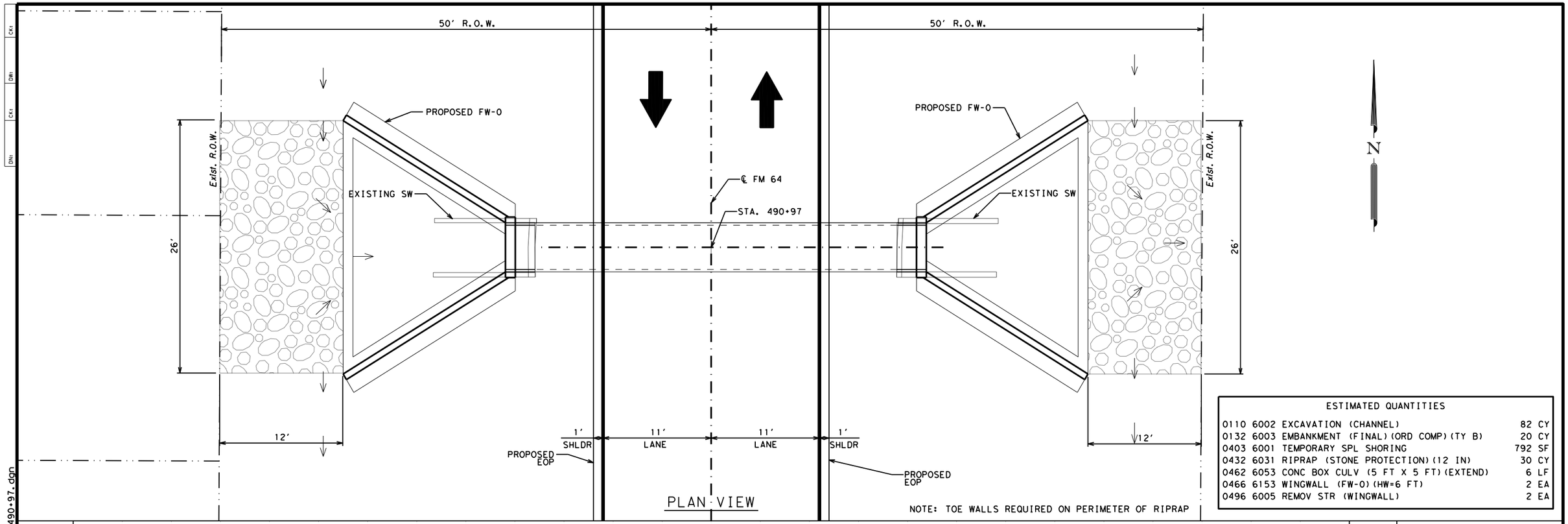


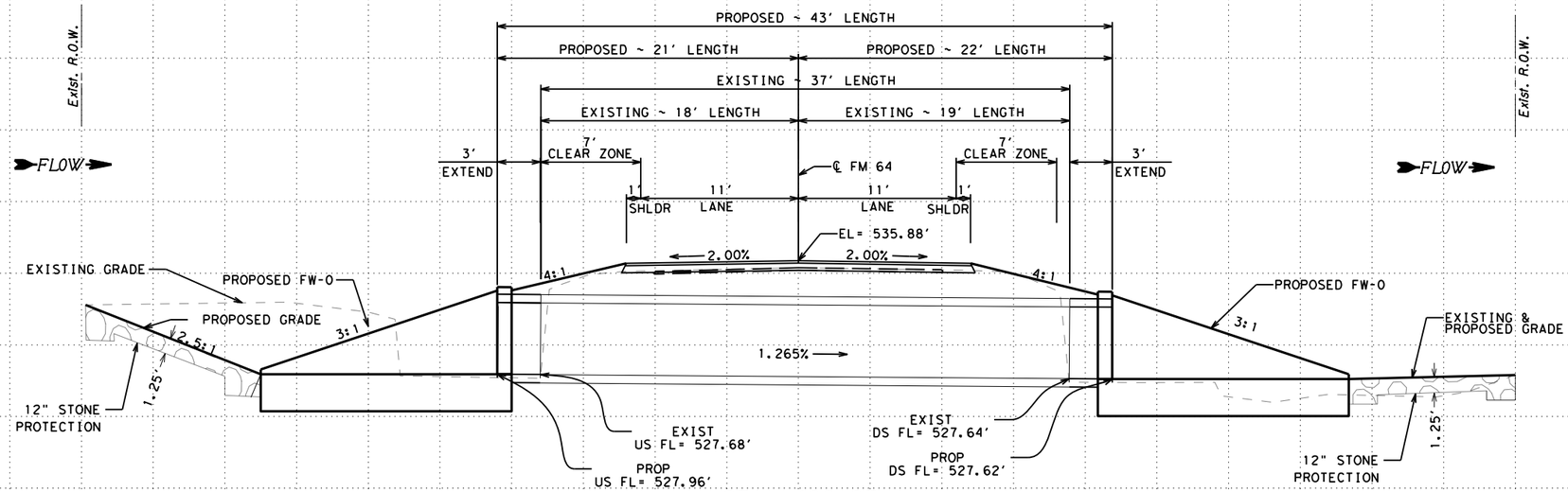
PLAN VIEW

NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

ESTIMATED QUANTITIES

0110 6002	EXCAVATION (CHANNEL)	82 CY
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	20 CY
0403 6001	TEMPORARY SPL SHORING	792 SF
0432 6031	RIPRAP (STONE PROTECTION)(12 IN)	30 CY
0462 6053	CONC BOX CULV (5 FT X 5 FT)(EXTEND)	6 LF
0466 6153	WINGWALL (FW-0)(HW=6 FT)	2 EA
0496 6005	REMOV STR (WINGWALL)	2 EA

STANDARDS: SRR, FW-0, SCC-5 & 6, SCC-MD



STA. 490+97

EXISTING ~ 1 - 5' X 5' X 37' BOX

PROPOSED ~ 1 - 5' X 5' X 43' BOX
EXTENSION ~ 3' US & DS
W/ FW-0 US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD
22' LT @ STA. 492+26
ELEV= 533.36'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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FM 64
CULVERT LAYOUT
STA. 490+97

SHEET 6 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		86

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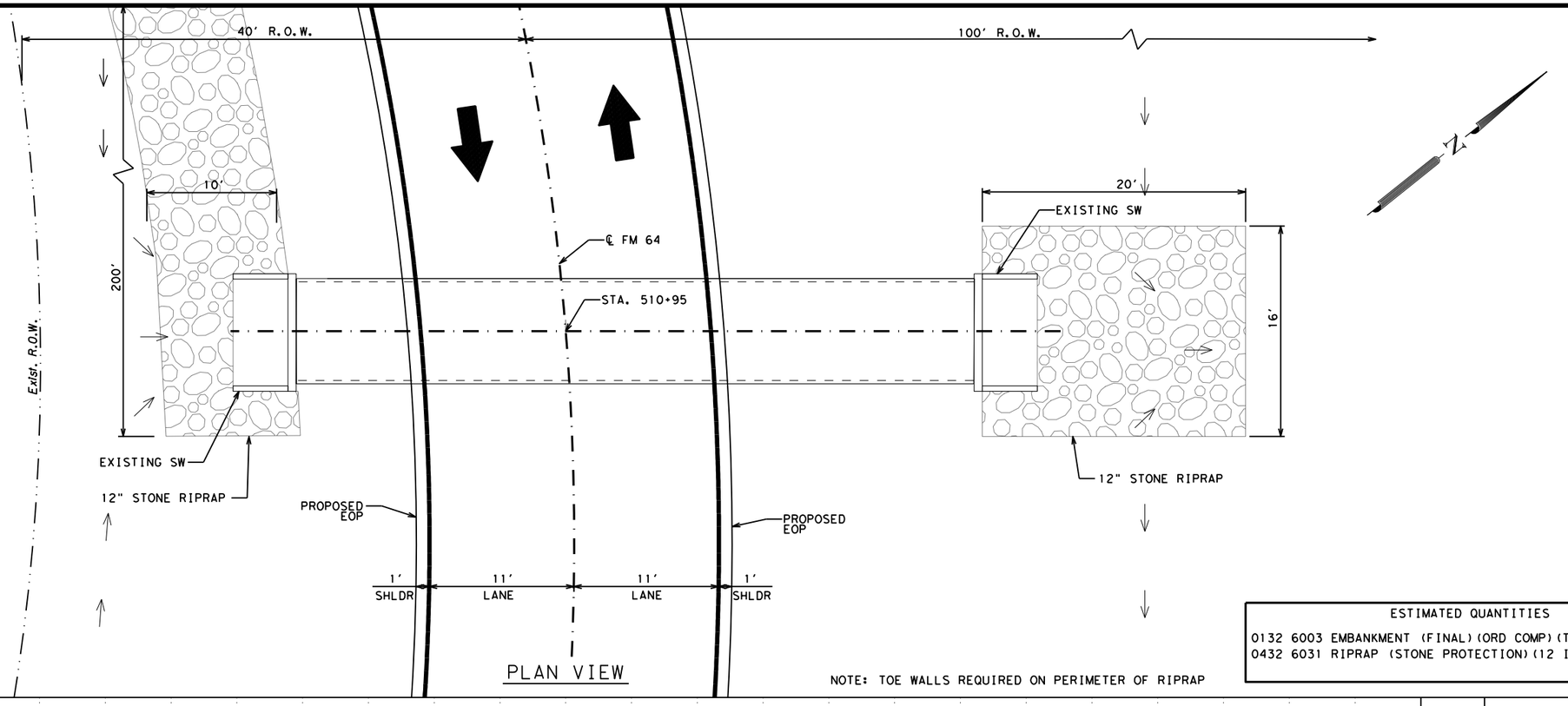
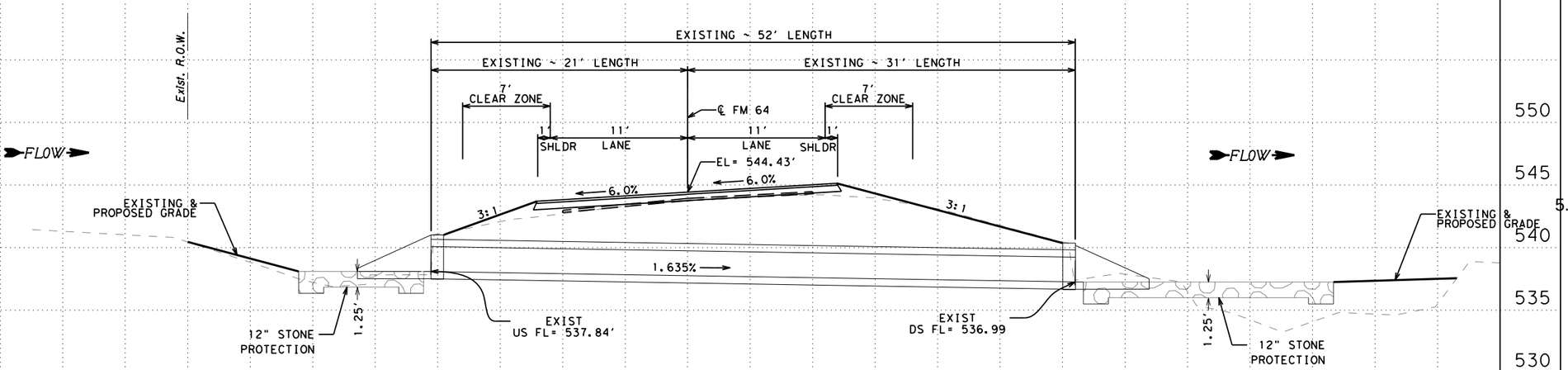


PLAN VIEW

NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	47 CY
0432 6031 RIPRAP (STONE PROTECTION) (12 IN)	108 CY



STA. 510+95

EXISTING ~ 1 - 8' X 2' X 37' BOX
W/ STRAIGHT WINGS US & DS
PROPOSED ~ NO CULVERT WORK REQUIRED

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: SRR

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE RATER
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PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 510+95

SHEET 7 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		87

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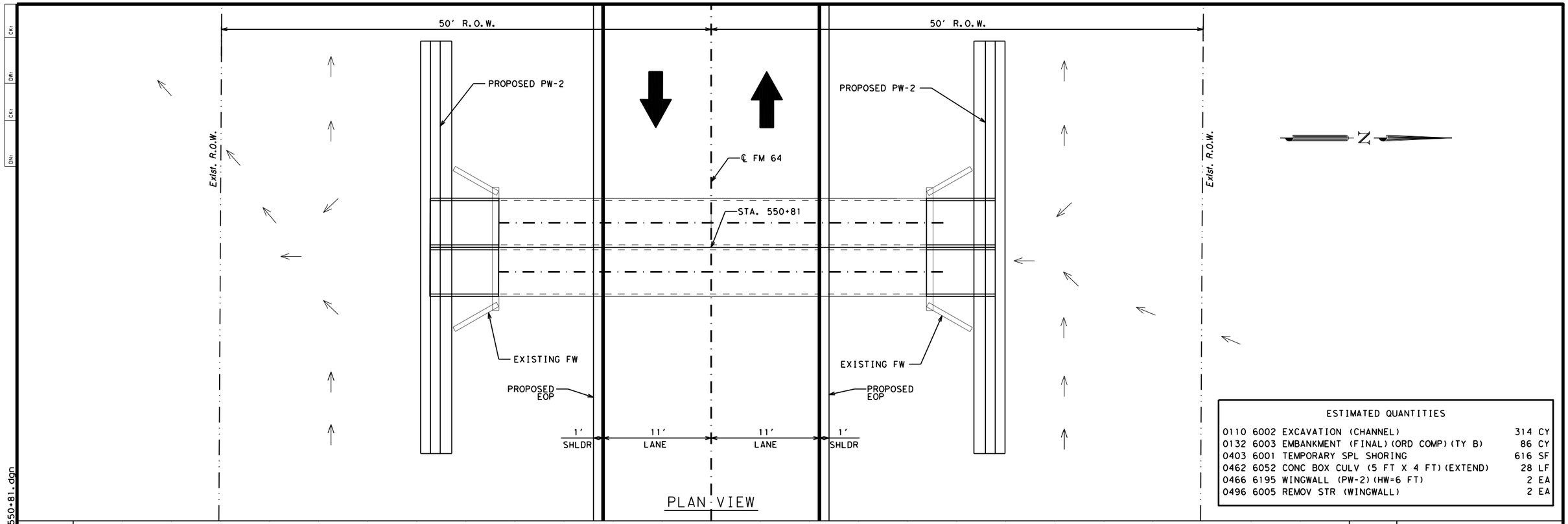
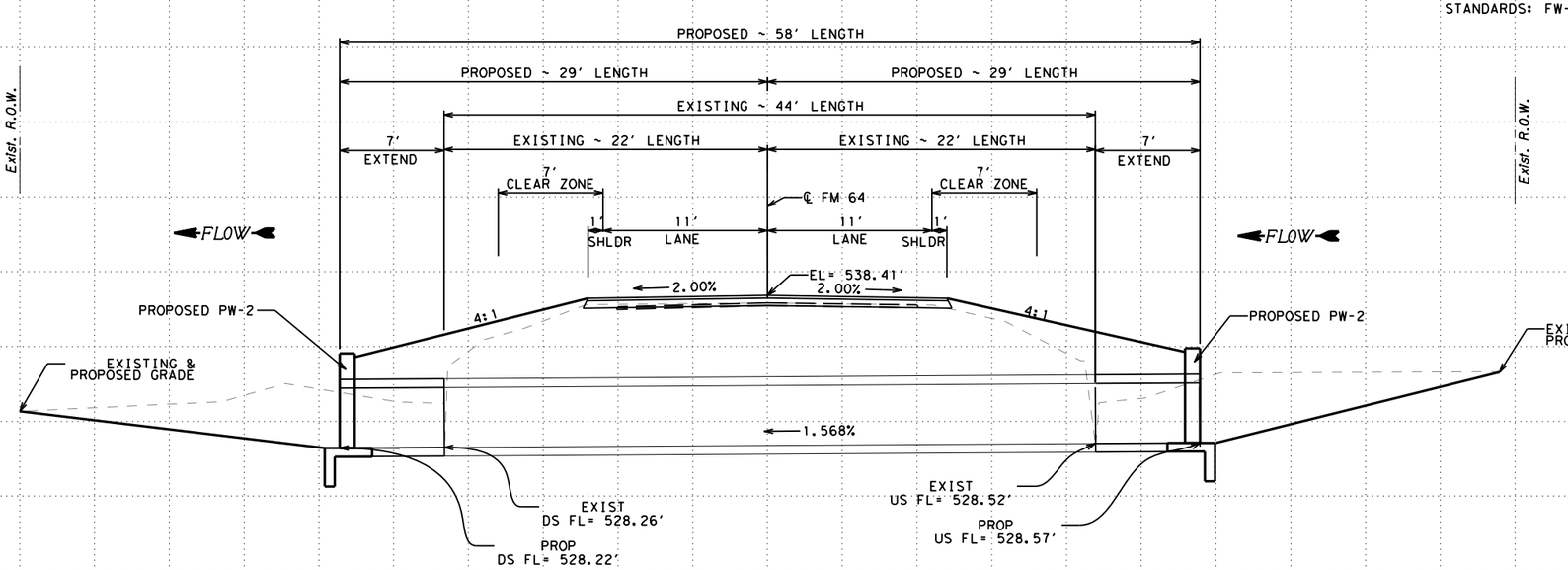


ESTIMATED QUANTITIES

0110 6002	EXCAVATION (CHANNEL)	314 CY
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	86 CY
0403 6001	TEMPORARY SPL SHORING	616 SF
0462 6052	CONC BOX CULV (5 FT X 4 FT)(EXTEND)	28 LF
0466 6195	WINGWALL (PW-2)(HW=6 FT)	2 EA
0496 6005	REMOV STR (WINGWALL)	2 EA



STA. 550+81

EXISTING ~ 2 - 5' X 4' X 44' BOX

PROPOSED ~ 2 - 5' X 4' X 58' BOX
EXTENSION ~ 7' US & DS
W/ PW-2 US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: FW-0, MC-5-20, MC-MD

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 550+81

SHEET 8 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		88

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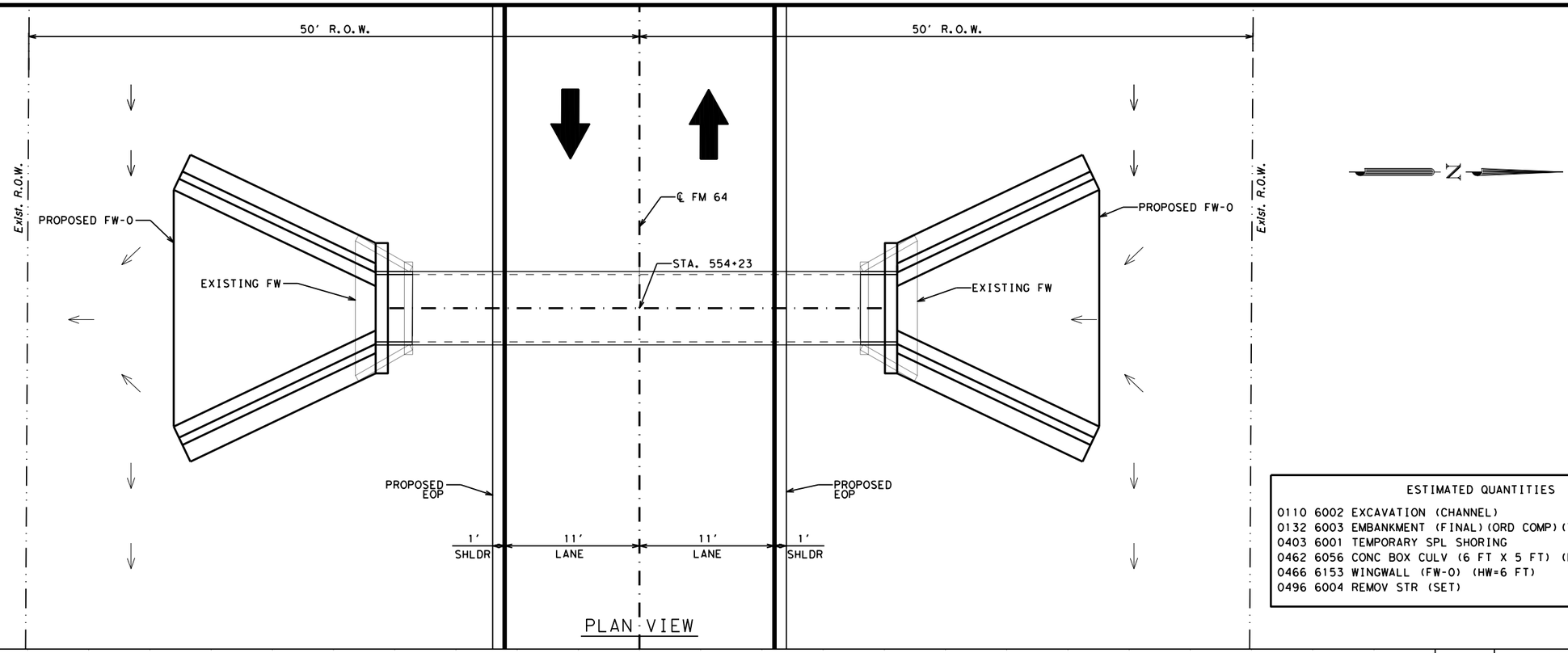
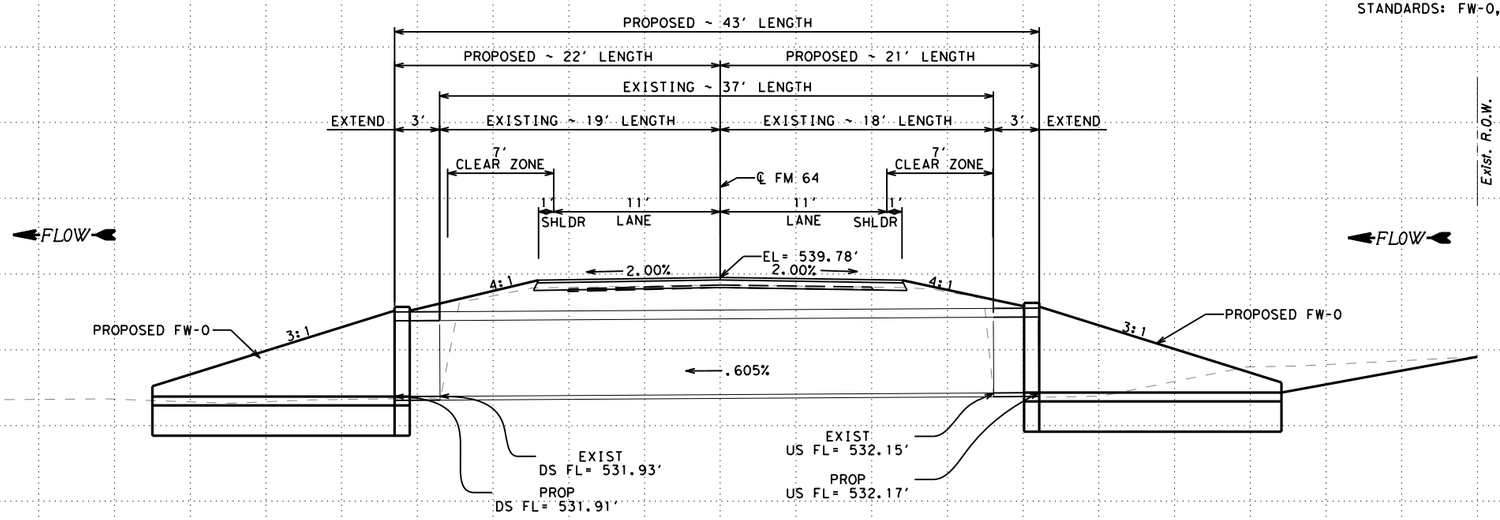


PLAN VIEW

ESTIMATED QUANTITIES		
0110 6002	EXCAVATION (CHANNEL)	53 CY
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	10 CY
0403 6001	TEMPORARY SPL SHORING	640 SF
0462 6056	CONC BOX CULV (6 FT X 5 FT) (EXTEND)	6 LF
0466 6153	WINGWALL (FW-0) (HW=6 FT)	2 EA
0496 6004	REMOV STR (SET)	2 EA



STA. 554+23

EXISTING ~ 1 - 6' X 5' X 37' BOX

PROPOSED ~ 1 - 6' X 5' X 43' BOX
WITH FW-0 US & DS
EXTENSION - 3' US & DS

STANDARDS: FW-0, SCC-5 & 6, SCC-MD

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 554+23

SHEET 9 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		89

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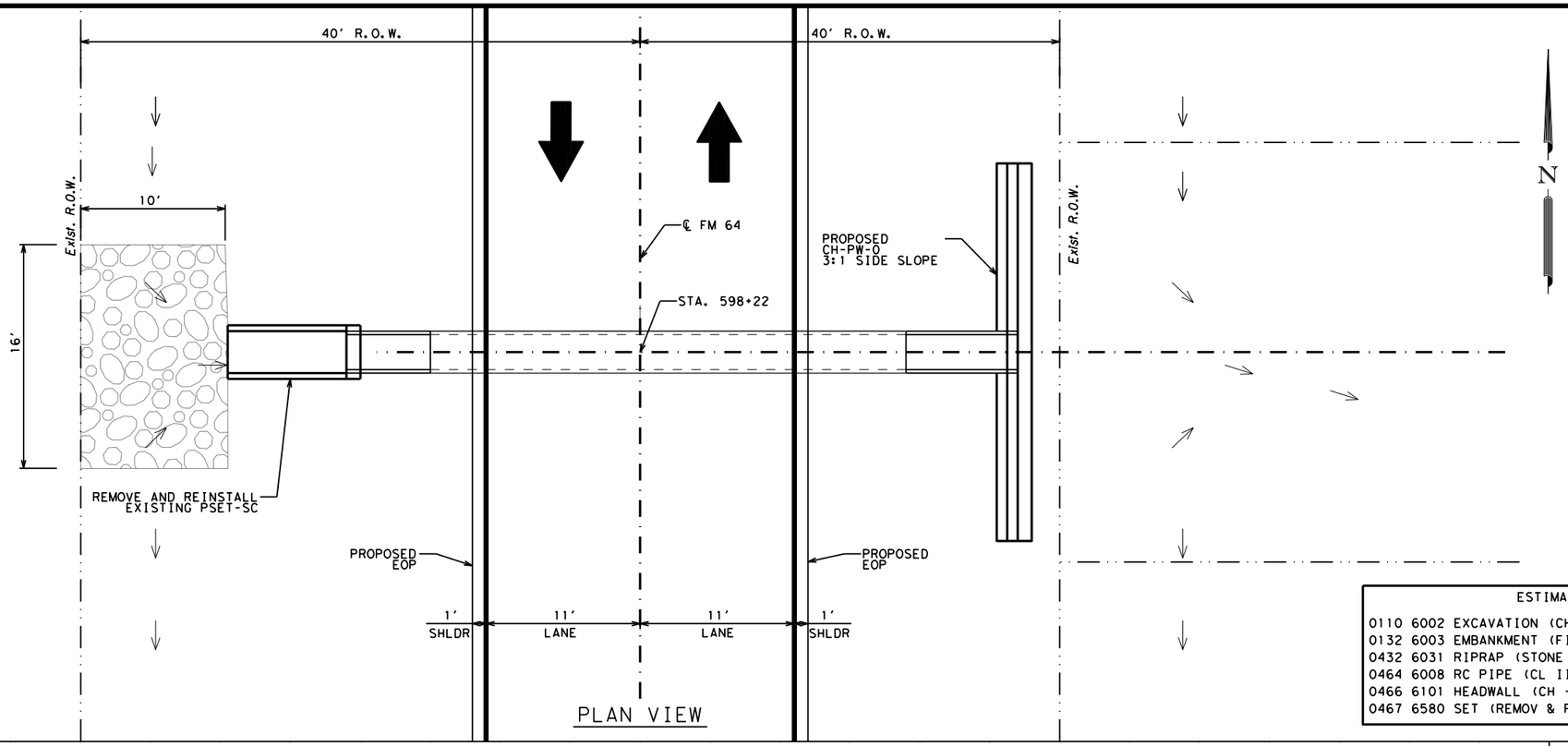
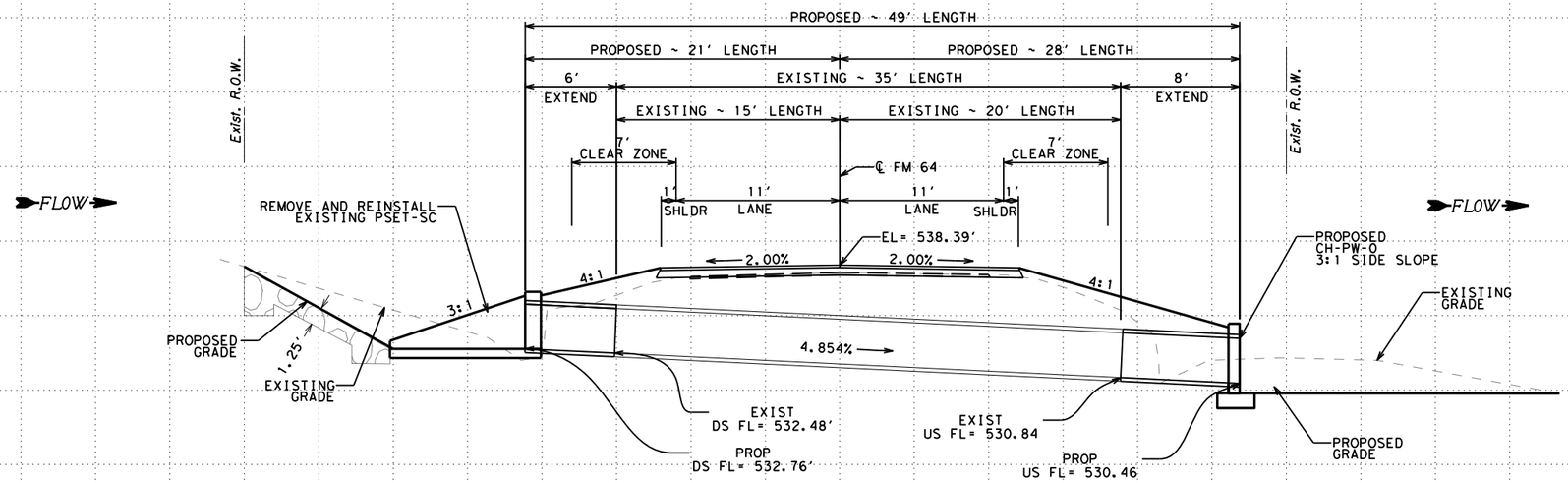


PLAN VIEW

ESTIMATED QUANTITIES	
0110 6002 EXCAVATION (CHANNEL)	20 CY
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	10 CY
0432 6031 RIPRAP (STONE PROTECTION)(12 IN)	10 CY
0464 6008 RC PIPE (CL III)(36 IN)	14 LF
0466 6101 HEADWALL (CH - PW - O) (DIA= 36 IN)	1 EA
0467 6580 SET (REMOV & REINSTALL)	1 EA



STA. 598+22

EXISTING ~ 1 - 36" X 35' RCP

PROPOSED ~ 1 - 36" X 49' RCP
WITH PSET-SC US & CH-PW-O DS
EXTENSION - 6' US & 8' DS

STANDARDS: PSET-SC, CH-PW-O

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 CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 598+22

SHEET 10 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		90

DATE: 5/5/2021 4:41:17 PM
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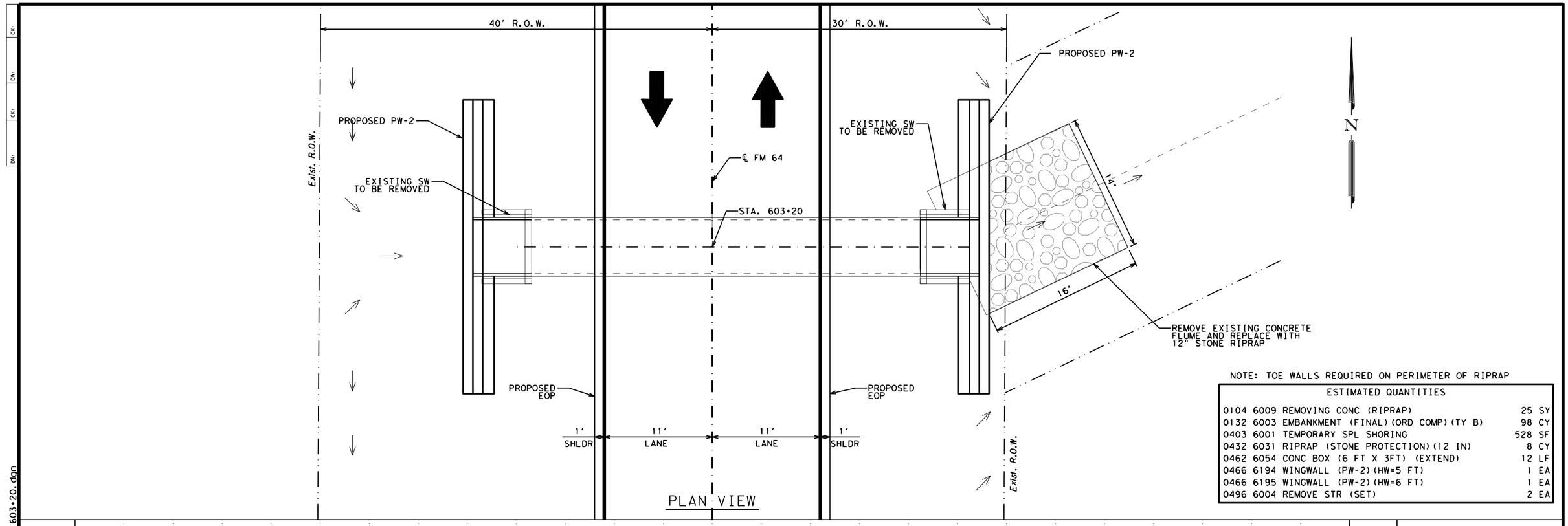
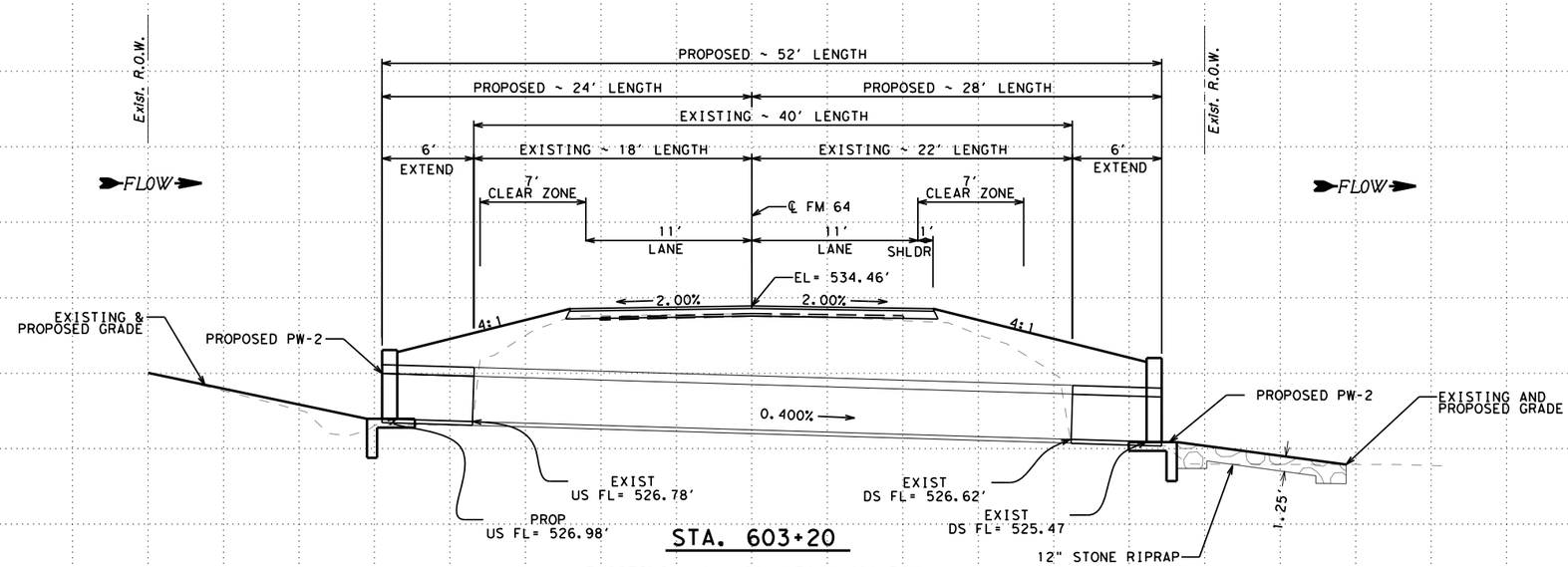


PLAN VIEW

NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

ESTIMATED QUANTITIES	
0104 6009 REMOVING CONC (RIPRAP)	25 SY
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	98 CY
0403 6001 TEMPORARY SPL SHORING	528 SF
0432 6031 RIPRAP (STONE PROTECTION)(12 IN)	8 CY
0462 6054 CONC BOX (6 FT X 3FT) (EXTEND)	12 LF
0466 6194 WINGWALL (PW-2)(HW=5 FT)	1 EA
0466 6195 WINGWALL (PW-2)(HW=6 FT)	1 EA
0496 6004 REMOVE STR (SET)	2 EA



STA. 603+20

EXISTING ~ 1 - 6' X 3' X 40' BOX

PROPOSED ~ 1 - 6' X 3' X 52' BOX
WITH PW-2 US & DS
EXTENSION - 6' US & DS

STANDARDS: SRR, PW-2, SCC-5 & 6, SCC-MD

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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FM 64
CULVERT LAYOUT
STA. 603+20

SHEET 11 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		91

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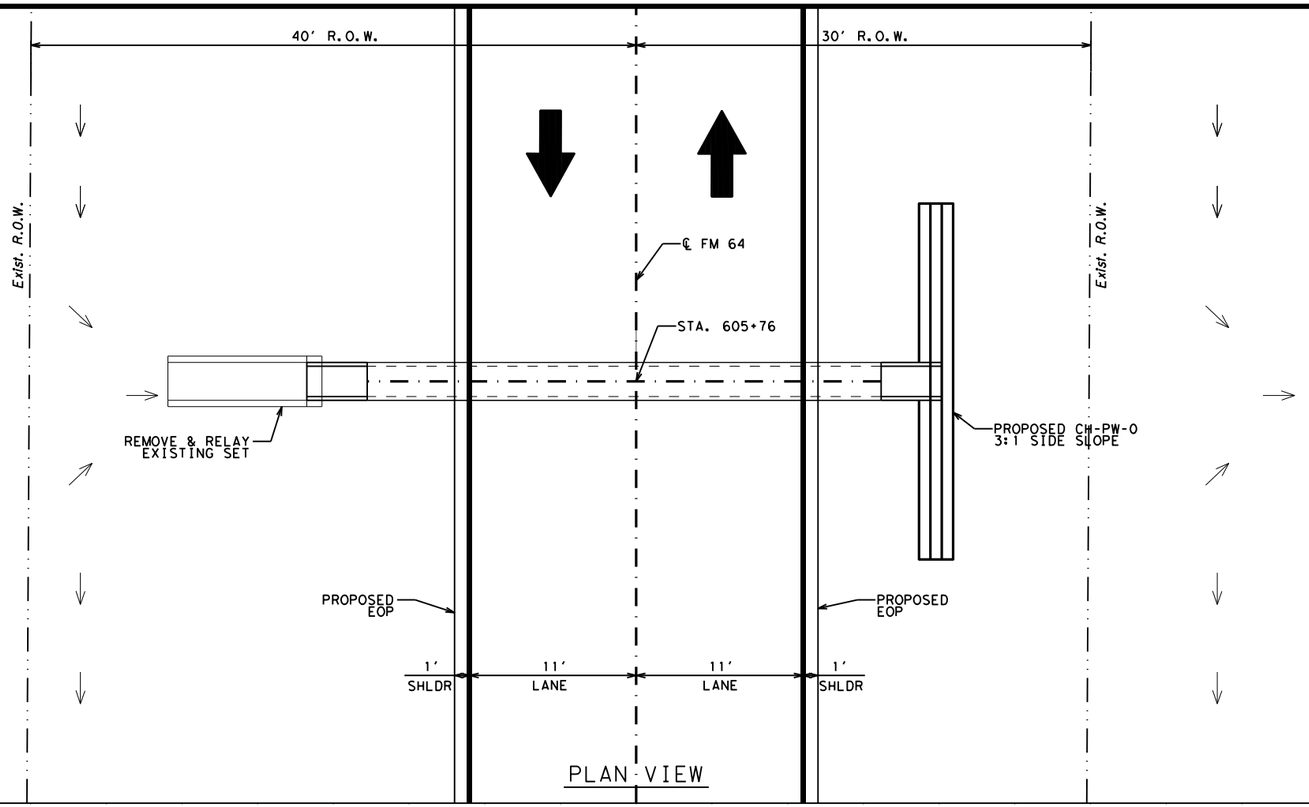
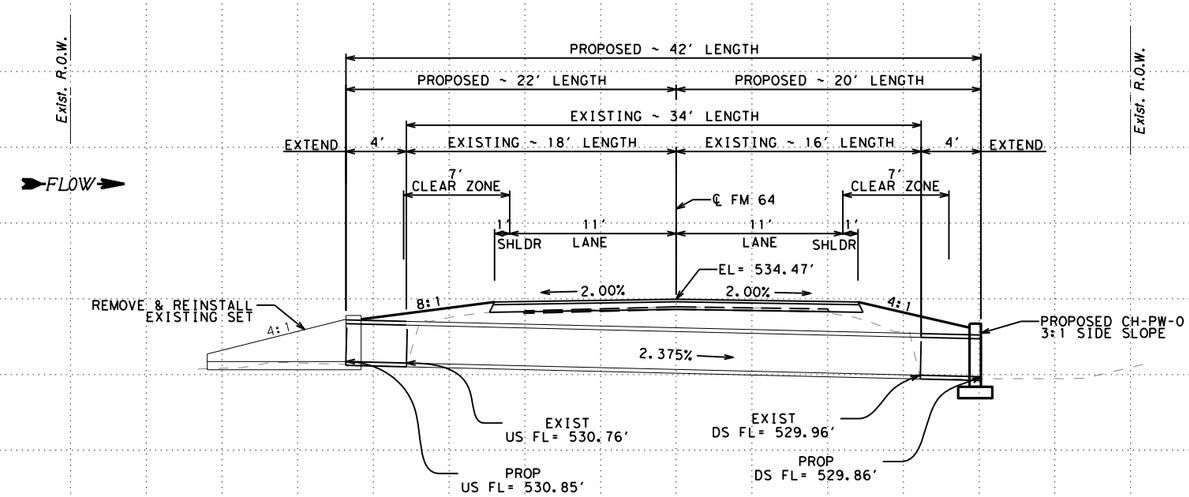
DW:
CK:
DN:



PLAN VIEW

N

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	30 CY
0464 6007 RC PIPE (CL III)(30 IN)	8 LF
0466 6099 HEADWALL (CH-PW-O)(DIA=30IN)	1 EA
0467 6580 SET (REMOV & REINSTALL)	1 EA



STA. 605+76

EXISTING ~ 1 - 30" X 34' RCP

PROPOSED ~ 1 - 30" X 42' RCP
WITH CH-PW-O DS
EXTENSION ~ 4' US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: CH-PW-O

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 605+76

SHEET 12 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		92

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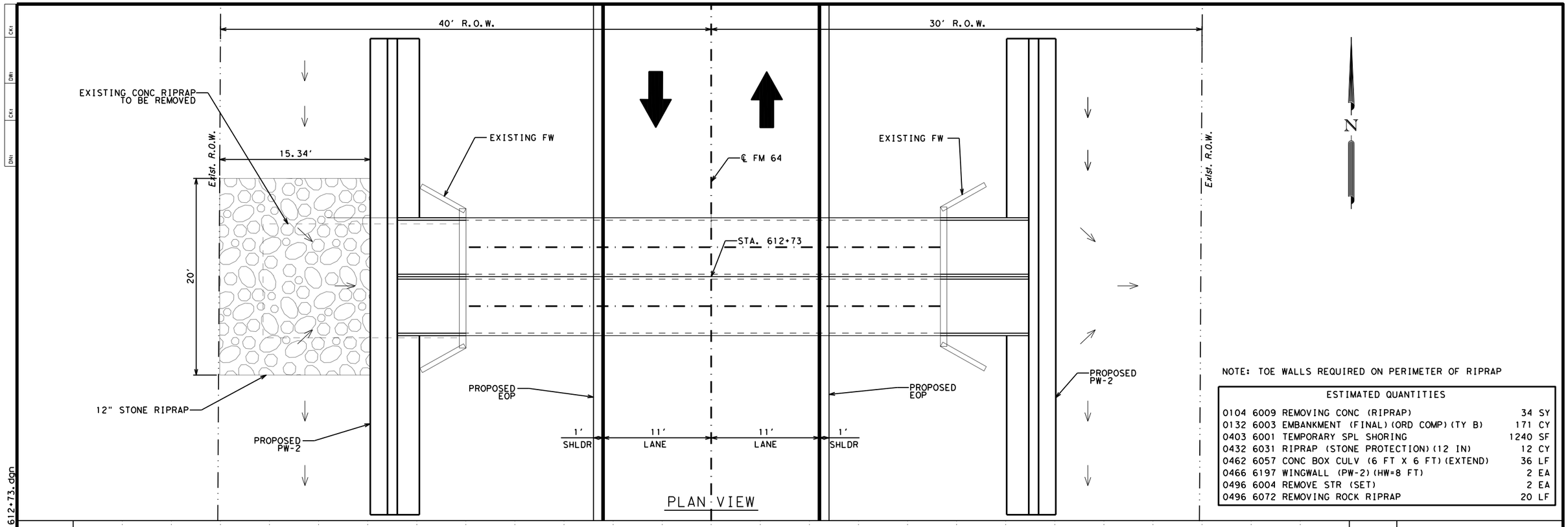
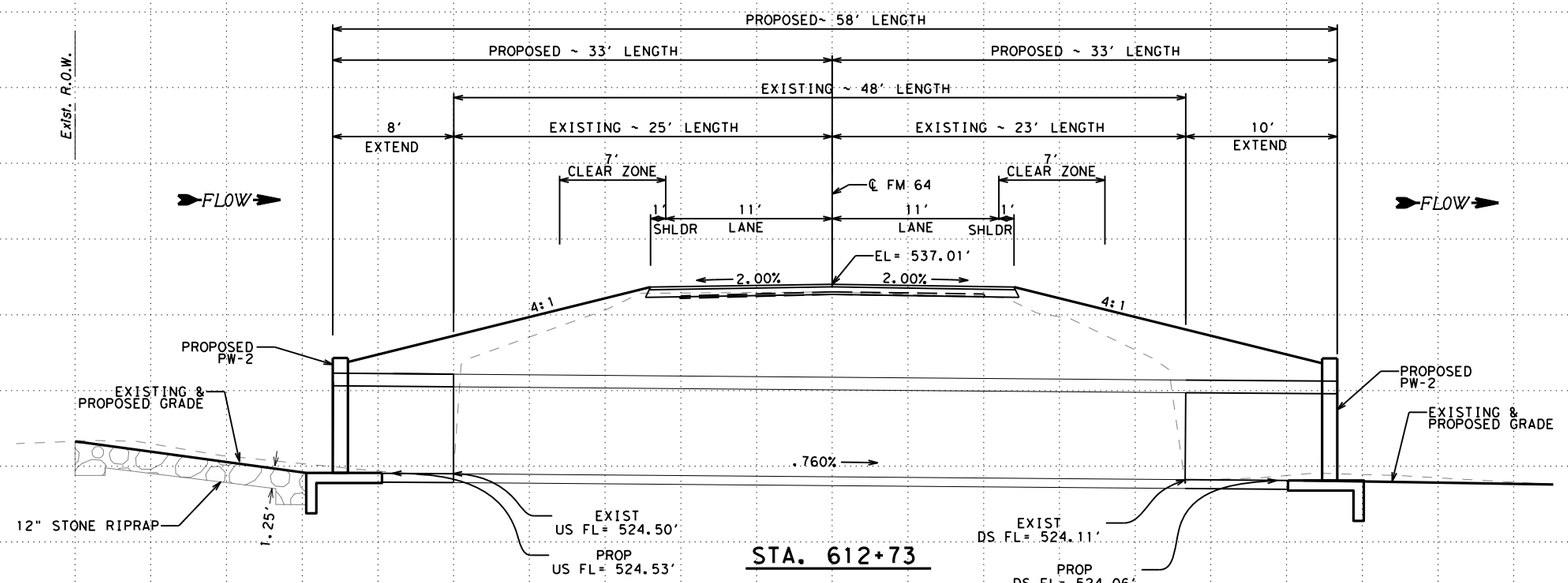


NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

ESTIMATED QUANTITIES	
0104 6009 REMOVING CONC (RIPRAP)	34 SY
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	171 CY
0403 6001 TEMPORARY SPL SHORING	1240 SF
0432 6031 RIPRAP (STONE PROTECTION)(12 IN)	12 CY
0462 6057 CONC BOX CULV (6 FT X 6 FT)(EXTEND)	36 LF
0466 6197 WINGWALL (PW-2)(HW=8 FT)	2 EA
0496 6004 REMOVE STR (SET)	2 EA
0496 6072 REMOVING ROCK RIPRAP	20 LF

STANDARDS: PW-2, MC-6-16, SCC-MD



STA. 612+73

EXISTING ~ 2 - 6' X 6' X 48' BOX

PROPOSED ~ 2 - 6' X 6' X 66' BOX
WITH PW-2 US & DS
EXTENSION ~ 8' US & 10' DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD
33.14' RT @ STA. 312+29
ELEV= 530.07'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 612+73

SHEET 13 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		93

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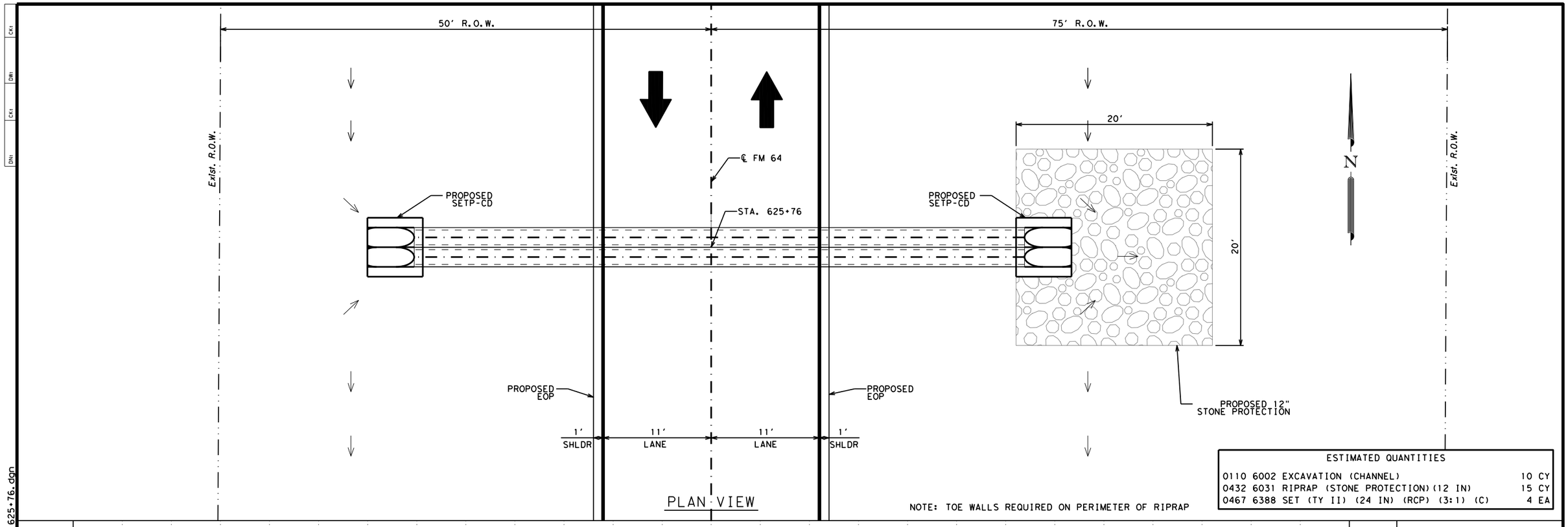


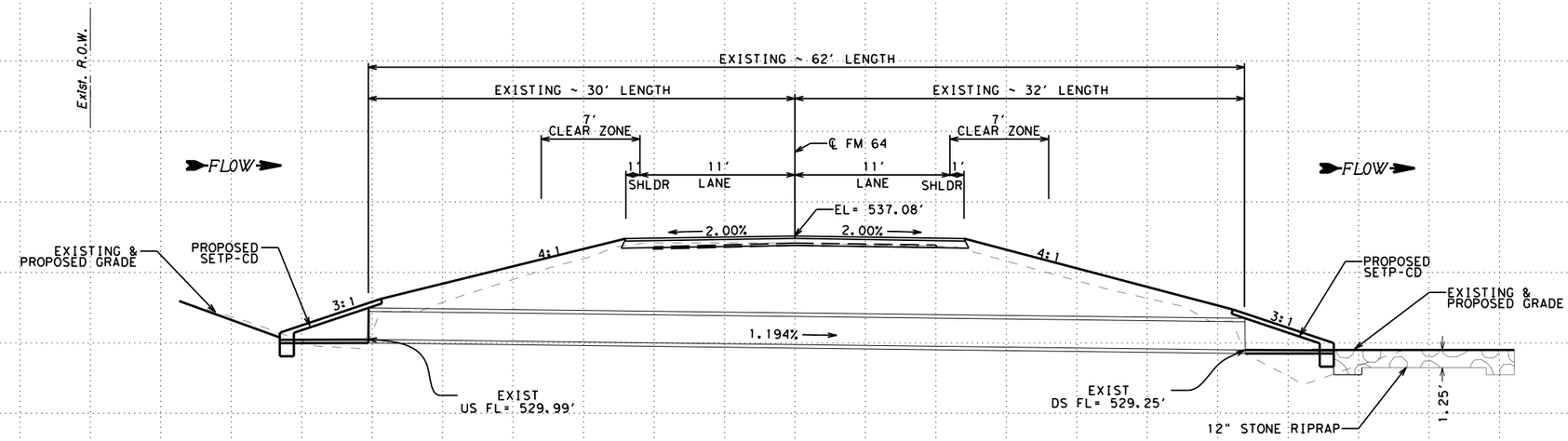
PLAN VIEW

NOTE: TOE WALLS REQUIRED ON PERIMETER OF RIPRAP

ESTIMATED QUANTITIES

0110 6002 EXCAVATION (CHANNEL)	10 CY
0432 6031 RIPRAP (STONE PROTECTION) (12 IN)	15 CY
0467 6388 SET (TY II) (24 IN) (RCP) (3:1) (C)	4 EA

STANDARDS: SRR, SETP-CD



STA. 625+76

EXISTING ~ 2 - 24" X 62' RCP

PROPOSED ~ 2 - 24" X 62' RCP
WITH PSET-CD US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD
36.14' LT @ STA. 625+32
ELEV= 532.15'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 625+76

SHEET 14 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		94

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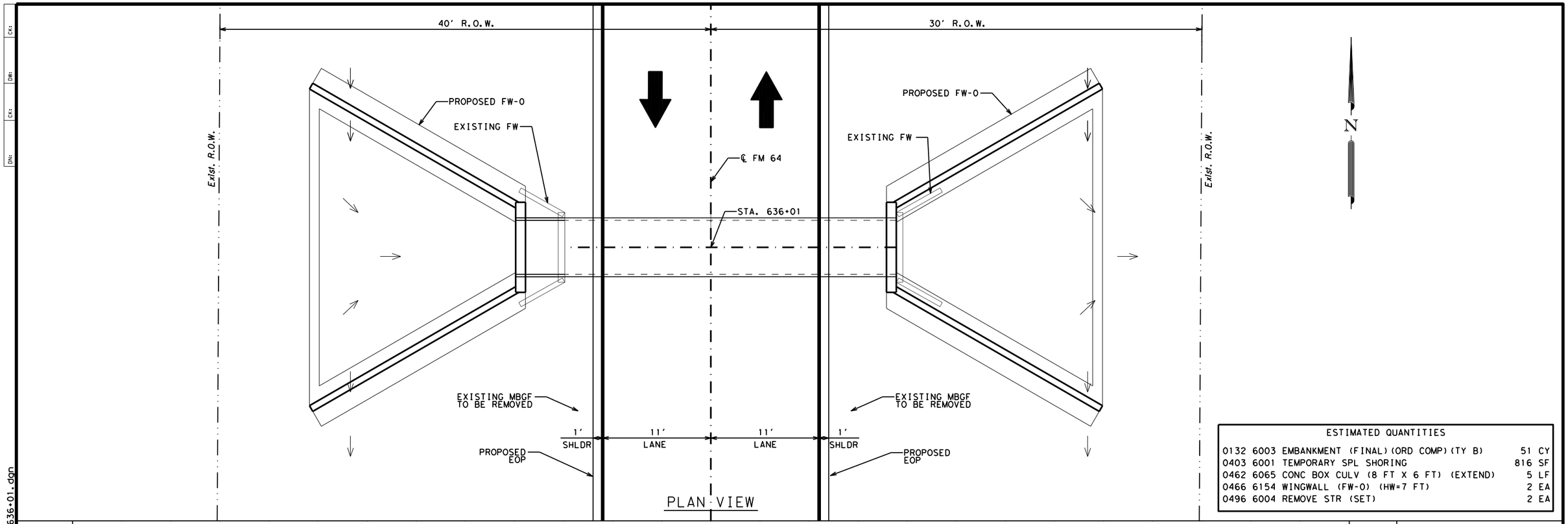
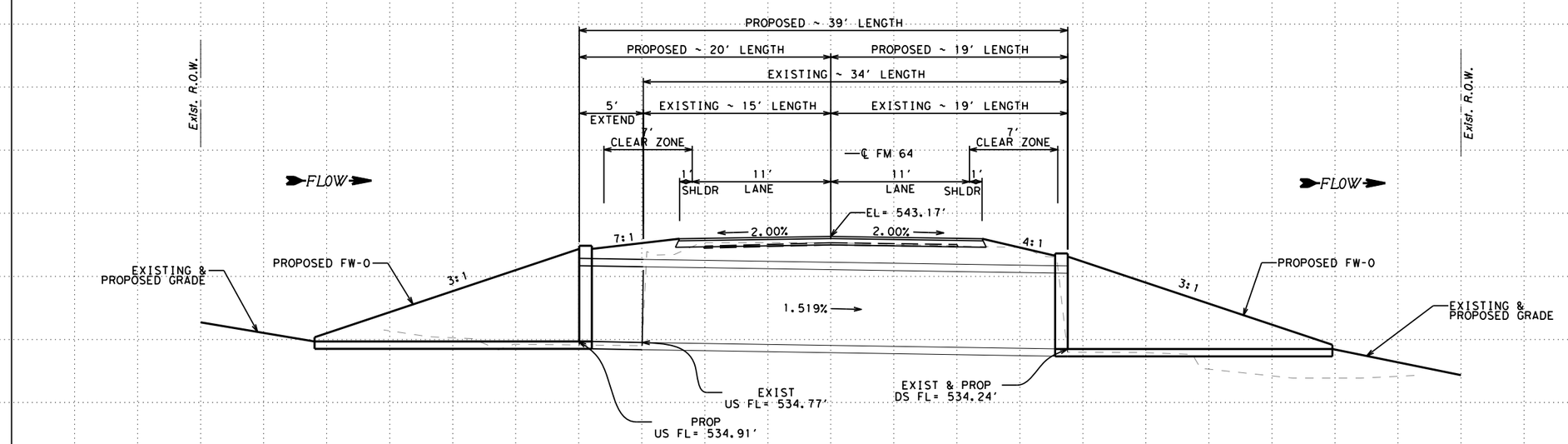


PLAN VIEW

ESTIMATED QUANTITIES		
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	51 CY
0403 6001	TEMPORARY SPL SHORING	816 SF
0462 6065	CONC BOX CULV (8 FT X 6 FT) (EXTEND)	5 LF
0466 6154	WINGWALL (FW-0) (HW=7 FT)	2 EA
0496 6004	REMOVE STR (SET)	2 EA



STA. 636+01

EXISTING ~ 1 - 8' X 6' X 34' BOX

PROPOSED ~ 1 - 8' X 6' X 39' BOX
WITH FW-0 US & DS
EXTENSION - 5' US

STANDARDS: FW-0, SCC-8, SCC-MD

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM CAPPED ROD
33' RT @ STA. 4+42
ELEV= 670.70'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 636+01

SHEET 15 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		95

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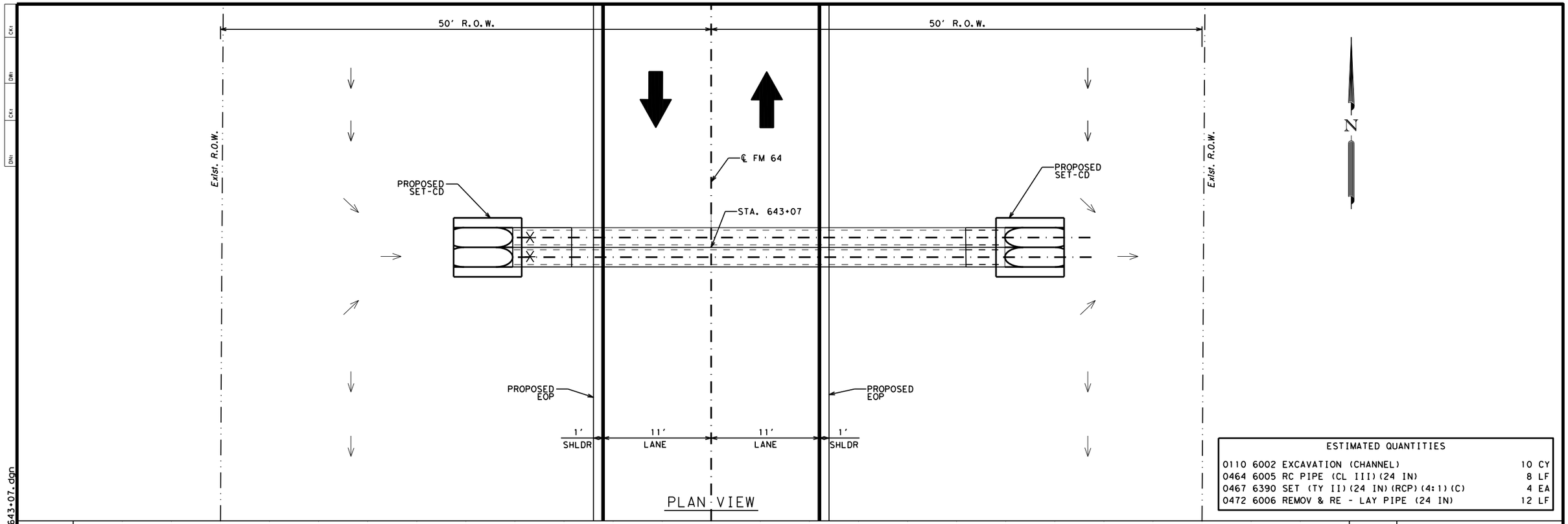
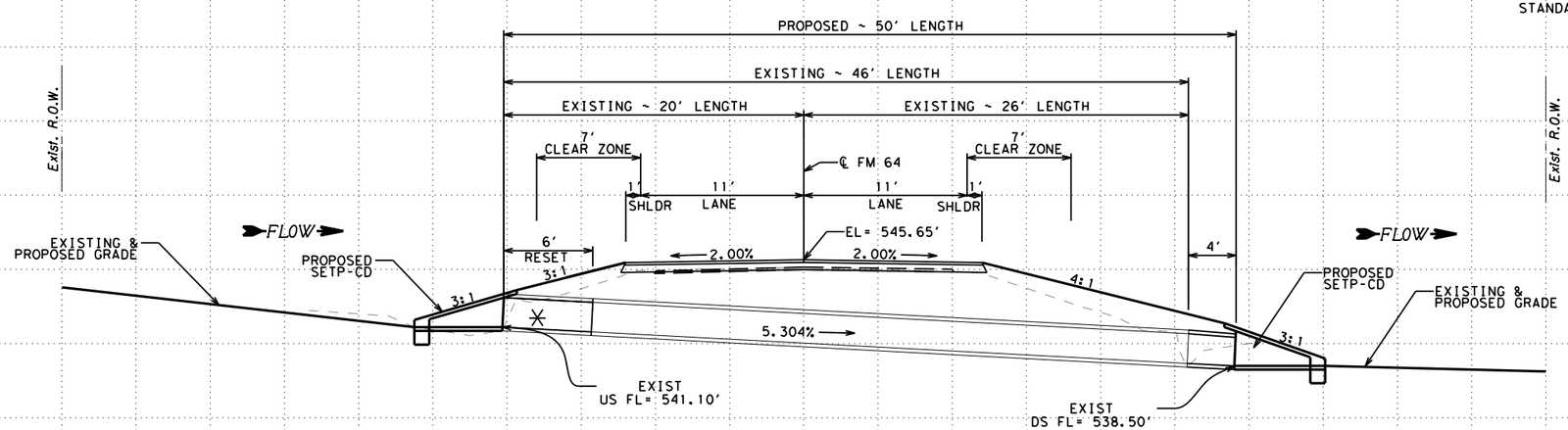


PLAN VIEW

ESTIMATED QUANTITIES	
0110 6002 EXCAVATION (CHANNEL)	10 CY
0464 6005 RC PIPE (CL III)(24 IN)	8 LF
0467 6390 SET (TY II)(24 IN)(RCP)(4:1)(C)	4 EA
0472 6006 REMOV & RE - LAY PIPE (24 IN)	12 LF



STANDARDS: SETP-CD

STA. 643+07

EXISTING ~ 2 - 24" X 46' RCP

PROPOSED ~ 2 - 24" X 50' RCP
WITH SETP-CD US & DS
REMOVE AND RESET 12' US

✳ REMOVE 6' OF PIPE AND RESET

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM RR SPIKE SET
31' RT @ STA. 642+06
ELEV= 543.14'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 643+07

SHEET 16 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		96

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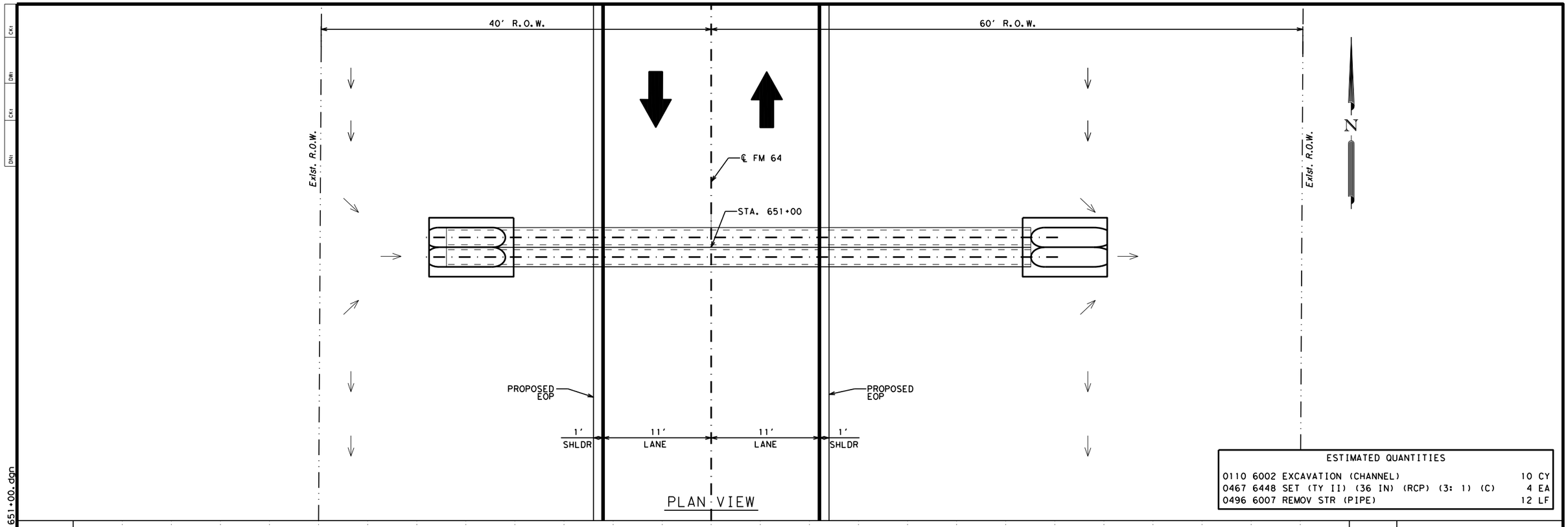
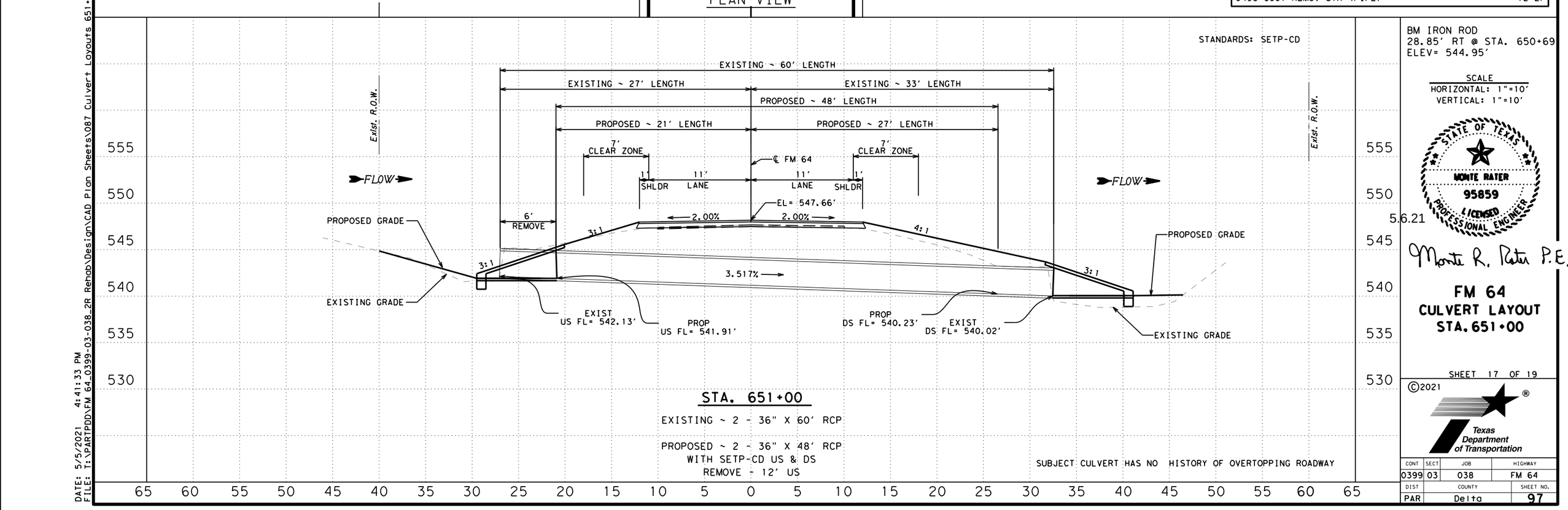


ESTIMATED QUANTITIES

0110 6002 EXCAVATION (CHANNEL)	10 CY
0467 6448 SET (TY II) (36 IN) (RCP) (3: 1) (C)	4 EA
0496 6007 REMOV STR (PIPE)	12 LF



STA. 651+00

EXISTING ~ 2 - 36" X 60' RCP

PROPOSED ~ 2 - 36" X 48' RCP
WITH SETP-CD US & DS
REMOVE - 12' US

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD
28.85' RT @ STA. 650+69
ELEV= 544.95'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 651+00

SHEET 17 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		97

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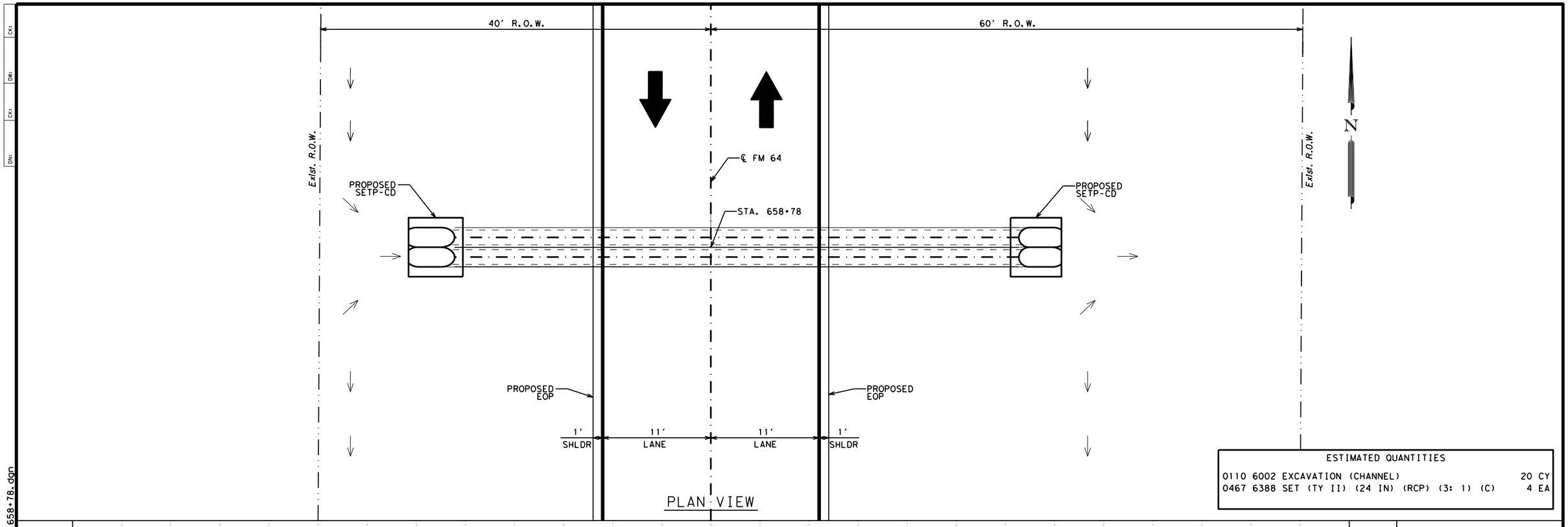
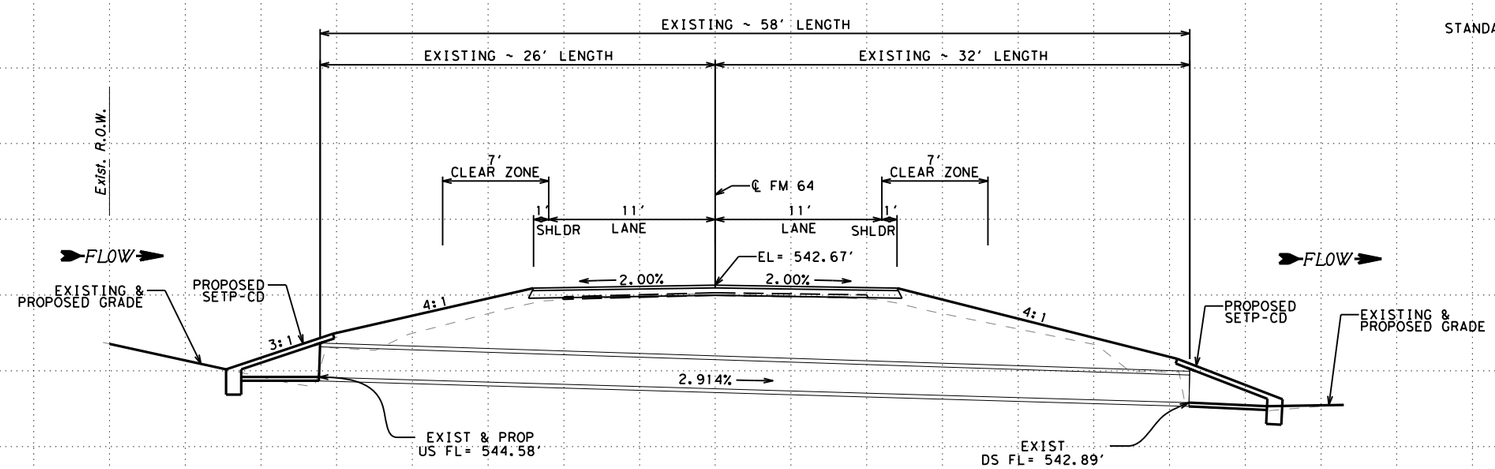


PLAN VIEW

ESTIMATED QUANTITIES	
0110 6002 EXCAVATION (CHANNEL)	20 CY
0467 6388 SET (TY II) (24 IN) (RCP) (3: 1) (C)	4 EA



STANDARDS: SETP-CD

STA. 658+78

EXISTING ~ 2 - 24" X 58' RCP

PROPOSED ~ 2 - 24" X 58' RCP
WITH SETP-CD US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

BM IRON ROD
21.53' LT @ STA. 659+44
ELEV= 546.27'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

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FM 64
CULVERT LAYOUT
STA. 658+78

SHEET 18 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		98

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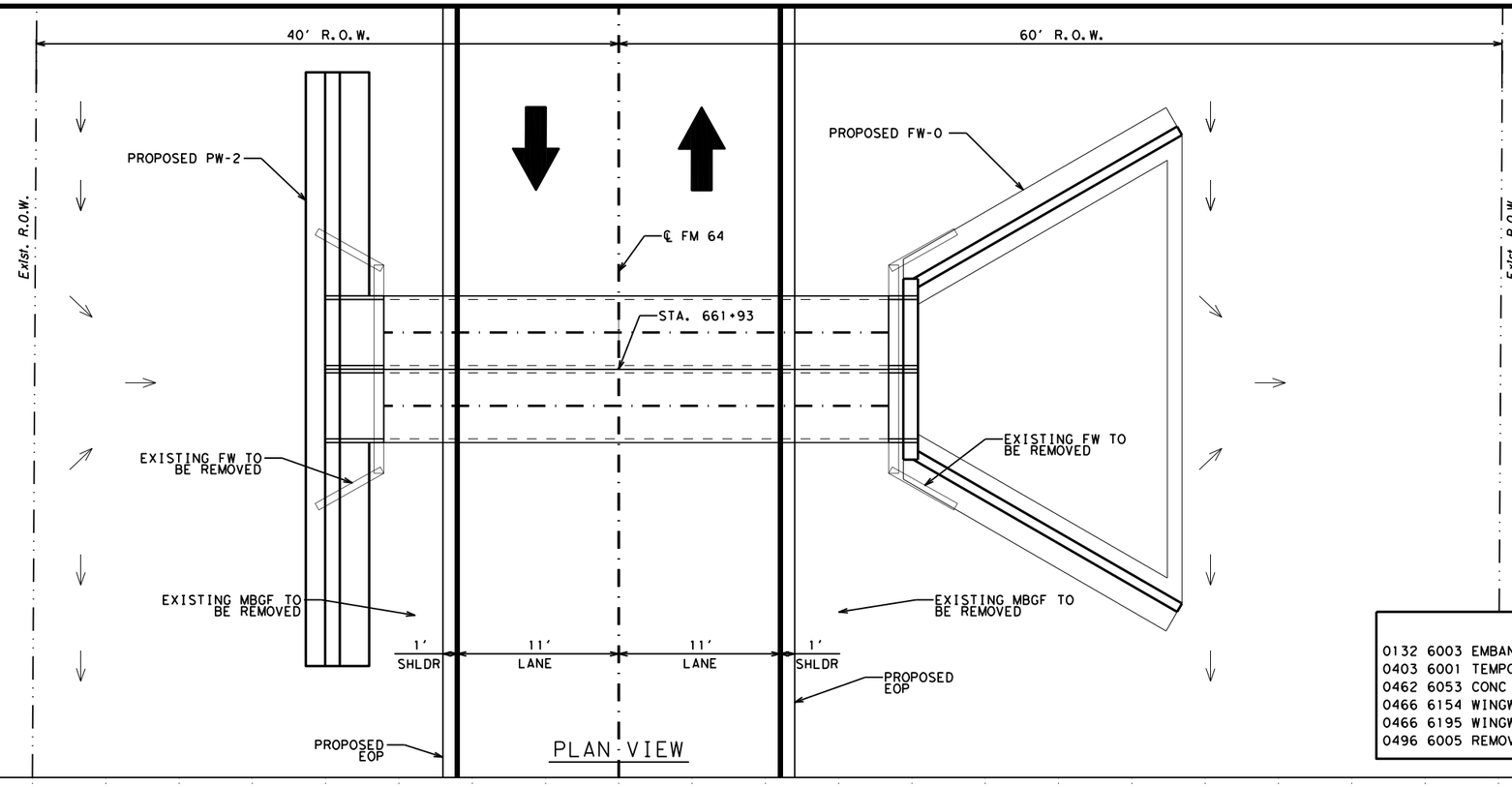
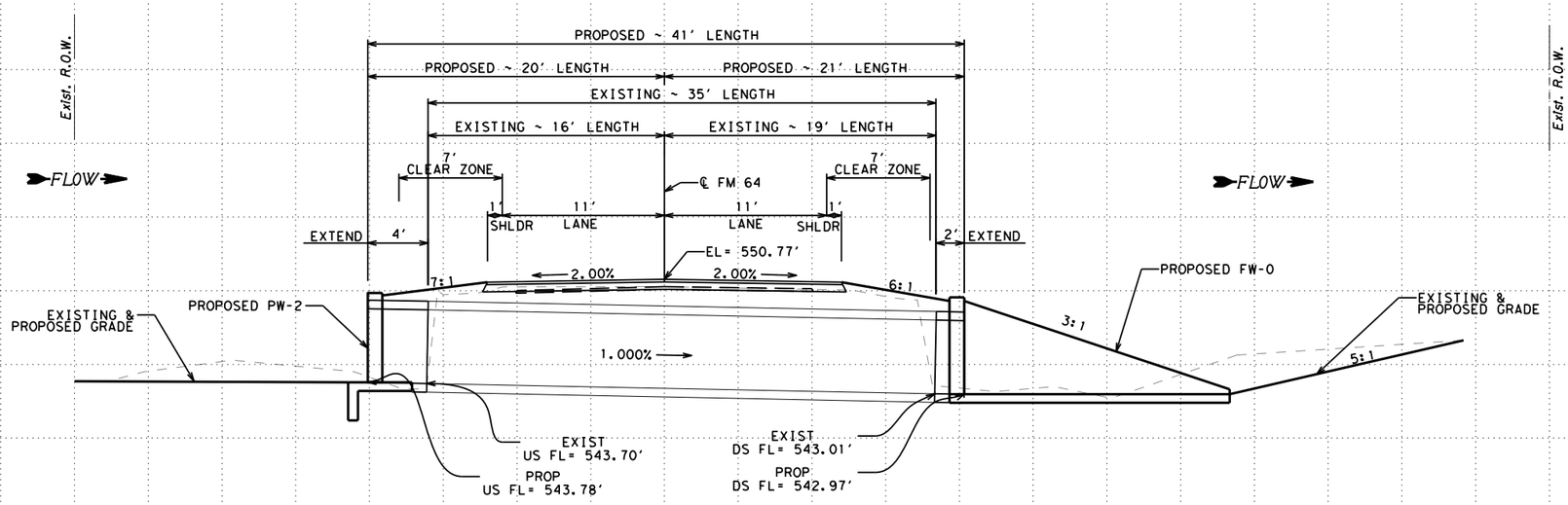


PLAN VIEW

ESTIMATED QUANTITIES	
0132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	20 CY
0403 6001 TEMPORARY SPL SHORING	845 SY
0462 6053 CONC BOX CULV (5 FT X 5 FT)(EXTEND)	6 LF
0466 6154 WINGWALL (FW-0) (HW=7 FT)	1 EA
0466 6195 WINGWALL (PW-2)(HW=6 FT)	1 EA
0496 6005 REMOVE STR (WINGWALL)	2 EA



STA. 661+93

EXISTING ~ 2 - 5 X 5 X 35' BOX

PROPOSED ~ 2 - 5 X 5 X 41' BOX
WITH PW-2 US & FW-0 DS
EXTENSION ~ 4' US & DS

SUBJECT CULVERT HAS NO HISTORY OF OVERTOPPING ROADWAY

STANDARDS: PW-2, FW-0, MC-5-20

BM IRON ROD
16.96' RT @ STA. 662+68
ELEV= 548.57'

SCALE
HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

STATE OF TEXAS
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Monte R. Rater P.E.

FM 64
CULVERT LAYOUT
STA. 661+93

SHEET 19 OF 19

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		99

DATE: 5/5/2021 4:41:37 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\089 Culvert Layouts 661+93.dgn

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (C.Y.)	Class "C" Conc (Curb) (2) (C.Y.)	Class "C" Conc (Wingwall) (3) (C.Y.)	Total Wingwall Area (S.F.)
439+20 (Both)	1 ~ 6'x 3'	3'	SCC-5&6	PW-2	0°	3:1	7"	7"	0.750'	4.333'	N/A	N/A	10.000'	7.167'	N/A	0.0	0.4	12.0	162
463+14 (Both)	2 ~ 6'x 3'	3'	MC-6-16	FW-0	0°	3:1	7"	7"	0.500'	3.833'	10.500'	6.062'	12.124'	N/A	N/A	6.4	0.6	7.0	102
490+97 (Both)	1 ~ 5'x 5'	3'	SCC-5&6	FW-0	0°	3:1	7"	7"	0.500'	5.833'	16.500'	9.526'	19.053'	N/A	N/A	7.0	0.2	14.0	234
550+12 (Both)	2 ~ 5'x 4'	3'	MC-5-20	FW-0	0°	3:1	7"	7"	0.500'	4.833'	13.500'	7.794'	15.588'	11.750'	N/A	0.0	0.4	11.6	162
554+23 (Both)	1 ~ 6'x 5'	3'	SCC-5&6	FW-0	0°	3:1	7"	7"	0.500'	5.833'	16.500'	9.526'	19.053'	7.167'	N/A	0.0	0.2	14.6	234
550+81 (Both)	2 ~ 5'x 4'	5.5'	MC-5-20	PW-2	0°	3:1	7"	7"	1.750'	6.333'	N/A	N/A	16.000'	11.750'	N/A	0.0	1.6	26.0	394
554+23 (Both)	1 ~ 6'x 5'	2'	SCC-5&6	FW-0	0°	3:1	7"	7"	0.333'	5.667'	16.000'	9.238'	18.475'	N/A	N/A	7.2	0.2	13.6	222
603+20 (Lt)	1 ~ 6'x 3'	3'	SCC-5&6	PW-2	0°	3:1	7"	7"	1.000'	4.583'	N/A	N/A	10.750'	7.167'	N/A	0.0	0.3	7.1	93
603+20 (Rt)	1 ~ 6'x 3'	4'	SCC-5&6	PW-2	0°	3:1	7"	7"	2.000'	5.583'	N/A	N/A	13.750'	7.167'	N/A	0.0	0.5	10.4	148
612+73 (Lt)	2 ~ 6'x 6'	5.5'	MC-6-16	PW-2	0°	3:1	7"	7"	1.000'	7.583'	N/A	N/A	19.750'	13.750'	N/A	0.0	0.5	20.1	294
612+73 (Rt)	2 ~ 6'x 6'	5.5'	MC-6-16	PW-2	0°	3:1	7"	7"	1.500'	8.083'	N/A	N/A	21.250'	13.750'	N/A	0.0	0.8	22.3	338
636+01 (Both)	1 ~ 8'x 6'	3'	SCC-8	FW-0	0°	3:1	7"	7"	1.000'	7.333'	21.000'	12.124'	24.249'	9.167'	N/A	0.0	0.6	24.2	372
661+93 (Rt)	2 ~ 5'x 5'	3'	MC-5-20	FW-0	0°	3:1	7"	7"	1.000'	6.333'	18.000'	10.392'	20.785'	11.750'	N/A	0.0	0.4	9.0	139
661+93 (Lt)	2 ~ 5'x 5'	3'	MC-5-20	PW-2	0°	3:1	7"	7"	0.500'	6.083'	N/A	N/A	15.250'	11.750'	N/A	0.0	0.2	12.4	180

NOTES:
Skew Angle = 0° for SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standards.
30° Maximum for Safety End Treatment

SL:1 = Horizontal:1 Vertical
Side Slope at culvert for Flared or Straight Wingwalls. Channel Slope for Parallel Wingwalls.
Slope shall be 3:1 or flatter for Safety End Treatments.

T = Box Culvert Top Slab Thickness. Dimension can be found on the applicable Box Culvert Standard.

U = Box Culvert Wall Thickness. Dimension can be found on the applicable Box Culvert Standard.

C = Curb Height.

See applicable wing or end treatment standards for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.
Hw = Height of Wingwall.
A = Distance from Face of Curb to End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
B = Offset of End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
Lw = Length of Longest Wingwall.
Ltw = Length of Culvert Toewall (Not applicable when using Riprap Apron).
Atw = Length of Anchor Toewall (Applicable to Safety End Treatment only).
Total Wingwall Area = Wingwall area in S.F. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) The wall heights shown will be rounded to the nearest Foot for bidding purposes.

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

(3) Concrete volume shown is total of wing, footing, culvert toewall (if any), anchor toewall (if any) and wingwall toewall. Riprap apron, culvert and curb quantities are not included.

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

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		100

DATE: 5/5/2021 4:41:39 PM
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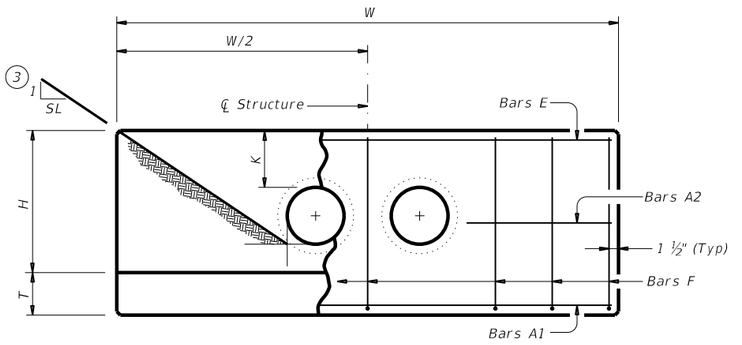
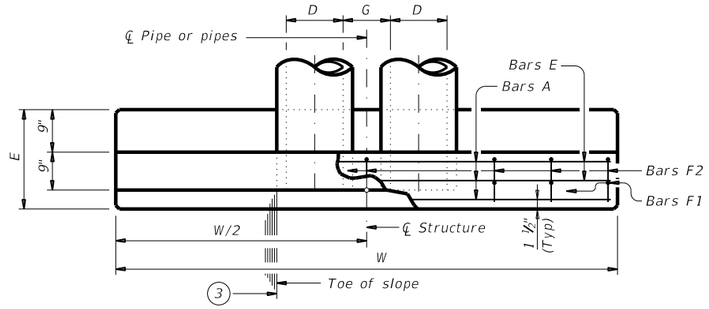
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

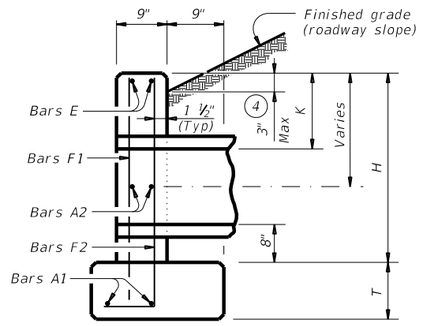
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	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



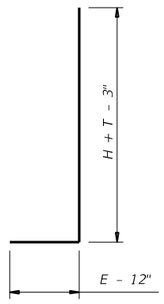
ELEVATION



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.

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Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

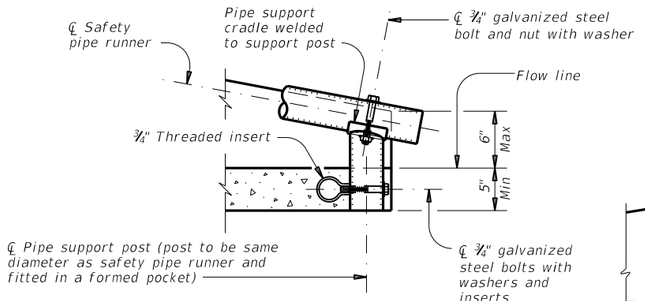
CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		101

DATE: 5/5/2021 4:41:44 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\091 pset5cs5-20.dgn

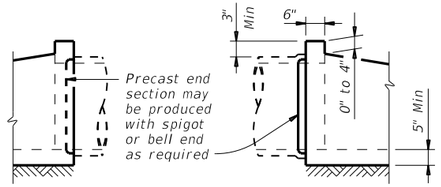
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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"	N/A	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				



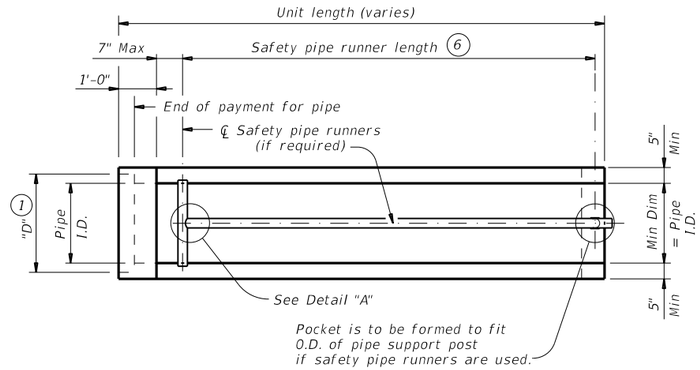
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



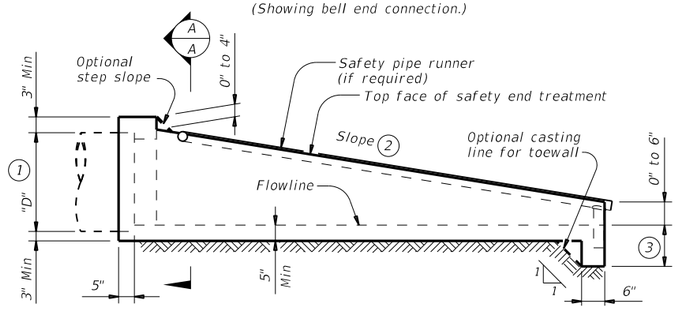
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



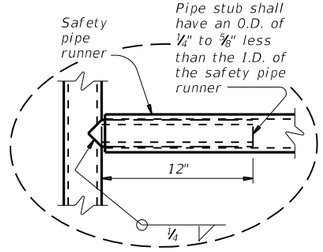
PLAN

(Showing bell end connection.)

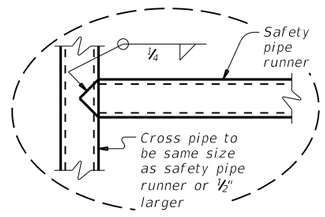


LONGITUDINAL ELEVATION

(Showing bell end connection.)



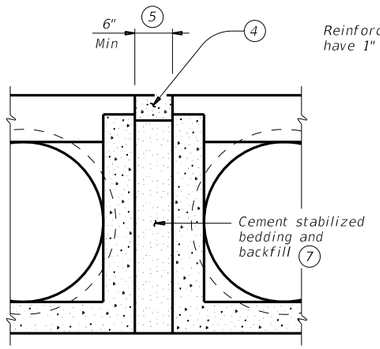
OPTION A



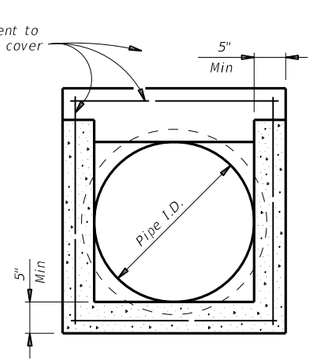
OPTION B

DETAIL A

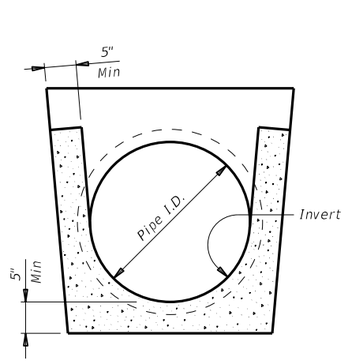
(If required)



MULTIPLE PIPE INSTALLATION

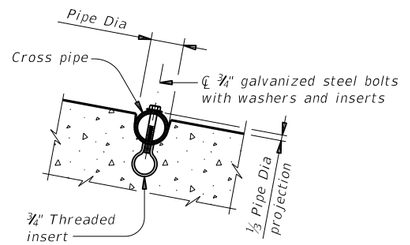


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

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

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

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

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

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

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

(6) Measured along slope.

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

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

GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See 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

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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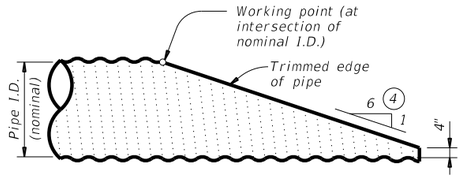
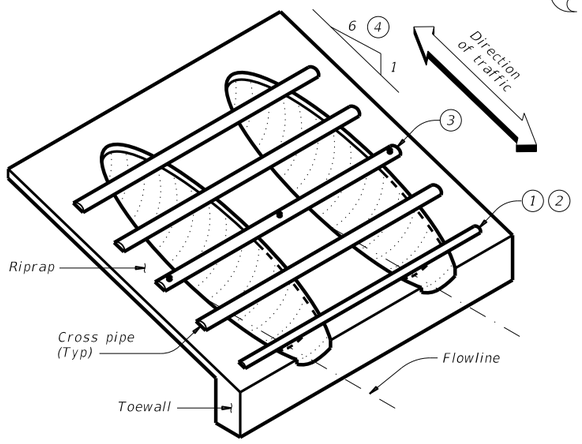
	DIST	COUNTY		SHEET NO.
	PAR	Delta		102



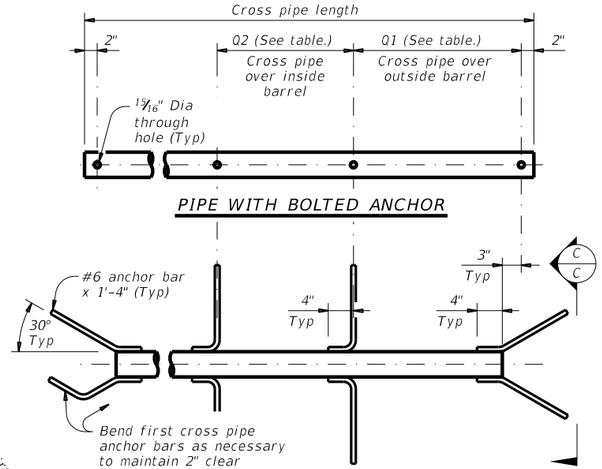
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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

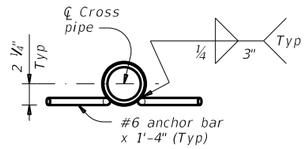


ISOMETRIC VIEW OF TYPICAL INSTALLATION



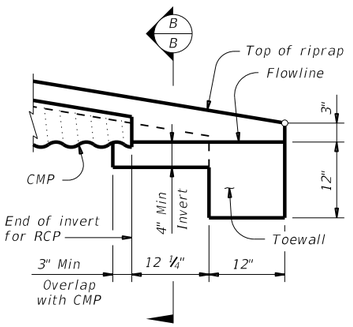
PIPE WITH BOLTED ANCHOR

PIPE WITH ANCHOR BARS



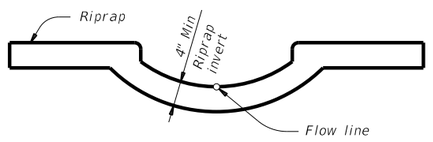
SECTION C-C

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 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

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

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

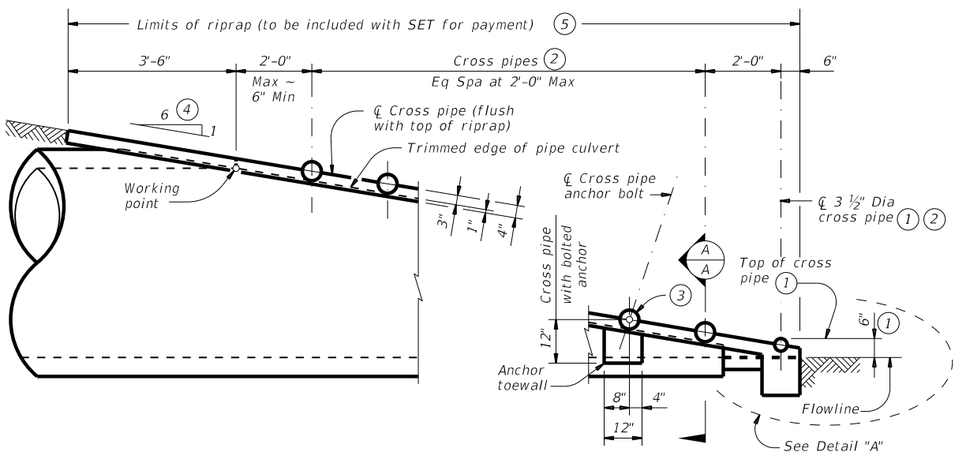
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

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

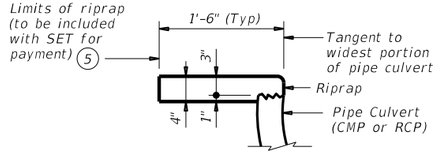
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

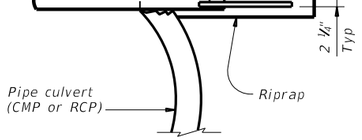


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

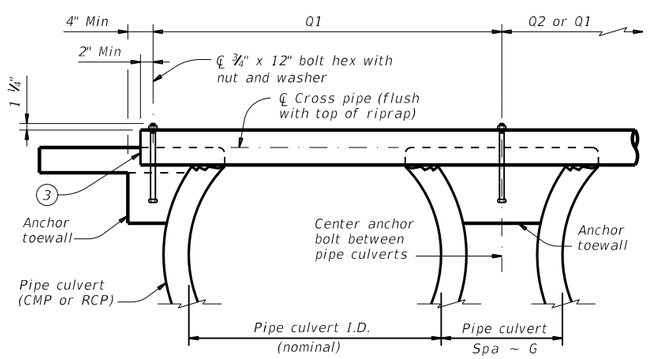
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



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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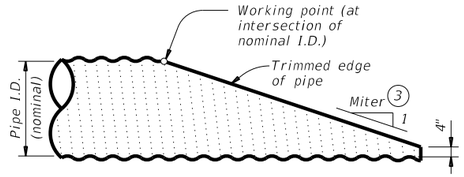
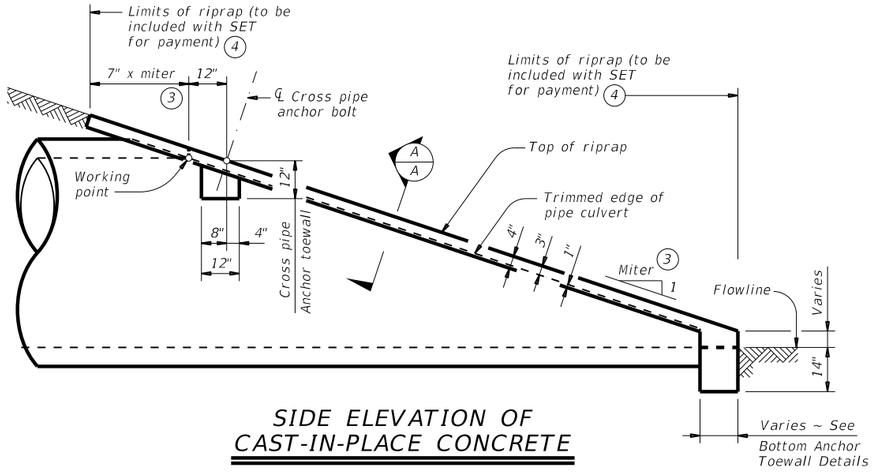


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

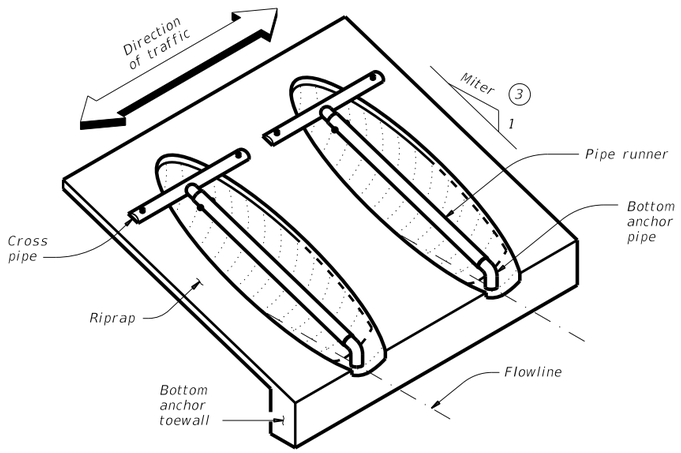
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(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

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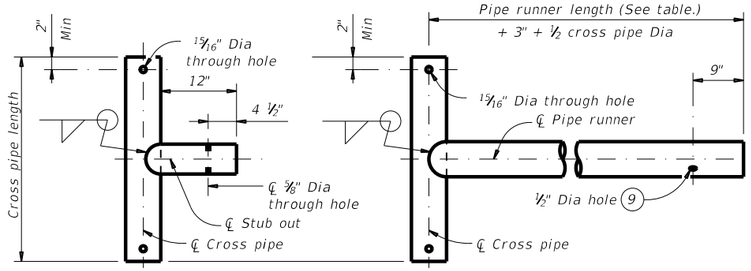
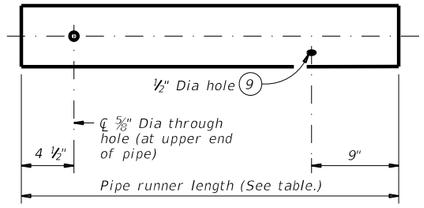


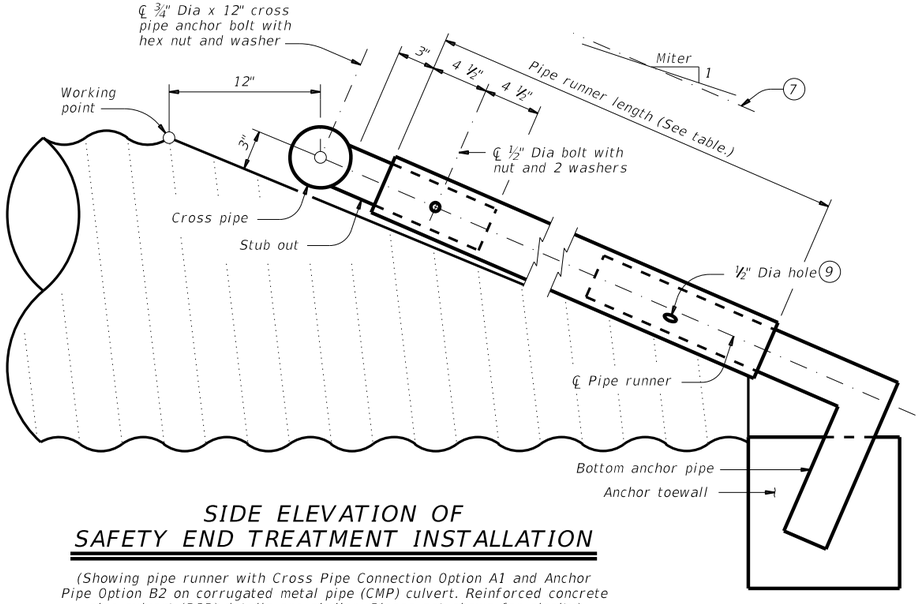
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



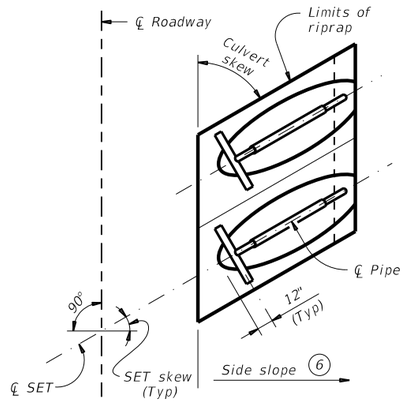
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

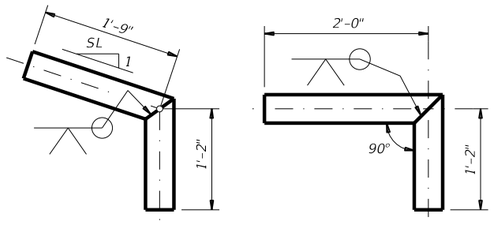


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

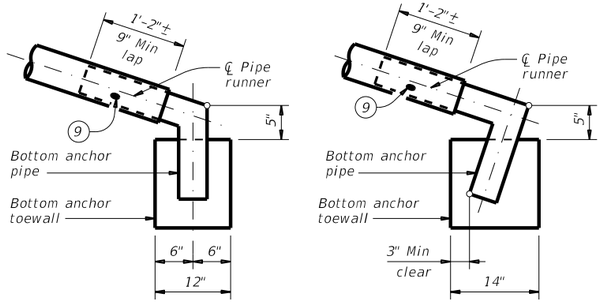


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

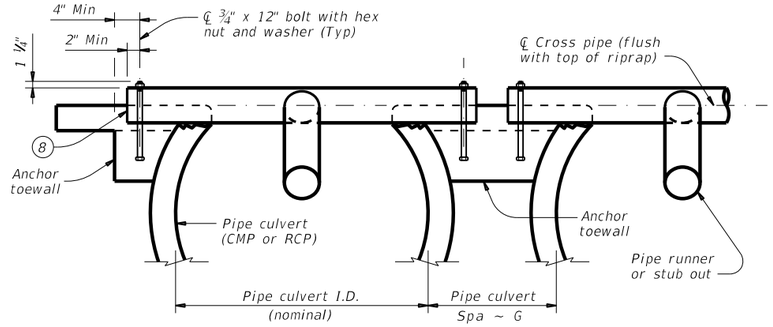
BOTTOM ANCHOR PIPE DETAILS (10)



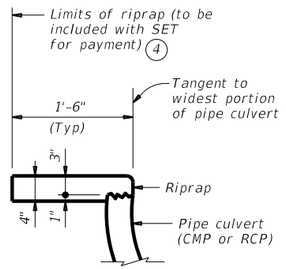
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

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

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

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

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

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

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

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

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

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		105

DATE: 5/5/2021 4:42:01 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\092 fw-0stde-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (2~wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
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
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:
(All values are in feet.)

Hw = H + T + C – 0.250'
A = (Hw – 0.333') (SL)
B = (A) tangent (30°)
Lw = (A) ÷ cosine (30°)

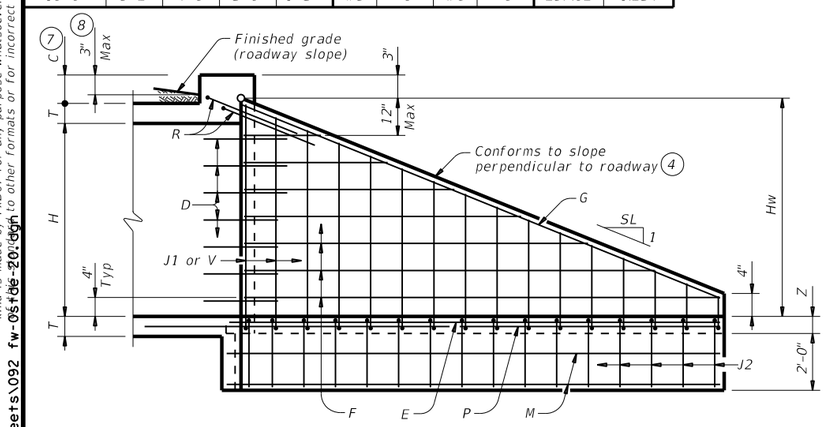
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

For precast culverts:
Ltw = (N) (2U + S) + (N – 1) (0.5')

Total wingwall area (two wings ~ SF) = (Hw + 0.333') (Lw)

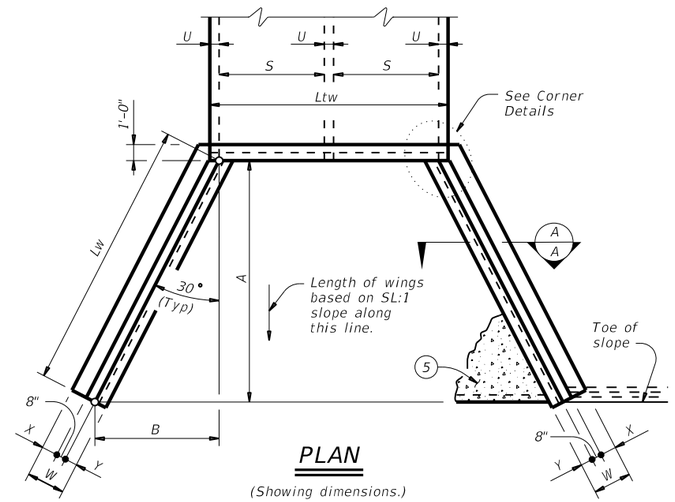
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



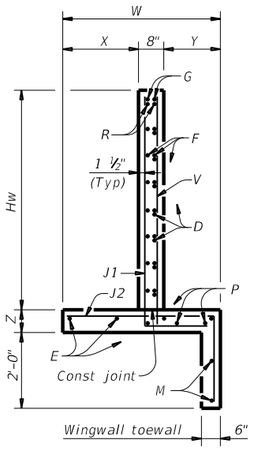
INSIDE ELEVATION

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

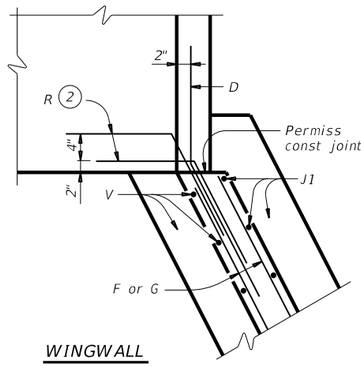


PLAN

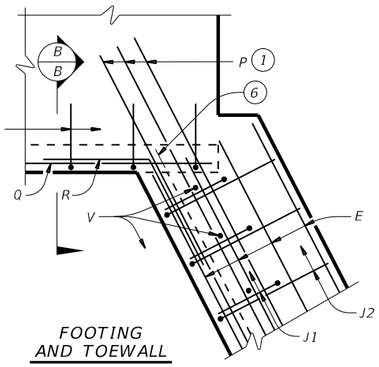
(Showing dimensions.)



SECTION A-A



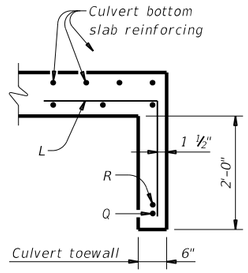
WINGWALL



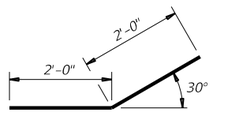
FOOTING AND TOEWALL

CORNER DETAILS

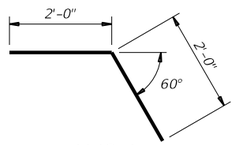
(Culvert and culvert toewall reinforcing not shown for clarity.)



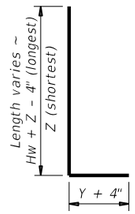
SECTION B-B (5)



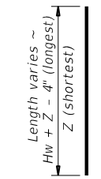
BARS D



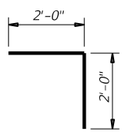
BARS R



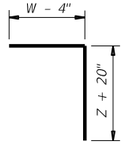
BARS J1



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 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) 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.

(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.

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 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

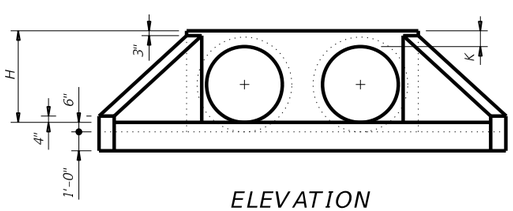
CONCRETE WINGWALLS WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

FILE: fw-0stde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		106

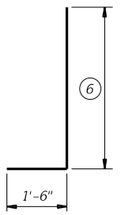
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe						Values to be Added for Each Addt'l Pipe		
		W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' - 7 1/2"	2' - 6"	2' - 10"	3' - 3 1/4"	88	0.6	1' - 9"	20	0.2
	15"	5' - 5 3/4"	2' - 9 1/2"	3' - 4"	3' - 10 1/4"	103	0.7	2' - 2"	24	0.3
	18"	6' - 4 1/4"	3' - 1"	3' - 10"	4' - 5"	124	0.9	2' - 8"	32	0.3
	21"	7' - 2 3/4"	3' - 4 1/2"	4' - 4"	5' - 0"	143	1.1	3' - 1"	43	0.4
	24"	8' - 2 1/2"	3' - 9 1/2"	4' - 10"	5' - 7"	164	1.3	3' - 7"	50	0.5
	27"	9' - 1"	4' - 1"	5' - 4"	6' - 2"	179	1.5	3' - 11"	56	0.6
	30"	9' - 11 1/2"	4' - 4 1/2"	5' - 10"	6' - 8 3/4"	203	1.7	4' - 4"	65	0.8
	33"	10' - 10"	4' - 8"	6' - 4"	7' - 3 3/4"	224	2.0	4' - 8"	71	0.9
	36"	11' - 8 1/4"	4' - 11 1/2"	6' - 10"	7' - 10 3/4"	249	2.2	5' - 1"	81	1.0
	42"	13' - 5 1/4"	5' - 6 1/2"	7' - 10"	9' - 0 1/2"	298	2.8	5' - 10"	97	1.3
	48"	15' - 9"	6' - 1 1/2"	9' - 4"	10' - 9 1/4"	360	3.8	6' - 7"	117	1.7
	54"	17' - 5 3/4"	6' - 8 1/2"	10' - 4"	11' - 11 1/4"	427	4.5	7' - 6"	151	2.1
	60"	19' - 2 3/4"	7' - 3 1/2"	11' - 4"	13' - 1"	481	5.3	8' - 3"	174	2.5
	66"	20' - 11 1/2"	7' - 10 1/2"	12' - 4"	14' - 3"	544	6.2	8' - 9"	194	2.9
	72"	22' - 8 1/2"	8' - 5 1/2"	13' - 4"	15' - 4 3/4"	601	7.1	9' - 4"	213	3.3
3:1	12"	6' - 3"	2' - 6"	4' - 3"	4' - 11"	118	0.8	1' - 9"	22	0.2
	15"	7' - 5"	2' - 9 1/2"	5' - 0"	5' - 9 1/4"	137	1.1	2' - 2"	28	0.3
	18"	8' - 6 3/4"	3' - 1"	5' - 9"	6' - 7 3/4"	170	1.3	2' - 8"	37	0.5
	21"	9' - 8 3/4"	3' - 4 1/2"	6' - 6"	7' - 6"	195	1.6	3' - 1"	48	0.6
	24"	11' - 0"	3' - 9 1/2"	7' - 3"	8' - 4 1/2"	227	2.0	3' - 7"	58	0.7
	27"	12' - 2"	4' - 1"	8' - 0"	9' - 2 3/4"	251	2.3	3' - 11"	67	0.8
	30"	13' - 4"	4' - 4 1/2"	8' - 9"	10' - 1 1/4"	293	2.7	4' - 4"	77	1.0
	33"	14' - 5 3/4"	4' - 8"	9' - 6"	10' - 11 3/4"	318	3.1	4' - 8"	84	1.2
	36"	15' - 7 3/4"	4' - 11 1/2"	10' - 3"	11' - 10"	351	3.5	5' - 1"	96	1.4
	42"	17' - 11 1/2"	5' - 6 1/2"	11' - 9"	13' - 6 3/4"	432	4.5	5' - 10"	119	1.7
	48"	21' - 1 3/4"	6' - 1 1/2"	14' - 0"	16' - 2"	537	6.1	6' - 7"	146	2.3
	54"	23' - 5 1/2"	6' - 8 1/2"	15' - 6"	17' - 10 3/4"	630	7.3	7' - 6"	186	2.9
	60"	25' - 9 1/4"	7' - 3 1/2"	17' - 0"	19' - 7 1/2"	719	8.7	8' - 3"	219	3.4
	66"	28' - 1"	7' - 10 1/2"	18' - 6"	21' - 4 1/4"	811	10.1	8' - 9"	242	3.9
	72"	30' - 4 3/4"	8' - 5 1/2"	20' - 0"	23' - 1 1/4"	924	11.7	9' - 4"	272	4.4
4:1	12"	7' - 10 3/4"	2' - 6"	5' - 8"	6' - 6 1/2"	148	1.1	1' - 9"	24	0.3
	15"	9' - 4"	2' - 9 1/2"	6' - 8"	7' - 8 1/2"	181	1.5	2' - 2"	32	0.4
	18"	10' - 9 1/2"	3' - 1"	7' - 8"	8' - 10 1/4"	221	1.9	2' - 8"	42	0.5
	21"	12' - 2 3/4"	3' - 4 1/2"	8' - 8"	10' - 0"	260	2.3	3' - 1"	57	0.7
	24"	13' - 9 1/2"	3' - 9 1/2"	9' - 8"	11' - 2"	301	2.8	3' - 7"	67	0.9
	27"	15' - 3"	4' - 1"	10' - 8"	12' - 3 3/4"	334	3.3	3' - 11"	77	1.0
	30"	16' - 8 1/4"	4' - 4 1/2"	11' - 8"	13' - 5 3/4"	385	3.8	4' - 4"	89	1.3
	33"	18' - 1 3/4"	4' - 8"	12' - 8"	14' - 7 1/2"	425	4.5	4' - 8"	101	1.4
	36"	19' - 7"	4' - 11 1/2"	13' - 8"	15' - 9 1/4"	472	5.1	5' - 1"	115	1.7
	42"	22' - 5 3/4"	5' - 6 1/2"	15' - 8"	18' - 1"	583	6.5	5' - 10"	141	2.1
	48"	26' - 6 1/4"	6' - 1 1/2"	18' - 8"	21' - 6 3/4"	730	8.9	6' - 7"	175	2.8
	54"	29' - 5"	6' - 8 1/2"	20' - 8"	23' - 10 1/4"	875	10.7	7' - 6"	226	3.6
	60"	32' - 3 3/4"	7' - 3 1/2"	22' - 8"	26' - 2"	996	12.7	8' - 3"	264	4.3
	66"	35' - 2 1/2"	7' - 10 1/2"	24' - 8"	28' - 5 3/4"	1,140	14.9	8' - 9"	300	4.9
	72"	38' - 1 1/4"	8' - 5 1/2"	26' - 8"	30' - 9 1/2"	1,297	17.3	9' - 4"	334	5.6
6:1	12"	11' - 2"	2' - 6"	8' - 6"	9' - 9 3/4"	224	1.9	1' - 9"	28	0.4
	15"	13' - 2 1/4"	2' - 9 1/2"	10' - 0"	11' - 6 1/2"	268	2.5	2' - 2"	37	0.5
	18"	15' - 2 1/2"	3' - 1"	11' - 6"	13' - 3 1/4"	330	3.2	2' - 8"	50	0.7
	21"	17' - 2 3/4"	3' - 4 1/2"	13' - 0"	15' - 0 1/4"	387	3.9	3' - 1"	69	0.9
	24"	19' - 4 1/2"	3' - 9 1/2"	14' - 6"	16' - 9"	453	4.8	3' - 7"	80	1.2
	27"	21' - 4 3/4"	4' - 1"	16' - 0"	18' - 5 3/4"	512	5.7	3' - 11"	96	1.4
	30"	23' - 5 1/4"	4' - 4 1/2"	17' - 6"	20' - 2 1/2"	593	6.7	4' - 4"	110	1.7
	33"	25' - 5 1/2"	4' - 8"	19' - 0"	21' - 11 1/4"	675	7.8	4' - 8"	127	2.0
	36"	27' - 5 3/4"	4' - 11 1/2"	20' - 6"	23' - 8"	735	9.0	5' - 1"	144	2.3
	42"	31' - 6 1/4"	5' - 6 1/2"	23' - 6"	27' - 1 1/2"	922	11.5	5' - 10"	179	3.0
	48"	37' - 3 1/2"	6' - 1 1/2"	28' - 0"	32' - 4"	1,191	15.9	6' - 7"	231	4.0
	54"	41' - 4 1/4"	6' - 8 1/2"	31' - 0"	35' - 9 1/2"	1,424	19.2	7' - 6"	300	5.0
	60"	45' - 4 3/4"	7' - 3 1/2"	34' - 0"	39' - 3"	1,631	22.9	8' - 3"	353	6.0

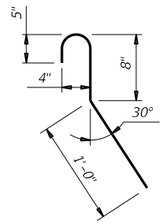


ELEVATION

(Showing dimensions.)



BARS V



BARS CL

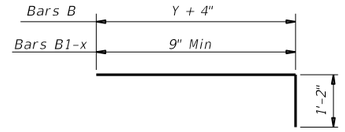
(Length = 2'-5")

TABLE OF (5) REINFORCING STEEL

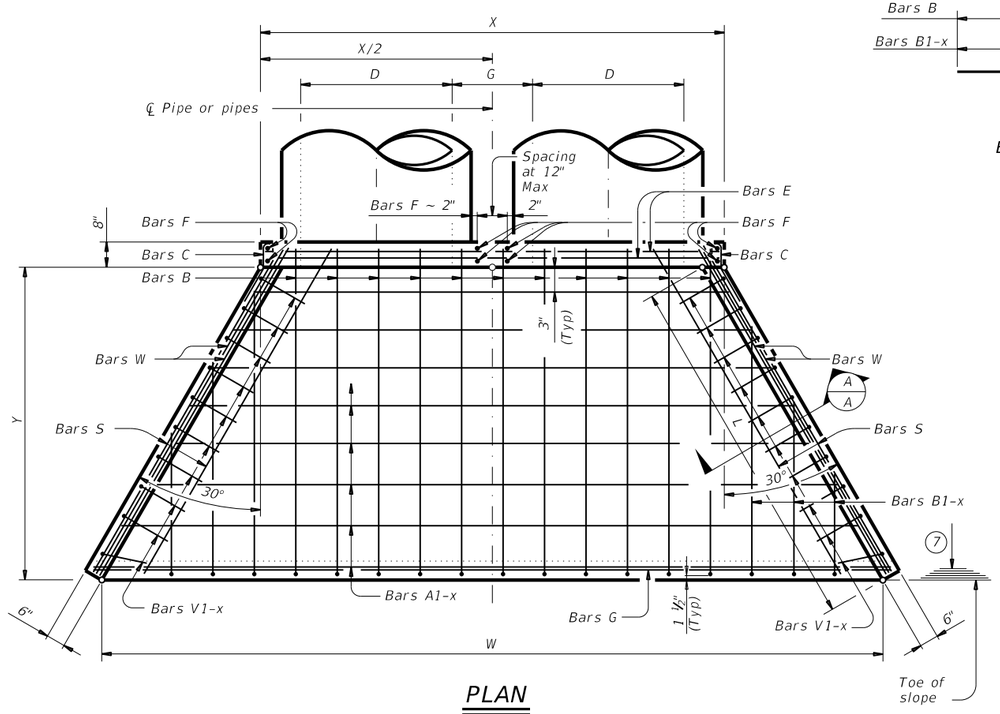
Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
C	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' - 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

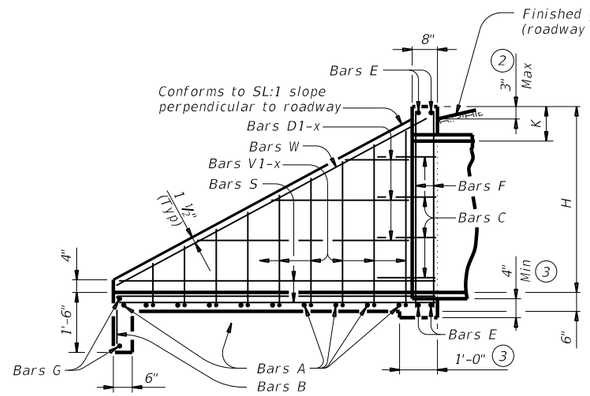
Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"



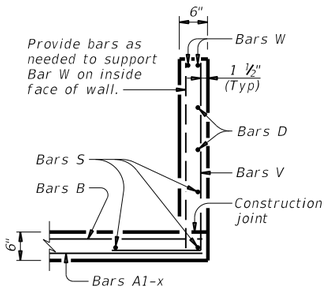
BARS B and B1-x



PLAN



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$

(7) Lengths of wings based on SL:1 slope along this line.

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 FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		107

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

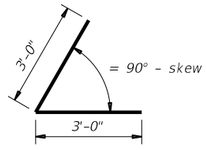
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

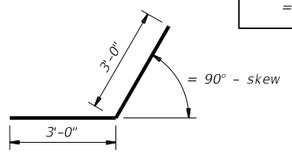
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

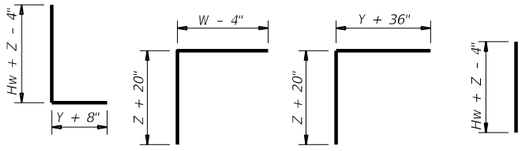
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:
(All values are in feet.)

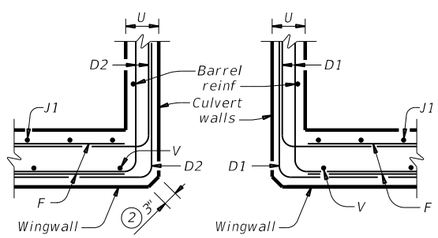
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

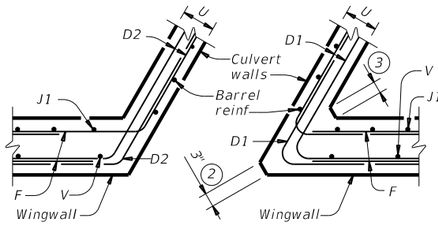
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

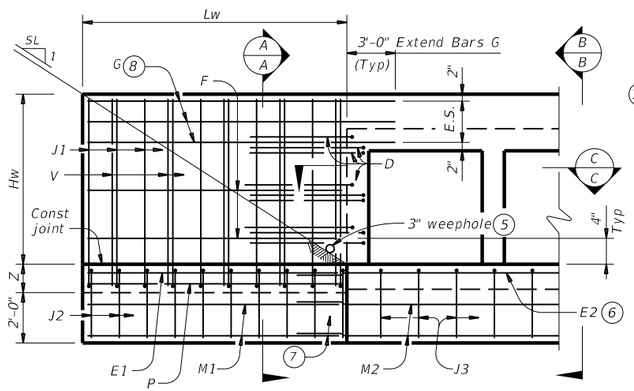
See applicable box culvert standard sheet for S, H, T, and U values.



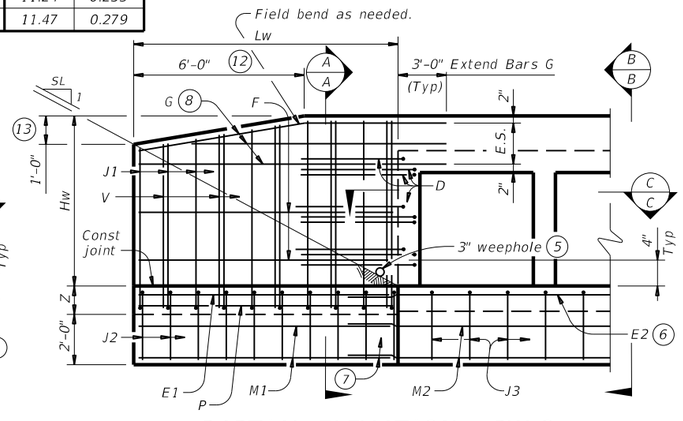
SECTION C-C - PW-1



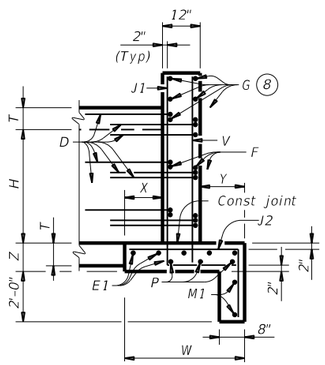
SECTION C-C - PW-2



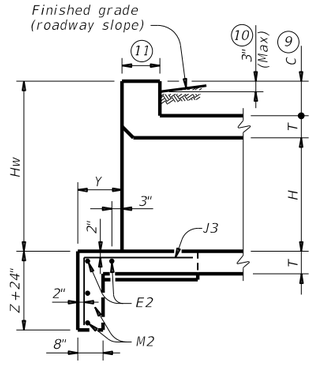
PARTIAL ELEVATION - PW-1



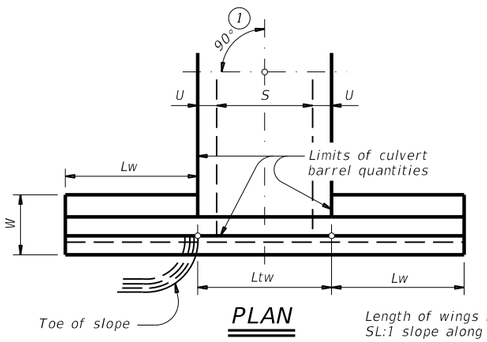
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

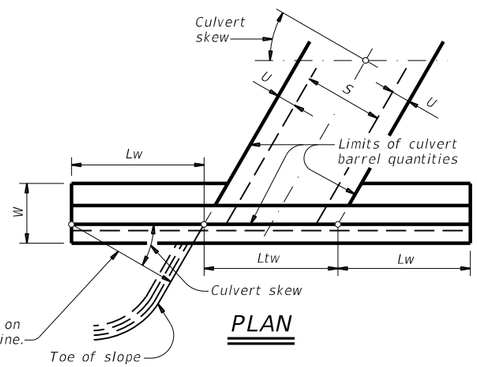


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

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'.

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
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REVISIONS	0399	03	038	FM 64
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	PAR	Delta		108

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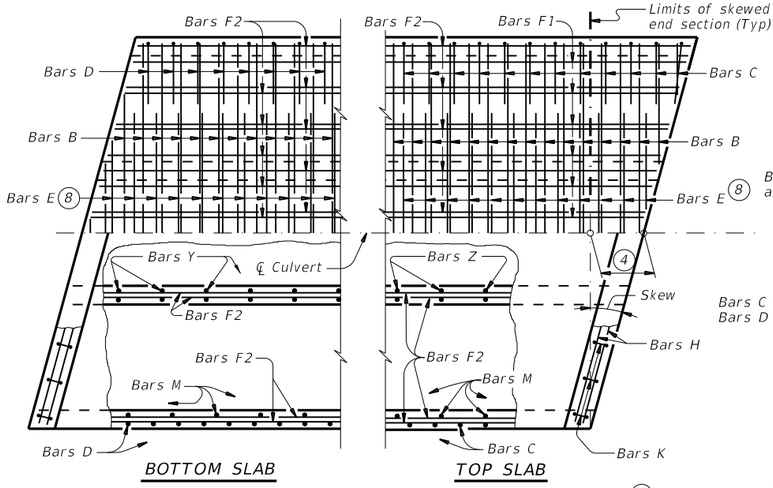
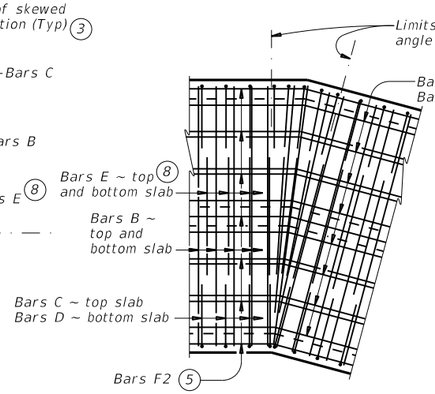
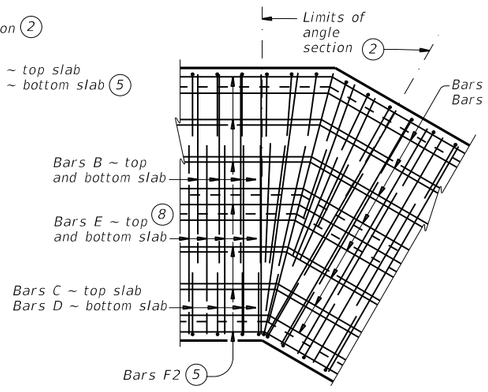


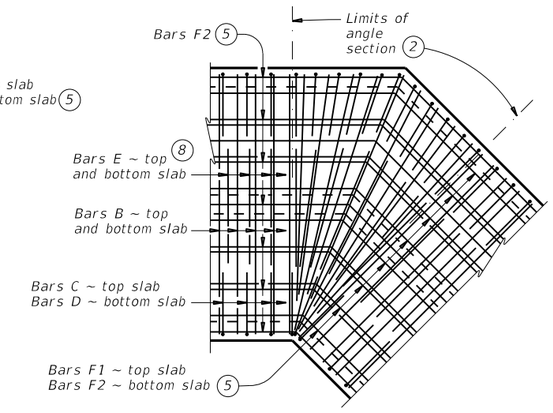
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



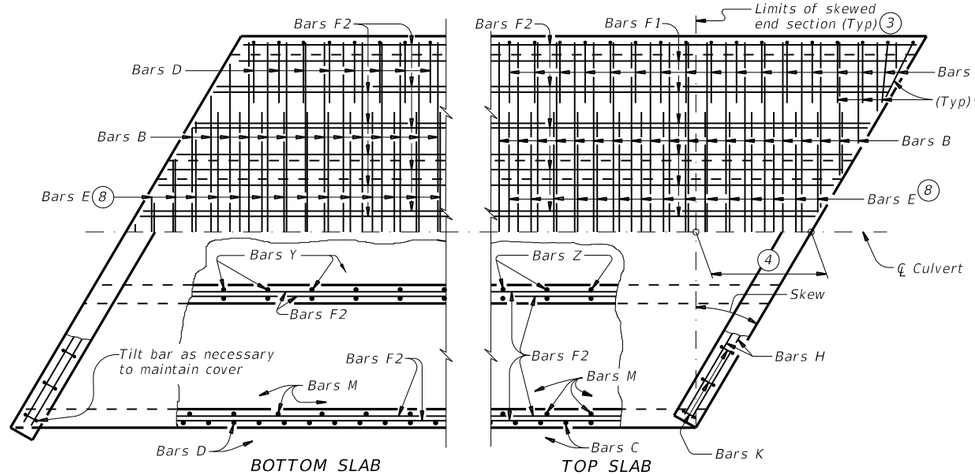
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



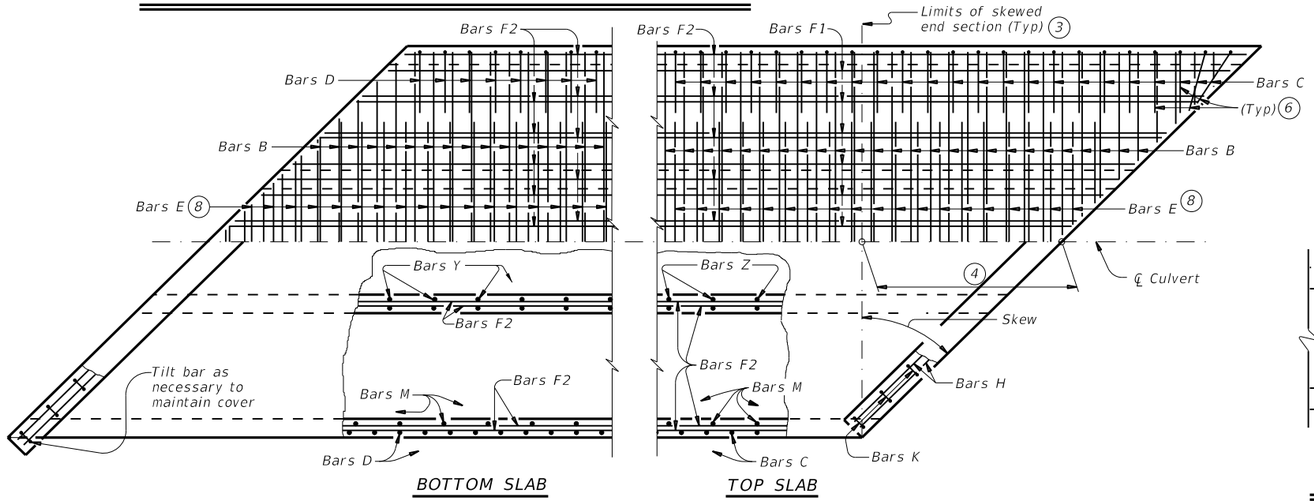
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

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

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

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

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

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

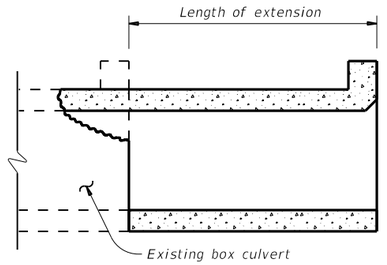
4 [One half of overall width] x [tangent of the skew angle]

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

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

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

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



LENGTHENING DETAIL 1

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

GENERAL NOTES:

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

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	PAR	Delta		109

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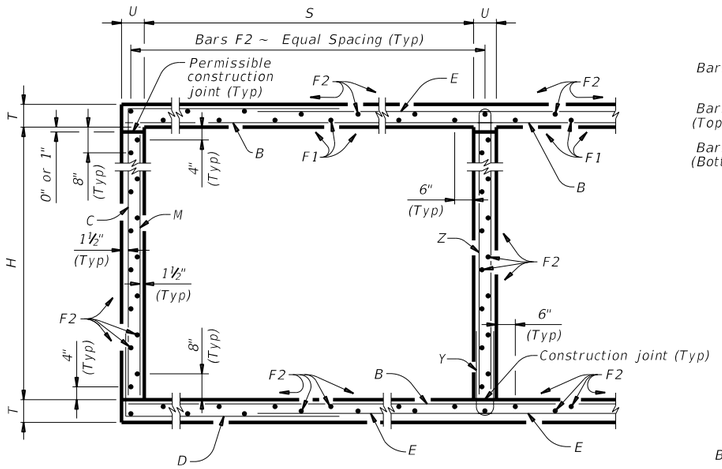
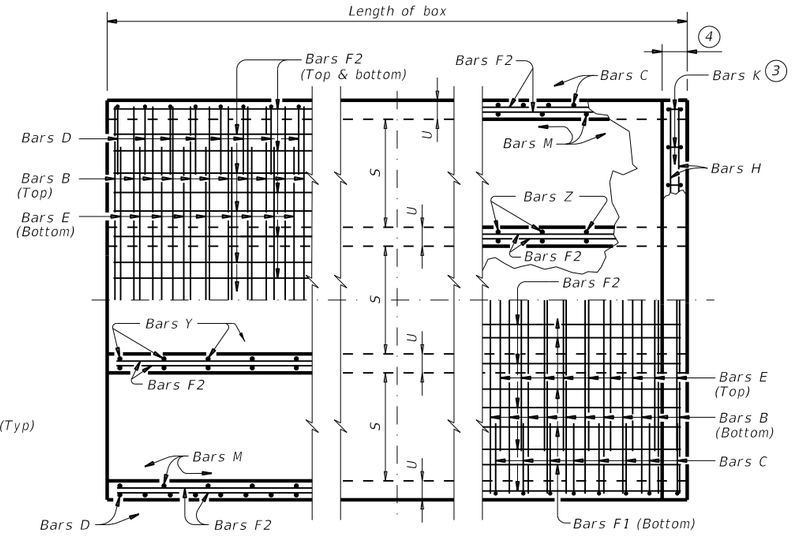


TYPICAL SECTION



BOTTOM SLAB TOP SLAB

PART PLANS

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

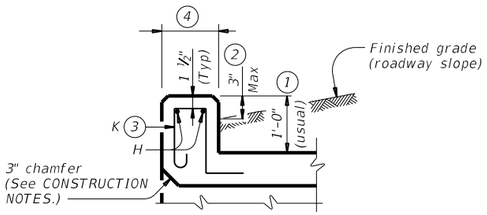
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts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

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

GENERAL NOTES:

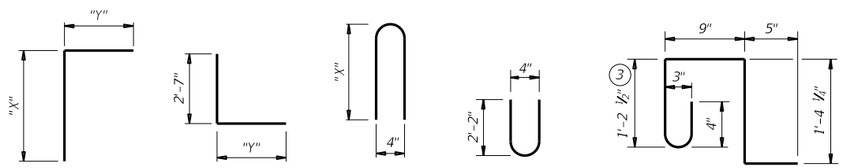
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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



SECTION THRU CURB

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



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

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

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		110

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FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\092.1 mc520ste-20.dgn

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

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

5'-0" SPAN

0' TO 20' FILL

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		111

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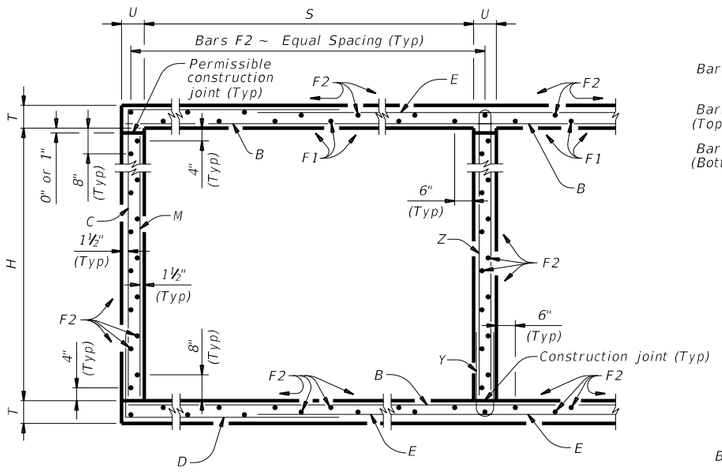
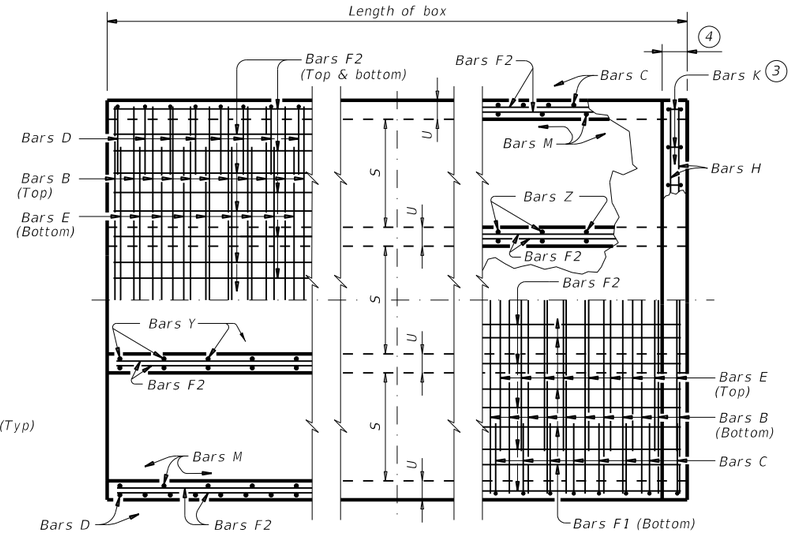
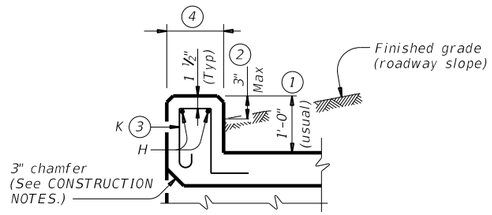


TYPICAL SECTION

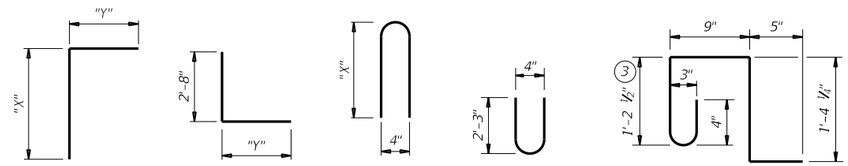


PART PLANS



SECTION THRU CURB

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



BARS C | BARS D | BARS Z | BARS Y | BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		112

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DATE: 5/5/2021 4:42:19 PM
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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4						Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	6' – 0"	2' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	44	18"	39' – 9"	1,168	108	9"	2' – 0"	144	54	9"	4' – 9"	171	5' – 5"	195	13' – 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' – 0"	2' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	63	18"	39' – 9"	1,673	108	9"	2' – 0"	144	108	9"	4' – 9"	343	5' – 5"	391	20' – 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' – 0"	2' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	82	18"	39' – 9"	2,177	108	9"	2' – 0"	144	162	9"	4' – 9"	514	5' – 5"	586	26' – 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' – 0"	2' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	101	18"	39' – 9"	2,682	108	9"	2' – 0"	144	216	9"	4' – 9"	685	5' – 5"	782	33' – 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' – 0"	2' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	120	18"	39' – 9"	3,186	108	9"	2' – 0"	144	270	9"	4' – 9"	857	5' – 5"	977	39' – 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' – 0"	3' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	3' – 0"	216	54	9"	4' – 9"	171	7' – 5"	268	13' – 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' – 0"	3' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	3' – 0"	216	108	9"	4' – 9"	343	7' – 5"	535	20' – 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' – 0"	3' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	3' – 0"	216	162	9"	4' – 9"	514	7' – 5"	803	26' – 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' – 0"	3' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	3' – 0"	216	216	9"	4' – 9"	685	7' – 5"	1,070	33' – 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' – 0"	3' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	3' – 0"	216	270	9"	4' – 9"	857	7' – 5"	1,338	39' – 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' – 0"	4' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	4' – 0"	289	54	9"	4' – 9"	171	9' – 5"	340	13' – 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' – 0"	4' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	4' – 0"	289	108	9"	4' – 9"	343	9' – 5"	679	20' – 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' – 0"	4' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	4' – 0"	289	162	9"	4' – 9"	514	9' – 5"	1,019	26' – 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' – 0"	4' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	4' – 0"	289	216	9"	4' – 9"	685	9' – 5"	1,359	33' – 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' – 0"	4' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	4' – 0"	289	270	9"	4' – 9"	857	9' – 5"	1,698	39' – 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' – 0"	5' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	56	18"	39' – 9"	1,487	108	9"	5' – 0"	361	54	9"	4' – 9"	171	11' – 5"	412	13' – 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' – 0"	5' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	79	18"	39' – 9"	2,098	108	9"	5' – 0"	361	108	9"	4' – 9"	343	11' – 5"	824	20' – 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' – 0"	5' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	102	18"	39' – 9"	2,708	108	9"	5' – 0"	361	162	9"	4' – 9"	514	11' – 5"	1,235	26' – 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' – 0"	5' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	125	18"	39' – 9"	3,319	108	9"	5' – 0"	361	216	9"	4' – 9"	685	11' – 5"	1,647	33' – 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' – 0"	5' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	148	18"	39' – 9"	3,930	108	9"	5' – 0"	361	270	9"	4' – 9"	857	11' – 5"	2,059	39' – 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' – 0"	6' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	62	18"	39' – 9"	1,646	108	9"	6' – 0"	433	54	9"	4' – 9"	171	13' – 5"	484	13' – 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' – 0"	6' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	87	18"	39' – 9"	2,310	108	9"	6' – 0"	433	108	9"	4' – 9"	343	13' – 5"	968	20' – 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' – 0"	6' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	112	18"	39' – 9"	2,974	108	9"	6' – 0"	433	162	9"	4' – 9"	514	13' – 5"	1,452	26' – 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' – 0"	6' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	137	18"	39' – 9"	3,638	108	9"	6' – 0"	433	216	9"	4' – 9"	685	13' – 5"	1,936	33' – 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' – 0"	6' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	162	18"	39' – 9"	4,302	108	9"	6' – 0"	433	270	9"	4' – 9"	857	13' – 5"	2,420	39' – 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

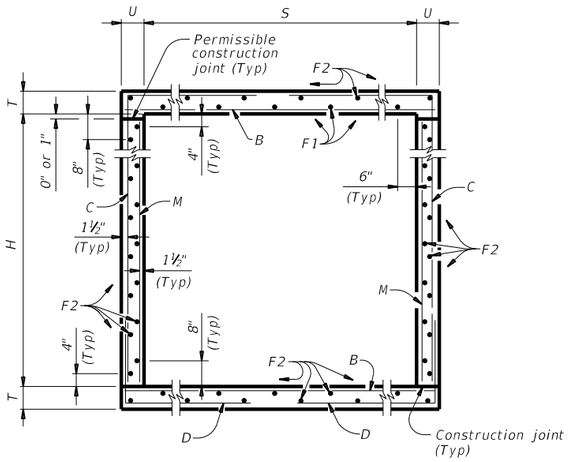
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

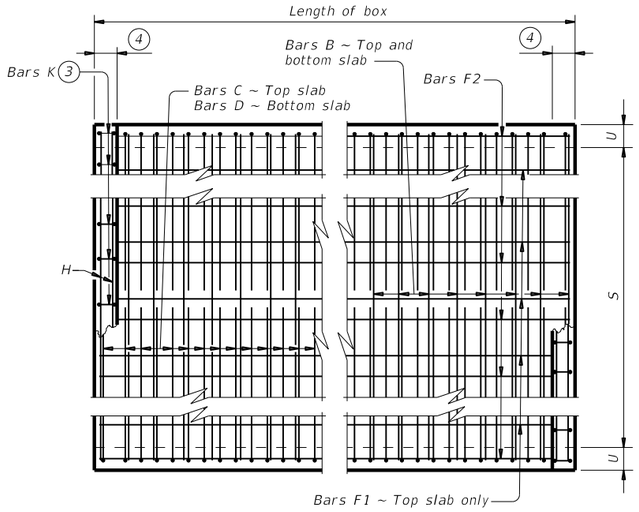
MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		113

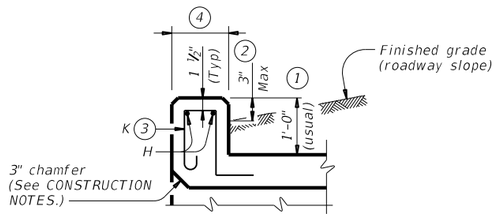
DATE: 5/7/2021 1:14:57 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\096 scc08ste-21.dgn



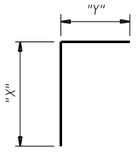
TYPICAL SECTION



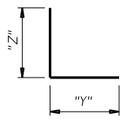
PLAN OF REINF STEEL



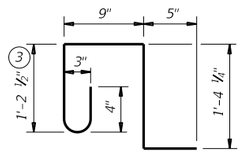
SECTION THRU CURB



BARS C



BARS D



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

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	Delta		114

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' – 0"	3' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 10"	1,433	3' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8' – 0"	3' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 11"	1,446	3' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8' – 0"	3' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	9' – 2"	1,487	3' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8' – 0"	4' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 10"	1,595	4' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8' – 0"	4' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 11"	1,609	4' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8' – 0"	4' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	10' – 2"	1,649	4' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8' – 0"	5' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 10"	1,757	5' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8' – 0"	5' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 11"	1,771	5' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8' – 0"	5' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	11' – 2"	1,811	5' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	9' – 3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8' – 0"	6' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 10"	1,920	6' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8' – 0"	6' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 11"	1,933	6' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8' – 0"	6' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	12' – 2"	1,974	6' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8' – 0"	7' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	12' – 8"	2,055	7' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8' – 0"	7' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	12' – 8"	3,082	7' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8' – 0"	7' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 10"	3,123	7' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8' – 0"	7' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 11"	3,143	7' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8' – 0"	7' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	13' – 2"	3,204	7' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8' – 0"	8' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 8"	2,217	8' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8' – 0"	8' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	13' – 8"	3,325	8' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8' – 0"	8' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 10"	3,366	8' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8' – 0"	8' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 11"	3,386	8' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8' – 0"	8' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	14' – 2"	3,447	8' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

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

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	Delta		115

DATE: 5/7/2021 1:15:38 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\096 scc08ste-20.dgn

DATE: 5/7/2021 1:09:42 PM
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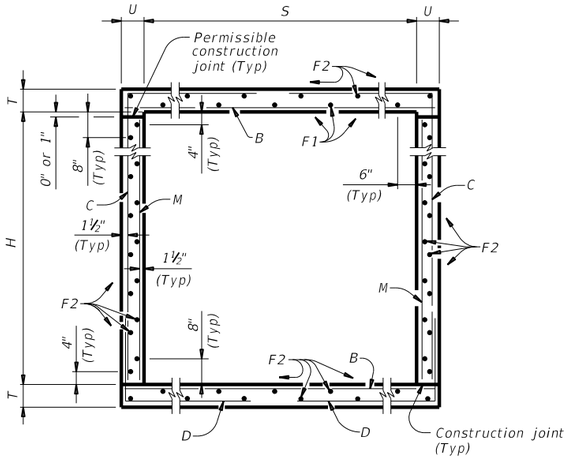
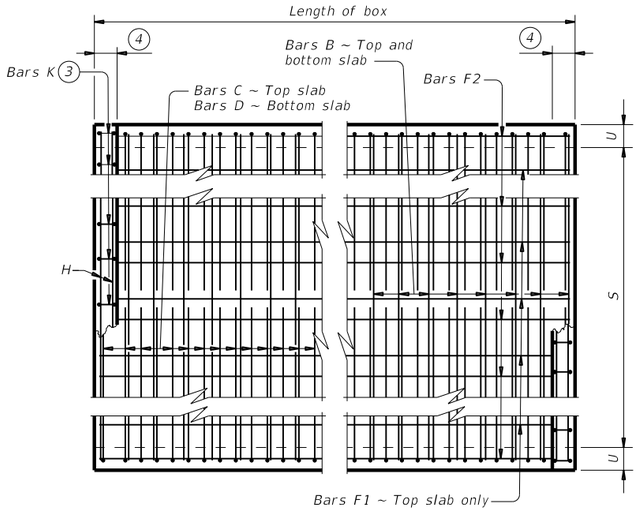
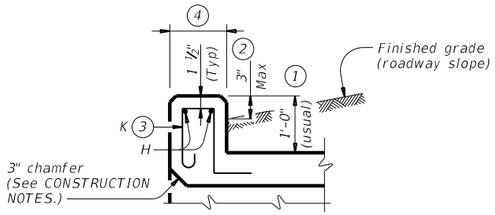


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

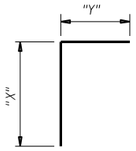
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
-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

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

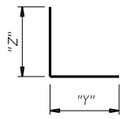
GENERAL NOTES:

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

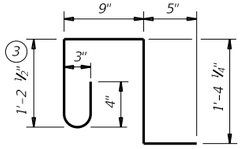
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

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

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	Delta		116

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

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

DATE: 5/7/2021 1:11:37 PM
FILE: T:\PAR1PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\097 scc56ste-20.dgn scc56ste-21.dgn

HL93 LOADING SHEET 2 OF 2

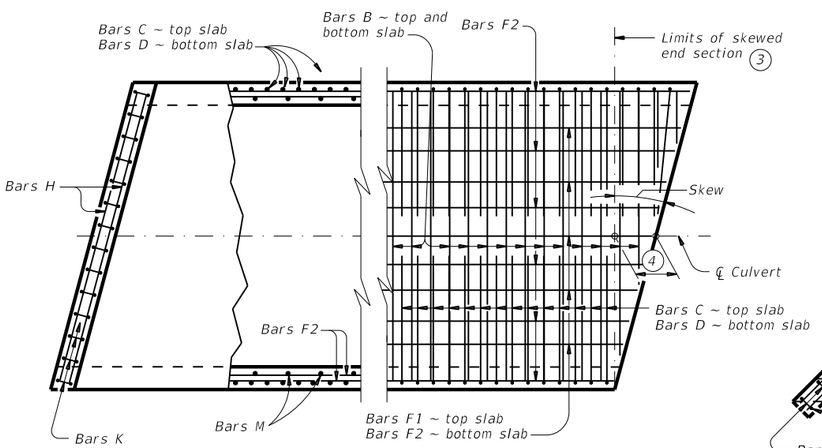
Texas Department of Transportation

Bridge Division Standard

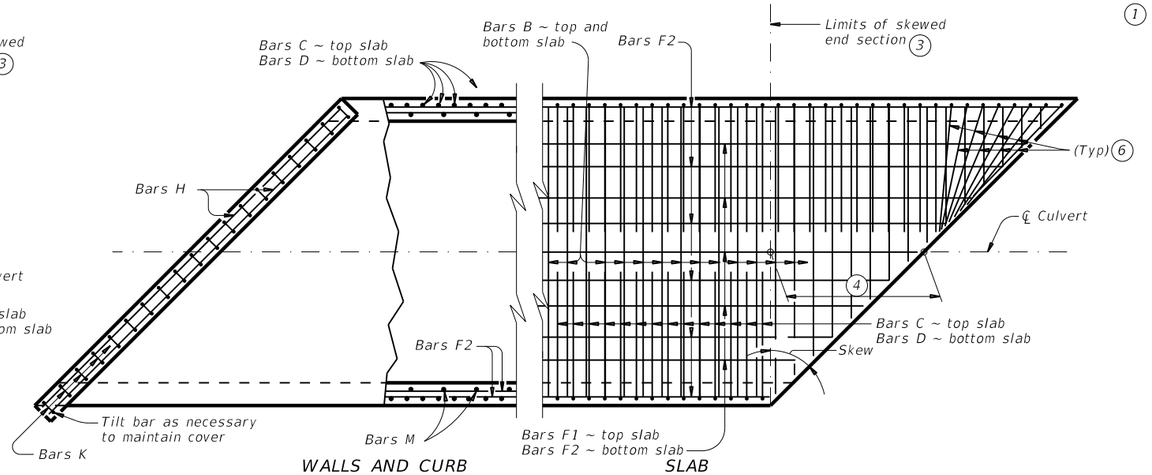
SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-5 & 6

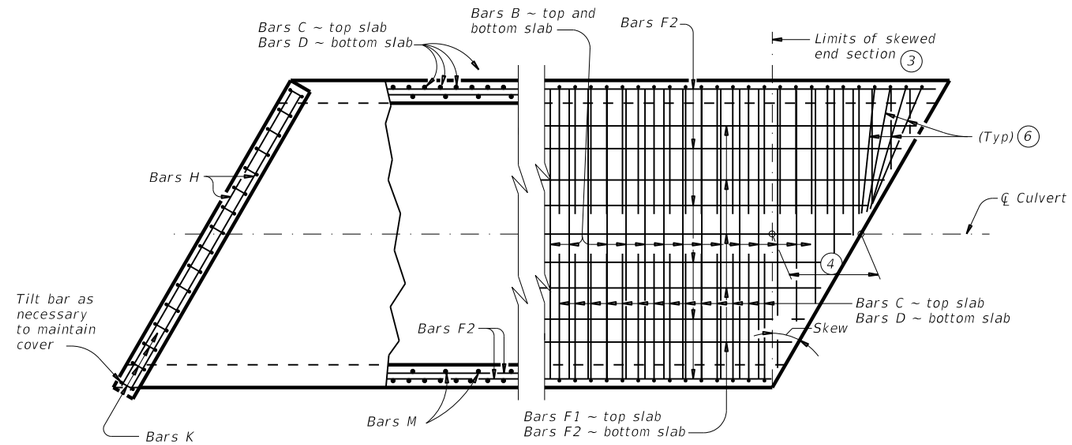
FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	PAR	Delta		117



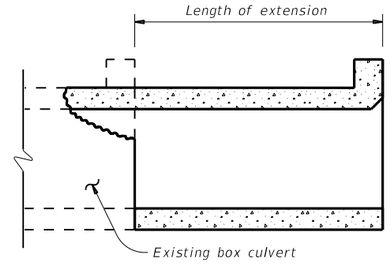
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



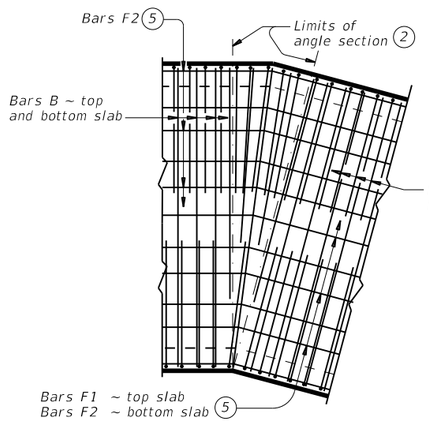
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



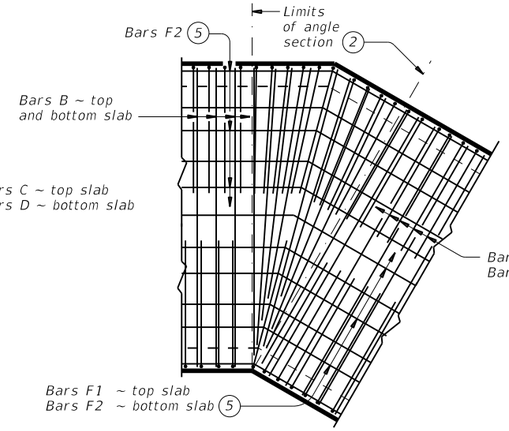
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



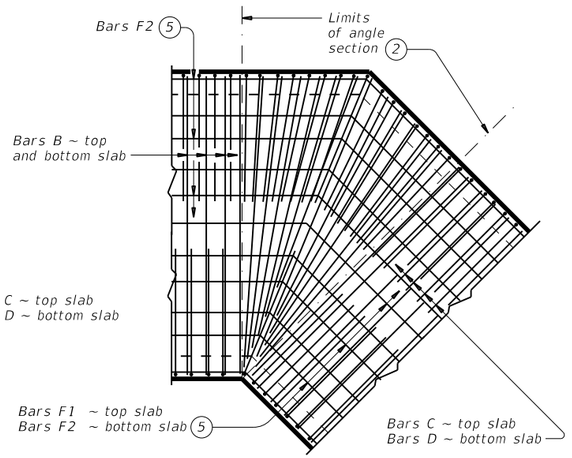
LENGTHENING DETAIL (1)



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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

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

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

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		118

DATE: 5/5/2021 4:42:32 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\098 sccmdste-20.dgn

DATE: 5/5/2021 4:42:35 PM

SUMMARY OF SMALL SIGNS

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

- Post Type: FRP = Fiberglass; TWT = Thin-wall 10BWG = 10 BWG; S80 = Sched 80
- Posts (1 or 2)
- Anchor Type: UA = Univer-Conc; UB = Univer-Bolt; SA = Slip-Conc; SB = Slip-Bolt; WS = Wedge Steel; WP = Wedge Plastic
- 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 (See Note 2): TY N = Type N; TY S = Type S

STATION	SIGN NO.	SIGN DESIGNATION	SIGN CONTENT	SIGN DIMENSIONS (See above Note)	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type	Posts (1 or 2)	Anchor Type	Mounting Designation		BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
L 383+66	1	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 384+45	2	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 384+63	3	M1-6F	<FM SHIELD> FARM ROAD 1532	24 x 24	X		10BWG	1	SA	P		
		M6-2L	<ARROW - ANGLED UP LEFT> <AUXILIARY SIGN>	21 x 15								
L 385+00	4	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 385+37	5	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP (PLAQUE)	36 x 18								
L 385+74	6	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 385+96	7	M1-6F	<FM SHIELD> FARM ROAD 1532	24 x 24	X		10BWG	1	SA	P		
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15								
L 386+28	8	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 387+00	9	R12-1T	WEIGHT LIMIT/GROSS XXXX LBS	24 x 36			10BWG	1	SA	P		
L 387+00	10	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 387+85	11	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 388+09	12	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD 1532	24 x 24								
L 390+85	13	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	XX MPH	24 x 24								
R 391+96	14	R2-1	SPEED LIMIT 55	36 x 48	X		10BWG	1	SA	P		
L 393+64	15	D1-1	↑ COOPER	66 x 18	X		10BWG	1	SA	P		
L 402+49	16	M2-1	JCT <AUXILIARY SIGN>	21 X 15	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD 1532	24 x 24								
R 410+64	17	D20-1T	CO RD 3400 ←	24 x 24	X		10BWG	1	SA	P		
R 413+45	18	M1-6F	<FM SHIELD> FARM ROAD 64	24 x 24	X		10BWG	1	SA	P		
		D10-7aT	646	3 x 10								
L 415+03	19	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3400	36 x 8								
R 418+57	20	D20-1T	CO RD 3410 →	24 x 24	X		10BWG	1	SA	P		
L 419+61	21	D20-1T	CO RD 3400 →	24 x 24	X		10BWG	1	SA	P		
R 422+56	22	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3410	36 x 8								
L 428+11	23	D20-1T	CO RD 3410 ←	24 x 24	X		10BWG	1	SA	P		
R 486+21	24	D20-1T	CO RD 3420 →	24 x 24	X		10BWG	1	SA	P		
R 490+52	25	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3420	36 x 8								
L 494+48	26	D20-1T	CO RD 3420 ←	24 x 24	X		10BWG	1	SA	P		
R 502+03	27	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	XX MPH	24 x 24								
R 506+26	28	D20-1T	CO RD 3430 →	24 x 24	X		10BWG	1	SA	P		
R 508+07	29	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 508+94	30	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 509+71	31	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 510+43	32	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								

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

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

http://www.txdot.gov/

NOTE:

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

2. For 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	0399	03	038	FM 64
4-16	DIST	COUNTY		SHEET NO.
8-16	PAR	Delta		119

DATE: 5/5/2021 4:42:38 PM

SUMMARY OF SMALL SIGNS

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

STATION	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 80	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge Steel WP = Wedge Plstic	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 (See Note 2) TY N = Type N TY S = Type S
R 510+91	33	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3430	8 x 36								
R 511+19	34	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 511+96	35	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 512+66	36	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 513+44	37	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 514+23	38	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 515+26	39	D20-1T	CO RD 3430 ⬅	24 x 24	X		10BWG	1	SA	P		
L 519+44	40	M1-6F	<FM SHIELD> FARM ROAD 64	24 x 24	X		10BWG	1	SA	P		
		D10-7aT	644	3 x 10								
L 520+67	41	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	XX MPH	24 x 24								
R 546+70	42	D20-5T	CO RD 3400 ⬅	24 x 42	X		10BWG	1	SA	P		
			CO RD 3440 ➡									
L 550+43	43	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3400	36 x 8								
R 552+26	44	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3440	36 x 8								
L 556+21	45	D20-5T	CO RD 3440 ⬅	24 x 42	X		10BWG	1	SA	P		
			CO RD 3400 ➡									
R 575+08	46	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
R 583+56	47	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	XX MPH	24 x 24								
L 590+58	48	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 591+14	49	D20-1T	CO RD 3140 ⬅	24 x 24	X		10BWG	1	SA	P		
L 591+40	50	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 592+15	51	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 592+91	52	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 593+60	53	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 593+66	54	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3140	36 x 8								
L 594+35	55	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 595+27	56	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 596+00	57	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 597+17	58	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
L 599+66	59	D20-1T	CO RD 3140 ➡	24 x 24	X		10BWG	1	SA	P		
L 602+58	60	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	XX MPH	24 x 24								
R 622+09	61	W1-5L	SYMBOL - WINDING ROAD LEFT	36 x 36	X		10BWG	1	SA	P		
R 625+29	62	M1-6F	<FM SHIELD> FARM ROAD 64	24 x 24	X		10BWG	1	SA	P		
		D10-7aT	642	3 x 10								
R 626+47	63	D20-1T	CO RD 3440 ➡	24 x 24	X		10BWG	1	SA	P		

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For 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	0399	03	038	FM 64
4-16	DIST	COUNTY		SHEET NO.
8-16	PAR	Delta		120

DATE: 5/5/2021 4:42:40 PM

SUMMARY OF SMALL SIGNS

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

STATION	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 80	Posts (1 or 2)	Anchor Type: UA = Univer-Conc UB = Univer-Bolt SA = Slip-Conc SB = Slip-Bolt WS = Wedge Steel WP = Wedge Plstic	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 (See Note 2): TY N = Type N TY S = Type S
R 627+60	64	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 628+37	65	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 629+17	66	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 629+95	67	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 630+65	68	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
R 631+00	69	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-3T	CR 3440	36 x 8								
R 631+42	70	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 632+24	71	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 633+00	72	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 633+70	73	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 634+55	74	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG		SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 635+34	75	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 636+08	76	W1-8R	<CHEVRON RIGHT>	30 x 36	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 638+30	77	D20-1T	CO RD 3440 ←	24 x 24	X		10BWG	1	SA	P		
		W1-8L	<CHEVRON LEFT>	30 x 36								
L 638+30	77	D20-1T	CO RD 3440 ←	24 x 24	X		10BWG	1	SA	P		
L 641+98	78	W1-5L	SYMBOL - WINDING ROAD LEFT	36 x 36	X		10BWG	1	SA	P		
R 655+00	79	W3-5	<SYMBOL - REDUCED SPEED AHD> 45 MPH	48 x 48	X		10BWG	1	SA	P		
R 663+50	80	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		10BWG	1	SA	P		
		M1-6T	128 TEXAS	24 x 24								
R 665+07	81	R2-1	SPEED LIMIT 45	36 x 48	X		10BWG	1	SA	P		
L 665+07	82	R2-1	SPEED LIMIT 55	36 x 48	X		10BWG	1	SA	P		
R 665+63	83	I-2aT	Pecan Gap City Limit POP. 203	60 x 24	X		10BWG	1	SA	P		
R 673+62	84	D1-2	← LADONIA BEN FRANKLIN →	102 x 30	X		S80	1	SA	T		
L 674+36	85	S3-1	<SYMBOL - SCHOOL BUS STOP AHEAD>	48 x 48	X		10BWG	1	SA	P		
L 675+32	86	R2-1	SPEED LIMIT 45	36 x 48	X		10BWG	1	SA	P		
R 675+32	87	R2-1	SPEED LIMIT 30	36 x 48	X		10BWG	1	SA	P		
R 677+74	88	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD 64	24 x 24								
R 679+99	89	R12-1T	WEIGHT LIMIT/GROSS XXXX LBS	24 x 36	X		10BWG	1	SA	P		
R 680+26	90	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP (PLAQUE)	36 x 18								
R 680+26	91	M1-6F	<FM SHIELD> FARM ROAD 64	24 x 24	X		10BWG	1	SA	U		
		M6-2L	<ARROW - ANGLED UP LEFT> <AUXILIARY SIGN>	21 x 15								
		M1-6F	<FM SHIELD> FARM ROAD 128	24 x 24								
		M6-2R	<ARROW - ANGLED UP RIGHT> <AUXILIARY SIGN>	21 x 15								
R 681+45	92	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		W4-4P	CROSS TRAFFIC DOES NOT STOP (PLAQUE)	36 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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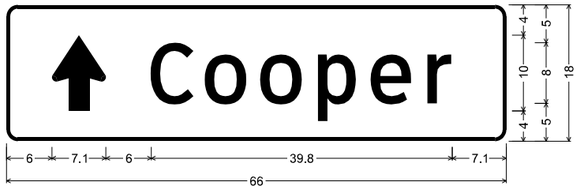
Texas Department of Transportation

Traffic Operations Division Standard

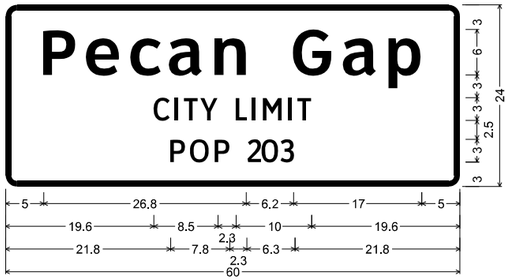
SUMMARY OF SMALL SIGNS

SOSS

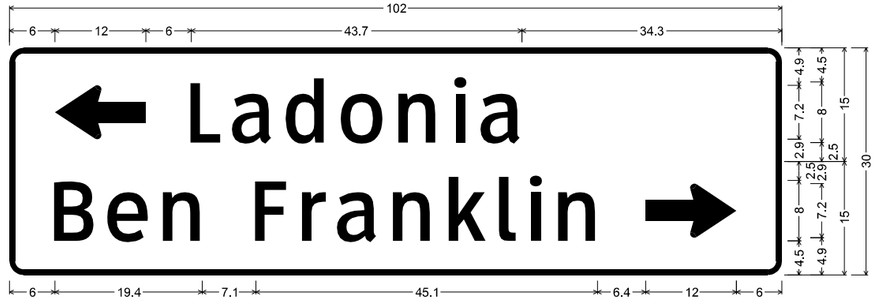
FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
4-16	DIST	COUNTY		SHEET NO.
8-16	PAR	Delta		121



Sign #15 D1-1 8in UP;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 10.0" X 7.1" 90'; "Cooper", ClearviewHwy-3-W;



Sign #83 I-2aT ;
1.5" Radius, 0.8" Border, White on, Green;
"Pecan Gap", ClearviewHwy-5-W-R; "CITY LIMIT", ClearviewHwy-3-W;
"POP 197", ClearviewHwy-3-W;



Sign #84 D1-2 ;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Ladonia", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Ben Franklin", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.11

Monte R. Rater P.E.

FM 64
SIGN DETAILS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		122

DATE: 5/5/2021 4:42:43 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\103 SIGN DETAILS.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

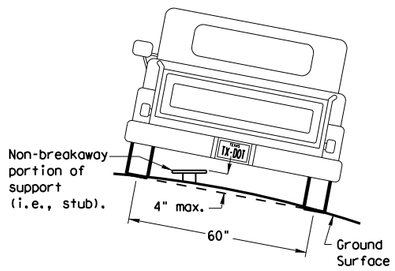
Anchor Type

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

Sign Mounting Designation

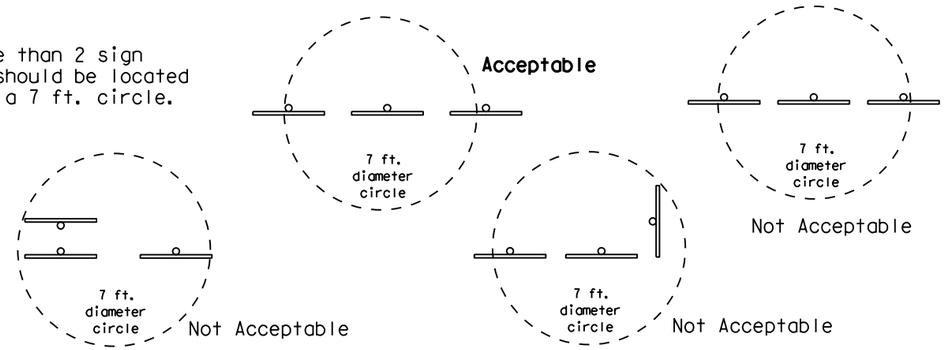
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))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

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



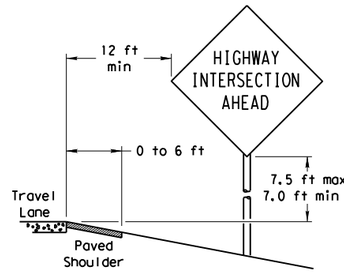
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



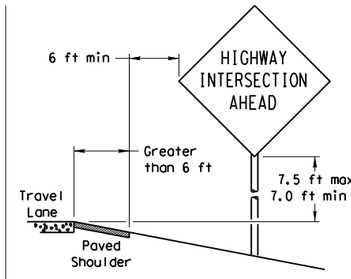
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

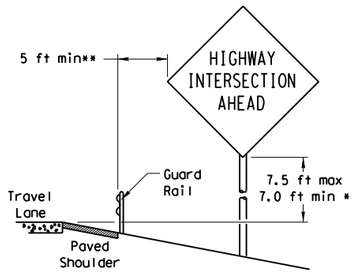
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



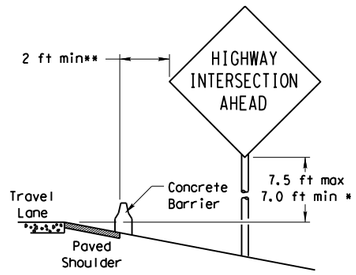
GREATER THAN 6 FT. WIDE

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.

BEHIND BARRIER



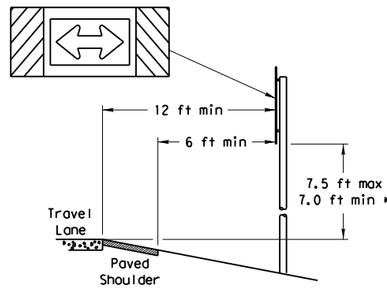
BEHIND GUARDRAIL



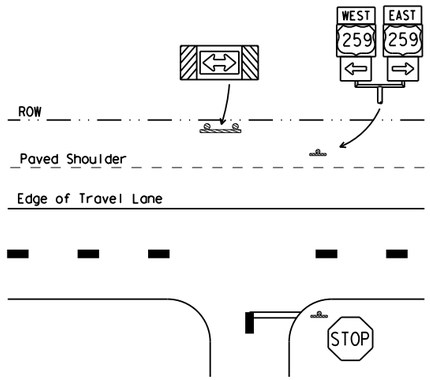
BEHIND CONCRETE BARRIER

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

T-INTERSECTION



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



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

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

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

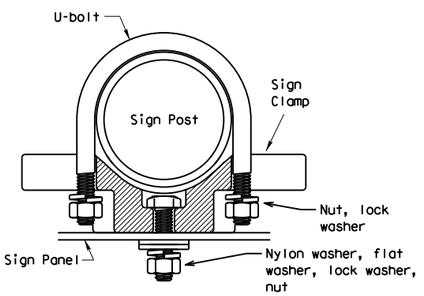
The maximum values may be increased when directed by the Engineer.

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

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

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

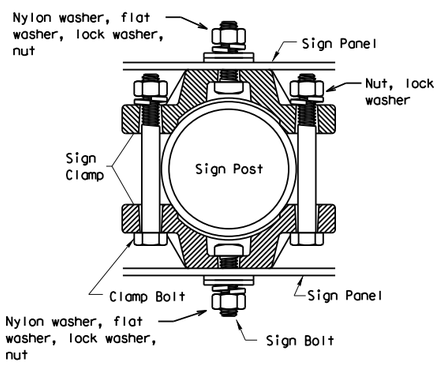


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

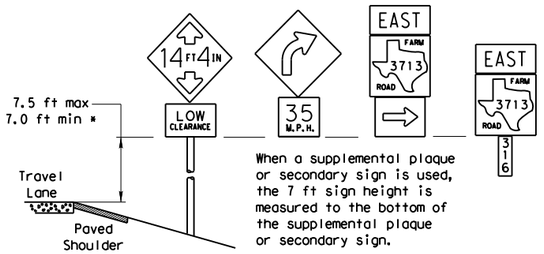
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



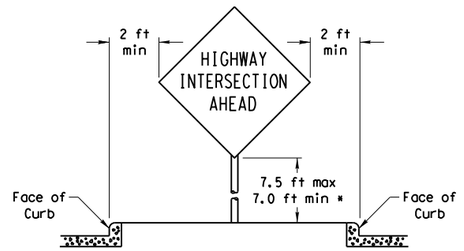
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



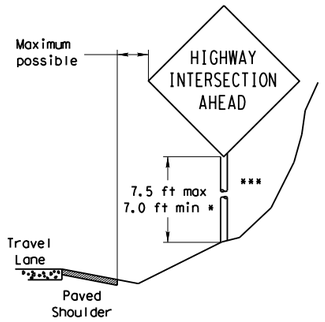
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		123

DATE: 5/5/2021 4:42:45 PM
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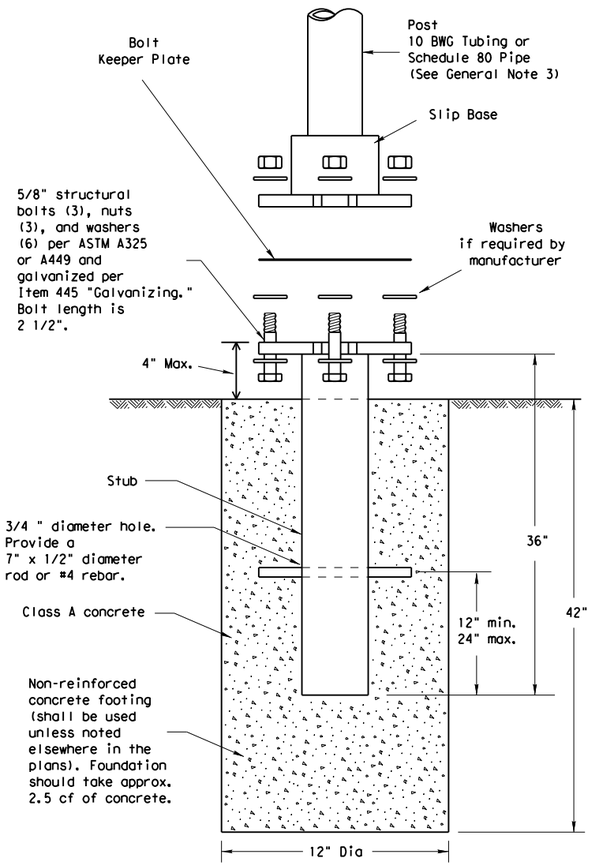
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

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

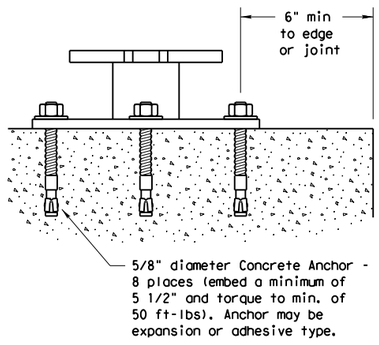
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum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

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		124

DATE: 5/5/2021 4:42:47 PM
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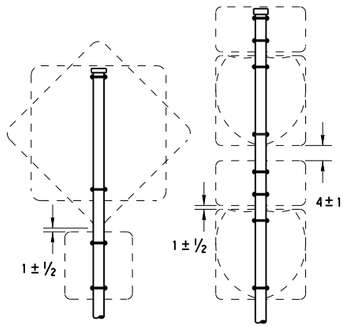
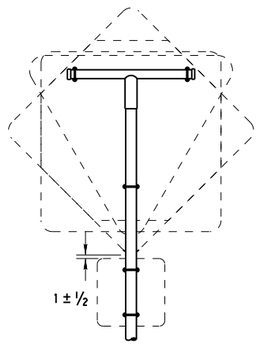


SM RD SGN ASSM TY XXXXX(1)XX(P)



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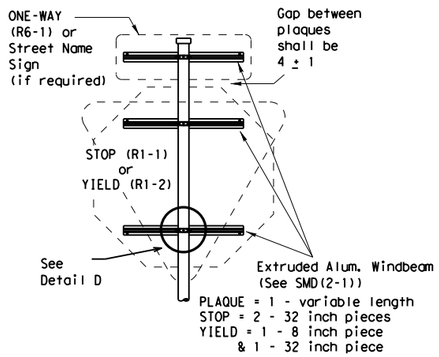

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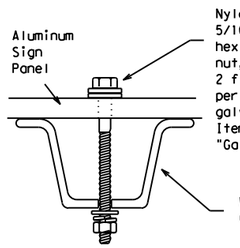
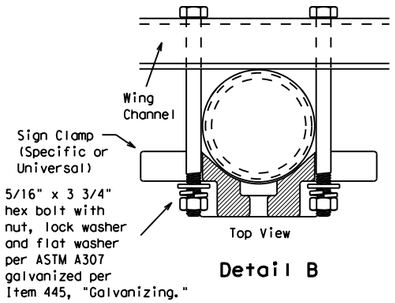
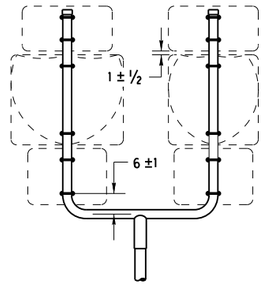


Detail A



Detail B



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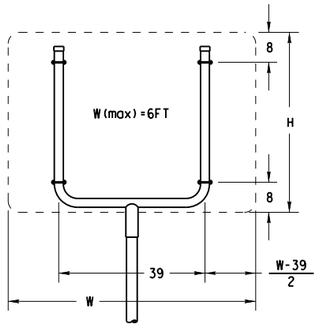

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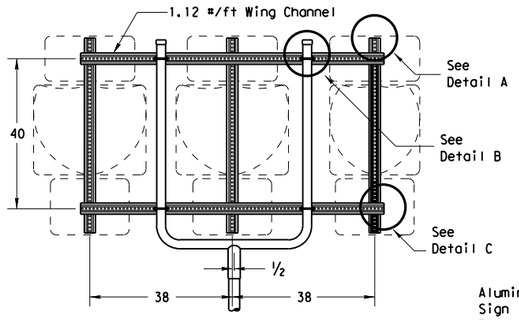
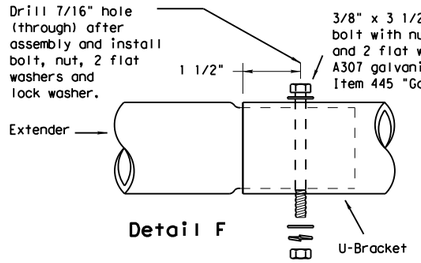
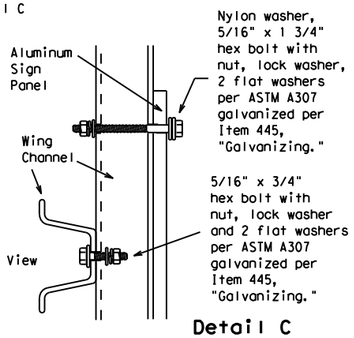


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

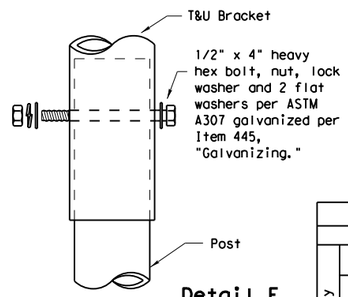


Detail F

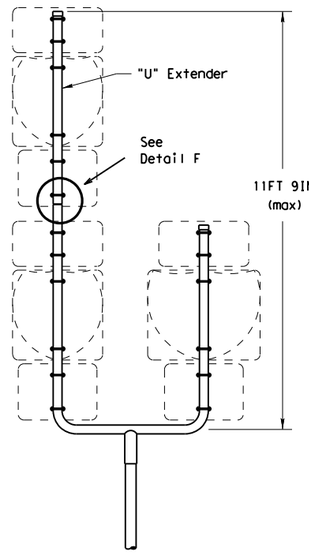
Splices shall only be allowed behind the sign substrate.



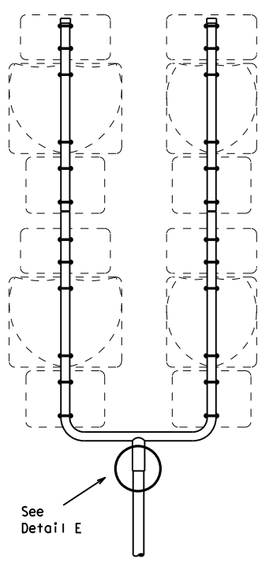
Detail C



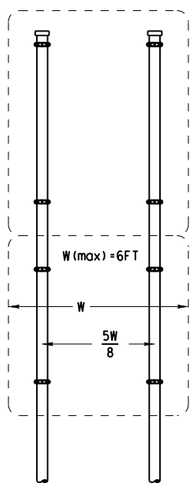
Detail E



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

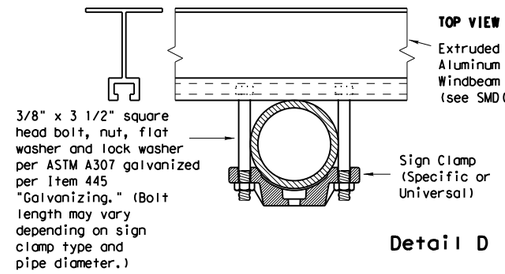


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

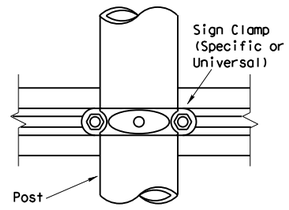


SM RD SGN ASSYM TY XXXXX(2)XX(P)

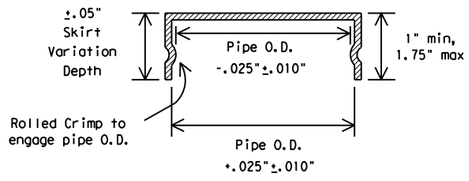
SIDE VIEW



Detail D



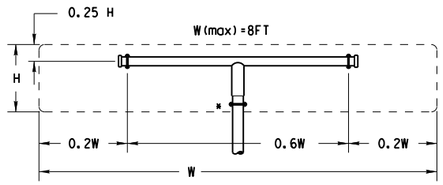
FRICTION CAP DETAIL



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.



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

All dimensions are in english unless detailed otherwise.

GENERAL NOTES:

1.

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64

DIST	COUNTY	SHEET NO.
PAR	Delta	125

9-08 REVISIONS

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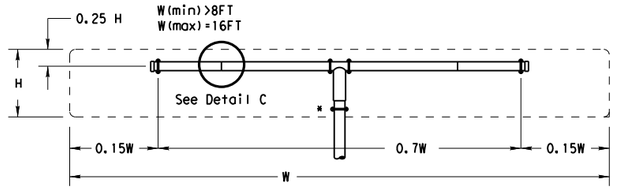
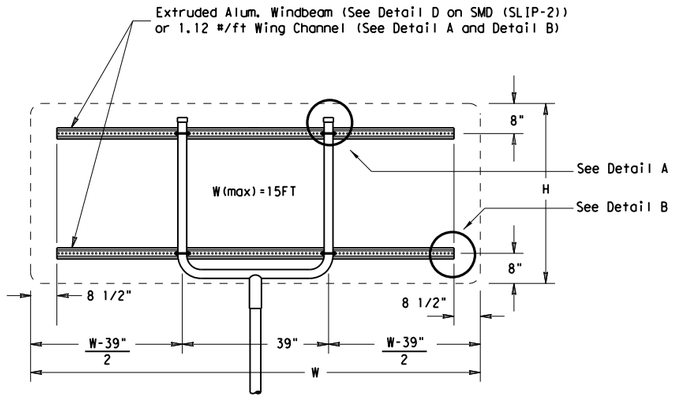
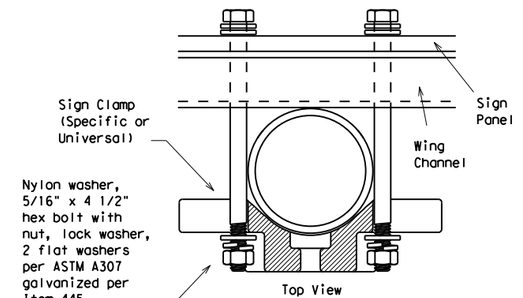


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

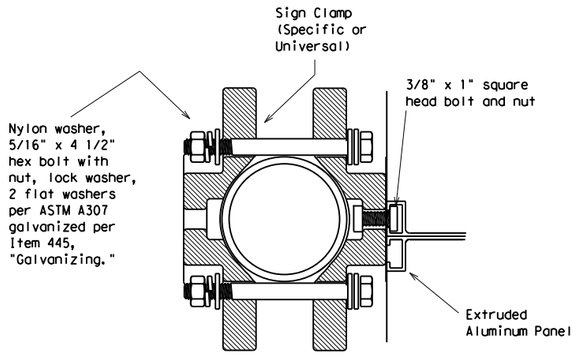


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

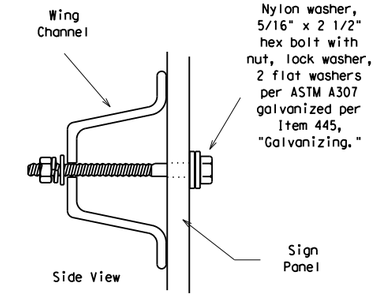


Top View

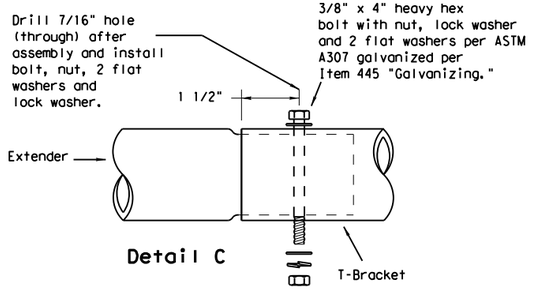
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

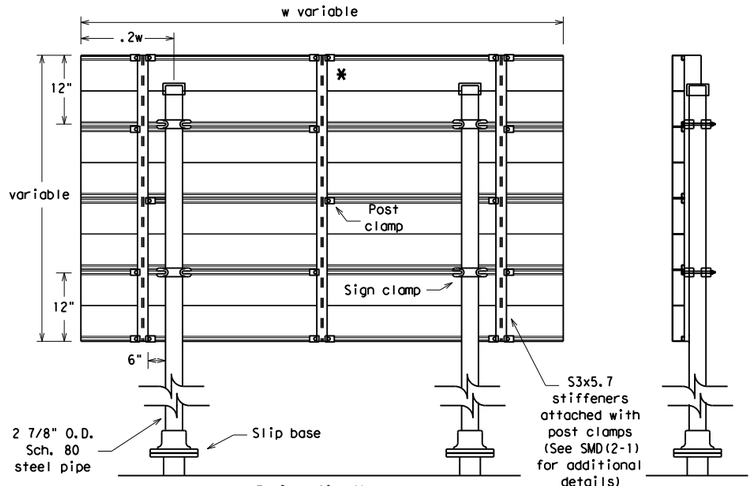


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

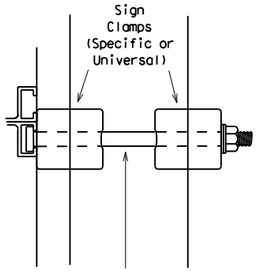


Typical Sign Mount

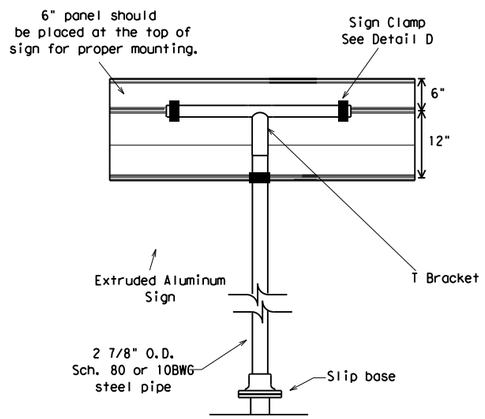
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

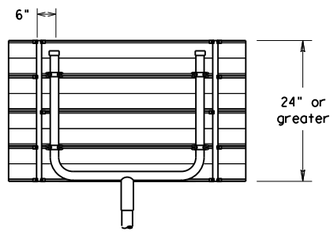
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

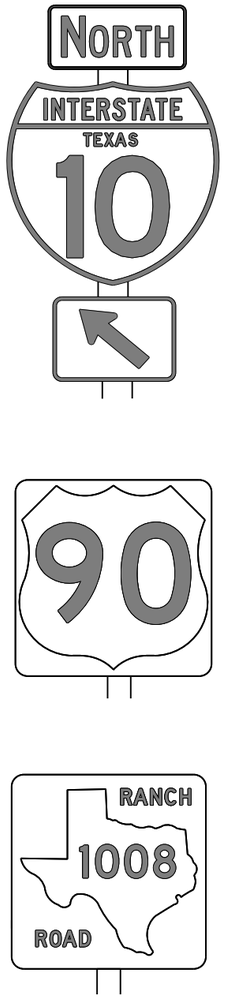
REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		126

DATE: 5/5/2021 4:42:53 PM
FILE: T:\PARIPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\108 tsr3f13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

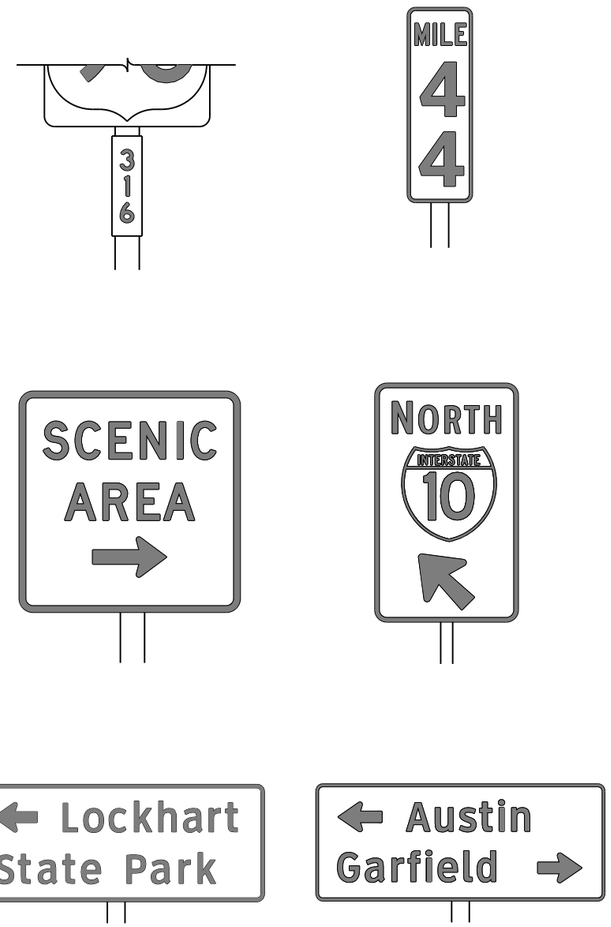
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

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

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



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

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

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

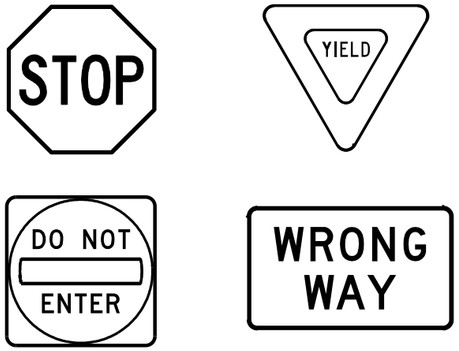
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	PAR	Delta		127

DATE: 5/5/2021 4:42:56 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\109 tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

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



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

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

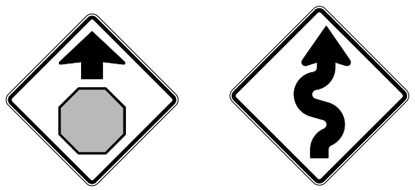
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

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

TYPICAL EXAMPLES

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

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

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

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

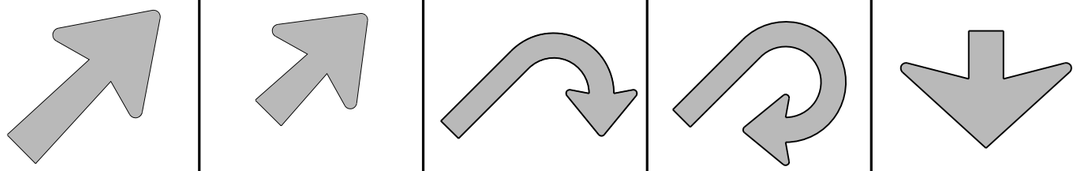
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	PAR	Delta		128

DATE: 5/5/2021 4:42:58 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\110 tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

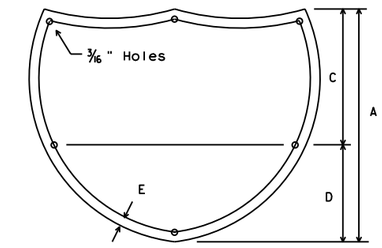
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

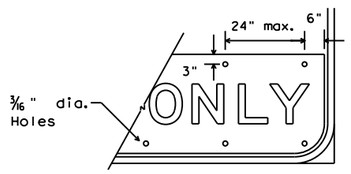
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

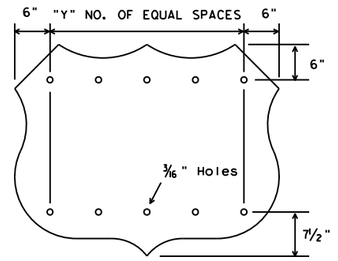


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

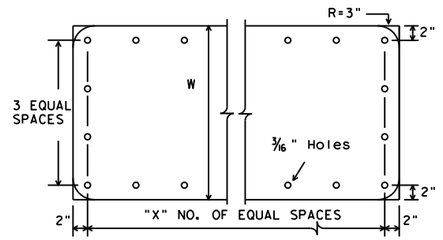


EXIT ONLY PANEL



U.S. ROUTE MARKERS

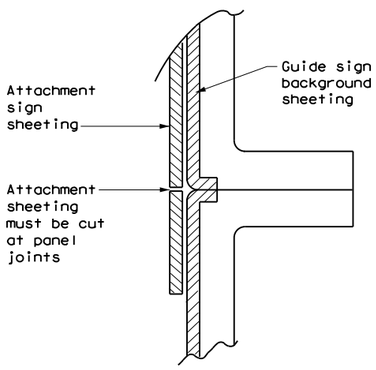
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

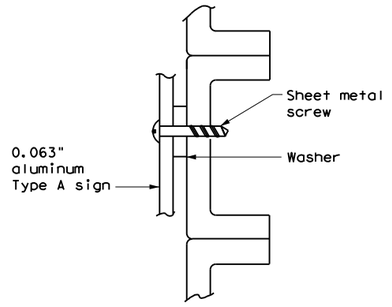
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



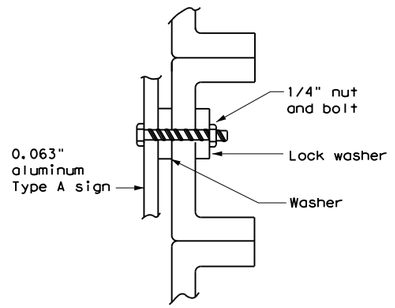
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



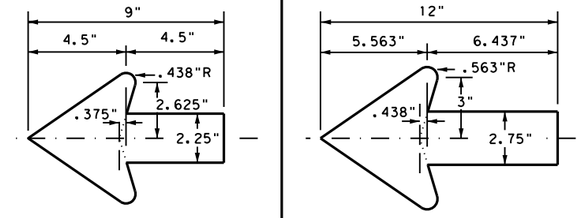
NUT/BOLT ATTACHMENT

NOTE:

Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.

Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

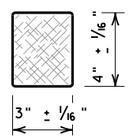
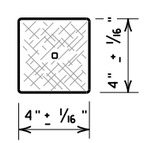
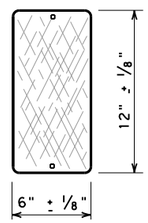
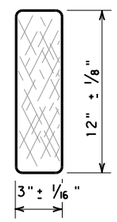
TYPICAL SIGN REQUIREMENTS

TSR(5)-13

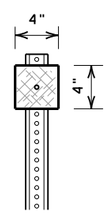
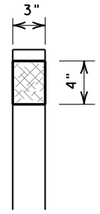
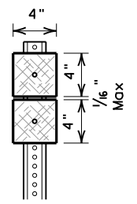
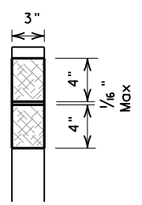
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	PAR	Delta		129

DATE: 5/5/2021 4:43:00 PM
FILE: T:\PARTPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\111 dom120.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

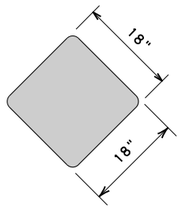
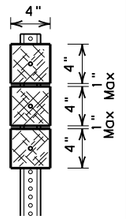
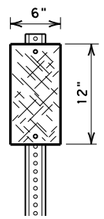
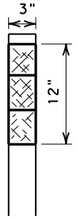
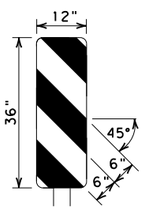
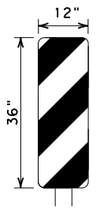
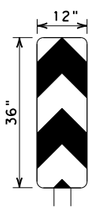
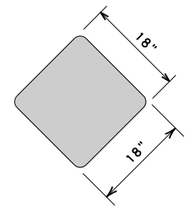
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

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

DIRECTION
If Required
BI = Bi-Directional

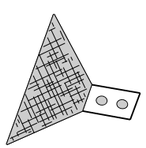
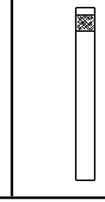
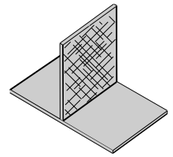
OBJECT MARKERS

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

DEPARTMENTAL MATERIAL SPECIFICATIONS

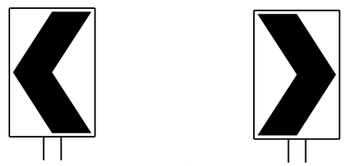
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

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

CHEVRONS

DEVICE



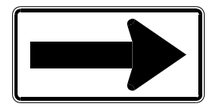
W1-8

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

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

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

NOTE:

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

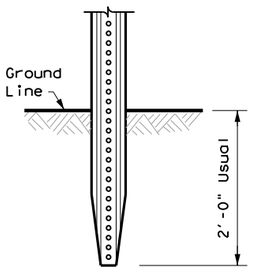
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	PAR	Delta		130

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

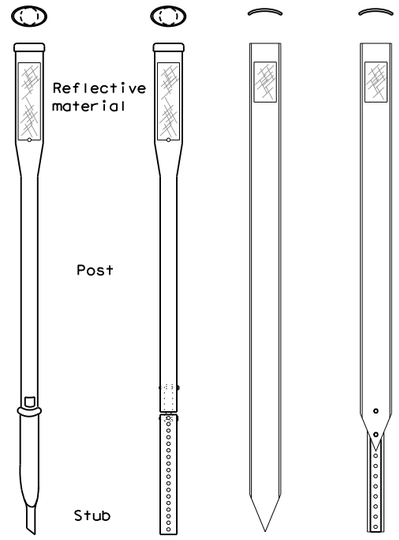


NOTES

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.

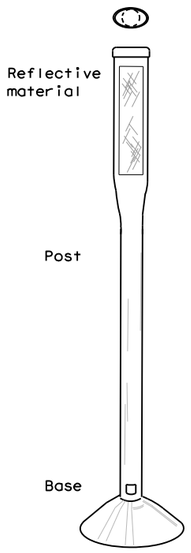
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



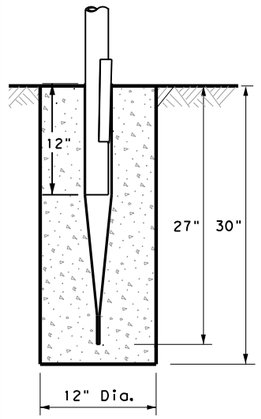
SURFACE MOUNT

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.

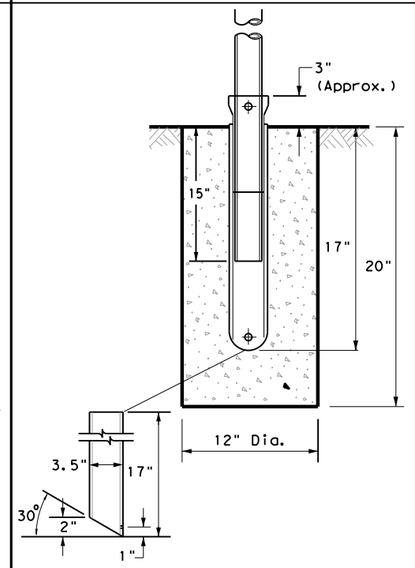
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

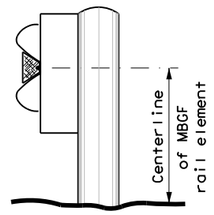
NOTE

1. Install per manufacturer's recommendations.

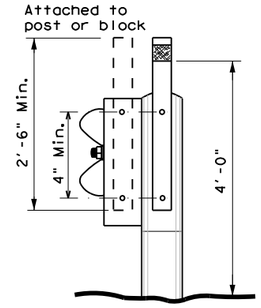
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

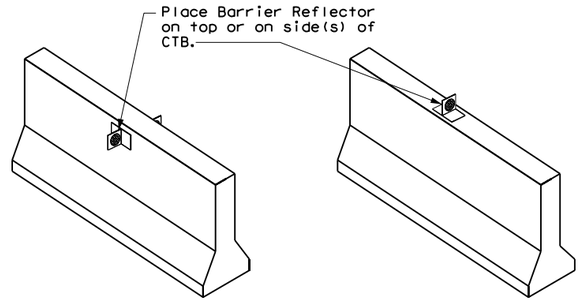
GF1



GF2



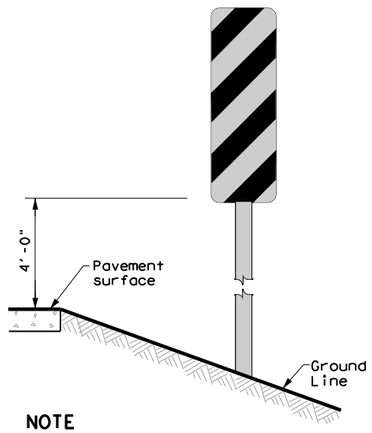
CONCRETE TRAFFIC BARRIER (CTB)



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.

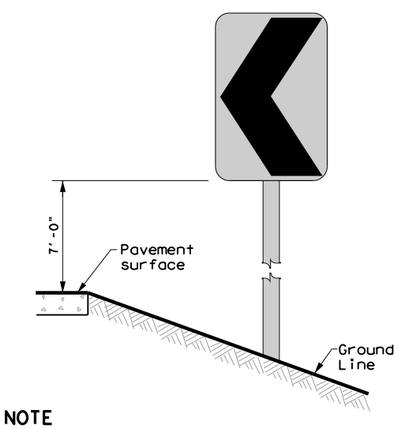
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

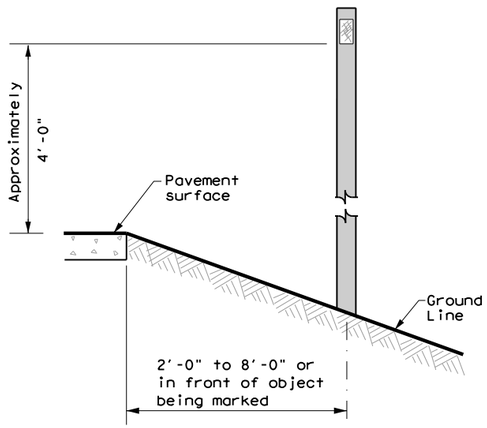
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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
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REVISIONS	0399	03	038	FM 64
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	PAR	Delta		131

20B

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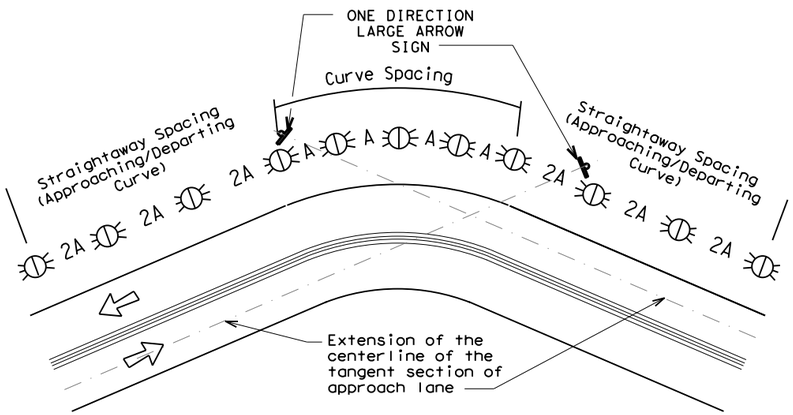
DATE: 5/5/2021 4:43:05 PM
FILE: T:\PAR\PDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\113 dom3-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

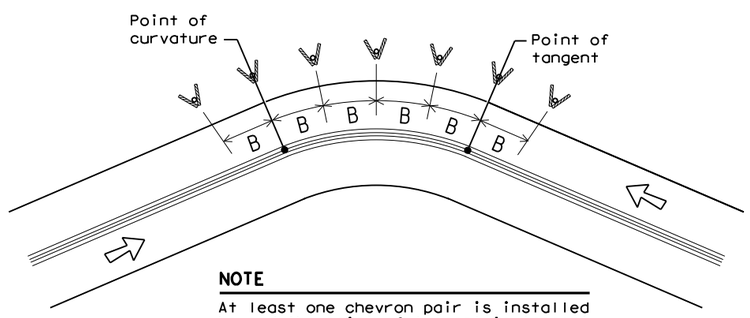
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0399	03	038	FM 64
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	PAR	Delta		132

20C

DATE: 5/5/2021 4:43:07 PM
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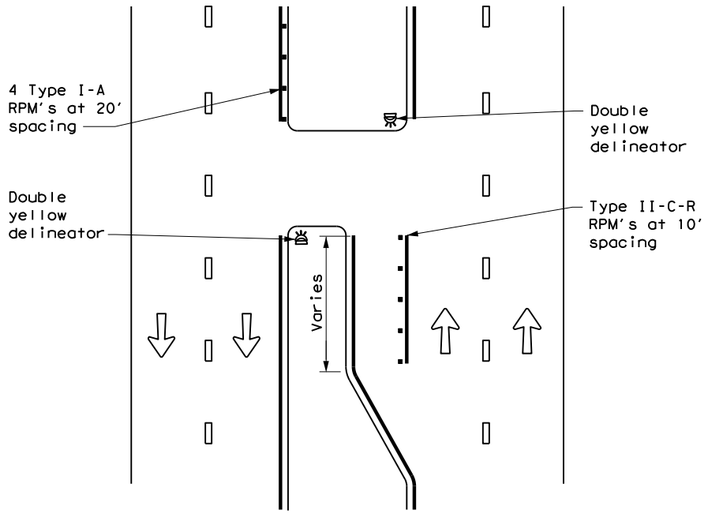
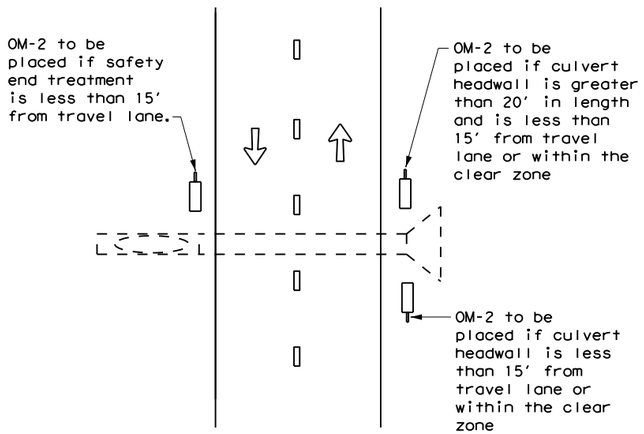
CROSSOVERS



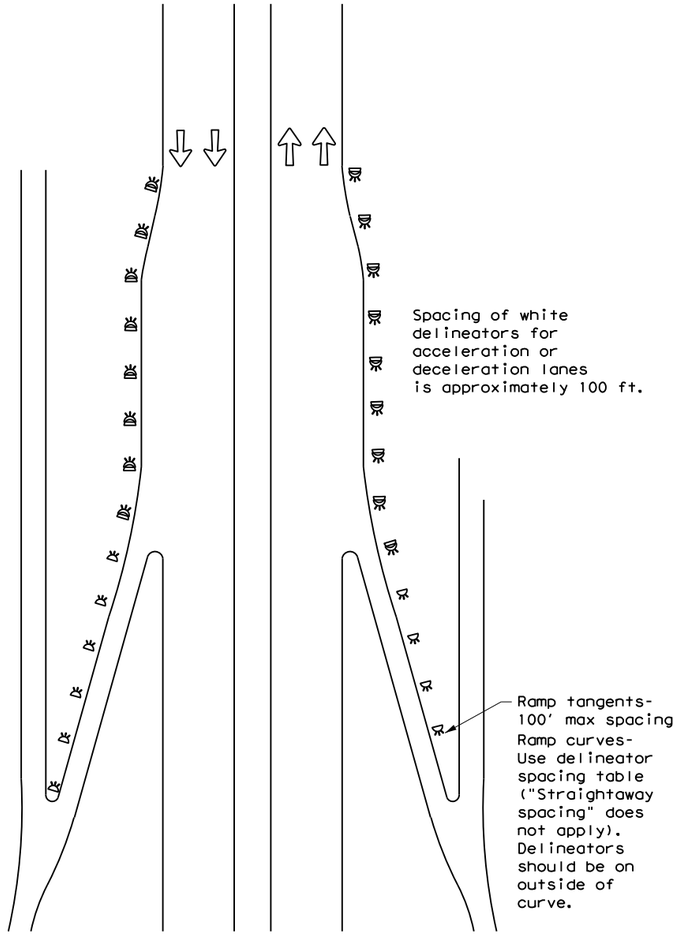
DETAIL 1

FOR CULVERTS WITHOUT MBGF



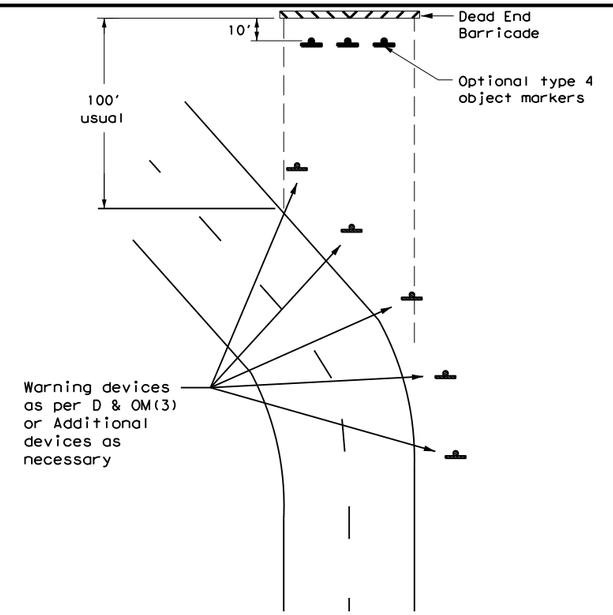
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



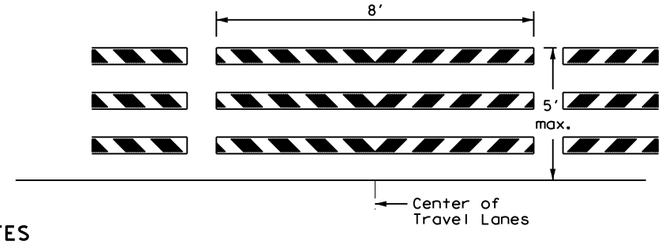
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

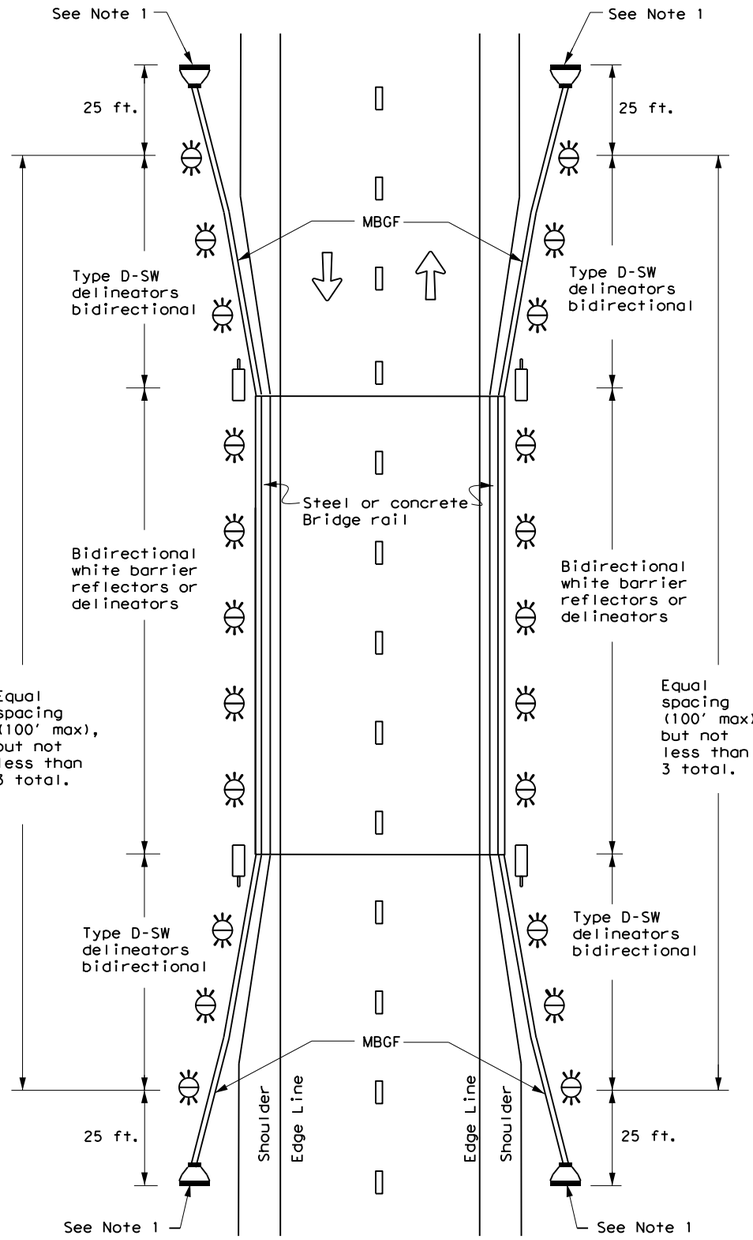
D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
3-15	DIST	COUNTY		SHEET NO.
7-20	PAR	Delta		133

20D

DATE: 5/5/2021 4:43:09 PM
FILE: T:\PARIPDD\FM 64_0399-03-038_2R Rehab\Design\CAD Plan Sheets\114.1 dom5-20.dgn

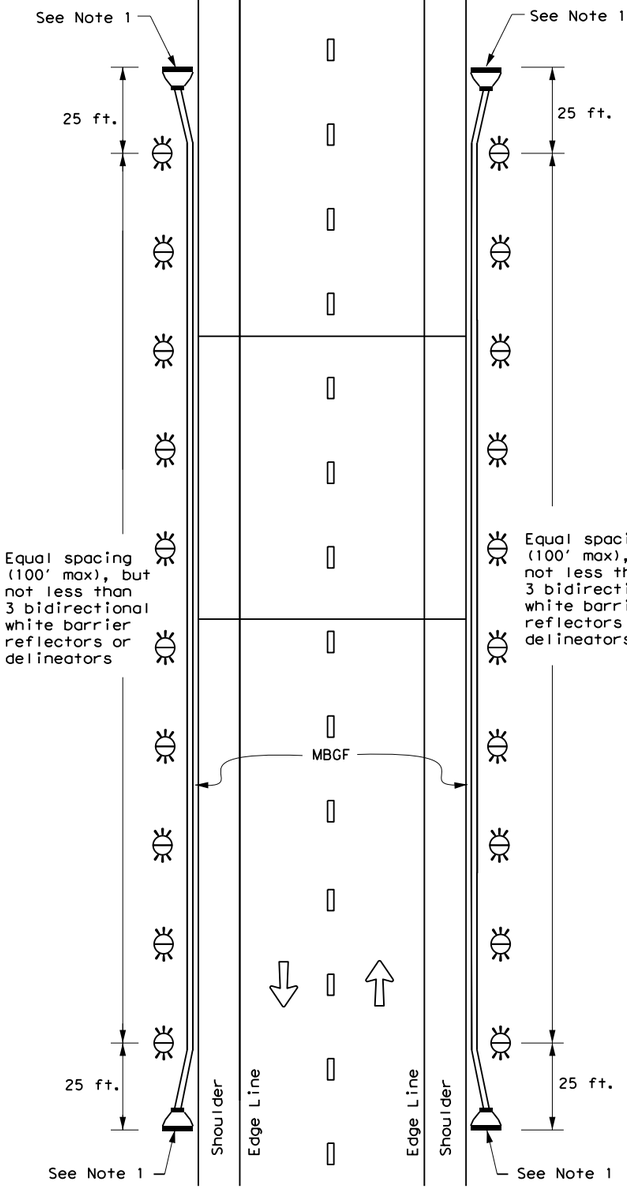
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

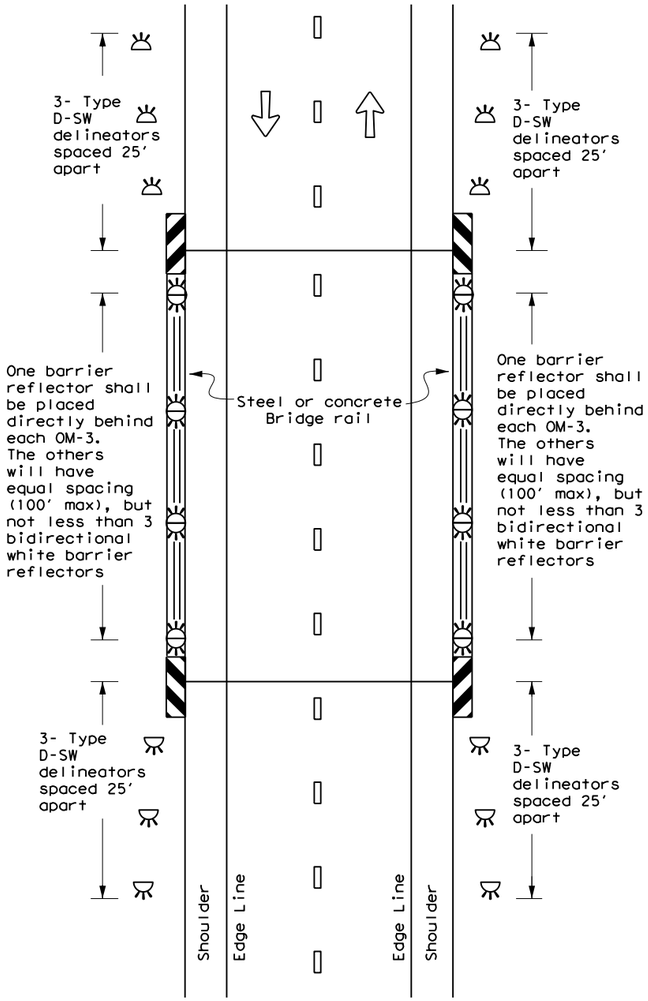
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

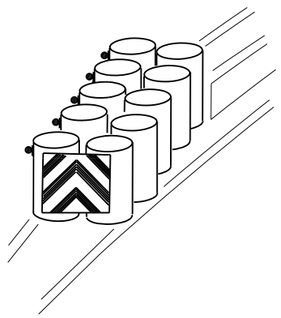
Traffic Safety Division Standard

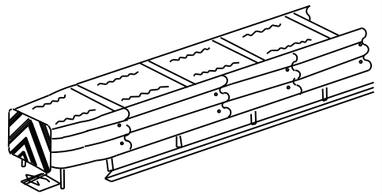
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

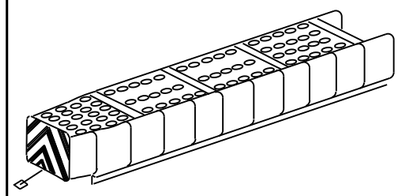
D & OM(5)-20

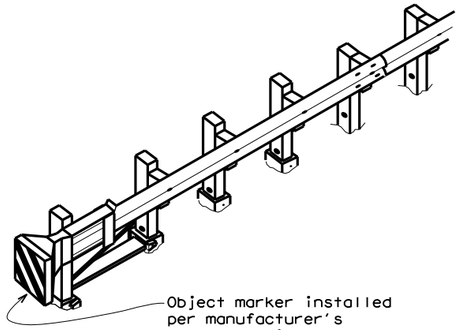
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
7-20	DIST	COUNTY		SHEET NO.
	PAR	Delta		134

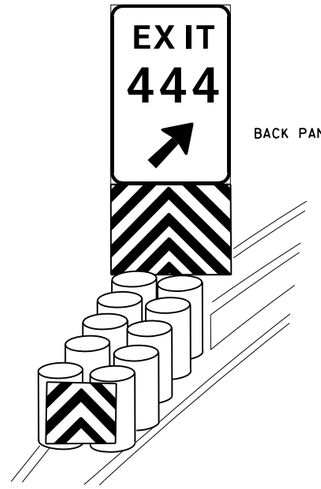
20E

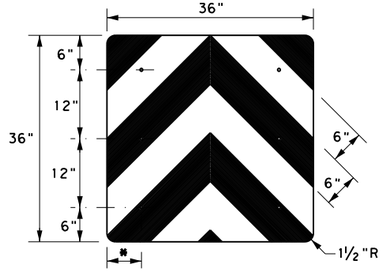


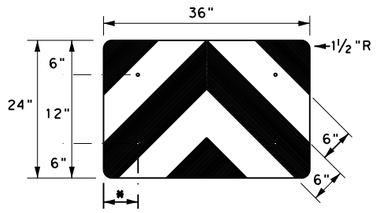




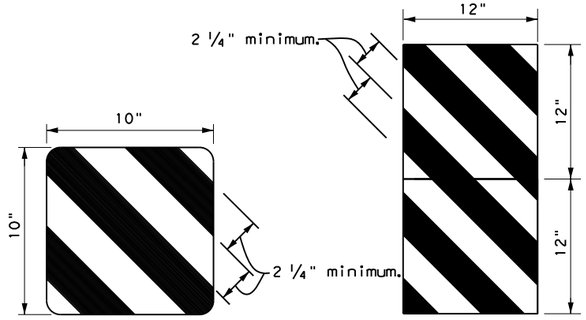




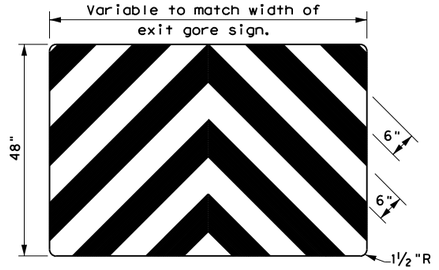


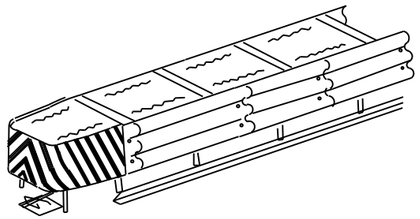


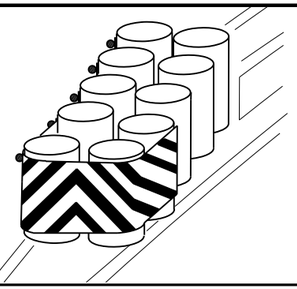
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

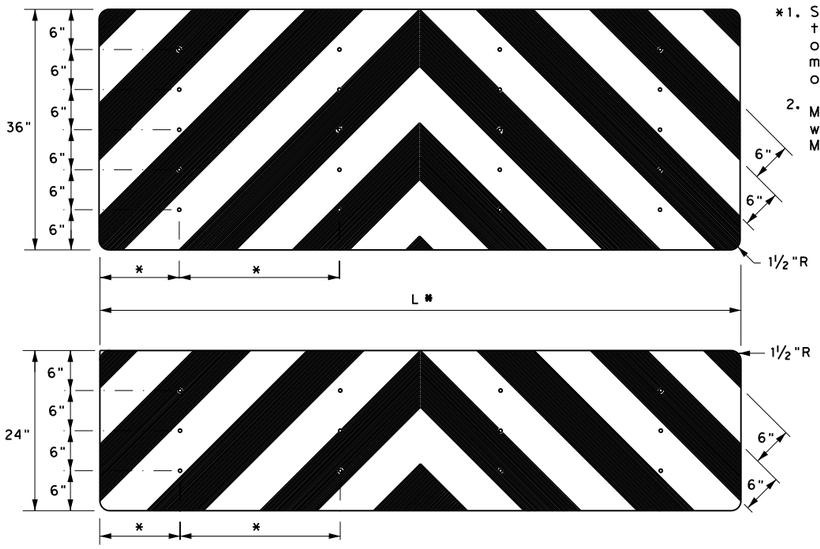


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0399	03	038	FM 64
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	PAR	Delta		135
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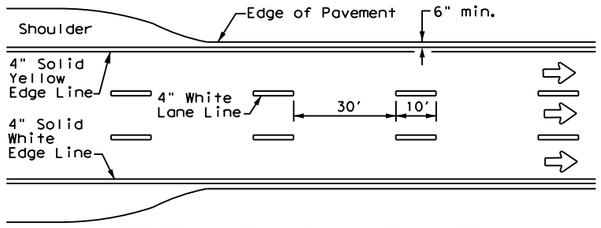
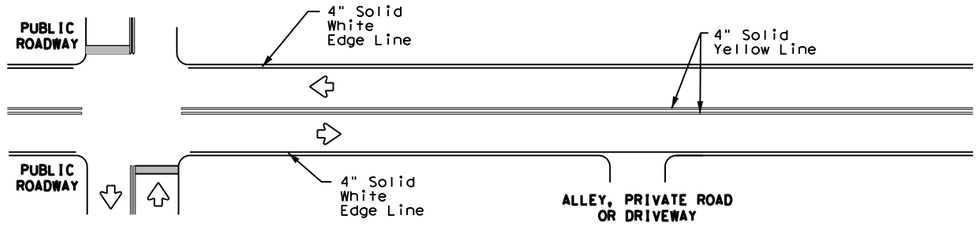
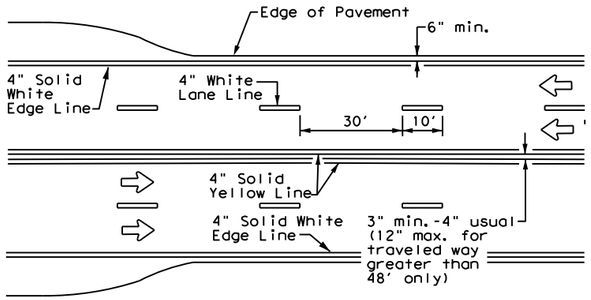


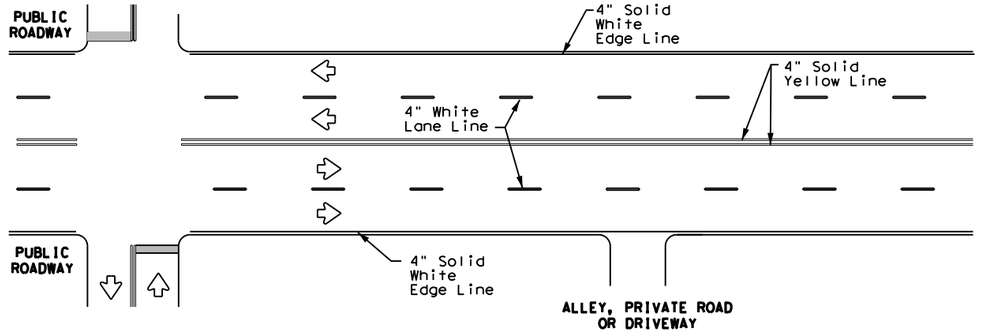
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



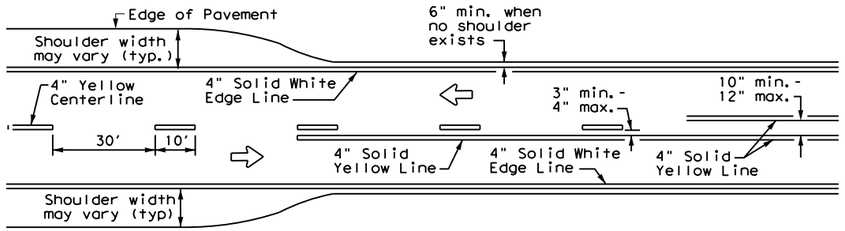
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



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

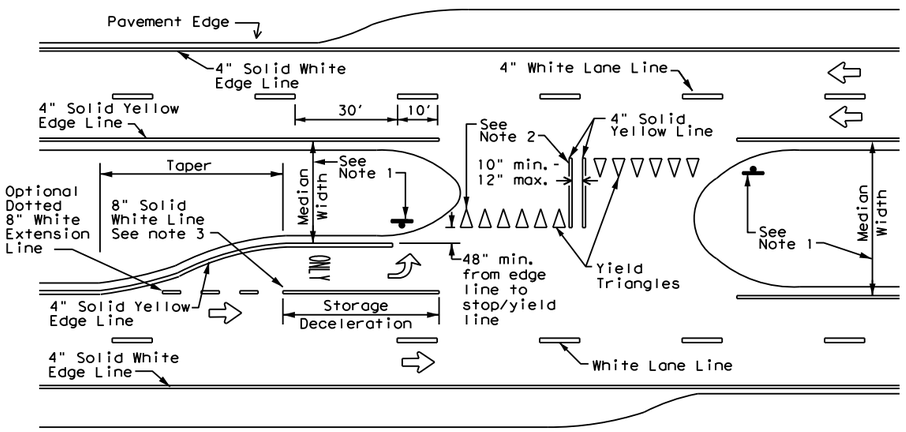


TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

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

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

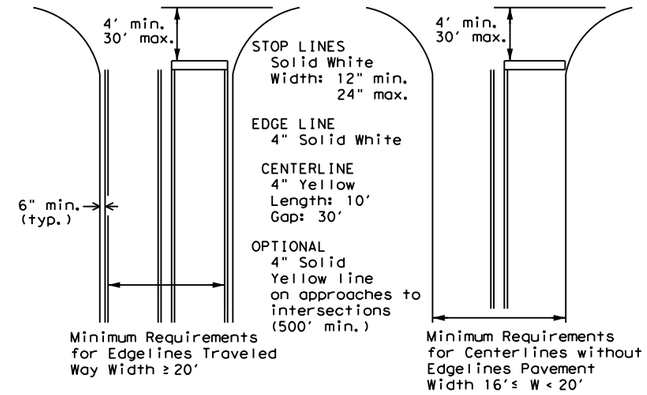
GENERAL NOTES

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

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

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
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5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	PAR	Delta		136

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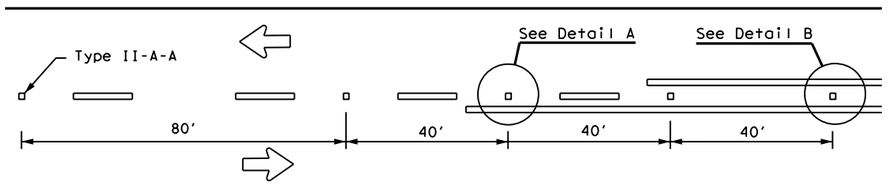
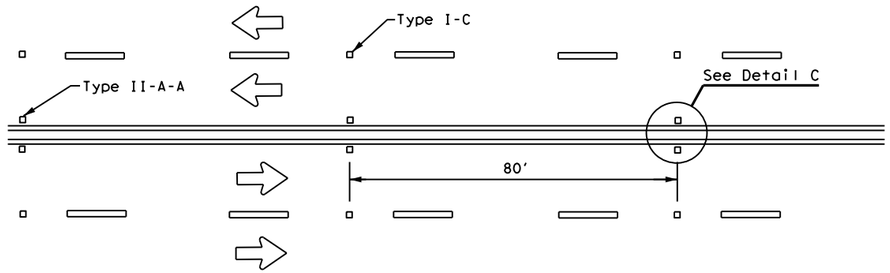
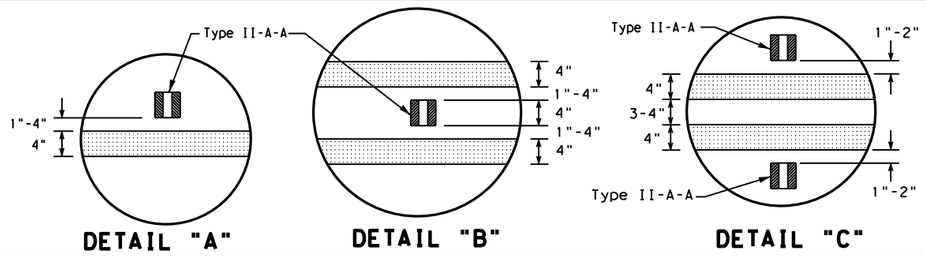
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



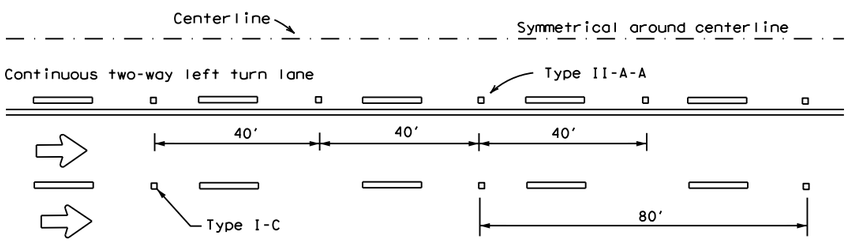
CENTERLINE FOR ALL TWO LANE ROADWAYS



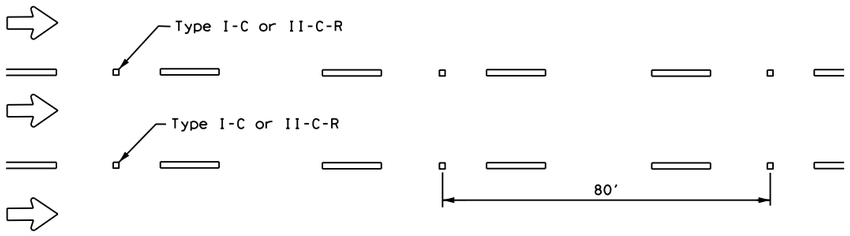
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

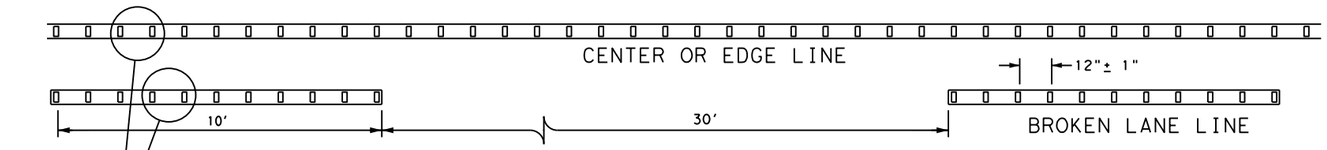


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



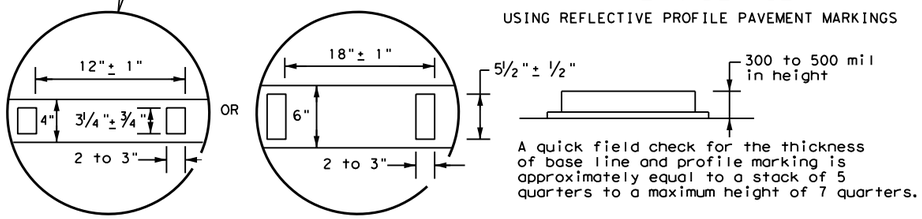
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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

NOTE

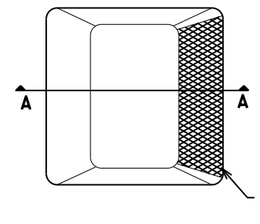
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

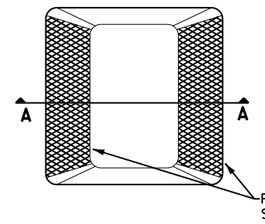
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

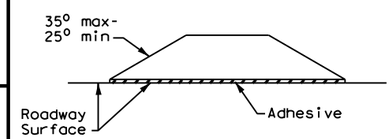
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

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5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	PAR	Delta		137

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SITE DESCRIPTION

PROJECT LIMITS: *THIS PROJECT IS IN NORTH CENTRAL DELTA COUNTY ON FM 64, FROM 1532 TO FM 128.*

PROJECT DESCRIPTION: *REHABILITATE EXISTING ROAD.*

MAJOR SOIL DISTURBING ACTIVITIES:

INCLUDES PREP ROW, EMBANKMENT, CULVERT MODIFICATIONS, SUBGRADE WIDENING, DITCH GRADING, EROSION AND SEDIMENTARY CONTROLS, TEMPORARY AND PERMANENT SEEDING.

TOTAL PROJECT AREA: *54 ACRES*

TOTAL AREA TO BE DISTURBED: *27.3 AC (51%)*

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

The existing soil consists of Houston Black and Leson consisting of clay, moderatly well drained, very slowly permeable soils. Slope range from 1 to 3 percent. Native grasses, brush, and trees cover the existing soil.

NAME OF RECEIVING WATERS:

Segment of Jennings Creek which flows approximatley 4 miles and empties into East Fork Jernigan Creek - segment 0307D,then flows approximatley 8 miles and empties into Cooper Lake.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES & STRUCTURAL PRACTICES:

EROSION CONTROL:

- X TEMPORARY SEEDING
- X PERMANENT PLANTING, SODDING, OR SEEDING
- ___ MULCHING
- ___ SOIL RETENTION BLANKET
- ___ BUFFER ZONES
- ___ PRESERVATION OF NATURAL RESOURCES

OTHER:

DISTURED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME AND DO WITHIN 21 DAYS.

SEDIMENTATION CONTROL:

- X SILT FENCES
- ___ HAY BALES
- X ROCK BERMS
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ___ DIVERSION DIKE AND SWALE COMBINATIONS
- ___ PIPE SLOPE DRAINS
- ___ PAVED FLUMES
- ___ ROCK BEDDING AT CONSTRUCTION EXIT
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- ___ CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- ___ STORM INLET SEDIMENT TRAP
- ___ STONE OUTLET STRUCTURES
- ___ CURBS AND GUTTERS
- ___ STORM SEWERS
- ___ VELOCITY CONTROL DEVICES

POST-CONSTRUCTION CONTROLS:

- ___ RETENTION / IRRIGATION
- ___ EXTENDED DETENTION BASIN (ie: ROCK BERMS)
- ___ VEGETATIVE FILTER STRIPS
- ___ GRASSY SWALES
- X VEGETATIVE LINED DRAINAGE DITCHES
- ___ CONSTRUCTED WET LANDS
- ___ WET BASINS
- ___ SAND FILTER SYSTEMS

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

MAJOR SOIL DISTURBING ACTIVITIES SHALL NOT BE PERFORMED UNTIL EMBANKMENT PLACEMENT IS SCHEDULED TO BEGIN WITHIN FIVE (5) WORKING DAYS.

INSTALL EROSION AND SEDIMENTATION CONTROLS PRIOR TO SOIL DISTURBANCE WHENEVER POSSIBLE.

ONCE BEGUN, EARTHWORK ACTIVITIES SHALL BE PROGRESSED WITHOUT DELAY, UNLESS APPROVED BY THE ENGINEER, UNTIL FINAL GRADING IS ACCOMPLISHED.

EROSION CONTROL MEASURES SHALL BE APPLIED IMMEDIATELY UPON COMPLETION OF THE EMBANKMENT PLACEMENT TO MINIMIZE POTENTIAL WATER QUALITY IMPACTS.

REMARKS: *Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, waterbody or streambed.*
The Contractor shall designate a location for, construct, and maintain an area for concrete mixing, handling and delivery equipment to wash out.
Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the runoff of pollutants.
All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

MAINTENANCE: *All erosion and sediment controls will be maintained in good working order. If a repair is necessary, it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The areas adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.*

INSPECTION: *An inspection will be performed by a TxDOT inspector at least once every seven (7) calendar days. An inspection and maintenance report will be made per each inspection. Stormwater controls will be modified as directed by the Engineer based on these reports.*

OTHER EROSION AND SEDIMENT CONTROLS:

WASTE MATERIALS: *All trash and construction debris from the job site will be disposed of by the Contractor at a local dump. No construction materials will be buried on site.*

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): *Any hazardous waste spills shall be reported to the TxDOT Safety Officer in Paris. It shall be the responsibility of the waste owner to provide for the required clean-up. If the owner cannot be determined, the district laboratory shall direct in the clean-up operation.*

SANITARY WASTE: *Any sanitary waste shall be collected from portable units as necessary or as required by local regulation by a licensed sanitary waste management contractor. All sanitary waste from permanent sites will be collected by local sanitary sewer systems.*

OFFSITE VEHICLE TRACKING:

- ___ HAUL ROADS DAMPENED FOR DUST CONTROL
- X LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- X EXCESS DIRT ON ROAD REMOVED DAILY
- ___ STABILIZED CONSTRUCTION ENTRANCE

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL SUBCONTRACTORS ARE AWARE OF AND COMPLY WITH ALL COMPONENTS OF THE SW3P.

STATE OF TEXAS
MONTE RATER
95859
LICENSED
PROFESSIONAL ENGINEER

5.6.21

Monte R. Rater P.E.

FM 64
STORMWATER POLLUTION PREVENTION PLAN

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		138

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

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. TEMPORARY BMPS OR OTHER SUITABLE MEANS OF CONTAINMENT WILL BE USED TO RE-ESTABLISH VEGETATIVE AREAS.
2. POST CONSTRUCTION BMPS WILL BE USED TO RE-ESTABLISH VEGETATIVE AREAS.
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.

2.

3.

4.

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	
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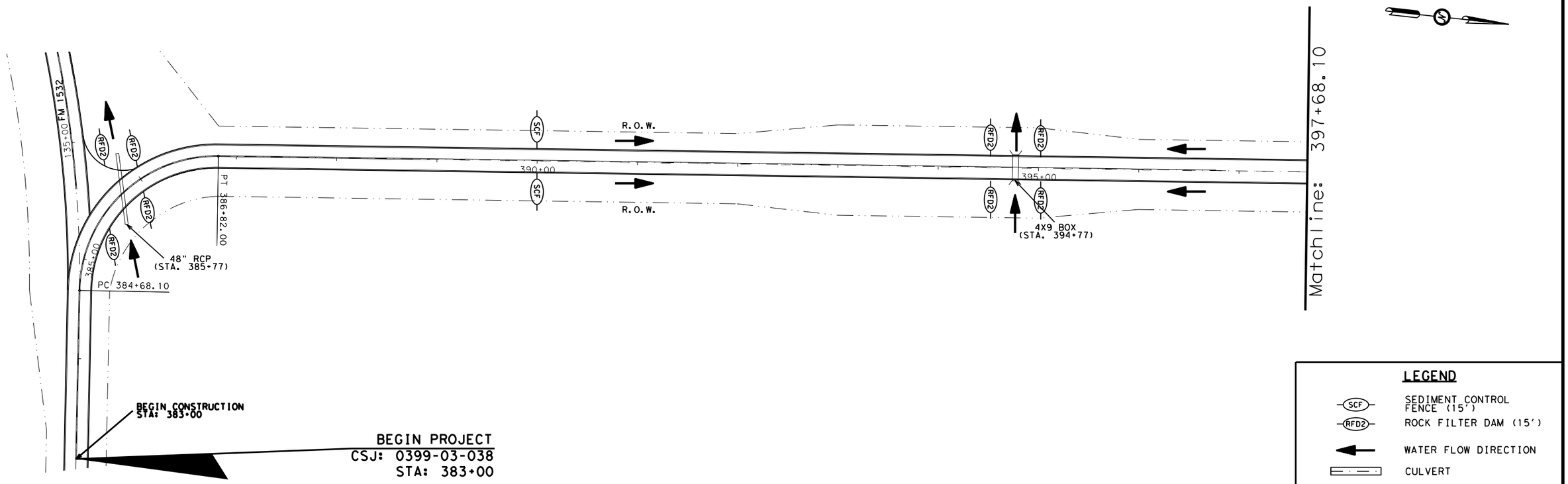
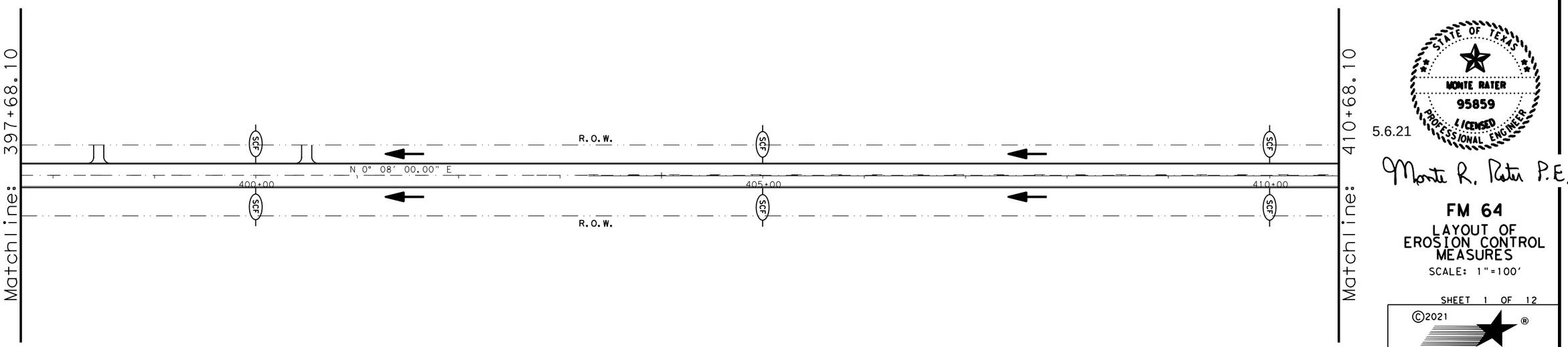
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	PAR	Delta		139	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					





STATE OF TEXAS
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5.6.21

Monte R. Rater P.E.

FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 1 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		140

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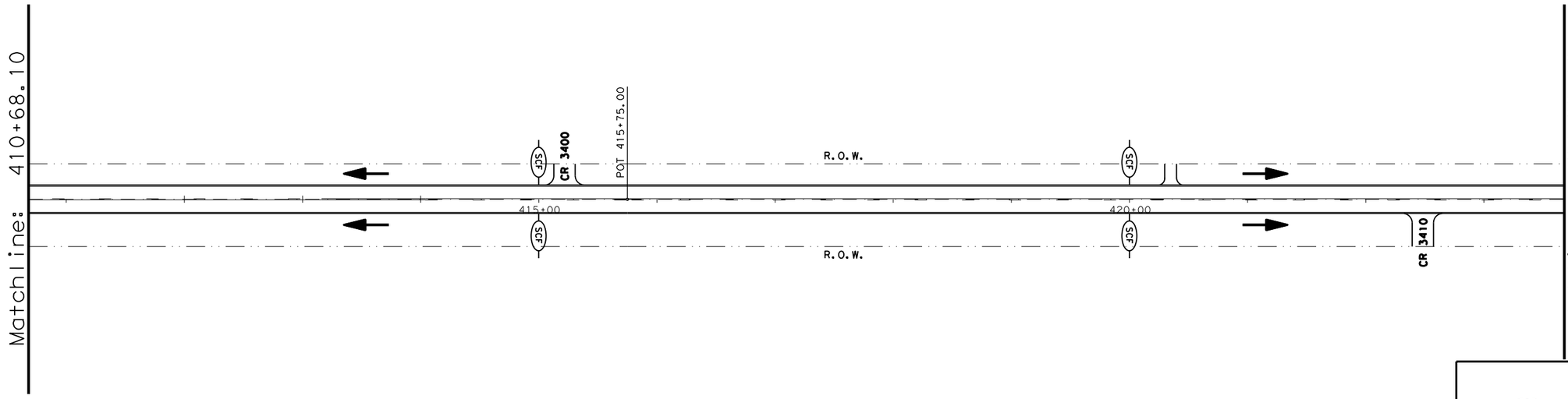
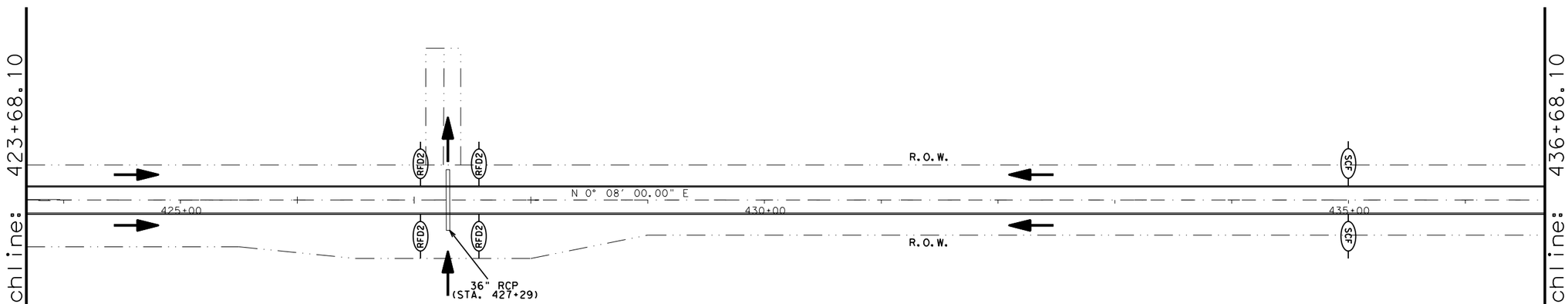


LEGEND

- SCF — SEDIMENT CONTROL FENCE (15')
- RFD2 — ROCK FILTER DAM (15')
- WATER FLOW DIRECTION
- CULVERT



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Monte R. Rater P.E.

FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 2 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		141

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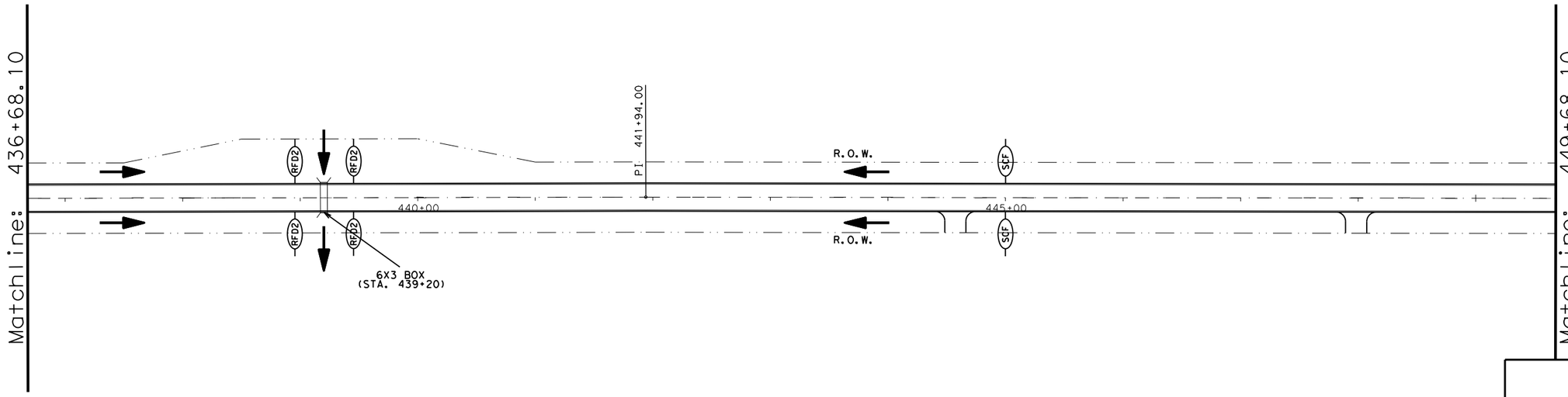

LEGEND

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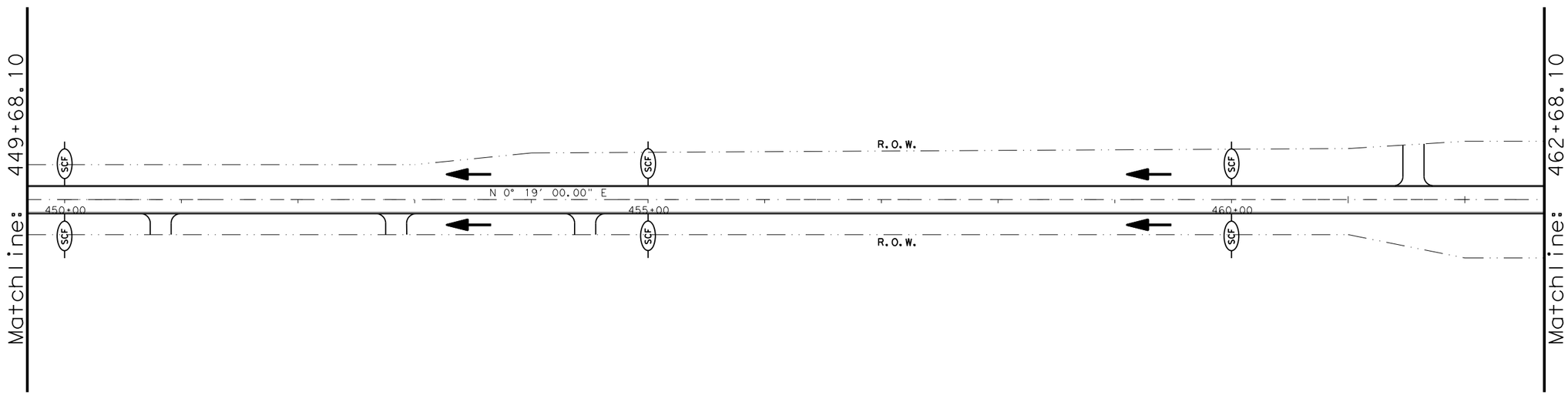
- CULVERT



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LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 3 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		142

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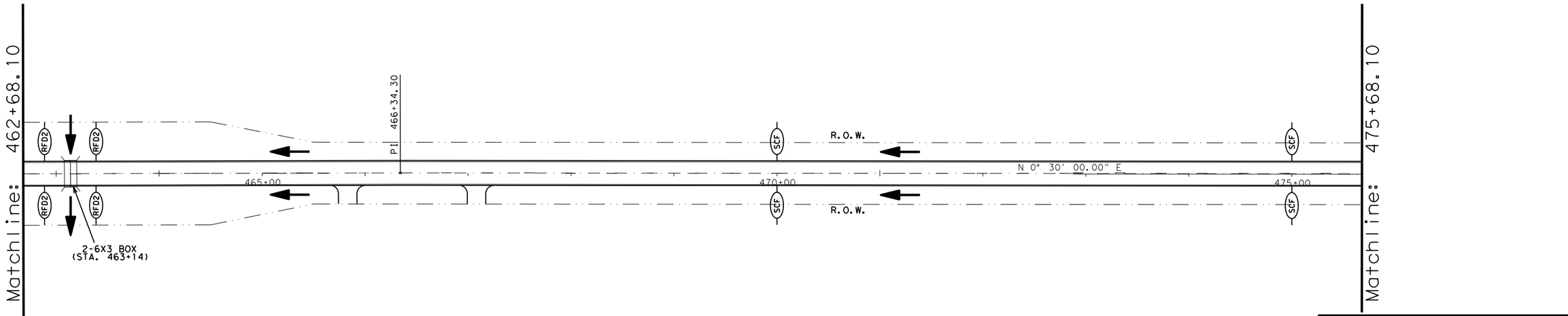

LEGEND

- SCF — SEDIMENT CONTROL FENCE (15')
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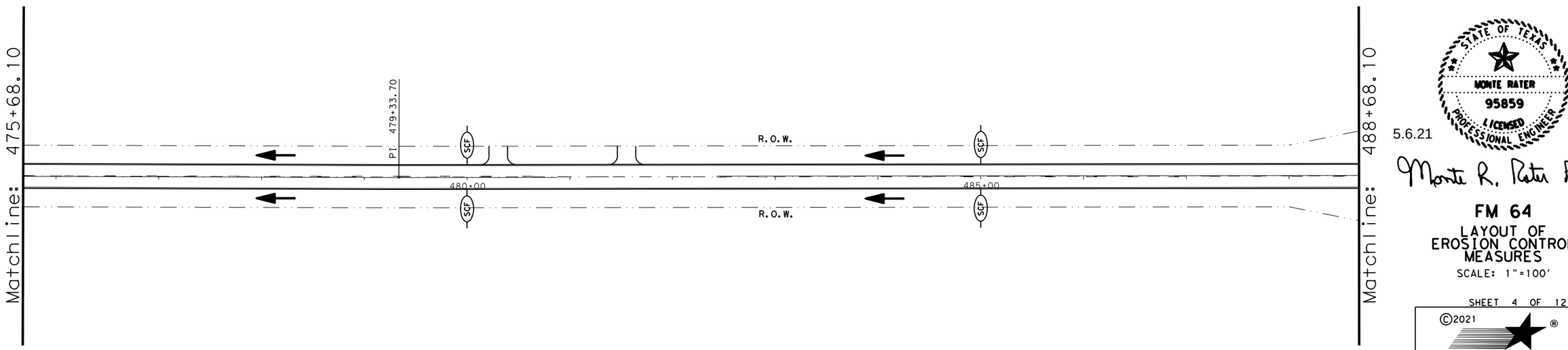
- WATER FLOW DIRECTION
- CULVERT



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FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 4 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		143

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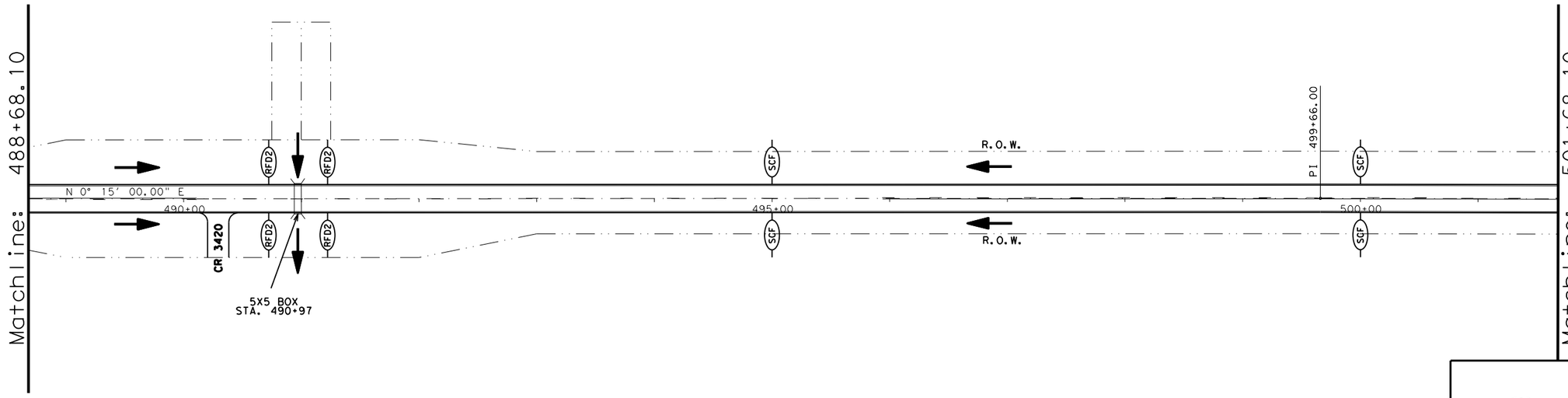

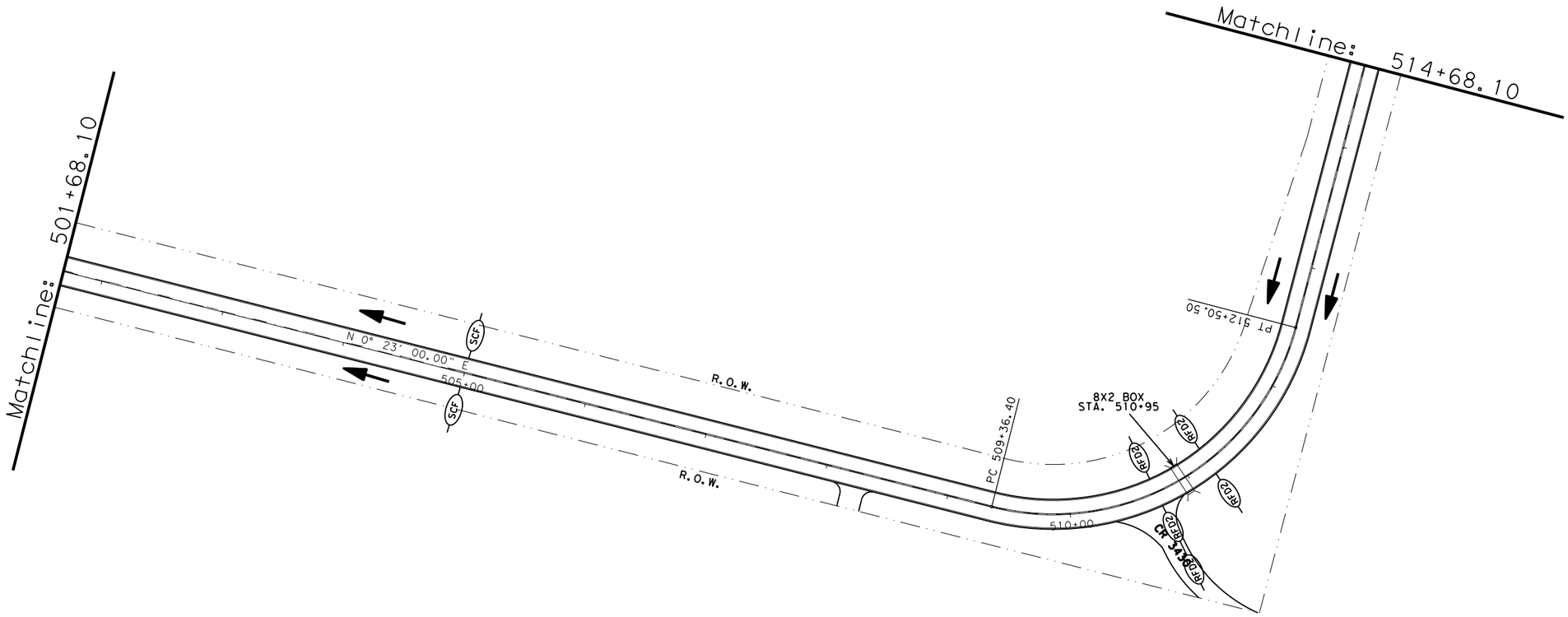

LEGEND

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LAYOUT OF EROSION CONTROL MEASURES

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SHEET 5 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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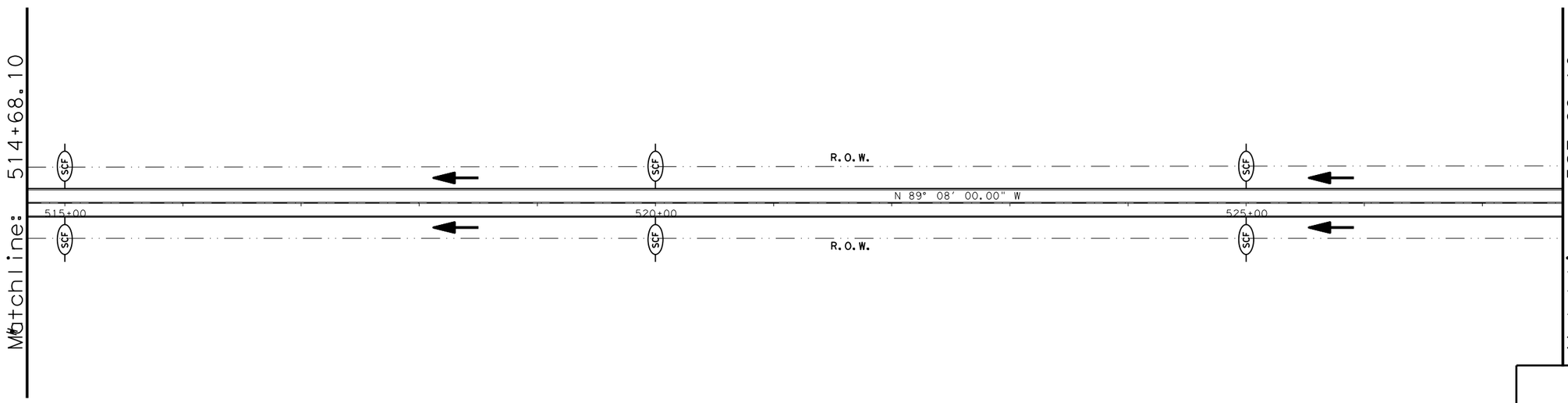

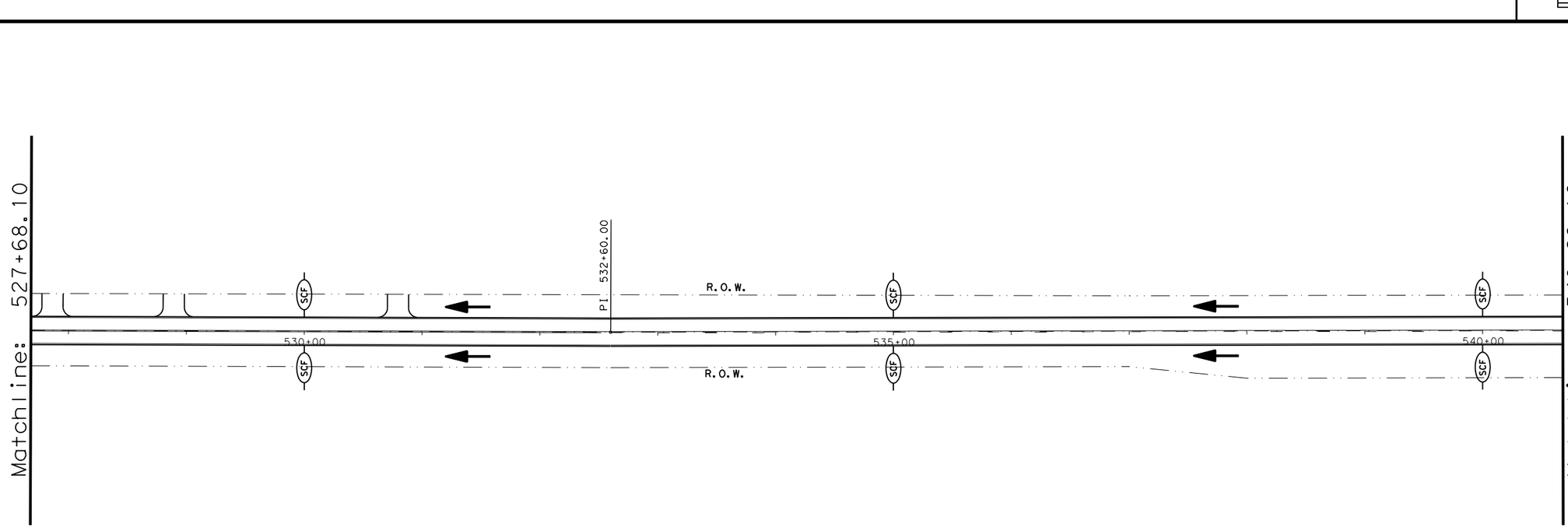

LEGEND

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LAYOUT OF EROSION CONTROL MEASURES

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SHEET 6 OF 12

Texas Department of Transportation

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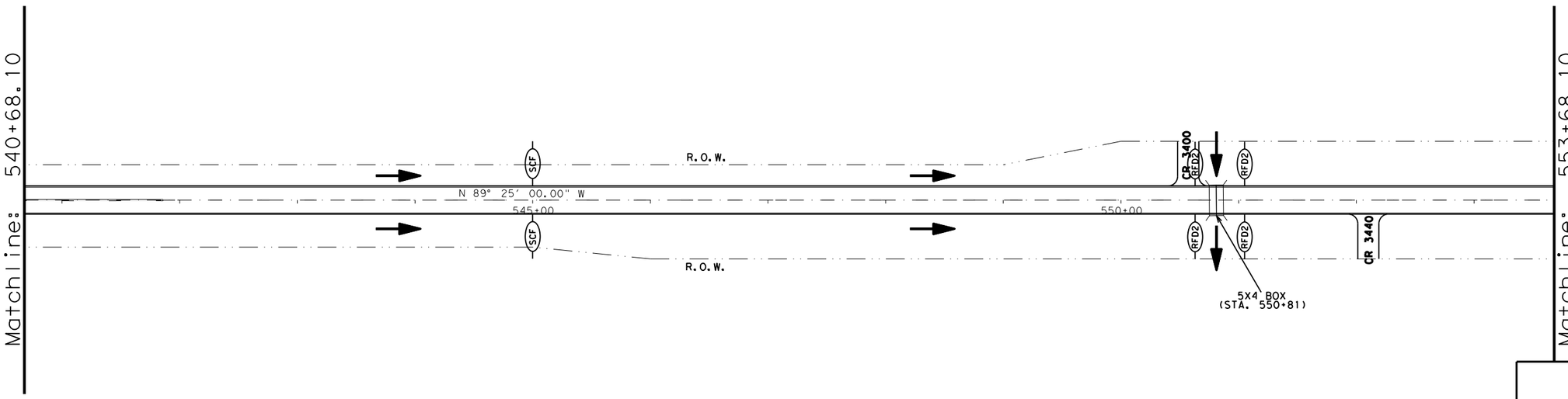

LEGEND

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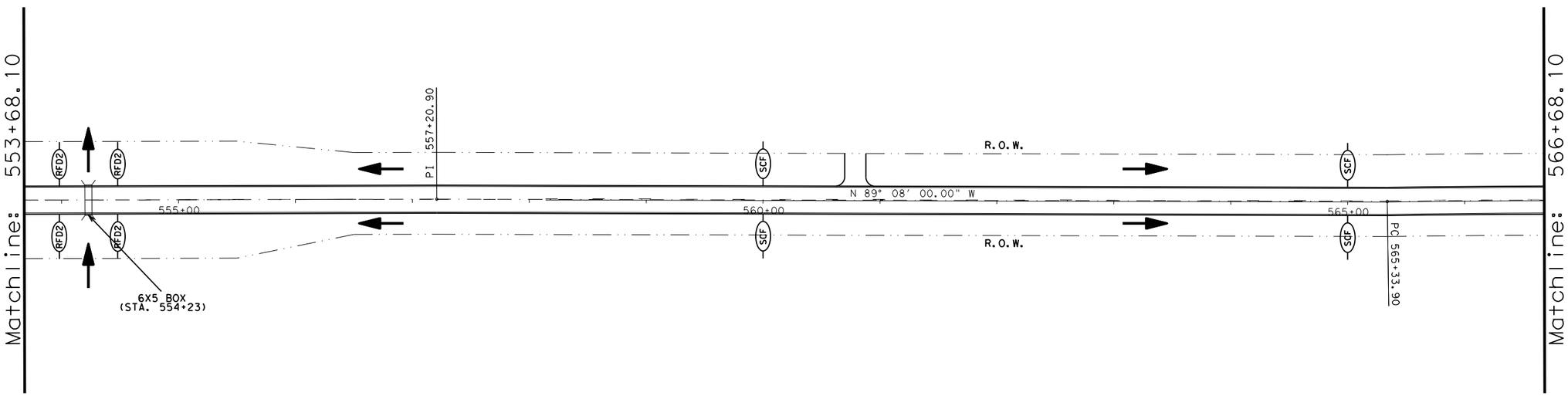

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LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 7 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
DIST	COUNTY		SHEET NO.
PAR	Delta		146

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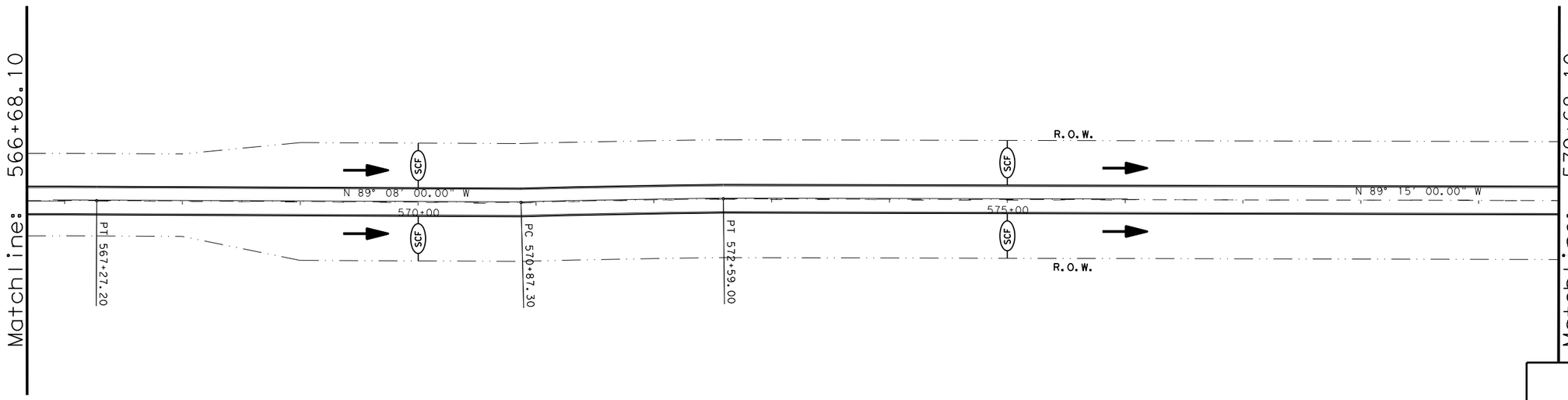

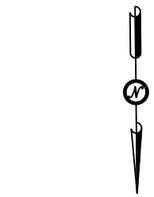

LEGEND

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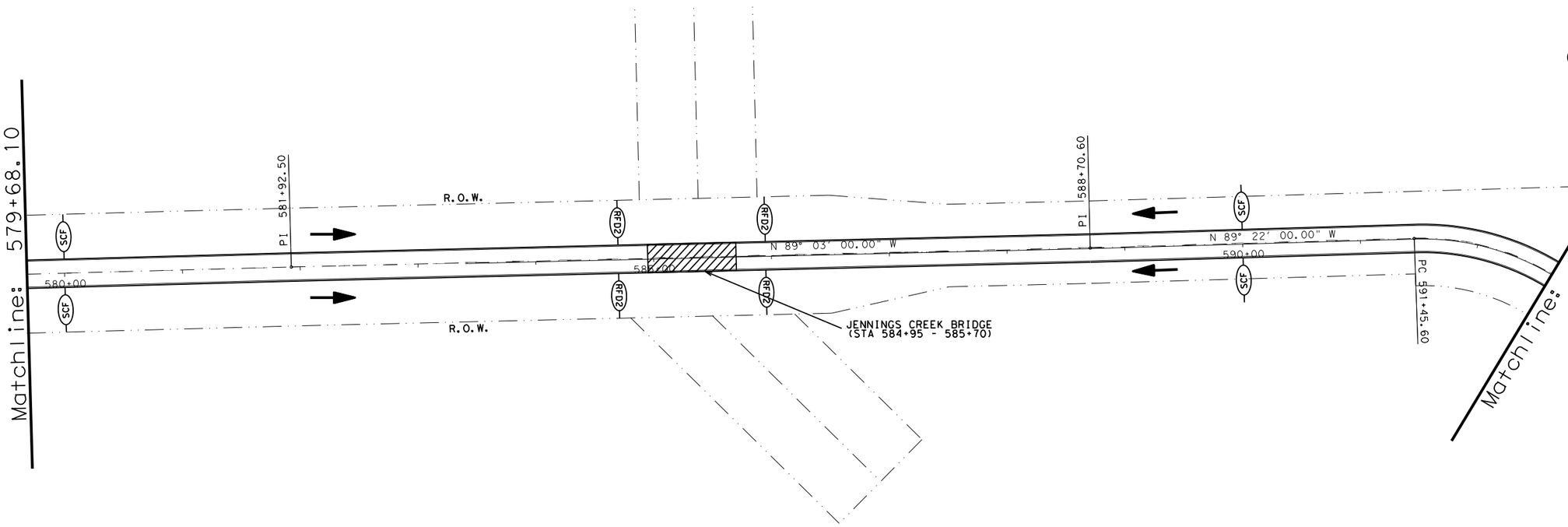

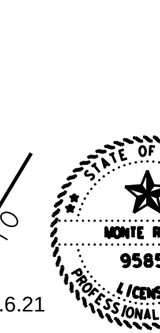

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FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 8 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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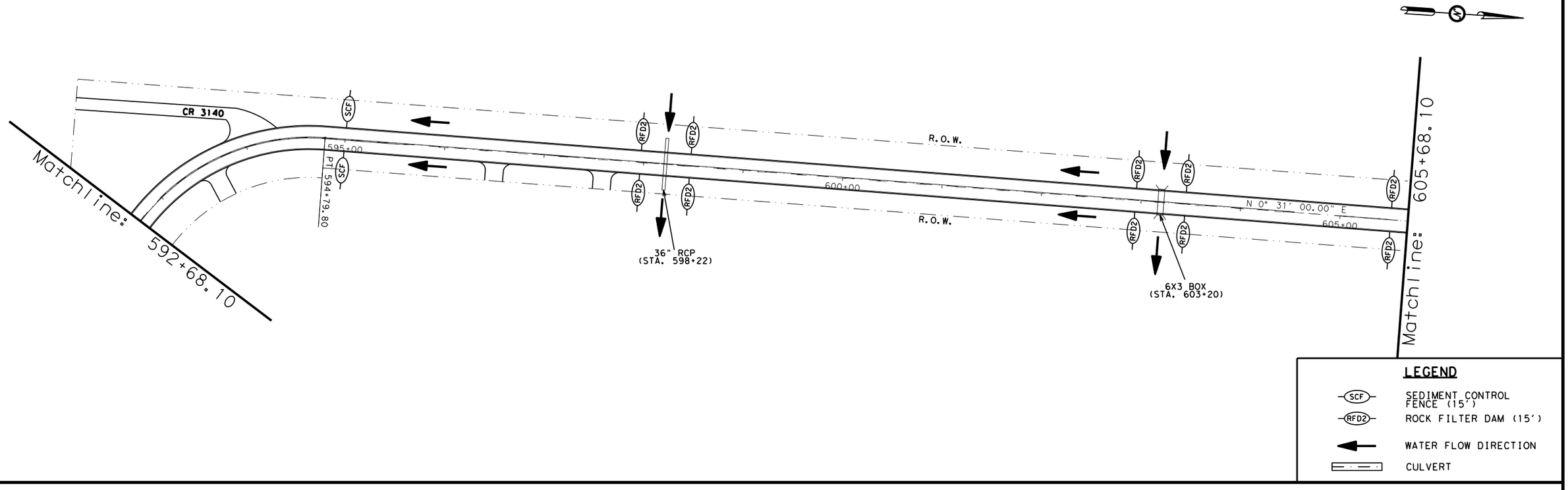

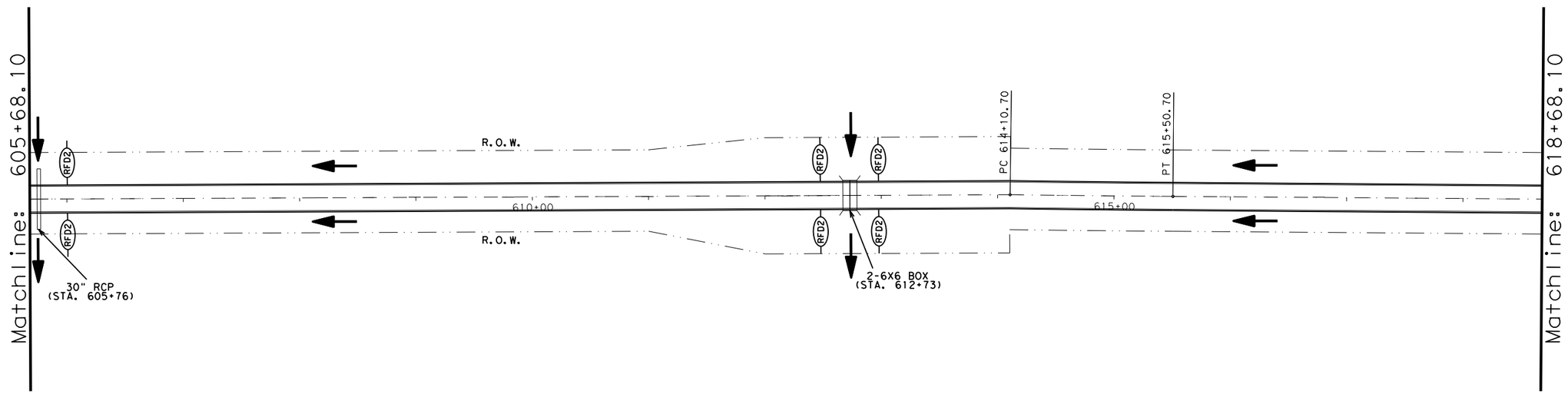

LEGEND

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LAYOUT OF EROSION CONTROL MEASURES

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SHEET 9 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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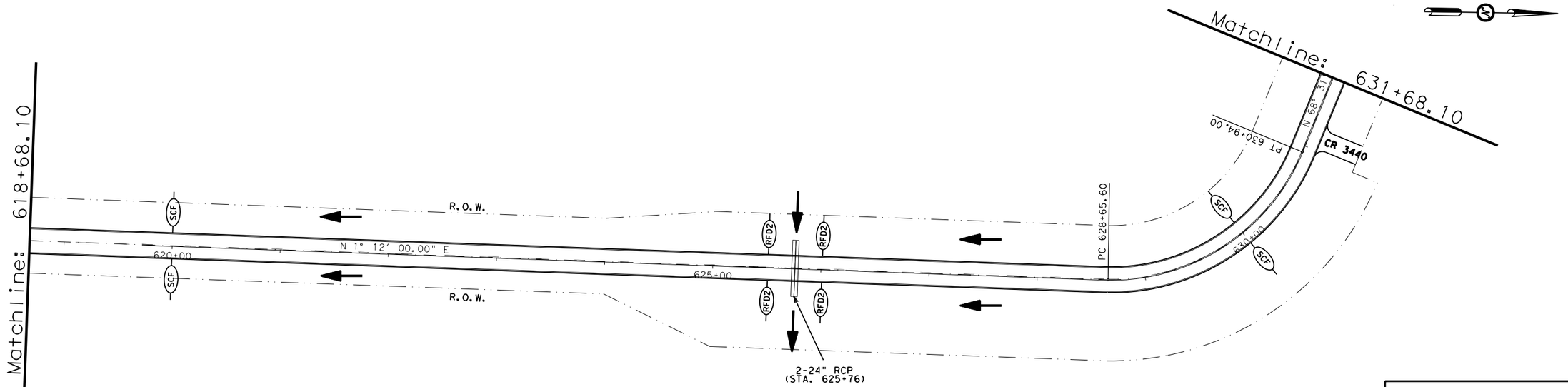

LEGEND

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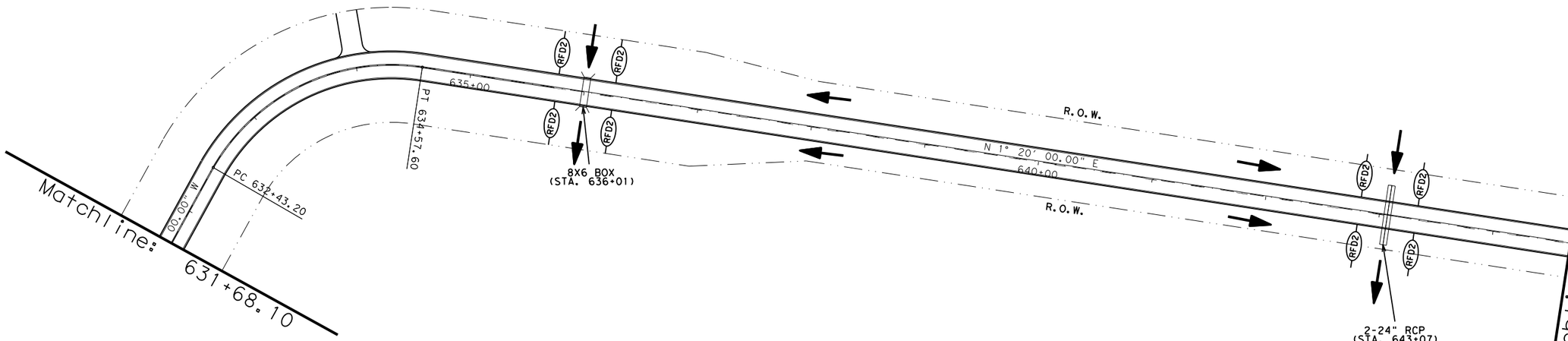

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FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 10 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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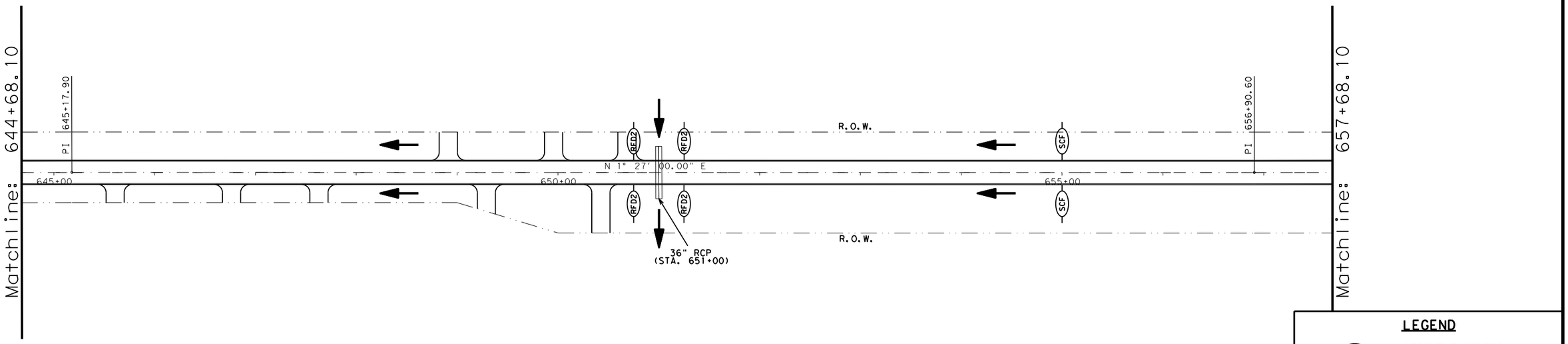

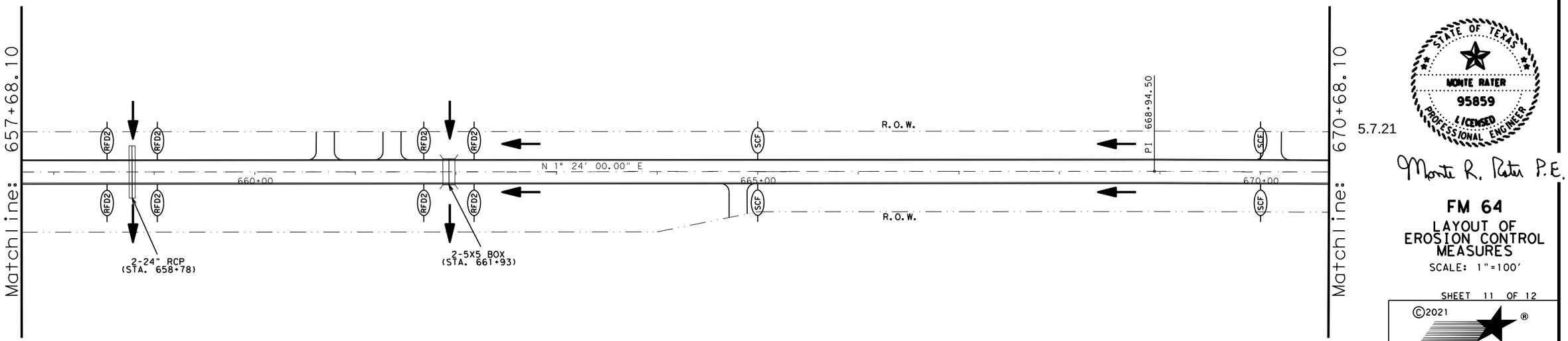

LEGEND

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FM 64
LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 11 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
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PAR	Delta		150

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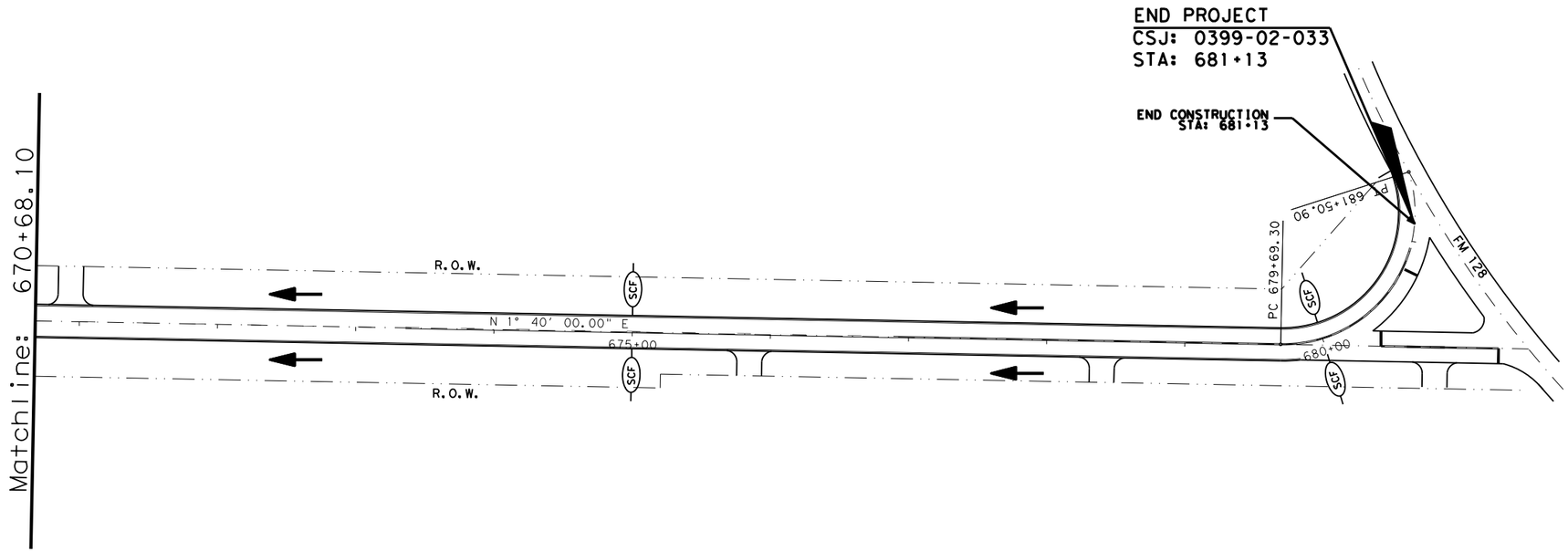

LEGEND

SCF	SEDIMENT CONTROL FENCE (15')
RFD2	ROCK FILTER DAM (15')
	WATER FLOW DIRECTION
	CULVERT

5.7.21

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LAYOUT OF EROSION CONTROL MEASURES

SCALE: 1"=100'

SHEET 12 OF 12

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0399	03	038	FM 64
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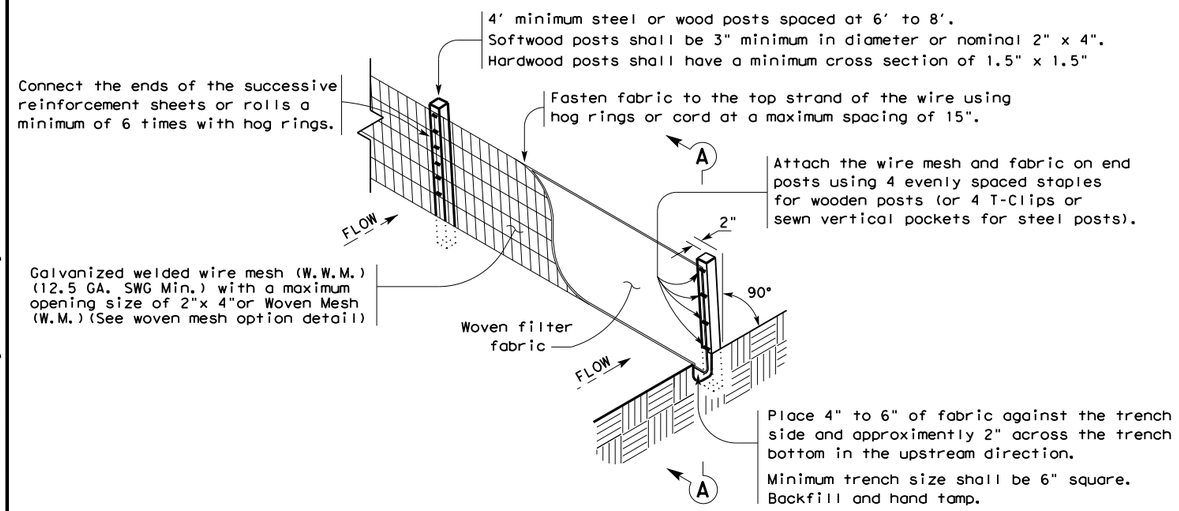
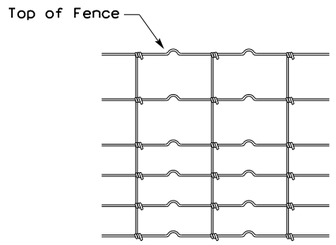
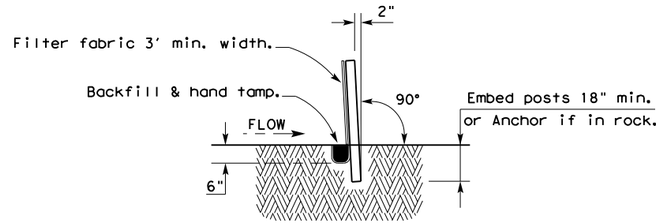


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

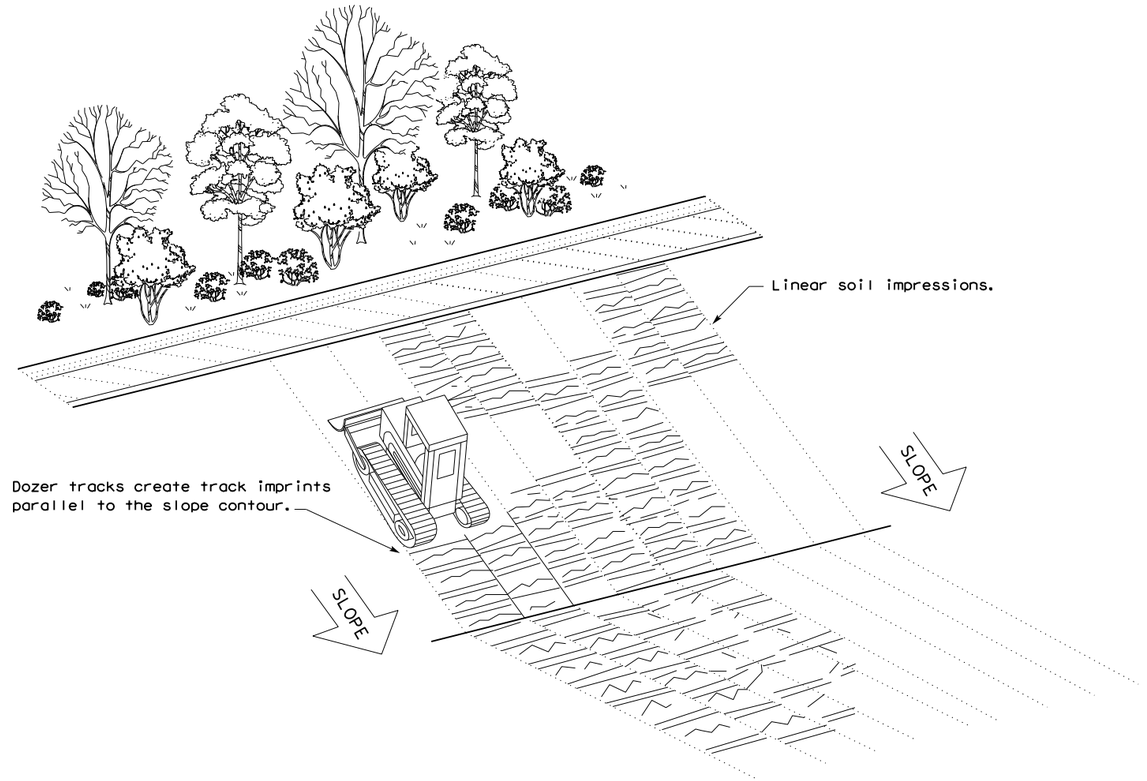
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
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	PAR	Delta			152	

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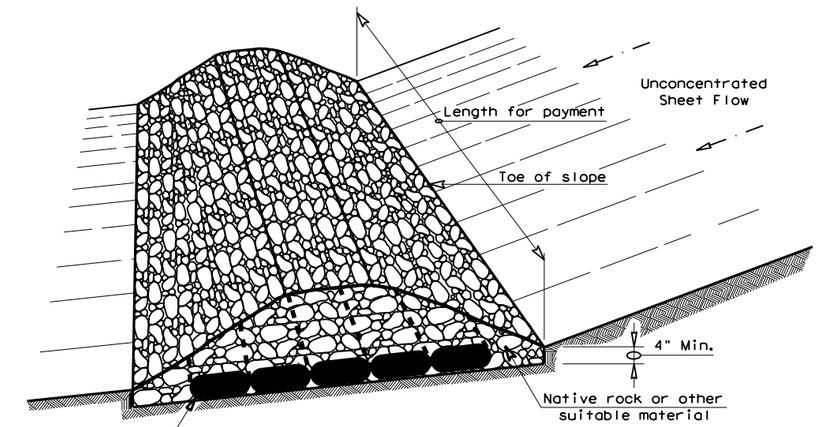
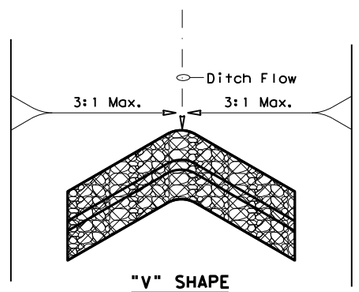
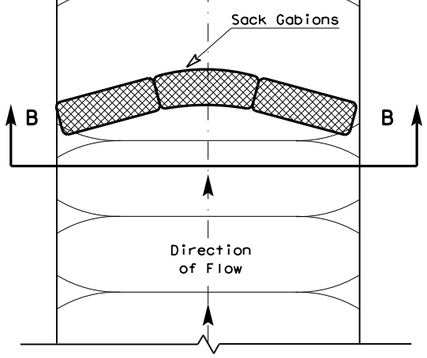


FILTER DAM AT TOE OF SLOPE

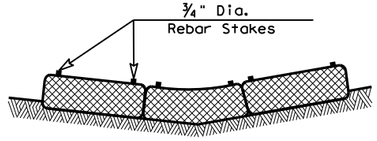
RFD1



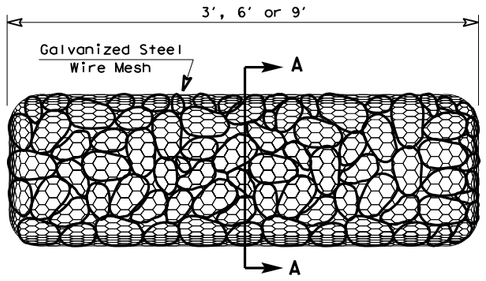
"V" SHAPE PLAN VIEW



PLAN VIEW

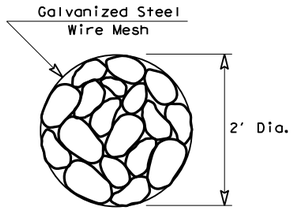


SECTION B-B

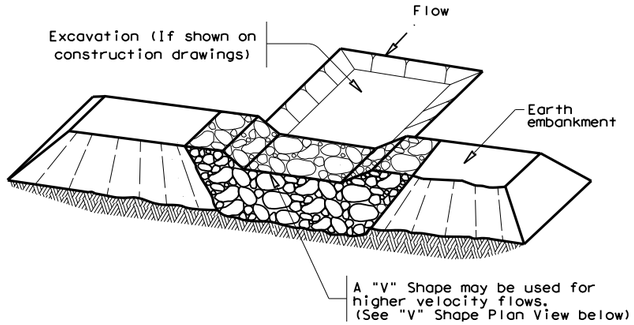


TYPE 4 (SACK GABIONS)

RFD4

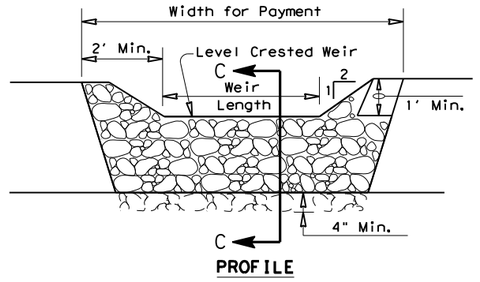


SECTION A-A

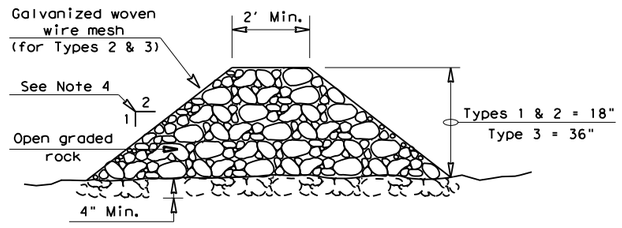


FILTER DAM AT SEDIMENT TRAP

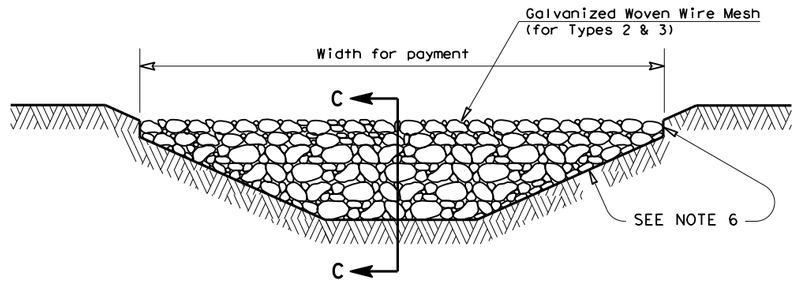
RFD1 OR RFD2



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
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REVISIONS	0399	03	038	FM 64
	DIST	COUNTY		SHEET NO.
	PAR	Delta		153