INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT: STP 2021(788) HES

FALLS COUNTY

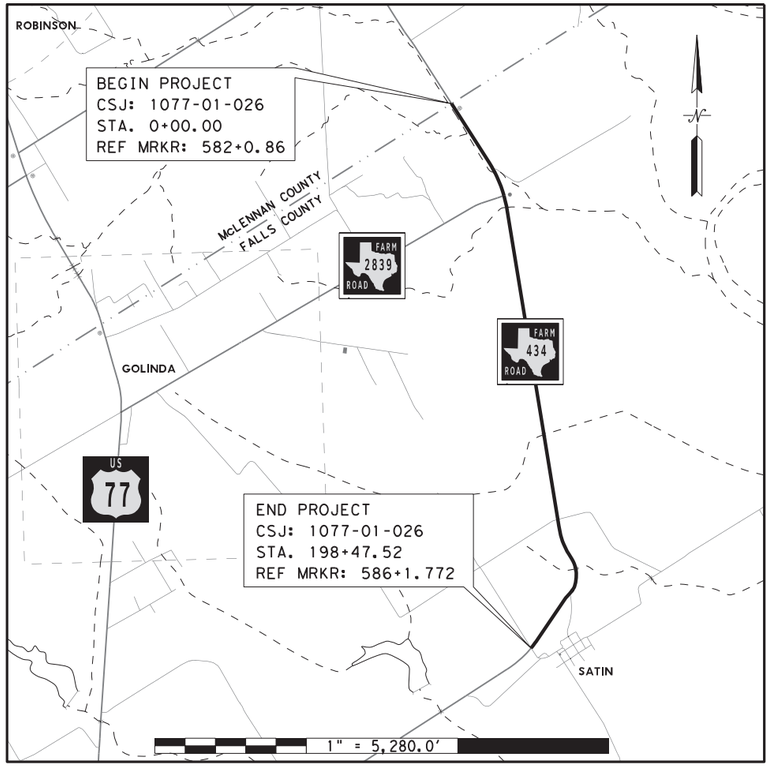
FM 434

CSJ 1077-01-026

ROADWAY:	FT= 19,277.520	MI.= 3.650
BRIDGE:	FT= 570.000	MI.= 0.109
TOTAL:	FT= 19,847.520	MI.= 3.759

LIMITS: FROM: McLENNAN COUNTY LINE TO: CR 4039

FOR THE CONSTRUCTION OF HAZARD ELIMINATION & SAFETY CONSISTING OF IMPROVE GUARDRAIL TO DESIGN STANDARDS, SAFETY TRT FIXED OBJ, PROFILE EDGELINE MARKINGS, AND ADDITIONAL PAVED SURFACE WIDTH



EXCEPTIONS: NONE
EQUATIONS: NONE
RR CROSSINGS: NONE
SCALE: 1" = 5,280.0'

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, WILL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL - AID CONSTRUCTION CONTRACTS(FORM FHWA 1273, MAY 2012).

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP 2021(788)HES		FM 434
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	WACO	FALLS	1
CHECK	CONTROL	SECTION	JOB	
	1077	01	026	

DESIGN SPEED = 45 MPH

YEAR	ADT
2021	820
2041	1630

Texas Department of Transportation

Recommended for Letting 6/3/2021
DocuSigned by: Josh Voiles AC8604F84EC2483...

Recommended for Letting 6/3/2021
Director of Transportation Planning & Development

Approved for Letting 6/15/2021
DocuSigned by: B69BD79BDD564C9...
District Engineer

GENERAL

	1	TITLE SHEET
	2	INDEX OF SHEETS
	3	EXISTING TYPICAL SECTIONS
	4	PROPOSED TYPICAL SECTIONS
	5	PROJECT LAYOUT
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*** THE STANDARD SHEET SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY DIRECT SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.**

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

INDEX OF SHEETS

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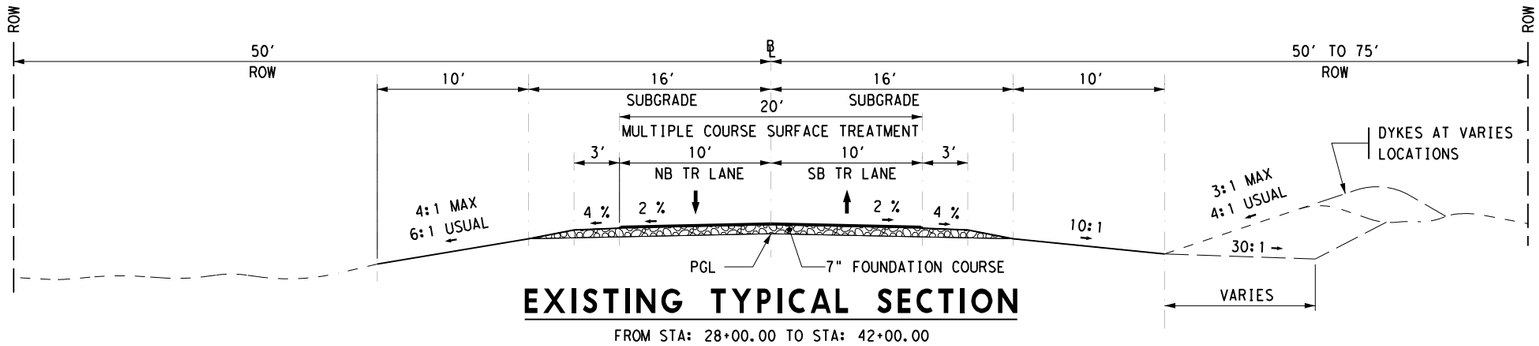
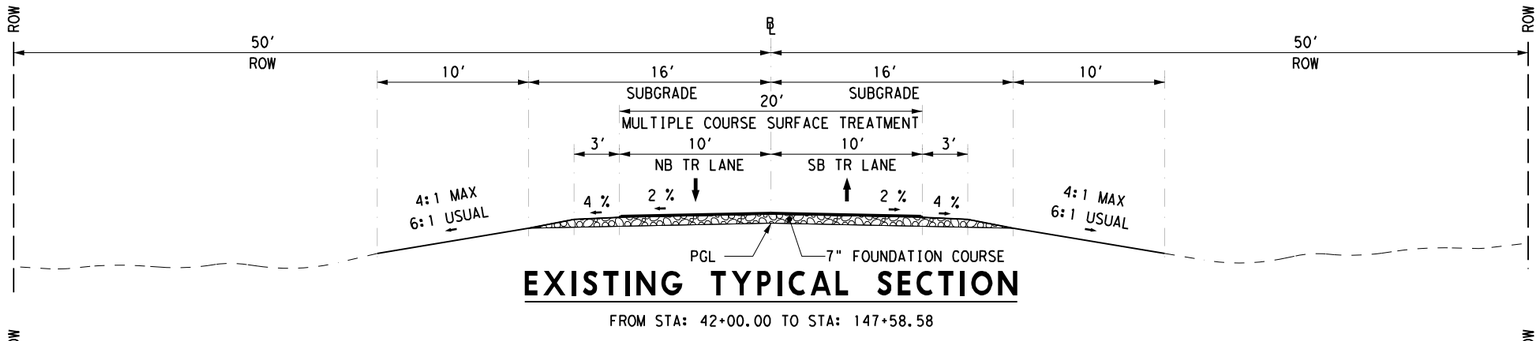
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		2



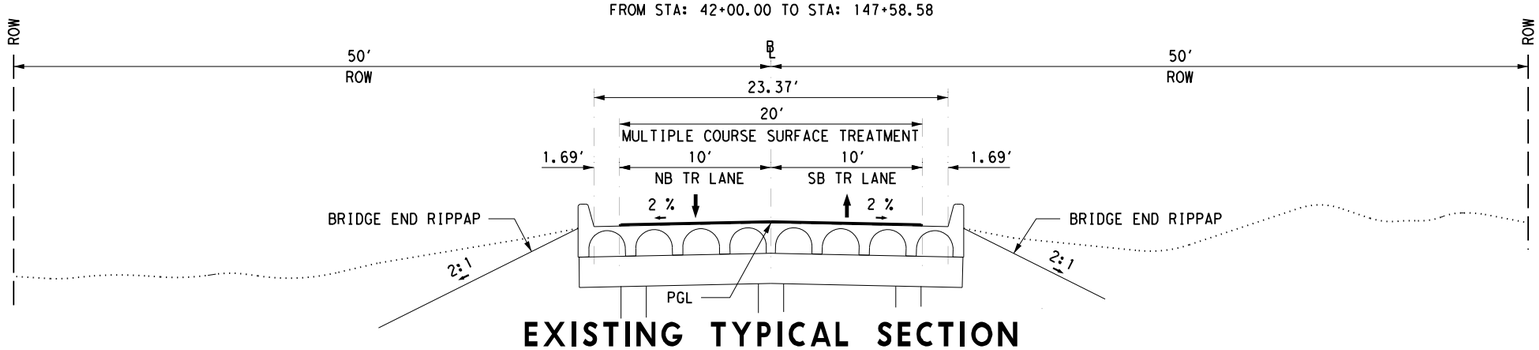
EXISTING TYPICAL SECTION

FROM STA: 28+00.00 TO STA: 42+00.00



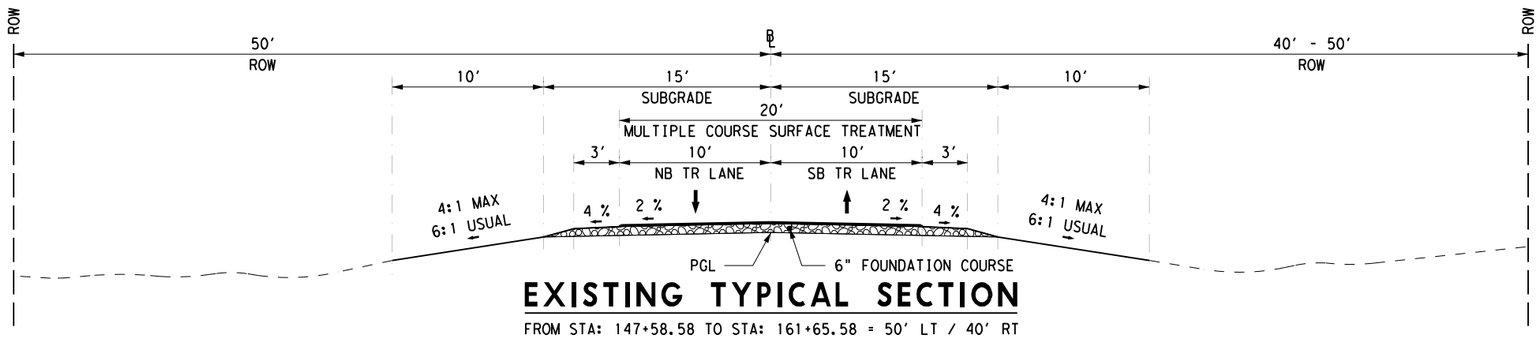
EXISTING TYPICAL SECTION

FROM STA: 42+00.00 TO STA: 147+58.58



EXISTING TYPICAL SECTION

NBI: 09-074-0-1077-01-014
6 ~ 30.0' CONC SLAB & GIRDER SPANS
FROM STA: 37+16.72 TO STA: 38+96.72



EXISTING TYPICAL SECTION

FROM STA: 147+58.58 TO STA: 161+65.58 = 50' LT / 40' RT
FROM STA: 161+65.58 TO STA: 165+91.14 = 50'LT / 50'RT
FROM STA: 166+24.14 TO STA: 198+47.52 = 50'LT / 50' RT

NOTES:

1. CONTRACTOR ATTENTION IS DRAWN TO THE POSSIBLE PRESENCE OF FULL DEPTH HMA REPAIRS AND PATCHES THROUGHOUT ROADWAY SECTION

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

EXISTING TYPICAL SECTIONS

SCALE: 1" = NONE HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		3

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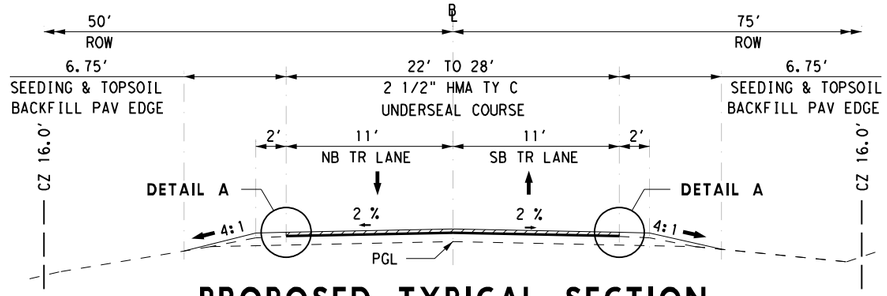
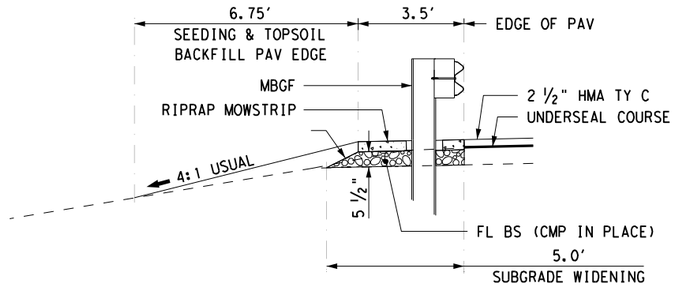
NODE



PROPOSED TYPICAL SECTION

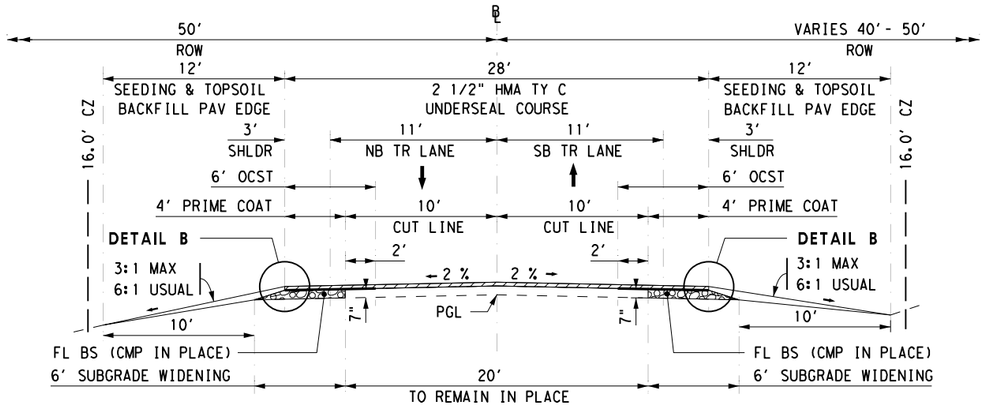
FROM STA: 28+00.00 TO STA: 33+00.00
FROM STA: 36+96.06 TO STA: 37+16.75
FROM STA: 38+96.72 TO STA: 39+19.32



DETAIL A

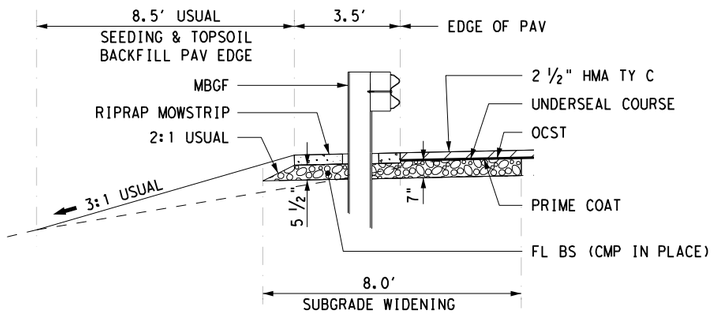
(SEE NOTE 1)

FROM STA: 31+26.42 TO STA: 33+26.42 (LT)
FROM STA: 30+15.20 TO STA: 32+15.20 (RT)



PROPOSED TYPICAL SECTION

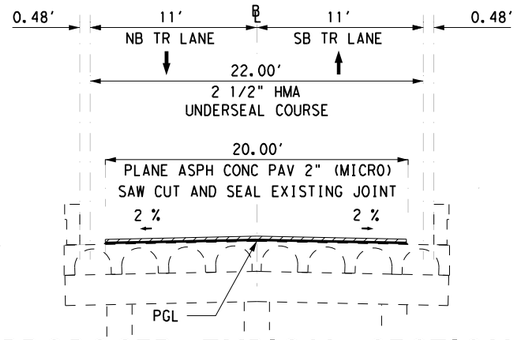
FROM STA: 33+00.00 TO STA: 36+45.06
TRANSITION STA: 36+45.06 TO STA: 36+96.06
TRANSITION STA: 39+19.32 TO STA: 36+69.32
FROM STA: 36+69.32.00 TO STA: 198+47.52



DETAIL B

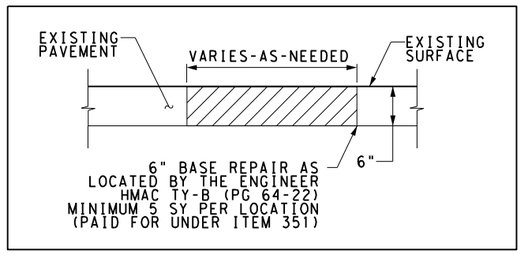
(SEE NOTE 1)

FROM STA: 36+31.30 TO STA: 36+93.80 (LT)
FROM STA: 35+69.94 TO STA: 36+94.94 (RT)
FROM STA: 39+19.32 TO STA: 40+44.32 (LT)
FROM STA: 39+19.32 TO STA: 39+81.82 (RT)
FROM STA: 117+25.73 TO STA: 120+25.73 (LT)
FROM STA: 116+37.28 TO STA: 119+37.28 (RT)
FROM STA: 164+75.74 TO STA: 168+00.74 (LT)
FROM STA: 164+10.61 TO STA: 167+10.61 (RT)



PROPOSED TYPICAL SECTION

NBI: 09-074-0-1077-01-014
6 ~ 30.0' CONC SLAB & GIRDER SPANS
FROM STA: 37+16.72 TO STA: 38+96.72



FLEXIBLE PAVEMENT REPAIR DETAIL

N.T.S.

NOTES:

1. ALL MBGF DETAILS ON THE RIGHT SIDE OF THE ROADBED WILL BE MIRROR IMAGE OF WHAT IS SHOWN.
2. FROM STA. 0+00.00 TO STA. 28+00.00 WILL BE RESTRIPING ONLY.
3. ONE COURSE SURFACE TREATMENT (OCST) WILL BE ASPH (CRS-2) AND AGGR (TY D GR 5 OR TY L GR 5).

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

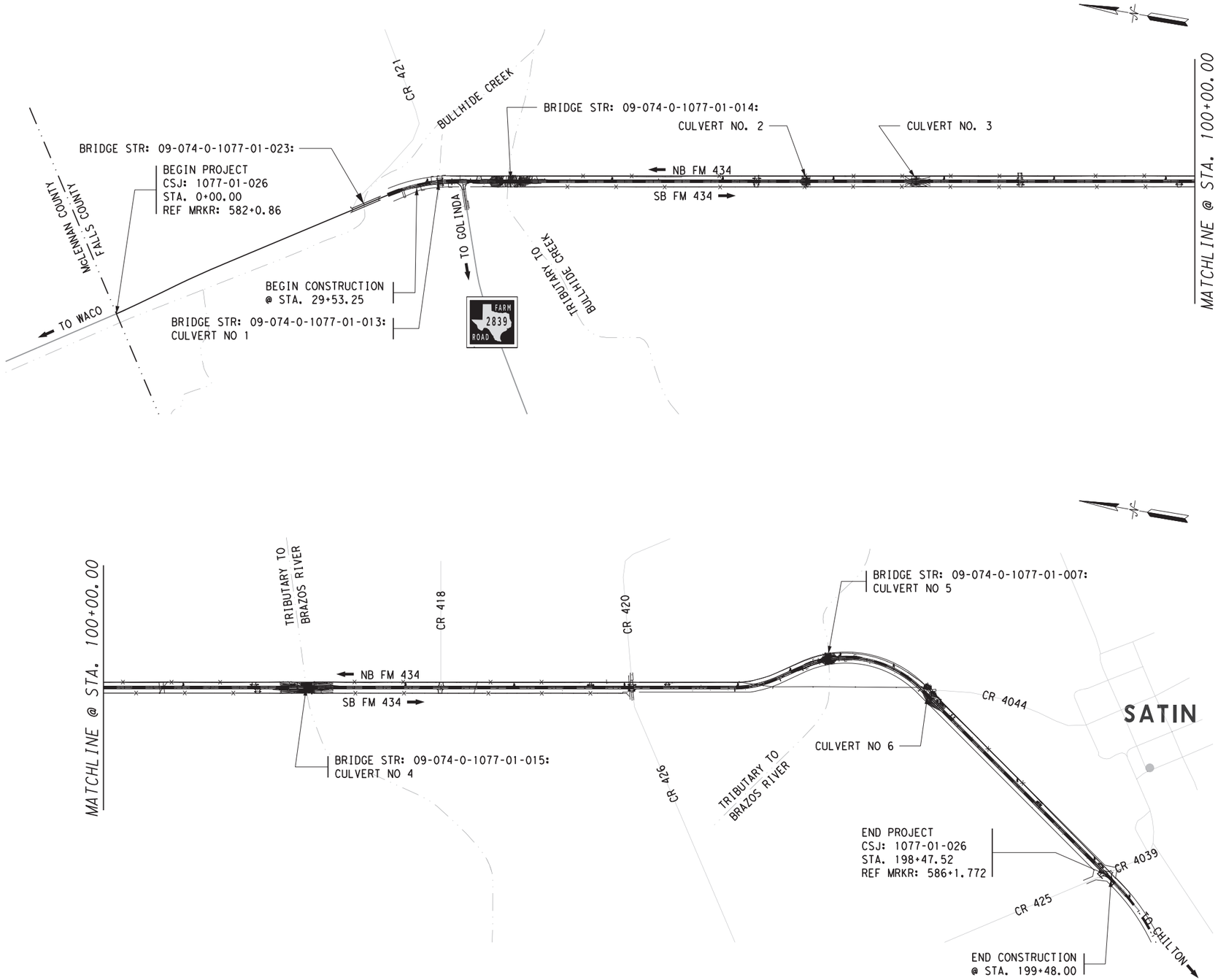
SIGNATURE OF REGISTRANT & DATE

PROPOSED TYPICAL SECTIONS

SCALE: 1" = NONE HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		4



STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

PROJECT LAYOUT

SCALE: 1" = 1000' HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		5

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...\Project Layout.dgn

NODE

BASIS OF ESTIMATE TABLES

Table 1: Basis of Estimate for Erosion Control Items

Item	Description	Rate	Basis	Quantities
*166	FERTILIZER			
	FERTILIZER (20-10-10) (PERMANENT)	300 LBS / AC	8.79 AC	1.3 TON
	FERTILIZER (20-10-10) (TEMPORARY)	300 LBS / AC	8.79 AC	1.3 TON
168	VEGETATIVE WATERING			
	(3 APPLICATIONS - PERM)	13,100 GAL/AC/APP	8.79 AC	346 MG
	(1 APPLICATIONS - TEMP)	13,100 GAL/AC/APP	8.79 AC	115MG

* FOR CONTRACTOR'S INFORMATION ONLY

Table 2: Basis of Estimate for Base Work

Item	Description	Rate	Basis	Quantities
216	PROOF ROLLING			
	PROOF ROLLING	8HR /ROADBED-MILE	3.19 ROADBED-MILE	26 HR
247	FLEXIBLE BASE			
	(TY D GR 1-2 FNAL POS)	138 LB/CF	89,856 CF	3,328 CY *6,200 TON
310	PRIME COAT			
	PRIME COAT (MC-30 OR AE-P)	0.20 GAL / SY	21,763 SY	4,352 GAL

Table 3: Basis of Estimate for Seal Coats

Item	Description	Rate	Basis	Quantities
316	**SEAL COAT**			
	ASPH (CRS-2)	0.25 GAL / SY	21,763 SY	5,441 GAL
	AGGR (TY D GR 5 OR TY L GR 5)	1 CY / 150 SY	21,763 SY	151 CY

Table 4: Basis of Estimate for Asphalt Pavements

Item	Description	Rate	Basis	Quantities
3076	**DENSE-GRADED HOT MIX ASPHALT**			
	TY-C PG 64-22	275 LB / SY	52,693 SY	7,245 TON

Table 5: Basis of Estimate for Roadside Maintenance

Item	Description	Rate	Basis	Quantities
730	ROADSIDE MOWING	45.6 AC / CYCLE	2 CYC / YR	91.2 AC

Table 6: Basis of Estimate for Interlayer Material

Item	Description	Rate	Basis	Quantities
3085	**UNDERSEAL COURSE**	**0.25 GAL / SY**	**52,693 SY**	**13,173 GAL**
	FOR CONTRACTOR'S INFORMATION			
	SPRAY APPLIED MEMBRANE	0.25 GAL / SY	52,693 SY	13,173 GAL
	TRAIL	0.20 GAL / SY	52,693 SY	10,539 GAL
	ASPH (AC-15P, AC-20XP, AC10-2TR, AC-12-5TR)	0.25 GAL / SY	52,693 SY	13,173 GAL
	AGGR (TY-PD GR-5 OR TY-PL GR-5) (SAC-B)	1 CY / 150 SY	52,693 SY	351 CY

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans is 8.79 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits

or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

This project required TPDES Permit TXR 150000_with environmental resources agencies. There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations", provides a listing of regulatory agencies that may need to be contacted regarding this project.

Contractor questions on this project are to be emailed to the Waco District at the following address:

Bill Compton - Wacoprebid@txdot.gov, 254-867-2707, 100 S. Loop Dr., Waco, TX
Carmen Chau - Wacoprebid@txdot.gov, 254-867-2794, 100 S. Loop Dr., Waco, TX

Or Via phone or in person to the following individual(s):
Area Engineer's: Josh Voiles (254) 582-5432
Assistant Area Engineer's: Anel Rivera Rosado (254) 582-5432

All contractor questions will be reviewed by the Area Engineer or Assistant Area 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%20 Responses/

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.

GENERAL NOTES

ITEM 5: CONTROL OF THE WORK

Submit all fabrication and shop drawings per TxDOT's online shop drawing submittal system and copy the Area Engineer on the email submittal, unless otherwise directed.

Where a precast or cast-in-place concrete element is shown in the plans, Contractor may submit a precast concrete alternate 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 Department. Contractor is responsible for impacts to the project schedule and cost resulting from the use of alternates.

ITEM 6: CONTROL OF MATERIALS

References to manufacturer's trade name or catalog numbers are for the purpose of identification only and the contractor will be permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project.

ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

If utilizing private property for waste disposal sites, field office sites, equipment storage sites or for any other purpose involved with this project, provide to the Engineer written proof of the property owner's approval of the use of this property. This proof may be in the form of a letter or agreement signed by the property owner or other documents acceptable to the Engineer.

Personal vehicles of the contractor's employees will not be parked within the right of way at any time including any section closed to public traffic, unless the vehicle is being utilized for construction procedures. However, the contractor's employees may park on the right of way at the sites where the contractor has his office, equipment and materials storage yard.

The contractor is alerted to the possible presence of swallows under the existing bridges or culverts. Because the migratory bird treaty act prohibits harm to swallows, their eggs or their nestlings, the contractor will not begin potentially disturbing activities on or near the bridge until the birds have abandoned any occupied nests (approximately September 1). Active nests may not be removed regardless of the date.

Prior to the swallows returning to the nests (approximately March 1), abandoned nests will be removed from the bridge. The contractor will prevent the establishment of new nests on any portion of the structure. Methods for preventing the establishment of new nests must be approved by the project Engineer. Examples of acceptable nest prevention methods are bird-deterrent netting and bird-repelling sprays and/or gels to be applied to the structure. This work will not be paid for directly, but will be subsidiary to the various bid items.

The Contractor will submit detailed site-specific plans for work in each "water of the United States" designated on the EPIC sheet. These plans must be approved by the TxDOT Engineer prior to starting any work in these areas. The plans must also describe facilities and work activities adjacent the Ordinary High-Water Marks. The plan must show actual dimensions and materials for:

- Proposed construction roads and work areas leading to or in close proximity to the Ordinary High-Water Marks
- Temporary material or equipment storage areas in close proximity to the Ordinary High-Water Marks
- Locations of proposed sediment and erosion control devices
- Identification of construction equipment and construction techniques to accomplish the work

Once this drawing and supporting information is reviewed and approved by TxDOT, all construction workers should be made aware of the limits designated on the drawings by the Contractor's supervision. Work in all waters of the US will be limited to the minimum necessary required to construct the bridge, culvert or roadway fills. Work will also include all activities needed for bridge and culvert demolitions. Working or disturbing soil in the stream channel outside the limits of the work plan will not be allowed. Orange fencing will be provided and maintained to establish the TxDOT approved boundaries in which work may be conducted between the Ordinary High-Water Marks. Orange fencing will not be paid for but will be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling".

ITEM 8: PROSECUTION AND PROGRESS

This Project will be a Standard Workweek in accordance with Article 8.3.1.4.

Meet bi-weekly or at intervals as agreed upon with the engineer to notify him or her of planned work for the upcoming 3-week period.

For this project, provide a Bar Chart progress schedule.

ITEM 134: BACKFILLING PAVEMENT EDGES

Start backfilling pavement edges as soon as possible after the surface course is started.
Use existing material when possible. If additional material is needed secure from an off ROW source having a PI between 10 and 30

Use Type "A" or "B" material to backfill pavement edges as shown in plans. Type "A" or "B" material shall consist of suitable material that when compacted will support the pavement edge.

Blade the existing vegetation into a neat wind-row prior to overlay. After placing Ty A or Ty B backfill, placement of topsoil per item 160, and seeding the material from the wind-row shall be replaced on the completed slopes.

Emulsion shall be placed at a 50/50 solution of water to emulsion over disturbed area. Emulsion rate=0.15 Gal/SY residual. This work, materials and equipment shall be subsidiary to Item 134.

ITEM 150: BLADING

The limits of blading and grading operations will be to the minimum width and length necessary to accomplish the required work. The Contractor will limit the removal of permanent grass that is already established at the proper lines and grades.

ITEM 160: TOPSOIL

Salvage the existing topsoil from the cut/fill areas. Topsoil not stored in small windrows will be stockpiled in locations with heights no greater than four (4) feet and dumped loose from Contractor equipment. The Contractor will minimize topsoil compaction and limit equipment being driven over stockpiled topsoil.

Additional Topsoil will come from approved sources outside of the ROW. Topsoil must come from a location within six (6) inches of the natural ground surface to ensure it contains nutrients and is not sterile soil. Off ROW top soil will contain a minimum organic content of three & one-half (3.5%) percent, based on soil test results.

ITEM 164: SEEDING FOR EROSION CONTROL

Temporary seeding mixtures (cool and warm) will also include three (3) lbs of Bermuda grass seed per acre, with all seeds being planted concurrently.

Contractor will mow or disc wheat and or oats in spring prior to vegetation going to seed.

Permanent seed mixes for both urban and rural projects including sand or clay soils in the Waco District will be bid and installed to include a minimum of one & one-half (1.5) pounds per acre Green Sprangletop seed and four (4) pounds per acre Bermudagrass seed, with other seed types also being included and quantities remaining unchanged.

ITEM 169: SOIL RETENTION BLANKETS

Use Tables under Item 164 to determine type of seeds to be used. Water for application, seeding, labor, equipment, tools, supplies, materials, fertilizer and incidentals will not be paid for directly but will be subsidiary to this Item.

ITEM 247: FLEXIBLE BASE

Construct uniform layer thickness of 6 inches, or less with the required density and moisture content.

Minimum PI is equal to three (3) for all grades, or a minimum Bar Linear Shrinkage of 2%.

RAP may not be incorporated into Flexbase Material

ITEM 310: PRIME COAT

When cutback asphalt is used, a minimum curing time of seven (7) days will be required before application of Item 316, "Seal Coat", unless otherwise approved in writing.

ITEM 316: SEAL COAT

Warm Season asphalt will be applied between May 1 and September 15 unless approved in writing.

Cool Season asphalt will be applied between September 15 and May 1 unless approved in writing.

No AC or Emulsion for surface treatment items will be placed between September 15 and May 1 unless approved in writing.

All trucks hauling materials to be paid for by truck measurement will be “struck off” prior to delivery to the project.

Unless otherwise approved, seal coat will not be exposed to traffic for more than fourteen (14) calendar day before application of HMAC..

Utilize an asphalt distributor capable of providing a transversely varied asphalt rate. The Engineer will select the pavements where the transversely varied asphalt rate is required.
When a transversely varied rate is required, the asphalt rate outside of the wheel paths will be between 22 and 32% higher than the asphalt rate applied in the wheel paths. Provide calibration documents to the Engineer that include a description of the spray bar(s) and nozzles that will be used and the percentage difference in asphalt rate achieved by each tested spray bar and nozzle arrangement. The nozzles proposed for use shall be clearly stamped or marked from the factory identifying the manufacturer.

ITEM 320: EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT

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

The use of windrow pick-up equipment is allowed except on the first course of roadway material placed over the subgrade.

ITEM 351: FLEXIBLE PAVEMENT STRUCTURE REPAIR

For this project, a laydown machine will be required during the construction & placement of this item.

Locations and Quantities will vary as directed. The minimum area to be repaired will be five (5) SY.

ITEM 354: PLANING AND TEXTURING PAVEMENT

Patch pavement cut to excessive depth by equipment failure with an approved epoxy material. Re-plane patched area to an acceptable approved ride quality. Payment for these corrections is subsidiary to this item

Mill the pavement producing a final pavement surface with transverse pattern of 0.2 inch center to center of each strike area with a difference of no greater than one-sixteenth (1/16) inch between the ridge and valley (RVD) measurement of the final milled surface. The speed of the milling machine and RPMs of the drum will be set to ensure a smooth surface per manufacturer’s instructions.

Saw existing asphalt along neat lines where portions are to be left in place temporarily or permanently. Sawing is not paid for directly, but is subsidiary to this item.

Take possession of recycled asphalt pavement from the project and recycle the material.

Properly dispose of unsalvageable material at Contractor’s expense.

Remove the loose material from the roadway before opening to traffic.

ITEM 400: EXCAVATION AND BACKFILL OF STRUCTURES

Aggregate for cement stabilized backfill will be coarse aggregates, GRADE 3, 4 or 5 and fine aggregate, as shown in Item 421, “Hydraulic Cement Concrete”. The ratio of course aggregate to sand should not contain more than sixty percent (60%) sand unless otherwise approved.

CLASS B bedding is required if rock is encountered.

ITEM 420 CONCRETE SUBSTRUCTURES

BENT NUMBERING:
For bridges with four or more spans, number every third bent (counting the abutments) on the up-station and down-station faces of the outside column(s) at approximately the mid height of the column. For structures with three columns or less per bent, place numbers on column A. Where there are four or more columns per bent, place numbers on both outside columns. Bent numbers shall be as shown on the bridge layout.

Provide block numbers with a height of 6". Place numbers using appropriate die cut stencils and black paint. All materials, labor and incidentals associated with placing bent numbers are subsidiary to the various bid items.

For bridges with aesthetic treatments, the numbering will be incorporated into the aesthetics package.

NATIONAL BRIDGE INVENTORY NUMBERS:
Provide National Bridge Inventory (NBI) numbers on all bridge structures and bridge class culverts.

Re-stencil all NBI numbers on bridge class structures within project limits.

Where beam types allow access to the face of abutment backwall, place NBI numbers on the face of each abutment backwall using 3" block numbers. Locate NBI numbers between the outside beams at opposite corners of the bridge.

Where beam types do not allow access to the face of abutment backwall, place NBI numbers on the face of each abutment cap using 3" block numbers. Locate NBI numbers below the outside beams at opposite corners of the bridge.

Where a bridge begins, ends or contains a bent common to multiple structures, place NBI numbers on both faces near both ends of the common bent cap. The number placed at each of the four locations will correspond to the NBI number assigned to the bridge immediately above the number. Locate NBI numbers below the outside beam. Place using 3" Block Numbers.

For Bridge Class Culverts, place National Bridge Inventory numbers at the middle of the downstream headwall using 3" block letters.

For all conditions, use appropriate die cut stencils and black paint for placement. All materials, labor and incidentals associated with placing NBI numbers are subsidiary to the various bid items.

Reduce headwall heights, if necessary, to provide a maximum of three (3) inches projection above the roadway slope. No increase or decrease will be made in plan quantities of concrete or reinforcing steel for this work.

ITEM 421: HYDRAULIC CEMENT CONCRETE

Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (Site Manager). Mix Design templates will be provided by the Engineer.

Provide sulfate resistant concrete for box culverts and all drilled shafts.

Supply the Engineer with a list of certified personnel and copies of their current ACI certificates before beginning production and when personnel changes are made. Supply hard copies of calibration reports for testing equipment when required by the Engineer.

ITEM 440: REINFORCEMENT FOR CONCRETE

Fiber Reinforced Concrete (FRC) can be used as a substitute for Non-Structural Class Reinforced Concrete in Mow-Strip and Rip Rap Items. FRC may also be used for other Non-Structural Class Reinforced Concrete Items as approved.

ITEM 451: RETROFIT RAILING

Refinish the outside face of the concrete slabs and curbs on the underpasses where railing is removed in such a manner as to leave a neat surface. Grind existing anchor bolts flush with the concrete. Paint the ends of the anchor bolts with two coats of zinc dust-zinc rich oxide paint as described under Item 450, "Railing". This work will not be paid for directly, but will be subsidiary to Item 451, "Retrofit Railing".

ITEM 462: CONCRETE BOX CULVERTS AND DRAINS

Joints between pre-cast concrete box culverts will be pre-formed flexible joint sealants as described in Section 464.3.3, "Jointing".

For this contract, the contractor may use either pre-cast or cast in place culvert construction.

Reshape embankment side slopes, provide embankment as required, and add topsoil to achieve a smooth uniform finish around the installation of the safety end treatments and culvert extensions as directed. Finishing and reshaping work will be subsidiary to Items 132, "Embankment", Item 162, "Sodding for Erosion Control", and Item 467, "Safety End Treatment".

Provide and install pneumatically placed concrete on the ditch bottom and side slopes between temporary terminations between old and new culverts. Pnuematically placed concrete will be placed to the height of the largest culvert on the ditch side slopes; and to a limit 10 feet outside the location of BMPs along the ditch bottom. Cement stabilized sand may be substituted for pneumatically placed concrete, with Engineer approval.

ITEM 464: REINFORCED CONCRETE PIPE

The concrete collars and the connections of pipes to existing or proposed concrete boxes or pipe will not be paid for directly but will be considered subsidiary to the various bid items.

ITEM 500: MOBILIZATION

Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

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.

Install traffic marking signs prior to sealcoat application and remove within three days after placement of traffic markings.

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

A meeting between the contractor and Engineer to discuss upcoming changes in construction phasing and traffic switches is required at least fourteen (14) days prior to the phase change. Items to be discussed at this meeting include temporary signing, traffic control, pavement markings, the processes necessary for the phase change and subcontractor scheduling.

When excavation is required next to a pavement lane carrying traffic and the widening is not completed by the end of the work day, backfill against the edge of the pavement with at least a 3:1 slope using an acceptable material to support vehicular traffic. Carefully remove and dispose of

this material when work resumes. Backfilling pavement edges, and the materials required for the work will be subsidiary to this item.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

The Contractor Responsible Person(s) (CRP) for Work Zone Traffic Controls will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Any misaligned or damaged traffic control devices will be repaired as soon as practical after deficiency is discovered.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee(s) available to respond on the project for emergencies and for taking corrective measures within One (1) Hour.

ITEM 504: FIELD OFFICE

:

Furnish one Asphalt Mix Control Laboratory (Type D) for this project.

ITEM 506: TEMPROARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS

Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devices and are discharged into the restricted areas, before the next rain event or within 24 hours of the discharge.

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality. Remove the temporary stream crossings in their entirety and return the affected areas to their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

Provide SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice and Contractor Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" plywood sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

No soil disturbing activities will begin on any section of TxDOT ROW without adequate sedimentation controls first being installed and functioning at adjacent drainage outfalls. Begin and continuously prosecute the repairs, additions and maintenance of erosion and sedimentation control devices within seven days after the Contractor receives each Form 2118, Field Inspection and Maintenance Report, from the Engineer. Failure of the Contractor to fulfill either of the above requirements places TxDOT in potential non-compliance with permit requirements and may result in withholding estimates or stopping work or both until all environmental permit requirements are fulfilled.

Concrete Washouts are required per the CGP. The Concrete Washout Area(s) structural controls must consist of temporary berms, temporary shallow pits, and/or temporary storage tanks to prevent contaminated runoff and must be lined as to prevent contamination of underlying soil. Ensure pits properly maintained including removal of concrete as not to allow over flow. The location(s) of washout area will be approved by the Engineer. When washout pits are no longer needed, they will be removed and area will be restored to original condition. This work, materials and labor will not be measured or paid for directly but will be subsidiary to Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls."

Cleaning and sweeping of open roadways due to material spillage or loss from Contractor equipment or tires will be the responsibility of the Contractor at no cost to TxDOT. This work will not be charged as Item 738, "Cleaning and Sweeping Highways". Cleaning and sweeping of roadways will be completed as directed, including multiple times per day if necessary, to maintain acceptable roadways for the traveling public and to meet environmental regulations. Construction activities will cease when material deposited on the roadway is not properly removed or when equipment is not available as needed. Adequate construction exits will be planned, constructed and maintained by the Contractor per Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls".

ITEM 510: ONE-WAY TRAFFIC CONTROL

Provide portable signals from pre-qualified manufactures on the TxDOT Work Zone Compliant List.

ITEM 512: PORTABLE TRAFFIC BARRIER

Department-furnished concrete traffic barrier units are at a TxDOT yard near the project location or other locations within fifty (50) miles of the project as directed. Barrier provided by TxDOT will be single slope or F-shape barrier. The Contractor will furnish equipment necessary to load the units at the stockpile locations.

For designated source portable barrier, the Department will provide the connection hardware. Should adequate hardware not be available, the Contractor will acquire the hardware, provide to the Department and be reimbursed via force account.

Upon completion of the project, all barrier will remain property of the Department and stockpiled at a TxDOT yard near the project location or other locations within fifty (50) miles of the project as directed. The Contractor will furnish equipment necessary to load and unload the units at the stockpile locations. When stockpiling, separate damaged barriers from salvaged barriers as directed.

Stockpiling of portable concrete traffic barriers will not be permitted to be stockpiled (stacked) more than three (3) barriers high in any direction.

Portable concrete traffic barrier that is determined unusable will become property of contractor and will not be returned to TxDOT stockpile location. This work will be considered subsidiary to this item.

All hardware will become the property of the Department and will be returned to the TxDOT Maintenance yard within fifty (50) miles of the project as directed. Place hardware in fifty-five (55) gallon barrels with holes in bottom to allow drainage.

ITEM 540: METAL BEAM GUARD FENCE

Furnish one type of post throughout the project except as specifically noted in the plans.

Wooden block out will not be allowed.

ITEMS 542 & 544: REMOVING METAL BEAM GUARD FENCE & GUARDRAIL END TREATMENTS

W-Beam elements, steel posts and composite material blockouts deemed salvageable will remain the property of the State and will be dismantled and returned to the TxDOT Maintenance yard within fifty (50) miles of project as directed. All other guard fence, and SGT's deemed non-salvageable will become the property of the contractor.

ITEM 544: GUARDRAIL END TREATMENTS

The use of wooden block-outs will not be allowed.

ITEM 545: CRASH CUSHON ATTENUATORS

Stockpile crash cushion attenuators at Bellmead yard.

ITEM 560: MAILBOX ASSEMBLIES

Mail boxes will be kept in a position accessible to the carrier's vehicle along the travel way except when performance of grading operations necessitates the moving of mail boxes. When grading operations necessitate the moving of mail boxes, the contractor will place them at a nearby location which will be accessible to the carrier's vehicle. Mail boxes will be returned to a position accessible to the carrier's vehicle along the travel way when grading operations are not in progress. This work will not be paid for directly, but will be subsidiary to Item 560, "Mailbox Assemblies".

ITEM 585: RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule 3 on the travel lanes.

Milling will not be allowed as a corrective action for excessive deviations in the surface layer.

ITEM 636: SIGNS

Verify all dimensions at the actual proposed sign location in order to maintain dimensions as shown on the Sign Mounting Details.

Stake the location of the new signs to be approved.

ITEM 644: SMALL ROADSIDE SIGN ASSEMBLIES

Bolt Clamp type will be used on Texas Triangular Slip Base System.

As practical with new construction, leave the existing sign assemblies in place until the proposed foundation, post and sign are in installed, and then remove the old sign assemblies.

Do not leave any sign foundation holes open overnight. Ensure all holes drilled are at least the minimum required depth with no loose material remaining in the hole.

Stake proposed sign locations and receive approval before installation of sign foundations.

Existing Mile Markers Signs are to be relocated to their original location(s) as they were prior to the beginning of the project.

Expanded foam foundations are not permitted.

Cut the bottom of all posts square.

For sign types which design details are not shown on these plans, fabricate according to the "STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS".

Removed material that is deemed salvageable (signs and posts) will be the property of TxDOT. Deliver salvageable material to the TxDOT Maintenance Office. Remove unsalvageable material.

The Contractor will relocate the existing double sided street name signs and furnish the post mounted brackets for the street name signs to be paid for as part of the proposed Stop Signs (R1-1). Existing street name signs will be mounted above Stop signs. If damaged while being relocated, the Contractor will furnish new double sided street name sign at their own expense.

ITEM 658: DELINEATOR AND OBJECT MARKER ASSEMBLIES

All flexible and GF2 delineators will have a tubular body.

The delineator assembly BRF Class A (D-SW) and (D-SY) are to be single delineators (Class I) attached to a flat, plastic bracket to facilitate the mounting of the delineator on top of the bridge rail at the locations shown on the plans. Submit a sample for approval before ordering materials.

ITEM 666: RETROREFLECTORIZED PAVEMENT MARKINGS

The Contractor will layout the proposed striping in accordance with TxDOT Traffic Control Plan Standards and latest version Texas Manual on Uniform Traffic Control Devices (TMUTCD) and project striping layout sheets. The Engineer will verify proposed striping layout prior to the beginning of striping operations.

The Contractor will locate the beginning and ending points of No Pass Zones.

ITEM 672: RAISED PAVEMENT MARKERS

Existing raised pavement markers to be replaced will be removed at the same time that the new markers are placed (i.e. remove and replace in one operation). Existing raised pavement markers replaced by new markers will be removed in accordance with Item 677, “Eliminating Existing Pavement Markings and Markers”. Immediately fill the damaged area in the pavement due to the removal of existing markers with an approved bituminous material. This removal and backfill work will not be paid for directly, but will be subsidiary to Item 672, "Raised Pavement Markers".

ITEM 730: ROADSIDE MOWING

Throughout the course of the project, when in the opinion of the Engineer, tall grass and weeds affect the safety of the public by restricting visibility, interfere with normal traffic flow or appear unsightly, the contractor will be required to mow same. Final cleanup will include mowing of grass and weeds. This work will be paid by the acre.

Mowing cycles will coincide with adjoining construction projects and adjoining segments maintained by contracted maintenance.

At the discretion of the Engineer, mow non-paved areas within the project prior to placement of permanent vegetation. The Contractor will plan and schedule to perform the full width mowing cycle work under this Item as follows:

RURAL AREAS
- At least two (2) times per year
- June 1 to July 15 and late October to late November

ITEM 3076: DENSE-GRADED HOT-MIX ASPHALT

Design for a target Laboratory-molded density of 97.0% when using the Texas Gyratory Compactor (TGC) (Tex-204-F, Part I).

Use aggregate that meets the Surface Aggregate Classification (SAC) requirement of Class B.

Maximum stripping of 0% is required.

RAP from Contractor owned sources may be used if the RAP is fractionated.

ITEM 6001: PORTABLE CHANGEABLE MESSAGE SIGN

This project will require “full matrix” type portable changeable message signs.

Ensure that the Contractor’s Responsible Person for traffic control can revise messages within thirty (30) minutes of notification.

Furnish two (2) portable changeable message signs. The portable changeable message sign(s) will be used for all lane closures and freeway closures as shown on the traffic control plan standard sheets.

Supply portable changeable message sign(s) in accordance with the Traffic Control Plan standard sheets and Article 6f.55 of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways Part VI.

ITEM 6185: TRUCK MOUNTED ATTENUATORS

The total number of truck mounted attenuators (TMA) required when utilizing the traffic control standards are shown in the tables below.

TCP 1 Series	Scenario	Required TMA
(1-1)-18 / (1-2)-18	All	1
(1-6)-18	All	1

TCP 2 Series	Scenario	Required TMA
(2-1)-18 / (2-2)-18	All	1

TCP 3 Series	Scenario			Required TMA
(3-1)-13	All			2
(3-3)-14	A	B	D	2
	C			3

Shadow vehicles equipped for truck mounted attenuators (TMA) for stationary operations will be paid for by the day and must be available for use at any time as determined by the Engineer.

Mobile operations will be paid for by the hour, per specifications. For mobile operations, payment will be made only while the TMA is in use.

For mobile operations requiring multiple TMA's, judgement may be applied in lower speed, urban / in town traffic environments to reduce the numbers of TMA in use where the added TMA may pose a hazard for traffic entering and exiting driveways, side streets, etc.

The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMA needed for the project for those times per plan requirements. Additional TMAs used that are not specified in the plans in which the contractor expects compensation will require prior approval from the Engineer.

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QUANTITY SHEET

CONTROLLING PROJECT ID 1077-01-026 **DISTRICT** Waco **COUNTY** Falls
HIGHWAY FM 434

			CONTROL SECTION JOB		**1077-01-026**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00004781**		
			COUNTY		**Falls**		
			HIGHWAY		**FM 434**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	104-6021	REMOVING CONC (CURB)	LF	379.000		379.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	169.000		169.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	20.000		20.000	
	134-6004	BACKFILL (TY A OR B)	STA	169.000		169.000	
	150-6001	BLADING	STA	5.000		5.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	42,548.000		42,548.000	
	164-6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	42,548.000		42,548.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	42,548.000		42,548.000	
	168-6001	VEGETATIVE WATERING	MG	461.000		461.000	
	169-6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	500.000		500.000	
	216-6001	PROOF ROLLING	HR	26.000		26.000	
	247-6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	CY	3,514.000		3,514.000	
	310-6027	PRIME COAT(MC-30 OR AE-P)	GAL	4,352.000		4,352.000	
	316-6022	ASPH (CRS-2)	GAL	5,527.000		5,527.000	
	316-6485	AGGR (TY-D GR-5 OR TY-L GR-5)	CY	151.000		151.000	
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	500.000		500.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	440.000		440.000	
	400-6006	CUT & RESTORING PAV	SY	38.000		38.000	
	401-6001	FLOWABLE BACKFILL	CY	5.200		5.200	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	183.000		183.000	
	403-6001	TEMPORARY SPL SHORING	SF	690.000		690.000	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	2.500		2.500	
	420-6070	CL C CONC (PILE ENCASEMENT)	CY	1.500		1.500	
	429-6007	CONC STR REPAIR (VERTICAL & OVERHEAD)	SF	3.000		3.000	
	432-6027	RIPRAP (STONE COMMON)(DRY)(24 IN)	CY	106.000		106.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	194.000		194.000	
	432-6051	RIPRAP (STONE COMMON)(GROUT)(18 IN)	CY	957.000		957.000	
	438-6002	CLEANING AND SEALING EXIST JOINTS(CL3)	LF	92.000		92.000	
	438-6006	CLEANING AND SEALING JOINTS (CL 3)	LF	69.000		69.000	
	451-6005	RETROFIT RAIL (TY T221)	LF	380.000		380.000	
	462-6002	CONC BOX CULV (3 FT X 3 FT)	LF	92.000		92.000	
	462-6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	LF	15.000		15.000	
	462-6076	CONC BOX CULV (10 FT X 8 FT)(EXTEND)	LF	35.000		35.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	144.000		144.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	192.000		192.000	
	466-6172	WINGWALL (PW - 1) (HW=11 FT)	EA	2.000		2.000	
	466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA	1.000		1.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1077-01-026 **DISTRICT** Waco **COUNTY** Falls
HIGHWAY FM 434

			CONTROL SECTION JOB		**1077-01-026**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00004781**		
			COUNTY		**Falls**		
			HIGHWAY		**FM 434**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	1.000		1.000	
	467-6015	SET (TY I) (36 IN) (4: 1) (C)	EA	1.000		1.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	8.000		8.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	6.000		6.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	4.000		4.000	
	467-6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	EA	2.000		2.000	
	480-6001	CLEAN EXIST CULVERTS	EA	4.000		4.000	
	496-6007	REMOV STR (PIPE)	LF	197.000		197.000	
	496-6099	REMOVE STR (RAIL)	LF	204.000		204.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	10.000		10.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	248.000		248.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	248.000		248.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	3,430.000		3,430.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	3,430.000		3,430.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	4.000		4.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF	210.000		210.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	210.000		210.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	210.000		210.000	
	530-6002	INTERSECTIONS (ACP)	SY	329.000		329.000	
	530-6005	DRIVEWAYS (ACP)	SY	2,628.000		2,628.000	
	530-6014	DRIVEWAYS AND TURNOUTS (ACP)	SY	172.000		172.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	16,712.000		16,712.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	2,000.000		2,000.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,375.000		1,375.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	5.000		5.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	16.000		16.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	5.000		5.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6004	CRASH CUSH ATTEN (STKPL)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	552-6003	WIRE FENCE (TY C)	LF	200.000		200.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	2.000		2.000	
	644-6009	IN SM RD SN SUP&AM TY10BWG(1)SB(P)	EA	1.000		1.000	
	644-6020	IN SM RD SN SUP&AM TY10BWG(2)SB(P)	EA	1.000		1.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	43.000		43.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1077-01-026 **DISTRICT** Waco **COUNTY** Falls
HIGHWAY FM 434

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1077-01-026**			
		PROJECT ID		**A00004781**			
		COUNTY		**Falls**			
		HIGHWAY		**FM 434**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	644-6076	REMOVE SM RD SN SUP&AM	EA	35.000		35.000	
	644-6080	RELOCATE SM RD SN SUP & AM TY TEMP	EA	9.000		9.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	4.000		4.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	35.000		35.000	
	658-6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	EA	8.000		8.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	210.000		210.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	828.000		828.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	20.000		20.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	8,400.000		8,400.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	1,835.000		1,835.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	91.000		91.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	32,024.000		32,024.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	4,200.000		4,200.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	11,496.000		11,496.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	353.000		353.000	
	730-6107	FULL - WIDTH MOWING	CYC	2.000		2.000	
	3076-6017	D-GR HMA TY-C SAC-B PG64-22	TON	7,245.000		7,245.000	
	3085-6001	UNDERSEAL COURSE	GAL	13,173.000		13,173.000	
	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	450.000		450.000	
	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	

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SUMMARY OF ROADWAY ITEMS

ROADWAY LAYOUT SHEET NO.	USUAL RDWY WIDTH	WIDEN AREA	MOWSTRIP AREA	RDWY AREA	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	150 6001 BLADING	112 6001 SUBGRADE WIDENING (ORD COMP)	134 6004 BACKFILL (TY A OR B)	216 6001 PROOF ROLLING	247 6053 FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	310 6027 PRIME COAT(MC-30 OR AE-P)	316 6022 ASPH (CRS-2)
	FT	SY	SY	SY	CY	STA	STA	STA	HR	CY	GAL	GAL
1	20											
2	25	313.1	762.6	3082.3			8.69	8.69	1.0	208	95	212
3	28	1777.8		6222.2			20.00	20.00	3.1	396	533	667
4	28	1777.8		6222.2			20.00	20.00	3.1	396	533	667
5	28	1777.8		6222.2			20.00	20.00	3.1	396	533	667
6	28	1777.8	466	6222.2			20.00	20.00	3.1	467	533	667
7	28	1777.8		6222.2			20.00	20.00	3.1	396	533	667
8	28	1777.8		6222.2			20.00	20.00	3.1	396	533	667
9	28	1777.8	497	6222.2	20	5	20.00	20.00	3.1	472	533	667
10	28	1730.1		6055.2			20.00	20.00	3.1	387	524	649
PROJECT TOTALS		14487.8	1726	52692.9	20	5	168.69	168.69	26	3514	4352	5527

SUMMARY OF ROADWAY ITEMS (CONT)

ROADWAY LAYOUT SHEET NO.	RDWY WIDTH	WIDEN AREA	MOWSTRIP AREA	RDWY AREA	316 6485 AGGR (TY-D GR-5 OR TY-L GR-5)	351 6002 FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	354 6021 PLANE ASPH CONC PAV(0" TO 2")	400 6006 CUT & RESTORING PAV	402 6001 TRENCH EXCAVATION PROTECTION	432 6027 RIPRAP (STONE COMMON)(DRY)(24 IN)	432 6051 RIPRAP (STONE COMMON)(GROUT)(18 IN)	3076 6017 D-GR HMA TY-C SAC-B PG64-22	3085 6001 UNDERSEAL COURSE
	FT	SY	SY	SY	CY	SY	SY	SY	LF	CY	CY	TON	GAL
CSJ 1077-01-026													
1													
2	25	313.1	763	3082.3	7		440.0					424	771
3	28	1777.8		6222.2	18							856	1556
4	28	1777.8		6222.2	18							856	1556
5	28	1777.8		6222.2	18							856	1556
6	28	1777.8	466	6222.2	18							856	1556
7	28	1777.8		6222.2	18							856	1556
8	28	1777.8		6222.2	18							856	1556
9	28	1777.8	497	6222.2	18			38	100	106	131	856	1556
10	28	1730.1		6055.2	18							833	1514
						500							
PROJECT TOTALS		14487.8	1726	52692.9	151	500	440	38	100	106	131	7245	13173

SUMMARY OF MBGF ITEMS

LOCATION	432 6045 RIPRAP (MOW STRIP)(4 IN)	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6002 REMOVE TERMINAL ANCHOR SECTION	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)	552 6003 WIRE FENCE (TY C)
	CY	LF	EA	LF	EA	EA	EA	LF
NBI 09-074-0-1077-01-013								
BR OF BULLHIDE CREEK	44	400		275	1	4	1	
NBI 09-074-0-1077-01-014								
S BRANCH OF BULLHIDE CREEK	42	375	4			4		
NBI 09-074-0-1077-01-015								
TRIB OF BRAZOS RIVER	52	600		575	4	4		200
NBI 09-074-0-1077-01-007								
TRIB OF BRAZOS RIVER	56	625		525		4	4	
PROJECT TOTALS	194	2000	4	1375	5	16	5	**200**

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SHEET 1 OF 5

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		8

ID	STA	SIDE	W	L	R1	R2	401 6001 FLOWABLE BACKFILL	464 6003 RC PIPE (CL III)(18 IN)	464 6005 RC PIPE (CL III)(24 IN)	467 6363 SET (TY II)(18 IN)(RCP)(6: 1) (P)	467 6395 SET (TY II)(24 IN)(RCP)(6: 1) (P)	496 6007 REMOV STR (PIPE)	530 6002 INTERSECTIONS (ACP)	530 6005 DRIVEWAYS (ACP)	530 6014 DRIVEWAYS AND TURNOUTS (ACP)	560 6011 MAILBOX INSTALL-S (TWW-POST) TY 4
							CY	LF	LF	EA	EA	LF	SY	SY	SY	EA
D 2-1	28+23.22	RT	16	65	15	15								125		
D 2-2 (FM 2839)	33+76.00	RT	30	59	71	38							329			
D 2-3	35+24.25	LT	33	36	15	15								143		
D 4-1	60+35.91	LT	32	36	15	15								140		
D 4-2	60+32.34	RT	32	36	15	15			40		2			140		
D 5-1	84+17.58	LT	25	36	15	15			40		2			110		
D 5-2	84+22.45	RT	28	36	15	15								122		
D 5-3	98+58.63	RT	33	36	15	15								142		
D 6-1	114+61.72	LT	32	36	15	15								140		
D 6-2	114+96.65	RT	33	36	15	15								143		
D 7-1	130+56.53	LT	33	36	15	15								142		
D 7-2	130+47.00	RT	32	36	15	15								140		
D 8-1	144+07.70	LT	16	36	15	15		40		2		40			89	1
D 8-2 (CR 420)	147+79.43	LT	20	36	30	30								125		
D 8-3 (CR 426)	147+82.66	RT	17	26	30	30								90		
D 8-4	151+02.71	LT	23	36	15	15								101		
D 9-1 (CR 4044)	175+68.94	LT	19	100	105	22	5.2		112		2			285		
D 9-2	188+97.47	LT	26	36	15	15		32		2				115		
D 10-1	190+10.71	LT	16	36	15	15		72		4		64			83	1
D 10-2	197+98.48	LT	33	18	15	15								78		
D 10-3 (CR 425)	198+66.04	RT	41	17	25	52								143		
D 10-4 (CR 4039)	199+07.24	LT	27	38	46	38								204		
CSJ TOTALS							5.2	144	192	8	6	104	329	2628	172	2

ID	FOR CONTRACTOR'S INFORMATION ONLY						
	247 FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	310 PRIME COAT(MC-30 OR AE-P)	316 (CRS-2)	316 AGGR(TY D GR 5 OR TY L GR 5)	496 REMOV STR (SET)	3076 D-GR HMA TY-C SAC-B PG64-22	3085 UNDERSEAL COURSE
	CY	GAL	GAL	CY		TON	GAL
D 2-1	22	25	32	1		17	
D 2-2 (FM 2839)	65	66	83	3		45	82
D 2-3	25	29	36	1		20	
D 4-1	24	28	35	1		19	
D 4-2	24	28	35	1		19	
D 5-1	19	22	28	1		15	
D 5-2	21	24	31	1		17	
D 5-3	24	28	36	1		20	
D 6-1	24	28	35	1		19	
D 6-2	25	29	36	1		20	
D 7-1	24	28	36	1		20	
D 7-2	24	28	35	1		19	
D 8-1	16	18	23	1	2	12	
D 8-2 (CR 420)	22	25	32	1		17	
D 8-3 (CR 426)	15	18	23	1		12	
D 8-4	18	20	26	1		14	
D 9-1 (CR 4044)	49	57	72	2		39	
D 9-2	20	23	29	1		16	
D 10-1	15	17	21	1	4	11	
D 10-2	13	16	20	1		11	
D 10-3 (CR 425)	24	29	36	1		20	
D 10-4 (CR 4039)	35	41	51	2		28	

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SHEET 2 OF 5

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		9

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SUMMARY OF DRAINAGE ITEMS

LOCATION	402 6001 TRENCH EXCAVATION PROTECTION	432 6051 RIPRAP (STONE COMMON)(GROUT)(18 IN)	462 6002 CONC BOX CULV (3 FT X 3 FT)	466 6179 WINGWALL (PW - 1) (HW=4 FT)	466 6181 WINGWALL (PW - 1) (HW=6 FT)	467 6015 SET (TY I) (36 IN) (4:1) (C)	467 6450 SET (TY II) (36 IN) (RCP) (4:1) (C)	467 6453 SET (TY II) (36 IN) (RCP) (6:1) (C)	480 6001 CLEAN EXIST CULVERTS	496 6007 REMOV STR (PIPE)
	LF	CY	LF	EA	EA	EA	EA	EA	EA	LF
CULVERT 2 STA 64+86.70							4		1	
CULVERT 3 STA 74+77.80						1		2	1	
CULVERT 6 STA 177+00	83	75	92	1	1					93
PROJECT TOTALS	**83**	**75**	**92**	**1**	**1**	**1**	**4**	**2**	**2**	**93**

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	160 6003 FURNISHING AND PLACING TOPSOIL (4")	164 6033 DRILL SEEDING (PERM) (RURAL) (SANDY)	164 6051 DRILL SEED (TEMP)(WARM OR COOL)	168 6001 VEGETATIVE WATERING	169 6004 SOIL RETENTION BLANKETS (CL 1) (TY D)	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	MG	SY	LF	LF	LF	LF
CSJ 1077-01-026									
SHEET 1 OF 9	1340	1340	1340	14.5		48	48	380	380
SHEET 2 OF 9	5224	5224	5224	56.6				240	240
SHEET 3 OF 9	5176	5176	5176	56.0	200			760	760
SHEET 4 OF 9	5188	5188	5188	56.2				360	360
SHEET 5 OF 9	4635	4635	4635	50.2	300	100	100	240	240
SHEET 6 OF 9	5149	5149	5149	55.7				240	240
SHEET 7 OF 9	5113	5113	5113	55.4				210	210
SHEET 8 OF 9	5826	5826	5826	63.1		100	100	760	760
SHEET 9 OF 9	4897	4897	4897	53.0				240	240
PROJECT TOTALS	42548	42548	42548	461	500	248	248	3430	3430

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CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		10

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SUMMARY OF PAVEMENT MARKING ITEMS									
LOCATION	533 6004 RUMBLE STRIPS (CENTERLINE) ASPHALT	658 6014 INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	658 6062 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI)	658 6100 INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	666 6048 REFL PAV MRK TY I (W)24"(SLD)(100 MIL)	666 6303 RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	666 6312 RE PM W/RET REQ TY I (Y)4"(BR K)(100MIL)	666 6315 RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	672 6009 REFL PAV MRKR TY II-A-A
	LF	EA	EA	EA	LF	LF	LF	LF	EA
SHEET 1 OF 10							500		25
SHEET 2 OF 10	1072	4	13		32	624	430	1625	43
SHEET 3 OF 10	2000		2			4000	500	1585	44
SHEET 4 OF 10	2000			4		4000	500	442	31
SHEET 5 OF 10	2000					4000	500		25
SHEET 6 OF 10	2000		9			4000	500		25
SHEET 7 OF 10	2000		1			4000	490		25
SHEET 8 OF 10	1920				27	3840	440	1563	38
SHEET 9 OF 10	1880		10	4	12	3880	100	3488	49
SHEET 10 OF 10	1840				20	3680	240	2793	48
PROJECT TOTALS	16712	4	35	8	91	32024	4200	11496	353

SUMMARY OF SIGNING ITEMS			
LOCATION	644 6009 IN SM RD SN SUP&AM TY10BWG(1)SB(P)	644 6020 IN SM RD SN SUP&AM TY10BWG(2)SB(P)	644 6060 IN SM RD SN SUP&AM TYTWT(1)WS(P)
	EA	EA	EA
SHEET 1 OF 10			
SHEET 2 OF 10	1	1	9
SHEET 3 OF 10			3
SHEET 4 OF 10			
SHEET 5 OF 10			
SHEET 6 OF 10			
SHEET 7 OF 10			
SHEET 8 OF 10			9
SHEET 9 OF 10			16
SHEET 10 OF 10			6
PROJECT TOTALS	1	1	43

SUMMARY OF REMOVAL ITEMS		
LOCATION	644 6076 REMOVE SM RD SN SUP&AM	644 6080 RELOCATE SM RD SN SUP & AM TY TEMP
	EA	EA
CSJ 1077-01-026	35	9
PROJECT TOTALS	35	9

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CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		11

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS															
LOCATION	510 6003	512 6013	512 6025	512 6037	545 6003	545 6004	545 6019	662 6050	662 6063	662 6075	662 6095	662 6111	6001 6002	6185 6002	6185 6003
	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	PORT CTB (MOVE)(SGL SLP)(TY 1)	PORT CTB (STKPL)(SGL SLP)(TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (STKPL)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	MO	LF	LF	LF	EA	EA	EA	EA	LF	LF	LF	EA	EA	DAY	HR
CSJ 1077-01-026	4	210	210	210	2	2	2	210	828	20	8400	1835	2	300	450
PROJECT TOTALS	4	210	210	210	2	2	2	210	828	20	8400	1835	2	300	450

SUMMARY OF BRIDGE ITEMS											
BID ITEM	104 6021	403 6001	420 6066	420 6070	429 6007	432 6051	438 6002	438 6006	451 6005	462 6055	462 6076
	REMOVING CONC (CURB)	TEMPORARY SPL SHORING	CL C CONC (RAIL FOUNDATION)	CL C CONC (PILE ENCASEMENT)	CONC STR REPAIR (VERTICAL & OVERHEAD)	RIPRAP (STONE COMMON)(GROUT)(18 IN)	CLEANING AND SEALING EXIST JOINTS(CL3)	CLEANING AND SEALING JOINTS (CL 3)	RETROFIT RAIL (TY T221)	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	CONC BOX CULV (10 FT X 8 FT)(EXTEND)
	LF	SF	CY	CY	SF	CY	LF	LF	LF	LF	LF
S BR BULLHIDE CREEK											
NBI 09-074-0-1077-01-014	379		2.5	1.5	3		92	69	380		
NBI 09-074-0-1077-01-015 (CULVERT 4)		480				484					35
NBI 09-074-0-1077-01-007 (CULVERT 5)		210				267				15	
PROJECT TOTALS	379	690	2.5	1.5	3	751	92	69	380	15	35

SUMMARY OF BRIDGE ITEMS CONT.					
BID ITEM	466 6172	466 6181	466 6183	480 6001	496 6099
	WINGWALL (PW - 1) (HW=11 FT)	WINGWALL (PW - 1) (HW=6 FT)	WINGWALL (PW - 1) (HW=8 FT)	CLEAN EXIST CULVERTS	REMOVE STR (RAIL)
	EA	EA	EA	EA	LF
S BR BULLHIDE CREEK					
NBI 09-074-0-1077-01-014					204
NBI 09-074-0-1077-01-015 (CULVERT 4)	2			5	
NBI 09-074-0-1077-01-007 (CULVERT 5)		1	1	5	
PROJECT TOTALS	2	1	1	10	204

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CONSOLIDATED SUMMARIES

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		12

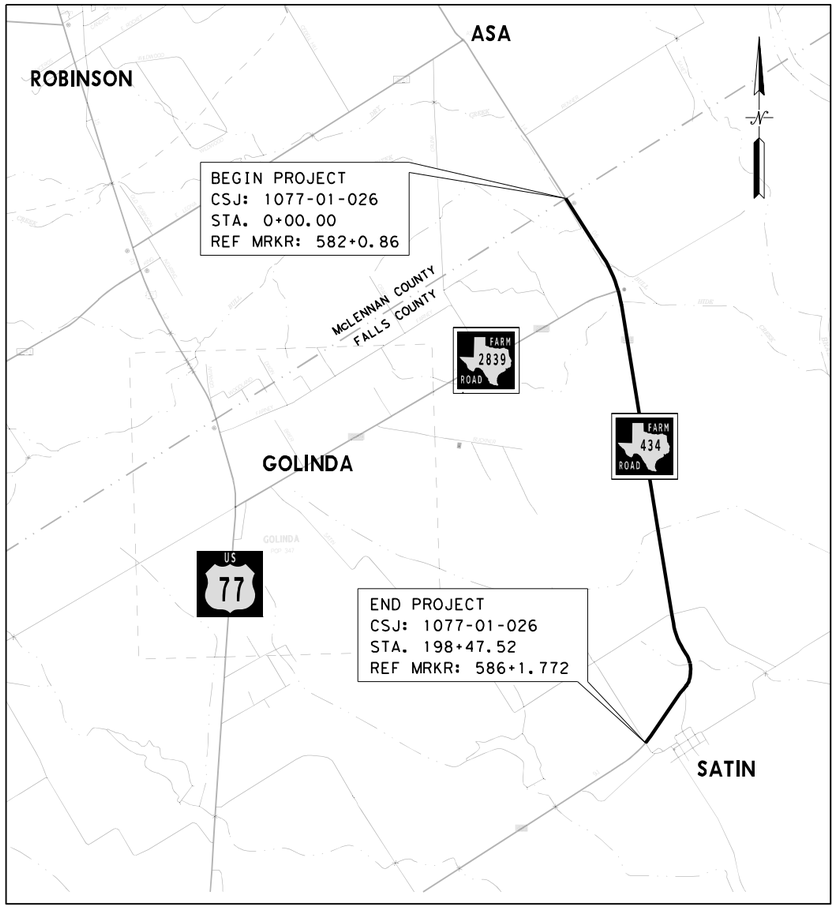
LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
1	1	15	S BR OF BULLHIDE CREEK	37+01.72	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"	1								1	
2	1	15	S BR OF BULLHIDE CREEK	39+11.72	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"	1								1	
3	2	15	S BR OF BULLHIDE CREEK	37+01.72	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"		1	1	1					1	
4	2	15	S BR OF BULLHIDE CREEK	39+11.72	TL-3	BI	N/A	N/A	PCTB	24"	42"	26' 0"		1	1	2					1	
												TOTALS	2	2	2							

LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.
http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwyise.htm

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		
	WACO	FALLS		
	FEDERAL AID PROJECT			SHEET NO.
	SEE TITLE SHEET			13



VICINITY MAP

SCALE: 1" = 5,280.0'

NOTES:

1. ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (TMUTCD), AND WILL BE MAINTAINED AS DIRECTED. ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.
2. FOR CHANNELING DEVICE PLACEMENT AND SPACING FOR ALL PHASES, REFER TO THE TCP STANDARDS.
3. SEE BC STANDARD SHEETS FOR REQUIRED PROJECT LIMITS AND CROSSROAD SIGNGING

GENERAL

A. INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES AS SHOWN AND IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED.

B. ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES WILL BE CONSIDERED SUBSIDIARY TO THE ITEM "BARRICADES, SIGNS AND TRAFFIC HANDLING".

C. WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.

D. THE CONTRACTOR WILL PROVIDE SAFE ACCESS TO AND FROM ALL PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.

E. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF OPERATION BELOW.

F. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.

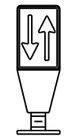
G. ANY REQUEST TO ALTER THE SEQUENCE OF OPERATION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR WRITTEN APPROVAL.

SEQUENCE OF CONSTRUCTION

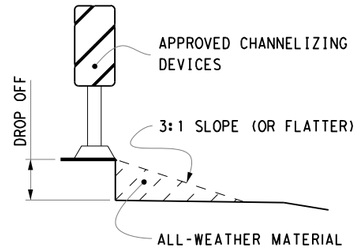
A. THIS PROJECT CONSISTS OF ONE SEPARATE WORK AREAS AS DEFINED BY CSJ 1077-01-026, FROM McLENNAN COUNTY LINE TO CR 4039

B. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK TO THE AREA ENGINEER PRIOR TO THE BEGINNING OF CONSTRUCTION, WHICH GENERALLY CONFORMS TO THE FOLLOWING SEQUENCE:

1. SET PROJECT BARRICADES.
2. INSTALL REQUIRED TEMPORARY EROSION CONTROL DEVICES AS DIRECTED.
3. CONSTRUCT PROPOSED CULVERTS, CULVERT EXTENSIONS, AND END TREATMENTS.
4. COMPLETE EACH ROADWAY SECTION BEFORE MOVING TO THE NEXT SECTION. LIMIT SECTIONS TO 1.5 MILE MAXIMUM PER TRAVEL LANE OR AS DIRECTED. EACH ROADWAY SECTION WILL GENERALLY FOLLOW THE STEPS LISTED BELOW AND INCLUDE DRIVEWAY AND MAILBOX TURNOUTS.
   - A. WIDEN PROPOSED SHOULDER USING SUBGRADE WIDENING.
   - B. RECLAIM EXISTING MATERIAL AND SPREAD EVENLY FOR BACKFILL OF PAVEMENT EDGE.
   - C. INSTALL FLEX BASE
   - D. PRIME THE PROPOSED SHOULDER
   - E. CONSTRUCT DRIVEWAYS AND INTERSECTIONS
   - F. CONSTRUCT ONE COURSE SURFACE COURSE (OCST) ON SHOULDER AND TWO FEET (2.0') IN EXISTING TRAVEL LANE AND OR AS DIRECTED.
   - G. OCST DRIVEWAYS AND INTERSECTIONS
   - H. PLACE TEMP SEEDING.
5. PLACE PTCB AND TEMPORARY PORTABLE TRAFFIC SIGNAL IN ACCORDANCE WITH TCP (2-8B) AT N.B.I: 09-074-0-1077-01-014 FOR MULTIPLE DAY CLOSURES.
6. REMOVE EXISTING BRIDGE RAIL AND CONSTRUCT BRIDGE RAIL RETROFIT
7. INSTALL MBGF AND MOWSTRIP
8. PLACE UNDERSEAL AND LAYDOWN D-GR HMA TY-C OVER FULL WIDTH OF ROADWAY.
9. PLACE TEMPORARY WORK ZONE TABS
10. PLACE PERMANENT PAVEMENT MARKING.
11. BACKFILL PAVEMENT EDGES AS NECESSARY
12. PLACE PERMANENT SEEDING AND OR SOD.
13. COMPLETE ALL OTHER WORK AS SHOWN IN THE PLANS
14. CLEAN UP PROJECT AND REMOVE TEMPORARY EROSION CONTROL DEVICES AND PROJECT BARRICADES.

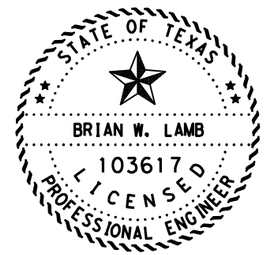


2 WAY VERTICAL PANELS WILL BE REQUIRED TO SIMULATE CENTERLINE.



PAV EDGE DROP-OFF DETAIL

1. LESS THAN 2 INCHES: CW 8-11 SIGNS ARE REQUIRED.
2. GREATER THAN 2 INCHES BUT LESS THAN 24 INCHES: VERTICAL PANELS AND EITHER CW 8-9a OR CW 8-11 SIGNS ARE REQUIRED.
3. GREATER THAN 24 INCHES: POSITIVE BARRIER REQUIRED.
4. THE SAFETY SLOPE WILL BE CONSTRUCTED WITH AN ALL- WEATHER MATERIAL SUCH AS RAP, WHICH IS CLEAN AND FREE OF DEBRIS AND LARGE ROCKS.



P.E. 5/19/2021

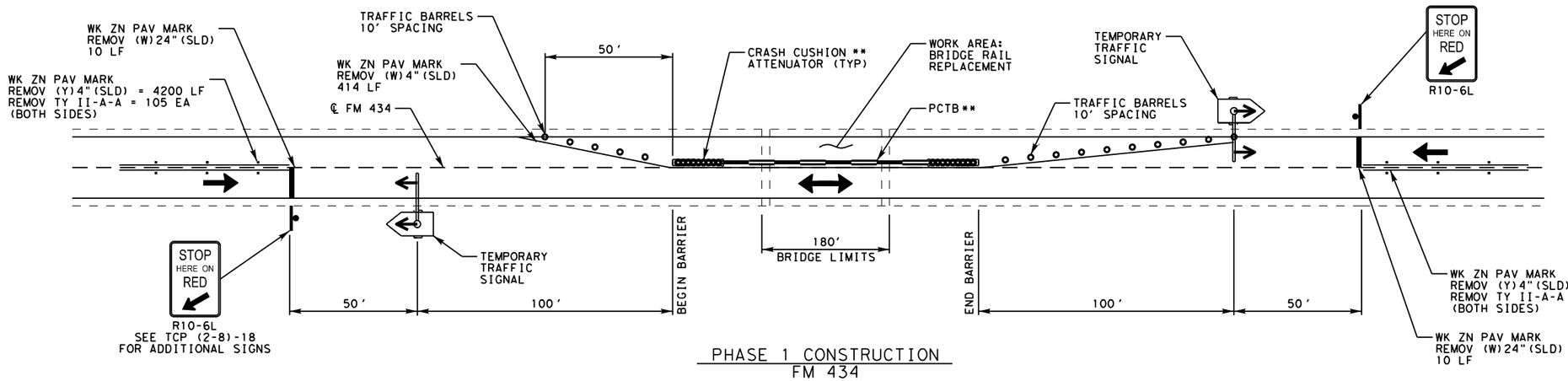
SIGNATURE OF REGISTRANT & DATE

SEQUENCE OF CONSTRUCTION

SCALE: FEET
1" =5280.0'HORIZ.

SHEET 1 OF 1

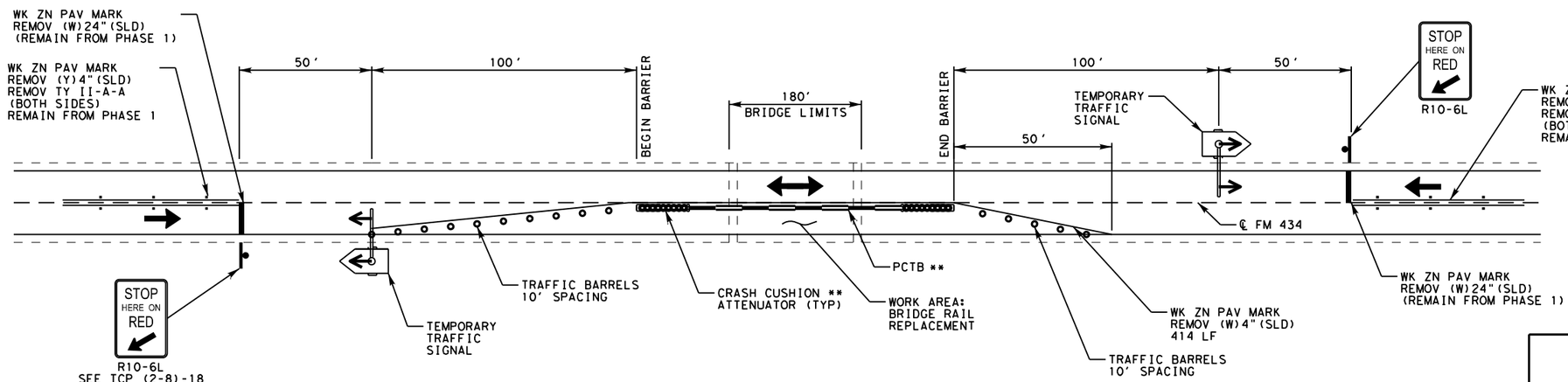
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		14



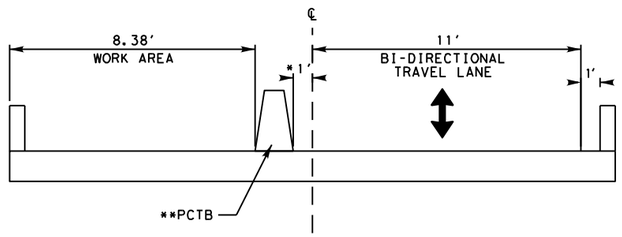
PHASE 1 CONSTRUCTION
FM 434
S BR OF BULLHIDE CREEK

NOTES:

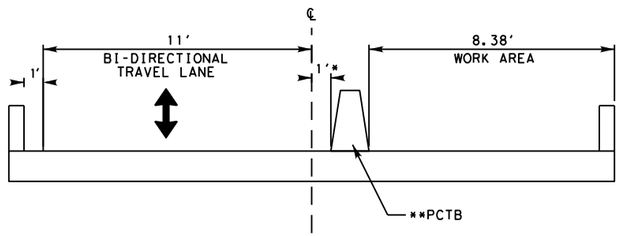
1. ALL WARNING SIGNS, BARRICADES AND CHANNELING DEVICES SHALL BE PLACED IN ACCORDANCE WITH THE "TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" OR AS DIRECTED BY THE ENGINEER TO MEET LOCAL CONDITIONS.
2. PORTABLE TRAFFIC SIGNALS WILL BE REQUIRED AND WILL BE PAID FOR BY ITEM 510. REFER TO TCP(2-8b)-18 FOR ADDITIONAL DETAILS.
3. PCTB WILL BE INPLACE PRIOR TO REMOVING BRIDGE RAIL.
4. BARRIER WILL BE PINNED IF PLACED WITHIN 2 FT OF A DROP-OFF OR PAVEMENT EDGE.
5. SEE TCP(2-8b)-18 FOR ADDITIONAL SIGNING, BARRICADES, AND PAVEMENT MARKING REQUIREMENTS.



PHASE 2 CONSTRUCTION
FM 434
S BR OF BULLHIDE CREEK



TCP TYPICAL SECTION PHASE 1
PCTB PLACEMENT (LEFT SIDE REPLACEMENT)



TCP TYPICAL SECTION PHASE 2
PCTB PLACEMENT (RIGHT SIDE REPLACEMENT)

* PCTB OFFSET DISTANCE MAY BE CHANGED AS DIRECTED
** PCTB/CRASH CUSHIONS WILL BE PLACED TO PROTECT AREA OF WING AND BRIDGE RAIL REMOVAL AS DIRECTED

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

CTB LAYOUT FOR BRIDGE CONSTRUCTION

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		15

5/14/2021 2:31:34 PM

...\CTB LAYOUT BRIDGE CONSTRUCTION

NODE

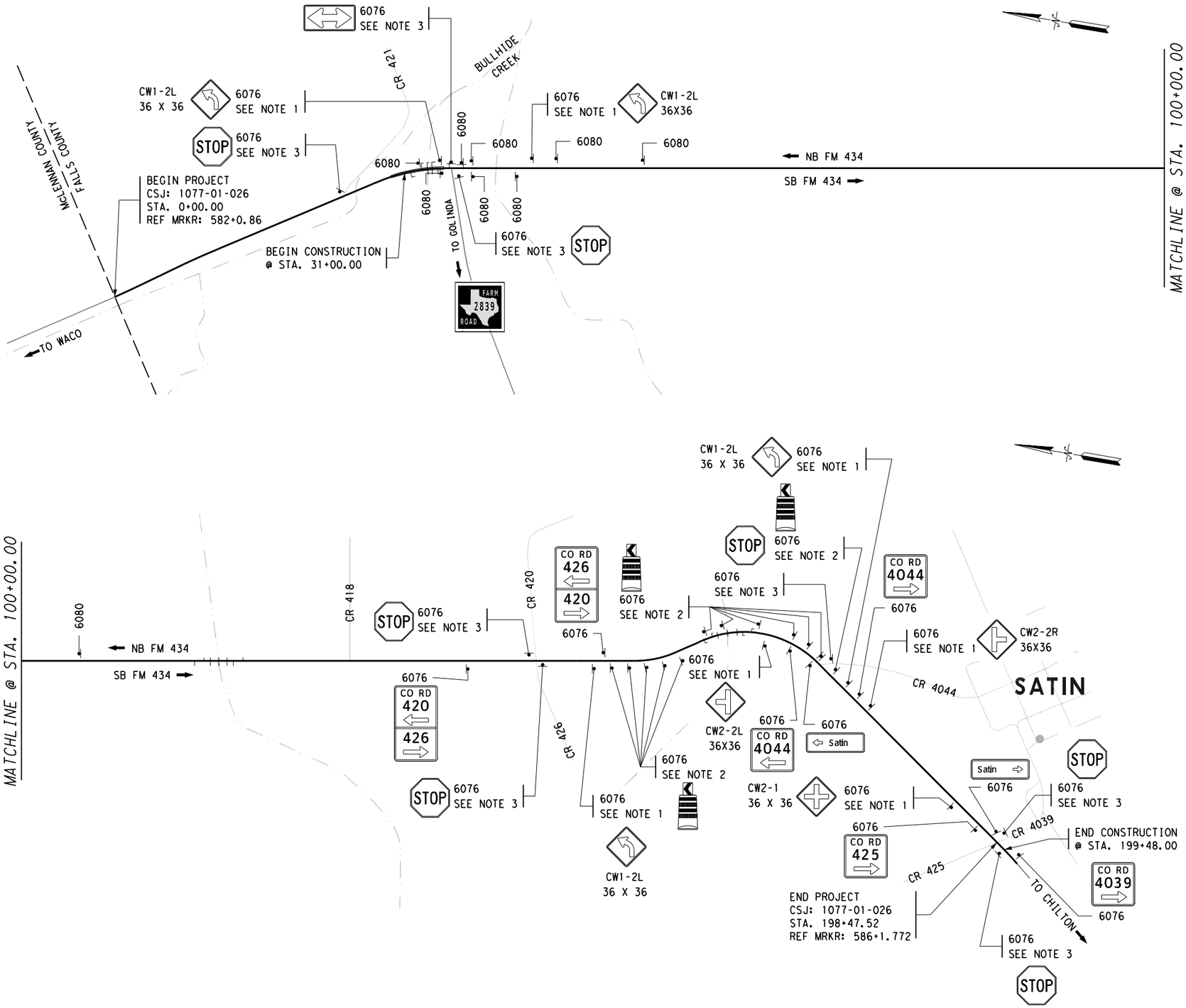
5/14/2021 2:31:42 PM

..\Remove & Replace Existing Signs

NODE

NOTES:

1. REMOVE ALL WARNING SIGNS AND INSTALL THE APPORIATE CONSTRUCTION SIGNS AS SHOWN. THIS WILL NOT BE PAID FOR DIRECTLEY BUT WILL BE CONSIDERED PART OF ITEM 502.
2. ALL CHEVERONS WILL BE REMOVED AND REPLACE AS SHOWN WITH BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES BC (8) - 14.
3. THIS EXISTING SIGN WILL REMAIN IN PLACE UNTILL THE PROPOSED SIGN IS INSTALLED UNLESS OTHERWISE DIRECTED.



ITEM	DESCRIPTION	UNIT
644 6076	REMOVE SM RD SN SUP&AM	35 EA
644 6080	RELOCATE SM RD SN SUP & AM TY TEMP	9 EA

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

REMOVE & REPLACE EXISTING SIGNS

SCALE: 1" = 1000' HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		16

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

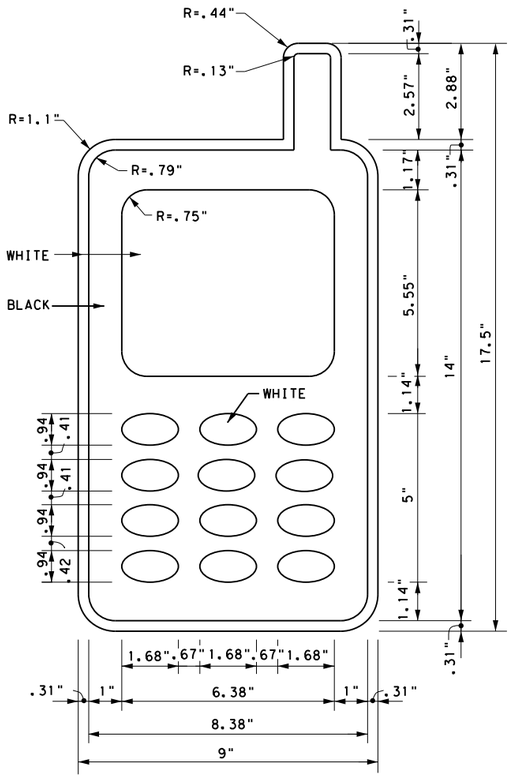
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY APPAREL NOTES:

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



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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

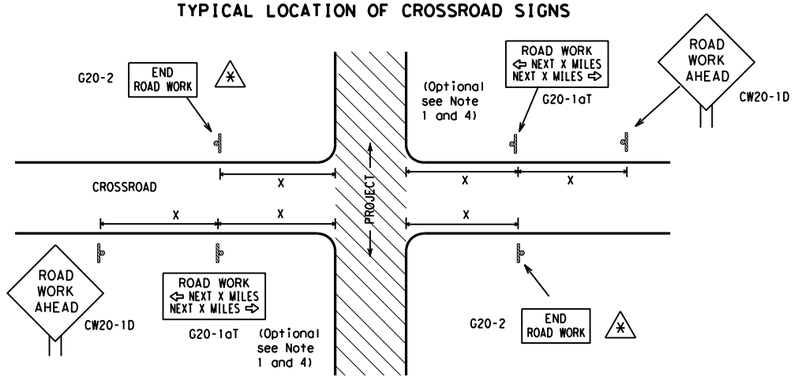
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	WAC	FALLS		17

DATE: 02/05/2021 10:03 AM
FILE: DOCUMENT NAME

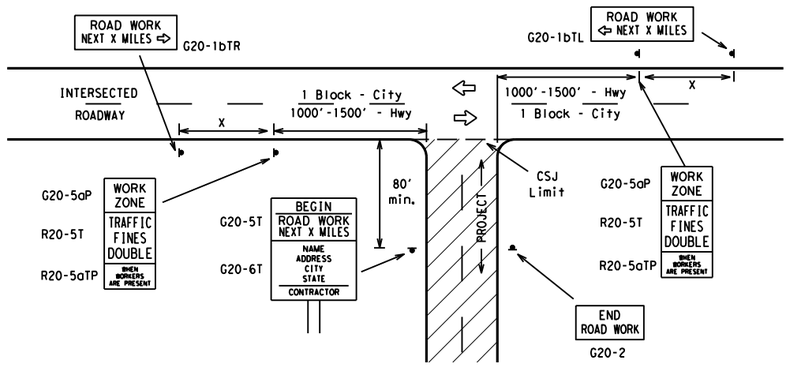
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

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

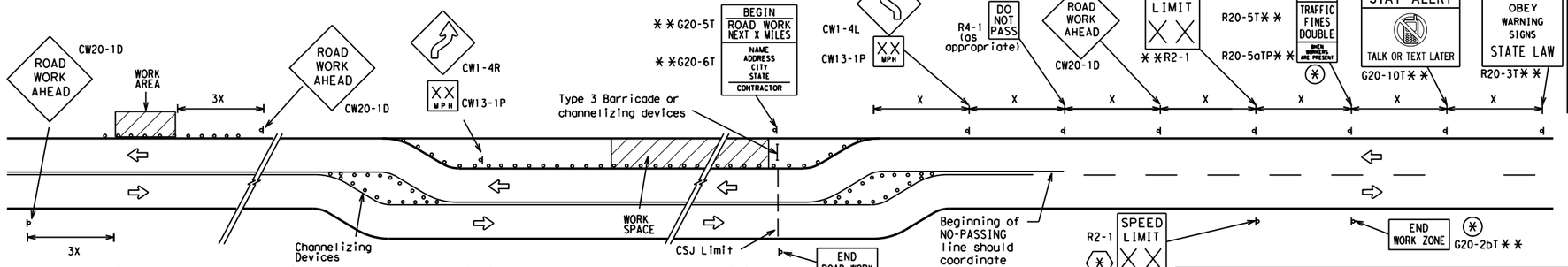
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

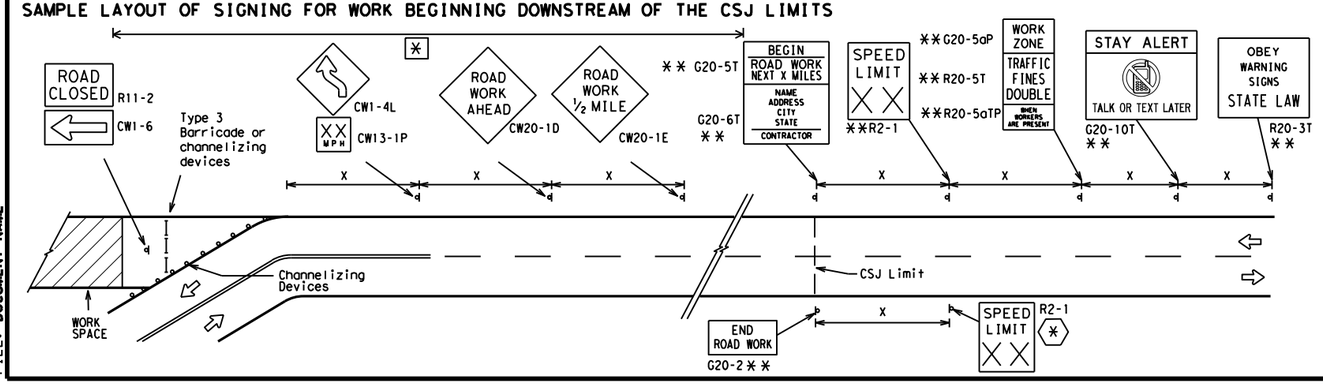
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WAC	FALLS		18

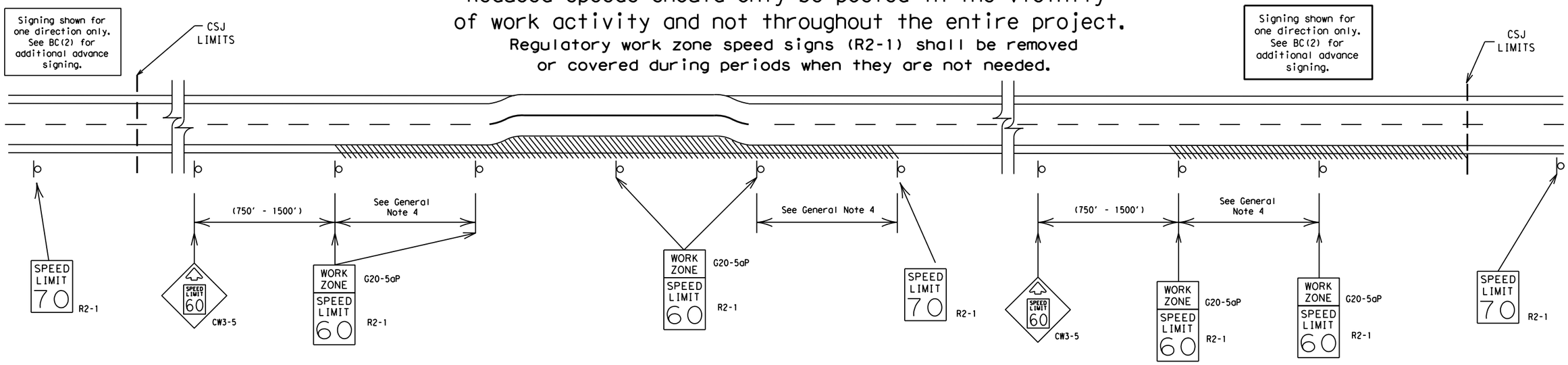
DATE: 02/05/2021 10:03 AM
FILE: DOCUMENT NAME

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WAC	FALLS		19

DATE: 02/05/2021 10:03 AM
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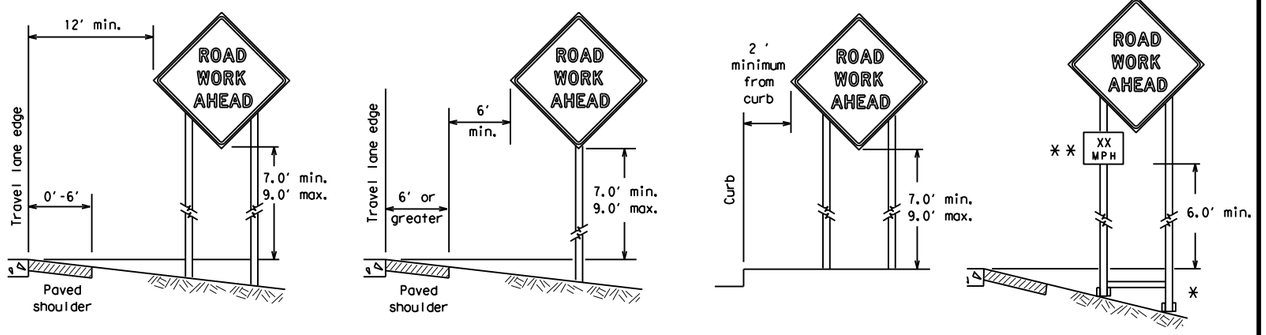
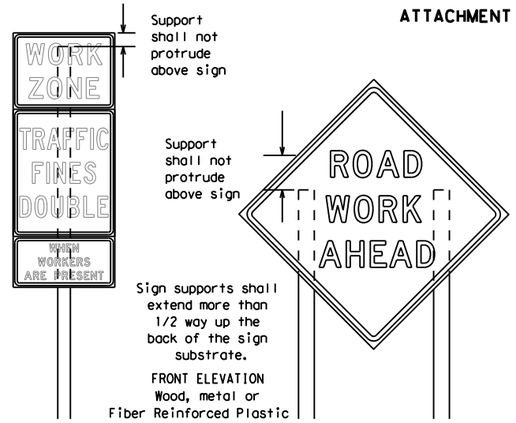
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

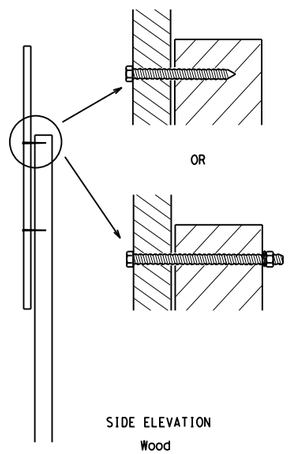


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





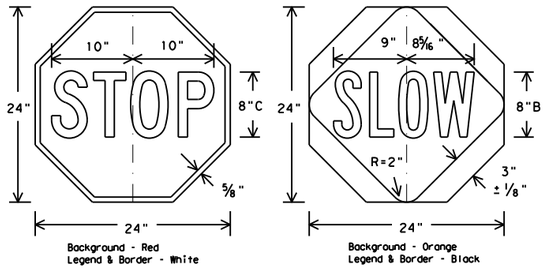
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

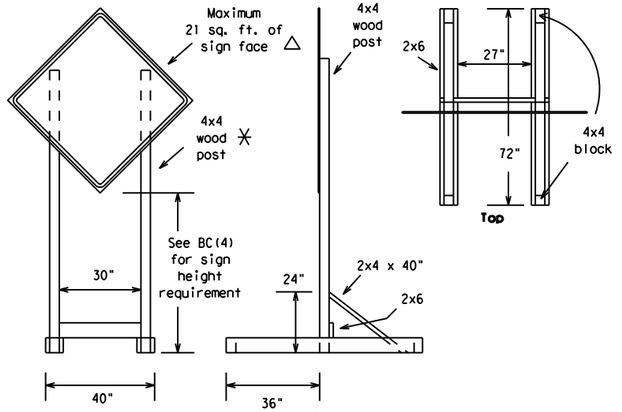
1. Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

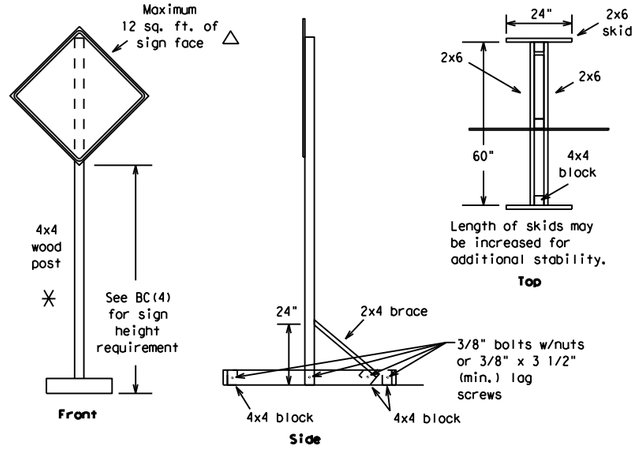
Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

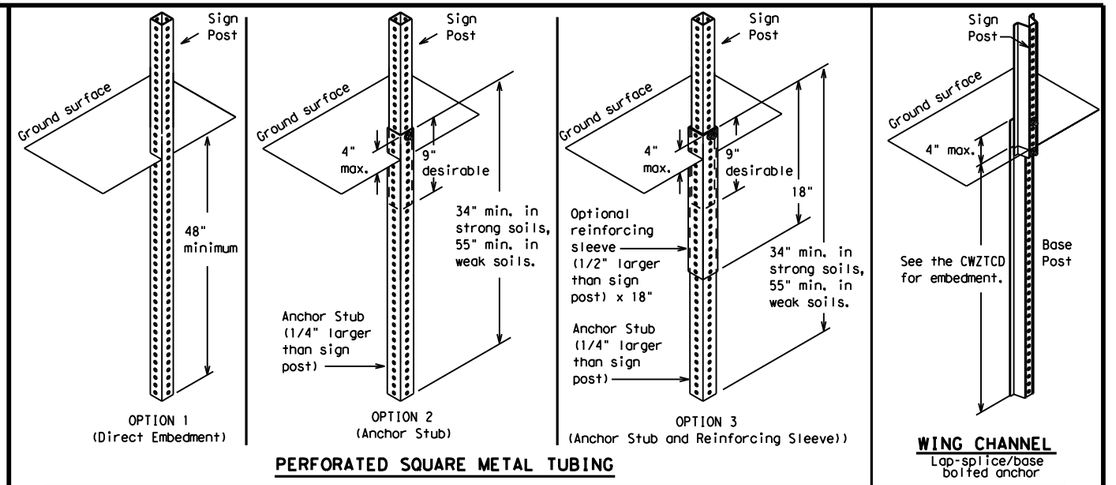
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WAC	FALLS		20





SKID MOUNTED WOOD SIGN SUPPORTS

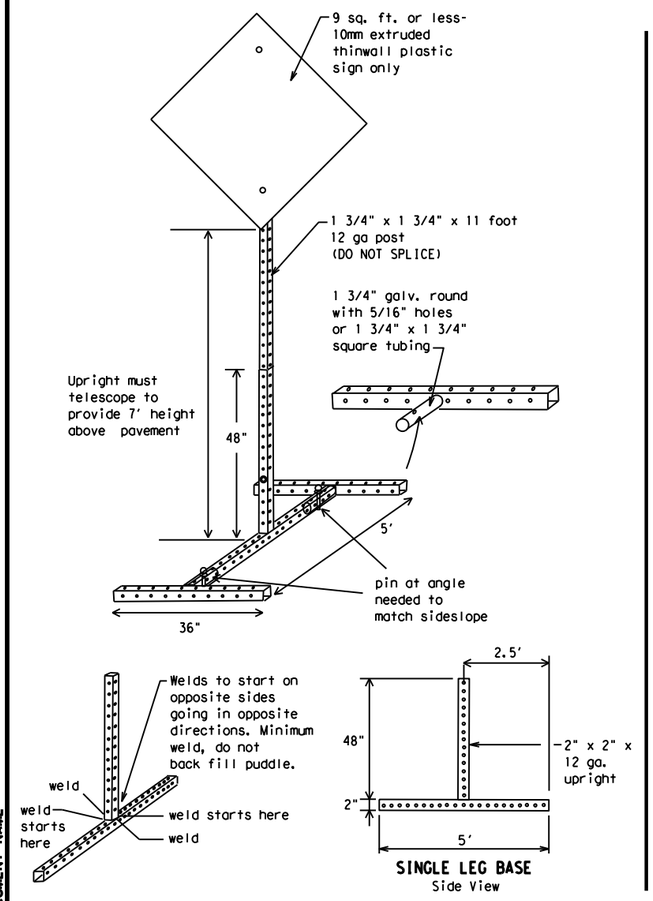
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

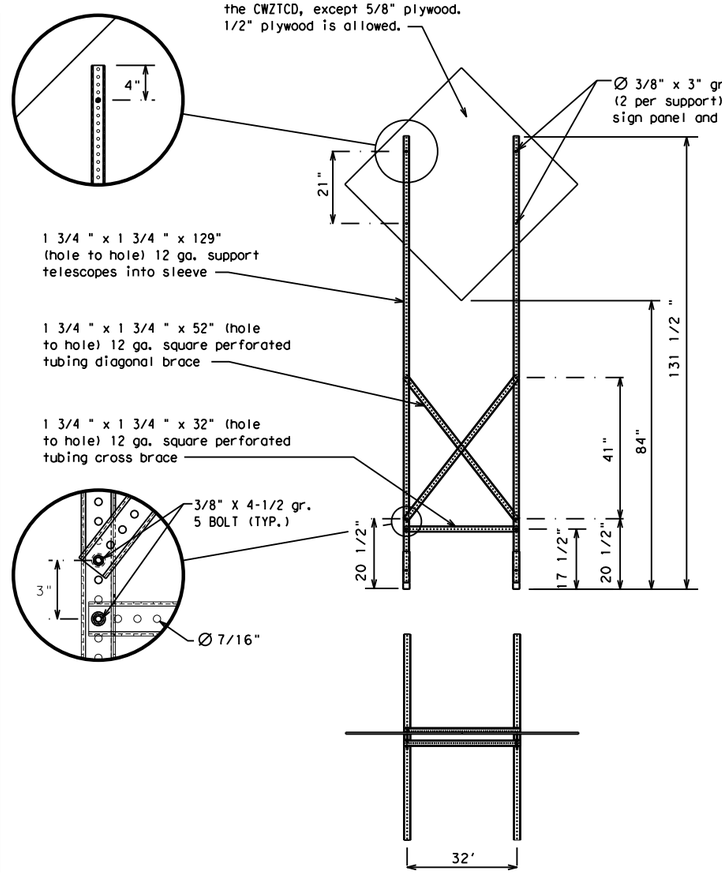


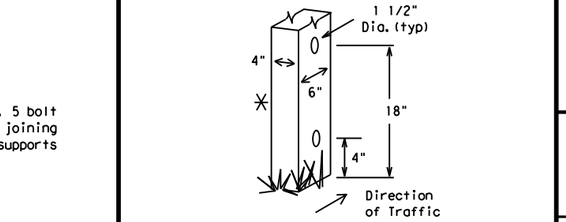
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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

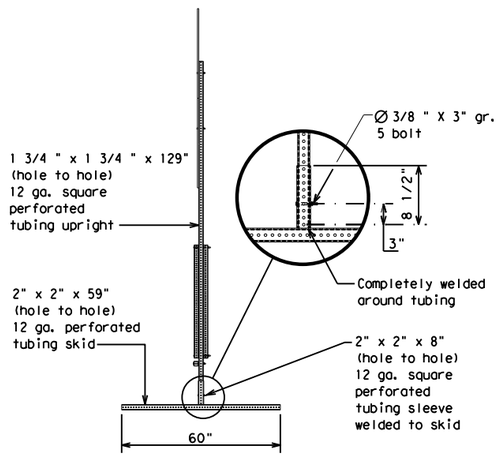






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



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

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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	1077	01	026	FM 434
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WAC	FALLS		21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

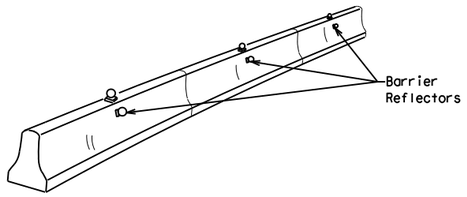
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WAC	FALLS		22

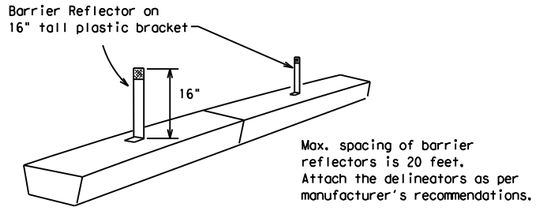
100

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.

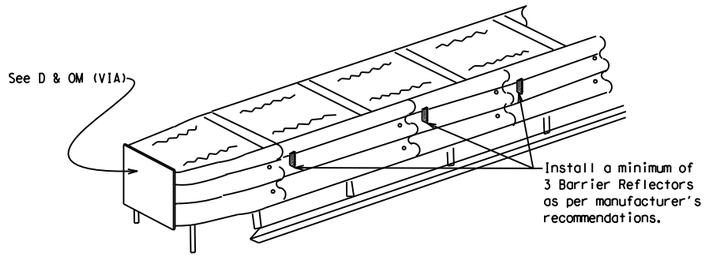


CONCRETE TRAFFIC BARRIER (CTB)

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)

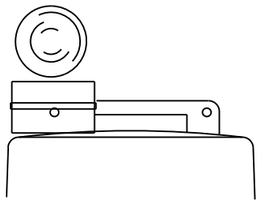


DELINEATION OF END TREATMENTS

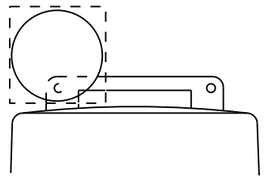
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

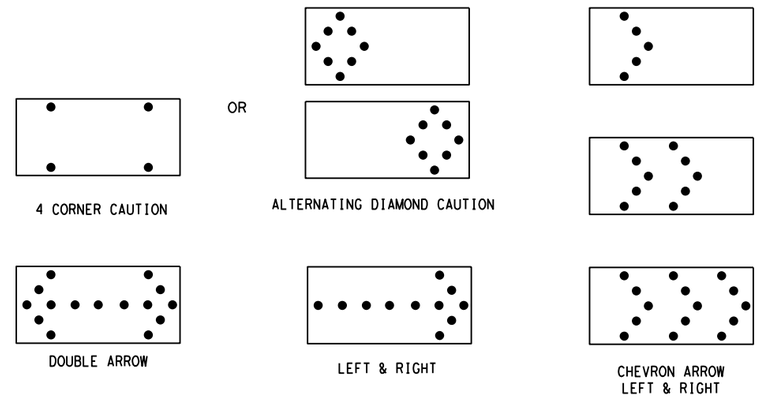
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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
REVISIONS	1077	01	026	FM 434
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	WAC	FALLS		23

101

DATE: 02/05/2021 10:03 AM
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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:

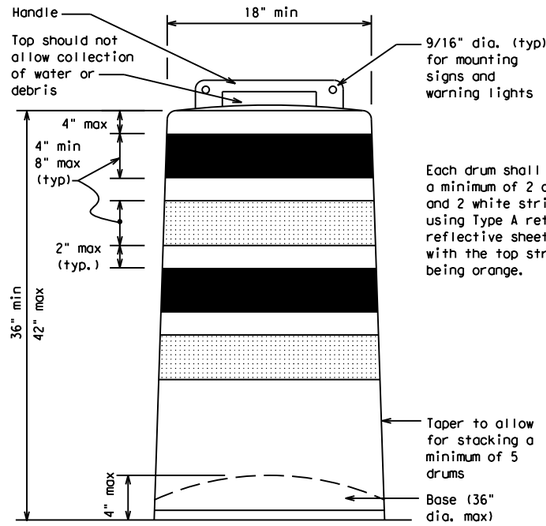
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

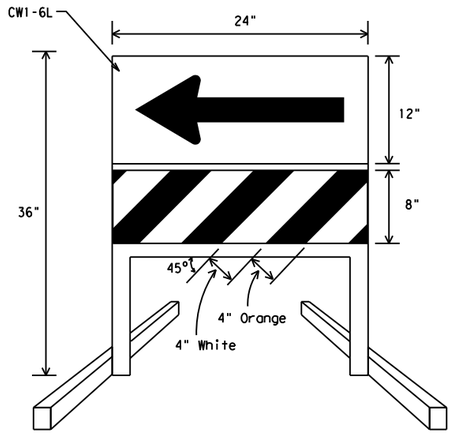
RETROREFLECTIVE SHEETING

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

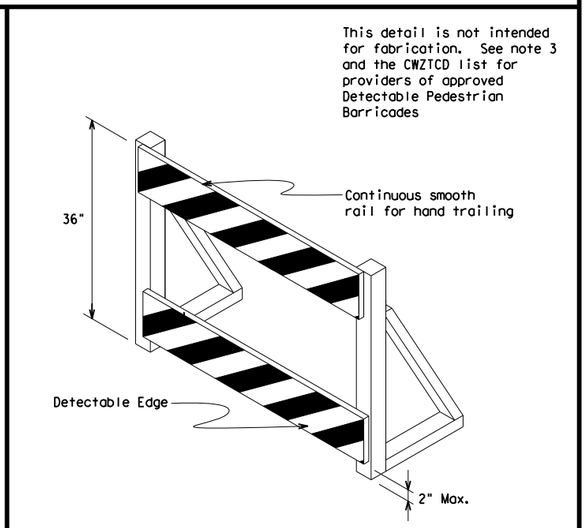
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.





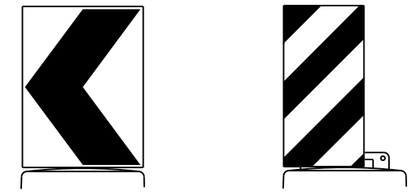
DIRECTION INDICATOR BARRICADE

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.

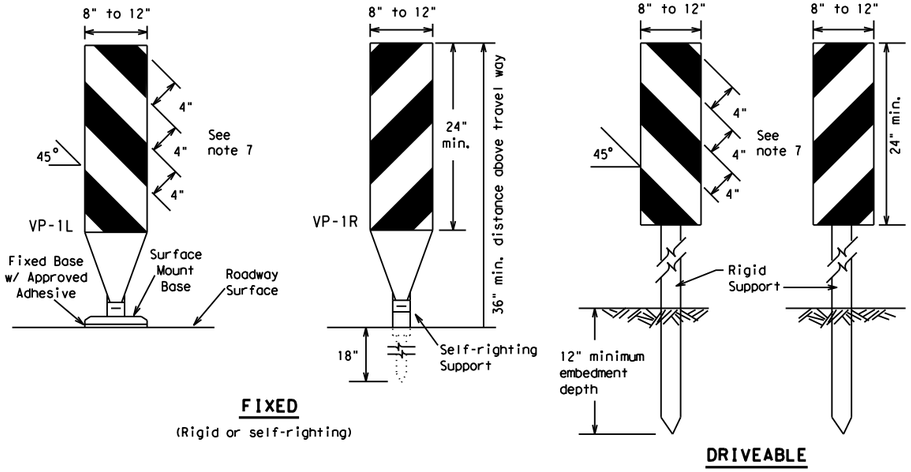
Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

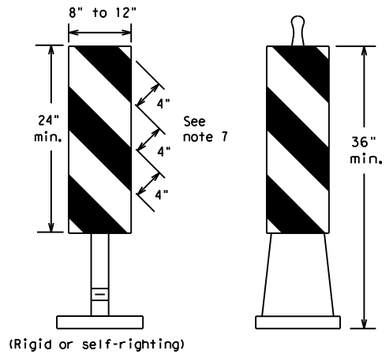
BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	WAC	FALLS		24



FIXED
(Rigid or self-righting)

DRIVEABLE

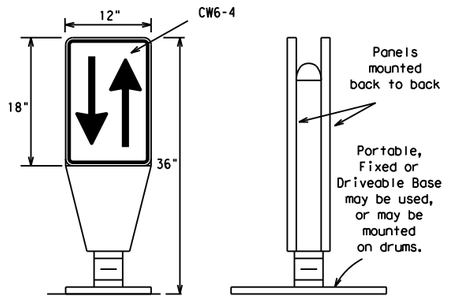


(Rigid or self-righting)

PORTABLE

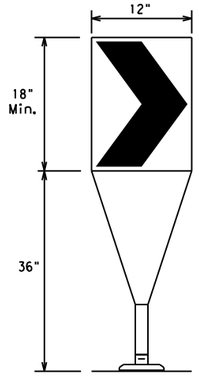
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



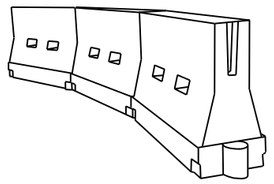
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
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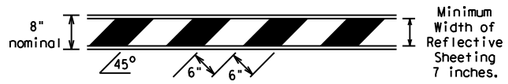
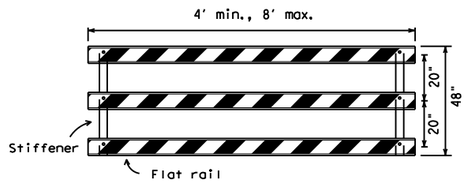
TYPE 3 BARRICADES

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.



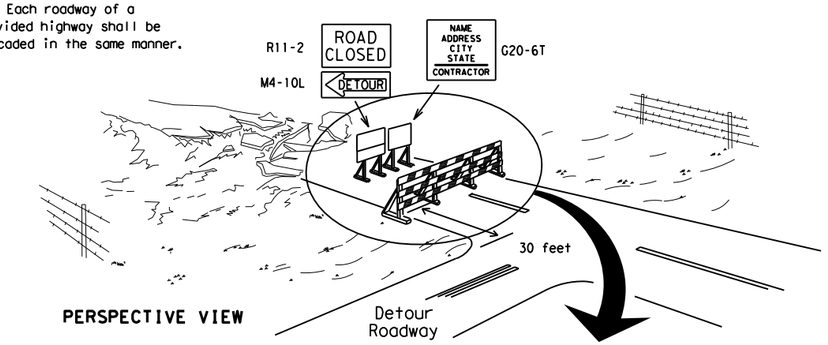
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

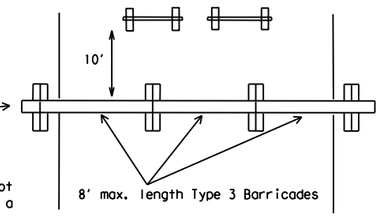
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

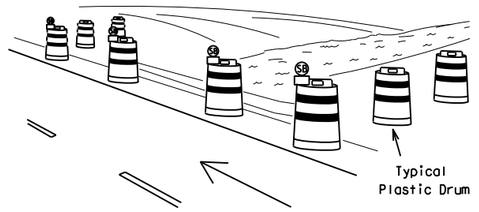
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

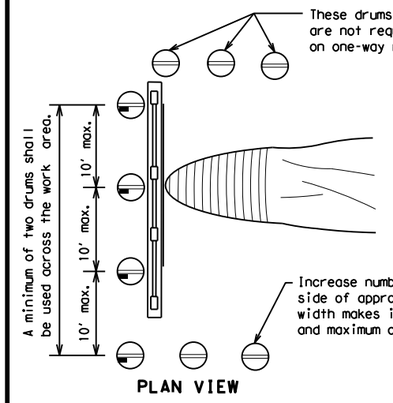
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

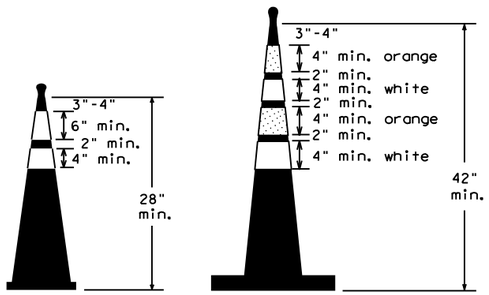
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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

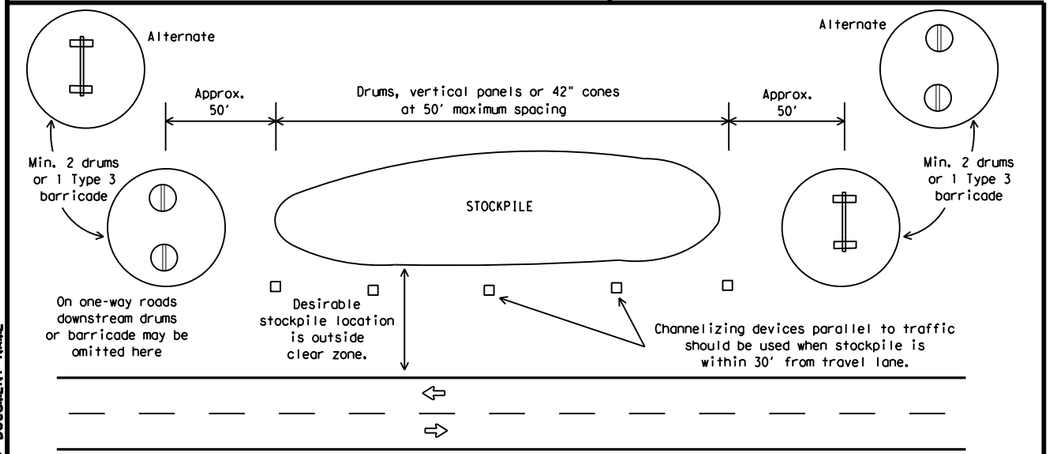
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

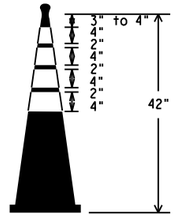
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

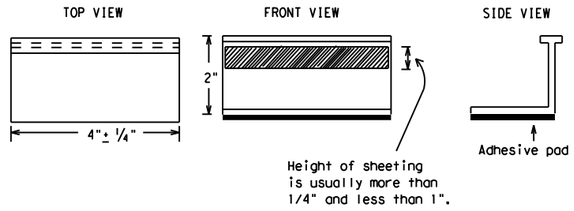
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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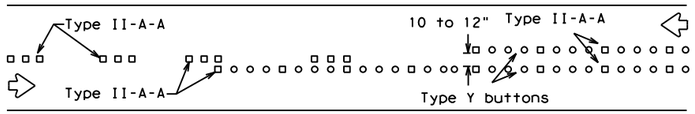
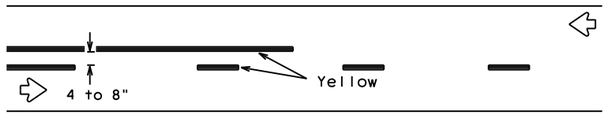
PAVEMENT MARKING PATTERNS

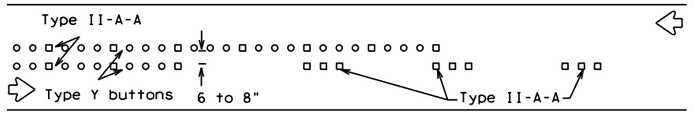
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



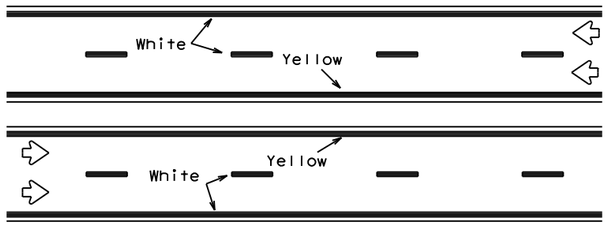
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



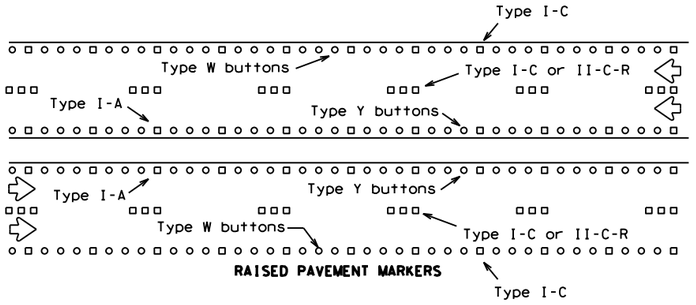
RAISED PAVEMENT MARKERS - PATTERN B

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

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



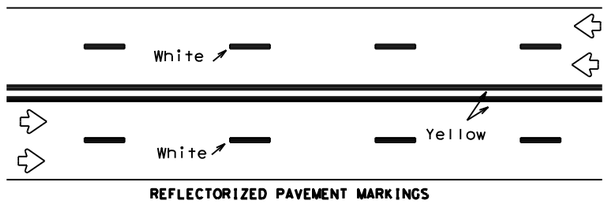
REFLECTORIZED PAVEMENT MARKINGS



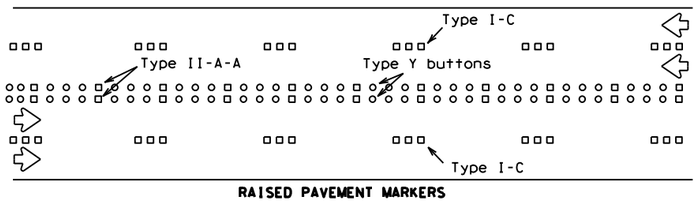
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



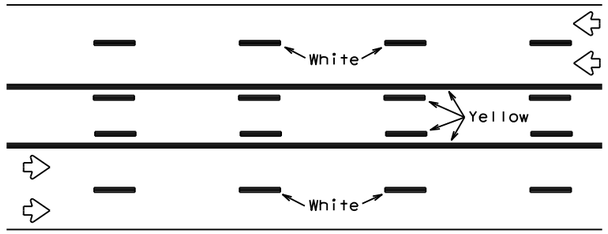
REFLECTORIZED PAVEMENT MARKINGS



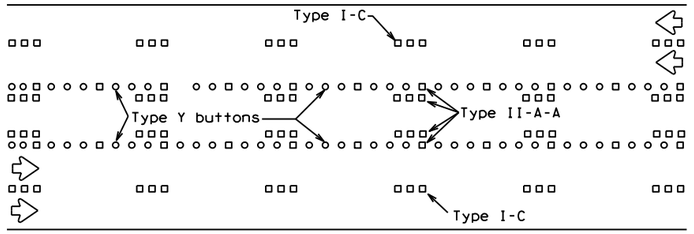
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

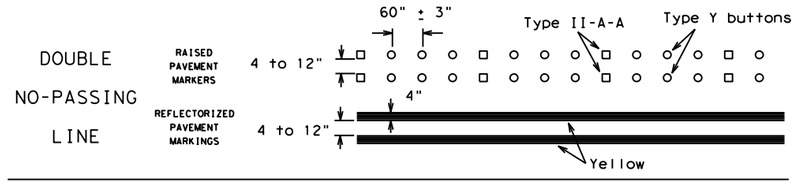
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

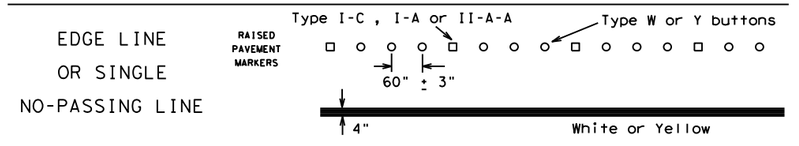
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

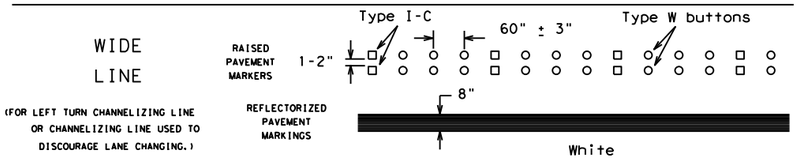


EDGE LINE OR SINGLE NO-PASSING LINE



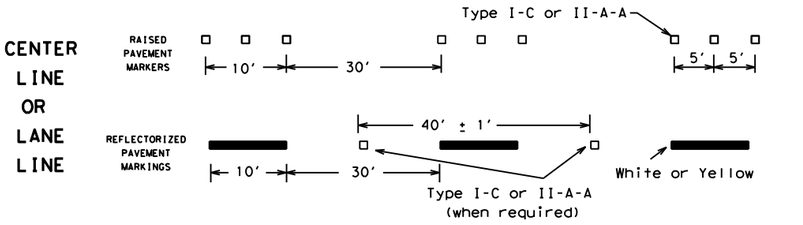
WIDE LINE

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

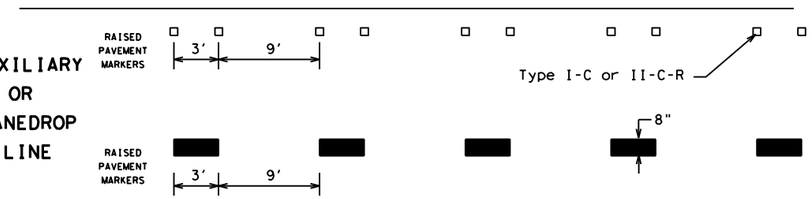


BROKEN LINES

CENTER LINE OR LANE LINE

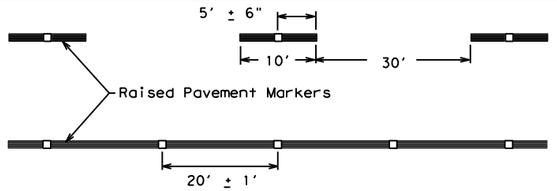


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

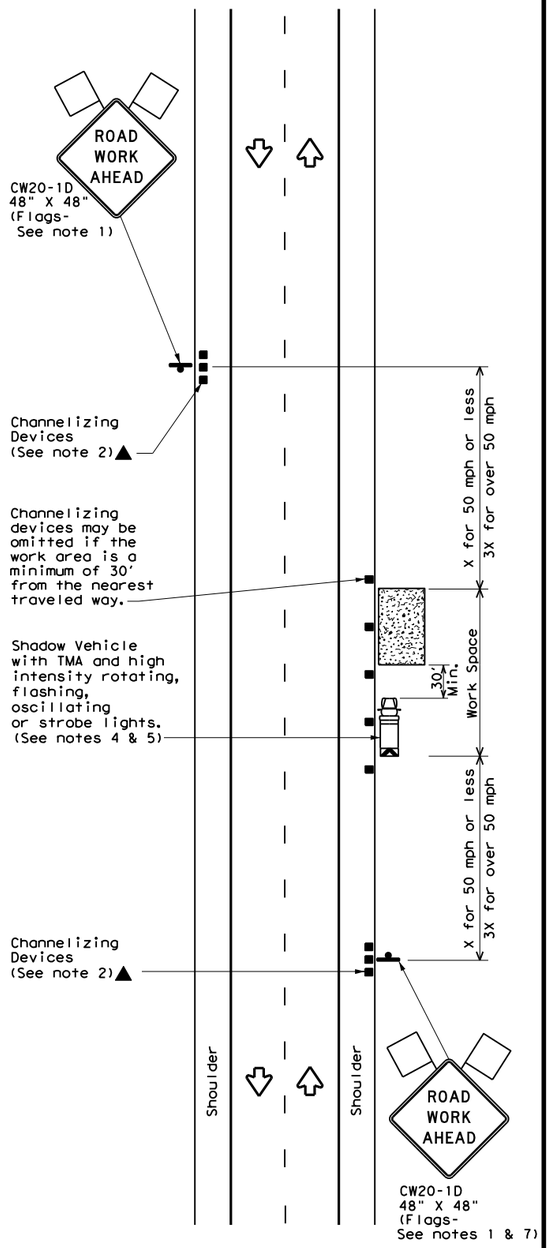
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

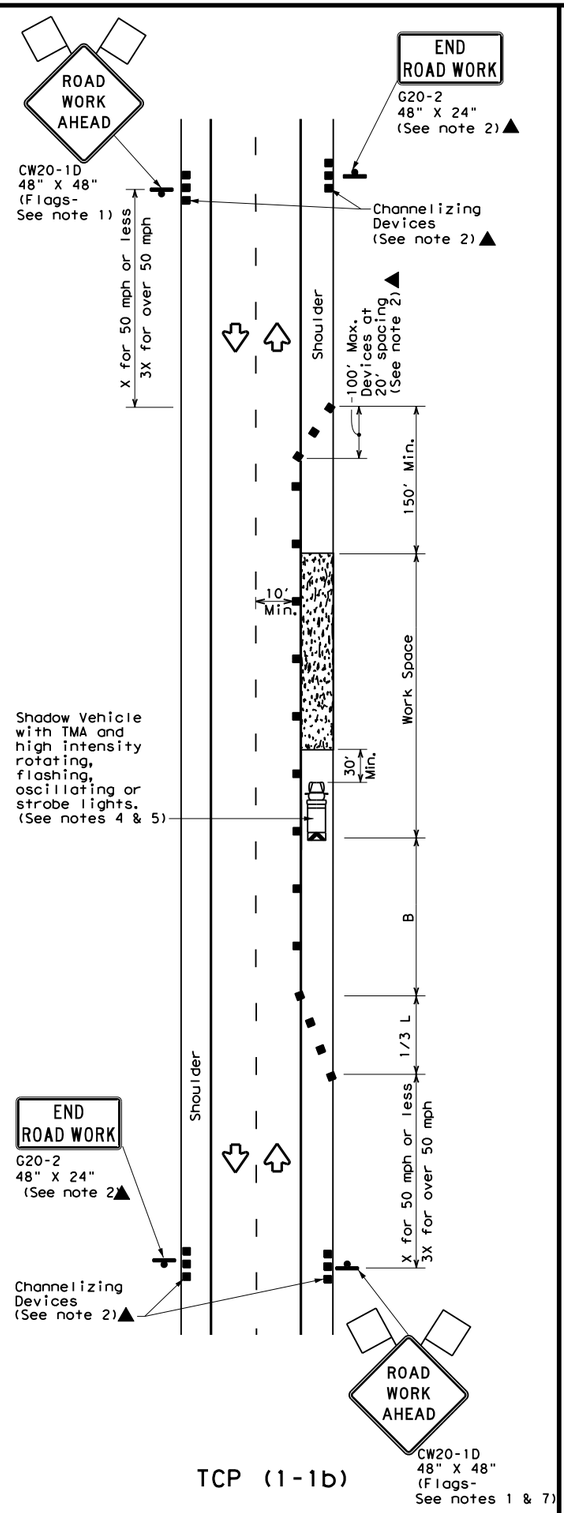
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	WAC	FALLS		28
11-02 8-14				

106



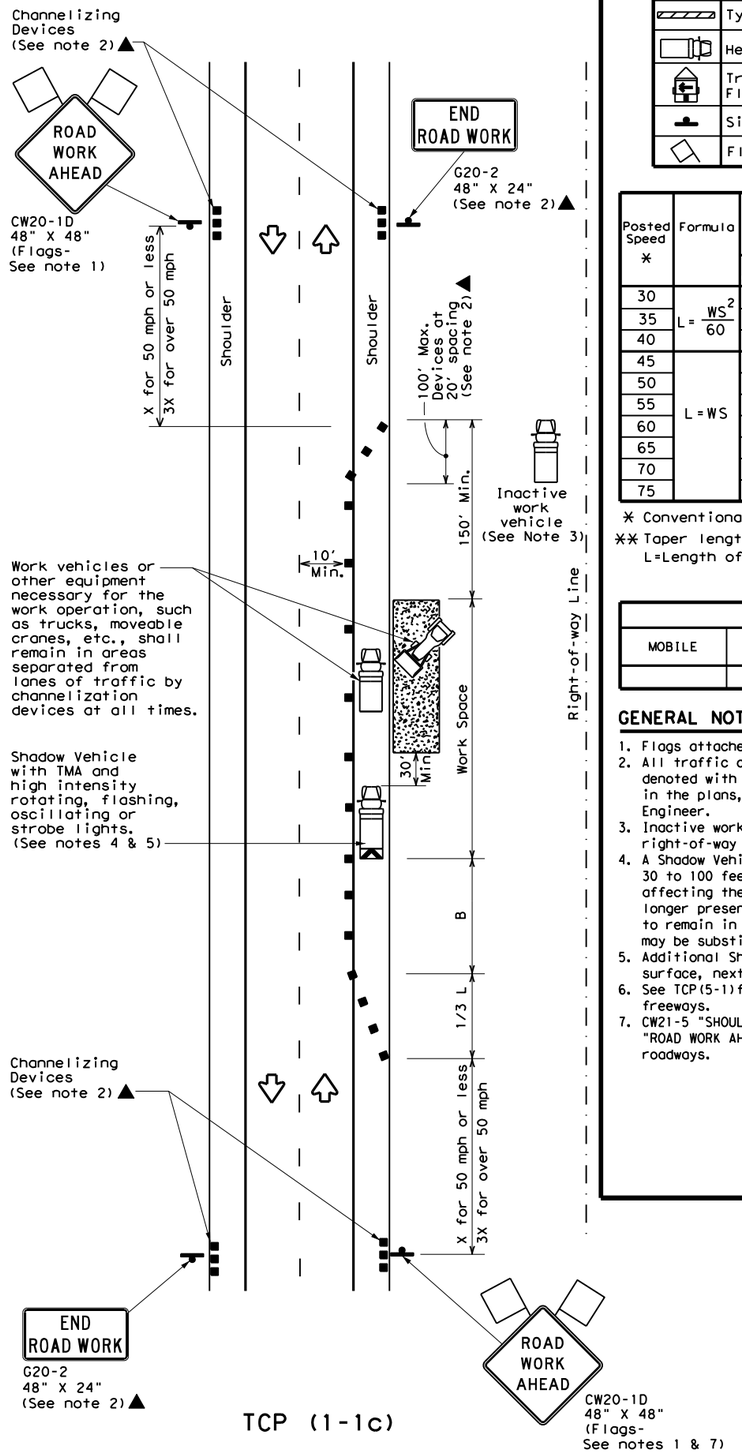
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98	1077	01	026	FM 434
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	WACO	FALLS		29

DATE: 02/18/2021 9:00:39 PM
FILE: DOCUMENTNAME:standards\tcp1-1-18.dgn

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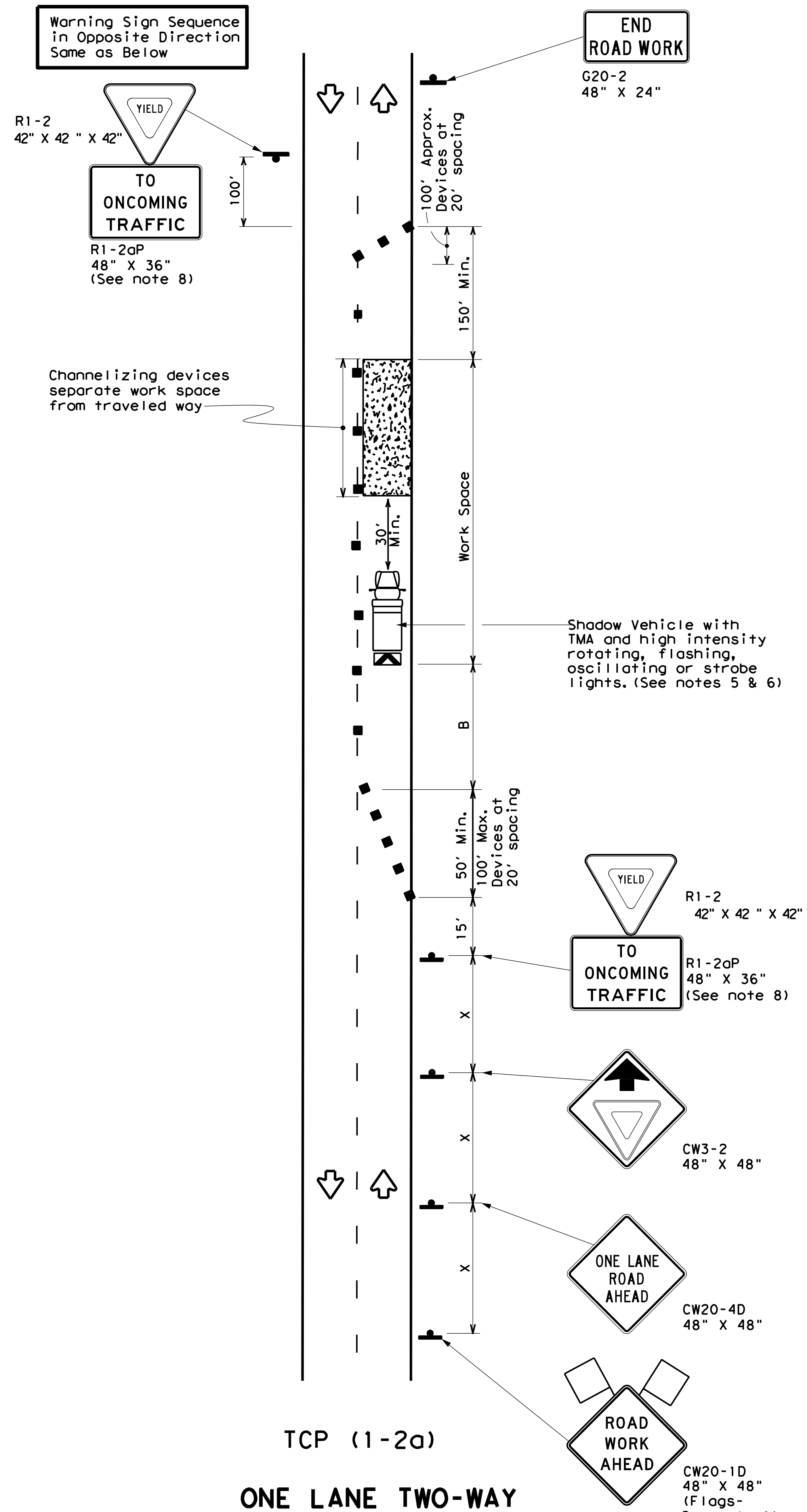
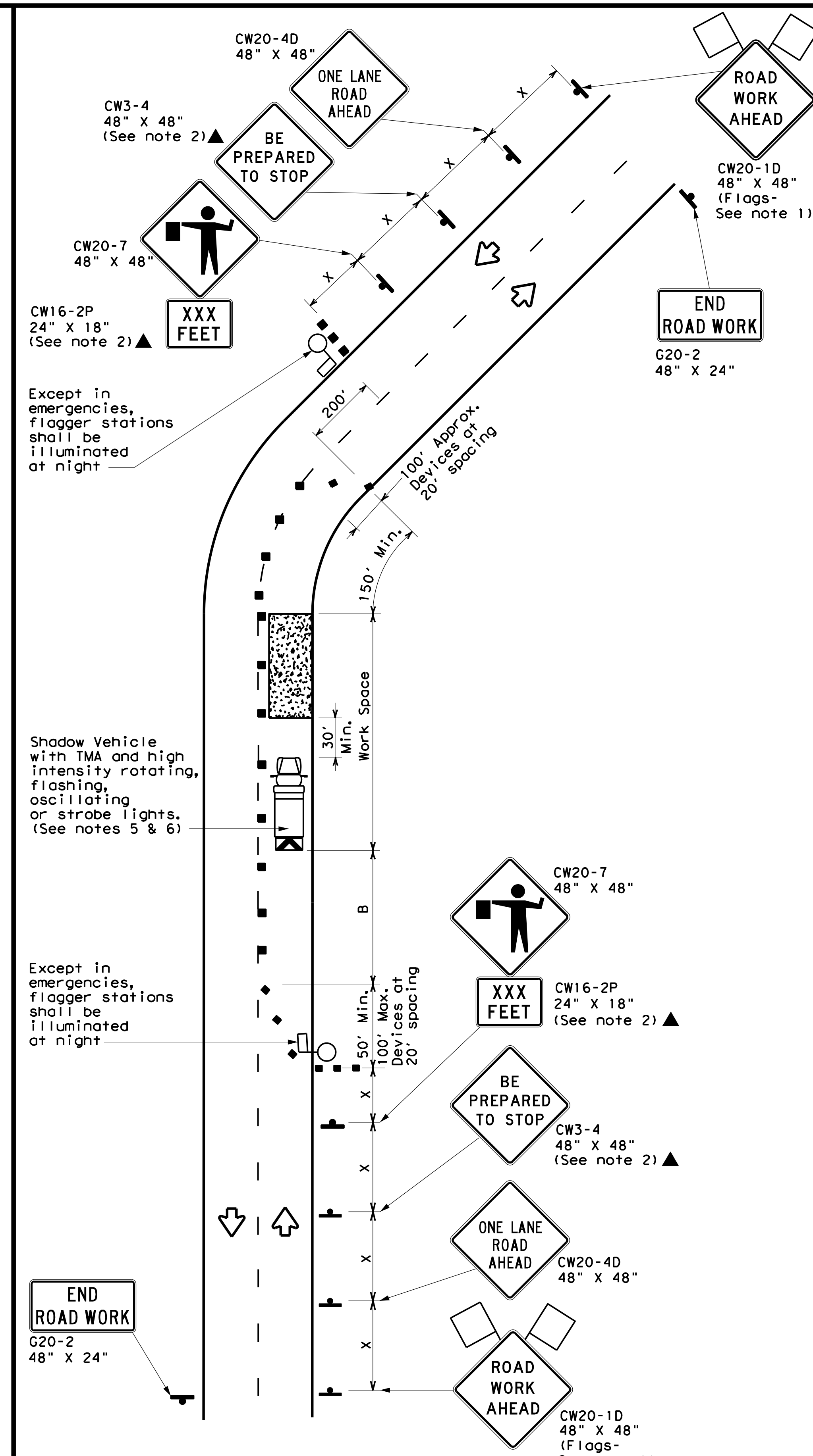


TCP (1-2a)

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

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	1077	01	026	FM 434
	DIST		COUNTY	SHEET NO.
	WACO		FALLS	30

152

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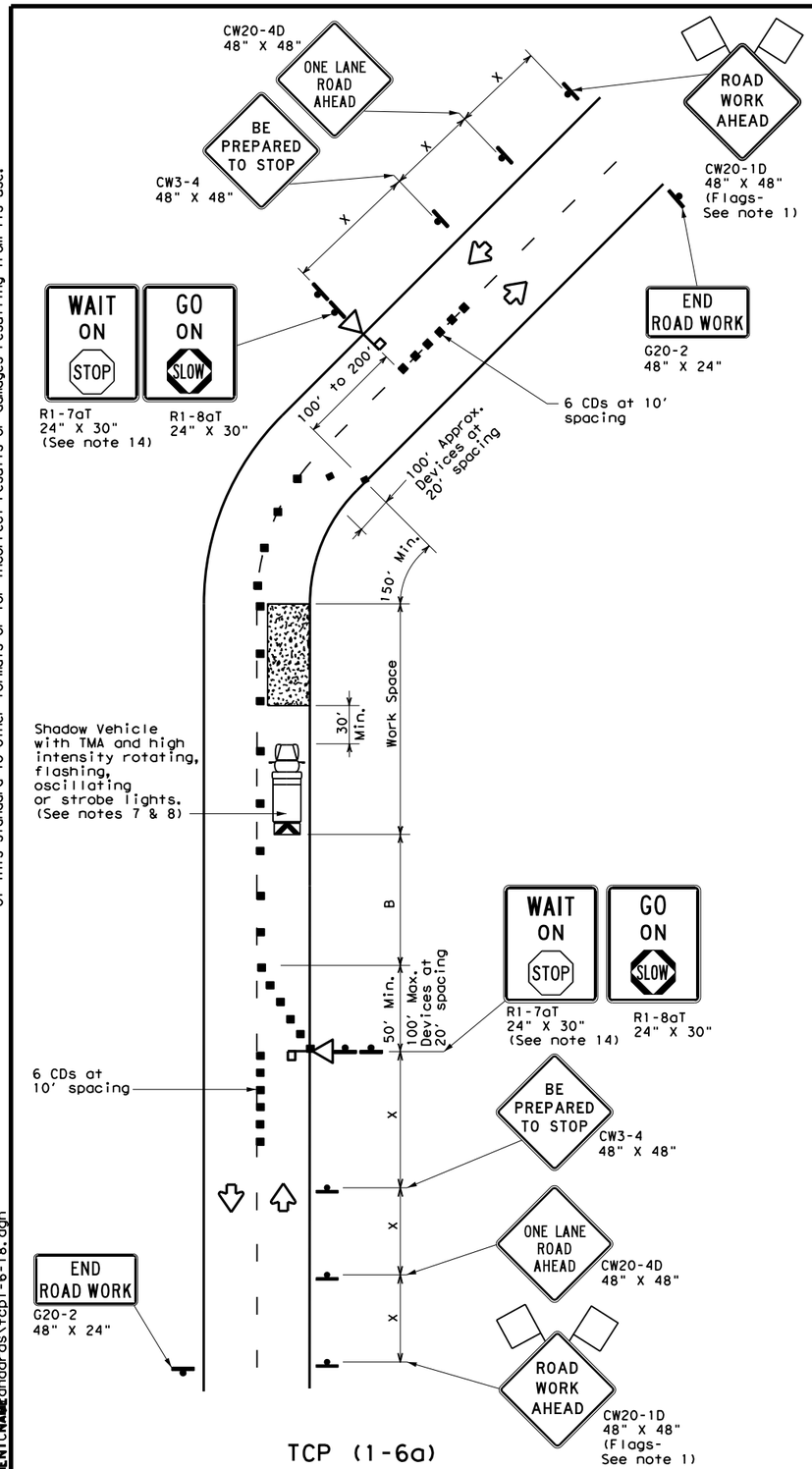
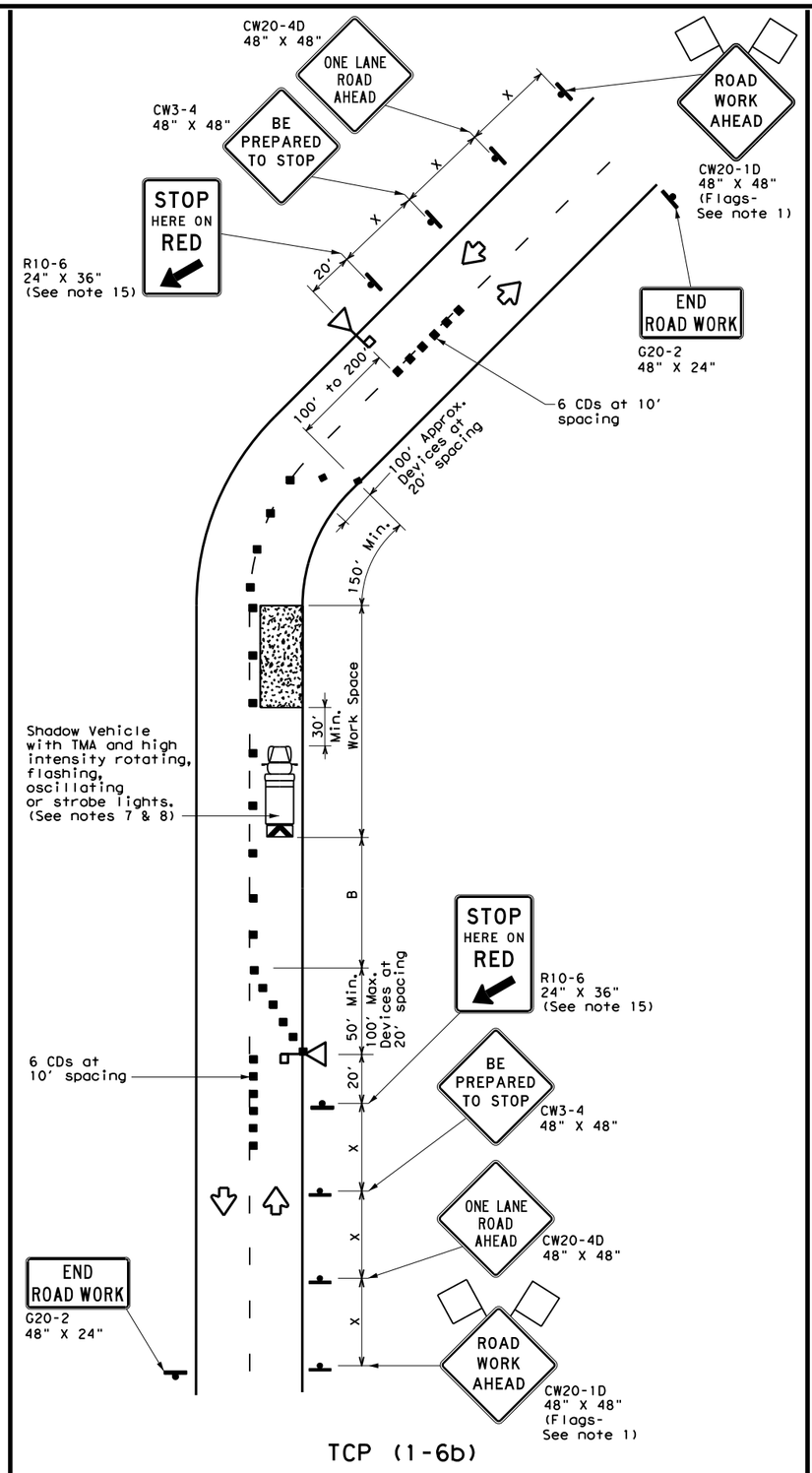


TCP (1-6a)

ONE LANE TWO-WAY CONTROL WITH STOP/SLOW AFADs



TCP (1-6b)

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
AUTOMATED FLAGGER ASSISTANCE DEVICES (AFADS)

TCP(1-6)-18

FILE: tcp1-6-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		31

DATE: DATE 2012
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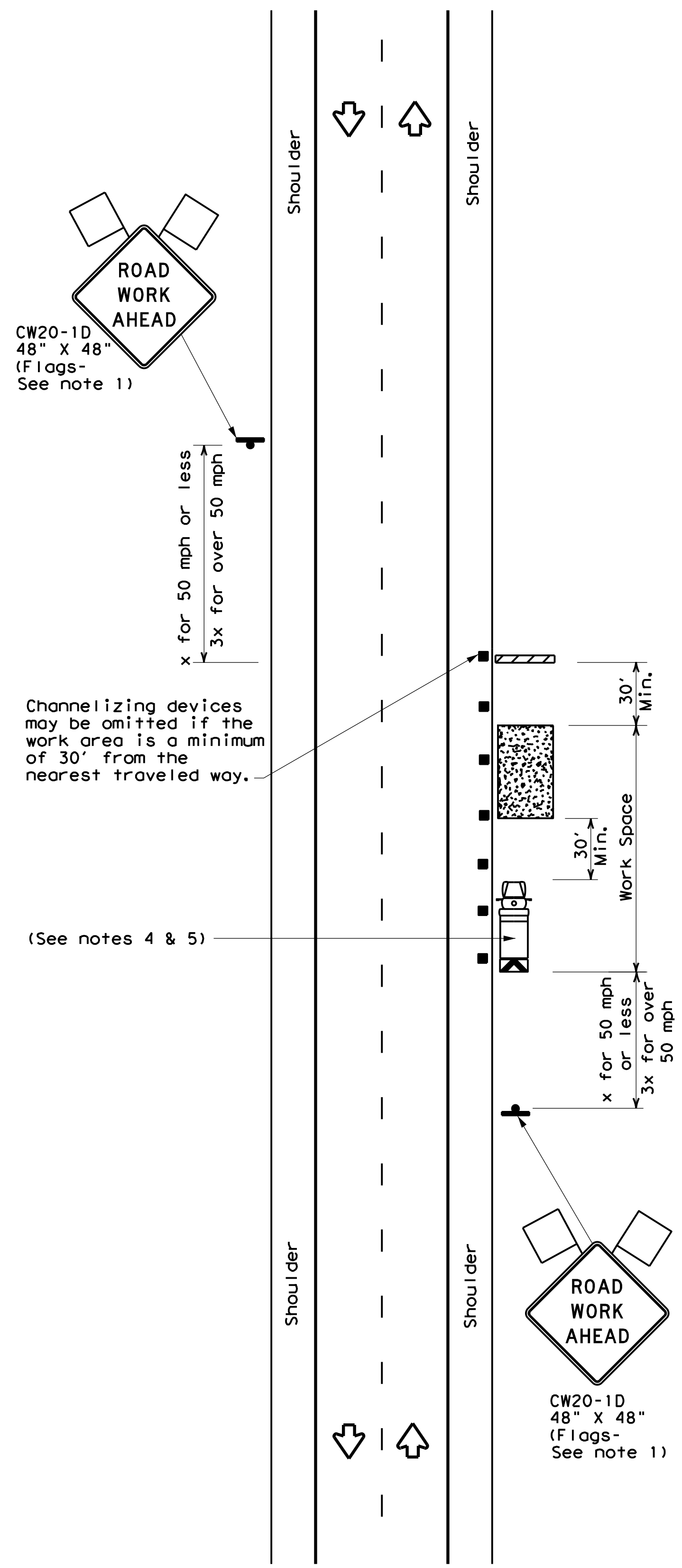
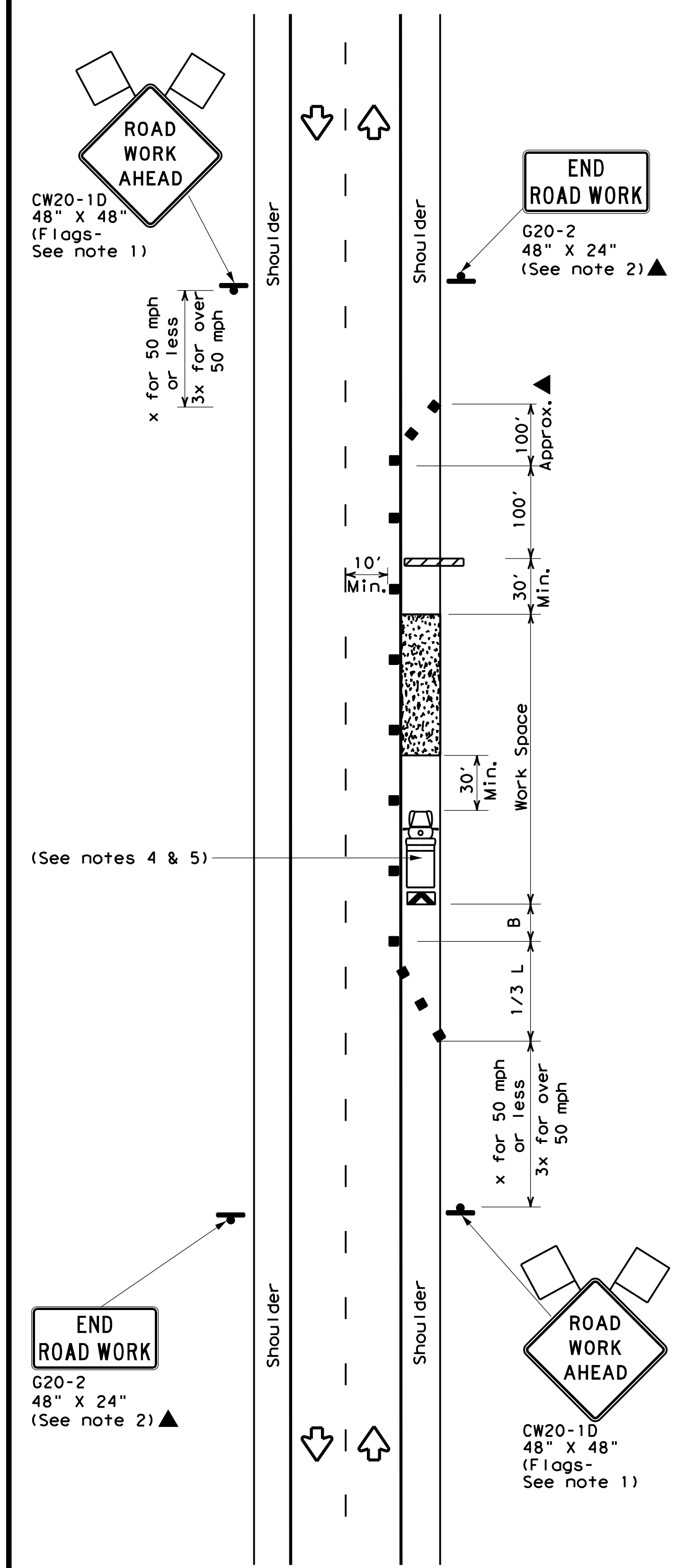


TCP (2-1a)

WORK SPACE NEAR SHOULDER

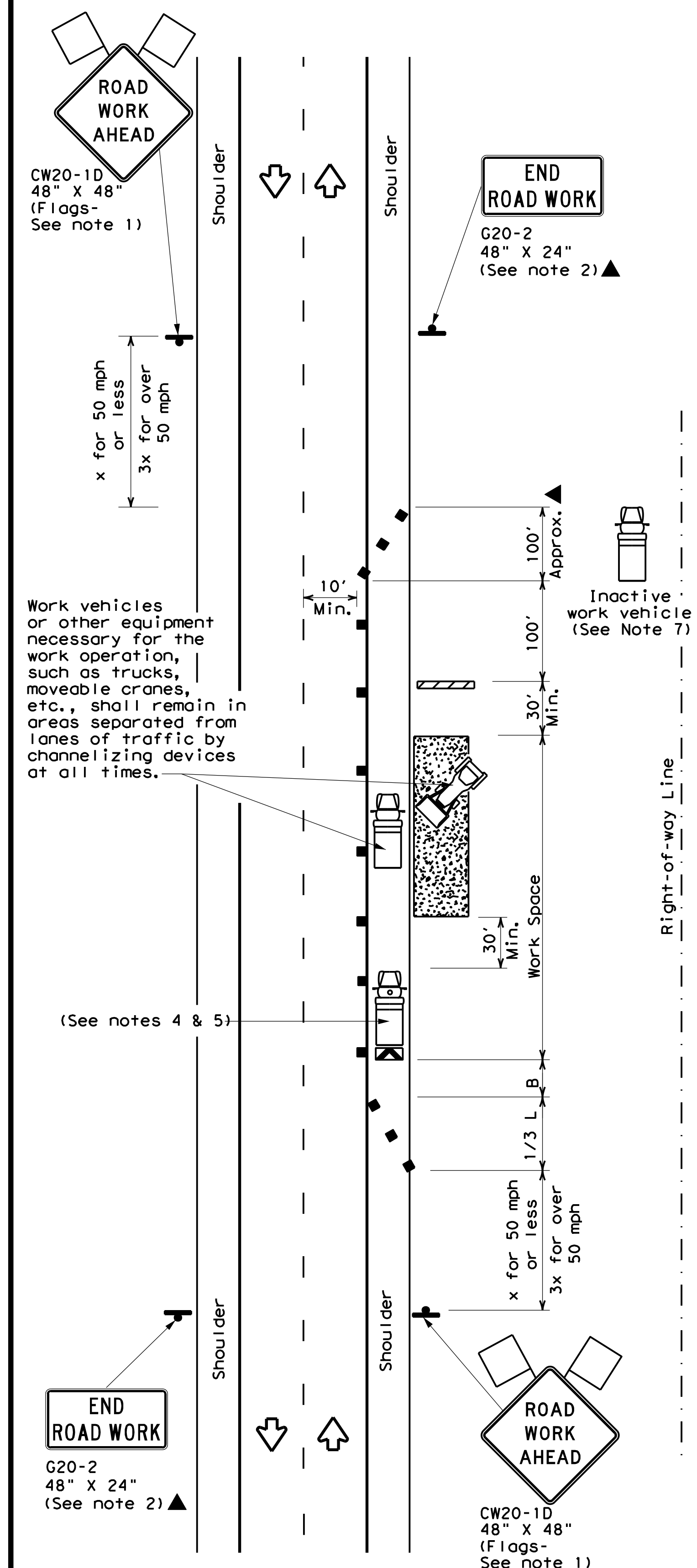
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn		DN:	CK:	DW:	CK:
©TxDOT December 1985		CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18		1077	01	026	FM 434
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		WACO		FALLS	32

161

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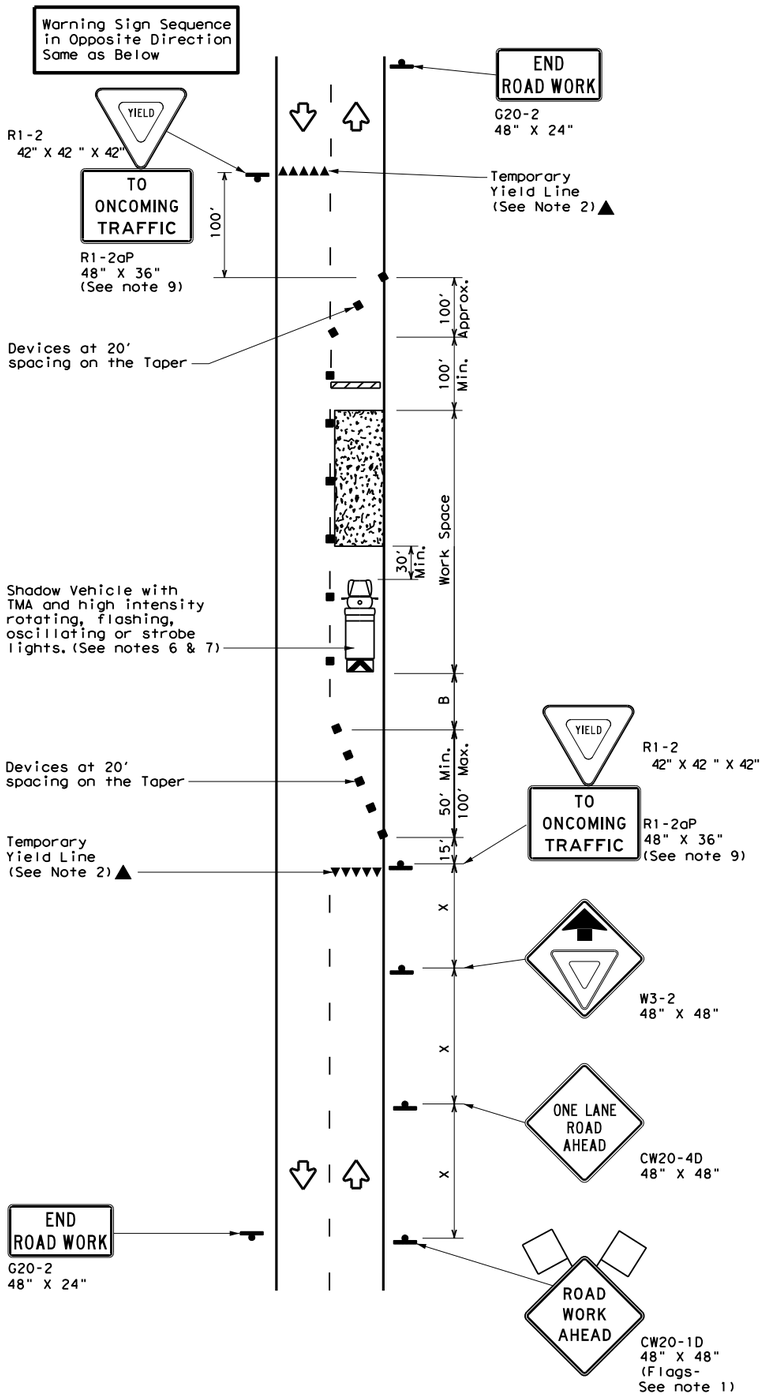
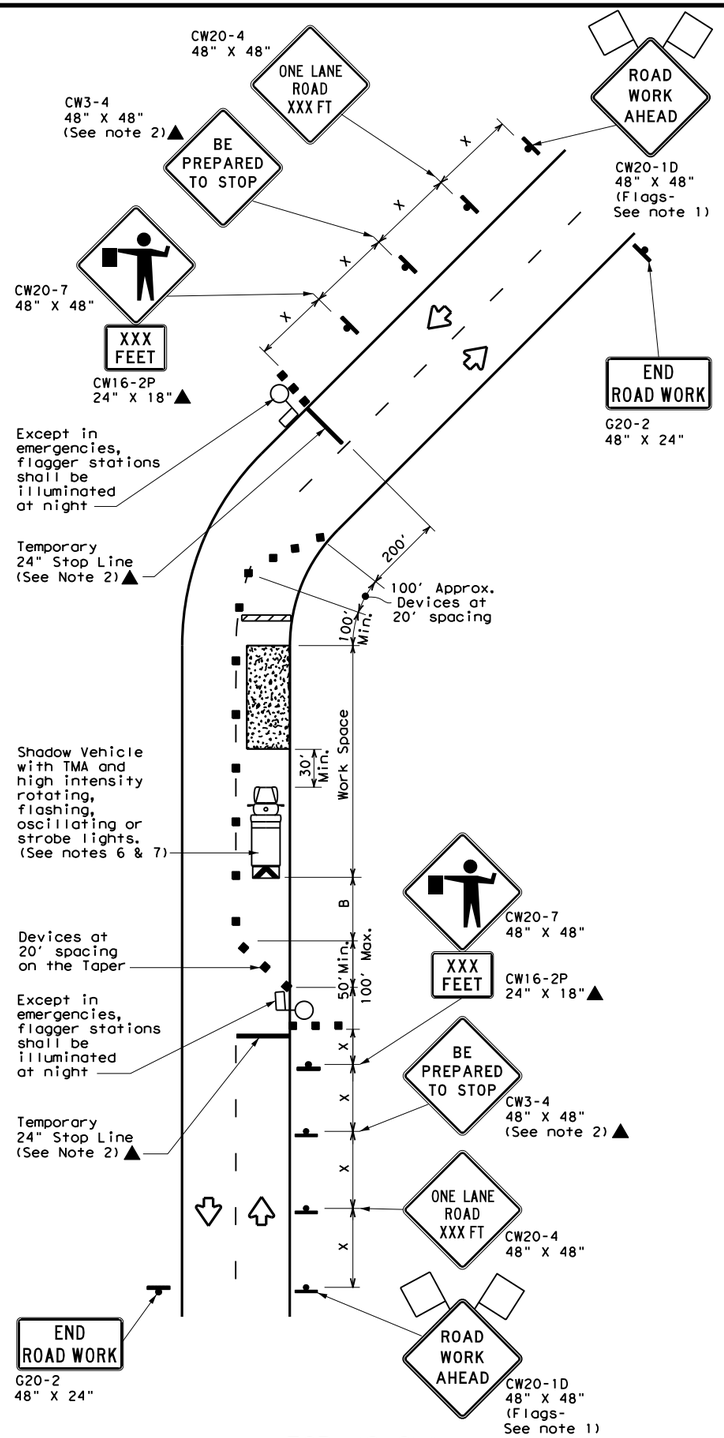


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1077	01	026	FM 434
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	WACO	FALLS		33

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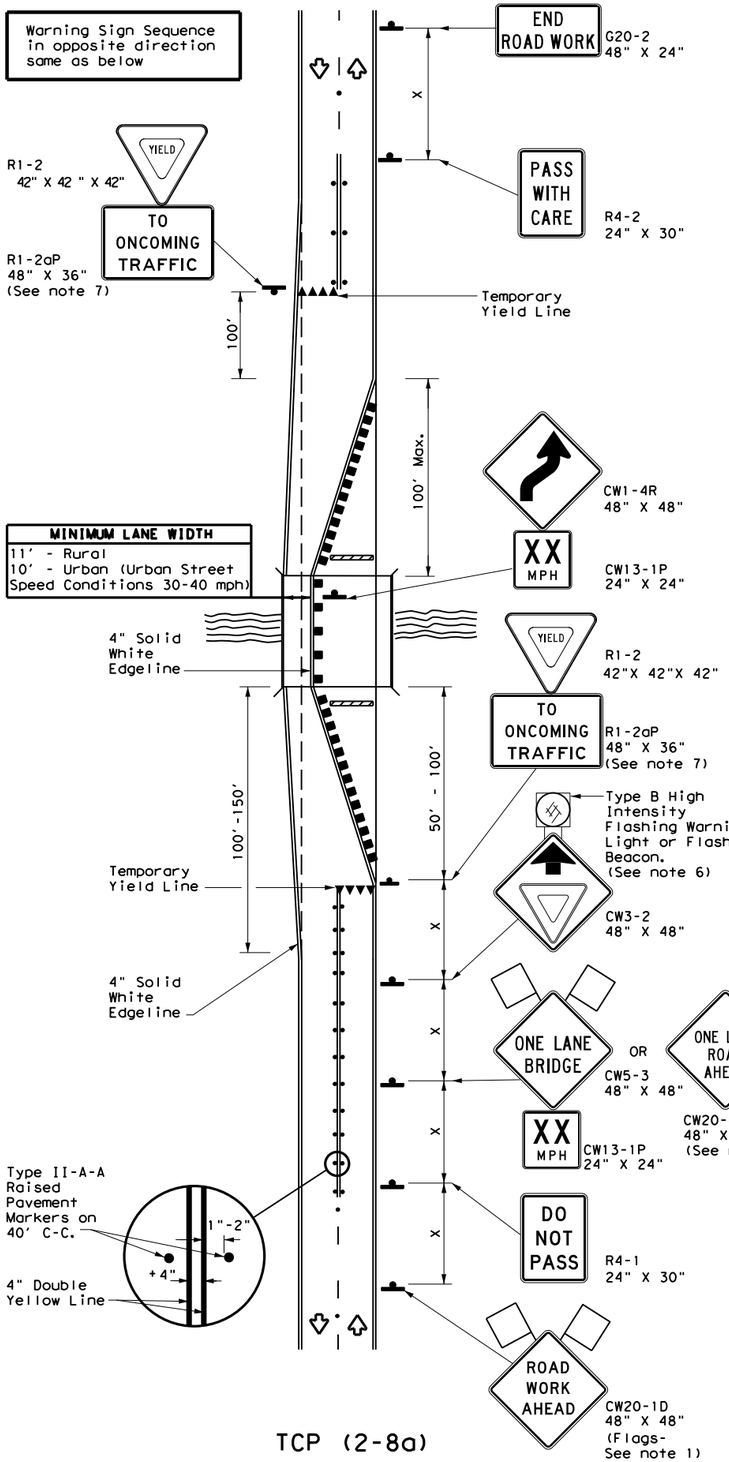
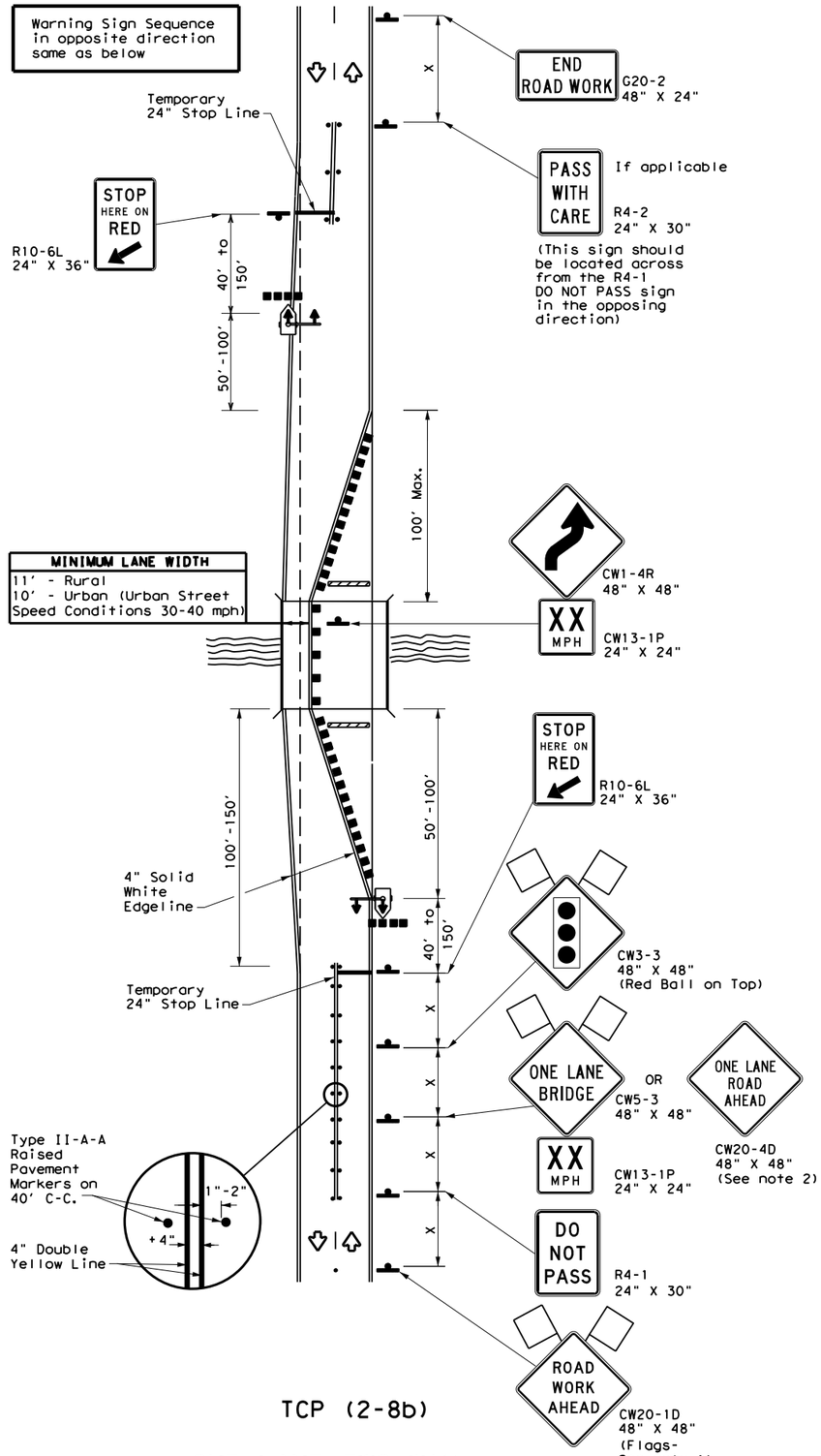


TCP (2-8a)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH YIELD SIGNS
(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

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.

TCP (2-8a)

5. Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
6. If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
7. The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.

TCP (2-8b)

8. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
9. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

Texas Department of Transportation | Traffic Operations Division Standard

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

TCP(2-8)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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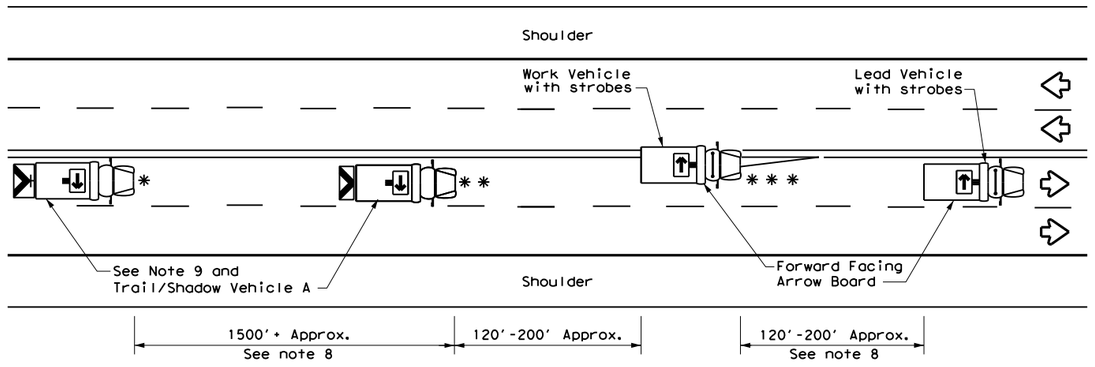
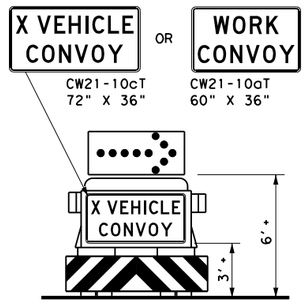
1-97 2-12	WACO	FALLS		34
4-98 2-18				



TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

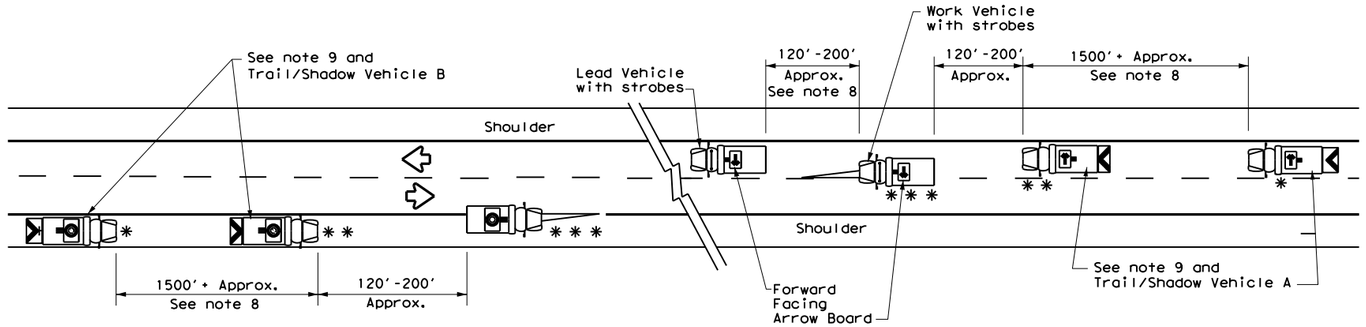
with RIGHT Directional display Flashing Arrow Board

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

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

GENERAL NOTES

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

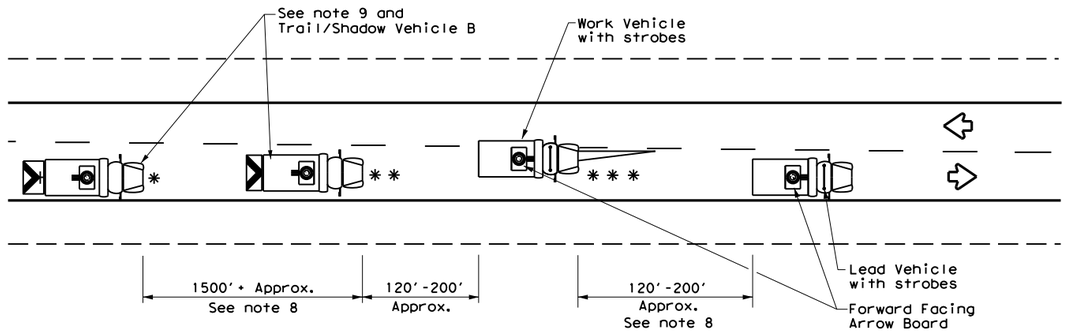


WORK ON SHOULDER

WORK ON TRAVEL LANE

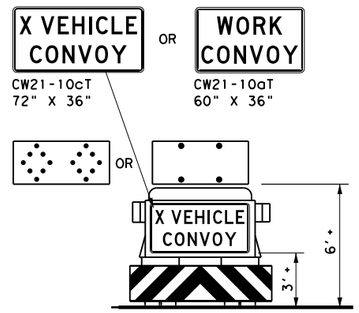
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



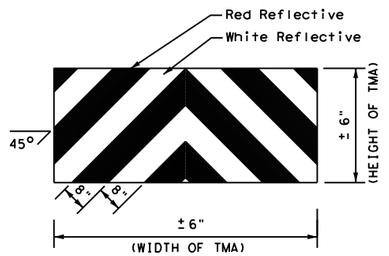
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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	WACO	FALLS		35

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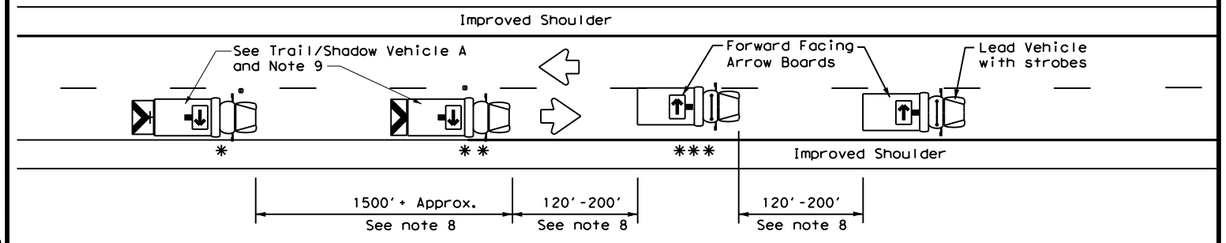
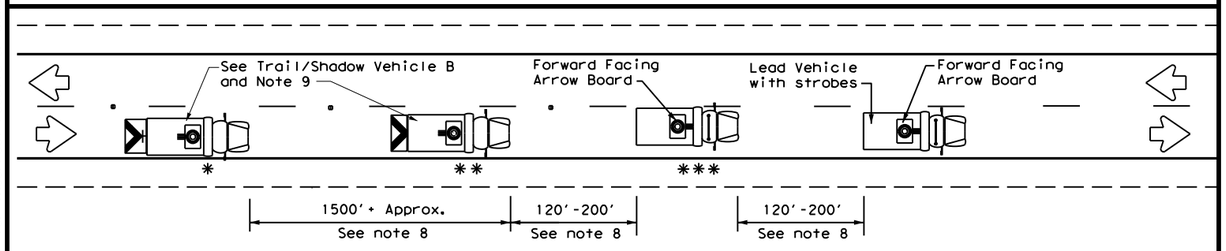


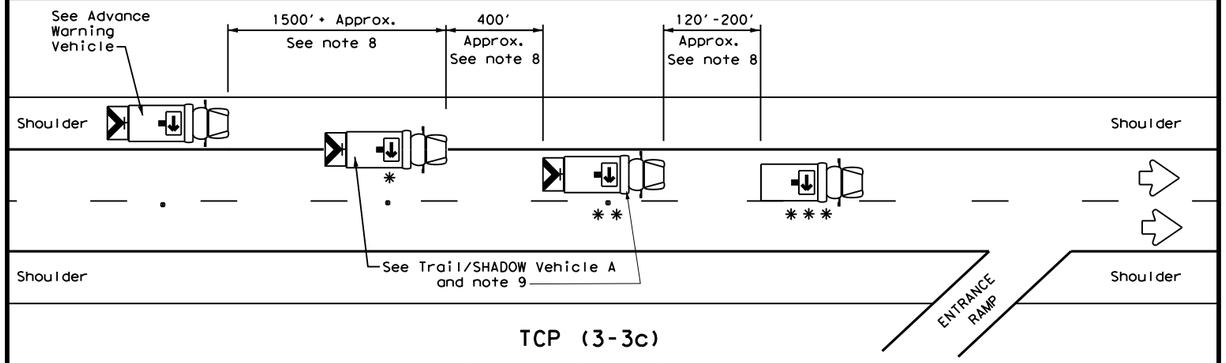
TCP (3-3a)

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



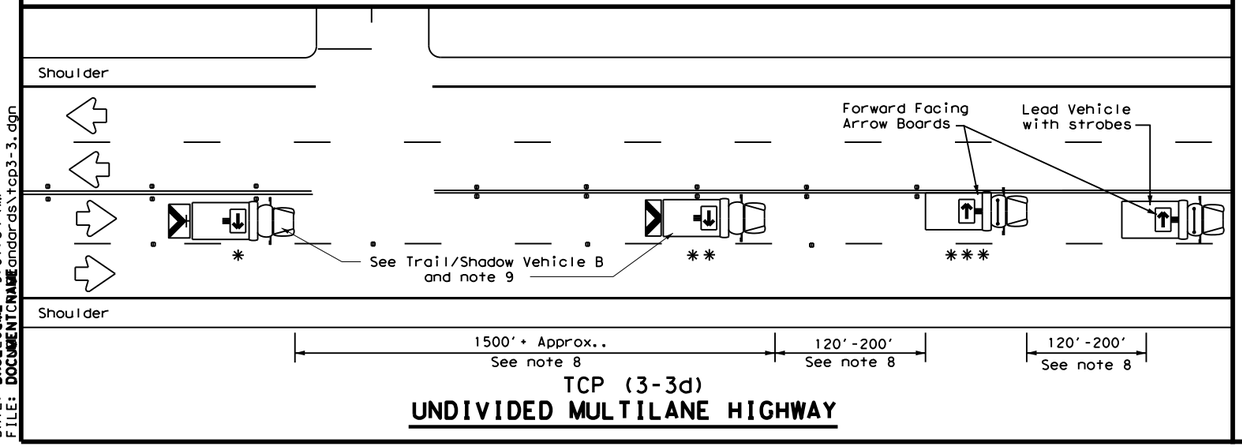
TCP (3-3b)

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



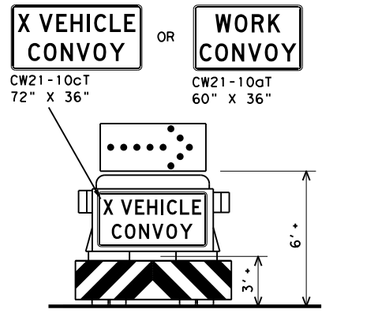
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



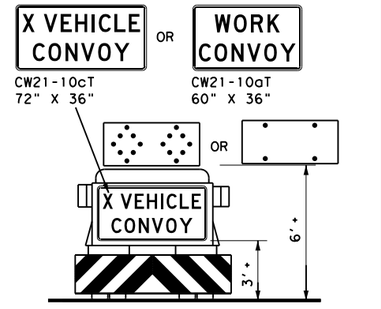
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



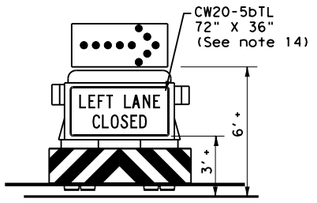
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

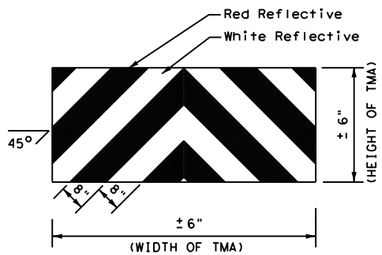


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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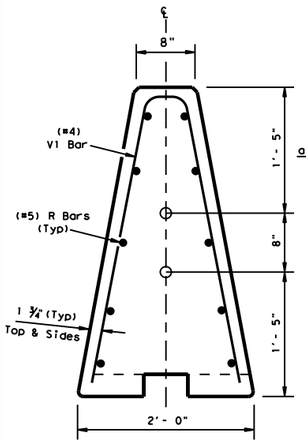
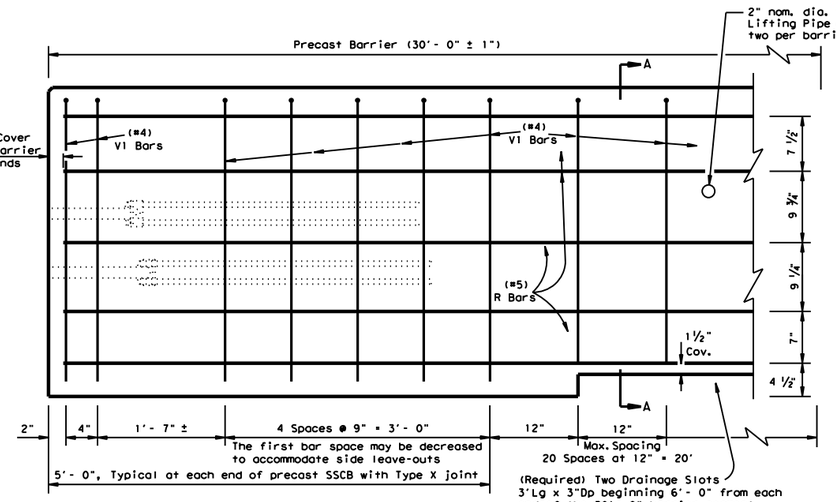


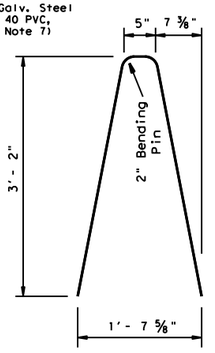
End View
Precast Barrier

Pipe locations for Joint Type X connection



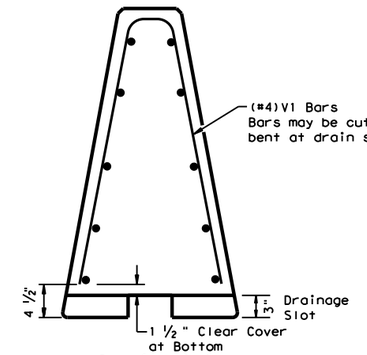
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



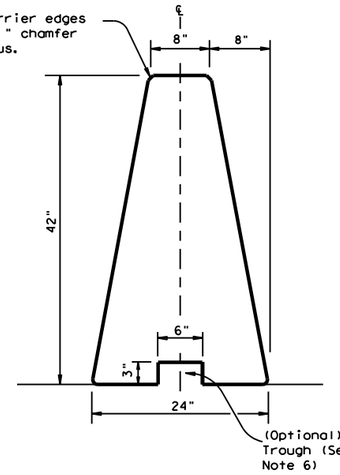
V1 Bar
#4 Rebar

Note:
V1 Bars above the drainage slots may bent to accomadate 1 ½" clear cover as directed by the Engineer.



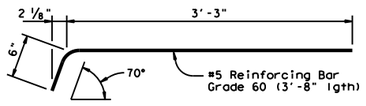
Section A-A
Steel Placement at (Required) Drainage Slots

All precast barrier edges shall have a ¾" chamfer or tooled radius.



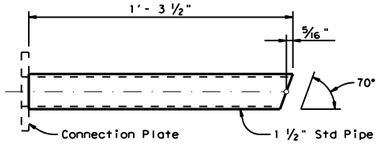
Single Slope Concrete Traffic Barrier

Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.



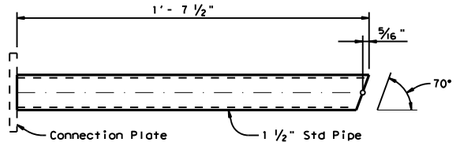
DEFORMED BAR ANCHOR DETAILS

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



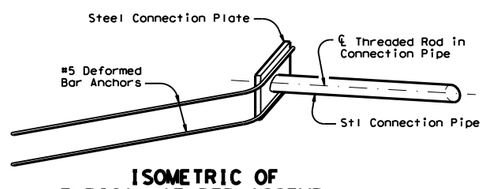
UPPER CONNECTION PIPE DETAILS

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.

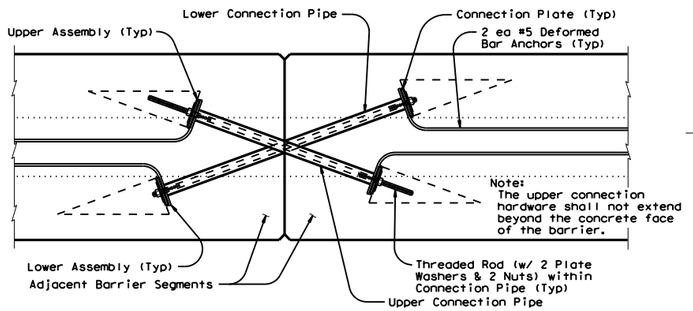


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

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 a tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
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.
9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."



TYPE X JOINT INSTALLATION DETAIL

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

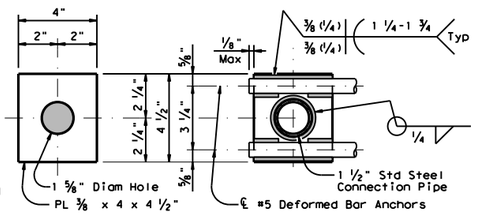
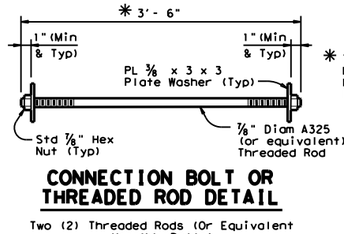


PLATE DIMENSIONS **WELDING DETAILS**

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.

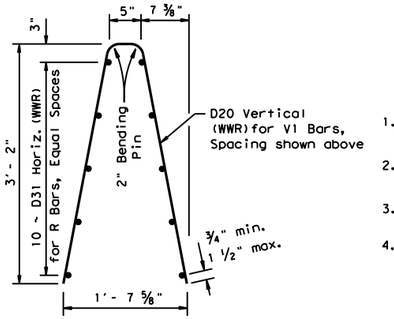


* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts)
(w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts)
required per Joint.

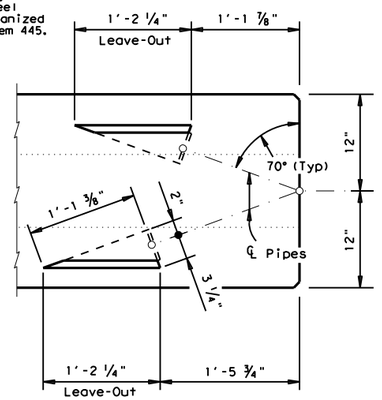
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



Welded Wire Reinforcement (WWR) Option for Bars R and V1

(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".



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
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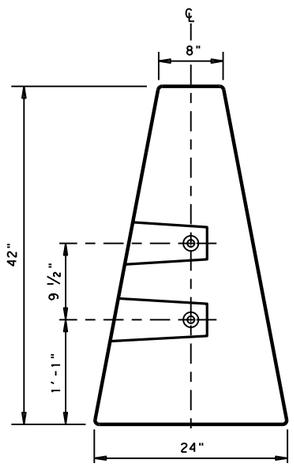
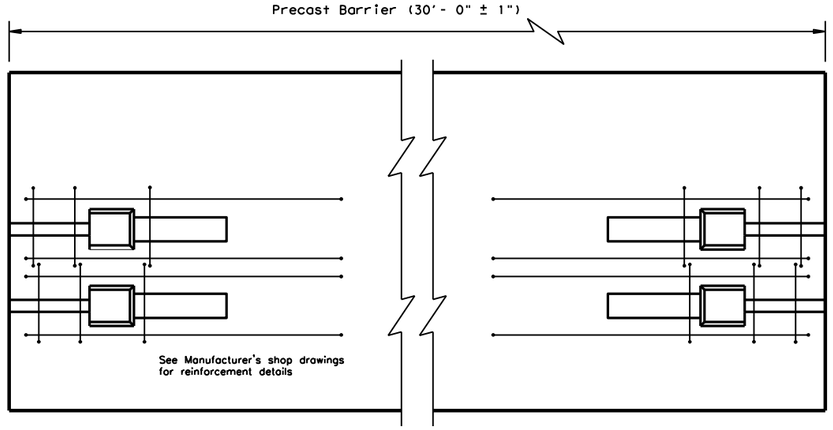
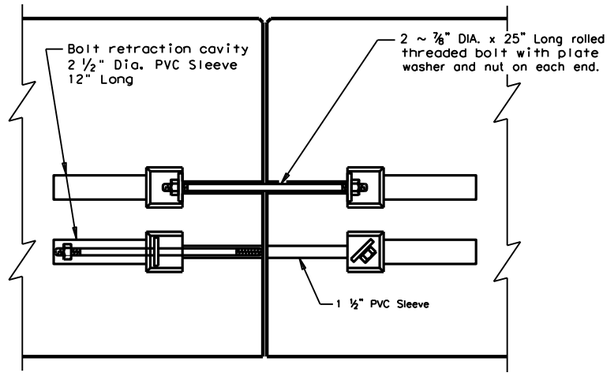


END VIEW
"QUICK-BOLT" POCKET LOCATIONS



ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details



ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

Joint Connection (Type Q)

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

VIEW FROM ABOVE
J-J HOOK CONNECTION

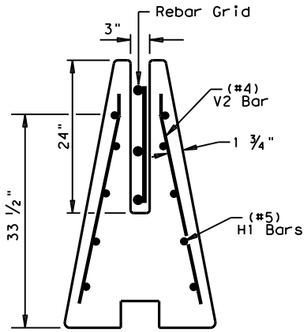
END VIEW

Proprietary Joint Connections (SSCB)

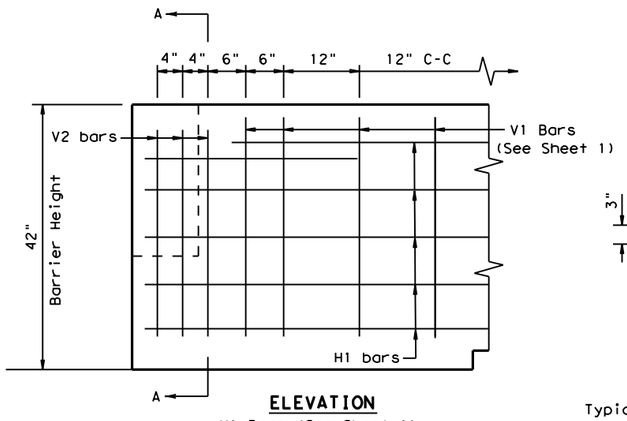
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

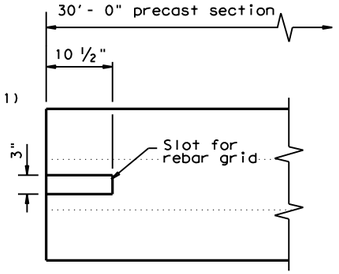
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



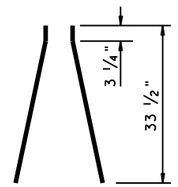
SECTION A-A
Showing (Type R) Rebar Grid



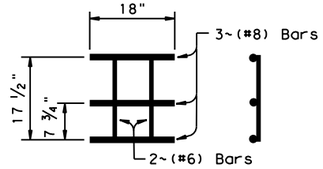
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

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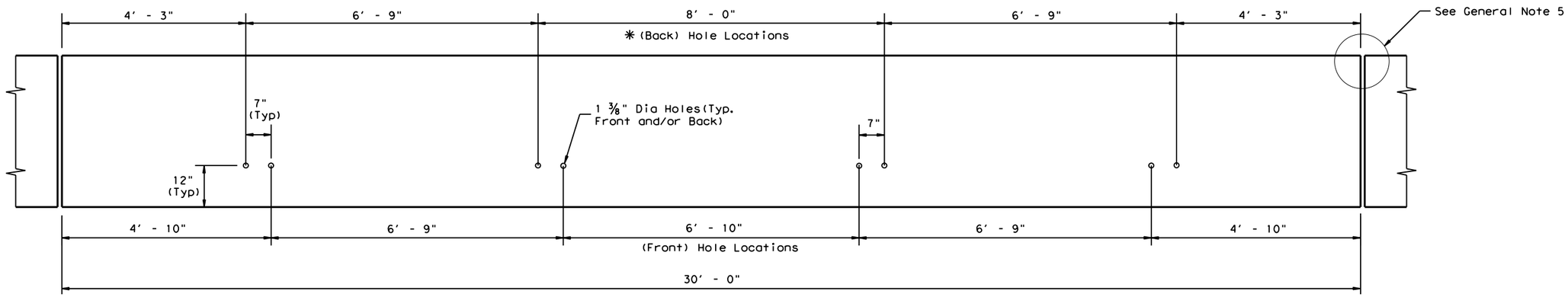
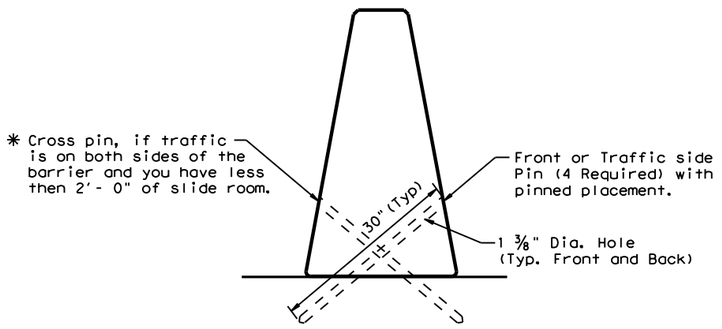


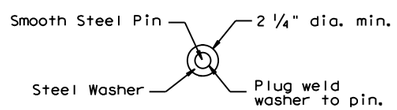
DETAIL 1

Precast SSCB(42")
Showing hole locations

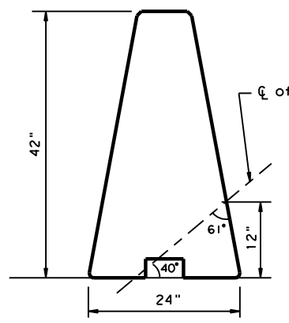


DETAIL 2

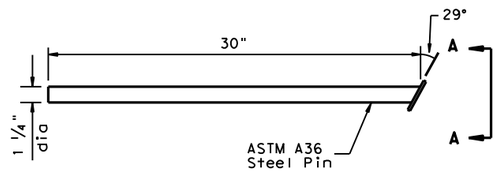
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



VIEW A-A

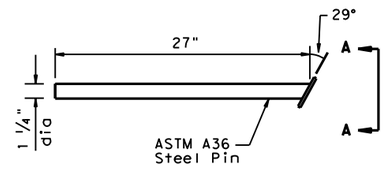


HOLE LOCATION DETAIL



(30") PIN DETAIL

See Detail 2



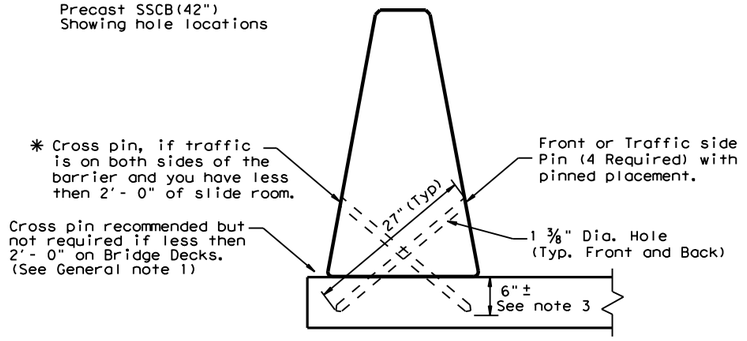
(27") PIN DETAIL

See Detail 3

Note:
Steel washer welded to pin at 29° angle so that the washer is flush with barrier surface. (See View A-A)

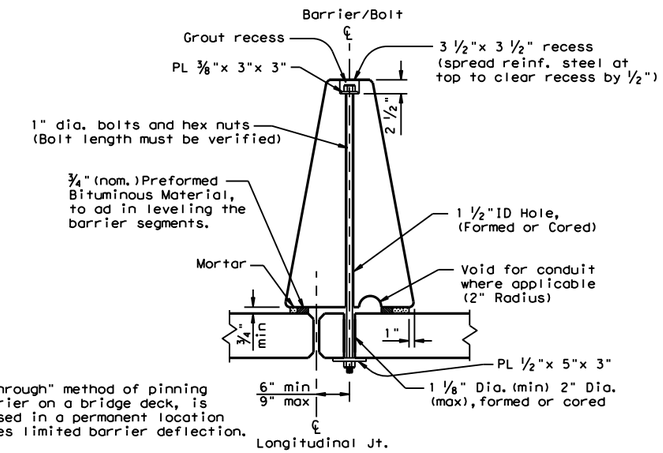
DETAIL 3

Bridge Deck or CRCP
(27" Pin required).



CORE DRILLING EXISTING BARRIER

Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding ½" shall be patched.



Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 3/8 in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼ in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

SSCB(5)-10

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©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
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	WACO	FALLS		39

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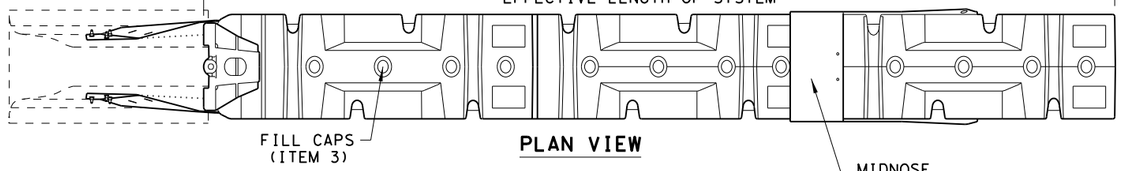
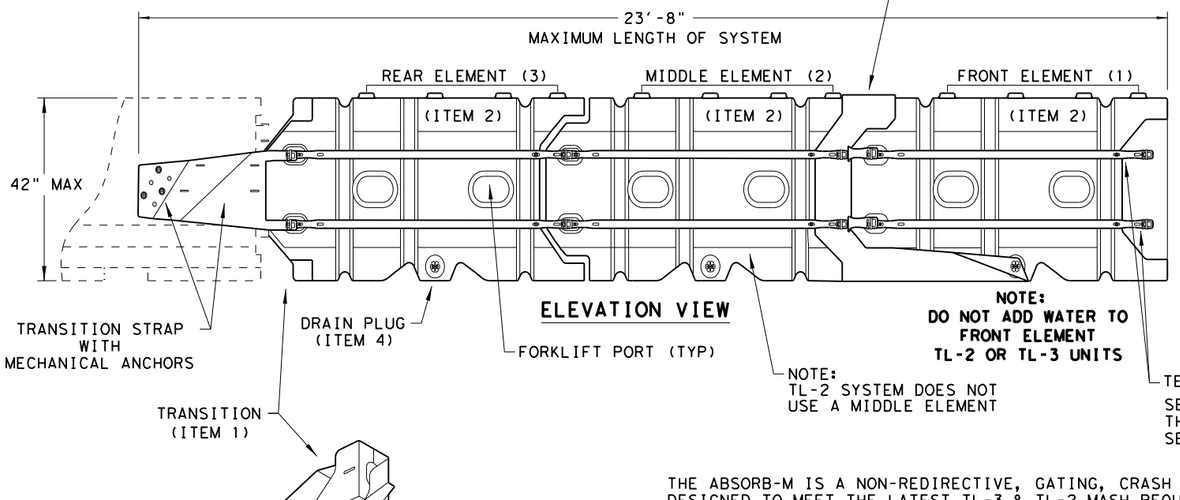
SYSTEM SHOWN - ABSORB-M TL-3



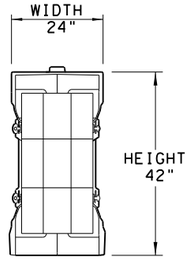
PLAN VIEW

TRAFFIC FLOW

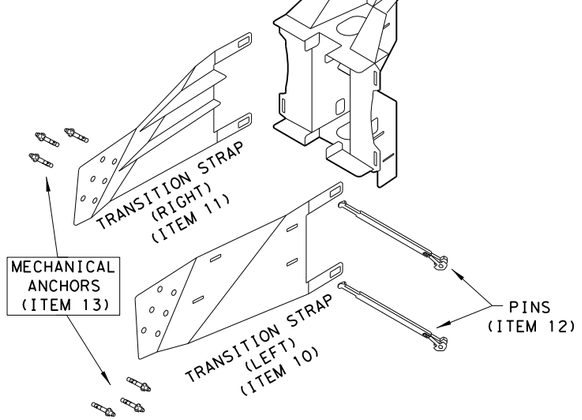


ELEVATION VIEW

TRAFFIC FLOW



SECTION A-A



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.

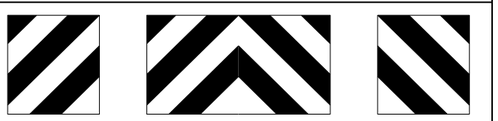
GENERAL NOTES

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).

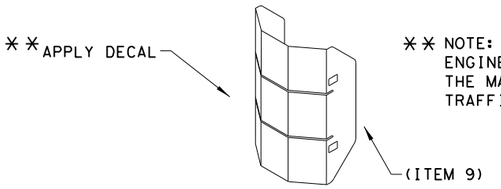
BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	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



TRAFFIC FLOW LEFT-SIDE BARRIER | TRAFFIC FLOW BOTH-SIDE BARRIER | TRAFFIC FLOW RIGHT-SIDE BARRIER



NOSE PLATE

** 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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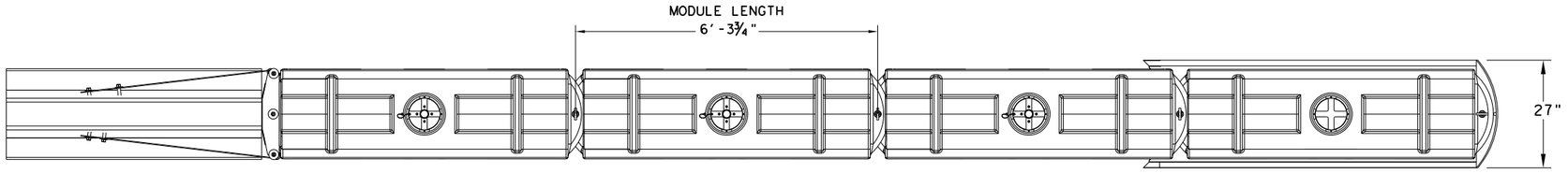
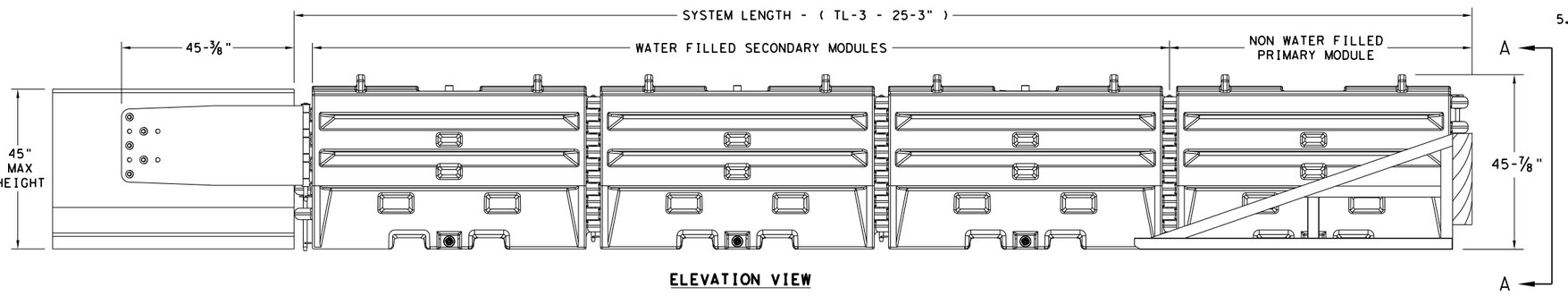


PLAN VIEW



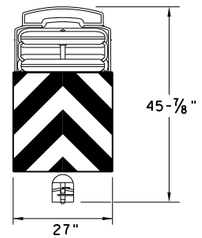
ELEVATION VIEW

GENERAL NOTES

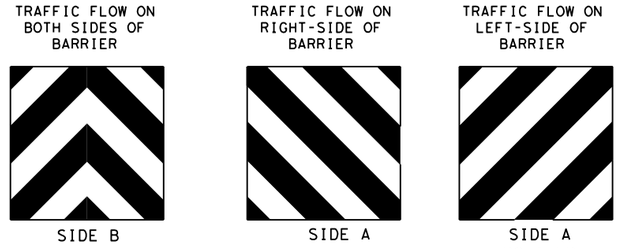
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, 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"

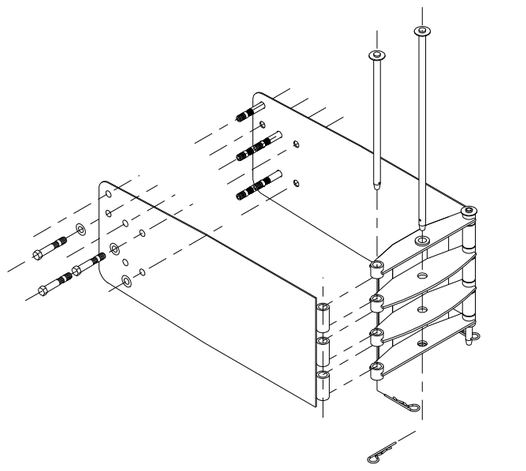


SECTION A-A



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

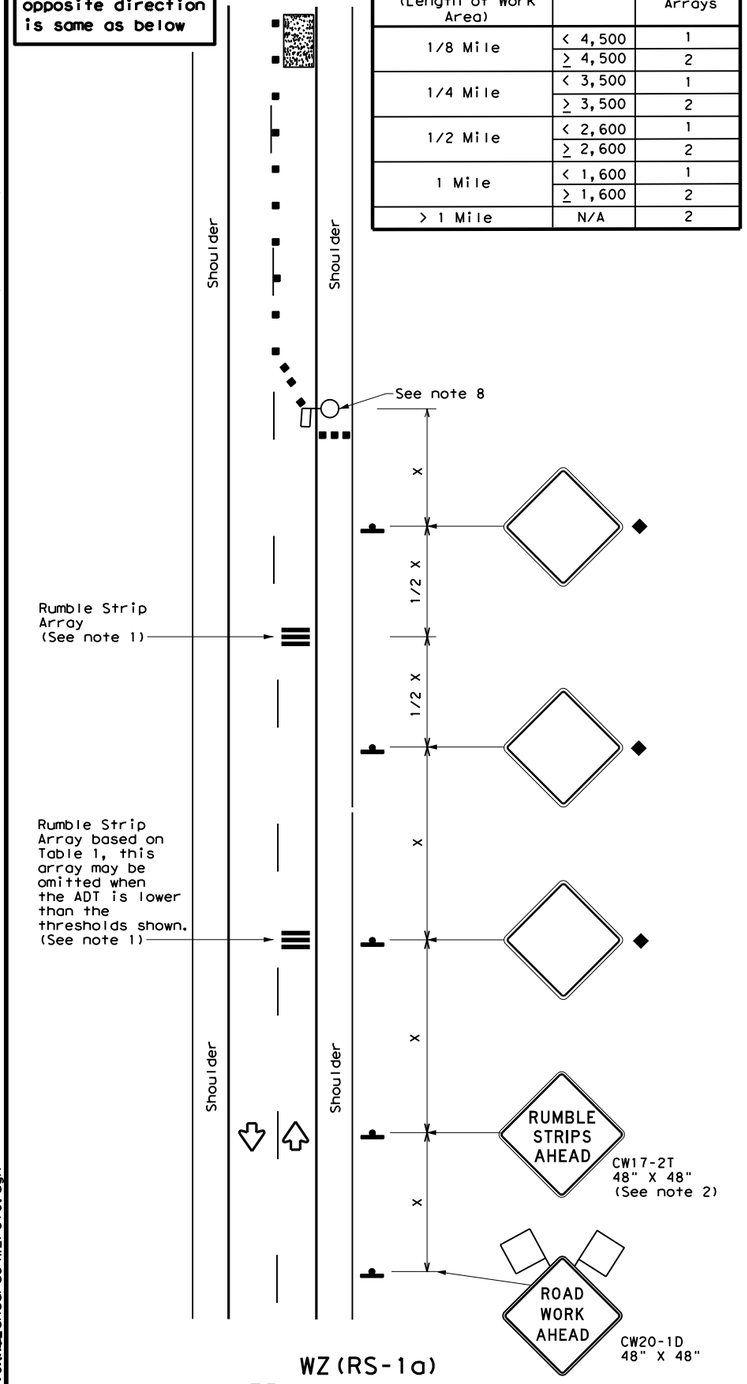
SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		41

DATE: DATE/TIME 9:02:19 AM
FILE: DOCUMENTNAME standards\wzrs16.dgn

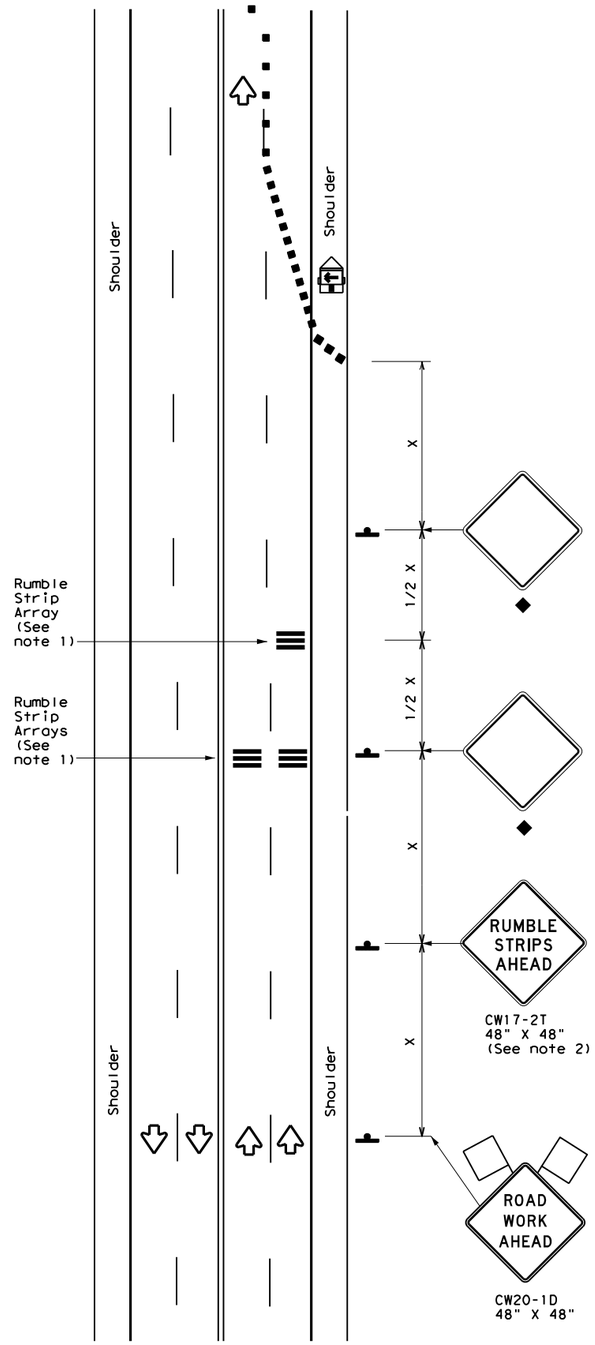
Warning sign and rumble strip sequence in opposite direction is same as below

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

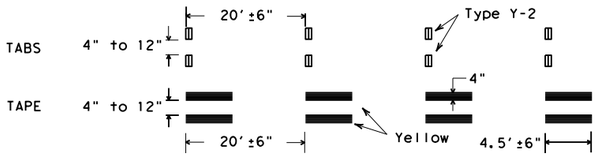
FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
2-14	DIST	COUNTY		SHEET NO.
4-16	WACO	FALLS		42

DATE: DATE2012ME 9:02:26 AM
FILE: DOCUMENTNAMEandards\wzstpm-13.dgn

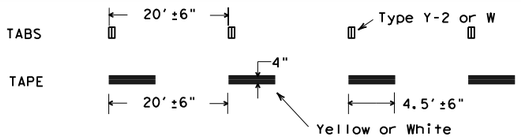
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

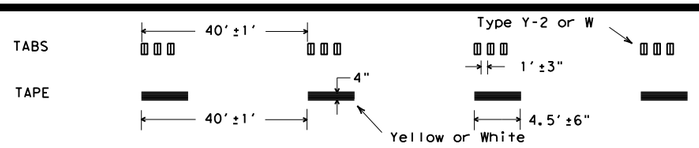


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



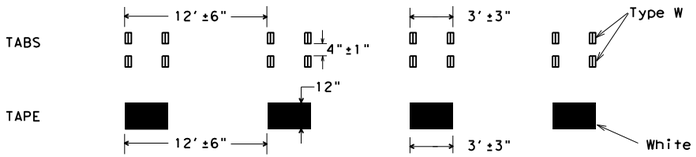
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

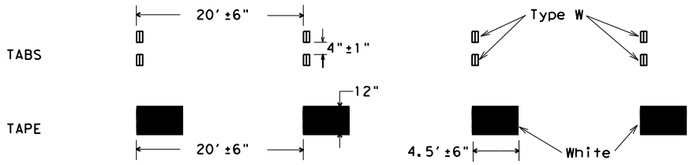


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



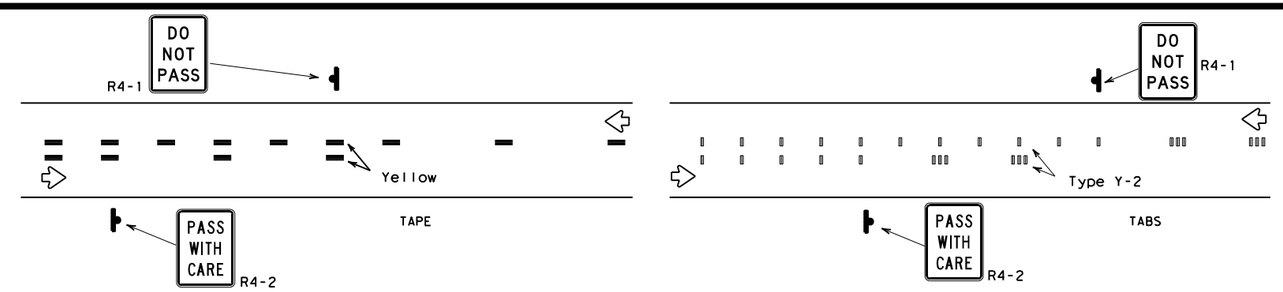
NOTES:

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

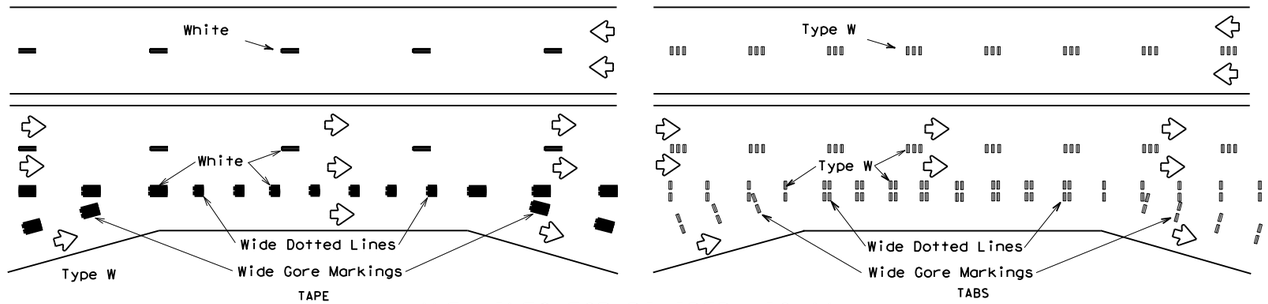
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

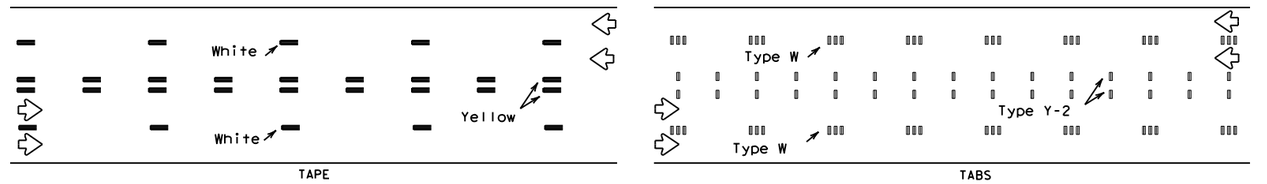
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



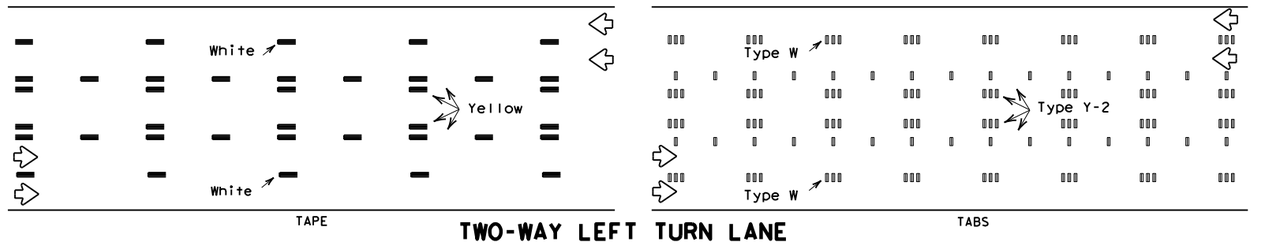
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



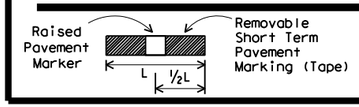
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		1077	01	026	FM 434
1-97		DIST	COUNTY		SHEET NO.
3-03		WACO	FALLS		43
7-13					

DATE: DATE2012WE 9:02:35 AM
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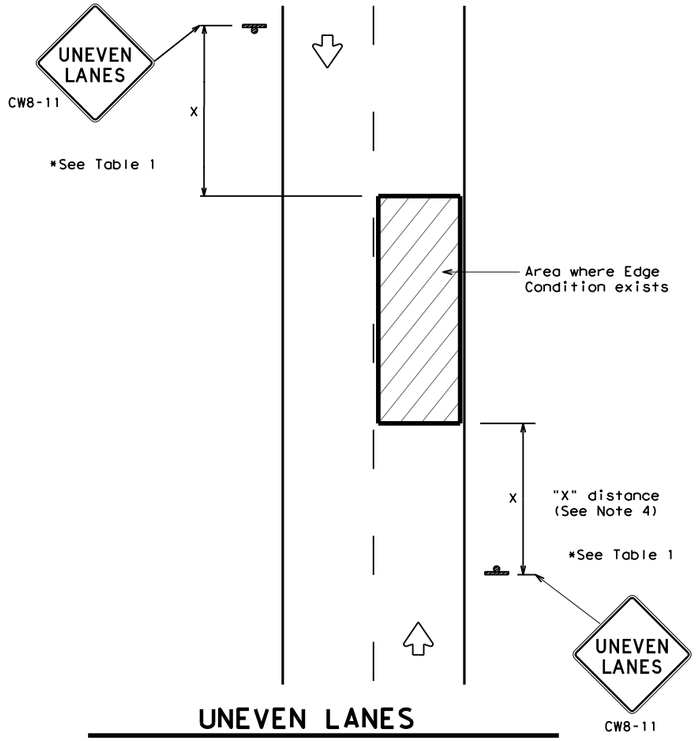
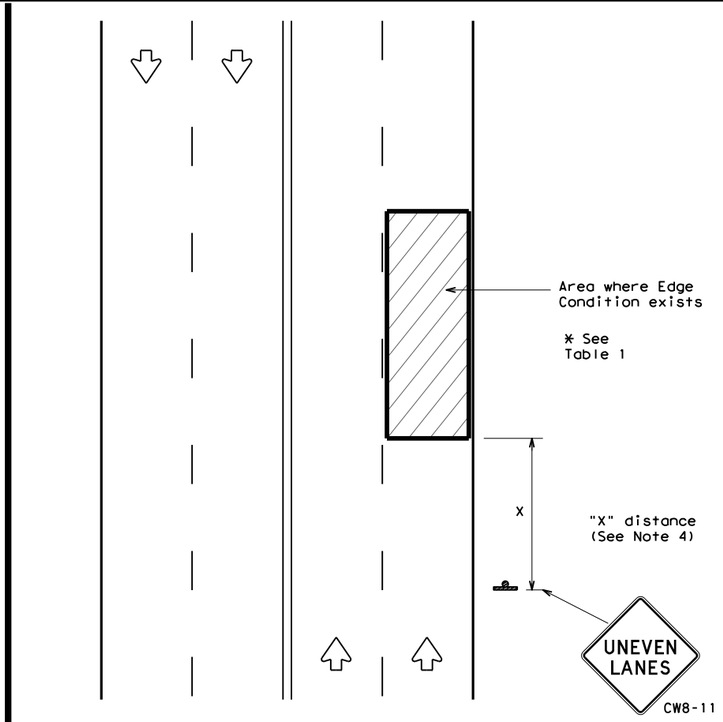
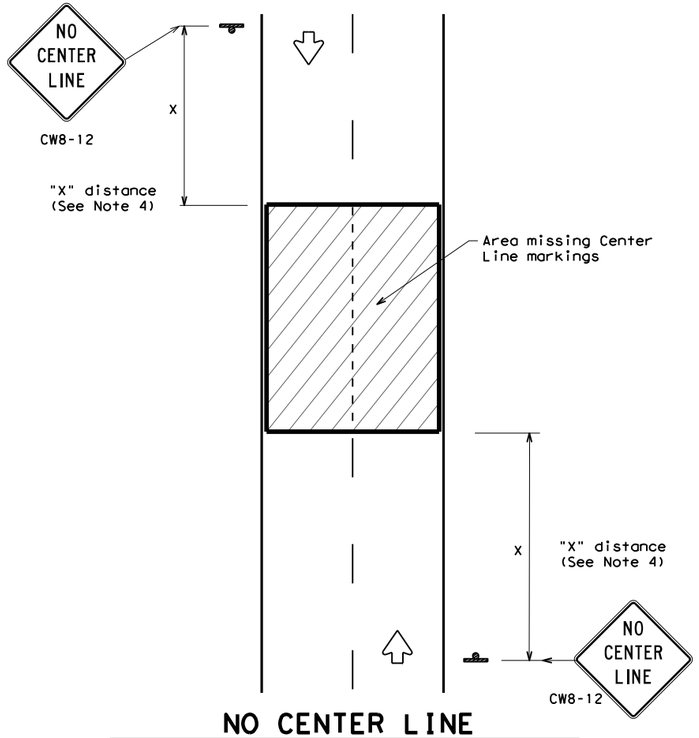


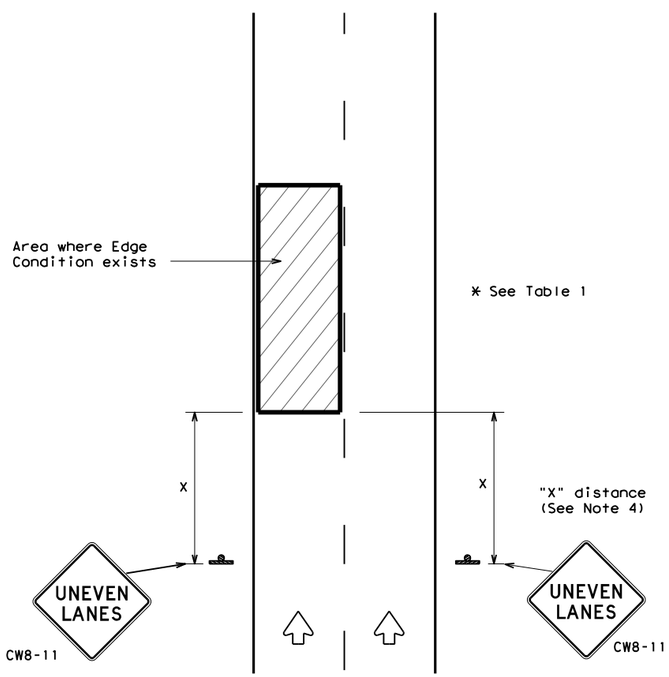
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

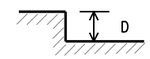
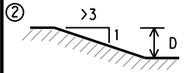
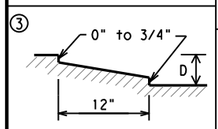
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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	1077	01	026	FM 434
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	WACO	FALLS		44

		Station	Northing	Easting
Element: Circular				
PC	( )	0+00.00	10488727.8166	3323391.2025
PI	( )	1+38.51	10488612.4013	3323467.7859
CC	( )		10493623.5411	3330769.3203
PT	( )	2+77.00	10488499.4378	3323547.9419
Radius:		8854.6451		
Delta:		1°47'32.64"Left		
Degree of Curvature (Arc):		0°38'49.45"		
Length:		277.0024		
Tangent:		138.5125		
Chord:		276.9911		
Middle Ordinate:		1.0832		
External:		1.0833		
Tangent Direction:		S 33°33'58.05" E		
Radial Direction:		S 56°26'01.95" W		
Chord Direction:		S 34°27'44.37" E		
Radial Direction:		S 54°38'29.31" W		
Tangent Direction:		S 35°21'30.69" E		
Element: Linear				
PT	( )	2+77.00	10488499.4378	3323547.9419
PI	( )	4+56.75	10488352.8415	3323651.9629
Tangential Direction:		S 35°21'30.69" E		
Tangential Length:		179.7522		
Element: Linear				
PI	( )	4+56.75	10488352.8415	3323651.9629
PC	( )	6+21.71	10488218.3104	3323747.4227
Tangential Direction:		S 35°21'30.69" E		
Tangential Length:		164.9581		
Element: Circular				
PC	( )	6+21.71	10488218.3104	3323747.4227
PI	( )	8+33.89	10488045.2688	3323870.2085
CC	( )		10483591.6417	3317227.0769
PT	( )	10+45.97	10487865.9583	3323983.6433
Radius:		7995.0593		
Delta:		3°02'25.43"Right		
Degree of Curvature (Arc):		0°42'59.90"		
Length:		424.2575		
Tangent:		212.1785		
Chord:		424.2077		
Middle Ordinate:		2.814		
External:		2.815		
Tangent Direction:		S 35°21'30.69" E		
Radial Direction:		S 54°38'29.31" W		
Chord Direction:		S 33°50'17.98" E		
Radial Direction:		S 57°40'54.74" W		
Tangent Direction:		S 32°19'05.26" E		
Element: Linear				
PT	( )	10+45.97	10487865.9583	3323983.6433
PI	( )	10+52.74	10487860.2354	3323987.2637
Tangential Direction:		S 32°19'05.26" E		
Tangential Length:		6.7719		
Element: Linear				
PI	( )	10+52.74	10487860.2354	3323987.2637
PI	( )	23+25.51	10486784.6283	3324667.7107
Tangential Direction:		S 32°19'05.26" E		
Tangential Length:		1272.7682		
Element: Linear				
PI	( )	23+25.51	10486784.6283	3324667.7107
PI	( )	26+24.30	10486532.6142	3324828.2230
Tangential Direction:		S 32°29'37.66" E		
Tangential Length:		298.7897		
Element: Linear				
PI	( )	26+24.30	10486532.6142	3324828.2230
PC	( )	26+80.42	10486485.2820	3324858.3697
Tangential Direction:		S 32°29'37.66" E		
Tangential Length:		56.1174		
Element: Circular				
PC	( )	26+80.42	10486485.2820	3324858.3697
PI	( )	29+96.47	10486218.7107	3325028.1538
CC	( )		10485648.8028	3323545.0465
PT	( )	33+04.04	10485907.0386	3325080.5691
Radius:		1557.0856		
Delta:		22°56'50.76"Right		
Degree of Curvature (Arc):		3°40'46.85"		
Length:		623.6257		
Tangent:		316.0489		
Chord:		619.4659		
Middle Ordinate:		31.1167		
External:		31.7512		
Tangent Direction:		S 32°29'37.66" E		
Radial Direction:		S 57°30'22.34" W		
Chord Direction:		S 21°01'12.28" E		
Radial Direction:		S 80°27'13.10" W		
Tangent Direction:		S 9°32'46.90" E		
Element: Linear				
PT	( )	33+04.04	10485907.0386	3325080.5691
PI	( )	37+16.72	10485500.0750	3325149.0100
Tangential Direction:		S 9°32'46.90" E		
Tangential Length:		412.6784		
Element: Linear				
PI	( )	37+16.72	10485500.0750	3325149.0100
PI	( )	38+96.62	10485322.6700	3325178.8450
Tangential Direction:		S 9°32'46.90" E		
Tangential Length:		179.8963		
Element: Linear				
PI	( )	38+96.62	10485322.6700	3325178.8450
PC	( )	157+01.90	10473680.8750	3327136.6982
Tangential Direction:		S 9°32'46.90" E		
Tangential Length:		11805.2777		

		Station	Northing	Easting
Element: Circular				
PC	( )	157+01.90	10473680.8750	3327136.6982
PI	( )	159+04.57	10473481.0081	3327170.3108
CC	( )		10473839.2458	3328078.4038
PT	( )	161+01.32	10473312.0241	3327282.2079
Radius:		954.9297		
Delta:		23°57'54.74"Left		
Degree of Curvature (Arc):		6°00'00.00"		
Length:		399.4201		
Tangent:		202.6735		
Chord:		396.5148		
Middle Ordinate:		20.8073		
External:		21.2707		
Tangent Direction:		S 9°32'46.90" E		
Radial Direction:		S 80°27'13.10" W		
Chord Direction:		S 21°31'44.27" E		
Radial Direction:		S 56°29'18.36" W		
Tangent Direction:		S 33°30'41.64" E		
Element: Linear				
PT	( )	161+01.32	10473312.0241	3327282.2079
PI	( )	161+65.58	10473258.4400	3327317.6900
Tangential Direction:		S 33°30'41.64" E		
Tangential Length:		64.2669		
Element: Linear				
PI	( )	161+65.58	10473258.4400	3327317.6900
PI	( )	163+18.71	10473130.7700	3327402.2300
Tangential Direction:		S 33°30'41.64" E		
Tangential Length:		153.123		
Element: Linear				
PI	( )	163+18.71	10473130.7700	3327402.2300
PC	( )	163+47.75	10473106.5506	3327418.2675
Tangential Direction:		S 33°30'41.64" E		
Tangential Length:		29.0479		
Element: Circular				
PC	( )	163+47.75	10473106.5506	3327418.2675
PI	( )	163+89.55	10473071.7052	3327441.3413
CC	( )		10472497.6789	3326498.7660
PCC	( )	164+31.30	10473035.2134	3327461.7117
Radius:		1102.8181		
Delta:		4°20'25.74"Right		
Degree of Curvature (Arc):		5°11'43.43"		
Length:		83.5448		
Tangent:		41.7924		
Chord:		83.5248		
Middle Ordinate:		0.791		
External:		0.7916		
Tangent Direction:		S 33°30'41.64" E		
Radial Direction:		S 56°29'18.36" W		
Chord Direction:		S 31°20'28.77" E		
Radial Direction:		S 60°49'44.10" W		
Tangent Direction:		S 29°10'15.90" E		
Element: Circular				
PCC	( )	164+31.30	10473035.2134	3327461.7117
PI	( )	170+42.99	10472501.1019	3327759.8629
CC	( )		10472564.2666	3326618.0521
PT	( )	175+21.94	10472003.1362	3327404.6175
Radius:		966.2052		
Delta:		64°40'29.59"Right		
Degree of Curvature (Arc):		5°55'47.93"		
Length:		1090.6424		
Tangent:		611.6937		
Chord:		1033.6552		
Middle Ordinate:		149.8464		
External:		177.3514		
Tangent Direction:		S 29°10'15.90" E		
Radial Direction:		S 60°49'44.10" W		
Chord Direction:		S 3°09'58.90" W		
Radial Direction:		N 54°29'46.31" W		
Tangent Direction:		S 35°30'13.69" W		
Element: Linear				
PT	( )	175+21.94	10472003.1362	3327404.6175
PI	( )	176+48.67	10471899.9663	3327331.0168
Tangential Direction:		S 35°30'13.69" W		
Tangential Length:		126.7323		
Element: Linear				
PI	( )	176+48.67	10471899.9663	3327331.0168
PC	( )	199+53.83	10470023.3900	3325992.2800
Tangential Direction:		S 35°30'13.69" W		
Tangential Length:		2305.1583		
Element: Circular				
PC	( )	199+53.83	10470023.3900	3325992.2800
PI	( )	200+56.50	10469939.8127	3325932.6566
CC	( )		10471509.6882	3323908.8592
PT	( )	201+59.05	10469861.2800	3325866.5300
Radius:		2559.243		
Delta:		4°35'39.92"Right		
Degree of Curvature (Arc):		2°14'19.60"		
Length:		205.2201		
Tangent:		102.6651		
Chord:		205.1651		
Middle Ordinate:		2.0567		
External:		2.0584		
Tangent Direction:		S 35°30'13.69" W		
Radial Direction:		N 54°29'46.31" W		
Chord Direction:		S 37°48'03.65" W		
Radial Direction:		N 49°54'06.39" W		
Tangent Direction:		S 40°05'53.61" W		

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

ALIGNMENT DATA SHEETS

HORIZONTAL ALIGNMENT DATA SHEET 1 OF 2

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		45

NOTES:

1. VERTICAL ALIGNMENT DATA IS TAKEN FROM AS BUILT RECORDS AND FOR CONTRACTOR REFERENCE ONLY. (CSJ 1077-01-002, 1077-01-007, 1077-01-023)
2. AS BUILT STATION EQUATION:
   AS BUILT STA = -(STA)+51644.58

VPI STATION	VPI ELEVATION	VC LENGTH (FT)	BACK GRADE	FORWARD GRADE	K VALUE	CREST/SAG	DESIGN SPEED
192+44.58	402.27	1000	-0.285%	-1.944%	603	CREST	80
180+44.58	378.94	800	-1.944%	0.000%	412	SAG	80
174+44.58	378.94	300	0.000%	-1.880%	160	CREST	60
167+44.58	365.78	400	-1.880%	-0.015%	214	CREST	65
156+44.58	365.60	NC	-0.015%	0.080%			
135+44.58	367.28	NC	0.080%	0.244%			
130+44.58	368.50	NC	0.244%	0.154%			
117+44.58	370.00	NC	0.154%	0.250%			
111+44.58	371.50	200	0.250%	0.650%	500	SAG	80
97+44.58	380.60	200	0.650%	0.000%	308	CREST	70
51+44.58	380.60	400	0.000%	-2.120%	189	CREST	60
46+44.58	370.00	400	-2.120%	0.000%	189	SAG	70
41+19.58	370.00	200	0.000%	0.500%	400	SAG	80
37+94.58	371.63	200	0.500%	-0.500%	200	CREST	65
34+69.58	370.00	200	-0.500%	0.000%	400	SAG	80
28+34.58	371.71	NC	0.000%	0.348%			
27+29.58	372.07	NC	0.348%	0.536%			
24+44.58	373.60	150	0.536%	-0.665%	125	CREST	55
21+79.58	371.84	NC	-0.665%	-0.401%			
21+24.58	371.62	100	-0.401%	0.198%	167	SAG	65
20+74.58	371.90	NC	0.198%	0.000%			
11+44.58	370.00	NC	0.000%	-0.200%			

MIN DESIGN SPEED 55

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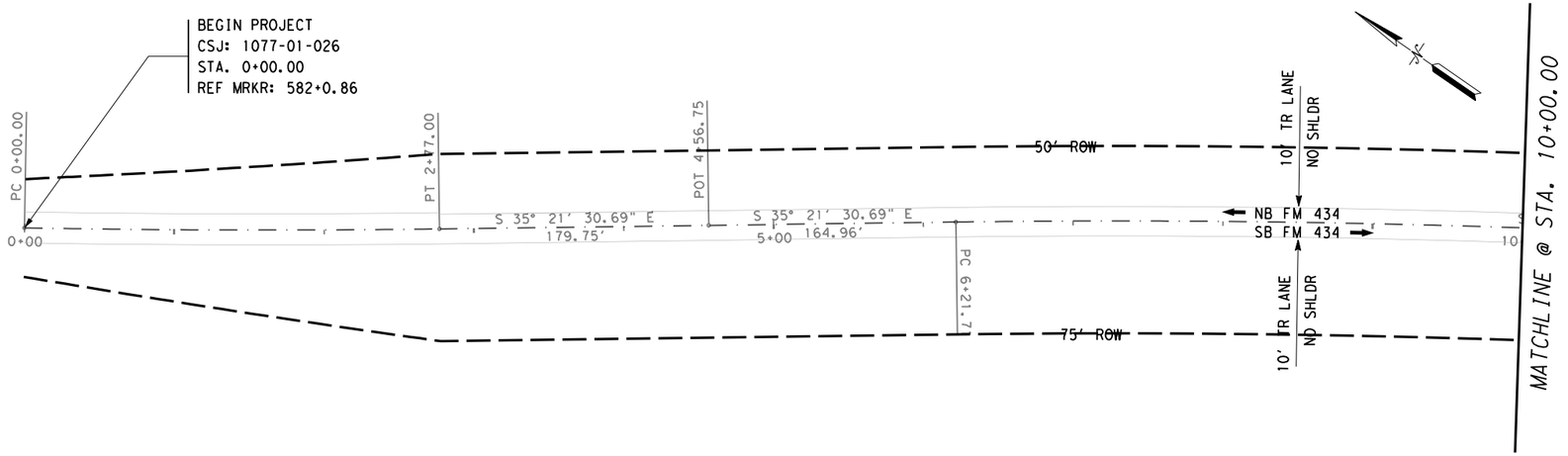
ALIGNMENT DATA SHEETS

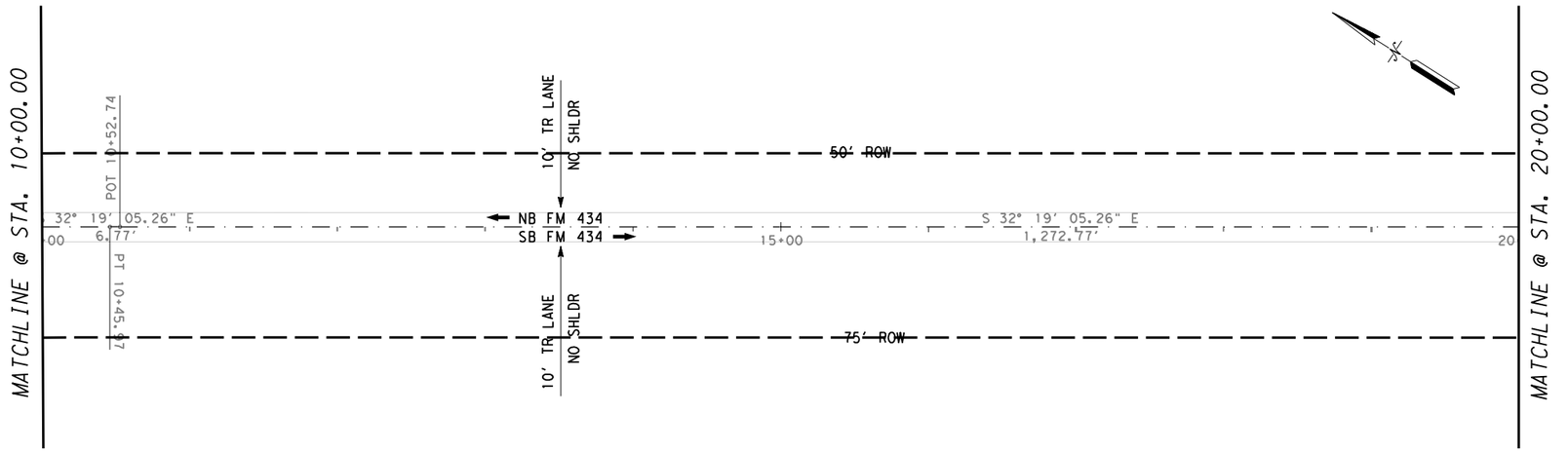
VERTICAL ALIGNMENT DATA SHEET 2 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		46

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.





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BRIAN W. LAMB
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P.E.

5/19/2021

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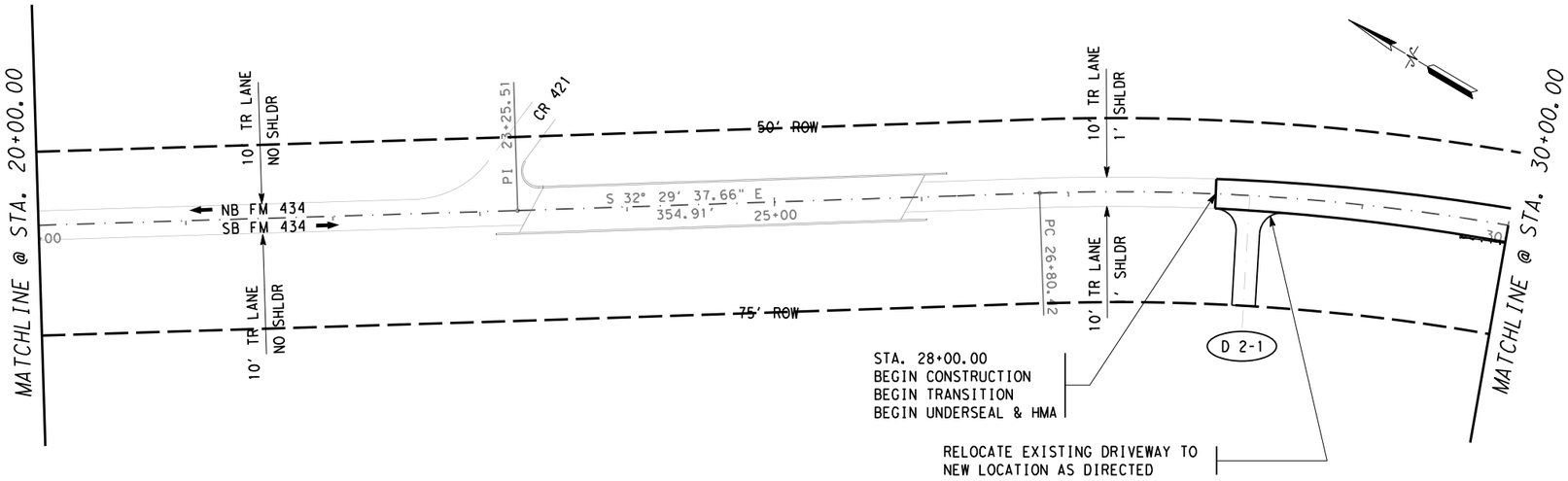
ROADWAY LAYOUT

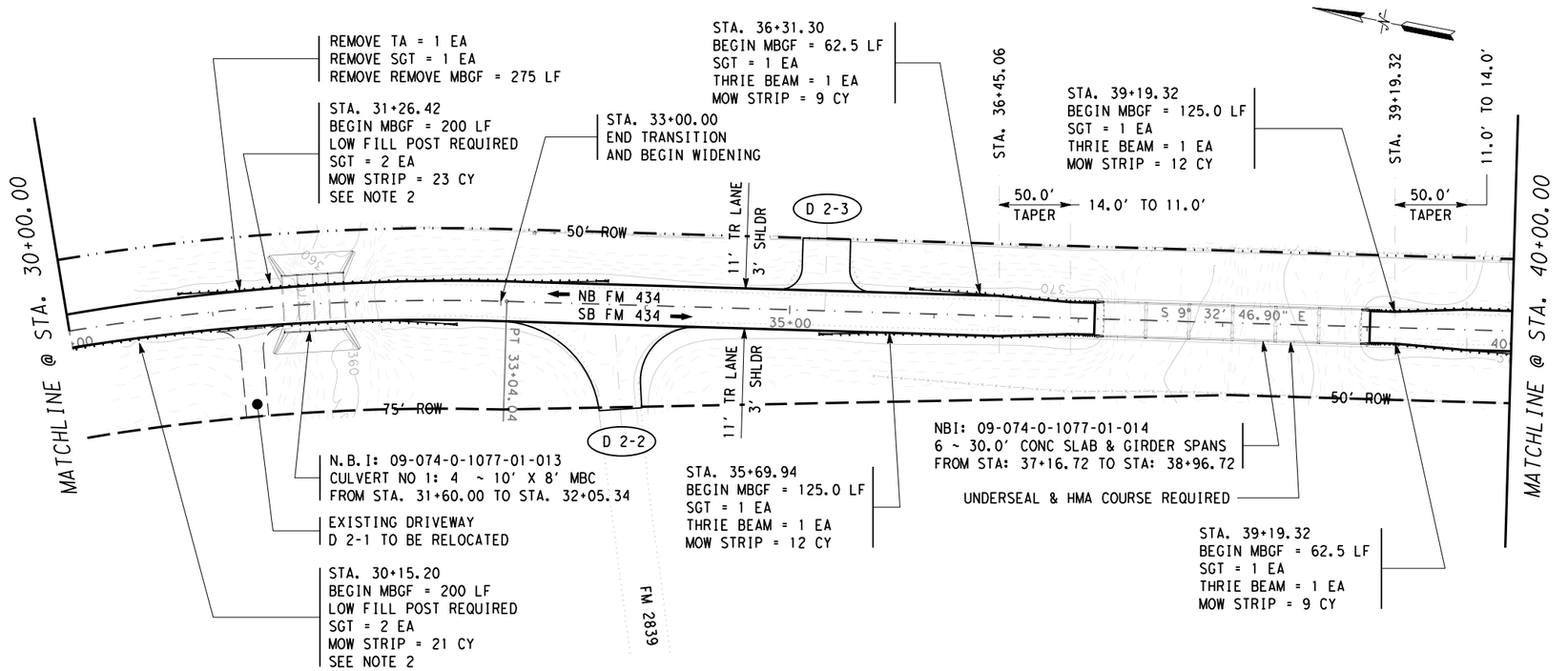
FROM STA 0+00.00 TO STA 20+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 1 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		47





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.
2. EXTEND MOWSTRIP TO BACK OF HEADWALL AS SHOWN ON PLANS.
3. AT CONSTRUCTION LIMITS, CONTRACTOR WILL BE REQUIRED TO CONSTRUCT A 100' TAPER TO A BUTT JOINT. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO PERTINENT BID ITEMS.
4. AT BRIDGE BEGIN AND END LIMITS, CONTRACTOR WILL BE REQUIRED TO TAPER HMA AT A RATE OF 1" TO 50' AS NEEDED TO CREATE A SMOOTH TRANSITION. THIS WORK AND ANY MILLING OPERATIONS REQUIRED TO MAKE TRANSITION WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO PERTINENT BID ITEMS.

ITEM	DESCRIPTION	UNIT
432 6045	RIPRAP (MOW STRIP)(4 IN)	86 CY
540 6002	MTL W-BEAM GD FEN (STEEL POST)	775 LF
540 6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	4 EA
542 6001	REMOVE METAL BEAM GUARD FENCE	275 LF
542 6002	REMOVE TERMINAL ANCHOR SECTION	2 EA
544 6001	GUARDRAIL END TREATMENT (INSTALL)	8 EA
544 6003	GUARDRAIL END TREATMENT (REMOVE)	1 EA

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ROADWAY LAYOUT

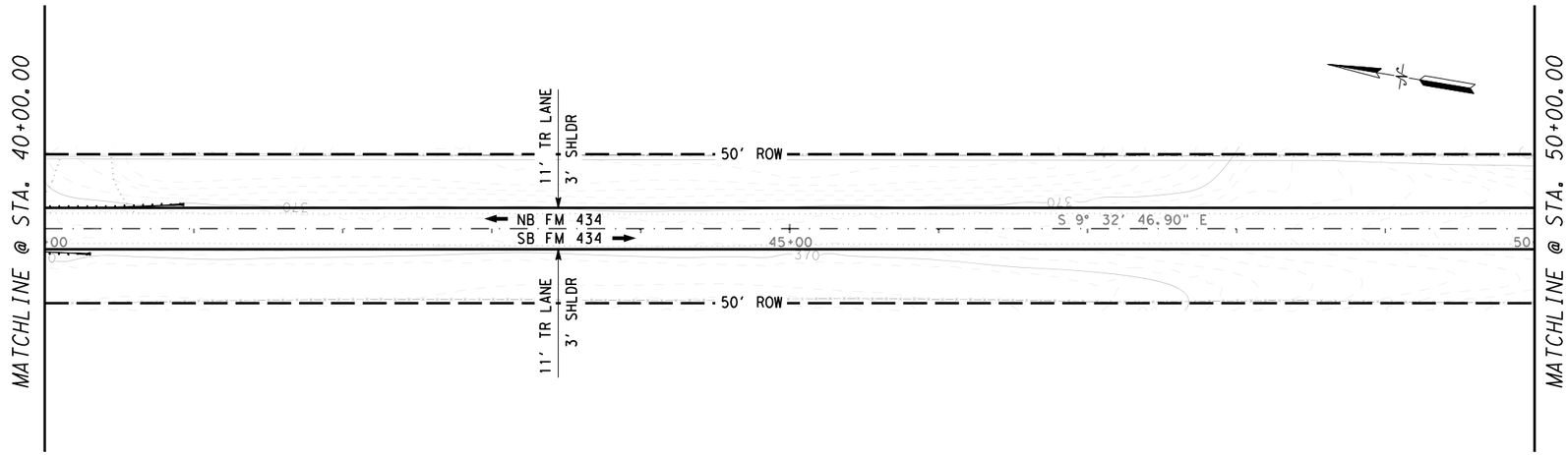
STA 20+00.00 TO STA 40+00.00

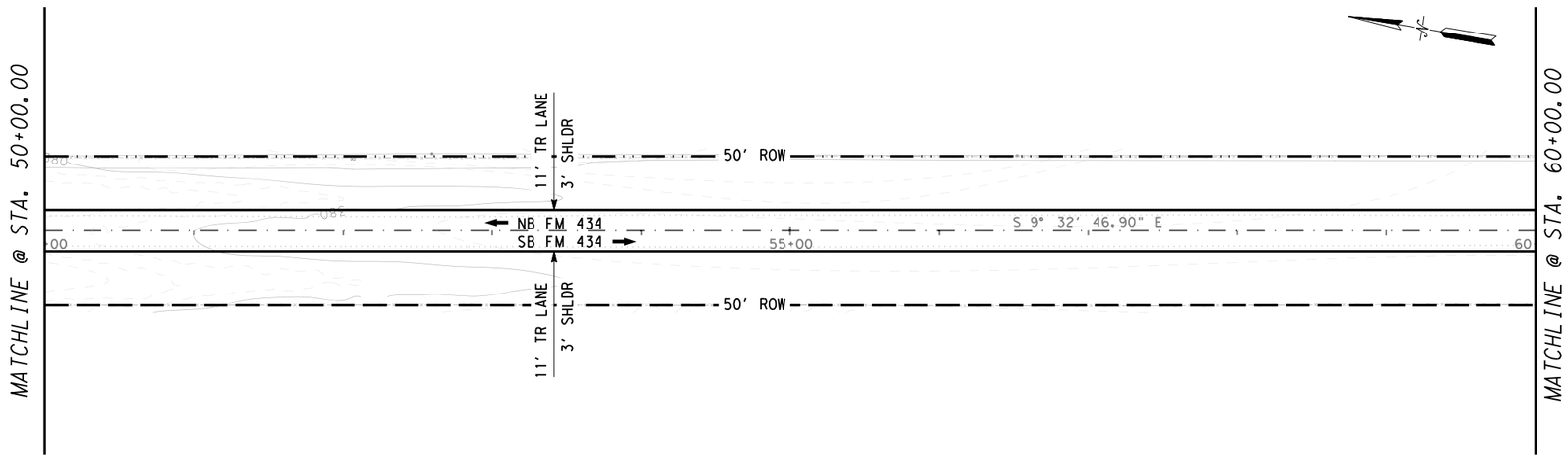
SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		48

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED





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ROADWAY LAYOUT

STA 40+00.0 TO STA 60+00.00

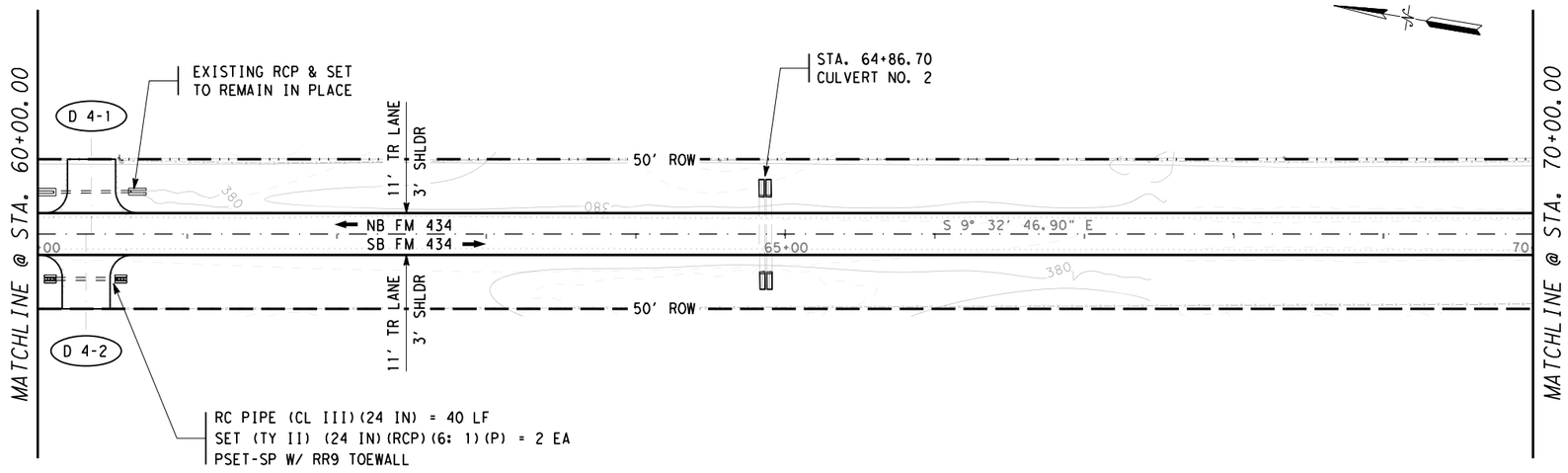
SCALE: 1" = 100' HORIZ. FEET

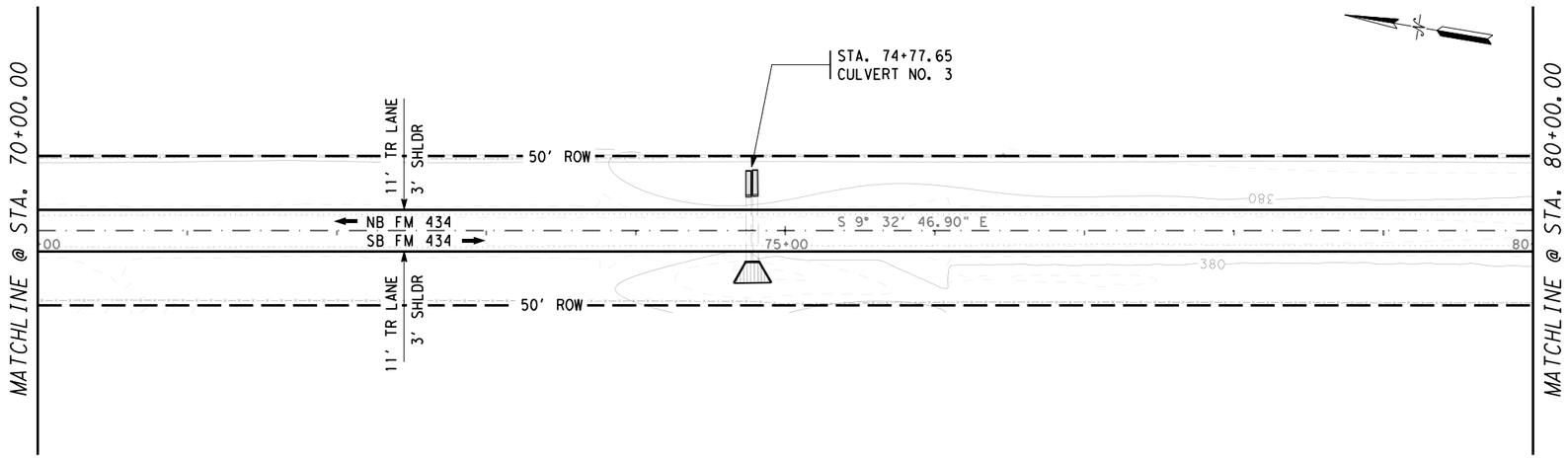
SHEET 3 OF10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		49

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.





ITEM	DESCRIPTION	UNIT
464 6005	RC PIPE (CL III)(24 IN)	40 LF
467 6395	SET (TY II) (24 IN)(RCP)(6: 1)(P)	2 EA

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ROADWAY LAYOUT

STA 60+00.00 TO STA 80+00.00

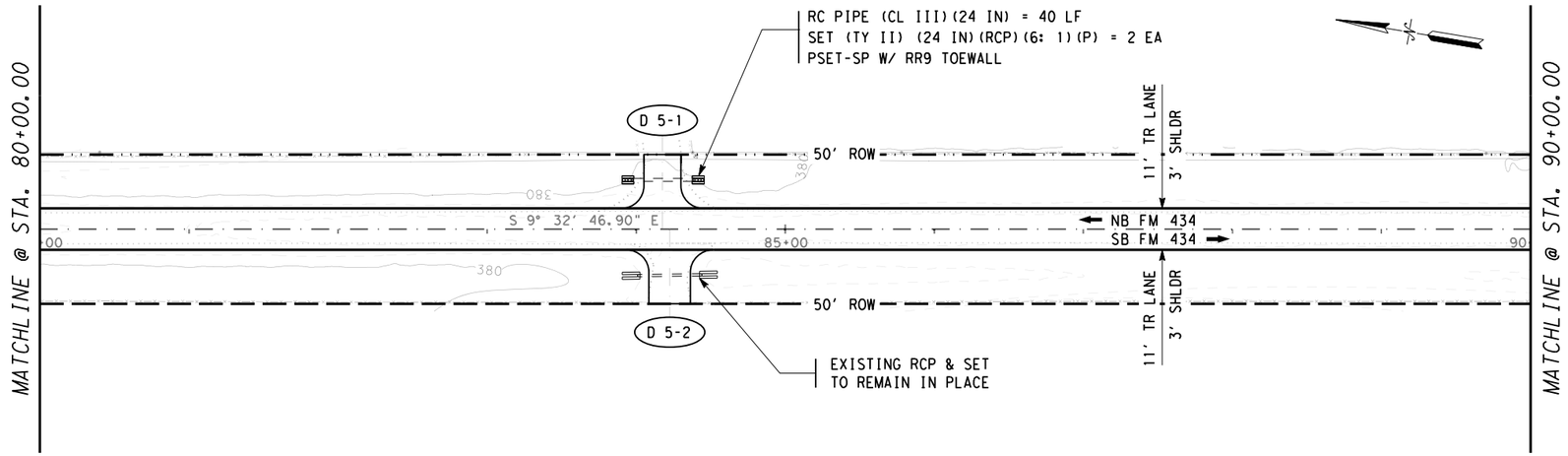
SCALE: 1" = 100' HORIZ. FEET

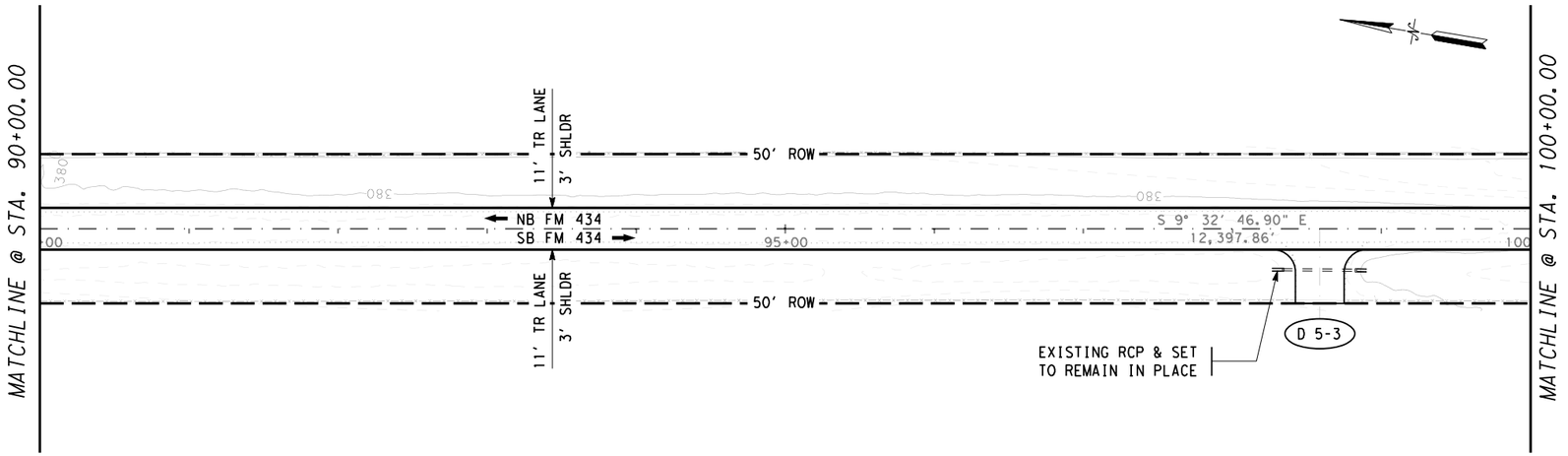
SHEET 4 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		50

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.





ITEM	DESCRIPTION	UNIT
464 6005	RC PIPE (CL III)(24 IN)	40 LF
467 6395	SET (TY II) (24 IN)(RCP)(6: 1)(P)	2 EA

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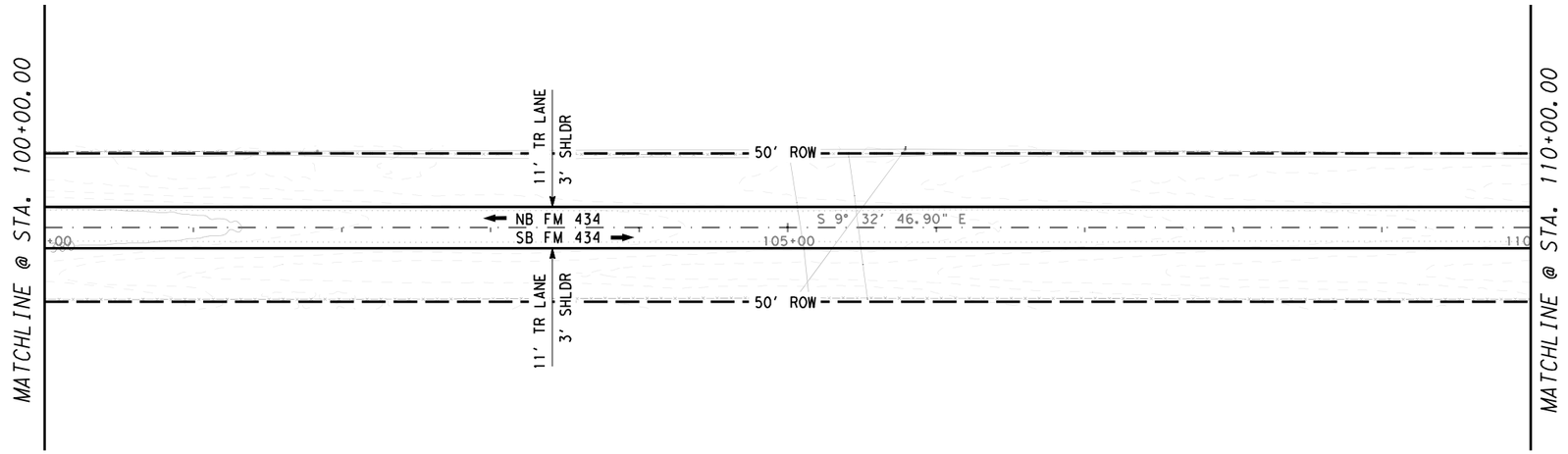
ROADWAY LAYOUT

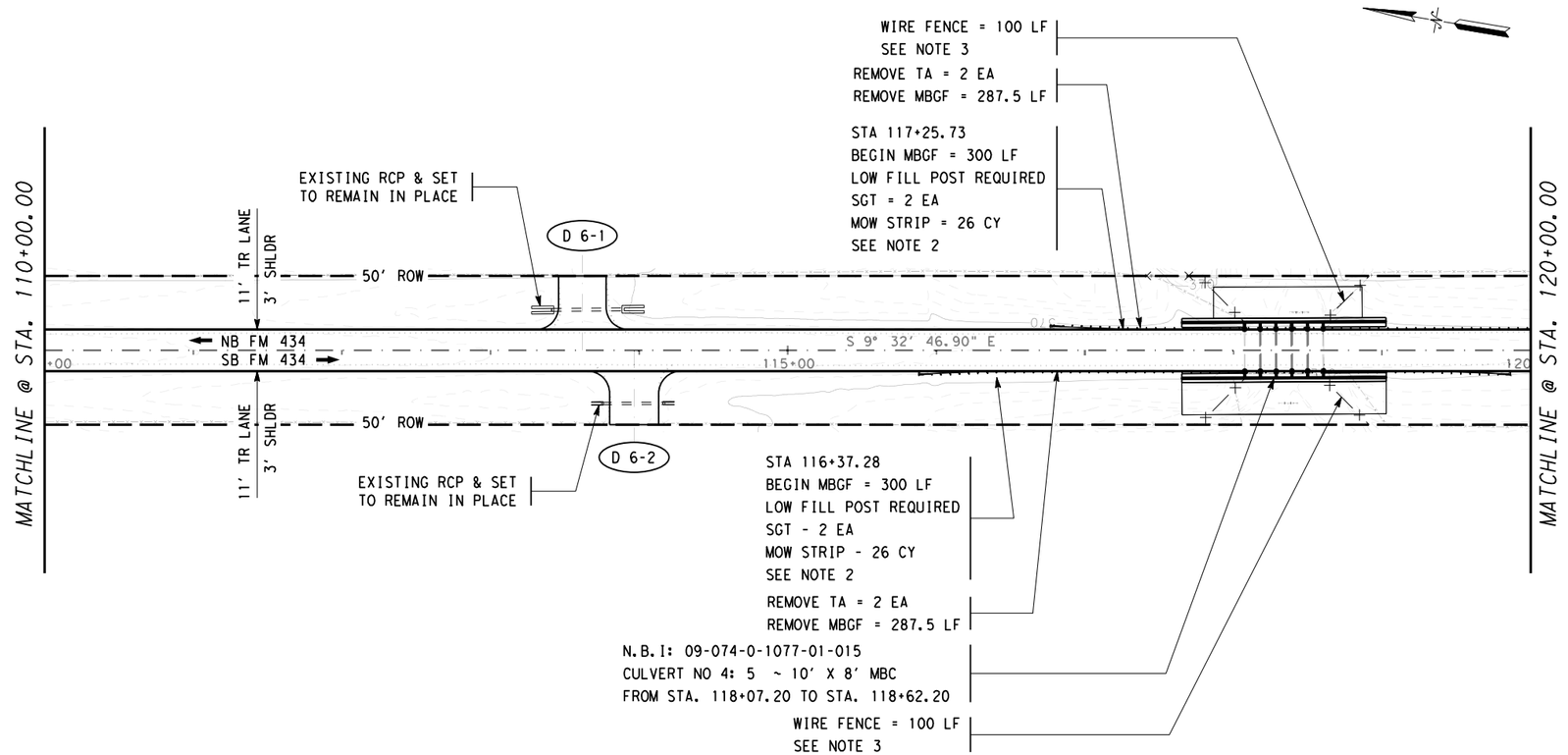
STA 80+00.00 TO STA 100+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 5 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		51





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.
2. EXTEND MOWSTRIP TO BACK OF HEADWALL AS SHOWN IN PLANS.
3. EYE BOLTS WILL BE REQUIRED AT WINGWALLS FOR CULVERT 4 TO TIE IN WIRE FENCING. THIS WILL BE CONSIDERED SUBSIDIARY TO ITEM 552, "WIRE FENCE". SEE WF(2)-10 FOR ADDITIONAL DETAILS.

ITEM	DESCRIPTION	UNIT
432 6045	RIPRAP (MOW STRIP)(4 IN)	52 CY
540 6002	MTL W-BEAM GD FEN (STEEL POST)	600 LF
542 6001	REMOVE METAL BEAM GUARD FENCE	575 LF
542 6002	REMOVE TERMINAL ANCHOR SECTION	4 EA
544 6001	GUARDRAIL END TREATMENT (INSTALL)	4 EA
552 6003	WIRE FENCE (TY C)	200 LF

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ROADWAY LAYOUT

STA 100+00.00 TO STA 120+00.00

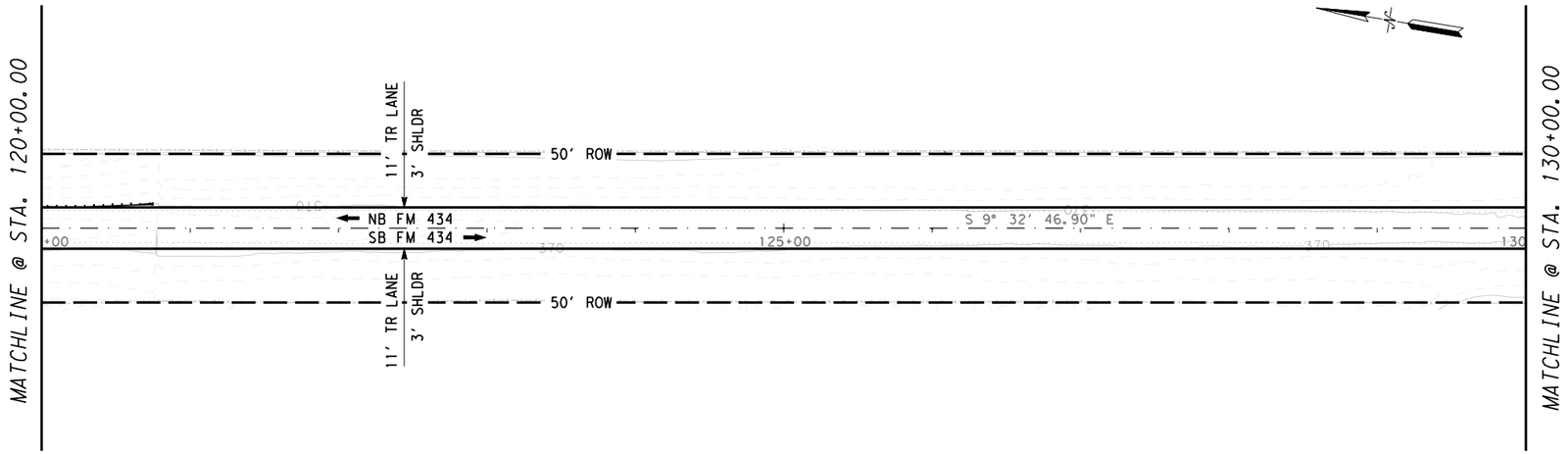
SCALE: 1" = 100' HORIZ. FEET

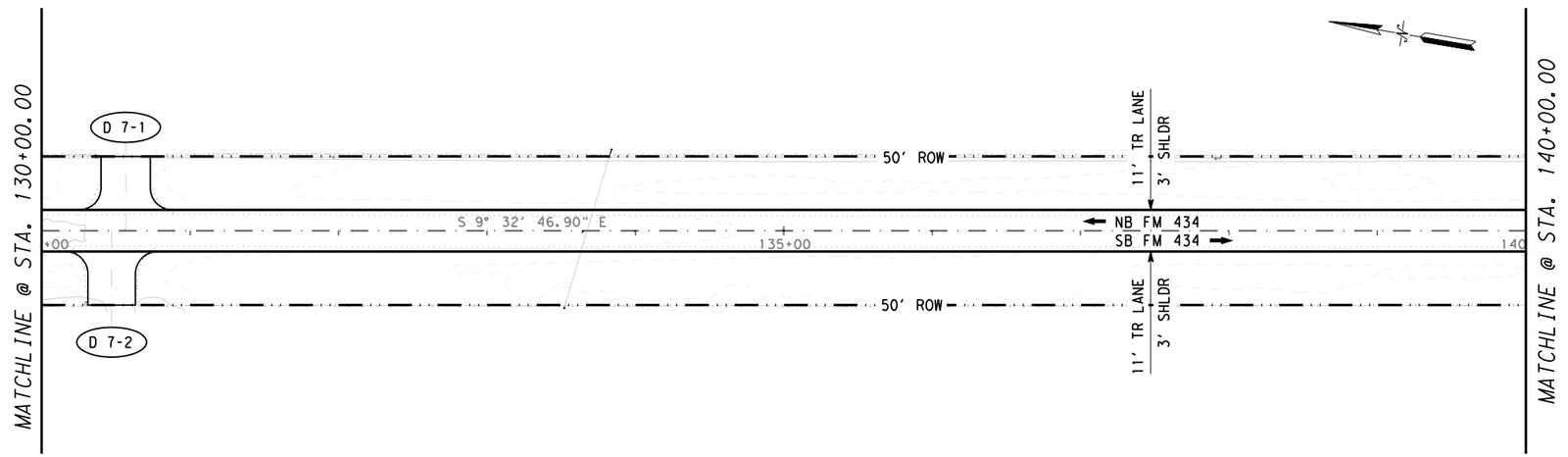
SHEET 6 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		52

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.





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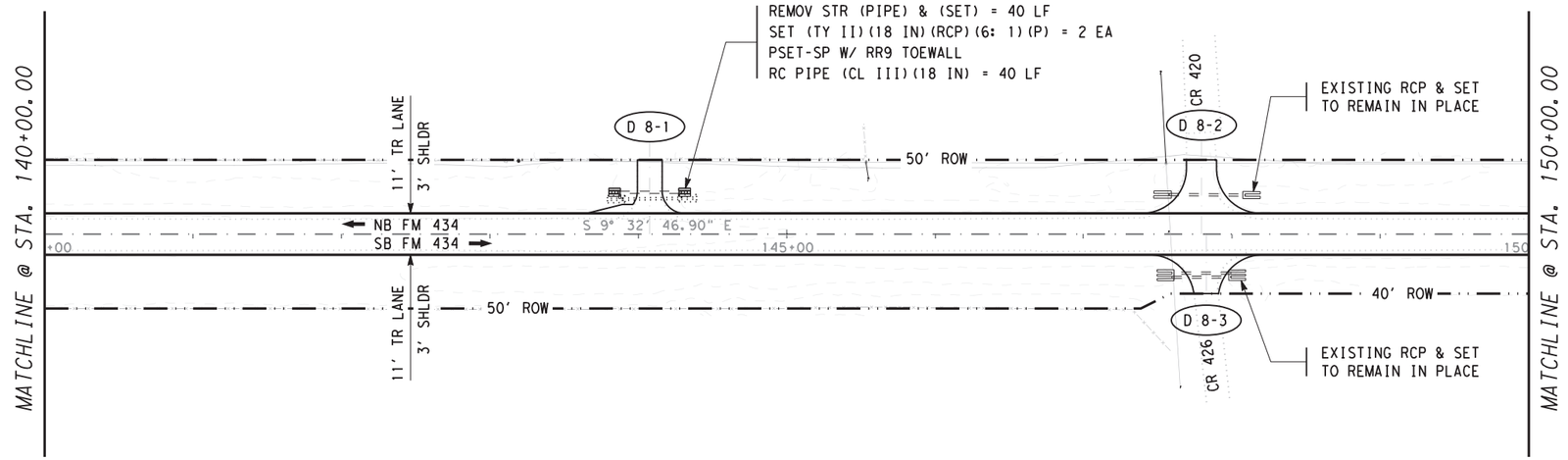
ROADWAY LAYOUT

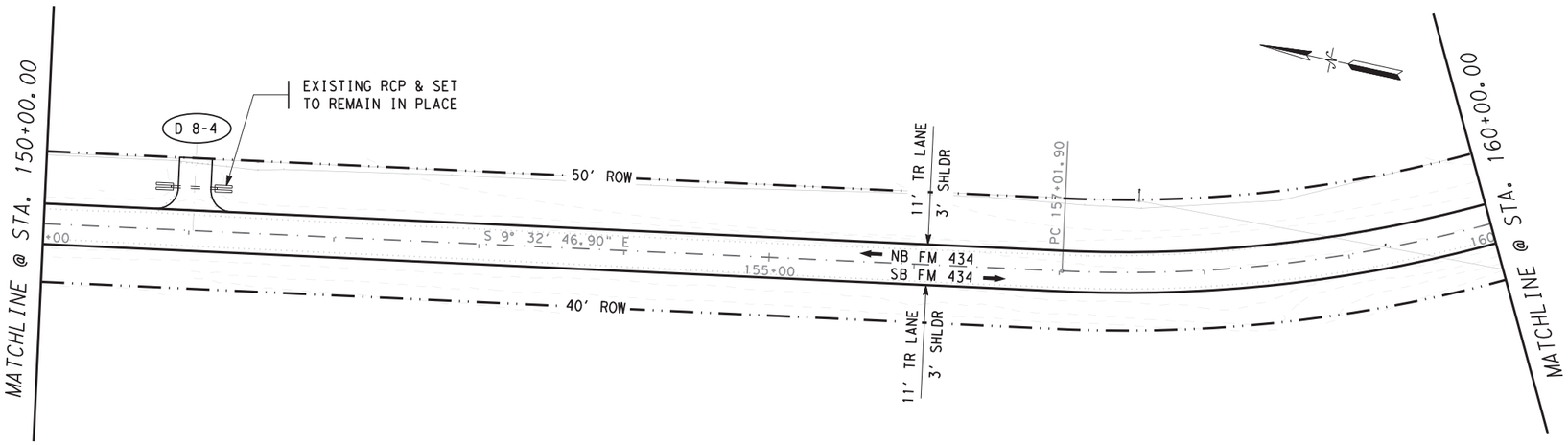
STA 120+00.00 TO STA 140+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 7 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		53





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.
2. THE REMOVAL OF THE EXISTING SET'S WILL BE CONSIDERED SUBSIDIARY TO ITEM 496, "REMOV STR (PIPE)".

ITEM	DESCRIPTION	UNIT
464 6003	RC PIPE (CL III)(18 IN)	40 LF
467 6363	SET (TY II)(18 IN)(RCP)(6: 1)(P)	2 EA
496 6007	REMOV STR (PIPE)	40 LF
	FOR CONTRACTOR'S INFORMATION ONLY	
496 6004	REMOV STR (SET)	2 EA

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ROADWAY LAYOUT

STA 140+00.00 TO STA 160+00.00

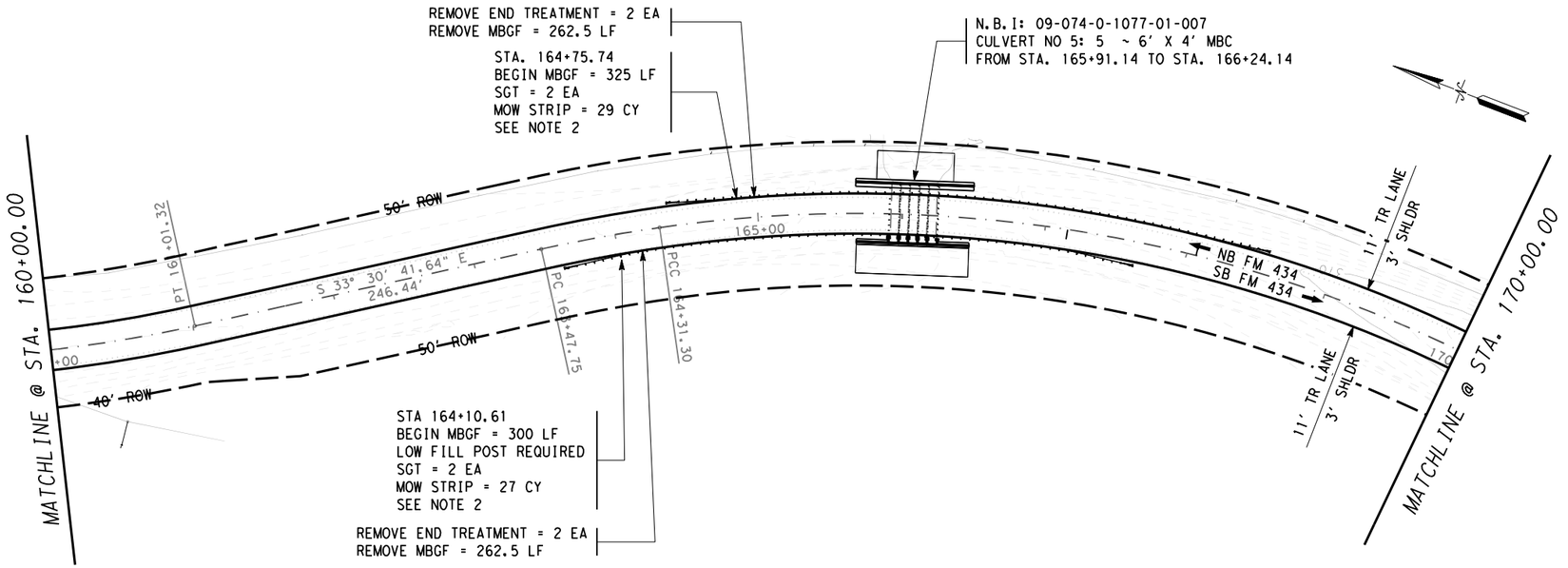
SCALE: 1" = 100' HORIZ. FEET

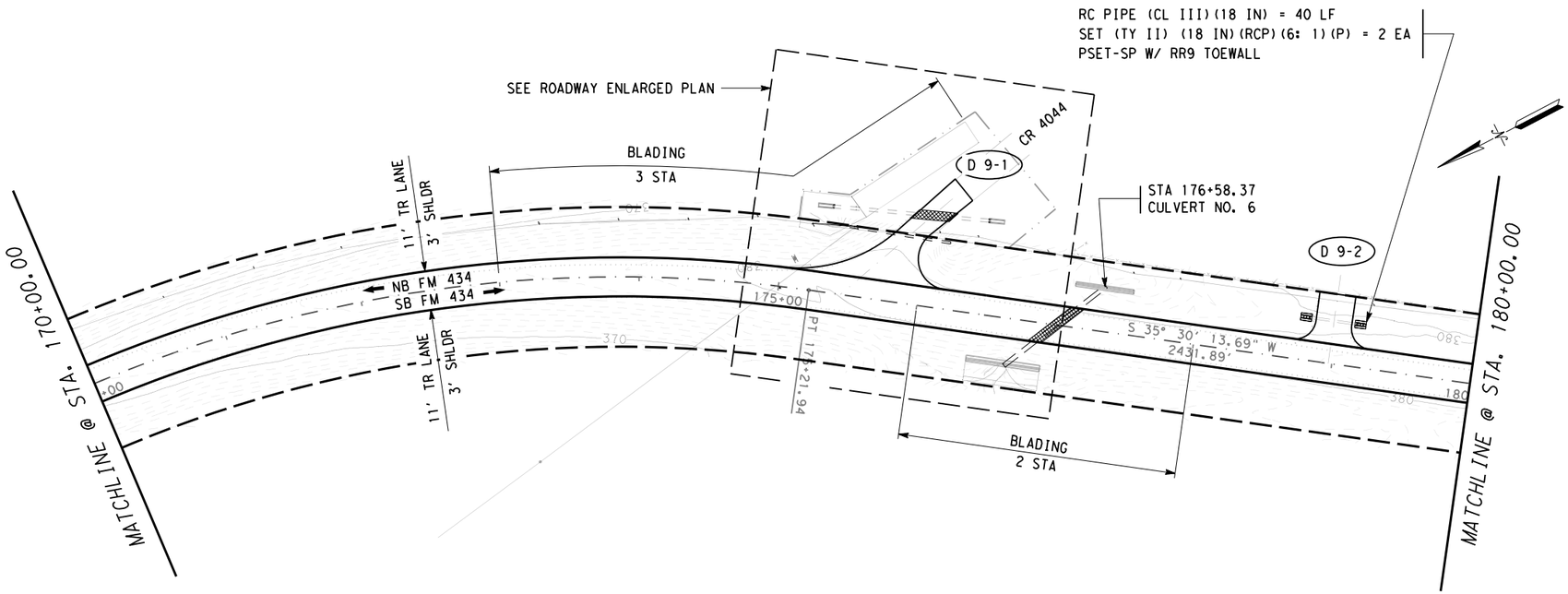
SHEET 8 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		54

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.
2. EXTEND MOWSTRIP TO BACK OF HEADWALL AS SHOWN IN PLANS.





ITEM	DESCRIPTION	UNIT
150 6001	BLADING	5 STA
432 6045	RIPRAP (MOW STRIP)(4 IN)	56 CY
464 6003	RC PIPE (CL III)(18 IN)	40 LF
467 6363	SET (TY II)(18 IN)(RCP)(6: 1)(P)	2 EA
540 6002	MTL W-BEAM GD FEN (STEEL POST)	625 LF
542 6001	REMOVE METAL BEAM GUARD FENCE	525 LF
544 6001	GUARDRAIL END TREATMENT (INSTALL)	4 EA
544 6003	GUARDRAIL END TREATMENT (REMOVE)	4 EA

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B. W. Lamb, P.E. 5/19/2021

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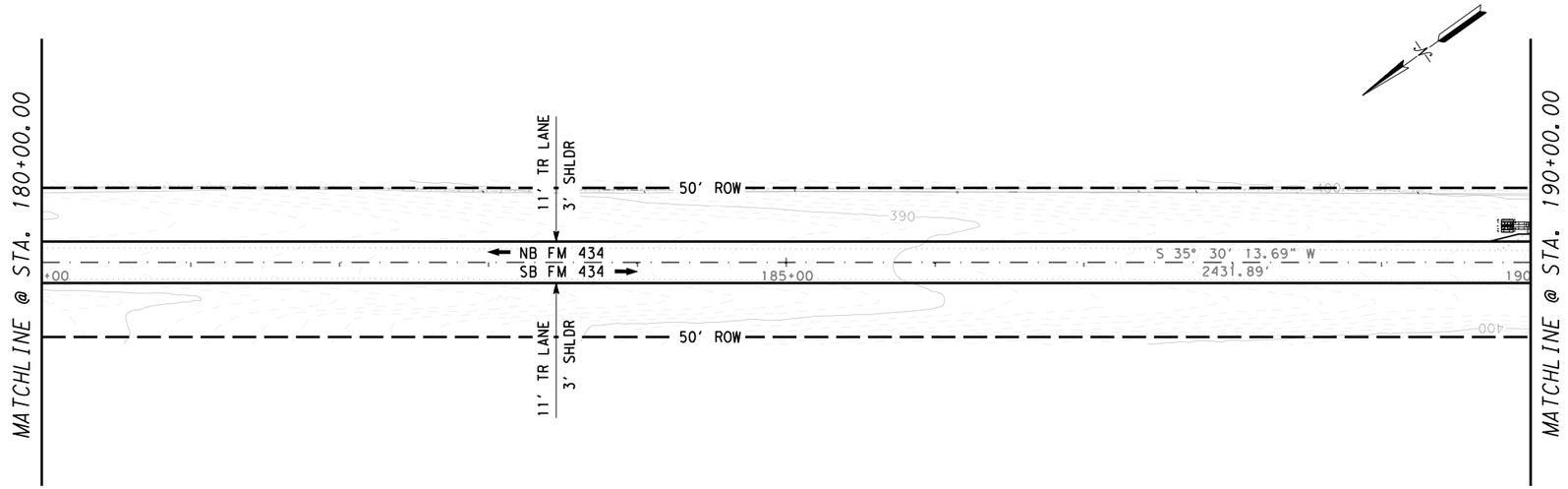
ROADWAY LAYOUT

STA 160+00.00 TO STA 180+00.00

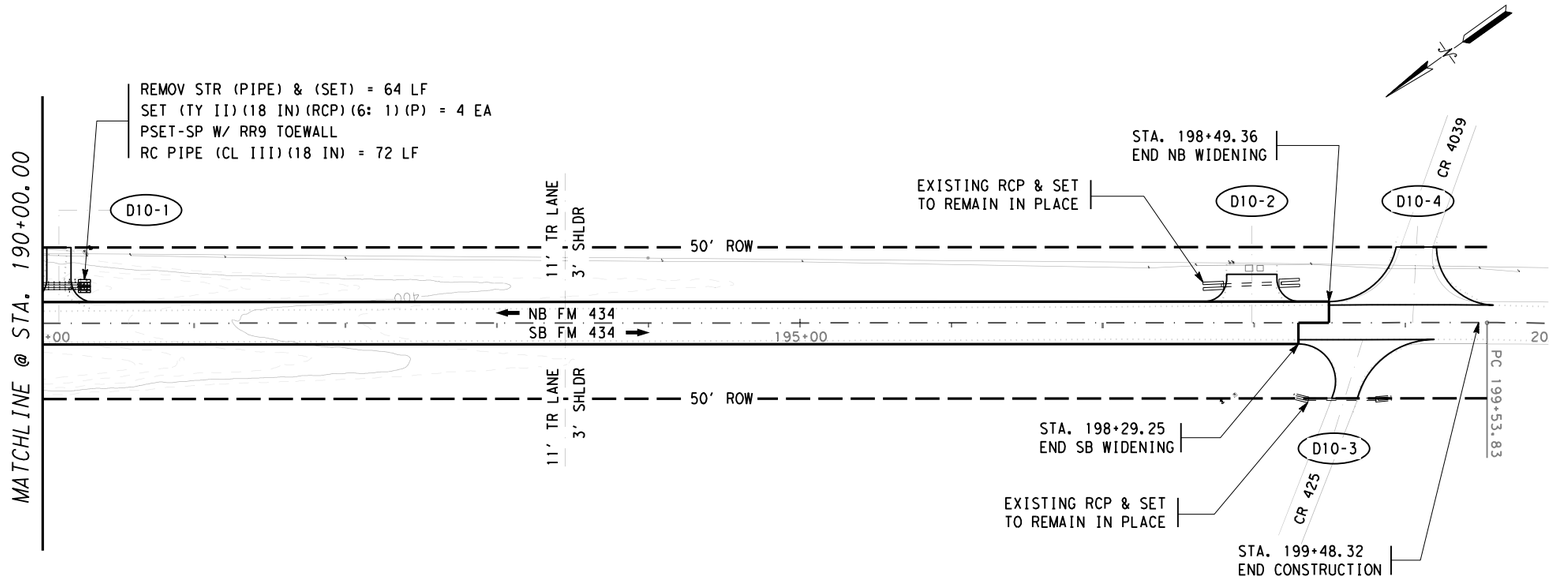
SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		55



NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED.
2. THE REMOVAL OF THE EXISTING SET'S WILL BE CONSIDERED SUBSIDIARY TO ITEM 496, "REMOV STR (PIPE)".
3. AT CONSTRUCTION LIMITS CONTRACTOR WILL BE REQUIRED TO CONSTRUCT A 100' TAPER TO A BUTT JOINT. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE PERTINENT BID ITEMS.



ITEM	DESCRIPTION	UNIT
464 6003	RC PIPE (CL III)(18 IN)	72 LF
467 6363	SET (TY II)(18 IN)(RCP)(6: 1)(P)	4 EA
496 6007	REMOV STR (PIPE)	64 LF
	FOR CONTRACTOR'S INFORMATION ONLY	
496 6004	REMOV STR (SET)	4 EA

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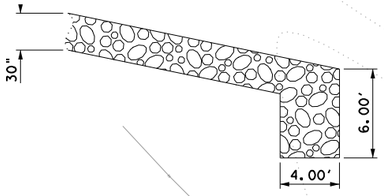
ROADWAY LAYOUT

STA 180+00.00 TO STA 199+46.32

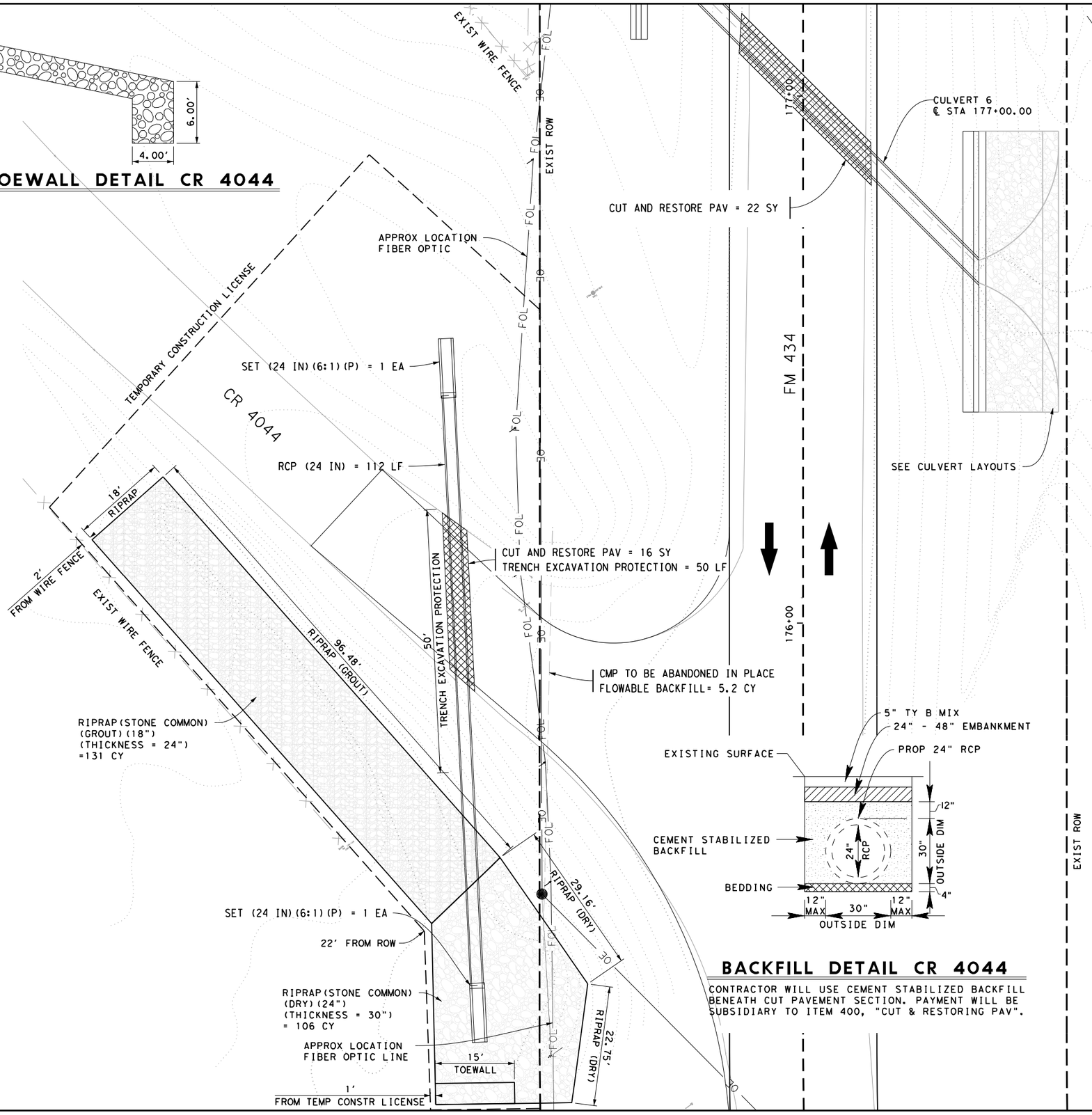
SCALE: FEET
1" = 100' HORIZ.

SHEET 10 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		56



24" SRR TOEWALL DETAIL CR 4044



BACKFILL DETAIL CR 4044

CONTRACTOR WILL USE CEMENT STABILIZED BACKFILL BENEATH CUT PAVEMENT SECTION. PAYMENT WILL BE SUBSIDIARY TO ITEM 400, "CUT & RESTORING PAV".

NOTES:

1. CONTRACTOR TO VERIFY ALL UTILITIES IN FIELD BEFORE BEGINNING OPERATIONS.
2. GRADING TO BE COMPLETED WITH ITEM 150, "BLADING" USING ALL AVAILABLE EXISTING MATERIAL BEFORE COMPLETING WITH ITEM 132, "EMBANKMENT".
3. CONTRACTOR TO VERIFY FIELD CONDITIONS PRIOR TO ORDERING MATERIALS.
4. CONTRACTOR TO COORDINATE WITH ENGINEER PRIOR TO PERFORMING WORK OUTSIDE ROW.

ITEM	DESCRIPTION	UNIT
132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	20 CY
400 6006	CUT & RESTORING PAV	38 SY
401 6001	FLOWABLE BACKFILL	5.2 CY
402 6001	TRENCH EXCAVATION PROTECTION	50 LF
432 6027	RIPRAP (STONE COMMON)(DRY)(24 IN)	106 CY
432 6051	RIPRAP (STONE COMMON)(GROUT)(18 IN)	131 CY
464 6005	RC PIPE (CL III)(24 IN)	112 LF
467 6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	2 EA

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ROADWAY ENLARGED PLAN

CR 4044

SCALE: 1" = 20' HORIZ. FEET

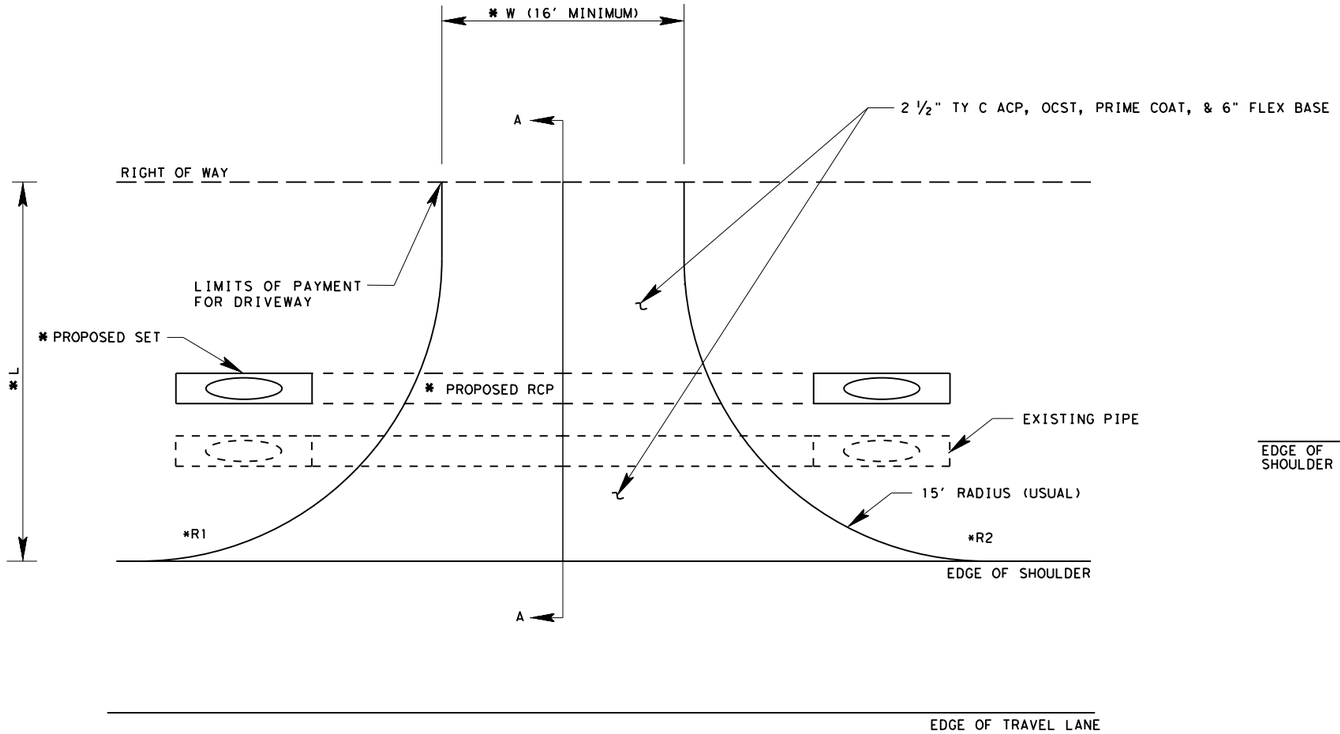
SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		57

5/14/2021 2:35:43 PM

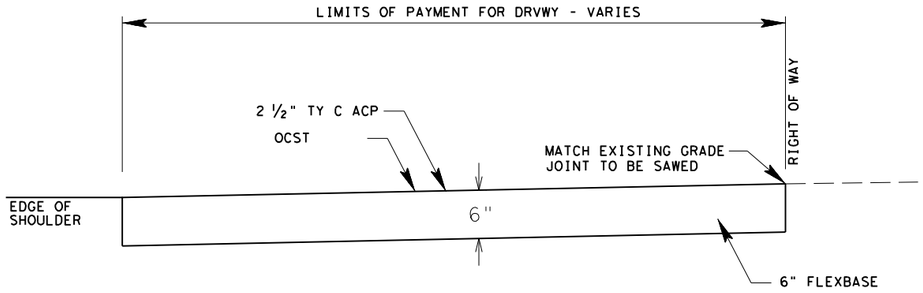
...\CULVERT LAYOUTS NO 6.dgn

NODE



NOTES:

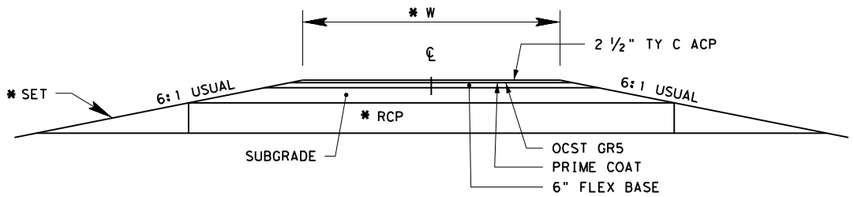
THE CONTRACTORS ATTENTION IS DIRECTED TO THE DRIVEWAY PIPE LOCATION. THE EXACT LOCATION / OFFSET / ELEVATION OF THE NEW DRIVEWAY PIPE FROM THE ROADWAY IS TO BE BASED ON THE ALIGNMENT OF THE NEW DITCH AS CONSTRUCTED AS PART OF THE ROADWAY WIDENING. THIS LOCATION MAY OR MAY NOT BE THE SAME AS THE CURRENT PIPE LOCATION. THE CONTRACTOR IS RESPONSIBLE FOR PROPERLY LOCATING THE NEW PIPE AND MAINTAINING POSITIVE DRAINAGE THROUGHOUT CONSTRUCTION.



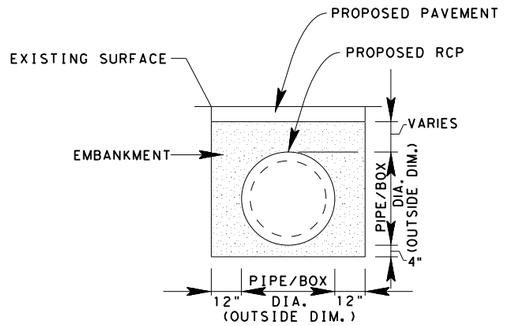
SECTION A-A

DRIVEWAYS (ACP)

DRIVEWAYS (ACP) WILL CONSIST OF: BLADING AND RESHAPING THE SUBGRADE, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH AND PLACEMENT OF 6" FLEXBASE, PRIME, OCST, AND 2 ½" ACP.



DRIVEWAY TYPICAL SECTION



BACKFILL DETAIL

* SEE SUMMARY OF DRIVEWAY ITEMS FOR: LOCATION, DIMENSION "W", "L", "R1", "R2", AND RCP/SET DETAILS (IF REQ'D). (DRIVEWAY PIPE AND SET MAY BE NEW INSTALLATION OR RELOCATED AS SHOWN ON SUMMARY)

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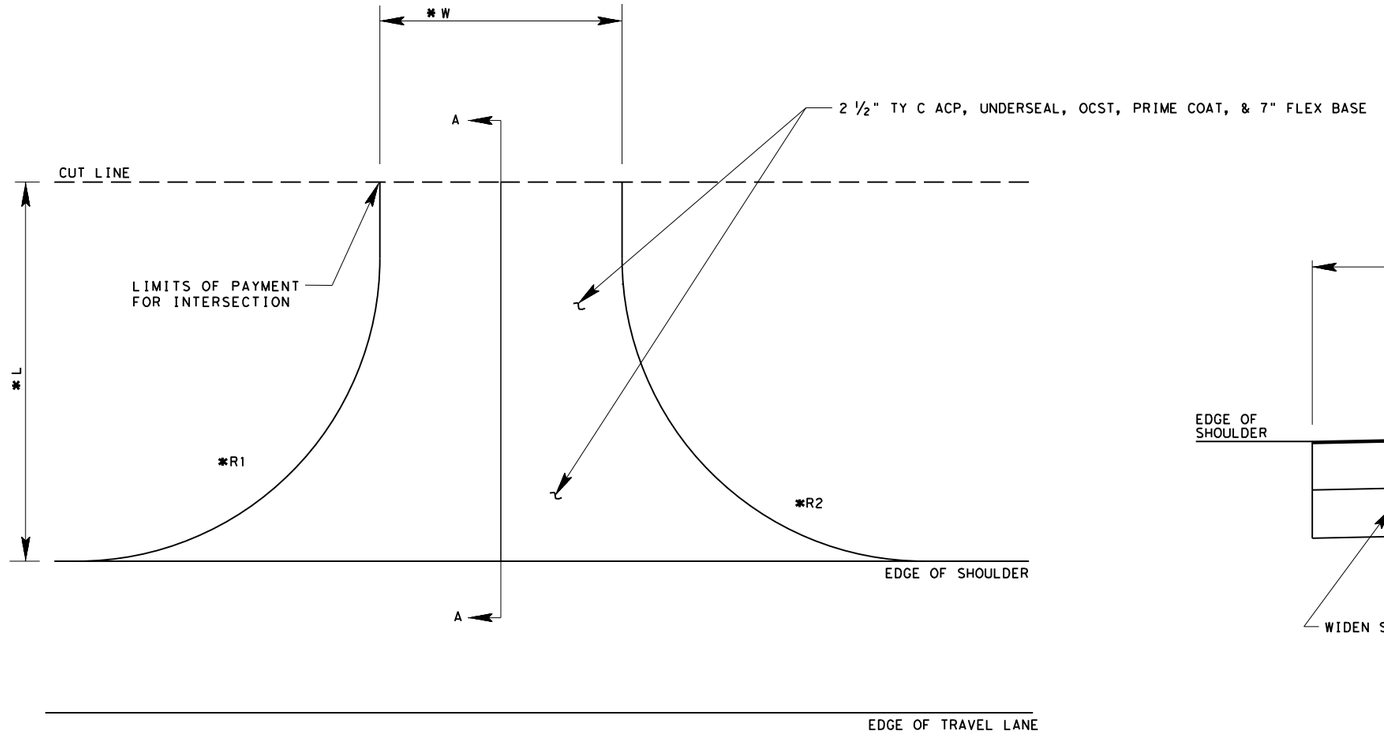
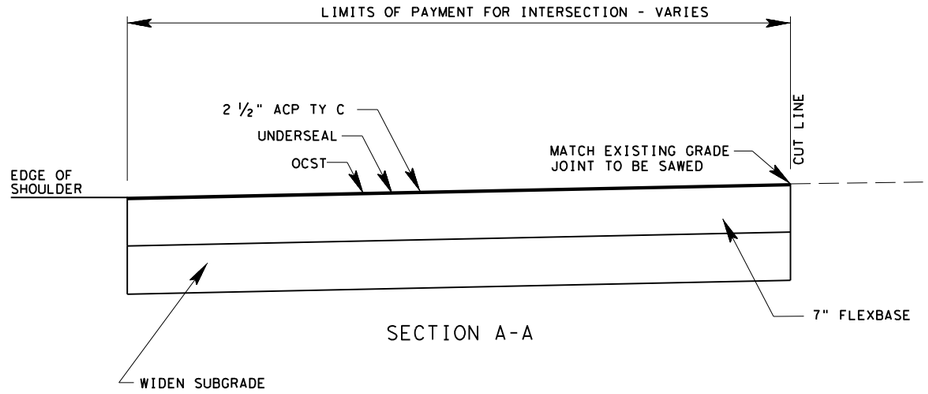
DRIVEWAY DETAILS

ACP

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		58

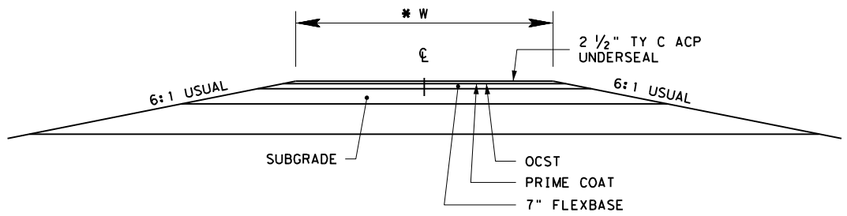




SECTION A-A

INTERSECTIONS (ACP)

INTERSECTIONS (ACP) WILL CONSIST OF: WIDENING THE SUBGRADE, SPREADING EXISTING MATERIAL, ANY EXTRA EMBANKMENT MATERIAL NECESSARY TO ACHIEVE THE PROPER SUBGRADE WIDTH, AND PLACEMENT OF 7" FLEX BASE, PRIME, OCST, UNDERSEAL, AND 2 ½" TY C ACP.



INTERSECTION TYPICAL SECTION

* SEE SUMMARY OF INTERSECTION ITEMS FOR: LOCATION, DIMENSION "W", "L", "R1", "R2".

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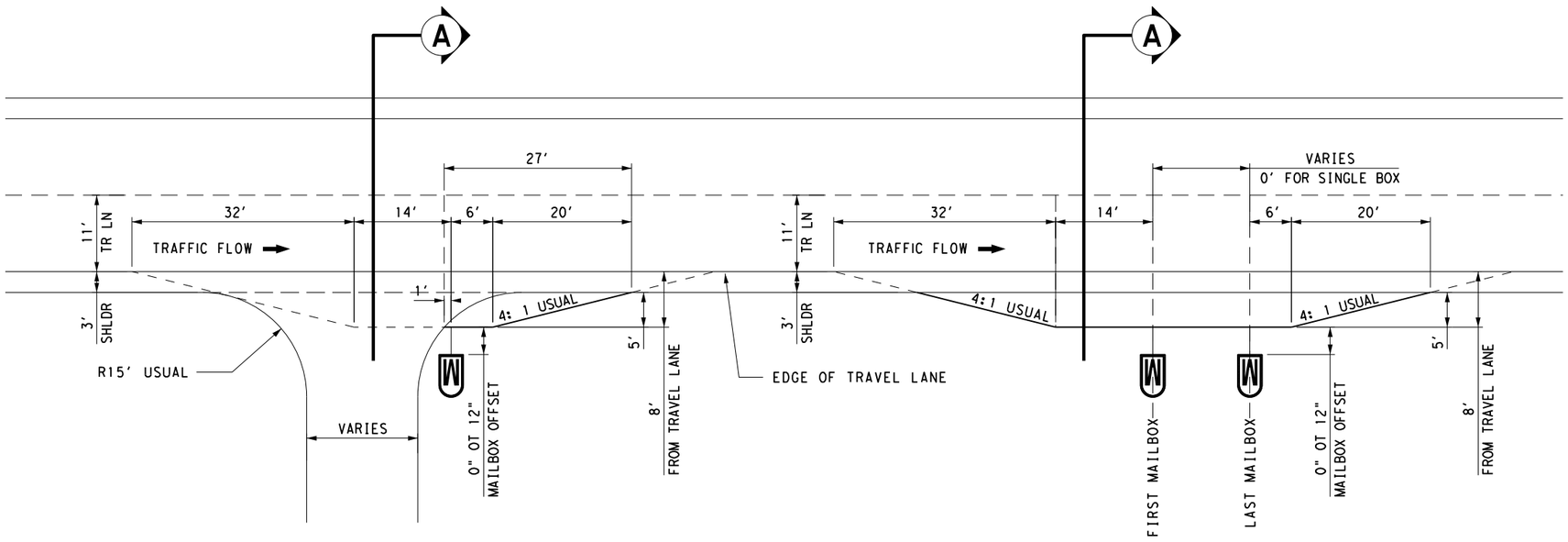
INTERSECTION DETAILS

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		59

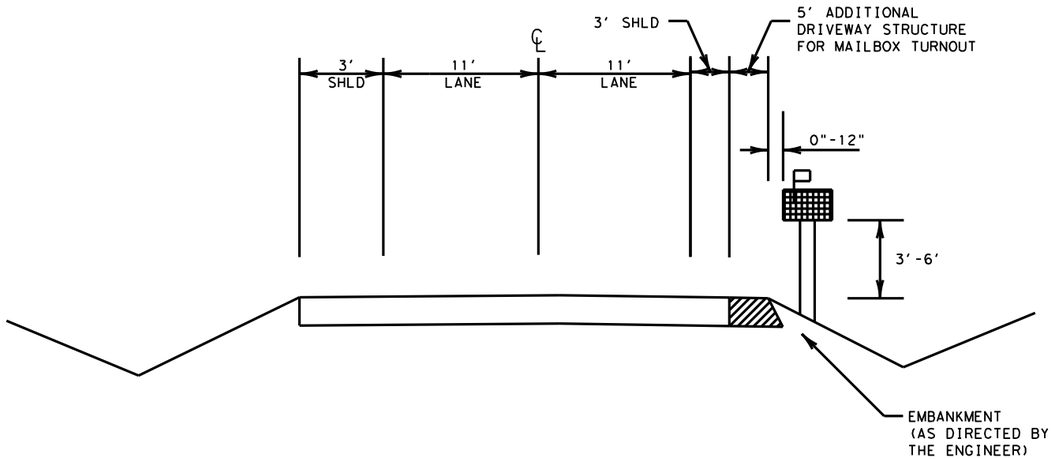
NOTES:

USE THE PROPOSED DRIVEWAY PAVEMENT STRUCTURE AS SHOWN ON THE DRIVEWAY DETAILS FOR ALL PROPOSED MAIL BOX TURNOUTS.



TYPICAL MAILBOX TURNOUT DETAIL

SCALE: 1" = 20.0'



SECTION "A"

N.T.S.

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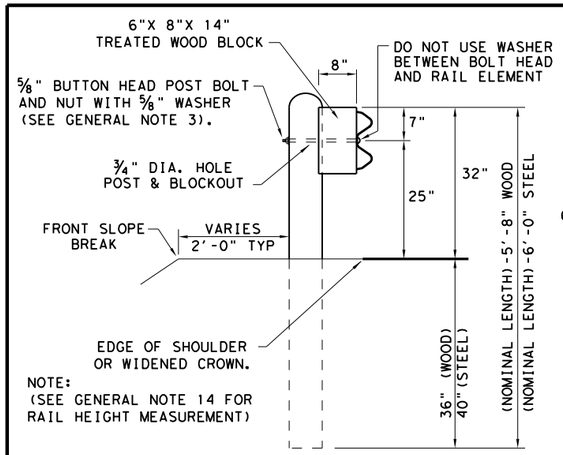
MAILBOX TURNOUT DETAILS

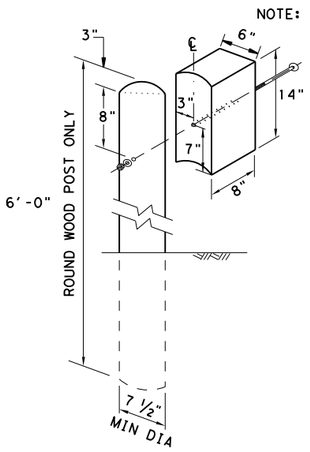
SCALE: 1" = AS NOTED FEET HORIZ.

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		60

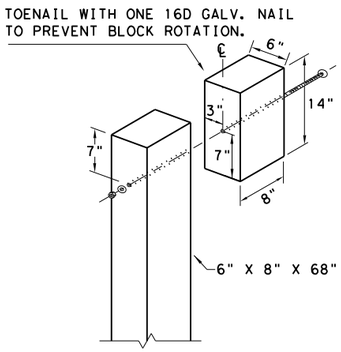


TYPICAL POST PLACEMENT

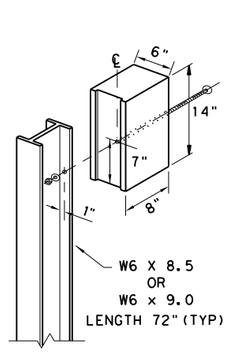


WOOD BLOCK TO ROUND WOOD POST

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

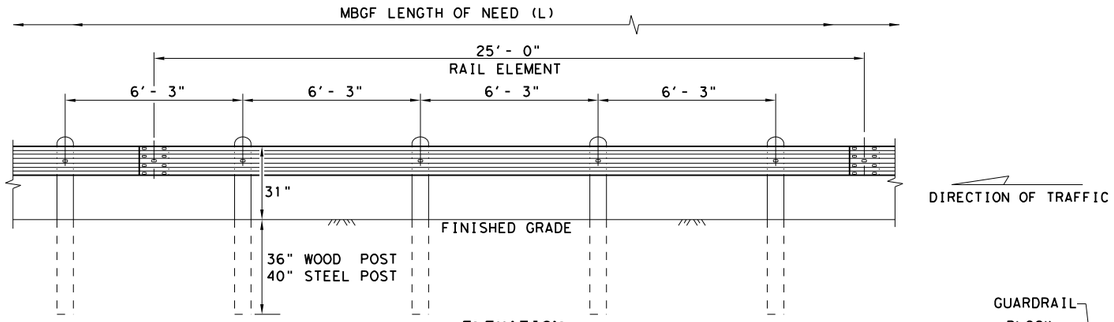


WOOD BLOCK TO RECTANGULAR WOOD POST



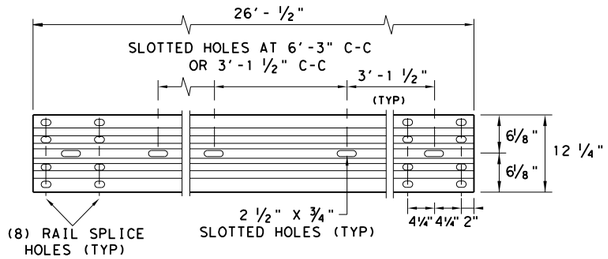
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



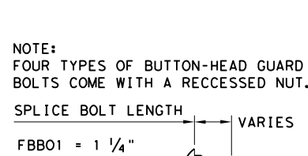
ELEVATION
MID-SPAN RAIL SPLICE

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



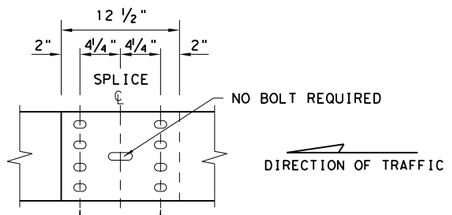
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



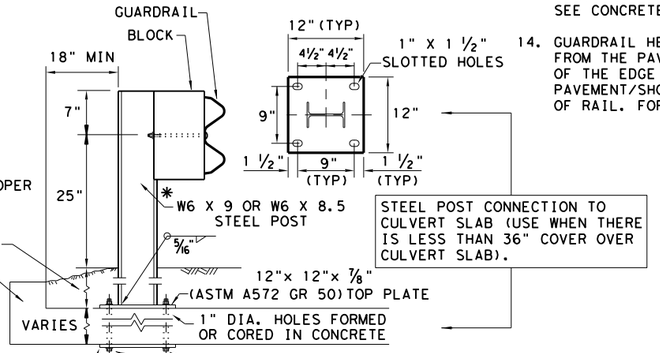
BUTTON HEAD BOLT

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	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		61

DATE: 6/3/2021
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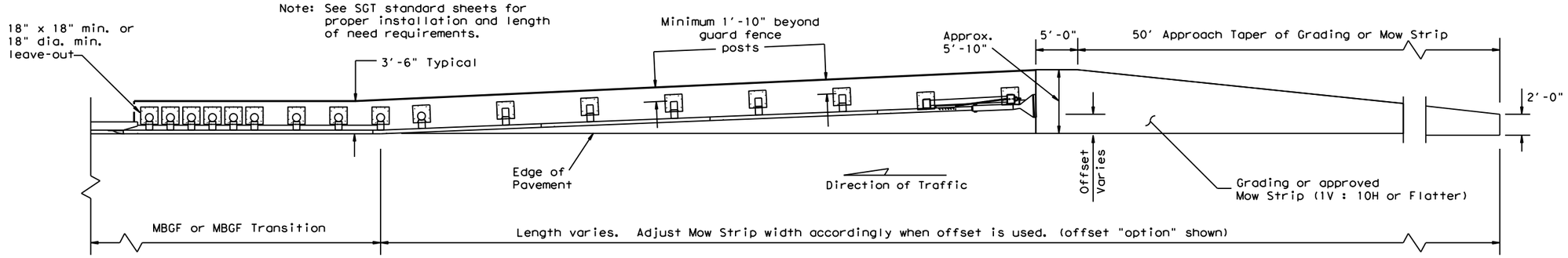
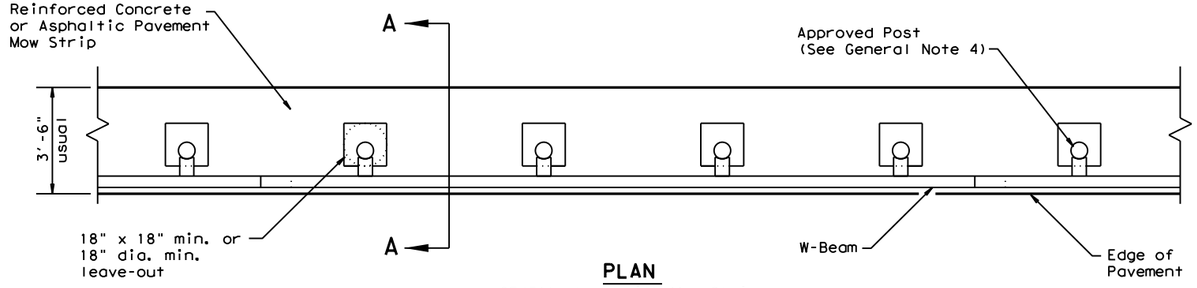
DATE: 6/3/2021
FILE: ...\Standards\gf31ms19.dgn

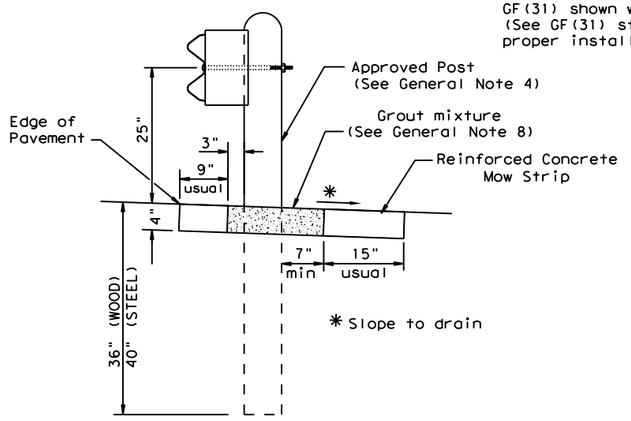


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



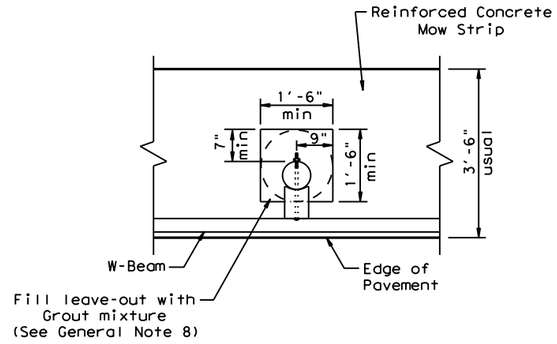
PLAN

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



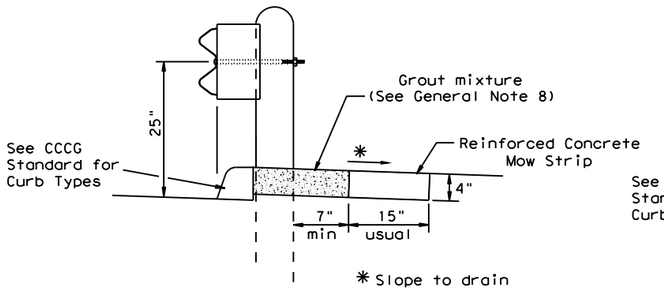
SECTION A-A

Typical



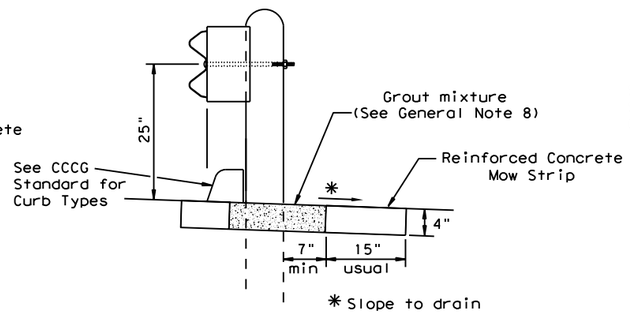
MOW STRIP DETAIL

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



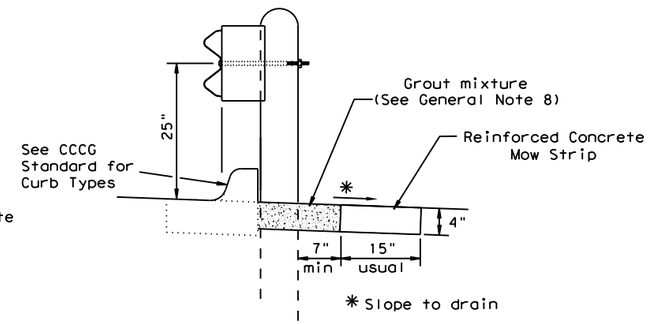
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

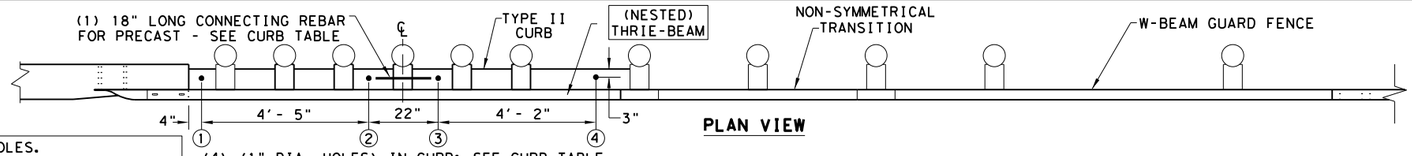
Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		62



PLAN VIEW

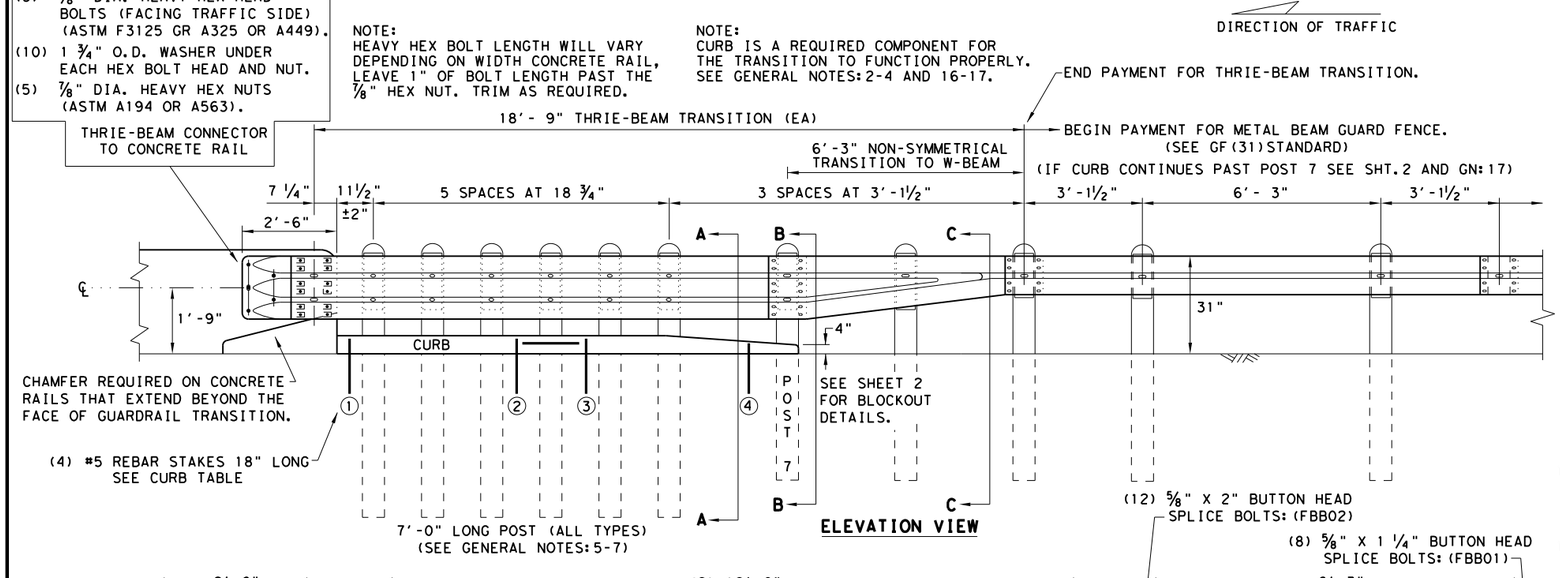
(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

(5) 1" DIA. HOLES.
(5) ⅞" DIA. HEAVY HEX HEAD BOLTS (FACING TRAFFIC SIDE) (ASTM F3125 GR A325 OR A449).
(10) 1 ¾" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
(5) ⅞" DIA. HEAVY HEX NUTS (ASTM A194 OR A563).

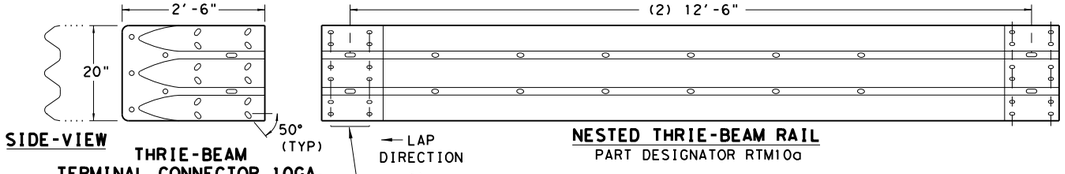
NOTE:
HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE ⅞" HEX NUT. TRIM AS REQUIRED.

NOTE:
CURB IS A REQUIRED COMPONENT FOR THE TRANSITION TO FUNCTION PROPERLY. SEE GENERAL NOTES: 2-4 AND 16-17.

DIRECTION OF TRAFFIC



ELEVATION VIEW



SIDE-VIEW

THRIE-BEAM TERMINAL CONNECTOR 10GA.
PART DESIGNATOR RTE01b
NOTE: SEE GENERAL NOTE: 9

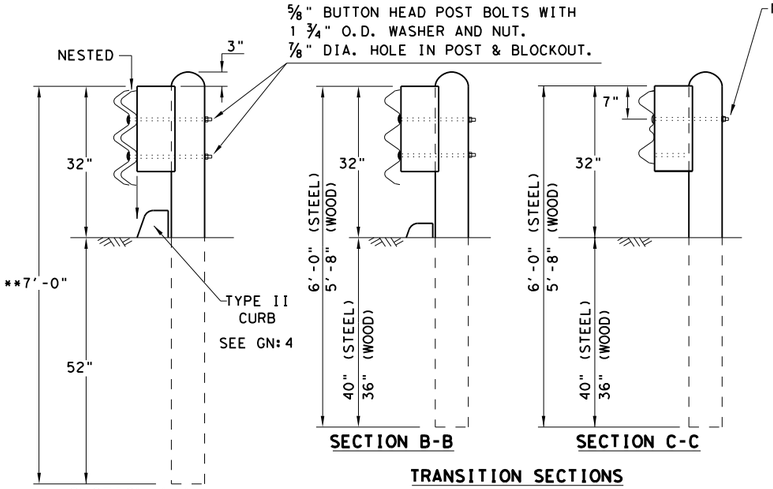
NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

NON-SYMMETRICAL W-BEAM TO THRIE-BEAM TRANSITION 10GA.
PART DESIGNATOR RWT02a OR RWT02b

(12) ⅝" X 2" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS: (FBB02)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS: (FWR03)

PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE NESTED RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



SECTION A-A

SECTION B-B

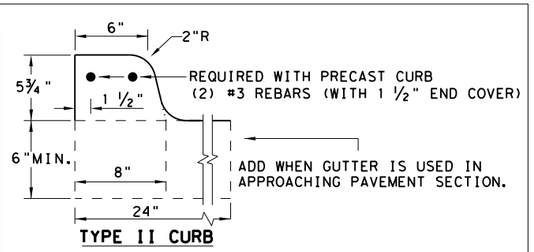
SECTION C-C

TRANSITION SECTIONS

NOTE: ALL POST TYPES, SEE GENERAL NOTE: 5 & 6

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

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.



TYPE II CURB

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

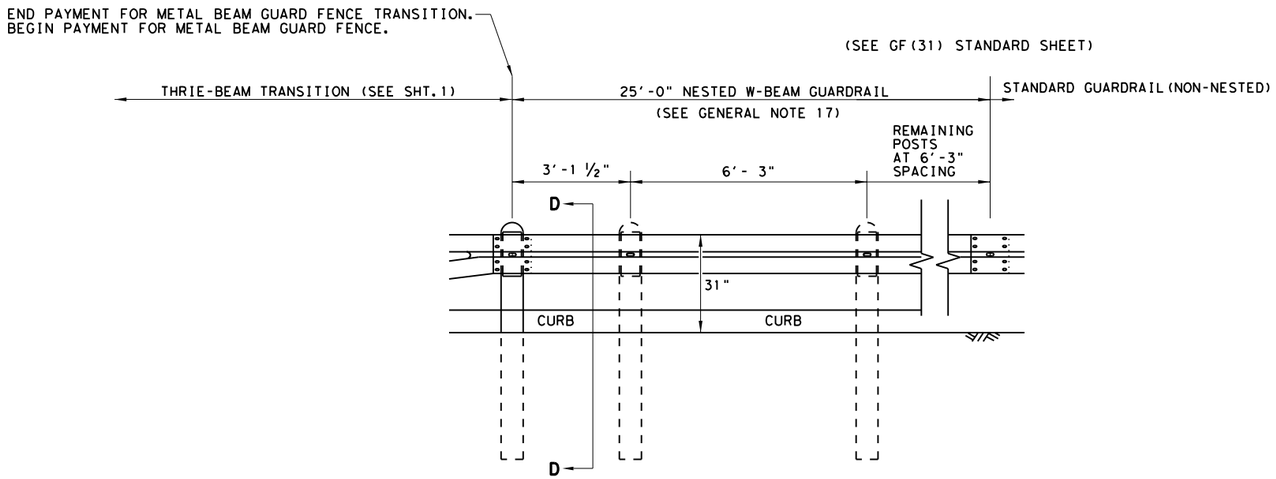
FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1077	01	026	FM 434	
	DIST	COUNTY		SHEET NO.	
	WACO	FALLS		63	

DATE: 6/3/2021
FILE: ...\Standards\gf31trt1320.dgn

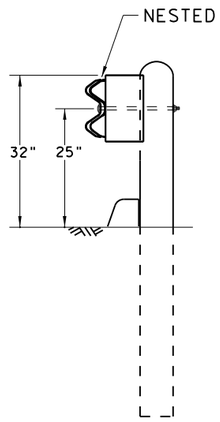
DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 6/3/2021
FILE: ...\$tandards\gf31tr1320.dgn

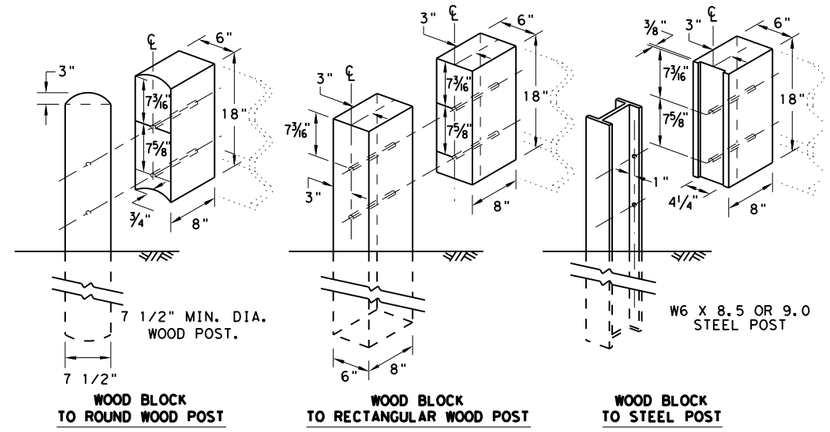
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

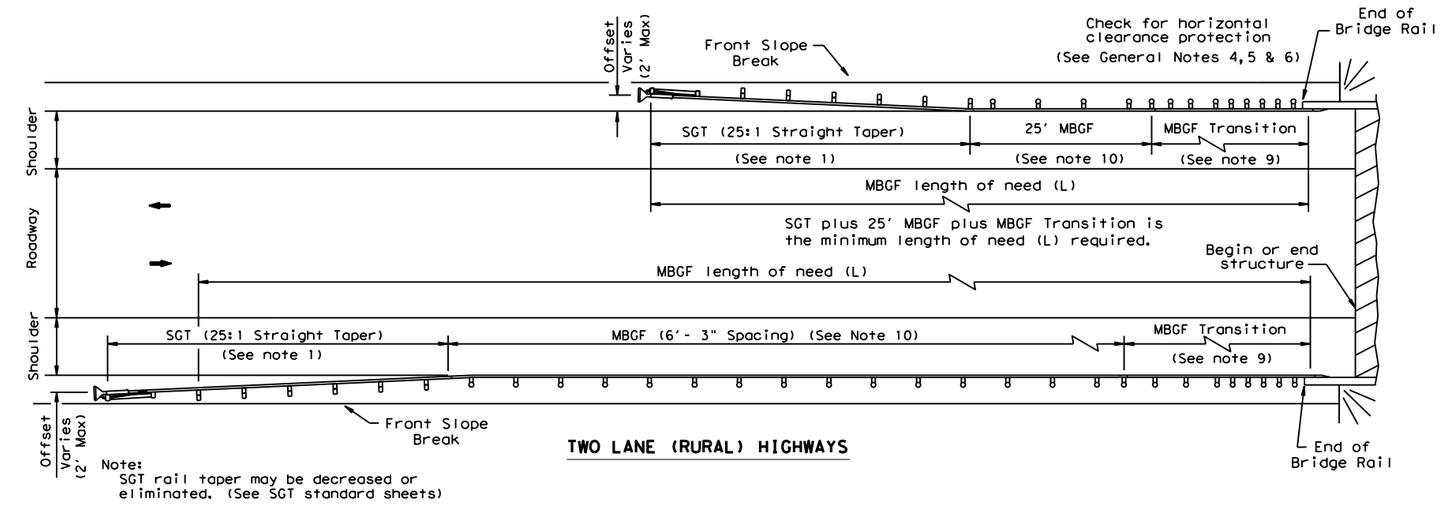
SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

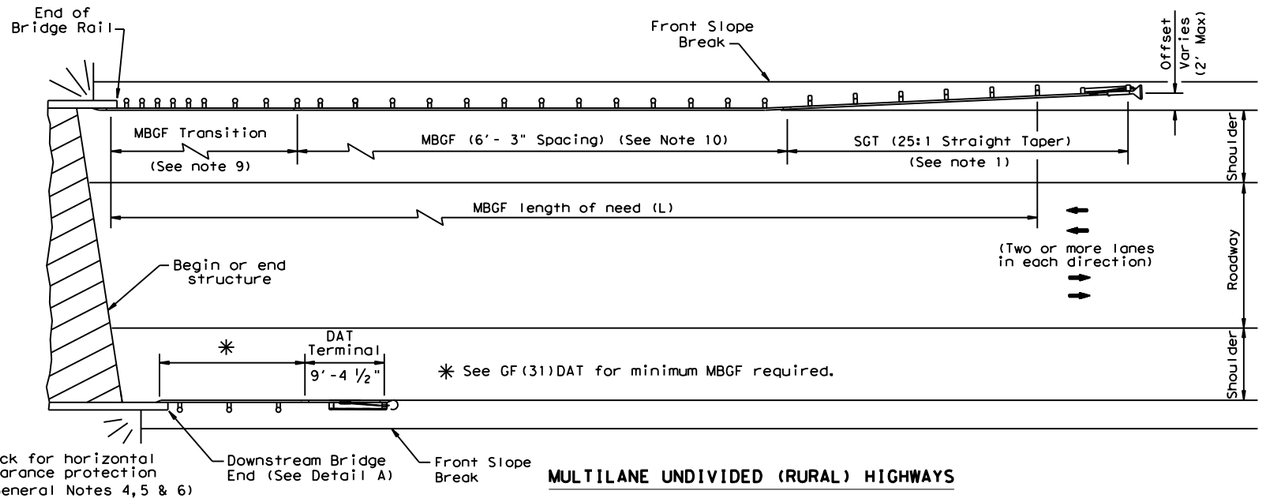
GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		64

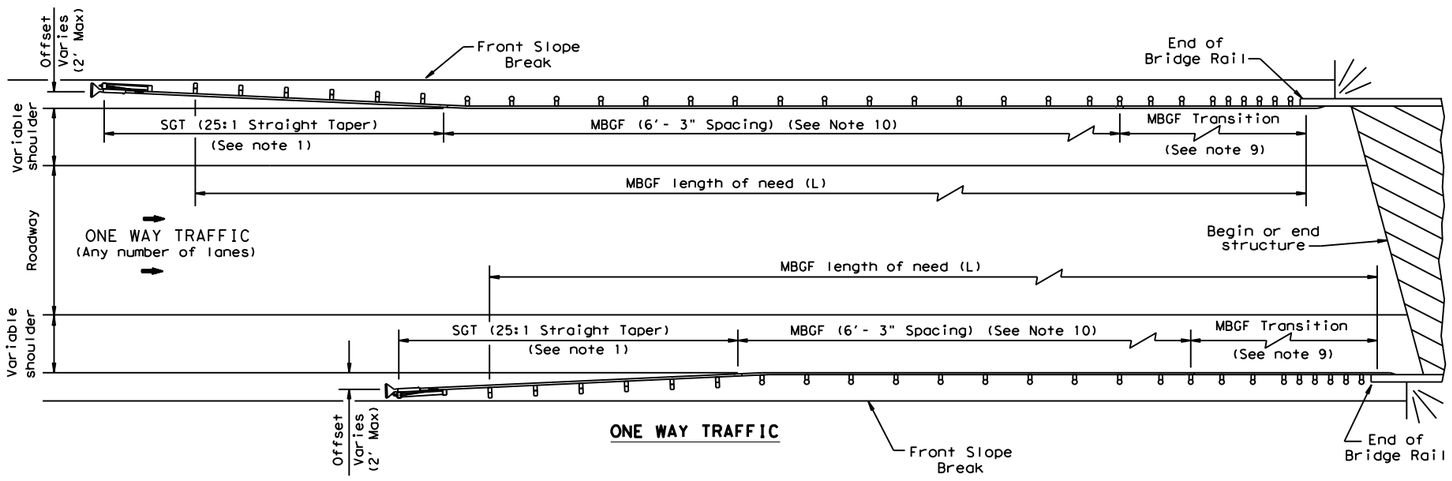


TWO LANE (RURAL) HIGHWAYS

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



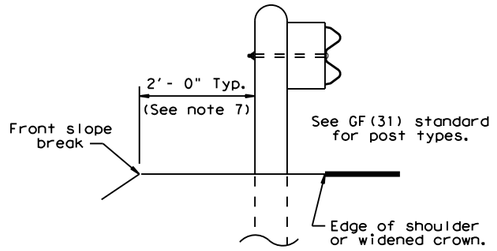
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



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	1077	01	026	FM 434
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	WACO	FALLS		65

DATE: 6/3/2021 9:05:01 AM
FILE: ...\3. Roadway\Standards\bed14.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

CABLES

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

PLAN VIEW

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 ⅝"

6'-3" | 6'-3" | 6'-3" | 6'- ¾" | 6'-3" | 6'-3" | 6'-3" | 37 ½" | 5'-3 ⅜"

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

RAIL
HEIGHT
31"

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

ARROWS

DETAIL (D)

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL (B)

A

32-¼"

FINISHED
GRADE

CABLES

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

68-⅛"

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1

ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

**SOIL
ANCHOR POST**
ITEM (1)

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

HEAD
HEIGHT
32-¼"

TOP OF POST

31-⅞"

FINISHED
GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

**SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9**

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 ⅝"

2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)

ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

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

2'-0" MAX.
RAIL OFFSET

APPROACH GRADING
(1V:10H OR FLATTER)
SEE PRODUCT ASSEMBLY MANUAL
FOR ADDITIONAL GUIDANCE.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'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. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST(MPL)FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		66

DATE: 6/3/2021
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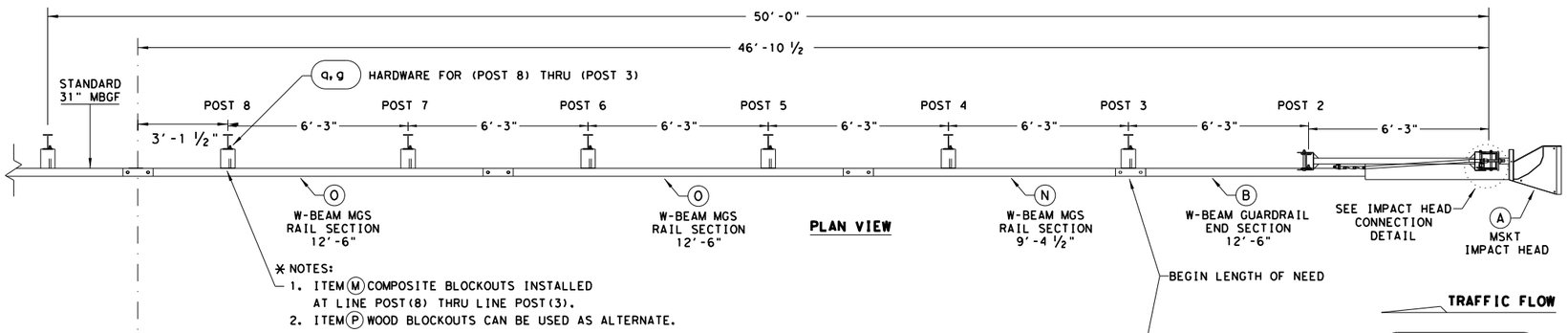
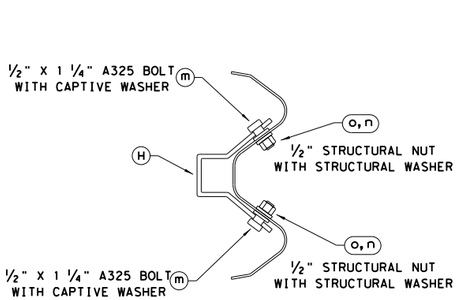
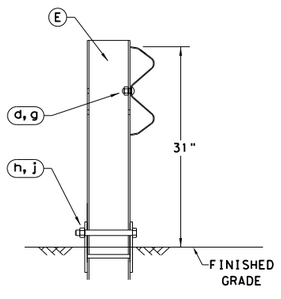


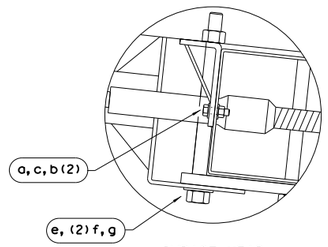
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



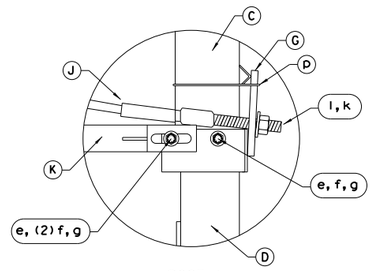
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

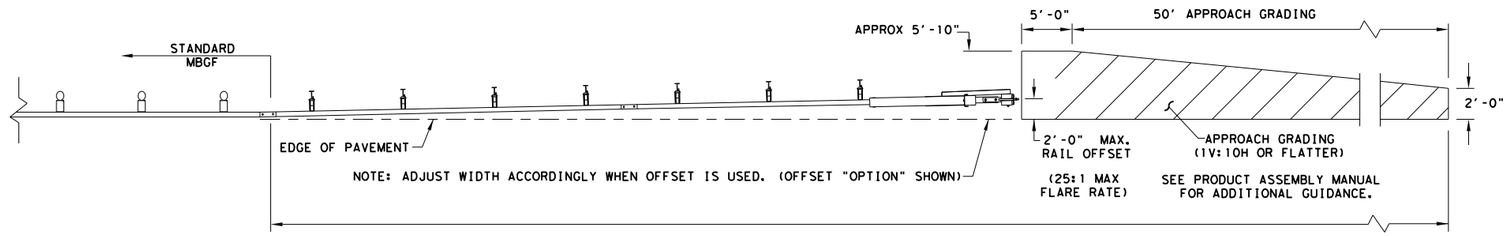
GENERAL NOTES

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

SEE NOTES: *

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

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
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DATE: 6/3/2021
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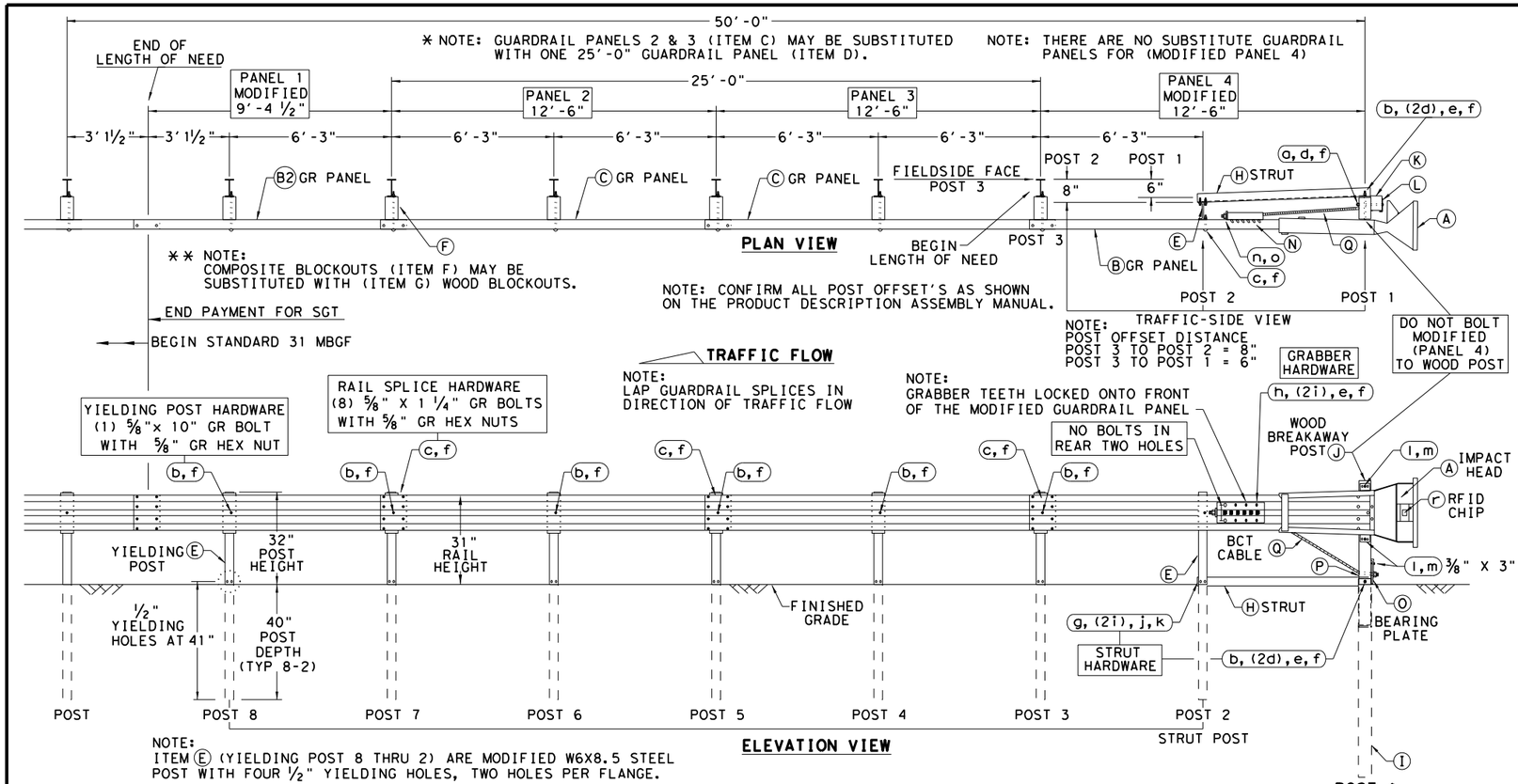
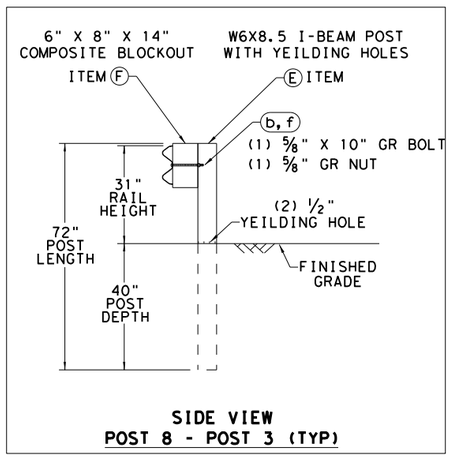


GENERAL NOTES

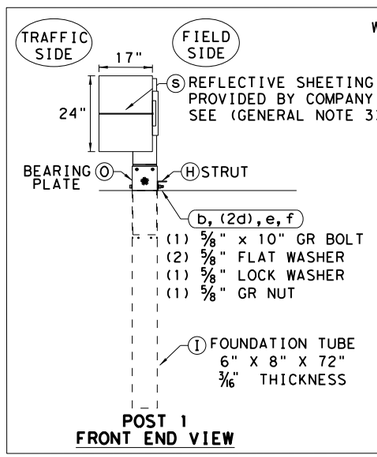
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D *	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G **	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

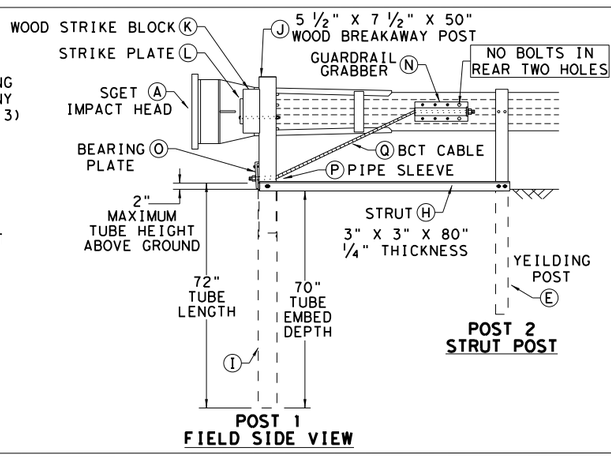
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



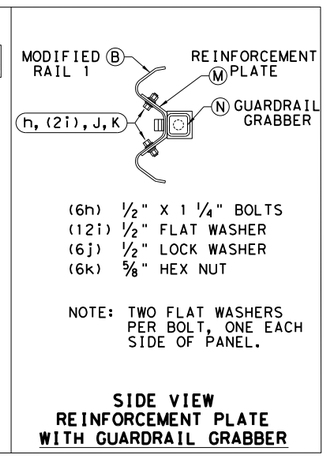
SIDE VIEW
POST 8 - POST 3 (TYP)



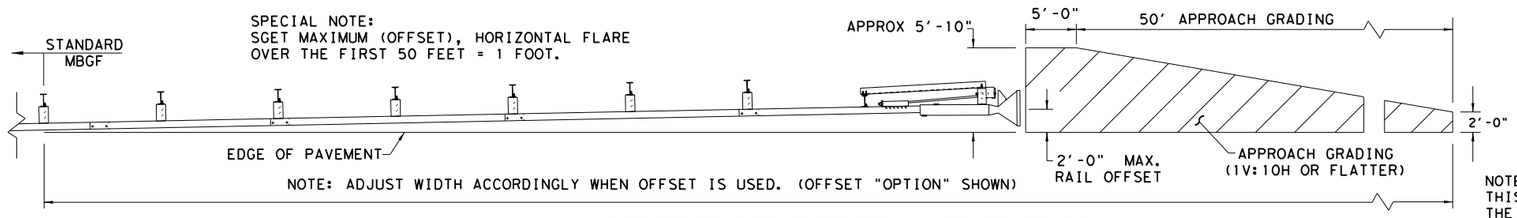
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT		CK: KM	DW: VP		CK: VP
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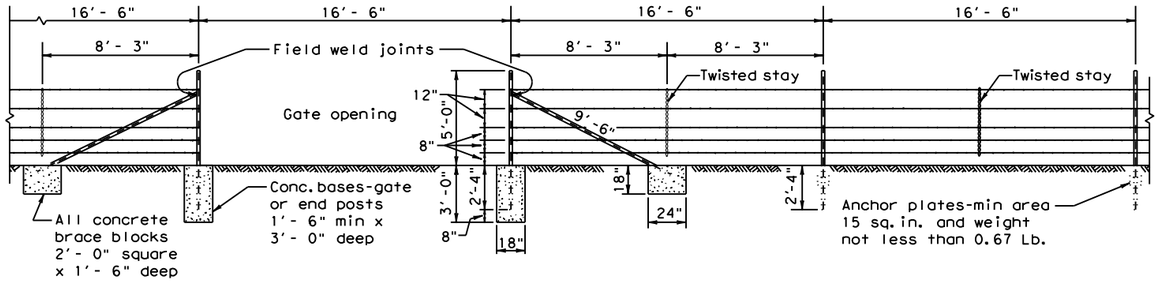
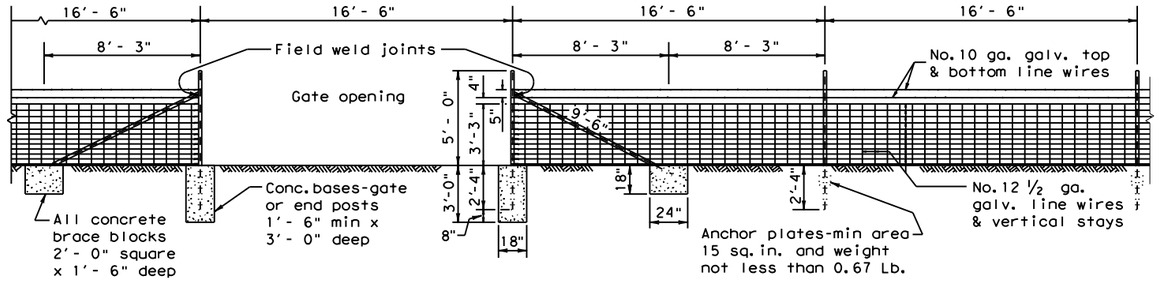
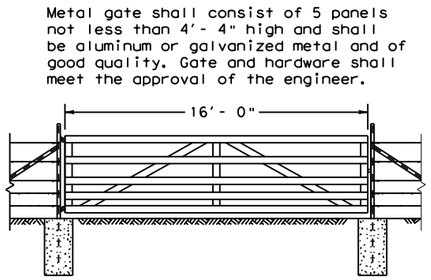


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

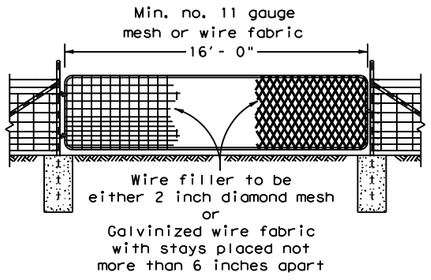
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



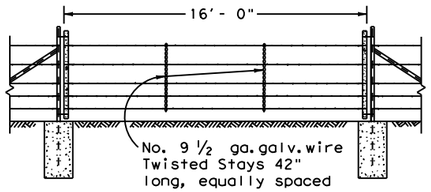
SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "D" FENCE
(See General Note 8)



DETAIL TYPE 1 GATE



DETAIL TYPE 2 GATE

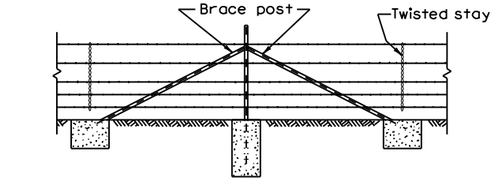


DETAIL TYPE 3 GATE

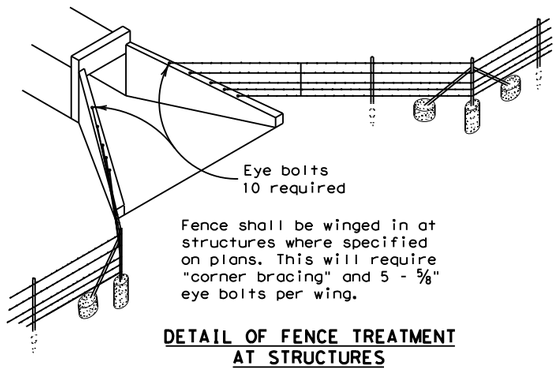
GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

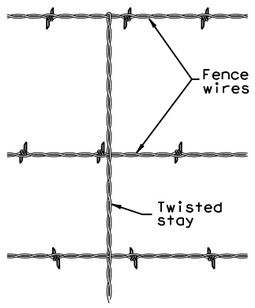
   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.



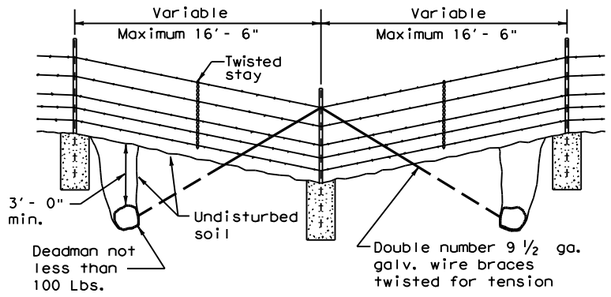
CORNER OR PULL POST ASSEMBLY



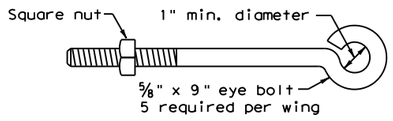
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

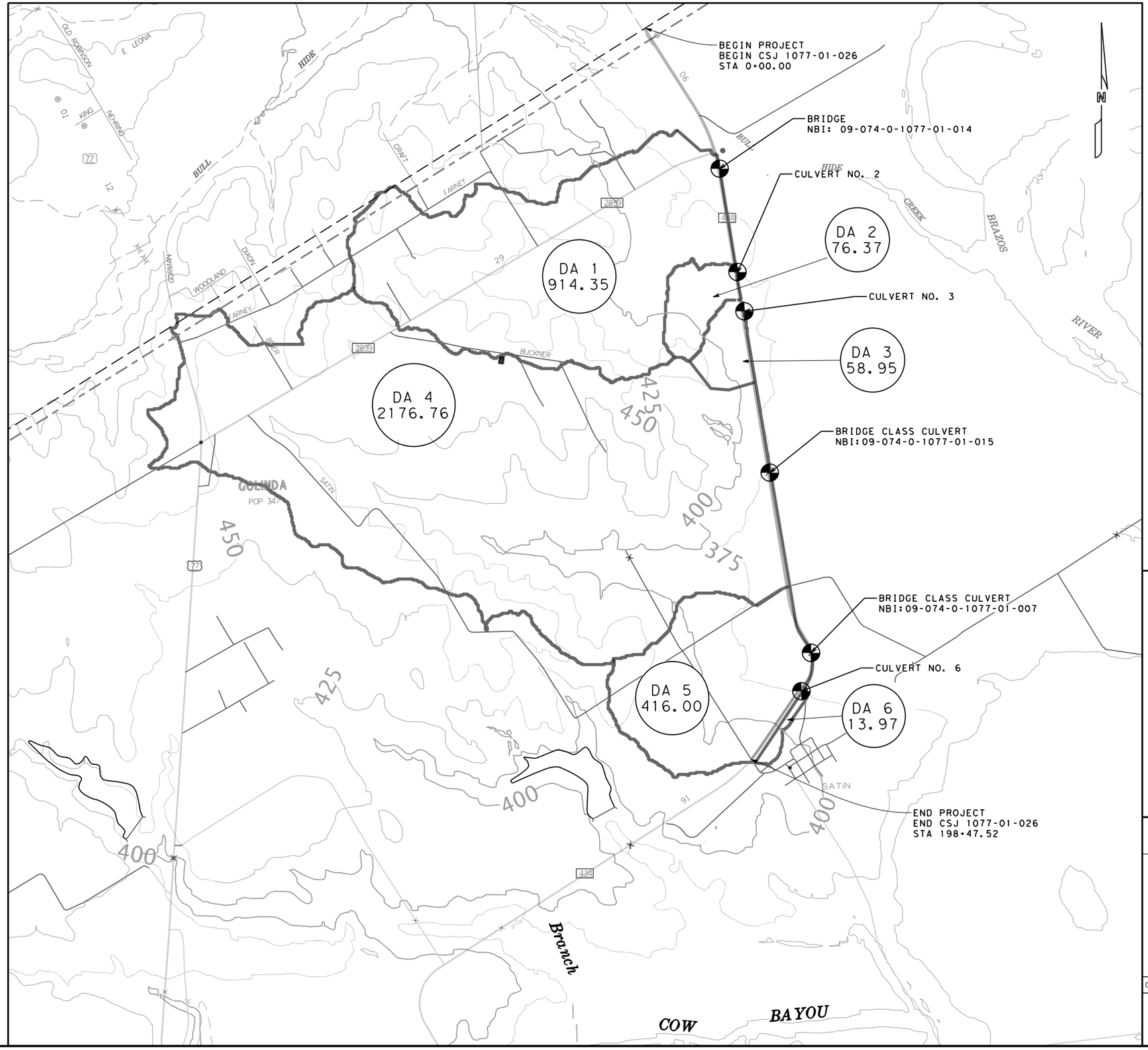
Texas Department of Transportation | Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE
(STEEL POSTS)

WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		69

DATE: 6/3/2021
FILE: ...\3, Roadway\Standards\wf210.dgn



NOTES:

1. DRAINAGE AREA 5 INCLUDES DRAINAGE AREA 6
2. DRAINAGE AREAS ARE NOT LOCATED WITHIN A FEMA DESIGNATED FLOODPLAIN. FALLS COUNTY DOES NOT HAVE FLOODPLAIN MAPPING.

DA ##
ACRES

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

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DRAINAGE AREA MAP

SCALE: 1" = 2 MI HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		70

Rational Method

DRAINAGE AREA ID	STA	CULVERT	DRAINAGE AREA (AC)	C	Tc (MIN)	5 YR I (IN/HR)	5 YR Q (CFS)	EXIST HW ELEV	PROPOSED HW ELEV	PROPOSED TW ELEV	PROPOSED TW VEL (FPS)	CHANGE HW ELEV	100 YR I (IN/HR)	100 YR Q (CFS)	EXIST HW ELEV	PROPOSED HW ELEV	PROPOSED TW ELEV	PROPOSED TW VEL (FPS)	CHANGE HW ELEV	ALLOW RDWY ELEV
DA 2	64+86.96	Culvert 2	76.37	0.53	44.62	2.71	111.63	380.20	381.16	377.39	6.14	0.96	4.90	201.66	382.29	382.31	377.75	7.12	0.02	382.23
DA 3	74+77.93	Culvert 3	58.95	0.36	40.94	2.88	61.82	379.72	379.85	378.33	1.69	0.13	5.18	111.36	381.14	381.58	378.71	1.96	0.44	382.26
DA 6	176+19.17	Culvert 6	13.97	0.34	45.61	2.44	11.63	374.22	374.07	370.57	5.31	-0.15	4.44	21.12	374.91	374.70	370.75	6.41	-0.21	380.95

HEC-HMS

DRAINAGE AREA ID	STA	CULVERT	DRAINAGE AREA (SQ MI)	CN	Tc (MIN)	25 YEAR Q (CFS)	EXIST HW ELEV	PROPOSED HW ELEV	PROPOSED TW ELEV	PROPOSED TW VEL (FPS)	CHANGE HW ELEV	100 YEA Q (CFS)	EXIST HW ELEV	PROPOSED HW ELEV	PROPOSED TW ELEV	PROPOSED TW VEL (FPS)	CHANGE HW ELEV	ALLOW RDWY ELEV
DA 4	118+34.02	Culvert 4	3.40	72	124.38	2176.00	369.11	368.85	367.21	8.26	-0.26	4127.30	371.86	371.84	369.08	9.77	-0.02	371.45
DA 5	166+08.28	Culvert 5	0.65	77	67.88	692.00	364.01	364.39	359.72	10.09	0.38	1204.30	366.59	367.21	360.32	12.35	0.62	367.71

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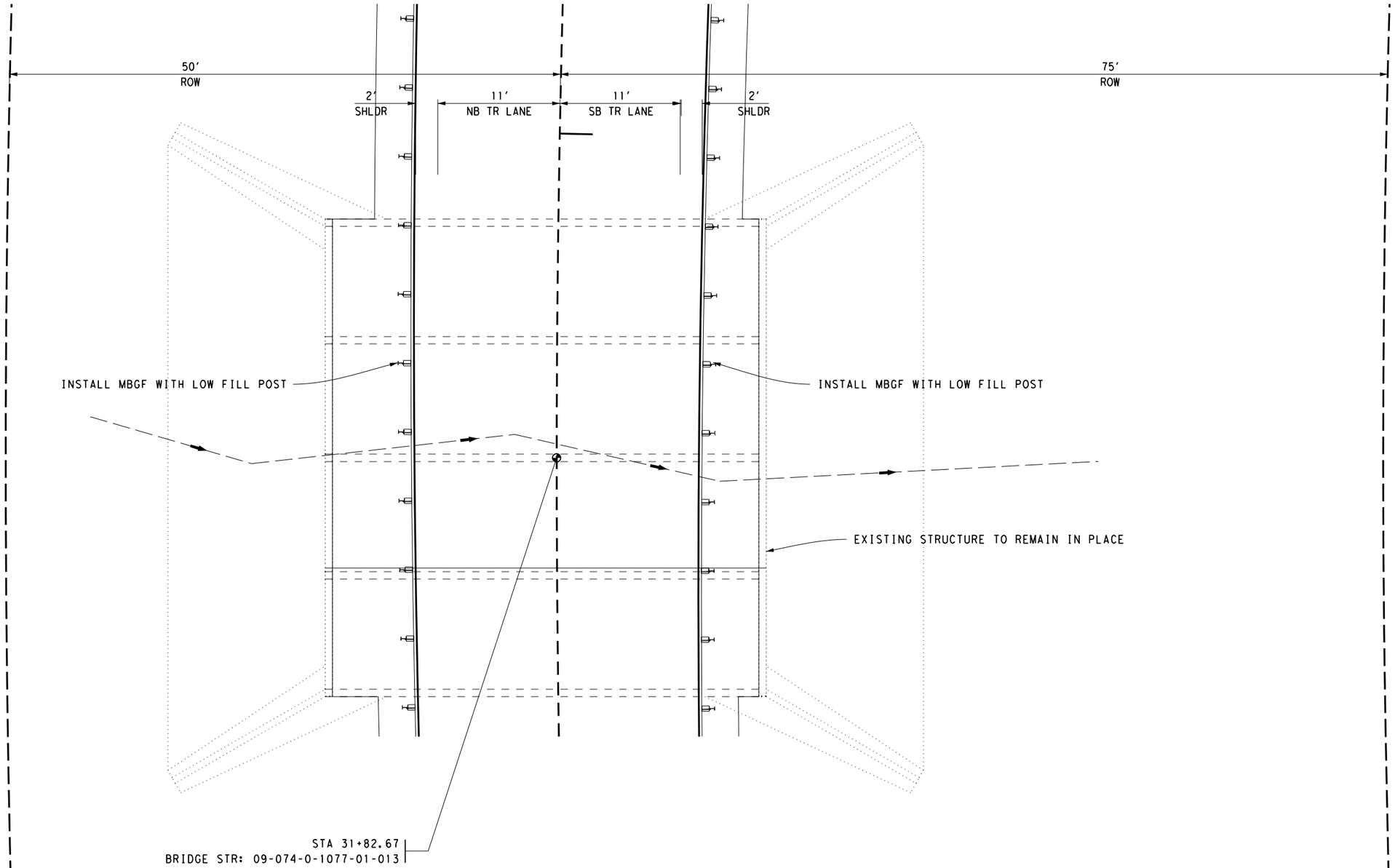
HYDRAULIC DATA

SHEET 1 OF 1

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		71



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CULVERT LAYOUTS

CULVERT #1

SCALE: 1″ = 10′ HORIZ. FEET

SHEET 1 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		72

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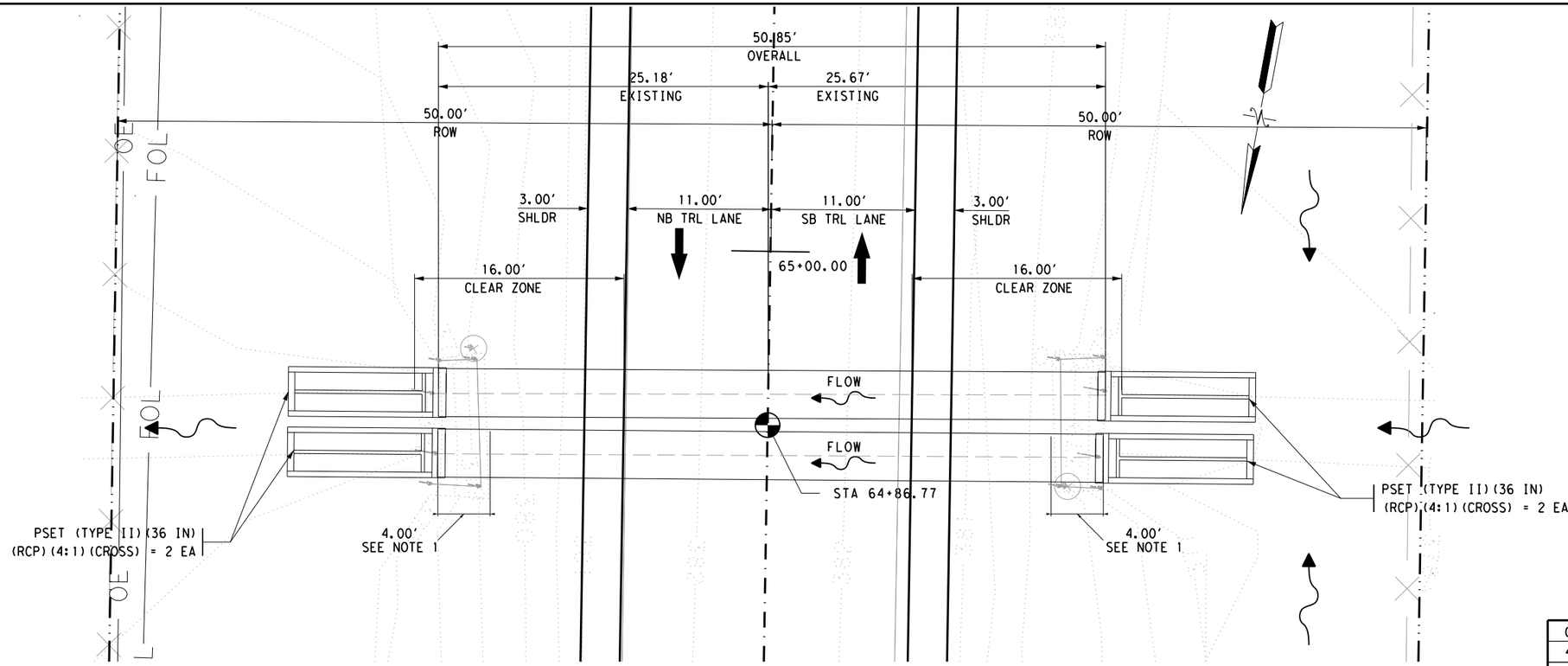
...\CULVERT LAYOUTS.dgn

NODE

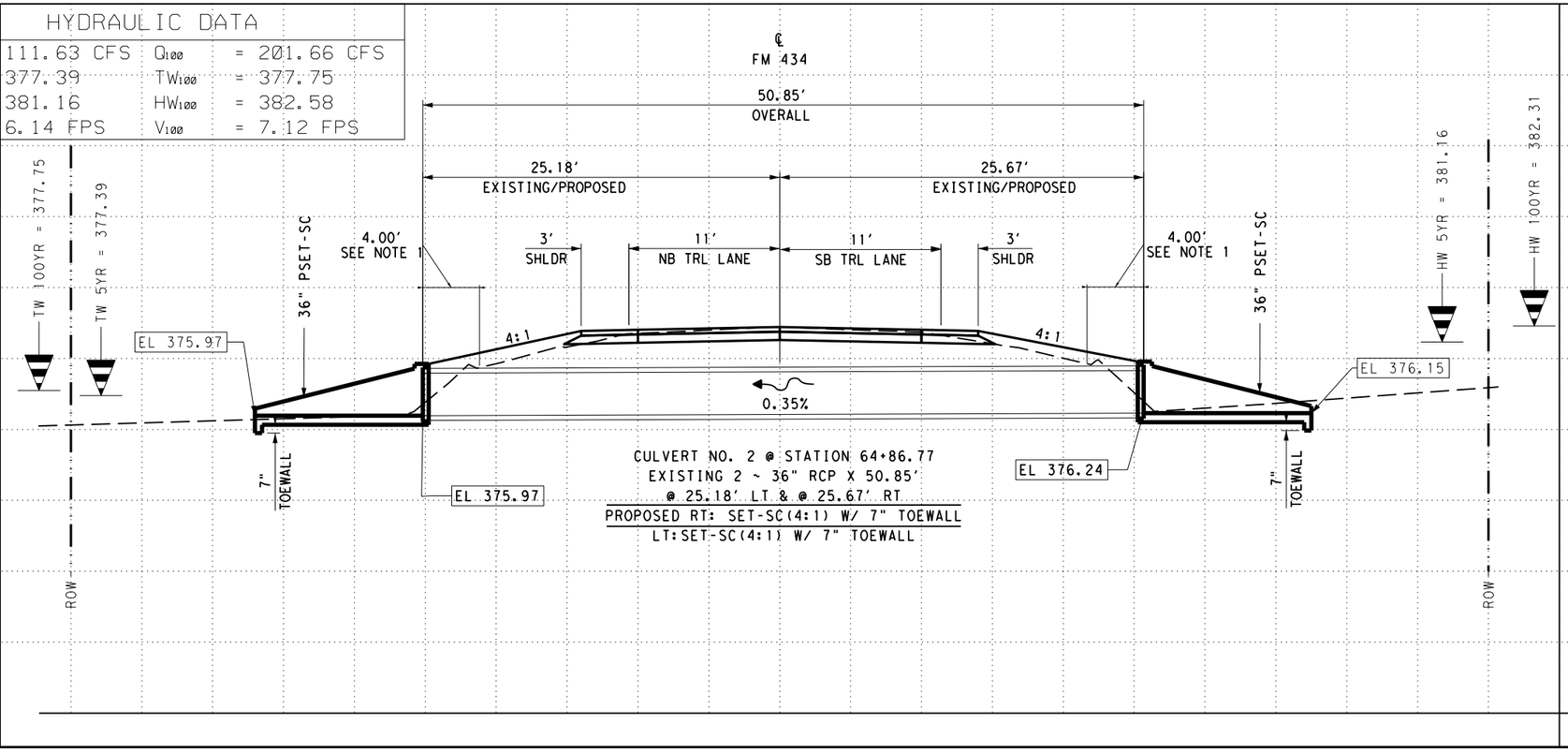


NOTES:

1. BREAK BACK 4.00' OR TO FIRST JOINT, SUBSIDIARY TO 467 6450

QUANTITY	DESCRIPTION	UNIT
467 6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	4 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
	FOR CONTRACTOR'S INFOMATION ONLY	
	BREAK BACK CULVERT	16 LF

HYDRAULIC DATA			
Q_5 =	111.63 CFS	Q_{100} =	201.66 CFS
TW_5 =	377.39	TW_{100} =	377.75
HW_5 =	381.16	HW_{100} =	382.58
V_5 =	6.14 FPS	V_{100} =	7.12 FPS



CULVERT NO. 2 @ STATION 64+86.77
EXISTING 2 ~ 36" RCP X 50.85'
@ 25.18' LT & @ 25.67' RT
PROPOSED RT: SET-SC(4:1) W/ 7" TOEWALL
LT: SET-SC(4:1) W/ 7" TOEWALL

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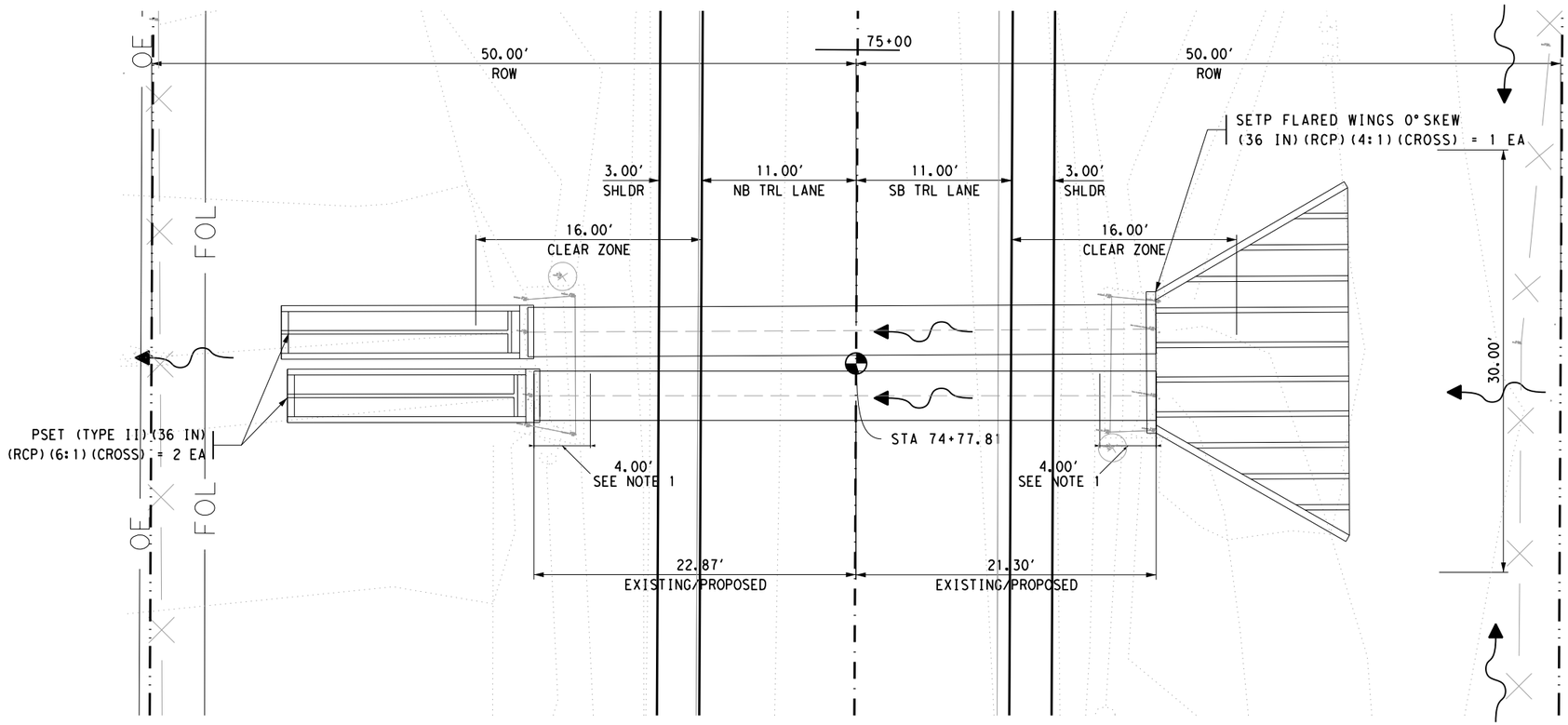
CULVERT LAYOUTS

CULVERT #2

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 2 OF 9

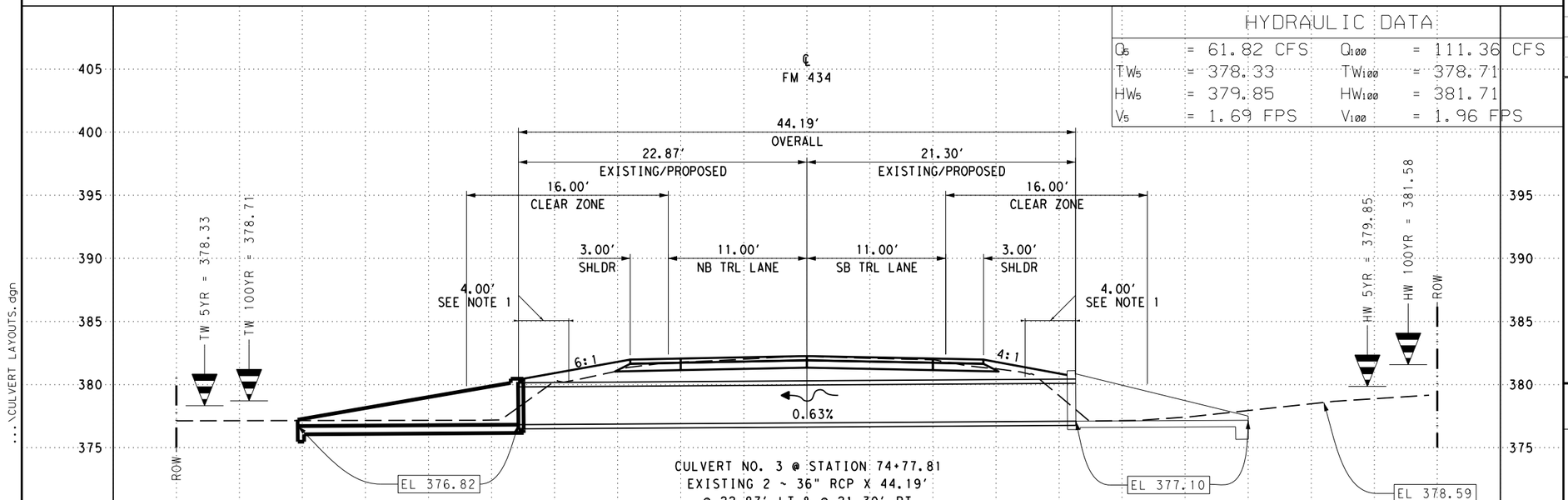
CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		73



NOTES:

1. BREAK BACK 4.00' OR TO FIRST JOINT, SUBSIDIARY TO 467 6015 AND 467 6453

QUANTITY	DESCRIPTION	UNIT
467 6015	SET (TY I) (36 IN) (4: 1) (C)	1 EA
467 6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	2 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
	FOR CONTRACTOR'S INFOMATION ONLY	
	BREAK BACK CULVERT	16 LF



HYDRAULIC DATA

Q_5	= 61.82 CFS	Q_{100}	= 111.36 CFS
TW_5	= 378.33	TW_{100}	= 378.71
HW_5	= 379.85	HW_{100}	= 381.71
V_5	= 1.69 FPS	V_{100}	= 1.96 FPS

CULVERT NO. 3 @ STATION 74+77.81
EXISTING 2 ~ 36" RCP X 44.19'
@ 22.87' LT & @ 21.30' RT
PROPOSED RT: INSTALL SETP-FW-0 (4:1) 36"
LT: 2 EA PSET-SC (6:1) W/ 7" TOEWALL

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CULVERT LAYOUTS

CULVERT #3

SCALE: FEET
1" = 10' HORIZ.
1" = 10' VERTICAL

SHEET 3 OF 9

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		74

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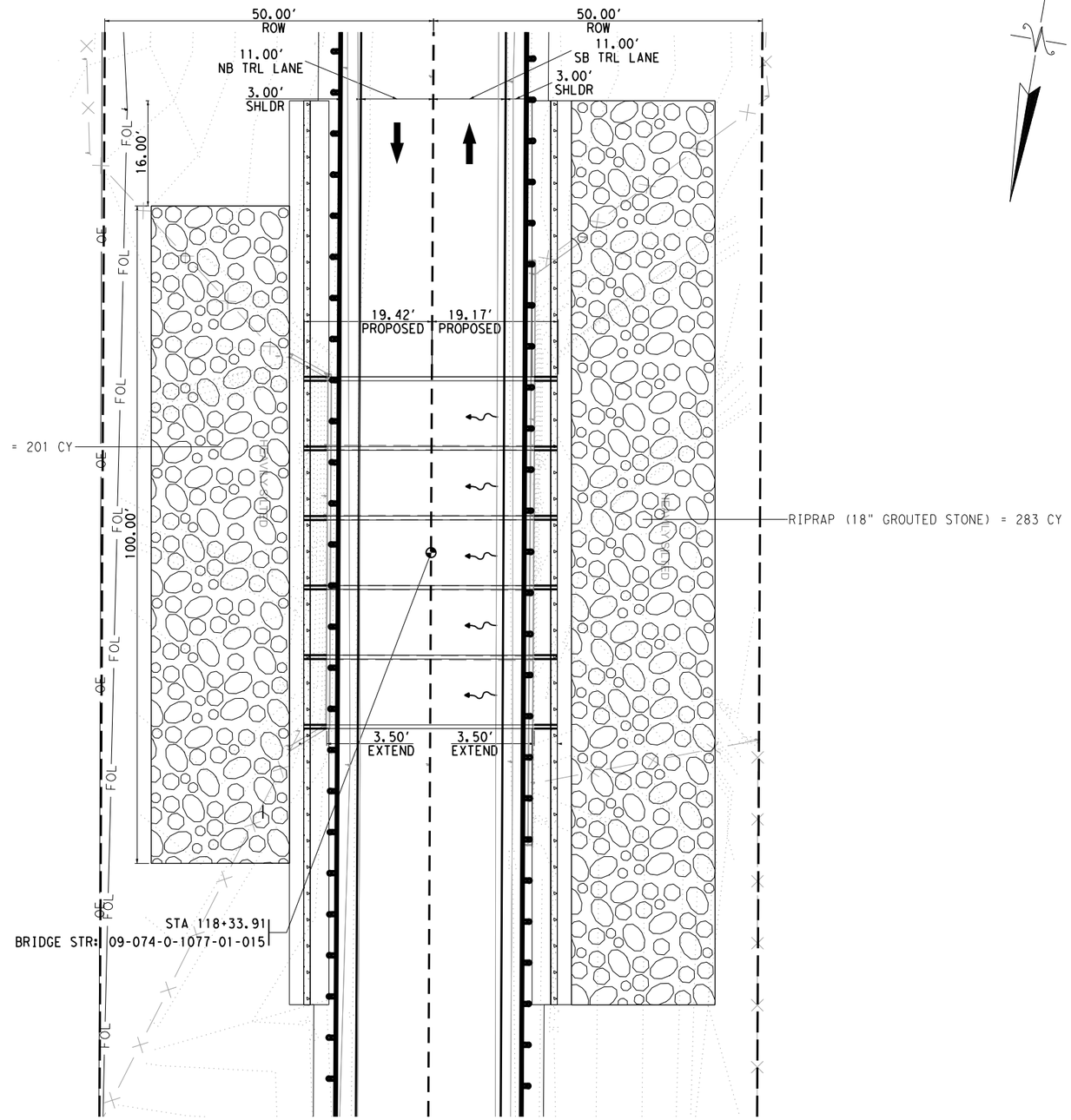
NODE

NOTES:



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CULVERT LAYOUTS

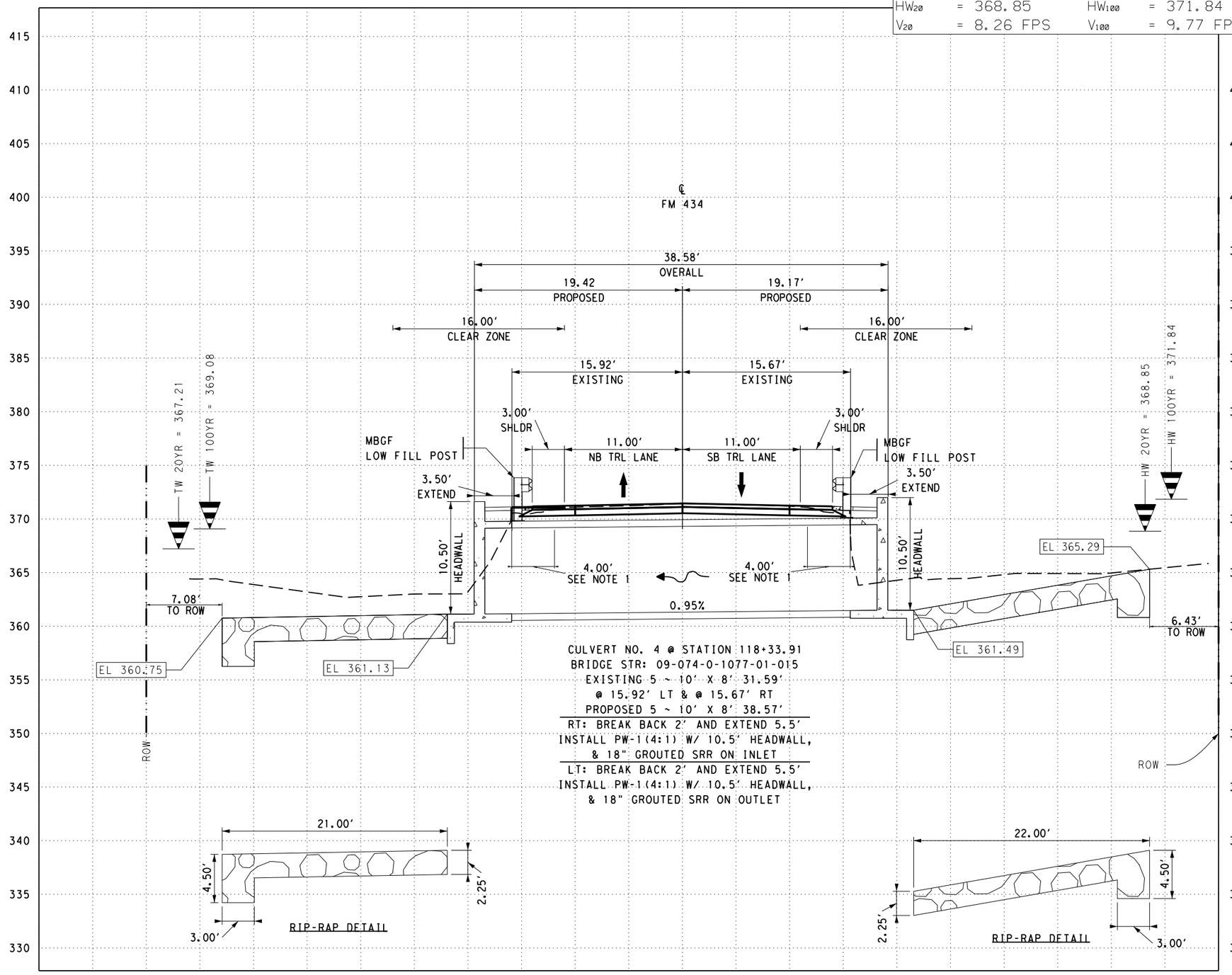
CULVERT #4

SCALE: 1" = 20' HORIZ. FEET

SHEET 4 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		75

HYDRAULIC DATA			
Q_{20}	= 2176.00 CFS	Q_{100}	= 4137.30 CFS
TW_{20}	= 367.21	TW_{100}	= 369.08
HW_{20}	= 368.85	HW_{100}	= 371.84
V_{20}	= 8.26 FPS	V_{100}	= 9.77 FPS



NOTES:

1. BREAK BACK 4.00' OR TO FIRST JOINT, SUBSIDIARY TO 462 6076

QUANTITY	DESCRIPTION	UNIT
403 6001	TEMPORARY SPL SHORING	476 SF
432 6051	RIPRAP (STONE COMMON) (GROUT) (18 IN)	484 CY
462 6076	CONC BOX CULV (10 FT X 8 FT) (EXTEND)	35 LF
466 6172	WINGWALL (PW - 1) (HW=11 FT)	2 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
	FOR CONTRACTOR'S INFOMATION ONLY	
	BREAK BACK CULVERT	40 LF

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CULVERT LAYOUTS

CULVERT #4

SCALE: 1" = 10' HORIZ. FEET

SHEET 5 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		76

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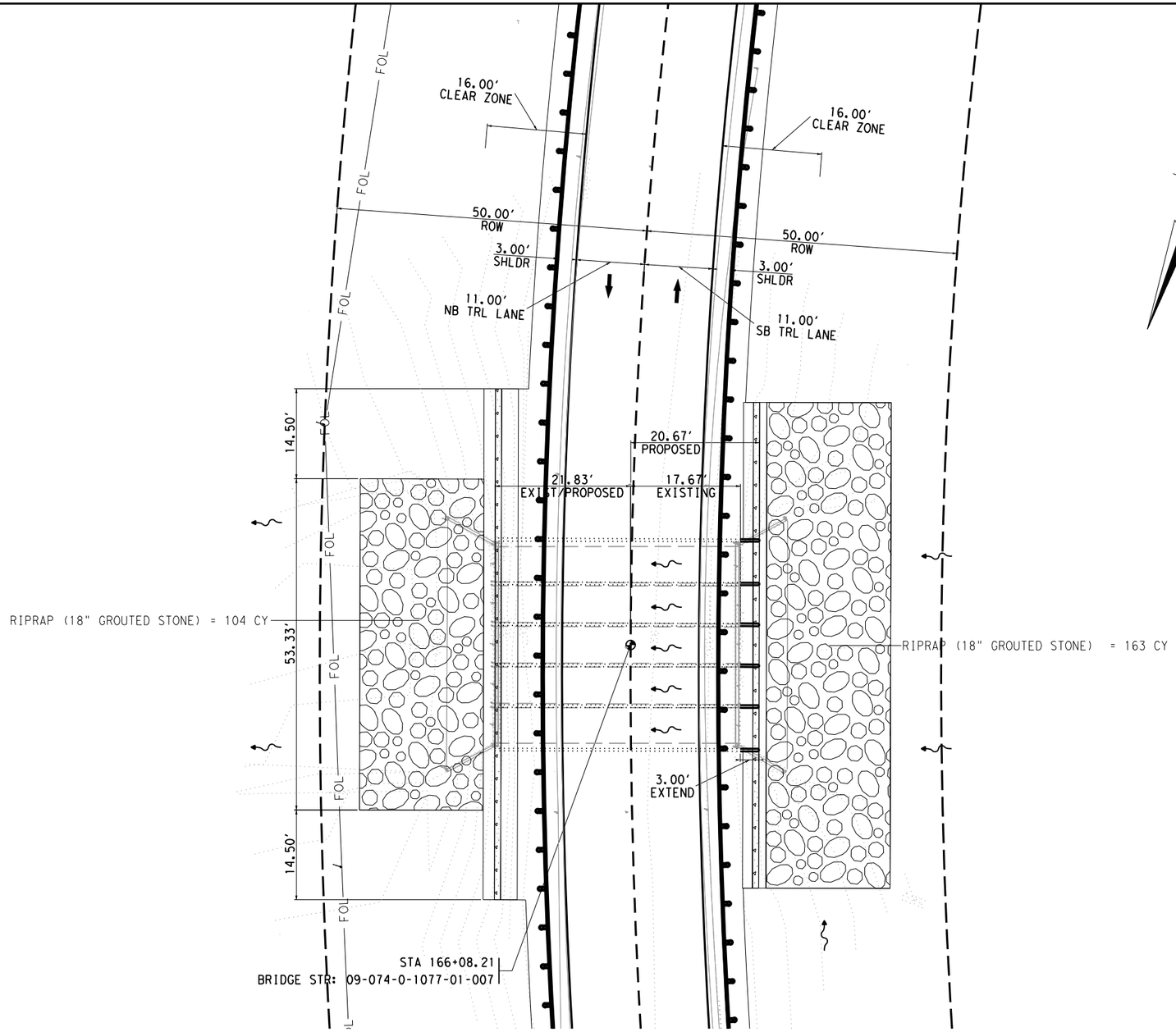

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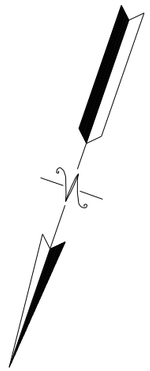

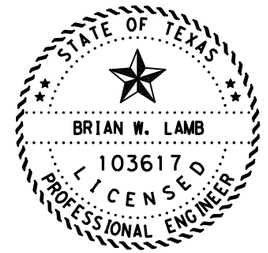

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CULVERT LAYOUTS

CULVERT #5

SCALE: 1" = 20' HORIZ. FEET

SHEET 6 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		77

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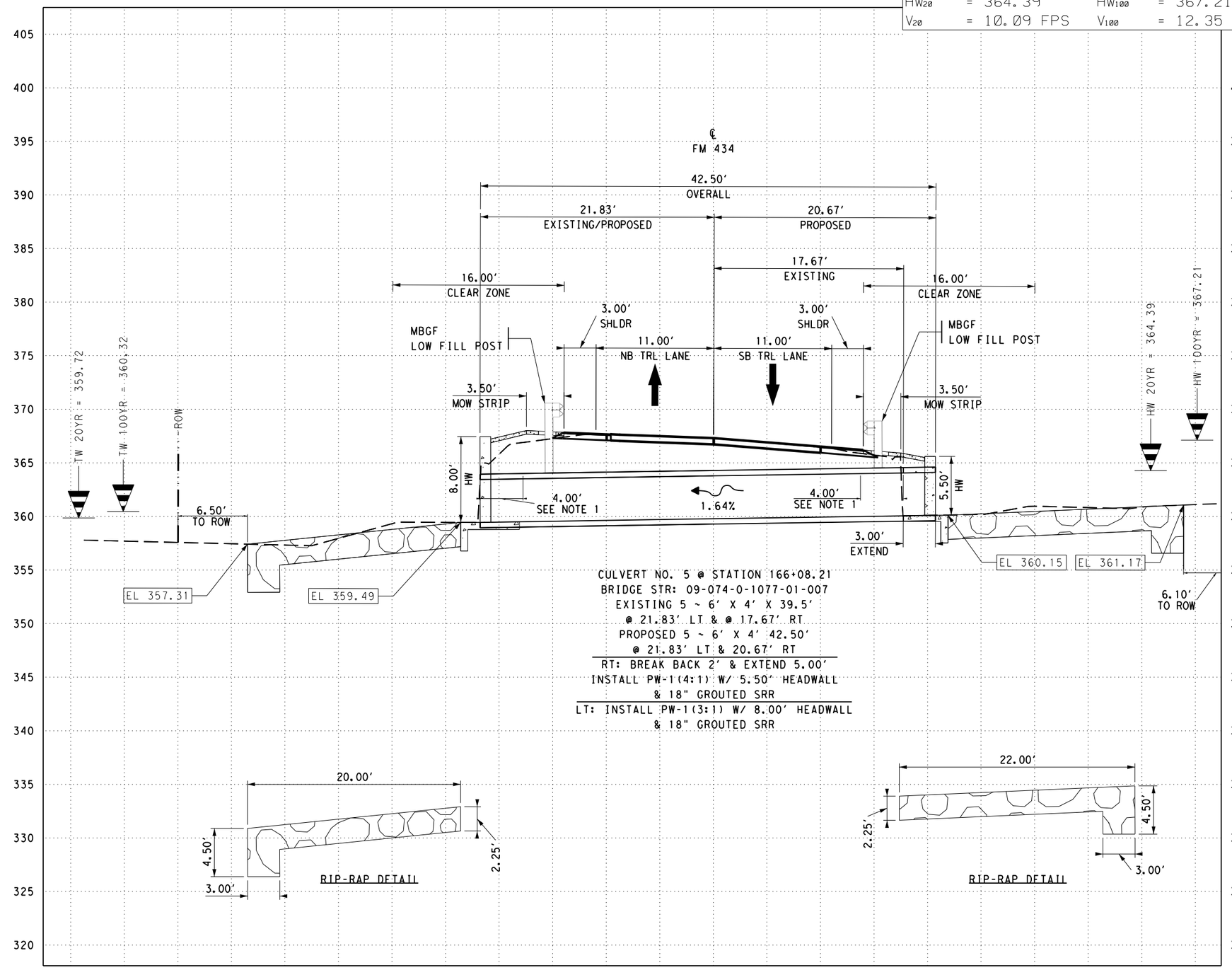
...\CULVERT LAYOUTS.dgn

NODE

HYDRAULIC DATA			
Q_{20}	= 692.00 CFS	Q_{100}	= 1204.30 CFS
TW_{20}	= 359.72	TW_{100}	= 360.32
HW_{20}	= 364.39	HW_{100}	= 367.21
V_{20}	= 10.09 FPS	V_{100}	= 12.35 FPS

NOTES: BREAK BACK 4.00' OR TO NEAREST JOINT, SUBSIDIARY TO 462 6055 AND 466 6183



CULVERT NO. 5 @ STATION 166+08.21
BRIDGE STR: 09-074-0-1077-01-007
EXISTING 5 ~ 6' X 4' X 39.5'
@ 21.83' LT & @ 17.67' RT
PROPOSED 5 ~ 6' X 4' 42.50'
@ 21.83' LT & 20.67' RT

RT: BREAK BACK 2' & EXTEND 5.00'
INSTALL PW-1(4:1) W/ 5.50' HEADWALL
& 18" GROUTED SRR

LT: INSTALL PW-1(3:1) W/ 8.00' HEADWALL
& 18" GROUTED SRR

RIP-RAP DETAIL

RIP-RAP DETAIL

QUANTITY	DESCRIPTION	UNIT
403 6001	TEMPORARY SPL SHORING	210 SF
432 6051	RIPRAP (STONE COMMON)(GROUT)(18 IN)	267 CY
462 6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	15 LF
466 6181	WINGWALL (PW - 1) (HW=6 FT)	1 EA
466 6183	WINGWALL (PW - 1) (HW=8 FT)	1 EA
480 6001	CLEAN EXIST CULVERTS	1 EA
	FOR CONTRACTOR'S INFOMATION ONLY	
	BREAK BACK CULVERT	40 LF

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CULVERT LAYOUTS

CULVERT #5

SCALE: 1" = 10' FEET HORIZ.

SHEET 7 OF 9

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		78

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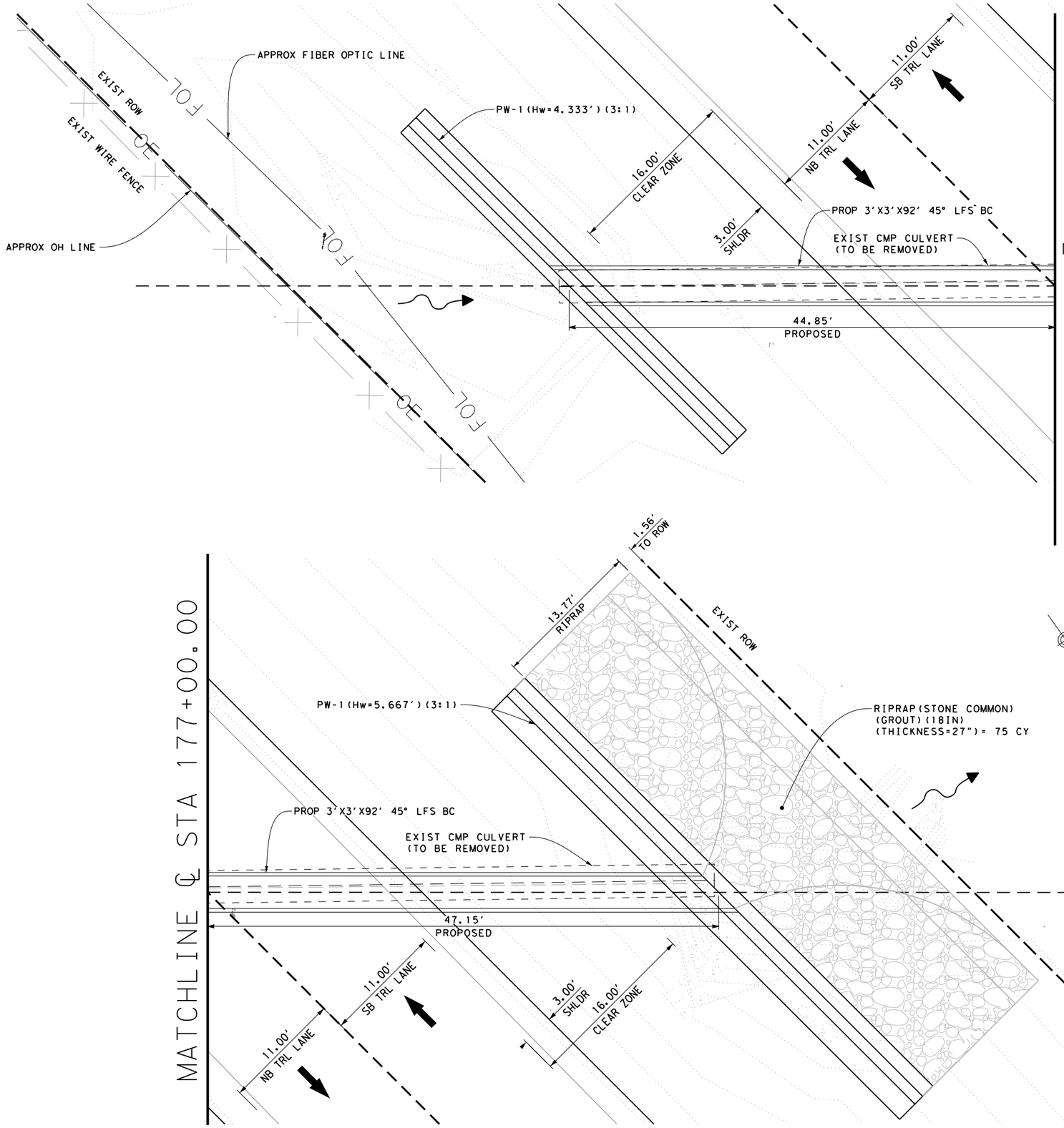
NODE



402 6001	TRENCH EXCAVATION PROTECTION	LF	83
432 6051	RIPRAP (STONE COMMON) (GROUT) (18 IN)	CY	75
462 6002	CONC BOX CULV (3 FT X 3 FT)	lf	92
466 6179	WINGWALL (PW - 1) (HW=4 FT)	EA	1
466 6181	WINGWALL (PW - 1) (HW=6 FT)	EA	1
496 6007	REMOV STR (PIPE)	LF	93

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CULVERT LAYOUTS

CULVERT #6

SCALE: 1" = 10' HORIZ. FEET

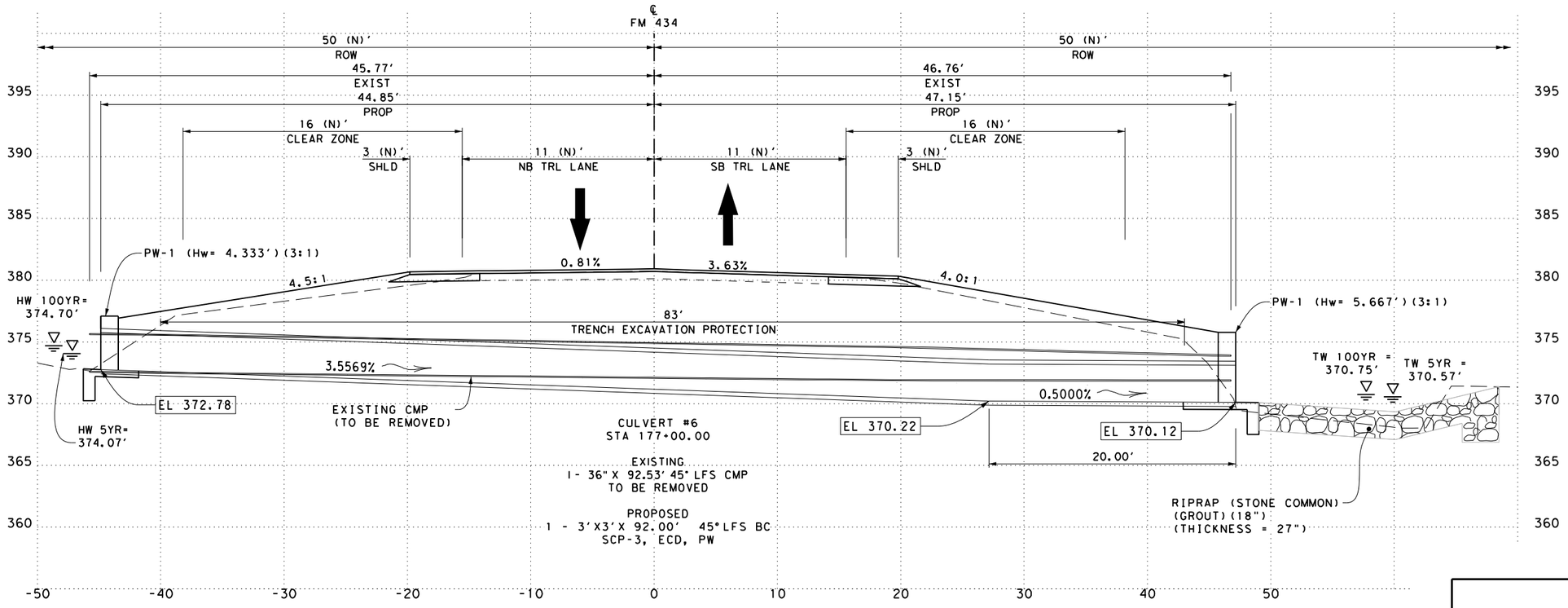
SHEET 8 OF 9

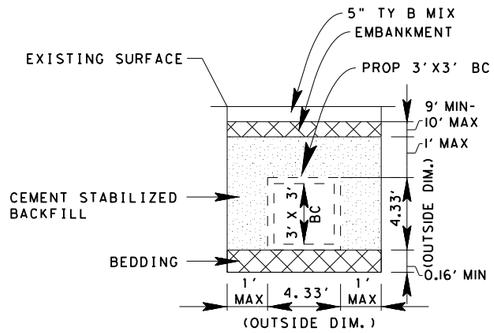
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		79

HYDRAULIC DATA			
Q_5	= 11.63 CFS	Q_{100}	= 21.12 CFS
TW_5	= 370.57	TW_{100}	= 370.75
HW_5	= 374.07	HW_{100}	= 374.70
V_5	= 5.31 FPS	V_{100}	= 6.41 FPS

NOTES:

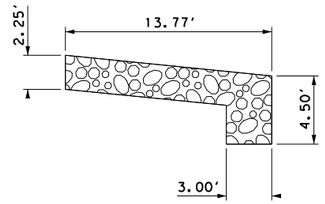
1. DIMENSIONS ON SKEW UNLESS OTHERWISE SHOWN





BACKFILL DETAIL PROP CULVERT 6

CONTRACTOR WILL USE CEMENT STABILIZED BACKFILL BENEATH CUT PAVEMENT SECTION. PAYMENT WILL BE SUBSIDIARY TO ITEM 400, "CUT & RESTORING PAV".



RIPRAP DETAIL PROP CULVERT 6

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CULVERT LAYOUTS

CULVERT #6

SCALE: 1" = 10' FEET HORIZ.

SHEET 9 OF 9

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		80

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...\CULVERT LAYOUTS NO 6.dgn

NODE

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" (2) Conc (Curb) (CY)	Class "C" (3) Conc (Wingwall) (CY)	Total Wingwall Area (SF)
CULVERT 4 STA 118+33.91 (Both)	5 ~10'x 8'	1'	MC-10-7	PW-1	0°	4:1	8"	7"	1.833'	10.500'	N/A	N/A	42.000'	53.500'	N/A	0.0	7.2	116.2	1764
CULVERT 5 STA 166+08.21 (Lt)	5 ~ 6'x 4'	4'	MC-6-16	PW-1	0°	3:1	9"	7"	3.250'	8.000'	N/A	N/A	24.000'	33.500'	N/A	0.0	4.0	26.3	384
CULVERT 5 STA 166+08.21 (Rt)	5 ~ 6'x 4'	1.5'	MC-6-16	PW-1	0°	4:1	9"	7"	0.750'	5.500'	N/A	N/A	22.000'	33.500'	N/A	0.0	0.9	17.2	242
CULVERT 6 STA 177+00.00 (Lt)	1 ~ 3'x 3'	5'	SCP-3	PW-1	45°	3:1	4"	4"	1.000'	4.333'	N/A	N/A	18.385'	5.185'	N/A	0.0	0.2	10.8	159
CULVERT 6 STA 177+00.00 (Rt)	1 ~ 3'x 3'	6'	SCP-3	PW-1	45°	3:1	4"	4"	2.333'	5.667'	N/A	N/A	24.042'	5.185'	N/A	0.0	0.4	18.0	272

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021
SIGNATURE OF REGISTRANT & DATE

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		81

DATE: 5/14/2021 2:39:17 PM
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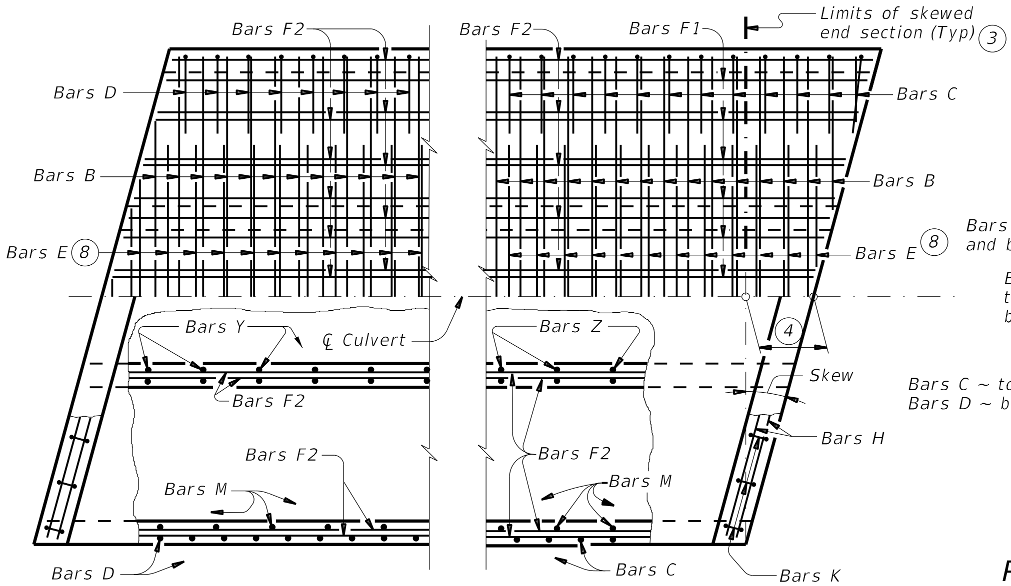
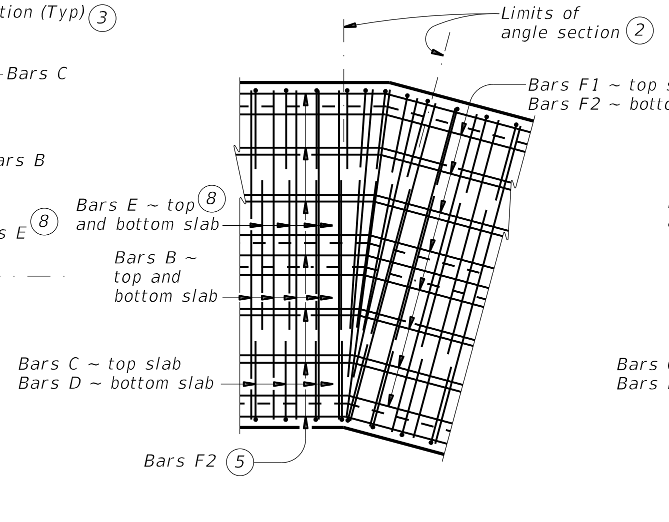
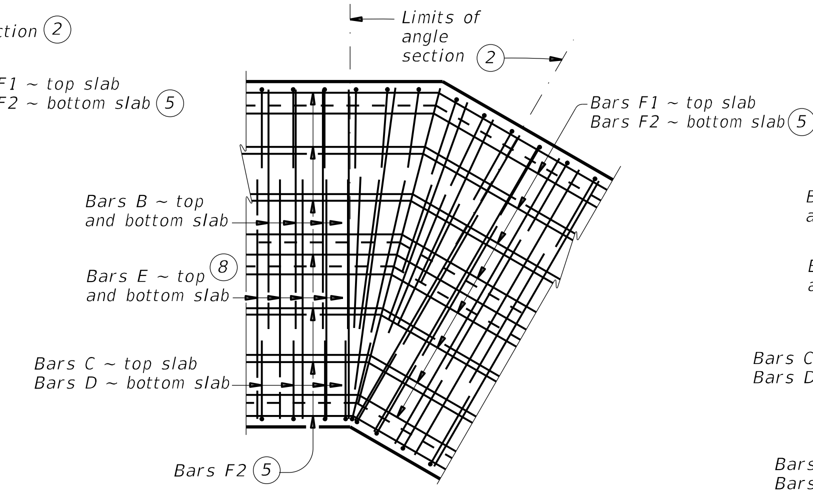


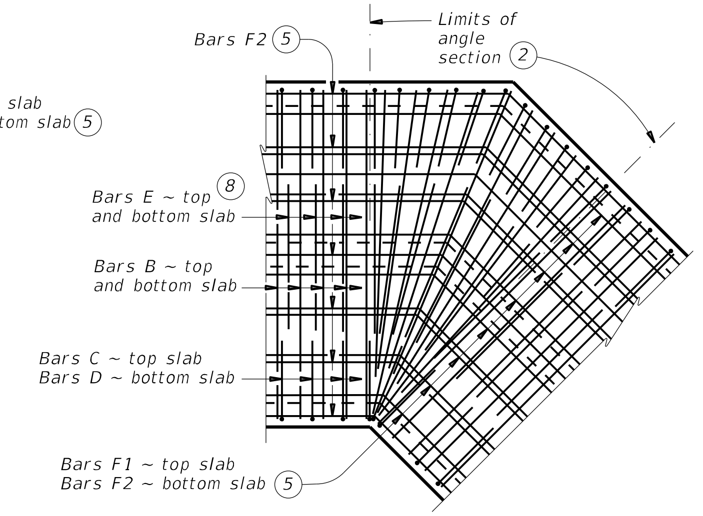
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



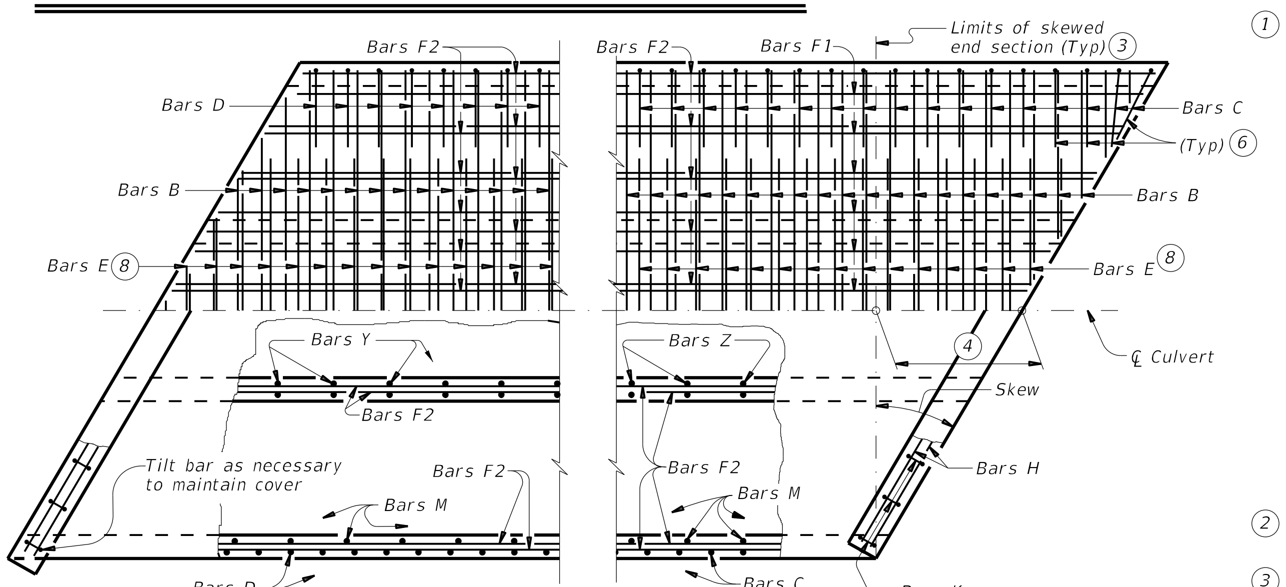
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



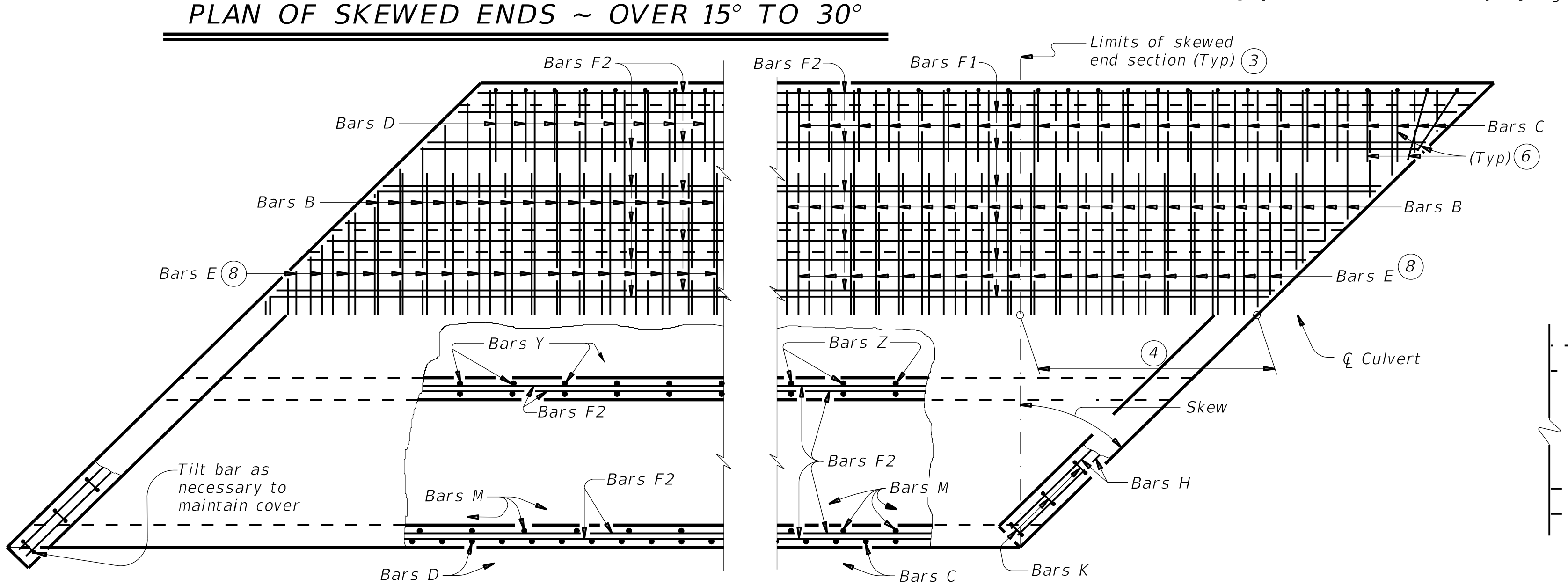
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

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

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

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

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

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

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

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

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

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

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

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.

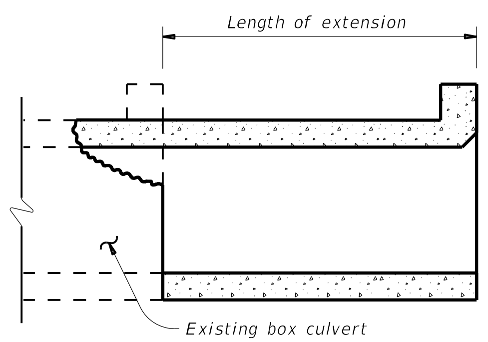
MATERIAL NOTES:

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.



LENGTHENING DETAIL (1)

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST		COUNTY	SHEET NO.
	WACO		FALLS	82

DATE: 02/12/2021 9:07:42 PM
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DATE:
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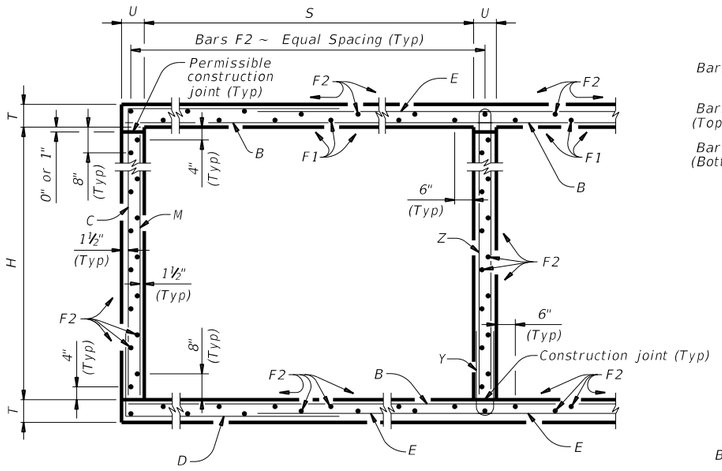
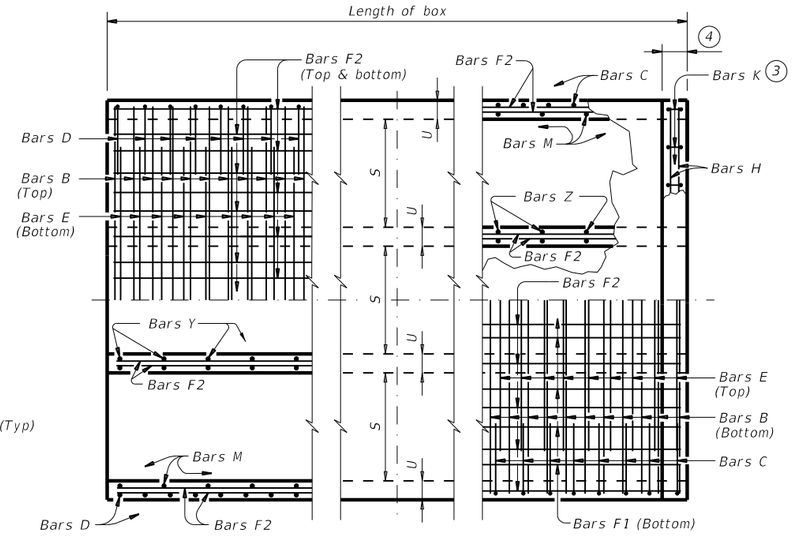


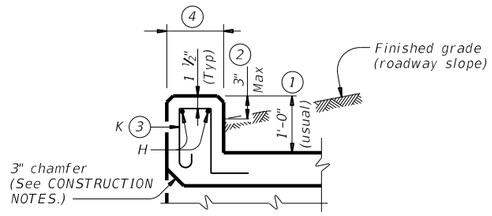
TYPICAL SECTION



BOTTOM SLAB

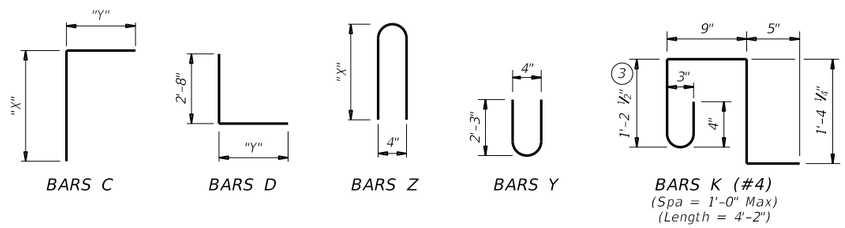
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-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

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	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		83

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DATE:
FILE:

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	No.	Spa	Length	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

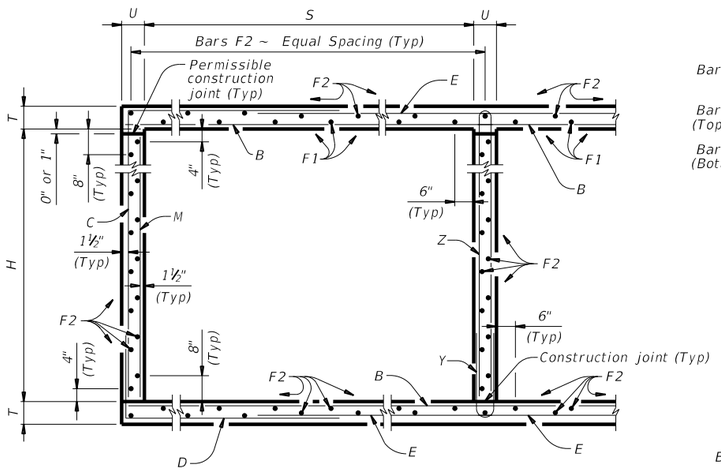
6'-0" SPAN

0' TO 16' FILL

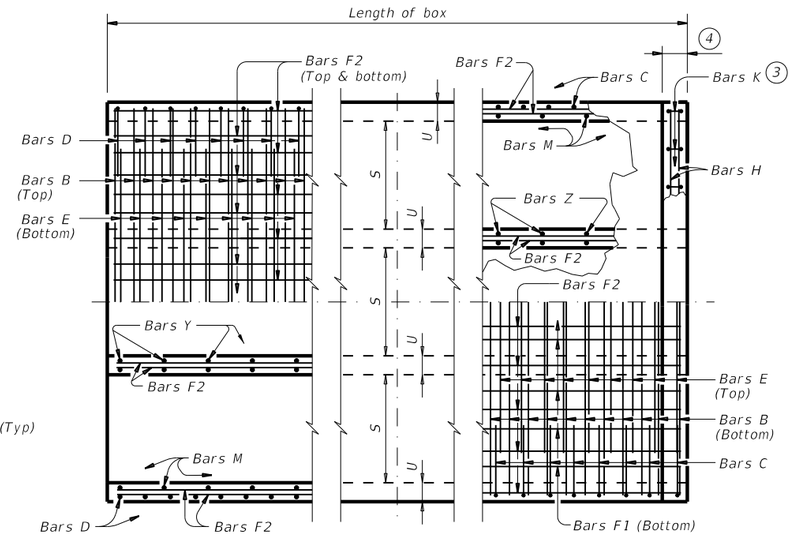
MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		84

DATE:
FILE:



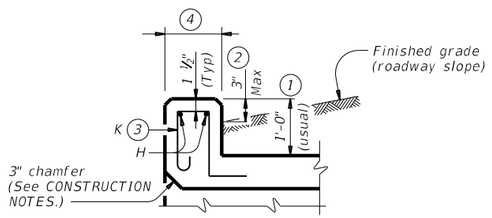
TYPICAL SECTION



BOTTOM SLAB

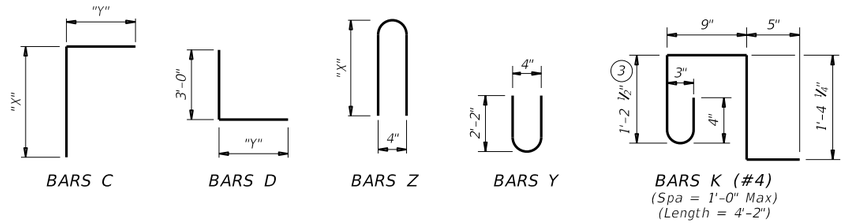
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
4'-0"	4'-6 ½"	5'-9"
5'-0"	5'-6 ½"	5'-9"
6'-0"	6'-6 ½"	5'-9"
7'-0"	7'-6 ½"	5'-9"
8'-0"	8'-6 ½"	5'-9"
9'-0"	9'-6 ½"	5'-9"
10'-0"	10'-6 ½"	5'-9"



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

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
10'-0" SPAN
0' TO 7' FILL

MC-10-7

FILE: mc107ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		85

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DATE:
FILE:

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B (5)					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4						Bars H 4 ~ #4 (5)		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	10' – 0"	4' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	108	#6	9"	10' – 4"	1,676	8' – 10"	1,433	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	66	18"	39' – 9"	1,752	108	9"	4' – 0"	289	54	9"	4' – 7"	165	9' – 3"	334	21' – 6"	57	46	128	1.333	374.6	1.6	185	54.9	15,168
3	10' – 0"	4' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	108	#6	9"	10' – 4"	1,676	8' – 10"	1,433	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	95	18"	39' – 9"	2,523	108	9"	4' – 0"	289	108	9"	4' – 7"	331	9' – 3"	667	32' – 1"	86	68	189	1.942	539.8	2.4	275	80.1	21,865
4	10' – 0"	4' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	108	#6	9"	10' – 4"	1,676	8' – 10"	1,433	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	124	18"	39' – 9"	3,293	108	9"	4' – 0"	289	162	9"	4' – 7"	496	9' – 3"	1,001	42' – 8"	114	88	245	2.551	704.9	3.2	359	105.2	28,553
5	10' – 0"	4' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	108	#6	9"	10' – 4"	1,676	8' – 10"	1,433	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	153	18"	39' – 9"	4,063	108	9"	4' – 0"	289	216	9"	4' – 7"	661	9' – 3"	1,335	53' – 3"	142	110	306	3.160	870.0	3.9	448	130.3	35,248
6	10' – 0"	4' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	108	#6	9"	10' – 4"	1,676	8' – 10"	1,433	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	182	18"	39' – 9"	4,833	108	9"	4' – 0"	289	270	9"	4' – 7"	827	9' – 3"	1,668	65' – 6"	175	130	362	3.770	1,050.3	4.7	537	155.5	42,550
2	10' – 0"	5' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	108	#6	9"	11' – 4"	1,838	8' – 10"	1,433	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	72	18"	39' – 9"	1,912	108	9"	5' – 0"	361	54	9"	4' – 7"	165	11' – 3"	406	21' – 6"	57	46	128	1.398	386.2	1.6	185	57.5	15,634
3	10' – 0"	5' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	108	#6	9"	11' – 4"	1,838	8' – 10"	1,433	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	103	18"	39' – 9"	2,735	108	9"	5' – 0"	361	108	9"	4' – 7"	331	11' – 3"	812	32' – 1"	86	68	189	2.029	554.5	2.4	275	83.5	22,456
4	10' – 0"	5' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	108	#6	9"	11' – 4"	1,838	8' – 10"	1,433	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	134	18"	39' – 9"	3,558	108	9"	5' – 0"	361	162	9"	4' – 7"	496	11' – 3"	1,217	42' – 8"	114	88	245	2.659	722.7	3.2	359	109.5	29,268
5	10' – 0"	5' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	108	#6	9"	11' – 4"	1,838	8' – 10"	1,433	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	165	18"	39' – 9"	4,381	108	9"	5' – 0"	361	216	9"	4' – 7"	661	11' – 3"	1,623	53' – 3"	142	110	306	3.290	891.0	3.9	448	135.5	36,088
6	10' – 0"	5' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	108	#6	9"	11' – 4"	1,838	8' – 10"	1,433	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	196	18"	39' – 9"	5,204	108	9"	5' – 0"	361	270	9"	4' – 7"	827	11' – 3"	2,029	65' – 6"	175	130	362	3.921	1,074.5	4.7	537	161.6	43,516
2	10' – 0"	6' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	108	#6	9"	12' – 4"	2,001	8' – 10"	1,433	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	78	18"	39' – 9"	2,071	108	9"	6' – 0"	433	54	9"	4' – 7"	165	13' – 3"	478	21' – 6"	57	46	128	1.463	397.9	1.6	185	60.1	16,100
3	10' – 0"	6' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	108	#6	9"	12' – 4"	2,001	8' – 10"	1,433	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	111	18"	39' – 9"	2,947	108	9"	6' – 0"	433	108	9"	4' – 7"	331	13' – 3"	956	32' – 1"	86	68	189	2.115	569.3	2.4	275	87.0	23,047
4	10' – 0"	6' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	108	#6	9"	12' – 4"	2,001	8' – 10"	1,433	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	144	18"	39' – 9"	3,824	108	9"	6' – 0"	433	162	9"	4' – 7"	496	13' – 3"	1,434	42' – 8"	114	88	245	2.767	740.7	3.2	359	113.8	29,986
5	10' – 0"	6' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	108	#6	9"	12' – 4"	2,001	8' – 10"	1,433	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	177	18"	39' – 9"	4,700	108	9"	6' – 0"	433	216	9"	4' – 7"	661	13' – 3"	1,912	53' – 3"	142	110	306	3.420	912.1	3.9	448	140.7	36,931
6	10' – 0"	6' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	108	#6	9"	12' – 4"	2,001	8' – 10"	1,433	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	210	18"	39' – 9"	5,576	108	9"	6' – 0"	433	270	9"	4' – 7"	827	13' – 3"	2,390	65' – 6"	175	130	362	4.072	1,098.7	4.7	537	167.6	44,484
2	10' – 0"	7' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	108	#6	9"	13' – 4"	2,163	8' – 10"	1,433	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	78	18"	39' – 9"	2,071	108	9"	7' – 0"	505	54	9"	4' – 7"	165	15' – 3"	550	21' – 6"	57	46	128	1.528	405.5	1.6	185	62.7	16,406
3	10' – 0"	7' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	108	#6	9"	13' – 4"	2,163	8' – 10"	1,433	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	111	18"	39' – 9"	2,947	108	9"	7' – 0"	505	108	9"	4' – 7"	331	15' – 3"	1,100	32' – 1"	86	68	189	2.202	578.8	2.4	275	90.5	23,425
4	10' – 0"	7' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	108	#6	9"	13' – 4"	2,163	8' – 10"	1,433	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	144	18"	39' – 9"	3,824	108	9"	7' – 0"	505	162	9"	4' – 7"	496	15' – 3"	1,650	42' – 8"	114	88	245	2.876	751.9	3.2	359	118.2	30,436
5	10' – 0"	7' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	108	#6	9"	13' – 4"	2,163	8' – 10"	1,433	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	177	18"	39' – 9"	4,700	108	9"	7' – 0"	505	216	9"	4' – 7"	661	15' – 3"	2,200	53' – 3"	142	110	306	3.549	925.1	3.9	448	145.9	37,453
6	10' – 0"	7' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	108	#6	9"	13' – 4"	2,163	8' – 10"	1,433	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	210	18"	39' – 9"	5,576	108	9"	7' – 0"	505	270	9"	4' – 7"	827	15' – 3"	2,750	65' – 6"	175	130	362	4.223	1,113.5	4.7	537	173.7	45,078
2	10' – 0"	8' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	108	#6	9"	14' – 4"	2,325	8' – 10"	1,433	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	84	18"	39' – 9"	2,230	108	9"	8' – 0"	577	54	9"	4' – 7"	165	17' – 3"	622	21' – 6"	57	46	128	1.593	417.2	1.6	185	65.3	16,871
3	10' – 0"	8' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	108	#6	9"	14' – 4"	2,325	8' – 10"	1,433	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	119	18"	39' – 9"	3,160	108	9"	8' – 0"	577	108	9"	4' – 7"	331	17' – 3"	1,244	32' – 1"	86	68	189	2.288	593.5	2.4	275	93.9	24,016
4	10' – 0"	8' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	108	#6	9"	14' – 4"	2,325	8' – 10"	1,433	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	154	18"	39' – 9"	4,089	108	9"	8' – 0"	577	162	9"	4' – 7"	496	17' – 3"	1,867	42' – 8"	114	88	245	2.984	769.8	3.2	359	122.5	31,152
5	10' – 0"	8' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	108	#6	9"	14' – 4"	2,325	8' – 10"	1,433	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	189	18"	39' – 9"	5,019	108	9"	8' – 0"	577	216	9"	4' – 7"	661	17' – 3"	2,489	53' – 3"	142	110	306	3.679	946.2	3.9	448	151.1	38,295
6	10' – 0"	8' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	108	#6	9"	14' – 4"	2,325	8' – 10"	1,433	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	224	18"	39' – 9"	5,948	108	9"	8' – 0"	577	270	9"	4' – 7"	827	17' – 3"	3,111	65' – 6"	175	130	362	4.374	1,137.7	4.7	537	179.7	46,045
2	10' – 0"	9' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	162	#6	6"	15' – 4"	3,731	8' – 10"	2,149	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	90	18"	39' – 9"	2,390	108	9"	9' – 0"	649	54	9"	4' – 7"	165	19' – 3"	694	21' – 6"	57	46	128	1.657	477.8	1.6	185	67.9	19,297
3	10' – 0"	9' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	162	#6	6"	15' – 4"	3,731	8' – 10"	2,149	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	127	18"	39' – 9"	3,372	108	9"	9' – 0"	649	108	9"	4' – 7"	331	19' – 3"	1,389	32' – 1"	86	68	189	2.374	657.3	2.4	275	97.3	26,567
4	10' – 0"	9' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	162	#6	6"	15' – 4"	3,731	8' – 10"	2,149	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	164	18"	39' – 9"	4,355	108	9"	9' – 0"	649	162	9"	4' – 7"	496	19' – 3"	2,083	42' – 8"	114	88	245	3.092	836.7	3.2	359	126.8	33,828
5	10' – 0"	9' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	162	#6	6"	15' – 4"	3,731	8' – 10"	2,149	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	201	18"	39' – 9"	5,337	108	9"	9' – 0"	649	216	9"	4' – 7"	661	19' – 3"	2,778	53' – 3"	142	110	306	3.809	1,016.2	3.9	448	156.3	41,096
6	10' – 0"	9' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	162	#6	6"	15' – 4"	3,731	8' – 10"	2,149	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	238	18"	39' – 9"	6,320	108	9"	9' – 0"	649	270	9"	4' – 7"	827	19' – 3"	3,472	65' – 6"	175	130	362	4.526	1,210.9	4.7	537	185.8	48,972
2	10' – 0"	10' – 0"	8"	7"	162	#6	6"	21' – 6"	5,231	162	#6	6"	16' – 4"	3,974	8' – 10"	2,149	162	#6	6"	15' – 4"	3,731	14	18"	39' – 9"	372	90	18"	39' – 9"	2,390	108	9"	10' – 0"	721	54	9"	4' – 7"	165	21' – 3"	767	21' – 6"	57	46	128	1.722	487.5	1.6	185	70.5	19,685
3	10' – 0"	10' – 0"	8"	7"	162	#6	6"	32' – 1"	7,807	162	#6	6"	16' – 4"	3,974	8' – 10"	2,149	162	#6	6"	25' – 11"	6,306	21	18"	39' – 9"	558	127	18"	39' – 9"	3,372	108	9"	10' – 0"	721	108	9"	4' – 7"	331	21' – 3"	1,533	32' – 1"	86	68	189	2.461	668.8	2.4	275	100.8	27,026
4	10' – 0"	10' – 0"	8"	7"	162	#6	6"	42' – 8"	10,382	162	#6	6"	16' – 4"	3,974	8' – 10"	2,149	162	#6	6"	36' – 6"	8,881	28	18"	39' – 9"	743	164	18"	39' – 9"	4,355	108	9"	10' – 0"	721	162	9"	4' – 7"	496	21' – 3"	2,300	42' – 8"	114	88	245	3.200	850.0	3.2	359	131.2	34,360
5	10' – 0"	10' – 0"	8"	7"	162	#6	6"	53' – 3"	12,957	162	#6	6"	16' – 4"	3,974	8' – 10"	2,149	162	#6	6"	47' – 1"	11,457	35	18"	39' – 9"	929	201	18"	39' – 9"	5,337	108	9"	10' – 0"	721	216	9"	4' – 7"	661	21' – 3"	3,066	53' – 3"	142	110	306	3.938	1,031.3	3.9	448	161.5	41,699
6	10' – 0"	10' – 0"	8"	7"	162	#6	6"	66' – 4"	16,140	162	#6	6"	16' – 4"	3,974	8' – 10"	2,149	162	#6	6"	57' – 8"	14,032	42	18"	39' – 9"	1,115	238	18"	39' – 9"	6,320	108	9"	10' – 0"	721	270	9"	4' – 7"	827	21' – 3"	3,833	65' – 6"	175	130	362	4.677	1,227.8	4.7	537	191.8	49,648

(5) Bar lengths over 60' include one bar lap; refer to MATERIAL NOTES for minimum lap lengths.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

10'-0" SPAN

0' TO 7' FILL

MC-10-7

FILE: mc107ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
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REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		86

DATE: 6/3/2021 9:08:13 AM
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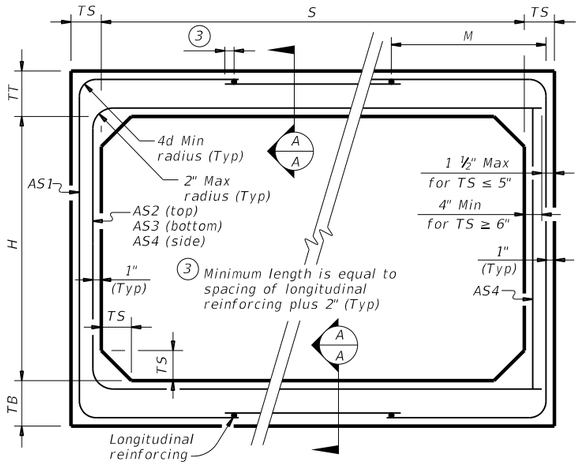
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
3	2	7	6	4	< 2	–	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	–	–	–	2.4
3	2	4	4	4	3 – 5	31	0.10	0.11	0.12	0.10	–	–	–	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	–	–	–	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	–	–	–	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	–	–	–	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	–	–	–	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	–	–	–	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	–	–	–	2.4
3	3	7	6	4	< 2	–	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	–	–	–	2.8
3	3	4	4	4	3 – 5	31	0.10	0.14	0.14	0.10	–	–	–	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	–	–	–	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	–	–	–	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	–	–	–	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	–	–	–	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	–	–	–	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	–	–	–	2.8

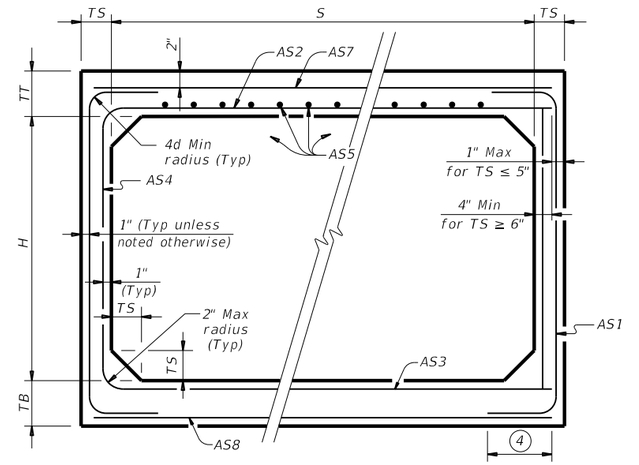
(1) For box length = 8'-0"

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



CORNER OPTION "A" CORNER OPTION "B"

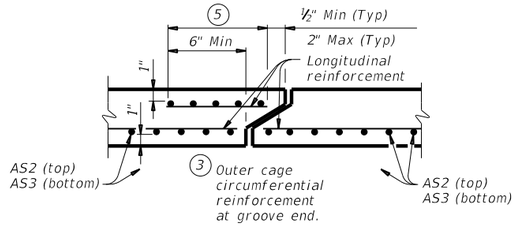
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

3'-0" SPAN

SCP-3

FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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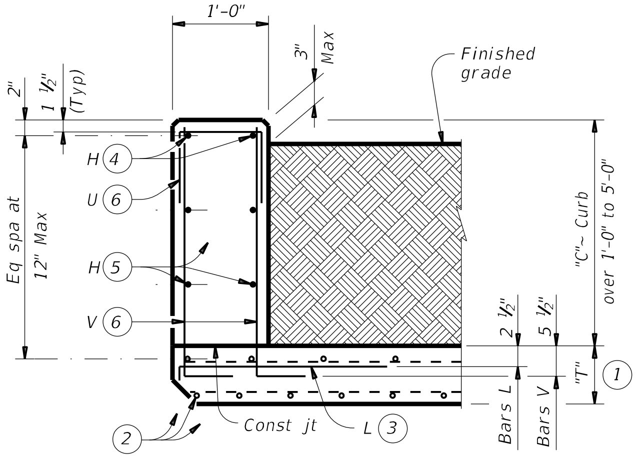
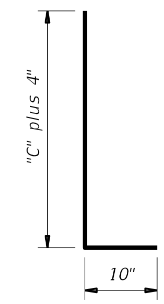
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		87

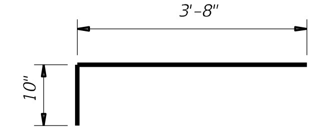


TYPICAL SECTION

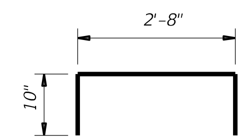
Used for curbs over 1'-0" to 5'-0"



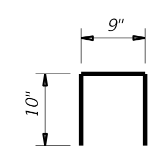
BARS V (#5) (6)
Spaced at 12" Max



BARS L (#5) (3)
Spaced at 12" Max



OPTIONAL
BARS L (#5) (3)(7)
Spaced at 12" Max



BARS U (#4) (6)
Spaced at 12" Max

(1) "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.

(2) Adjust normal culvert slab bars as necessary to clear obstructions.

(3) Place bars L as shown. Tilt hook as necessary to maintain cover.

(4) Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.

(5) Additional bars H(#4) as required to maintain 12" Max spacing.

(6) Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.

(7) Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.

(8) Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:
Adjust reinforcing steel as necessary to provide 1 ¼" cover.
For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs.
Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.
This Curb is considered as part of the Box Culvert for payment.

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

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Texas Department of Transportation | Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST		COUNTY	SHEET NO.
	WACO		FALLS	88

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

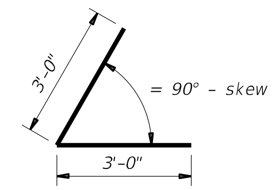
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"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

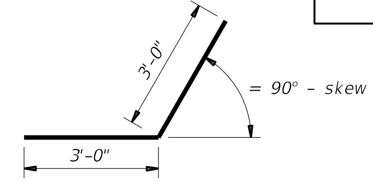
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

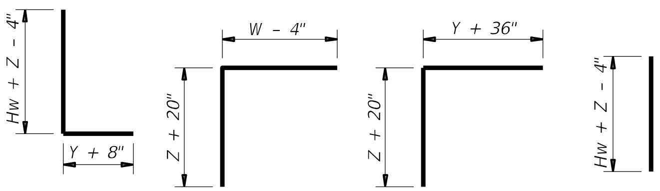
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



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.

(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.

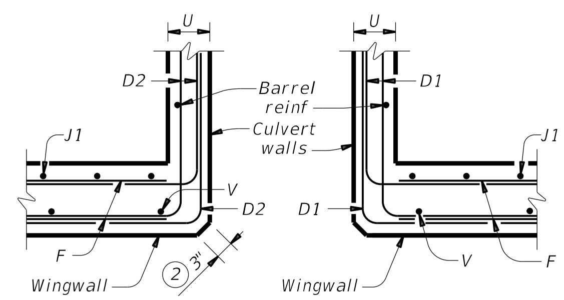
(10) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

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.

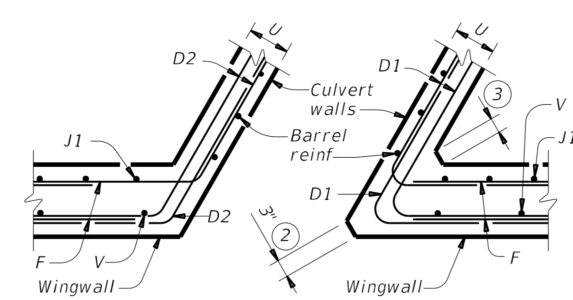
(11) 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.

(12) 3'-0" for Hw < 4'.

(13) 6" for Hw < 4'.



SECTION C-C - PW-1

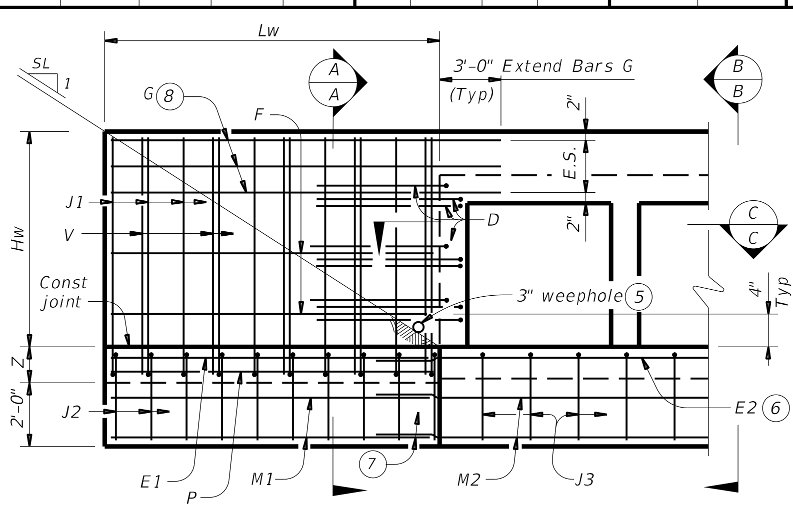


SECTION C-C - PW-2

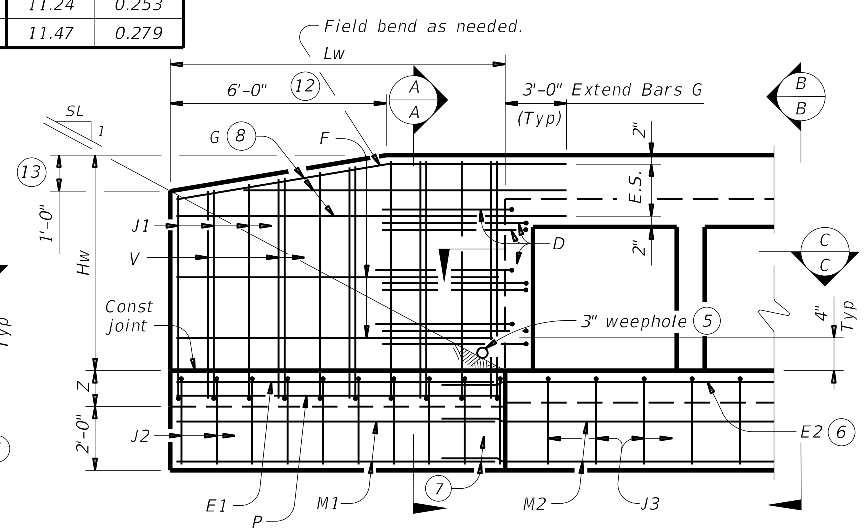
DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

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.

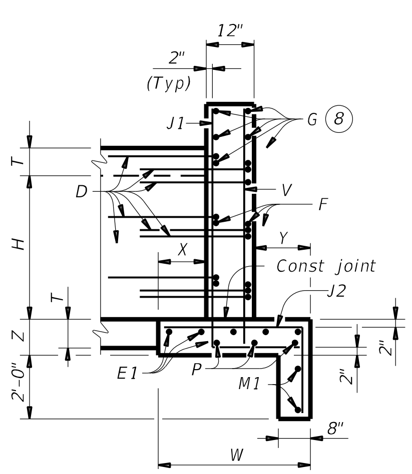


PARTIAL ELEVATION - PW-1

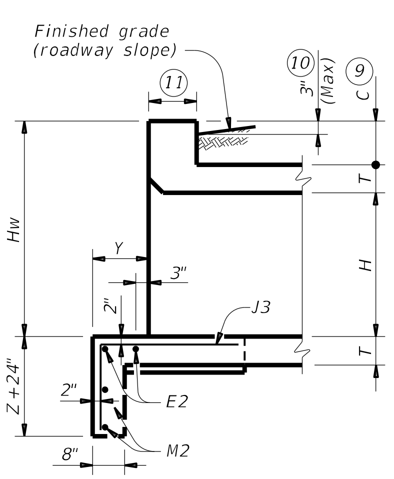


PARTIAL ELEVATION - PW-2

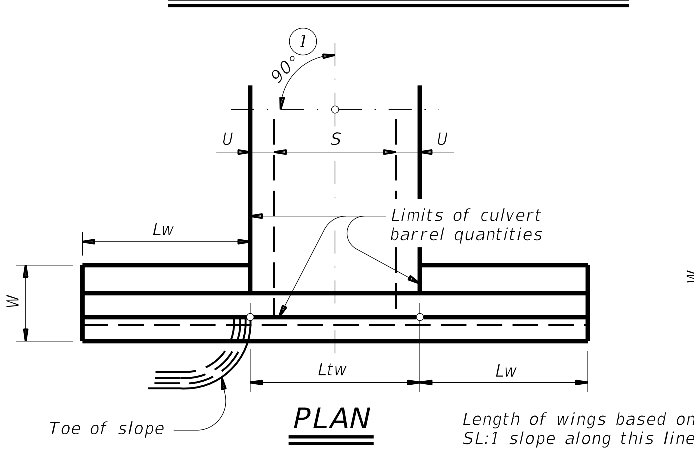
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



SECTION A-A
(Showing wing reinforcement.)



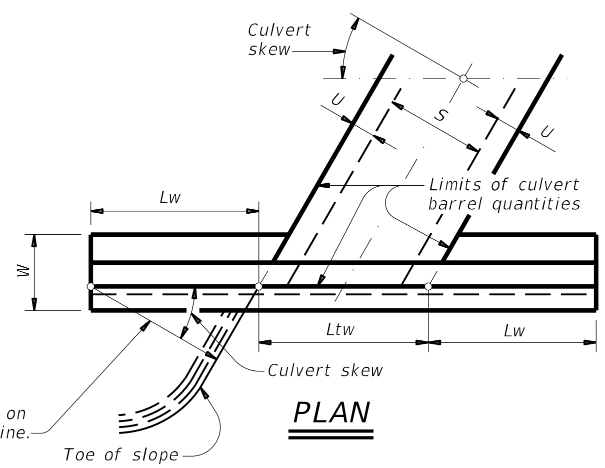
SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS

Length of wings based on SL:1 slope along this line.



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

Texas Department of Transportation
Bridge Division Standard

CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 1077	SECT 01	JOB 026	HIGHWAY FM 434
REVISIONS	DIST WACO	COUNTY FALLS		SHEET NO. 89

DATE: 02/12/2021
FILE: pwstde01-20.dgn

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

Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
3:1	33"	14' – 5 ¾"	4' – 8"	9' – 6"	10' – 11 ¾"	316	3.4	4' – 8"	84	1.2
	36"	15' – 7 ¾"	4' – 11 ½"	10' – 3"	11' – 10"	349	3.8	5' – 1"	96	1.4
	42"	17' – 11 ½"	5' – 6 ½"	11' – 9"	13' – 6 ¾"	430	4.9	5' – 10"	119	1.8
	48"	21' – 1 ¾"	6' – 1 ½"	14' – 0"	16' – 2"	535	6.5	6' – 7"	146	2.4
	54"	23' – 5 ½"	6' – 8 ½"	15' – 6"	17' – 10 ¾"	628	7.8	7' – 6"	186	3.0
	60"	25' – 9 ¼"	7' – 3 ½"	17' – 0"	19' – 7 ½"	717	9.2	8' – 3"	219	3.5
	66"	28' – 1"	7' – 10 ½"	18' – 6"	21' – 4 ¼"	809	10.7	8' – 9"	242	4.0
	72"	30' – 4 ¾"	8' – 5 ½"	20' – 0"	23' – 1 ¼"	922	12.3	9' – 4"	272	4.6
4:1	33"	18' – 1 ¾"	4' – 8"	12' – 8"	14' – 7 ½"	423	4.8	4' – 8"	101	1.5
	36"	19' – 7"	4' – 11 ½"	13' – 8"	15' – 9 ¼"	470	5.5	5' – 1"	115	1.7
	42"	22' – 5 ¾"	5' – 6 ½"	15' – 8"	18' – 1"	581	7.0	5' – 10"	141	2.2
	48"	26' – 6 ¼"	6' – 1 ½"	18' – 8"	21' – 6 ¾"	728	9.4	6' – 7"	175	3.0
	54"	29' – 5"	6' – 8 ½"	20' – 8"	23' – 10 ¼"	873	11.3	7' – 6"	226	3.7
	60"	32' – 3 ¾"	7' – 3 ½"	22' – 8"	26' – 2"	994	13.4	8' – 3"	264	4.4
	66"	35' – 2 ½"	7' – 10 ½"	24' – 8"	28' – 5 ¾"	1,138	15.6	8' – 9"	300	5.0
	72"	38' – 1 ¼"	8' – 5 ½"	26' – 8"	30' – 9 ½"	1,295	18.0	9' – 4"	334	5.7
6:1	33"	25' – 5 ½"	4' – 8"	19' – 0"	21' – 11 ¼"	673	8.3	4' – 8"	127	2.1
	36"	27' – 5 ¾"	4' – 11 ½"	20' – 6"	23' – 8"	733	9.5	5' – 1"	144	2.4
	42"	31' – 6 ¼"	5' – 6 ½"	23' – 6"	27' – 1 ½"	920	12.1	5' – 10"	179	3.1
	48"	37' – 3 ½"	6' – 1 ½"	28' – 0"	32' – 4"	1,189	16.6	6' – 7"	231	4.1
	54"	41' – 4 ¼"	6' – 8 ½"	31' – 0"	35' – 9 ½"	1,422	20.0	7' – 6"	300	5.1
	60"	45' – 4 ¾"	7' – 3 ½"	34' – 0"	39' – 3"	1,629	23.8	8' – 3"	353	6.1

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

(2) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

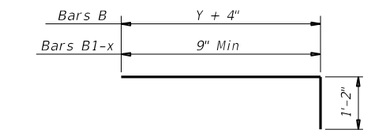
(4) Dimensions shown are usual and maximum.

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

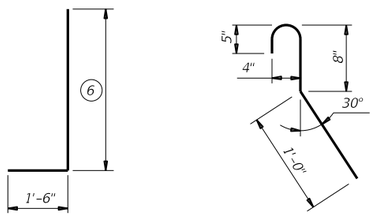
(6) Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

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.

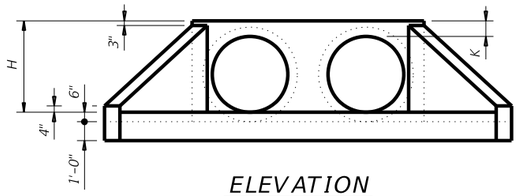


BARS B and B1-x



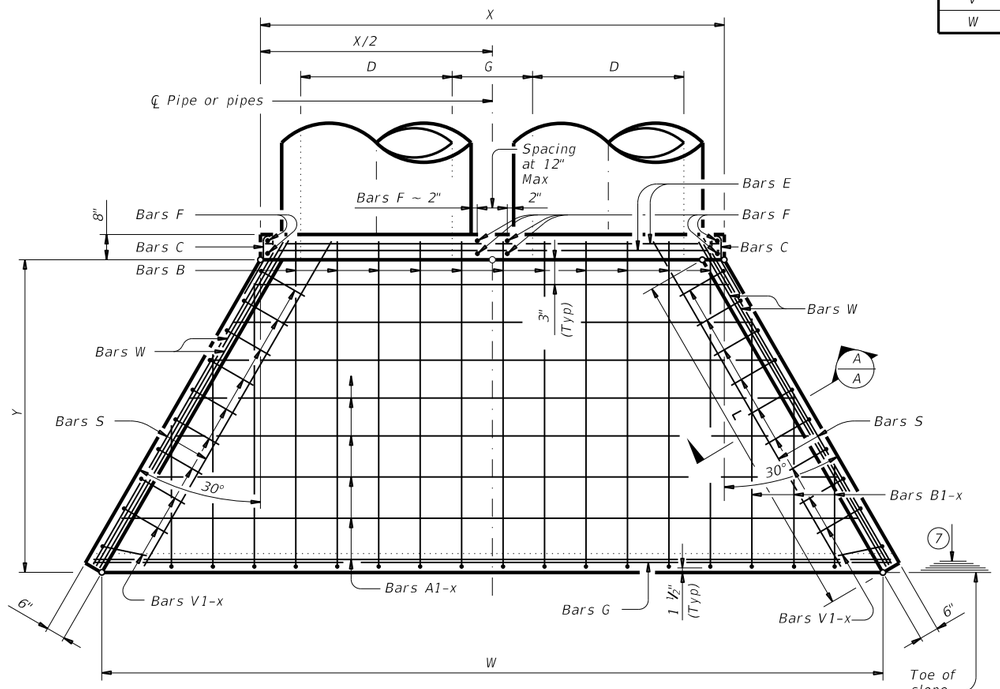
BARS V

BARS C
(Length = 2'-5")

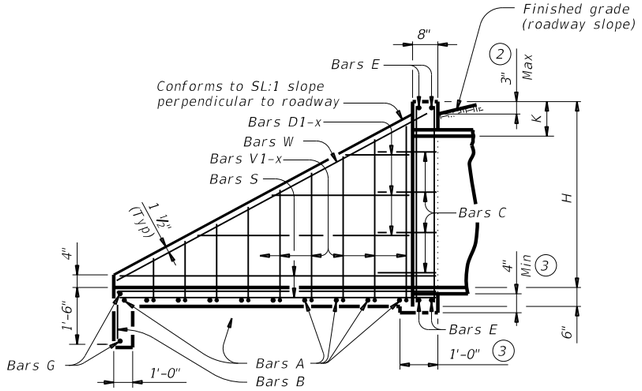


ELEVATION

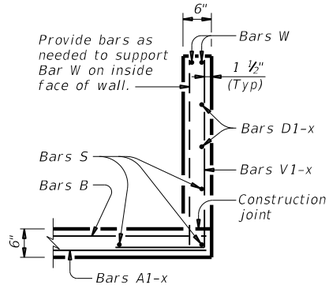
(Showing dimensions.)



PLAN



TYPICAL WING ELEVATION



SECTION A-A

TABLE OF REINFORCING STEEL (5)

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
33"	1' – 11"	1' – 0"	3' – 9"
36"	2' – 1"	1' – 0"	4' – 0"
42"	2' – 4"	1' – 0"	4' – 6"
48"	2' – 7"	1' – 3"	5' – 3"
54"	3' – 0"	1' – 3"	5' – 9"
60"	3' – 3"	1' – 3"	6' – 3"
66"	3' – 3"	1' – 3"	6' – 9"
72"	3' – 4"	1' – 3"	7' – 3"

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galavanized reinforcing steel, if required elsewhere in the plans.

Adjust reinforcing bars, as neccessary, to provide a minimum clear cover of 1 ½".

Provide Class C concrete (f`c= 3,600 psi).

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

Provide ASTM A307 bolts and nuts.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after lubrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Anchorage rods must be clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

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

All bolts, nuts, washers, brackets, angles and pipe runners are considered parts of the safety end treatment for payment.

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

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SHEET 1 OF 3

Texas Department of Transportation

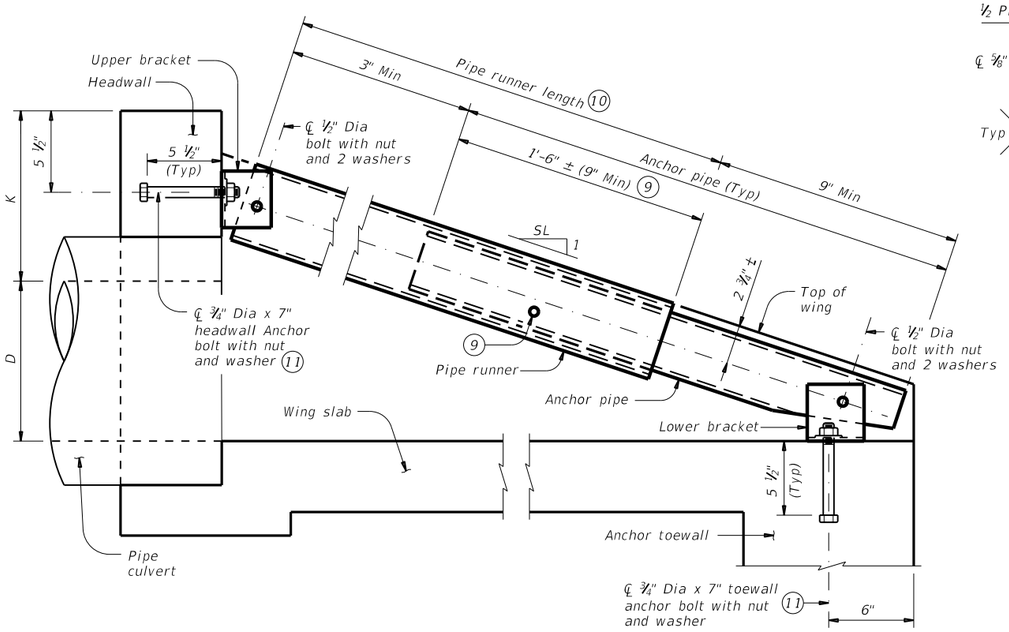
Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

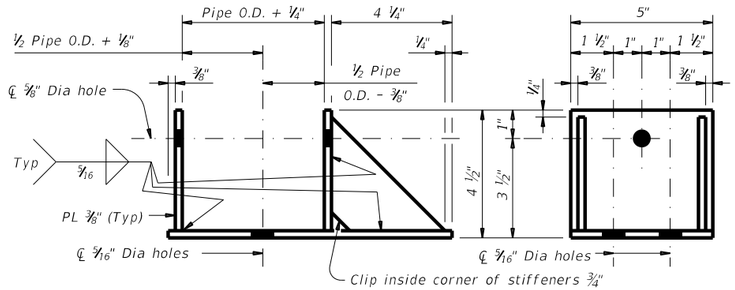
SETP-FW-0

FILE: setpf0se-20.dgn	DN: GAF	CK: CAT	DW: BWH	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		90

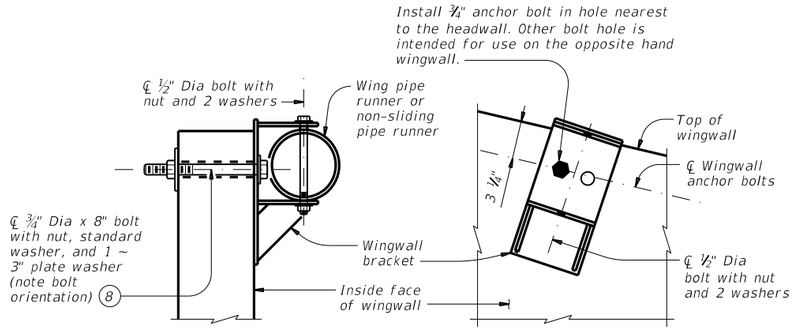


SECTION B-B

(Showing headwall pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



ELEVATION — SIDE VIEW

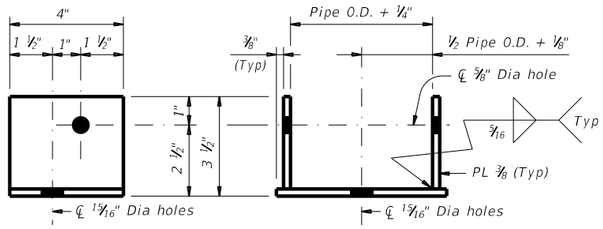


SECTION C-C
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

NOTE: Match the wingwall bracket to the upper bracket size.

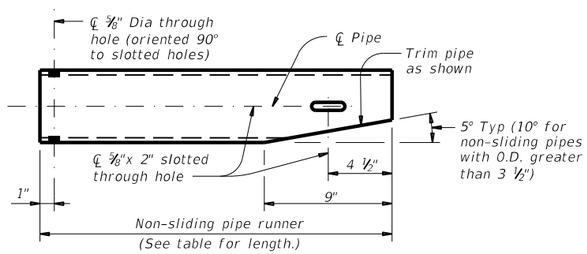
WINGWALL BRACKET DETAILS



SIDE VIEW — ELEVATION

NOTE: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, with the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS



Note: Pipe size is the same as required for headwall pipe runner. Adjust the corresponding lower bracket accordingly.

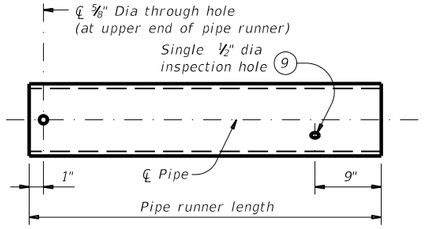
NON-SLIDING PIPE RUNNER DETAILS (10)

(8) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(9) After installation of the pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

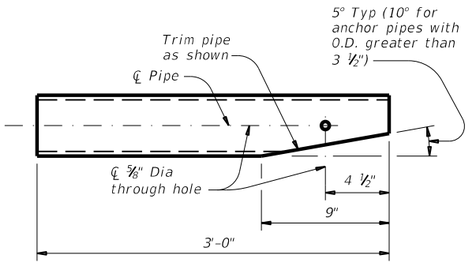
(10) Non-sliding pipe runners are used for those installations that would require pipe runner lengths of 1'-9" or less. The non-sliding pipe runner, when required, replaces the outermost pipe runner and anchor pipe. See table on Sheet 3 of 3 to determine if the non-sliding pipe runner is required.

(11) At Contractor's option, an adhesive anchor may be used. Provide adhesive anchors that are ¾" Dia ASTM A307 Grade A fully threaded rods. Embed threaded rods into curb, wingwalls, and/or toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

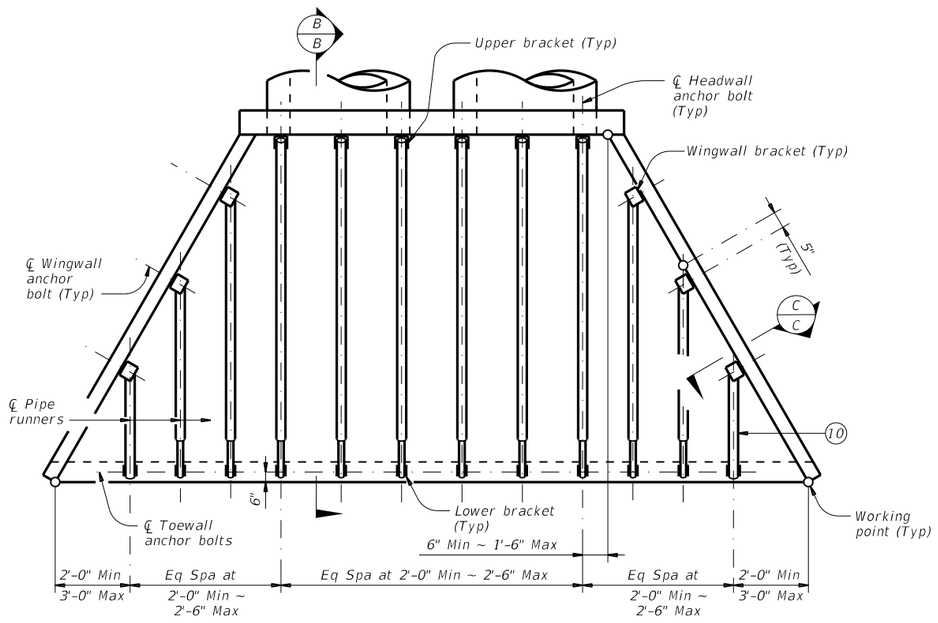


Note: Use pipe diameter required for headwall pipe runner and for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



PIPE RUNNER PLAN

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0 SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-0

FILE: setpf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		91

DATE: 6/3/2021 9:08:34 AM
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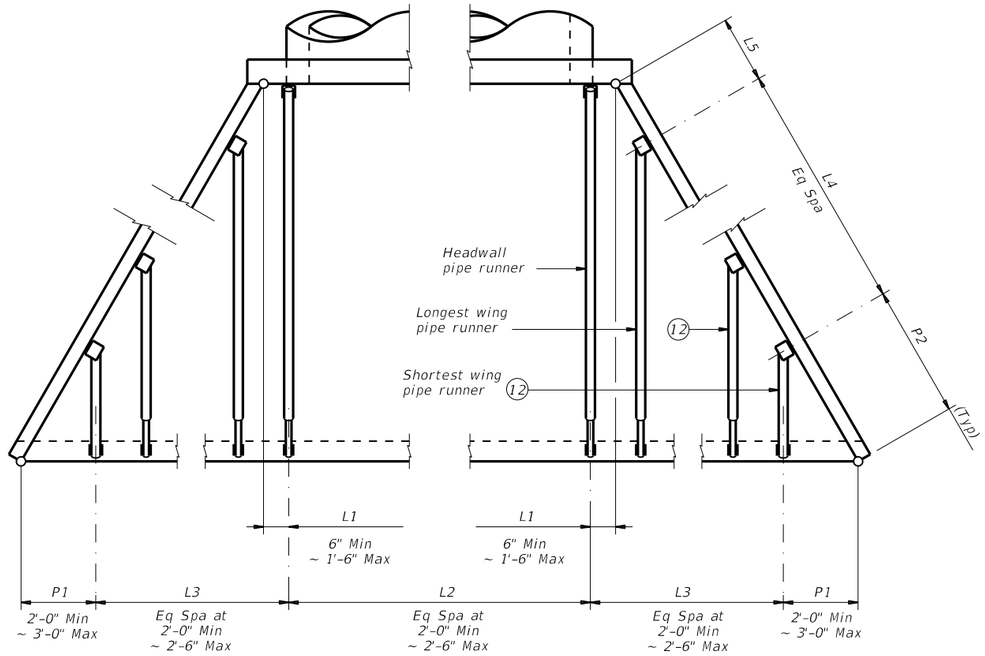
Side Slope	Pipe Culvert Dia	L1	P1	No. of Spaces in L3	L3 Overall Dimension	P2	No. of Spaces in L4	L4 Overall Dimension	Headwall Pipe Runner Length	No. of Wing Pipes (13)	Longest Wingwall Pipe Runner Length	Shortest Wingwall Pipe Runner Length	Non-Sliding Pipe Length	Pipe Runner Size (14)	Total Length of Wingwall Pipe Runners (13)
3:1	33"	0' – 9"	2' – 0"	2	4' – 2 3/4"	3' – 7"	1	4' – 2 3/4"	8' – 4"	4	5' – 5 1/2"	N/A	3' – 1"	3" STD	17' – 1"
	36"	0' – 9"	2' – 0"	2	4' – 8"	3' – 7"	1	4' – 8"	9' – 1 1/2"	4	5' – 10 1/4"	N/A	3' – 1"	3" STD	17' – 10 1/2"
	42"	1' – 0"	3' – 0"	2	4' – 9 1/2"	5' – 7"	1	4' – 9 1/2"	10' – 8 1/4"	4	7' – 9 1/2"	3' – 5"	N/A	4" STD	22' – 5"
	48"	1' – 3"	2' – 0"	3	7' – 4"	3' – 7"	2	9' – 9 1/4"	13' – 0 3/4"	6	10' – 6 1/4"	6' – 0 3/4"	3' – 1"	4" STD	39' – 4"
	54"	0' – 6"	2' – 0"	3	7' – 5 1/2"	3' – 7"	2	9' – 11 1/4"	14' – 7 3/4"	6	10' – 8"	6' – 1 1/2"	3' – 1"	4" STD	39' – 9"
	60"	0' – 9"	2' – 0"	4	8' – 6 3/4"	3' – 7"	3	12' – 10 1/4"	16' – 2 3/4"	8	13' – 3 3/4"	5' – 6"	3' – 1"	4" STD	62' – 7 1/4"
	66"	1' – 0"	2' – 0"	4	9' – 8 1/4"	3' – 7"	3	14' – 6 1/4"	17' – 9 3/4"	8	14' – 10 1/4"	6' – 0"	3' – 1"	4" STD	68' – 8 3/4"
	72"	1' – 3"	3' – 0"	4	9' – 9 1/2"	5' – 7"	3	14' – 8 1/4"	19' – 4 3/4"	8	16' – 10"	3' – 5"	N/A	5" STD	81' – 0"
4:1	33"	0' – 9"	2' – 0"	3	6' – 0 3/4"	3' – 7"	2	8' – 1"	11' – 4 1/2"	6	8' – 8 3/4"	5' – 1 1/4"	3' – 0"	4" STD	33' – 8"
	36"	0' – 9"	2' – 0"	3	6' – 7 3/4"	3' – 7"	2	8' – 10 1/4"	12' – 4 3/4"	6	9' – 5"	5' – 5 1/2"	3' – 0"	4" STD	35' – 9"
	42"	1' – 0"	2' – 9"	3	7' – 3 1/2"	5' – 1"	2	9' – 8 3/4"	14' – 5 1/2"	6	11' – 6 1/4"	2' – 10 1/4"	N/A	4" STD	43' – 1 1/2"
	48"	1' – 3"	2' – 3"	4	9' – 9 1/4"	4' – 1"	3	14' – 8"	17' – 6 3/4"	8	15' – 0 1/2"	1' – 11 1/2"	N/A	4" STD	68' – 0"
	54"	0' – 6"	2' – 6"	4	9' – 11 1/4"	4' – 7"	3	14' – 10 3/4"	19' – 7 1/2"	8	15' – 8 1/4"	2' – 4 3/4"	N/A	5" STD	72' – 4"
	60"	0' – 9"	2' – 0"	5	11' – 10"	3' – 7"	4	18' – 11 1/4"	21' – 8 1/4"	10	18' – 5"	5' – 8 3/4"	3' – 0"	5" STD	102' – 7"
	66"	1' – 0"	2' – 9"	5	12' – 6"	5' – 1"	4	19' – 11 3/4"	23' – 9"	10	20' – 8 1/4"	2' – 10 1/4"	N/A	5" STD	117' – 8 1/2"
	72"	1' – 3"	2' – 0"	6	14' – 7 3/4"	3' – 7"	5	24' – 5"	25' – 9 3/4"	12	23' – 3 1/2"	5' – 10 1/4"	3' – 0"	5" STD	151' – 8 3/4"
6:1	33"	0' – 9"	2' – 0"	4	9' – 8 3/4"	3' – 7"	3	14' – 7"	17' – 7"	8	14' – 3"	5' – 8 1/2"	2' – 11 1/2"	4" STD	65' – 9 1/2"
	36"	0' – 9"	2' – 9"	4	9' – 10"	5' – 1"	3	14' – 9"	19' – 1 1/4"	8	15' – 8 3/4"	2' – 9 1/4"	N/A	5" STD	74' – 0"
	42"	1' – 0"	2' – 3"	5	12' – 3 3/4"	4' – 1"	4	19' – 8 1/2"	22' – 1 3/4"	10	19' – 2 1/4"	1' – 10 3/4"	N/A	5" STD	105' – 5"
	48"	1' – 3"	2' – 6"	6	14' – 11"	4' – 7"	5	24' – 10 1/4"	26' – 8 1/2"	12	24' – 1 3/4"	2' – 4"	N/A	5" STD	158' – 10 1/2"
	54"	0' – 6"	2' – 0"	7	16' – 4 3/4"	3' – 7"	6	28' – 1 1/4"	29' – 9"	14	26' – 1 1/2"	5' – 6 3/4"	2' – 11 1/2"	5" STD	196' – 0 1/2"
	60"	0' – 9"	3' – 0"	7	17' – 4 1/2"	5' – 7"	6	29' – 9 1/2"	32' – 9 1/2"	14	29' – 4 1/4"	3' – 2 1/2"	N/A	5" STD	227' – 11 1/4"



PIPE RUNNER LAYOUT

(12) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner the shortest.

(13) Quantities shown include, if present, the non-sliding pipes.

(14) The anchor pipe size is the next smaller size than the pipe runner size.

STANDARD PIPE RUNNER AND ANCHOR PIPE SIZES (14)

Pipe Size	Pipe O.D.	Pipe I.D.
2" STD	2.375"	2.067"
3" STD	3.500"	3.068"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"

TOTAL PIPE LENGTHS FORMULAS:

$$\text{Total Length of All Pipe Runners} = \text{Total Length of Wingwall Pipe Runners} + \left(\text{No. of Headwall Pipe Runners}\right)\left(\text{Headwall Pipe Runner Length}\right)$$

$$\text{Total Length of All Anchor Pipes} = (3.000')\left(\text{No. of Wing Pipe Runners} + \text{No. of Headwall Pipe Runners} - \text{No. of Non-Sliding Pipe Runners}\right)$$

SPECIAL NOTE:

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, verify all dimensions in the field prior to fabrication of the safety end treatment components.

Pipe Culvert Dia	No. of Pipe Culverts	No. of L2 Spaces	L2 Overall Dimension	No. of Headwall Pipes
33"	1	1	2' – 0 1/4"	2
	2	3	6' – 8 1/4"	4
	3	5	11' – 4 1/4"	6
	4	7	16' – 0 1/4"	8
	5	9	20' – 8 1/4"	10
	6	11	25' – 4 1/4"	12
36"	1	1	2' – 3 3/4"	2
	2	3	7' – 4 3/4"	4
	3	5	12' – 5 3/4"	6
	4	7	17' – 6 3/4"	8
	5	10	22' – 7 3/4"	11
	6	12	27' – 8 3/4"	13
42"	1	1	2' – 4 3/4"	2
	2	4	8' – 2 3/4"	5
	3	6	14' – 0 3/4"	7
	4	8	19' – 10 3/4"	9
	5	11	25' – 8 3/4"	12
	6	13	31' – 6 3/4"	14
48"	1	1	2' – 5 3/4"	2
	2	4	9' – 0 3/4"	5
	3	7	15' – 7 3/4"	8
	4	9	22' – 2 3/4"	10
	5	12	28' – 9 3/4"	13
	6	15	35' – 4 3/4"	16
54"	1	2	4' – 6 3/4"	3
	2	5	12' – 0 3/4"	6
	3	8	19' – 6 3/4"	9
	4	11	27' – 0 3/4"	12
	5	14	34' – 6 3/4"	15
	6	17	42' – 0 3/4"	18
60"	1	2	4' – 7 3/4"	3
	2	6	12' – 10 3/4"	7
	3	9	21' – 1 3/4"	10
	4	12	29' – 4 3/4"	13
	5	16	37' – 7 3/4"	17
	6	19	45' – 10 3/4"	20
66"	1	2	4' – 8 3/4"	3
	2	6	13' – 5 3/4"	7
	3	9	22' – 2 3/4"	10
	4	13	30' – 11 3/4"	14
	5	16	39' – 8 3/4"	17
	6	20	48' – 5 3/4"	21
72"	1	2	4' – 9 3/4"	3
	2	6	14' – 1 3/4"	7
	3	10	23' – 5 3/4"	11
	4	14	32' – 9 3/4"	15
	5	17	42' – 1 3/4"	18
	6	21	51' – 5 3/4"	22

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Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

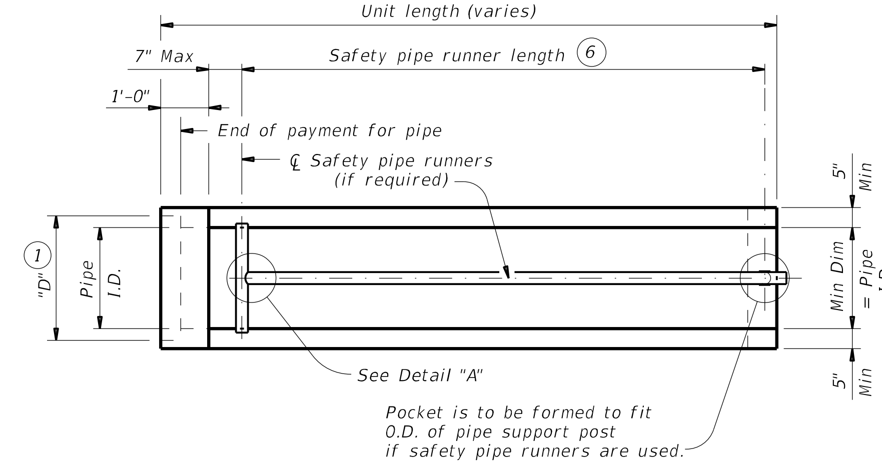
FOR 0° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-0

FILE: setpf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		92

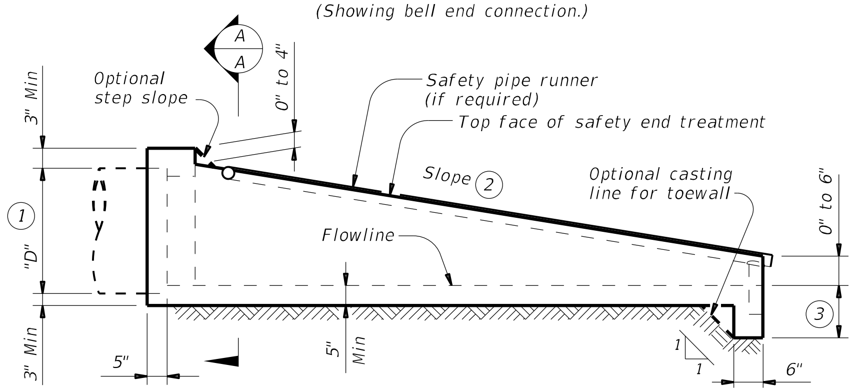
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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



PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

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.

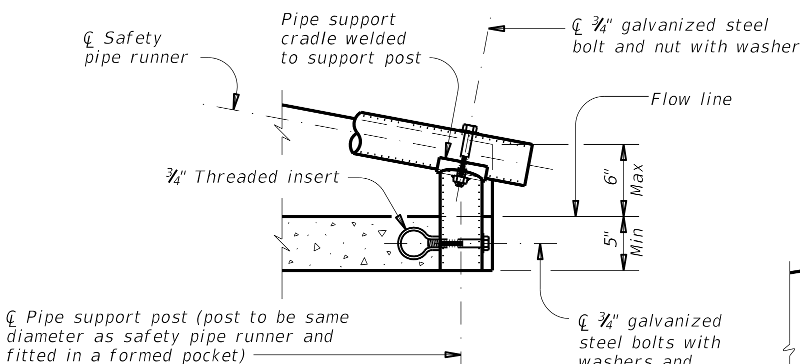
(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

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

(6) Measured along slope.

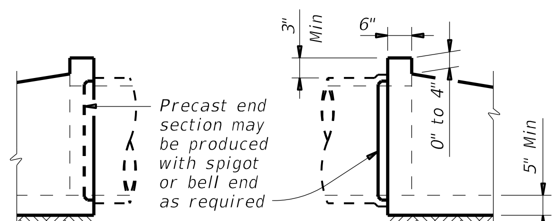
(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed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



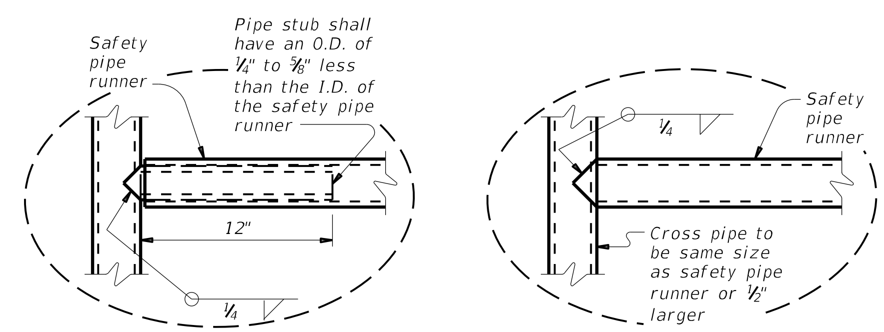
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



DETAIL A

(If required)

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).

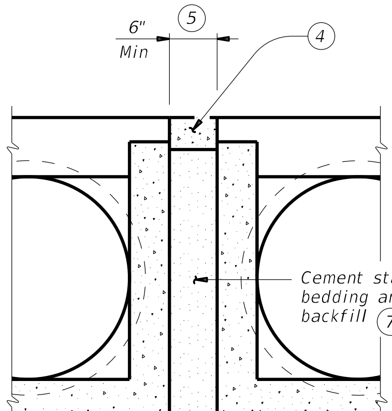
At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

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.

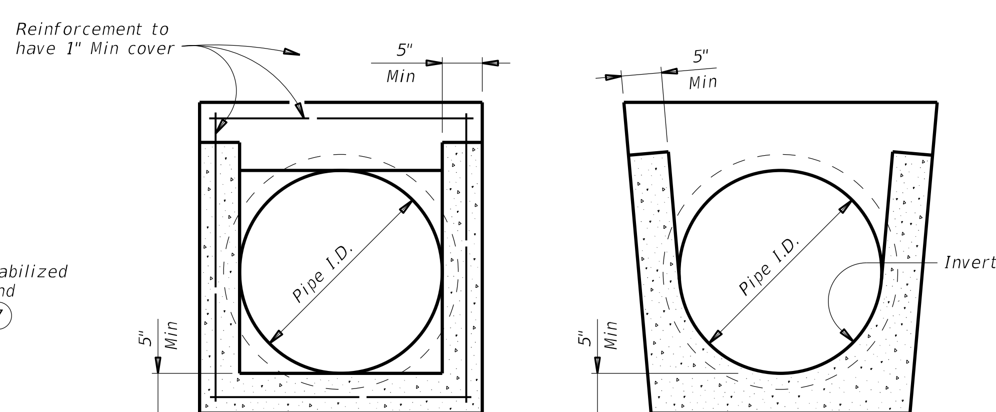
Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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.



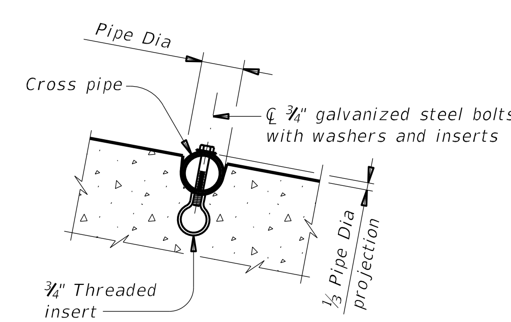
MULTIPLE PIPE INSTALLATION



OPTION WITH SQUARE BOTTOM

OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

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DATE:
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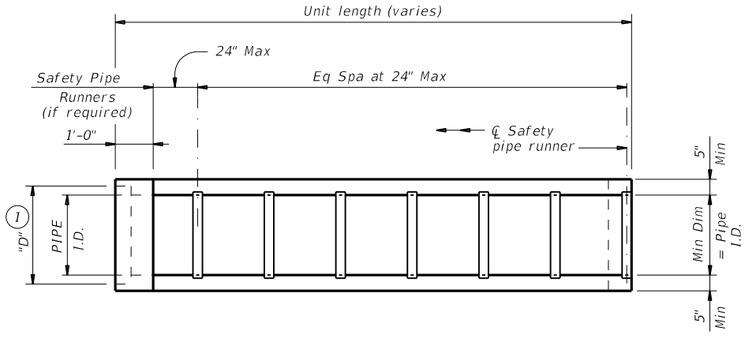
Texas Department of Transportation | Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

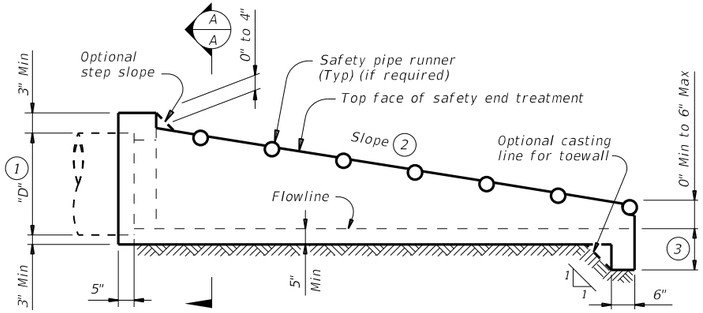
PSET-SC

FILE: psetscss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 1077	SECT 01	JOB 026	HIGHWAY FM 434
REVISIONS	DIST WACO	COUNTY FALLS		SHEET NO. 93



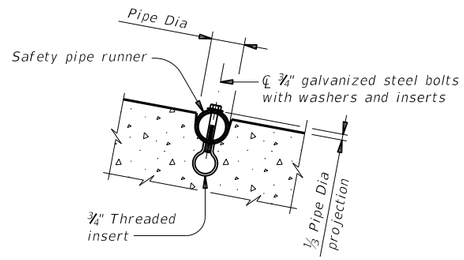
PLAN

(Showing bell end connection.)



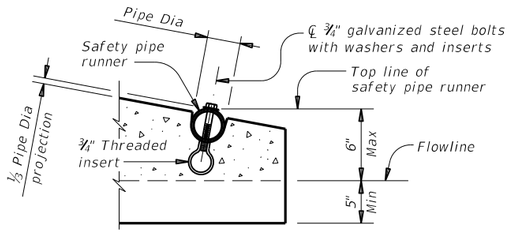
LONGITUDINAL ELEVATION

(Showing bell end connection.)

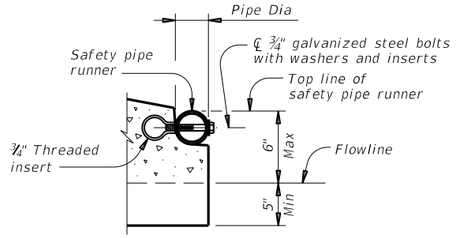


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



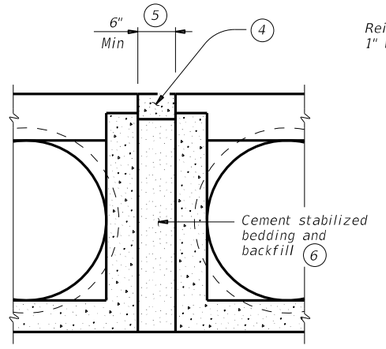
OPTION A



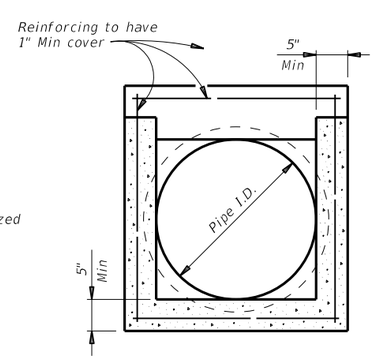
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

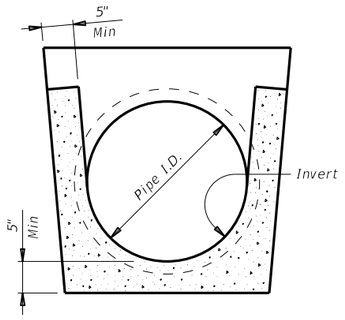
(If required)



MULTIPLE PIPE INSTALLATION

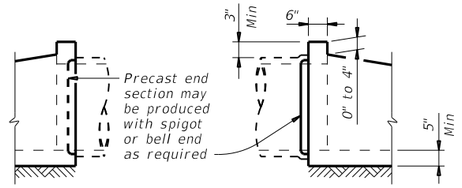


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

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

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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

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

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

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

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

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

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

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

GENERAL NOTES:

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

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

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

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

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

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

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

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

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		94

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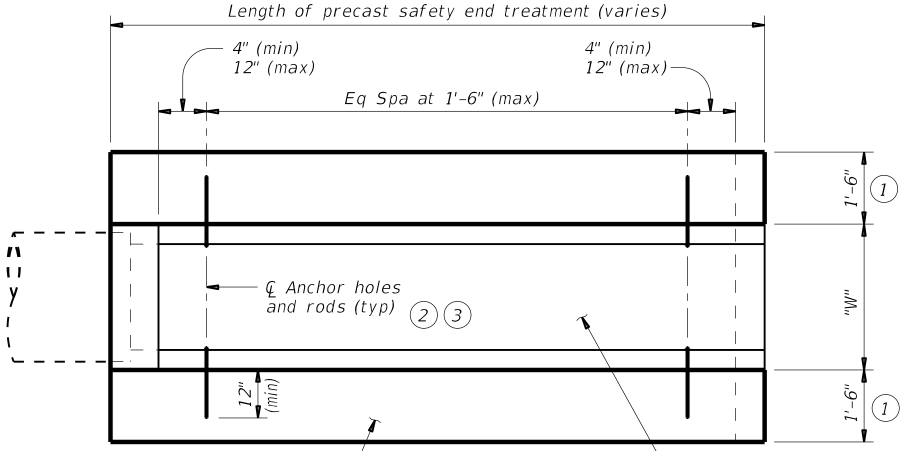
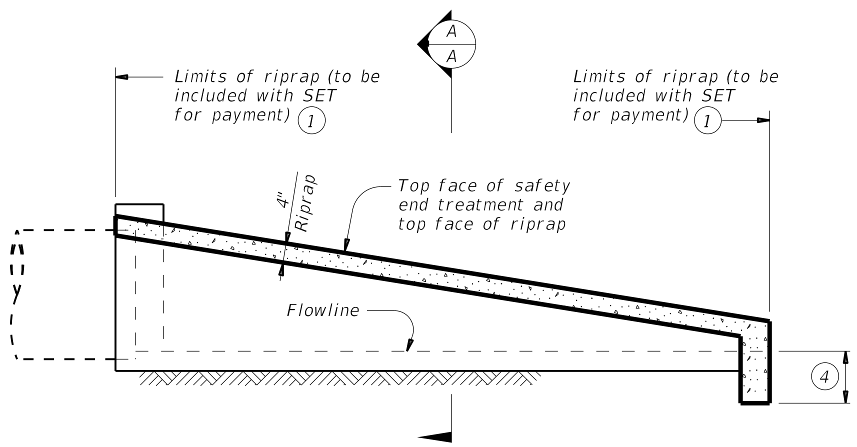
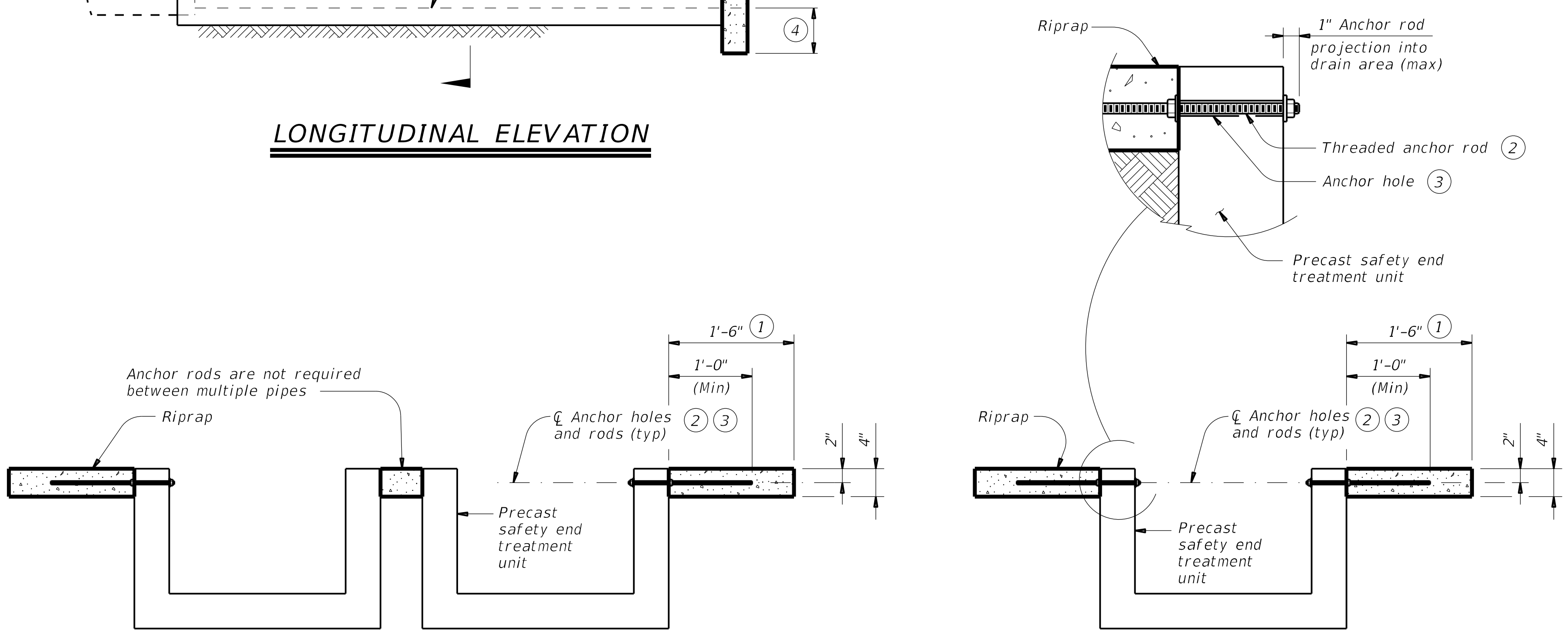


PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION

SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

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

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

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

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

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

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

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".
Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.
For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.
Payment for riprap and toewalls is included in the price bid for each safety end treatment.

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

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

Texas Department of Transportation
Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II RIPRAP DETAILS
PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
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	WACO		FALLS	95

DATE: 02/17/2021
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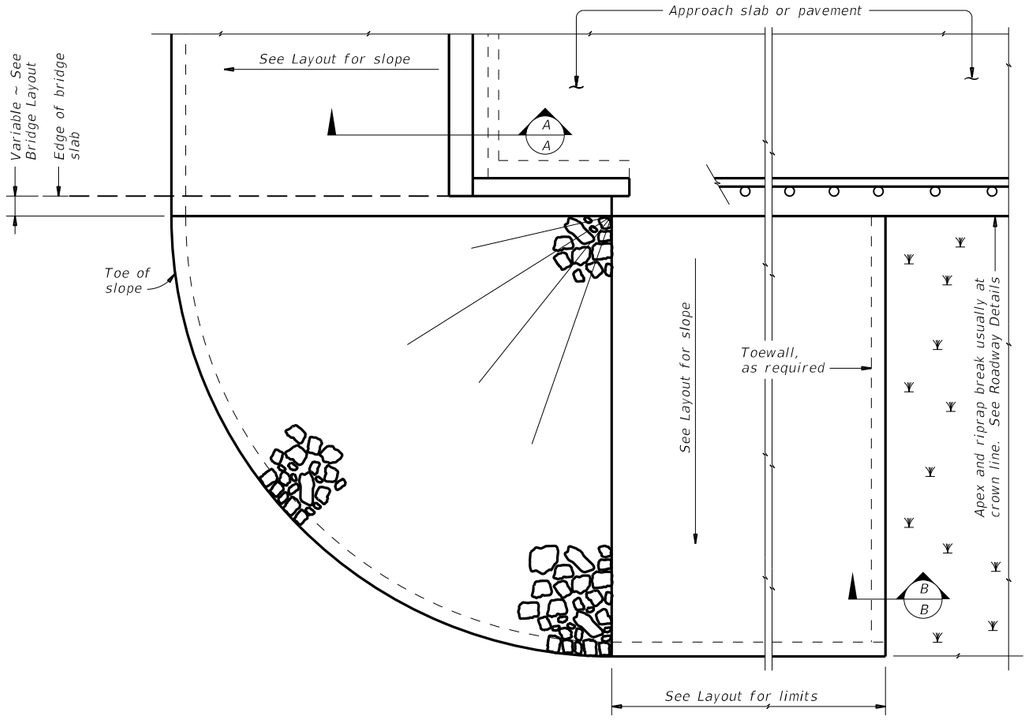
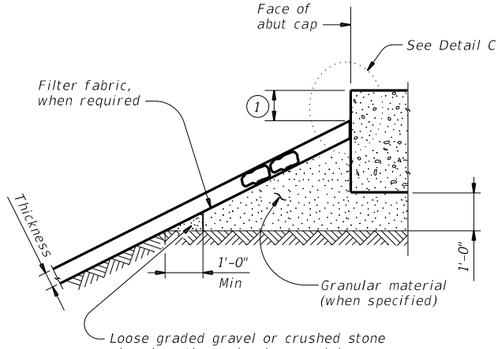
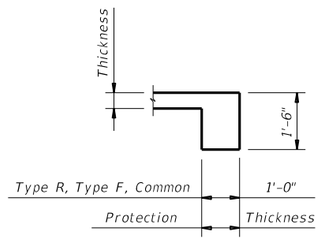


PLAN

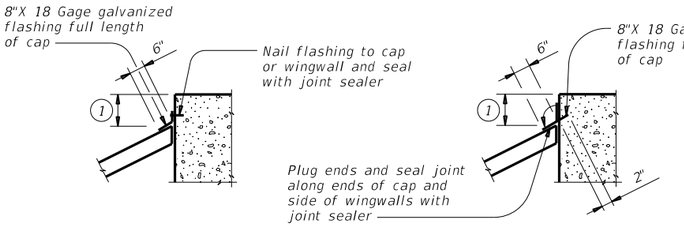


SECTION A-A AT CAP



SECTION B-B

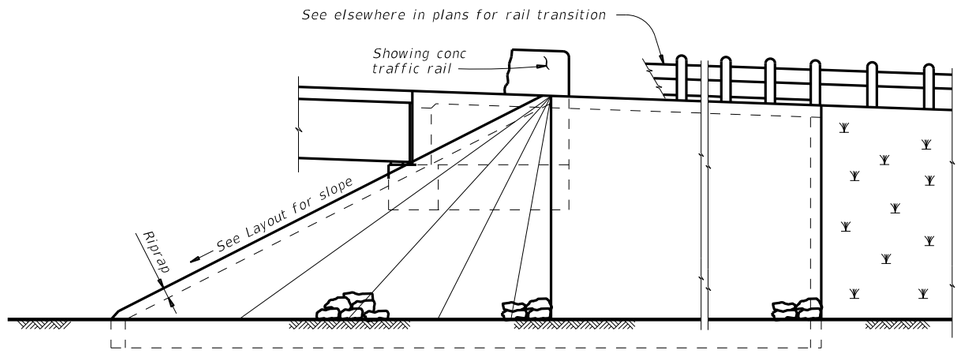
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



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.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
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	WACO	FALLS		96

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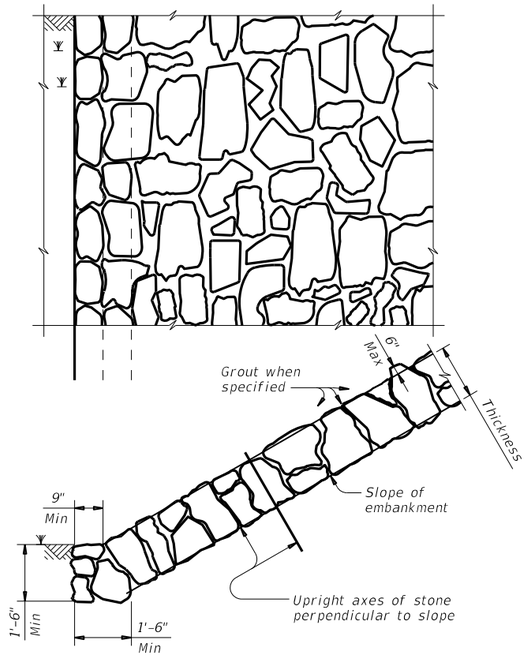


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

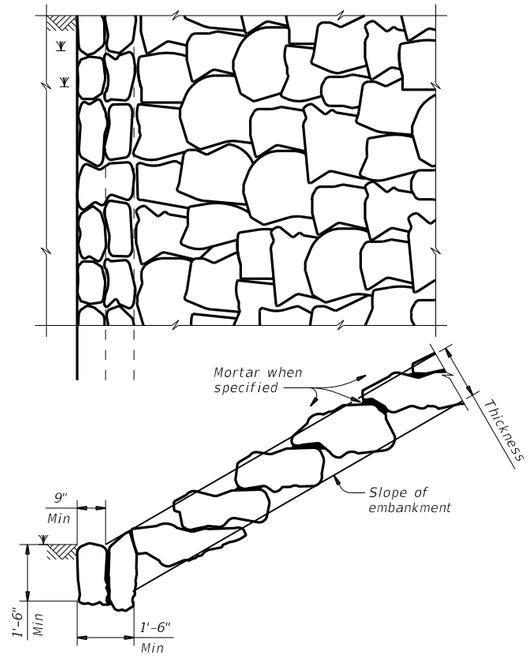


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

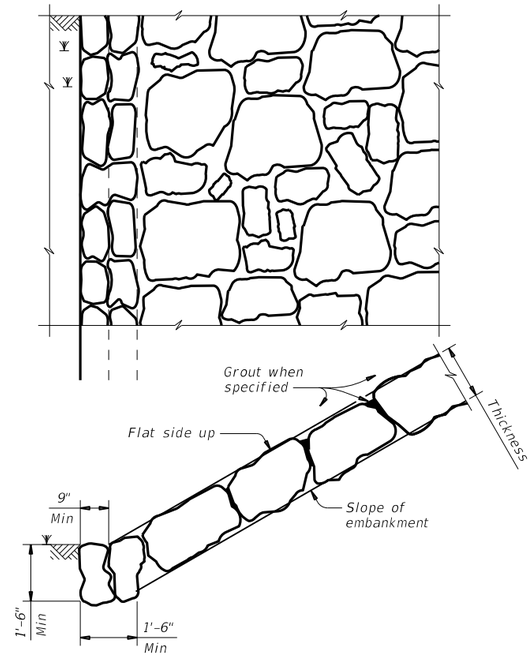


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

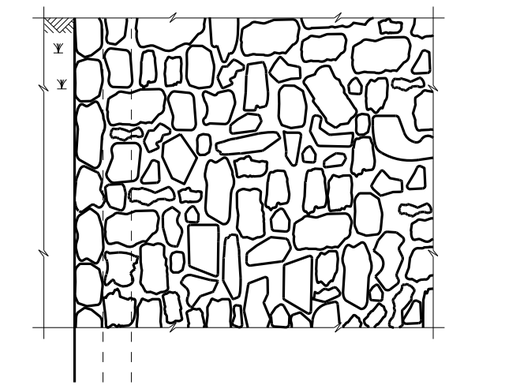


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

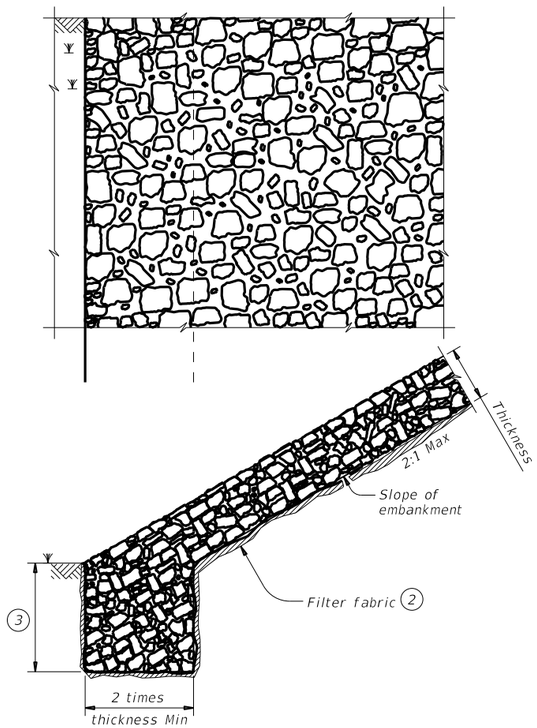


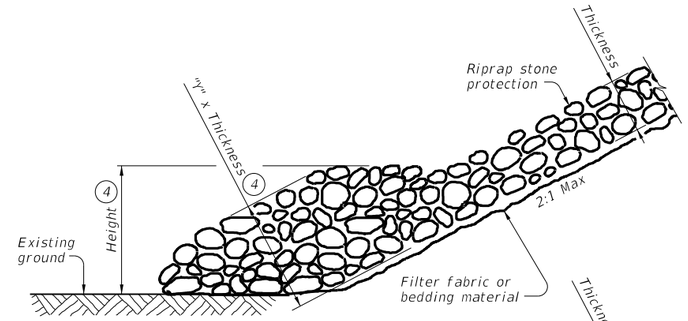
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

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

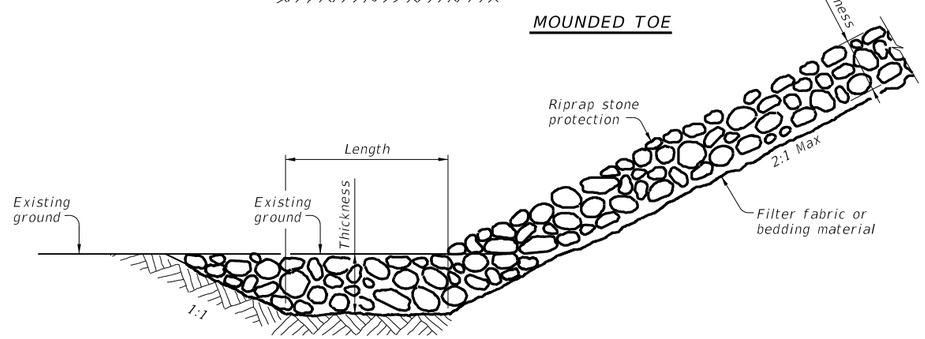
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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)

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	WACO	FALLS		97

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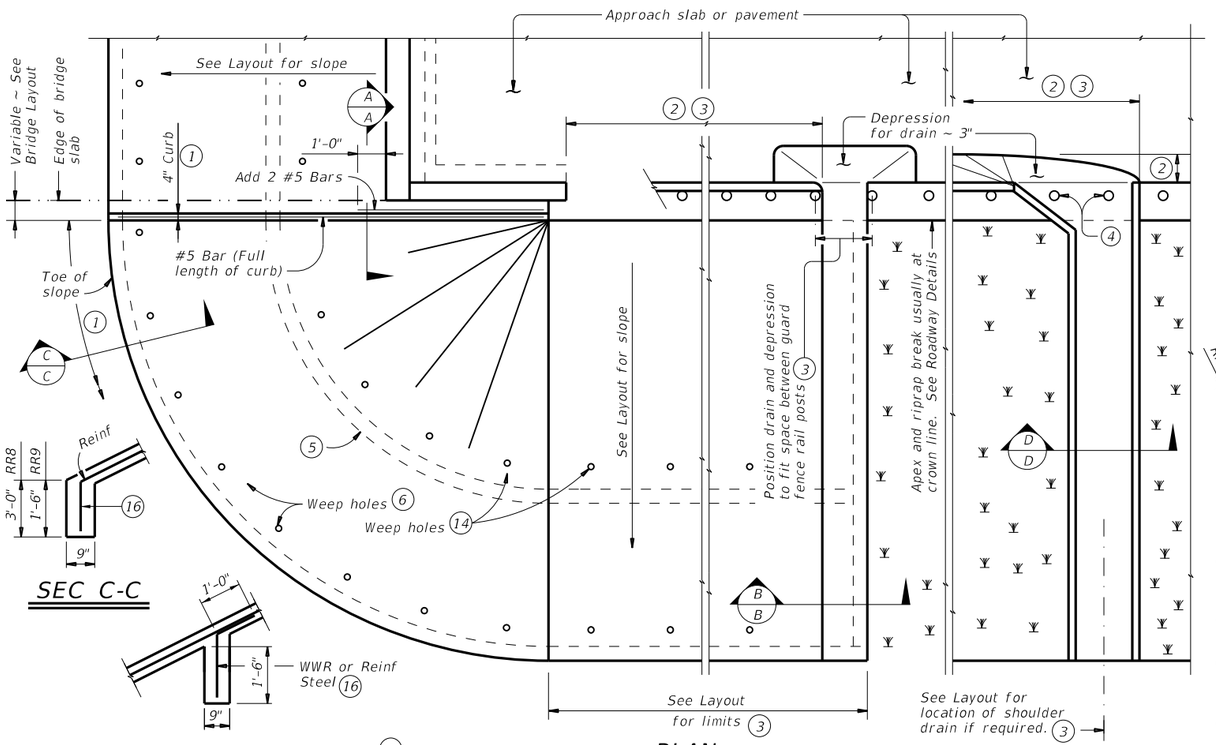
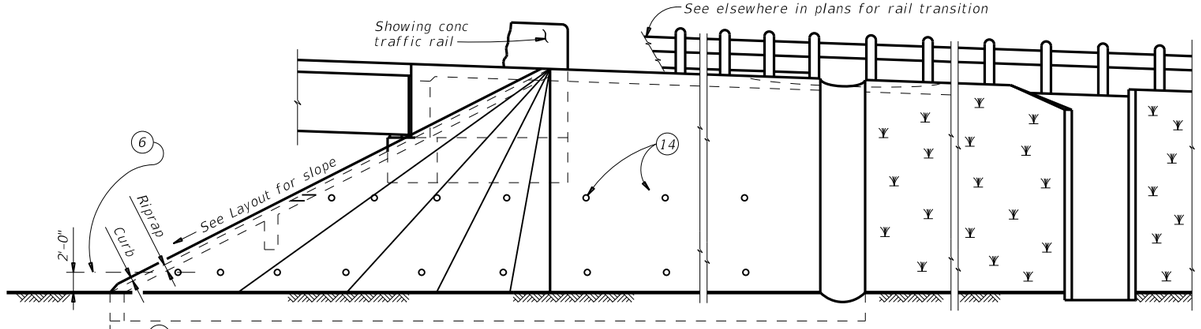


PLAN

SEC C-C

INTERMEDIATE TOEWALL



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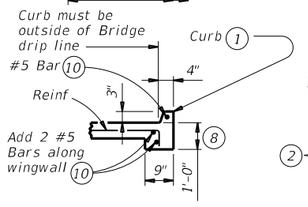
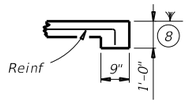
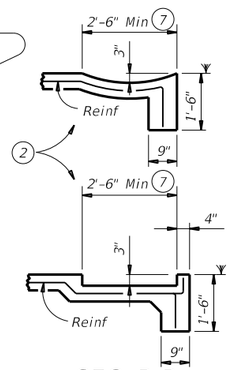


SEC A-A



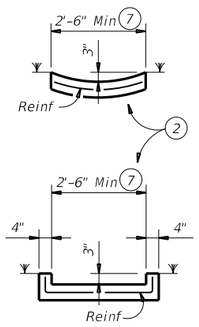
SEC B-B

(No drain)



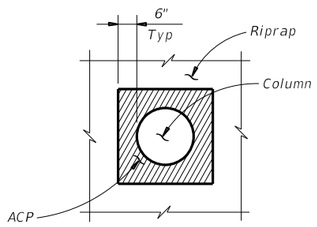
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

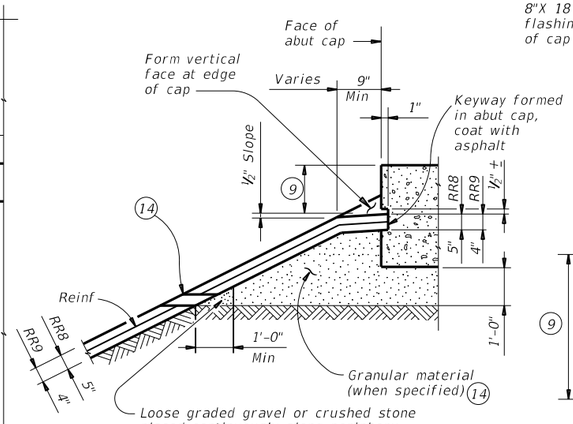
(Shoulder drain)



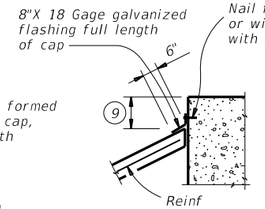
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

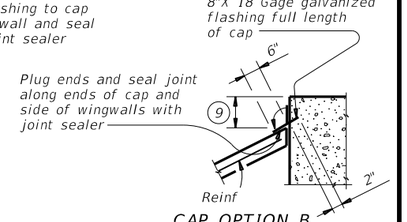
(As directed by the Engineer)



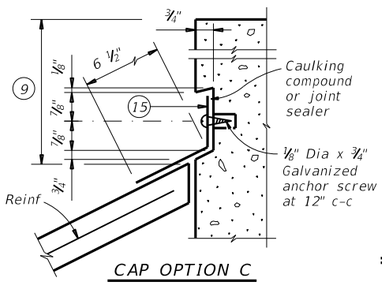
SHOWING KEYWAY OPTION



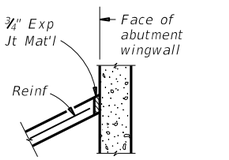
CAP OPTION A



CAP OPTION B

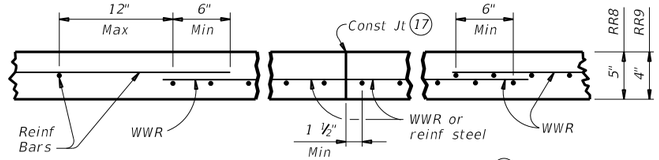


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

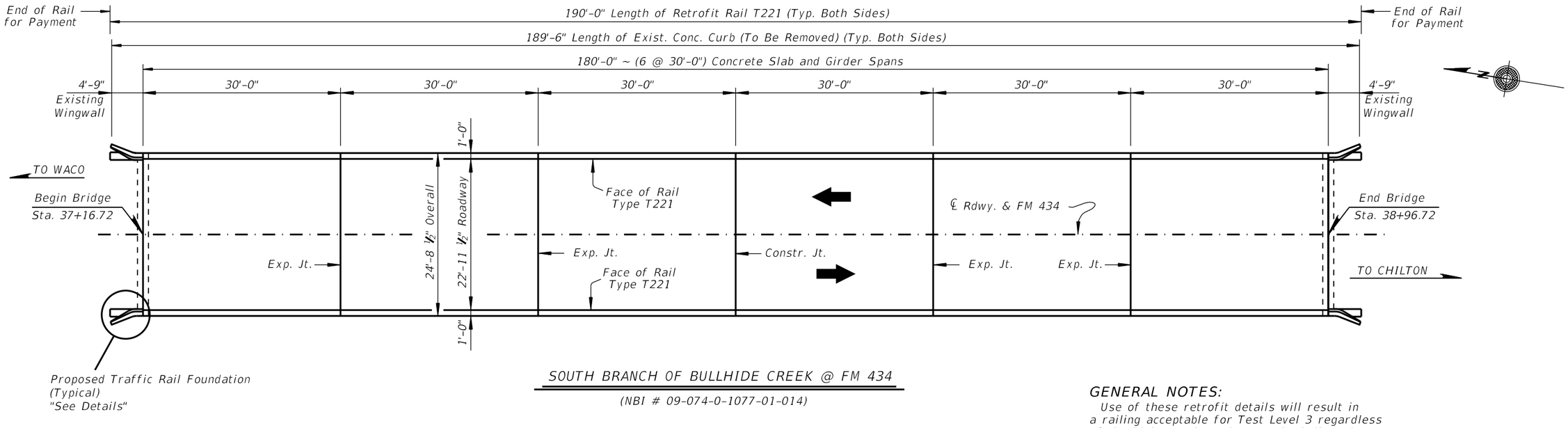
Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		98



SOUTH BRANCH OF BULLHIDE CREEK @ FM 434

(NBI # 09-074-0-1077-01-014)

FM 434 OVER SOUTH BRANCH OF BULLHIDE CREEK
180'-0" OVERALL LENGTH
(6 @ 30'-0") CONCRETE SLAB AND GIRDER SPANS
APPROX. 23' ROADWAY   NORMAL

Note:
Existing Structure has Historically proven to be Hydraulically adequate. There has been no overtopping of the bridge in the last 10 years.

Note:
See Standards GF(31)TRTL3-20, GF(31)-19 and BED-14 for additional Details not shown.

GENERAL NOTES:

Use of these retrofit details will result in a railing acceptable for Test Level 3 regardless of the higher ratings that may be indicated on the rail standard.

Rail strength tests have been performed on the epoxied (#6) anchor bar system which have demonstrated that the ultimate strength can be developed in the anchorage system.

Rail anchorage details shown, have been modified for this select structure type.

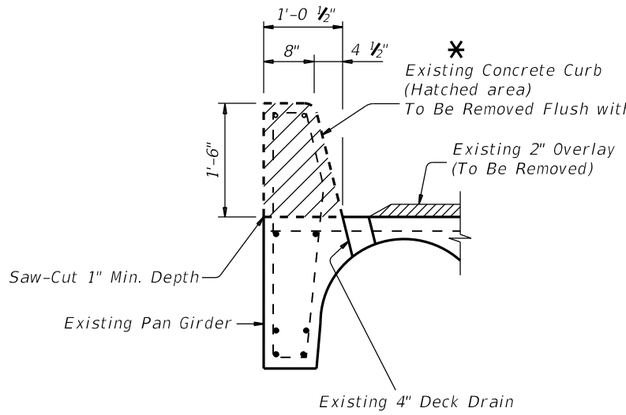
Payment for retrofit rail will be as per Item 451, "RETROFIT RAIL (TY T221)".

Removal of Existing Curb over Bridge Deck, including the top portion over Wingwall will be paid as per LF for "REMOVING CONC CURB".

All Materials and labor required for installing the Traffic Rail Foundation to be included in the Bid Price per CY for Item: "CL C CONC (RAIL FOUNDATION)".

Shop drawings will not be required for this rail.

Average weight of Railing with no Overlay is 370 PLF.



SECTION THRU EXISTING CURB

(SHOWING CURB - TO BE REMOVED)

* Note:
Contractor to remove existing curb as to prevent damaging the existing Pan Girder superstructure. Any repair required for related damages will be provided at the Contractor's expense.

ESTIMATED QUANTITIES

ITEM	0104-6021	0420-6066	0451-6005
LOCATION	REMOVING CONC (CURB)	CL C CONC (RAIL FOUNDATION)	RETROFIT RAIL (TY T221)
	L.F.	C.Y.	L.F.
FM 434 @ S. BR. BULLHIDE CREEK	379.0	2.5	380.0
TOTAL	379.0	2.5	380.0

PAUL F. CEPAK
85408
Paul F. Cepak, P.E.
05/10/2021

Texas Department of Transportation
©2021

RETROFIT TRAFFIC RAIL LAYOUT

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)   TYPE T221

FILE: BULLHIDE014RETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT			
ORIG DATE: FEB. 2021	DIST	FED REG	FEDERAL AID PROJECT ⊕				SHEET
REVISIONS	WACO	6					99
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	FALLS			1077	01	026	FM 434

LEVELS DISPLAYED

ACC:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
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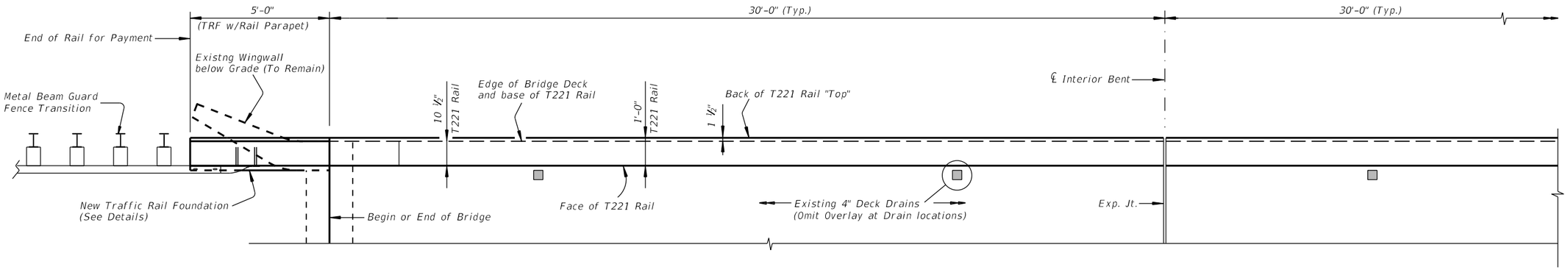
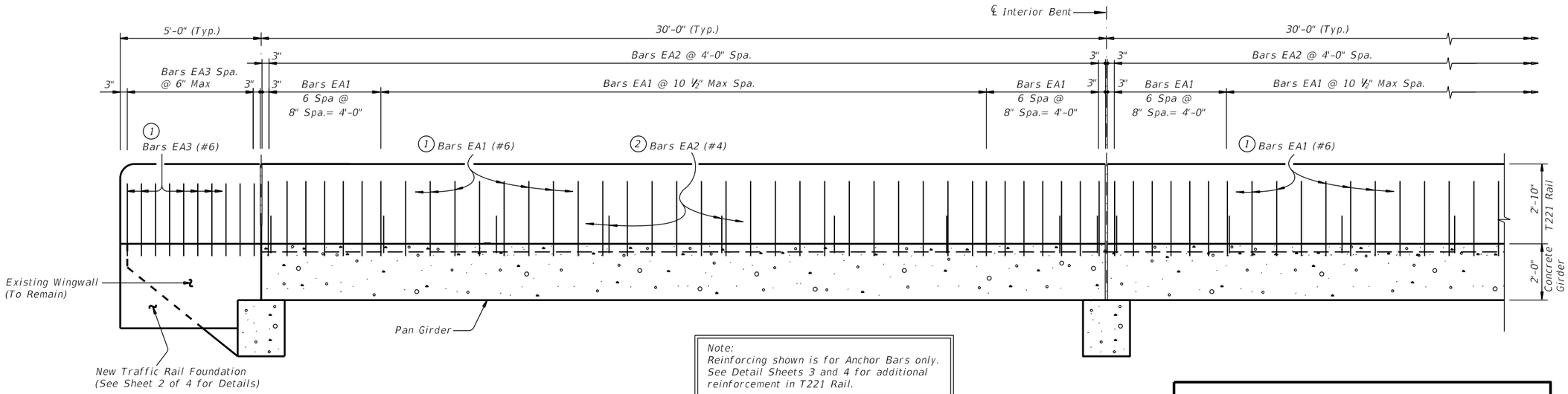


PART PLAN

FM 434 OVER S. BRANCH OF BULLHIDE CREEK



Note:
Reinforcing shown is for Anchor Bars only.
See Detail Sheets 3 and 4 for additional reinforcement in T221 Rail.

PART ELEVATION

FM 434 OVER S. BRANCH OF BULLHIDE CREEK

SEE RETROFIT TRAFFIC RAIL DETAILS SHEETS 2 THRU 4, FOR CORRESPONDING SECTIONS AND NOTES.

(1) Embed (#6) anchor bars a minimum embedment depth of 5 ¼" with Hilti RE500 V3 epoxy adhesive. Other Type III Class C, D, E, or F 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 RE500 V3 with the same embedment depth and anchor bar size and spacing. Follow Manufacturer's directions for installing the epoxied anchor bars. Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(2) Embed secondary (#4) anchor bars 1'-4" in length with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 10 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". (#4) anchor bars spaced longitudinally along rail at 4 ft Max (Spaced 3" longitudinally from outside edge and edge of side slot drains).

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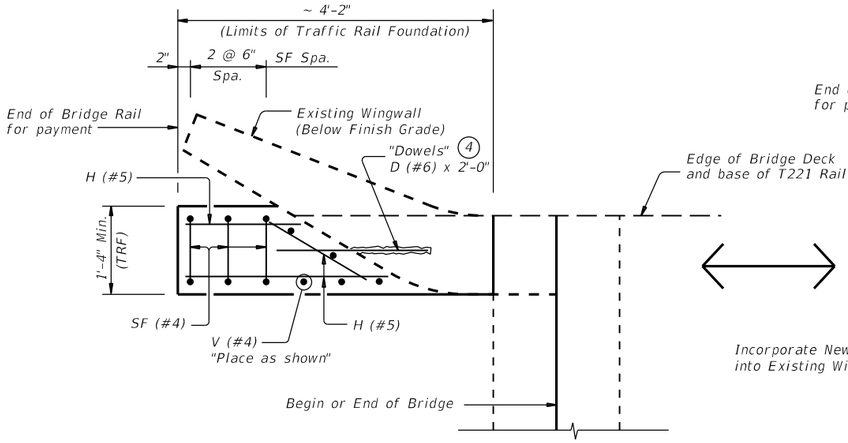
05/10/2021

RETROFIT TRAFFIC RAIL DETAILS

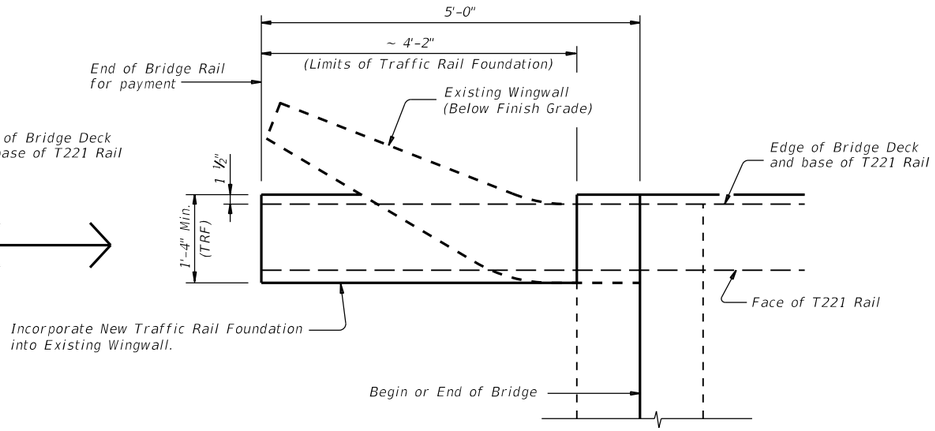
FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014) TYPE T221

FILE: BULLHIDE014RETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: FEB. 2021	DIST	FED REG	FEDERAL AID PROJECT •	SHEET
REVISIONS	WACO	6		100
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434



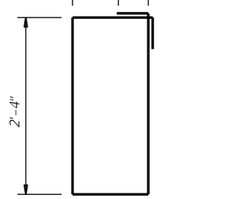
PLAN
(SHOWING TRAFFIC RAIL FOUNDATION REINFORCING)



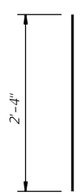
PLAN
(SHOWING TRAFFIC RAIL FOUNDATION WITH EXISTING WINGWALL)

(3) Remove top portion of existing Wingwall flush with finish Grade, cut and grind Reinforcement flush, and paint ends with two coats of zinc-rich paint conforming to the Item "Galvanizing".

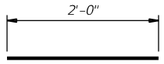
(4) Drill & Grout Bars D (1'-0" Min depth) into Existing Wingwall using Epoxy Adhesive. Conforming to the requirements of (DMS-6100).



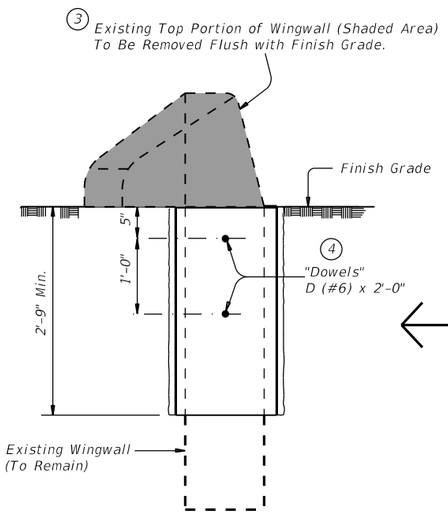
BARS SF (#4)
(Foundation)



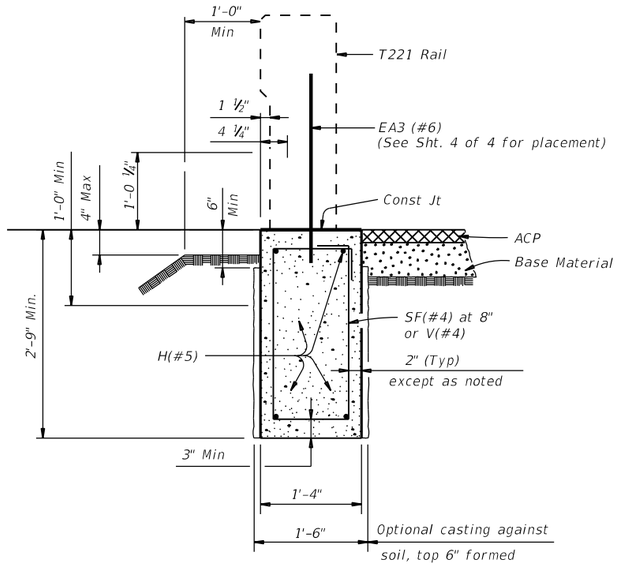
BARS V (#4)
(Foundation)



BARS D (#6)
(Foundation/Wingwall)



SECTION THRU WINGWALL
(SHOWING DOWEL PLACEMENT IN TRAFFIC RAIL FOUNDATION)



SECTION THRU WINGWALL
(SHOWING TRAFFIC RAIL FOUNDATION REINF.)

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05/10/2021

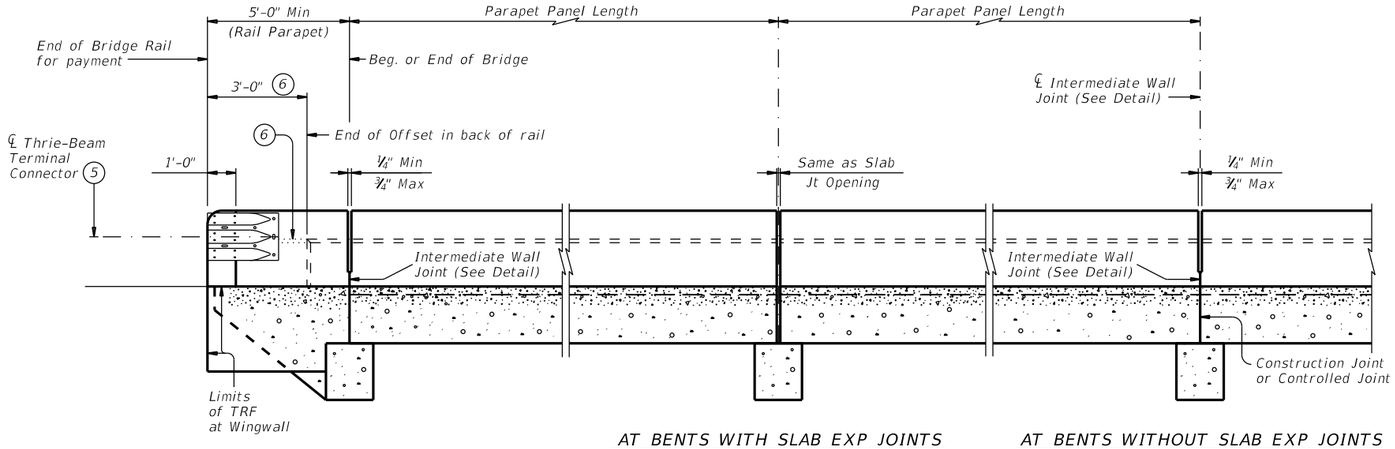
SHEET 2 OF 4 SHEETS

RETROFIT TRAFFIC RAIL DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014) TYPE T221

FILE: BULLHIDE014RETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT			
ORIG DATE: FEB. 2021	DIST	FED REG	FEDERAL AID PROJECT •				SHEET
REVISIONS	WACO	6					101
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	FALLS			1077	01	026	FM 434

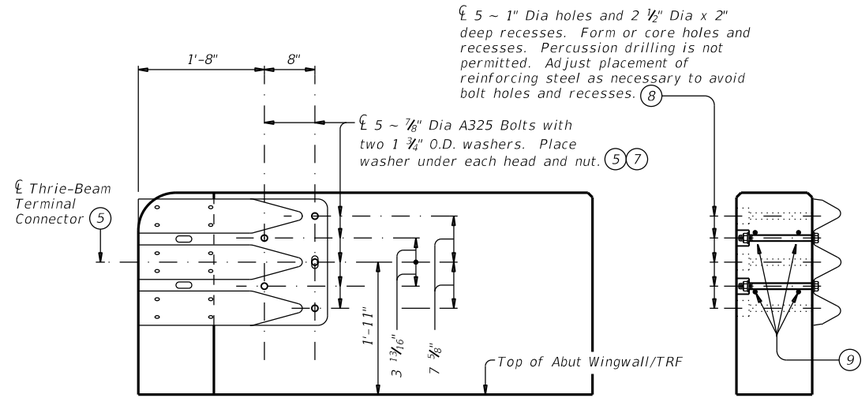


AT ABUTMENTS

AT BENTS WITH SLAB EXP JOINTS

AT BENTS WITHOUT SLAB EXP JOINTS

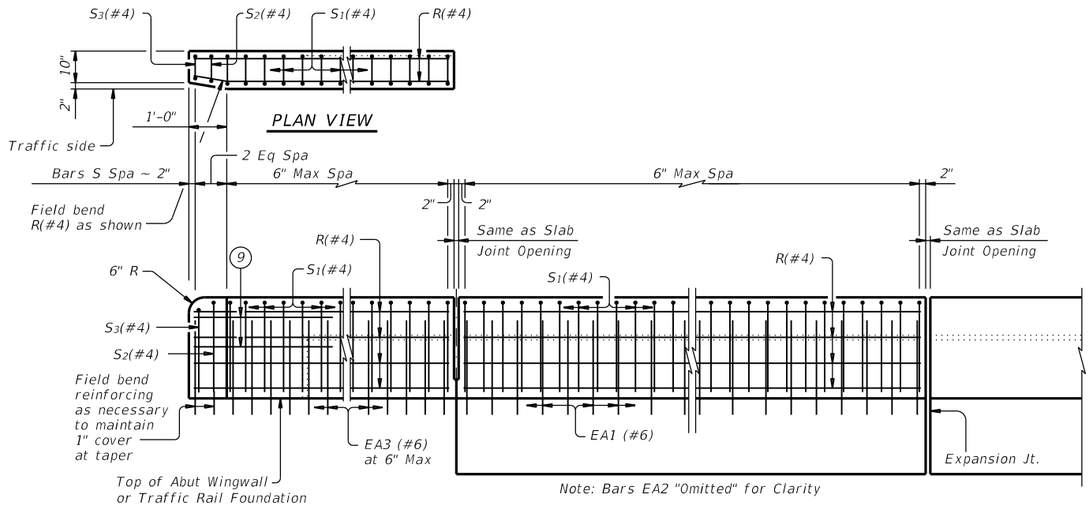
ROADWAY ELEVATION OF RAIL



ELEVATION

SECTION

TERMINAL CONNECTION DETAILS



AT ABUT WINGWALL

AT BENTS WITH SLAB EXP JOINTS

AT SLAB

AT BENTS WITH SLAB EXP JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

(5) *Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.*

(6) *Back of rail offset may, with Engineer's approval, be continued to the end of the railing.*

(7) *Provide bolts of sufficient length to extend ½" to ¾" beyond nut.*

(8) *Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.*

(9) *Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.*

INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.

Paul F. Cepak, P.E.

05/10/2021

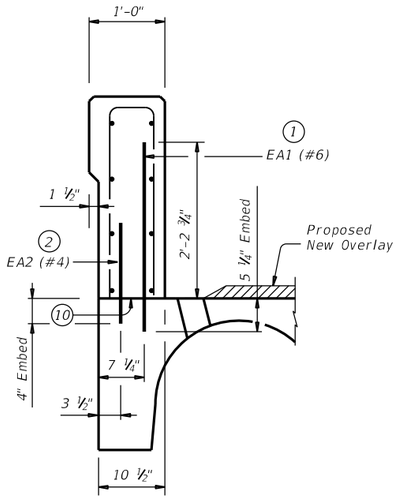
SHEET 3 OF 4 SHEETS

RETROFIT TRAFFIC RAIL DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

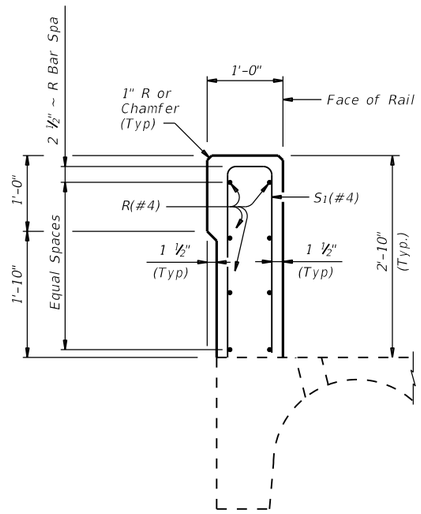
(STR.#014) TYPE T221

FILE: BULLHIDE014RETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: FEB. 2021	DIST	FED REG	FEDERAL AID PROJECT •	SHEET
REVISIONS	WACO	6		102
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434



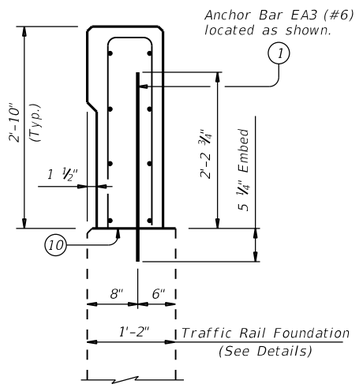
SECTION THRU RAIL AT BRIDGE DECK

(SHOWING RETROFIT REINFORCING ON BRIDGE DECK)



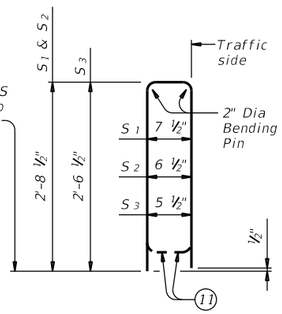
SECTION THRU RAIL

(SHOWING T221 RAIL REINFORCING)

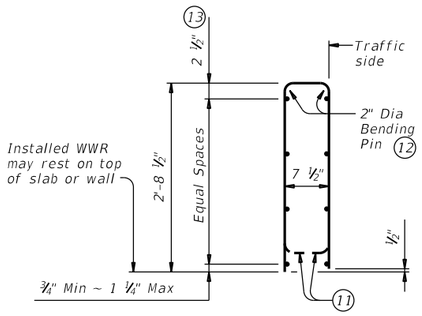


SECTION THRU RAIL AT WINGWALL

(SHOWING BARS EA3 ANCHORAGE)

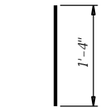


BARS S (#4)

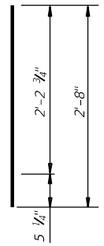


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



ANCHOR
BAR EA2 (#4)
(Bridge Deck)



ANCHOR
BARS EA1 (#6) (Bridge Deck)
or EA3 (#6) (Wing/TRF)

CONSTRUCTION NOTES:

This railing may be constructed with slip-forms when approved by the Engineer, with equipment approved by the Engineer. Sensor control for both line and grade must be provided. Tack welding to provide bracing for slip-form operations is acceptable.

By adding additional anchorage, welding can be performed at a minimum spacing of 3 ft between the cage and additional anchorage. Do not weld to the required anchorage.

It is permissible to weld to S bars at any location on the cage. If increased bracing is needed, additional anchorage devices must be added and welding must be performed in the upper two thirds of the cage.

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Chamfer all exposed concrete corners.

MATERIAL NOTES:

Galvanize all steel components except reinforcing steel unless otherwise shown on plans.

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

(#6) and (#4) anchor bars used for the epoxied anchorage system must not be epoxy coated within the required embedment.

Deformed WWR (ASTM 1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other that shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-5"
Epoxy coated ~ #4 = 2'-1"

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

(1) Embed (#6) anchor bars a minimum embedment depth of 5 ¼" with Hilti RE500 V3 epoxy adhesive. Other Type III Class C, D, E, or F epoxy adhesives meeting the requirements ofDMS-6100, "Epoxies and Adhesives", may be used if it can be demonstrated that they meet or exceed the strength of Hilti HIT RE500 V3 with the same embedment depth and anchor bar size and spacing. Follow Manufacturer's directions for installing the epoxied anchor bars. Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(2) Embed secondary (#4) anchor bars 1'-4" in length with a Type III Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 10 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". (#4) anchor bars spaced longitudinally along rail at 4 ft Max (Spaced 3" longitudinally from outside edge and edge of side slot drains).

(10) Do not cast rails or parapet walls on top of overlays/seal coats.

(11) Bend or cut as required to clear drain slots.

(12) No longitudinal wires may be in top center of cage.

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05/10/2021

SHEET 4 OF 4 SHEETS

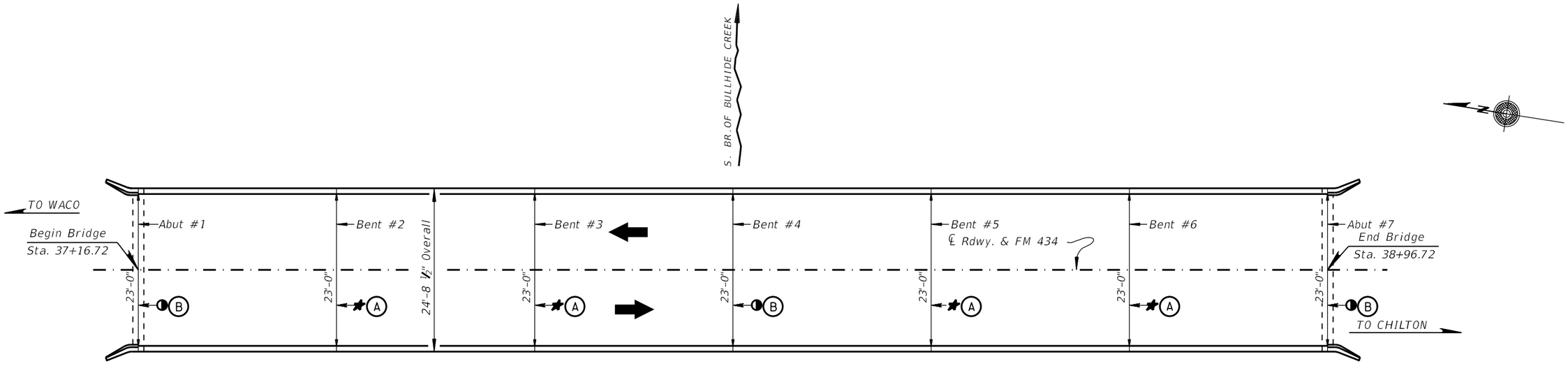
Texas Department of Transportation

RETROFIT TRAFFIC RAIL DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014) TYPE T221

FILE: BULLHIDE014RETRO.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT			
ORIG DATE: FEB. 2021	DIST	FED REG	FEDERAL AID PROJECT #				SHEET
REVISIONS	WACO	6					103
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	FALLS			1077	01	026	FM 434



LAYOUT PLAN

SOUTH BRANCH OF BULLHIDE CREEK @ FM 434

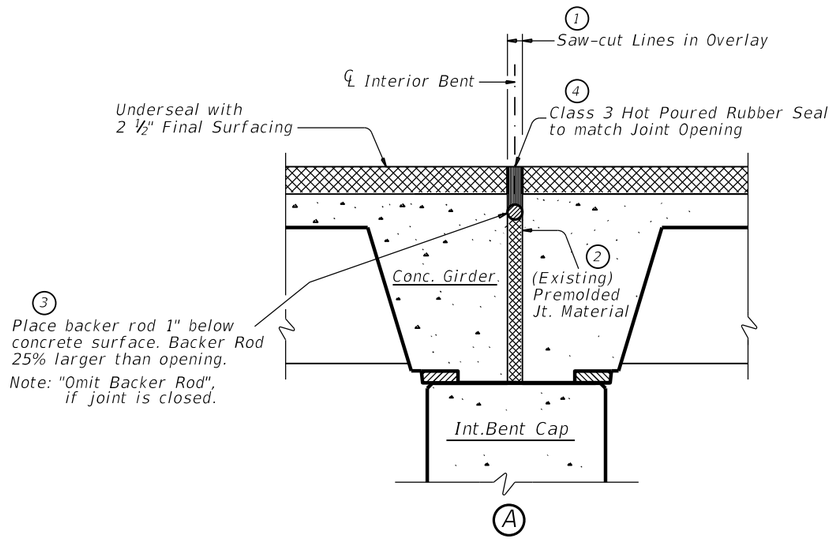
(NBI # 09-074-0-1077-01-014)

NOTE:
REMOVE APPROX. 2" OF EXISTING OVERLAY DOWN TO BRIDGE DECK.

FM 434 OVER S. BRANCH OF BULLHIDE CREEK
180'-0" OVERALL LENGTH
(6 @ 30'-0") CONCRETE
PAN GIRDER SPANS
23'-0" ROADWAY

◑ Denotes Location for Cleaning and Sealing Joints. (See Relief Joint Detail)

★ Denotes Location for Cleaning and Sealing Expansion Joints.



INTERIOR BENT LOCATION
ABUTMENT SIMILAR

EXPANSION JOINT DETAIL

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE JOINT WITH HOT POURED RUBBER SEAL:

1. Saw cut through the asphalt at the centerline of joint. Make multiple saw cuts to create a ½" minimum joint opening or match the existing joint opening. Clean joint opening of all old expansion materials/devices, bituminous materials, dirt, grease and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints."
2. Obtain approval of cleaned joint prior to proceeding with joint sealing operation.
3. Place backer rod into joint opening below top of concrete as shown. Backer rod must be of the type that can handle the heat and be compatible with the Hot Poured Rubber seal. The backer rod must be 25% larger than the joint opening.
4. Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush to the top of the asphaltic concrete pavement.

Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints."

REPAIR ANY SIGNIFICANT SPALLED OR CRACKED AREAS, AS DETERMINED BY THE ENGINEER, AROUND THE JOINT OPENING WITH TYPE II POLYMER CONCRETE IN ACCORDANCE WITH DMS-6140, "POLYMER CONCRETE FOR JOINT SYSTEMS". THIS WORK WILL BE CONSIDERED SUBSIDIARY TO ITEM 438.

(A) ESTIMATED QUANTITIES

ITEM	438-6002
LOCATION	CLEANING AND SEALING EXIST JOINTS (CL 3)
	L.F.
STR. #014 FM 434 OVER S. BRANCH OF BULLHIDE CREEK	92.0
TOTAL	92.0

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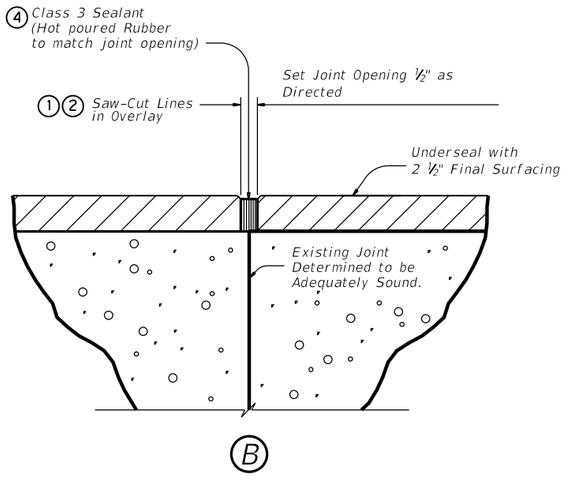
05/10/2021

LAYOUT & DETAILS FOR CLEANING AND SEALING EXPANSION JOINTS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)

FILE: SBBHCRKJTREP.DGN	DN: DOT	CK: DOT	DW: JJ	CK: DOT
ORIG DATE: FEB. 2021	DIST	FED REG	MAINTENANCE PROJECT ●	SHEET
REVISIONS	WACO	6		104
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434



Ⓑ

SECTION THRU RELIEF JOINT

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE JOINT WITH HOT POURED RUBBER SEAL:

① *Saw cut through the asphalt at the centerline of joint. Make multiple saw cuts to create a ½" minimum joint opening or match the existing joint opening. Clean joint opening of all old expansion materials/devices, bituminous materials, dirt, grease and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints."*

② *Obtain approval of cleaned joint prior to proceeding with joint sealing operation.*

③ *Place backer rod into joint opening below top of concrete as shown. Backer rod must be of the type that can handle the heat and be compatible with the Hot Poured Rubber seal. The backer rod must be 25% larger than the joint opening.*

④ *Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush to the top of the asphaltic concrete pavement.*

Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints."

Ⓑ *ESTIMATED QUANTITIES*

ITEM	438-6006
LOCATION	CLEANING AND SEALING JOINTS (CL3)
	L.F.
STR. #014 FM 434 OVER S. BRANCH OF BULLHIDE CREEK	69.0
TOTAL	69.0

GENERAL NOTES:

CLEANING EXISTING JOINT OPENING OF ALL DEBRIS, PROVIDING AND PLACING BACKER ROD, SAW-CUTTING JOINT OPENING, AND SEALING JOINT IS PAID FOR BY ITEM 438, "CLEANING AND SEALING JOINTS" AND MEASURED BY THE L.F. OF "CLEANING AND SEALING OF EXISTING JOINTS (CL 3)."

OBTAIN APPROVAL FOR ALL TOOLS, EQUIPMENT, MATERIALS AND TECHNIQUES PROPOSED FOR USE TO PREPARE THE JOINT.

PROVIDE THE CLASS 3 JOINT SEALANT IN ACCORDANCE WITH DMS-6310, "JOINT SEALANTS AND FILLERS."

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05/10/2021

Texas Department of Transportation

LAYOUT & DETAILS FOR CLEANING AND SEALING EXPANSION JOINTS

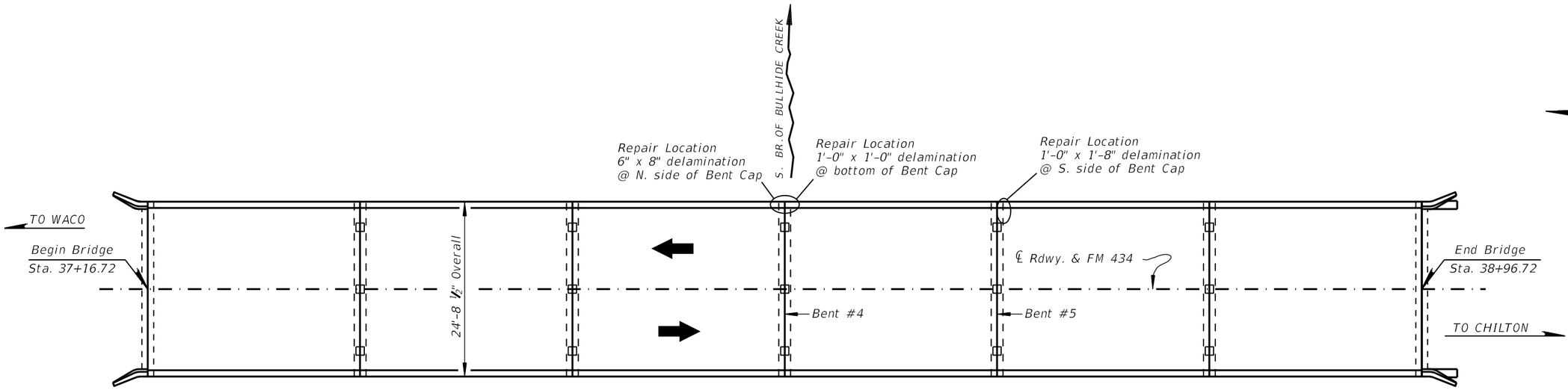
FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)

FILE: SBBHCRKJTREP.DGN	DN: DOT	CK: DOT	DW: JJ	CK: DOT
ORIG DATE: FEB. 2021	DIST	FED REG	MAINTENANCE PROJECT ●	SHEET
REVISIONS	WACO	6		105
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434

LEVELS DISPLAYED ACC:

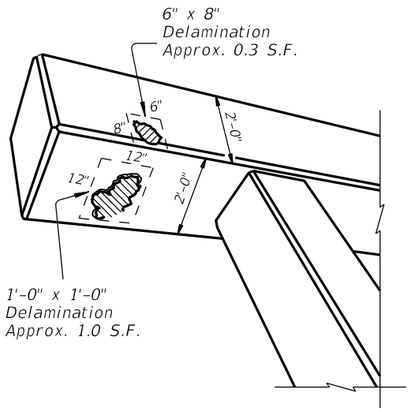
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63		



SOUTH BRANCH OF BULLHIDE CREEK @ FM 434

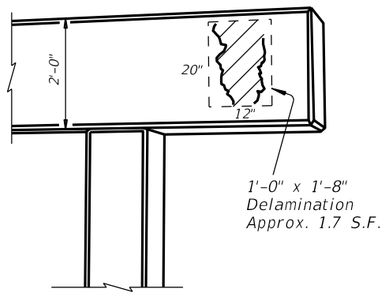
(NBI # 09-074-0-1077-01-014)

ITEM	429-6007
LOCATION	CONC. STR REPAIR (VERTICAL & OVERHEAD)
	S.F.
BENT CAP #4 BOTTOM	1.0
BENT CAP #4 NORTH SIDE	0.3
BENT CAP #5 SOUTH SIDE	1.7
TOTAL	3.0



ELEVATION AT INTERIOR BENT #4

(SHOWING LIMITS OF DELAMINATION)



ELEVATION AT INTERIOR BENT #5

(SHOWING LIMITS OF DELAMINATION)

GENERAL NOTES:

Provide materials as outlined in the Concrete Repair Manual.

Obtain approval for all tools , equipment, materials and techniques proposed for use to repair spalled Interior Bent Cap.

All materials and labor required for repairing delaminated/spalled Interior Bent Caps shall be included in the price bid per SF for Item: CONC STR REPAIR (VERTICAL & OVERHEAD)

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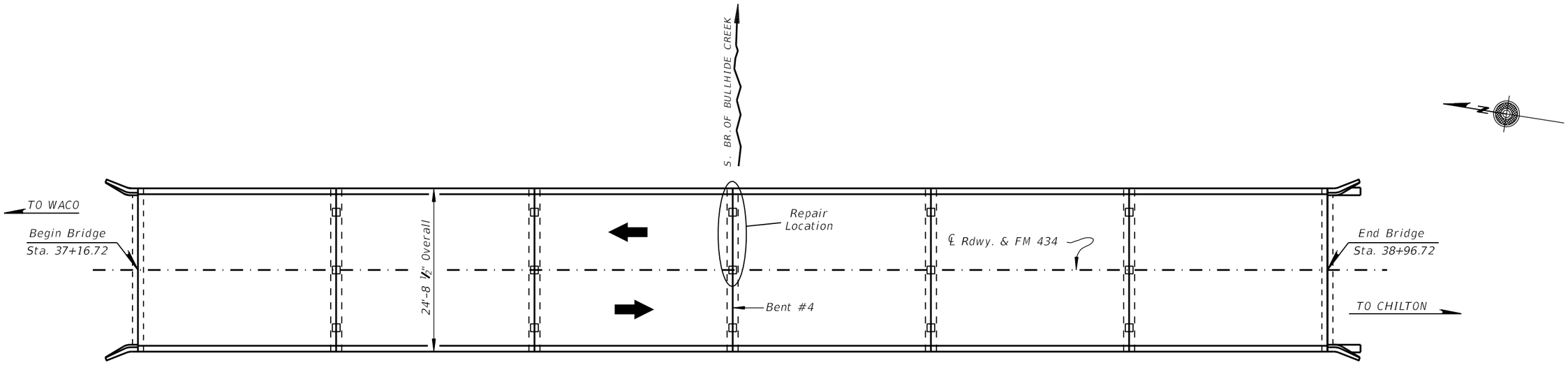
INTERIOR BENT CAP REPAIR DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)

FILE: BULLHIDEENC.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: MAR. 2021	DIST	FED REG	FEDERAL AID PROJECT	SHEET
REVISIONS	WACO	6		106
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434

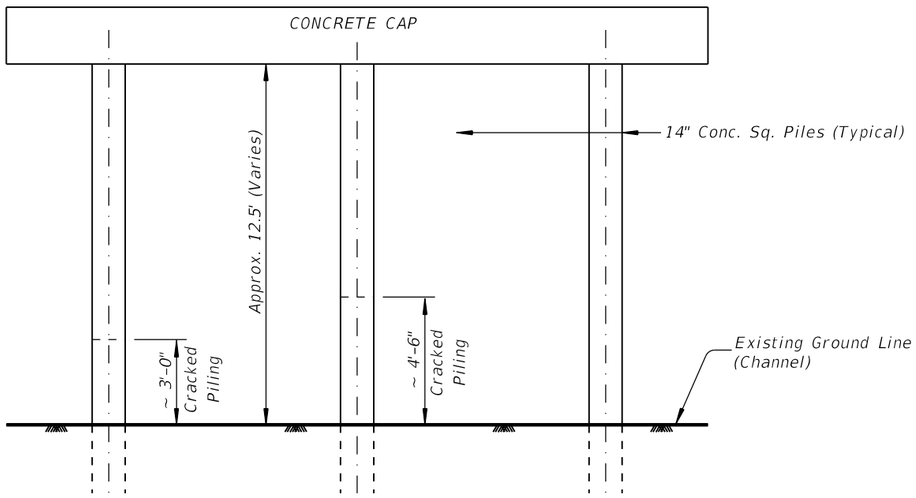
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 43 73 83 94 104 114 124 134 144 154 164 174 184
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
ACC:



SOUTH BRANCH OF BULLHIDE CREEK @ FM 434

(NBI # 09-074-0-1077-01-014)

FM 434 OVER SOUTH BRANCH OF BULLHIDE CREEK
180'-0" OVERALL LENGTH
(6 @ 30'-0") CONCRETE SLAB AND GIRDER SPANS
APPROX. 23' ROADWAY NORMAL



ELEVATION
(SHOWING 3 CONCRETE PILE BENT)
(LOOKING SOUTH)

GENERAL NOTES:

VERIFY DIMENSIONS FOR CONCRETE PILING REPAIR AND GROUND ELEVATIONS. ENCASEMENT LENGTH MAY BE ADJUSTED BY THE ENGINEER BASED ON ACTUAL CHANNEL AND GROUND LINE ELEVATIONS.

EXISTING CONDITIONS MAY BE UNDER WATER. CONTRACTOR WILL BE RESPONSIBLE FOR DEWATERING. PAYMENT FOR DEWATERING WILL BE INCLUDED IN THE PRICE BID FOR ITEM 420 CONCRETE SUBSTRUCTURE. IF THE CONTRACTOR CAN SUBMIT A PLAN AND ADEQUATELY DEMONSTRATE THE ABILITY TO PERFORM THE REPAIRS TO THE ENGINEER FOR APPROVAL, DEWATERING MAY NOT BE NECESSARY.

OBTAIN APPROVAL FOR THE MIX DESIGN AND THE CONSTRUCTION PROCEDURES BEFORE THE BEGINNING OF THE WORK.

IF UNDERWATER PLACEMENT IS APPROVED, CONCRETE MIX SHOULD BE DESIGNED FOR UNDERWATER PLACEMENT AND MAY REQUIRE THE USE OF ANTI-WASHOUT ADMIXTURES.

PROVIDE CLASS C CONCRETE FOR ENCASEMENT WITH A STRENGTH OF 3,000 PSI IN 24 HOURS AND COARSE AGGREGATE GRADES NOT GREATER THAN NO. 5 (¾"). PROVIDE A CONCRETE MIX WITH 2 GALLONS OF CORROSION INHIBITOR PER CY.

PREPARE EXISTING CONCRETE PILING (ALL AROUND) WITH A ROUGHEN SURFACE BEFORE PLACING CONCRETE ENCASEMENT. DO NOT DAMAGE EXISTING REINFORCING STEEL AND DO NOT REMOVE CONCRETE BEHIND EXISTING CONCRETE PILING REINFORCING STEEL.

ALL STEEL REINFORCING IS TO BE GRADE 60.

ALL MATERIALS AND LABOR REQUIRED FOR CONSTRUCTING PILE ENCASEMENTS SHALL BE INCLUDED IN THE PRICE BID PER CY FOR CL "C" CONC (PILE ENCASEMENT).

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

05/10/2021

PILE ENCASEMENT DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)

FILE: BULLHIDEENC.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: MAR. 2021	DIST	FED REG	FEDERAL AID PROJECT •	SHEET
REVISIONS	WACO	6		107
	COUNTY		CONTROL SECT JOB	HIGHWAY
	FALLS		1077 01 026	FM 434

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
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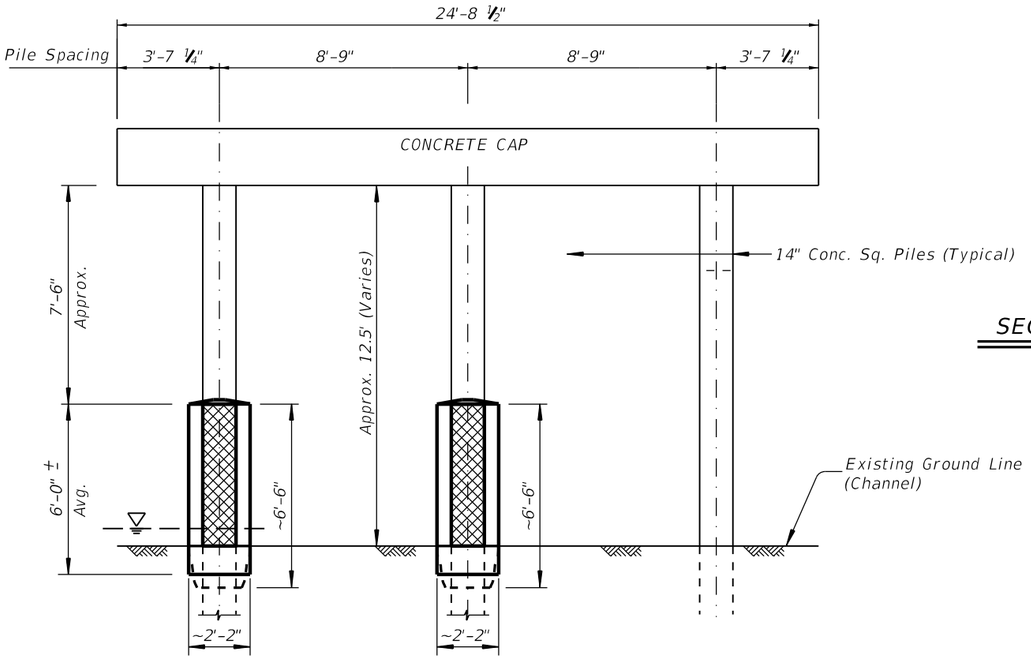
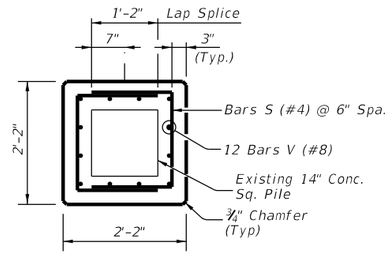
ACC:

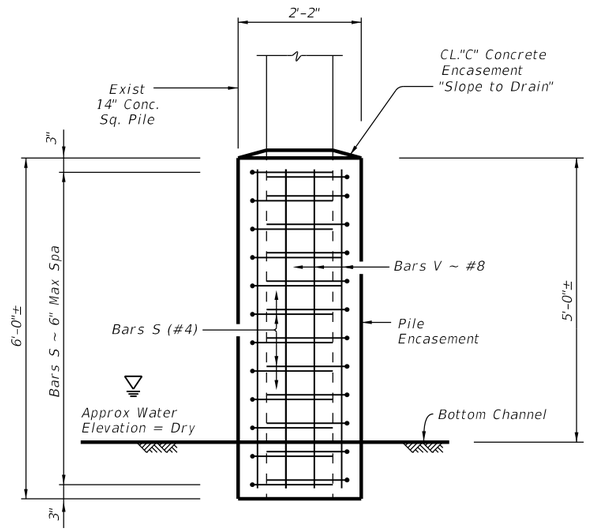


ELEVATION – BENT #4
(SHOWING 3 CONC. PILE BENT)



SQUARE ENCASEMENT

SECTION SHOWING REINFORCING AND CONCRETE ENCASEMENT



ELEVATION

PILE ENCASEMENT DETAILS

CONCRETE PILE ENCASEMENT PROCEDURE:

1) Verify channel line elevations and report to the Engineer for possible adjustments.
2) Submit a concrete mix design and procedures for casting the encasements for approval.
3) Clean mud, dirt on the Concrete Pilings with hand tools and high pressure water.
4) Place and secure the steel reinforcement and install formwork.
5) Place the concrete in the encasement per approved procedures and in accordance with Item 420.
6) Leave forms in-place for at least 48 hours and until the concrete reaches a compressive strength of 3000 psi.

ESTIMATED QUANTITIES FOR REINF.

(FOR ONE PILE ENCASEMENT)

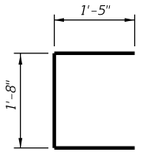
	Bar	No.	Size	Length	Weight
	S	24	#4	4'-6"	72
	V	12	#8	5'-8"	182
*	Reinforcing Steel			Lb	254

* For Contractors Information Only

TABLE OF ESTIMATED QUANTITIES
(TOTAL FOR BENT #4)

ITEM	DESCRIPTION	UNIT	QUANTITY
0420-6070	CL C CONC (PILE ENCASEMENT)	CY	1.5 (1)

(1) Quantity is based on 0.74 CY per pile encasement (2 pile encasements per Bent #4).



BAR S (#4)

STATE OF TEXAS
PAUL F. CEPAK
85408
LICENSED
PROFESSIONAL ENGINEER

Paul F. Cepak, P.E.

05/10/2021

SHEET 2 OF 2 SHEETS

Texas Department of Transportation
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PILE ENCASEMENT DETAILS

FM 434 @ S. BRANCH OF BULLHIDE CREEK

(STR.#014)

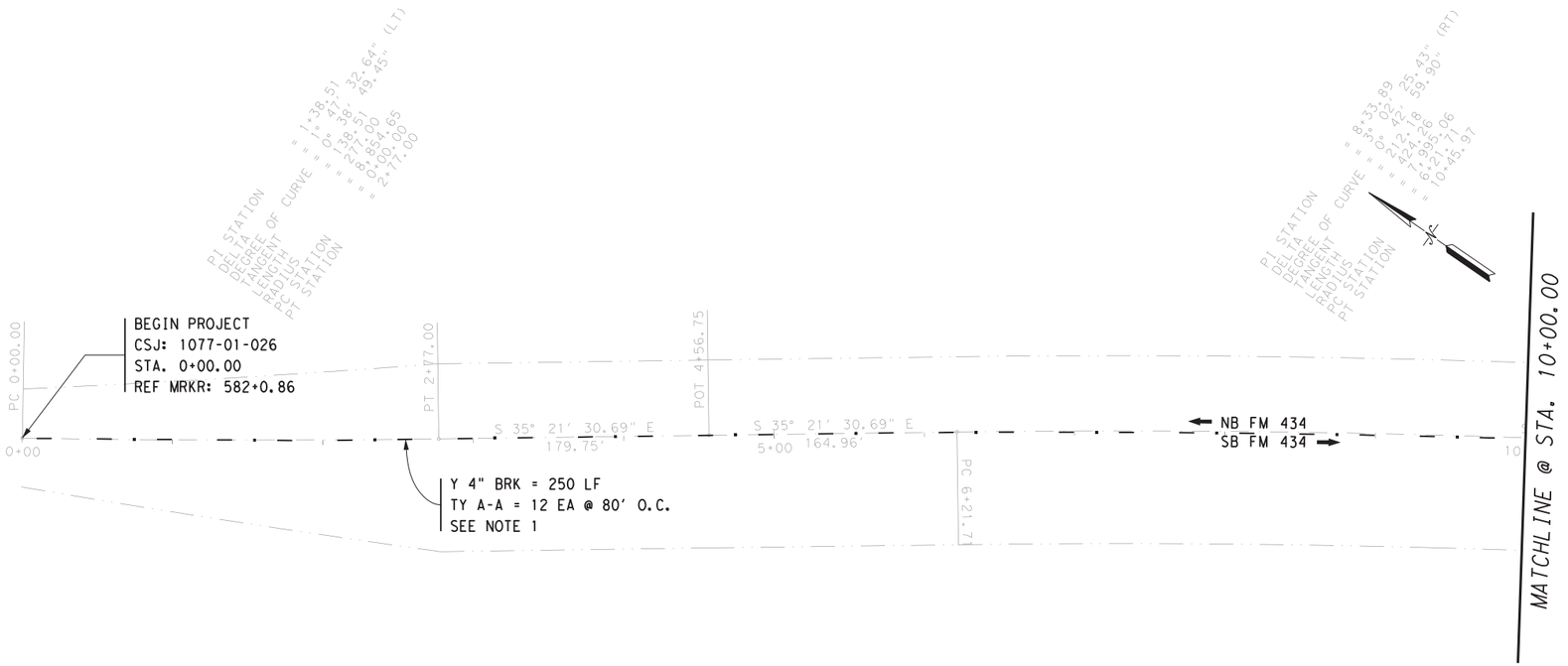
FILE: BULLHIDEENC.DGN	DN: DOT	CK: DOT	DW: GNH	CK: DOT
ORIG DATE: MAR. 2021	DIST	FED REG	FEDERAL AID PROJECT	SHEET
REVISIONS	WACO	6		108
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	FALLS	1077	01	026	FM 434

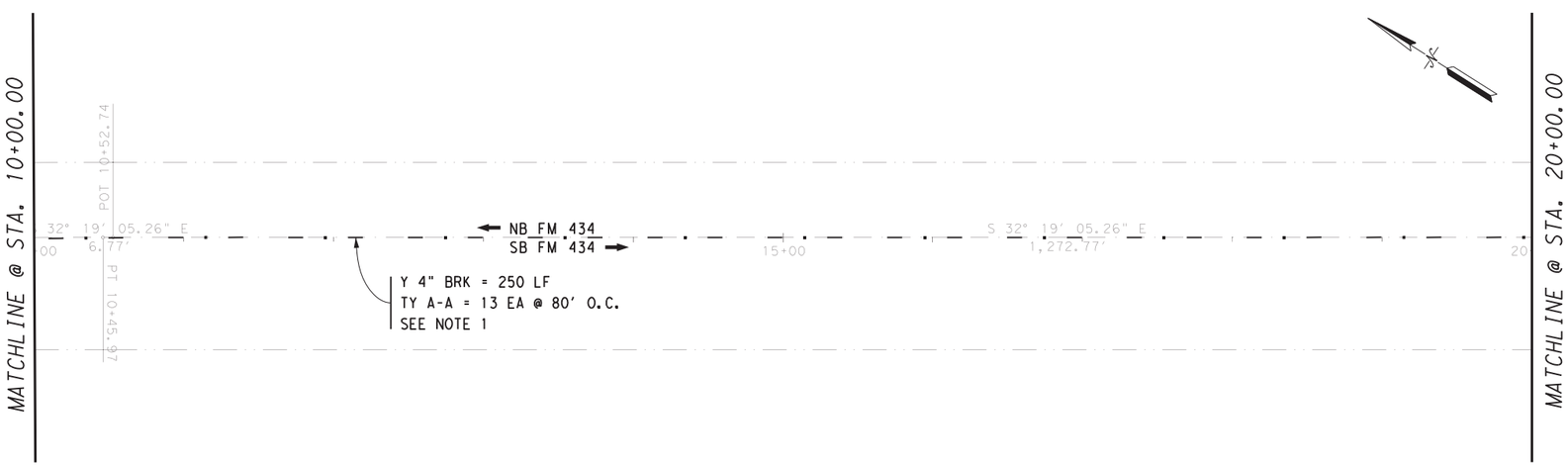
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC:

NOTES:

1. MATCH EXISTING STRIPE UNLESS OTHERWISE DIRECTED.





ITEM	DESCRIPTION	UNIT
666 6312	RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
672 6009	REFL PAV MRKR TY II-A-A	25 EA

STATE OF TEXAS
CHI-CHUNG CHAU
88459
LICENSED
PROFESSIONAL ENGINEER

May 19, 2021

SIGNATURE OF REGISTRANT & DATE

PAV MRKR & SIGN LAYOUT

FROM STA 0+00.00 TO STA 20+00.00

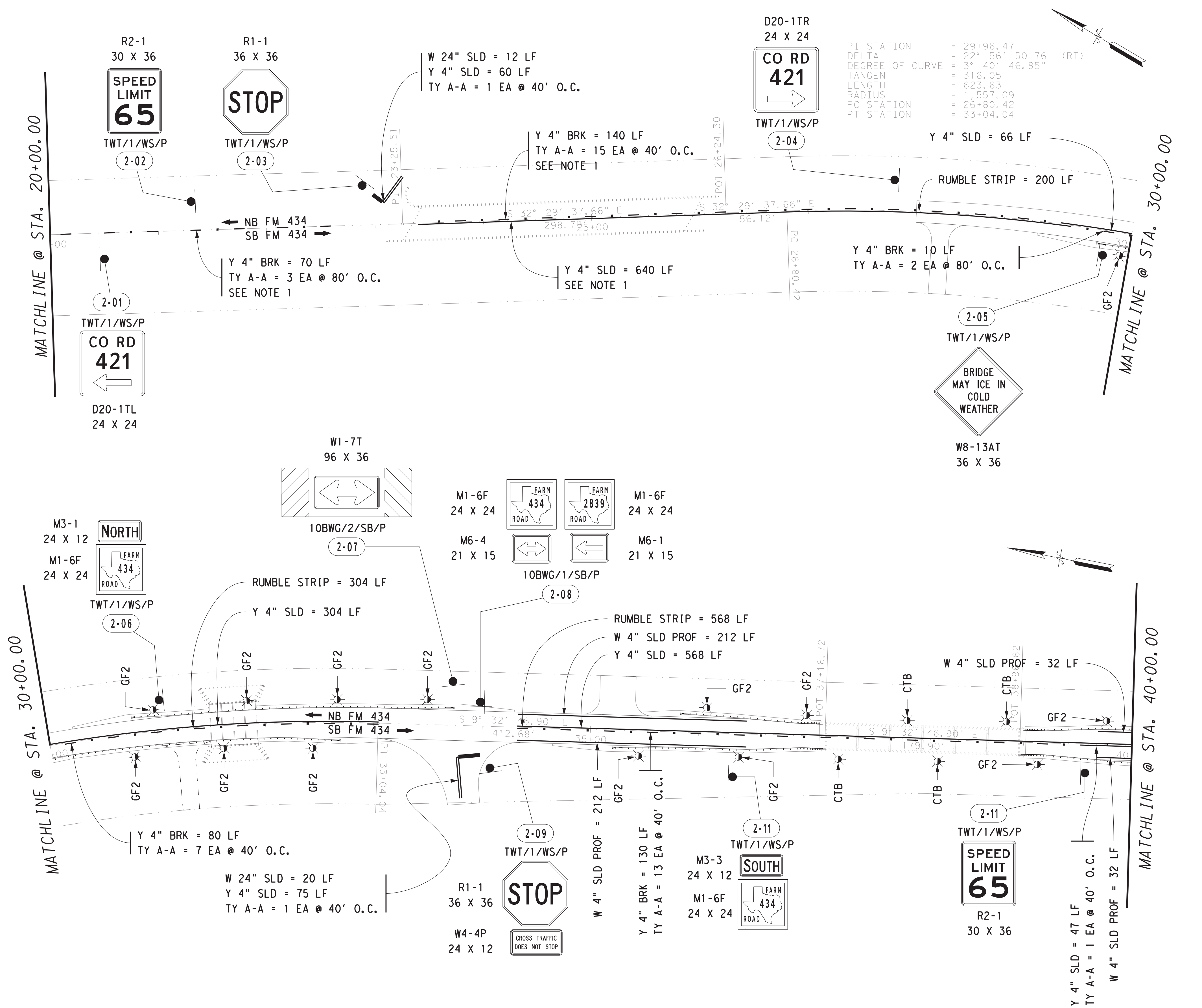
SCALE: 1" = 100' HORIZ. FEET

SHEET 1 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		109

NOTES:

1. MATCH EXISTING STRIPE UNLESS OTHERWISE DIRECTED.



ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1072 LF
644 6009	IN SM RD SN SUP&AM TY 10BWG(1)SB(P)	1 EA
644 6020	IN SM RD SN SUP&AM TY 10BWG(2)SB(P)	1 EA
644 6060	IN SM RD SN SUP&AM TY TWT(1)WS(P)	9 EA
658 6014	INSTL DEL ASSM (D-SY)SZ(BRF)CTB(BI)	4 EA
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	13 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	32 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	760 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	430 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	1625 LF
672 6009	REFL PAV MRKR TY II-A-A	43 EA

STATE OF TEXAS
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PAV MRKR & SIGN LAYOUT

20+00.00 TO STA 40+00.00

SCALE: FEET
1" = 100' HORIZ.

SHEET 2 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST		COUNTY	SHEET NO.
	TEXAS	WACO		FALLS	110

5/14/2021 2:41:19 PM

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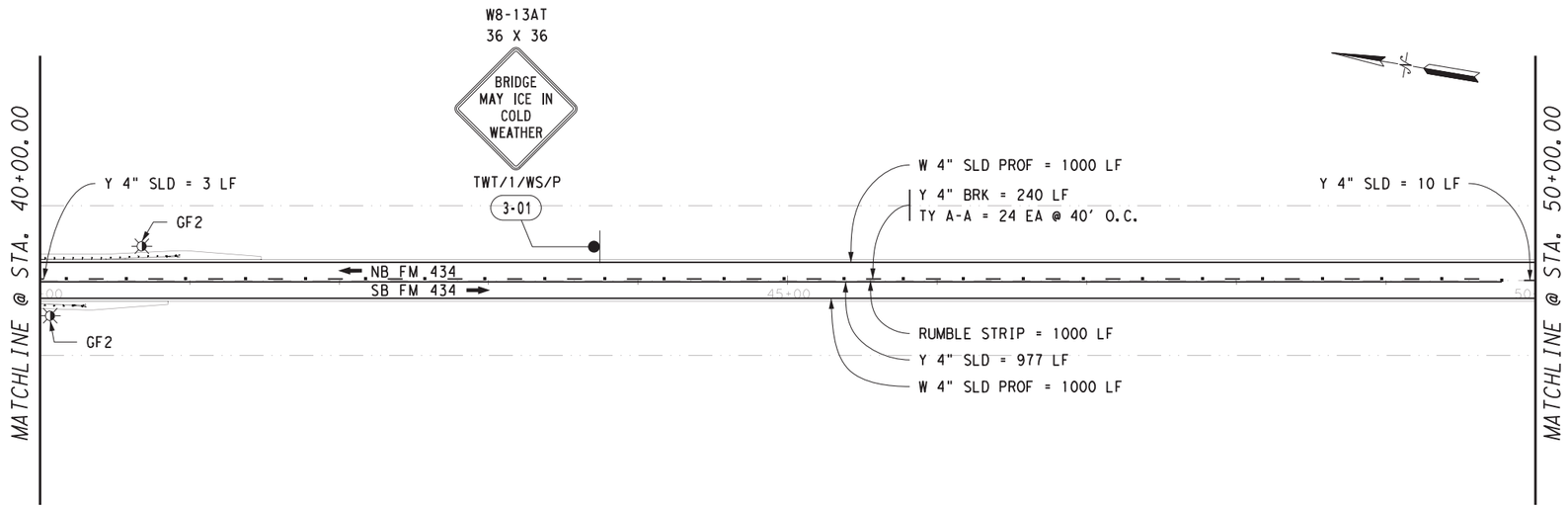
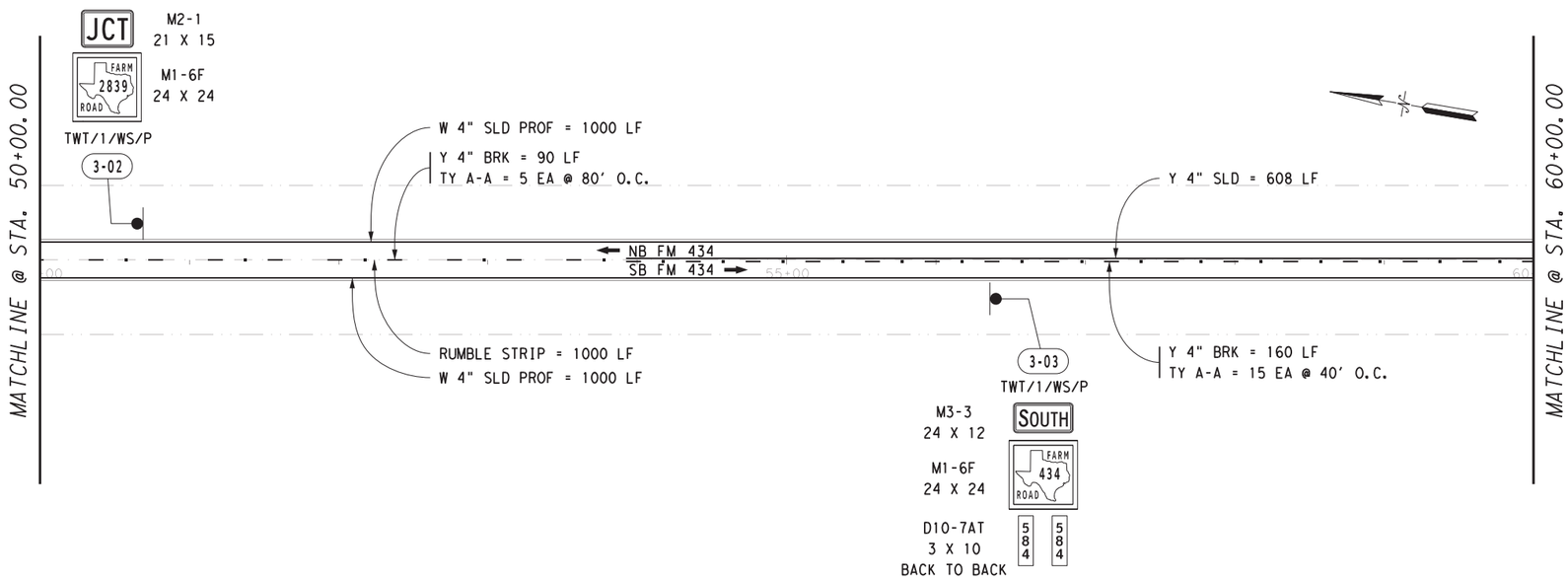
NODE

NOTES:





ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2000 LF
644 6060	IN SM RD SN SUP&AM TY TWT(1)WS(P)	3 EA
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	2 EA
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	4000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	1585 LF
672 6009	REFL PAV MRKR TY II-A-A	44 EA

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STA 40+00.0 TO STA 60+00.00

SCALE: FEET
1" = 100' HORIZ.

SHEET 3 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		III

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5/14/2021

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NODE

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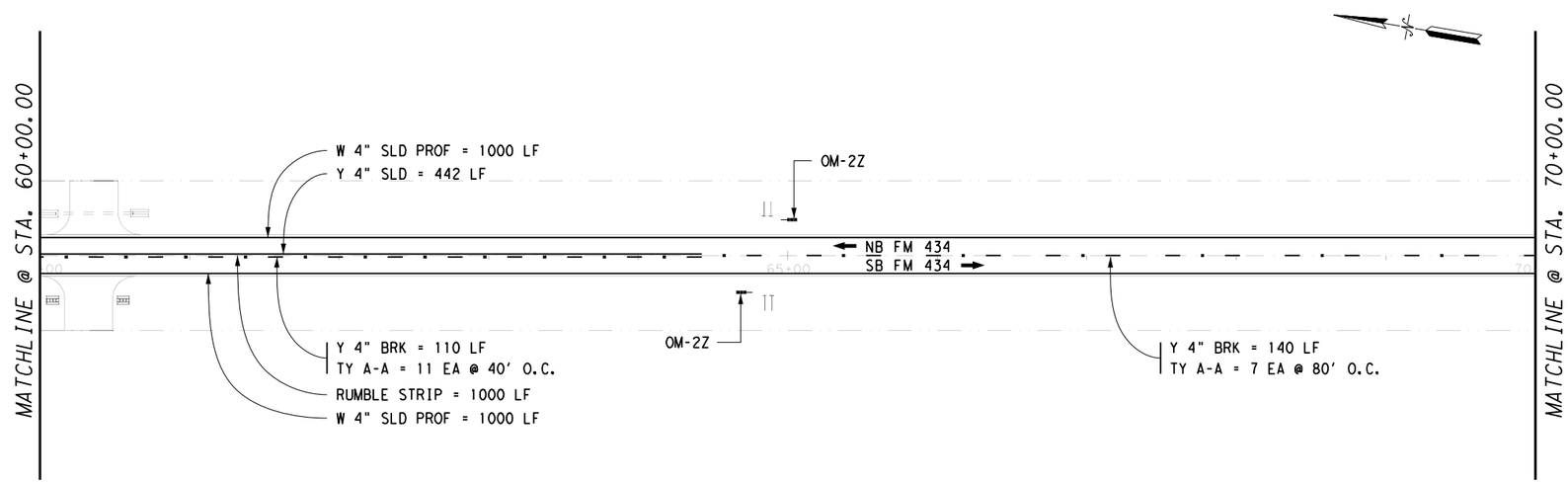

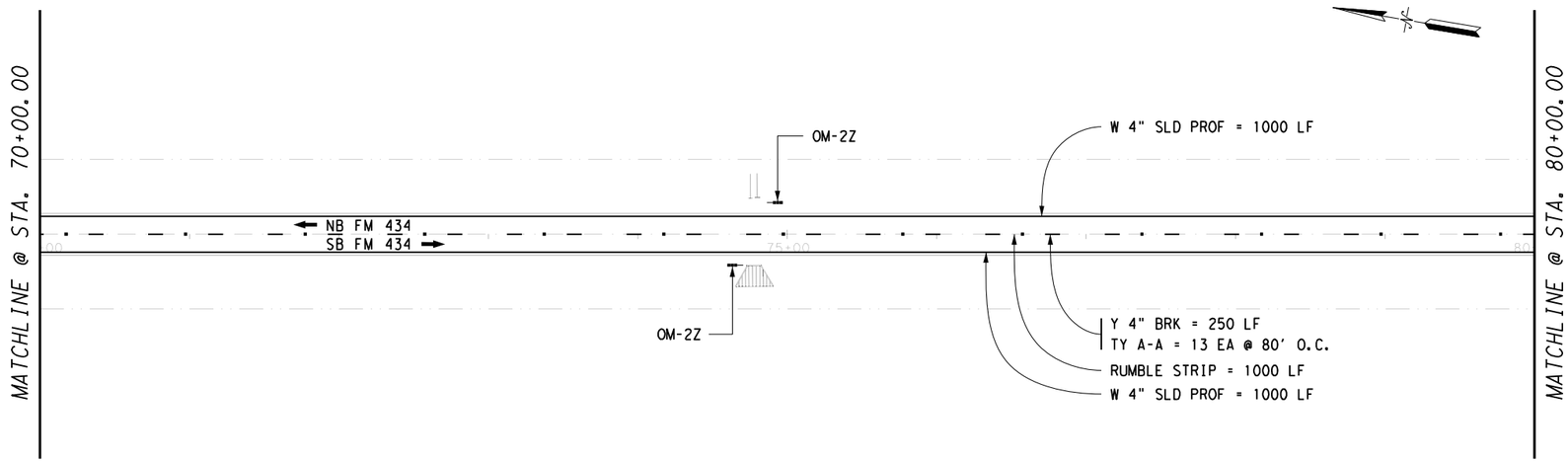

ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2000 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	4000 LF
658 6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	4 EA
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	442 LF
672 6009	REFL PAV MRKR TY II-A-A	31 EA

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STA 60+00.00 TO STA 80+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 4 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		112

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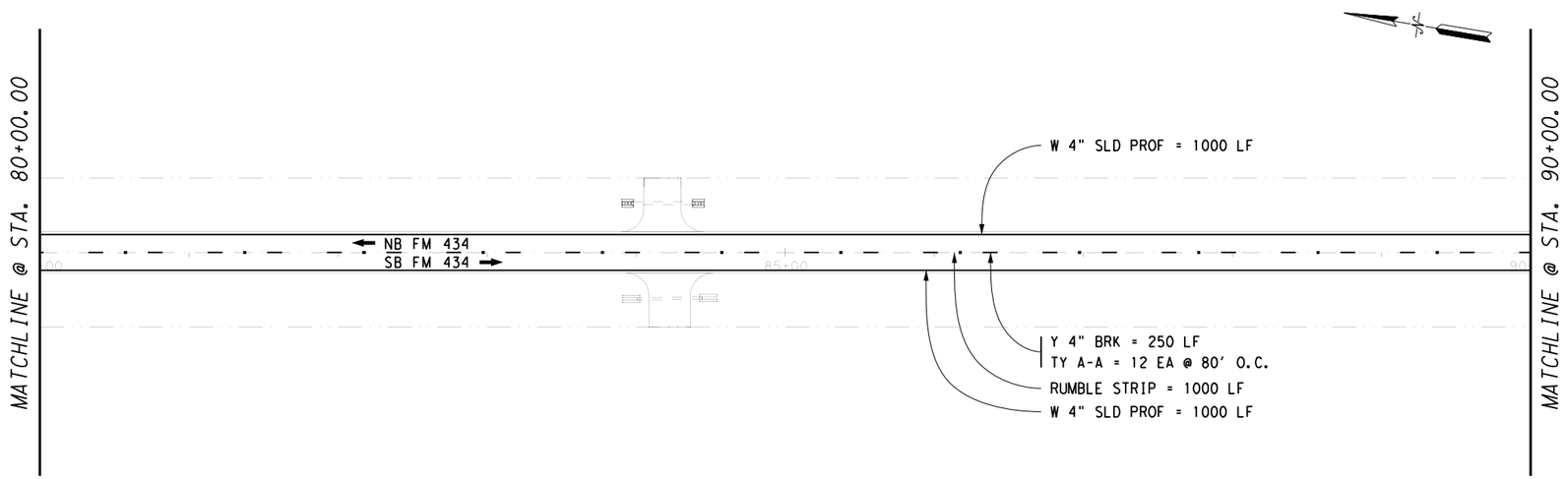
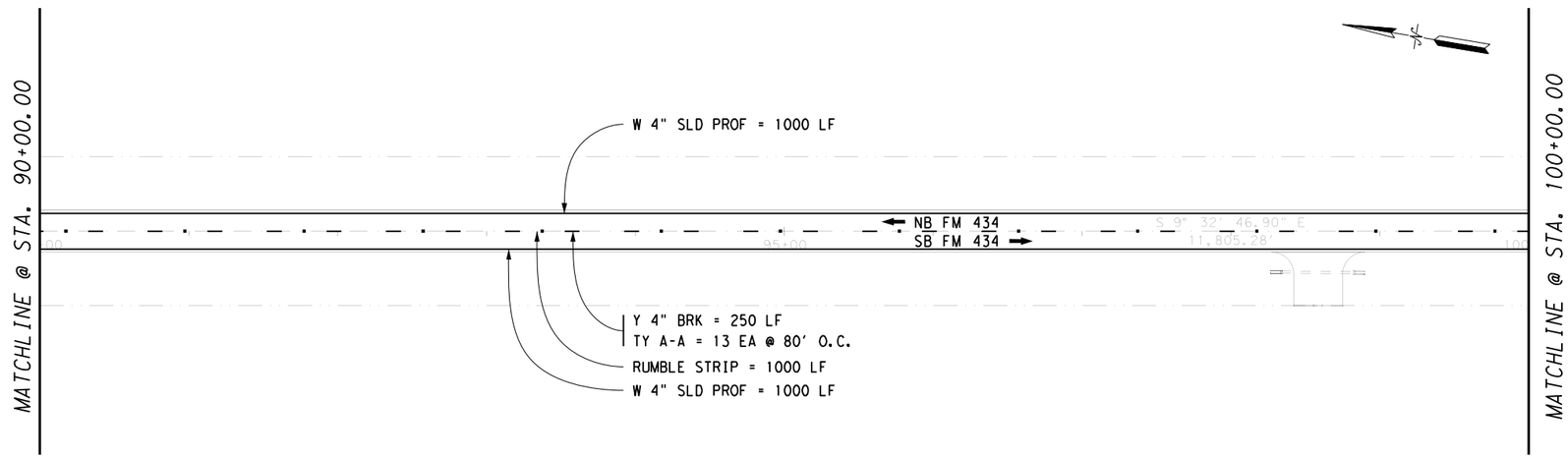
NODE

NOTES:





ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2000 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	4000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
672 6009	REFL PAV MRKR TY II-A-A	25 EA

STATE OF TEXAS
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STA 80+00.00 TO STA 100+00.00

SCALE: FEET
1" = 100' HORIZ.

SHEET 5 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		113

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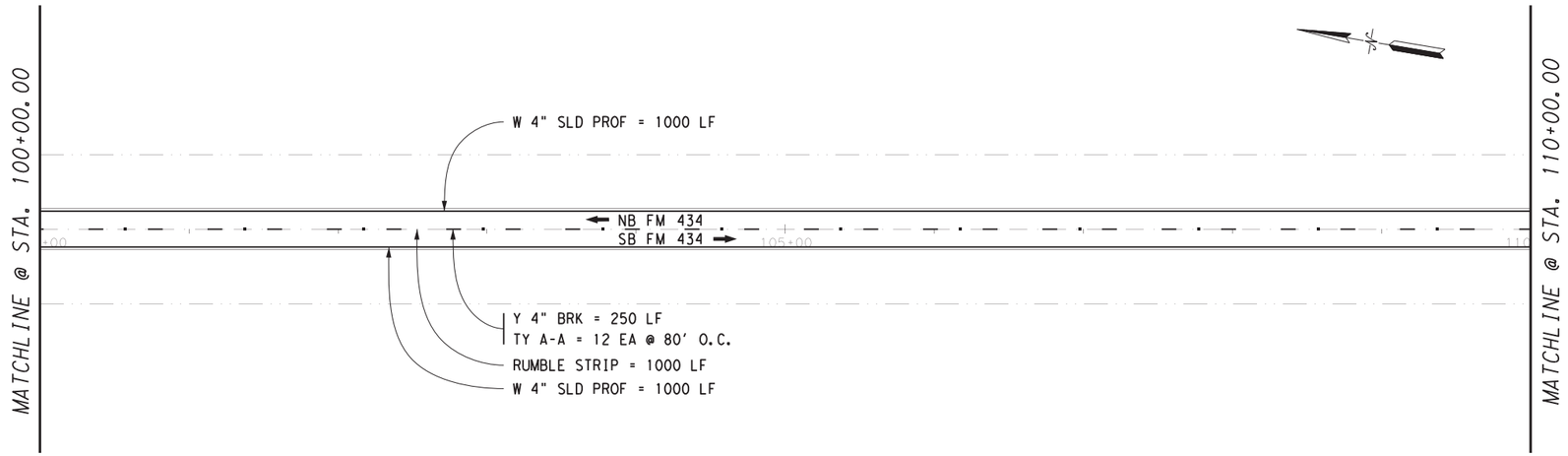
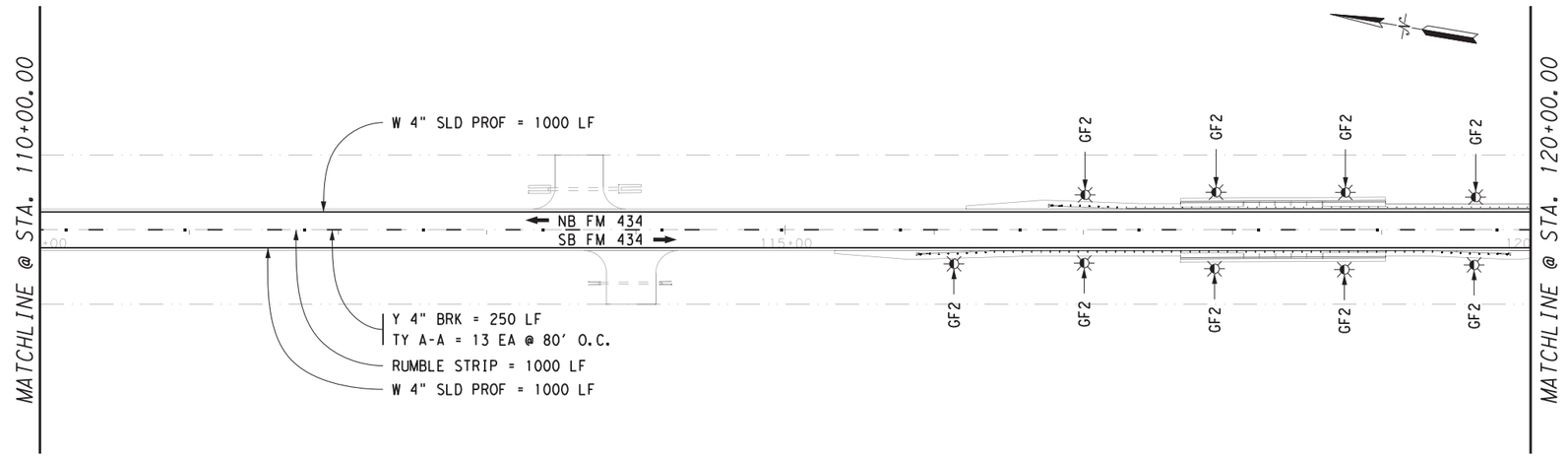
NODE

NOTES:





ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2000 LF
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	9 EA
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	4000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	500 LF
672 6009	REFL PAV MRKR TY II-A-A	25 EA

STATE OF TEXAS
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CC PE — May 19, 2021

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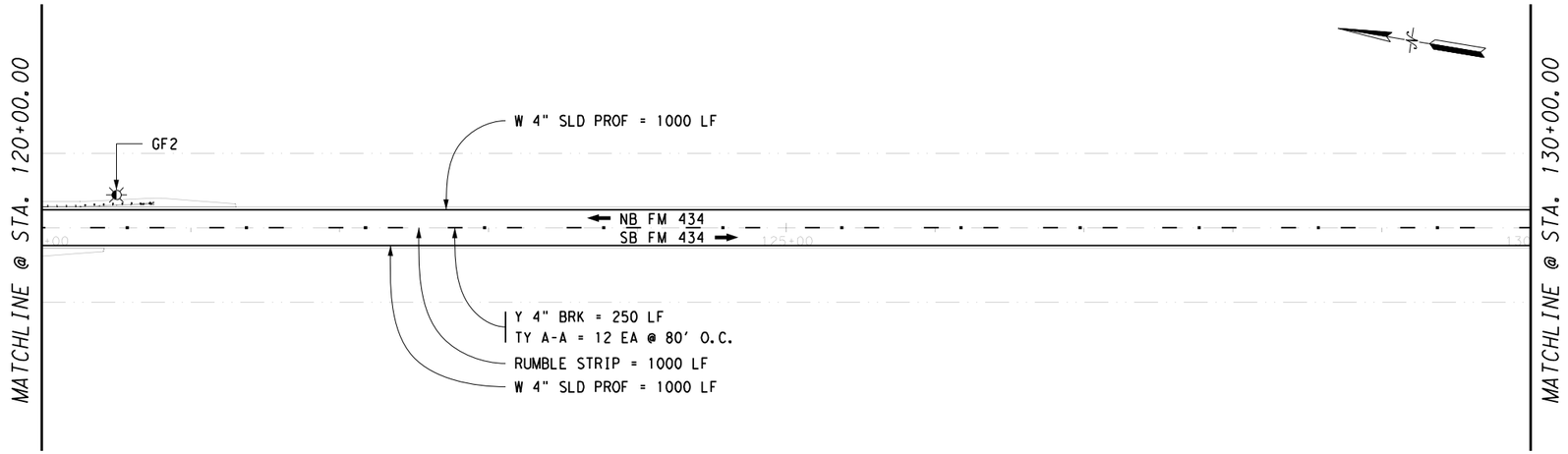
PAV MRKR & SIGN LAYOUT

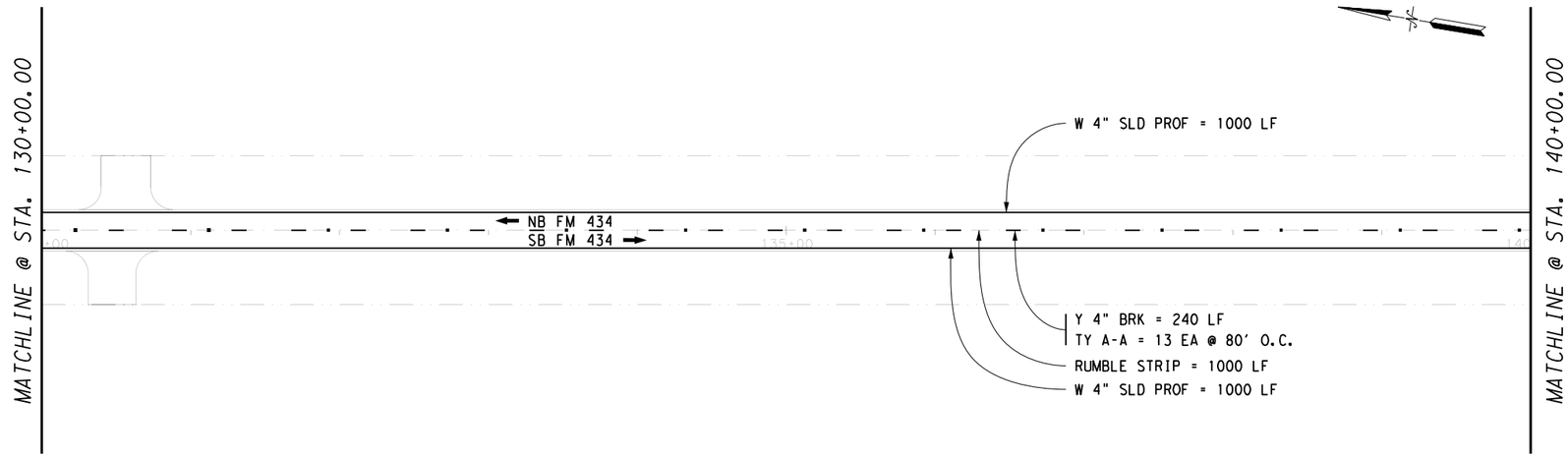
STA 100+00.00 TO STA 120+00.00

SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		114

NOTES:





ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	2000 LF
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	1 EA
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	4000 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	490 LF
672 6009	REFL PAV MRKR TY II-A-A	25 EA

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PE May 19, 2021

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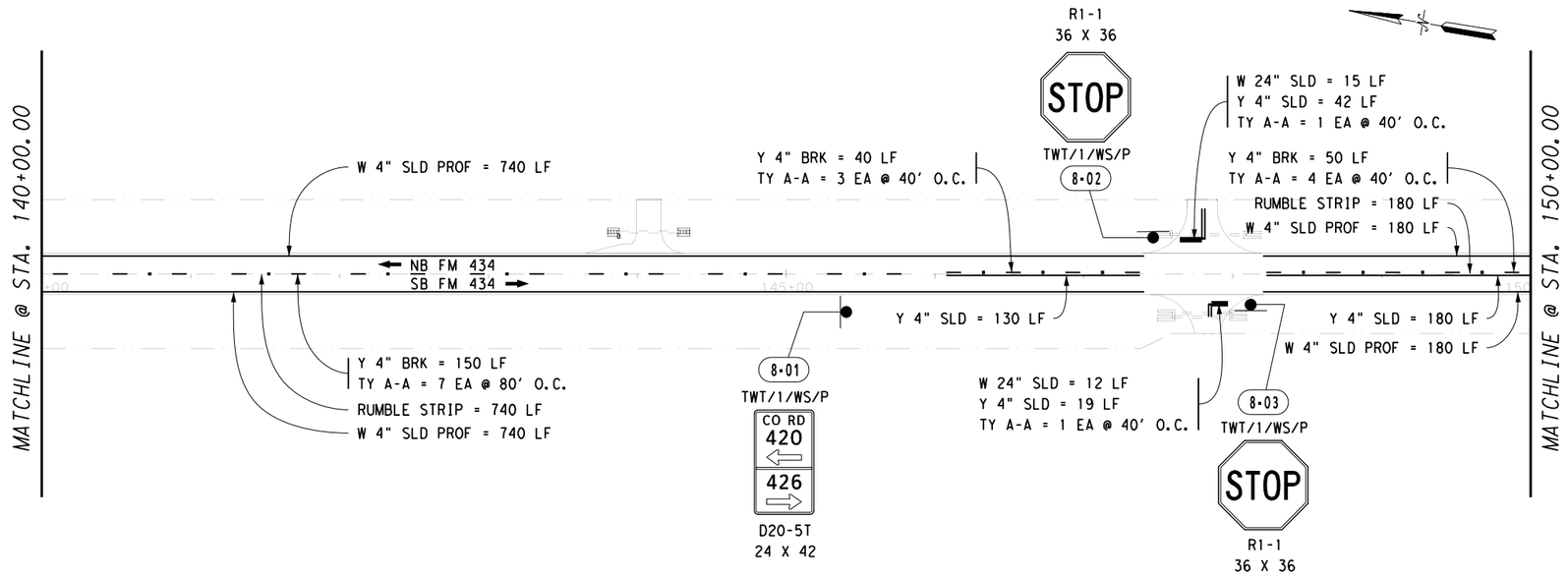
PAV MRKR & SIGN LAYOUT

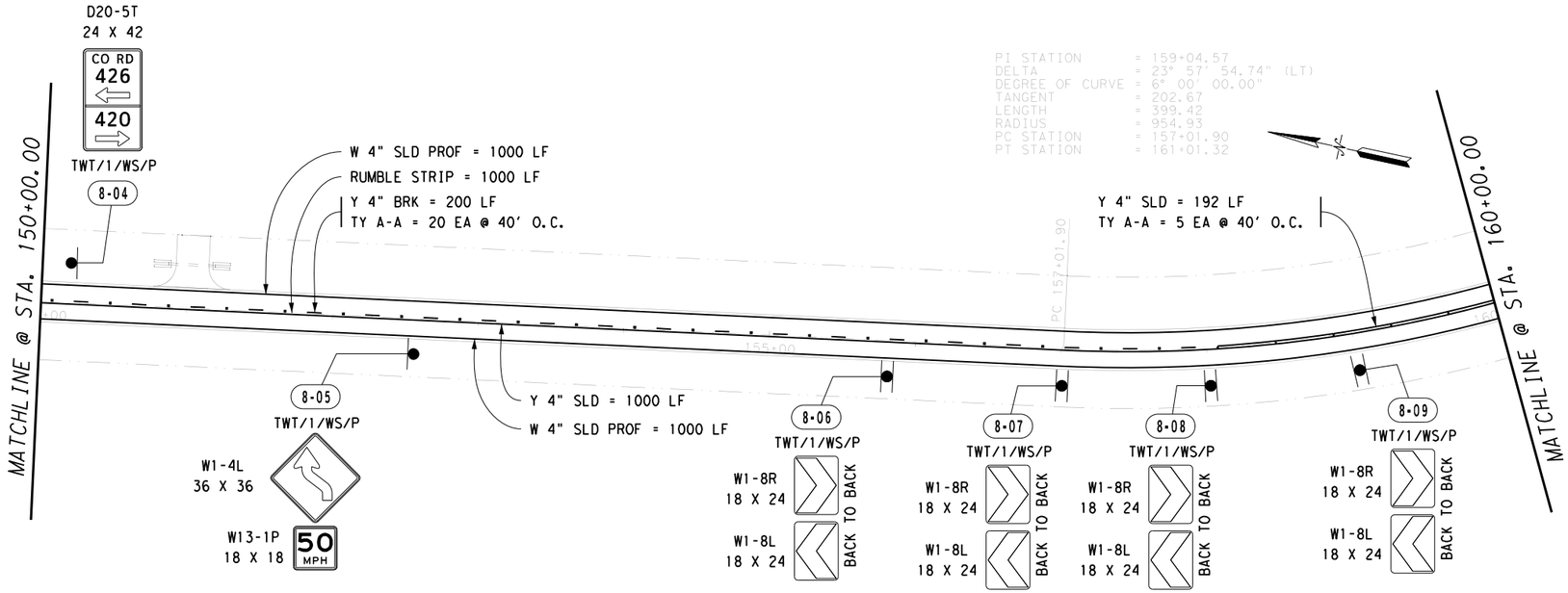
STA 120+00.00 TO STA 140+00.00

SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		115

NOTES:





ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1920 LF
644 6060	IN SM RD SN SUP&AM TY TWT(1)WS(P)	9 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	27 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	3840 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	440 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	1563 LF
672 6009	REFL PAV MRKR TY II-A-A	38 EA

STATE OF TEXAS
CHI-CHUNG CHAU
88459
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May 19, 2021

SIGNATURE OF REGISTRANT & DATE

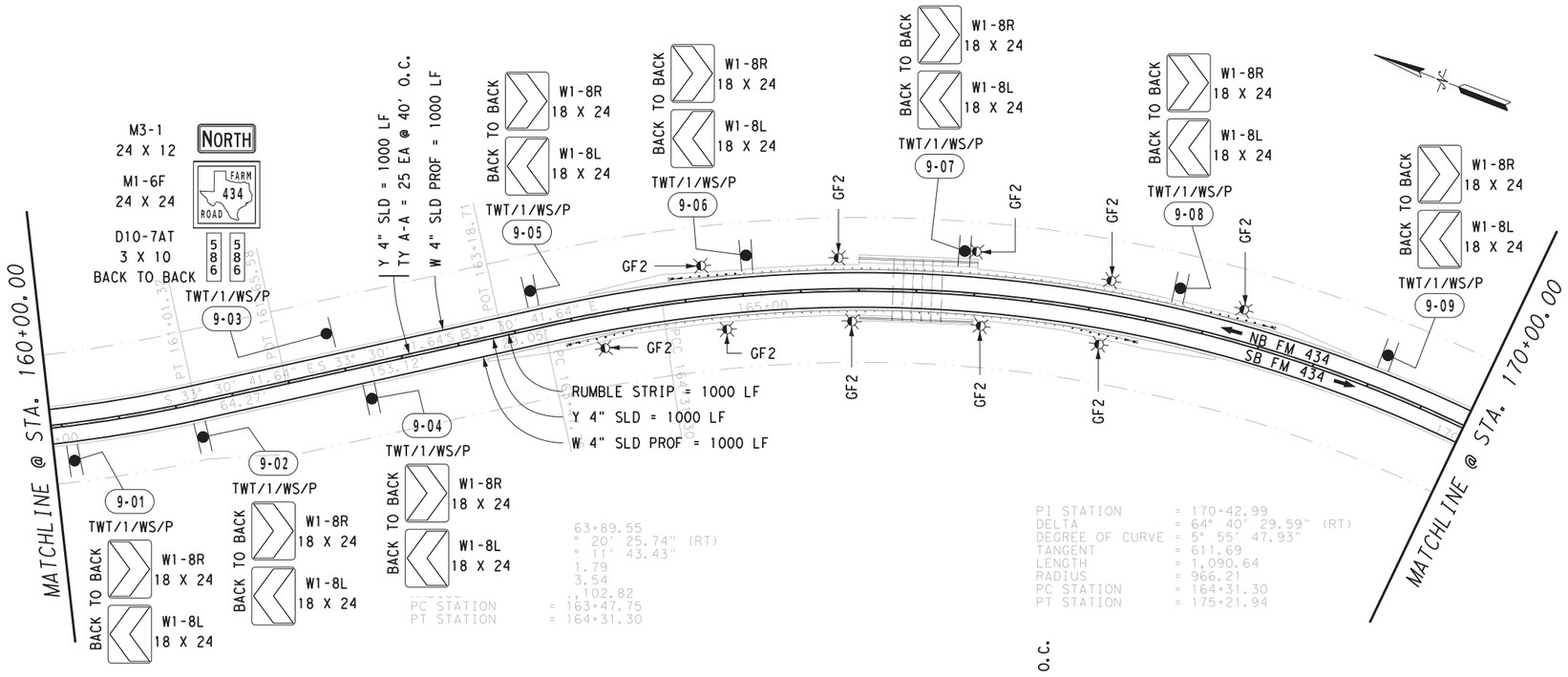
PAV MRKR & SIGN LAYOUT

STA 140+00.00 TO STA 160+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 8 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		116



NOTES:

ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1880 LF
644 6060	IN SM RD SN SUP&AM TY TWT(1)WS(P)	19 EA
658 6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	10 EA
658 6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	4 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	12 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	3880 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	100 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	3488 LF
672 6009	REFL PAV MRKR TY II-A-A	49 EA

STATE OF TEXAS
CHI-CHUNG CHAU
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May 19, 2021

SIGNATURE OF REGISTRANT & DATE

PAV MRKR & SIGN LAYOUT

STA 160+00.00 TO STA 180+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 9 OF 10

CHANGE ORDER	FED.RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		117

5/14/2021 2:41:32 PM

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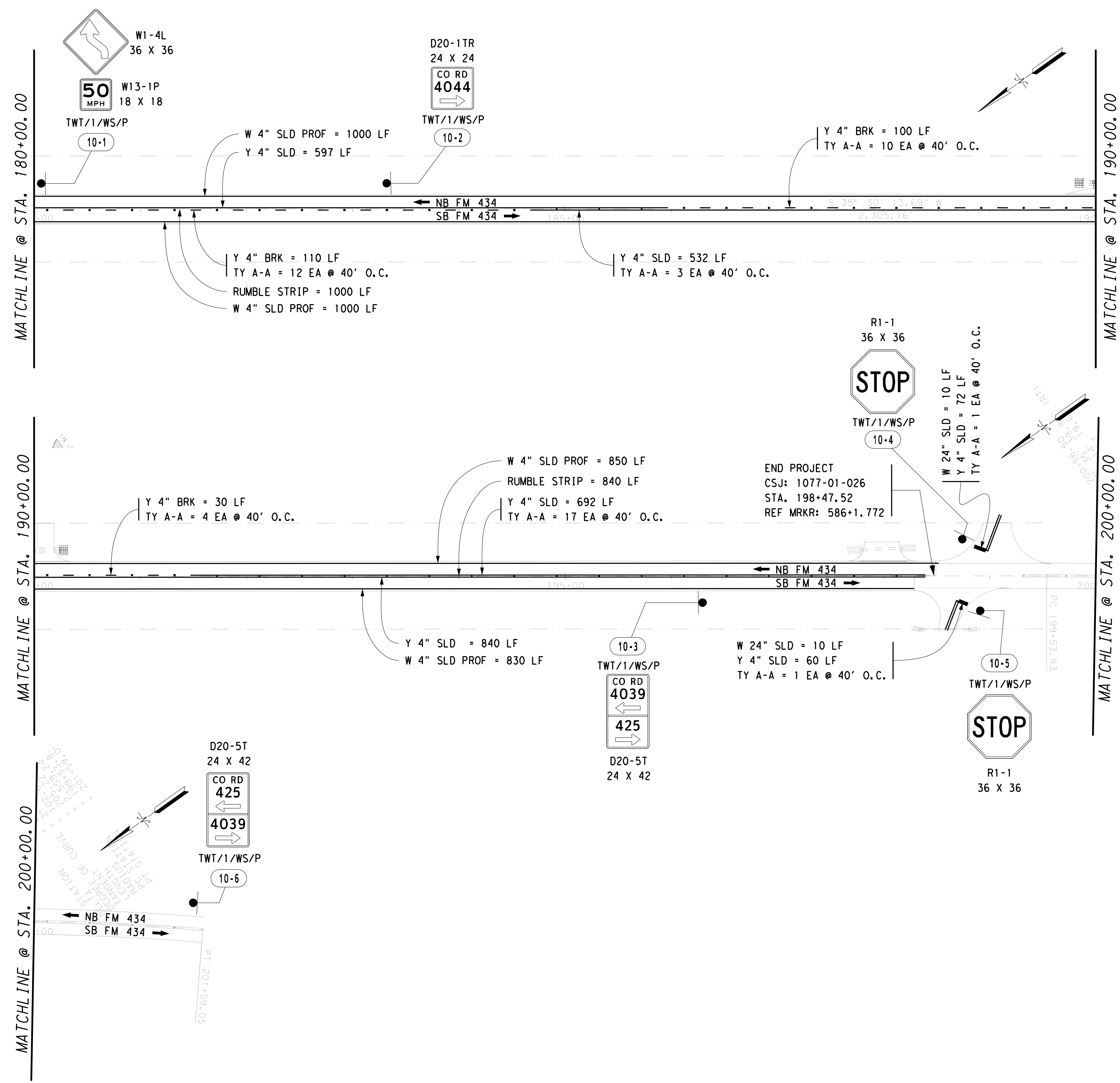
NODE



NOTES:

ITEM	DESCRIPTION	UNIT
533 6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	1840 LF
644 6060	IN SM RD SN SUP&AM TY TWT(1)WS(P)	6 EA
666 6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	20 LF
666 6303	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	3680 LF
666 6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	240 LF
666 6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	2793 LF
672 6009	REFL PAV MRKR TY II-A-A	48 EA

STATE OF TEXAS
CHI-CHUNG CHAU
88459
LICENSED PROFESSIONAL ENGINEER

May 19, 2021

SIGNATURE OF REGISTRANT & DATE

PAV MRKR & SIGN LAYOUT

STA 180+00.00 TO STA 200+00.00

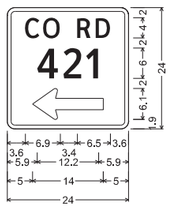
SCALE: FEET
1" = 100' HORIZ.

SHEET 10 OF 10

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST		COUNTY	SHEET NO.
	TEXAS	WACO		FALLS	118

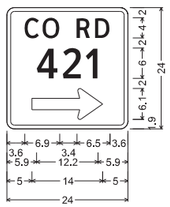
2:41:35 PM
5/14/2021
...\PVMRK SGN LAYOUT.dgn
NODE

2-01



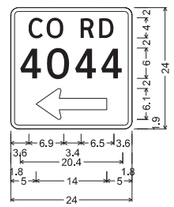
D20-1TL_24x24;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"421", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';

2-04



D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"421", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

9-12



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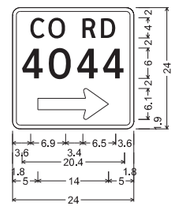
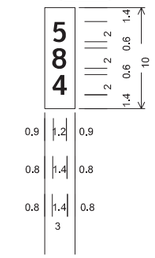
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"4044", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';

10-02



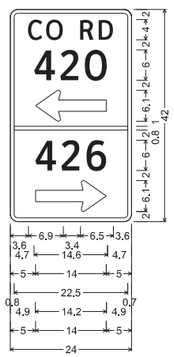
D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"4044", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

3-03



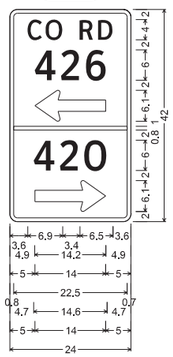
D10-7aT 3in; = 2 EA
No border, White on, Green;
"5", ClearviewHwy-4-W;
"8", ClearviewHwy-4-W;
"4", ClearviewHwy-4-W;

8-01



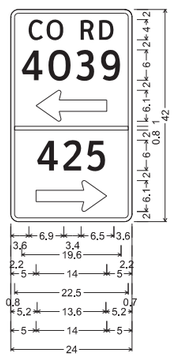
D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"420", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"426", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

8-04



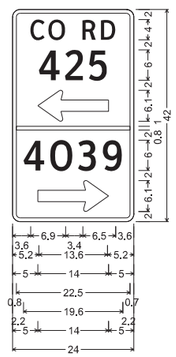
D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"426", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"420", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

10-03



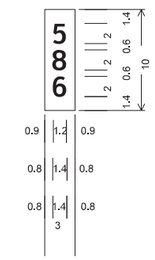
D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"4039", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"425", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

10-06



D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"425", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"4039", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

9-03



D10-7aT 3in; = 2 EA
No border, White on, Green;
"5", ClearviewHwy-4-W;
"8", ClearviewHwy-4-W;
"4", ClearviewHwy-4-W;

STATE OF TEXAS
CHI-CHUNG CHAU
88459
LICENSED
PROFESSIONAL ENGINEER

May 19, 2021
SIGNATURE OF REGISTRANT & DATE

SMALL SIGN DETAILS

SCALE: 1" = NONE HORIZ. FEET

SHEET 1 OF 1

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		119

PROPOSED SMALL SIGN DATA SHEET

SHEET	SIGN	STATION (FOR CONTRACTOR INFO ONLY)		ID	LEGEND OR TYPE A3	SIGN WIDTH (IN)	SIGN HEIGHT (IN)	SIGN AREA (SF)	SIGN AREA (TOTAL) (SF)	PANEL	POST SIZE	NO. OF POST	ANCHOR TYPE	SIGN MOUNT	644 6009 IN SM RD SN SUP&AM TY 10BWG (1) SB (P) EA	644 6020 IN SM RD SN SUP&AM TY 10BWG (2) SB (P) EA	644 6060 IN SM RD SN SUP&AM TY TWT (1) WS (P) EA
2	01	20+50.00	RT	D20-1TL	CO RD 421 <---	24	24	4.0	4.0	TY A	TWT	1	WS	P			1
2	02	21+31.00	LT	R2-1	SPEED LIMIT	30	36	7.5	7.5	TY A	TWT	1	WS	P			1
2	03	23+89.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
2	04	30+79.00	LT	D20-1TR	CO RD 421 --->	24	24	4.0	4.0	TY A	TWT	1	WS	P			1
2	05	29+76.00	RT	W8-13AT	BRIDGE MAY ICE IN COLD WEATHER	36	36	9.0	9.0	TY A	TWT	1	WS	P			1
2	06	34+04.00	LT	M3-1	NORTH	24	12	2.0	6.0	TY A	TWT	1	WS	P			1
				M1-6F	FM 434	24	24	4.0									
2	07	33+71.00	LT	W1-7T	<--->	96	36	24.0	24.0	TY A	10 BWG	2	SB	P		1	
2	08	33+98.00	LT	M1-6F	FM 434	24	24	4.0	12.4	TY A	10 BWG	1	SB	P	1		
				M6-4	<--->	21	15	2.2									
				M1-6F	FM 2839	24	24	4.0									
				M6-1	<---	21	15	2.2									
2	09	34+08.00	RT	R1-1	STOP	36	36	7.5	9.5	TY A	TWT	1	WS	P			1
				W4-4P	CROSS TRAFFIC DOES NOT STOP	24	12	2.0									
2	10	36+32.00	RT	M3-3	SOUTH	24	12	2.0	6.0	TY A	TWT	1	WS	P			1
				M1-6F	FM 434	24	24	4.0									
2	11	39+57.00	RT	R2-1	SPEED LIMIT 65	30	36	7.5	7.5	TY A	TWT	1	WS	P			1
														SHEET 2 OF 10:	1	1	9
3	01	43+70.00	LT	W8-13AT	BRIDGE MAY ICE IN COLD WEATHER	36	36	9.0	9.0	TY A	TWT	1	WS	P			1
3	02	50+69.00	LT	M2-1	JCT	21	15	2.2	6.2	TY A	TWT	1	WS	P			1
				M1-6F	FM 2839	24	24	4.0									
3	03	56+40.00	RT	M3-3	SOUTH	24	12	2.0	6.2	TY A	TWT	1	WS	P			1
				M1-6F	FM 434	24	24	4.0									
				D10-7AT	584	3	10	0.2									
				D10-7AT	584	3	10	0.2									
														SHEET 3 OF 10:			**3**
8	01	145+40.00	RT	D20-5T	CO RD 420 <--- CO RD 426 --->	24	42	7.0	7.0	TY A	TWT	1	WS	P			1
8	02	147+46.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
8	03	148+12.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
8	04	150+20.00	LT	D20-5T	CO RD 426 <--- CO RD 420 --->	24	42	7.0	7.0	TY A	TWT	1	WS	P			1
8	05	152+57.00	RT	W1-4L	LEFT CURVE	36	36	9.0	11.3	TY A	TWT	1	WS	P			1
				W13-1P	50 MPH	18	18	2.3									
8	06	155+82.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
8	07	157+02.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
8	08	158+02.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
8	09	159+02.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
														SHEET 8 OF 10:			**9**

SMALL SIGN DATA SHEET

SHEET 1 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		120

PROPOSED SMALL SIGN DATA SHEET

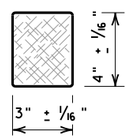
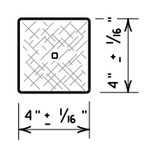
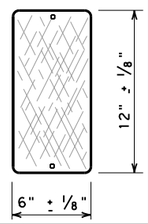
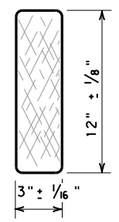
SHEET	SIGN	STATION (FOR CONTRACTOR INFO ONLY)		ID	LEGEND OR TYPE	SIGN WIDTH	SIGN HEIGHT	SIGN AREA	SIGN AREA (TOTAL)	PANEL	POST SIZE	NO. OF POST	ANCHOR TYPE	SIGN MOUNT	644 6009 IN SM RD SN SUP&AM TY 10BWG (1) SB (P)	644 6020 IN SM RD SN SUP&AM TY 10BWG (2) SB (P)	644 6060 IN SM RD SN SUP&AM TY TWT (1) WS (P)
					A3	(IN)	(IN)	(SF)	(SF)						EA	EA	EA
9	01	160+13.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	02	161+01.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	03	162+00.00	LT	M3-1	NORTH	24	12	2.0	6.2	TY A	TWT	1	WS	P			1
				M1-6F	FM 434	24	24	4.0									
				D10-7AT	586	3	10	0.2									
				D10-7AT	586	3	10	0.2									
9	04	162+21.00	RT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	05	163+44.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	06	164+92.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	07	166+39.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	08	167+86.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	09	169+33.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	10	170+80.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	11	172+25.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	12	173+06.00	RT	D20-1TL	CO RD 4044 <---	24	24	4.0	4.0	TY A	TWT	1	WS	P			1
9	13	173+74.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	14	175+22.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
9	15	175+47.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
9	16	176+82.00	LT	W1-8R	>>	18	24	3.0	3.0	TY A	TWT	1	WS	P			1
				W1-8L	<<	18	24	3.0									
														SHEET 9 OF 10:			16
10	01	180+07.00	LT	W1-4L	CURVE LEFT	36	36	9.0	11.3	TY A	TWT	1	WS	P			1
				W13-1P	50 MPH	18	18	2.3									
10	02	183+32.00	LT	D20-1TR	CO RD 4044 ---->	24	24	4.0	4.0	TY A	TWT	1	WS	P			1
10	03	196+30.00	RT	D20-5T	CO RD 4039 <---	24	42	7.0	7.0	TY A	TWT	1	WS	P			1
					CO RD 425 --->												
10	04	198+74.00	LT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
10	05	198+91.00	RT	R1-1	STOP	36	36	7.5	7.5	TY A	TWT	1	WS	P			1
10	06	201+48.00	LT	D20-5T	CO RD 425 <---	24	42	7.0	7.0	TY A	TWT	1	WS	P			1
					CO RD 4039 --->												
														SHEET 10 F 10:			6
														TOTAL:	1	1	37

SMALL SIGN DATA SHEET

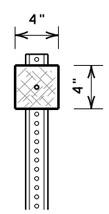
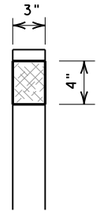
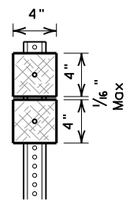
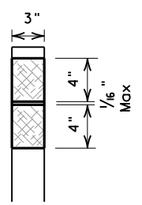
SHEET 2 OF 2

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		121

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

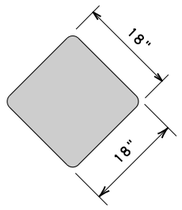
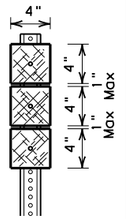
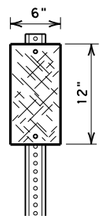
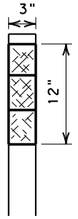
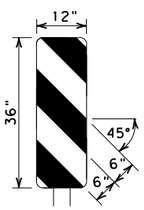
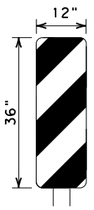
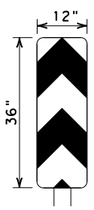
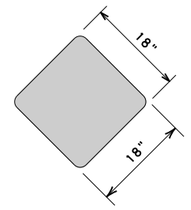
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

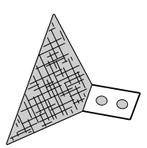
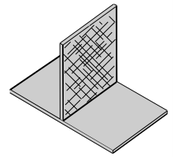
OBJECT MARKERS

	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

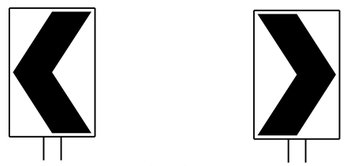
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

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



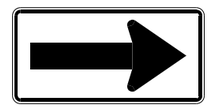
W1-8

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	1077	01	026	FM 434
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WACO	FALLS		122

20A

DATE: 6/3/2021 9:10:32 AM
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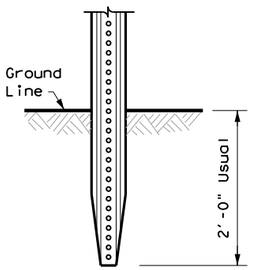
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

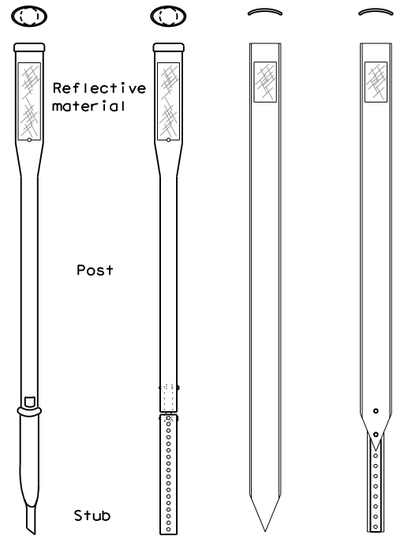


NOTES

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

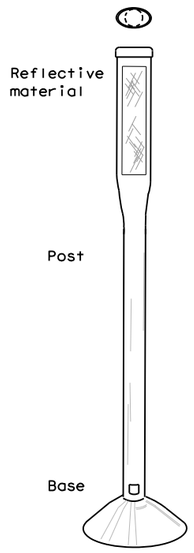
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



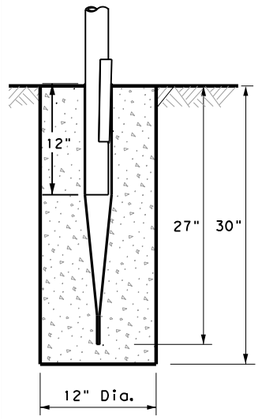
SURFACE MOUNT

NOTES

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

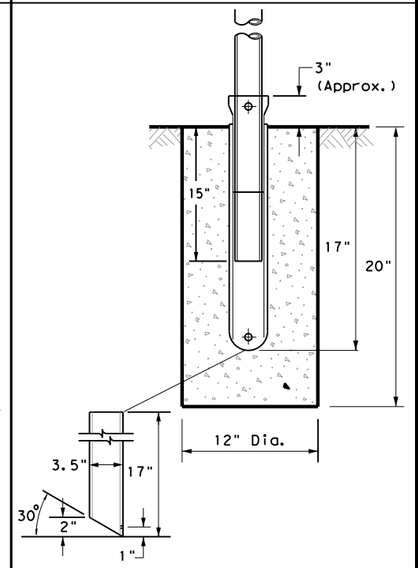
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

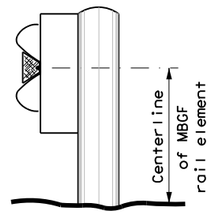
NOTE

1. Install per manufacturer's recommendations.

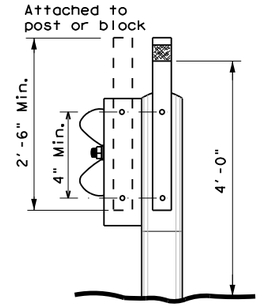
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

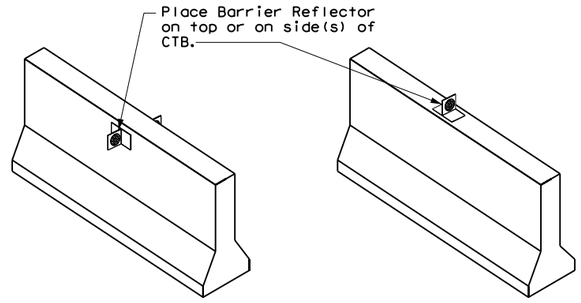
GF1



GF2



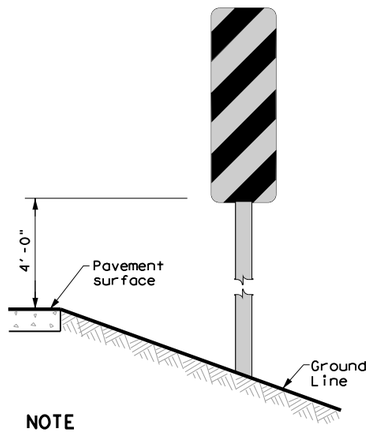
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

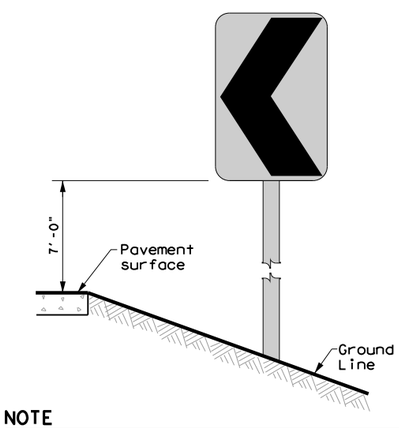
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

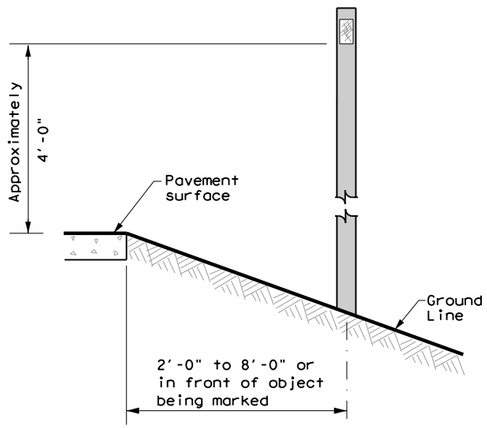
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	WACO	FALLS		123

20B

DATE: 6/3/2021 9:10:39 AM
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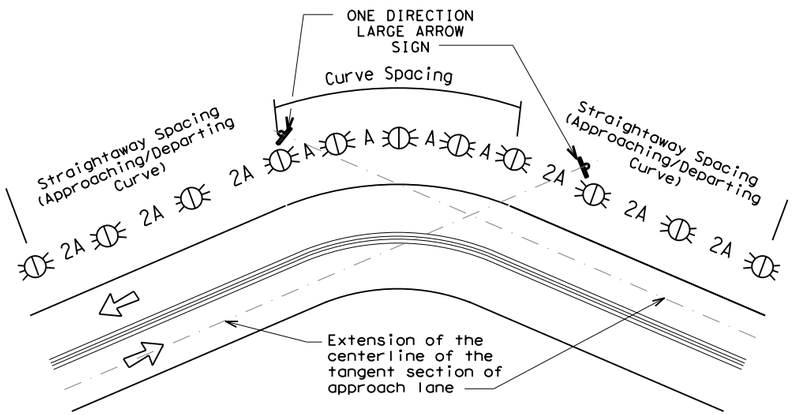
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

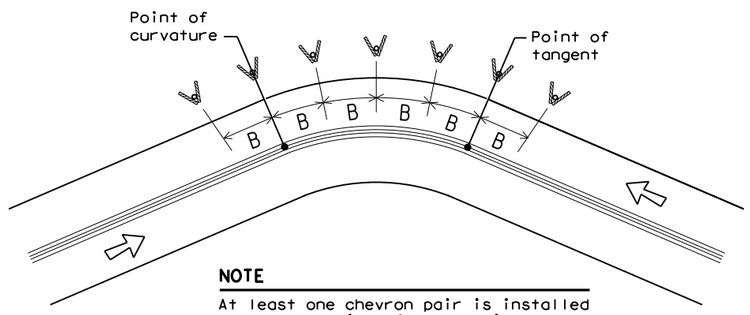
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	1077	01	026	FM 434
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	WACO	FALLS		124

20C

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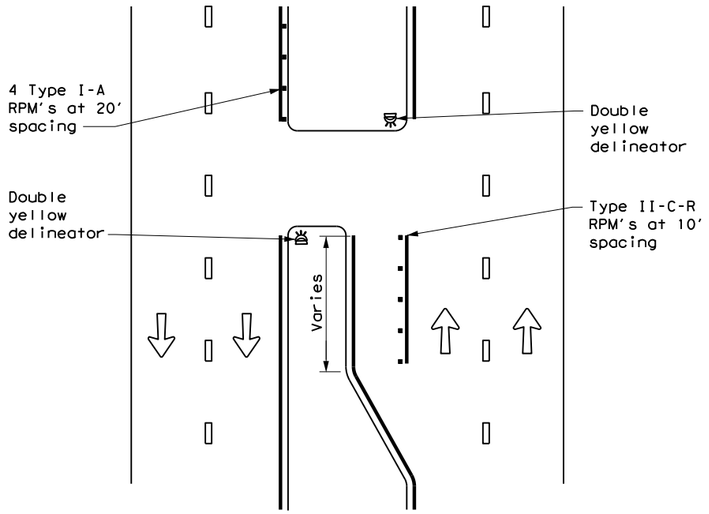
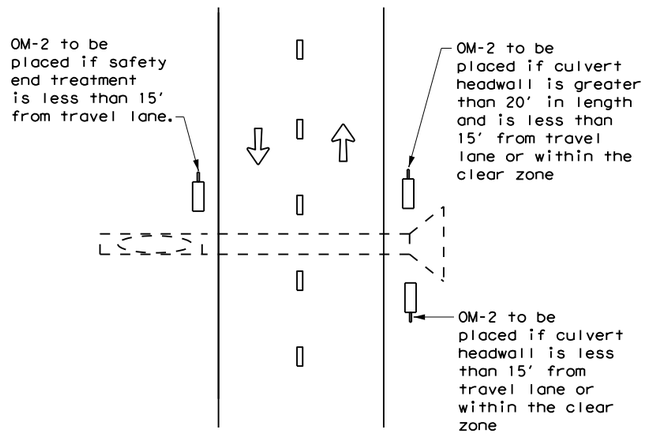
CROSSOVERS



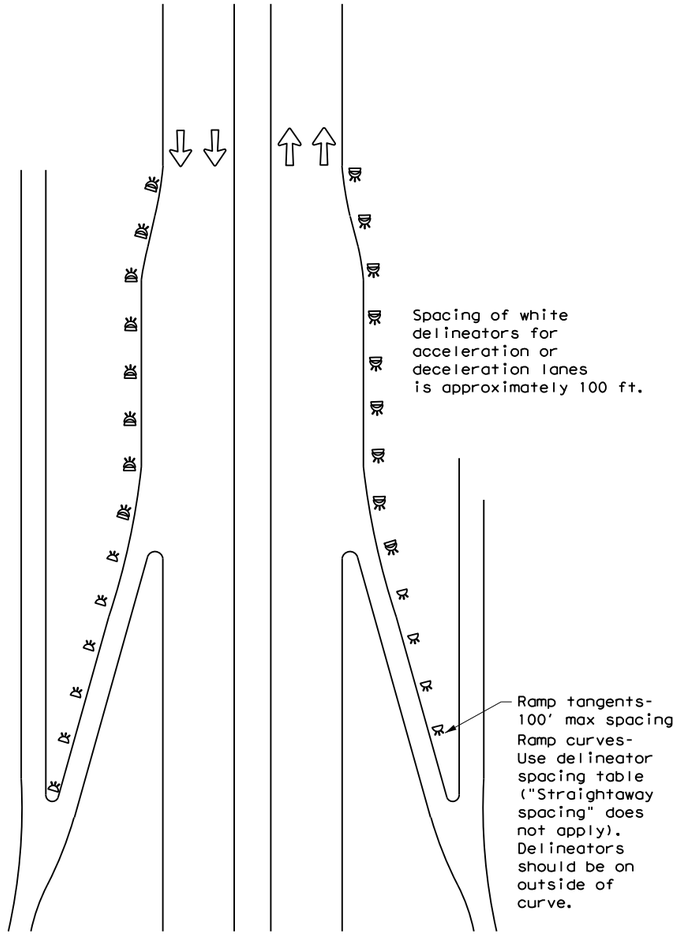
DETAIL 1

FOR CULVERTS WITHOUT MBGF



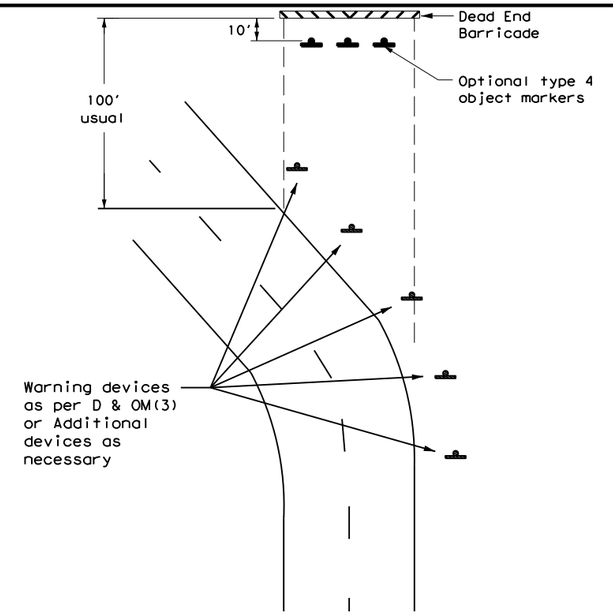
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



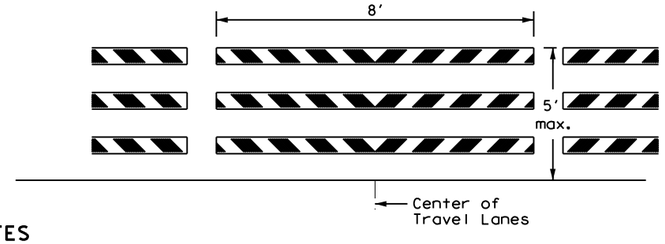
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND

	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	1077	01	026	FM 434
3-15	DIST	COUNTY		SHEET NO.
7-20	WACO	FALLS		125

20D

DATE: 6/3/2021 9:10:54 AM
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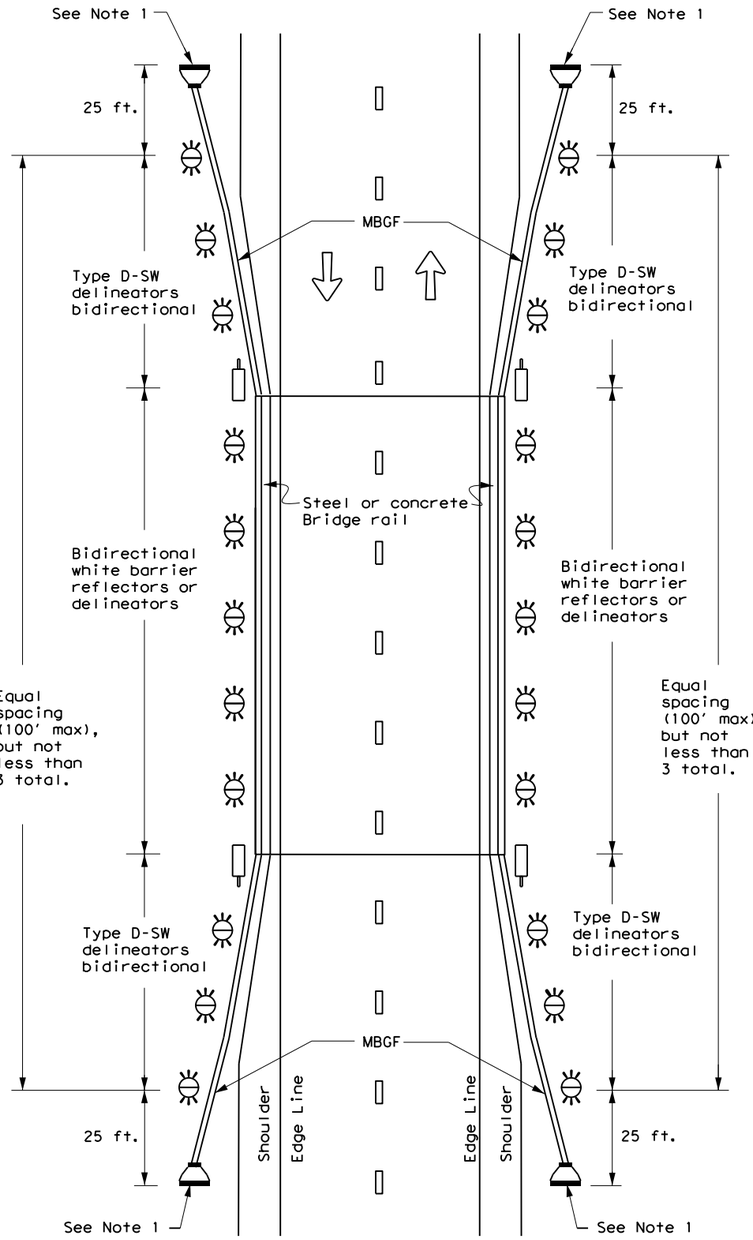
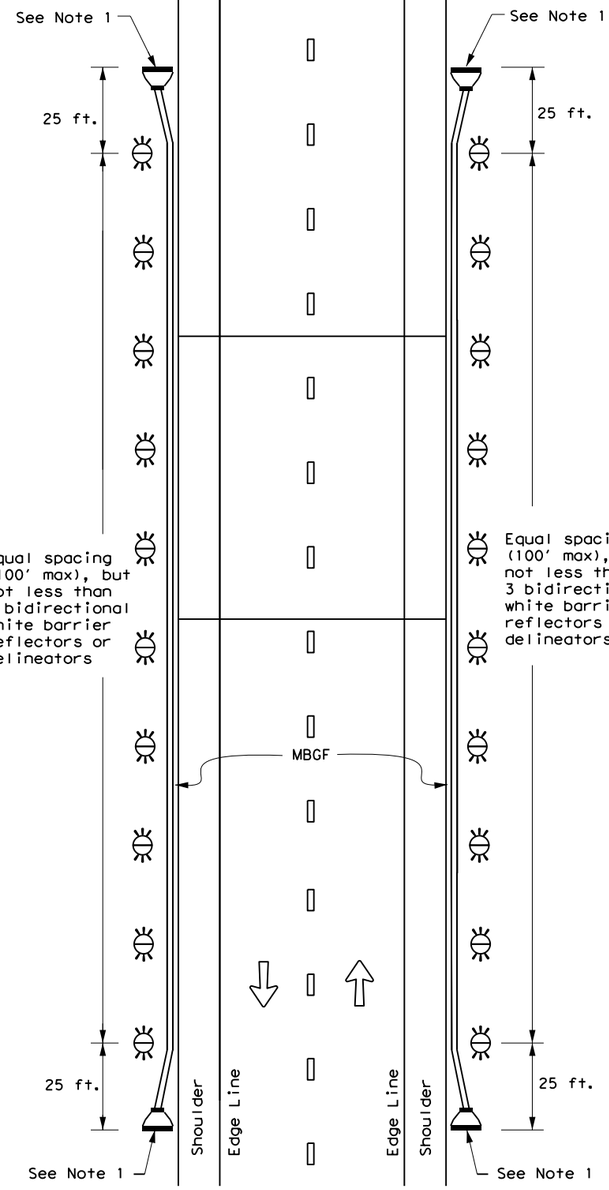
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

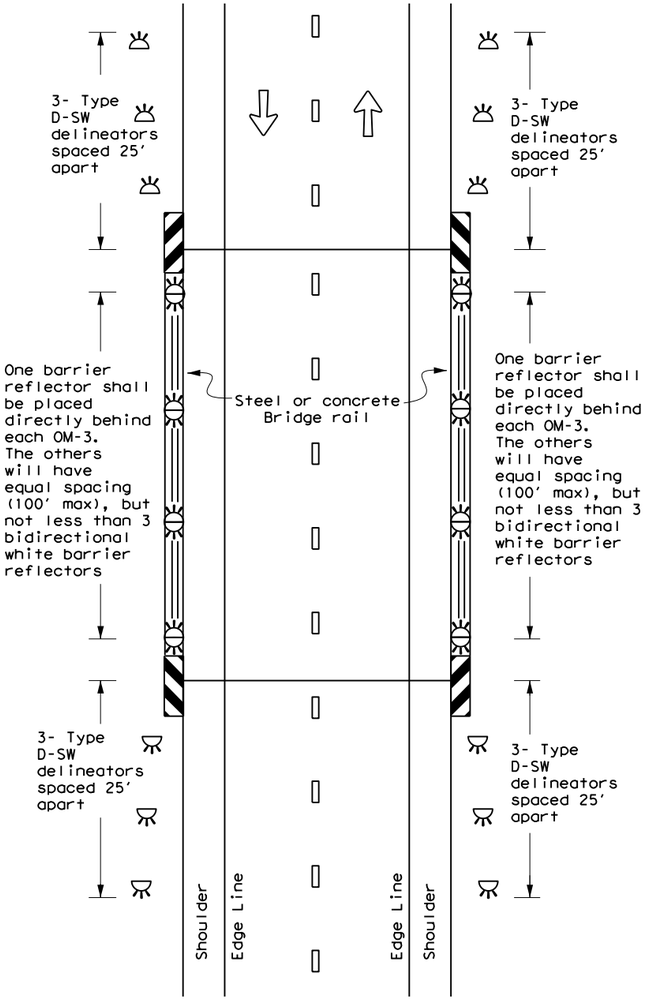
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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	1077	01	026	FM 434
7-20	DIST	COUNTY		SHEET NO.
	WACO	FALLS		126

20E

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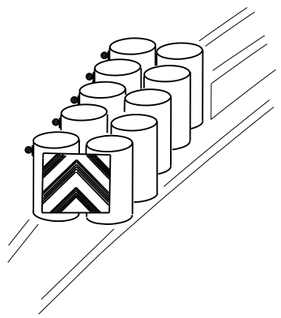
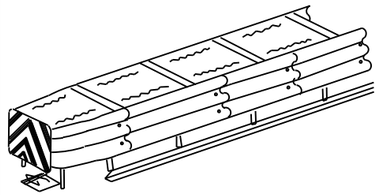
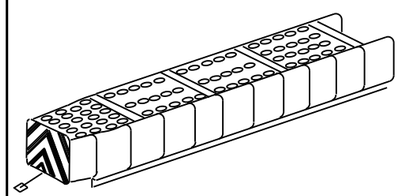
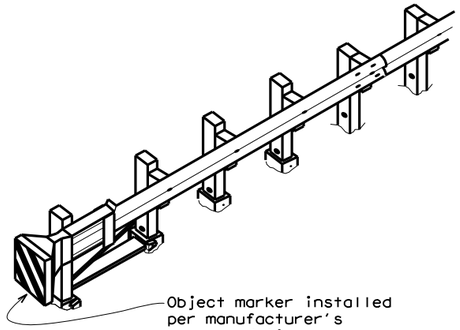
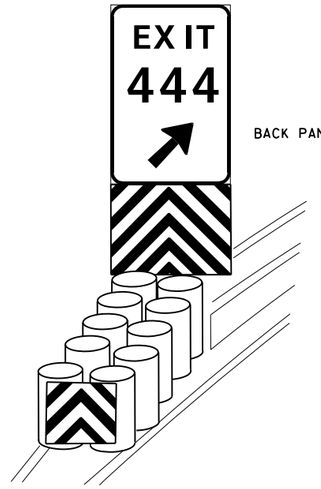
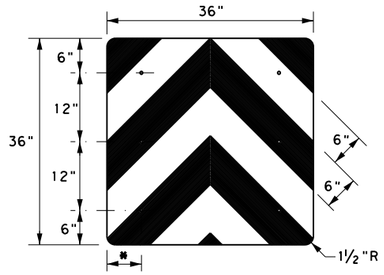


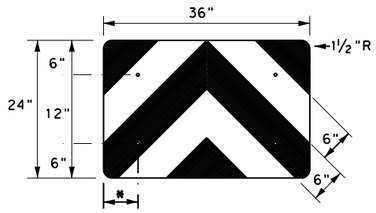




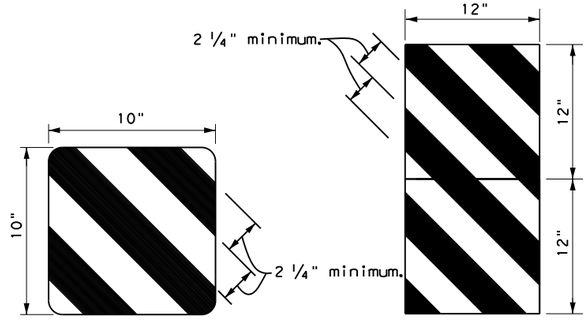




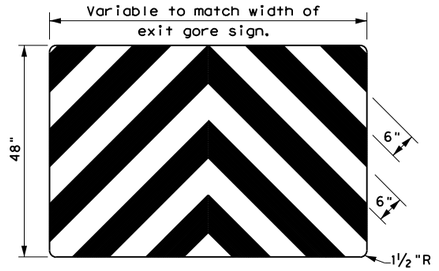


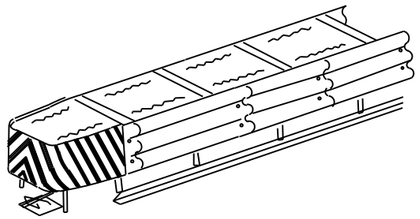


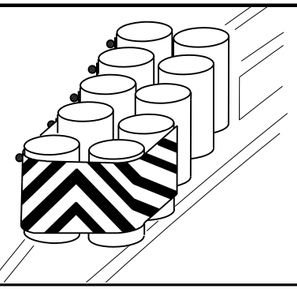
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

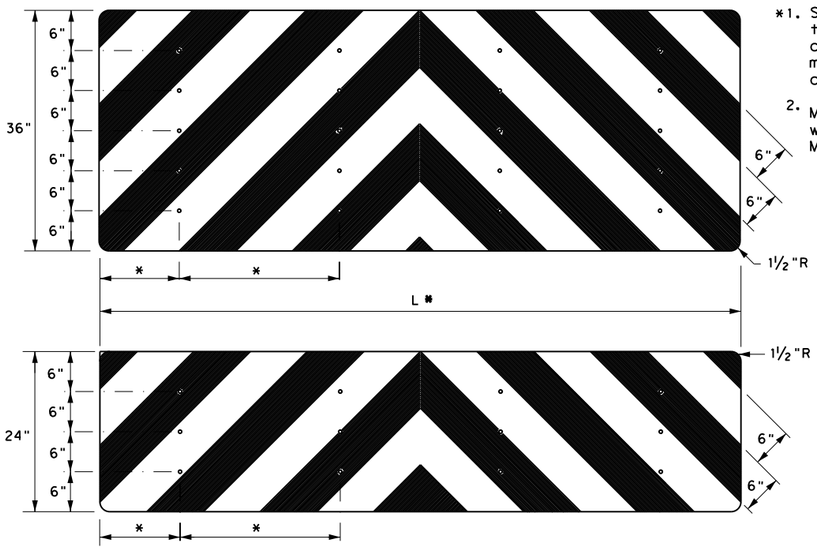


OBJECT MARKERS SMALLER THAN 3 FT^2









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	1077	01	026	FM 434
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	WACO	FALLS		127
4-98 7-20				

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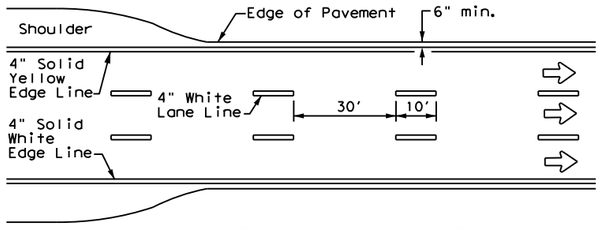
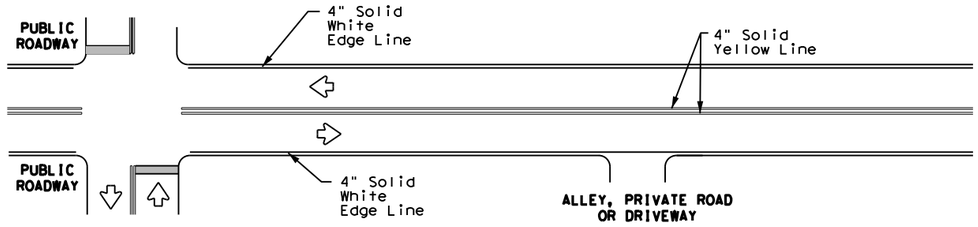
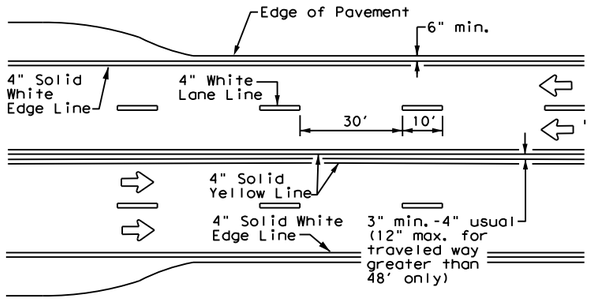


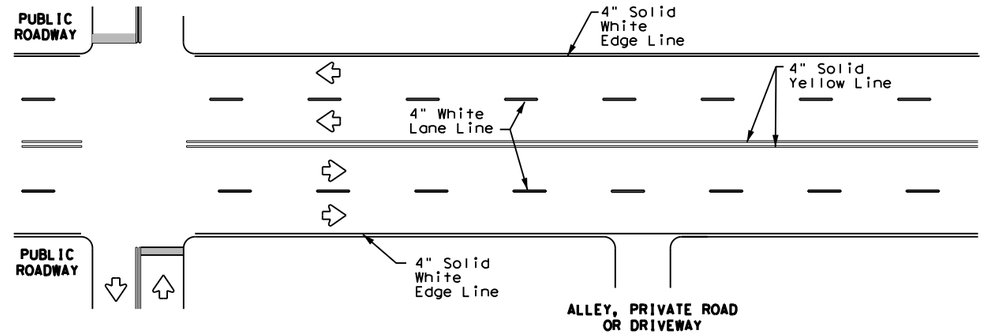
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



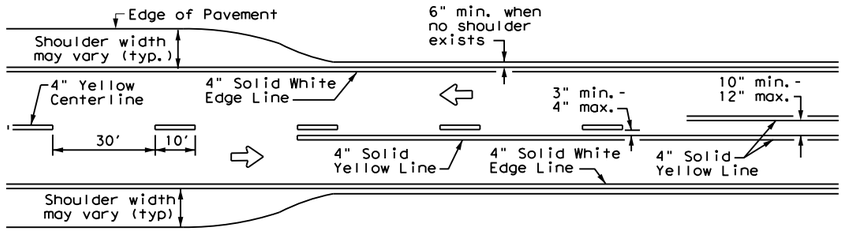
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



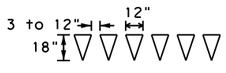
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



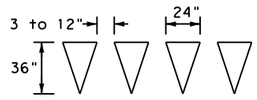
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

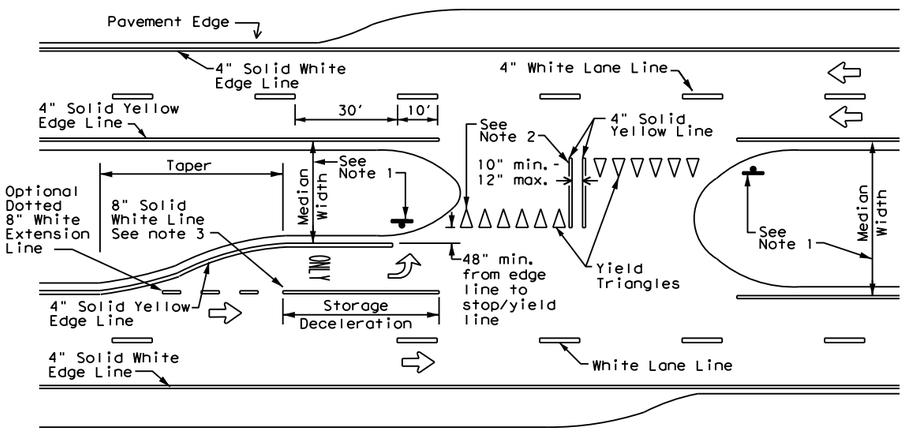


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

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

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

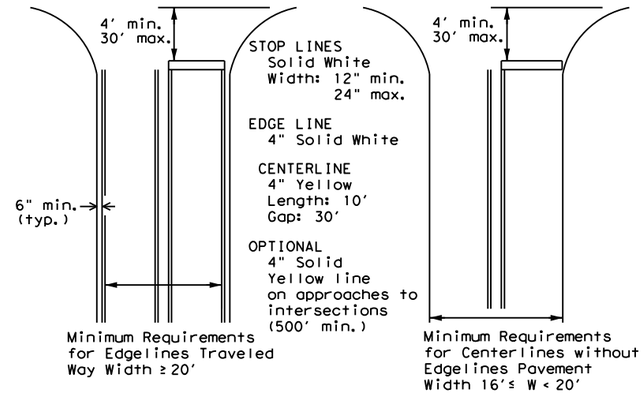
GENERAL NOTES

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

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

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1077	01	026	FM 434
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	WACO	FALLS		128

22A

DATE: 6/3/2021 9:11:13 AM
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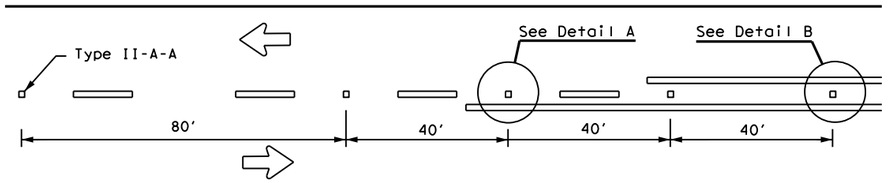
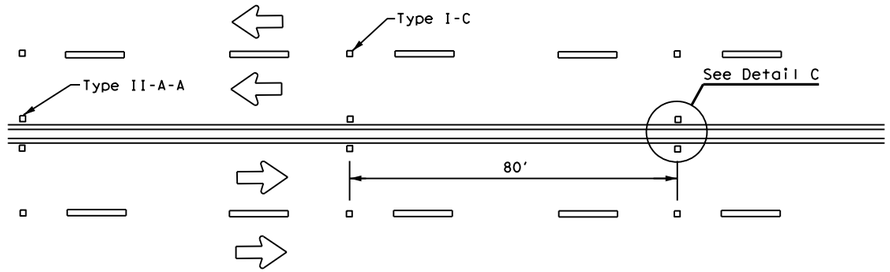
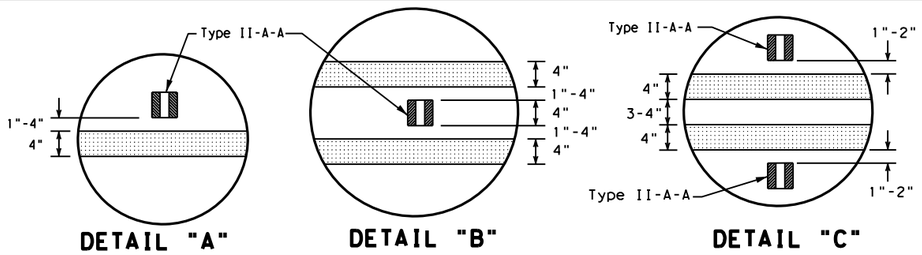
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



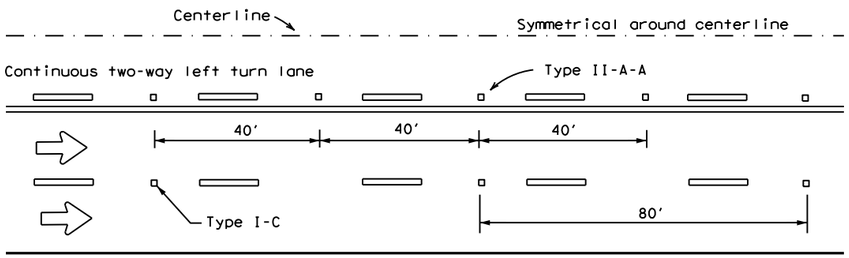
CENTERLINE FOR ALL TWO LANE ROADWAYS



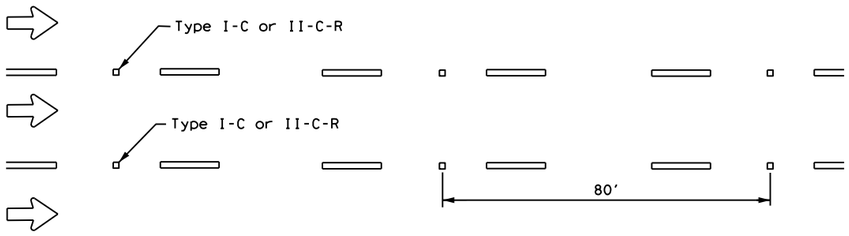
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

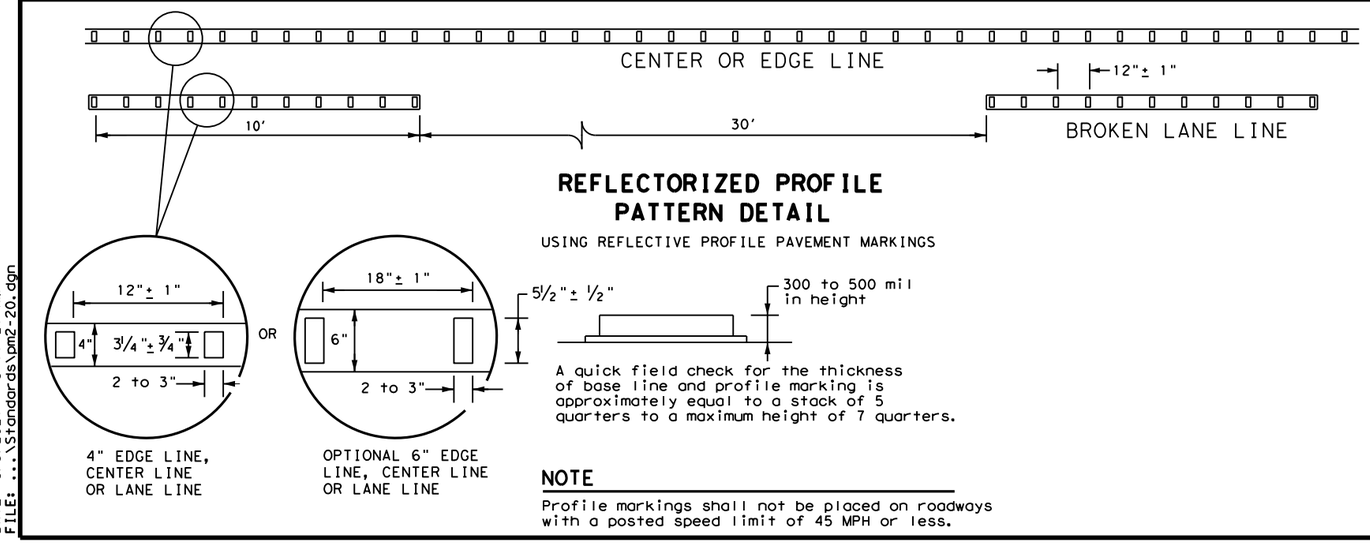


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

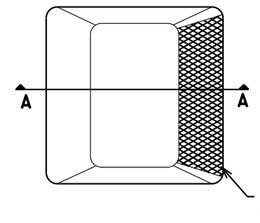
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

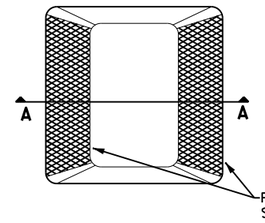
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

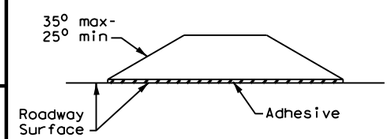
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



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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©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
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	WACO	FALLS		129

22B

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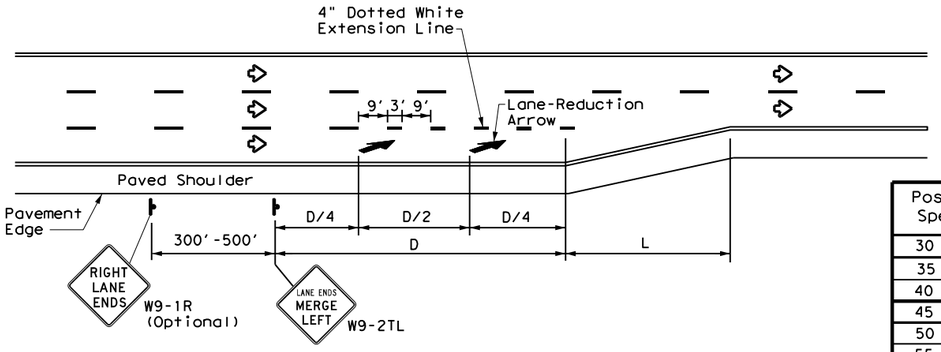
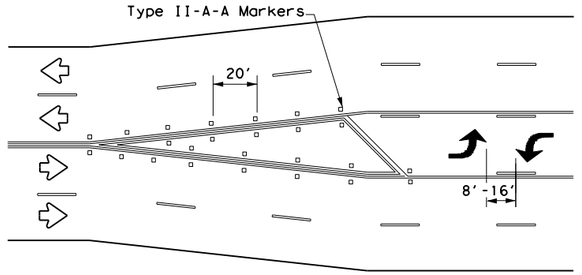


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



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

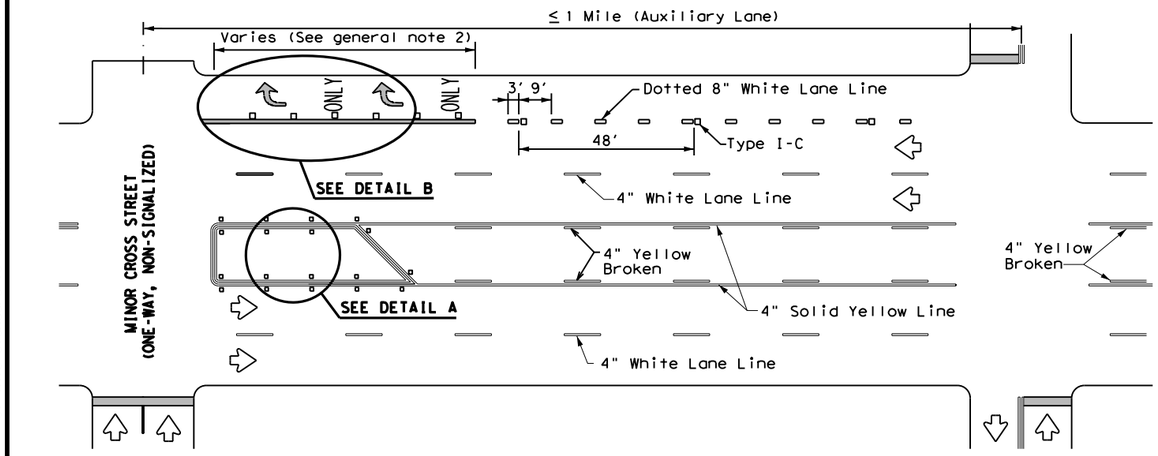
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

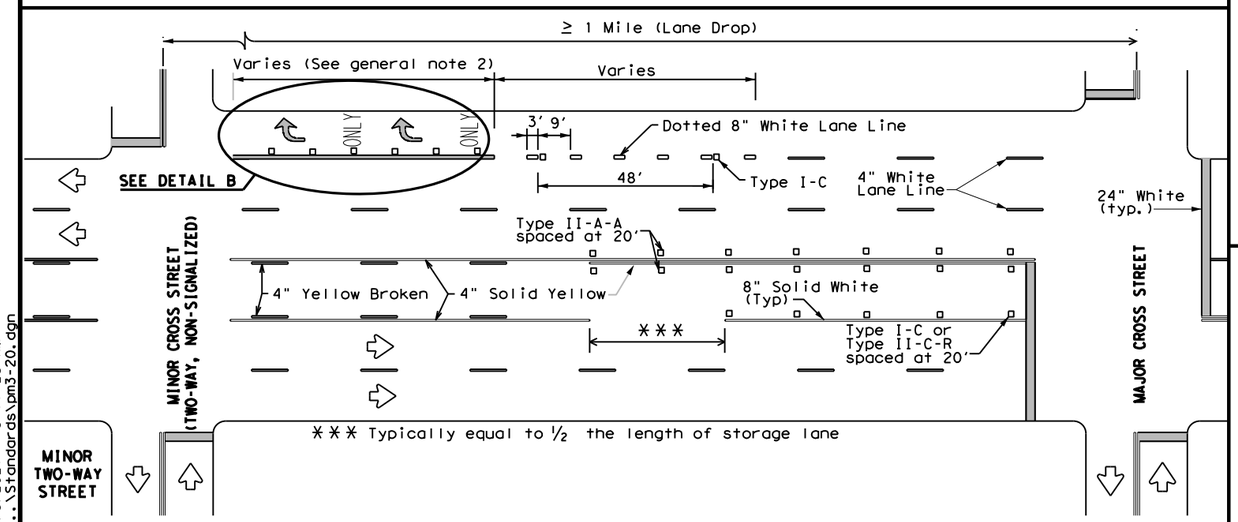
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

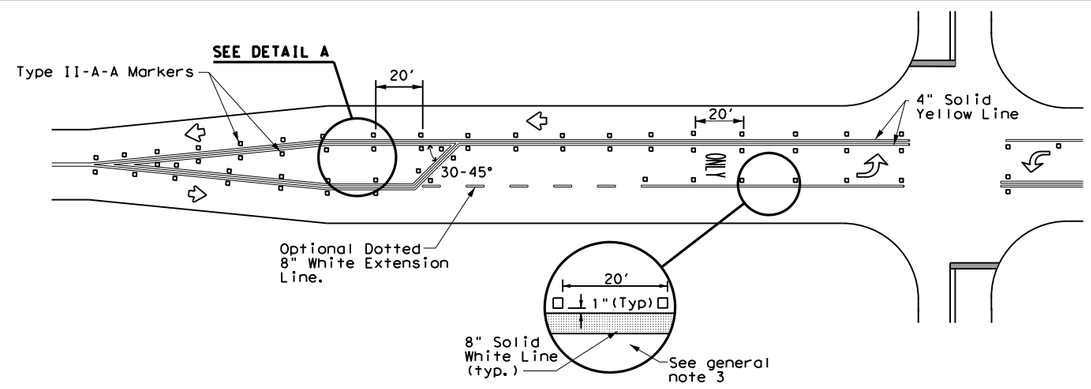
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



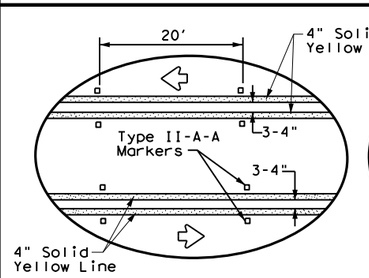
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



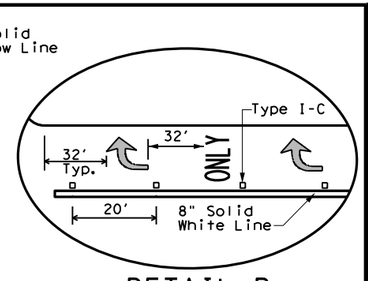
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

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©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	WACO	FALLS		130
3-03 6-20				

220

DATE: 6/3/2021 9:11:28 AM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

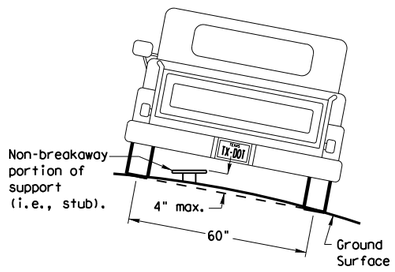
Anchor Type

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

Sign Mounting Designation

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

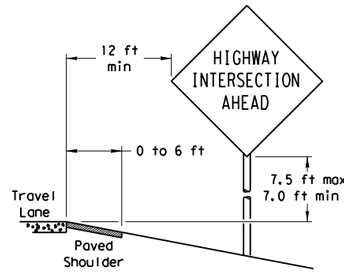
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

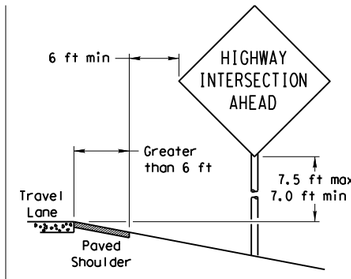
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

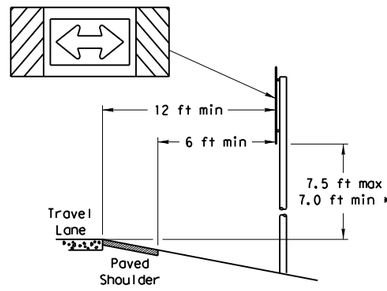
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



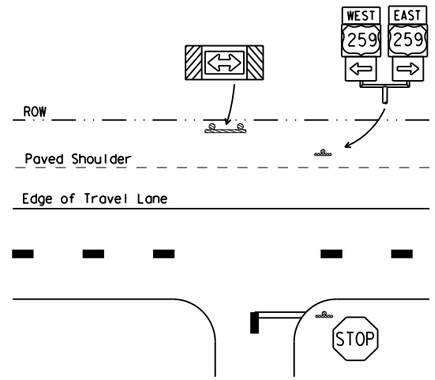
GREATER THAN 6 FT. WIDE

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

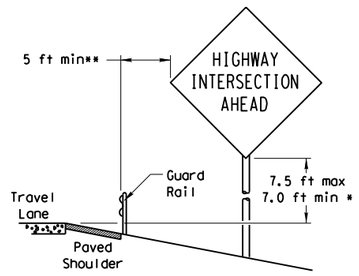
T-INTERSECTION



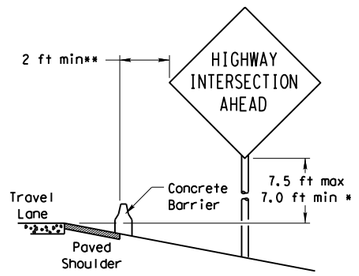
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

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

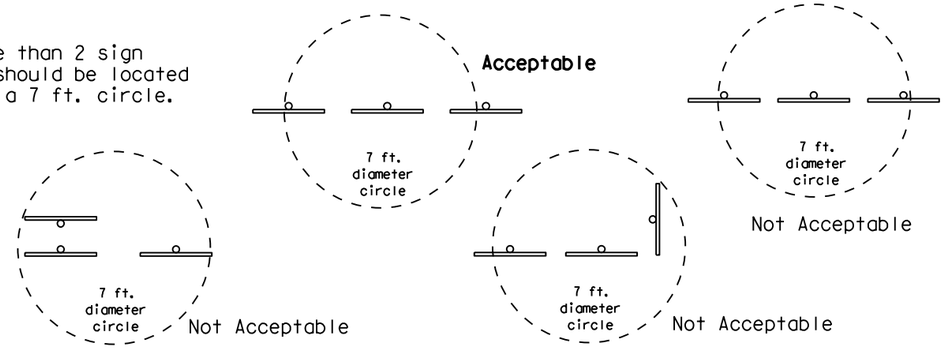
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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

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

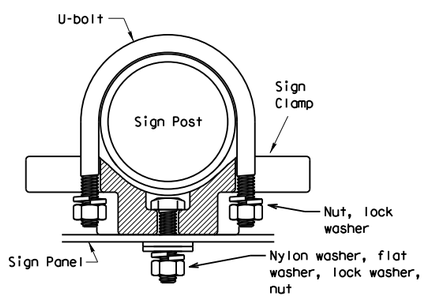
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

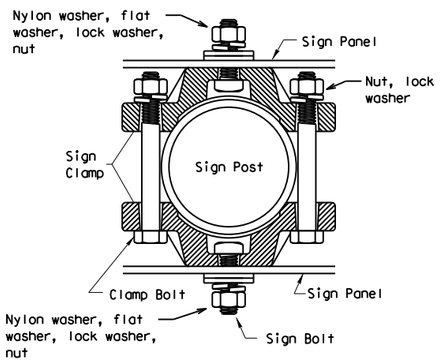


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

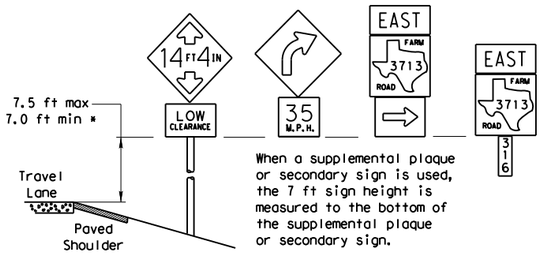
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



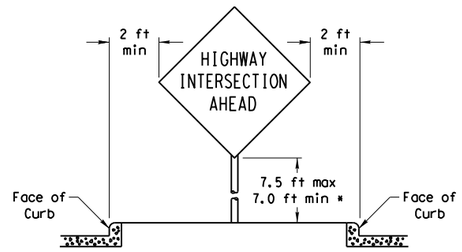
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



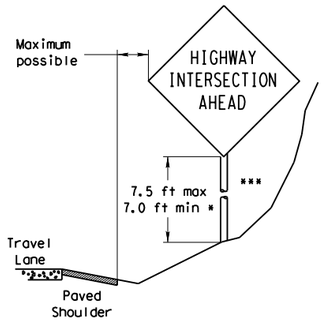
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		131

DATE: 6/3/2021 9:11:34 AM
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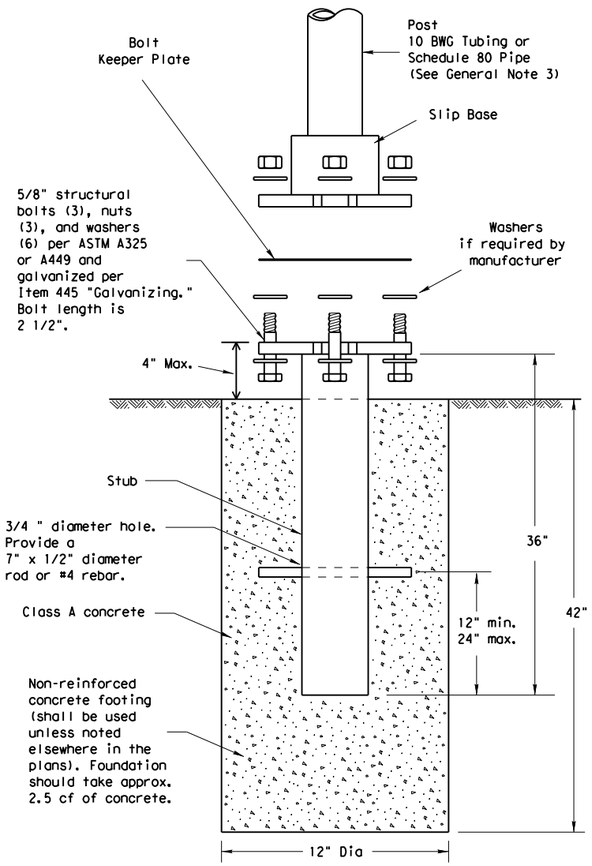
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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.

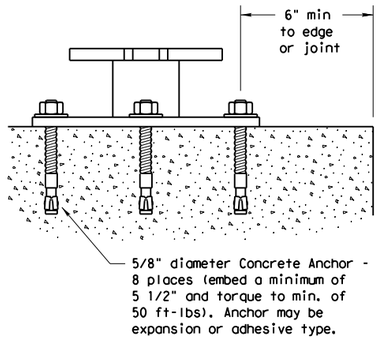
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
1077	01	026	FM 434

DIST	COUNTY	SHEET NO.
WACO	FALLS	132

DATE: 6/3/2021 9:11:41 AM
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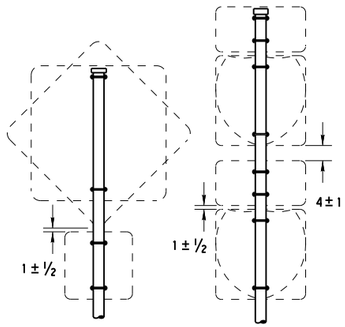
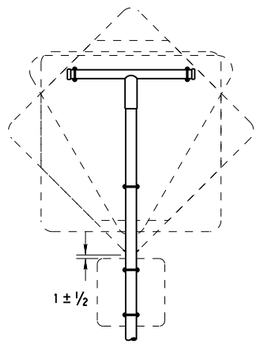


SM RD SGN ASSM TY XXXXX(1)XX(P)



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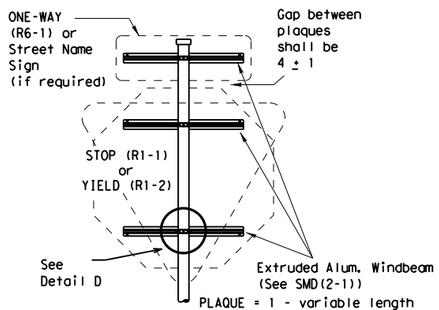
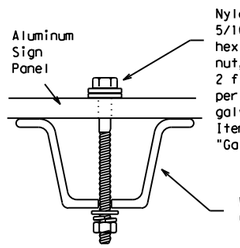
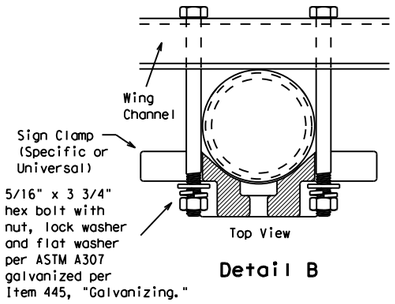


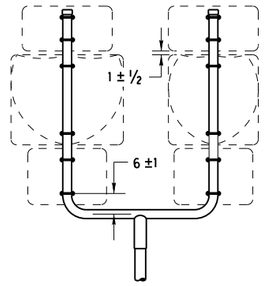
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



Detail B



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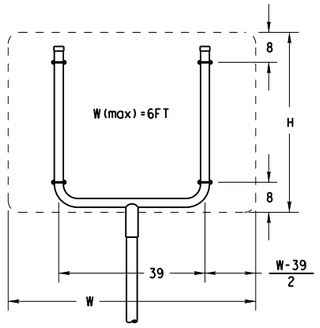

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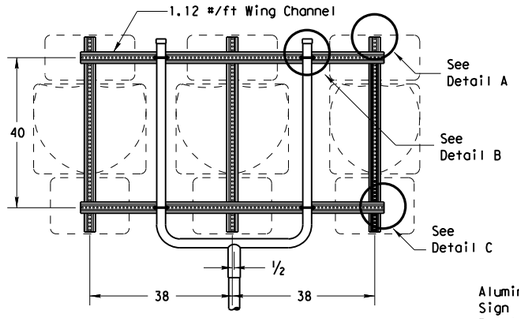
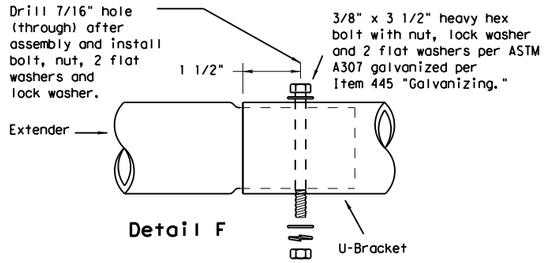
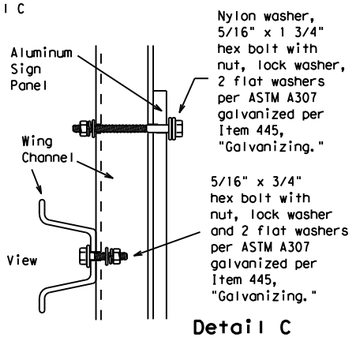


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

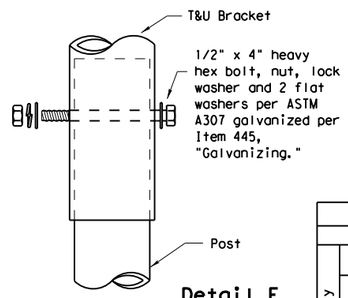


Detail F

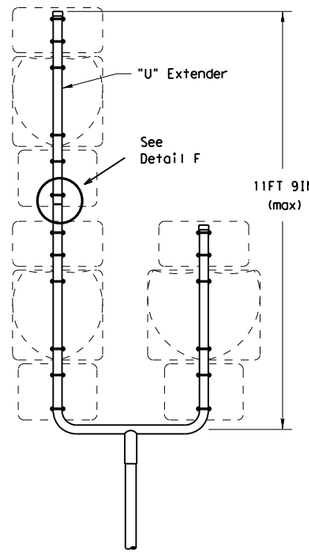
Splices shall only be allowed behind the sign substrate.



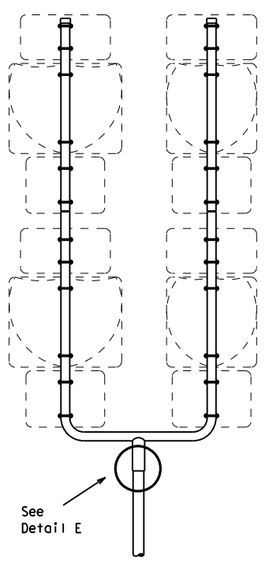
Detail C



Detail E



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



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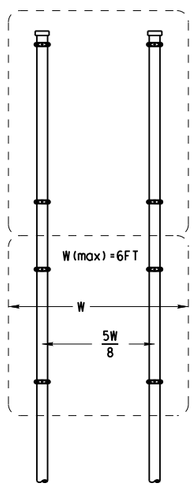
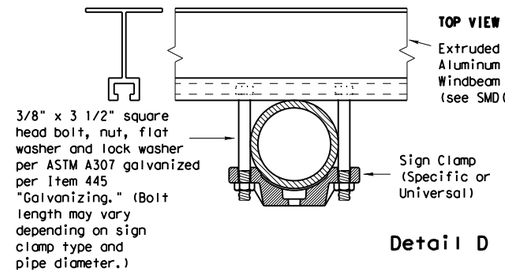
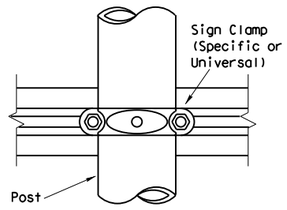


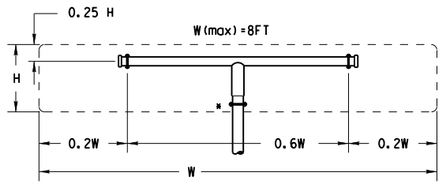
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

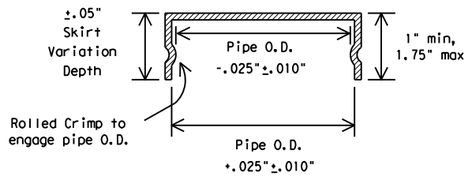




All dimensions are in english unless detailed otherwise.

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

FRICTION CAP DETAIL



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

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

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

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)

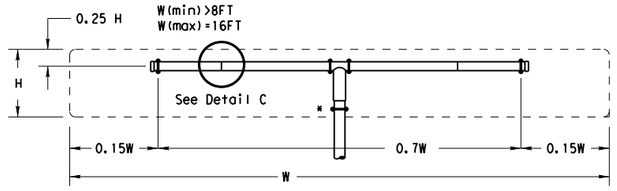
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

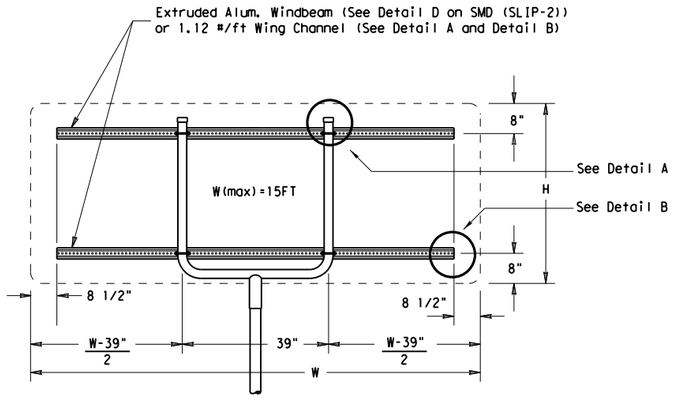
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		133

DATE: 6/3/2021 9:11:49 AM
FILE: ...\8. Traffic\Standards\smds2.dgn



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

(* - See Note 12)



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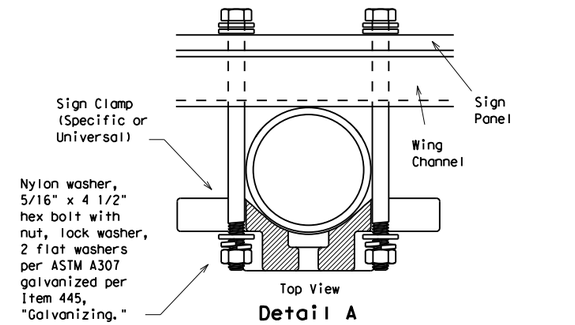
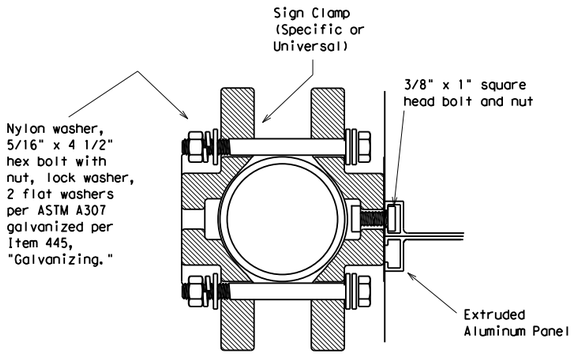
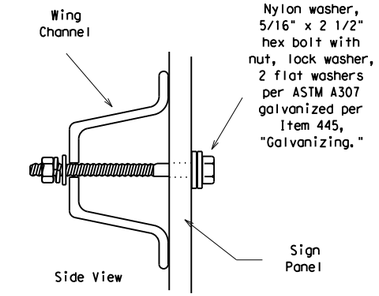


Detail A

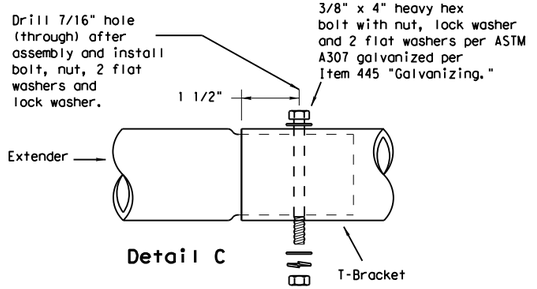


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

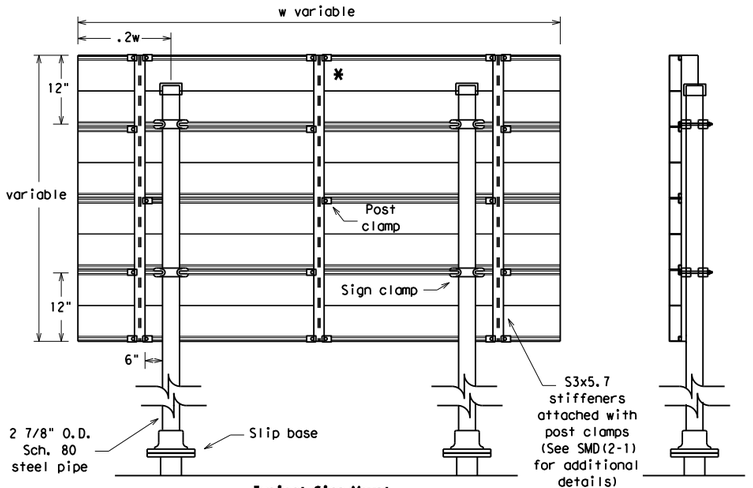


Detail B



Detail C

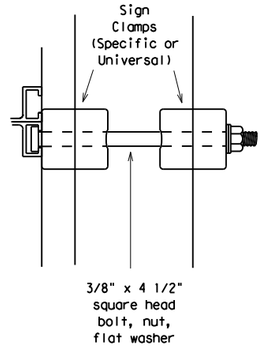
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

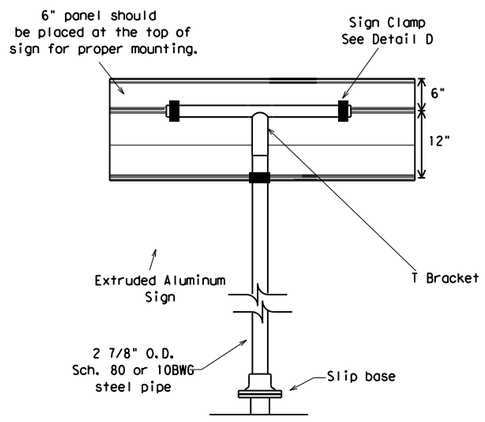
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

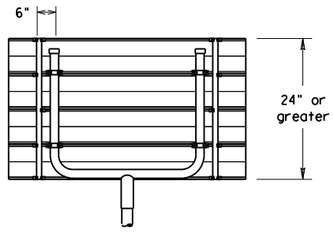


See Detail E
for clamp installation

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
1077	01	026	FM 434
DIST	COUNTY		SHEET NO.
WACO	FALLS		134

DATE: 6/3/2021 9:11:56 AM
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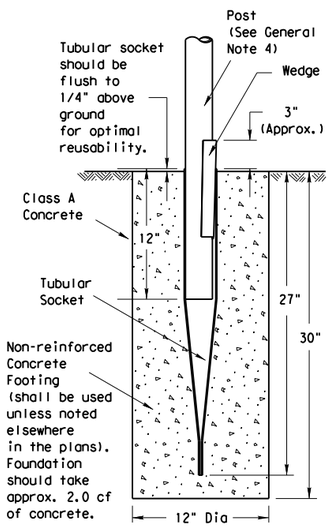
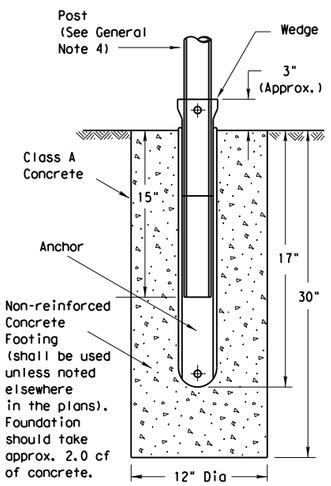
Wedge Anchor Steel System



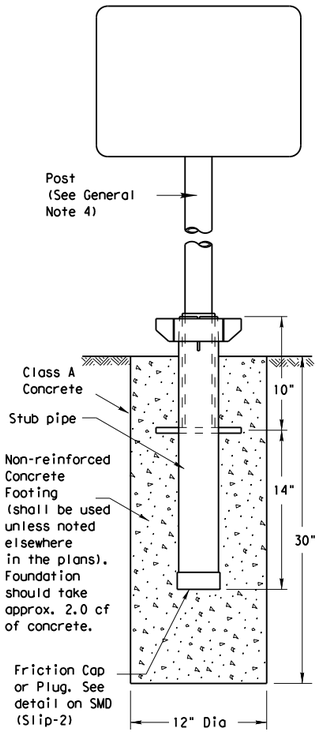
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

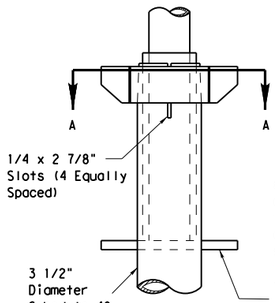


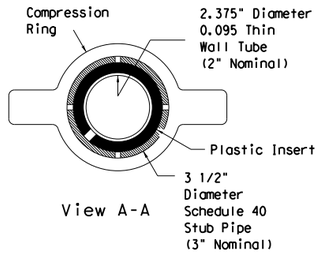
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



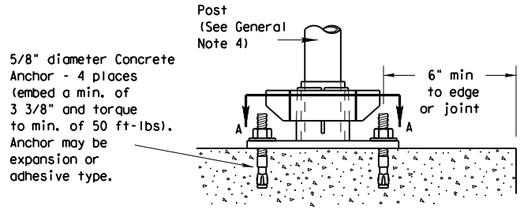
SM RD SGN ASSM TY TWT(X)UA(P)



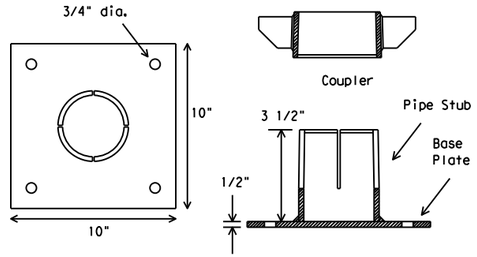


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

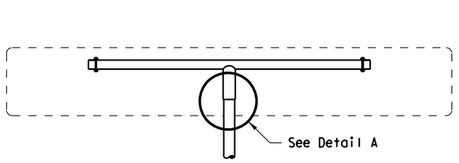


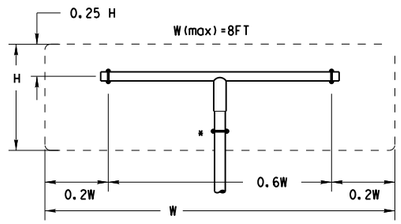
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



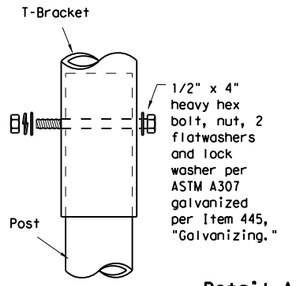
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
1077	01	026	FM 434
DIST	COUNTY		SHEET NO.
WACO	FALLS		135

26E

DATE: 6/3/2021 9:12:04 AM
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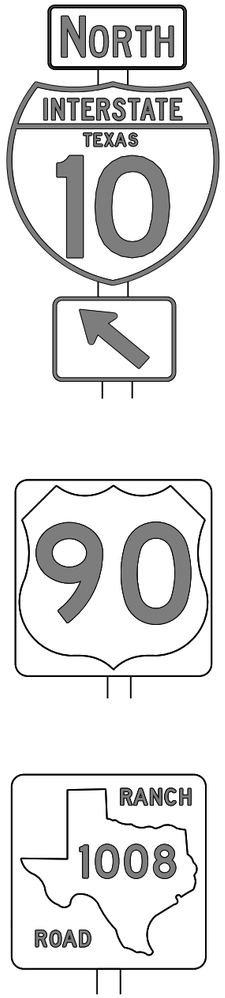
DATE: 6/3/2021 9:12:11 AM
FILE: ...\Standards\tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

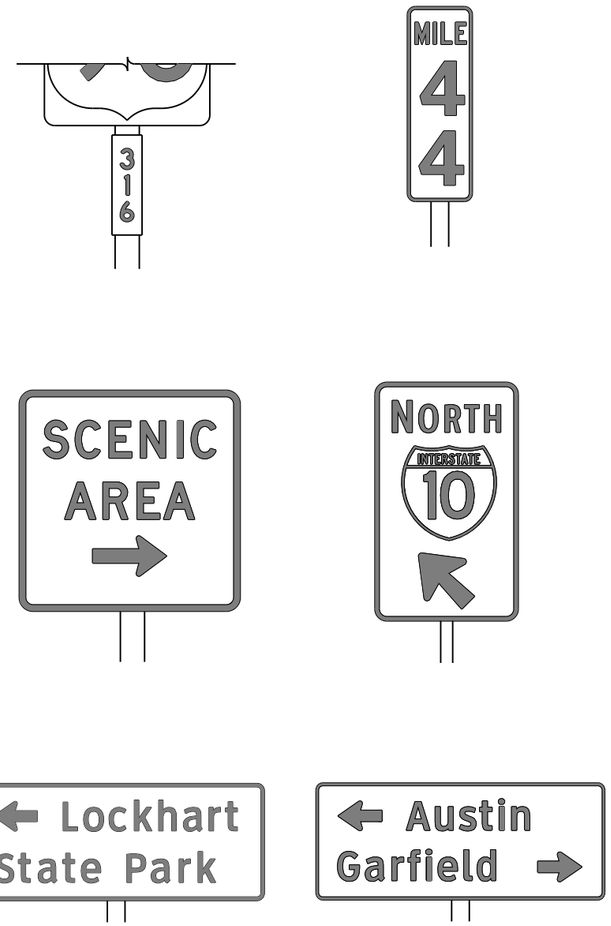
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

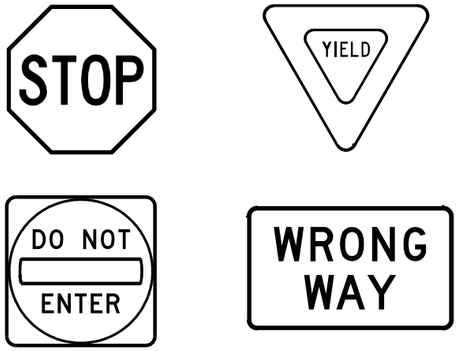
TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WACO	FALLS		136

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

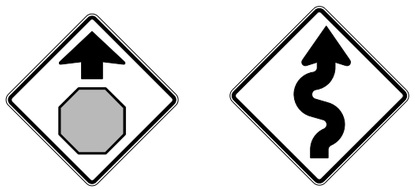
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

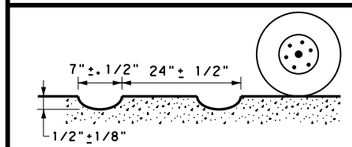
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	WACO	FALLS		137

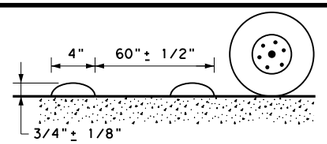
DATE: 6/3/2021 9:12:18 AM
FILE: ...\Standards\tsr4-13.dgn

DATE: 6/3/2021 9:12:24 AM
FILE: ...\Standards\rs(3)-13.dgn

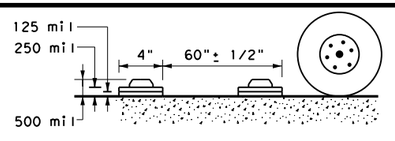
CENTERLINE RUMBLE STRIPS



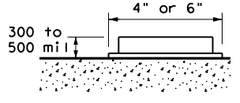
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

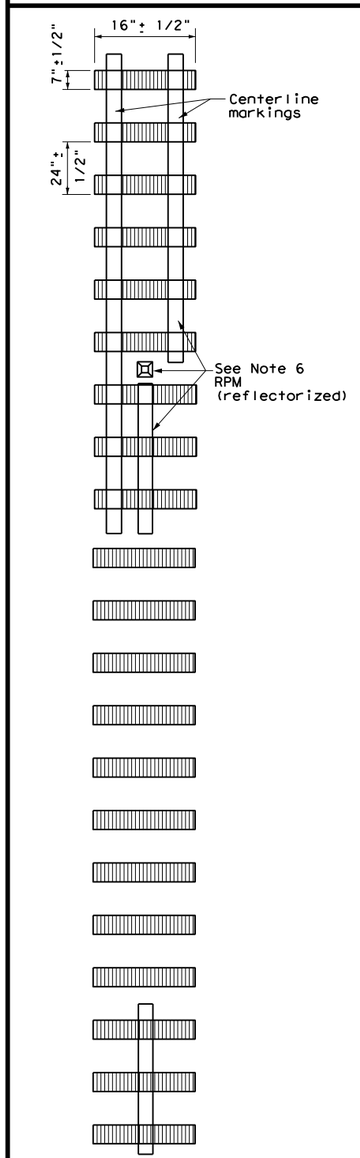


PREFORMED THERMOPLASTIC STRIPS



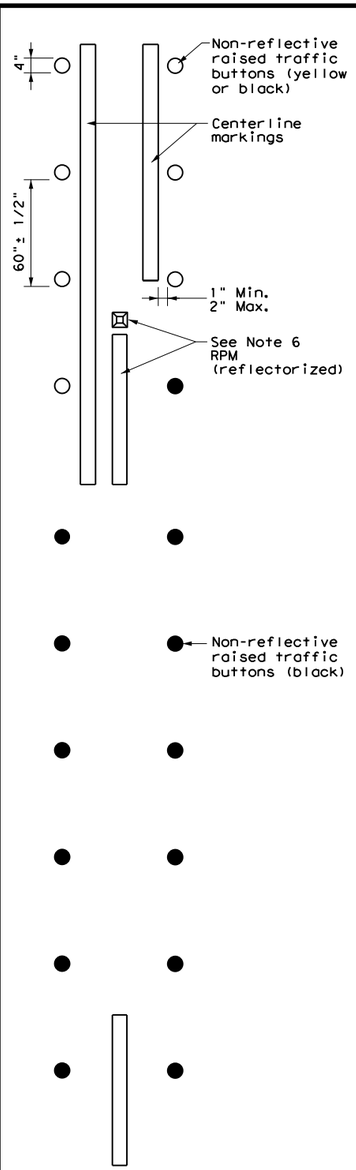
PROFILE MARKINGS

PROFILE VIEW



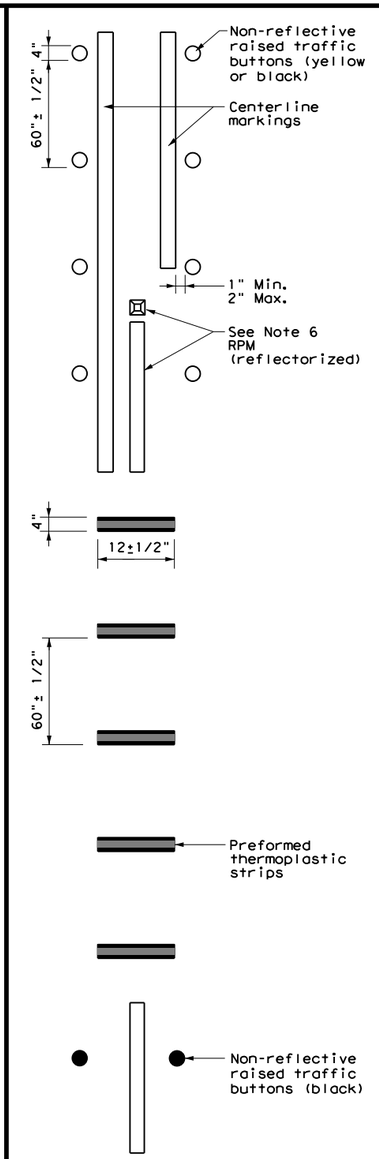
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



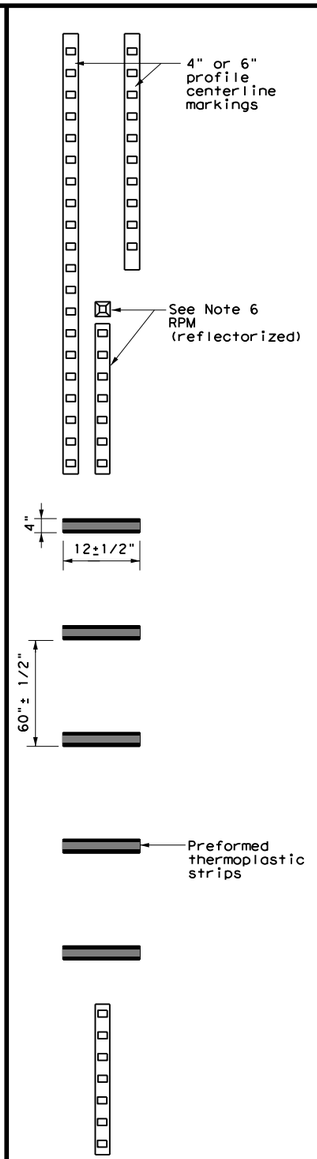
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

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

12. See standard sheet RS(4).

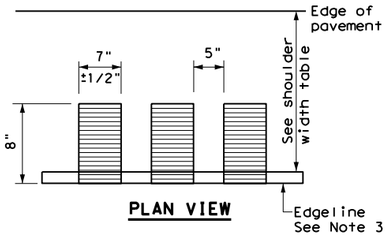
TWO LANE TWO-WAY ROADWAYS

Texas Department of Transportation®
Traffic Operations Division Standard

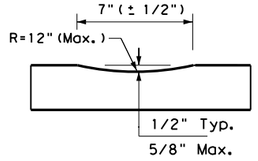
CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		138

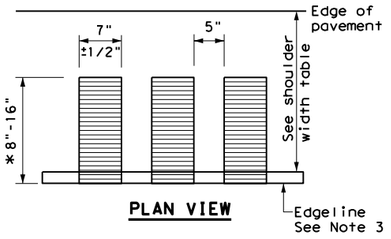


PLAN VIEW

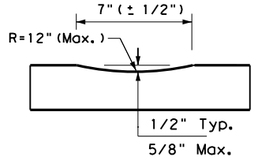


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



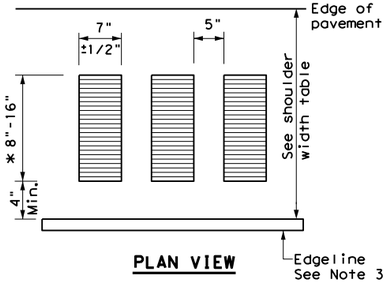
PLAN VIEW



* This distance may vary based on width of shoulder

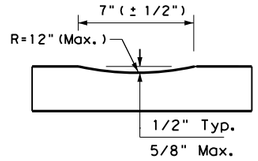
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



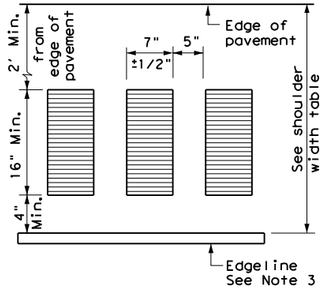
PLAN VIEW

* This distance may vary based on width of shoulder

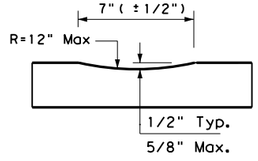


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

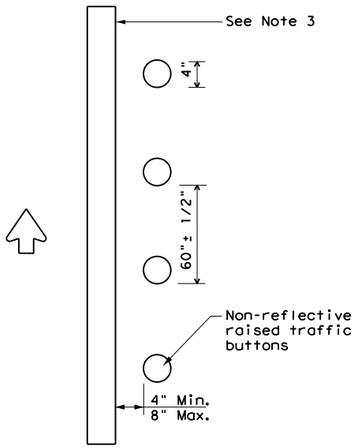


PLAN VIEW



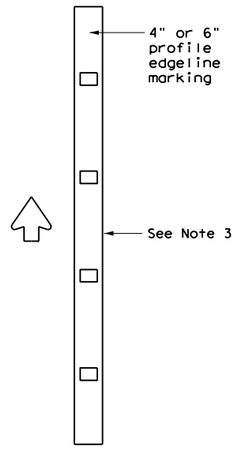
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		139

DATE: 6/3/2021 9:12:30 AM
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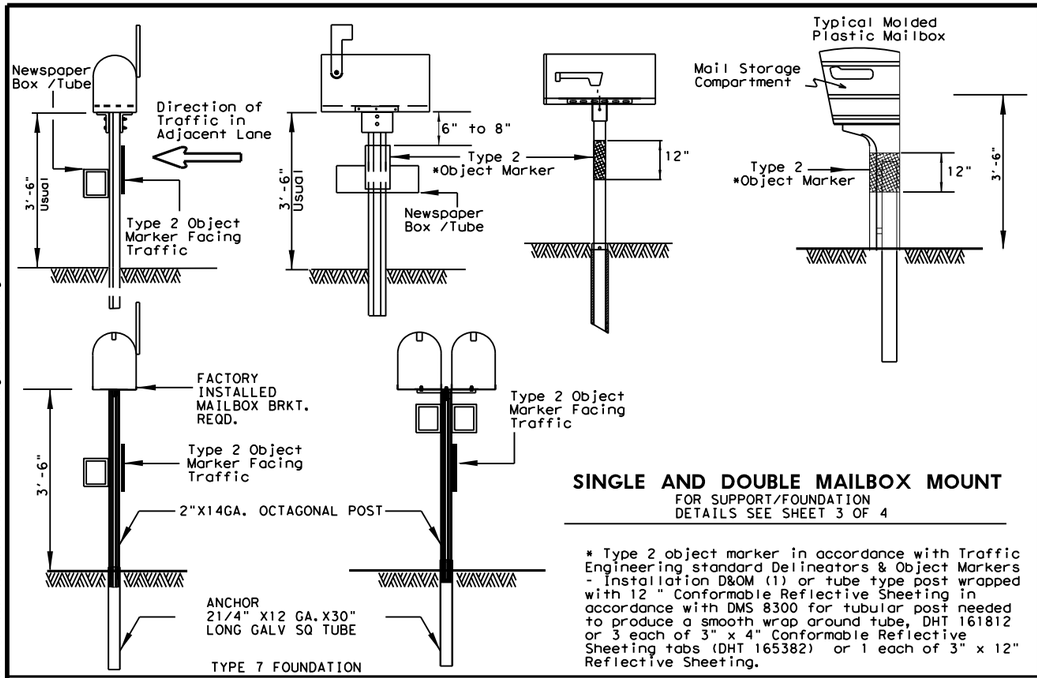


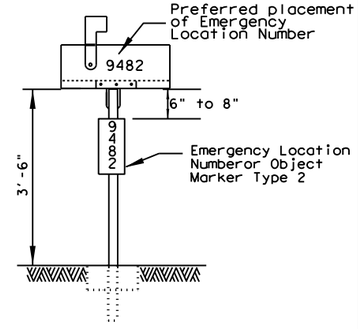
SINGLE AND DOUBLE MAILBOX MOUNT

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 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

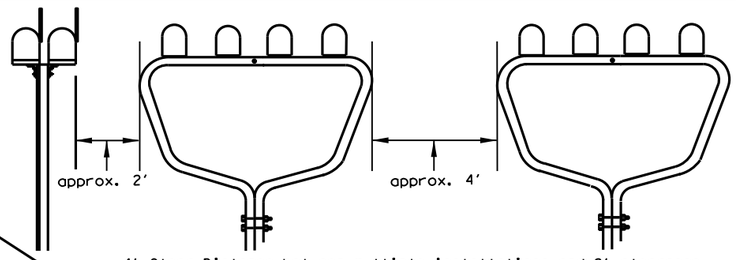
* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT (POUNDS)
SIDE	18	15	18.3	15	22.4
BACK	11 1/2	11 1/2		15	

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

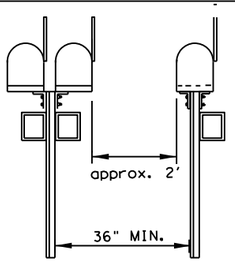
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

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



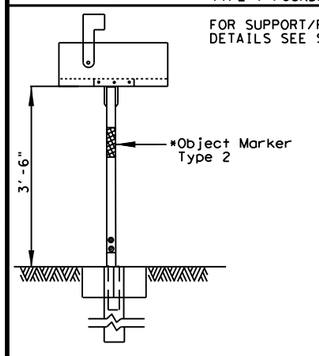
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

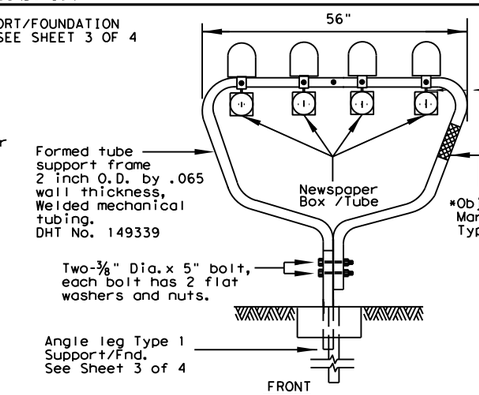
MULTIPLE MAILBOX PLACEMENT

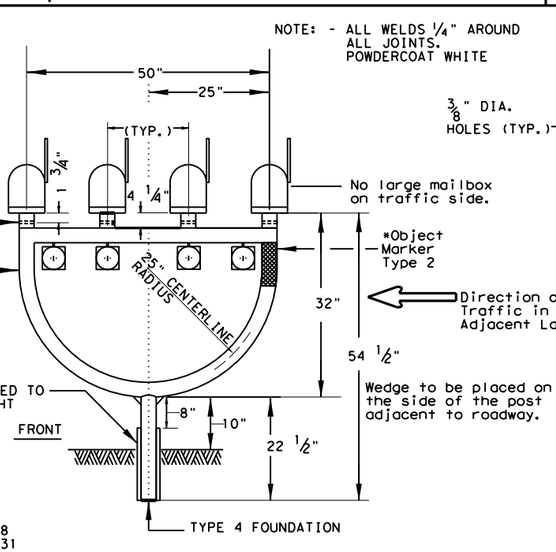


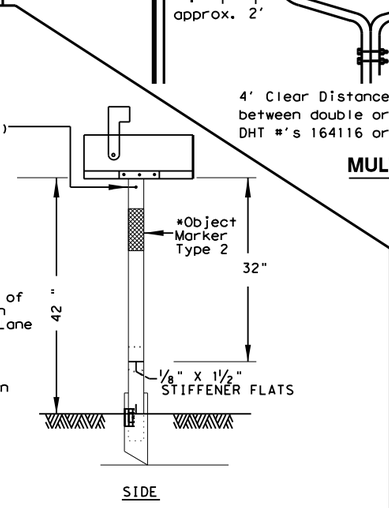
Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

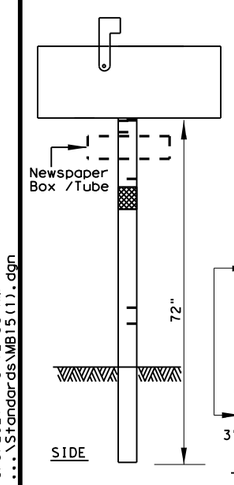
SINGLE & DOUBLE MAILBOX PLACEMENT

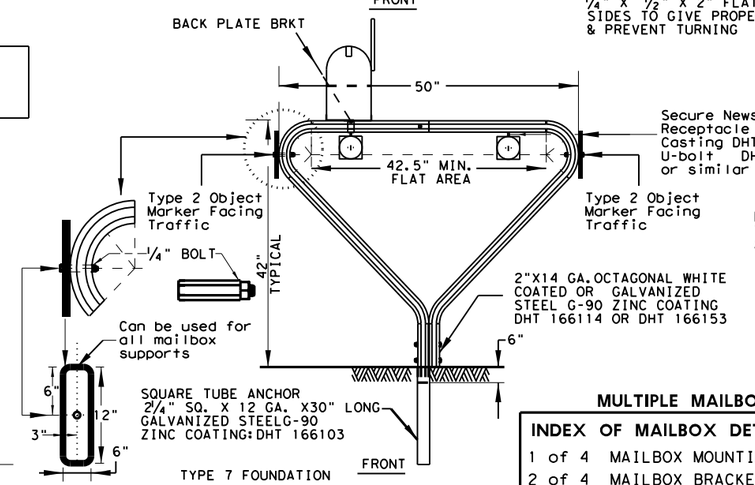












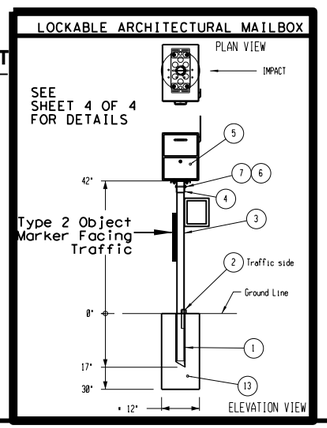
DOUBLE AND MULTIPLE MAILBOX MOUNT

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

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.



MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

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	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		140

6/3/2021 9:12:36 AM
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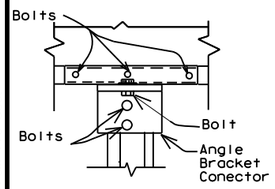
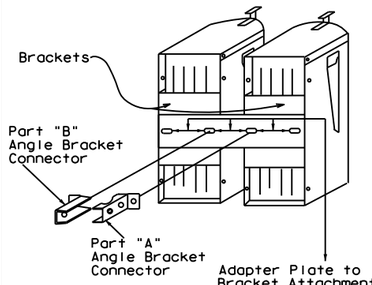


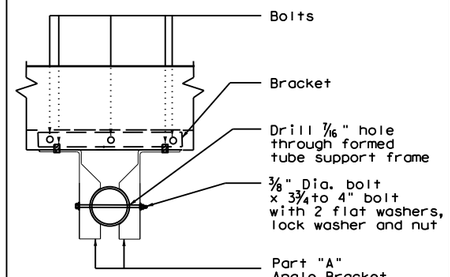
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

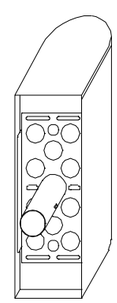


(Not permitted for Large Mailboxes)

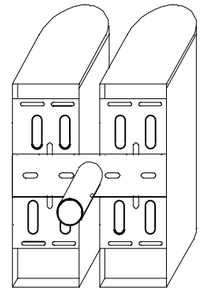
DOUBLE MAILBOX



MULTIPLE MAILBOX



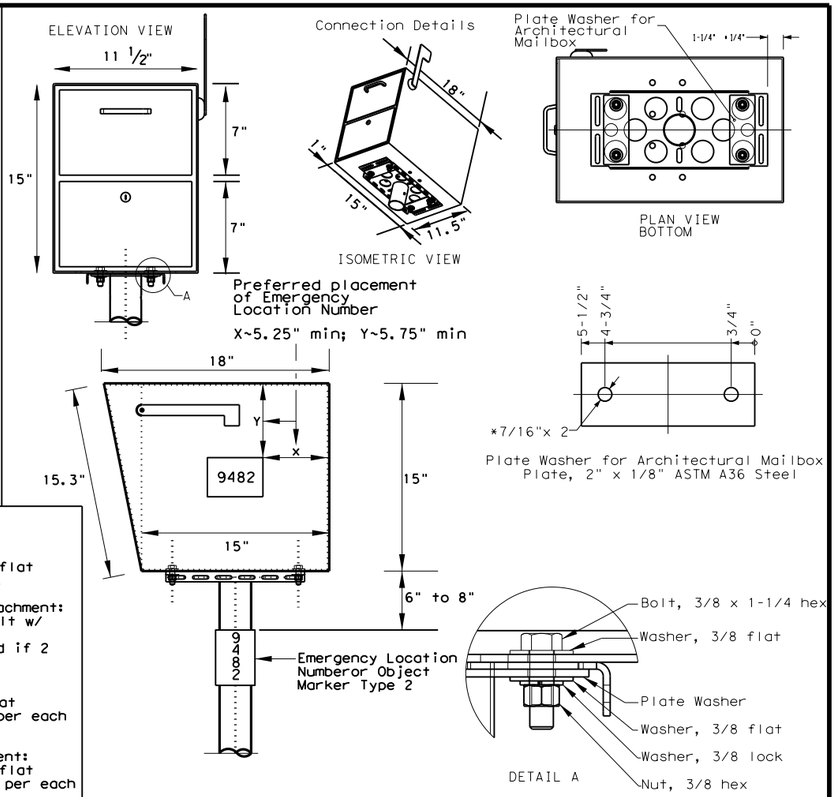
To be used with 2⅜" OD RR or thinwall Steel posts.



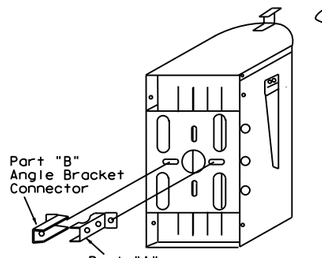
To be used with thinwall Steel posts. Not to be used with RR posts.

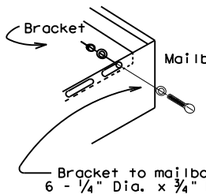
WELDED SINGLE MAILBOXBRACKET

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS



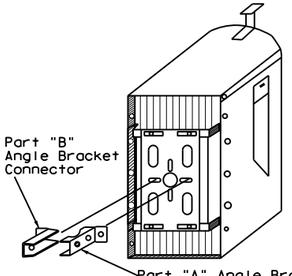


Bracket to mailbox attachment: 6 - ¼" Dia. x ¾" bolt w/ 2 flat washers and nut per each bolt.

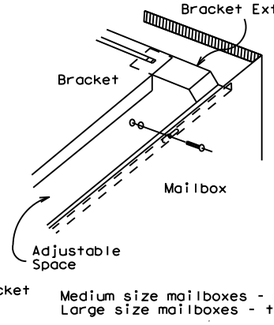
Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to 2 - ⅜" Dia. x 2½" 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 - ¼" Dia. x ¾" bolt w/2 flat washers and nut per each bolt.

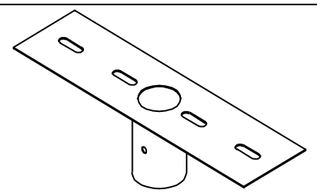
Bracket to bracket extension attachment: 2 - ¼" Dia. x ¾" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt w/2 flat washers, lock washer and nut per each bolt.

Angle to mailbox support attachment: 2 - ⅜" Dia. x 2½" bolt w/2 flat washers, lock washer, and nut per each bolt.

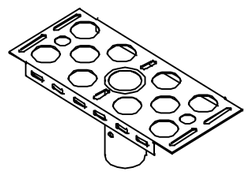
Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES



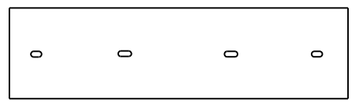
DHT 162323

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



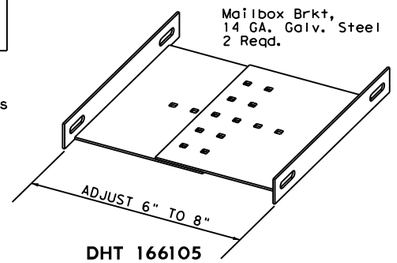
DHT 161443

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

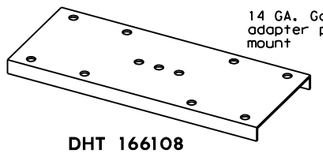


DHT #3789

Used for mounting two Mailboxes on the same post.



DHT 166105

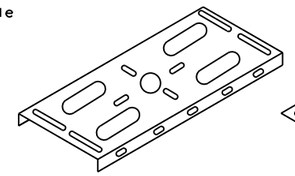


14 GA. Galv. Steel adapter plate for double mount

DHT 166108

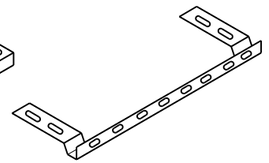
HARDWARE AT TXDOT REGIONAL WAREHOUSES

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



DHT 148939

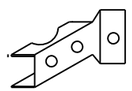
Mailbox Bracket



DHT 148938

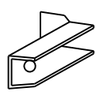
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



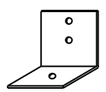
DHT 159489

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.

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.

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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	1077	01	026		FM 434		
	DIST	COUNTY			SHEET NO.		
	WACO	FALLS			141		

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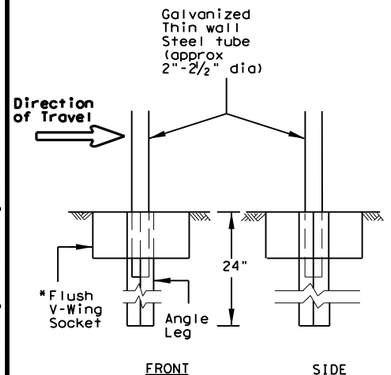
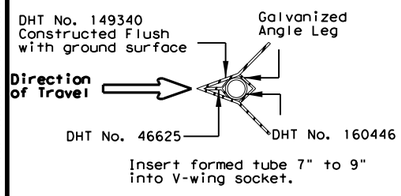
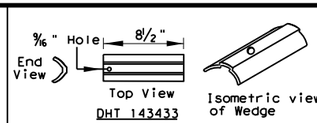




Insert formed tube 7" to 9" into V-wing socket.

TYPE 1 SUPPORT/FOUNDATION

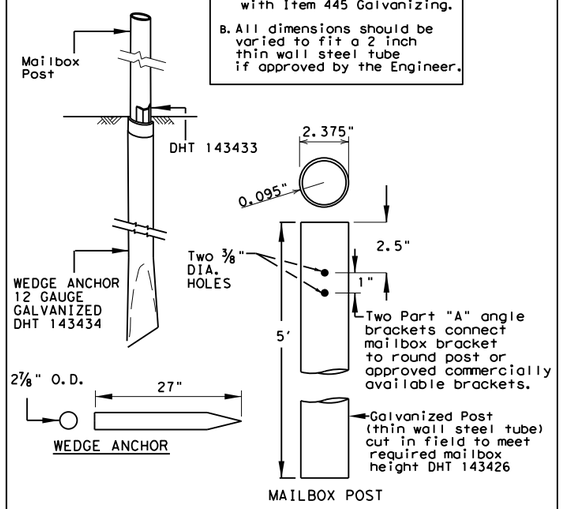
THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



NOTES FOR TYPE 2 SUPPORT/FOUNDATION

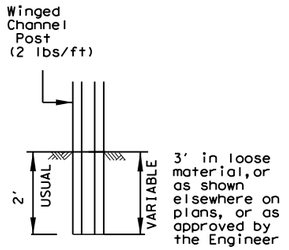
A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

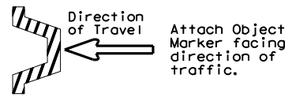
B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.



TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



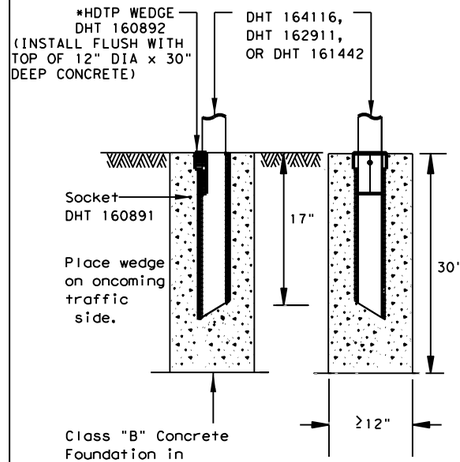


DHT No. 4289 to ASTM A 1011 SS GRADE 50, STEEL.

TYPE 3 SUPPORT/FOUNDATION

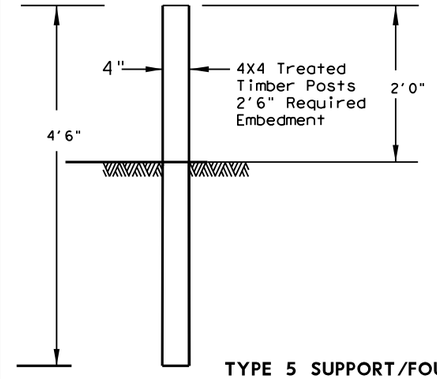
WINGED CHANNEL POST

Note on DHT Number
See Table of Applicable DHT Numbers on this sheet 4 for DHT description.



TYPE 4 SUPPORT/FOUNDATION

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

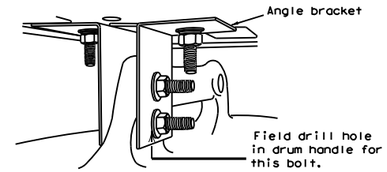


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

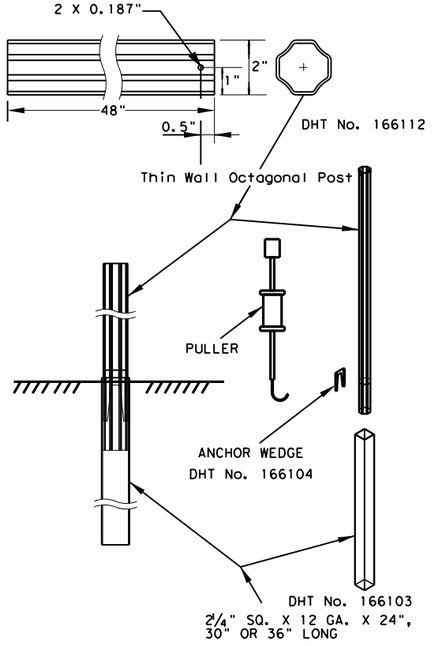
Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



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



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

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.

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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	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		142

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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

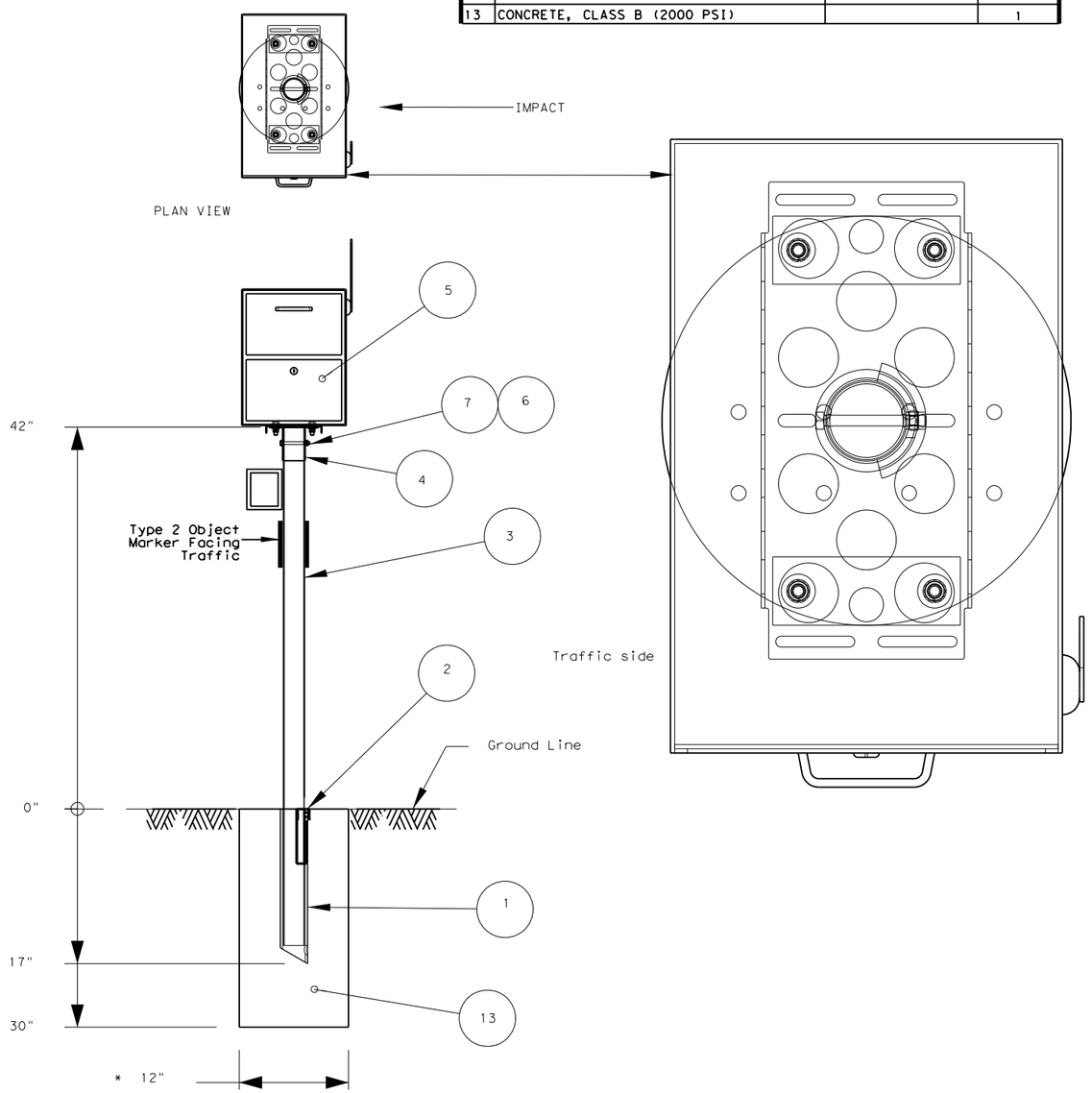

TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
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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SHEET 4 OF 4

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
REVISIONS	1077	01	026	FM 434
	DIST	COUNTY		SHEET NO.
	WACO	FALLS		143

DATE:
FILE:

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. Project will disturb more than 5 acres, 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. Station 31+75
2. Station 118+25
3.
4.
5.
6.
7.
8.

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. SEE STATEMENT ABOVE

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. SEE STATEMENT ABOVE

2.

V. PROTECTED SPECIES AND HABITAT

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Migratory Bird Treaty Act (MBTA)
2. Plains Spotted Skunk: Contractors will be advised of potential occurence in the project area, and to avoid harming the species if encountered, and to avoed unnecessary impacts to dens
3.
4.
5. SEE STATEMENT BELOW

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.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	09	FALLS		144
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				

SITE DESCRIPTION

PROJECT LIMITS:

From: McLennan County Line To: CR 4039

LOCATION MAPS:

Refer to the Title Sheet for project location map

PROJECT DESCRIPTION:

CSJ 1077-01-026 :

For the construction of hazard elimination & safety consisting of improve guardrail to design standards, safety trt fixed obj, profile edgeline markings, and additional paved surface width

MAJOR SOIL DISTURBING ACTIVITIES:

The major soil disturbing activities for this project will consist of culvert extenstions, culvert replacements, driveway pipe, saftey treat fixed objects, and roadway widening

TOTAL PROJECT AREA:	45.56 AC
TOTAL AREA TO BE DISTURBED:	8.79 AC

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 1077-01-026 :

Predominate soil type is sandy loam.
Vegetative cover is in average condition with 80% coverage.

NAME OF RECEIVING WATERS:

CSJ 1077-01-026 :

Bullhide Creek receives drainage from this project and Branches of the Brazos River which ultimately drains into the Brazos River within stream segment 1225.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- [x] TEMPORARY SEEDING
- [x] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [x] SOIL RETENTION BLANKET
- [x] NATURAL BARRIERS OR BUFFER ZONES
- [x] PRESERVATION OF NATURAL RESOURCES

OTHER: TXR 150000, Part III, Section G, 2 Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Temporary stabilization must be completed no more than 14 calendar days after initiation of soil stabilization measures, and final stabilization must be achieved prior to termination of permit coverage.

STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, As Applicable)

- [T] SILT FENCES
- [ ] HAY BALES
- [T] SANDBAG OR 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
- [P] STONE OUTLET STRUCTURES
- [ ] CURBS AND GUTTERS
- [ ] STORM SEWERS
- [ ] VELOCITY CONTROL DEVICES

OTHER:

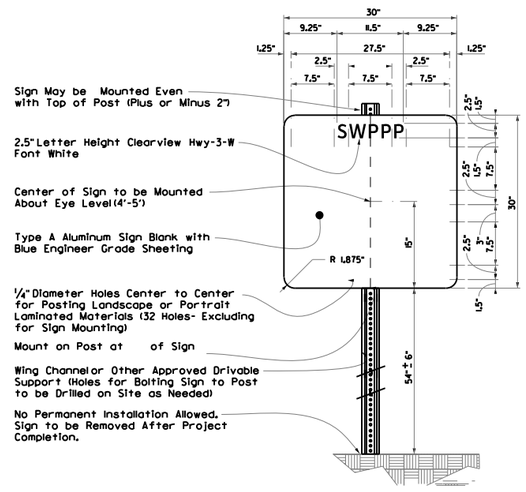
NARRATIVE-SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

The order of activities will be as follows:
1. Preserve existing vegetative cover as much as possible.
2. Install temporary sediment control fencing, rock berms and other items as shown on plans prior to any soil disturbing activities.
3. Remove existing bridge, construct proposed culvert and roadway and perform any necessary excavation, embankment and grading.
4. Place soil retention blankets and temporary/permanent seeding as shown in the plans and as directed by the engineer.

STORM WATER MANAGEMENT:

An integral part of the SWPPP for this project includes the EPIC Sheet, Item 506, Waco District Waters of the US Notes, Waco District Typical Applications for Best Management Practices, Form 2118 TxDOT inspection forms, Contractor daily inspection forms, miscellaneous general notes on environmental requirements, TxDOT EC Standards, 2014 Standard Specifications, TxDOT roadway design drawings, SWPPP design and working BMP drawings, Site Manager Data Base, EMS Stage Gate Inspections and the Waco District environmental folders. The requirements of the TxDOT EMS will be fully implemented including training requirements for Contractors and TxDOT staff.

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:

All erosion and sediment best management practices (BMPs) will be maintained in good working order per the environmental notes, details and standards included as part of the project plans and contract documents. BMP repairs will be made at the earliest possible date, but no later than seven calendar days after the inspection report has been completed and immediately after the ground has dried sufficiently to allow equipment access. BMPs damaged by the Contractor will be repaired or replaced immediately. The installation and repair of BMPs at creeks and outfalls will be given priority.

INSPECTION:

TxDOT Form 2118 inspections to support TXR150000 and 404 permits will be conducted on a seven day interval on the same day of the week, until permits are terminated. The Contractor will provide daily BMP inspection reports on work days. Stage Gate Inspections and other BMP inspections will be conducted by the District and Area Office Staff based on requirements of the TxDOT Environmental Management System (EMS).

WASTE MATERIALS:

Any waste materials generated during construction will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up will be done in accordance with federal, state, and local regulations. The Contractor will maintain a list of all chemicals and wastes required for the project; including chemicals used by sub-contractors, and will implement written spill prevention and clean-up plans.

SANITARY WASTE:

Sanitary waste from portable units will be collected by a licensed sanitary waste management contractor.

OFF SITE VEHICLE TRACKING:

- [x] HAUL ROADS DAMPENED FOR DUST CONTROL
- [x] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [x] EXCESS DIRT ON ROAD REMOVED DAILY
- [x] STABILIZED CONSTRUCTION ENTRANCE

REMARKS:

Disposal areas, stockpiles, and haul roads will be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas will not be located in any wetland, waterbody or streambed. Construction staging area and vehicle maintenance area will be constructed by the contractor in a manner to minimize the runoff pollutants.

Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end will be subsidiary to Item 506.

SEDIMENTATION BASINS:

Since the area disturbed is less than 10 acres, per outfall location, a sedimentation basin is not required.

STATE OF TEXAS
BRIAN W. LAMB
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LICENSED
PROFESSIONAL ENGINEER

P.E. 6-4-2021

SIGNATURE OF REGISTRANT & DATE

WACO DISTRICT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	CONT	SECT	JOB	HIGHWAY
6	TEXAS	1077	01	026	FM 434
		DIST	COUNTY		SHEET NO.
SCALE:		WACO	FALLS		145

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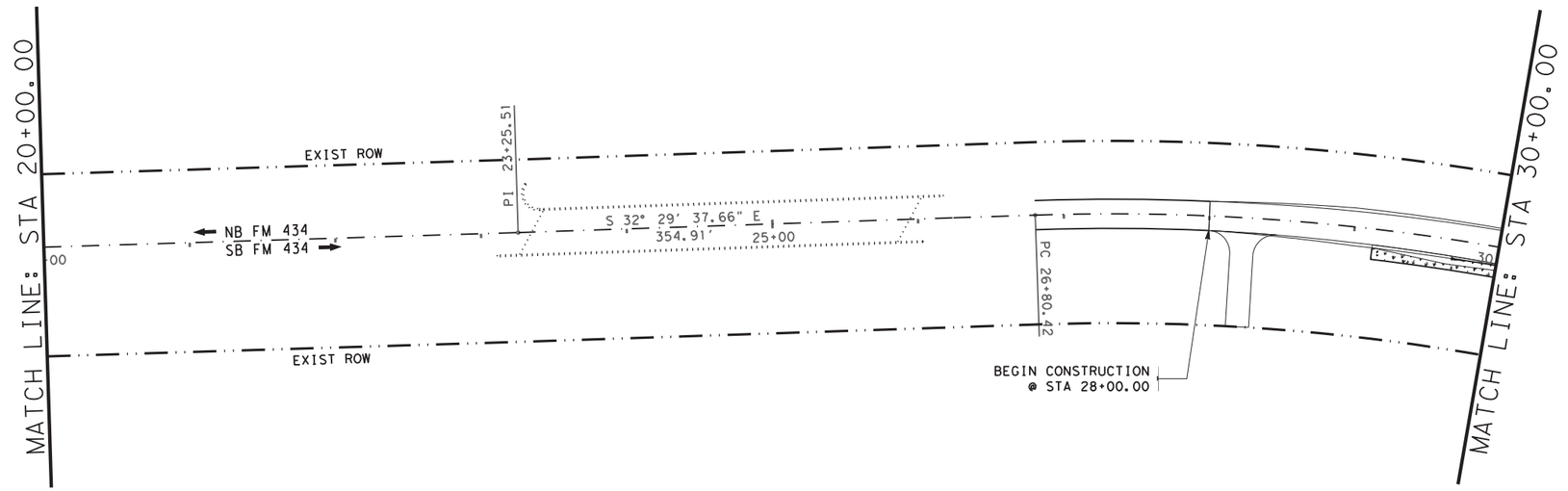
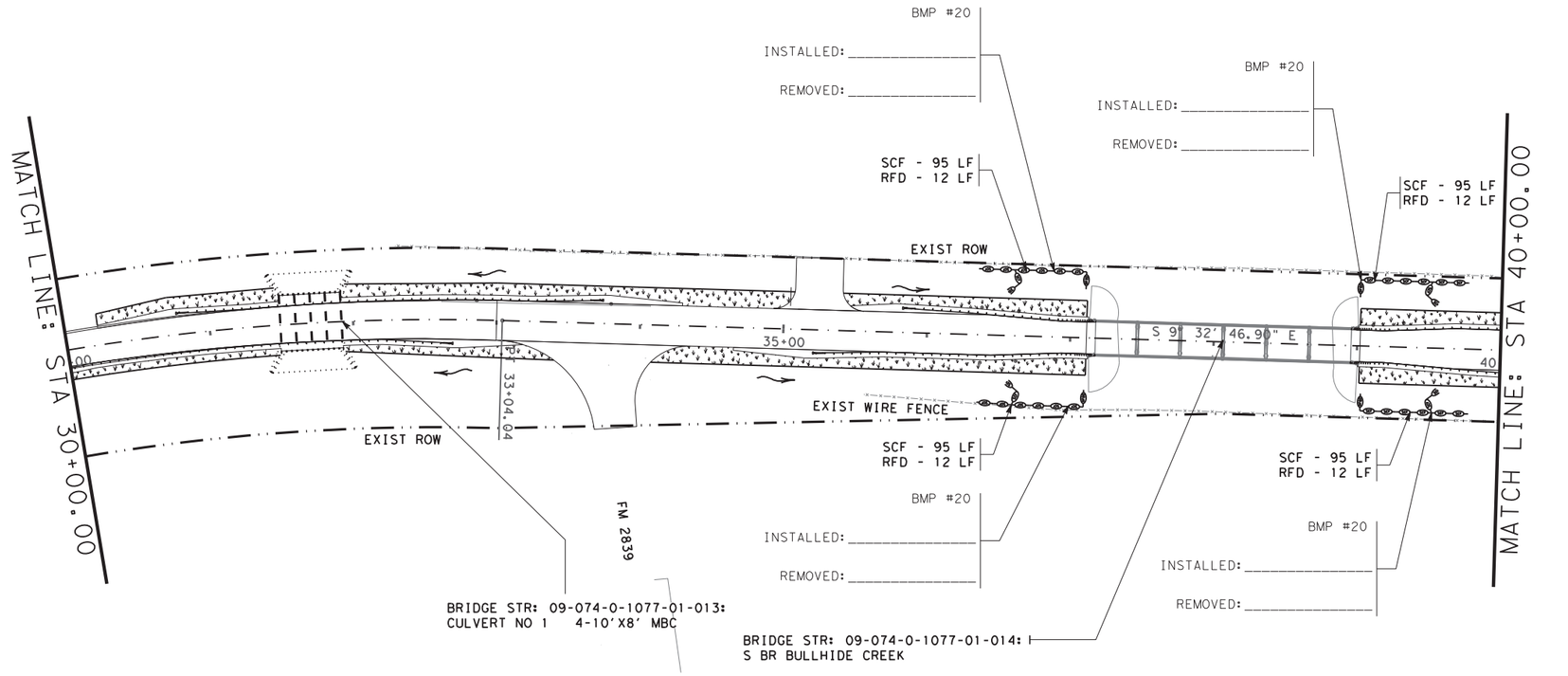
6/4/2021
...\Plan Sheets\SW3P.dgn
NODE





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	1340
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	1340
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	1340
168 6001	VEGETATIVE WATERING	MG	14.5
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	48
506 6011	ROCK FILTER DAMS (REMOVE)	LF	48
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	380
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	380

STATE OF TEXAS
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P.E. 5/19/2021

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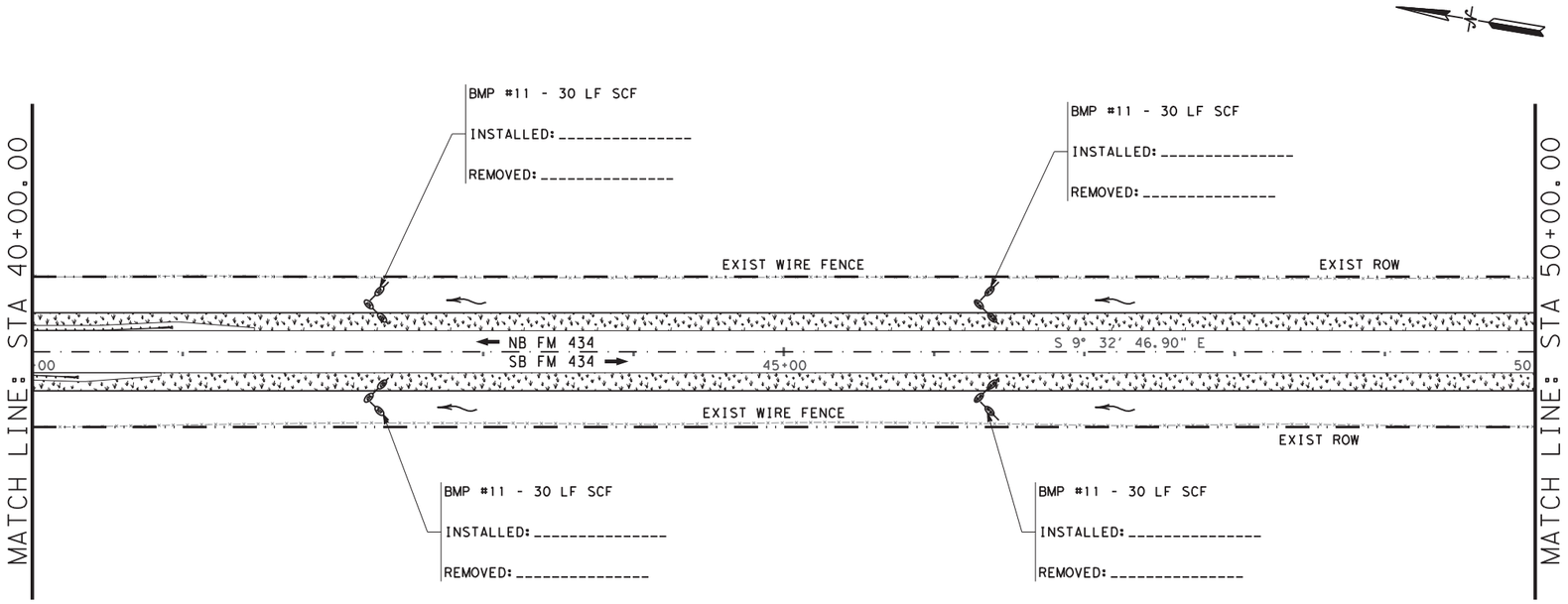
EROSION CONTROL LAYOUT

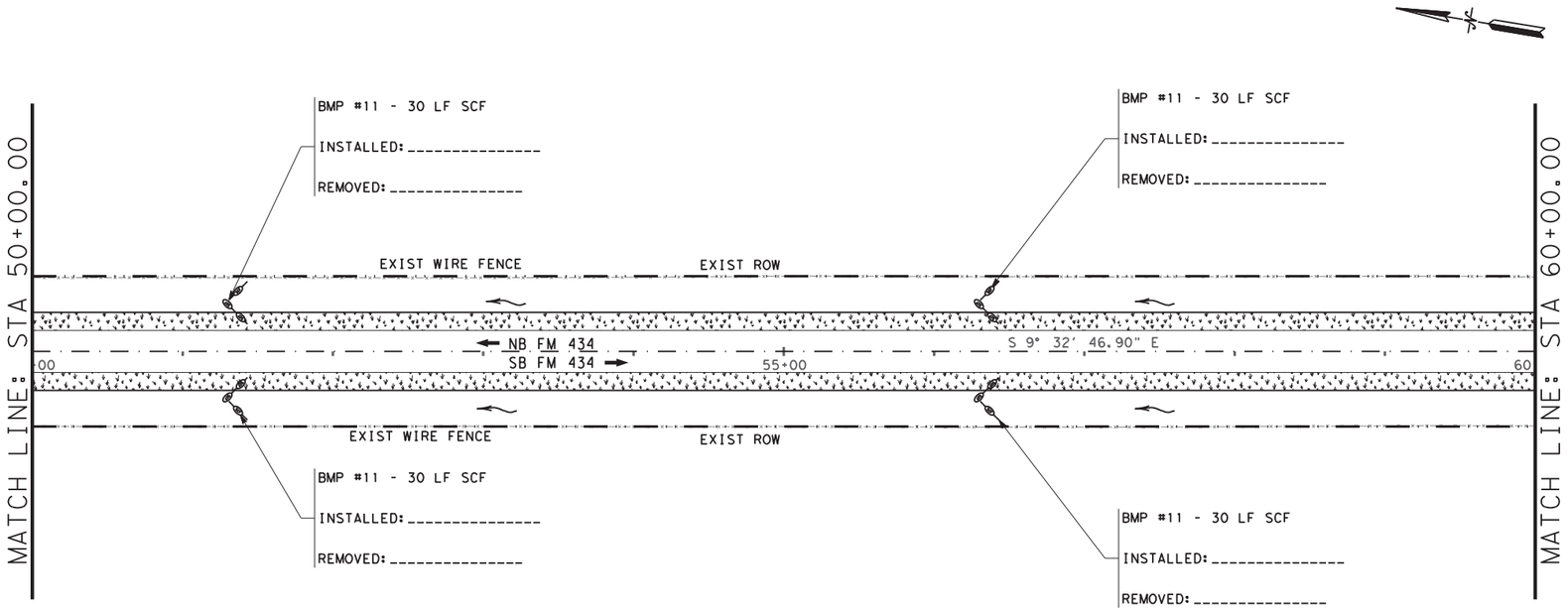
STA 20+00.00 TO STA 40+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 1 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		146





TOPSOIL AND SEEDING

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5176
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5176
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5176
168 6001	VEGETATIVE WATERING	MG	56
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	200
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	760
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	760

STATE OF TEXAS
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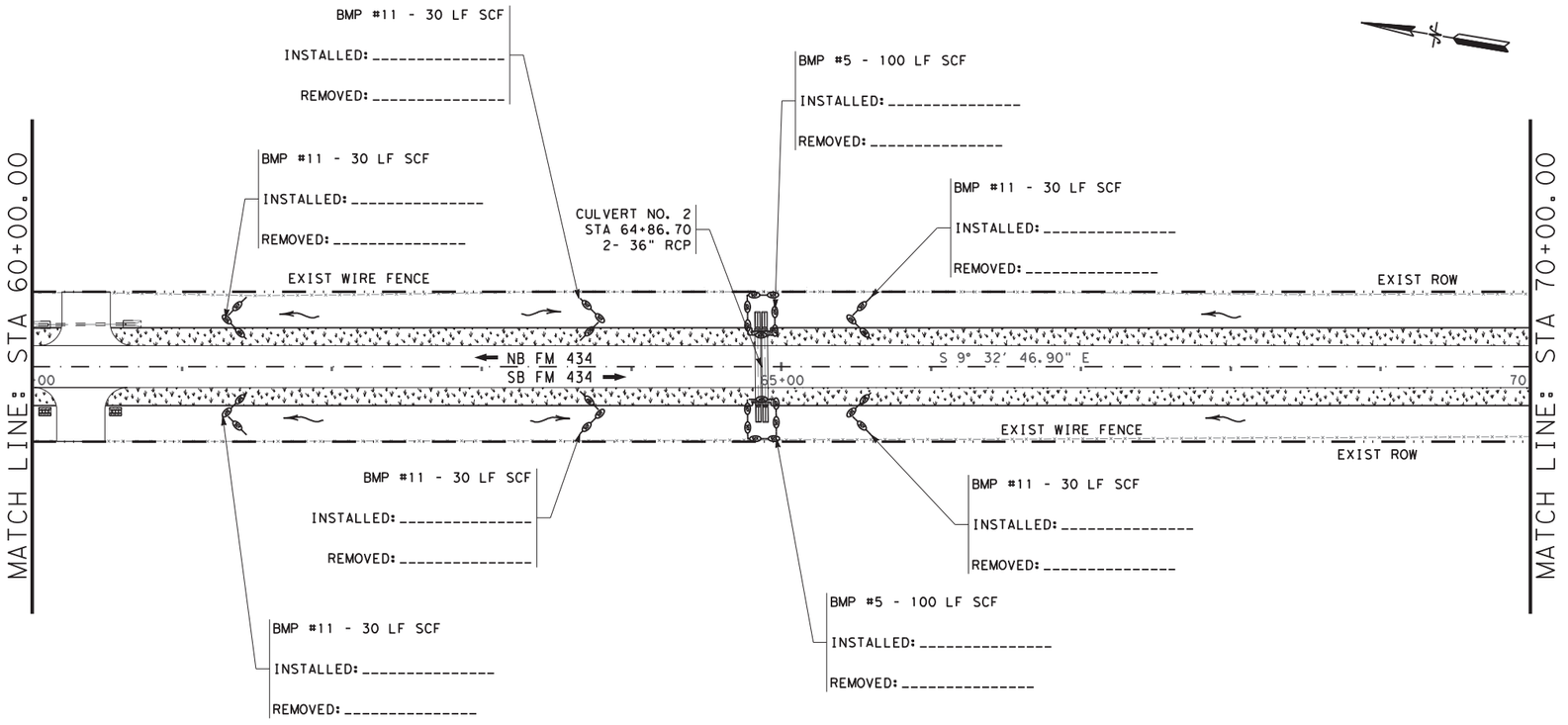
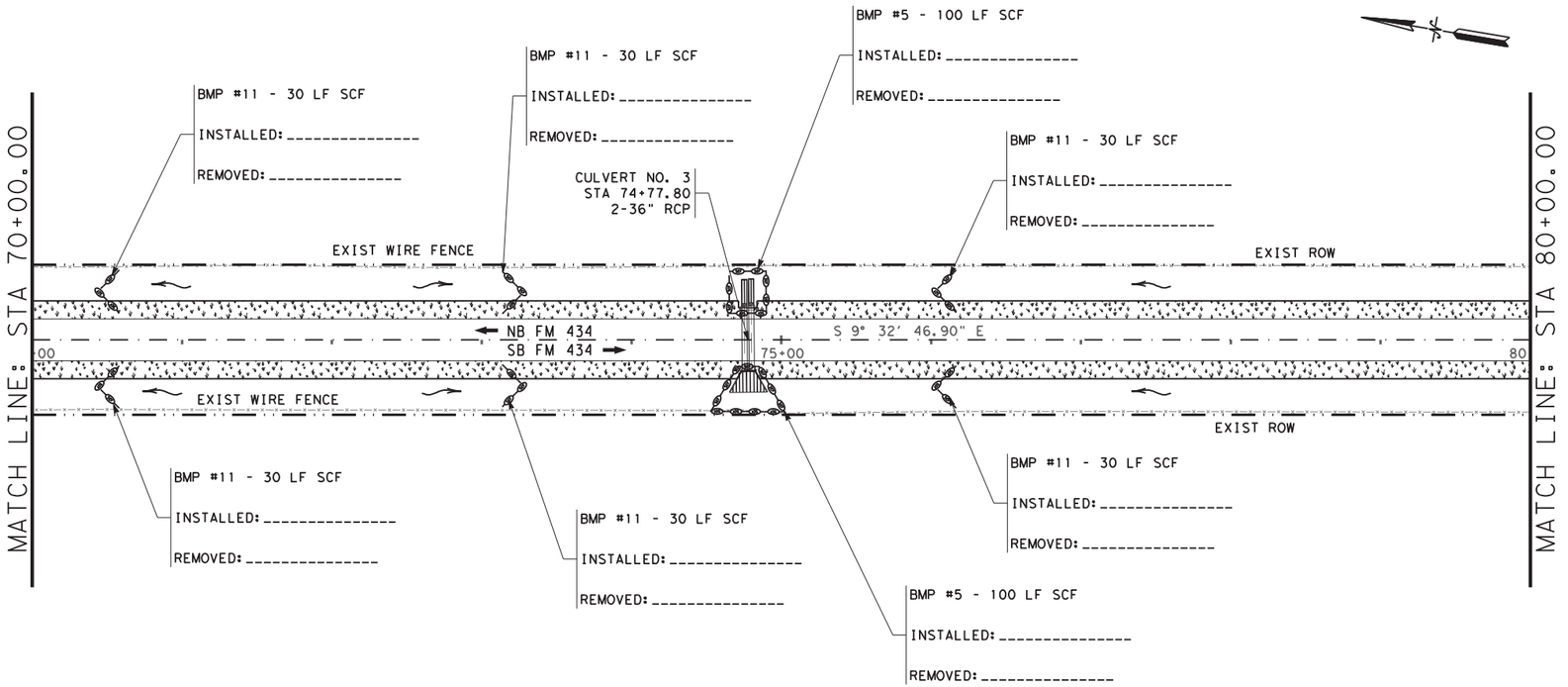
EROSION CONTROL LAYOUT

STA 40+00.0 TO STA 60+00.00

SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		147





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE
2. INSTALL SOIL RETENTION BLANKETS AT CULVERTS AS DIRECTED.

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5176
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5176
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5176
168 6001	VEGETATIVE WATERING	MG	56
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	200
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	760
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	760

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EROSION CONTROL LAYOUT

STA 60+00.00 TO STA 80+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 3 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		148

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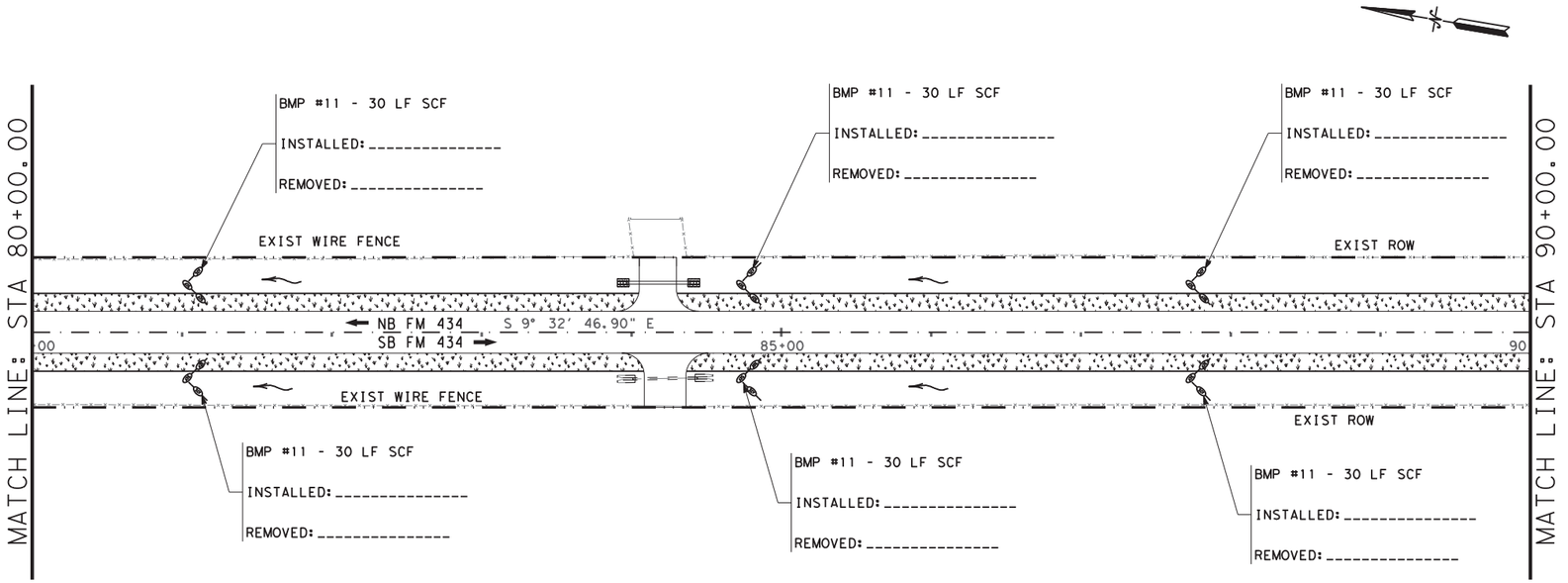
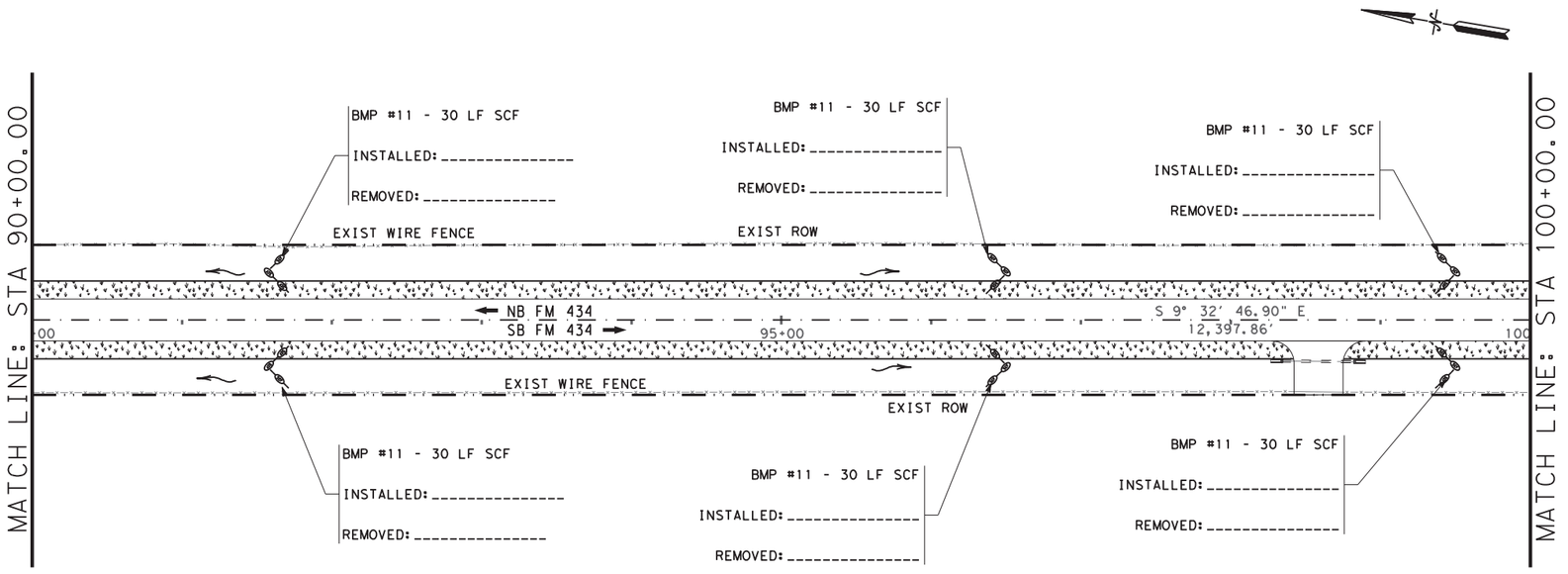
NODE

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE





TOPSOIL AND SEEDING

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5188
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5188
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5188
168 6001	VEGETATIVE WATERING	MG	56.2
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	360
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	360

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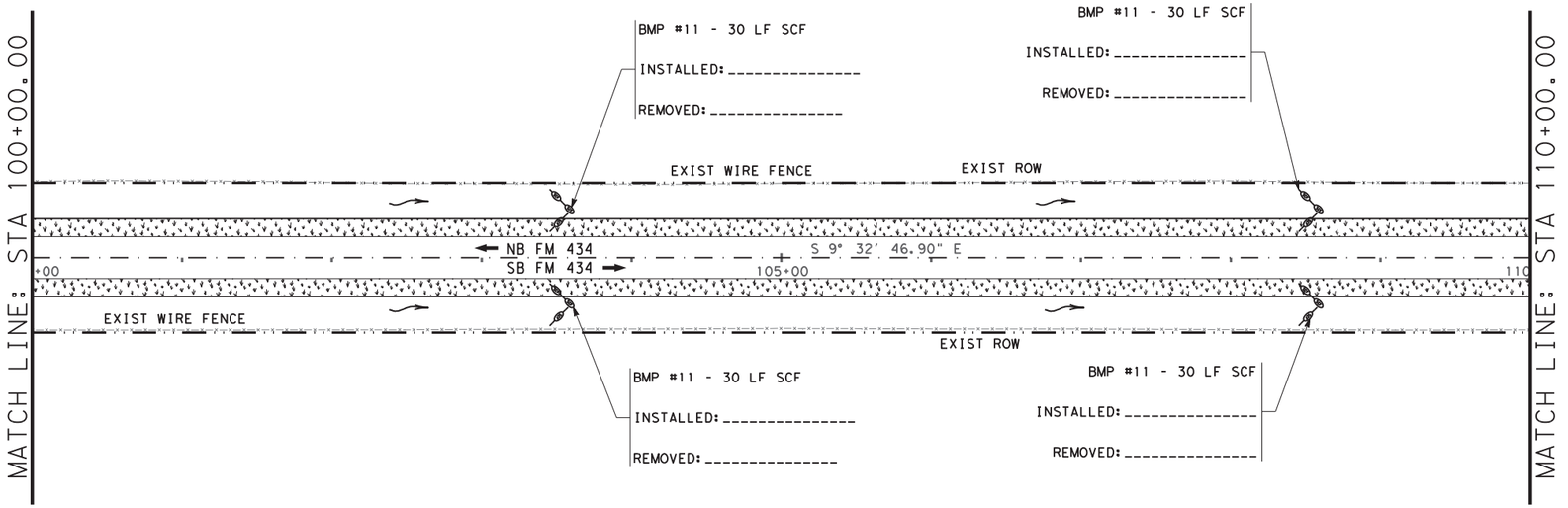
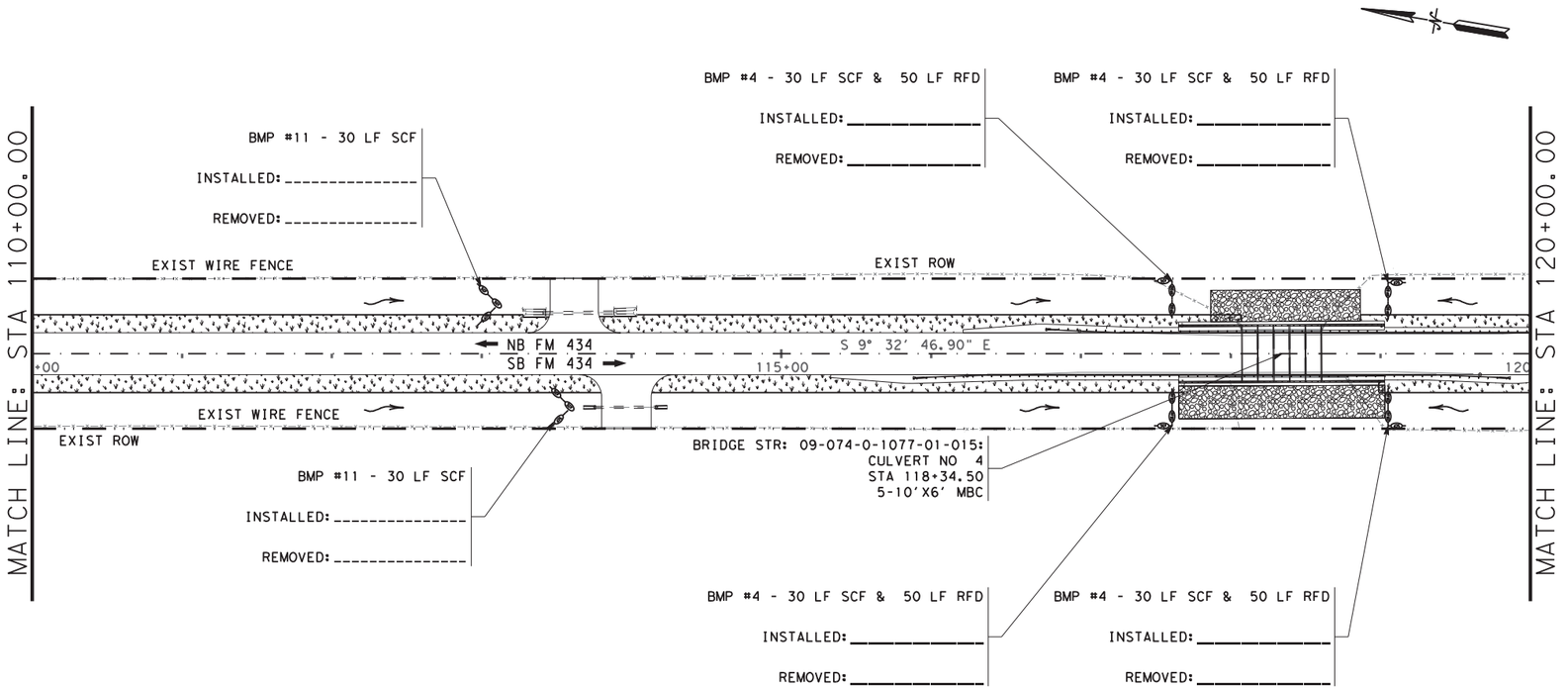
EROSION CONTROL LAYOUT

STA 80+00.00 TO STA 100+00.00

SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		149





NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE
2. INSTALL SOIL RETENTION BLANKETS AT CULVERTS AS DIRECTED.

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	4635
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	4635
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	4635
168 6001	VEGETATIVE WATERING	MG	50.2
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	300
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	100
506 6011	ROCK FILTER DAMS (REMOVE)	LF	100
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	240
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	240

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EROSION CONTROL LAYOUT

STA 100+00.00 TO STA 120+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 5 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		150

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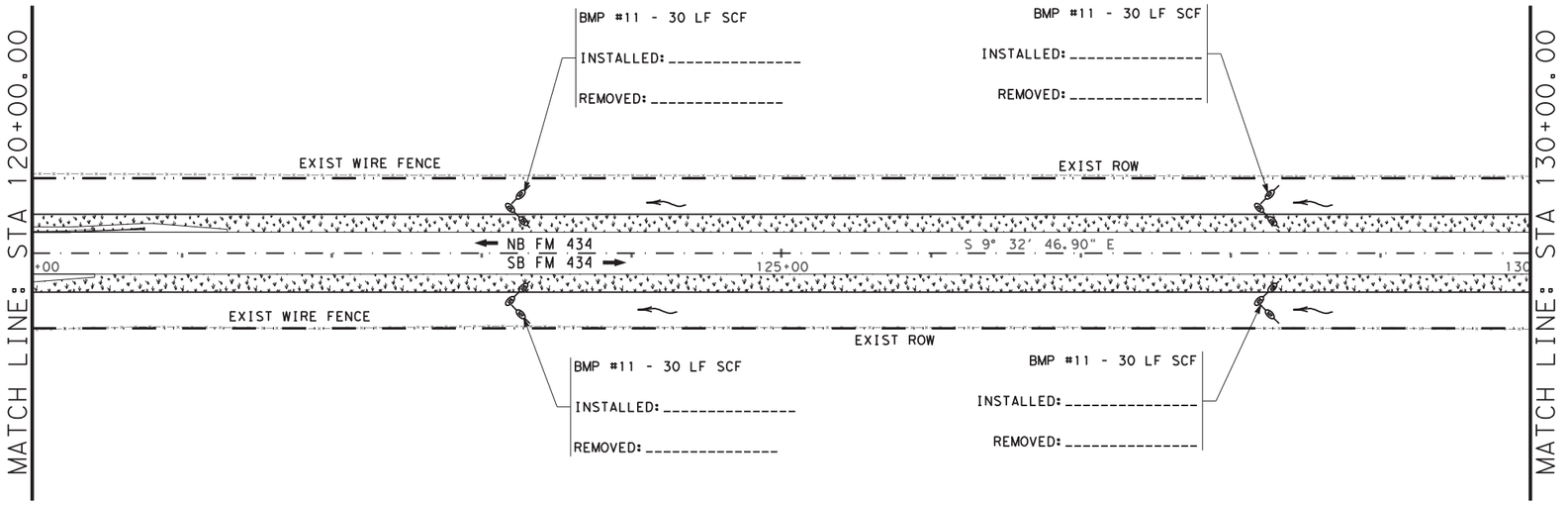

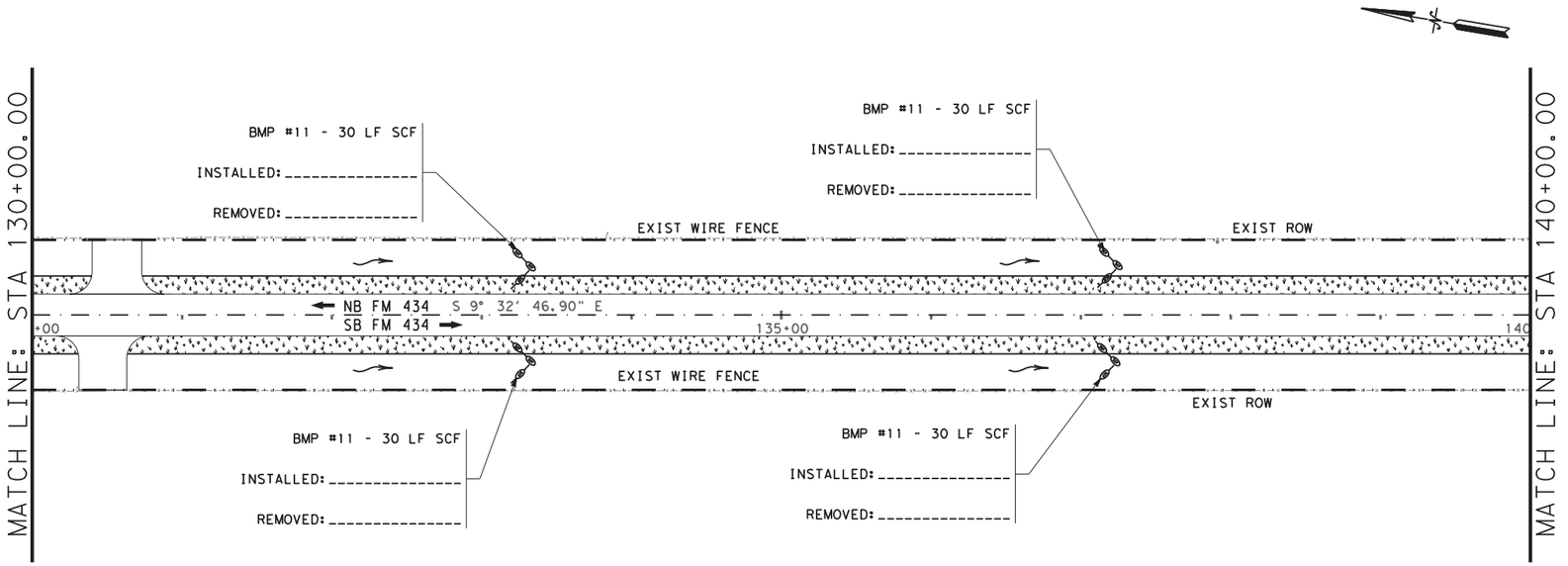

TOPSOIL AND SEEDING

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5149
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5149
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5149
168 6001	VEGETATIVE WATERING	MG	55.7
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	240
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	240

STATE OF TEXAS
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P.E. 5/19/2021

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EROSION CONTROL LAYOUT

STA 120+00.00 TO STA 140+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 6 OF 9

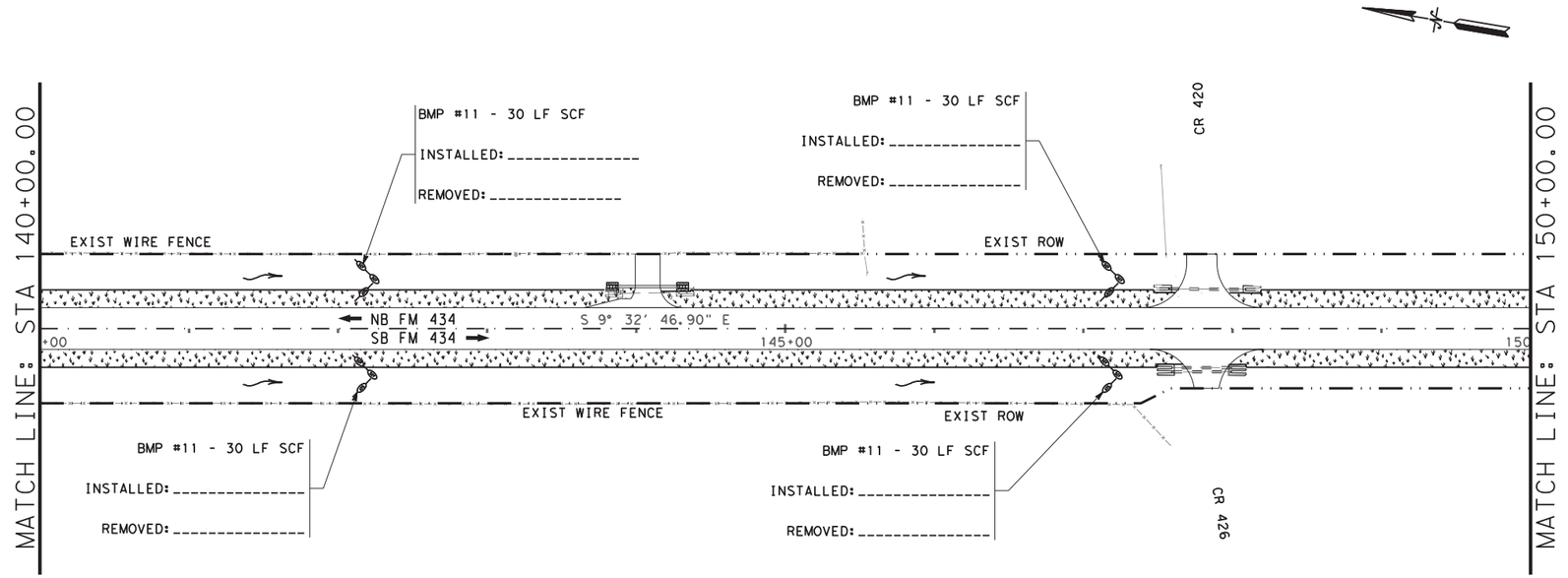
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		151

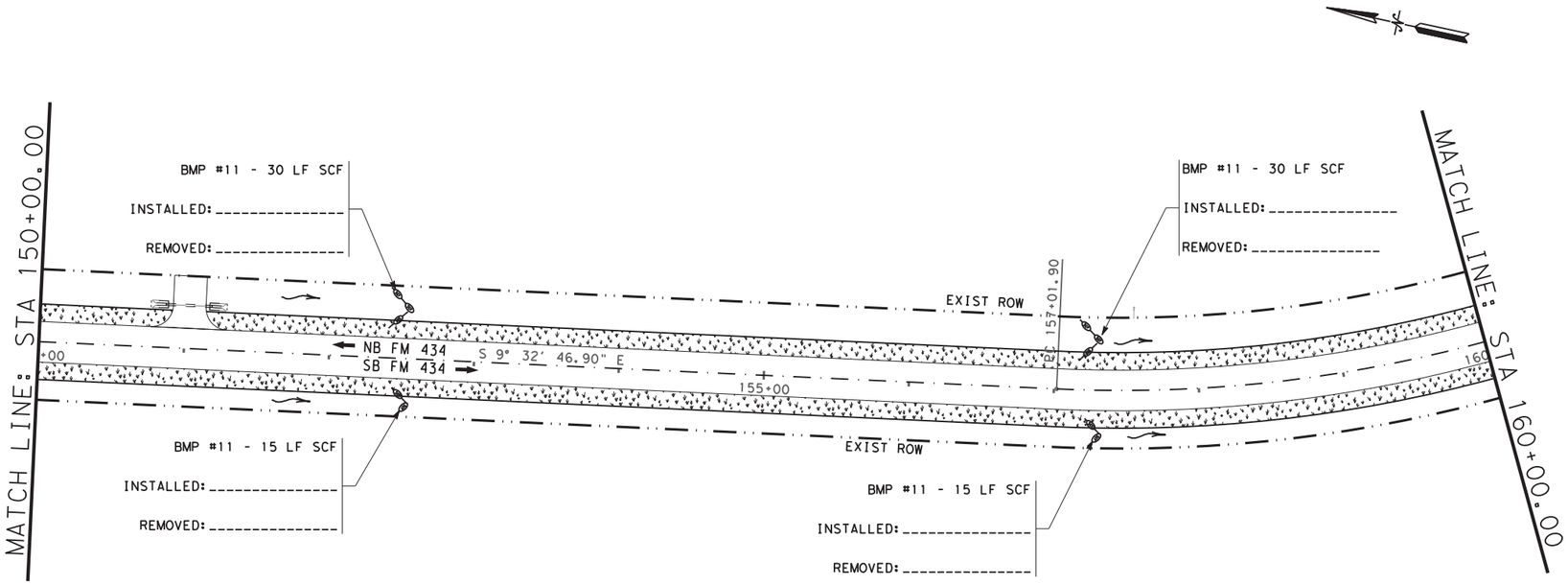
...\EROSION CONTROL LAYOUT.dgn

NODE

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE





160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5113
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5113
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5113
168 6001	VEGETATIVE WATERING	MG	55.4
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	210
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	210

STATE OF TEXAS
BRIAN W. LAMB
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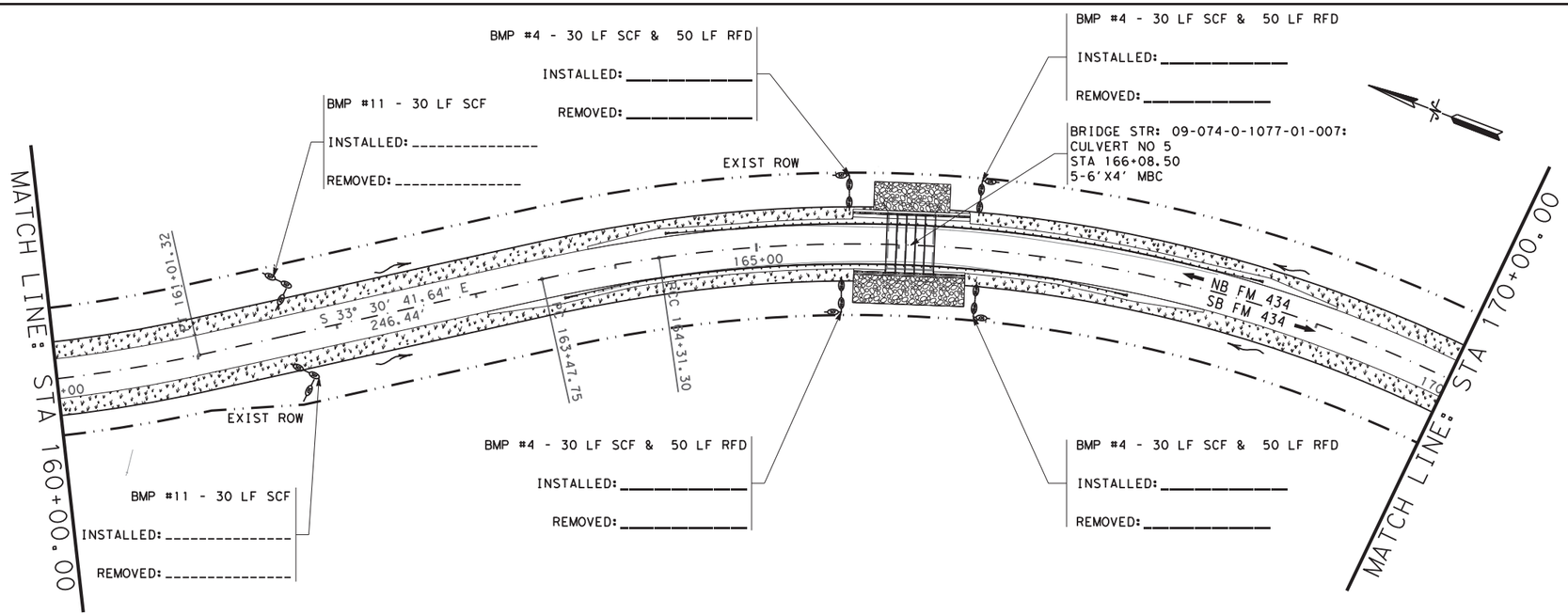
P.E. 5/19/2021
SIGNATURE OF REGISTRANT & DATE

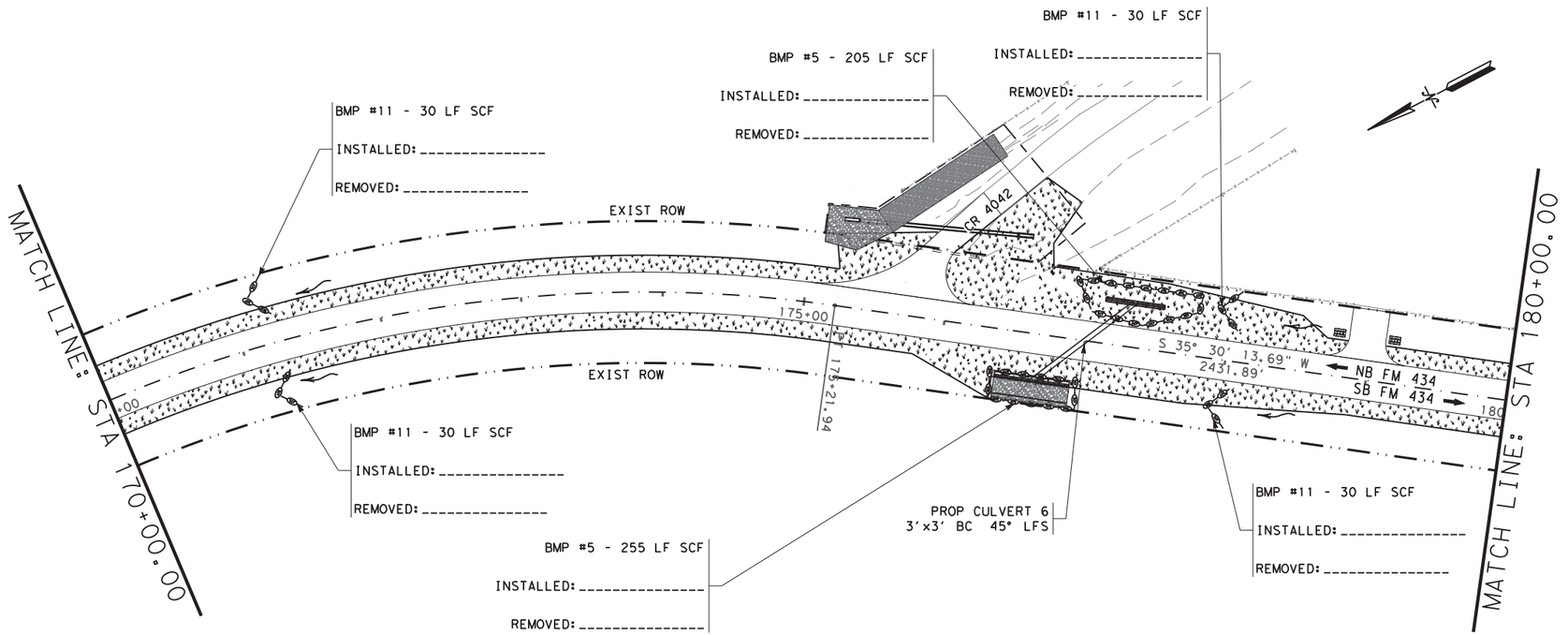
EROSION CONTROL LAYOUT

STA 140+00.00 TO STA 160+00.00

SCALE: 1" = 100' HORIZ. FEET

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		152





TOPSOIL AND SEEDING

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE
2. INSTALL SOIL RETENTION BLANKETS AT CULVERTS AS DIRECTED.

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5826
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	5826
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	5826
168 6001	VEGETATIVE WATERING	MG	63.1
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	100
506 6011	ROCK FILTER DAMS (REMOVE)	LF	100
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	760
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	760

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

EROSION CONTROL LAYOUT

STA 160+00.00 TO STA 180+00.00

SCALE: 1" = 100' HORIZ. FEET

SHEET 8 OF 9

CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		153

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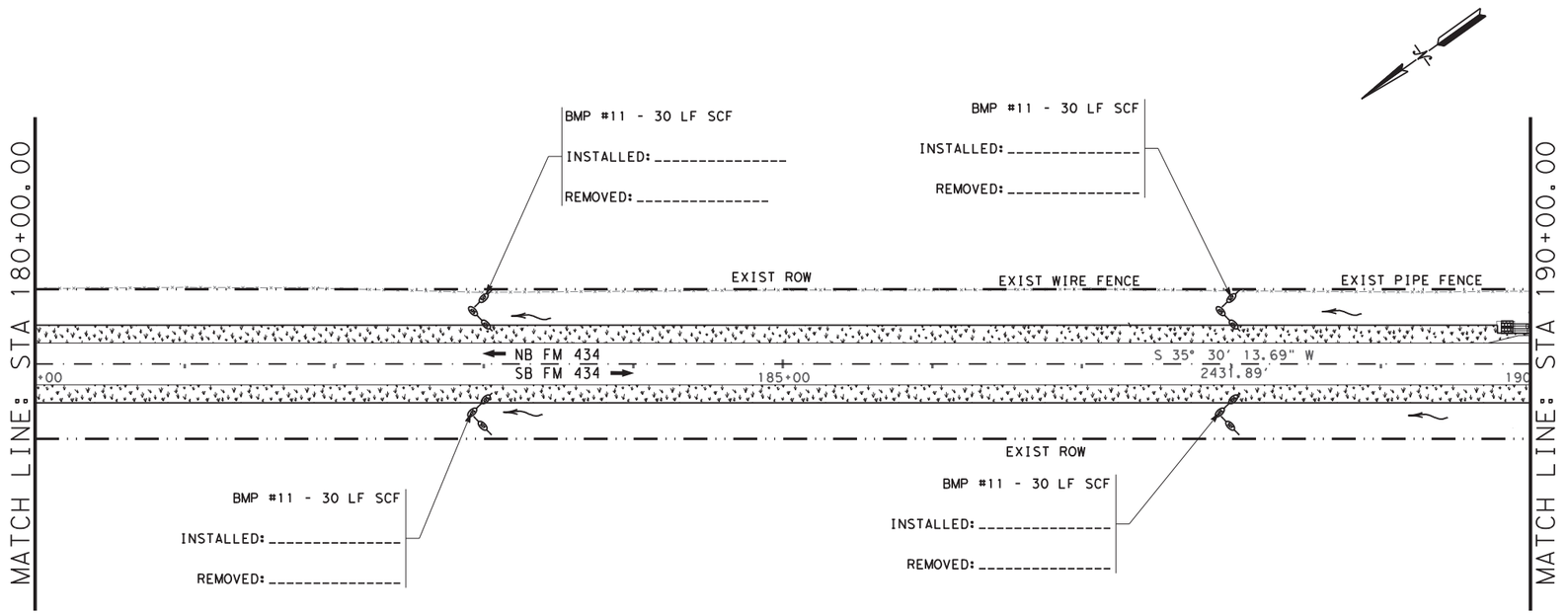
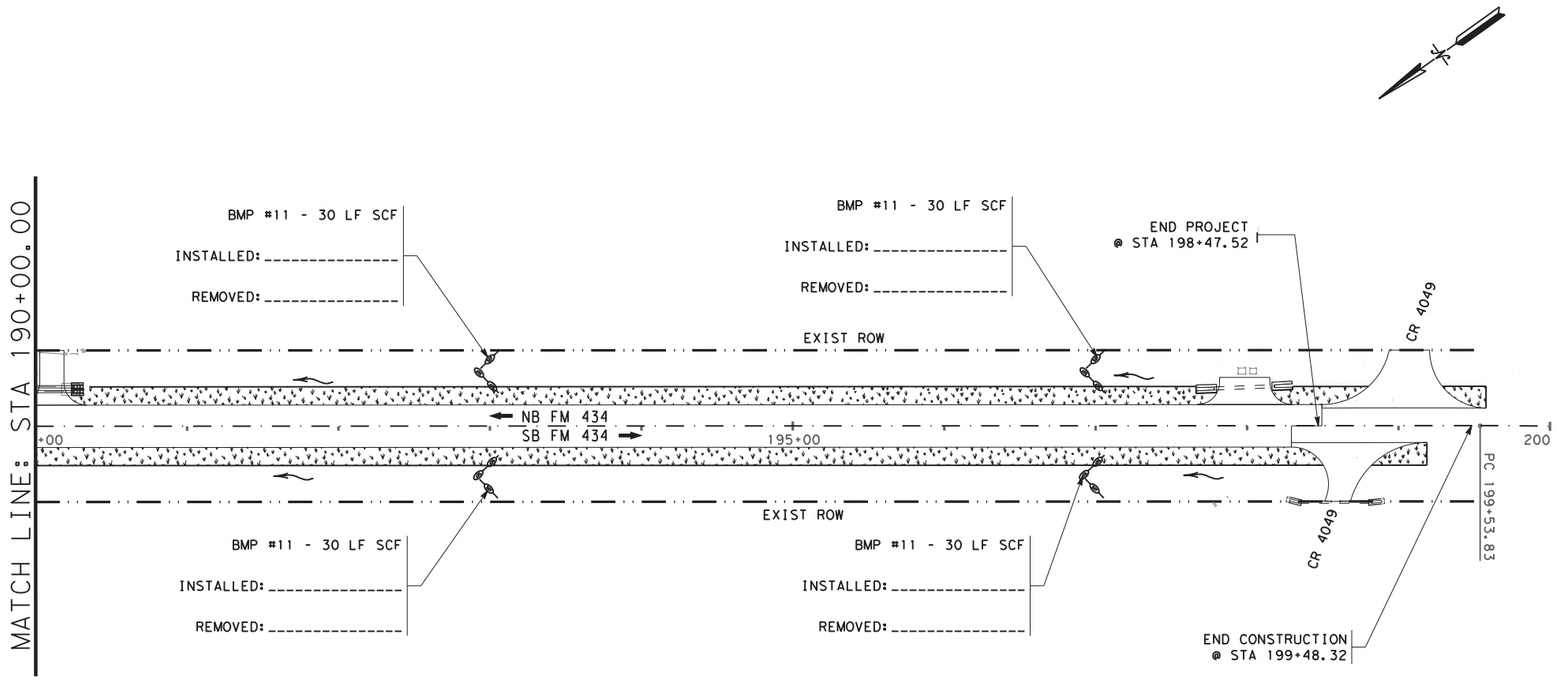




TOPSOIL AND SEEDING

NOTES:

1. ALL DITCH BLOCKS TO REMAIN IN PLACE
2. INSTALL SOIL RETENTION BLANKETS AT CULVERTS AS DIRECTED.

160 6003	FURNISHING AND PLACING TOPSOIL (4")	SY	4897
164 6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	4897
164 6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	4897
168 6001	VEGETATIVE WATERING	MG	53
169 6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	
506 6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	
506 6011	ROCK FILTER DAMS (REMOVE)	LF	
506 6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	240
506 6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	240

STATE OF TEXAS
BRIAN W. LAMB
103617
LICENSED
PROFESSIONAL ENGINEER

P.E. 5/19/2021

SIGNATURE OF REGISTRANT & DATE

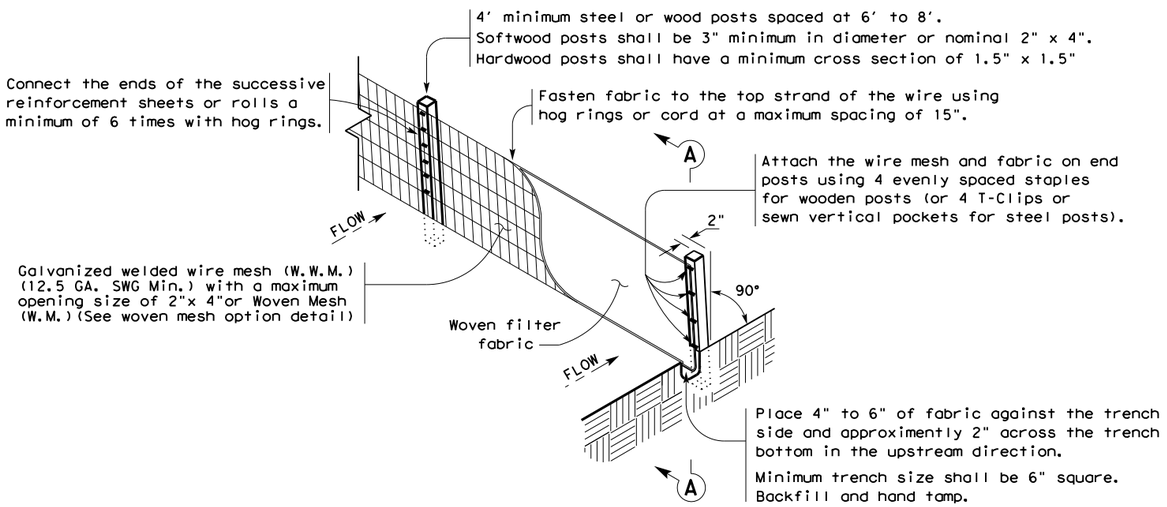
EROSION CONTROL LAYOUT

STA 180+00.00 TO STA 200+00.00

SCALE: 1" = 100' HORIZ. FEET

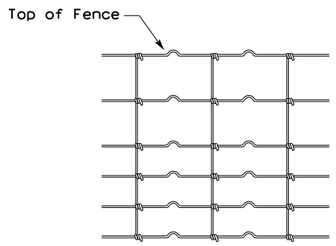
SHEET 9 OF 9

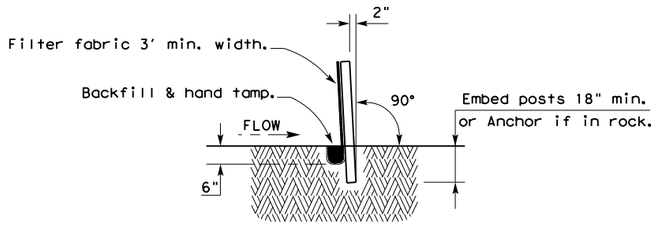
CHANGE ORDER	FED. RD. DIV. NO.	CONT	SECT	JOB	HIGHWAY
	6	1077	01	026	FM 434
	STATE	DIST	COUNTY		SHEET NO.
	TEXAS	WACO	FALLS		154



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

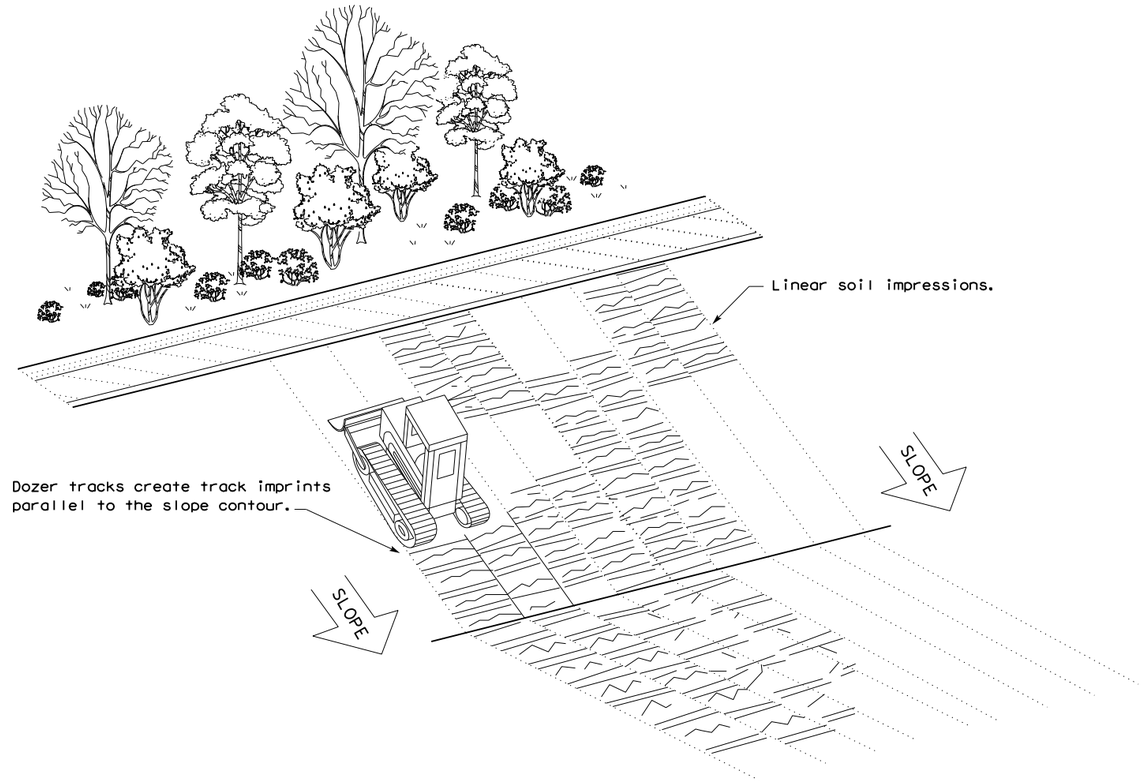
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1077	01	026		FM 434	
	DIST	COUNTY			SHEET NO.	
	WACO	FALLS			155	

6/8/2021
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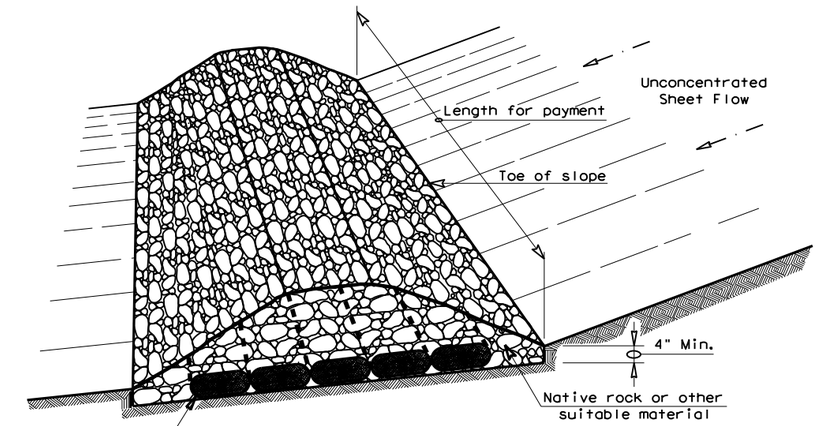
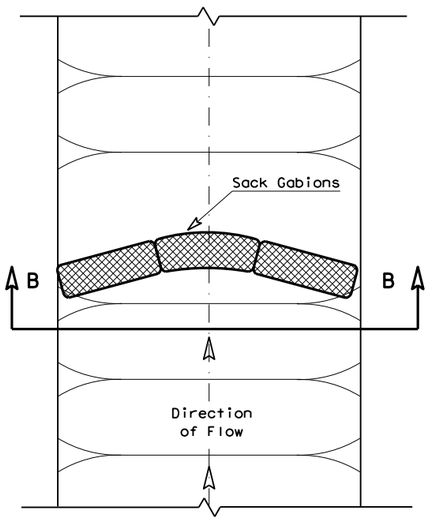
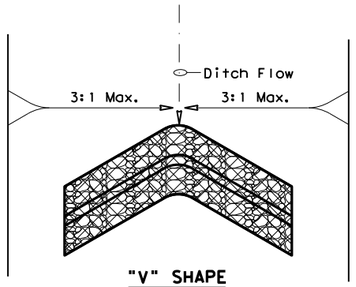


FILTER DAM AT TOE OF SLOPE

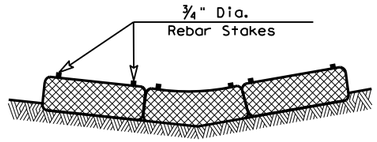
RFD1



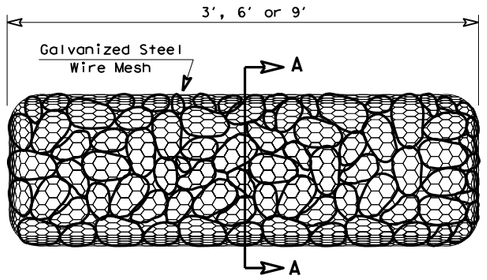
PLAN VIEW



"V" SHAPE
PLAN VIEW

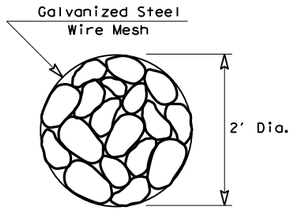


SECTION B-B

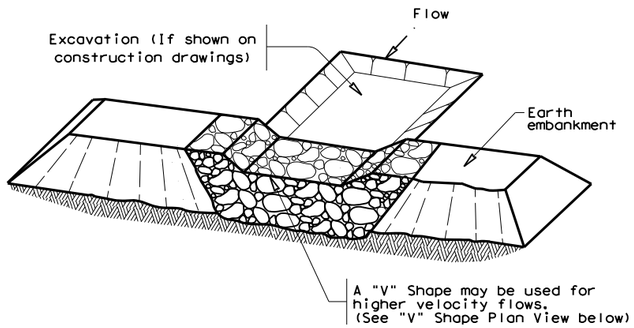


TYPE 4 (SACK GABIONS)

RFD4

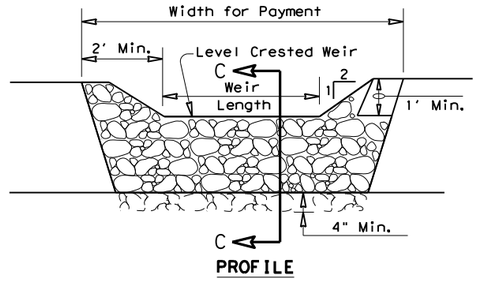


SECTION A-A

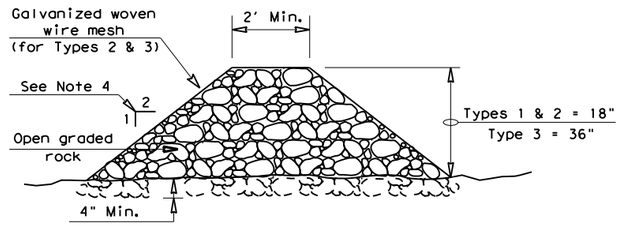


FILTER DAM AT SEDIMENT TRAP

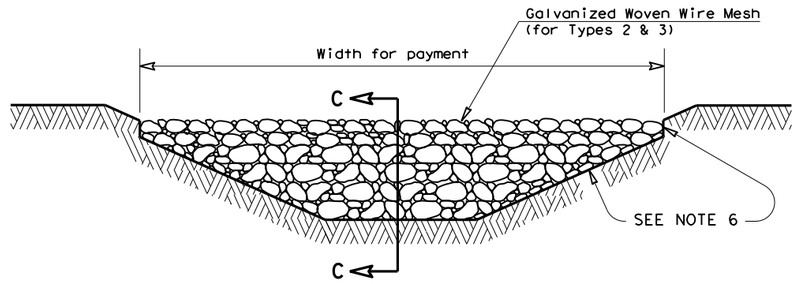
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

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.

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.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS		
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1077	01	026		FM 434	
	DIST	COUNTY			SHEET NO.	
	WACO	FALLS			156	

DATE: 6/3/2021
FILE: ...\Standards\ec216.dgn

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

1. Prior to TxDOT allowing the Contractor to start construction, the Contractor will provide the required storm water and 404 permit documentation and support activities, including but not limited to the following:

   - Provide a list of all chemicals, construction and waste products that will be generated, stored or brought upon TxDOT ROW. The list includes expected construction debris, sanitary wastes, construction chemicals and petroleum products used or generated by the Contractor and sub-contractors. Along with the list, the Contractor will supply a spill prevention plan and clean up procedures that will include each of these chemical products or generated waste.

   - Provide in the construction schedule the necessary line items that will comply with the schedule and planning requirements of the storm water permit.

   - Post the TxDOT storm water permit and any Contractor permits, per permit requirements.

   - Provide copies of storm water permits for Contractor PSL(s). As new PSL(s) may be obtained for the project, provide copies of new or amended permits to TxDOT. The Contractor will not disturb soil without the proper permits.

   - Provide scale drawings of off ROW PSL's within one mile of the project, for field offices, borrow sources, plant sites or other uses.

   - Provide permit information on any Contractor batch plants or concrete crushing plants to be located at a Contractor PSL(s) within one mile of the project limits or boundaries. Copies of the air and water permits are to be provided to TxDOT before materials will be used on the project. No asphalt or concrete batch plants or concrete crushing plants will be located on TxDOT ROW.

   - Provide a letter indicating a Contractor Responsible Person for environmental compliance (CRP) for the project, and maintain a CRP throughout the project duration.

   - Provide all environmental documentation including certification of compliance and EMS training documents/certificates prior to starting work. The Contractor is to provide daily BMP inspection reports that document all field BMPs needing repair or replacement. The Contractor is to clearly document specific BMPs needing repair and location each work day. The Contractor is encouraged to be proactive in fixing BMPs without TxDOT direction.

   - Provide documentation required for Waters of the US, Note #3 and submittals for Item 496 bridge removal. Bridge removal methods submitted will follow all Waters of the US note requirements. The Contractor is not to start construction within the Ordinary High Water Marks of any stream until receiving approval for stream channel construction methods from TxDOT.

   - Provide a written procedure for managing all chemicals and construction items placed in vertical containment structures. Also, provide methods to be used for the treatment, disposal, collection or release of storm water.

   - Provide an estimated date by letter, for the submittal of marked up bridge drawings, indicating cut locations for any structural steel requiring cutting or torching of steel, coated with lead containing paints.

2. Place and maintain trash cans and portable sanitary facilities at locations where there is active construction. Worker generated trash and construction debris will be kept from being transported by storm water and will be collected daily from the ground and routinely hauled from the work area.

3. Contractor will provide TxDOT copies of all correspondence with MS4s, TCEQ, EPA, DSHS and Corps of Engineers regarding activities on this project.

4. Contractor to conduct storm water inspections and develop SWPPP documents to support Contractor permits obtained for the project including PSL(s).

5. Contractor will maintain written documentation of locations of all portable sanitary facilities. The Contractor is required to document the location and disposition of all spills and cleanups from portable sanitary facilities.

6. Contractor will not store chemicals on TxDOT ROW, unless chemicals are stored following all environmental and safety regulations. Fuels for construction equipment will not be stored on TxDOT ROW.

7. The Contractor will store fuels and bulk chemicals on Contractor PSL(s) using a secondary containment method, such as double lined tanks and/or free standing containment reservoirs made of plastic or steel designed to hold bulk chemicals or drums.

8. The Contractor will not remove sediment controls without the prior approval of TxDOT, except for a sediment control that may back up water and cause safety or traffic problems.

SCALE = NTS SHEET 1 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILE: BMPLAYOUTS.dgn	DN:		CK:	DW:	CK:
© TxDOT 2009	CONT	SECT	JOB		HIGHWAY
REVISIONS	1077	01	026		FM 434
DEC 2013 FEB 2015	DIST	COUNTY			SHEET NO.
	WACO	FALLS			157

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

9. Any sediment controls removed by the Contractor must be re-installed before the next rainfall event or by the end of day, as approved in advance.

10. Vegetative buffer strips may be used in place of temporary sediment controls such as silt fences and rock filter dams. The amount of disturbed soil area will be limited to 1/3 of an acre or less for a minimum of 50 feet of grassed ditch and 2/3 of an acre of disturbed soil for a minimum of 100 feet of grassed ditch.

11. Construction equipment found to be leaking oil, fuel or coolant will be immediately stopped, the leaking fluid collected and the equipment fixed. Equipment continuing to leak will be removed from the project at no cost to TxDOT. Leaking fluids from equipment will be collected and removed from the project or PSL.

12. Earth berms or mounds typically used to stockpile topsoil and used in place of boundary silt fence will be seeded upon being constructed. Long term use of earth berms or mounds will not be continued without establishing grass on the control.

13. The Contractor will inform TxDOT of new areas where soil will be disturbed to facilitate planning for new sediment controls. Areas of vegetated soil will not be disturbed by the Contractor, unless adequate sediment controls can be installed before the next rainfall event. The Contractor will assist TxDOT in keeping an accurate set of working SWPPP drawings that show the locations of all temporary sediment and erosion controls.

14. The Contractor will maintain an adequate amount of temporary sediment controls on hand at the field office or project staging area for critical SWPPP maintenance, including silt fence (minimum of 200 feet) and rock / fabric for rock filter dams (minimum for 100 feet of Type III dams).

    The requirement for BMP rock quantities on hand is waived for small projects for on and off system bridge installations. The Contractor having a BMP Subcontractor does not eliminate the requirement for the Contractor to have the required silt fence and rock on hand, typically stored at the Contractor PSL.

15. Failure of a sub-contractor to complete storm water work on time will require the Contractor to start storm water sediment control work immediately and complete the work with high priority, or be subject to stop work on the entire project.

16. Earth materials on roads as a result of soil tracking will not be allowed to be transported off ROW in storm water. Soil or rock material found on roadways deposited from Contractor equipment will be removed daily.

17. Unless approved, completed concrete curb inlets will not be blocked by sediment controls. The contractor will frequently sweep the completed or partially completed roadway to keep sediment out of drainage pipes.

18. The Contractor will be responsible for proper dust control and will route construction traffic in a manner that minimizes dust generation.

19. Water for dust control will contain no pollutants, but may be non-potable from upland stock ponds. No quantity of water to be used for construction purposes may be taken from a 404 stream, prior to the proper authorizations or permits being obtained by the Contractor.

20. Contractor is to direct workers and sub-contractors to use portable sanitary facilities provided by the Contractor and not to trespass off ROW.

21. Contractor will provide written verification to TxDOT that earth borrow pits and disposal sources meet environmental and regulatory requirements, prior to use. Excavations will meet all OSHA requirements and the current safety guidelines established for TxDOT Quarries and Pits.

22. Boundary silt fences that are terminated down slope, with one end being at the lowest elevation, will be installed with an L - hook to contain sediment. Boundary silt fences that are installed on flat ground will have L-hooks on both ends.

23. Rock filter dams across ditches will be constructed where the rock filter dam ends are embedded within the ditch side slopes and ditch bottom. The top center elevation of the rock filter dam will be at least 6 inches lower than the elevations on the rock filter dam ends.

24. Silt fence will be constructed in a U or V pattern across ditch lines and up the ditch side slope to keep storm water from flowing around the ends of the silt fence. Small silt fences that do not adequately span the ditch and allows storm water around the end(s) will not be used. Where there is adequate space, large U pattern silt fences are preferred to facilitate sediment collection and sediment removal with equipment.

25. Sediment controls (RFDs or silt fences) will be located along road ditches as marked on the SWPPP drawings. Modifications to the sediment control spacing will be adjusted during the project based on sediment control effectiveness. The installation and maintenance of sediment controls at or near outfalls, where storm water leaves TxDOT ROW, takes persistent over ditch line sediment controls.

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

FILE: BMPLAYOUTS.dgn	DN:	CK:	DW:	CK:
© TxDOT 2009	CONT.	SECT	JOB	HIGHWAY
REVISIONS	1077	01	026	FM 434
DEC 2013	DIST	COUNTY		SHEET NO.
FEB 2015	WACO	FALLS		158

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

26. Storm water draining sheet flow over disturbed soil sloped towards the ROW property line, will be intercepted by a boundary silt fence typically installed with L-shaped ends.

27. For ditch grading and shoulder up work, the Contractor is limited during good weather to remove up to one mile (limited to five acres of disturbed soil) of ditch line sediment controls; on one side of the roadway. Outfall controls cannot be removed during this activity. Ditch line controls must be replaced upon completion of work and before the next rain event.

28. Sediment controls damaged by the Contractor, as defined by permit, must be fixed or replaced immediately upon discovery.

29. Notches in silt fences are not typically allowed. Specific silt fences that back up water onto lanes of traffic may be notched if approved.

30. For silt fence maintenance, the Contractor will leave approximately 4 inches of deposited sediment up stream of silt fences and not over excavate around silt fences or rock filter dams.

31. The Contractor will inform TxDOT of new construction areas and where soil is planned to be disturbed. Sediment controls will be installed at outfalls prior to the Contractor beginning soil disturbing activities up slope from the outfall.

32. Water from concrete saw cutting, concrete grinding and concrete coring activities; or fine materials from concrete chipping and salvage will not be allowed to enter storm drains or enter streams.

33. Storm water containing suspended sediment and turbidity needing to be removed from excavations or low areas will be pumped or gravity drained through vegetated buffer strips (50 foot minimum) or placed in ditches with temporary sediment controls, prior to the water being discharged into a stream.

34. Uncontaminated water from natural groundwater seepage, springs, foundations and drains that does not contain suspended sediment or any pollutants may be discharged without storm water controls.

35. Lime or cement if spilled in ditches or outside the defined limits of application is considered a pollutant and will be excavated and removed the same day, to avoid contaminating streams.

36. If located along the project ROW, RAP stockpiles will be located where there is a minimum 100 feet of vegetative buffer strip before storm water will reach a stream. RAP will not be used as a construction material within the Ordinary High Water Marks of a stream channel of a 404 designated stream.

37. If allowed on the project, concrete truck wash out areas will have adequate volume to allow 12 inch freeboard for rain and will be lined with 6 mils of plastic. No concrete will be stored higher than the 12 inch freeboard. Cleaning of truck chutes and equipment does not constitute concrete truck wash out and this activity may be completed at the concrete placement location. Wash out areas will not be located closer than 50 ft from down slope inlets or stream channels.

38. For outfalls near stock ponds closer than 50 foot from disturbed soil at the ROW line, redundant sediment controls will be provided, typically a combination of rock filter dam and a silt fence constructed in line of the flow.

39. Earth stockpiles will utilize silt fence sediment controls, positioned on the low end of the stockpile drainage area with L-hooks or silt fence installed around the entire stockpile.

40. Sediment controls including rock filter dams and silt fences will not be installed across any 404 streams. Sediment controls at 404 streams will be positioned to limit sediment entering the stream from the banks and around structures/culverts, and will allow free flow of storm water to pass through the ROW without being dammed by any sediment controls. Remove loose materials from stream channels prior to each rain event.

41. Sediment controls for non-404 streams may be constructed across the drainage channel in unlimited locations. It is appropriate to use sediment control details typically used for 404 streams for non-404 streams when flow velocities are high. Remove loose material from stream channels prior to each rain event.

42. Incomplete drainage pipe installation across the roadway does not remove the requirement for having sediment controls around the ends of the pipe. To stay within permit requirements, sediment controls should be installed over and around the terminated end and along each side of the banks as soon as construction on the pipe has been completed. Remove loose material from stream channels prior to each rain event.

43. Safety end / headwall construction temporarily will require the removal of part of the sediment control placed over and around the pipe end. Retain in place as much functioning sediment control as possible. Replace the silt fence over and around the top of the pipe, immediately upon concrete placement and form removal. Do not remove culvert sediment controls that cannot be replaced before the next rain event. Sediment control at the ends of culverts must be in place and available for any rain event until the disturbed soil areas are re-vegetated.

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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	CONT	SECT	JOB		HIGHWAY		
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	DIST	COUNTY			SHEET NO.		
	WACO	FALLS			159		

BEST MANAGEMENT PRACTICE (BMP) GENERAL NOTES

44. Between the Ordinary High Water Marks of a 404 stream channel, the Contractor will disturb only the minimum amount of stream channel that is necessary to complete the work.

45. Rock riprap for erosion control does not replace the requirements to maintain sediment control until vegetation is re-established. Replace sediment controls immediately after installing erosion rock.

46. At the direction of TxDOT, sediment deposited into existing and new culverts will be removed subsidiary to Item 506. Sediment to be removed is either pre-existing material before construction starts or sediment generated as a part of this project.

47. Provide treated 2X4 cross bracing for rectangular inlet silt fence, subsidiary to Item 506.

48. Loose or granular earth materials will not be used to repair silt fence undercuts. Silt fence undercut repairs will be conducted with well compacted soils or the silt fence will be reset in a nearby location.

49. Silt fence steel T posts of approximately 1.25 pounds per foot are allowed at a spacing of 8 feet or less. Silt fence steel T posts between approximately 1.25 pounds per foot and 0.85 pounds per foot are allowed for T post spacing of 5 feet or less.

50. Silt fence to be used to slow the flow of storm water down slopes will be positioned approximately horizontal (on the contour) with L hooks on the ends and limited to approximately 200 feet in length. Multiple sections and levels of silt fence may be required in addition to temporary / permanent erosion control flumes.

51. Soil retention blankets will be installed rolled down the slope with the small dimension side embedded at the top of slope, unless recommended otherwise by the manufacturer. Excess grass, rocks, trash, debris or clods will be removed before seeding and installing soil retention blankets. All installations will be by the manufacturer recommendations. Contractor equipment, including tractor mowers will be kept off areas with soil retention blankets until the grass is established.

Texas Department of Transportation
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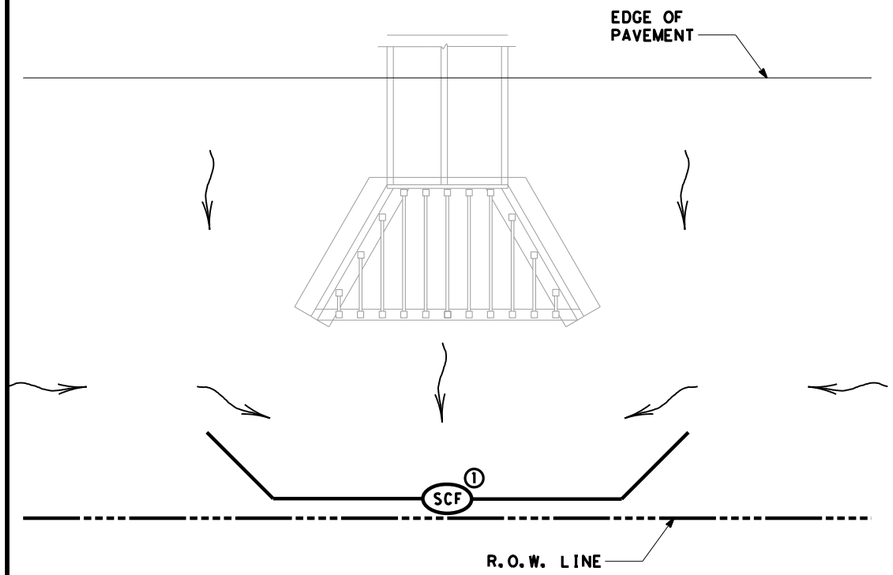
TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

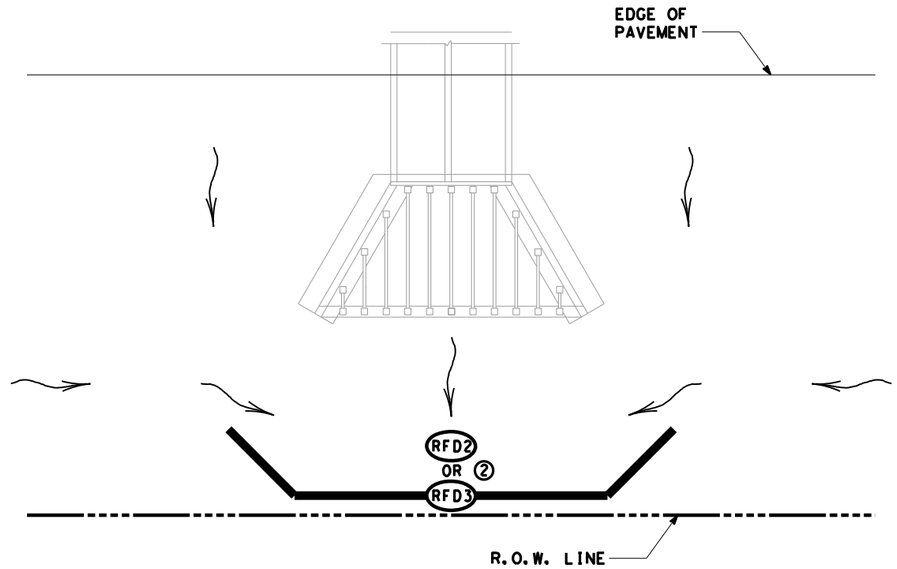
TA-BMP

FILE: BMPLAYOUTS.dgn	DN:		CK:	DW:		CK:	
	CONT	SECT	JOB		HIGHWAY		
REVISIONS DEC 2013 FEB 2015	1077	01	026		FM 434		
	DIST	COUNTY				SHEET NO.	
	WACO	FALLS				160	



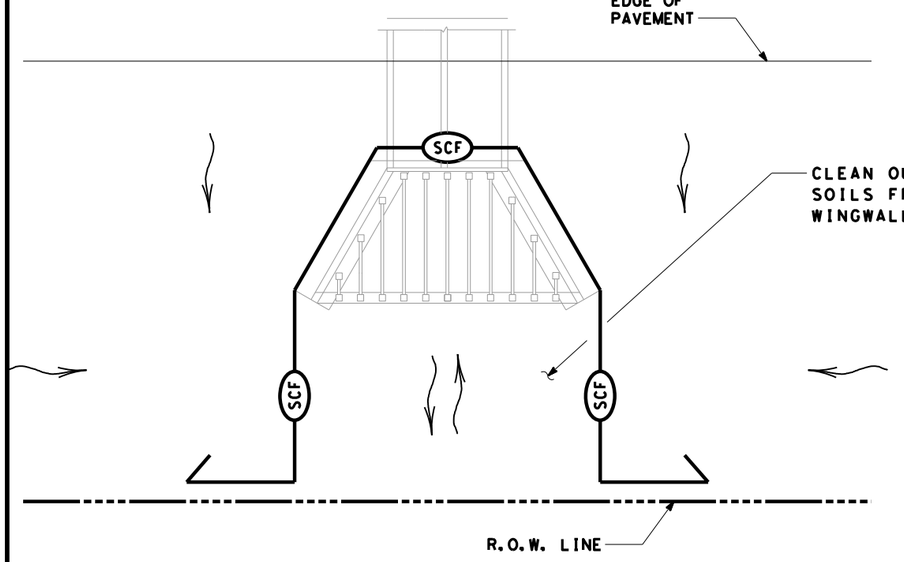
BEST MANAGEMENT PRACTICE (BMP) #1

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



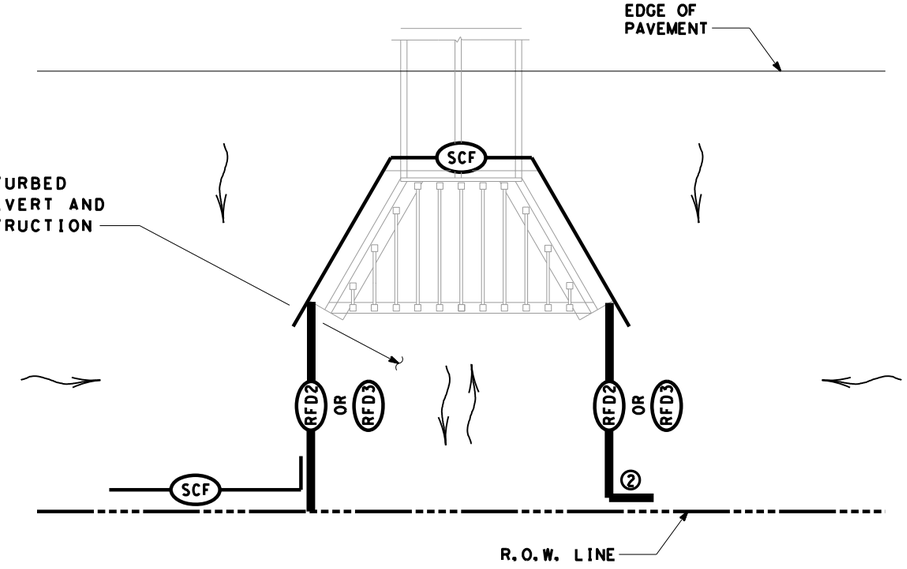
BEST MANAGEMENT PRACTICE (BMP) #2

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #3

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #4

FOR 404 OR NON-404 STREAMS ~ SEDIMENT CONTROL AT EXIT OR ENTRANCE OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

1. EXTEND SILT FENCE SO STORM WATER DOES NOT GO AROUND THE ENDS. USE L-HOOKS ON ENDS AS REQUIRED.
2. EXTEND ROCK FILTER DAM SO STORM WATER DOES NOT GO AROUND THE ENDS.

SCALE = NTS SHEET 5 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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REVISIONS	1077	01	026	FM 434
DEC 2013	DIST	COUNTY		SHEET NO.
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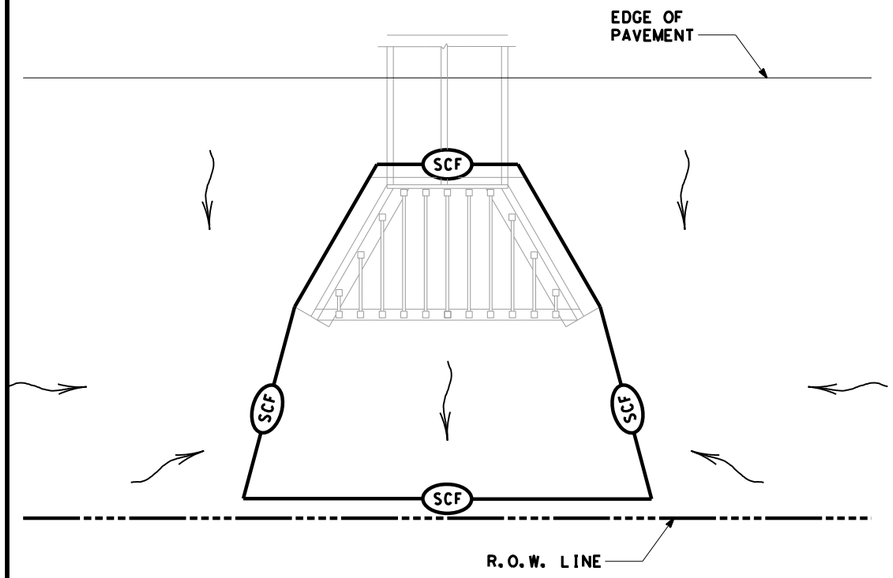
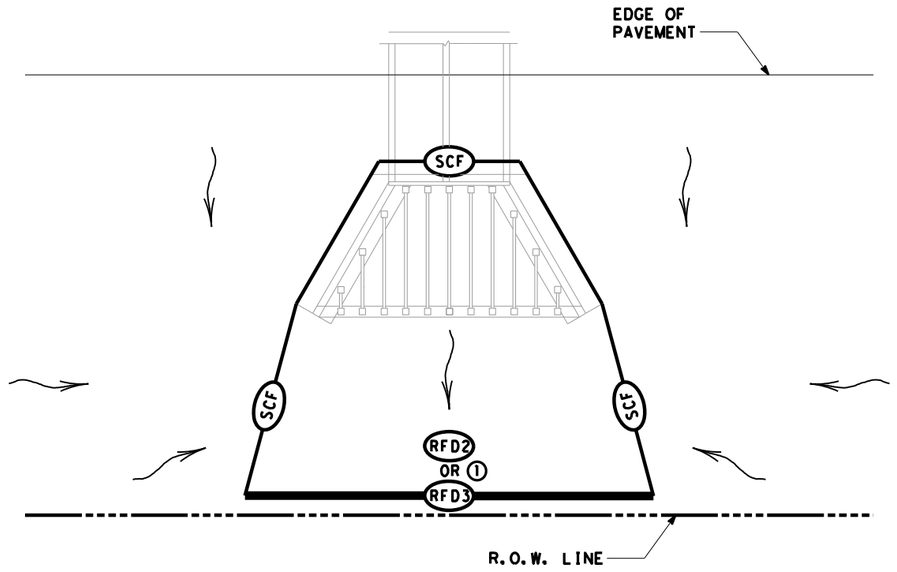


BEST MANAGEMENT PRACTICE (BMP) #5

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #6

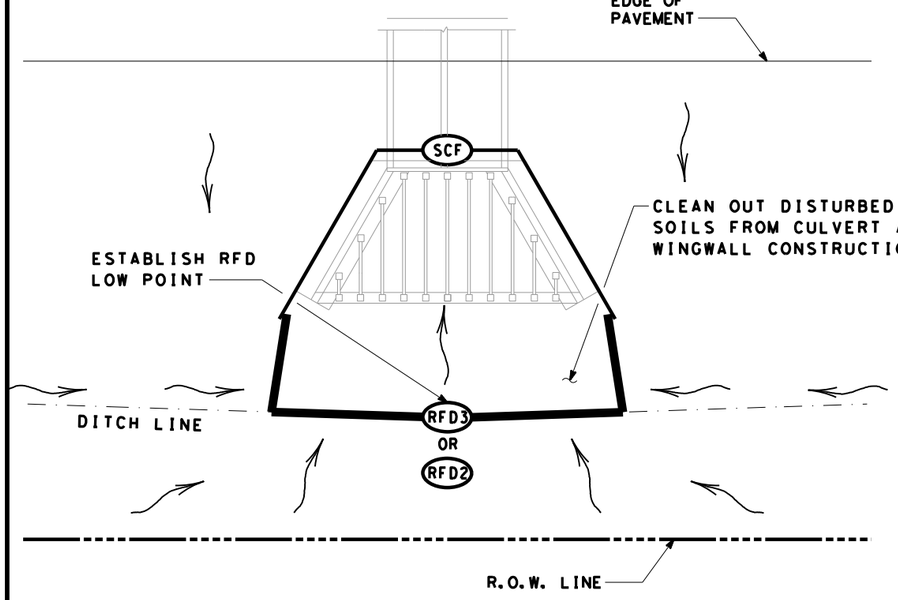
FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT EXIT OF CULVERT

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

NOTES:

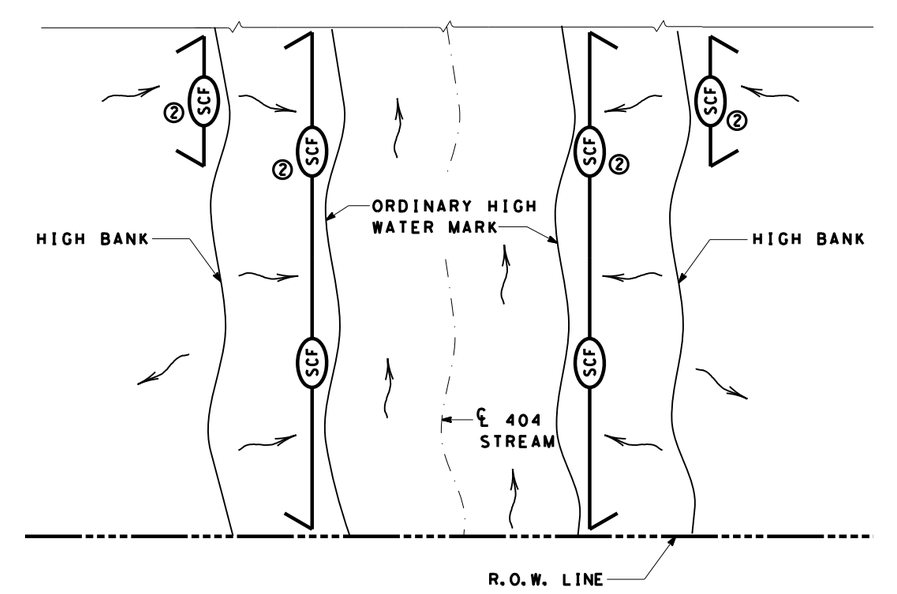
① PROVIDE OVERLAP OF SILT FENCE WITH ROCK FILTER DAM.

② USE SILT FENCE L-HOOKS ON ENDS TO BLOCK STORM WATER SEDIMENT



BEST MANAGEMENT PRACTICE (BMP) #7

FOR NON-404 STREAMS ONLY ~ SEDIMENT CONTROL AT ENTRANCE OF CULVERT



BEST MANAGEMENT PRACTICE (BMP) #8

FOR 404 STREAMS ~ SEDIMENT CONTROL DURING PROJECT CLEARING AND GRUBBING

SCALE = NTS SHEET 6 OF 10

Texas Department of Transportation
Waco District Standard

TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

TA-BMP

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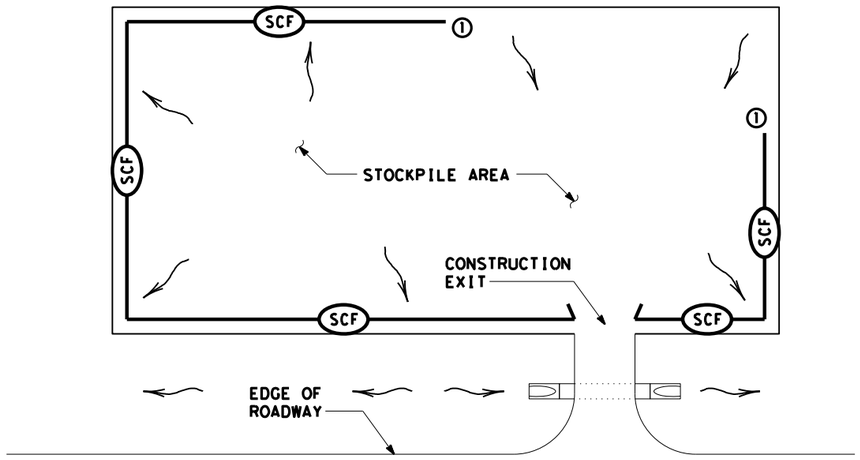
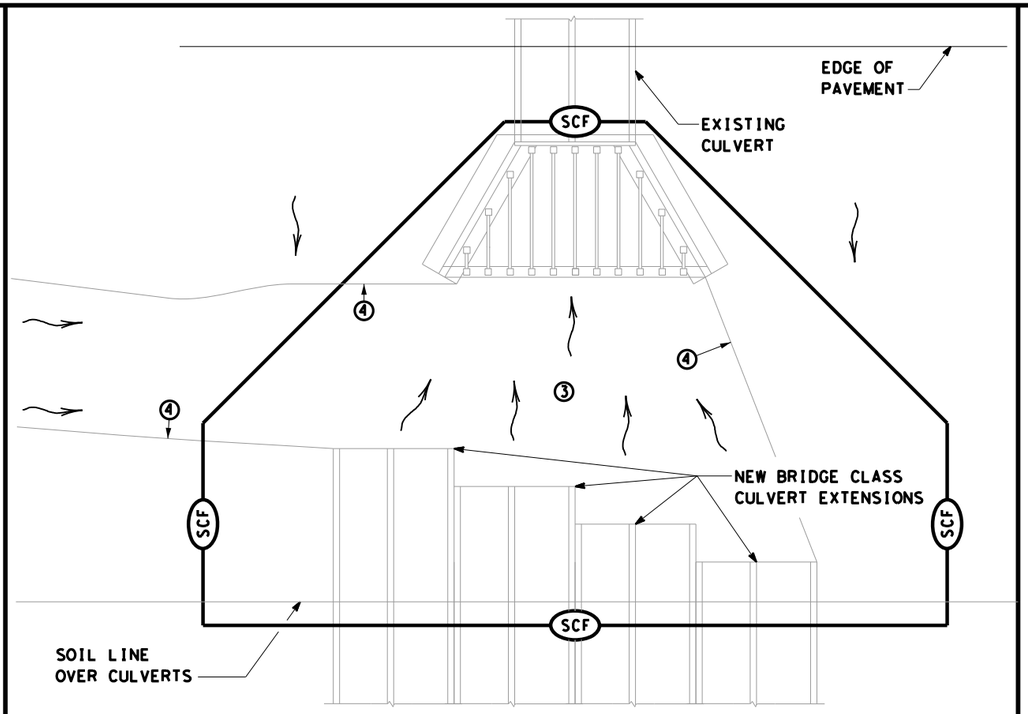
REVISIONS	1077	01	026	FM 434
DEC 2013	DIST	COUNTY		SHEET NO.
FEB 2015	WACO	FALLS		162



BEST MANAGEMENT PRACTICE (BMP) #9

STOCKPILE SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #10

FOR 404 OR NON-404 STREAMS ONLY ~
SEDIMENT CONTROL AT PHASED CONSTRUCTION OF BRIDGE CLASS CULVERTS

SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)
	DIRECTION OF FLOW

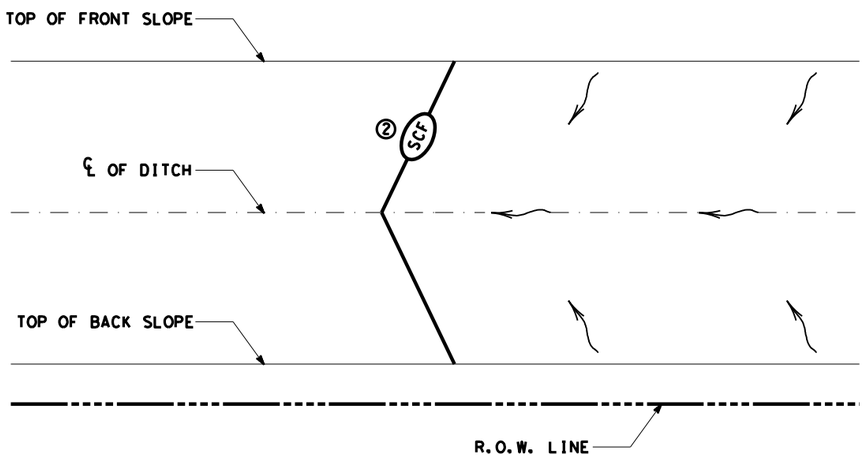
NOTES:

① START SEDIMENT CONTROL AT LOCATION SO ALL STORM WATER WITH SEDIMENT IS COLLECTED

② ROCK FILTER DAMS OR EARTH/GRASSED EMBANKMENTS CAN BE SUBSTITUTED AS DIRECTED.

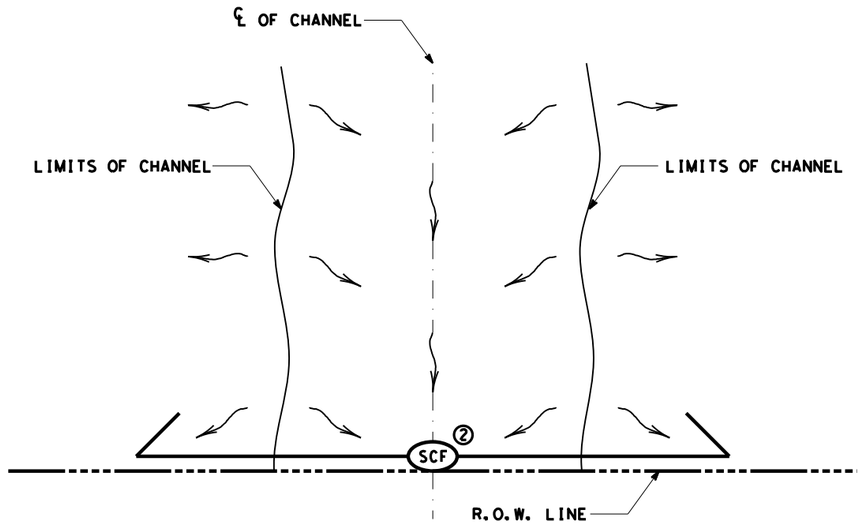
③ PROVIDE A SMOOTH TRANSITION FROM THE INVERT ELEVATIONS BETWEEN CULVERTS. REMOVE LOOSE SOIL FROM EXCAVATED AREA BETWEEN CULVERTS.

④ PROVIDE AND INSTALL PNEUMATICALLY PLACED CONCRETE ON THE DITCH BOTTOM AND SIDE SLOPES BETWEEN TEMPORARY TERMINATIONS BETWEEN OLD AND NEW CULVERTS. PNEUMATICALLY PLACED CONCRETE WILL BE PLACED TO THE HEIGHT OF THE LARGEST CULVERT ON THE DITCH SIDE SLOPES; AND TO A LIMIT 10 FEET OUTSIDE THE LOCATION OF BMPS ALONG THE DITCH BOTTOM. CEMENT STABILIZED SAND MAY BE SUBSTITUTED FOR PNEUMATICALLY PLACED CONCRETE, IN AREAS WHERE INSTALLATION WORKS AND AT THE OPTION OF TXDOT.



BEST MANAGEMENT PRACTICE (BMP) #11

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED UP SLOPE



BEST MANAGEMENT PRACTICE (BMP) #12

BOUNDRY SEDIMENT CONTROL ~ BOTH ENDS OF CONTROL TERMINATED DOWN SLOPE

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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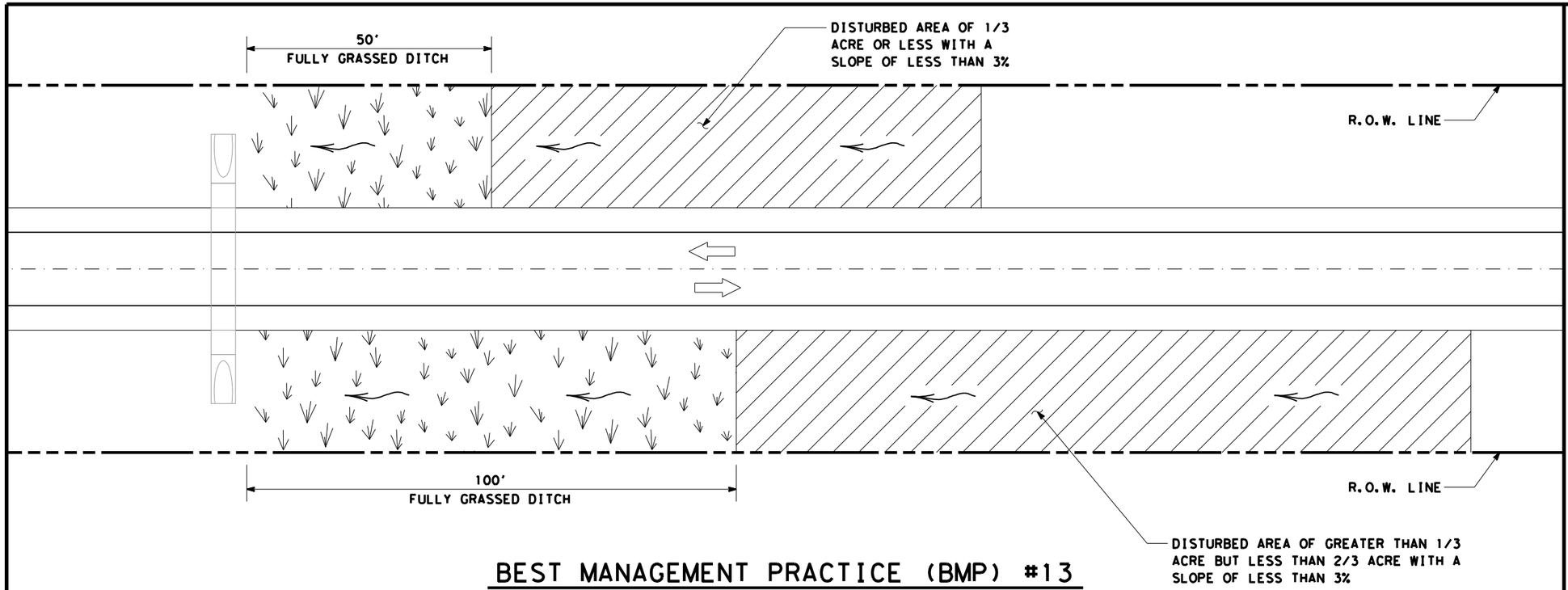
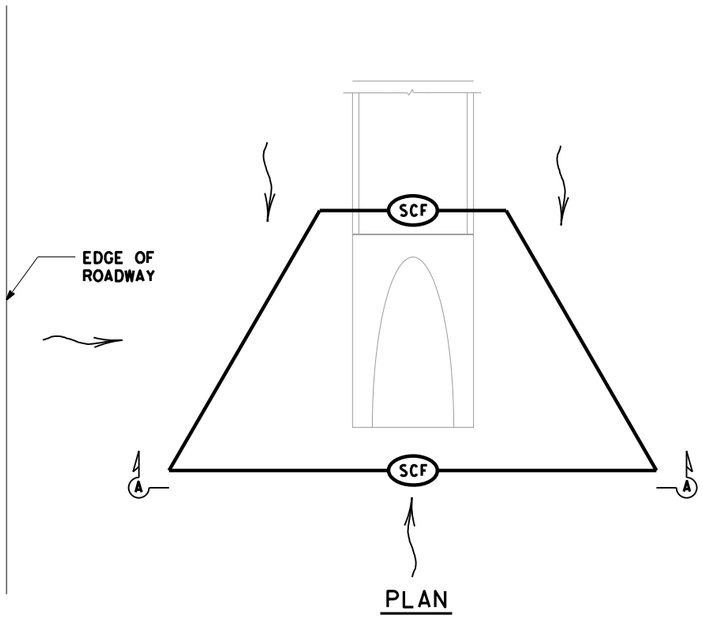
FEB 2015		WACO	FALLS				163

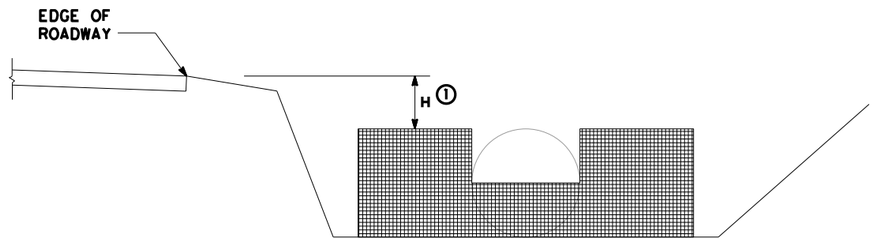


BEST MANAGEMENT PRACTICE (BMP) #13

USE OF VEGETATIVE BUFFERS IN PLACE OF TEMPORARY SEDIMENT CONTROLS SUCH AS SILT FENCE AND ROCK FILTER DAMS



PLAN



VIEW A-A

BEST MANAGEMENT PRACTICE (BMP) #14

NON-404 STREAMS AND DITCHES ONLY - SEDIMENT CONTROL AT PARALLEL DRAINAGE STRUCTURE ENTRANCE ②

	FULLY GRASSED DITCH
	DISTURBED AREA
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE

① FOR H DIMENSIONS LESS THAN 1.5' SILT FENCE MAY NEED TO BE NOTCHED AS SHOWN IN VIEW A-A. ADD EXTRA POSTS AT NOTCH.

② BMP #14 MAY BE USED AT CROSS DRAINAGE STRUCTURES AS DIRECTED.

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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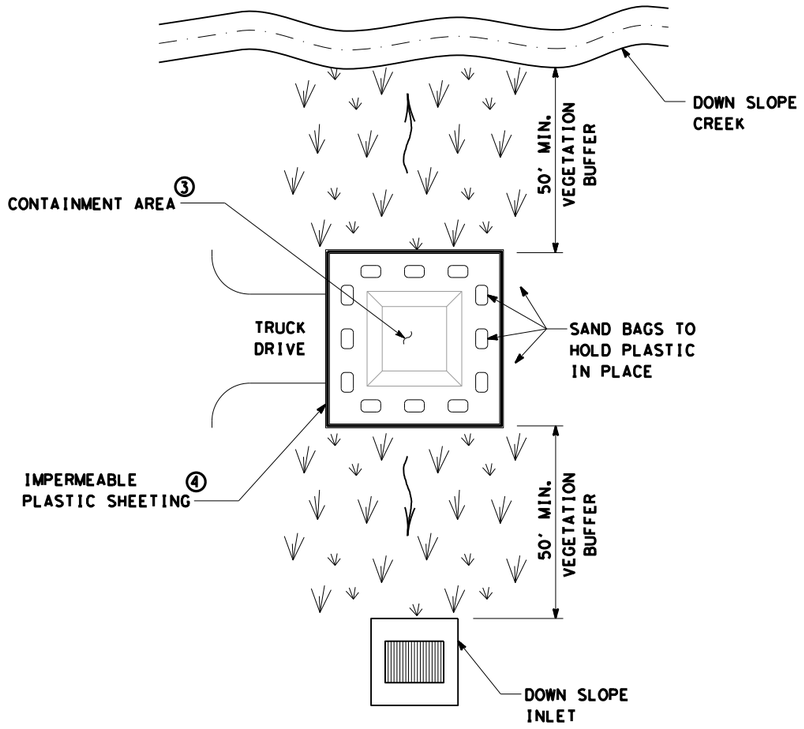
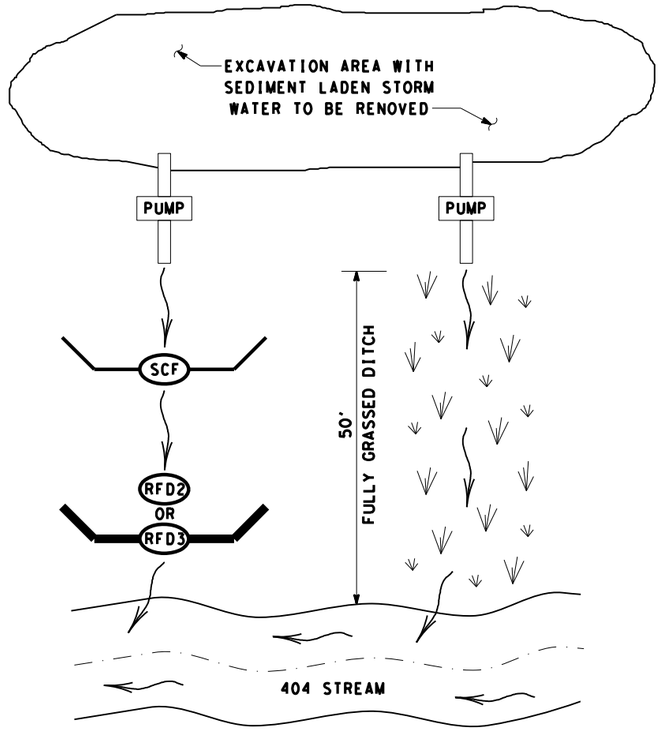


BEST MANAGEMENT PRACTICE (BMP) #15

CONCRETE TRUCK WASHOUT AREA



BEST MANAGEMENT PRACTICE (BMP) #16

PUMPED STORM WATER SEDIMENT CONTROLS ①

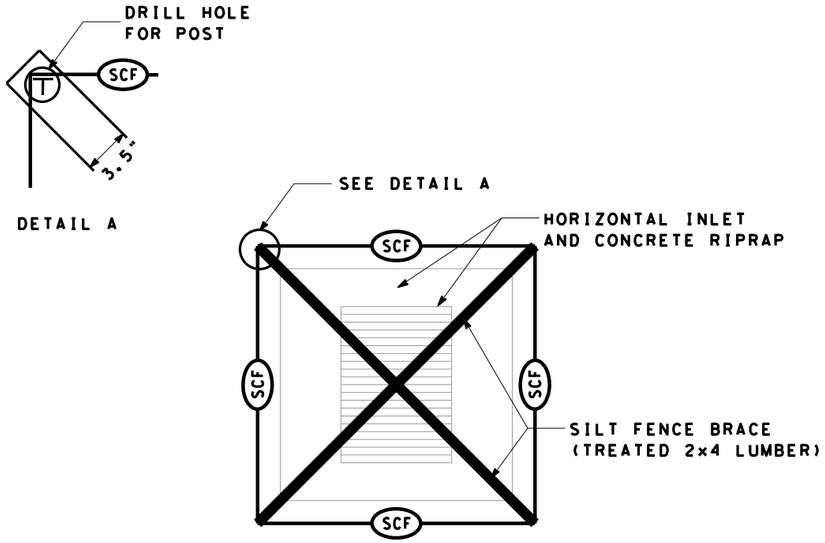
	FULLY GRASSED DITCH
	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TY 2)
RFD3	ROCK FILTER DAM (TY 3)

① PUMPED STROM WATER FROM AN EXCAVATION AREA SHOULD BE DISCHARGED IN A 50' VEGETATIVE BARRIER OR THROUGH TWO TEMPORARY SEDIMENT CONTROLS BEFORE ENTERING A 404 STREAM.

② FOR LANDOWNER STOCKPONDS WITHIN 50' OF THE RIGHT OF WAY LINE, PROVIDE REDUNDANT SEDIMENT CONTROLS AT THE CONVEYANCE OF THE POND. MINIMUM OF TWO SEDIMENT CONTROLS.

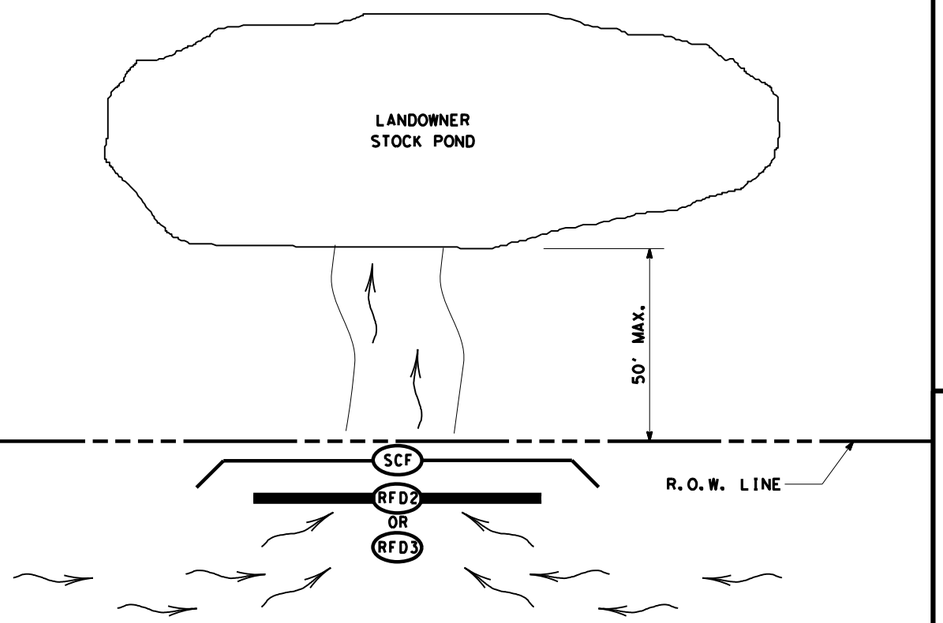
③ WHEN CONTAINMENT AREA REACHES 1' FREEBOARD, DISCONTINUE WASHOUT PLACEMENT AND REMOVE MATERIAL UPON SOLIDIFICATION.

④ EACH TIME SOLIDIFIED MATERIAL IS REMOVED REPLACE PLASTIC SHEETING.



BEST MANAGEMENT PRACTICE (BMP) #17

HORIZONTAL INLET SEDIMENT CONTROL



BEST MANAGEMENT PRACTICE (BMP) #18

LANDOWNER STOCKPOND SEDIMENT CONTROL ②

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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REVISIONS DEC 2013 FEB 2015	1077	01	026	FM 434
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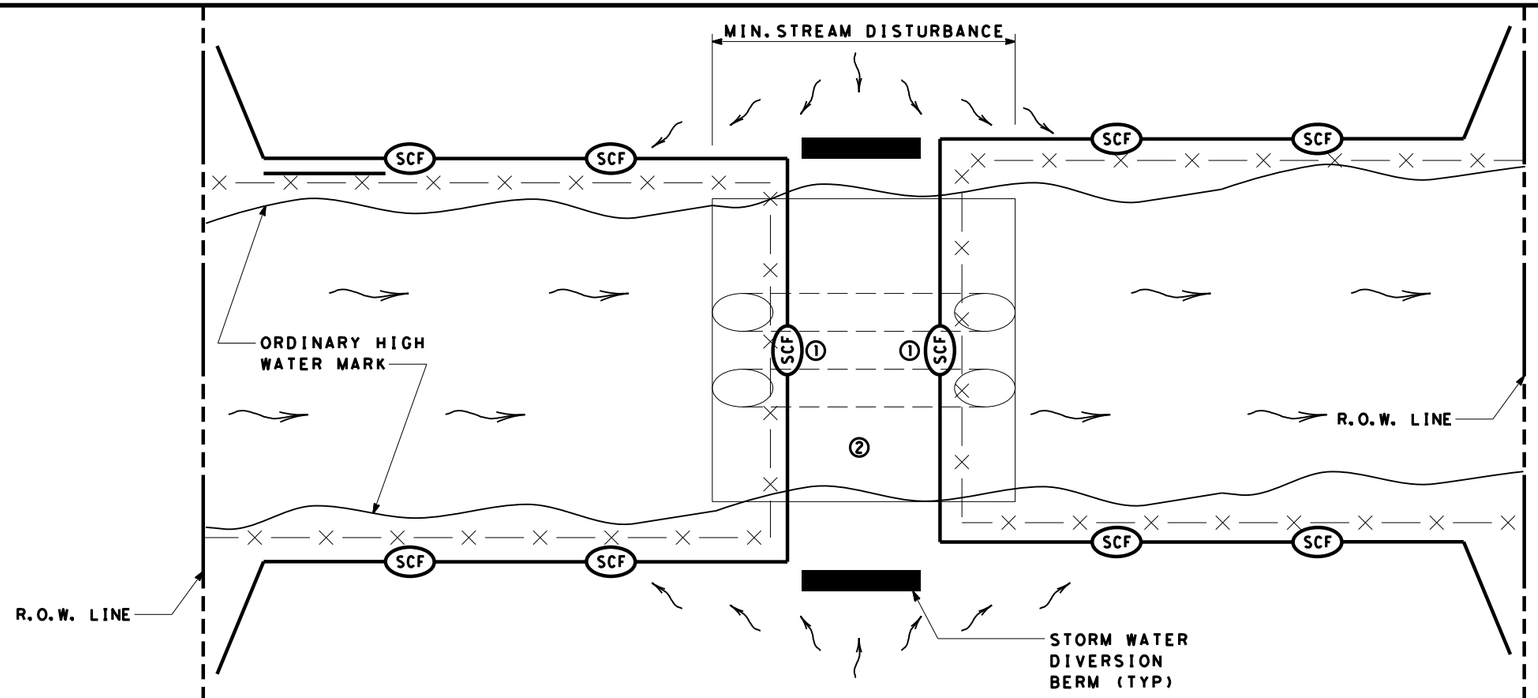


BEST MANAGEMENT PRACTICE (BMP) #19

TYPICAL 404 STREAM CROSSING (SEDIMENT CONTROL AT CROSSING)

	DIRECTION OF FLOW
SCF	SEDIMENT CONTROL FENCE
RFD	ROCK FILTER DAM
	SECURITY FENCING

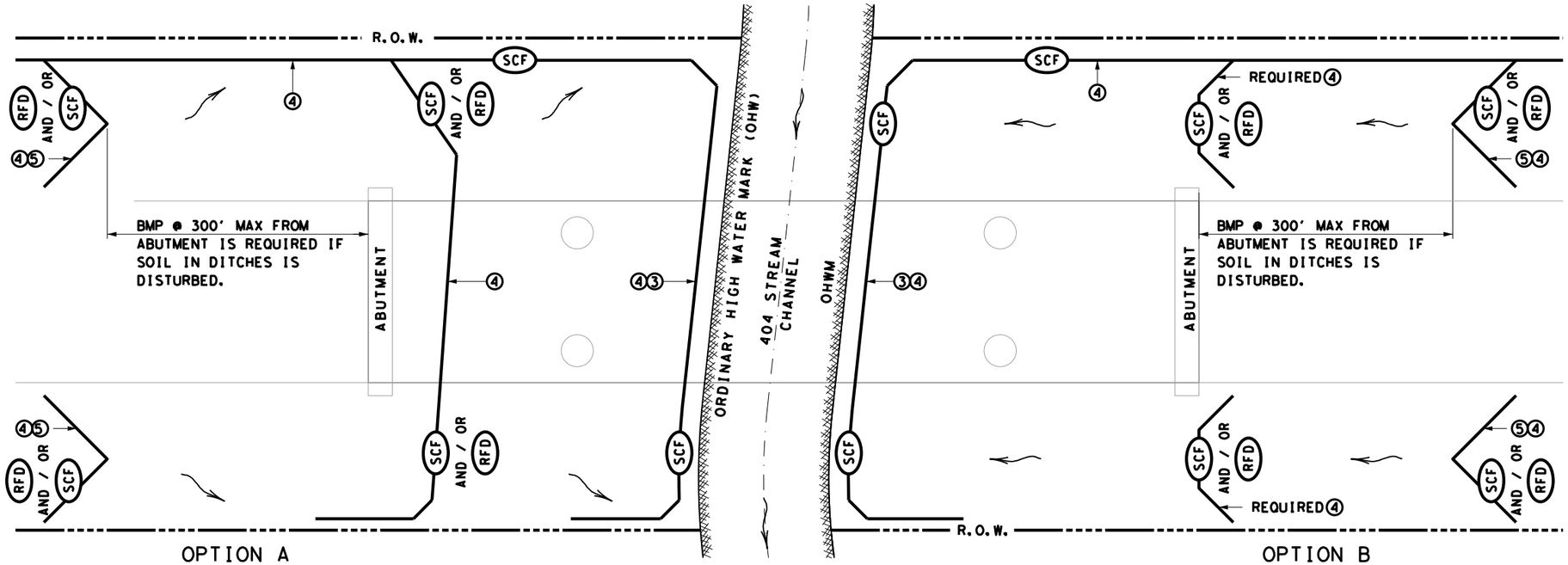
① HAY BALES MAY BE SUBSTITUTED FOR SILT FENCE OVER THE STREAM CROSSING.

② CROSSING WILL BE AS PER REQUIREMENTS OF THE WATERS OF THE US GENERAL NOTES.

③ INSTALL SILT FENCE SLIGHTLY UP FROM OHW MARK FROM R.O.W. TO R.O.W.

④ USE SILT FENCE L-HOOKS ON LEVEL OR DOWN SLOPING ENDS TO BLOCK STORM WATER SEDIMENT

⑤ INSTALL LARGE V OR U SHAPED BMP'S FROM ABUTMENT AS SHOWN. IF THERE IS STEEP DITCH CONDITIONS DECREASE SPACING AND CONSIDER RFD'S. ADD ADDITIONAL BMP'S IF GRADE IS STEEP OR IF FLOW IS HIGH.



BEST MANAGEMENT PRACTICE (BMP) #20

FOR 404 STREAMS ~ BMP'S AT BRIDGES

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TYPICAL APPLICATIONS FOR BEST MANAGEMENT PRACTICES

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