| FED.RD. DIV.NO. | PROJECT NO. | | SHEET NO. |
|---|---|---|---|
| 6 | RMC - 640150001 | | 1 |
| STATE | STATE DIST. | COUNTY | |
| TEXAS | YKM | COLORADO, ETC. | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |

# STATE OF TEXAS
# TEXAS DEPARTMENT OF TRANSPORTATION

# PLANS OF PROPOSED
# STATE HIGHWAY IMPROVEMENT

*WORK CONSISTING OF CULVERT REPAIR*

*CSJ: 6401-50-001*

*COUNTY: COLORADO, ETC.*

*LIMITS: US 90, ETC.*

## INDEX OF SHEETS



STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED
PROFESSIONAL ENGINEER

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

Mark C Netardus P.E. — *MAINTENANCE ENGINEER*

07/26/2024 — *DATE*


0 5 10
GRAPHIC SCALE (MILES)

*CONTRACTOR:* _____
*DATE OF LETTING:* _____
*DATE WORK BEGAN:* _____
*DATE WORK COMPLETED:* _____
*DATE WORK ACCEPTED:* _____
*FINAL CONTRACT COST: $* _____

*LIST OF APPROVED FIELD CHANGES:*

*THIS IS TO CERTIFY THAT THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS, CONTRACT AND LISTED FIELD CHANGES.*

_____ , P. E. — *AREA ENGINEER*

_____ — *DATE*

STATE OF TEXAS
MICHAEL L. BRZOZOWSKI
115528
LICENSED
PROFESSIONAL ENGINEER

*APPROVED FOR LETTING:* 7-29-2024 — *DATE*

Michael Brzozowski PE — *DIRECTOR OF OPERATIONS*

## AUSTIN, COLORADO, MATAGORDA, WHARTON

### YOAKUM DISTRICT

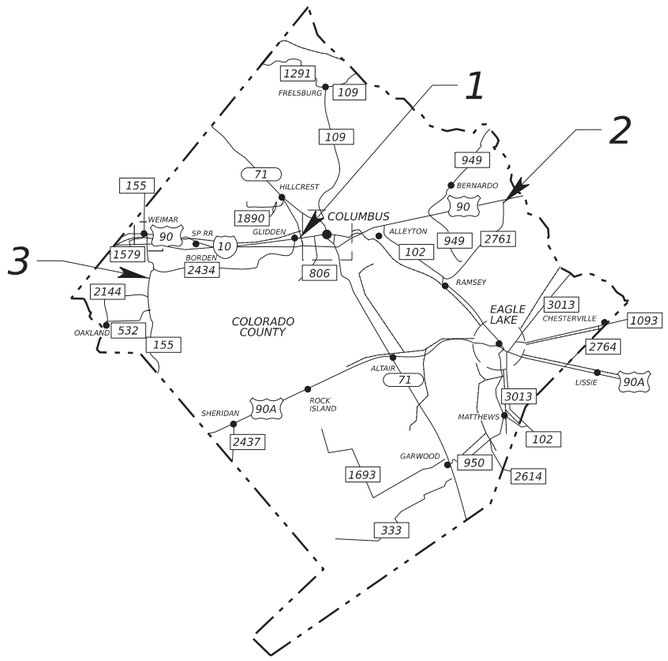
*EXCEPTIONS: NONE*
*EQUATIONS: NONE*
*RAILROAD CROSSINGS: NONE*

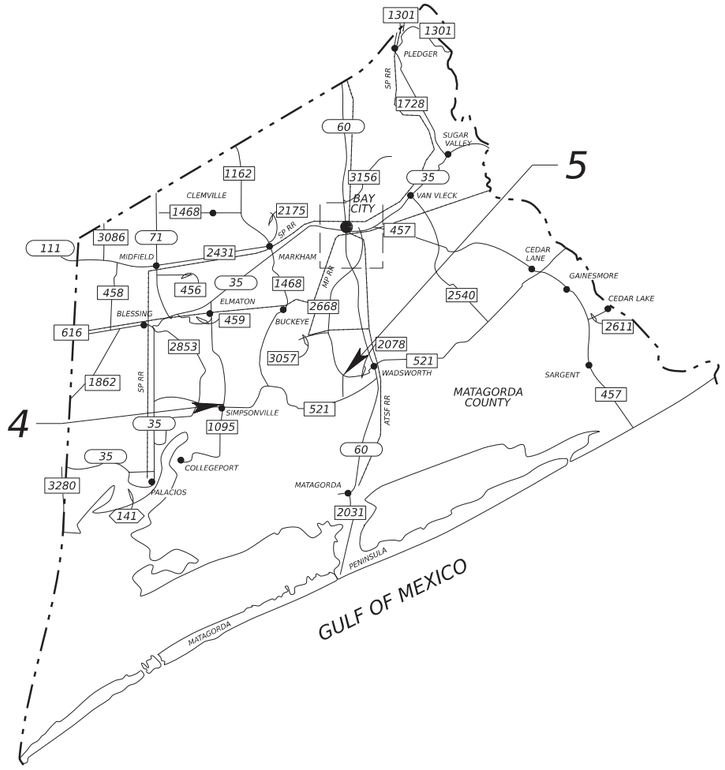
*SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 2023).*

**TEXAS DEPARTMENT OF TRANSPORTATION**

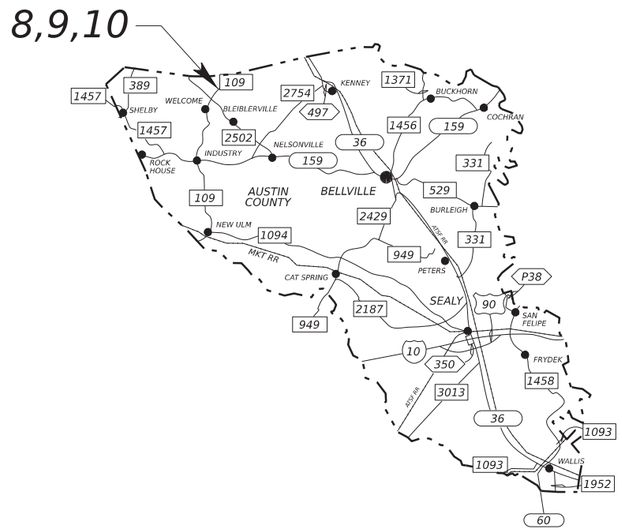


YOAKUM DISTRICT








# PROJECT LOCATION MAP

Texas Department of Transportation



SHEET 1 OF 1

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 2 |

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FILE: Index_of_Sheets.dgn
DATE: 7/22/2024

**GENERAL NOTES:**

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

Mark Netardus Mark.Netardus@txdot.gov
Michael Brzozowski Michael.Brzozowski@txdot.gov

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

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

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

**IV. UNIVERSAL TEXAS**

Fiber optic cable systems may be buried on the railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. The state and/or its contractor shall telephone Texas One Call at 1-800-545-6005 (a 24-hour number) to determine if fiber optic cable is buried anywhere on the railroad's premises to be used by the state. If it is, the state and/or its contractor will telephone the telecommunications company(ies) involved, arrange for a cable locator, and make arrangements for relocation or other protection of the fiber optic cable prior to beginning any work on the railroad's premises.

Individual structures will be extended on one side at a time through completion before construction work is begun on the opposite side unless otherwise directed.

Do not work on the roadway before sunrise or after sunset unless otherwise approved.

Leave all traffic lanes open to traffic at night, weekends and holidays unless otherwise approved.

Furnish a certified copy of the legal gross weight of each vehicle hauling materials by weight and certified measurements for all trucks hauling material by volume.
Leave all intersecting roadways, side streets, and entrances open during construction unless otherwise approved. Should there be a request to restrict access for such reasons as parallel culvert replacement, reconstruction, etc., approval will be required 48 hours in advance and the contractor will be required to coordinate satisfactorily with any affected property owners.

**Project Number: 6401-50-001**

**County: Colorado, Etc.**

**Highway: US 90, Etc.**

Unless otherwise approved, maintain a minimum safety clearance from the edge of the travelway for material stockpiled in proximity of traffic lanes based on the current average traffic count of the particular highway as follows:

0 - 1500 = 16 feet
Over 1500 = 30 feet

In the event the above requirements cannot be met, make arrangements to stockpile material off the right of way.

At those locations where centerline structures are to be replaced, remove existing structures and install new structures in half widths. Work and materials required for temporary bulkheads will be considered subsidiary. One-way traffic will be allowed during daylight hours only.

The Department will provide the cylinder testing machine for this project. Deliver the test specimens to the engineer's curing facilities as directed.

Do not clean out concrete trucks within the right of way.

The contractor shall field verify all existing pipe, box culvert, and safety end treatments sizes prior to fabrication of related items. All work involved with field verifying will not be measured or paid for directly but will be subsidiary to pertinent items.

**ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES**

No significant traffic generator events identified.

If the contractor proposes work beyond the TxDOT obtained permit limitations, the contractor is responsible for additional costs, delays, and obtaining new or revised permits prior to construction.

**ITEM 8: PROSECUTION AND PROGRESS**

Provide progress schedule as a Bar Chart.

**ITEM 132: EMBANKMENT**

Furnish Type C embankment consisting of suitable earth material such as loam, clay or other such material that will form a stable embankment and has a plasticity index of at least 15 but not more than 40.

## ITEM 400: EXCAVATION AND BACKFILL FOR STRUCTURES

Flexible base (Ty D) may be used for cement stabilized backfill aggregate, as approved.

## ITEM 432: RIPRAP

Place 1/2-inch expansion joint material between the two concrete areas or structures where riprap is placed against other concrete such as concrete pavement and structures unless otherwise shown on the plans or as directed. This work will not be paid for directly but will be subsidiary to the pertinent items.

Unless otherwise shown on the plans or directed, riprap will be 5" deep and reinforced; reinforced toewalls 6" wide and 12" deep will be placed around the perimeter of each location.

## ITEM 460: CORRUGATED METAL PIPE

Corrugations shall be 2 2/3 by 1/2 inch and minimum 16 gauge.

## ITEM 462: CONCRETE BOX CULVERTS AND DRAINS

Use precast concrete boxes on this project.

Removing and disposing of portions of existing structures including wingwalls, headwalls, safety end treatments, etc. is subsidiary to the proposed culvert extension, proposed end treatment, or remove structure (small)(large)(box culvert)(pipe) items.

## ITEMS 464 & 467: REINFORCED CONCRETE PIPE & SAFETY END TREATMENT

If required, concrete collars, as approved, will be used at pipe joints. Collars will be reinforced as directed. No direct compensation will be made for concrete collars and they will be subsidiary to the pertinent items.

## ITEM 467: SAFETY END TREATMENT

Precast safety end treatment sections will not be allowed.

Provide reinforced concrete riprap for all pipe safety end treatments. Round corners on safety end treatment riprap to a minimum 12-inch radius as directed. The riprap will not be paid for directly but will be subsidiary to Item 467.

**Project Number: 6401-50-001**

**County: Colorado, Etc.**

**Highway: US 90, Etc.**

Provide and use a form along the cut end of the pipe when placing the adjacent reinforced concrete riprap for pipe safety end treatment sections.

Riprap cross slope above the working point may need to be flatter than 6:1 slope to improve driveway tie-in as directed by the engineer.

## ITEM 496: REMOVING STRUCTURES

Remove existing structures and install new structures in half widths unless otherwise directed or approved by the engineer. Work and materials required for temporary bulkheads will be subsidiary.

Material removed under this item will not be deemed salvageable.

## 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.

Use WZ(RS)-22 in conjunction with TCP(2-2).

Use TCP(2-2b) for one-lane, two-way traffic control.

When using TCP(2-2b), a pilot car is required to lead traffic through the workspace with or without channelizing devices on the center line unless otherwise approved.

When using TCP(2-2b), channelizing devices may be omitted during base, subgrade and seal coat operations unless otherwise directed. Flaggers will be required at public intersections when channelizing devices are omitted.

When using TCP(2-2b), arrow boards, displaying the caution mode, may be used to enhance the flagger stations. If used, place the arrow board in advance of the flagger station a distance of ½X, the sign spacing distance shown on BC(2). Use arrow boards as shown on BC(7).

When using TCP(2-2b), the temporary 24" stop line and the CW16-2P plaques may be omitted.

**Project Number: 6401-50-001**

**County: Colorado, Etc.**

**Highway: US 90, Etc.**

When using TCP(2-2b), an additional "Road Work Ahead" and "Be Prepared To Stop" signs will be required on each end of the lane closure unless otherwise approved.

Provide suitable warning lights mounted high enough to be visible from all directions on all construction equipment, including pilot vehicles, and operate warning lights when the equipment is within the right of way. Equip other equipment such as trucks, trailers, autos, etc., with emergency flashers and use emergency flashers while within the work area.

Project limit traffic control devices will not be required for this project.

**ITEM 506: TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS**

1. See SWP3 plan sheet for total disturbed acreage.

2. The disturbed area in this project, all project locations in the contract, and contractor project specific locations (PSLs), within one (1) mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges.

3. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans.

4. Obtain any required authorization from the TCEQ for any contractor PSLs for construction activities on or off right-of-way (ROW).

5. When the total disturbed area for all projects in the contract and PSLs within one (1) mile of the project limits exceeds five (5) acres, provide a copy of the contractor NOI.

6. Provide a signed sketch detailing the location of any contractor's PSLs on ROW or within one (1) mile of the project.

**ITEM 6185: TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)**

Shadow vehicle(s) with TMA are set up for stationary and/or mobile operations. The contractor will be responsible for determining if operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

# STRUCTURE SUMMARY

| CULVERT LOCATION | | | DESCRIPTION | ITEM 132 | ITEM 400 | | | ITEM 402 | ITEM 432 | | ITEM 460 CMP (GAL STL) | | | ITEM 462 CONC BOX CULVERT | | ITEM 464 RC PIPE (CL III) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | EMBANKMENT (VEHICLE) (ORD COMP) (TY C) | CEM STABIL | CUT & RESTORING | * STRUCT | TRENCH EXCAVATION | RIPRAP (CONC) | RIPRAP (STONE | AR DES 3 | 18" | 24" | 3'X3' | 6'X3' | 18" | 24" | 30" |
| COUNTY | ROADWAY | STA | | EST CY | BKFL CY | PAV SY | EXCAV CY | PROTECTION LF | (CL C) CY | (12 IN) CY | LF | LF | LF | LF | LF | LF | LF | LF |
| NON-BRIDGE CLASS CULVERTS | | | | | | | | | | | | | | | | | | |
| COLORADO | US 90 | 128+95 LT | EXIST 1 - 15" X 32.8' CMP & 1 - 18" X 32.8' CMP TO BE REMOVED. PROP 1 - DES 3 X 38' CMP & SET (TY II)(DES 3)(CMP)(6:1)(P) LT & RT USING SETP-PD-A. | 3.9 | 8.7 | 13 | 19.6 | | | | 38 | | | | | | | |
| COLORADO | FM 2761 | 297+00 | EXIST 3 - 18" x 40' CMP W/ 3:1 SET LT & RT TO BE REMOVED. PROP 3 - 18" X 38' CMP & SET (TY II)(18")(CMP)(4:1) (C) LT & RT USING SETP-CD. | 1.7 | 20.9 | 25 | 54.2 | | | | | 114 | | | | | | |
| COLORADO | FM 155 | 233+72 | EXIST 1 - 30" X 37.5' RCP W/ 4:1 SETs LT & RT. REMOVE EXIST SET LT & RT. PROP - SET (TY II)(30")(RCP)(3:1)(C) LT & RT USING SETP-CD. | | | | | | | | | | | | | | | |
| MATAGORDA | FM 1095 | 436+66 | EXIST 3 - 24" X 52' RCP TO BE REMOVED. PROP 3 - 24" X 46' RCP & SET (TY II)(24")(RCP)(3:1)(C) LT & RT USING SETP-CD. | 1.2 | 41.3 | 34 | 135.0 | 46 | | | | | | | | | 138 | |
| MATAGORDA | FM 2078 | 0+18 | EXIST 1 - 18" X 49' RCP TO BE REMOVED PROP 1 - 18" X 48' RCP & SET (TY II)(18")(RCP)(6:1)(C) LT & RT USING SETP-CD. | 2.7 | 11.0 | 13 | 27.4 | | | | | | | | | 48 | | |
| WHARTON | FM 1160 | 560+51 LT | EXIST 2 - DES 5 X 32.8' CMP TO BE REMOVED. PROP 1 - 6' X 3' X 38' CBC & SET (TY I)(S = 6 FT)(HW = 4 FT)(6:1)(P) LT & RT USING BCS, SCP-6, SETB-PD, SCP-MD & PROP 1 - 30" X 6' RCP TO STUB INTO PROP CBC & SET (TY II)(30")(RCP)(6:1)(P) LT USING SETP-PD. | 16.0 | 30.6 | 27 | 93.6 | | 2 | | | | | | 38 | | | 6 |
| WHARTON | FM 442 | 259+09 LT | EXIST 2 - 36" X 30' RCP TO BE REMOVED. PROP 1 - 6' X 3' X 42' CBC USING SCP-6 & SCP-MD & SET (TY I)(S = 6)(HW = 4)(6:1)(P) LT & RT USING SETB-PD. | 50.0 | 27.1 | 24 | 153.3 | 39 | | | | | | | 42 | | | |
| AUSTIN | FM 109 | 104+88 | EXIST 1 - 30" X 81.9' RCP TO BE REMOVED PROP 1 - 30" X 75' RCP & SET (TY II)(30")(RCP)(3:1)(C) LT & RT USING SETP-CD. | | 27.5 | 16 | 124.6 | 75 | | | | | | | | | | 75 |
| AUSTIN | FM 109 | 114+26 | EXIST 1 - 36" X 92.7' RCP TO BE REMOVED PROP 1 - 3' X 3' X 75' CBC & WINGWALL (FW - 0) (HW=3 FT) LT & WINGWALL (FW - 0) (HW=5 FT) RT USING BCS, SCP-3, FW-0, SCP-MD, ECD. | | 25.6 | 20 | 180.9 | 75 | 1.5 | 3 | | | | 75 | | | | |
| AUSTIN | FM 109 | 115+95 LT | EXIST 1 - 24" x 18' CMP & SET LT & RT. REMOVE 2' LT & 3' RT. EXTEND 4' LT & 5' RT. ADD SET (TY II)(24")(CMP)(6:1)(P) LT & RT USING SETP-PD. | 2.3 | | | 10.2 | | | | | | 9 | | | | | |
| | | | PROJECT TOTALS | 77.8 | 192.7 | 172 | 798.8 | 235 | 3.5 | 3 | 38 | 114 | 9 | 75 | 80 | 48 | 138 | 81 |

# SEEDING SUMMARY

| LOCATION | ITEM 164 | | | ITEM 166 | ITEM 168 | REMARKS |
|---|---|---|---|---|---|---|
| | BROADCAST SEED (PERM) (RURAL) (CLAY) | BROADCAST SEED (TEMP) (WARM) | BROADCAST SEED (TEMP) (COOL) | * FERTILIZER 500 LBS/AC | VEGETATIVE WATERING 13.58 MG/AC X 3 CYCLES | |
| | SY | SY | SY | TON | MG | |
| AS APPROVED OR DIRECTED BY THE ENGINEER | 223 | 56 | 56 | 0.02 | 1.88 | |
| PROJECT TOTALS | 223 | 56 | 56 | 0.02 | 1.88 | |

* FOR CONTRACTOR'S INFORMATION ONLY.

**STRUCTURE SUMMARY & DETAILS**

Texas Department of Transportation





| FED.RD. DIV.NO. | PROJECT NO. | | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 6 |

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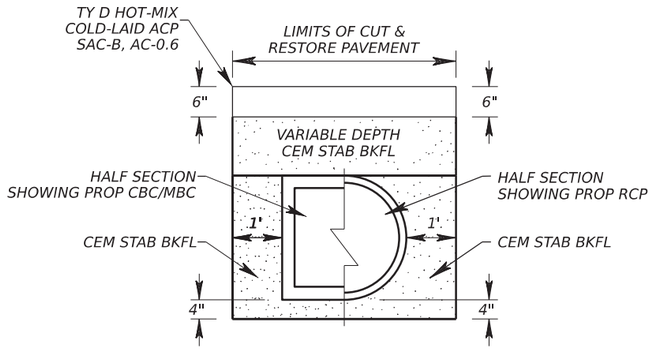
FILE: Index_of_Sheets.dgn
DATE: 7/22/2024

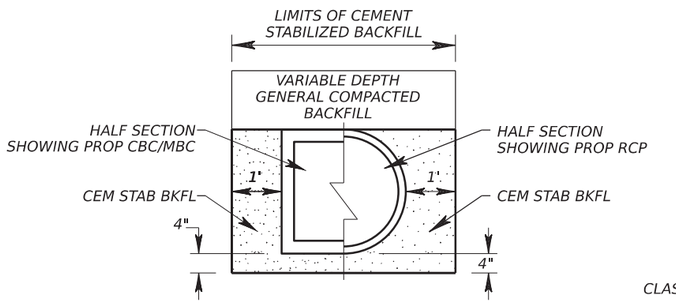
# STRUCTURE SUMMARY

| CULVERT LOCATION | | | DESCRIPTION | ITEM 466 | | ITEM 467 | | | | | | | | ITEM 496 | ITEM 506 | | ITEM 658 | ITEM 752 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SET (TY I) | SET (TY II) | | | | | | | | TEMP | TEMP | INSTL | | | TREE |
| | | | | WINGWALL (FW - 0) | WINGWALL (FW - 0) | (S=6FT) (HW=4FT) (6:1) | 18" CMP (4:1) | 18" RCP (6:1) | 24" CMP (6:1) | 24" RCP (3:1) | 30" RCP (3:1) | 30" RCP (6:1) | DES 3 CMP (6:1) | REMOV STR | SEDMT CONT FENCE | SEDMT CONT FENCE | OM ASSM (OM-2Y) (WC) | TREE REMOVAL | TREE REMOVAL | TRIMMING AND BRUSH |
| COUNTY | ROADWAY | STA | | (HW=3 FT) | (HW=5 FT) | (P) | (C) | (C) | (P) | (C) | (C) | (P) | (P) | (SMALL) | (INSTALL) | (REMOVE) | GND(BI) | (4" - 12" DIA) | (12" - 18" DIA) | REMOVAL |
| | | | | EA | EA | EA | EA | EA | EA | EA | EA | EA | EA | EA | LF | LF | EA | EA | EA | LF |
| NON-BRIDGE CLASS CULVERTS | | | | | | | | | | | | | | | | | | | | |
| COLORADO | US 90 | 128+95 LT | EXIST 1 - 15" X 32.8' CMP & 1 - 18" X 32.8' CMP TO BE REMOVED. PROP 1 - DES 3 X 38' CMP & SET (TY II)(DES 3)(CMP)(6:1)(P) LT & RT USING SETP-PD-A. | | | | | | | | | | 2 | 1 | 20 | 20 | | | | |
| COLORADO | FM 2761 | 297+00 | EXIST 3 - 18" x 40' CMP W/ 3:1 SET LT & RT TO BE REMOVED. PROP 3 - 18" X 38' CMP & SET (TY II)(18")(CMP)(4:1) (C) LT & RT USING SETP-CD. | | | | 6 | | | | | | | 1 | 20 | 20 | 2 | | | |
| COLORADO | FM 155 | 233+72 | EXIST 1 - 30" X 37.5' RCP W/ 4:1 SETs LT & RT. REMOVE EXIST SET LT & RT. PROP - SET (TY II)(30")(RCP)(3:1)(C) LT & RT USING SETP-CD. | | | | | | | | 2 | | | | 20 | 20 | 2 | | | |
| MATAGORDA | FM 1095 | 436+66 | EXIST 3 - 24" X 52' RCP TO BE REMOVED. PROP 3 - 24" X 46' RCP & SET (TY II)(24")(RCP)(3:1)(C) LT & RT USING SETP-CD. | | | | | | | 6 | | | | 1 | 20 | 20 | 2 | | | |
| MATAGORDA | FM 2078 | 0+18 | EXIST 1 - 18" X 49' RCP TO BE REMOVED PROP 1 - 18" X 48' RCP & SET (TY II)(18")(RCP)(6:1)(C) LT & RT USING SETP-CD. | | | | | 2 | | | | | | 1 | 20 | 20 | 2 | | | |
| WHARTON | FM 1160 | 560+51 LT | EXIST 2 - DES 5 X 32.8' CMP TO BE REMOVED. PROP 1 - 6' X 3' X 38' CBC & SET (TY I)(S = 6 FT)(HW = 4 FT)(6:1)(P) LT & RT USING BCS, SCP-6, SETB-PD, SCP-MD & PROP 1 - 30" X 6' RCP TO STUB INTO PROP CBC & SET (TY II)(30")(RCP)(6:1)(P) LT USING SETP-PD. | | | 2 | | | | | | 1 | | 1 | 20 | 20 | | | | |
| WHARTON | FM 442 | 259+09 LT | EXIST 2 - 36" X 30' RCP TO BE REMOVED. PROP 1 - 6' X 3' X 42' CBC USING SCP-6 & SCP-MD & SET (TY I)(S = 6)(HW = 4)(6:1)(P) LT & RT USING SETB-PD. | | | 2 | | | | | | | | 1 | 20 | 20 | | 1 | | 60 |
| AUSTIN | FM 109 | 104+88 | EXIST 1 - 30" X 81.9' RCP TO BE REMOVED PROP 1 - 30" X 75' RCP & SET (TY II)(30")(RCP)(3:1)(C) LT & RT USING SETP-CD. | | | | | | | | 2 | | | 1 | 20 | 20 | 2 | | 3 | 20 |
| AUSTIN | FM 109 | 114+26 | EXIST 1 - 36" X 92.7' RCP TO BE REMOVED PROP 1 - 3' X 3' X 75' CBC & WINGWALL (FW - 0) (HW=3 FT) LT & WINGWALL (FW - 0) (HW=5 FT) RT USING BCS, SCP-3, FW-0, SCP-MD, ECD. | 1 | 1 | | | | | | | | | 1 | 20 | 20 | 2 | | 2 | 20 |
| AUSTIN | FM 109 | 115+95 LT | EXIST 1 - 24" x 18" CMP & SET LT & RT. REMOVE 2' LT & 3' RT. EXTEND 4' LT & 5' RT. ADD SET (TY II)(24")(CMP)(6:1)(P) LT & RT USING SETP-PD. | | | | | | 2 | | | | | | 20 | 20 | | | | |
| | | | PROJECT TOTALS | 1 | 1 | 4 | 6 | 2 | 2 | 6 | 4 | 1 | 2 | 8 | 200 | 200 | 12 | 1 | 5 | 100 |



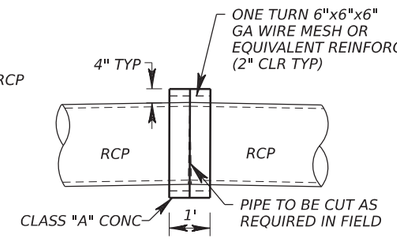

**CUT & RESTORE PAVEMENT DETAIL**

SECTION VIEW (NOT TO SCALE)




**EXCAVATION & BACKFILL FOR STRUCTURES DETAIL**

SECTION VIEW (NOT TO SCALE)

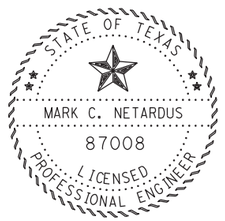



**PIPE COLLAR DETAIL**

(NOT TO SCALE)

CUT & RESTORE PAVEMENT NOTES:

1. ACP IS SUBSIDIARY TO ITEM 400 CUT AND RESTORE PAVEMENT.
2. PROVIDE A SMOOTH AND UNIVORM DRIVING SURFACE AS APPROVED BY THE ENGINEER.




Mark C Netardus P.E.

07/26/2024

# STRUCTURE SUMMARY & DETAILS

NOT TO SCALE

Texas Department of Transportation





| FED.RD. DIV.NO. | PROJECT NO. | | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 7 |

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DATE: 7/22/2024

# Estimate & Quantity Sheet

**CONTROLLING PROJECT ID** 6401-50-001 **DISTRICT** Yoakum **COUNTY** Colorado
**HIGHWAY** US 90

| | | | | | | TOTAL EST. | TOTAL FINAL |
|---|---|---|---|---|---|---|---|
| | | **CONTROL SECTION JOB** | | **6401-50-001** | | | |
| | | **PROJECT ID** | | **A00187167** | | | |
| | | **COUNTY** | | **Colorado** | | | |
| | | **HIGHWAY** | | **US 90** | | | |
| **ALT** | **BID CODE** | **DESCRIPTION** | **UNIT** | EST. | FINAL | | |
| | 132-6021 | EMBANKMENT (VEHICLE)(ORD COMP)(TY C) | CY | 77.800 | | 77.800 | |
| | 164-6003 | BROADCAST SEED (PERM) (RURAL) (CLAY) | SY | 223.000 | | 223.000 | |
| | 164-6009 | BROADCAST SEED (TEMP) (WARM) | SY | 56.000 | | 56.000 | |
| | 164-6011 | BROADCAST SEED (TEMP) (COOL) | SY | 56.000 | | 56.000 | |
| | 168-6001 | VEGETATIVE WATERING | MG | 1.880 | | 1.880 | |
| | 400-6005 | CEM STABIL BKFL | CY | 192.700 | | 192.700 | |
| | 400-6006 | CUT & RESTORING PAV | SY | 172.000 | | 172.000 | |
| | 402-6001 | TRENCH EXCAVATION PROTECTION | LF | 235.000 | | 235.000 | |
| | 432-6007 | RIPRAP (CONC)(CL C) | CY | 3.500 | | 3.500 | |
| | 432-6031 | RIPRAP (STONE PROTECTION)(12 IN) | CY | 3.000 | | 3.000 | |
| | 460-6002 | CMP (GAL STL 18 IN) | LF | 114.000 | | 114.000 | |
| | 460-6003 | CMP (GAL STL 24 IN) | LF | 9.000 | | 9.000 | |
| | 460-6010 | CMP AR (GAL STL DES 3) | LF | 38.000 | | 38.000 | |
| | 462-6002 | CONC BOX CULV (3 FT X 3 FT) | LF | 75.000 | | 75.000 | |
| | 462-6010 | CONC BOX CULV (6 FT X 3 FT) | LF | 80.000 | | 80.000 | |
| | 464-6003 | RC PIPE (CL III)(18 IN) | LF | 48.000 | | 48.000 | |
| | 464-6005 | RC PIPE (CL III)(24 IN) | LF | 138.000 | | 138.000 | |
| | 464-6007 | RC PIPE (CL III)(30 IN) | LF | 81.000 | | 81.000 | |
| | 466-6150 | WINGWALL (FW - 0) (HW=3 FT) | EA | 1.000 | | 1.000 | |
| | 466-6152 | WINGWALL (FW - 0) (HW=5 FT) | EA | 1.000 | | 1.000 | |
| | 467-6215 | SET (TY I)(S= 6 FT)(HW= 4 FT)(6:1) (P) | EA | 4.000 | | 4.000 | |
| | 467-6345 | SET (TY II) (18 IN) (CMP) (4: 1) (C) | EA | 6.000 | | 6.000 | |
| | 467-6362 | SET (TY II) (18 IN) (RCP) (6: 1) (C) | EA | 2.000 | | 2.000 | |
| | 467-6380 | SET (TY II) (24 IN) (CMP) (6: 1) (P) | EA | 2.000 | | 2.000 | |
| | 467-6388 | SET (TY II) (24 IN) (RCP) (3: 1) (C) | EA | 6.000 | | 6.000 | |
| | 467-6417 | SET (TY II) (30 IN) (RCP) (3: 1) (C) | EA | 4.000 | | 4.000 | |
| | 467-6423 | SET (TY II) (30 IN) (RCP) (6: 1) (P) | EA | 1.000 | | 1.000 | |
| | 467-6537 | SET (TY II) (DES 3) (CMP) (6: 1) (P) | EA | 2.000 | | 2.000 | |
| | 496-6042 | REMOV STR (SMALL) | EA | 8.000 | | 8.000 | |
| | 500-6001 | MOBILIZATION | LS | 1.000 | | 1.000 | |
| | 502-6001 | BARRICADES, SIGNS AND TRAFFIC HANDLING | MO | 3.000 | | 3.000 | |
| | 506-6038 | TEMP SEDMT CONT FENCE (INSTALL) | LF | 200.000 | | 200.000 | |
| | 506-6039 | TEMP SEDMT CONT FENCE (REMOVE) | LF | 200.000 | | 200.000 | |
| | 658-6073 | INSTL OM ASSM (OM-2Y)(WC)GND(BI) | EA | 12.000 | | 12.000 | |
| | 752-6005 | TREE REMOVAL (4" - 12" DIA) | EA | 1.000 | | 1.000 | |
| | 752-6006 | TREE REMOVAL (12" - 18" DIA) | EA | 5.000 | | 5.000 | |
| | 752-6022 | TREE TRIMMING AND BRUSH REMOVAL | LF | 100.000 | | 100.000 | |

# Estimate & Quantity Sheet

**CONTROLLING PROJECT ID** 6401-50-001

**DISTRICT** Yoakum
**HIGHWAY** US 90

**COUNTY** Colorado

## BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

## WORKER SAFETY NOTES:

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

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

## COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

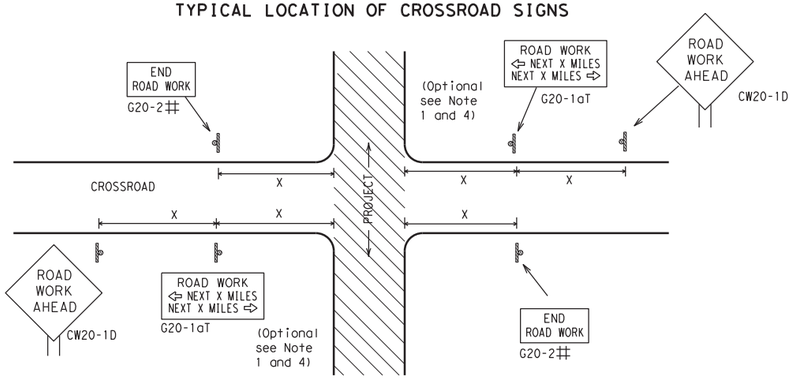
# BC(1)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| © TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21 | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 10 |



DATE: 7/22/2024 $TIME$
FILE: $FILE$

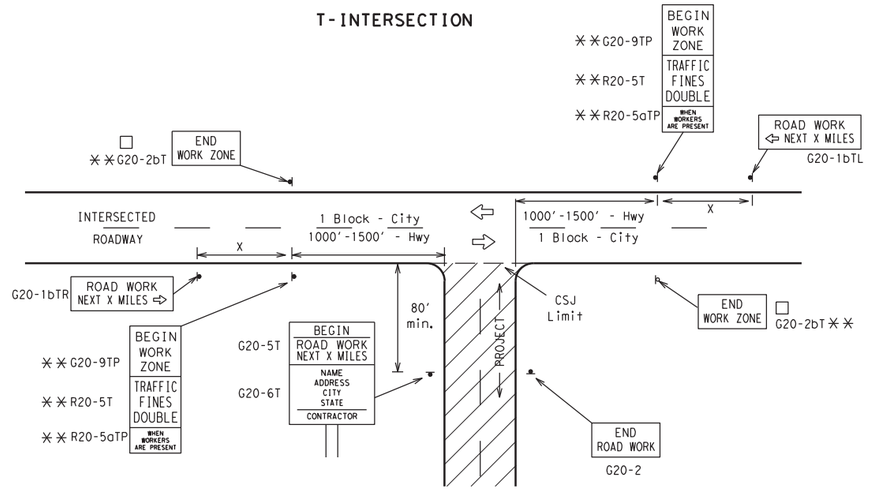
## TYPICAL LOCATION OF CROSSROAD SIGNS




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

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

## T-INTERSECTION




## CSJ LIMITS AT T-INTERSECTION

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

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

### SIZE

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

### SPACING

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

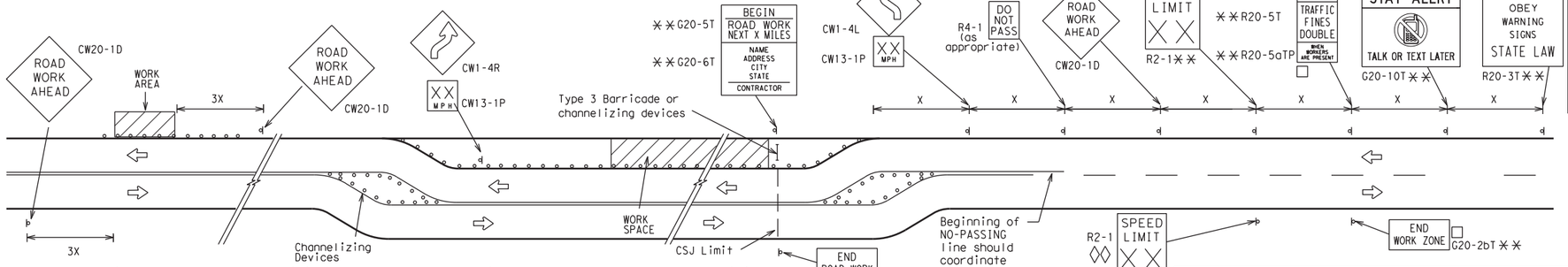
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

## GENERAL NOTES

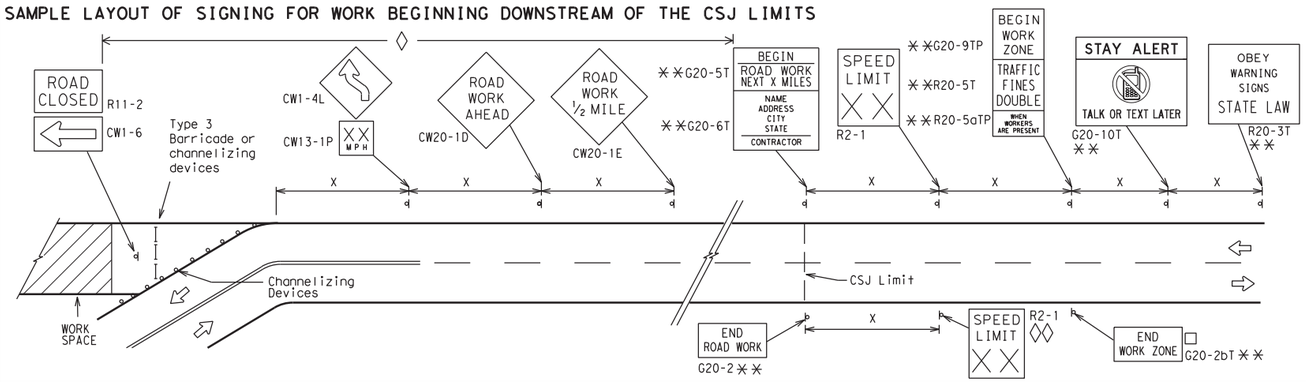
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

## WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS




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

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




## SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



## NOTES

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

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

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

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

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

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PROJECT LIMIT

# BC(2)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | YKM | COLORADO, ETC. | | 11 |



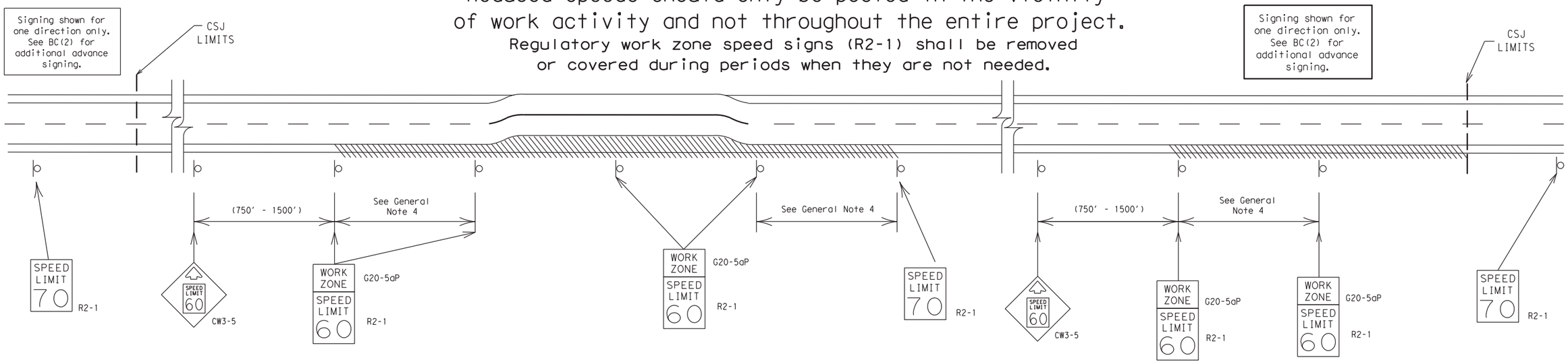
DATE: 7/22/2024 $TIME$
FILE: $FILE$

# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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




## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

### SHORT TERM WORK ZONE SPEED LIMITS

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

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

### GENERAL NOTES

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



Texas Department of Transportation | Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

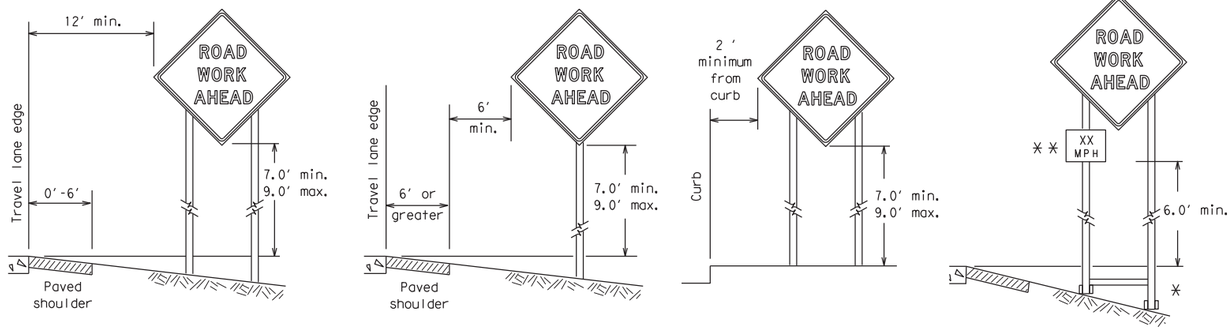
## BC(3)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 9-07 8-14 7-13 5-21 | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 12 |

97

DATE: 7/22/2024 $TIME$
FILE: $FILE$

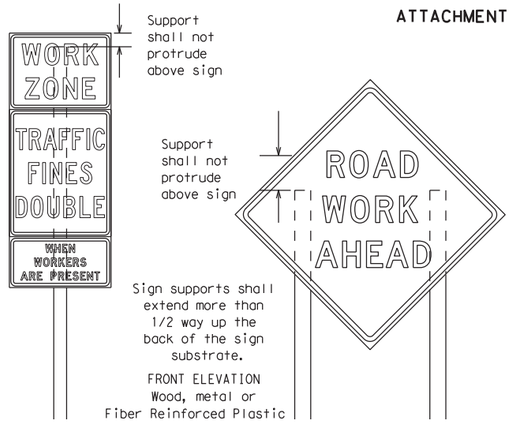
## TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



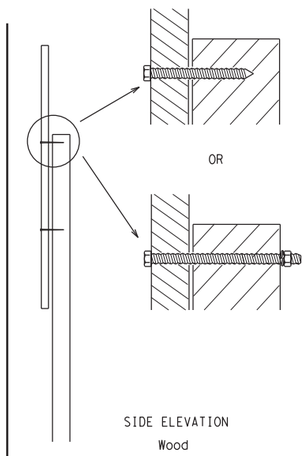

⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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




FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic




SIDE ELEVATION
Wood

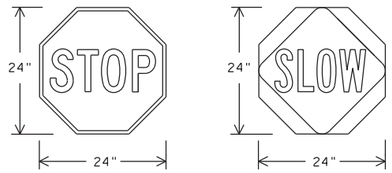
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

## STOP/SLOW PADDLES

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




Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

## CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

## GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

## SIGN MOUNTING HEIGHT

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

## SIZE OF SIGNS

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

## SIGN SUBSTRATES

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

## REFLECTIVE SHEETING

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

## SIGN LETTERS

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

## REMOVING OR COVERING

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

## SIGN SUPPORT WEIGHTS

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

## FLAGS ON SIGNS

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



Texas Department of Transportation | Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

# BC(4)-21

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|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | YKM | COLORADO, ETC. | | 13 |



DATE: 7/22/2024 $TIME$
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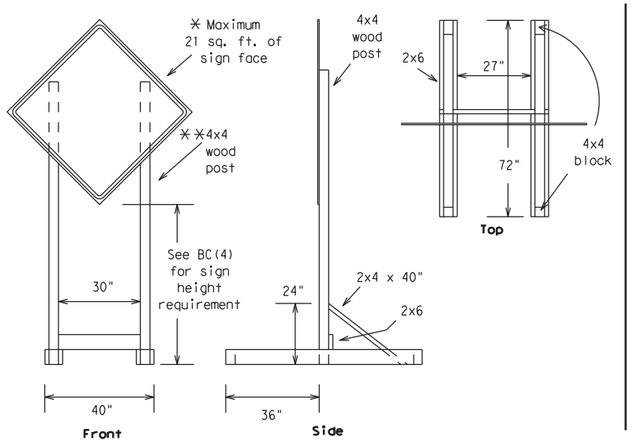
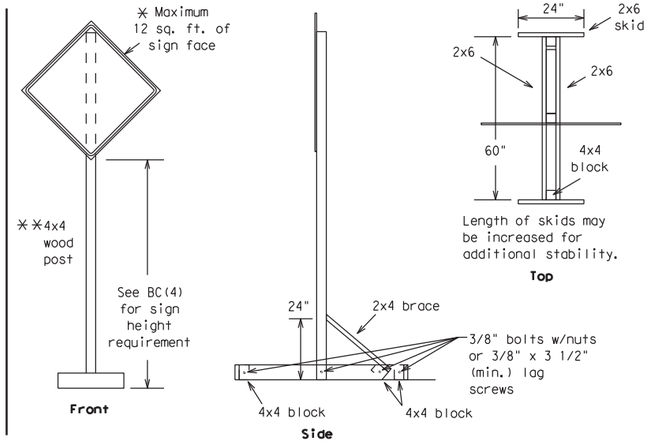
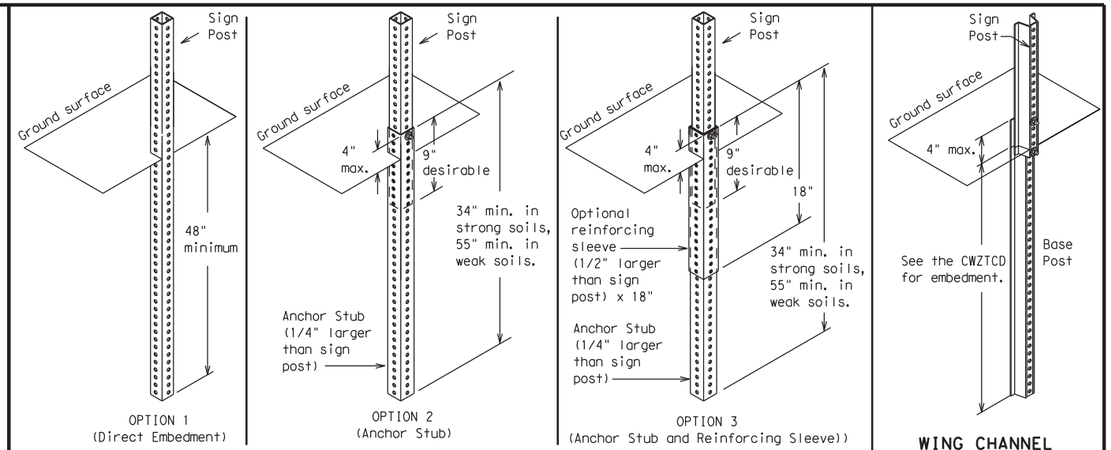



# SKID MOUNTED WOOD SIGN SUPPORTS

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




PERFORATED SQUARE METAL TUBING

**WING CHANNEL**
Lap-splice/base bolted anchor

# GROUND MOUNTED SIGN SUPPORTS

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










# SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

## WEDGE ANCHORS

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

## OTHER DESIGNS

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

## GENERAL NOTES

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

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

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

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



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# BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

# BC(5)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | YKM | COLORADO, ETC. | | 14 |



DATE: 7/22/2024 $TIME$
FILE: $FILE$

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

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

### Other Condition List

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

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

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

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

### Location List

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

### Warning List

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

### ** Advance Notice List

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

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

** See Application Guidelines Note 6.

### APPLICATION GUIDELINES

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

### WORDING ALTERNATIVES

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

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

### FULL MATRIX PCMS SIGNS

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

## BC(6)-21

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|---|---|---|---|---|---|
| ©TxDOT | November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | | YKM | COLORADO, ETC. | | 15 |

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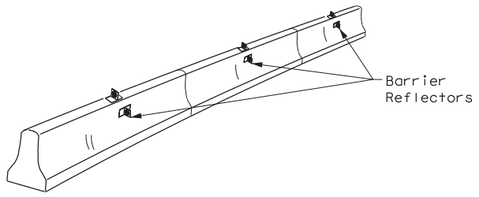
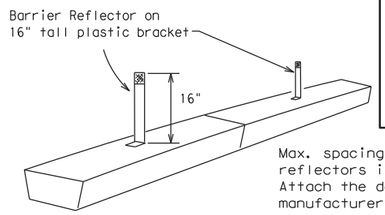
DATE: 7/22/2024 $TIME$
FILE: $FILE$

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




CONCRETE TRAFFIC BARRIER (CTB)

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

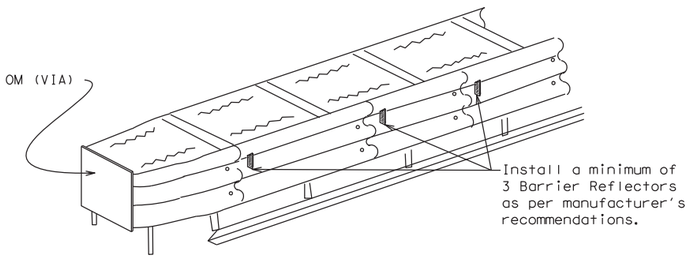



Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**

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

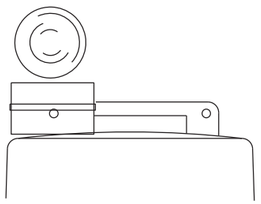



DELINEATION OF END TREATMENTS

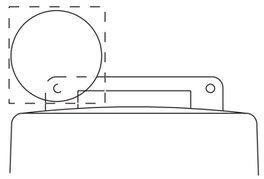
**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

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

# BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

## WARNING LIGHTS

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

## WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

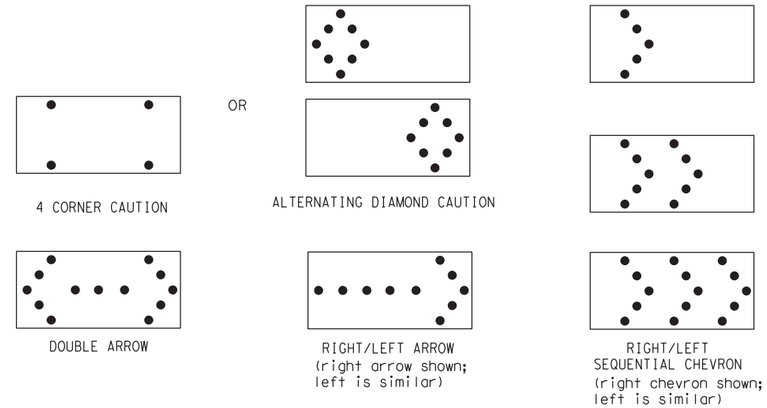
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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




4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

RIGHT/LEFT ARROW
(right arrow shown;
left is similar)

RIGHT/LEFT
SEQUENTIAL CHEVRON
(right chevron shown;
left is similar)

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

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

**ATTENTION**

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

# FLASHING ARROW BOARDS

## TRUCK-MOUNTED ATTENUATORS

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



Texas Department of Transportation

Traffic Safety Division Standard

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

# BC(7)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
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| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
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DATE: 7/22/2024 $TIME$
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## GENERAL NOTES

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

## GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

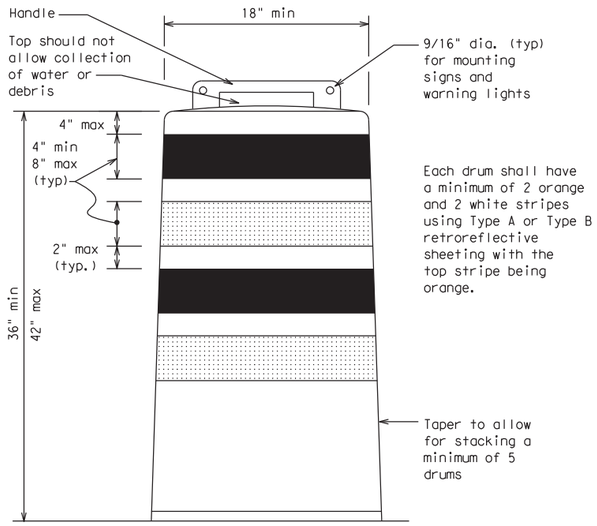
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

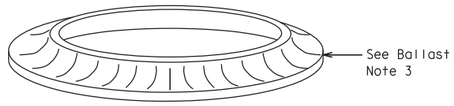
## RETROREFLECTIVE SHEETING

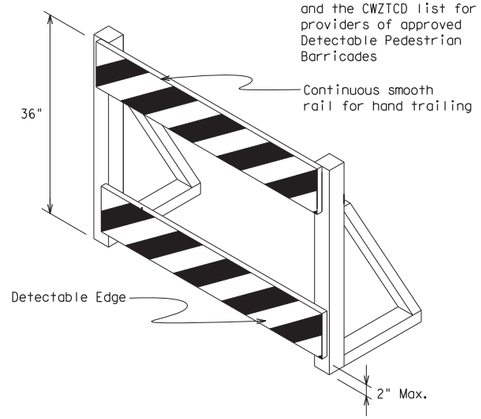
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

## BALLAST

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

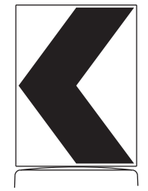



## DETECTABLE PEDESTRIAN BARRICADES

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



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

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

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

## SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

## BC(8)-21

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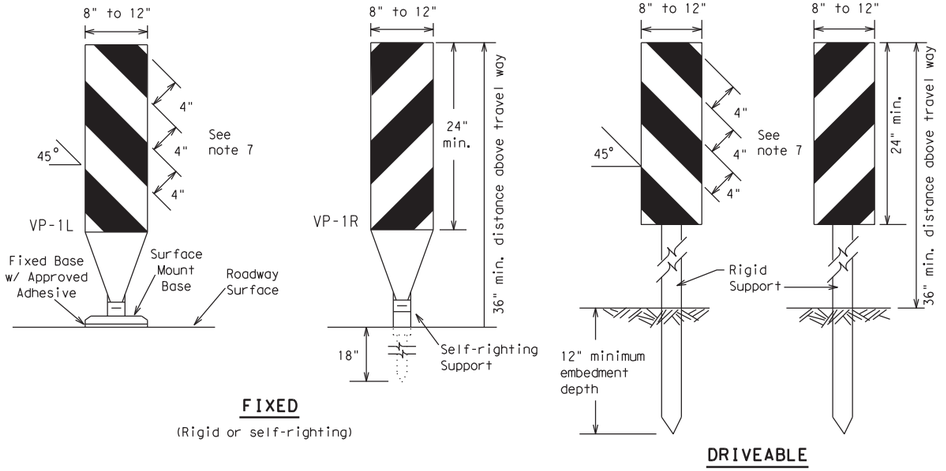
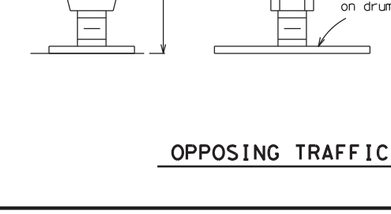



**FIXED**
(Rigid or self-righting)

**DRIVEABLE**

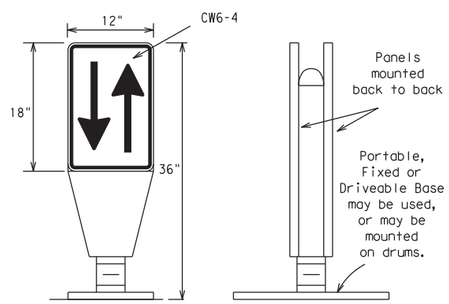



(Rigid or self-righting)

**PORTABLE**

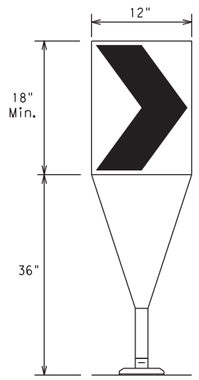
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

## 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)



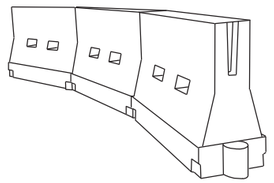

Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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). Place reflective sheeting near the top of the LCD along the full length of the device.

## WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

## SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

# BC(9)-21

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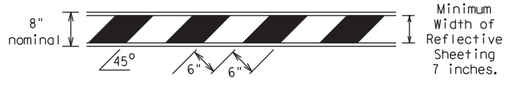
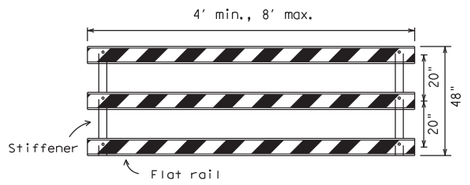
## TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



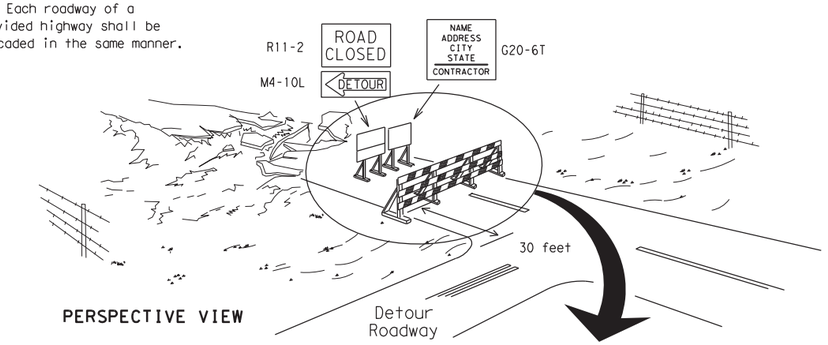

TYPICAL STRIPING DETAIL FOR BARRICADE RAIL




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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

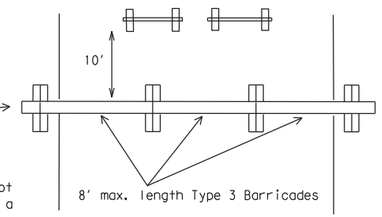
Each roadway of a divided highway shall be barricaded in the same manner.




PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

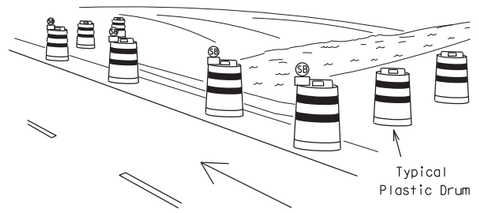
Barricade striping should slant downward in the direction of detour.




PLAN VIEW

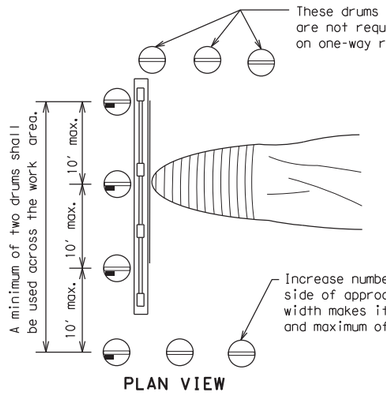
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION




PERSPECTIVE VIEW

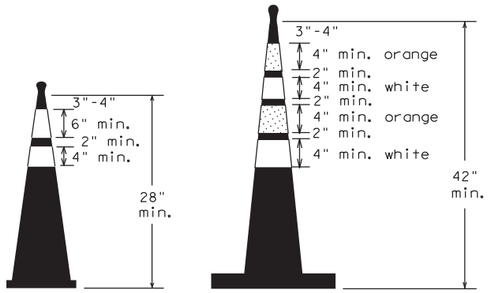
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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




PLAN VIEW

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

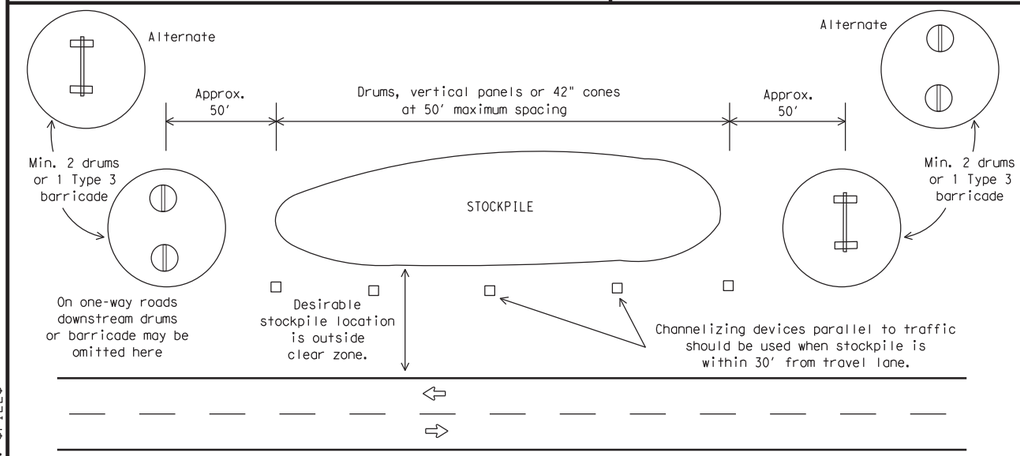
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS




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

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

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




TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

## BC(10)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | YKM | COLORADO, ETC. | | 19 |

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DATE: 7/22/2024 $TIME$
FILE: $FILE$

# WORK ZONE PAVEMENT MARKINGS

## GENERAL

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

## RAISED PAVEMENT MARKERS

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

## PREFABRICATED PAVEMENT MARKINGS

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

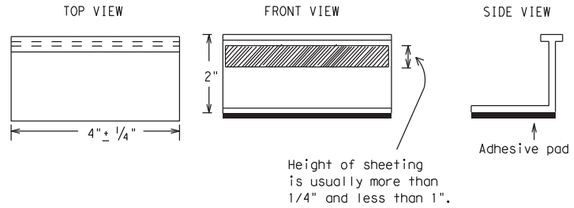
## MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

## REMOVAL OF PAVEMENT MARKINGS

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

# Temporary Flexible-Reflective Roadway Marker Tabs




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

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

## RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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



Texas Department of Transportation — Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

# BC(11)-21

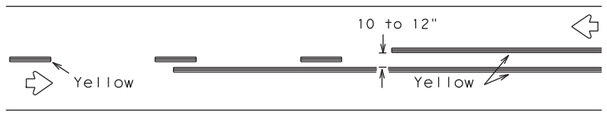
| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 1998 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 2-98 9-07 5-21 | DIST | COUNTY | | SHEET NO. |
| 1-02 7-13 | YKM | COLORADO, ETC. | | 20 |
| 11-02 8-14 | | | | |

105

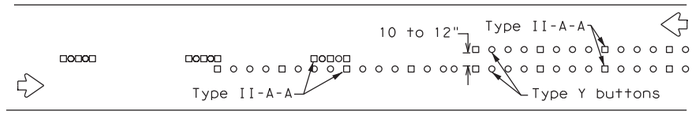
DATE: 7/22/2024 $TIME$
FILE: $FILE$

DATE: 7/22/2024 $TIME$
FILE: $FILE$

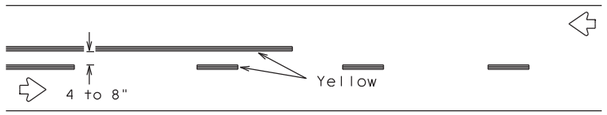
# PAVEMENT MARKING PATTERNS



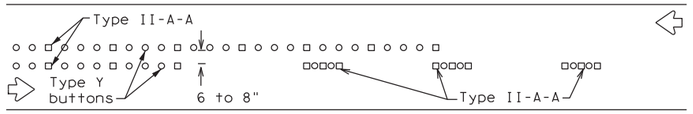

REFLECTORIZED PAVEMENT MARKINGS - PATTERN A




RAISED PAVEMENT MARKERS - PATTERN A



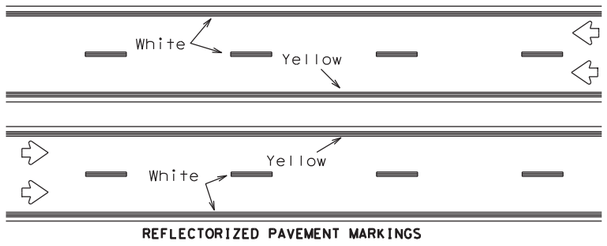

REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



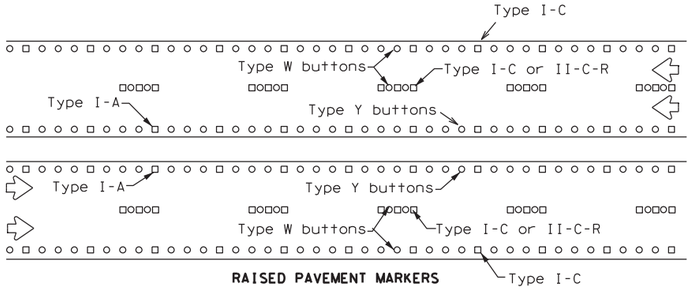

RAISED PAVEMENT MARKERS - PATTERN B

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

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



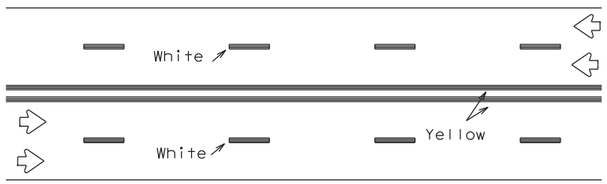

REFLECTORIZED PAVEMENT MARKINGS



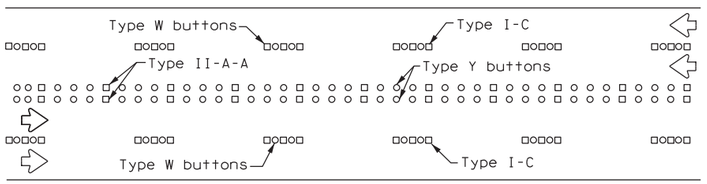

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



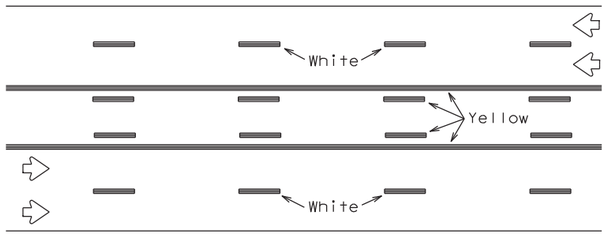

REFLECTORIZED PAVEMENT MARKINGS



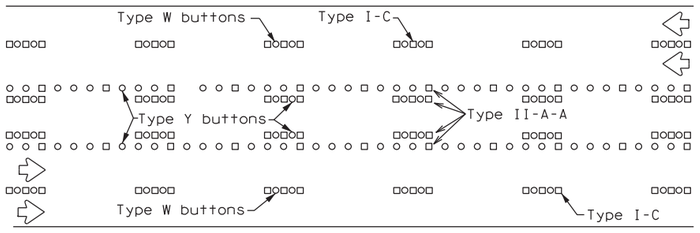

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS




REFLECTORIZED PAVEMENT MARKINGS




RAISED PAVEMENT MARKERS

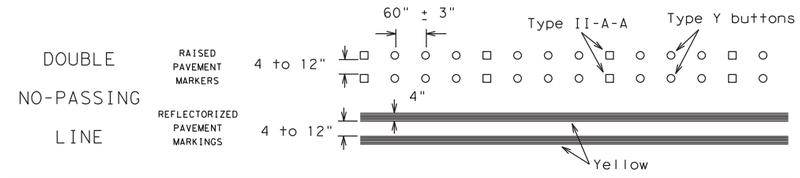
Prefabricated markings may be substituted for reflectorized pavement markings.

## TWO-WAY LEFT TURN LANE

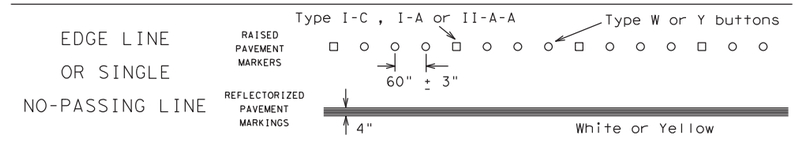
# STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

## SOLID LINES

### DOUBLE NO-PASSING LINE

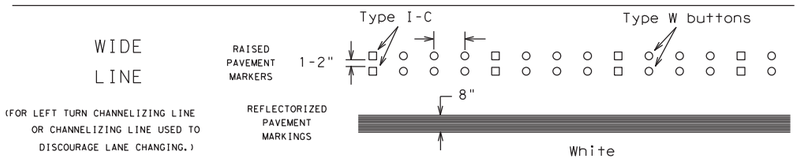



### EDGE LINE OR SINGLE NO-PASSING LINE



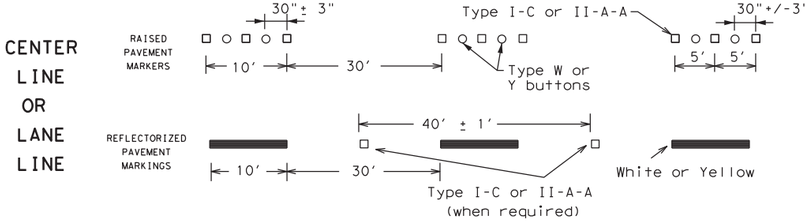

### WIDE LINE

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

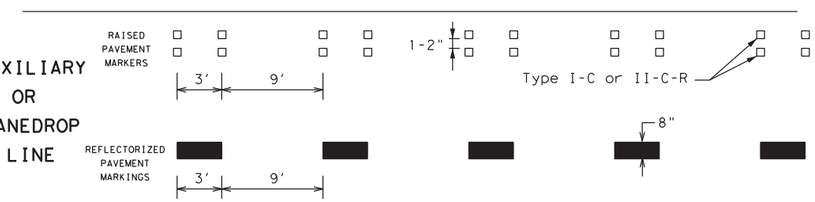



## BROKEN LINES

### CENTER LINE OR LANE LINE

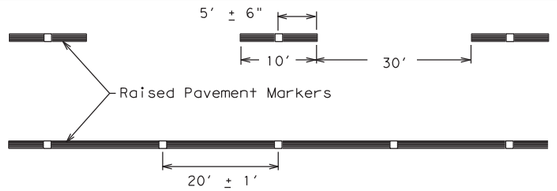



### AUXILIARY OR LANEDROP LINE




### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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




Centerline only - not to be used on edge lines

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



Texas Department of Transportation

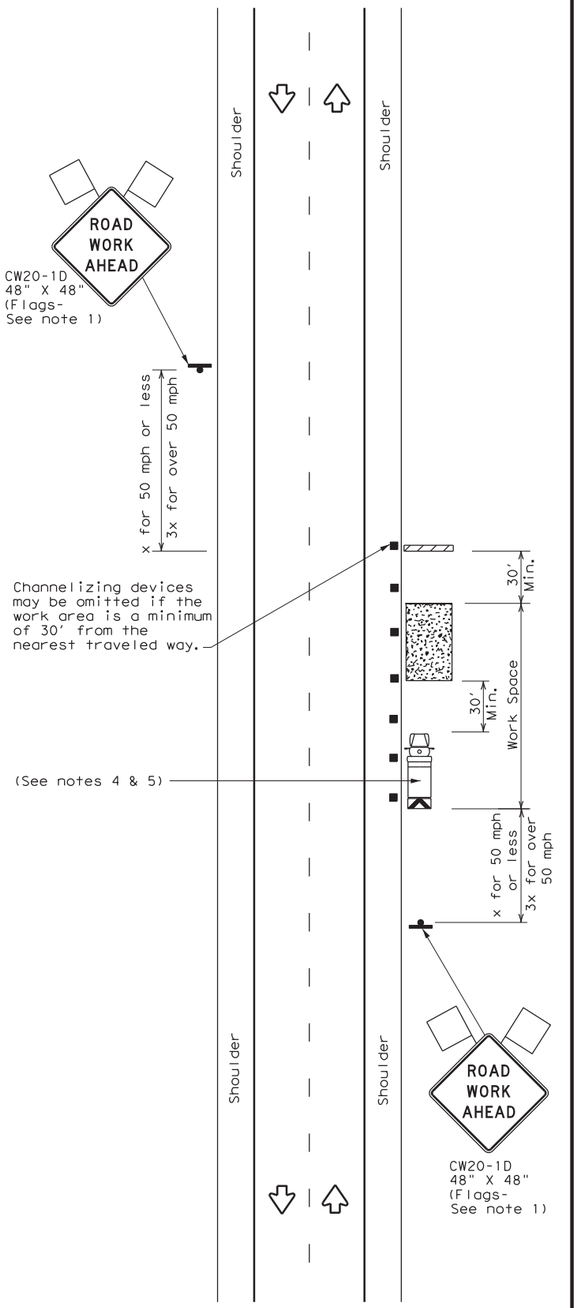
Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

## BC(12)-21

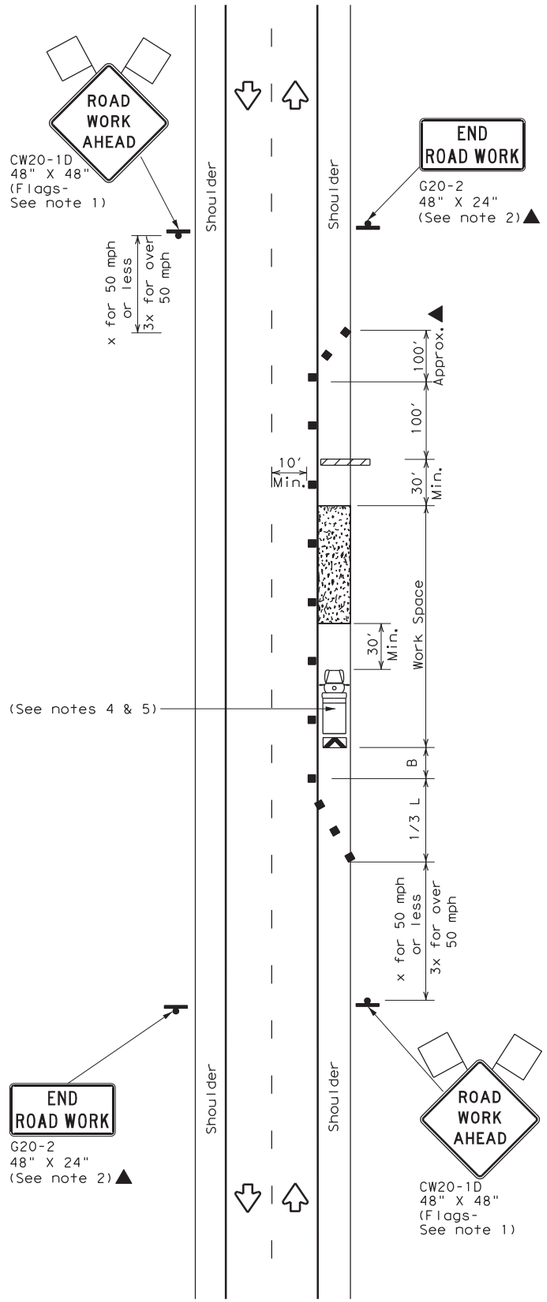
| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 1998 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14 | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 21 |

DATE: 7/22/2024 $TIME$
FILE: $FILE$



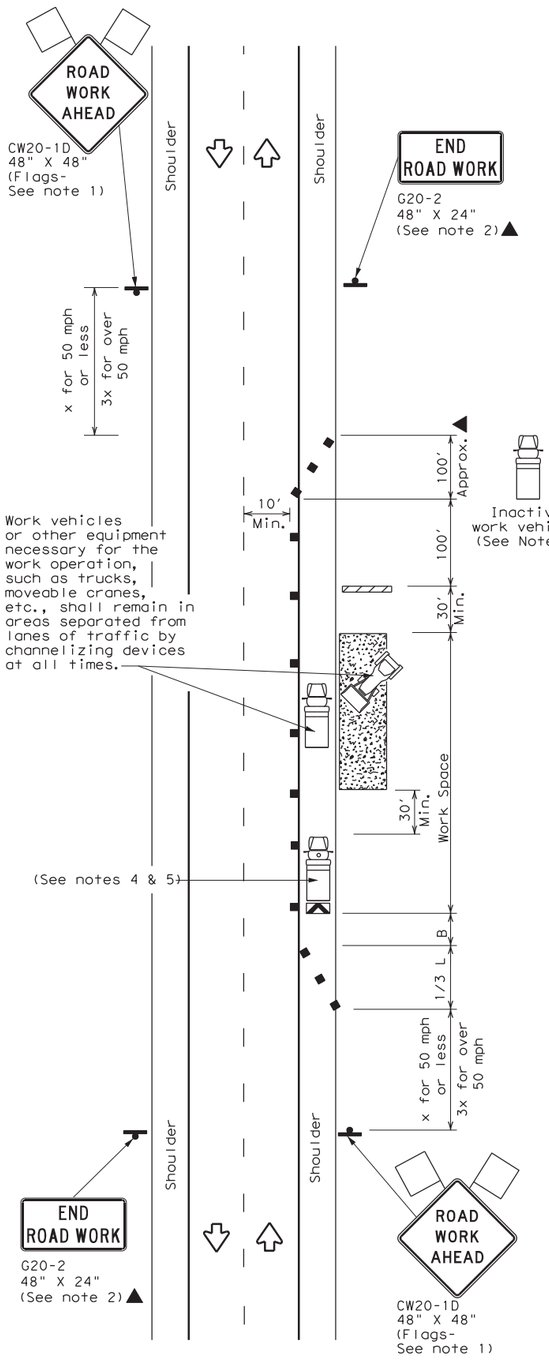

TCP (2-1a)

## WORK SPACE NEAR SHOULDER
Conventional Roads




TCP (2-1b)

## WORK SPACE ON SHOULDER
Conventional Roads




TCP (2-1c)

## WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

## GENERAL NOTES

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

Texas Department of Transportation

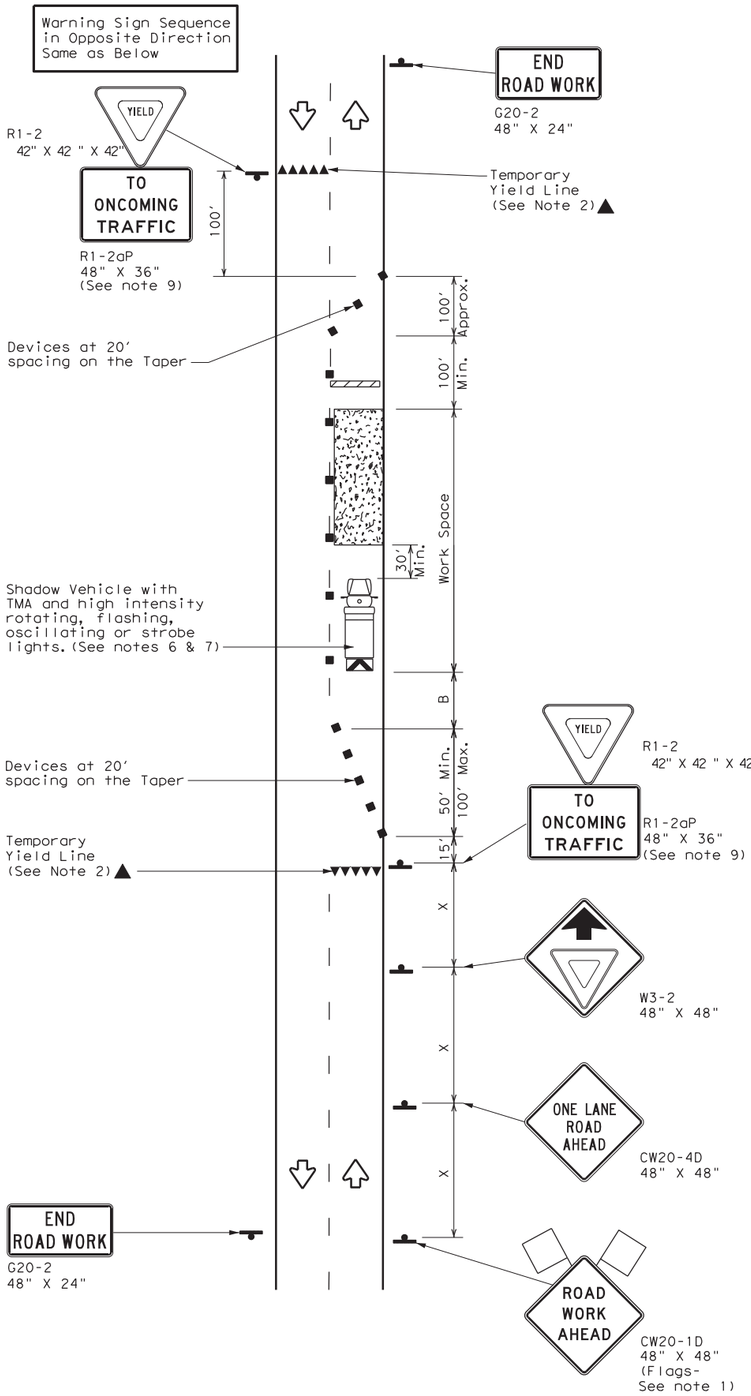
Traffic Operations Division Standard

# TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

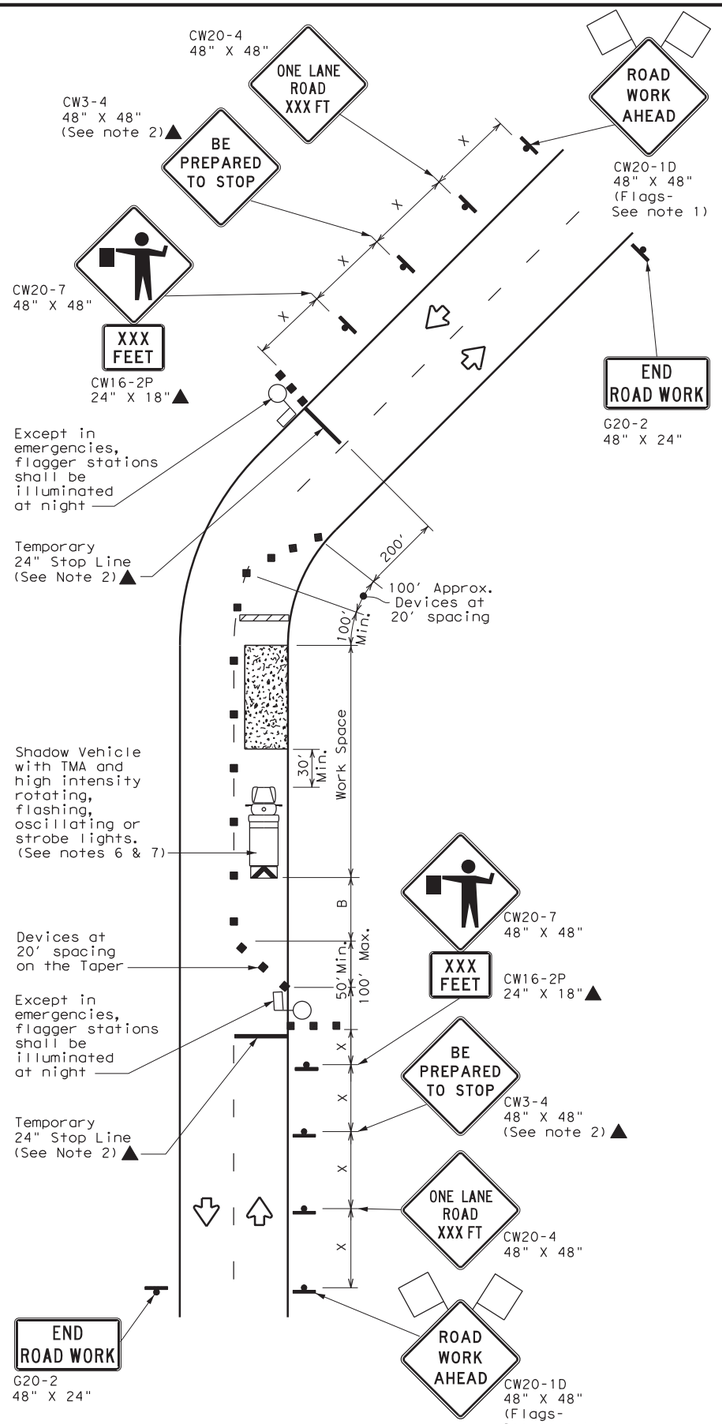
# TCP(2-1)-18

| FILE: tcp2-1-18.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| © TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 2-94 4-98 | DIST | COUNTY | | SHEET NO. |
| 8-95 2-12 | YKM | COLORADO, ETC. | | 22 |
| 1-97 2-18 | | | | |

DATE: 7/22/2024 $TIME$
FILE: $FILE$




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




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

## LEGEND

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

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

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

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

## GENERAL NOTES

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

### TCP (2-2a)

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

### TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

# TRAFFIC CONTROL PLAN
# ONE-LANE TWO-WAY TRAFFIC CONTROL

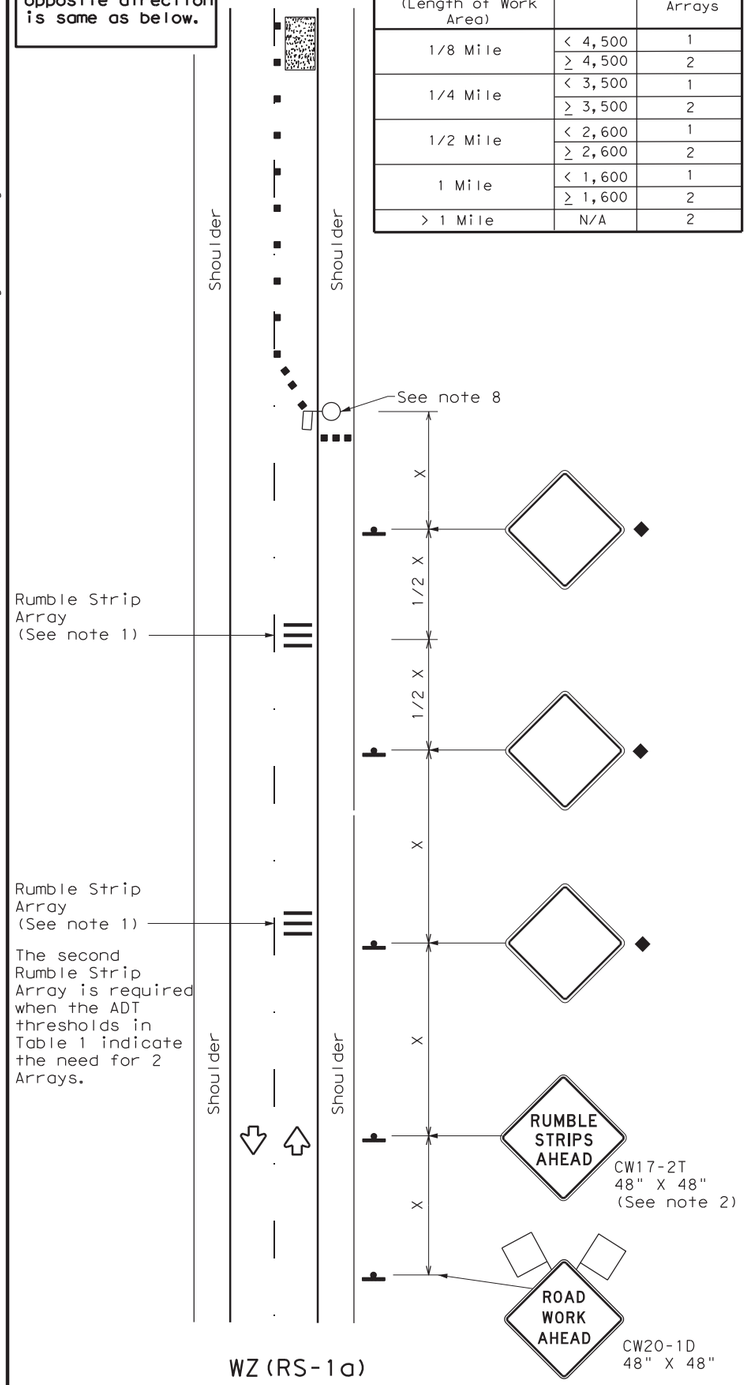
# TCP(2-2)-18

| FILE: tcp2-2-18.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| ©TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18 | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 23 |

DATE: 7/22/2024 $TIME$
FILE: $FILE$

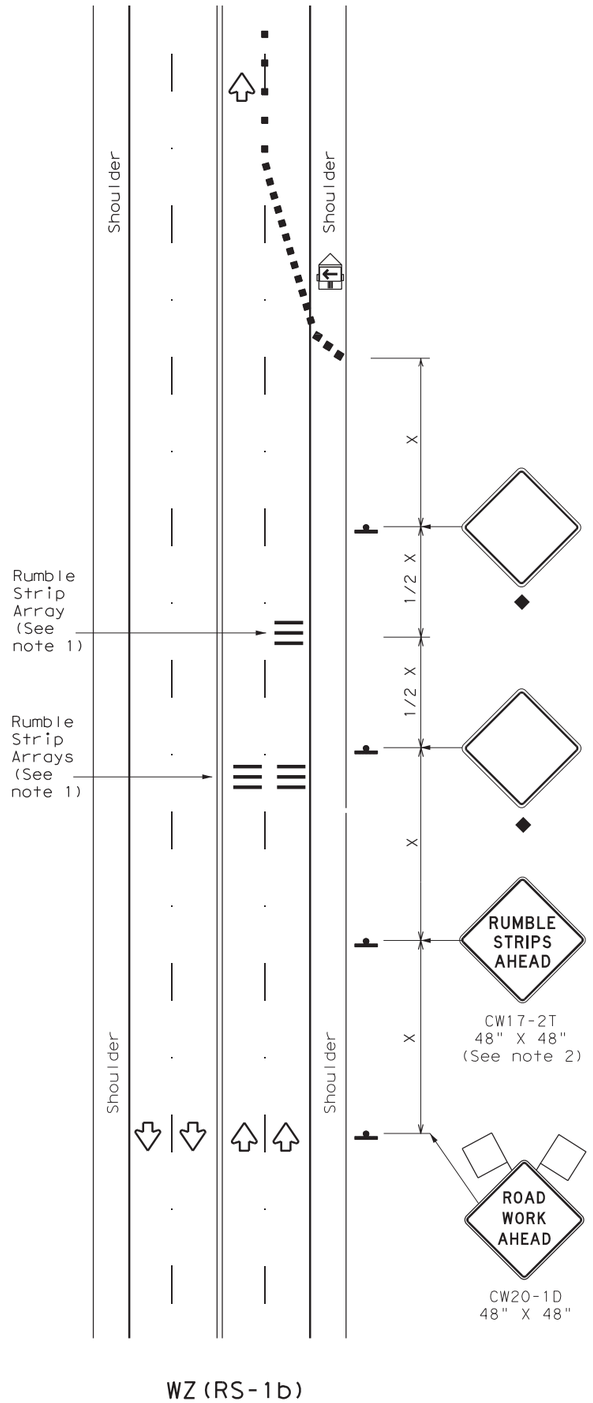
**Warning sign and rumble strip sequence in opposite direction is same as below.**

| 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)

## RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION




WZ(RS-1b)

## RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

## GENERAL NOTES

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

| LEGEND | | | |
|---|---|---|---|
| | 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.

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

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

Texas Department of Transportation

Traffic Safety Division Standard

# TEMPORARY RUMBLE STRIPS

## WZ(RS)-22

| FILE: wzrs22.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| © TxDOT November 2012 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 2-14 1-22 4-16 | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 24 |

117

LEGEND

CEM STAB BKFL

CUT & RESTORE PAV

US 90

PROPOSED 1 - DES 3 X 38' CMP

EXIST 1 - 15" X 32.8' CMP & 1 - 18" X 32.8' CMP
TO BE REMOVED

OLD MCDONALD RD
℄

EXIST SANITARY SEWER

SET (TY II)(DES 3)(CMP)(6:1)(P)

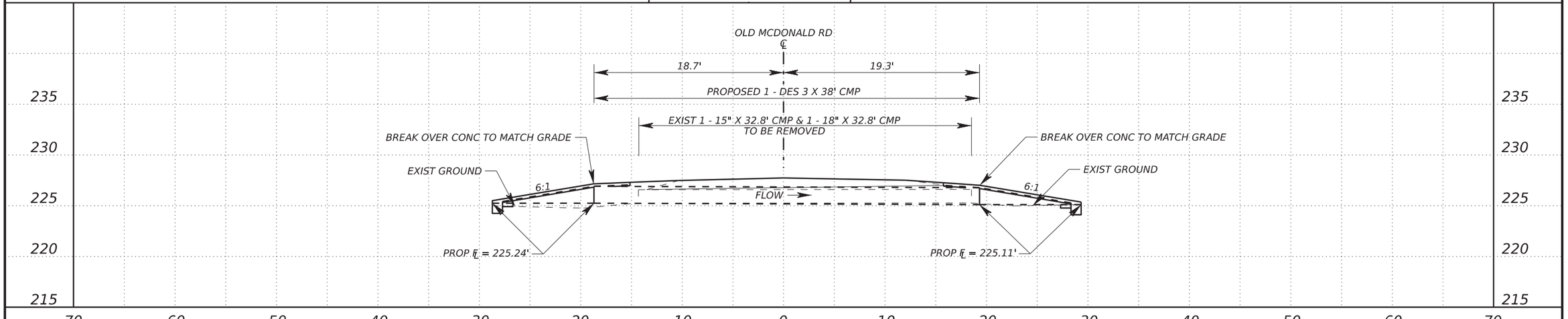
SET (TY II)(DES 3)(CMP)(6:1)(P)

EXIST ROW

EXIST UTILITY POLE

20' ROADWAY

LAT: 29.702920°N
LONG: 96.579800°W




## CULVERT STA 128+95 LT

EXIST 1 - 15" X 32.8' CMP & 1 - 18" X 32.8' CMP TO BE REMOVED.
PROP 1 - DES 3 X 38' CMP &
SET (TY II)(DES 3)(CMP)(6:1)(P) LT & RT
USING SETP-PD-A.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED
PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

US 90 - COLORADO CO
SCALE: 1" = 10'
Texas Department of Transportation



SHEET 1 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 25 |

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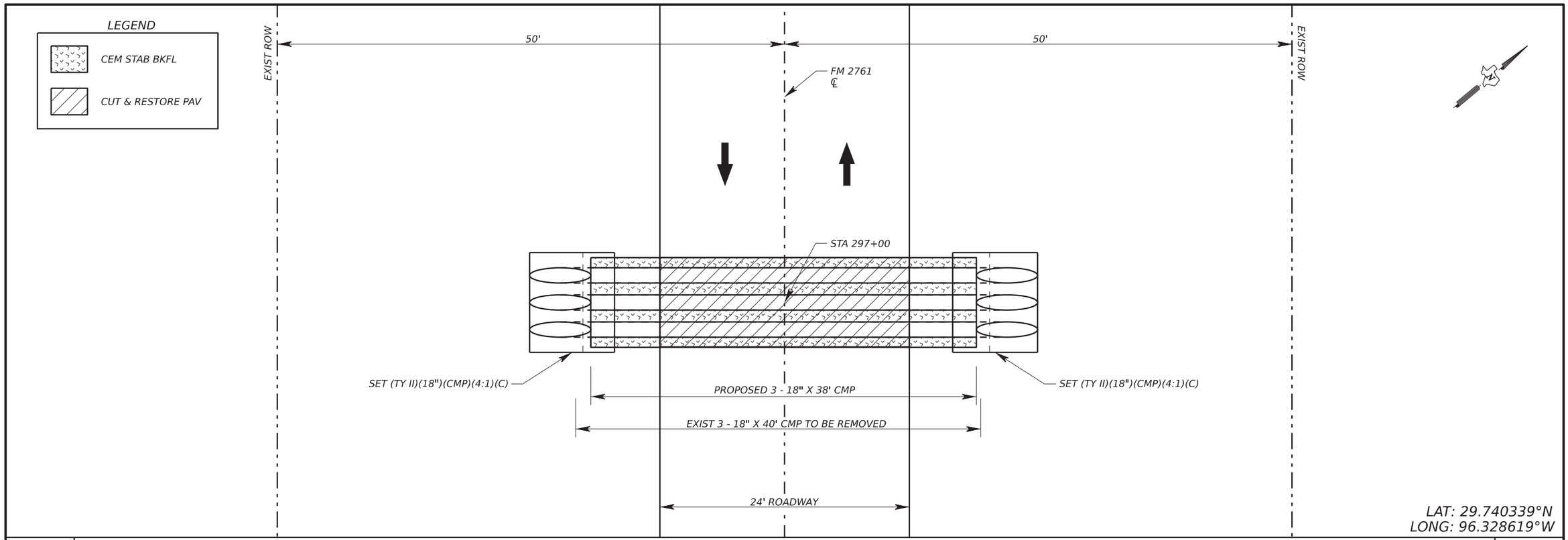
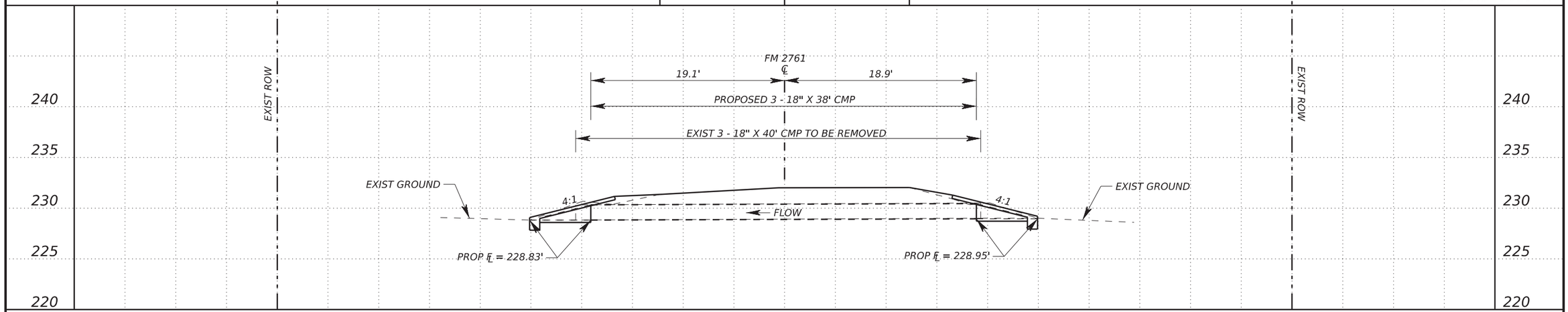
DATE: 7/22/2024

LEGEND

CEM STAB BKFL

CUT & RESTORE PAV




## CULVERT STA 297+00

EXIST 3 - 18" x 40' CMP W/ 3:1 SET LT & RT TO BE REMOVED.
PROP 3 - 18" X 38' CMP &
SET (TY II)(18")(CMP)(4:1) (C) LT & RT
USING SETP-CD.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED
PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 2761 - COLORADO CO
SCALE: 1" = 10'

Texas Department of Transportation



SHEET 2 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 26 |

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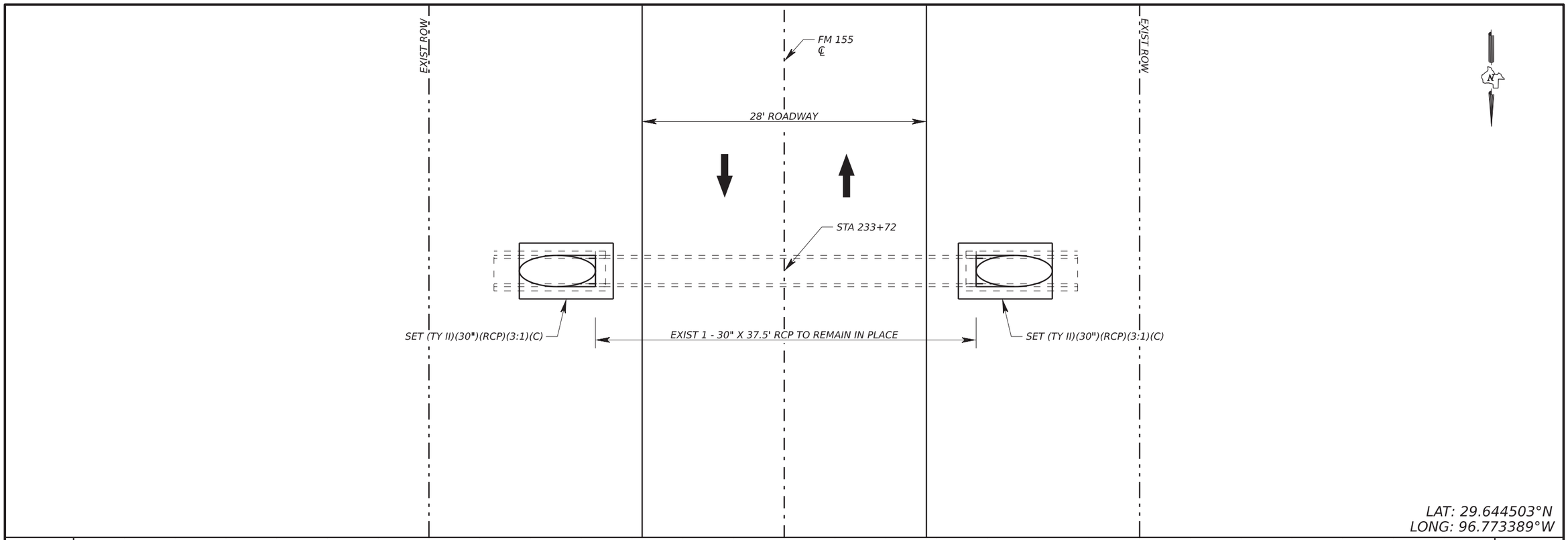
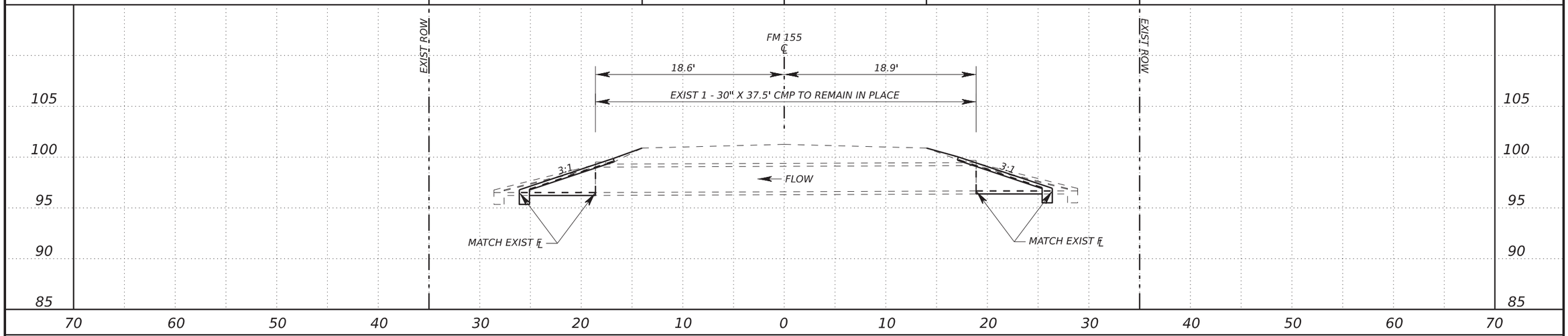
DATE: 7/22/2024




## CULVERT STA 233+72

EXIST 1 - 30" X 37.5' RCP W/ 4:1 SETs LT & RT.
REMOVE EXIST SET LT & RT.
PROP - SET (TY II)(30")(RCP)(3:1)(C) LT & RT
USING SETP-CD.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 155 - COLORADO CO
SCALE: 1" = 10'
Texas Department of Transportation





| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
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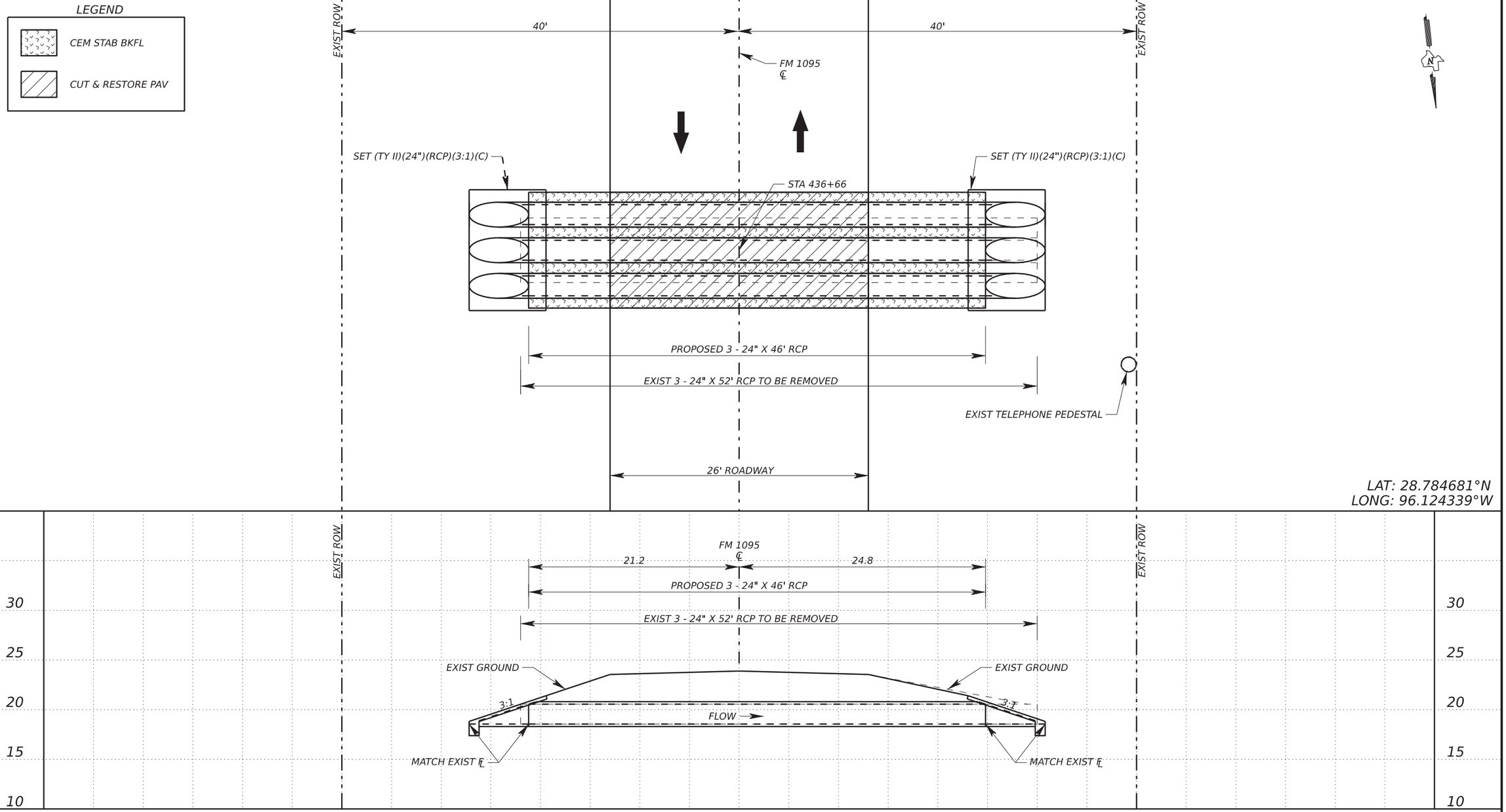
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 27 |

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FILE: SH185_Culvert_Layout2_2dSeed.dgn
DATE: 7/22/2024

## CULVERT STA 436+66

EXIST 3 - 24" X 52' RCP TO BE REMOVED.
PROP 3 - 24" X 46' RCP &
SET (TY II)(24")(RCP)(3:1)(C) LT & RT
USING SETP-CD.

STATE OF TEXAS
MARK C. NETARDUS
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LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

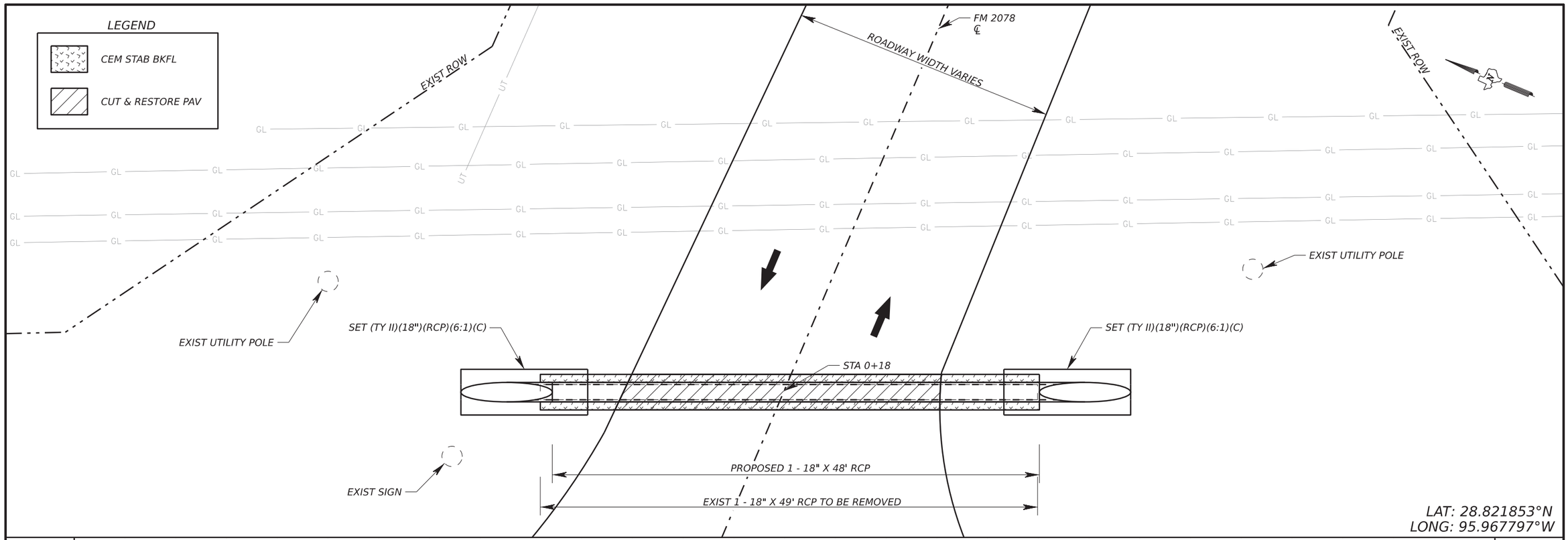
# CULVERT LAYOUT

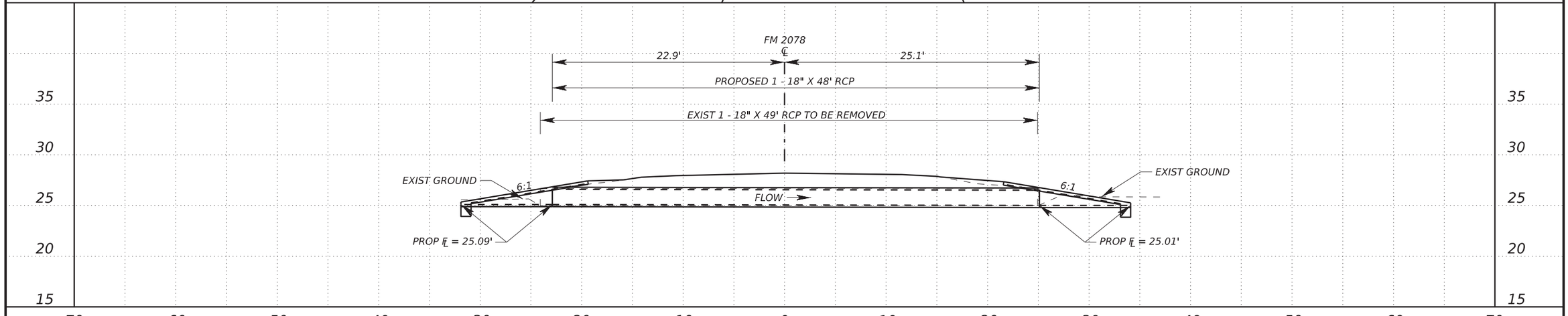
FM 1095 - MATAGORDA CO
SCALE: 1" = 10'
Texas Department of Transportation



SHEET 4 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 28 |




## CULVERT STA 0+18

EXIST 1 - 18" X 49' RCP TO BE REMOVED
PROP 1 - 18" X 48' RCP &
SET (TY II)(18")(RCP)(6:1)(C) LT & RT
USING SETP-CD.

STATE OF TEXAS
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87008
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PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 2078 - MATAGORDA CO
SCALE: 1" = 10'
Texas Department of Transportation



SHEET 5 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 29 |

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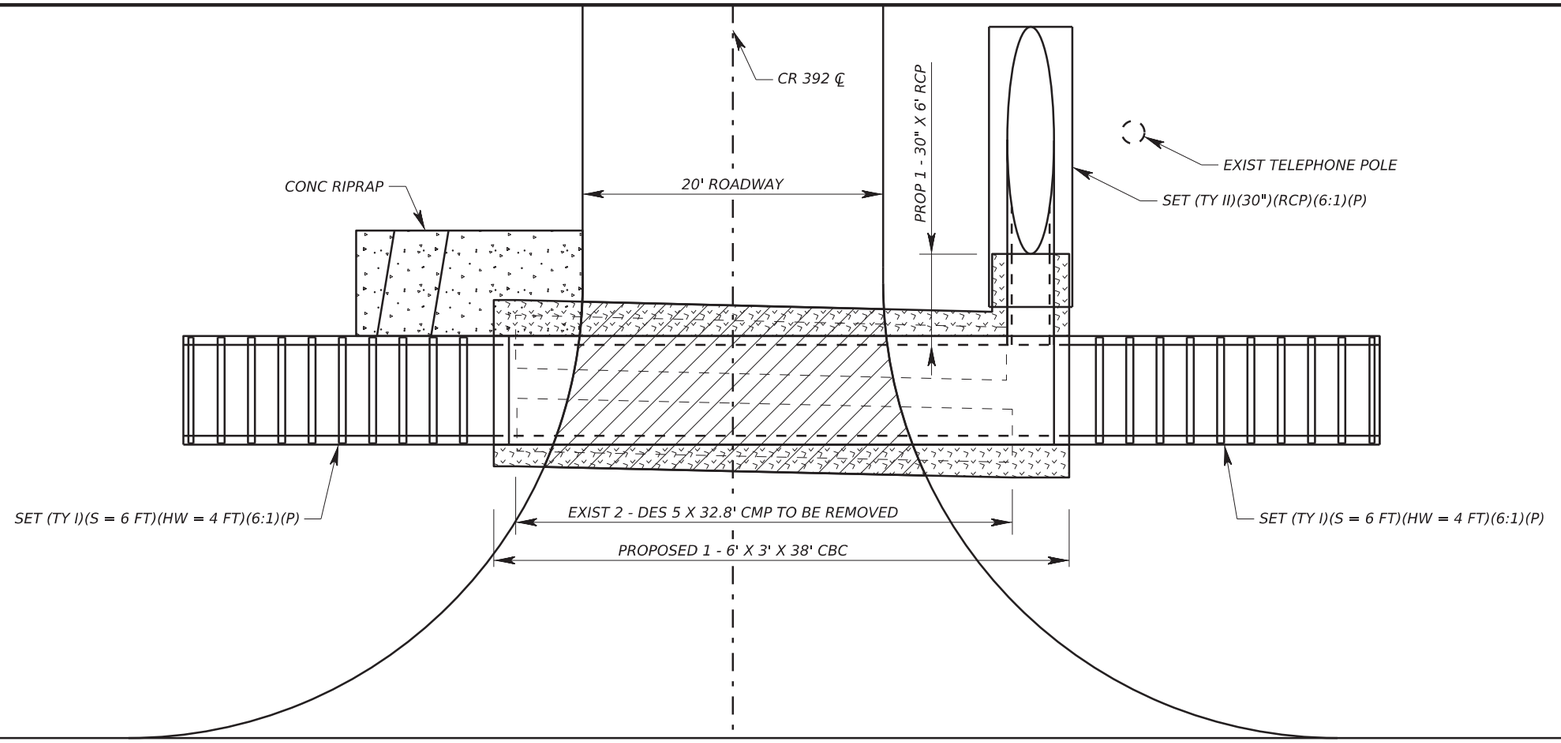
FILE: SH185_Culvert_Layout2_2dSeed.dgn
DATE: 7/22/2024

LEGEND

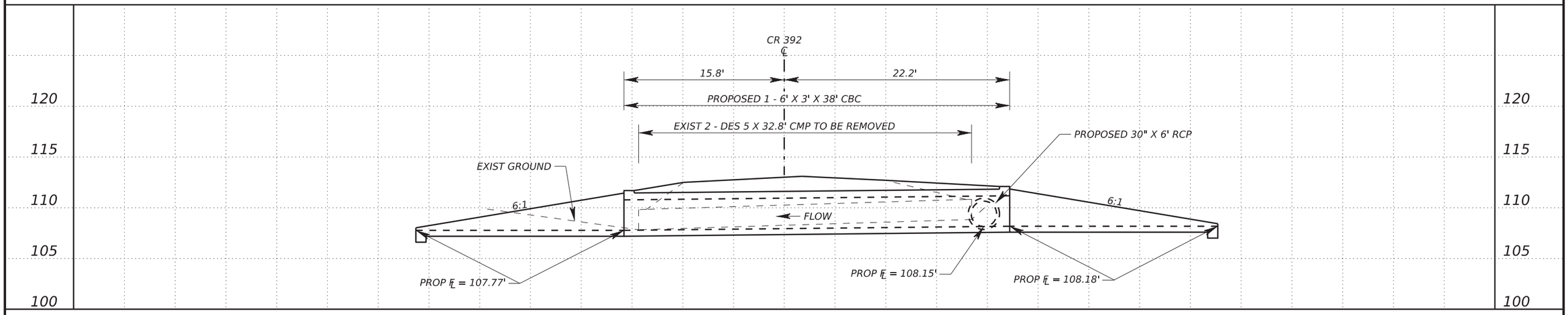
CEM STAB BKFL

CUT & RESTORE PAV




FM 1160

LAT: 29.259528°N
LONG: 96.396267°W




## CULVERT STA 560+51 LT

EXIST 2 - DES 5 X 32.8' CMP TO BE REMOVED.
PROP 1 - 6' X 3' X 38' CBC &
SET (TY I)(S = 6 FT)(HW = 4 FT)(6:1)(P) LT & RT
USING BCS, SCP-6, SETB-PD, SCP-MD &
PROP 1 - 30" X 6' RCP TO STUB INTO PROP CBC &
SET (TY II)(30")(RCP)(6:1)(P) LT
USING SETP-PD.

STATE OF TEXAS
MARK C. NETARDUS
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LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 1160 - WHARTON CO
SCALE: 1" = 10'

Texas Department of Transportation



SHEET 6 OF 10

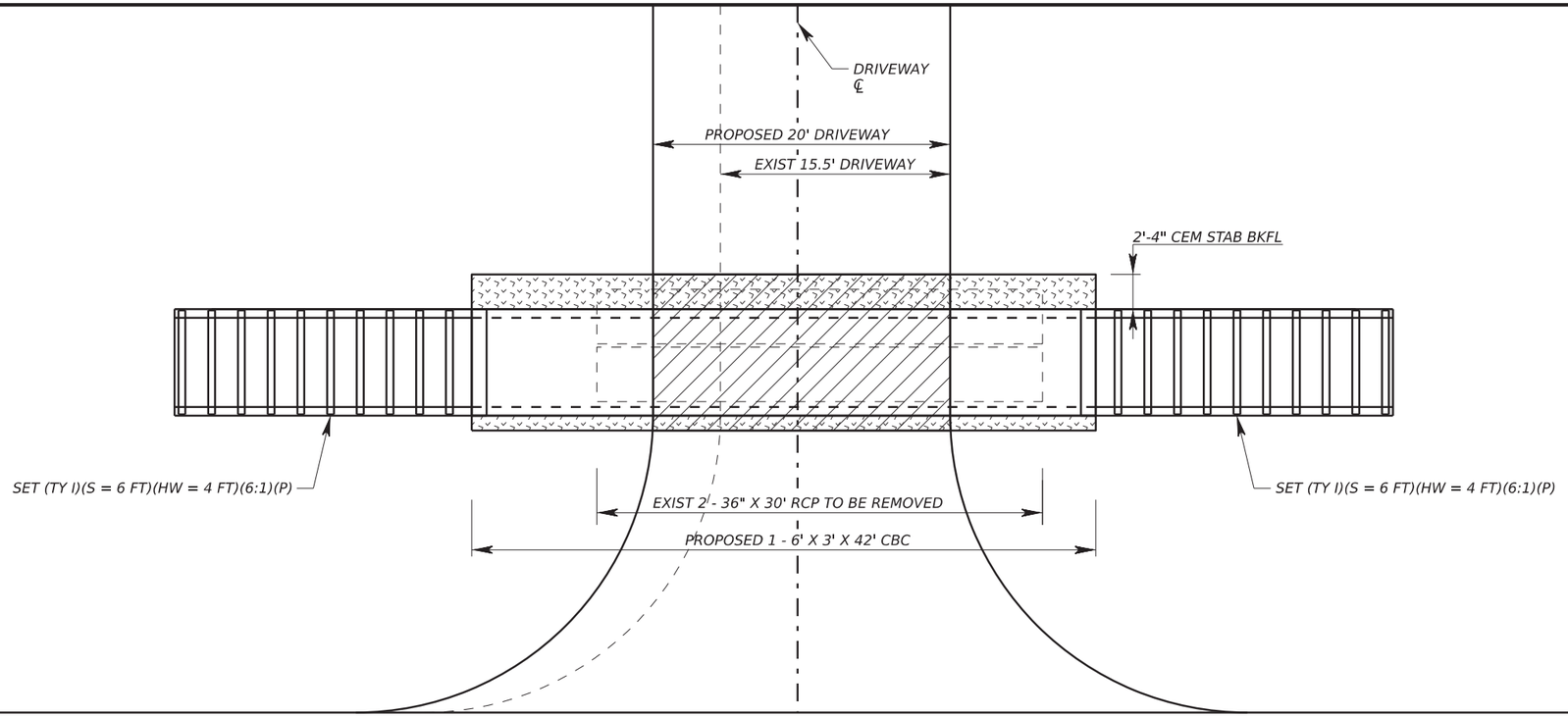
| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 30 |

PATH: T:\YKMANNEX\PS&E\043202097_SH185\Plan_Sheets\
FILE: SH185_Culvert_Layout2_2dSeed.dgn
DATE: 7/22/2024

LEGEND

CEM STAB BKFL

CUT & RESTORE PAV




FM 442

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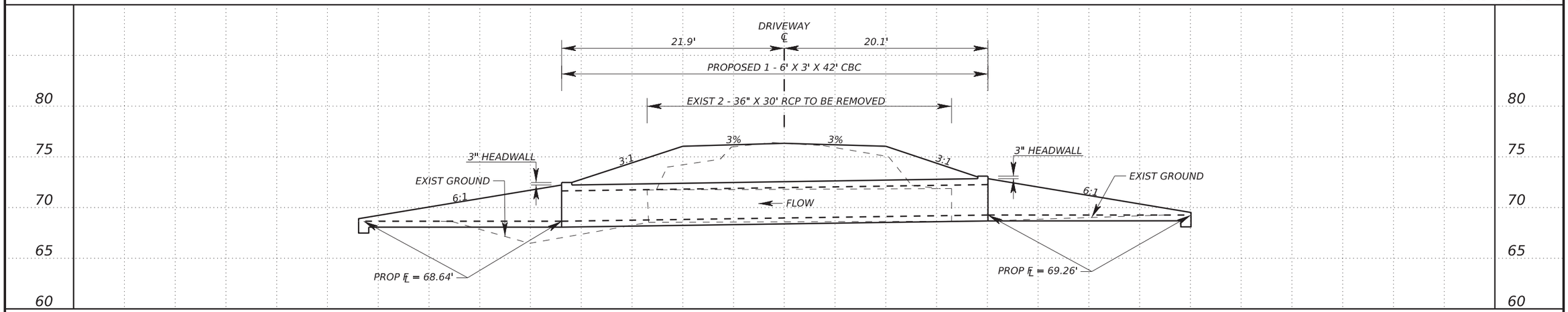
LONG: 95.960265°W




## CULVERT STA 259+09 LT

EXIST 2 - 36" X 30' RCP TO BE REMOVED.
PROP 1 - 6' X 3' X 42' CBC USING SCP-6 & SCP-MD &
SET (TY I)(S = 6)(HW = 4)(6:1)(P) LT & RT
USING SETB-PD.

STATE OF TEXAS
MARK C. NETARDUS
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LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 442 - WHARTON CO
SCALE: 1" = 10'

Texas Department of Transportation



SHEET 7 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 31 |

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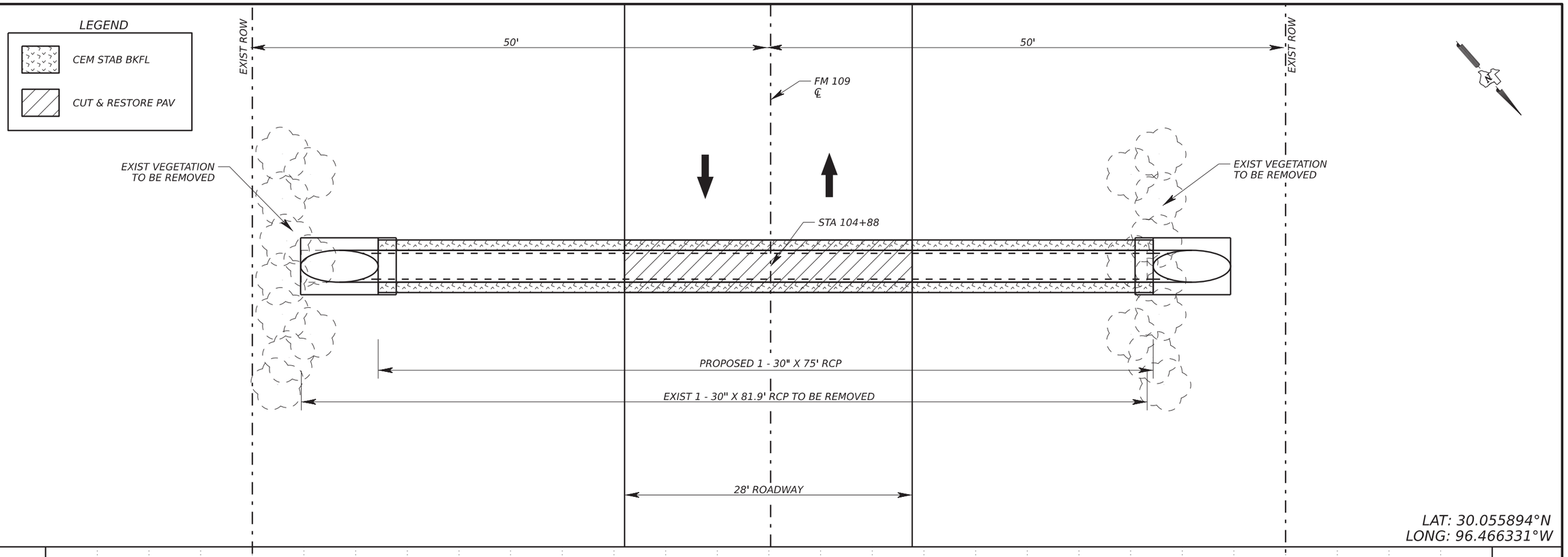
FILE: SH185_Culvert_Layout2_2dSeed.dgn
DATE: 7/22/2024




## CULVERT STA 104+88

EXIST 1 - 30" X 81.9' RCP TO BE REMOVED
PROP 1 - 30" X 75' RCP &
SET (TY II)(30")(RCP)(3:1)(C) LT & RT
USING SETP-CD.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED
PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

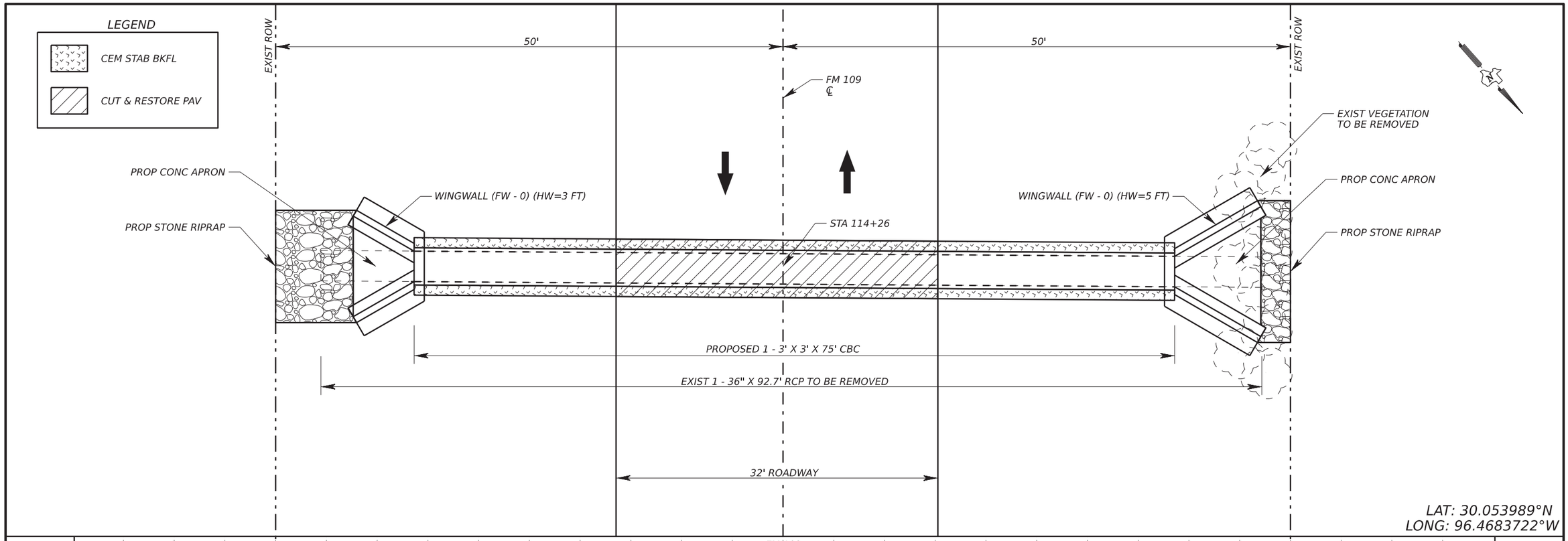
FM 109 - AUSTIN CO
SCALE: 1" = 10'
Texas Department of Transportation



SHEET 8 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 32 |

DATE: 7/22/2024
FILE: SH185_Culvert_Layout2_2aSeed.dgn
PATH: T:\YKMANNEX\PS&E\04320097_SH185\Plan_Sheets\




## CULVERT STA 114+26

EXIST 1 - 36" X 92.7' RCP TO BE REMOVED
PROP 1 - 3' X 3' X 75' CBC &
WINGWALL (FW - 0) (HW=3 FT) LT &
WINGWALL (FW - 0) (HW=5 FT) RT
USING BCS, SCP-3, FW-0, SCP-MD, ECD.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED
PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 109 - AUSTIN CO
SCALE: 1" = 10'

Texas Department of Transportation





| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 33 |

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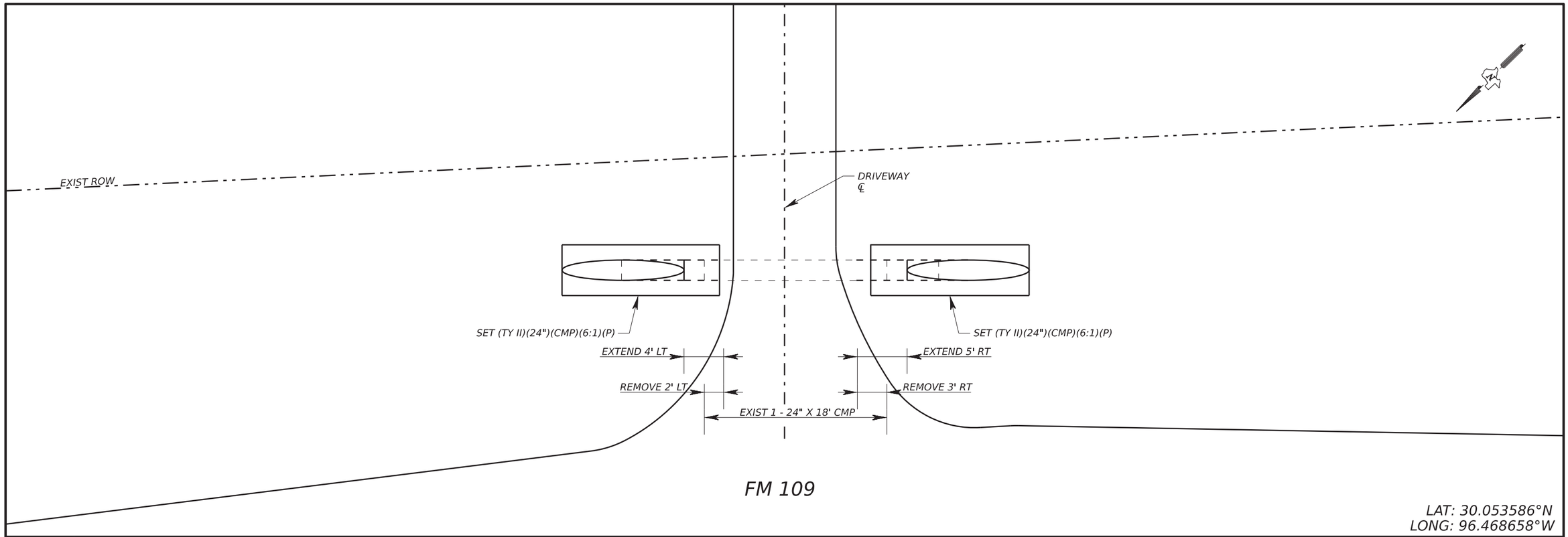
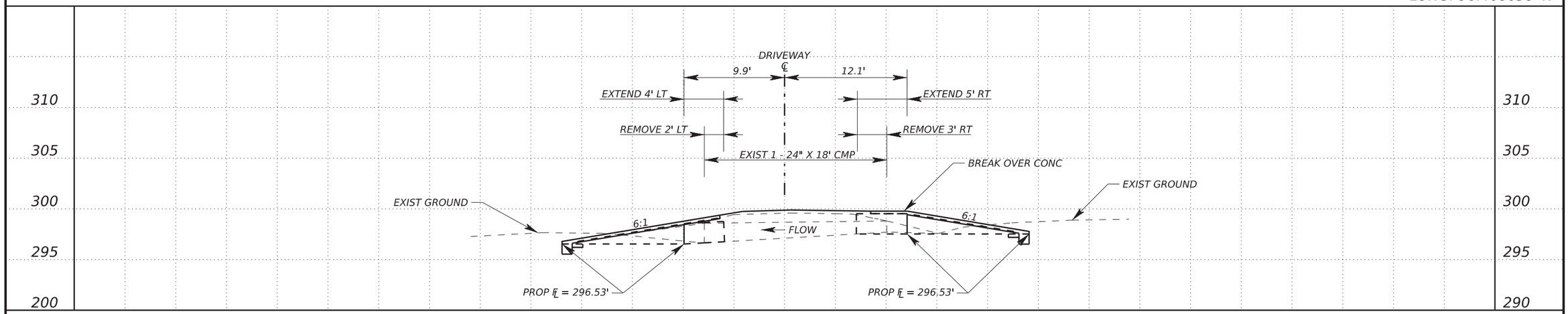
DATE: 7/22/2024




## CULVERT STA 115+95 LT

EXIST 1 - 24" x 18' CMP & SET LT & RT.
REMOVE 2' LT & 3' RT.
EXTEND 4' LT & 5' RT.
ADD SET (TY II)(24")(CMP)(6:1)(P) LT & RT
USING SETP-PD.

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

# CULVERT LAYOUT

FM 109 - AUSTIN CO
SCALE: 1" = 10'

Texas Department of Transportation



SHEET 10 OF 10

| FED.RD. DIV.NO. | | PROJECT NO. | |
|---|---|---|---|
| 6 | | | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |
| STATE | DIST. | COUNTY | SHEET NO. |
| TEXAS | YKM | COLORADO, ETC. | 34 |

PATH: T:\YKMANNEX\PS&E\043202097_SH185\Plan_Sheets\
FILE: SH185_Culvert_Layout2_2dSeed.dgn
DATE: 7/22/2024

| Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both) | Description of Box Culvert<br>No. Spans ~ Span X Height | Max Fill Height<br>(Ft) | Applicable Box Culvert Standard (4) | Applicable Wingwall or End Treatment Standard | Skew Angle<br>(0°,15°, 30° or 45°) | Side Slope or Channel Slope Ratio<br>(SL:1) | T Culvert Top Slab Thickness<br>(In) | U Culvert Wall Thickness<br>(In) | C Estimated Curb Height<br>(Ft) | Hw Height of Wingwall (1)<br>(Ft) | A Curb to End of Wingwall<br>(Ft) | B 0 set of End of Wingwall<br>(Ft) | Lw Length of Longest Wingwall<br>(Ft) | Ltw Culvert Toewall Length<br>(Ft) | Atw Anchor Toewall Length<br>(Ft) | Riprap Apron<br>(CY) | Class "C" Conc (Curb) (2)<br>(CY) | Class "C" Conc (Wingwall) (3)<br>(CY) | Total Wingwall Area<br>(SF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FM 1160 AT CR 392 (Both) | 1 ~ 6'x 3' | 1.5' | SCP-6 | SETB-PD | 0° | 6:1 | 8" | 7" | 0.250' | 3.667' | N/A | N/A | 20.500' | N/A | 7.167' | 0.0 | 0.2 | 10.2 | N/A |
| FM 442 STA 259+09 (Both) | 1 ~ 6'x 3' | 5' | SCP-6 | SETB-PD | 0° | 6:1 | 7" | 7" | 0.250' | 3.583' | N/A | N/A | 20.000' | N/A | 7.167' | 0.0 | 0.2 | 9.8 | N/A |
| FM 109 STA 114+26 (Rt) | 1 ~ 3'x 3' | 8' | SCP-3 | FW-0 | 0° | 2:1 | 4" | 4" | 1.500' | 4.583' | 8.500' | 4.907' | 9.815' | N/A | N/A | 0.9 | 0.2 | 3.4 | 48 |
| FM 109 STA 114+26 (Lt) | 1 ~ 3'x 3' | 8' | SCP-3 | FW-0 | 0° | 2:1 | 4" | 4" | 0.250' | 3.333' | 6.000' | 3.464' | 6.928' | N/A | N/A | 0.6 | 0.0 | 1.9 | 25 |

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 ared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or atter 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 = 0 set 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 di erent type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

**SPECIAL NOTE:**

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

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

STATE OF TEXAS
MARK C. NETARDUS
87008
LICENSED PROFESSIONAL ENGINEER

Mark C Netardus P.E.

07/26/2024

Texas Department of Transportation

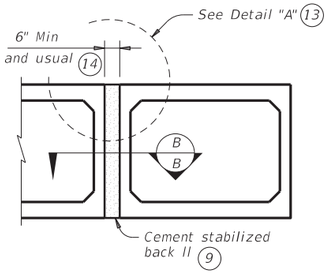
Bridge Division Standard

# BOX CULVERT SUPPLEMENT
## WINGS AND END TREATMENTS

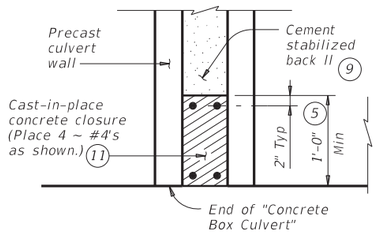
BCS

| FILE: CD-BCS-20.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 REVISIONS | CONT | SECT | JOB | HIGHWAY |
| | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 36 |

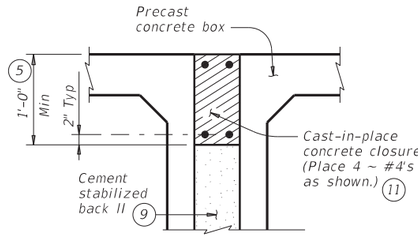
DATE: 7/22/2024 $TIME$
FILE: $FILE$



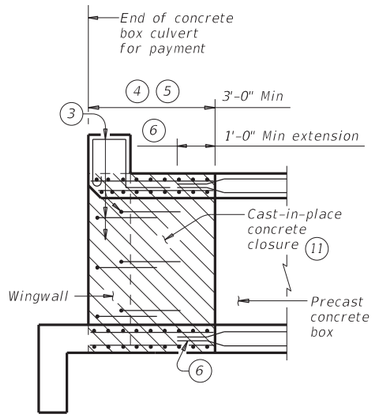

## MULTIPLE UNIT PLACEMENT




## SECTION B-B

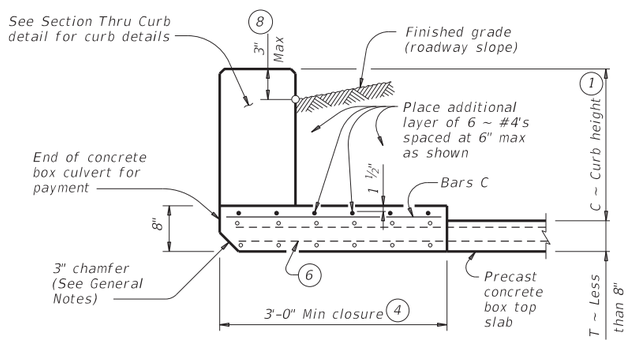



## DETAIL "A" (13)

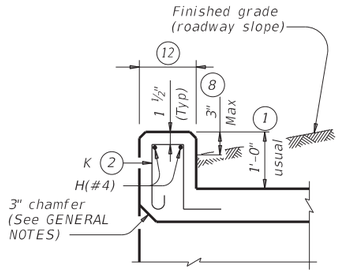



## WINGWALL CONNECTION

(Also applies to safety end treatment.)

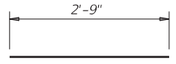



## SECTION THRU TOP SLABS LESS THAN 8"



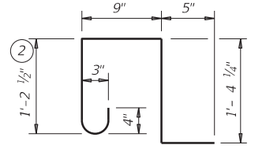

## SECTION THRU CURB

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




## BARS C (#4)

(Spa = 1'–0" Max)




## BARS K (#4)

(Spa = 1'–0" Max)
(Length = 4'–2")

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

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

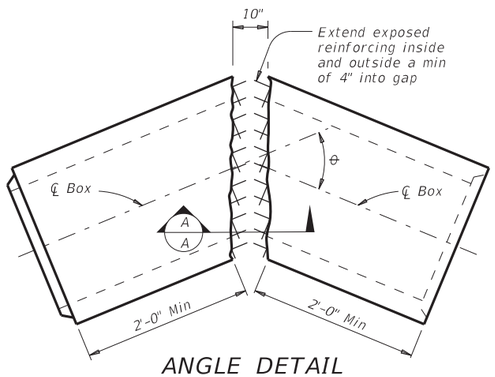
### MATERIAL NOTES:

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

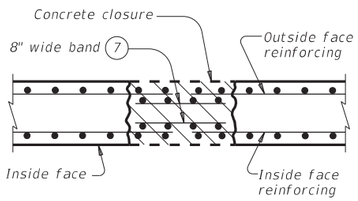
### GENERAL NOTES:

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

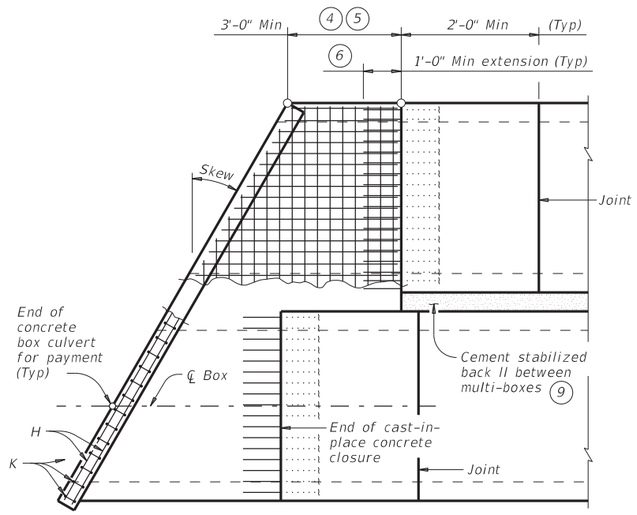
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out–to–out of bars.




## ANGLE DETAIL




## SECTION A-A




## PLAN OF SKEWED ENDS

(Showing multi–box placement.)

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

# BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

## SCP-MD

| FILE: CD-SCP-MD-20.dgn | DN: GAF | CK: LMW | DW: BWH/TxDOT | CK: GAF |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 37 |

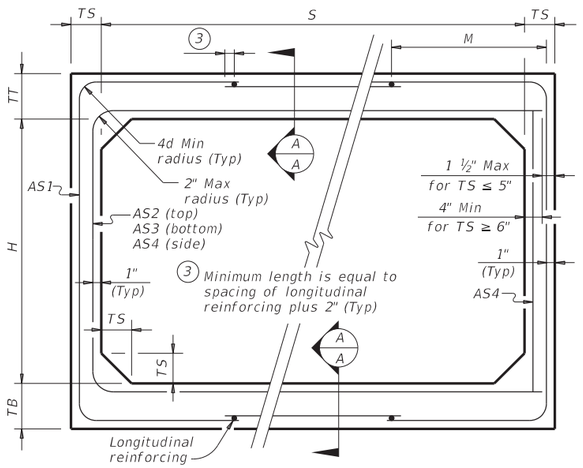
DATE: 7/22/2024 $TIME$
FILE: $FILE$

## BOX DATA

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

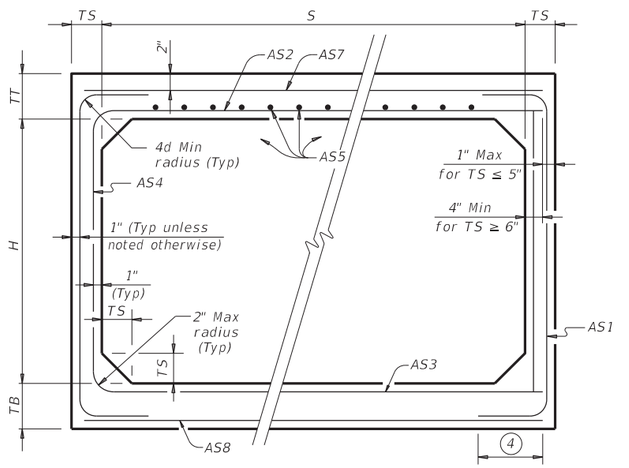
(1) For box length = 8'-0"

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




CORNER OPTION "A" CORNER OPTION "B"

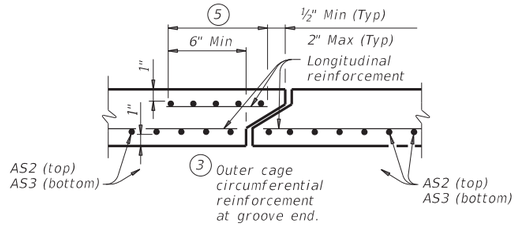
## FILL HEIGHT 2 FT AND GREATER




CORNER OPTION "A" CORNER OPTION "B"

## FILL HEIGHT LESS THAN 2 FT

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




## SECTION A-A

(Showing top and bottom slab joint reinforcement.)

**MATERIAL NOTES:**

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

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

**GENERAL NOTES:**

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

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

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

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

# SINGLE BOX CULVERTS PRECAST

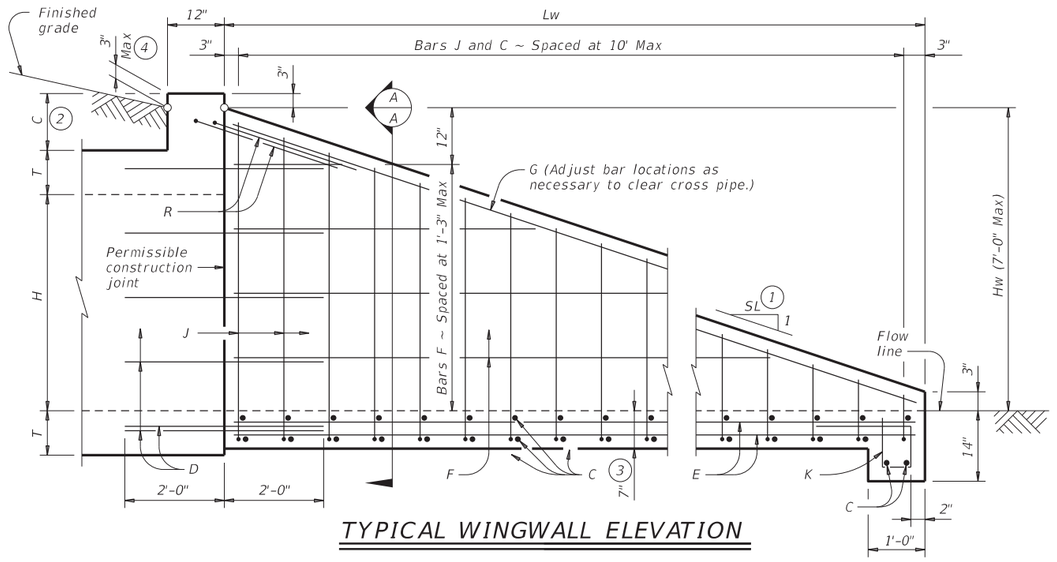
## 6'-0" SPAN

## SCP-6

| FILE: CD-SCP06-20.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 REVISIONS | CONT | SECT | JOB | HIGHWAY |
| | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 38 |

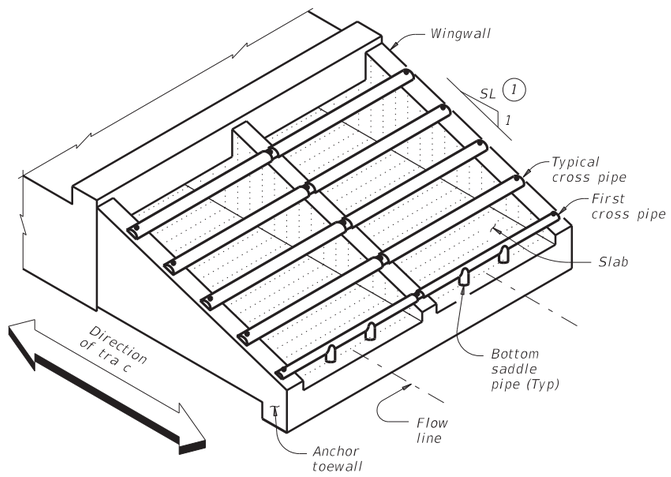
DATE: 7/22/2024 $TIME$
FILE: $FILE$

DATE: 7/22/2024 $TIME$
FILE: $FILE$




## TYPICAL WINGWALL ELEVATION

(Cross pipes not shown for clarity.)




## ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing bolted anchor option.)

### WING DIMENSION CALCULATIONS:

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

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

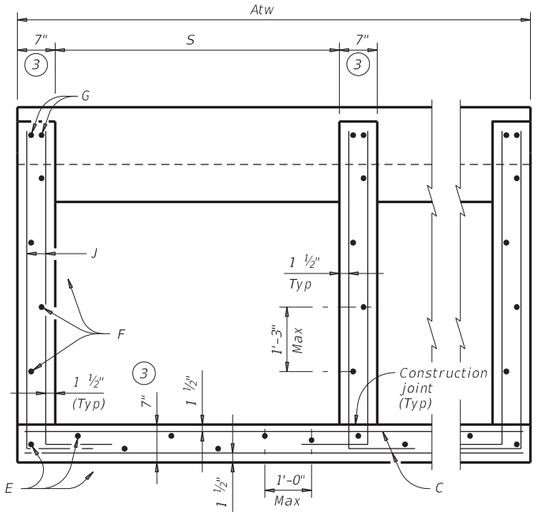
Total Wingwall Area (SF)
$= (0.5)\ (Hw + 0.250')\ (Lw)\ (N - 1)$
Total Concrete Volume (CY)
$= [(\text{Wingwall Area})\ (0.583') +$
$(Lw)\ (Atw)\ (0.583') +$
$(Atw)\ (1.000')\ (1.167' - 0.583')] \div (27)$
Total Reinforcing (Lb)
$= (1.55)\ (Lw)\ (Atw) +$
$(4.43)\ (Atw) +$
$(K)\ (Hw)\ (N + 1)\ (N\sqrt{Lw})$

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

| Slope SL:1 | K |
|---|---|
| 6:1 ~ | 10.41 |

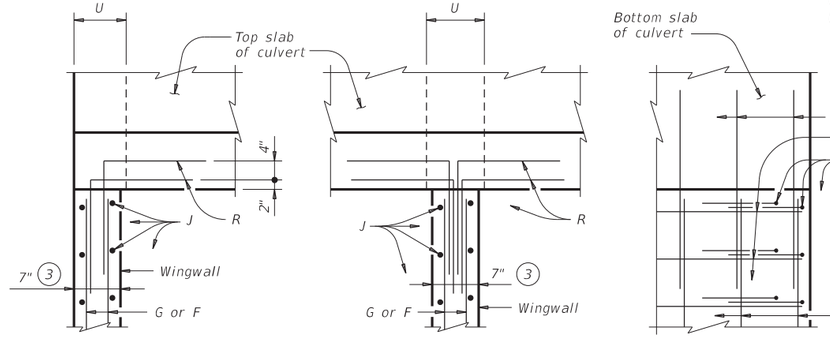
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

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



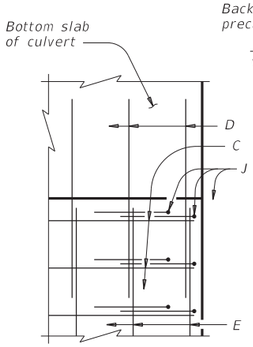

## SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)

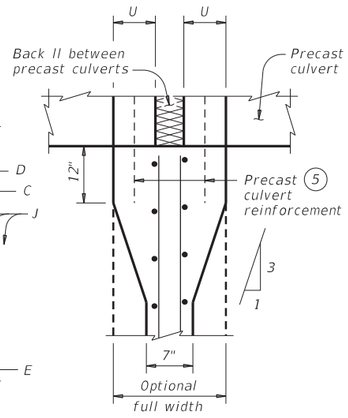



AT TOP OF EXTERIOR WINGWALL
(Cast-in-place culvert)

AT TOP OF INTERIOR WINGWALL
(Cast-in-place culvert)

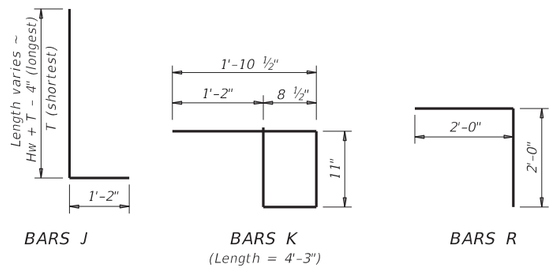



AT OUTSIDE OF BOTTOM SLAB
(Cast-in-place culvert)




AT INTERIOR WINGWALL
(Precast culvert)

## PLAN VIEWS OF CORNER DETAILS




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

1. Provide 6:1 or atter slope.
2. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to Extended Curb Details the Extended Curb Details (ECD) standard sheet.
3. Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
4. For vehicle safety, reduce height, if necessary, to provide a maximum 3" projection above nished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.
5. For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

### MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Adjust reinforcing as necessary to provide a minimum clear cover of 1½".
Provide Class "C" concrete (f`c = 3,600 psi).
Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts.
Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with Item 445, "Galvanizing."

### GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Speci cations.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.
Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
The quantities for concrete, reinforcing steel, and cross pipes resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

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



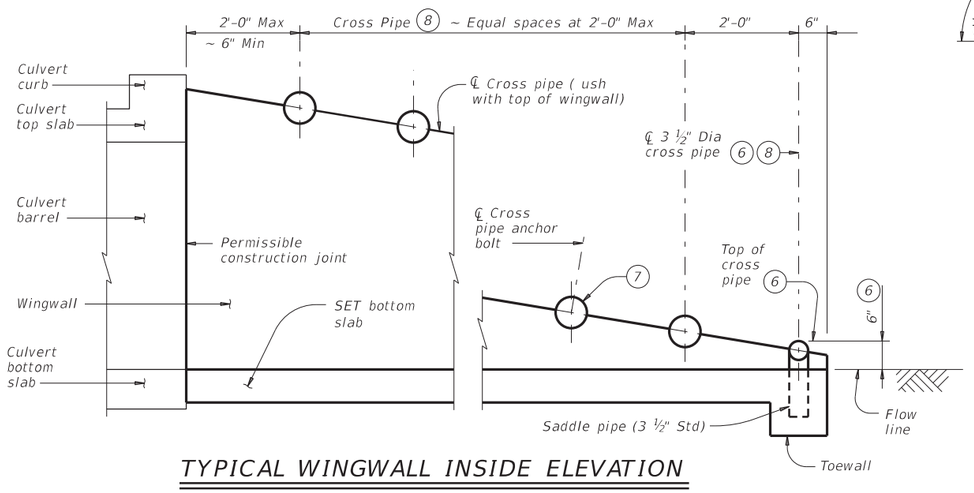
Texas Department of Transportation
Bridge Division Standard

# SAFETY END TREATMENT
## FOR BOX CULVERTS (MAXIMUM Hw = 7'-0")
## TYPE I ~ PARALLEL DRAINAGE

## SETB-PD

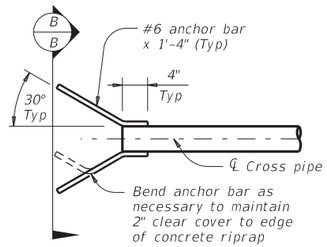
| FILE: CD-SETBPD-22.dgn | DN: GAF | CK: CAT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 06-2022 - Wing dimensions | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 39 |

DATE: 7/22/2024 $TIME$
FILE: $FILE$

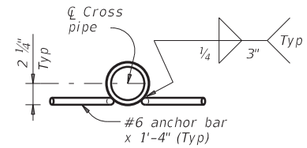



## TYPICAL WINGWALL INSIDE ELEVATION

*(Showing installation of cross pipes.)*

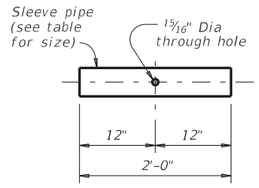



PART PLAN




SECTION B-B

## OPTIONAL ANCHOR BAR DETAILS




## SLEEVE PIPE DETAILS (9)

| REQUIRED PIPE SIZES (8) | | |
|---|---|---|
| Culvert Span Sizes | Cross Pipe Size | Sleeve Pipe Size (9) |
| First Pipe | 3 ½" STD | 2 ½" STD |
| 30" to 42" | 4" STD | 3" STD |
| 48" to 72" | 5" STD | 4" STD |
| 78" to 120" | 6" STD | 5" STD |

| STANDARD PIPE SIZES | | |
|---|---|---|
| Pipe Size | Pipe O.D. | Pipe I.D. |
| 2 ½" STD | 2.875" | 2.469" |
| 3" STD | 3.500" | 3.068" |
| 3 ½" STD | 4.000" | 3.548" |
| 4" STD | 4.500" | 4.026" |
| 5" STD | 5.563" | 5.047" |
| 6" STD | 6.625" | 6.065" |

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

(7) Always install the third cross pipe from the bottom of the culvert using a bolted connection. Take care to ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(8) Provide cross pipes and sleeve pipes (if required) as shown in the Required Pipe Sizes table. Provide 3 1#2" saddle pipes for the 3 1#2" first cross pipe.

(9) At Contractor's option, make the cross pipe continuous across the inside wingwalls. If this option is selected, omit the sleeve pipe and make a 15#16" diameter throughhole in the cross pipe to accept the anchor bolt at the centerline of each interior wingwall.

(10) Provide riprap when using the Optional Anchor Bar details. Riprap is included in the bid price for Safety End Treatment. Provide riprap in accordance with Item 432, "Riprap."







## SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

*(Anchor details and dimensions are similar to those shown below in Section Through Installation of 3 ½" First Cross Pipe detail.)*







## SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

## CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

Texas Department of Transportation

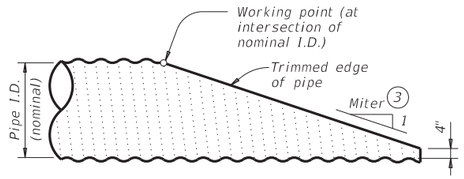
Bridge Division Standard

# SAFETY END TREATMENT
## FOR BOX CULVERTS (MAXIMUM Hw = 7'-0")
## TYPE I ~ PARALLEL DRAINAGE

## SETB-PD

| FILE: CD-SETBPD-22.dgn | DN: GAF | CK: CAT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 06-2022 ~ Wing dimensions | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 40 |

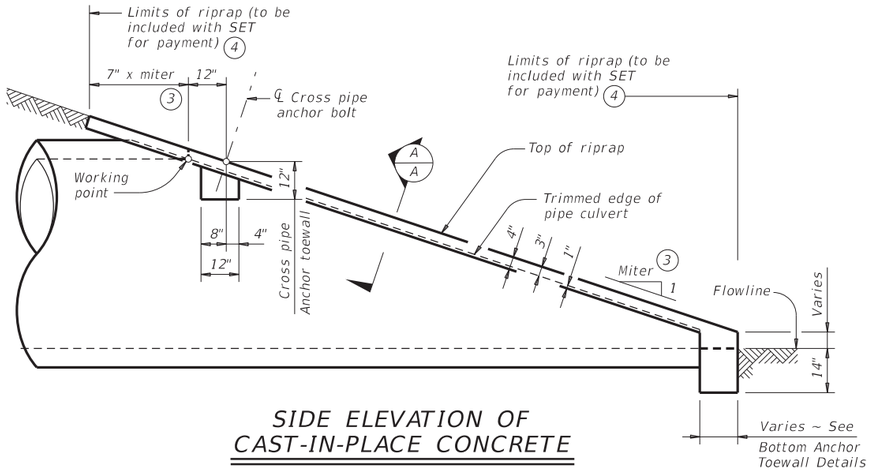
DATE: 7/22/2024 $TIME$
FILE: $FILE$




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

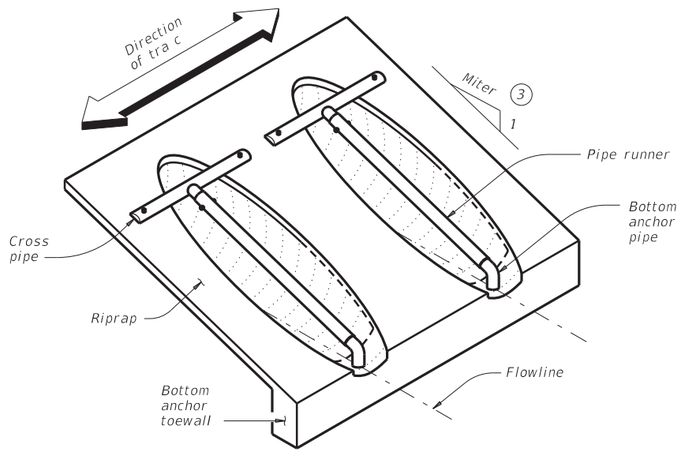
## SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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




## SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)




## ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

## CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

| Nominal Culvert I.D. | Pipe Culvert Spa ~ G | Cross Pipe Length | Pipe Runner Length | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3:1 Side Slope | | | | 4:1 Side Slope | | | | 6:1 Side Slope | | | |
| | | | 0° Skew | 15° Skew | 30° Skew | 45° Skew | 0° Skew | 15° Skew | 30° Skew | 45° Skew | 0° Skew | 15° Skew | 30° Skew | 45° Skew |
| 24" | 1' – 7" | 3' – 5" | N/A | N/A | N/A | 5' – 10" | N/A | N/A | N/A | 8' – 1" | N/A | N/A | N/A | 12' – 9" |
| 27" | 1' – 8" | 3' – 8" | N/A | N/A | 5' – 5" | 6' – 11" | N/A | N/A | 7' – 7" | 9' – 7" | N/A | N/A | 11' – 11" | 14' – 11" |
| 30" | 1' – 10" | 3' – 11" | N/A | N/A | 6' – 4" | 8' – 0" | N/A | N/A | 8' – 9" | 11' – 0" | N/A | N/A | 13' – 8" | 17' – 0" |
| 33" | 1' – 11" | 4' – 2" | 6' – 2" | 6' – 5" | 7' – 3" | 9' – 1" | 8' – 6" | 8' – 10" | 10' – 0" | 12' – 5" | 13' – 3" | 13' – 9" | 15' – 5" | 19' – 2" |
| 36" | 2' – 1" | 4' – 5" | 6' – 11" | 7' – 3" | 8' – 2" | 10' – 2" | 9' – 6" | 9' – 11" | 11' – 2" | 13' – 10" | 14' – 9" | 15' – 3" | 17' – 2" | 21' – 3" |
| 42" | 2' – 4" | 4' – 11" | 8' – 6" | 8' – 10" | 9' – 11" | 12' – 4" | 11' – 7" | 12' – 0" | 13' – 6" | 16' – 8" | 17' – 9" | 18' – 5" | 20' – 8" | 25' – 7" |
| 48" | 2' – 7" | 5' – 5" | 10' – 1" | 10' – 5" | 11' – 9" | N/A | 13' – 7" | 14' – 2" | 15' – 10" | N/A | 20' – 9" | 21' – 6" | 24' – 2" | N/A |
| 54" | 3' – 0" | 5' – 11" | 11' – 8" | 12' – 1" | N/A | N/A | 15' – 8" | 16' – 3" | N/A | N/A | 23' – 10" | 24' – 8" | N/A | N/A |
| 60" | 3' – 3" | 6' – 5" | 13' – 3" | N/A | N/A | N/A | 17' – 9" | N/A | N/A | N/A | 26' – 10" | N/A | N/A | N/A |

## TYPICAL PIPE CULVERT MITERS (3)

| Side Slope | 0° Skew | 15° Skew | 30° Skew | 45° Skew |
|---|---|---|---|---|
| 3:1 | 3:1 | 3.106:1 | 3.464:1 | 4.243:1 |
| 4:1 | 4:1 | 4.141:1 | 4.619:1 | 5.657:1 |
| 6:1 | 6:1 | 6.212:1 | 6.928:1 | 8.485:1 |

## CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

| Nominal Culvert I.D. | Single Pipe Culvert | Multiple Pipe Culverts |
|---|---|---|
| 12" thru 21" | Skews thru 45° | Skews thru 45° |
| 24" | Skews thru 45° | Skews thru 30° |
| 27" | Skews thru 30° | Skews thru 15° |
| 30" | Skews thru 15° | Skews thru 15° |
| 33" | Skews thru 15° | Always required |
| 36" | Normal (no skew) | Always required |
| 42" thru 60" | Always required | Always required |

## STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

| Pipe Size | Pipe O.D. | Pipe I.D. | Max Pipe Runner Length |
|---|---|---|---|
| 2" STD | 2.375" | 2.067" | N/A |
| 3" STD | 3.500" | 3.068" | 10' – 0" |
| 4" STD | 4.500" | 4.026" | 19' – 8" |
| 5" STD | 5.563" | 5.047" | 34' – 2" |

## ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

| Nominal Culvert I.D. | 3:1 Side Slope | | | | 4:1 Side Slope | | | | 6:1 Side Slope | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0° Skew | 15° Skew | 30° Skew | 45° Skew | 0° Skew | 15° Skew | 30° Skew | 45° Skew | 0° Skew | 15° Skew | 30° Skew | 45° Skew |
| 12" | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 |
| 15" | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.9 |
| 18" | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.9 | 1.0 |
| 21" | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 | 1.2 |
| 24" | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 1.0 | 1.0 | 1.0 | 1.1 | 1.3 |
| 27" | 0.7 | 0.7 | 0.8 | 0.9 | 0.8 | 0.9 | 0.9 | 1.1 | 1.1 | 1.1 | 1.2 | 1.4 |
| 30" | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 | 1.2 | 1.2 | 1.2 | 1.3 | 1.6 |
| 33" | 0.8 | 0.8 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.3 | 1.3 | 1.4 | 1.5 | 1.7 |
| 36" | 0.9 | 0.9 | 0.9 | 1.1 | 1.1 | 1.1 | 1.2 | 1.4 | 1.4 | 1.5 | 1.6 | 1.8 |
| 42" | 1.0 | 1.0 | 1.1 | 1.3 | 1.2 | 1.3 | 1.3 | 1.6 | 1.6 | 1.7 | 1.8 | 2.1 |
| 48" | 1.1 | 1.1 | 1.2 | N/A | 1.4 | 1.4 | 1.5 | N/A | 1.9 | 1.9 | 2.1 | N/A |
| 54" | 1.3 | 1.3 | N/A | N/A | 1.6 | 1.6 | N/A | N/A | 2.1 | 2.1 | N/A | N/A |
| 60" | 1.4 | N/A | N/A | N/A | 1.7 | N/A | N/A | N/A | 2.3 | N/A | N/A | N/A |

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with ared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

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

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



Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT
## FOR 12" DIA TO 60" DIA PIPE CULVERTS
## TYPE II ~ CROSS DRAINAGE

## SETP-CD

| FILE: CD-SETP-CD-20.dgn | DN: GAF | CK: CAT | DW: JRP | CK: GAF |
|---|---|---|---|---|
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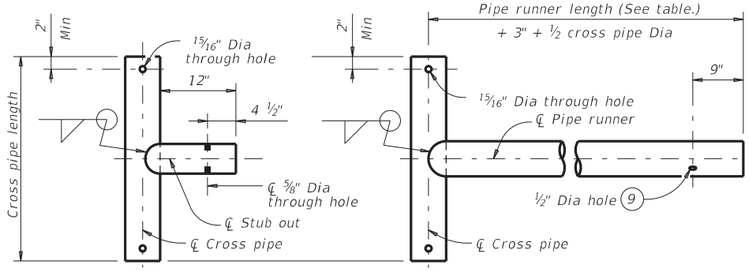
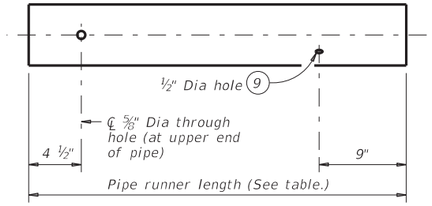



OPTION A1 OPTION A2

## CROSS PIPE AND CONNECTIONS DETAILS



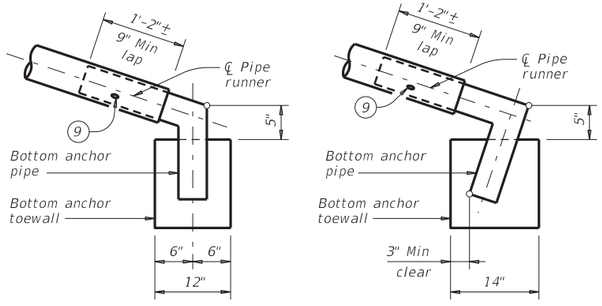

NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

## PIPE RUNNER DETAILS




OPTION B1 OPTION B2

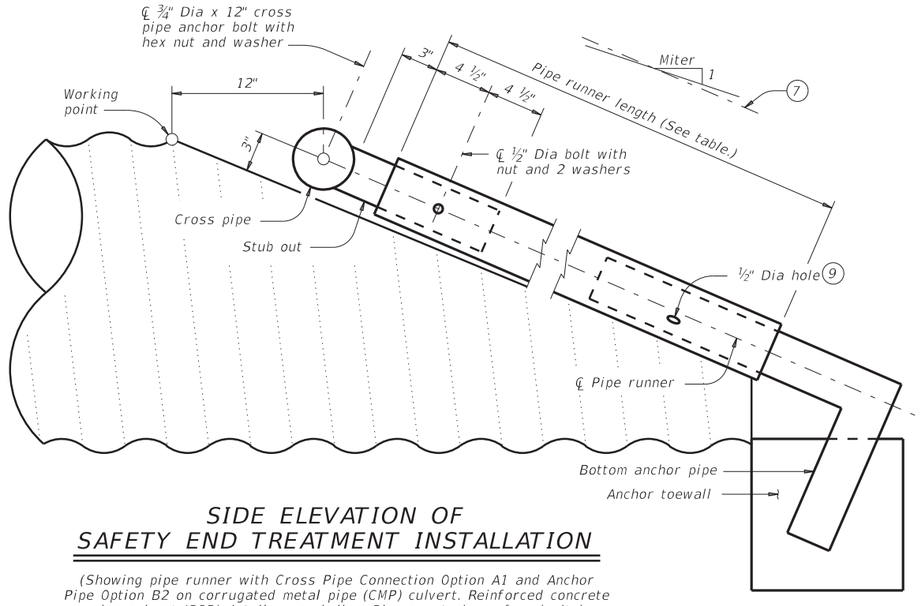
## BOTTOM ANCHOR PIPE DETAILS (10)




OPTION B1 OPTION B2

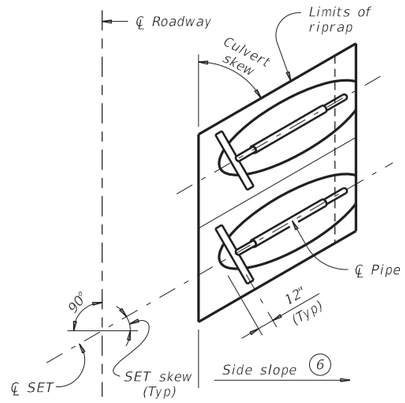
## BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)

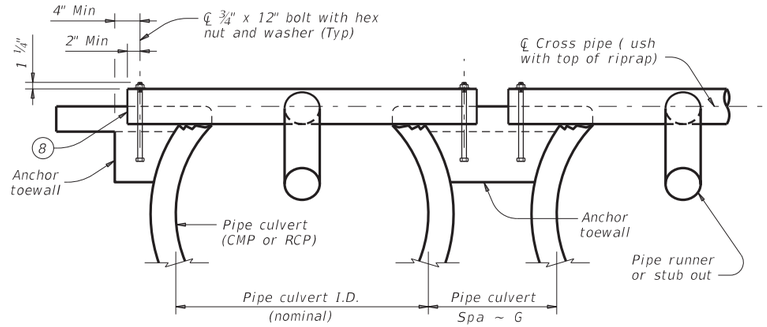



## SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

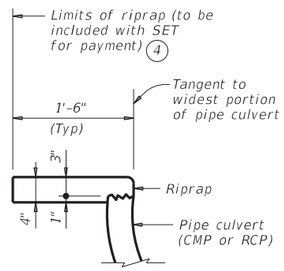
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)




## PLAN OF SKEWED INSTALLATION




SHOWING CROSS PIPE AND ANCHOR TOEWALL




SHOWING TYPICAL PIPE CULVERT AND RIPRAP

## SECTION A-A

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

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

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

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

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

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

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

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



Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT
## FOR 12" DIA TO 60" DIA PIPE CULVERTS
## TYPE II ~ CROSS DRAINAGE

## SETP-CD

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| | YKM | COLORADO, ETC. | | 42 |

DATE: 7/22/2024 $TIME$
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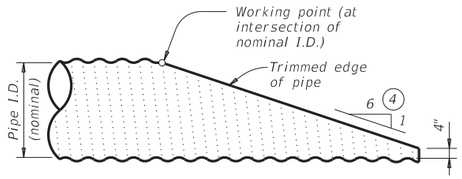
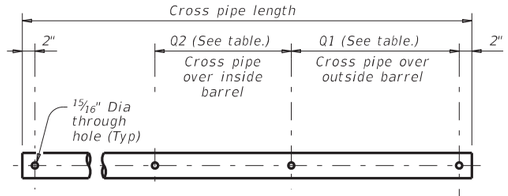


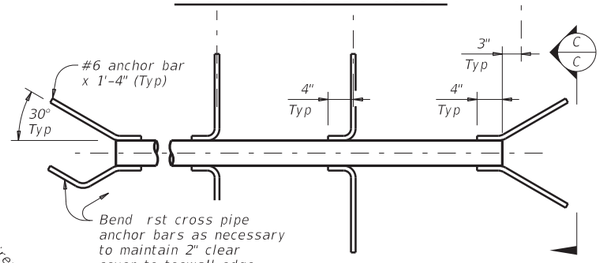

NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

## SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

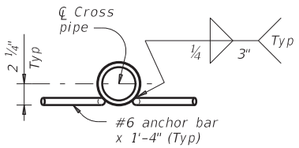
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



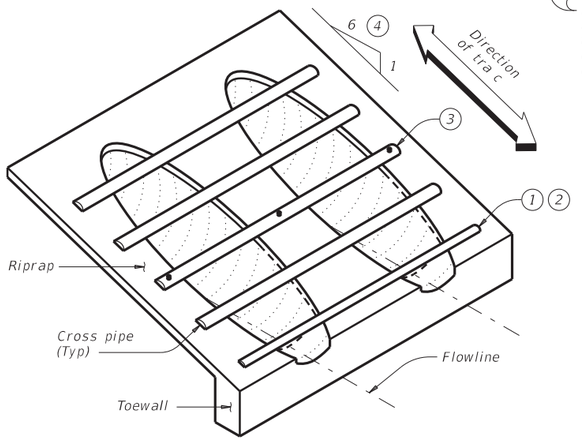

## PIPE WITH BOLTED ANCHOR




## PIPE WITH ANCHOR BARS

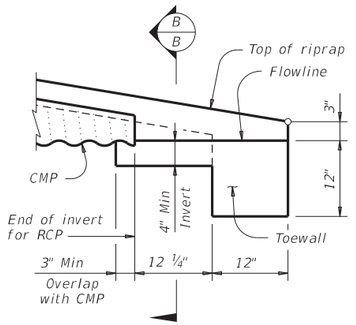



## SECTION C-C



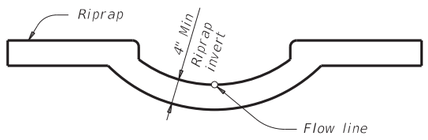

## ISOMETRIC VIEW OF TYPICAL INSTALLATION

## CROSS PIPE DETAILS




## DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)




## SECTION B-B

(Cross pipes not shown for clarity.)

## CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

| Nominal Culvert I.D. | Conc Riprap (CY) (6) | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for Use of Cross Pipes | Cross Pipe Sizes |
|---|---|---|---|---|---|---|---|
| 12" | 0.6 | 0' - 9" | N/A | 2' - 1" | 1' - 9" | 3 or more pipe culverts | 3" Std (3.500" O.D.) |
| 15" | 0.7 | 0' - 11" | N/A | 2' - 5" | 2' - 2" | | |
| 18" | 0.8 | 1' - 2" | N/A | 2' - 10" | 2' - 8" | | |
| 21" | 0.9 | 1' - 4" | N/A | 3' - 2" | 3' - 1" | | |
| 24" | 0.9 | 1' - 7" | N/A | 3' - 6" | 3' - 7" | | |
| 27" | 1.0 | 1' - 8" | N/A | 3' - 10" | 3' - 11" | 3 or more pipe culverts | 3 ½" Std (4.000" O.D.) |
| 30" | 1.1 | 1' - 10" | N/A | 4' - 2" | 4' - 4" | 2 or more pipe culverts | |
| 33" | 1.2 | 1' - 11" | 4' - 2" | 4' - 5" | 4' - 8" | All pipe culverts | |
| 36" | 1.3 | 2' - 1" | 4' - 5" | 4' - 9" | 5' - 1" | All pipe culverts | 4" Std (4.500" O.D.) |
| 42" | 1.5 | 2' - 4" | 4' - 11" | 5' - 5" | 5' - 10" | | |
| 48" | 1.7 | 2' - 7" | 5' - 5" | 6' - 0" | 6' - 7" | All pipe culverts | 5" Std (5.563" O.D.) |
| 54" | 2.0 | 3' - 0" | 5' - 11" | 6' - 9" | 7' - 6" | | |
| 60" | 2.2 | 3' - 3" | 6' - 5" | 7' - 4" | 8' - 3" | | |
| 66" | 2.4 | 3' - 3" | 6' - 11" | 7' - 10" | 8' - 9" | | |
| 72" | 2.7 | 3' - 4" | 7' - 5" | 8' - 5" | 9' - 4" | | |

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

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

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

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

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

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

### MATERIAL NOTES:

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

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

Provide ASTM A307 bolts and nuts.

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

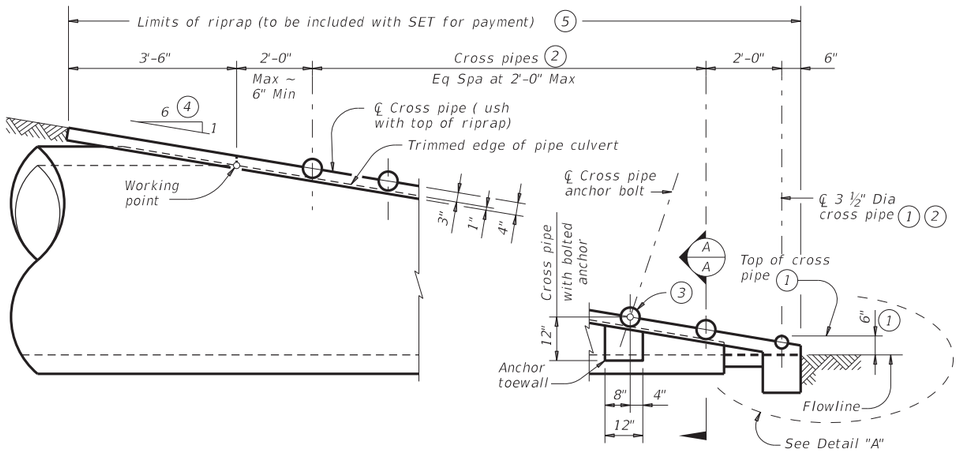
### GENERAL NOTES:

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

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

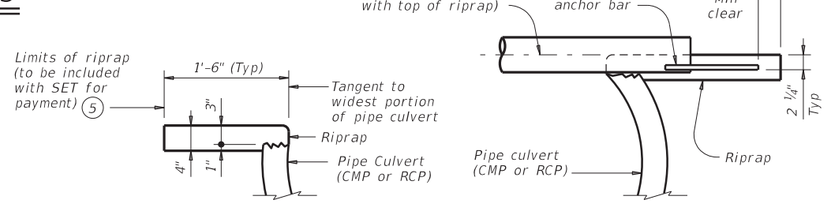
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."

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




## SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

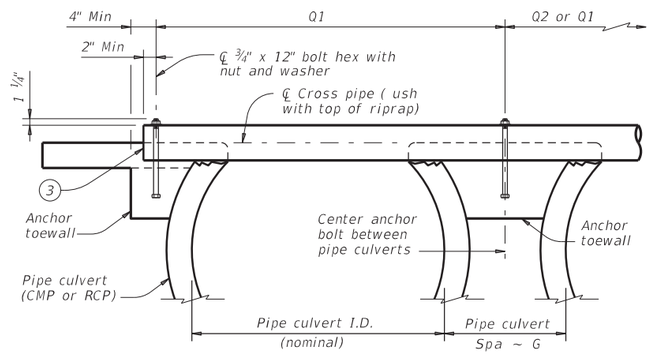
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)




## SHOWING CROSS PIPE WITH ANCHOR BAR




## SHOWING TYPICAL PIPE CULVERT AND RIPRAP




## SHOWING CROSS PIPE WITH BOLTED ANCHOR

## SECTION A-A

Texas Department of Transportation

Bridge Division Standard

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

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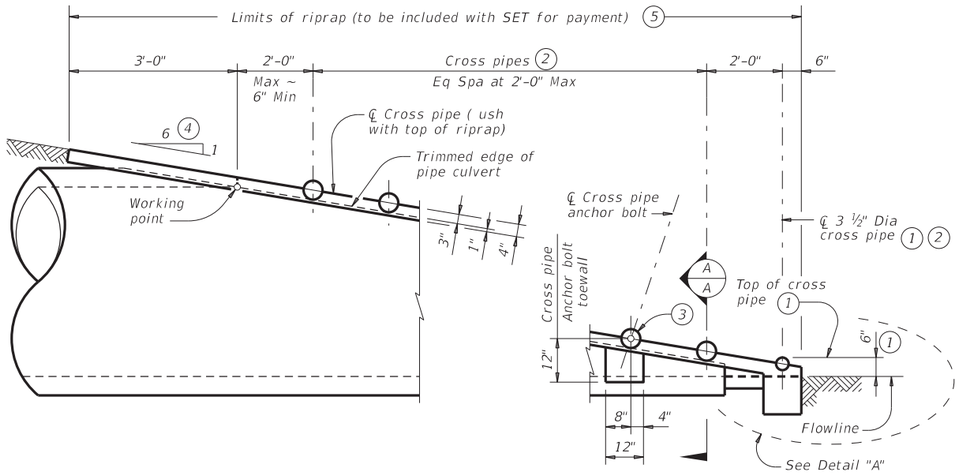



## SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

*(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. pipe runners not shown for clarity.)*

## CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES 2

### Corrugated Metal Pipe (CMP) Culverts

| Design | Conc Riprap (CY) 6 | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for Use of Cross Pipes | Cross Pipe Sizes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6 | 17" | 13" | 1' – 0" | N/A | 2' – 8" | 2' – 5" | 3 or more pipe culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 21" | 15" | 1' – 2" | N/A | 3' – 1" | 2' – 11" | | |
| 3 | 0.9 | 28" | 20" | 1' – 5" | N/A | 3' – 9" | 3' – 9" | 3 or more pipe culverts | 3 ½" Std (4.000" O.D.) |
| 4 | 1.0 | 35" | 24" | 1' – 8" | 4' – 4" | 4' – 6" | 4' – 7" | All pipe culverts | 4" Std (4.500" O.D.) |
| 5 | 1.2 | 42" | 29" | 1' – 11" | 4' – 11" | 5' – 2" | 5' – 5" | | |
| 6 | 1.4 | 49" | 33" | 2' – 2" | 5' – 6" | 5' – 11" | 6' – 3" | All pipe culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 57" | 38" | 2' – 5" | 6' – 2" | 6' – 8" | 7' – 2" | | |
| 8 | 1.8 | 64" | 43" | 2' – 10" | 6' – 9" | 7' – 6" | 8' – 2" | | |
| 9 | 1.9 | 71" | 47" | 3' – 2" | 7' – 4" | 8' – 3" | 9' – 1" | | |

### Reinforced Concrete Pipe (RCP) Culverts

| Design | Conc Riprap (CY) 6 | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for Use of Cross Pipes | Cross Pipe Sizes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6 | 22" | 13 ½" | 1' – 0" | N/A | 3' – 1" | 2' – 10" | 3 or more pipe culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 26" | 15 ½" | 1' – 2" | N/A | 3' – 6" | 3' – 4" | | |
| 3 | 0.9 | 28 ½" | 18" | 1' – 5" | N/A | 3' – 10" | 3' – 9 ½" | 3 or more pipe culverts | 3 ½" Std (4.000" O.D.) |
| 4 | 1.0 | 36 ¼" | 22 ½" | 1' – 8" | 4' – 5" | 4' – 7" | 4' – 8 ¼" | All pipe culverts | 4" Std (4.500" O.D.) |
| 5 | 1.2 | 43 ¾" | 26 ⅝" | 1' – 11" | 5' – 1" | 5' – 4" | 5' – 6 ¾" | | |
| 6 | 1.4 | 51 ½" | 31 ⅝" | 2' – 2" | 5' – 8" | 6' – 1" | 6' – 5 ¼" | All pipe culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 58 ½" | 36" | 2' – 5" | 6' – 4" | 6' – 10" | 7' – 3 ½" | | |
| 8 | 1.8 | 65" | 40" | 2' – 10" | 6' – 10" | 7' – 7" | 8' – 3" | | |
| 9 | 1.9 | 73" | 45" | 3' – 2" | 7' – 6" | 8' – 5" | 9' – 3" | | |

1. The proper installation of the rst cross pipe is critical for vehicle safety. Place the top of the rst cross pipe no more than 6" above the ow line.
2. Provide cross pipes, except the rst bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the rst bottom pipe.
3. Install the third Cross Pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not ow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
4. Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or atter is required for vehicle safety.
5. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap."
6. Quantities shown are for one end of one pipe culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

### MATERIAL NOTES:

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

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

Provide ASTM A307 bolts and nuts.

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

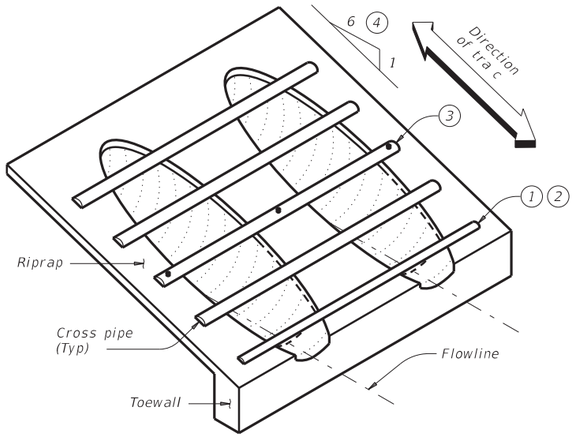
### GENERAL NOTES:

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

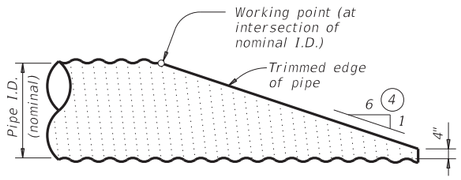
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

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

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




## ISOMETRIC VIEW OF TYPICAL INSTALLATION




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

## SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT
## FOR DESIGN 1 TO 9 ARCH PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

## SETP-PD-A

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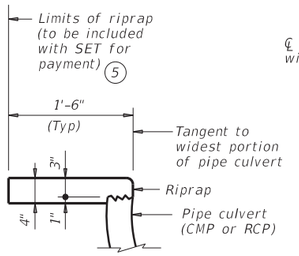
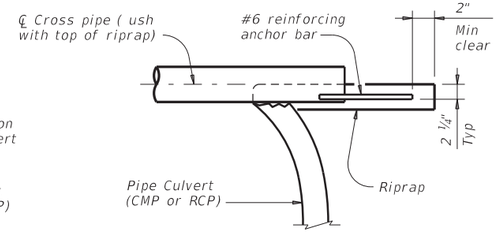
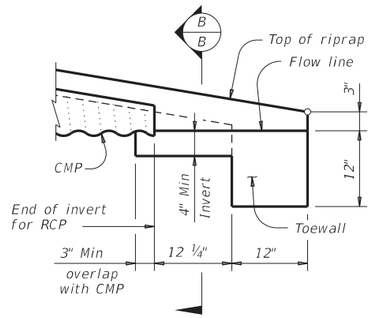
| | YKM | COLORADO, ETC. | | 44 |




SHOWING TYPICAL PIPE CULVERT AND RIPRAP

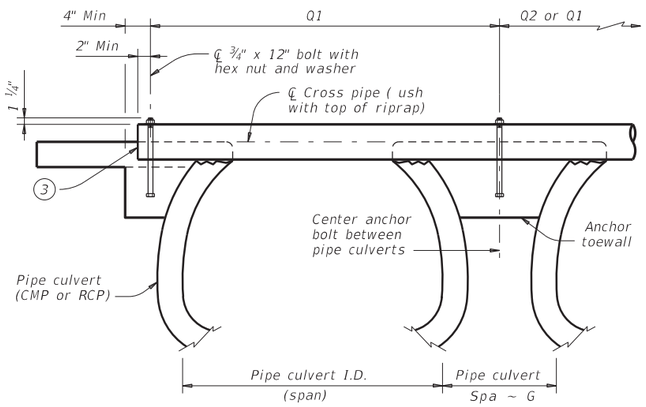



SHOWING CROSS PIPE WITH ANCHOR BAR



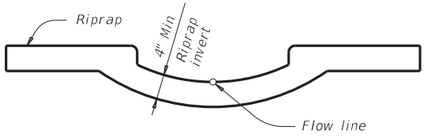

DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



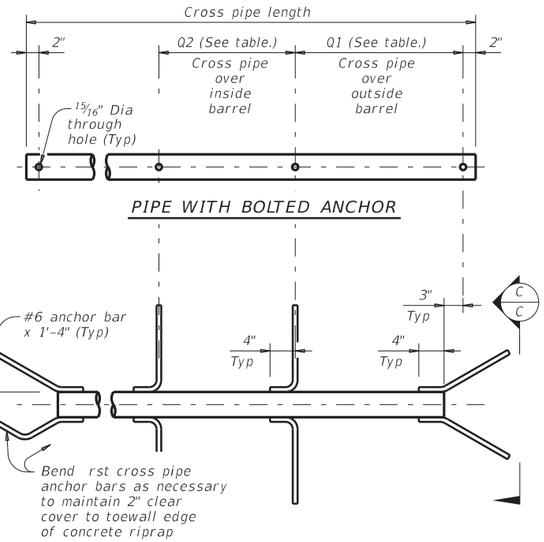

SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

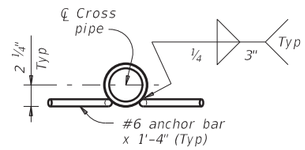



SECTION B-B

(Cross pipes not shown for clarity.)




PIPE WITH ANCHOR BARS




SECTION C-C

CROSS PIPE DETAILS

DATE: 7/22/2024 $TIME$
FILE: $FILE$

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT
## FOR DESIGN 1 TO 9 ARCH PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

## SETP-PD-A

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FILE: CD-SETP-PDA-20.dgn | DN: GAF | CK: TxDOT | DW: JRP | CK: GAF | | | |
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY | | | |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. | | | |
| | DIST | COUNTY | | SHEET NO. | | | |
| | YKM | COLORADO, ETC. | | 45 | | | |

DATE: 7/22/2024 $TIME$
FILE: $FILE$

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

| Dimensions | | | | | Variable Reinforcing | | | | Estimated Quantities per ft of wing length (2~wings) (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bars J1 | | Bars J2 | | | |
| Maximum Wingwall Height Hw | W | X | Y | Z | Size | Spa | Size | Spa | Reinf (Lb/Ft) | Conc (CY/Ft) |
| 2'-6" | 2'-5" | 1'-0" | 9" | 7" | #4 | 1'-0" | #4 | 1'-0" | 33.73 | 0.248 |
| 3'-0" | 2'-5" | 1'-0" | 9" | 7" | #4 | 1'-0" | #4 | 1'-0" | 37.07 | 0.261 |
| 3'-6" | 2'-5" | 1'-0" | 9" | 7" | #4 | 1'-0" | #4 | 1'-0" | 37.74 | 0.273 |
| 4'-0" | 2'-5" | 1'-0" | 9" | 7" | #4 | 1'-0" | #4 | 1'-0" | 38.41 | 0.285 |
| 4'-6" | 3'-2" | 1'-6" | 1'-0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 41.75 | 0.330 |
| 5'-0" | 3'-2" | 1'-6" | 1'-0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 45.09 | 0.343 |
| 5'-6" | 3'-2" | 1'-6" | 1'-0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 45.75 | 0.355 |
| 6'-0" | 3'-2" | 1'-6" | 1'-0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 46.42 | 0.367 |
| 7'-0" | 3'-8" | 1'-9" | 1'-3" | 7" | #4 | 1'-0" | #4 | 1'-0" | 52.77 | 0.414 |
| 8'-0" | 4'-2" | 2'-0" | 1'-6" | 8" | #5 | 1'-0" | #4 | 1'-0" | 60.19 | 0.486 |
| 9'-0" | 4'-8" | 2'-3" | 1'-9" | 8" | #4 | 6" | #4 | 6" | 81.49 | 0.535 |
| 10'-0" | 5'-2" | 2'-6" | 2'-0" | 8" | #5 | 6" | #4 | 6" | 97.25 | 0.584 |
| 11'-0" | 5'-8" | 2'-9" | 2'-3" | 8" | #6 | 6" | #5 | 6" | 133.65 | 0.634 |
| 12'-0" | 6'-2" | 3'-0" | 2'-6" | 9" | #7 | 6" | #5 | 6" | 162.29 | 0.721 |
| 13'-0" | 6'-8" | 3'-3" | 2'-9" | 11" | #7 | 6" | #5 | 6" | 178.80 | 0.856 |
| 14'-0" | 7'-2" | 3'-6" | 3'-0" | 1'-0" | #8 | 6" | #5 | 6" | 216.78 | 0.959 |
| 15'-0" | 7'-8" | 4'-0" | 3'-0" | 1'-1" | #9 | 6" | #6 | 6" | 283.06 | 1.068 |
| 16'-0" | 8'-2" | 4'-6" | 3'-0" | 1'-3" | #9 | 6" | #6 | 6" | 297.02 | 1.234 |

## TABLE OF WINGWALL REINFORCING
(2~wings)

| Bar | Size | No. | Spa |
|---|---|---|---|
| D | #5 | ~ | 1'-0" |
| E | #4 | ~ | 1'-0" |
| F | #4 | ~ | 1'-0" |
| G | #6 | 4 | ~ |
| M | #4 | 4 | ~ |
| P | #4 | ~ | 1'-0" |
| R | #5 | 6 | ~ |
| V | #4 | ~ | 1'-0" |

## TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

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

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

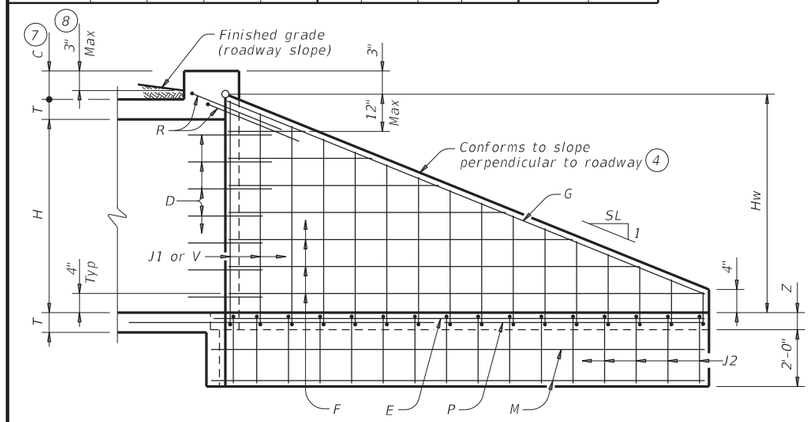
For cast–in–place culverts:
Ltw = (N) (S) + (N + 1) (U)

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

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

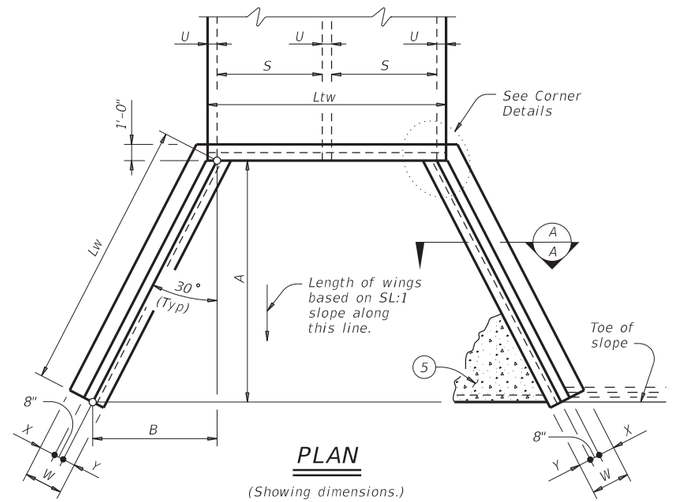
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



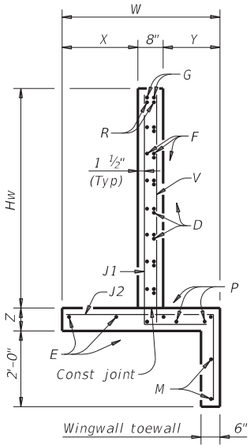

INSIDE ELEVATION

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

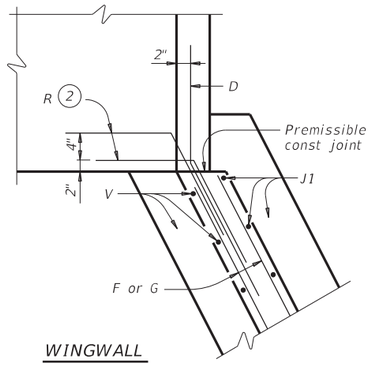



PLAN

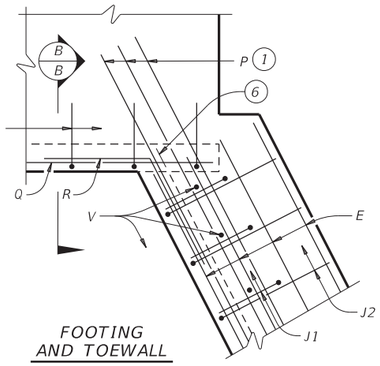
(Showing dimensions.)




SECTION A-A



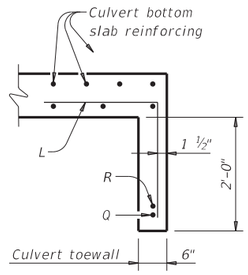

WINGWALL



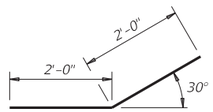

FOOTING AND TOEWALL

CORNER DETAILS

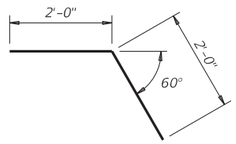
(Culvert and culvert toewall reinforcing not shown for clarity.)



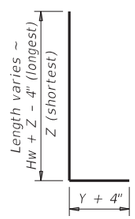

SECTION B-B (5)



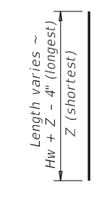

BARS D



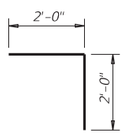

BARS R



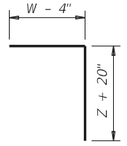

BARS J1




BARS V




BARS L




BARS J2

(1) Extend Bars P 3'–0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap." Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'–6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of ow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B–B will not be required.

(6) At Contractor's option, culvert toewall may be ended ush with wingwall toewall. Adjust reinforcing as needed.

(7) 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

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

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

### MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete synthetic bers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

### GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Speci cations.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

# CONCRETE WINGWALLS
## WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

## FW-0

| FILE: CD-FW0-20.dgn | DN: GAF | CK: CAT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 REVISIONS | CONT | SECT | JOB | HIGHWAY |
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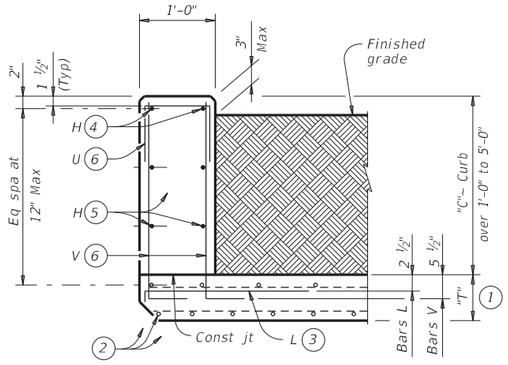
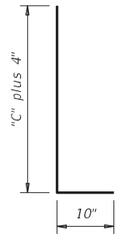
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 46 |

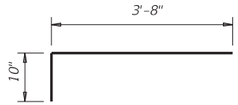



## TYPICAL SECTION

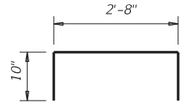
Used for curbs over 1'-0" to 5'-0"



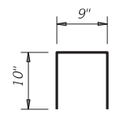

BARS V (#5) (6)
Spaced at 12" Max




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 nished 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 Speci cations.
These extended curb details have su cient strength to allow for future retro t of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.
This Curb is considered as part of the Box Culvert for payment.

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

Texas Department of Transportation

Bridge Division Standard

# EXTENDED CURB DETAILS FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

## ECD

| FILE: CD-ECD-20.dgn | DN: GAF | CK: TxDOT | DW: TxDOT | CK: GAF |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | COLORADO, ETC. | | 47 |

DATE: 7/22/2024 $TIME$
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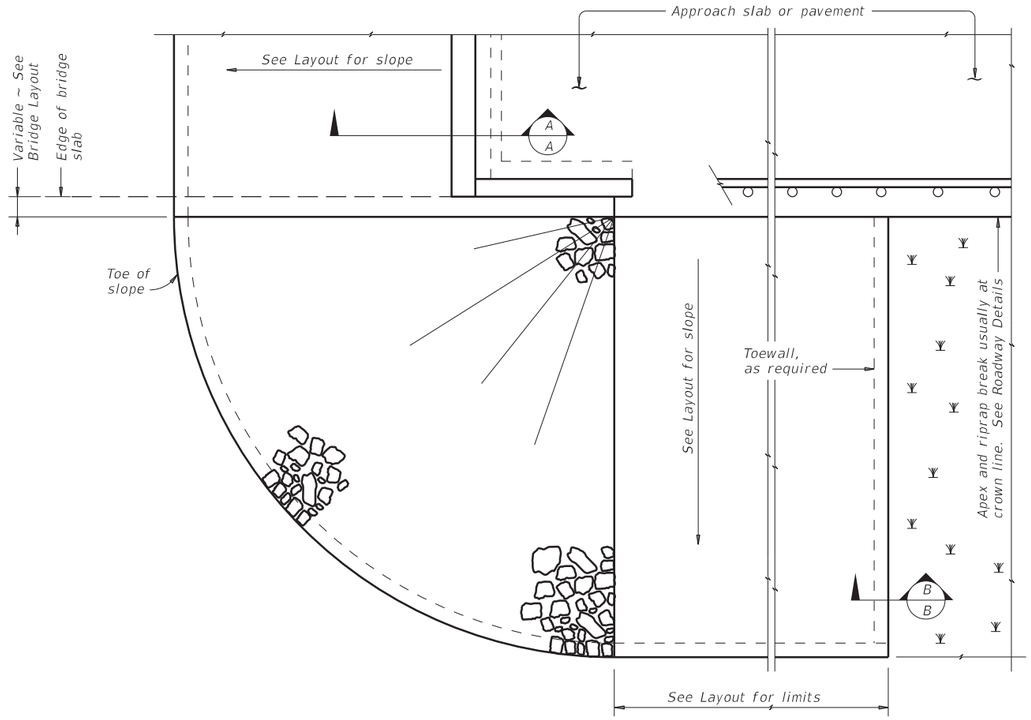
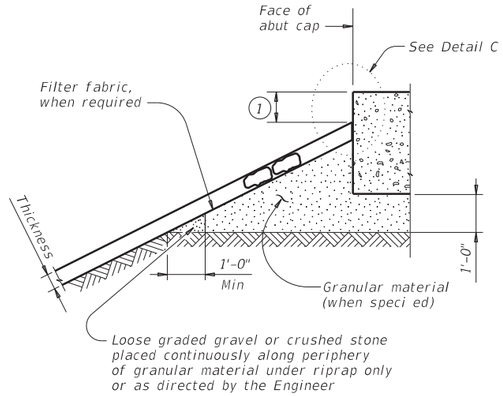
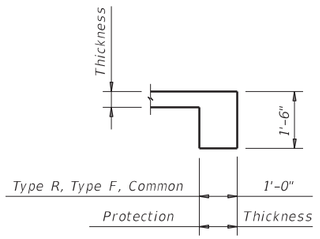
DATE: 7/22/2024 $TIME$
FILE: $FILE$




PLAN

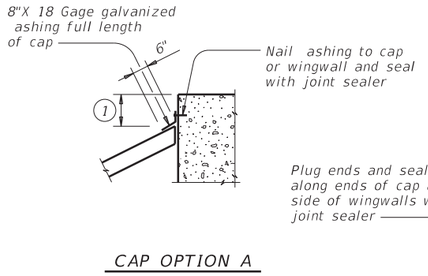



SECTION A-A AT CAP




SECTION B-B

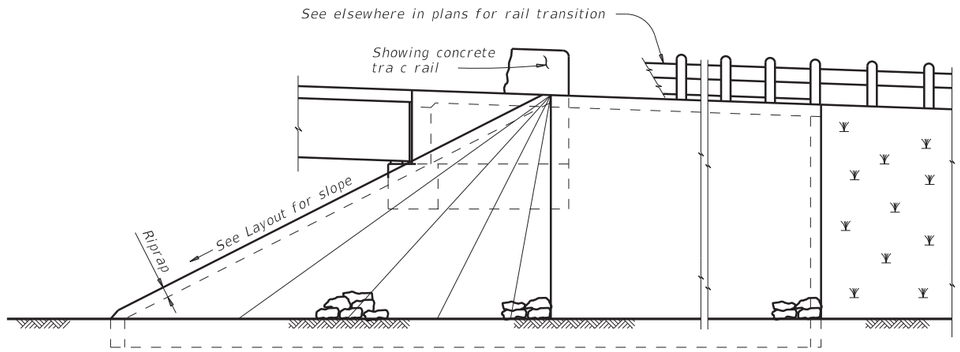
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".




CAP OPTION A

CAP OPTION B

DETAIL C




ELEVATION

(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.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap speci ed.
See elsewhere in plans for locations and details of shoulder drains.



Texas Department of Transportation

Bridge Division Standard

# STONE RIPRAP

SRR

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FILE: MS-SRR-19.dgn | DN: AES | CK: JGD | DW: BWH | CK: AES | | | |
| ©TxDOT April 2019 | CONT | SECT | JOB | HIGHWAY | | | |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. | | | |
| | DIST | COUNTY | | SHEET NO. | | | |
| | YKM | COLORADO, ETC. | | 48 | | | |

DATE: 7/22/2024 $TIME$
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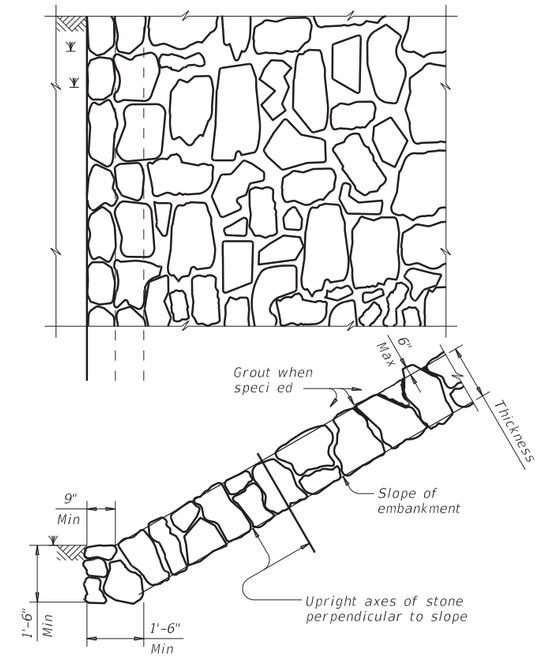



FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

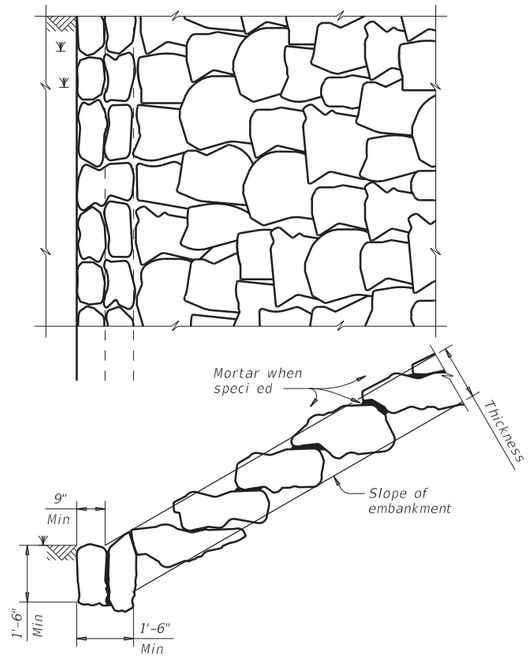



FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

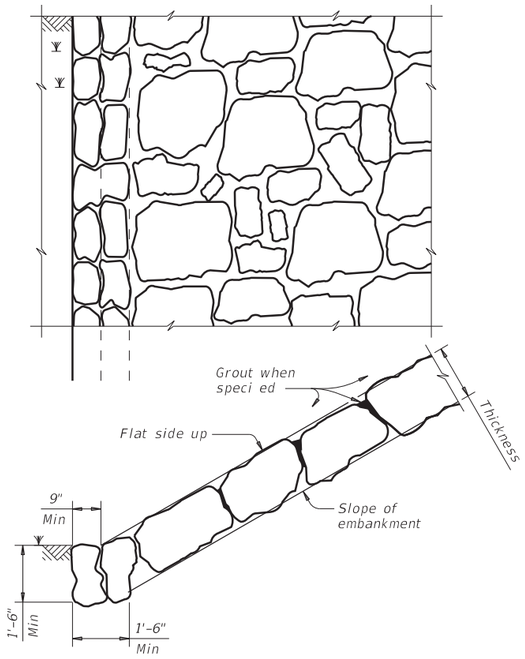



FIGURE 3 ~ TYPE F STONE RIPRAP

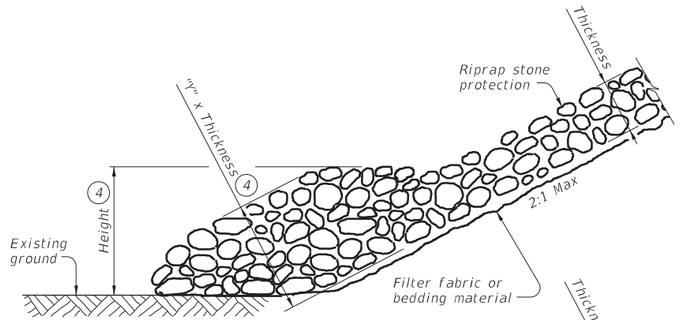
grouted

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

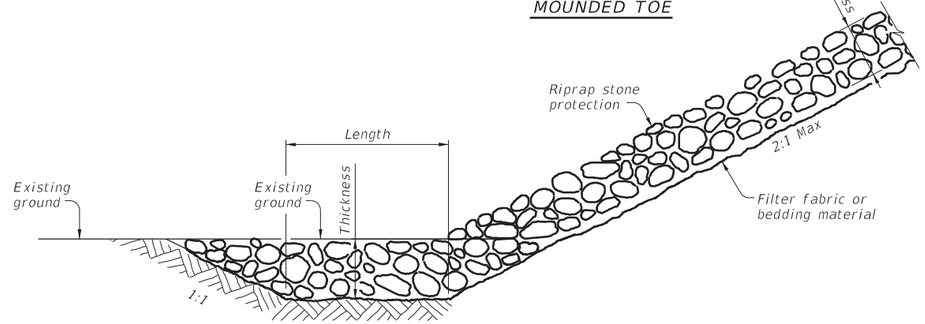
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be de ned. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.

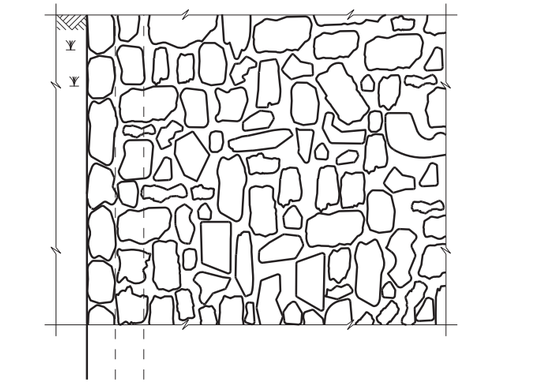



MOUNDED TOE




EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)



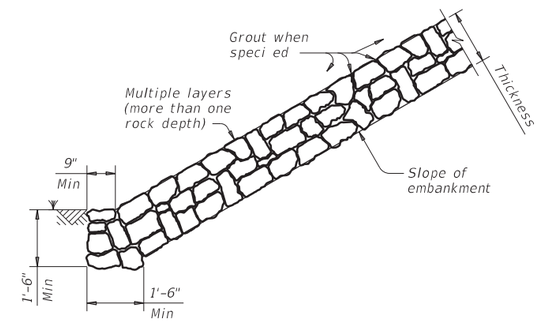
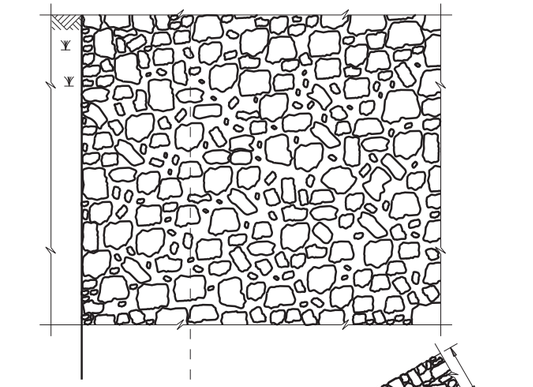



FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted



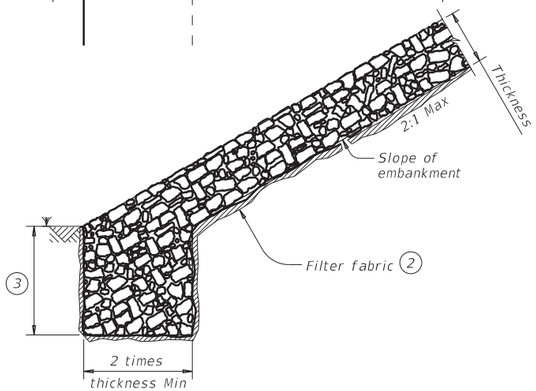



FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

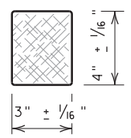
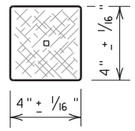
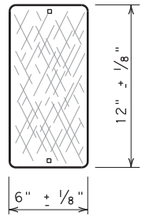
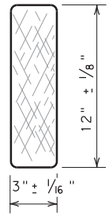
Bridge Division Standard

# STONE RIPRAP

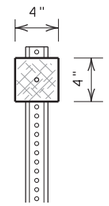
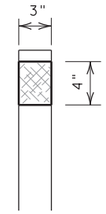
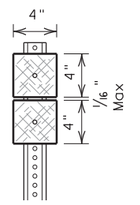
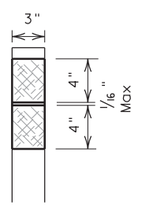
SRR

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FILE: MS-SRR-19.dgn | DN: AES | CK: JGD | DW: BWH | CK: AES | | | |
| ©TxDOT April 2019 | CONT | SECT | JOB | HIGHWAY | | | |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. | | | |
| | DIST | COUNTY | | SHEET NO. | | | |
| | YKM | COLORADO, ETC. | | 49 | | | |

## 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).<br>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

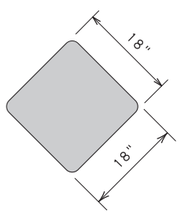
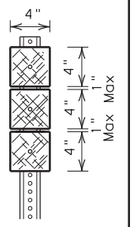
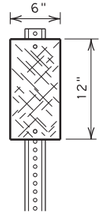
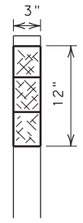
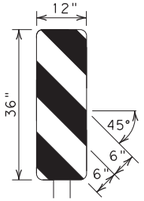
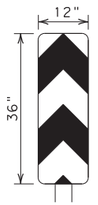
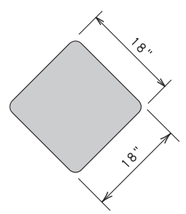
**NUMBER OF REFLECTORS OR DIRECTION**
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

**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

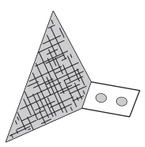
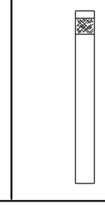
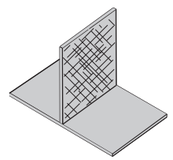
## OBJECT MARKERS

| | 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

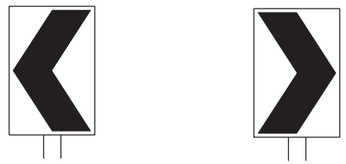
| | |
|---|---|
| FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES) | DMS-4400 |
| SIGN FACE MATERIALS | DMS-8300 |
| DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS | DMS-8600 |

## BARRIER REFLECTORS (BRF)

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

## CHEVRONS

DEVICE



W1-8

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

## ONE DIRECTION LARGE ARROW

DEVICE

W1-6

| SIZE (W x L) | 48" x 24" (Conventional) | 60" x 30" (Expressway & Freeway) |
|---|---|---|
| MOUNTING HEIGHT | 7'-0" | |

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

**NOTE:**

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

Texas Department of Transportation

Traffic Safety Division Standard

# DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

# D & OM(1)-20

| FILE: dom1-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| ©TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. |
| 4-10 7-20 | YKM | COLORADO, ETC. | | 50 |

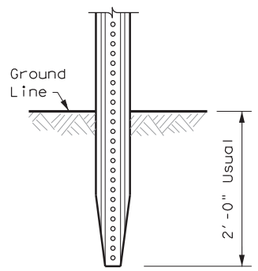
20A

DATE: 7/22/2024 $TIME$
FILE: $FILE$

# POST TYPE AND SUPPORT FOUNDATION DETAILS

## WING CHANNEL (WC)

### GND

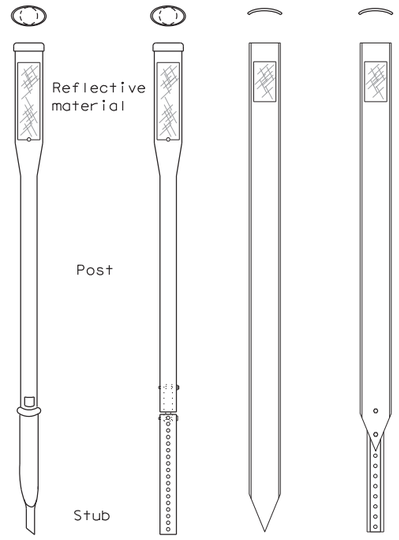



**NOTES**

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.

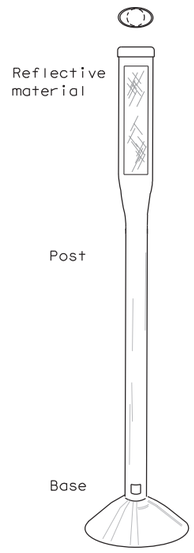
## FLEXIBLE POSTS (YFLX, WFLX)

### GND




EMBEDDED

### SRF



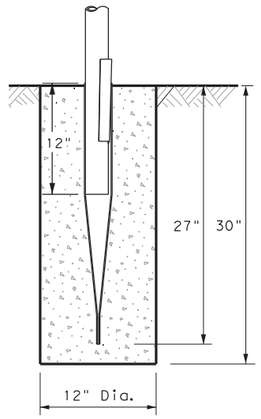

SURFACE MOUNT

**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.

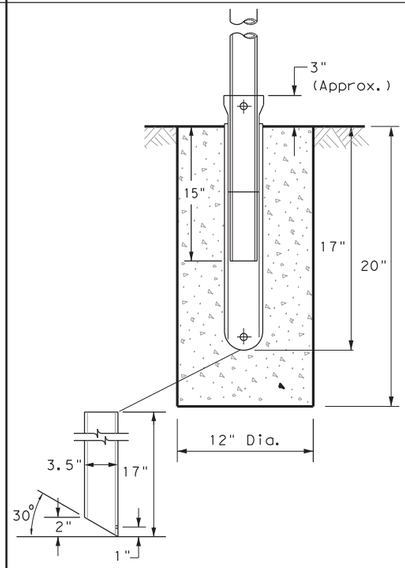
## WEDGE ANCHOR SYSTEMS

### WAS




STEEL

### WAP




PLASTIC

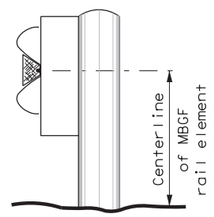
**NOTE**

1. Install per manufacturer's recommendations.

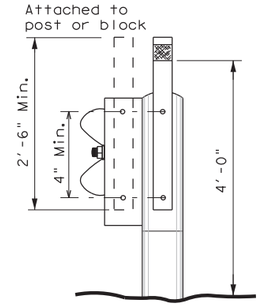
# TYPE OF BARRIER MOUNTS

## GUARD FENCE ATTACHMENT

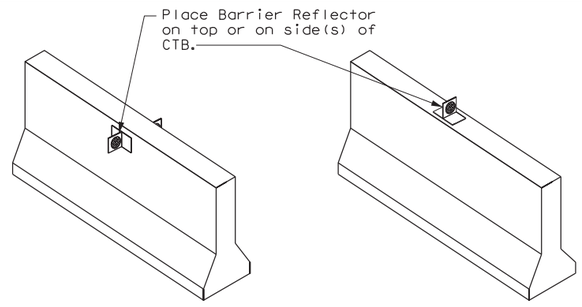
### GF1




### GF2



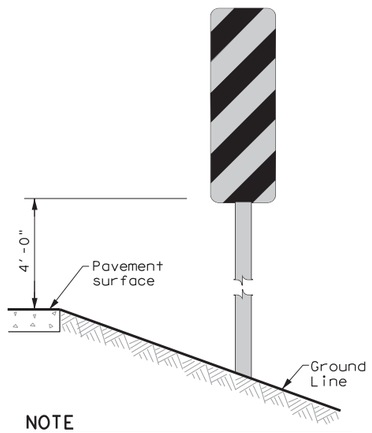

## CONCRETE TRAFFIC BARRIER (CTB)




**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.

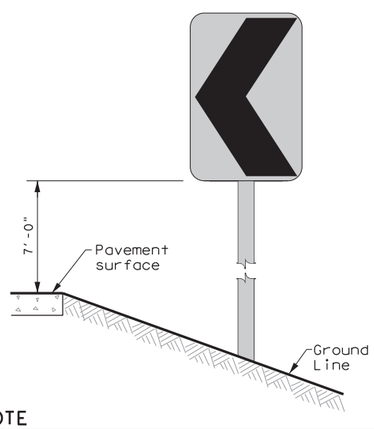
## TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS




**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)

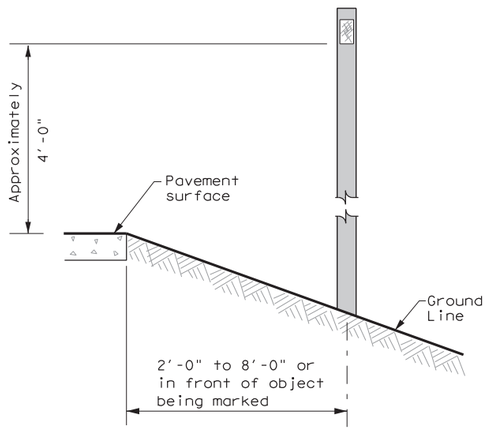
## CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN




**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

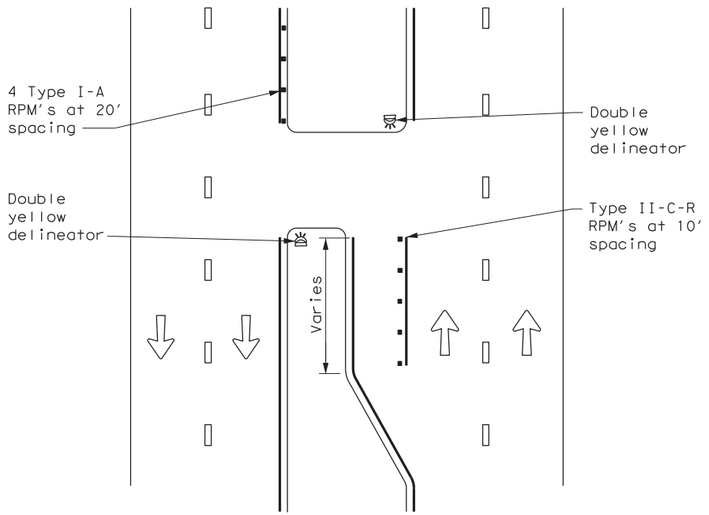
| FILE: dom2-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| ©TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. |
| 4-10 7-20 | YKM | COLORADO, ETC. | | 51 |

20B

DATE: 7/22/2024 $TIME$
FILE: $FILE$

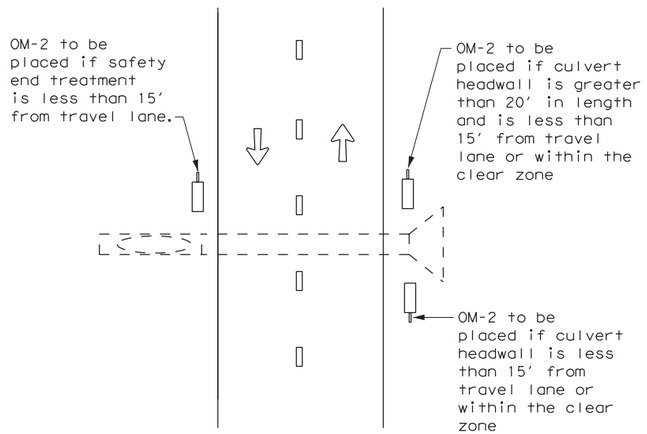
DATE: 7/22/2024 $TIME$
FILE: $FILE$

## CROSSOVERS



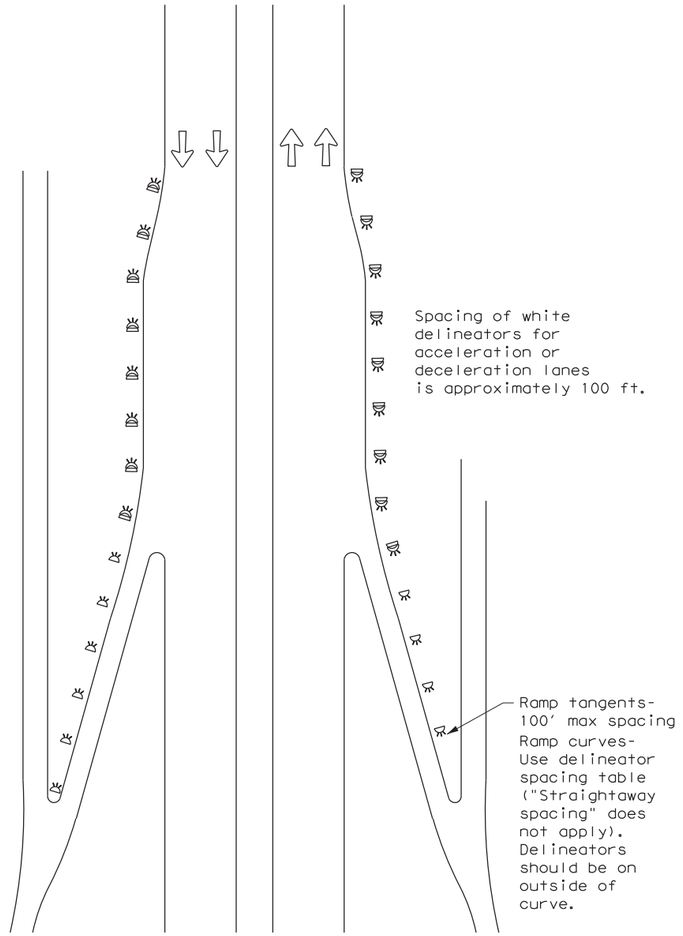

DETAIL 1

## FOR CULVERTS WITHOUT MBGF



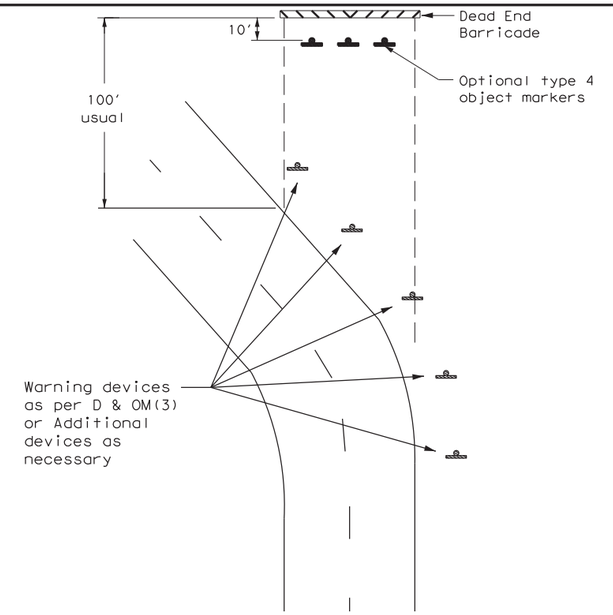

DETAIL 2

## FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



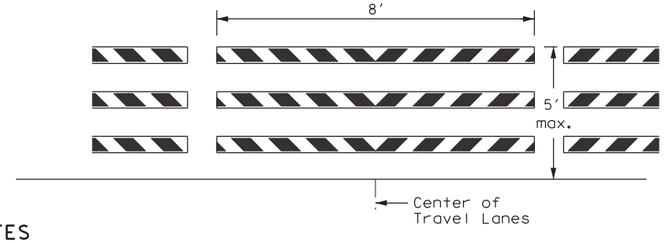

DETAIL 3

## 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: dgm4-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| ©TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. |
| 3-15 | DIST | COUNTY | | SHEET NO. |
| 7-20 | YKM | COLORADO, ETC. | | 52 |

20D

## I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is 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. If applicable list MS4 operator that may receive discharges from this project. MS4 operator should be notified prior to construction activities.

- ☒ Prevent stormwater pollution erosion and sedimentation in accordance with TPDES Permit TXR 150000.
- ☒ Comply with the SW3P and revise when necessary to control pollution or as required by the Engineer.
- ☐ Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA, or other inspectors.
- ☐ When Contractor project specific locations (PSL) increase disturbed soil area to 5 acres or more, sumbit Notice of Intent (NOI) to TCEQ and Engineer.
- ☐ MS4 Operator(s):

No Additional Comments

## II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

- ☐ No USACE Permit Required
- ☒ Work is authorized by the USACE under a Nationwide Permit **3** without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set.
- ☐ Work is authorized by the USACE under a Nationwide Permit _____ with a Pre-Construction Notification (PCN). The project specific permit issued by the USACE is included in the plan set.
- ☐ Work is authorized by the USACE under a Individual Permit (IP). The project specific permit issued by the USACE is included in the plan set.
- ☐ Work would be authorized by the USACE. The project specific permit issued by the USACE or Nationwide Permit will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

- ☒ No United States Coast Guard (USCG) Coordination Required
- ☐ United States Coast Guard (USCG) Permit
- ☐ United States Coast Guard (USCG) Exemption

---

Best Management Practices

| Erosion | Sedimentation | Post Construction TSS |
|---|---|---|
| ☒ Temporary Vegetation | ☒ Silt Fence | ☐ Vegetative Filter Strips |
| ☐ Vegetation Lined Ditches | ☐ Rock Filter Dam | ☒ Vegetation Lined Ditches |
| ☐ Sodding | ☐ Sand Bag Berm | ☐ Grassy Swales |

No Additional Comments

## 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 area and contact the Engineer immediately.

No Additional Comments

## IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications 162, 164, 192, 193, 506, 730, 751, and 752 in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

## V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

## VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structutres not including box culverts)? Yes ☐ No ☒

No further action required.

TxDOT is still required to notify DSHS 14 working days prior to any scheduled demolition.

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.

No Additional Comments

## VII. GENERAL NOTES

The contractor's attention is directed to the fact that discharges of permanent or temporary fill material into the waters of the United States, including jurisdictional wetlands, as necessary for construction, will require specific approval of the USACE under Section 404 of the Clean Water Act.

TxDOT will obtain the appropriate permit(s), Nationwide or Individual, when necessary as dictated by the proposed actions for the project and it's potential to affect USACE jurisdictional areas. The contractor may review the permitted plans at the office of the Area Engineer in charge of construction. TxDOT will hold the contractor responsible for following all conditions of the approved permit. If the contractor cannot work within the limits of the permit(s), then it becomes the contractor's entire responsibility to consult with the USACE pertaining to the need for changes or amendments to the conditions of the exiting permit(s) as origianlly obtained by the department.

Particular importance is stressed on the fact that any impacts to USACE jurisdictional waters of the United States, including jurisdictional wetlands, be the minimum necessary to complete the proposed work. The contractor shall maintain near normal flow of any jurisdictional waters of the United States at all times during construction. If the contractor needs further explanation of the conditions of the permit, including means of compliance, they may contact the Yoakum District Environmental Coordinator.

Version 13.1

Texas Department of Transportation

TxDOT Yoakum District

# ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

# EPIC

| FILE: EPIC Sheet.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| © TxDOT: March 2017 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 6401 | 50 | 001 | VA |
| | DIST | COUNTY | | SHEET NO. |
| | YKM | VA | | |

DATE:
FILE:

## STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with soil disturbing activity and for projects that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

### 1.0 SITE/PROJECT DESCRIPTION

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**
6401-50-001

**1.2 PROJECT LIMITS:**
From: SEE PROJECT LOCATION MAP

To: _____

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) SEE INDIVIDUAL ,(Long) PROJECT SHEETS

END: (Lat) _____ ,(Long) _____

**1.4 TOTAL PROJECT AREA (Acres):** <1 AC

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** <1 AC

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

_____

_____

_____

**1.7 MAJOR SOIL TYPES:**

| Soil Type | Description |
|---|---|
| SEE PROJECT LOCATION MAP | |
| Location 1: Wilson clay loam | 0 to 1 percent slopes |
| Location 2: Wockley fine sandy loam | 0 to 1 percent slopes |
| Location 3: Frelsburg clay | 1 to 3 percent slopes |
| Location 4: Laewest clay | 0 to 1 percent slopes |
| Location 5: Laewest clay | 0 to 1 percent slopes |
| Location 6: Lake Charles clay | 0 to 1 percent slopes |
| Location 7: Edna loam | 0 to 1 percent slopes |

**1.8 PROJECT SPECIFIC LOCATIONS (PSLs):**

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- ☐ PSLs determined during preconstruction meeting
- ☒ PSLs determined during construction
- ☐ No PSLs planned for construction

| Type | Sheet #s |
|---|---|
| | |
| | |
| | |
| | |
| | |

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

- ☒ Mobilization
- ☒ Install sediment and erosion controls
- ☐ Blade existing topsoil into windrows, prep ROW, clear and grub
- ☐ Remove existing pavement
- ☒ Grading operations, excavation, and embankment
- ☐ Excavate and prepare subgrade for proposed pavement widening
- ☒ Remove existing culverts, safety end treatments (SETs)
- ☐ Remove existing metal beam guard fence (MBGF), bridge rail
- ☐ Install proposed pavement per plans
- ☒ Install culverts, culvert extensions, SETs
- ☐ Install mow strip, MBGF, bridge rail
- ☐ Place flex base
- ☒ Rework slopes, grade ditches
- ☐ Blade windrowed material back across slopes
- ☐ Revegetation of unpaved areas
- ☐ Achieve site stabilization and remove sediment and erosion control measures
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

- ☒ Sediment laden stormwater from stormwater conveyance over disturbed area
- ☐ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- ☒ Solvents, paints, adhesives, etc. from various construction activities
- ☒ Transported soils from offsite vehicle tracking
- ☐ Construction debris and waste from various construction activities
- ☒ Contaminated water from excavation or dewatering pump-out water
- ☐ Sanitary waste from onsite restroom facilities
- ☐ Trash from various construction activities/receptacles
- ☐ Long-term stockpiles of material and waste
- ☐ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities.
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

**1.11 RECEIVING WATERS:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

| Tributaries | Classified Waterbody |
|---|---|
| SEE PROJECT LOCATION MAP | |
| Location 1: No tributary near project location | No classified waterbody near project location |
| Location 2: No tributary near project location | No classified waterbody near project location |
| Location 3: No tributary near project location | No classified waterbody near project location |

* Add (*) for impairred waterbodies with pollutant in ().

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- ☒ Development of plans and specifications
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☐ Submit NOI/CSN to local MS4
- ☒ Perform SWP3 inspections
- ☒ Maintain SWP3 records and update to reflect daily operations
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- ☒ Day To Day Operational Control
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☐ Submit NOI/CSN to local MS4
- ☒ Maintain schedule of major construction activities
- ☒ Install, maintain and modify BMPs
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

**1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:**

| MS4 Entity |
|---|
| |
| |
| |
| |
| |

**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**



July 2023 Sheet 1 of 3

*Texas Department of Transportation*

| FED. RD. DIV. NO. | PROJECT NO. | | SHEET NO. |
|---|---|---|---|
| | | | 54 |
| STATE | STATE DIST. | COUNTY | |
| TEXAS | YKM | COLORADO, ETC. | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |

## STORMWATER POLLUTION PREVENTION PLAN (SWP3):

### 2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

### 2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

**T / P**

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☒ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

### 2.2 SEDIMENT CONTROL BMPs:

**T / P**

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

**T / P**

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

### 2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

| Type | Stationing | |
|---|---|---|
| | From | To |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

### 2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☒ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Daily street sweeping
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

### 2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☐ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

### 2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

| Type | Stationing | |
|---|---|---|
| | From | To |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

### 2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

### 2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

### 2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

### 2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**



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*Texas Department of Transportation*

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| | | | 55 |
| STATE | STATE DIST. | COUNTY | |
| TEXAS | YKM | COLORADO, ETC. | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |

**1.7 MAJOR SOIL TYPES CONTINUED:**

| Soil Type | Description |
|---|---|
| SEE PROJECT LOCATION MAP | |
| Location 8,9:<br>Latium clay | 2 to 5 percent slopes |
| Location 10:<br>Frelsburg clay | 3 to 5 percent slopes |

**1.11 RECEIVING WATERS CONTINUED:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

| Tributaries | Classified Waterbody |
|---|---|
| SEE PROJECT LOCATION MAP | |
| Location 4:<br>Johnsons Timber Slough | Segment ID 1501<br>*Tres Palacios Creek Tidal<br>(Impaired for bacteria & dissolved oxygen) |
| Location 5:<br>No tributary near project location | No classified waterbody near project location |
| Location 6:<br>No tributary near project location | No classified waterbody near project location |
| Location 7:<br>Gardner Slough &<br>Quinine Slough | Segment ID 1305B<br>Caney Creek Above<br>Water Hole Creek |
| Locations 8-10:<br>Williams Creek &<br>East Mill Creek | Segment ID 1202K<br>*Mill Creek<br>(Impaired for Bacteria) |

**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**



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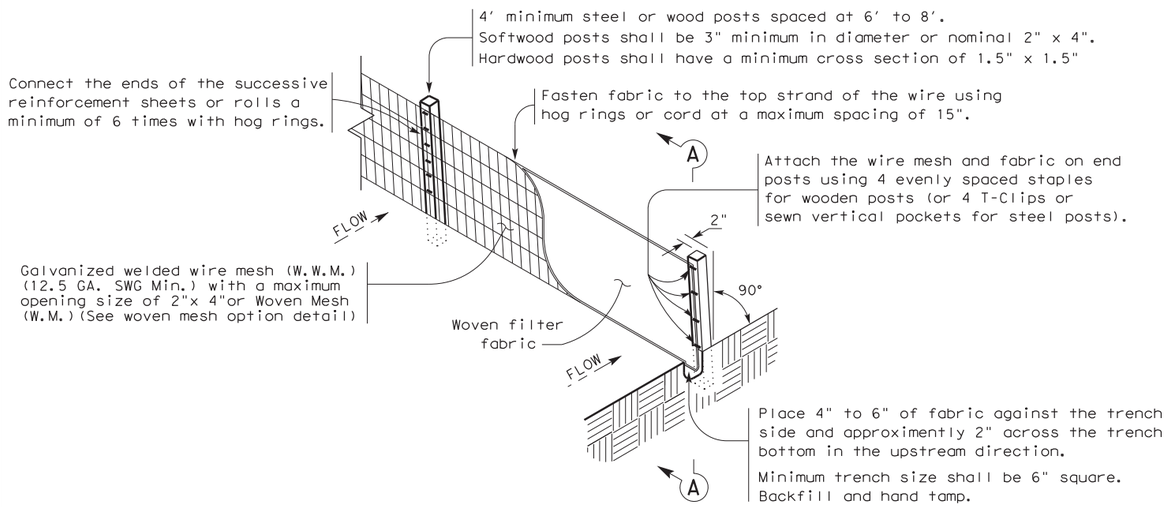
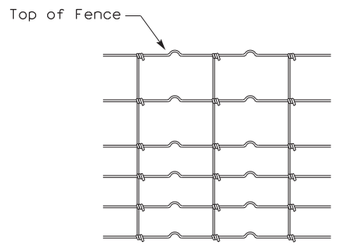
*Texas Department of Transportation*

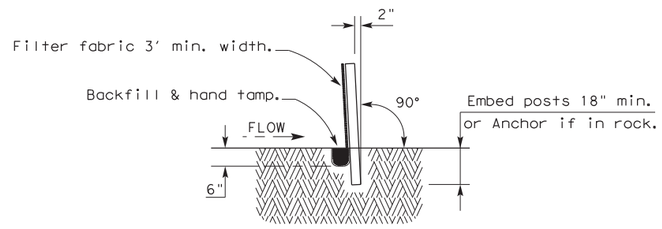
| FED. RD. DIV. NO. | PROJECT NO. | | SHEET NO. |
|---|---|---|---|
| | | | 56 |
| STATE | STATE DIST. | COUNTY | |
| TEXAS | YKM | COLORADO, ETC. | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 6401 | 50 | 001 | US 90, ETC. |




## 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.

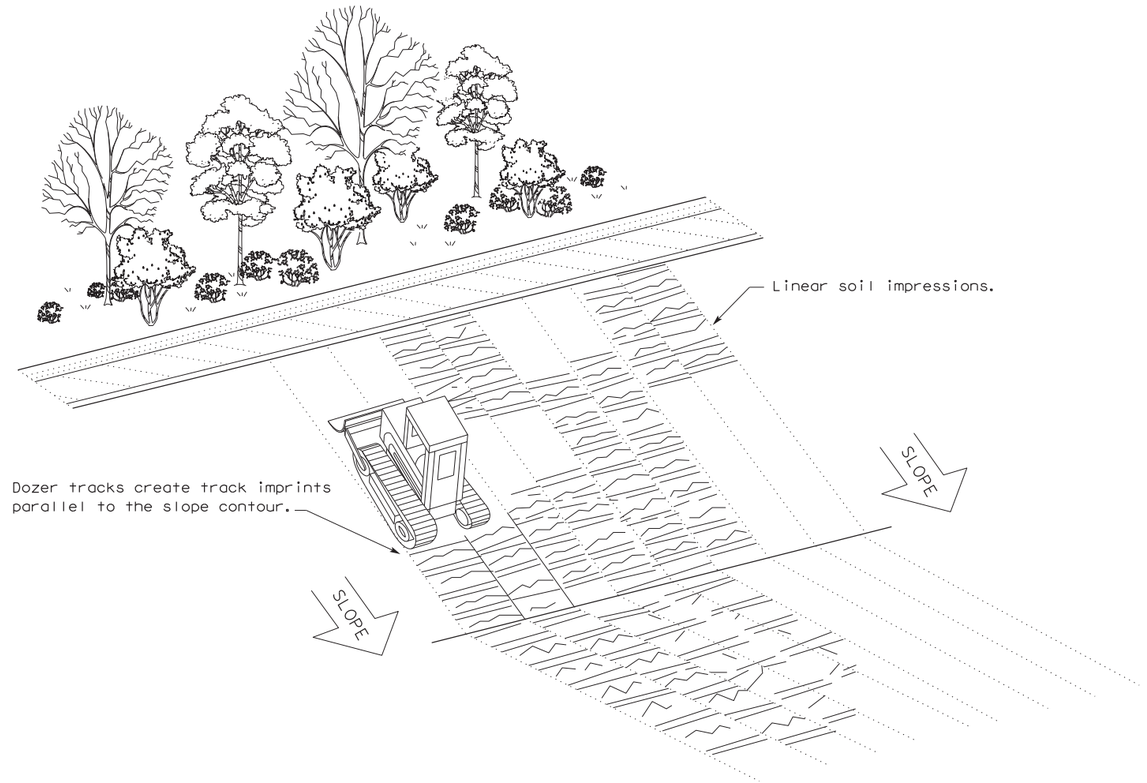
### LEGEND

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

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|---|---|---|---|---|---|---|
| FILE: ec116 | DN: TxDOT | CK: KM | DW: VP | DN/CK: LS | | |
| © TxDOT: JULY 2016 | CONT | SECT | JOB | HIGHWAY | | |
| REVISIONS | 6401 | 50 | 001 | US 90, ETC. | | |
| | DIST | COUNTY | | SHEET NO. | | |
| | YKM | COLORADO, ETC. | | 57 | | |

7/22/2024
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