| FED.RD. DIV.NO. | PROJECT NO. | | SHEET NO. |
|---|---|---|---|
| 6 | F 2023 (365) | | 1 |
| STATE | STATE DIST.NO. | COUNTY | |
| TEXAS | LBB | GARZA | |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILENAME | US84_Title_Sheet_Bridge.dgn | | |

**Design Speed: 75 MPH**
**2021 ADT: 10,979**
**2041 ADT: 13,614**
**Functional Class: Principal Arterial**

# STATE OF TEXAS
## DEPARTMENT OF TRANSPORTATION

## PLANS OF PROPOSED
## STATE HIGHWAY IMPROVEMENT
*BRIDGE REPLACEMENT PROGRAM*

**FEDERAL AID PROJECT**

# F 2023(365)

*NET LENGTH OF PROJECT:*

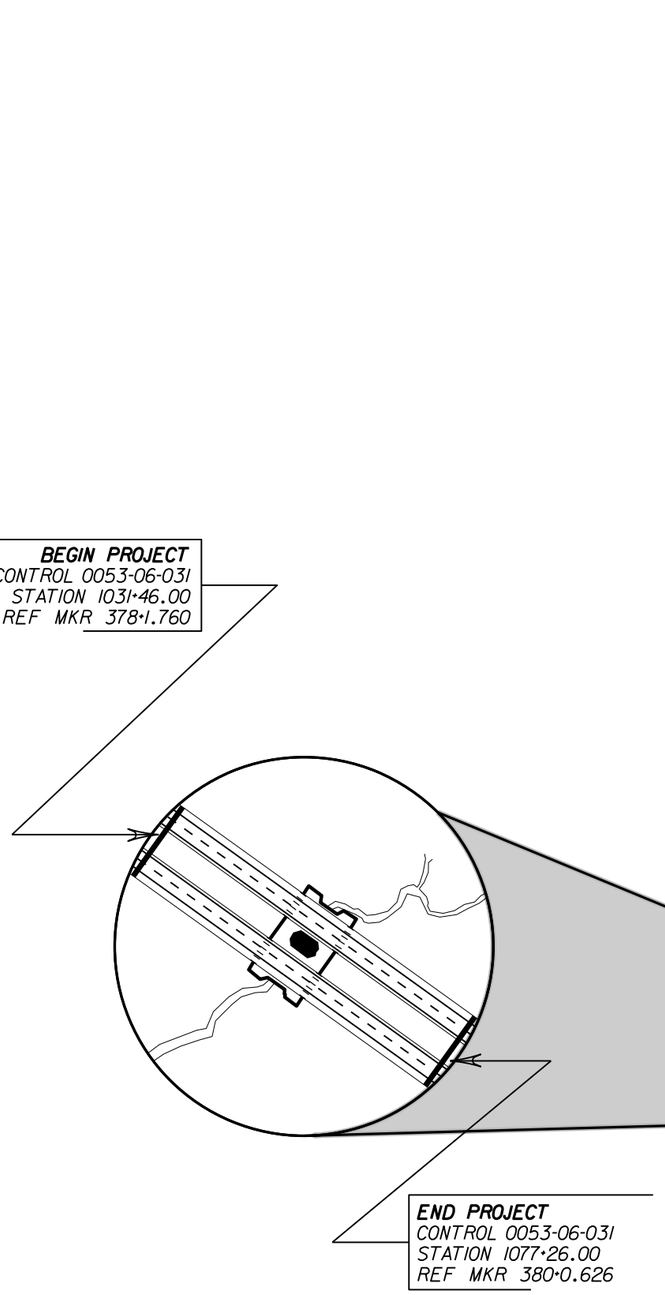
*4554.25 FT. = 0.863 MI. - ROADWAY*
*25.75 FT. = 0.004 MI. - BRIDGE*
*4580 FT. = 0.867 MI. - TOTAL LENGTH*

# US 84
# GARZA COUNTY

**LIMITS: FROM 0.18 MI. EAST OF FM 1269 TO 1.04 MI. EAST OF FM 1269**

*FOR THE CONSTRUCTION OF A BRIDGE REPLACEMENT AND EXTENSION CONSISTING OF CULVERT WORK, DITCH GRADING, MBGF, RIPRAP, PLANING, HMAC, REINFORCING FABRIC, SEALCOAT, AND STRIPING*

**BEGIN PROJECT**
CONTROL 0053-06-031
STATION 1031+46.00
REF MKR 378+1.760



**END PROJECT**
CONTROL 0053-06-031
STATION 1077+26.00
REF MKR 380+0.626




N

**LAYOUT NO SCALE**

**NO EQUATIONS**
**NO EXCEPTIONS**
**NO RAILROAD CROSSINGS**

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

Texas Department of Transportation



STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

*SUBMITTED FOR LETTING:* 11/3/2022
DocuSigned by: Shelley C. Harris P.E.
F9984108931347C...
*DISTRICT DESIGN ENGINEER*

*RECOMMENDED FOR LETTING:* 11/4/2022
DocuSigned by:
559AA9F194ED40A...
*AREA ENGINEER*

*APPROVAL FOR LETTING:* 11/4/2022
DocuSigned by: Bobby P. Warren P.E.
642C665E4DDD46A...
*DISTRICT ENGINEER*

## GENERAL



## TRAFFIC CONTROL



## TRAFFIC CONTROL STANDARDS



## ROADWAY



## ROADWAY STANDARDS



## DRAINAGE



## BRIDGE



## BRIDGE STANDARDS



## TRAFFIC



## TRAFFIC STANDARDS



## ENVIRONMENTAL



## ENVIRONMENTAL STANDARDS



STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED
PROFESSIONAL ENGINEER

THE "TXDOT" STANDARD SHEETS INCLUDED HEREON HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Shelley C. Harris, P.E.
11/4/2022



Texas Department of Transportation

# INDEX OF SHEETS

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 2 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_GEN_INDEX_SHEET | | |

DATE: &DATE&  &TIME&
FILE: &FILE&

**GENERAL NOTES:**

## Hot Mix Basis of Estimate

| ITEM | DESCRIPTION | *RATE (approx.) |
|---|---|---|
| 3076 | 4 IN, ACP (TYPE C) PG76-28 (EXEMPT) | 460 LBS/SY |

*Actual rates will be determined by Engineer in Field

## Hot Mix Area (SY)

| MIX TYPE | SY |
|---|---|
| Type C | 1,267 |

## Surface Treatment Basis of Estimate

| DESCRIPTION | EMUL (ERSN CONT) | SEAL COAT | REINF. FABRIC | TACK COAT | FOG SEAL |
|---|---|---|---|---|---|
| ASPH TYPE & GRADE | CSS-1H | AC-20-5TR | PG76-28 | trackless | CSS-1H |
| ASPH RATE (GAL/SY) | 0.22 | 0.42 | 0.15 | 0.14 | 0.30 |
| AGGR TYPE | | PB | | | |
| AGGR GRADE | | 4 | | | |
| AGGR RATE (CY/SY) | | 1/105 | | | |

## Surface Treatment Area (SY)

| EMUL (ERSN CONT) | SEAL COAT | REINF. FABRIC | TACK COAT | FOG SEAL |
|---|---|---|---|---|
| 5,978 | 21,609 | 1,267 | 1,267 | 1,267 |

**W.W.A.R.P**

Provide coarse aggregate for surface treatments and hotmix meeting a minimum class of **B** as published in the *AGGREGATE QUALITY MONITORING PROGRAM RATED SOURCE QUALITY CATALOGUE*.

**General Requirements and Covenants - Items 1 thru 9**

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

Seve Sisneros, Brownfield Area Engineer – seve.sisneros@txdot.gov (806) 637-4501



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3**

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name. Check the FTP site regularly for any updates.

**Item 1 – Abbreviations and Definitions**

Contract Prosecution – Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A contractor awarded multiple contracts, must be capable and sufficiently staffed to concurrently process any and all contracts at the same time.

**Item 2 – Instructions to Bidders**

The construction time determination schedule will be posted on the Contractor Q&A FTP site.

View the plans on-line or download from the web at:
http://www.dot.state.tx.us/business/plansonline/agreement.htm
Choose "I Agree" then, "Click here", then "State-Let-Construction", pick the letting month, then "Plans" and then choose the plans set.

Order plans from any of the plan reproduction companies shown on the web at:
http://www.dot.state.tx.us/business/contractors_consultants/repro_companies.htm

By signing this proposal, a bidder acknowledges that he/she has a copy of the "Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges", adopted by the Texas Department of Transportation, November 1, 2014. This specification book may be purchased from the Department or downloaded at:
http://www.txdot.gov/business/resources/txdot-specifications.html

**Utilities**

Overhead and underground utility installations exist within the project limits.

Call One Call to mark the locations of all utilities.

**Item 5 – Control of the Work**

Perform construction surveying in accordance with Article 5.9.3, "Method C."

Replace all damaged ROW and USGS monuments at the contractor's expense.

When deviation from the plans is requested by the Contractor, but not required for installation, the Contractor will bear any additional costs associated with the deviation.

Restore all disturbed areas due to trenching or any construction activity to a condition equivalent to the original condition within 14 working days from the time work began in the area including all necessary stabilization.

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

At the end of each day remove from the ROW, inside or outside the project limits, any excess material and debris resulting from construction.

Correct any deficiencies identified during the final inspection including required paperwork.

Submit all required paperwork within 60 days of project acceptance.

**Item 6 – Control of Materials**

Use materials from pre-qualified producers. A list of material producers pre-qualified by the Construction Division (CST) of the Texas Department of Transportation (TxDOT) can be found at the following website:
http://www.txdot.gov/business/resources/producer-list.html

In addition to the requirements of the plans and specifications, make all material and equipment furnished, installed, modified, tested, or otherwise used on this contract, and becoming the property of TxDOT, fully functional within the manufacturer normal specifications, warranties, and guarantees. Make any additional functions of the material and equipment normally supplied by the manufacturer, but not specified by TxDOT, completely functional.

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

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

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

**Article 6.11**



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3A**

Repair damage to the Right of Way to the satisfaction of the project supervisor.

**Item 7 – Legal Relations and Responsibilities**

Notify TxDOT 18 working days prior to any bridge demolition to allow TxDOT time to contact DSHS.

Coordinate street closures with the local fire, police, and other emergency personnel.

Maintain access to adjacent property at all times.

Notify, in writing, each residence and business 10 days prior to beginning construction of the phase/phases that are expected to affect their ingress and egress. This notice may be hand delivered or mailed.

When applicable, comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) sheets.

Provide a lidded dumpster to be used by Contractor's personnel on the job site. The lid or covering to the dumpsters needs to be able to stay closed in high winds for preventing trash from being blown out. This shall be considered subsidiary to the various bid items.

Dispose of all waste materials in compliance with local, state, and federal regulations. Submit a list of all approved waste sites to the Engineer for review.

All vehicles in the work zone shall use flashing amber strobe lights visible 360 degrees.

No significant traffic generator events identified.

This project will not require a railroad agreement, flagging, insurance, or right-of-entry.

Nearest concrete plant is over an hour from the project.

Prior to rain events the contractor is required to monitor and mitigate potential damage to the existing structure and work as approved by the Engineer.

**Item 8 - Prosecution and Progress**

This project is to be complete in ***175*** days and ***14*** months of barricades in accordance with the contract documents.

Liquidated damages as defined in SP 000-1243 ($832) will be increased by the calculated road user cost of $1,198, for a total of $2,030 per day.

Work must begin by ***5/1/2023***.

Monthly schedule updates are a very important aspect of managing the progress of this project. The Engineer may withhold the monthly estimate if the schedule update has not been received.

A bar chart will be required on this project.

Do not begin work before sunrise or end work after sunset unless authorized by the Engineer, and remove all equipment from the roadway before sundown.

Perform any erosion control measures such as seeding or sodding before beginning the next phase, or land, unless otherwise authorized by the Engineer.

Work around existing culverts, signs, mailboxes, object markers and delineators. Any damages resulting from the Contractor's operation shall be repaired by the Contractor to the satisfaction of the Engineer.

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

Shut down operations the working day before the following major traffic generating holidays: January 1st (New Year's); Last Monday in May (Memorial Day); July 4th (Independence Day); First Monday in September (Labor Day); Fourth Thursday in November (Thanksgiving); and December 24th (Christmas Eve).

Payment for final 3% mobilization will be made once all project signage has been removed and all other items according to Article 500.3. Timeliness for submittal of required paperwork and correction of deficiencies is a consideration in developing the final contractor evaluation score.

**Milestone**
Substantially complete the Milestone in 62 working days. The road-user cost liquidated damages is $2,030 per day. If it takes longer than 62 working days, then this amount will be assessed each day as liquidated damages until substantial completion is met. The maximum number of working days for computing the incentive credit for substantial completion is 30 days ($60,900 maximum). Substantial completion for the Milestone is defined as all the work for Phase 1 is completed. Saturdays and Sundays are **not** included in the incentive calculation.

**Item 9 - Measurement and Payment**

Submit material-on-hand payment requests by the monthly estimate cutoff date.

**Item 100 - Preparing Right Of Way**

The intent of this item is to remove the existing tree stump.

**Items 110 And 132 - Excavation and Embankment**



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3B**

Excavate silt and soil built up on each end of the bridge class culvert at the Draw. Excavate down to a level plane at the same elevation as the culvert flowline.

The Draw is a water of the U.S., therefore excavation must be accomplished with a Gradall by scooping up and loading into a truck to haul off. The excavated material cannot be pushed into a pile and then scooped up.

Provide Type C Embankment conforming to the following material specifications:

| | |
|---|---|
| Liquid Limit (maximum) | 45 |
| Plasticity Index (maximum) | 25 |
| Bar Linear Shrinkage (minimum) | 2 |

Consider all embankment to be Earth Embankment in accordance with Article 132.3.1.

Proof roll, as directed by the Engineer.

**Item 134 - Backfilling Pavement Edges and Item 150 - Blading**

Salvage existing topsoil and grass in windrows along the edge of the grading operations, or as directed by the Engineer. As a land is finished, spread the adjacent topsoil and grass uniformly over the disturbed area. Perform this work in phases not to exceed three miles, unless otherwise authorized by the Engineer.

Some reshaping of the ditch back slope may be required.

Water will be required as directed by the Engineer to compact backfill the pavement edges.

Compact the embankment using ordinary compaction.

**Item 164 - Seeding For Erosion Control**

After drill seeding, apply *CSS-1H* emulsified asphalt as a tacking agent, in accordance with Item 314, across the seeded area, as directed by the Engineer.

Notify the Engineer of scheduled seeding operations 24 hours prior to seeding applications. Do not begin seeding operations until the Engineer has approved seedbed preparations. Locate and flag all irrigation heads, valve covers, utility facility covers, etc. prior to commencing seed application operations.

Leave the seeded area lightly tracked in order to establish a better environment for seed germination.

Furnish seed tags from the seed supplier to the Engineer for verification of quantity and type.

Submit an available substitution to the Engineer, for approval, if a grass variety is not available.

Do not disturb or drive on newly seeded areas. Repair any damage to the seeded areas to the satisfaction of the Engineer.

A Cultipak planter may be used in lieu of drill seeding.

**Item 216 – Proof Rolling**

Provide a 25 ton roller, or other equipment approved by the Engineer for proof rolling.

Proof roll as directed.

**Item 302 - Aggregates for Surface Treatments**

Precoat aggregate with PG64-22 asphalt. Use Evotherm as the anti-stripping agent or an approved equivalent. The use of flux oil is not permitted.

Cure precoated aggregate a minimum of 72 hours before applying the aggregate to the roadway surface.

Aggregate will be subjected to five cycles of the magnesium sulfate soundness test in accordance with Test Method TEX-411-A. The loss shall not be greater than **20** percent.

The Contractor shall verify that stockpile locations do not interfere with any drainage channels.

The Contractor shall wet stockpiles to control dust as directed by the Engineer.

Allow 60 days for testing of material.

**Item 314 - Emulsified Asphalt Treatment**

Apply the emulsified asphalt and water mixture, as directed by the Engineer.

**Item 315 - Fog Seal**

Apply the emulsified asphalt and water mixture, as directed by the Engineer.

**Item 316 – Seal Coat**

Do not place asphalt between September 1 and April 30, unless otherwise directed by the Engineer.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3C**

Remove all excess aggregate by brooming after sufficient curing has occurred but no later than the end of the day, as directed by the Engineer. Remove all excess aggregate from the project in curb and gutter sections, and other areas as directed by the Engineer.

Schedule the placement width for all asphalt surfaces in a manner such that all joints will coincide with proposed lane lines (+/- 6 inches).

Cover or protect any sealed expansion joints or rail on bridges and any railroad tracks encountered on this project, as directed by the Engineer. Clean any of these items not properly protected. This work will not be paid for directly but will be considered subsidiary to Item 316.

Leave signs and barricades in place until all brooming and the application of the center stripe is completed, unless otherwise directed by the Engineer.

Set a string line for all surface treatment operations, unless otherwise directed by the Engineer. Remove the string line daily.

Use medium pneumatic tire rollers, as directed by the Engineer.

Do not use flat wheel rollers.

Asphalt storage tanks may be used.

Place a one course surface treatment full width upon completion of the work to seal and dress up the areas where temporary pavement markings have been placed for traffic relocation during construction. Use aggregate, asphalt type and rates as directed.

Apply lime water as directed, if in the opinion of the Engineer the pavement temperatures are becoming, or are expected to be, so elevated that the pavement surface could begin picking up under traffic or start bleeding. Failure to do so will be cause for the rejection and re-work of sections of roadway damaged by traffic at the Contractor's expense. Payment will be made for the application of lime water under item 204 “Sprinkling”. The lime will be subsidiary to this item.

If patching is required, use Type F hot mix or an approved equivalent for all patching. Place the patches using a blade and roller to achieve ride quality. Hand patching is not allowed unless approved by the Engineer.

Use asphalt spray bar end nozzles (T nozzles), or a deflector shield on both ends of the distributor spray bar.

Submit all invoices, bills of lading, and/or asphalt tickets in electronic format to the project inspector and Area Office’s Records Keeper no later than 24 hours after receipt.

No more than 4-inch overlap will be allowed at all longitudinal joints.

**Item 320 – Equipment for Asphalt Concrete Pavement**

Provide waterproof tarpaulins on all hauling equipment.

**Item 351 – Flexible Pavement Structure Repair**

Saw cut at least two inches deep around the edges of concrete or asphaltic pavement to be removed, unless otherwise directed by the Engineer.

The type and grade of tack coat shall be AC or PG.

The type and grade of prime shall be MC-30.

A motor grader will be allowed only as directed by the Engineer.

Use a roadway structure of 3" TY C for repairs.

The minimum repair area shall be 12' wide by 50' long.

**Item 354 – Planing and Texturing Pavement**

Stockpile the RAP (approx. 140 CY) in TxDOT Right-of-Way at US 84 EB TRM 382+0.7 (GPS 32.976844 -101.103155), southwest side of the roadway. This is approximately 2 miles from the project.

**Item 400 - Excavation and Backfill for Structures**

Furnish crushed caliche or sand and gravel as aggregate for cement stabilized backfill.

Deliver the cement stabilized backfill in a mixer truck in a flowable state and capable of filling all the voids.

Construct fill over structures to plan grade before hauling with heavy equipment over structures.

Compact backfill used for structures, other than flowable backfill, to a minimum density of 95 percent.

Use a template in order to secure reasonably accurate Class C shaping of the foundation material outside of cement stabilized areas.

Contact the utility company and properly secure the utility poles prior to excavating next to the utility poles. The work and material used to secure the utility poles are subsidiary to the pertinent items.

**Item 402 - Trench Excavation Protection**



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3D**

Maintain trench protection to protect State inspectors and Contractors during testing operations.

**Item 403 – Temporary Special Shoring**

The intent of this item is to provide a coffer dam so the water may be pumped out and work resumed after a rain event.

**Item 420 - Concrete Substructures**

Furnish and place preformed fiber material, a minimum one-half (1/2)-inch thick, as shown on the plans or directed by the Engineer.

Furnish a temperature recorder with the minimum capabilities of a 7-day recording time, 2 degree F division, and 120 VAC with 9-volt backup, for each curing tank used on the project. Supply all charts, recording pins, and other equipment necessary for complete operation of the temperature recorder during the project. The temperature recorder and all associated equipment will not be paid directly, but will be subsidiary to the various bid items.

Use Grade 3 or Grade 4 coarse aggregate in all concrete structures.

Cold weather protection requirements within 72 hours of a concrete pour as per the following table:

| PROJECTED LOW TEMP | PROTECTION REQUIRED |
|---|---|
| < 20 degrees | DO NOT POUR |
| 20-27 degrees | cover with plastic, then a insulating blanket, and plastic on top |
| 28-35 degrees | cover with plastic, then a insulating blanket |
| > 35 degrees | no protection required |

All projected temperatures will be based on the NOAA website. None of the above actions releases the Contractor from the responsibility for freeze damaged concrete for whatever reason.

Coring of structural classes of concrete will not be allowed. All coring of miscellaneous concrete shall be at the Contractor's expense including all prep work. Coring must be completed within 3 days of notice of failing 28-day samples; otherwise pay deductions apply using 28-day compressive strength.

Provide TY II curing compound for all curb and gutter, sidewalks, driveways, curb ramps, riprap, and cast-in-place SET's.

When doweling into concrete, clean out the hole, fill completely with epoxy, then place the dowel. Do not dip the dowel into epoxy first and shove it into the hole.

Do not place concrete when the wind gusts get to over 25 miles per hour.

Maintenance will install the NBI numbers after construction.

Place the evaporation retarder right after the finish float and before the curing compound.

Vibrate all concrete.

**Item 421 - Hydraulic Cement Concrete**

All Class C concrete will be designed using Option 3.

If fly ash is used, a maximum of 35% will be allowed.

The Engineer will perform all concrete job control testing.

Supply 2 – 4' x 8' x ¾" sheets of plywood, in order to perform required testing procedures at the location of concrete placements.

Use 4-inch by 8-inch cylinder molds for concrete with Grade 3 or smaller coarse aggregate. Supply new cylinder molds and lids subsidiary to the various bid items.

The Engineer will inspect concrete batch plants and trucks for approval.

For this project, the requirements of Article 421.4.8.1, "Certification of Testing Personnel" are waived, except that "Personnel performing these tests are subject to Departmental approval."

Concrete plant must be capable of providing automated moisture content control for both coarse and fine aggregate.

**Item 427 - Surface Finishes For Concrete**

Provide surface area I concrete surfaces with a rub finish as soon as forms are removed.

**Item 432 - Riprap**

Provide 4-inch thick concrete riprap, unless otherwise indicated in the plans.

Reinforce with steel reinforcing using either #3 bars on 12"x12" spacing or #4 bars on 18"x18" spacing centered in the slab unless otherwise shown in the plans. Fiber reinforcement or welded wire will not be allowed.

In large areas of riprap, provide one-half (1/2)-inch thick expansion joint material at approximately 15-foot intervals, or as determined by the Engineer.

Follow cold weather protection requirements listed under Item 420.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3E**

Seal between concrete boundaries.

**Item 466 – Headwalls and Wingwalls**

Install reinforced concrete aprons on all headwalls and wingwalls, using reinforcing composed of #4 bars at 12-inch spacings, center-to-center, or as shown on the detail sheet.

**Item 496 - Removing Structures**

Submit a demolition plan. Cut through the concrete, square off remaining structure and cut the reinforcement flush with surface of the concrete.

Demo the existing bridge with no more than 15 lb jackhammers.

**Item 502 - Barricades, Signs And Traffic Handling**

Prior to beginning construction, the Engineer shall approve the routing of traffic and sequence of work.

Additional signs and barricades as directed by the Engineer shall be considered subsidiary to Item 502.

Provide flashing portable arrow panels for all lane closures.

Wash the channelizing devices and barricades following each rainfall or snowfall event and at times deemed necessary by the Engineer.

To ensure the safety and convenience of traffic, flaggers may be required when construction machinery is being operated along, across, or adjacent to lanes carrying traffic. If considered necessary by the Engineer, supplemental signs and barricades may be required.

Fill any holes left by barricade or sign supports and restore the area to its original condition.

Barricades, Signs and Traffic Handling is a plan quantity item. If time is suspended, no additional compensation will be made.

Traffic switches will not be permitted on Fridays or any working day preceding a holiday unless authorized by the Engineer.

Cones or chevrons may be used in lieu of vertical panels at the discretion of the Engineer. Cones cannot be used to separate opposing traffic.

The Contractor shall bid the traffic control plan shown in the plans. Any proposed alterations to the TCP (combining work areas / phasing / etc.) shall be submitted to the Engineer at least 10 days prior to anticipated changes.

Square tubing sign supports may be used for temporary construction signs. Aluminum and wood signs may be mounted if the vertical supports are embedded into the ground. Square tubing supports on skids which are typically held in place with sand bags can only support signs made of light weight flutted plastic.

Any trench or drop off over 2" and less than 10" will require a safety slope of at least 1:1 if drop off is going to be existing for more than 2 nights. For drop-offs greater than 10", a safety slope will be required at the end of operations for that day. This safety slope may be constructed with RAP, embankment, or other material approved by the Engineer. The placement, maintenance, and removal of this safety slope is the responsibility of the Contractor and will be considered subsidiary to the various bid items.

Provide an all-weather surface for all sections of the roadway prior to time suspension as directed by the Engineer. The all-weather surface shall be the original undisturbed asphalt pavement or a one course surface treatment on the constructed roadbed as shown in the typical sections.

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.

Correct all noted deficiencies within 7 calendar days, otherwise, cease all operations until the noted deficiencies are corrected.

Stockpiles that meet the barricade requirements as shown on the BC(10) Standard are required to be erected at the time of material delivery in the Right-of-Way and maintained as long as the stockpile exists. Payment for Material-on-Hand will be withheld from the estimate for inadequate barricades or the failure to maintain barricades on a per stockpile basis as determined by the Engineer.

Like new traffic control devices will be required at the initial setup for all projects or as approved by the Engineer.

Provide flags and a CW8-15P "MOTORCYCLE WARNING" plaque on all CW20-1D "ROAD WORK AHEAD" signs except on side roads.

Use only the work zone speed limit and TCP signs that are relevant to the active work area and as directed. Reset signs for subsequent work phases as work progresses and approved by the Engineer. Reset normal speed limit signs at the ends of work zones.

Project limit signage is required on both sides of the roadway on a divided highway.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3F**

All bid items and work requiring traffic control is the responsibility of the contractor, even when not explicitly detailed in the plans. Consider this work subsidiary to Item 502.

TMAs and Portable Changeable Message Boards will not be used as Arrow Boards.

When the roadway is open to traffic and final striping is completed, any subsequent work shall be done under day time traffic control.

The contractor is to respond within 30 minutes to any traffic control maintenance after wind events, storms, etc., and as directed by the Engineer.

**Item 504 - Facilities for Field Office and Laboratory**

Furnish one Type D structure and one Type B structure. Field offices and laboratory shall be located adjacent to the project site.

Partition the floor of the Type D structure into a minimum of three interconnected rooms. Furnish each room with a door. Type D structure must have at least two windows and two exterior doors. Block and tie down portable structures.

Equip the Type D field lab with an eyewash facility capable of flushing the eyes for at least 15 minutes, connected to the main water supply or an approved stand-alone water supply.

Encompass the field office only with a fence enclosure providing a minimum 6.5-foot clearance around the perimeter of the field office.

Provide 2 tables and 1 meeting table. Provide 1 chair for each table and enough chairs for the meeting table. Provide 2 filing cabinets. Equip the field office and lab with window blinds.

Provide internet connectivity, a printer/fax/scanner/copier, and telephone service to field offices, including installation, monthly charges and the phones.

Equip all field offices and field labs with a surge protector at the circuit breaker panel.

**Item 506 - Temporary Erosion, Sedimentation, and Environmental Controls**

Place a weatherproof bulletin board containing the TCEQ required information on the project at a site directed by the Engineer. Post the following documents: (1) "TCEQ TPDES Storm Water Program" Construction Site Notice and (2) TCEQ "TPDES Permit." Place rain gauge(s) at locations designated by the Engineer. At the completion of the contract, the bulletin board will become the property of the State and will remain in place until 70 percent vegetation coverage has been obtained.

An N.O.I. is **NOT** required for this project.

Provide long-term, Type 1 construction exits, located at the Contractor's equipment storage area.

Silt fence, sandbags and other BMPs will be placed and relocated as directed by the Engineer in order to comply fully with the SW3P requirements.

The soil area disturbed by this project, including all disturbed areas within the limits of this project as described in the Contract and at Contractor project specific locations (PSLs) within one mile of the project limits, contributes to the establishment of the Texas Commission on Environmental Quality (TCEQ) Construction General Permit (CGP) requirements for storm water discharges. The Department will obtain an authorization from the TCEQ to discharge storm water for construction activities shown on the plans. The Contractor shall obtain the required authorization from the TCEQ for Contractor project specific locations (PSLs) for construction support activities off the right-of-way. As directed by the Engineer, the Contractor shall obtain any required authorization from the TCEQ for on-site PSLs. When the total area disturbed within the project limits and at PSLs within one mile of the project limits exceeds five acres, the Contractor shall provide a copy of the Contractor's Notice of Intent (NOI) submission and Construction General Permit for PSLs on the right-of-way to the Engineer (and submit a copy of NOIs to appropriate MS4 operators).

Sediments removed from BMPs shall be paid for by force account. The Contractor shall submit an invoice for the work.

Correct all noted deficiencies within 7 calendar days, otherwise, cease all operations until the noted deficiencies are corrected.

Maintain 100 feet of silt fence, 100 feet of erosion control logs, and 50 sandbags on site at all times for repairs/replacement as needed.

**Item 512 - Portable Concrete Traffic Barrier**

Reimbursable repair or replacement will be paid at contract bid prices.

Reflectors are required every 100 ft per BC Standards.

**Item 533 – Rumble Strips**

Use Option 4 for edgeline rumble strips.

**Item 540 - Metal Beam Guard Fence**

Mount an amber or white delineator on the guard fence post at 25-foot intervals. Use prismatic reflective sheeting. Place a minimum of three delineators at each metal beam guard fence placement.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3G**

All metal beam guard fence shall have steel posts.

Material-on-hand for metal beam guard fence rail will not be paid unless it is properly stored (out of the elements) to reduce white rust.

Reimbursable repair or replacement will be paid at contract bid prices.

Install the MBGF from the structure out to ensure proper post spacing and connection to the concrete rail.

Hammer drilling will not be allowed when attaching the MBGF transitions to the concrete rail.

**Item 542 – Removing Metal Beam Guard Fence**

Retain possession of removed guardfence.

Existing metal beam guardfence posts may be set in concrete.

Backfill existing post holes after removing existing metal beam guard fence.

**Item 544 – Guardrail End Treatments**

Reimbursable repair or replacement will be paid at contract bid prices.

All guardrail end treatments shall have steel posts.

Retain possession of removed guardrail end treatments.

**Item 545 - Crash Cushion Attenuators**

Reimbursable repair or replacement will be paid at contract bid prices.

Crash cushion attenuators require object marker stickers in accordance with D&OM (VIA).

**Item 585 - Ride Quality for Pavement Surfaces**

Use Surface Test Type A.

Corrective action, when required, shall be diamond grinding, as approved and directed by the Engineer. Seal all concrete surfaces after grinding with lindseed oil or as directed. This work is considered subsidiary.

**Item 658 - Delineator and Object Marker Assemblies**

Delineator and object marker assembly posts shall be driveable and composed of post-consumer recycled materials. Embedded stub shall be perforated square tubing.

Driveable posts shall be the three-piece Flexible Delineator Post System, utilizing a 2-3/8” round post with a square to round flexible joint. The Embedded Anchor shall be 2" x 12 gauge x 24" long steel perforated square tubing. The Posts shall be permanently sealed at the top and have a 3-1/2” wide x 13" flattened surface to accommodate up to a 3" x 12" reflective sheet on both sides.

Surface Mount posts shall be the three-piece Flexible Delineator Post System, utilizing a 2-3/8” round post with a square to round flexible joint. The Base shall have 6 mounting holes to accommodate for mounting on narrow headwalls as well as all surfaces. The Posts shall be permanently sealed at the top and have a 3-1/2” wide x 13" flattened surface to accommodate up to a 3" x 12" reflective sheet on both sides.

Guard Fence Delineator posts shall be 33” in length and permanently sealed at the top and have a 3-1/2” wide x 13" flattened surface to accommodate up to a 3" x 12" reflective sheet on both sides. They shall be flattened on both ends and transition to 2-3/8” round in the center for 360-degree visibility.

**Item 662 - Work Zone Pavement Markings**

Use short-term removable striping as directed by the Engineer.

Water based paint may be used for all non-removable striping if not prohibited in the plans and authorized by the Engineer. If water based paint is used, there will be no payment for striping refresh.

Any roadway opened to traffic shall be striped within 14 days.

The deviation rate in alignment shall not exceed one inch per 200 feet of roadway. The maximum deviation shall not exceed 2 inches nor shall any deviation be abrupt. Striping not in conformance shall be removed and replaced at the Contractor's expense.

No guide markers will be placed on a finished surface unless they fall on a proposed lane line. Stick-down markings will be removed by the Contractor prior to final marking.

Remove tabs at the same time as the RPM placement. Cut off tabs or remove by a method acceptable to the Engineer.

Type I markings must be at least one twenty-fifth (1/25) of an inch thick.

Remove ceramic buttons, RPMs, and Adhesives as directed by the Engineer. Payment for this work is subsidiary to Item 662.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3H**

Use thermoplastic adhesive to glue down work zone buttons and RPMs. Bituminous adhesive will not be allowed.

Dispose of the backing from tabs in an appropriate manner.

**Item 666 - Reflectorized Pavement Markings**

Reference the existing striping in order to stripe the roadway as it was prior to construction.

Mark the location of standard pavement markings, including barrier lines, no passing zones, gores, and transitions adjusting to meet latest standards or as directed by the Engineer.

For seal coated surfaces, leave the final course in place for three days and broom the roadway directly ahead of the striping machine prior to placing standard pavement markings.

After completion of all work and removal of the barricades, time charges will be suspended. The performance period for the project will not begin until all the striping has been completed. Final acceptance will not be granted until the performance period for pavement markings is complete. If replacement markings are needed, traffic control for moving operations will be required. No payment will be made for traffic control during replacement striping work. All traffic control work shall be considered subsidiary to the project’s replacement striping work.

The yellow or white long-line striping for re-striping operations will not lag one another by more than four (4) working days. The performance period for a roadway will not begin for a section of roadway or a project until all required striping for that section or project has been completed.

Provide a schedule and notify the District Traffic Office a minimum of 3 days prior to any striping operation. Contact via email at LBB-TRFOPS@TxDOT.GOV. If not notified, the time frame for testing and meeting the Retroreflectivity requirements in article 4.4 will start the day the department is made aware of that the markings have been applied.

**Item 677 - Eliminating Existing Pavement Markings and Markers**

Use the Surface Treatment Method.

**Item 730 - Roadside Mowing**

Mow full-width from pavement edge to Right-of-Way line 2 times. The Engineer shall dictate the times to mow and the areas in the project to mow.

Each mowing cycle is for the entire project and is 1.3 acres.

Notify the Engineer by 9:00 am each day for work completed the previous day, including hand trimming and cleanup. The Engineer will then inspect the section(s) of roadway for acceptance, not more than two (2) working days after notification.

Truck mounted attenuators shall be used while mowing.

**Item 734 – Litter Removal**

Perform litter removal prior to mowing and as directed by the Engineer.

**Item 3032 – Reinforced Paving Mat for Asphalt Pavement Overlays**

Provide a letter from the manufacturer that authorizes the installer to install the product.

Submerge a 2 in x 2 in of sample in D-Limonene or other approved solvent for 60 minutes. The result is passing if the solvent remains clear.

Don't install more reinforcing fabric that can't be covered that same day.

Provide PG76-28 binder at a rate of 0.15 gal/sy.

**Item 3076 – Dense-Graded Hot-Mix Asphalt**

PG 76-28 asphalt is required for this project.

Provide a summary spreadsheet for each lot in accordance with Article 520.2 of the Standard Specifications.

Design the mixture with a Superpave Gyratory Compactor (SGC).

Aggregate will be subjected to five cycles of the magnesium sulfate soundness test in accordance with Test Method TEX-411-A. The loss shall not be greater than **20** percent.

The mix will be evaluated for stripping through the boil and hamburg wheel tests. If it is determined to be stripping then 1% lime, liquid anti-strip or a warm mix additive proven to prevent stripping will be required.

Schedule the placement width for the final hotmix surface in such a manner that all joints will coincide with proposed lane lines (+/- 6 inches).

Provide emulsified trackless asphalt for tack coat at a rate of 0.10-0.14 gal/sy.

The Contractor will be required to tack 100% of the surfaces prior to the subsequent lift including all vertical joints.

Provide straight edges including the outside edge. Any edges not conforming to the typical sections will be cut and removed at the Contractor's expense.



**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3I**

Lay the shoulders first, then the main lanes.

No TxDOT RAP is available for this project.

There are paving widths less than 10 ft wide on this project.

Do not pave when temperatures get below 32 degrees F in a 12 hour period.

No substitute PG grade binders will be allowed.

Provide a square edge before laying the adjacent lane of hotmix as directed by the Engineer.

Asphalt stabilized base will not be allowed as RAP.

Fractionate the RAP if used in the mixture design.

Post-consumer RAS will not be allowed.

The TY C hotmix is considered a surface layer and is subject to the Minimum Pavement Surface Temperature requirements in Tables 14A and 14B.

If TY C fails performance tests then remove and replace the TY C and fabric, lay 0.5" TY D and relay new fabric and TY C at the Contractor's expense.

**Item 6001 - Portable Changeable Message Sign**

Provide messages as directed by the Engineer.

Provide 2 solar powered changeable message signs for the duration of this project.

Inform the public 2 weeks before construction begins.

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

Provide 2 TMAs for stationary use for the duration of the project. Stationary TMAs will be used during the various phases of work required for this project. Payment will be made by the day for each TMA used in stationary operations.

Provide 3 TMAs for mobile use. Mobile TMAs will be used for moving operations such as striping and RPM placement. Payment will be made by the day for each TMA used in mobile operations.

**Item 6307 – Temporary Speed Monitoring System**

Provide 2 speed monitoring trailers for this project.

**County:** Garza **Control:** 0053-06-031

**Highway:** US 84 **Sheet 3J**

Utilize the speed monitoring trailer on the project for the duration of this project as directed for the protection of the workers.

Change locations of speed monitoring trailer on a regular basis to improve driver attention.

| PROJECT:F 2023(365)<br>CONTROL: 0053-06-031<br>US 84 ALL BID ITEMS | | ALT | ITEM-CODE | | | DESCRIPTION | UNIT | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| EST. | FINAL | | ITEM NO | DESC | SP | | | EST. | FINAL |
| 1.000 | | | 100 | 6006 | | PREPARING ROW (TREE) (LESS THAN 24" DIA) | EA | 1.000 | |
| 321.000 | | | 104 | 6009 | | REMOVING CONC (RIPRAP) | EA | 321.000 | |
| 112.000 | | | 104 | 6037 | | REMOVING CONC (RAIL) | EA | 112.000 | |
| 55.000 | | | 110 | 6002 | | EXCAVATION (CHANNEL) | CY | 55.000 | |
| 7.700 | | | 134 | 6002 | | BACKFILL (TY B) | STA | 7.700 | |
| 7.700 | | | 150 | 6001 | | BLADING | STA | 7.700 | |
| 5,978.000 | | | 164 | 6035 | | DRILL SEEDING (PERM) (RURAL) (CLAY) | SY | 5978.000 | |
| 10.000 | | | 216 | 6001 | | PROOF ROLLING | HR | 10.000 | |
| 837.000 | | | 314 | 6013 | | EMULS ASPH (EROSN CONT) (CSS-1H) | GAL | 837.000 | |
| 380.000 | | | 315 | 6004 | | FOG SEAL (CSS-1H) | GAL | 380.000 | |
| 9,008.000 | | | 316 | 6017 | | ASPH (AC-20-5TR) | GAL | 9008.000 | |
| 204.000 | | | 316 | 6224 | | AGGR (TY-PB GR-4 SAC-B) | CY | 204.000 | |
| 1,267.000 | | | 354 | 6057 | | PLANE ASPH CONC PAV (4") | SY | 1267.000 | |
| 484.300 | | | 400 | 6005 | | CEM STABIL BKFL | CY | 484.300 | |
| 184.000 | | | 402 | 6001 | | TRENCH EXCAVATION PROTECTION | LF | 184.000 | |
| 948.000 | | | 403 | 6006 | | TEMPORARY SPL SHORING (COFFERDAM) | SF | 948.000 | |
| 183.800 | | | 420 | 6051 | | CL C CONC (CULV) | CY | 183.800 | |
| 12.800 | | | 420 | 6066 | | CL C CONC (RAIL FOUNDATION) | CY | 12.800 | |
| 50.100 | | | 432 | 6001 | | RIPRAP (CONC) (4 IN) | CY | 50.100 | |
| 10.000 | | | 432 | 6002 | | RIPRAP (CONC) (5 IN) | CY | 10.000 | |
| 22.500 | | | 432 | 6006 | | RIPRAP (CONC) (CL B) | CY | 22.500 | |
| 55.000 | | | 450 | 6014 | | RAIL (TY T551) | LF | 55.000 | |
| 1.000 | | | 465 | 6372 | | INLET (COMPL) (DROP) (SPL) | EA | 1.000 | |
| 2.000 | | | 466 | 6152 | | WINGWALL (FW-0) (HW=5FT) | EA | 2.000 | |
| 1.000 | | | 480 | 6001 | | CLEAN EXIST CULVERTS | EA | 1.000 | |
| 1.000 | | | 496 | 6009 | | REMOV STR (BRIDGE 0 - 99 FT LENGTH) | EA | 1.000 | |
| 1.000 | | | 500 | 6001 | | MOBILIZATION | LS | 1.000 | |
| 14.000 | | | 502 | 6001 | | BARRICADES, SIGNS AND TRAFFIC HANDLING | MO | 14.000 | |
| 100.000 | | | 506 | 6001 | | ROCK FILTER DAMS (INSTALL) (TY 1) | LF | 100.000 | |
| 100.000 | | | 506 | 6011 | | ROCK FILTER DAMS (REMOVE) | LF | 100.000 | |
| 900.000 | | | 506 | 6020 | | CONSTRUCTION EXITS (INSTALL) (TY 1) | SY | 900.000 | |
| 900.000 | | | 506 | 6024 | | CONSTRUCTION EXITS (REMOVE) | SY | 900.000 | |
| 572.000 | | | 506 | 6038 | | TEMP SEDMT CONT FENCE (INSTALL) | LF | 572.000 | |
| 286.000 | | | 506 | 6039 | | TEMP SEDMT CONT FENCE (REMOVE) | LF | 286.000 | |
| 1,248.000 | | | 506 | 6042 | | BIODEG EROSN CONT LOGS (INSTL) (18") | LF | 1248.000 | |
| 624.000 | | | 506 | 6043 | | BIODEG EROSN CONT LOGS (REMOVE) | LF | 624.000 | |
| 600.000 | | | 512 | 6067 | | PTB (FRN&INSTL)(F SHAPE)(TY 1) OR (STL) | LF | 600.000 | |
| 600.000 | | | 512 | 6069 | | PTB (MOVE)(F SHAPE)(TY 1) OR (STL) | LF | 600.000 | |
| 600.000 | | | 512 | 6071 | | PTB (REMOVE)(F SHAPE)(TY 1) OR (STL) | LF | 600.000 | |
| 600.000 | | | 533 | 6003 | | RUMBLE STRIPS (SHOULDER) ASPHALT | LF | 600.000 | |
| 450.000 | | | 540 | 6002 | | MTL W-BEAM GD FEN (STEEL POST) | LF | 450.000 | |



Texas Department of Transportation

NO SCALE



| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 4 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_GEN_E&Q.dgn | | |

# ESTIMATE & QUANTITY

DATE: &DATE&
FILE: &FILE&
&TIME&

| PROJECT:F 2023(365) | | ALT | ITEM-CODE | | | DESCRIPTION | UNIT | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL:0053-06-031 | | | | | | | | | |
| US 84 ALL BID ITEMS | | | | | | | | | |
| EST. | FINAL | | ITEM NO | DESC CODE | SP NO | | | EST. | FINAL |
| 2.000 | | | 540 | 6016 | | DOWNSTREAM ANCHOR TERMINAL SECTION | EA | 2.000 | |
| 2.000 | | | 540 | 6018 | | MTL BM GD FEN TRANS (NON-SYM) | EA | 2.000 | |
| 2.000 | | | 540 | 6022 | | MTL THRIE-BEAM GD FEN (STEEL POST) | EA | 2.000 | |
| 675.000 | | | 542 | 6001 | | REMOVE METAL BEAM GUARD FENCE | LF | 675.000 | |
| 1.000 | | | 542 | 6002 | | REMOVE TERMINAL ANCHOR SECTION | EA | 1.000 | |
| 2.000 | | | 544 | 6001 | | GUARDRAIL END TREATMENT (INSTALL) | EA | 2.000 | |
| 4.000 | | | 544 | 6003 | | GUARDRAIL END TREATMENT (REMOVE) | EA | 4.000 | |
| 2.000 | | | 545 | 6003 | | CRASH CUSH ATTEN (MOVE & RESET) | EA | 2.000 | |
| 2.000 | | | 545 | 6005 | | CRASH CUSH ATTEN (REMOVE) | EA | 2.000 | |
| 2.000 | | | 545 | 6019 | | CRASH CUSH ATTEN (INSTL)(S)(N)(TL3) | EA | 2.000 | |
| 4.000 | | | 658 | 6013 | | INSTL DEL ASSM (D-SW)SZ (BRF)CTB | EA | 4.000 | |
| 22.000 | | | 658 | 6061 | | INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 | EA | 22.000 | |
| 2.000 | | | 658 | 6099 | | INSTL OM ASSM (OM-2Z)(WFLX)(GND) | EA | 2.000 | |
| 5,080.000 | | | 662 | 6004 | | WK ZN PAV MRK NON-REMOV (W)4"(SLD) | LF | 5080.000 | |
| 1,280.000 | | | 662 | 6005 | | WK ZN PAV MRK NON-REMOV (W)6"(BRK) | LF | 1280.000 | |
| 5,080.000 | | | 662 | 6034 | | WK ZN PAV MRK NON-REMOV (Y)4"(SLD) | LF | 5080.000 | |
| 1,016.000 | | | 662 | 6046 | | WK ZN PAV MRK REMOV (REFL)TY I-A | EA | 1016.000 | |
| 1,016.000 | | | 662 | 6048 | | WK ZN PAV MRK REMOV (REFL)TY I-C | EA | 1016.000 | |
| 3,048.000 | | | 662 | 6056 | | WK ZN PAV MRK REMOV (TRAF BTN)TY W | EA | 3048.000 | |
| 3,048.000 | | | 662 | 6058 | | WK ZN PAV MRK REMOV (TRAF BTN)TY Y | EA | 3048.000 | |
| 382.000 | | | 662 | 6109 | | WK ZN PAV MRK SHT TERM (TAB)TY W | EA | 382.000 | |
| 5,080.000 | | | 666 | 6303 | | RE PM W/RET REQ TY I(W)4"(SLD)(100MIL) | LF | 5080.000 | |
| 1,280.000 | | | 666 | 6306 | | RE PM W/RET REQ TY I(W)6"(BRK)(100MIL) | LF | 1280.000 | |
| 5,080.000 | | | 666 | 6315 | | RE PM W/RET REQ TY I(Y)4"(SLD)(100MIL) | LF | 5080.000 | |
| 64.000 | | | 672 | 6010 | | REFL PAV MRKR TY II-C-R | EA | 64.000 | |
| 11,430.000 | | | 677 | 6001 | | ELIM EXT PAV MRK & MRKS (4") | LF | 11430.000 | |
| 1,267.000 | | | 3032 | 6001 | | REINFORCED FAB FOR ASPH PVMNT OVERLAYS | SY | 1267.000 | |
| 190.000 | | | 3032 | 6004 | | ASPH FOR REINF FAB (PG76-28) | GAL | 190.000 | |
| 177.000 | | | 3076 | 6066 | | TACK COAT | GAL | 177.000 | |
| 291.000 | | | 3076 | 6085 | | D-GR HMA TY-C PG76-28 (EXEMPT) | TON | 291.000 | |
| 720.000 | | | 6001 | 6001 | | PORTABLE CHANGEABLE MESSAGE SIGN | DAY | 720.000 | |
| 350.000 | | | 6185 | 6002 | | TMA (STATIONARY) | DAY | 350.000 | |
| 24.000 | | | 6185 | 6005 | | TMA (MOBILE OPERATION) | DAY | 24.000 | |
| 2.000 | | | 6307 | 6003 | | TEMP SPEED MONITOR SYS | EA | 2.000 | |
| | | | | | | | | | |
| | | | | | | **FEDERAL NON-PARTICIPATING ITEMS** | | | |
| 2.000 | | | 480 | 6001 | | CLEAN EXIST CULVERTS | EA | 2.000 | |
| 2.000 | | | 730 | 6107 | | FULL-WIDTH MOWING | CYC | 2.000 | |
| 2.000 | | | 734 | 6002 | | LITTER REMOVAL | CYC | 2.000 | |
| | | | | | | | | | |
| | | | | | | 18-CONTRACTOR FORCE ACCOUNT (PARTICIPATING) | | | |
| 1.000 | | | | | | EROSION CONTROL MAINTENANCE | LS | 1.000 | |
| 1.000 | | | | | | SAFETY CONTINGENCY | LS | 1.000 | |
| | | | | | | | | | |
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Texas Department of Transportation

NO SCALE Sheet 2 of 2

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 5 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_GEN_E&Q.dgn | | |

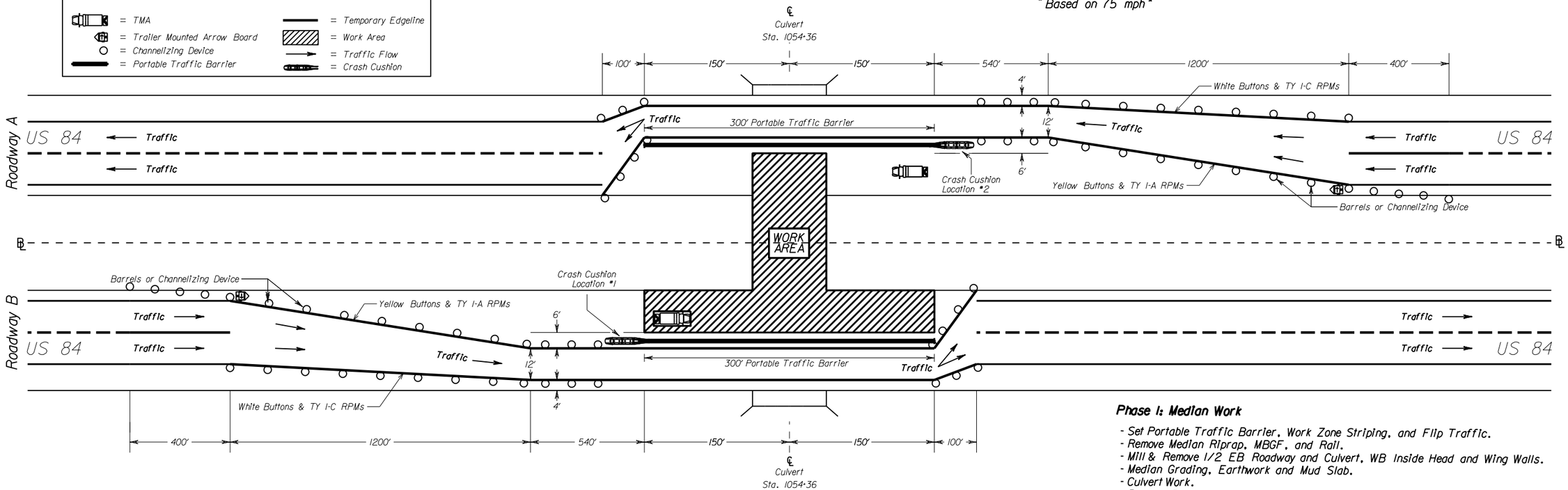
# ESTIMATE & QUANTITY

DATE: &DATE& &TIME&
FILE: &FILE&

## LEGEND:

= TMA
= Trailer Mounted Arrow Board
= Channelizing Device
= Portable Traffic Barrier
= Temporary Edgeline
= Work Area
= Traffic Flow
= Crash Cushion

*Based on 75 mph*




## PHASE I

### Phase I: Median Work

- Set Portable Traffic Barrier, Work Zone Striping, and Flip Traffic.
- Remove Median Riprap, MBGF, and Rail.
- Mill & Remove 1/2 EB Roadway and Culvert, WB Inside Head and Wing Walls.
- Median Grading, Earthwork and Mud Slab.
- Culvert Work.
- Restore Roadway.
- Backfill Median.

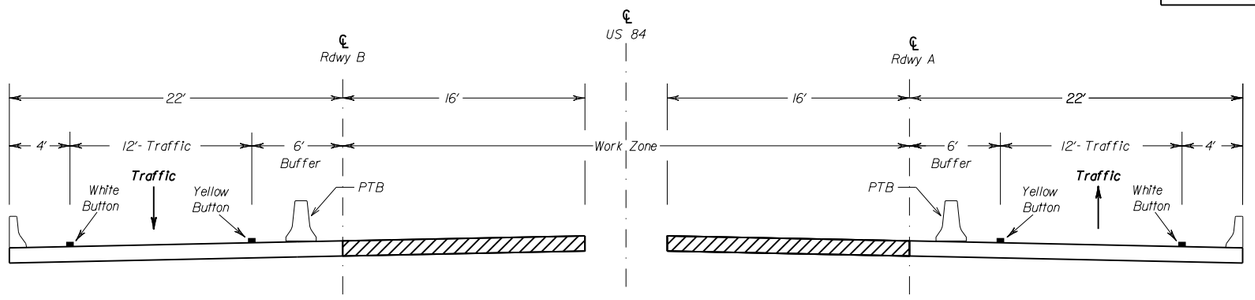
### WORK ZONE STRIPING PHASE I

| ITEM | | ELIMINATE | | | PLACE | | | |
|---|---|---|---|---|---|---|---|---|
| ITEM | | 0677 | 0677 | 0677 | 0662 | 0662 | 0662 | 0662 |
| CODE | | 6001 | 6001 | 6001 | 6046 | 6048 | 6056 | 6058 |
| ITEM | | ELIM EXT PAV MRK & MRKS (4") | ELIM EXT PAV MRK & MRKS (4") | ELIM EXT PAV MRK & MRKS (4") | WK ZN PAV MRK REMOV (REFL) TY I-A | WK ZN PAV MRK REMOV (REFL) TY I-C | WK ZN PAV MRK REMOV (TRAF BTN) TY W | WK ZN PAV MRK REMOV (TRAF BTN) TY Y |
| UNIT OF MEASURE | | L.F. | L.F. | L.F. | EA | EA | EA | EA |
| DESCRIPTION | | 4" SW | 4" BW | 4" SY | TY I-A | TY I-C | TY W (BTTN) | TY W (BTTN) |
| ROADWAY A | | | | | | | | |
| Begin STA | End STA | 2540 | 635 | 2540 | 254 | 254 | 762 | 762 |
| 1051+86 | 1077+26 | | | | | | | |
| ROADWAY B | | | | | | | | |
| Begin STA | End STA | 2540 | 635 | 2540 | 254 | 254 | 762 | 762 |
| 1031+46 | 1056+86 | | | | | | | |
| TOTAL | | 5080 | 1270 | 5080 | *508 | *508 | *1524 | *1524 |
| | | 11430 | | | | | | |

*Includes Quantity for One-Time Replacement

### PORTABLE TRAFFIC BARRIER PHASE I

| TYPE | | Portable Traffic Barrier | | | Crash Cushion | | |
|---|---|---|---|---|---|---|---|
| ITEM | | 0512 | 0512 | 0512 | 0545 | 0545 | 0545 |
| CODE | | 6067 | 6069 | 6071 | 6003 | 6005 | 6019 |
| DESCRIPTION | | PTB (FRN&INSTL) (F SHAPEXTY I) OR (STL) | PTB (MOVE) (F SHAPEXTY I) OR (STL) | PTB (REMOVE) (F SHAPEXTY I) OR (STL) | CRASH CUSH ATTEN (MOVE & RESET) | CRASH CUSH ATTEN (REMOVE) | CRASH CUSH ATTEN (INSTLXSXNXTL3) |
| UNIT OF MEASURE | | L.F. | L.F. | L.F. | EA | EA | EA |
| ROADWAY A | | | | | | | |
| Begin STA | End STA | 300 | | | | | 1 |
| 1051+86 | 1077+26 | | | | | | |
| ROADWAY B | | | | | | | |
| Begin STA | End STA | 300 | | | | | 1 |
| 1031+46 | 1056+86 | | | | | | |
| TOTAL | | 600 | | | | | 2 |




Work Zone Cross-Sections

SW = Solid White
SY = Solid Yellow
PTB = Portable Traffic Barrier

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

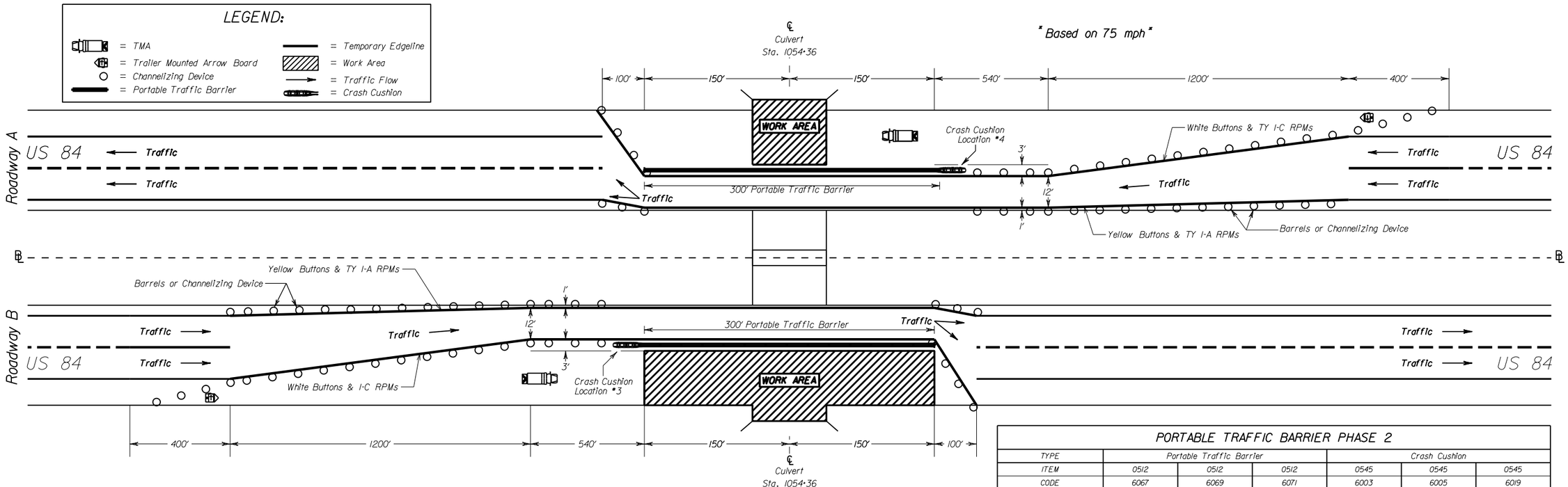

Texas Department of Transportation

# TRAFFIC CONTROL & PHASING (Phase I)

No Scale — Sheet 1 of 4

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 6 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | USO084_TCP_PHASE_I.dgn | | |

DATE: &DATE&
FILE: &FILE&
&TIME&




# PHASE 2

## WORK ZONE STRIPING PHASE 2

| | | PLACE | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ITEM | | 0662 | 0662 | 0662 | 0662 | 0662 | 0662 | 0662 |
| CODE | | 6004 | 6005 | 6034 | 6046 | 6048 | 6056 | 6058 |
| ITEM | | WK ZN PAV MRK NON-REMOV (W) 4" (SLD) | WK ZN PAV MRK NON-REMOV (W) 6" (BRK) | WK ZN PAV MRK NON-REMOV (Y) 4" (SLD) | WK ZN PAV MRK REMOV (REFL) TY I-A | WK ZN PAV MRK REMOV (REFL) TY I-C | WK ZN PAV MRK REMOV (TRAF BTN) TY W | WK ZN PAV MRK REMOV (TRAF BTN) TY Y |
| UNIT OF MEASURE | | L.F. | L.F. | L.F. | EA | EA | EA | EA |
| DESCRIPTION | | 4" SW | 6" BW | 4" SW | TY I-A | TY I-C | TY W (BTTN) | TY W (BTTN) |
| ROADWAY A | | | | | | | | |
| Begin STA | End STA | 2540 | 640 | 2540 | 254 | 254 | 762 | 762 |
| 1051+86 | 1077+26 | | | | | | | |
| ROADWAY B | | | | | | | | |
| Begin STA | End STA | 2540 | 640 | 2540 | 254 | 254 | 762 | 762 |
| 1031+46 | 1056+86 | | | | | | | |
| TOTAL | | 5080 | 1280 | 5080 | *508 | *508 | *1524 | *1524 |

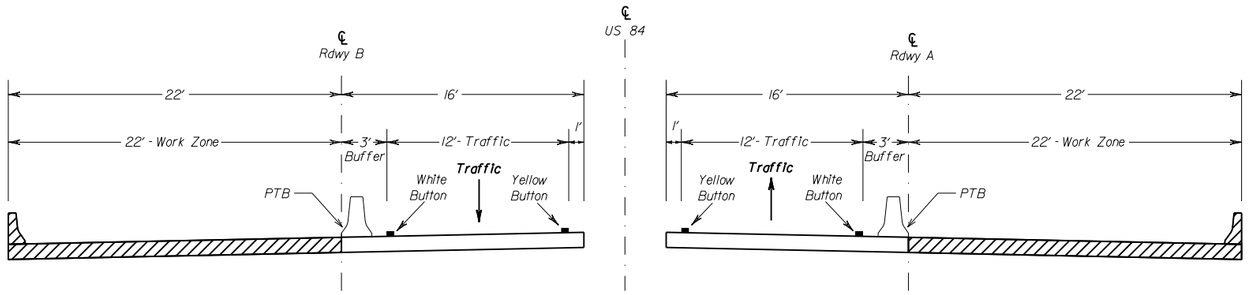
*Includes Quantity for One-Time Replacement

## PORTABLE TRAFFIC BARRIER PHASE 2

| TYPE | Portable Traffic Barrier | | | Crash Cushion | | |
|---|---|---|---|---|---|---|
| ITEM | 0512 | 0512 | 0512 | 0545 | 0545 | 0545 |
| CODE | 6067 | 6069 | 6071 | 6003 | 6005 | 6019 |
| DESCRIPTION | PTB (FRN&INSTL) (F SHAPEXTY I) OR (STL) | PTB (MOVE) (F SHAPEXTY I) OR (STL) | PTB (REMOVE) (F SHAPEXTY I) OR (STL) | CRASH CUSH ATTEN (MOVE & RESET) | CRASH CUSH ATTEN (REMOVE) | CRASH CUSH ATTEN (INSTLXSXNXTL3) |
| UNIT OF MEASURE | L.F. | L.F. | L.F. | EA | EA | EA |
| ROADWAY A | | | | | | |
| Begin STA / End STA | | 300 | 300 | 1 | 1 | |
| 1051+86 / 1077+26 | | | | | | |
| ROADWAY B | | | | | | |
| Begin STA / End STA | | 300 | 300 | 1 | 1 | |
| 1031+46 / 1056+86 | | | | | | |
| TOTAL | | 600 | 600 | 2 | 2 | |

### Phase 2: Outisde Work

- Reset Portable Traffic Barrier, Work Zone Striping, and Flip Traffic.
- Prepare ROW, Tree Stump Removal.
- Remove Outside Riprap, MBGF, and Rail.
- Mill & Remove 1/2 EB Roadway and Culvert, WB Outside Head and Wing Walls.
- Ditch and Channel Grading, and Earthwork.
- Culvert Work.
- Restore Roadway.
- Bridge Rail.
- MBGF.
- Riprap.
- Final Ditch and Channel Earthwork.
- Temporary Stripe In Final Configuration.
- Remove Portable Traffic Barrier and Open to Traffic.
- Seeding & Emulsion.




Work Zone Cross-Sections

SW = Solid White
SY = Solid Yellow
PTB = Portable Traffic Barrier

SHELLEY C. HARRIS 99197 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Shelley C. Harris, P.E.
11/4/2022

# TRAFFIC CONTROL & PHASING (Phase 2)


Texas Department of Transportation

No Scale Sheet 2 of 4

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 7 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US0084_TCP_PHASE_2.dgn | | |

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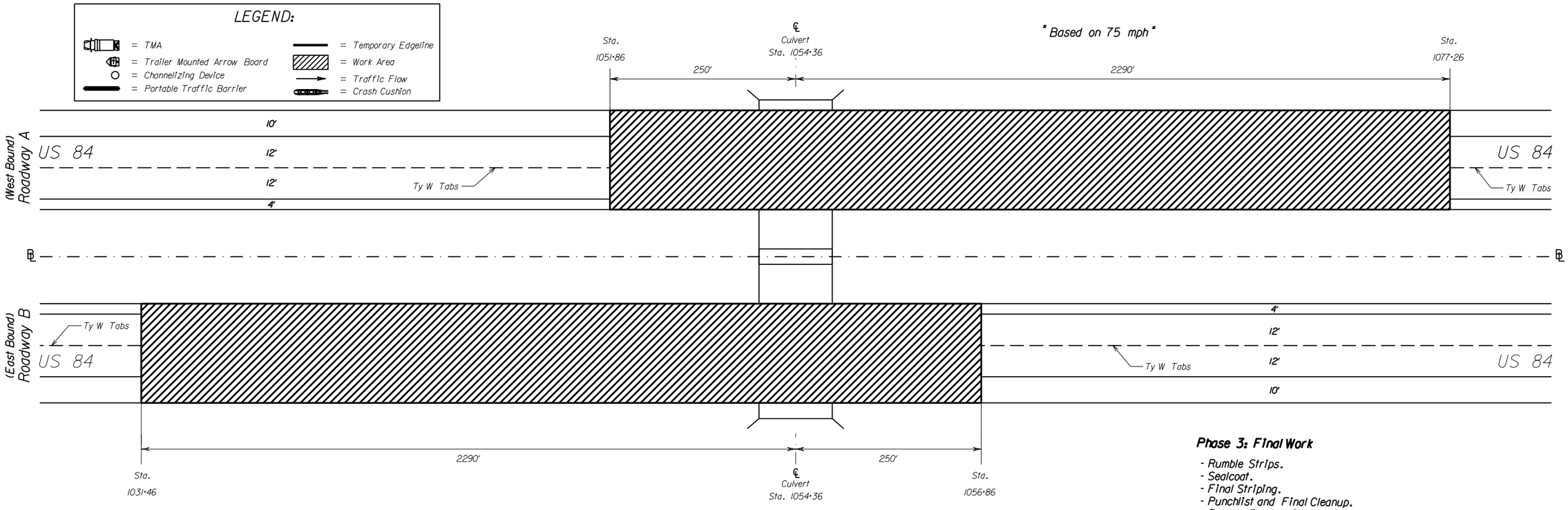
FILE: &FILE&




PHASE 3

**Phase 3: Final Work**

- Rumble Strips.
- Sealcoat.
- Final Striping.
- Punchlist and Final Cleanup.
- Remove Project Barricades and Signage.

* Reference TXDOT Standard TCP (1-5) for this Phase

| WORK ZONE STRIPING PHASE 3 | | |
|---|---|---|
| ITEM | | PLACE |
| CODE | | 6109 |
| ITEM | | WK ZN PAV MRK SHT TERM (TAB) TY W |
| UNIT OF MEASURE | | EA |
| DESCRIPTION | | TY W (TAB) |
| ROADWAY A | | |
| Begin STA | End STA | 191 |
| 1051+86 | 1077+26 | |
| ROADWAY B | | |
| Begin STA | End STA | 191 |
| 1031+46 | 1056+86 | |
| | | |
| TOTAL | | 382 |

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022


Texas Department of Transportation

# TRAFFIC CONTROL & PHASING (Phase 3)

No Scale Sheet 3 of 4

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 8 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US0084_TCP_PHASE_3.dgn | | |

DATE: &DATE& &TIME&
FILE: &FILE&

# PROJECT TRAFFIC CONTROL NOTES

Sequence of work will be approved by the Engineer.

Standard regulatory and warning signs which are not shown on the TCP sheets shall be in accordance with the current TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES and Standards BC(1)-(12).

The Contractor may be required to furnish other barricades and other types of devices as directed by the Engineer or as indicated in the TMUTCD, BC, WZ, and TCP standards.

Pavement markings conforming to the TMUTCD and sheets BC(1)-(12) will be in place before any overnight traffic is allowed on any construction surface.

All pavement markings and signs that conflict with traffic movements will be removed. Removal of Item 662, "Work Zone Pavement Markings (Removable)" will not be paid for but considered subsidiary to Item 662. Conflicting signs shall be covered or removed.


CW20-1D
48x48


G20-2
48X24


G20-1aT
72X36


CW20-1D

G20-2

Mounted back to back.

Barricades shall not be used as sign supports.

On any series of traffic control devices where reflectors may be used, lights will be required at the beginning and end of each series.

Signs, barricades, and cones not in use for 3 working days will be removed from the right-of-way.

Signs at the beginning and end of the project shall be in accordance with BC(2).

If needed, signs G20-2 and G20-1aT, or CW20-1D shall be placed at each intersecting highway and county road.

The Contractor will contact adjacent property owners concerning ingress and egress of their property during construction.

This roadway shall be considered a high speed roadway.

Unless otherwise stated in the plans, flags attached to signs are required.

The speed limit in the project shall be 60 mph unless existing speed limits are lower. Advisory speed limit signs shall be placed as directed.

TCP (2-6a) will be the primary traffic control for this project.

Post trained flagmen as needed in special situations as deemed by the Engineer.

| PORTABLE TRAFFIC BARRIER SUMMARY | | | | | | |
|---|---|---|---|---|---|---|
| TYPE | Portable Traffic Barrier | | | Crash Cushion | | |
| ITEM | 0512 | 0512 | 0512 | 0545 | 0545 | 0545 |
| CODE | 6067 | 6069 | 6071 | 6003 | 6005 | 6019 |
| DESCRIPTION | PTB (FRN&INSTL) (F SHAPEXTY I) OR (STL) | PTB (MOVE) (F SHAPEXTY I) OR (STL) | PTB (REMOVE) (F SHAPEXTY I) OR (STL) | CRASH CUSH ATTEN (MOVE & RESET) | CRASH CUSH ATTEN (REMOVE) | CRASH CUSH ATTEN (INSTL)(SKNKTL3) |
| UNIT OF MEASURE | L.F. | L.F. | L.F. | EA | EA | EA |
| PHASE 1 | 600 | | | | | 2 |
| PHASE 2 | | 600 | 600 | 2 | 2 | |
| PHASE 3 | | | | | | |
| | | | | | | |
| TOTAL | 600 | 600 | 600 | 2 | 2 | 2 |

Steel barrier may be substituted for the same pay length.

Install barrier reflectors as shown on BC (7).

| WORK ZONE STRIPING SUMMARY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ELIMINATE | | | PLACE | | | | | | | |
| ITEM | 0677 | 0677 | 0677 | 0662 | 0662 | 0662 | 0662 | 0662 | 0662 | 0662 | 0662 |
| CODE | 6001 | 6001 | 6001 | 6004 | 6005 | 6034 | 6046 | 6048 | 6056 | 6058 | 6109 |
| ITEM | ELIM EXT PAV MRK & MRKS (4") | ELIM EXT PAV MRK & MRKS (4") | ELIM EXT PAV MRK & MRKS (4") | WK ZN PAV MRK NON-REMOV (W)4"(SLD) | WK ZN PAV MRK NON-REMOV (W)6"(BRK) | WK ZN PAV MRK NON-REMOV (Y)4"(SLD) | WK ZN PAV MRK REMOV (REFL) TY I-A | WK ZN PAV MRK REMOV (REFL) TY I-C | WK ZN PAV MRK REMOV (TRAF BTN) TY W | WK ZN PAV MRK REMOV (TRAF BTN) TY Y | WK ZN PAV MRK SHT TERM (TAB) TY W |
| UNIT OF MEASURE | L.F. | L.F. | L.F. | L.F. | L.F. | L.F. | EA | EA | EA | EA | L.F. |
| DESCRIPTION | 4" SW | 4" BW | 4" SY | 4" SW | 6" BW | 4" SW | TY I-A | TY I-C | TY W (BTTN) | TY W (BTTN) | TY W (TAB) |
| PHASE 1 | 5080 | 1270 | 5080 | | | | 508 | 508 | 1524 | 1524 | |
| PHASE 2 | 5080 | 1270 | 5080 | 5080 | 1280 | 5080 | 508 | 508 | 1524 | 1524 | |
| PHASE 3 | | | | | | | | | | | 382 |
| | | | | | | | | | | | |
| TOTAL | 10160 | 2540 | 10160 | 5080 | 1280 | 5080 | •1016 | •1016 | •3048 | •3048 | 382 |
| | 22860 | | | | | | | | | | |

•Includes Quantity for One-Time Replacement

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Shelley C. Harris, P.E.
11/4/2022



Texas Department of Transportation

Sheet 4 of 4

| STATE DIST.NO. | COUNTY | SHEET NO. |
|---|---|---|
| 05 | GARZA | 9 |

| CONT. | SECT. | JOB | HIGHWAY NO. |
|---|---|---|---|
| 0053 | 06 | 031 | US 84 |
| FILE | US0084_TCP_NOTES_SUM.dgn | | |

# TRAFFIC CONTROL & PHASING (Notes and Summary)

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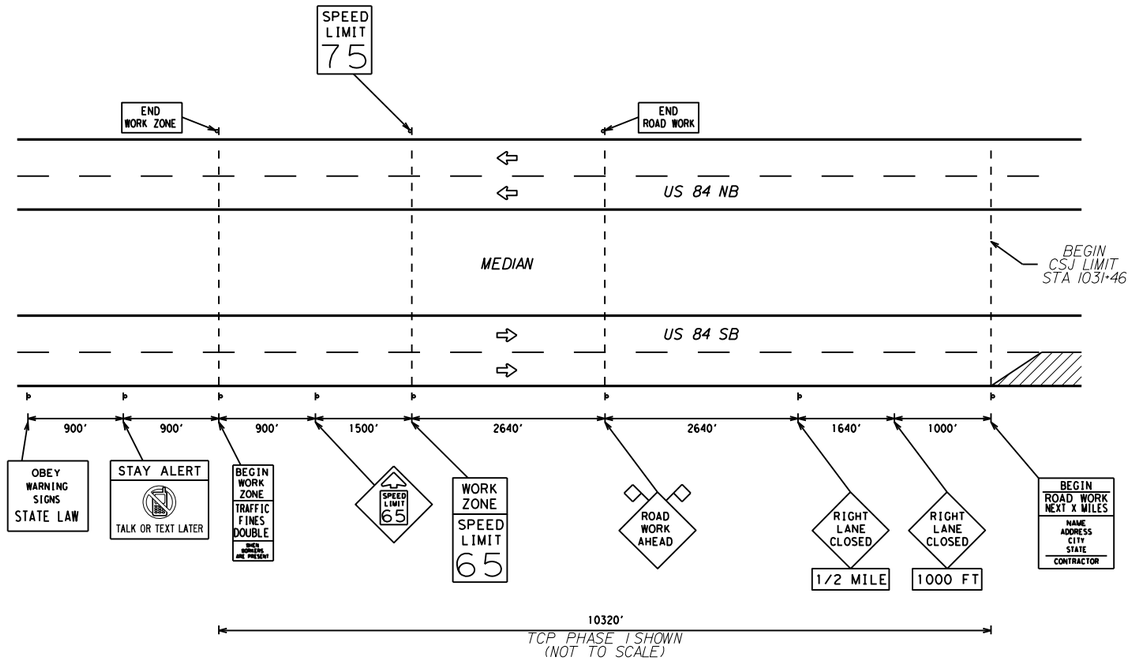
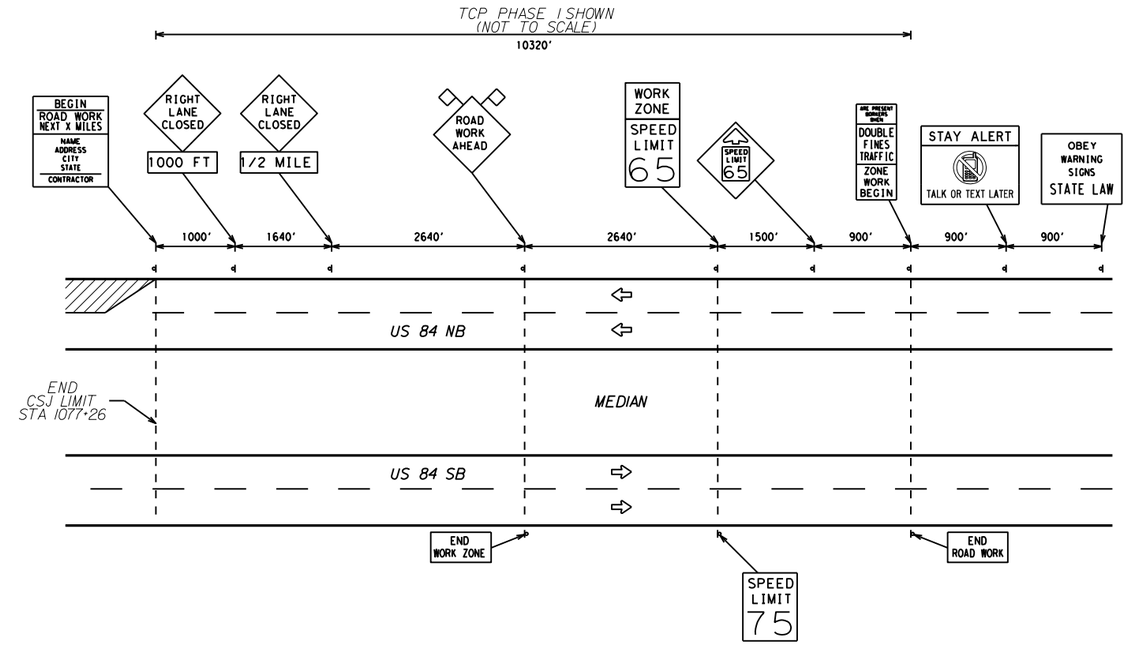
%TIME%




SEE TCP SHEETS FOR OTHER TEMPORARY SIGNAGE

TO BRIDGE




SEE TCP SHEETS FOR OTHER TEMPORARY SIGNAGE

TO BRIDGE

STATE OF TEXAS
SHELLEY C. HARRIS
99197
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PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

# US 84 PERIMETER SIGN LAYOUT



Texas Department of Transportation

NO SCALE Sheet 1 of 1

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 10 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US0084_TCP_SIGN_PREM.dgn | | |

DATE: &DATE&
FILE: &FILE&
&TIME&

| LOC NO. | TCP PHASE | PLAN SHEET NUMBER | LOCATION | STA | TEST LEVEL | DIRECTION OF TRAFFIC (UNI/BI) | FOUNDATION PAD | | BACKUP SUPPORT | | | AVAILABLE SITE LENGTH | CRASH CUSHION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | MOVE / RESET | | L | L | R | R | S | S |
| | | | | | | | PROPOSED MATERIAL | PROPOSED THICKNESS | DESCRIPTION | WIDTH | HEIGHT | | INSTALL | REMOVE | MOVE/ RESET | FROM LOC.# | N | W | N | W | N | W |
| 1 | 1 | | Rdwy A Inside Approach | 1052+86 | 3 | UNI | Hot Mix | 7" | Portable Traffic Barrier | 24" | 32" | 30′ | 1 | | | | | | | | X | |
| 2 | 1 | | Rdwy B Inside Approach | 1055+86 | 3 | UNI | Hot Mix | 7" | Portable Traffic Barrier | 24" | 32" | 30′ | 1 | | | | | | | | X | |
| 3 | 2 | | Rdwy A Outside Approach | 1052+86 | 3 | UNI | Hot Mix | 7" | Portable Traffic Barrier | 24" | 32" | 30′ | | 1 | 1 | 1 | | | | | | |
| 4 | 2 | | Rdwy B Outside Approach | 1055+86 | 3 | UNI | Hot Mix | 7" | Portable Traffic Barrier | 24" | 32" | 30′ | | 1 | 1 | 2 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | TOTALS | 2 | 2 | 2 | | | | | | | |

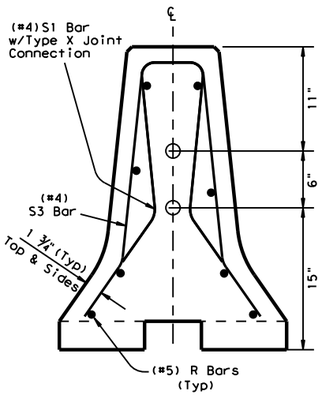
LEGEND:
L=LOW MAINTENANCE
R=REUSABLE
S=SACRIFICIAL
N=NARROW
W=WIDE

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

# CRASH CUSHION SUMMARY SHEET

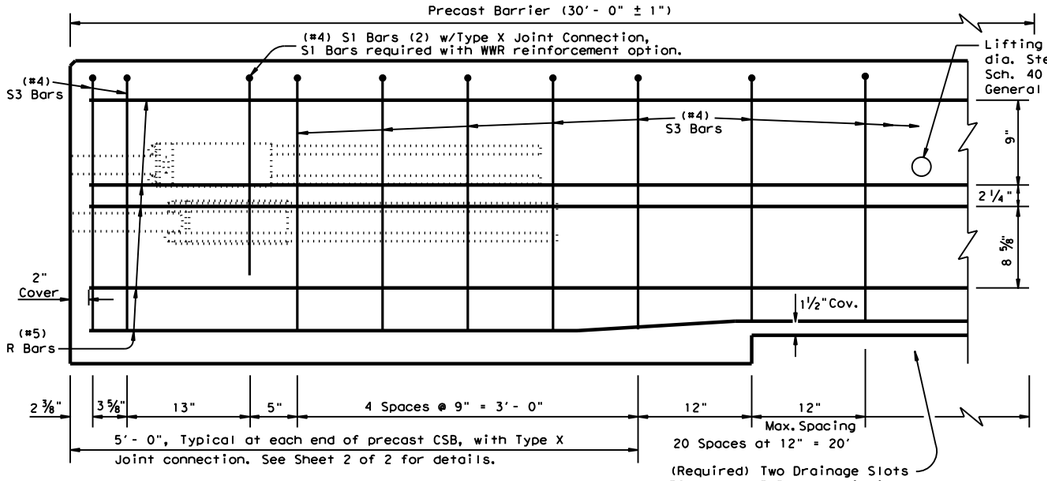
| FILE: ccss.dgn | DN: TxDOT | CK: | | CK: |
|---|---|---|---|---|
| © TxDOT | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | |
| | LBB | GARZA | | |
| | FEDERAL AID PROJECT | | | SHEET NO. |
| | | | | 11 |

DATE:
FILE:



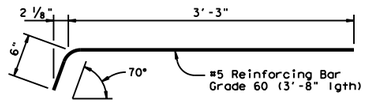

## End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



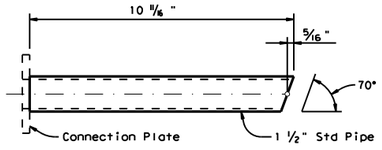

## Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



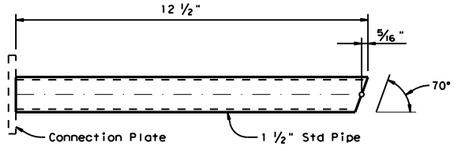

## DEFORMED BAR ANCHOR DETAILS

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



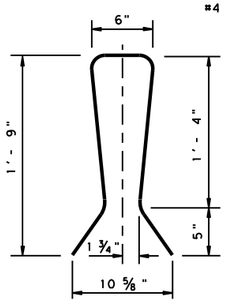

## UPPER CONNECTION PIPE DETAILS

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



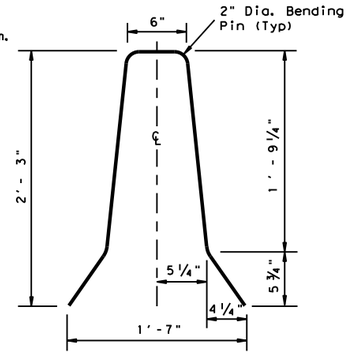

## LOWER CONNECTION PIPE DETAILS

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



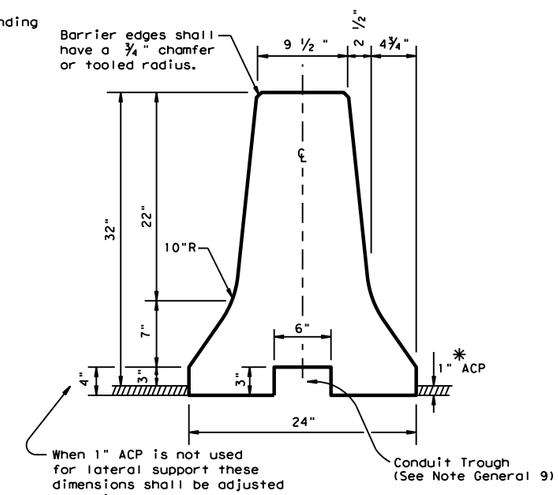

## S1 Bar

#4 Bar (2)
(Joint Type X)




## S3 Bar

#4 Bar

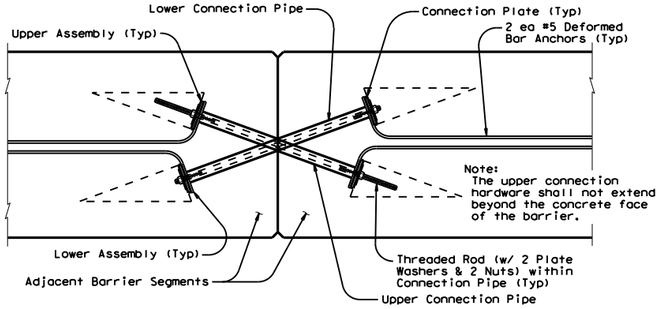



## Concrete Safety Barrier

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

### GENERAL NOTES

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




## TYPE X JOINT INSTALLATION DETAIL

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

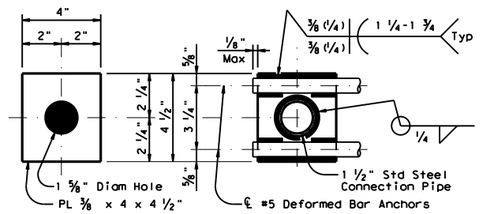
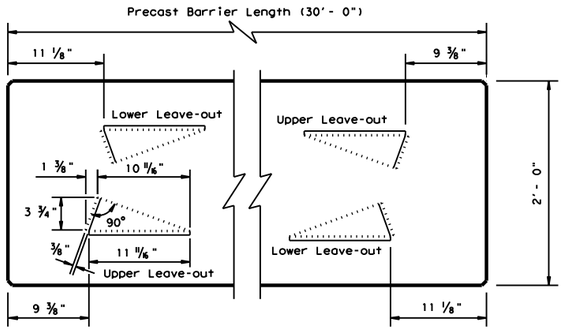


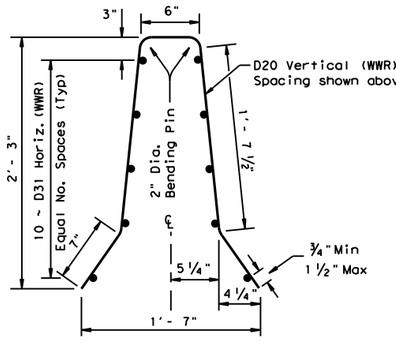

PLATE DIMENSIONS WELDING DETAILS

## CONNECTION PLATE DETAILS

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



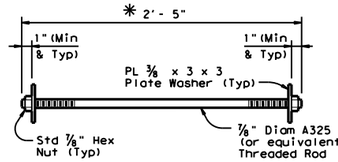

## BARRIER PLAN AT END JOINTS




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

### (WWR) General Notes

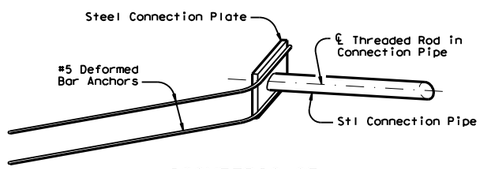
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing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




## CONNECTION BOLT OR THREADED ROD DETAIL

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

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




## ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

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

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

# CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

# CSB(1)-10

| FILE: csb110.dgn | DN: TxDOT | CK: AM | DW: BD | CK: VP |
|---|---|---|---|---|
| ©TxDOT December 2010 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 12 |

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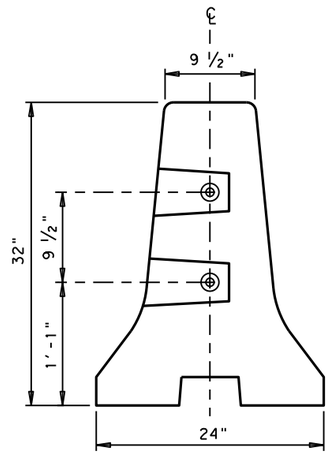
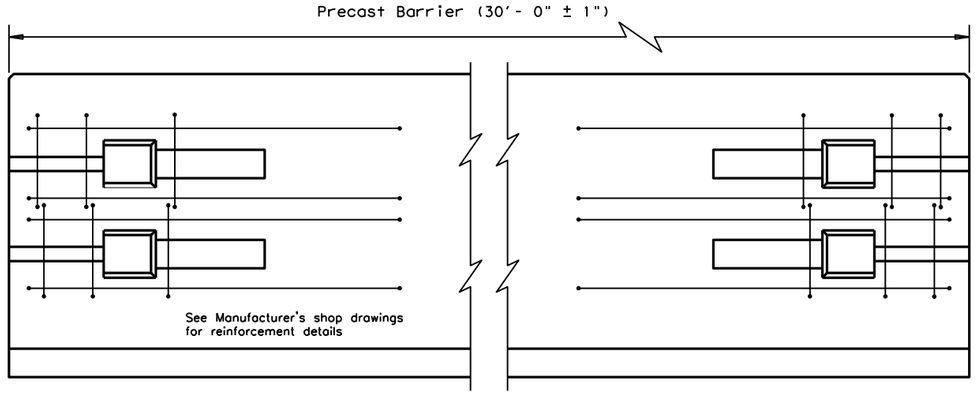
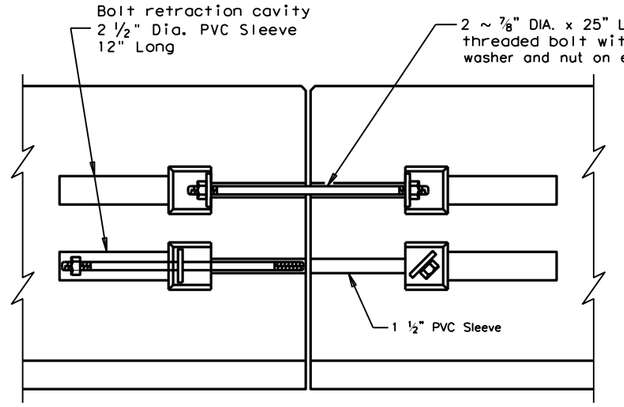



END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

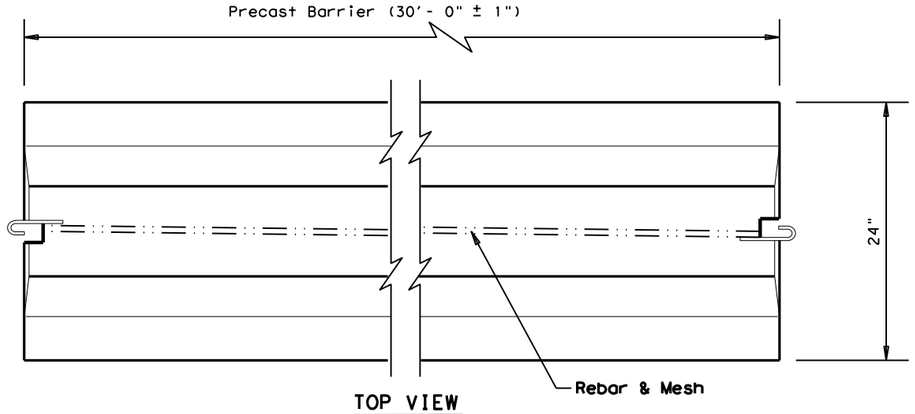



ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

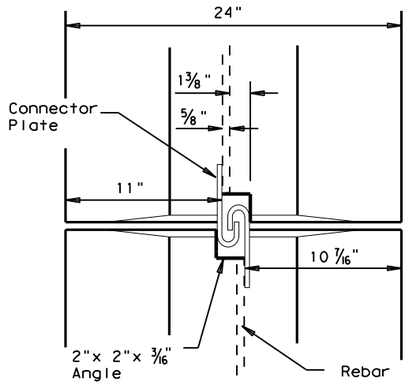



ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

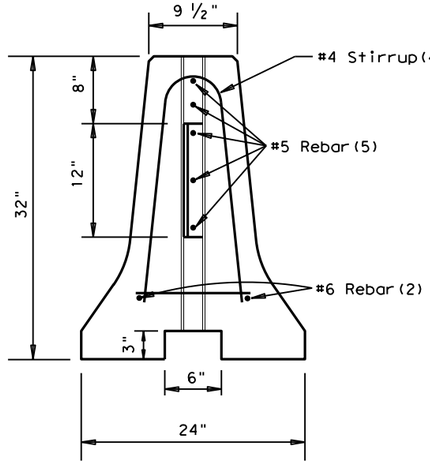
## Joint Connection (Type Q)




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




VIEW FROM ABOVE
J-J HOOK CONNECTION




END VIEW
J-J HOOK CONNECTION

## Joint Connection (Type J)

**Proprietary Joint Connections (CSB)**

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

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

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

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

# CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

# CSB(1)-10

| FILE: csb110.dgn | DN: TxDOT | CK: AM | DW: BD | CK: VP |
|---|---|---|---|---|
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| REVISIONS | 0053 | 06 | 031 | US 84 |
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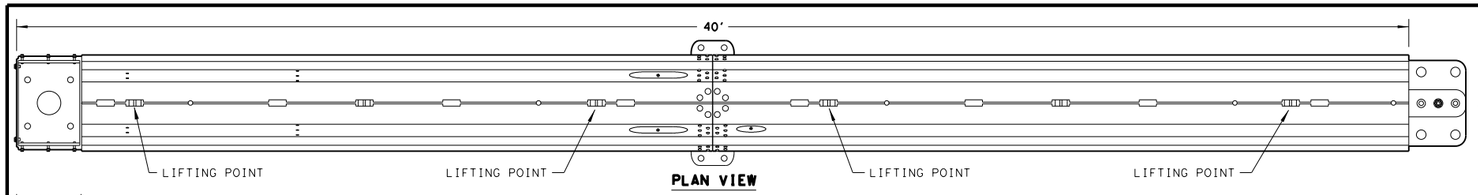
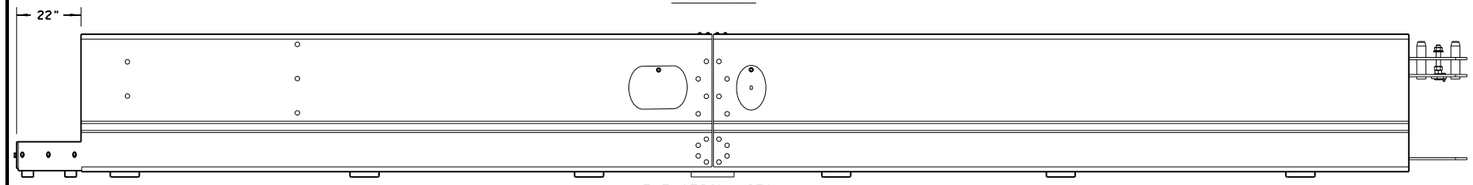
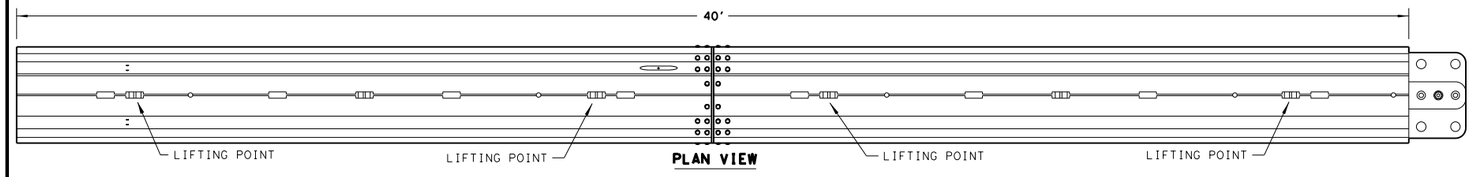



PLAN VIEW

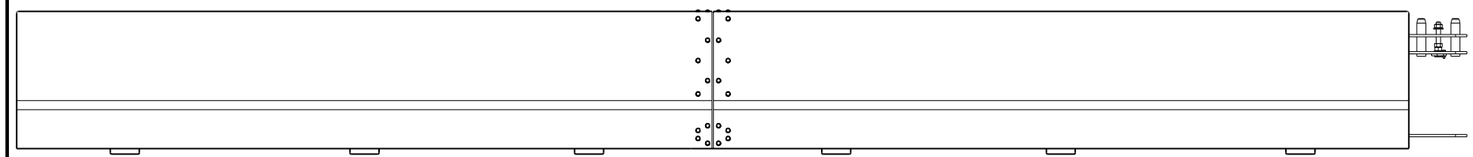



ELEVATION VIEW

BARRIERGUARD END SECTION - 40 FT. MALE OR FEMALE END SECTION

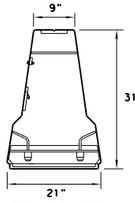



PLAN VIEW

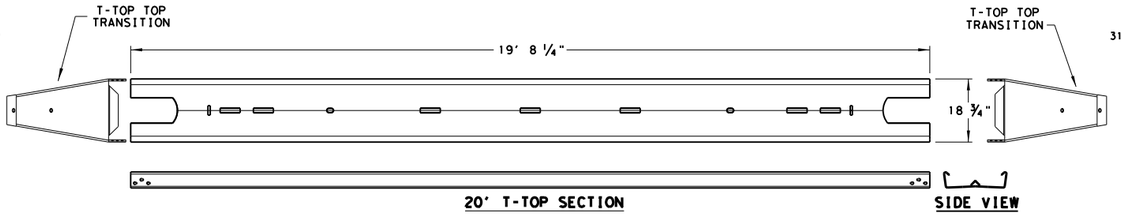


ELEVATION VIEW

BARRIERGUARD STANDARD SECTION - 40 FT.

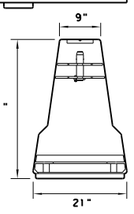



FEMALE END CROSS SECTION

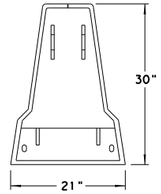



20' T-TOP SECTION

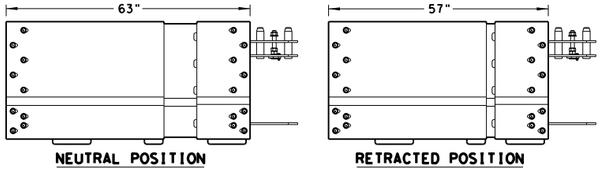
SIDE VIEW



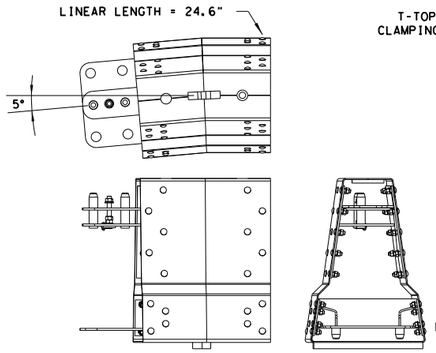

MALE END CROSS SECTION



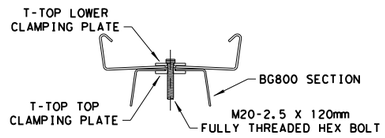

FULL HEIGHT TERMINAL COVER




VARIABLE LENGTH BARRIER

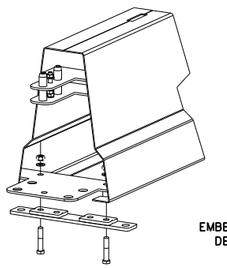



5° (LH) LEFT HAND ANGLE SECTION

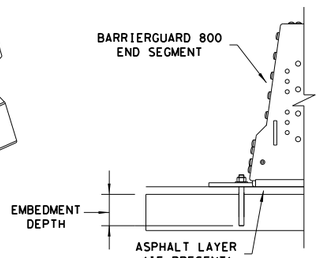



T-TOP MOUNTING DETAIL

NOTE: ADDITIONAL ANGLE SECTION AVAILABLE
5° (RH) RIGHT HAND ANGLE SECTION
10° (LH) LEFT HAND ANGLE SECTION
10° (RH) RIGHT HAND ANGLE SECTION



INTERMEDIATE ANCHOR AT QUICKLINK




SEE ANCHORING TABLE

## GENERAL NOTES

1. THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS BARRIERGUARD 800 AND BARRIERGUARD 800 MDS AND HAS BEEN DESIGNED AND MANUFACTURED BY LAURA METAAL ROAD SAFETY INC. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT LEE STUART AT LAURA METAAL ROAD SAFETY INC. AT (702) 664-2009 OR lstuart.laurametaal@outlook.com
2. THE BARRIERGUARD 800 SYSTEM HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 BARRIER. THE DEFLECTION TABLE OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.
3. THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF BARRIERGUARD 800 AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
4. BARRIERGUARD 800 REQUIRES ANCHORING (PINNING) AT EACH END OF THE INSTALLED LENGTH. (INTERMEDIATE ANCHORS CAN BE USED TO REDUCE DEFLECTION).
5. INSTALLATION OF BARRIERGUARD 800 OR BARRIERGUARD 800 MDS, NORMALLY STARTS WITH A MALE TERMINAL SECTION AND IS FINISHED WITH A FEMALE TERMINAL SECTION. STANDARD SECTIONS ARE USED BETWEEN THE TERMINAL SECTIONS TO OBTAIN THE REQUIRED LENGTH OF POSITIVE BARRIER PROTECTION.
6. THE FULL HEIGHT TERMINAL (FHT) SECTIONS MAY BE CAPPED WITH A FHT COVER, HOWEVER IF EXPOSED TO ON-COMING TRAFFIC THE END SHOULD BE PROTECTED WITH A SUITABLE CRASH CUSHION. THE BARRIERGUARD 800 RANGE IS COMPATIBLE WITH MOST COMMONLY USED CRASH CUSHION END TREATMENTS. FOR DETAILS OF BARRIERGUARD 800 CRASH CUSHION CONNECTIONS THAT ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR MORE DETAILS. THE FULL HEIGHT TERMINAL COVER IS SUITABLE FOR THE "DOWN STREAM" END OF A SYSTEM THAT DOES NOT HAVE EXPOSURE TO ON-COMING TRAFFIC.
7. WHEN INSTALLING THE MINIMUM DEFLECTION SYSTEM (MDS),THE SYSTEM CAN BE INSTALLED WITH ADDITIONAL INTERMEDIATE ANCHORS ALONG THE LENGTH OF THE BARRIER RUN AT INTERVALS SHOWN IN THE DEFLECTION TABLE. EACH BARRIER RUN CAN BE MADE UP OF ANY MIXTURE OF THE SYSTEMS BY THE INTRODUCTION OF INTERMEDIATE ANCHORS AND/OR T-TOP AS REQUIRED.
8. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND THUS ALLOWING THE BARRIERGUARD TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE METHODS ARE, THE MOVEMENT IN THE QUICKLINK, ADJUSTABLE 20FT. SECTIONS OR SHORT ANGLED SECTIONS WHICH ALLOW A RADIUS AS LOW AS 12FT. FOR FURTHER INFORMATION AND ADVICE CONTACT LAURA METAAL ROAD SAFETY INC.
9. A BARRIERGUARD 800 VARIABLE LENGTH BARRIER (VLB) SECTION SHOULD BE USED WHEN BARRIERGUARD 800 OR BARRIERGUARD 800 MDS IS ANCHORED ACROSS A BRIDGE EXPANSION JOINT. IF T-TOP IS TO BE USED IN CONJUNCTION WITH THE VLB, THE T-TOP SHOULD BE USED FOR MINIMUM 40FT ON EITHER SIDE OF THE VLB AND TERMINATED WITH TRANSITIONS. THE VLB SECTION PROVIDES APPROXIMATELY 7in OF EXTENSION AND 7in OF CONTRACTION. MULTIPLE VLB'S CAN BE LINKED TOGETHER TO PROVIDE MORE EXPANSION OR CONTRACTION. THE VLB'S SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT. THE VLB DOES NOT NEED TO BE PLACED DIRECTLY OVER THE EXPANSION JOINT BUT MUST BE BETWEEN THE NEAREST ANCHORS ON EACH SIDE OF THE JOINT. IT IS RECOMMENDED THAT THE VLB IS PLACED WITHIN 40FT OF THE JOINT.
10. THE T-TOP CAN BE INSTALLED EITHER BEFORE OR AFTER THE BARRIERGUARD 800 HAS BEEN FULLY ASSEMBLED AND ANCHORED IN PLACE. T-TOP IS REQUIRED WHEN THE BARRIERGUARD 800 IS USED AS A MDS, ANCHORED EVERY 20FT, GATE SECTIONS AND VARIABLE LENGTH BARRIERS. THE T-TOP SHOULD EXTEND 40FT ON EITHER SIDE OF THESE CONDITIONS AND BE TERMINATED WITH TRANSITIONS.
11. THE BARRIERGUARD 800 RANGE HAS BEEN DESIGNED TO BE USED ON AND HAS BEEN TESTED ANCHORED ON ASPHALT, CONCRETE AND COMPACTED SUBBASE. CONTACT LAURA METAAL ROAD SAFETY INC. FOR FURTHER INFORMATION.
12. BARRIERGUARD 800 COMPONENTS ARE MANUFACTURED IN SI (METRIC) UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE. ALL COMPONENTS ARE FULLY GALVANIZED.
13. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR DETAILS.

**BARRIERGUARD 800 DEFLECTION TABLE**

| | STANDARD SYSTEM | MINIMUM DEFLECTION SYSTEMS (MDS) |
|---|---|---|
| DESCRIPTION | ONLY ANCHORED AT THE EXTREME ENDS OF THE BARRIER LENGTH | ANCHORED EVERY 20 FT. |
| DEFLECTION AT MASH TL-3 | 5'-6" | 18 ½" |
| T-TOP REQUIREMENTS | NONE REQUIRED | REQUIRED FOR MDS SECTIONS |

**STANDARD ANCHORING REQUIREMENTS (TABLE)**

| | RESIN STUD ANCHORS | | | DRIVEN ANCHORS | | Hilti HSL-3 SHALLOW MECHANICAL |
|---|---|---|---|---|---|---|
| | CONCRETE * | UNREINFORCED CONCRETE * | ASPHALT | ASPHALT | SUBBASE/SOIL | CONCRETE |
| ANCHOR DIAMETER | 1 in. | 1 in. | 1 in. | 1-3/16 in. | 5-1/2 in. | * * |
| EMBEDMENT DEPTH | 6 in. | 8 in. | 16 in. | 16 in. | 32 in. | * * |
| DRILL DIAMETER | 1-1/8 in. | 1-1/8 in. | 1-1/8 in. | 1-3/16 in. | DRIVEN | * * |
| PULL OUT CAPACITY (MIN) | 17500 lb | 17500 lb | N/A | N/A | N/A | * * |
| SHEAR CAPACITY (MIN) | 25000 lb | 25000 lb | N/A | N/A | N/A | * * |

* ALTERNATIVE ANCHORS INCLUDING MECHANICAL ANCHORS FOR CONCRETE MAYBE USED IF THEY MEET THE STRENGTH REQUIREMENTS LISTED, DETAILS WILL BE MANUFACTURER SPECIFIC.
* * CONTACT: LAURA METAAL ROAD SAFETY INC. FOR SPECIFIC APPLICATION.

Texas Department of Transportation

Design Division Standard

# BARRIERGUARD 800 SYSTEM
# STEEL BARRIER
# MASH TL-3
# BARRIERGUARD-19

| | | | | |
|---|---|---|---|---|
| FILE: barrierguard19.dgn | DN: TxDOT | CK: KM | DW: VP | CK: |
| © TxDOT: JULY 2019 | CONT | SECT | JOB | HIGHWAY |
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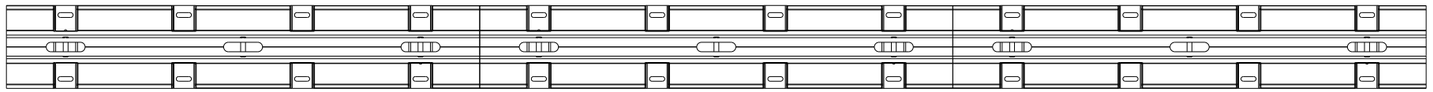
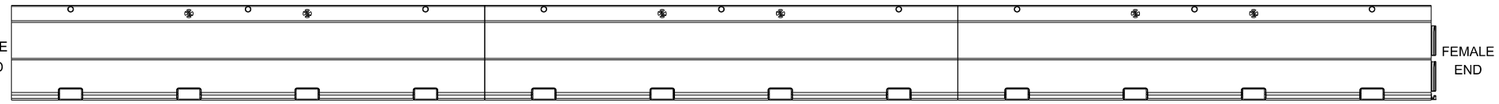
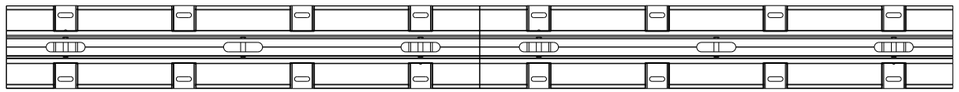


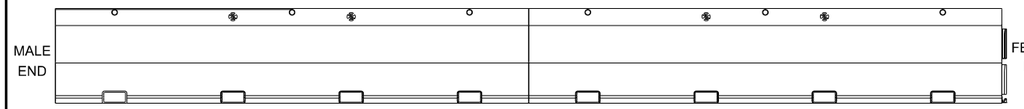
PLAN VIEW



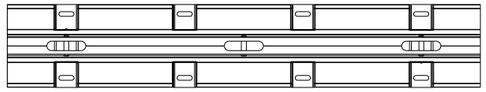

ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 50'-0"



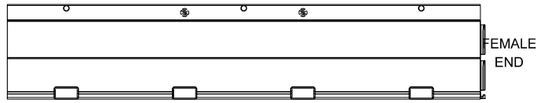
PLAN VIEW



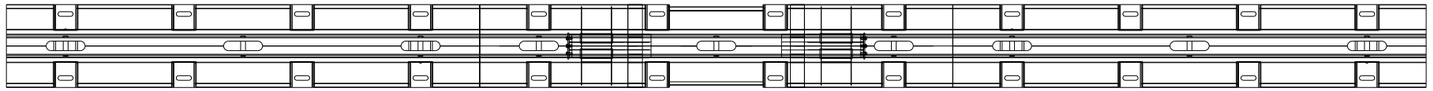

ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 33'-4"



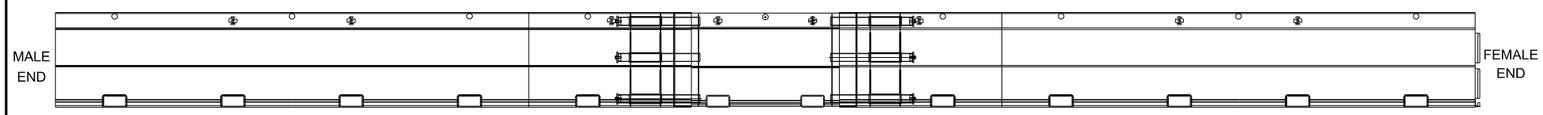
PLAN VIEW



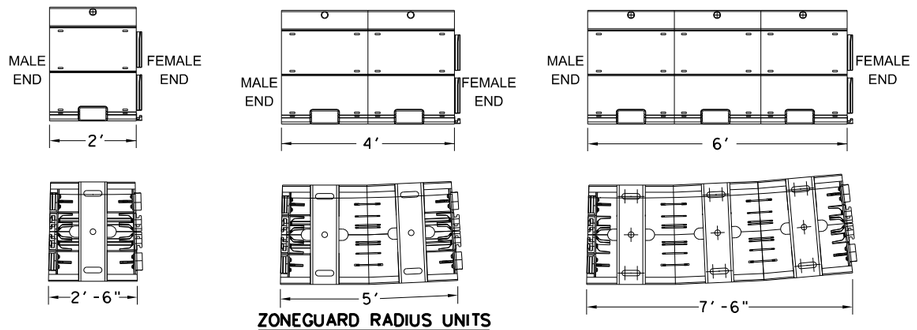

ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 16'-8"



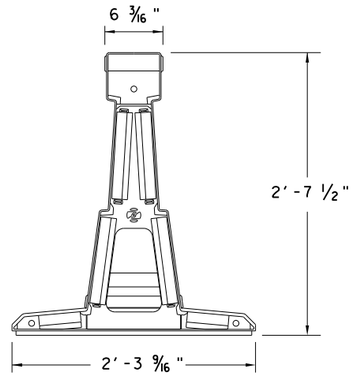
PLAN VIEW




ELEVATION VIEW
ZONEGUARD EXPANSION UNIT x 46'-5½"
(SEE GENERAL NOTE 5)




ZONEGUARD RADIUS UNITS




ZONEGUARD TYPICAL SECTION

## GENERAL NOTES

1. FOR TECHNICAL AND APPLICATION SUPPORT PLEASE CONTACT HILL & SMITH INC. AT 614-340-6294.
2. ZONEGUARD HAS BEEN ACCEPTED BY FHWA AS A MASH TL-3 LONGITUDINAL BARRIER.
3. STANDARD INSTALLATIONS REQUIRE ANCHORING AT EACH END OF THE RUN. MINIMUM DEFLECTION INSTALLATIONS REQUIRE ANCHORING AT 33'-4 CENTERS. NO MODIFICATIONS ARE NECESSARY OTHER THAN INCREASED ANCHORING.
4. 50-0' UNITS CAN BE USED TO ACHIEVE DOWN TO AN 800' RADIUS CURVE. 16'-8" UNITS CAN BE USED TO ACHIEVE CURVES DOWN TO 250' RADIUS. SPECIAL SHORT UNITS (SHOWN) IN 2.5 DEGREE INCREMENTS CAN BE USED TO ACHIEVE DIRECTION CHANGES OR AT A FIXED RADIUS OF 47'-0".
5. HILL & SMITH OFFERS AN EXPANSION UNIT THAT CAN BE USED ACROSS A BRIDGE EXPANSION JOINT OR TO ACCOMMODATE THERMAL EXPANSION. THE UNIT IS ANCHORED IN THE MIDDLE, AND ADJUSTED ACCORDING TO THE TEMPERATURE AT THE TIME OF INSTALLATION. THE EXPANSION JOINT CAN BE USED WITH ENGINEER APPROVAL. THE EXPANSION UNIT HAS NOT BEEN ASSESSED TO MASH CRITERIA.
6. ANCHOR PINS ARE 1 ¼" DIAMETER. LENGTH IS 1'-8" FOR ASPHALT AND 1'-0" FOR CONCRETE. SEE ANCHORING TABLE FOR ADDITIONAL DETAILS.

| | STANDARD INSTALLATION | MINIMUM DEFLECTION INSTALLATION CONCRETE | MINIMUM DEFLECTION INSTALLATION ASPHALT |
|---|---|---|---|
| | FOUR ANCHORS AT END OF THE RUN | TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4" | TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4" |
| MASH TL-3 DEFLECTION (2270 KG TRUCK @ 25° & 100 KM/HR) | 6'-10" | 5" | 2'-0" |

EXPECTED DEFLECTION TABLE

| DESCRIPTION | ASPHALT | CONCRETE |
|---|---|---|
| 1 1/4" PIN ANCHOR | 1'-8" LONG, MINIMUM ASPHALT COVER OF 3" | 1'-0" LONG, MINIMUM CONCRETE COVER OF 6" |
| 1 1/4" ALL THREAD ANCHOR | - | 1'-0" LONG, MINIMUM EMBEDMENT OF 6" |

ANCHORING TABLE

ALTERNATE ANCHORING METHODS CERTIFIED BY HILL & SMITH, INC. ARE AVAILABLE PER FHWA APPROVAL LETTER.

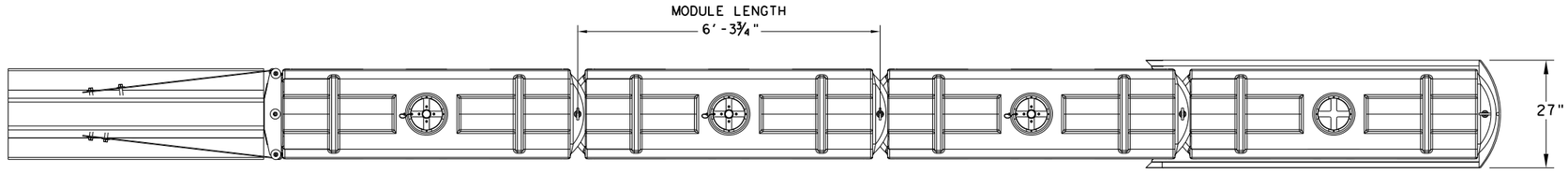
Texas Department of Transportation

Design Division Standard

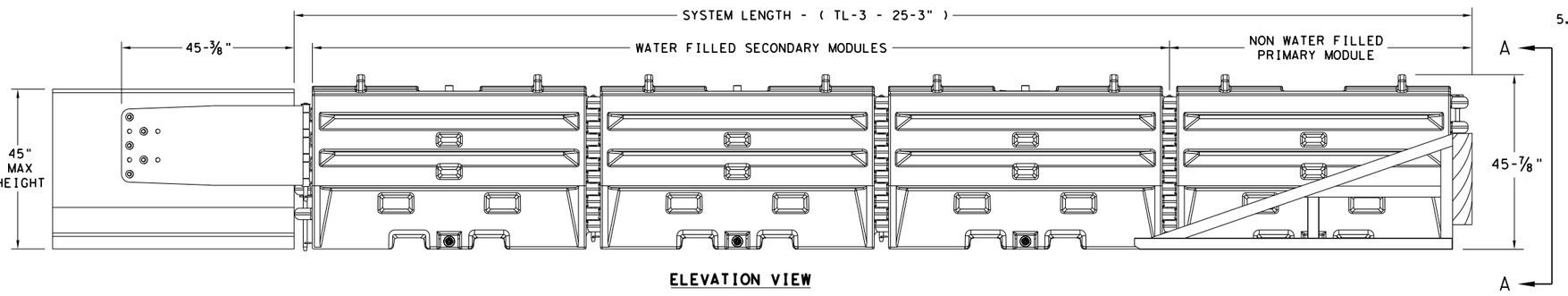
# ZONEGUARD SYSTEM
# STEEL BARRIER
# MASH TL-3
# ZONEGUARD-19

| | | | | | |
|---|---|---|---|---|---|
| FILE: zoneguard19 | DN: TxDOT | CK: KM | DW: VP | CK: CGL | |
| © TxDOT: JULY 2019 | CONT | SECT | JOB | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | US 84 | |
| | DIST | COUNTY | | SHEET NO. | |
| | LBB | GARZA | | 15 | |

DATE: $DATE$
FILE: $FILE$




PLAN VIEW



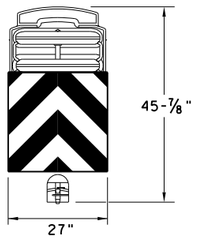

ELEVATION VIEW

## GENERAL NOTES

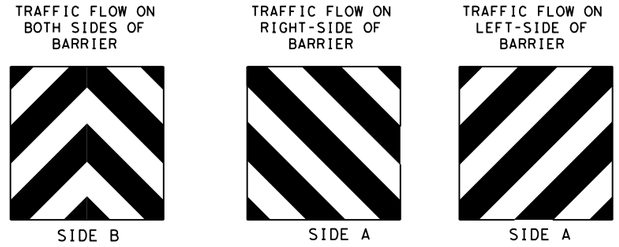
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE,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

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

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




SECTION A-A

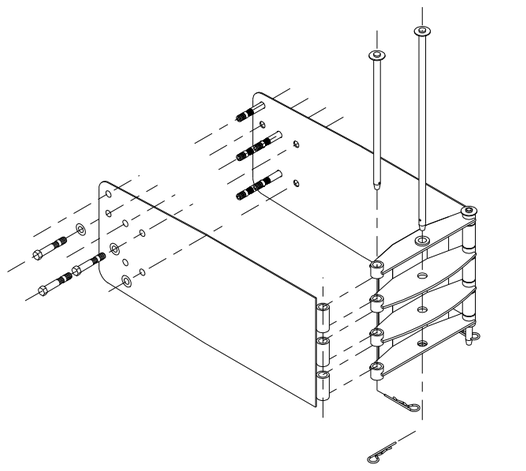



NOSE SHEETING PANEL DELINEATION

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

## BILL OF MATERIAL

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

Texas Department of Transportation

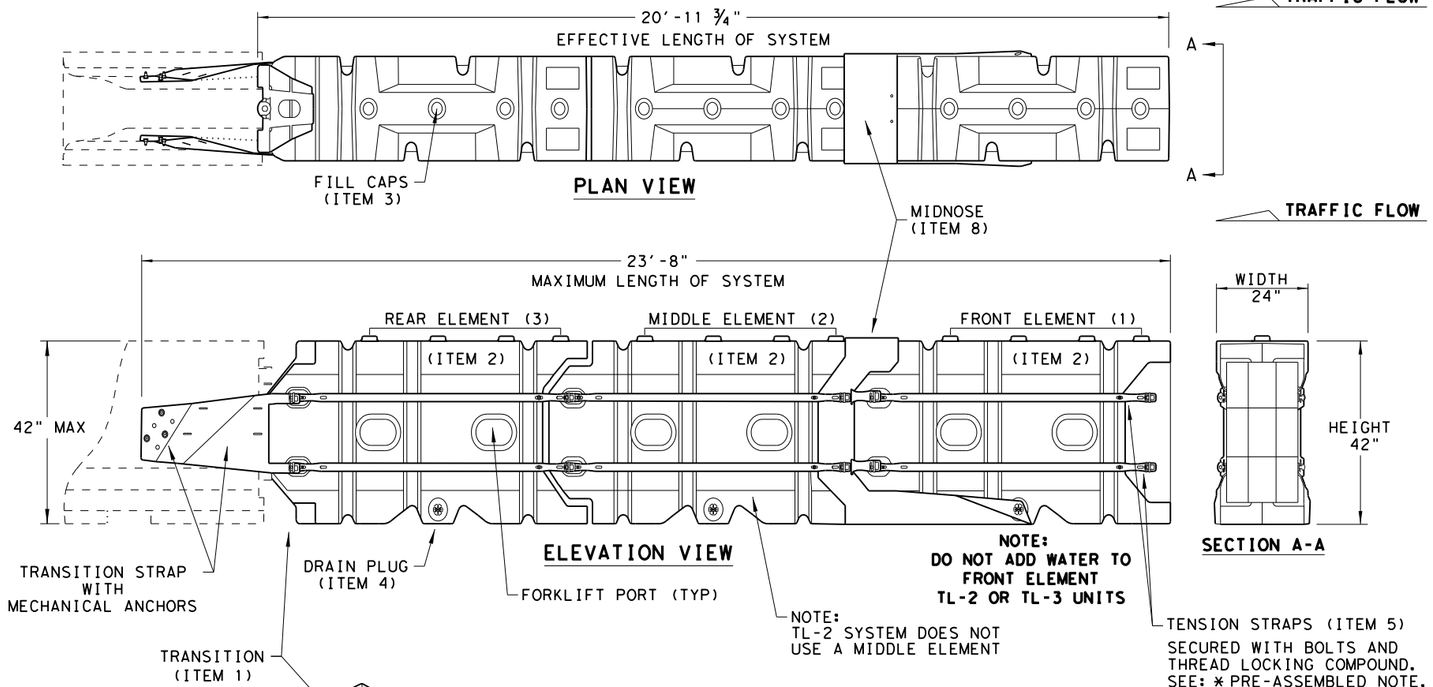
Design Division Standard

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

| FILE: sled19.dgn | DN: TxDOT | CK: KM | DW: VP | CK: |
|---|---|---|---|---|
| ©TxDOT: DECEMBER 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 16 |

DATE: $DATE$
FILE: $FILE$

SYSTEM SHOWN - ABSORB-M TL-3




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

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

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

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

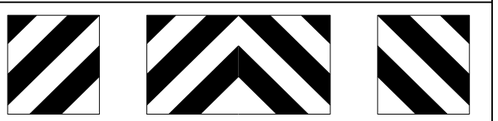
## GENERAL NOTES

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

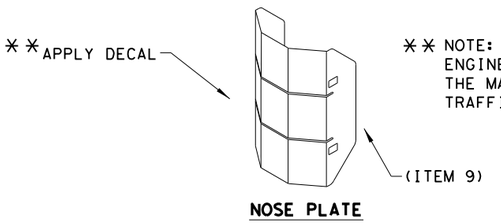
| BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS | | | QTY | QTY |
|---|---|---|---|---|
| ITEM # | PART NUMBER | PART DESCRIPTION | TL-2 SYSTEM | TL-3 SYSTEM |
| 1 | BSI-1809036-00 | TRANSITION-(GALV) | 1 | 1 |
| * 2 | BSI-1808002-00 | PRE-ASSEMBLED ABSORBING (ELEMENTS) | 2 | 3 |
| * 3 | BSI-4004598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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

**DELINEATION DECAL PLACEMENT GUIDE**



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




NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

| FILE: absorbm19 | DN: TxDOT | CK: KM | DW: VP | CK: |
|---|---|---|---|---|
| © TxDOT: JULY 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 17 |

DATE: $DATE$
FILE: $FILE$

## 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 | 0053 | 06 | 031 | US 84 |
| 4-03 7-13 | DIST | COUNTY | | SHEET NO. |
| 9-07 8-14 | LBB | GARZA | | 18 |
| 5-10 5-21 | | | | |

DATE: $DATE$
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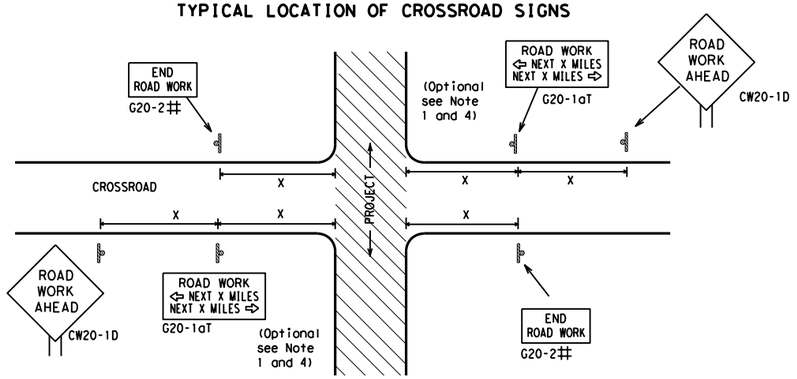
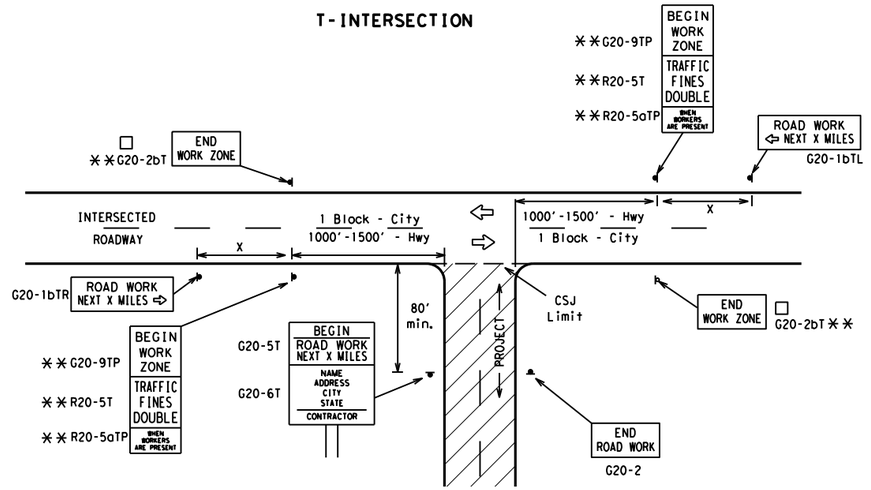
## TYPICAL LOCATION OF CROSSROAD SIGNS




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

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

## T-INTERSECTION




## CSJ LIMITS AT T-INTERSECTION

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

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

### SIZE

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

### SPACING

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

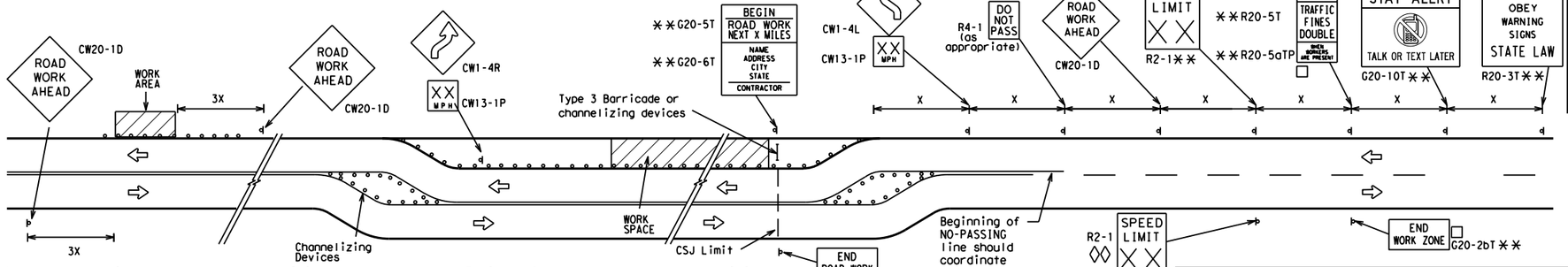
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

## GENERAL NOTES

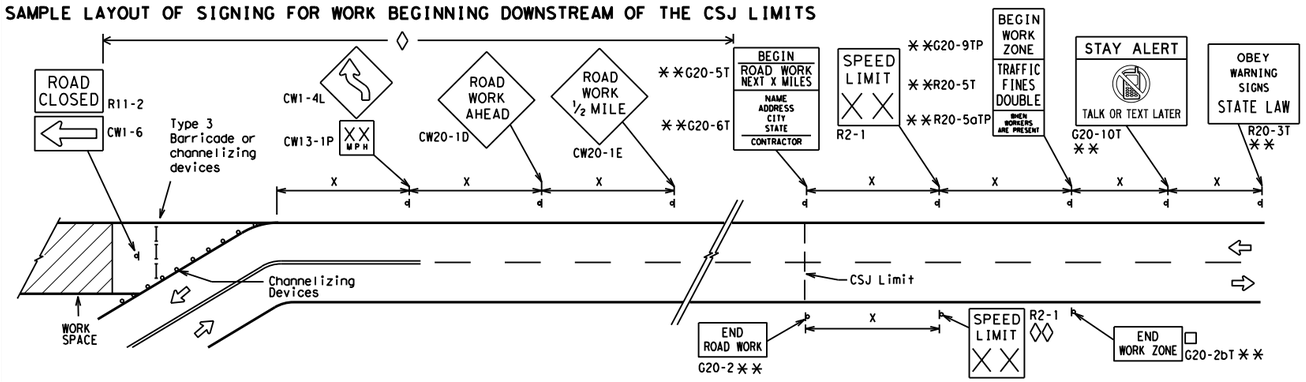
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

## WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS




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

## SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING 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 | 0053 | 06 | 031 | US 84 |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | LBB | GARZA | | 19 |



DATE: $DATE$
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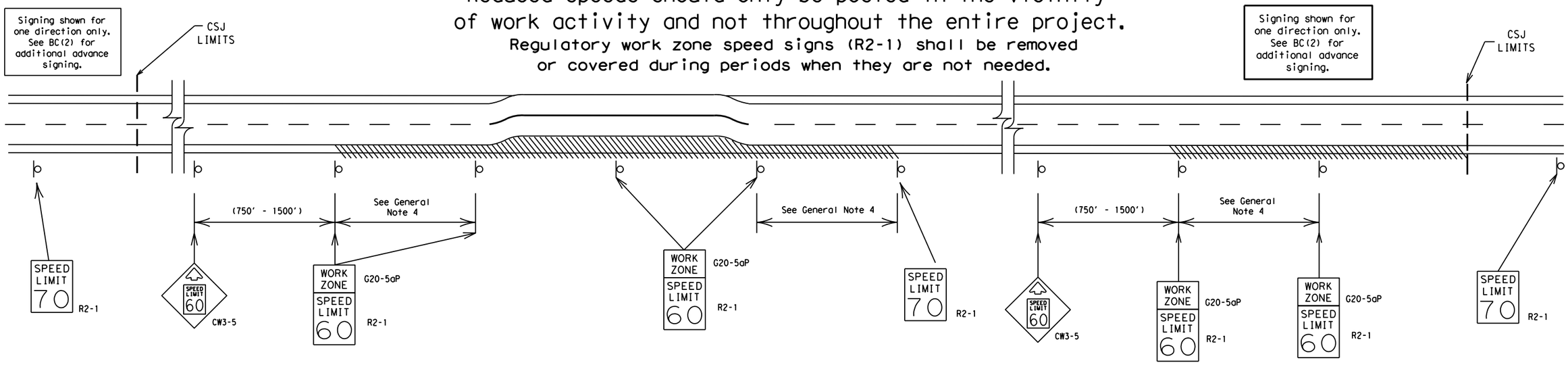
# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

**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

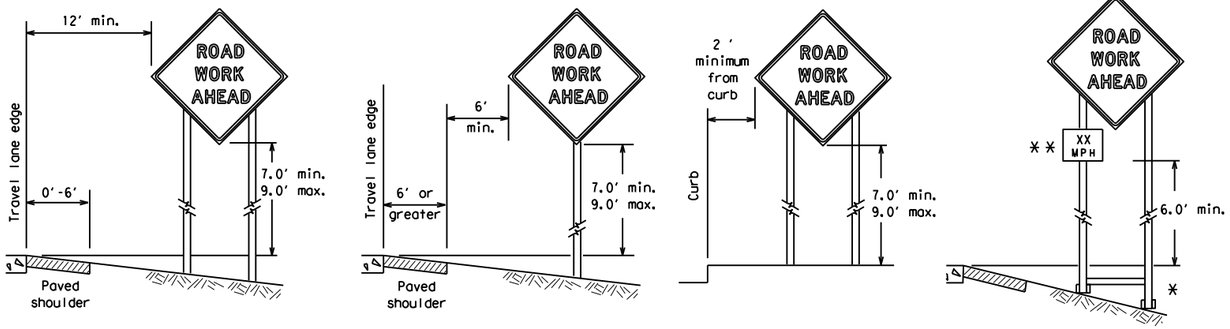
## BC(3)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | LBB | GARZA | | 20 |



DATE: $DATE$
FILE: $FILE$

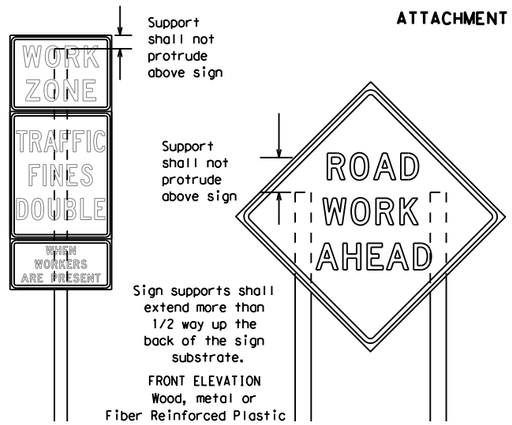
## TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

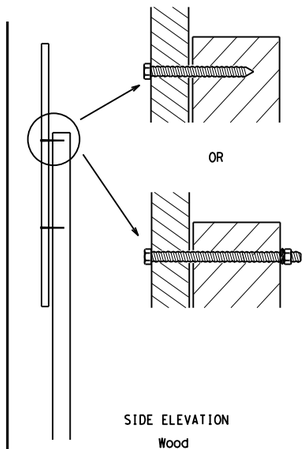



* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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



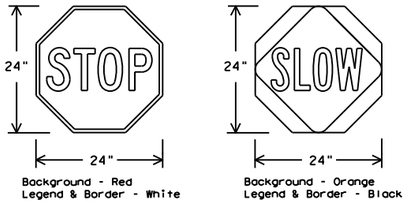

Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

**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

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
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| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | LBB | GARZA | | 21 |



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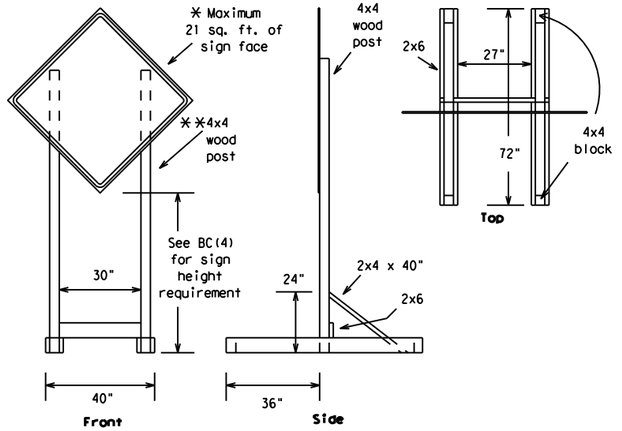
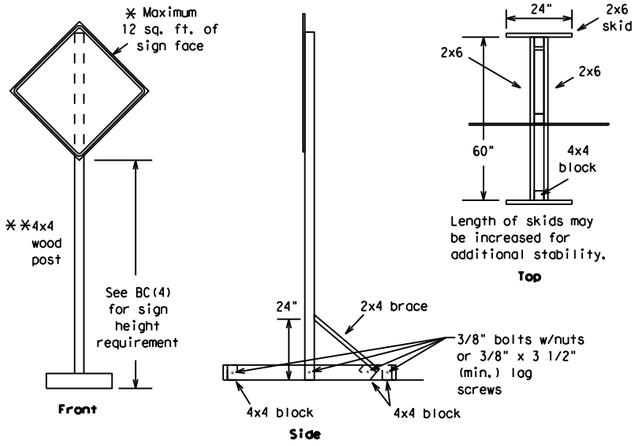
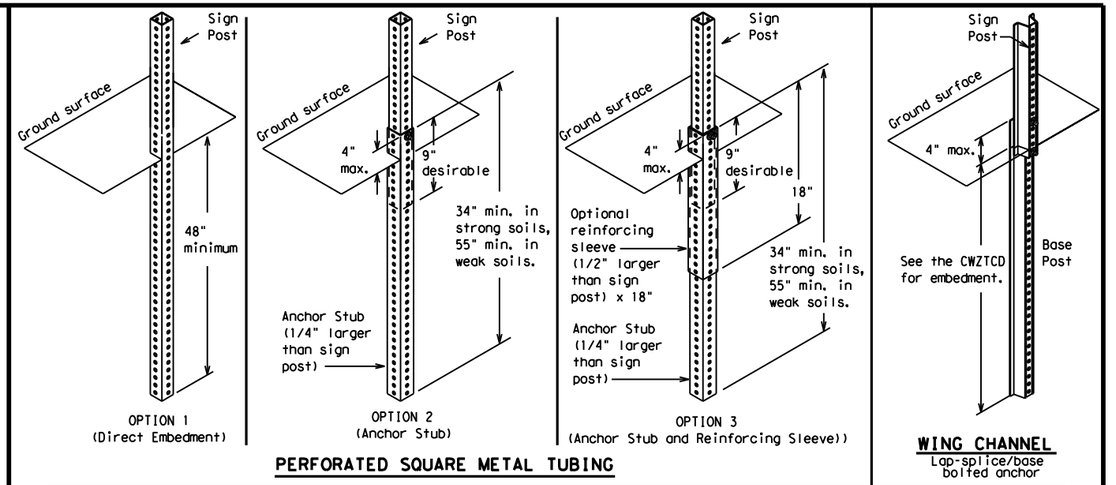


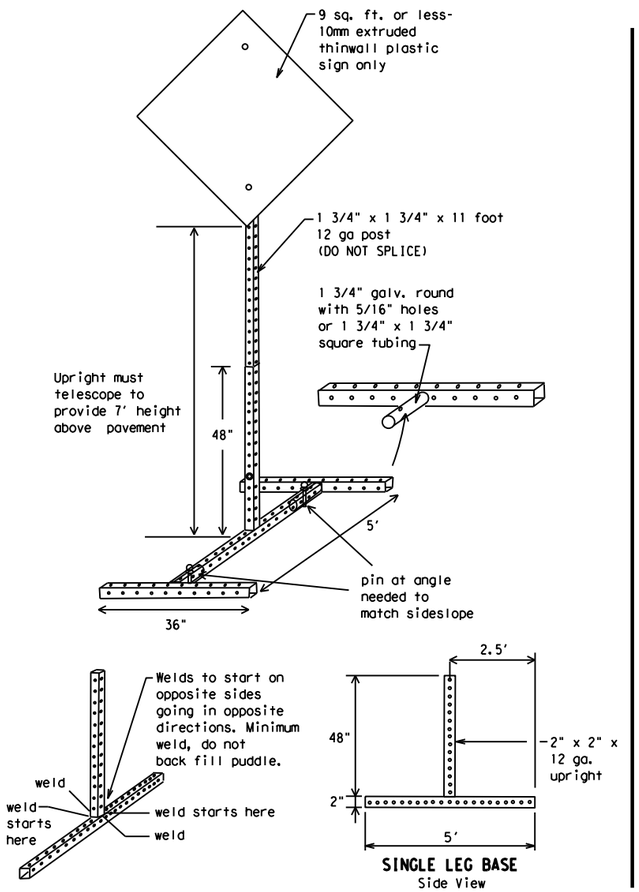

## SKID MOUNTED WOOD SIGN SUPPORTS

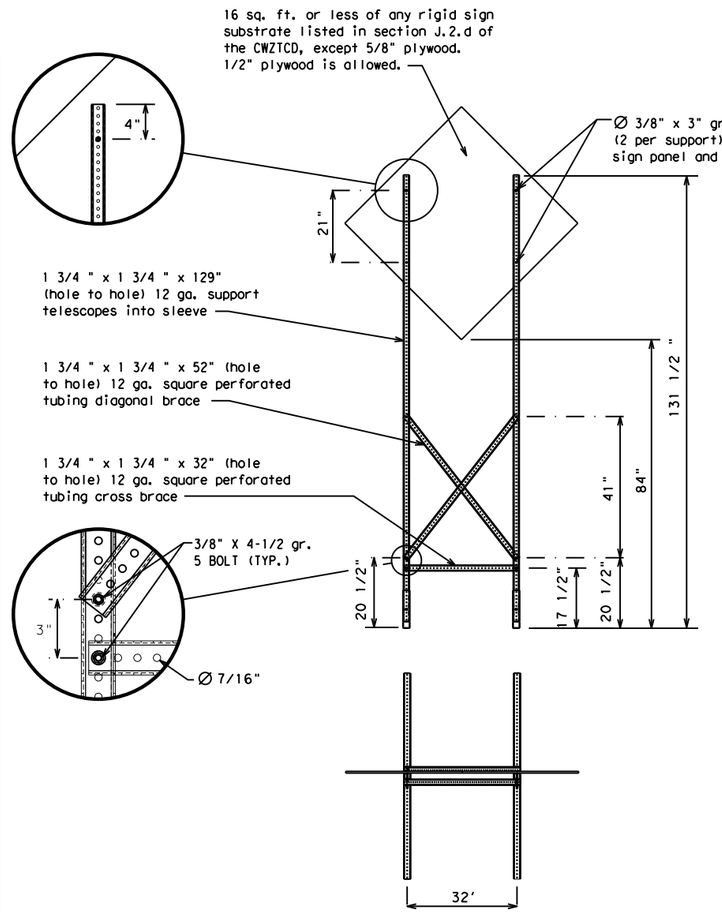
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

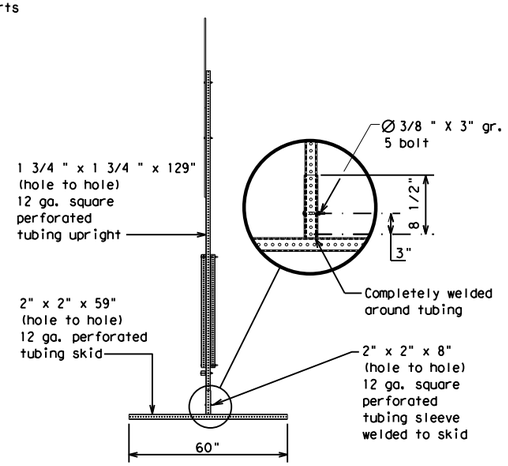



## GROUND MOUNTED SIGN SUPPORTS

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




## 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.



Texas Department of Transportation | Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

# BC(5)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
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DATE: $DATE$
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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

** 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

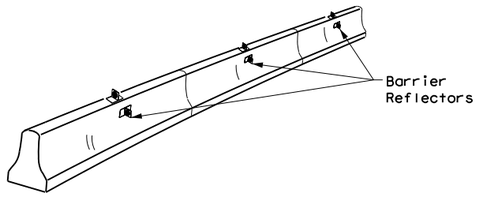
# BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

# BC(6)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | LBB | GARZA | | 23 |

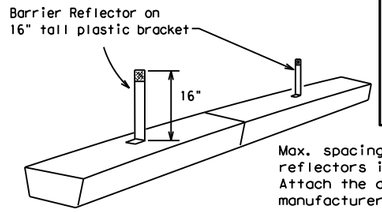
100

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




## CONCRETE TRAFFIC BARRIER (CTB)

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

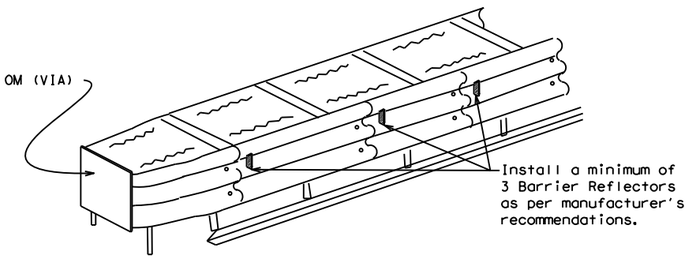



Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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

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

## LOW PROFILE CONCRETE BARRIER (LPCB)

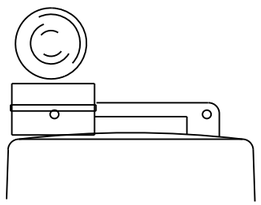



## DELINEATION OF END TREATMENTS

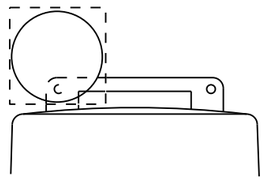
**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

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

# BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

## WARNING LIGHTS

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

## WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

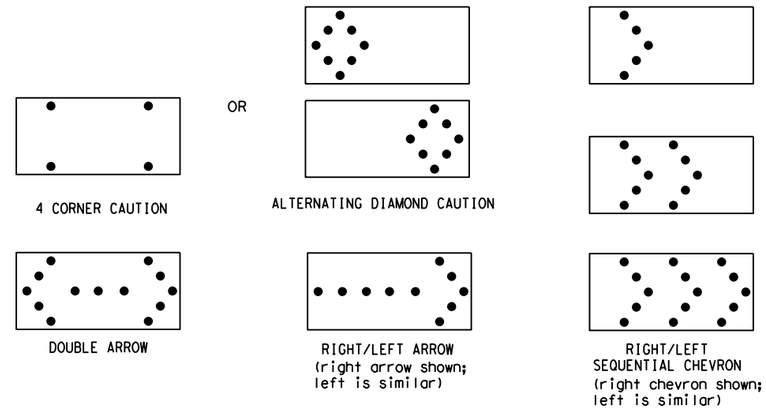
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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




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

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

**ATTENTION**

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

# FLASHING ARROW BOARDS

## TRUCK-MOUNTED ATTENUATORS

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



Texas Department of Transportation

Traffic Safety Division Standard

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

# BC(7)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
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| © TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | LBB | GARZA | | 24 |

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DATE: $DATE$
FILE: $FILE$

## 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:

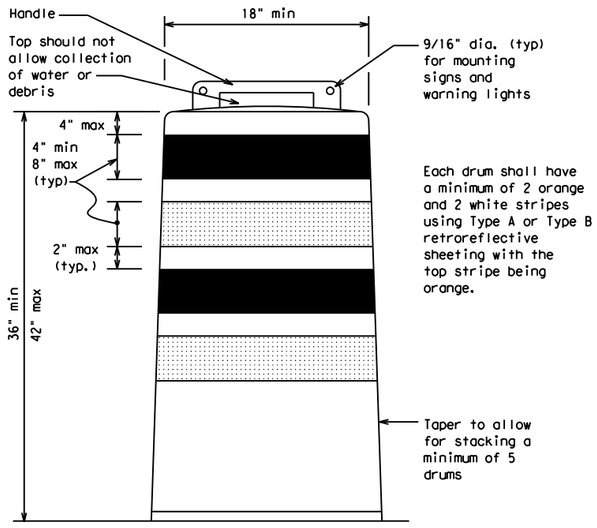
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

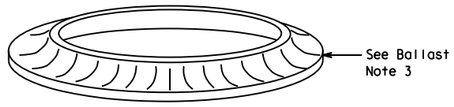
## RETROREFLECTIVE SHEETING

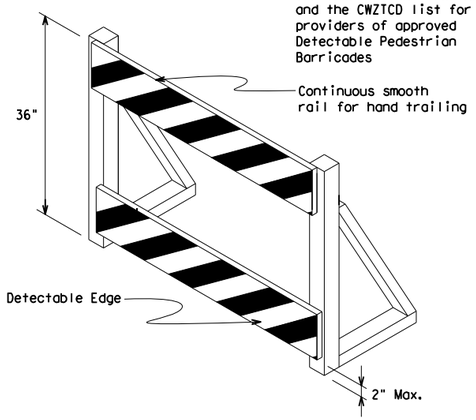
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.



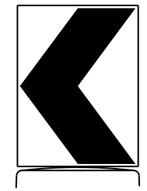



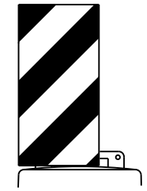

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

## DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

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

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

# BC(8)-21

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| REVISIONS | 0053 | 06 | 031 | US 84 |
| 4-03 8-14 | DIST | COUNTY | | SHEET NO. |
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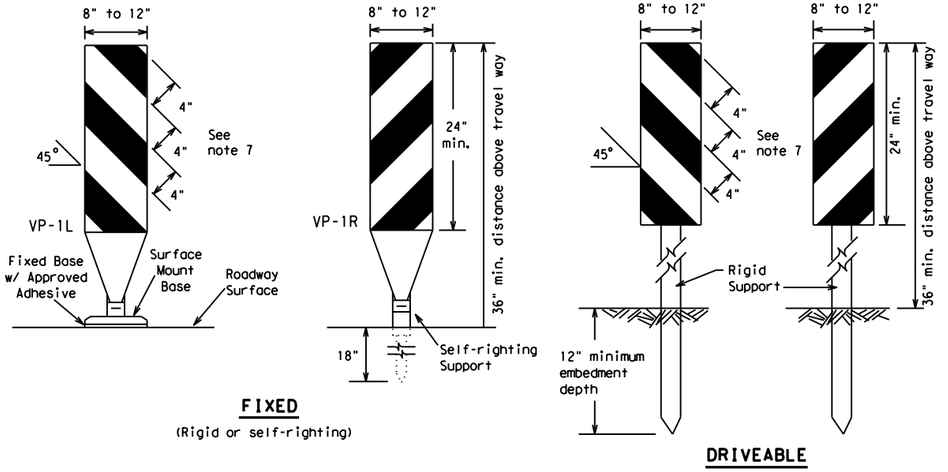
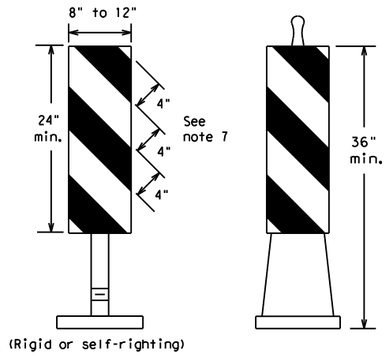



**FIXED**
(Rigid or self-righting)

**DRIVEABLE**

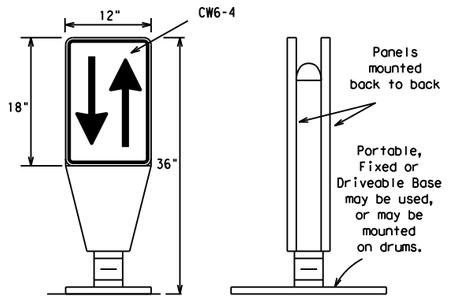



(Rigid or self-righting)

**PORTABLE**

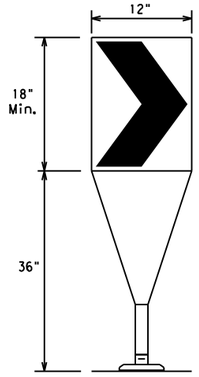
## VERTICAL PANELS (VPs)

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




## OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

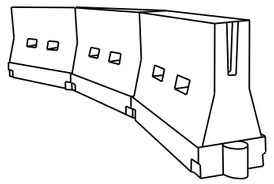
1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The 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.




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



## 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

## 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.

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

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

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

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

# BC(9)-21

| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
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| 7-13 5-21 | LBB | GARZA | | 26 |

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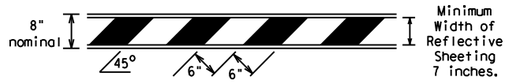
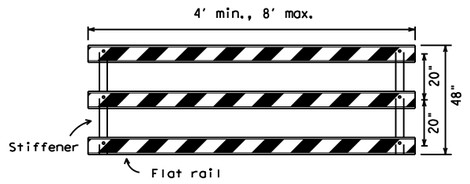
## TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



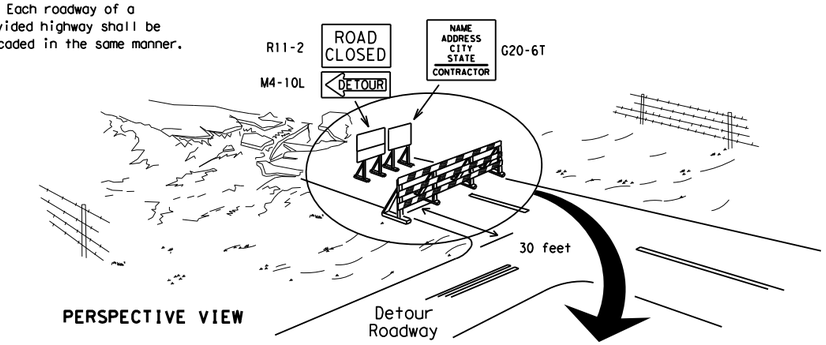

### TYPICAL STRIPING DETAIL FOR BARRICADE RAIL




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

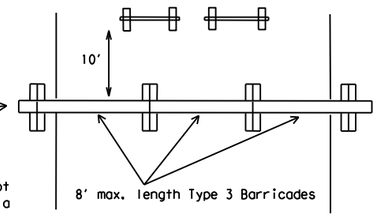
### TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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




PERSPECTIVE VIEW

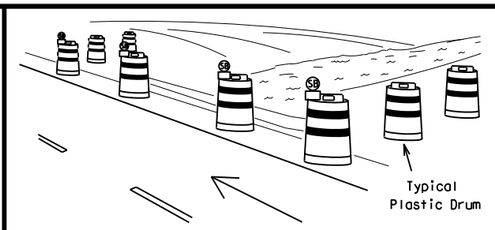
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.




PLAN VIEW

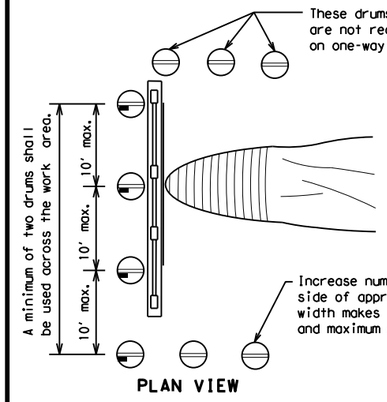
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

### TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION




PERSPECTIVE VIEW

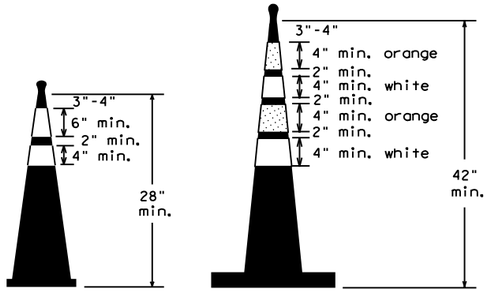
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



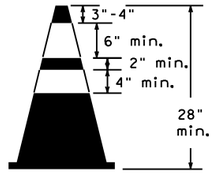

| LEGEND | |
|---|---|
| | Plastic drum |
| | Plastic drum with steady burn light or yellow warning reflector |
| SB | Steady burn warning light or yellow warning reflector |

PLAN VIEW

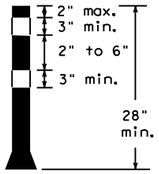
### CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS




Two-Piece cones




One-Piece cones

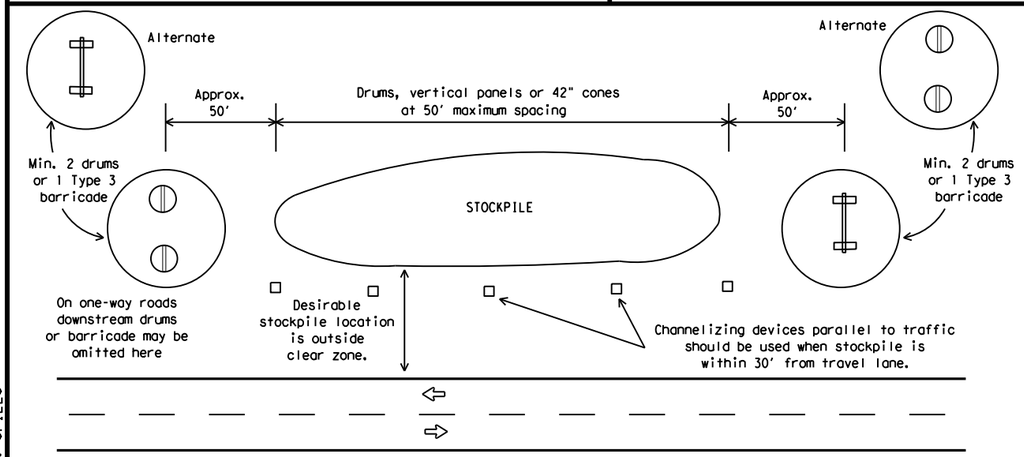



Tubular Marker

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

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

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




### TRAFFIC CONTROL FOR MATERIAL STOCKPILES



Texas Department of Transportation — Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

# BC(10)-21

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DATE: $DATE$
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# WORK ZONE PAVEMENT MARKINGS

## GENERAL

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

## RAISED PAVEMENT MARKERS

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

## PREFABRICATED PAVEMENT MARKINGS

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

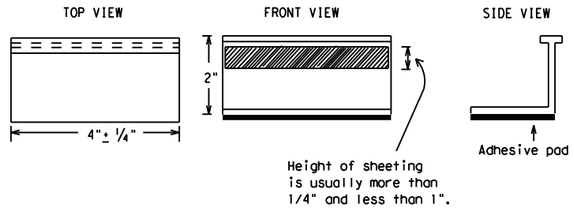
## MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

## REMOVAL OF PAVEMENT MARKINGS

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

# Temporary Flexible-Reflective Roadway Marker Tabs




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

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

## RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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



Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

# BC(11)-21

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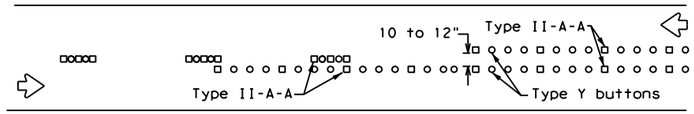
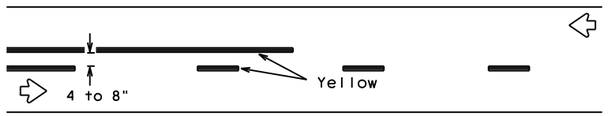
# PAVEMENT MARKING PATTERNS

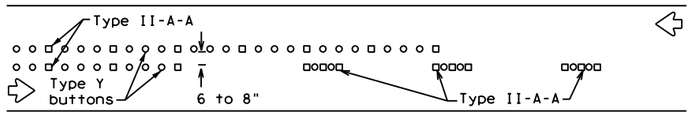

REFLECTORIZED PAVEMENT MARKINGS - PATTERN A




RAISED PAVEMENT MARKERS - PATTERN A



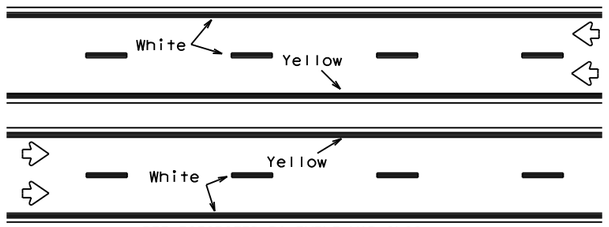

REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



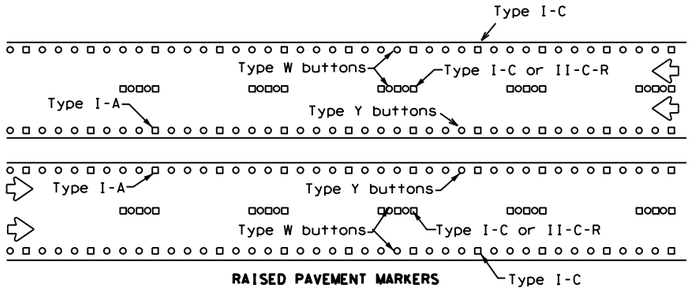

RAISED PAVEMENT MARKERS - PATTERN B

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

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



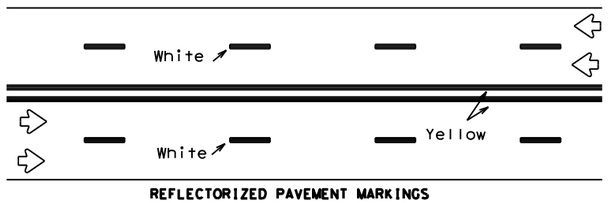

REFLECTORIZED PAVEMENT MARKINGS



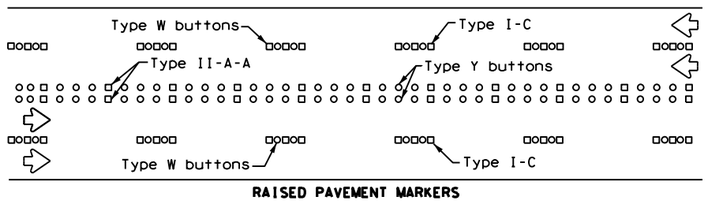

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



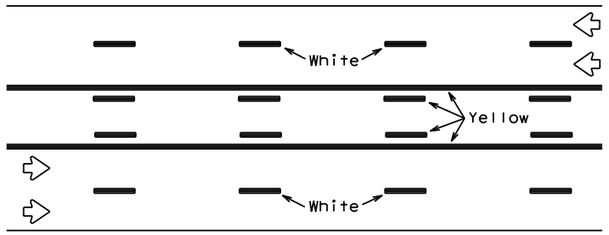

REFLECTORIZED PAVEMENT MARKINGS



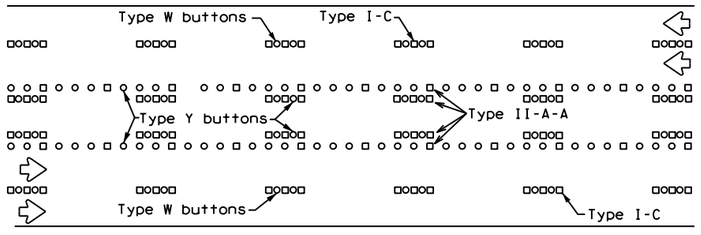

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS




REFLECTORIZED PAVEMENT MARKINGS




RAISED PAVEMENT MARKERS

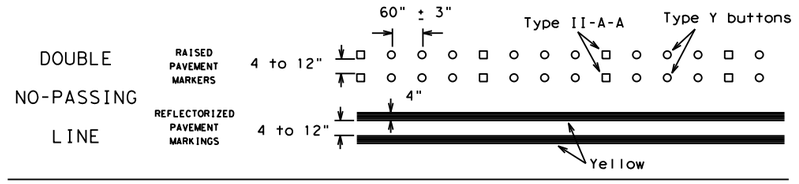
Prefabricated markings may be substituted for reflectorized pavement markings.

## TWO-WAY LEFT TURN LANE

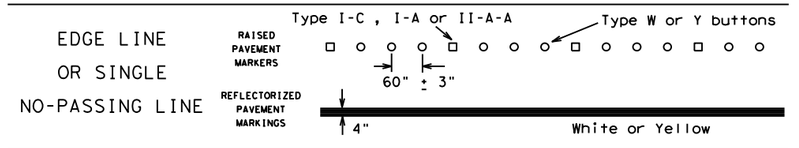
# STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

## SOLID LINES

DOUBLE NO-PASSING LINE

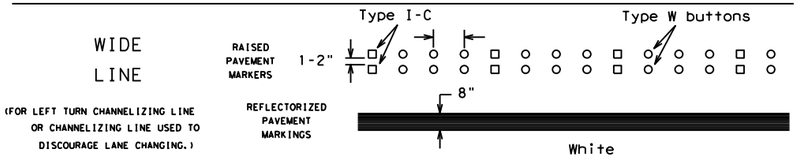



EDGE LINE OR SINGLE NO-PASSING LINE



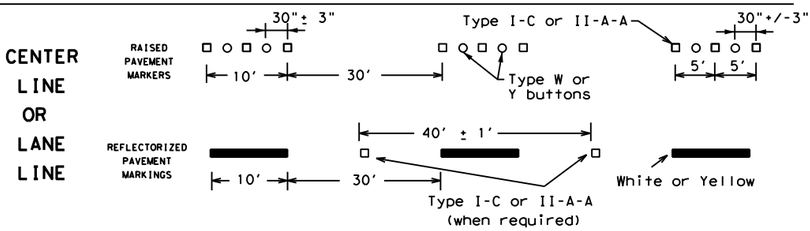

WIDE LINE

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

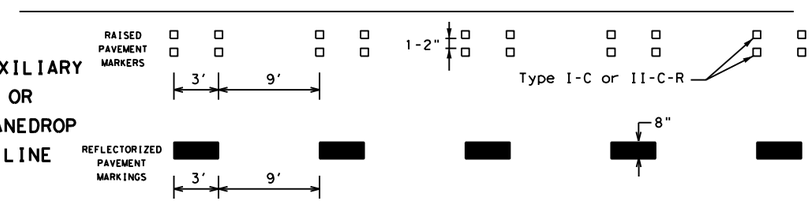



## BROKEN LINES

CENTER LINE OR LANE LINE

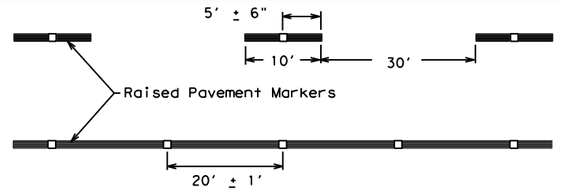



AUXILIARY OR LANEDROP LINE




### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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




Centerline only - not to be used on edge lines

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



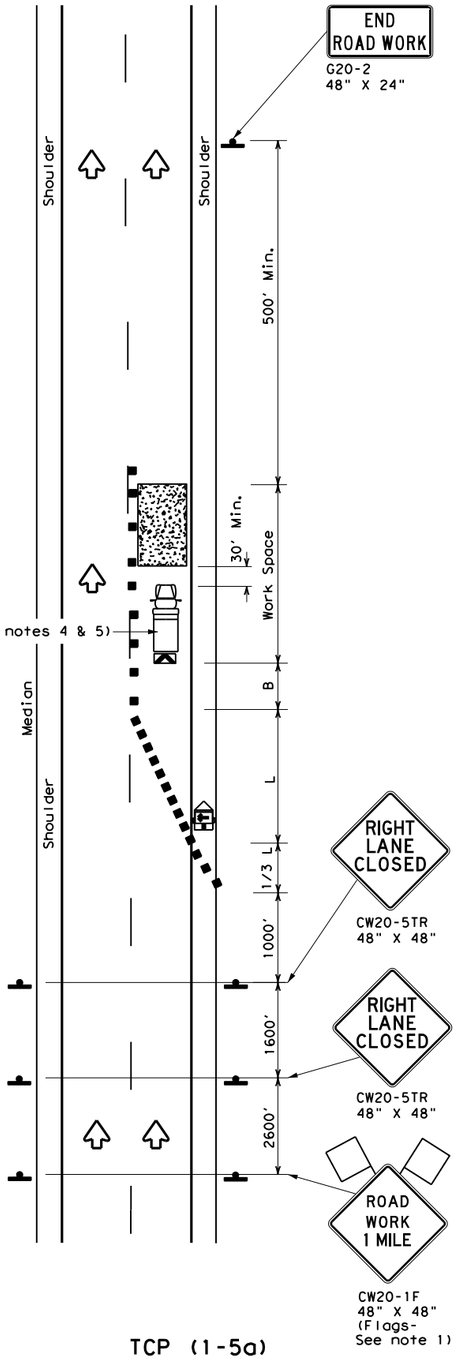
Texas Department of Transportation

Traffic Safety Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

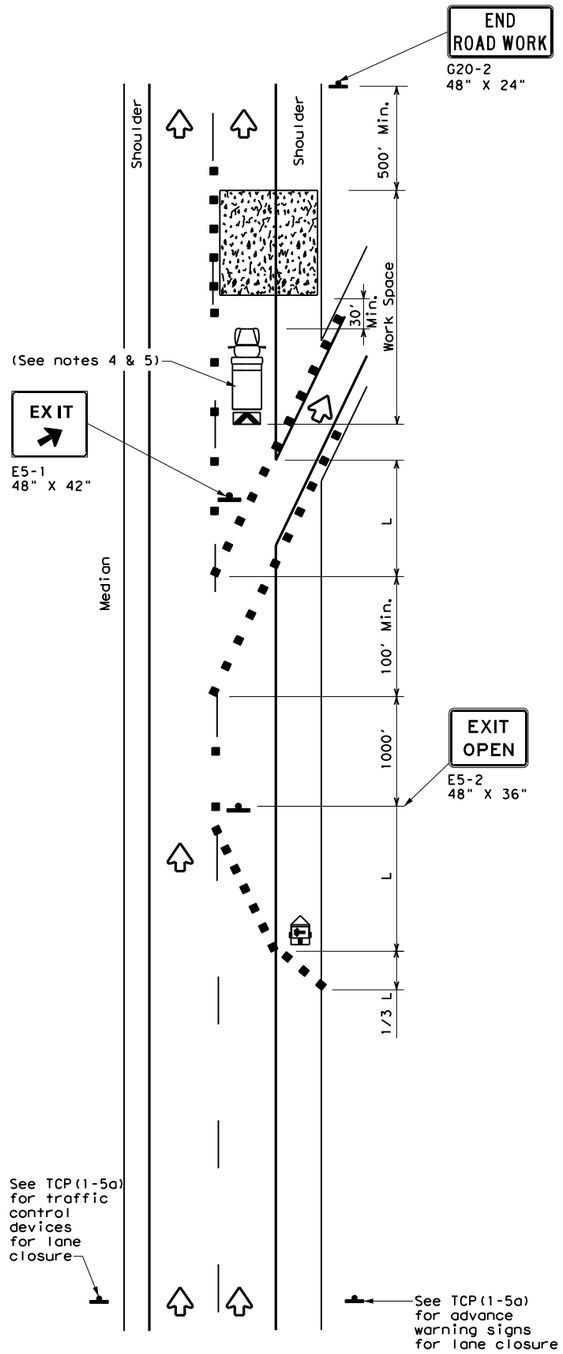
## BC(12)-21

| 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 | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 29 |



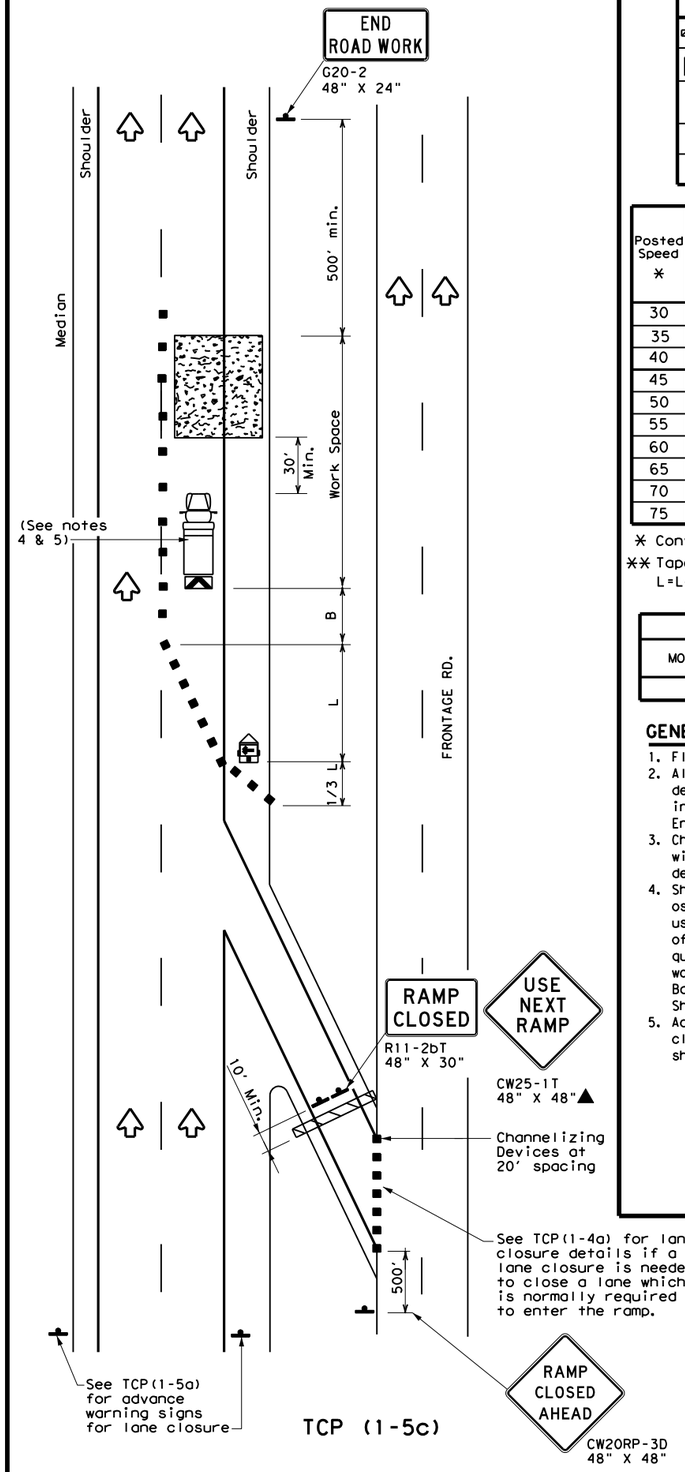

TCP (1-5a)

## ONE LANE CLOSURE




TCP (1-5b)

## LANE CLOSURE NEAR EXIT RAMPS




TCP (1-5c)

## LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

## GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
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 in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

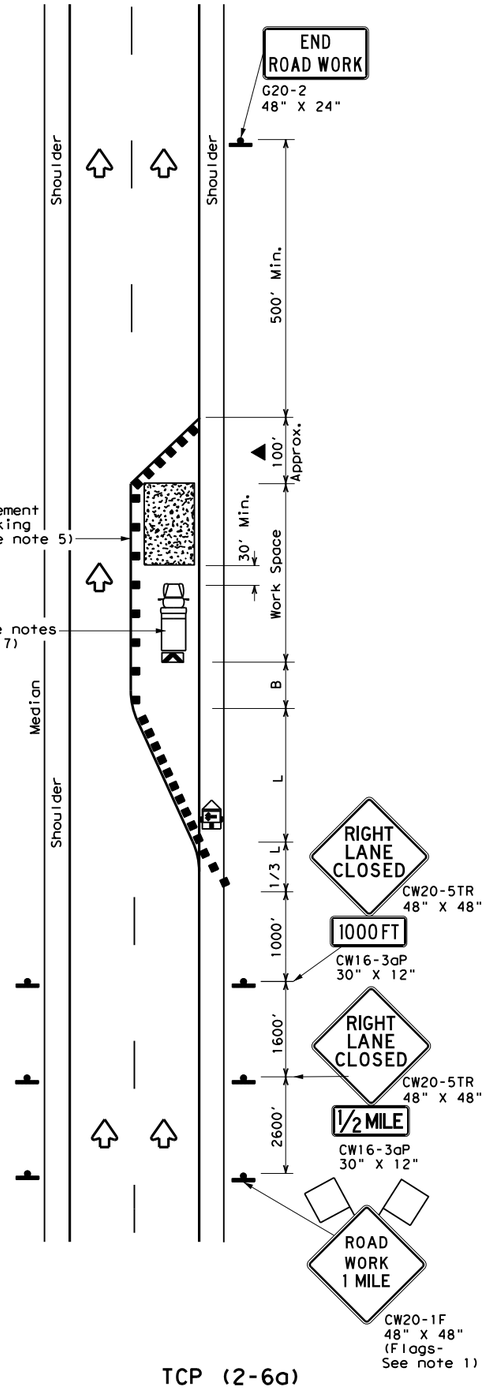
# TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

# TCP(1-5)-18

| FILE: tcp1-5-18.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| ©TxDOT February 2012 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 2-18 | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 30 |

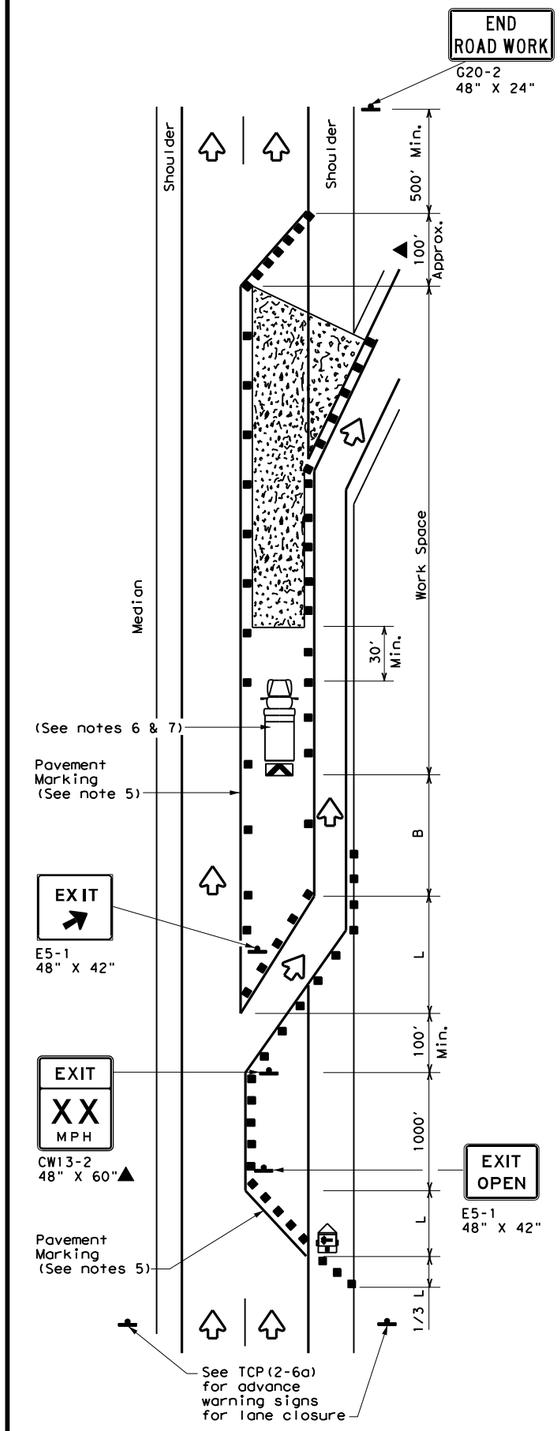
DATE: $DATE$
FILE: $FILE$

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



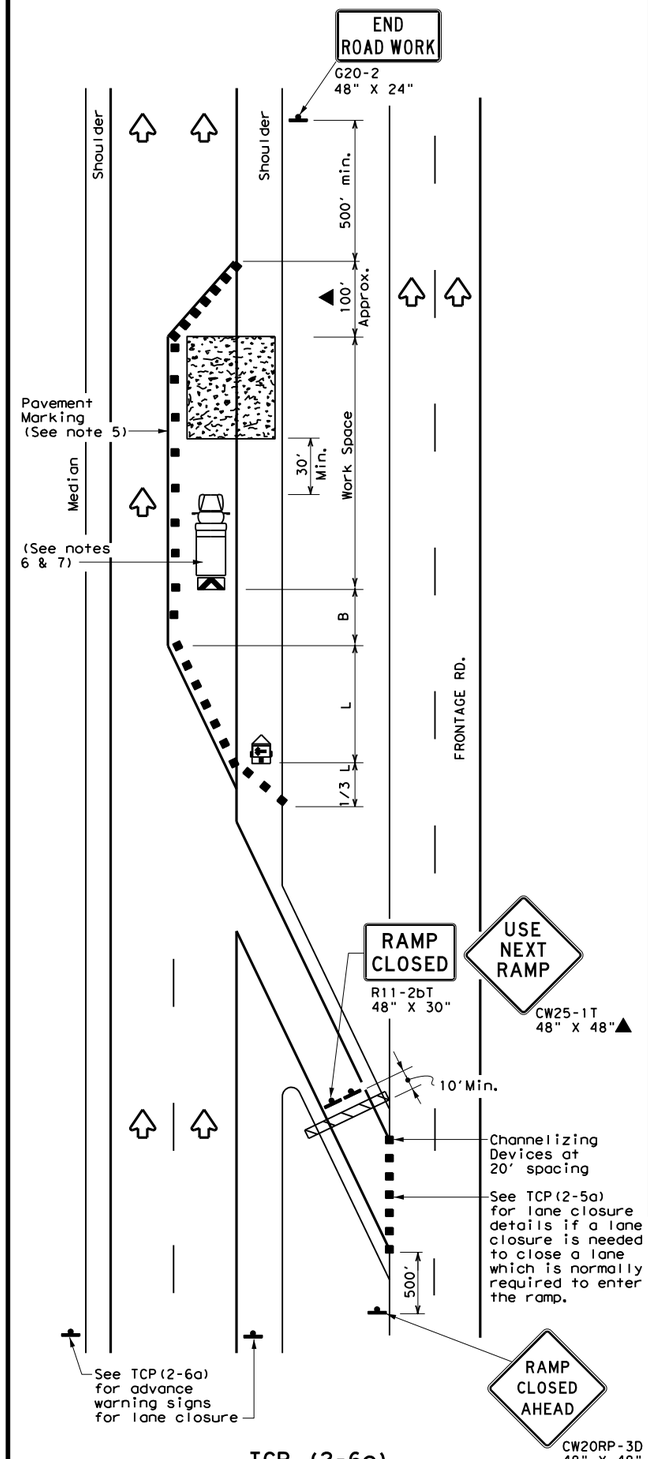

TCP (2-6a)

## ONE LANE CLOSURE




TCP (2-6b)

## LANE CLOSURE NEAR EXIT RAMPS




TCP (2-6c)

## LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

## GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. 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.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

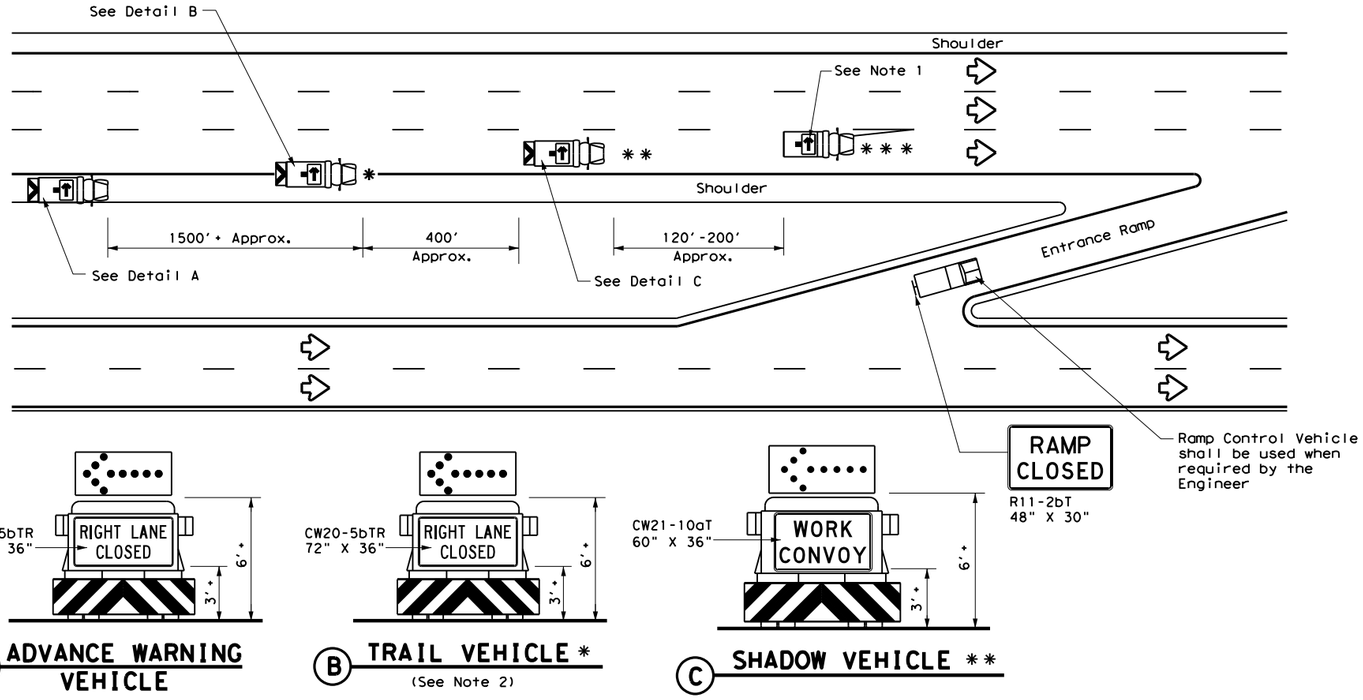
*Traffic Operations Division Standard*

# TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

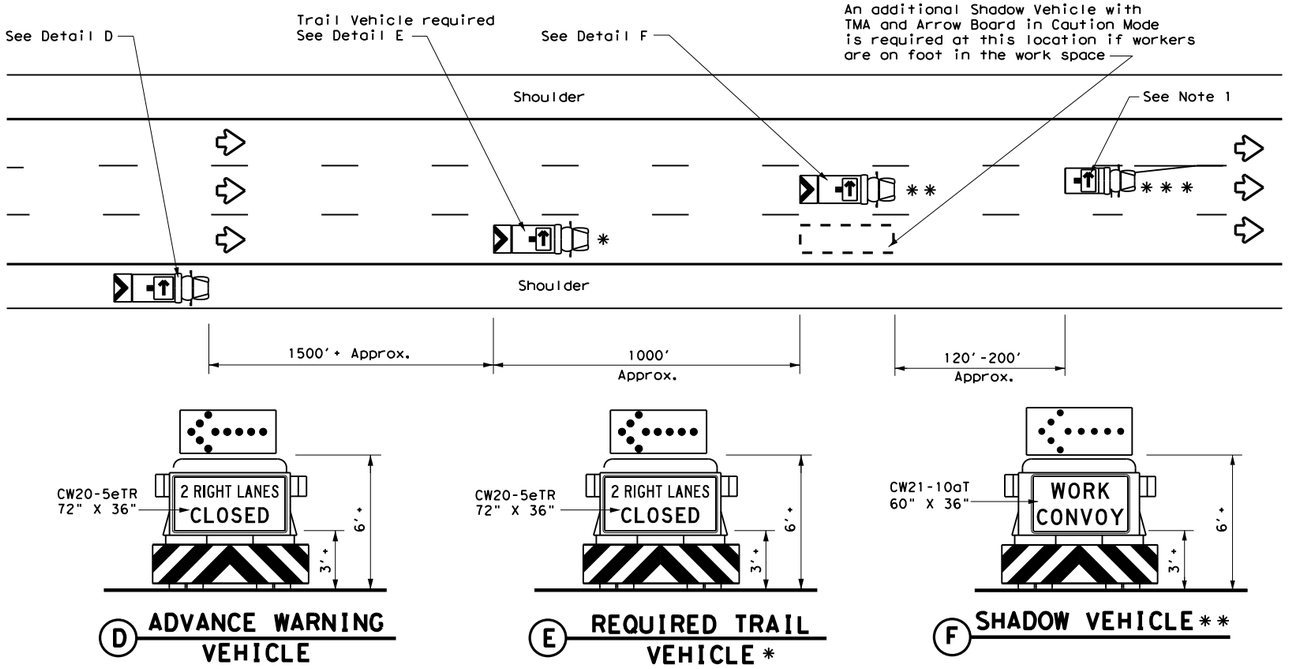
# TCP(2-6)-18

| FILE: tcp2-6-18.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| © TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18 | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 31 |

DATE: $DATE$
FILE: $FILE$




## RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)




## INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

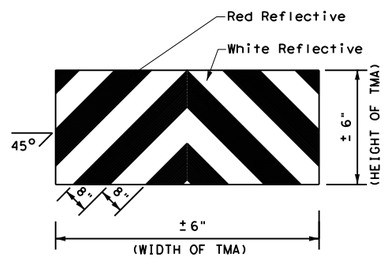
DATE: $DATE$
FILE: $FILE$

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

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

## GENERAL NOTES

1. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.




STRIPING FOR TMA

Texas Department of Transportation

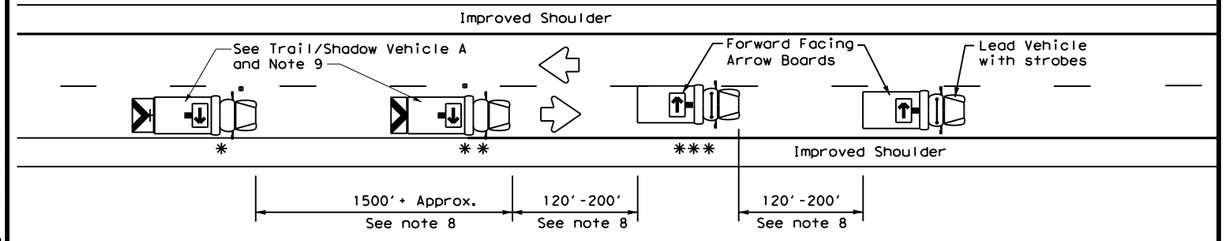
Traffic Operations Division Standard

# TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

# TCP(3-2)-13

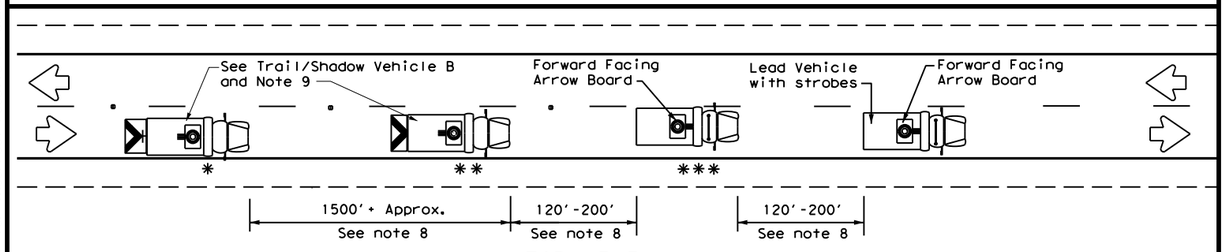
| FILE: tcp3-2.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 2-94 4-98 | DIST | COUNTY | | SHEET NO. |
| 8-95 7-13 | LBB | GARZA | | 32 |
| 1-97 | | | | |

176



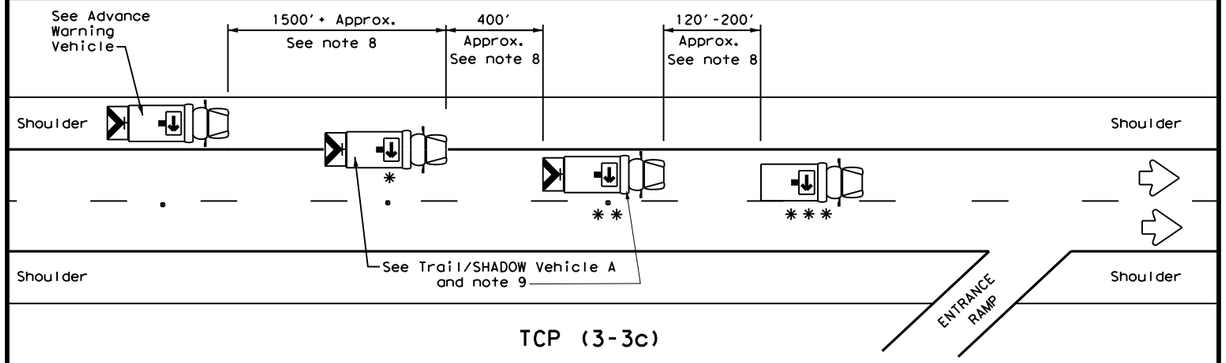

TCP (3-3a)

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



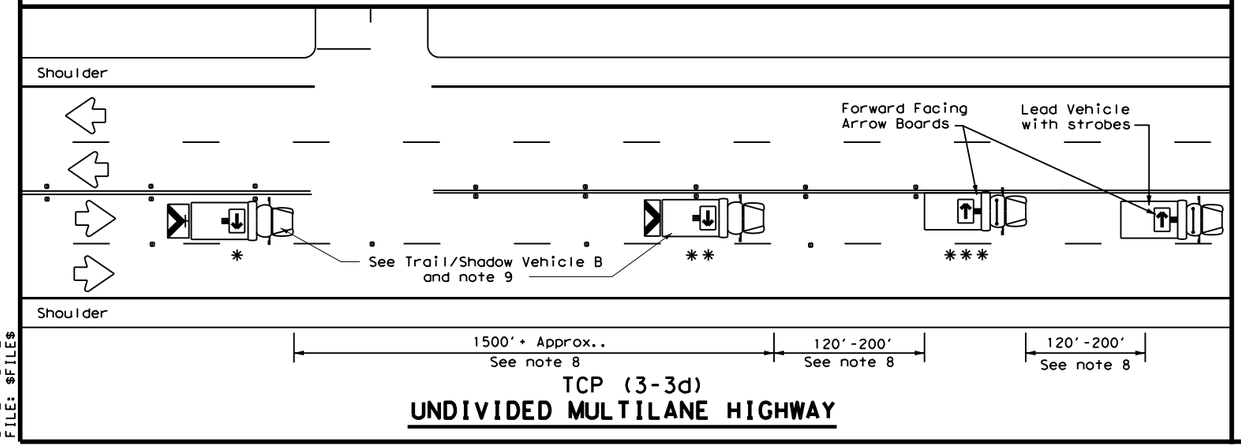

TCP (3-3b)

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




TCP (3-3c)

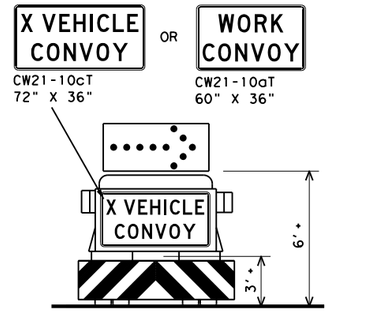
## DIVIDED MULTILANE HIGHWAY




TCP (3-3d)

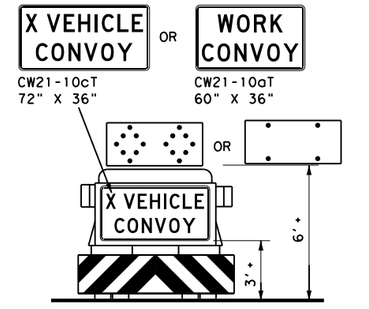
## UNDIVIDED MULTILANE HIGHWAY

DATE: $DATE$
FILE: $FILE$



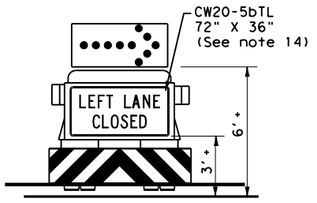

## TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

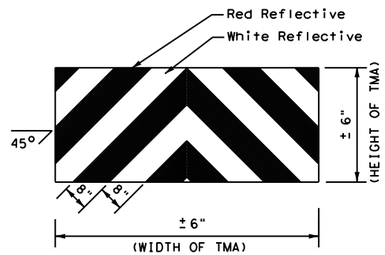



## TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode




## ADVANCE WARNING VEHICLE




## STRIPING FOR TMA

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

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

## GENERAL NOTES

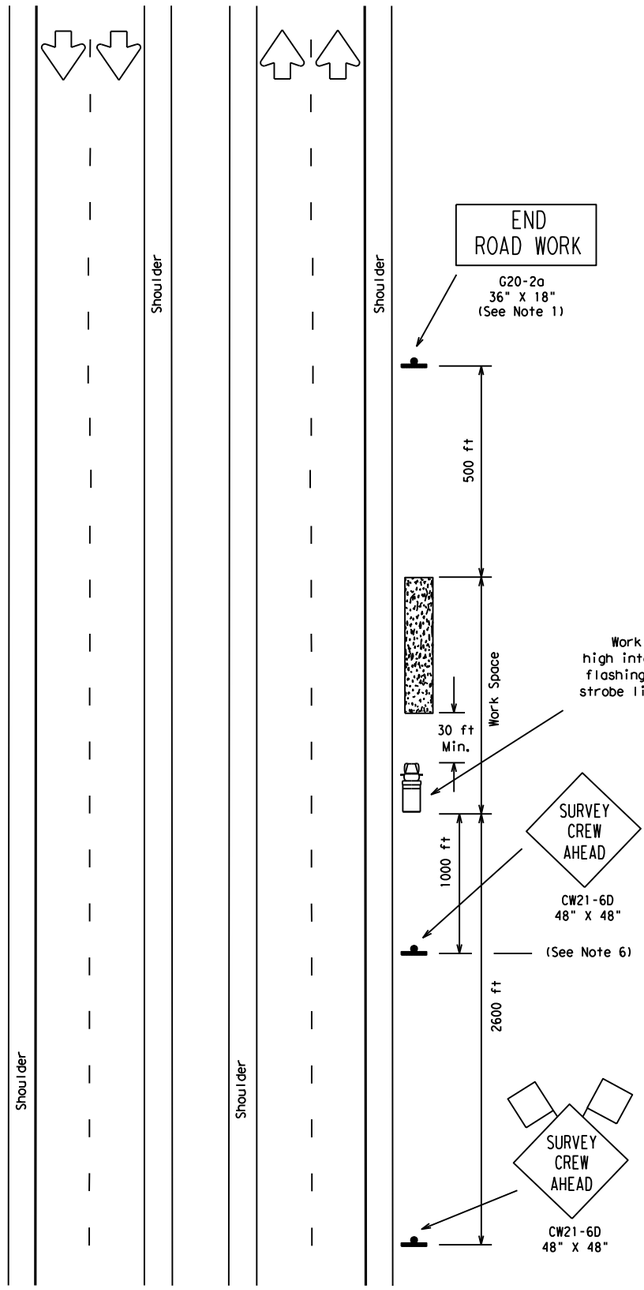
1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer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

Texas Department of Transportation

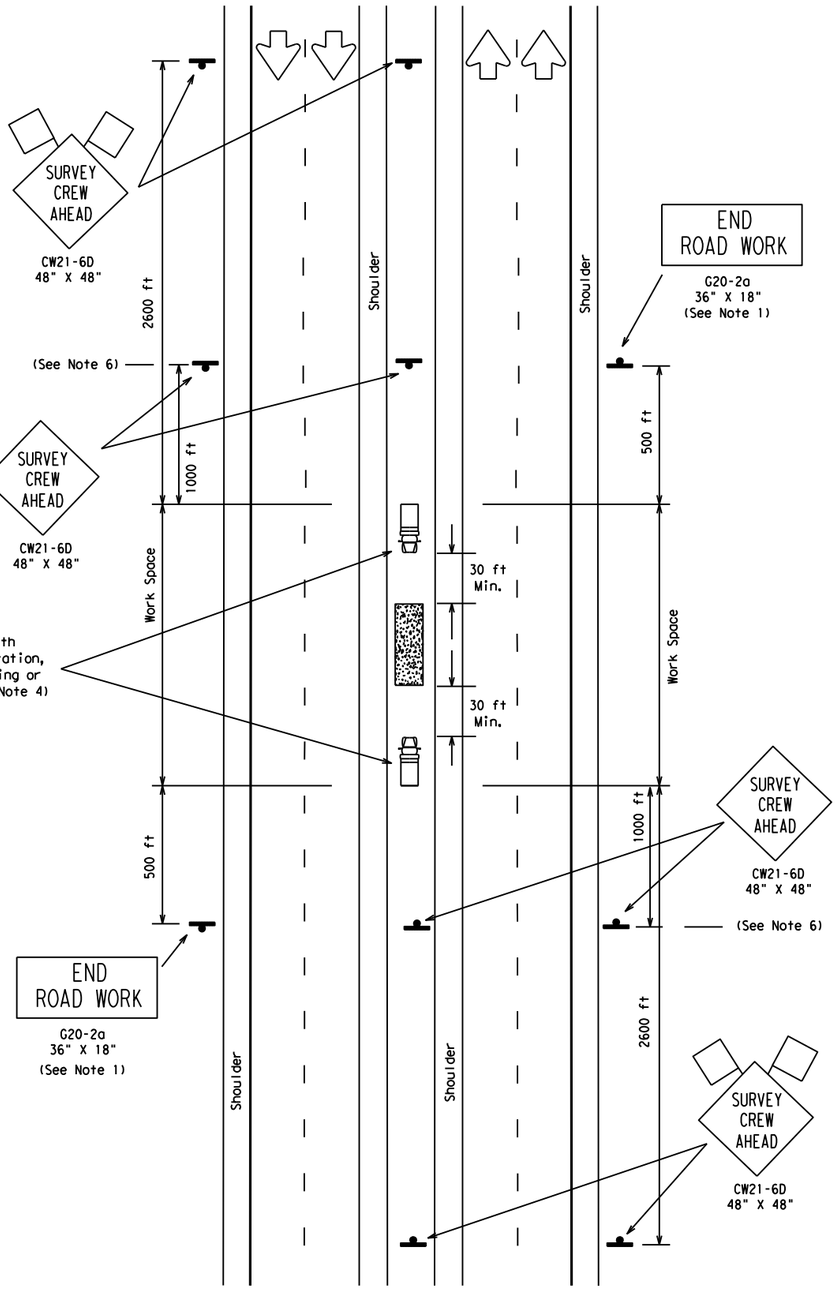
Traffic Operations Division Standard

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

| FILE: tcp3-3.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT September 1987 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 2-94 4-98 | DIST | COUNTY | | SHEET NO. |
| 8-95 7-13 | LBB | GARZA | | 33 |
| 1-97 7-14 | | | | |




TCP (S-4a)
WORK OFF RIGHT SHOULDER
OF DIVIDED ROADWAYS




TCP (S-4b)
WORK IN MEDIAN
OF DIVIDED ROADWAYS

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag
Heavy Work Vehicle Truck Mounted Attenuator (TMA)
Trailer Mounted Flashing Arrow Panel
Portable Changeable Message Sign (PCMS)
Flagger Sign Post

| Posted Speed ✳ | Formula | Minimum Desirable Taper Lengths ✳✳ 10' Offset | 11' Offset | 12' Offset | Suggested Maximum Spacing of Device On a Taper | On a Tangent | Min. Sign Spacing "X" Distance | Longitudinal Buffer Space "B" |
|---|---|---|---|---|---|---|---|---|
| 30 | $L = \frac{WS^2}{60}$ | 150' | 165' | 180' | 30' | 60'-75' | 120' | 90' |
| 35 | | 205' | 225' | 245' | 35' | 70'-90' | 160' | 120' |
| 40 | | 265' | 295' | 320' | 40' | 80'-100' | 240' | 155' |
| 45 | L=WS | 450' | 495' | 540' | 45' | 90'-110' | 320' | 195' |
| 50 | | 500' | 550' | 600' | 50' | 100'-125' | 400' | 240' |
| 55 | | 550' | 605' | 660' | 55' | 110'-140' | 500' | 295' |
| 60 | | 600' | 660' | 720' | 60' | 120'-150' | 600' | 350' |
| 65 | | 650' | 715' | 780' | 65' | 130'-165' | 700' | 410' |
| 70 | | 700' | 770' | 840' | 70' | 140'-175' | 800' | 475' |
| 75 | | 750' | 825' | 900' | 75' | 150'-185' | 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 |
| | ✓ | ✓ | | |

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be omitted for short duration (less than 1 hour) work.
2. When median work is protected on one side by existing median barriers, signing and protection vehicle may be omitted for the protected direction only.
3. CW20-1D "ROAD WORK AHEAD" signs may be substituted for "SURVEY CREW AHEAD" signs.
1. 4. A Shadow Vehicle with a TMA and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
5. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.
6. The CW21-6D "SURVEY CREW AHEAD" sign placed at 1000' ahead of the work space is optional, at the discretion of the Engineer. The signs shown at 2600' from the work space are required.
7. Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
1 Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

# TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

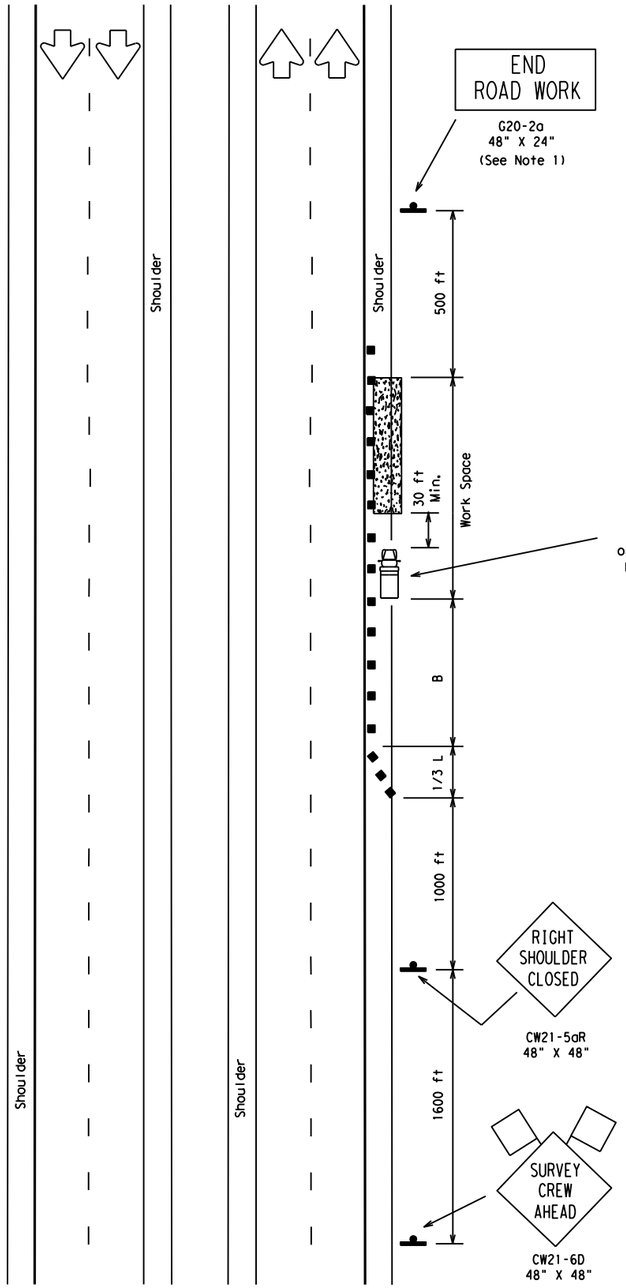
## TCP(S-4)-08A



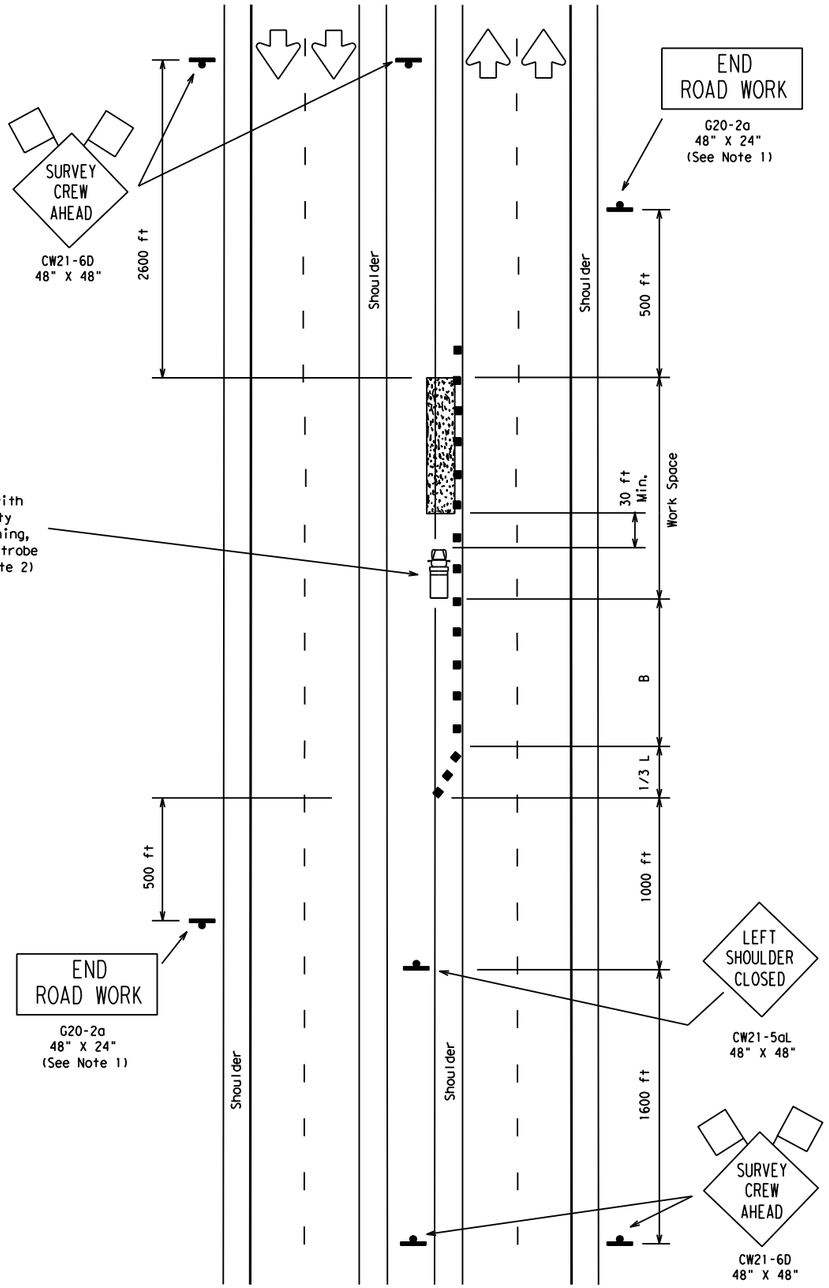
| DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|
| CONT | SECT | JOB | HIGHWAY |
| 0053 | 06 | 031 | US 84 |
| DIST | COUNTY | | SHEET NO. |
| LBB | GARZA | | 34 |

REVISIONS
8-08

DATE: $DATE$
FILE: $FILE$




TCP (S-5a)
WORK ON RIGHT SHOULDER
OF DIVIDED ROADWAYS




TCP (S-5b)
WORK ON MEDIAN SHOULDER
OF DIVIDED ROADWAYS

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag
Heavy Work Vehicle Truck Mounted Attenuator (TMA)
Trailer Mounted Flashing Arrow Panel
Portable Changeable Message Sign (PCMS)
Flagger Sign Post

| Posted Speed ✳ | Formula | Minimum Desirable Taper Lengths ✳✳ 10' Offset | 11' Offset | 12' Offset | Suggested Maximum Spacing of Device On a Taper | On a Tangent | Min. Sign Spacing "X" Distance | Longitudinal Buffer Space "B" |
|---|---|---|---|---|---|---|---|---|
| 30 | $L = \frac{WS^2}{60}$ | 150' | 165' | 180' | 30' | 60'-75' | 120' | 90' |
| 35 | | 205' | 225' | 245' | 35' | 70'-90' | 160' | 120' |
| 40 | | 265' | 295' | 320' | 40' | 80'-100' | 240' | 155' |
| 45 | L=WS | 450' | 495' | 540' | 45' | 90'-110' | 320' | 195' |
| 50 | | 500' | 550' | 600' | 50' | 100'-125' | 400' | 240' |
| 55 | | 550' | 605' | 660' | 55' | 110'-140' | 500' | 295' |
| 60 | | 600' | 660' | 720' | 60' | 120'-150' | 600' | 350' |
| 65 | | 650' | 715' | 780' | 65' | 130'-165' | 700' | 410' |
| 70 | | 700' | 770' | 840' | 70' | 140'-175' | 800' | 475' |
| 75 | | 750' | 825' | 900' | 75' | 150'-185' | 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 |
| | ✓ | ✓ | | |

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be omitted for short duration (less than 1 hour) work.
2. For short duration work, the Shadow Vehicle with TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
3. Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
4. If shoulders are not present, the 1/3L shoulder taper is to be omitted and four channelizing devices shall be placed in front of the arrow panel, perpendicular to traffic.
5. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
6. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

Texas Department of Transportation
Traffic Operations Division

# TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

## TCP(S-5)-08



REVISIONS

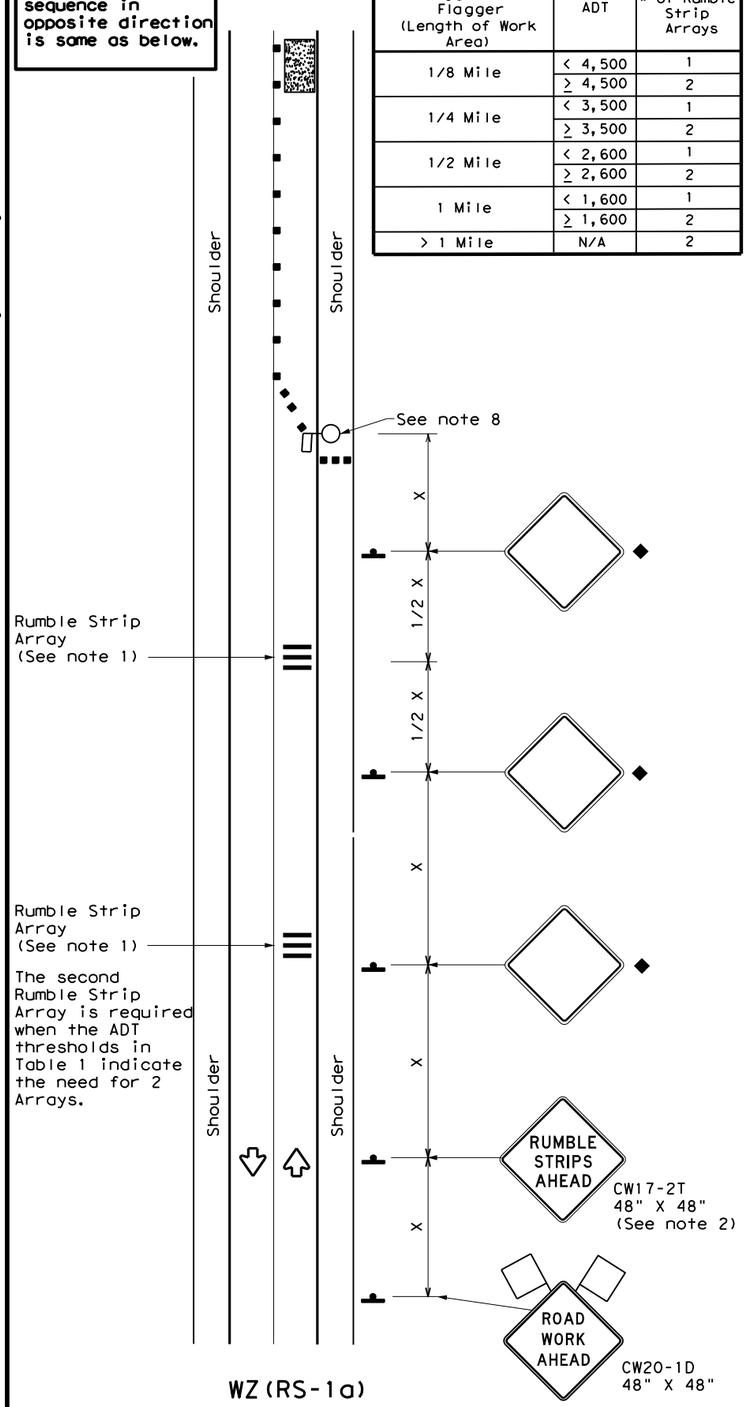
| DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|

| CONT | SECT | JOB | HIGHWAY |
|---|---|---|---|
| 0053 | 06 | 031 | US 84 |
| DIST | COUNTY | | SHEET NO. |
| LBB | GARZA | | 35 |

DATE: $DATE$
FILE: $FILE$

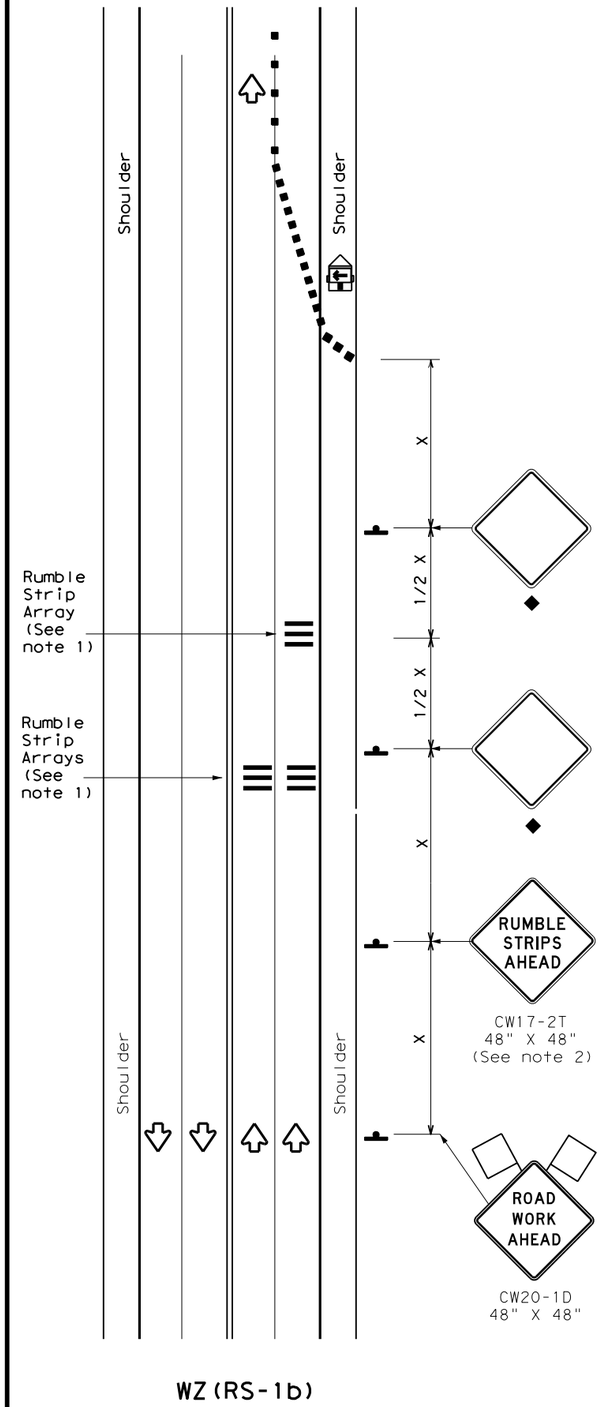
**Warning sign and rumble strip sequence in opposite direction is same as below.**

| 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 | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 36 |

117

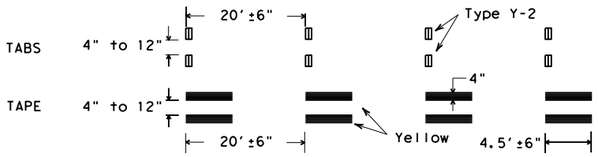
DATE: $DATE$
FILE: $FILE$

DATE: $DATE$
FILE: $FILE$

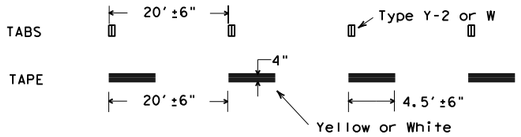
# WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

## SOLID LINES

DOUBLE NO-PASSING LINE

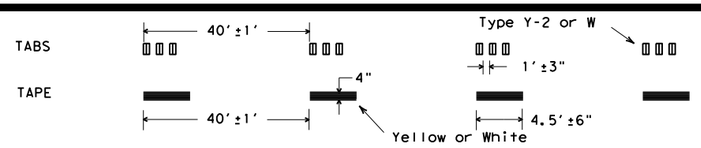



SINGLE NO-PASSING LINE or CHANNELIZATION LINE



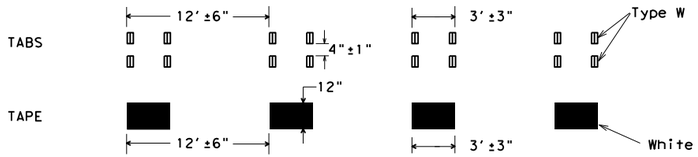

## BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

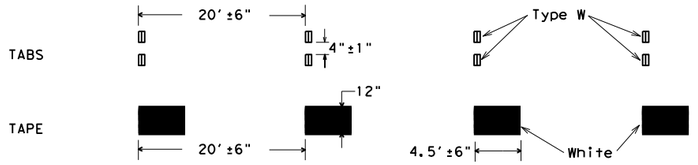



## WIDE DOTTED LINES

(FOR LANE DROP LINES)




## WIDE GORE MARKINGS



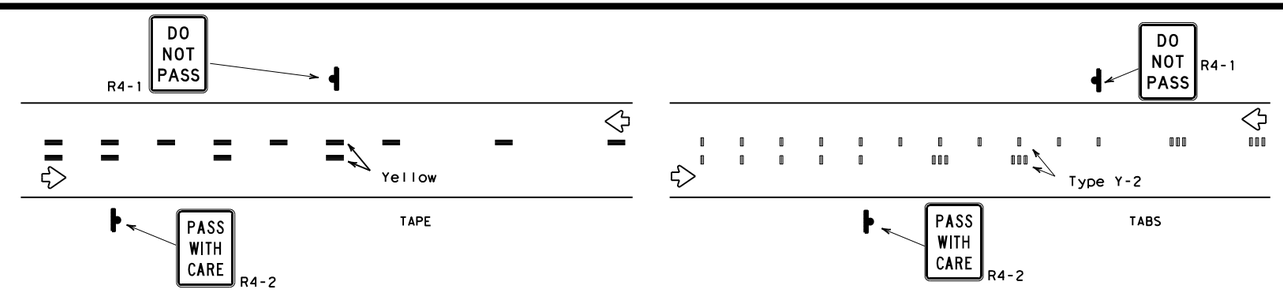

## NOTES:

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

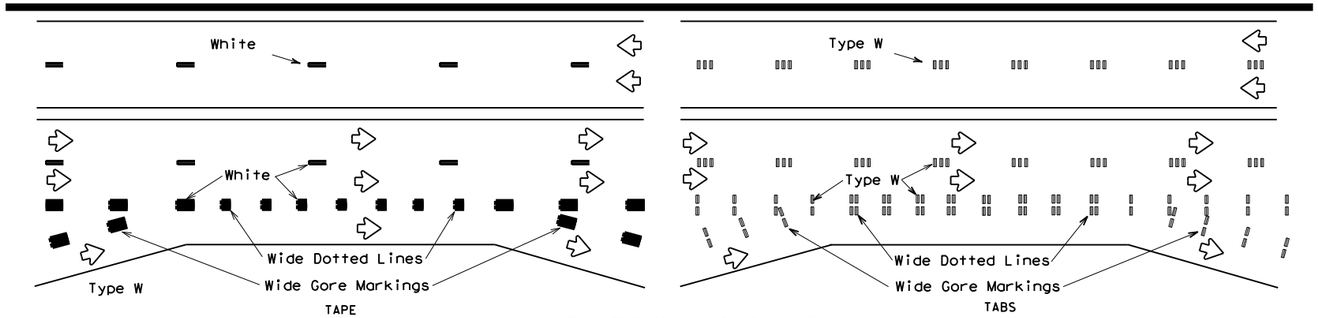
## TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

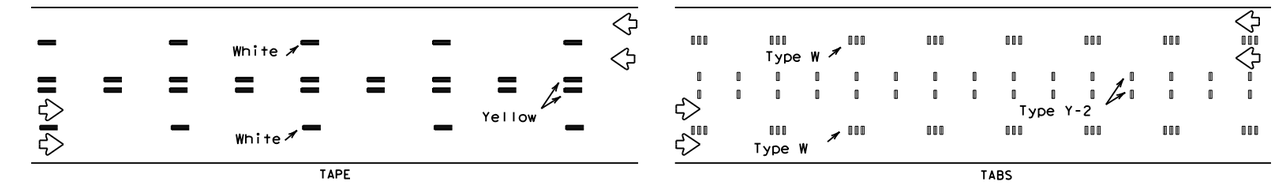
# WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



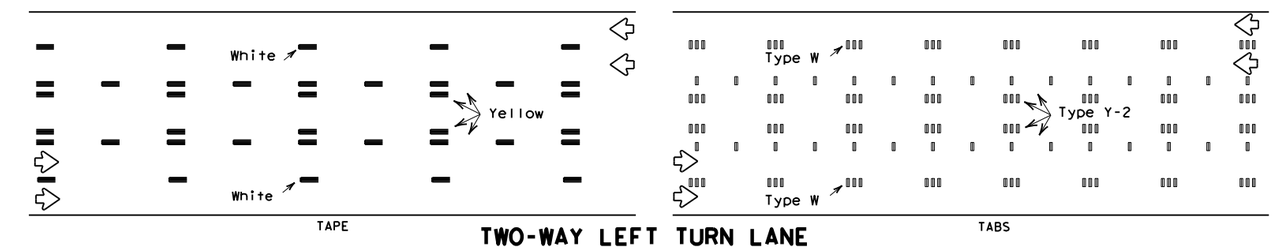

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



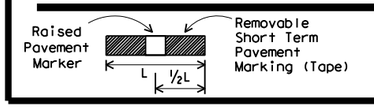

LANE LINES FOR DIVIDED HIGHWAY




LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS




TWO-WAY LEFT TURN LANE




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

## PREFABRICATED PAVEMENT MARKINGS

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

## RAISED PAVEMENT MARKERS

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

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

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

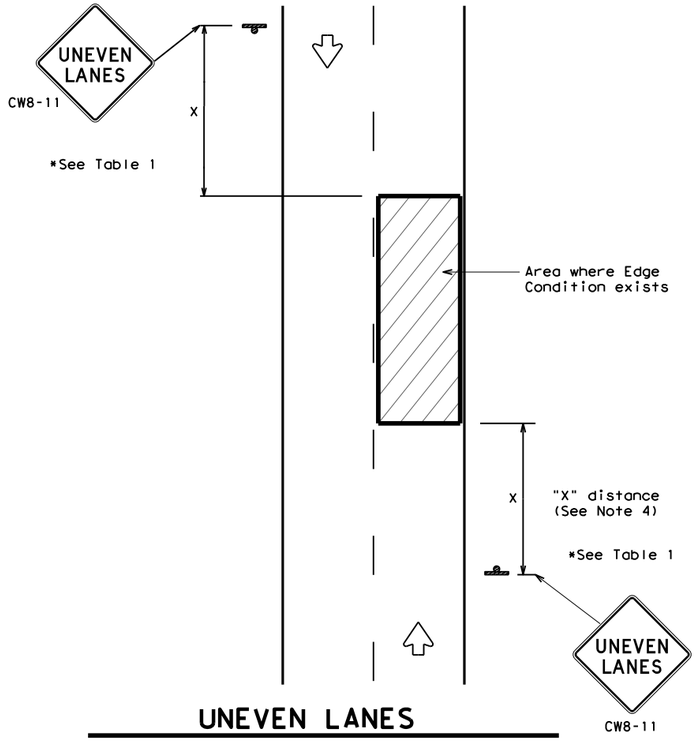
Texas Department of Transportation

Traffic Operations Division Standard

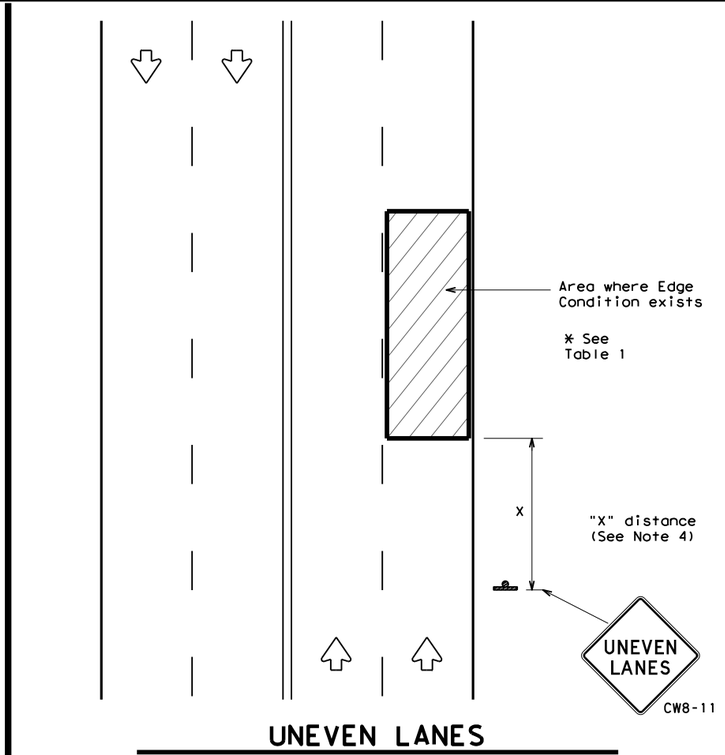
# WORK ZONE SHORT TERM PAVEMENT MARKINGS

## WZ(STPM)-13

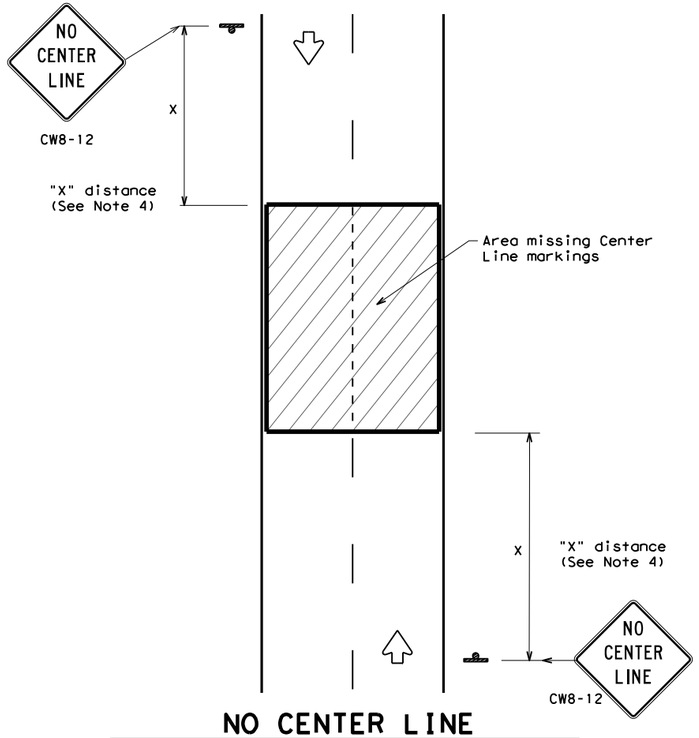
| FILE: | wzstpm-13.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|---|
| © TxDOT | April 1992 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | | 0053 | 06 | 031 | US 84 |
| 1-97 | | DIST | COUNTY | | SHEET NO. |
| 3-03 | | LBB | GARZA | | 37 |
| 7-13 | | | | | |



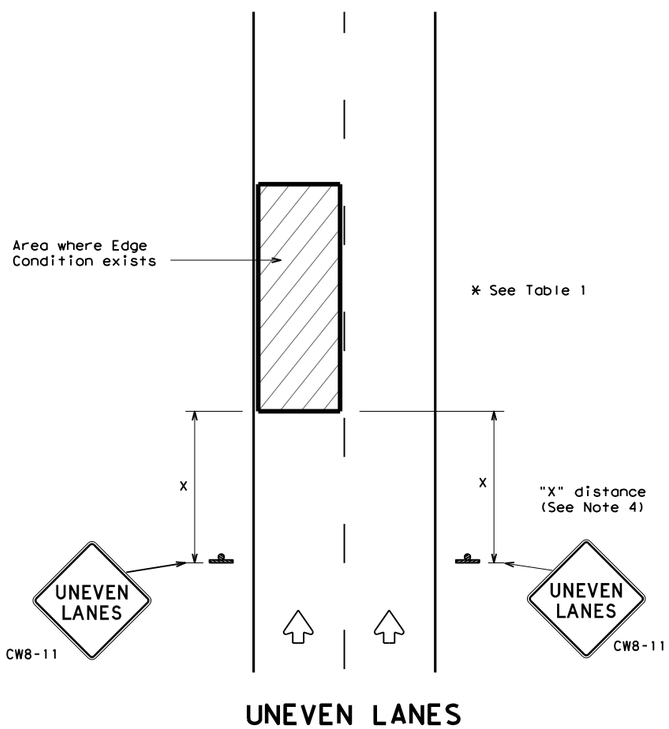

## UNEVEN LANES
## TWO LANE CONVENTIONAL ROAD




## UNEVEN LANES
## FOUR LANE CONVENTIONAL ROAD




## NO CENTER LINE
## TWO LANE CONVENTIONAL ROAD




## UNEVEN LANES
## DIVIDED ROADWAY

DATE: $DATE$
FILE: $FILE$

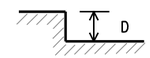
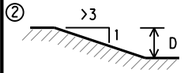
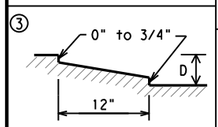
| DEPARTMENTAL MATERIAL SPECIFICATIONS | |
|---|---|
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |
| TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS | DMS-8241 |
| SIGN FACE MATERIALS | DMS-8300 |

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

## GENERAL NOTES

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

**TABLE 1**

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

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

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

Texas Department of Transportation

*Traffic Operations Division Standard*

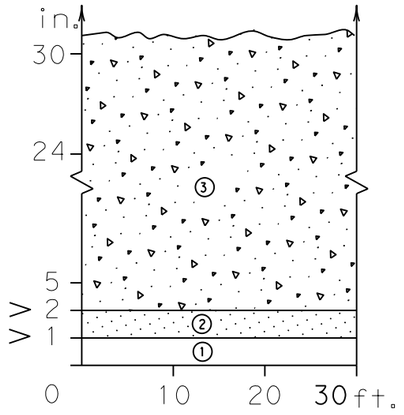
# SIGNING FOR UNEVEN LANES

# WZ(UL)-13

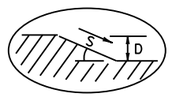
| FILE: wzul-13.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT April 1992 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 8-95 2-98 7-13 | DIST | COUNTY | | SHEET NO. |
| 1-97 3-03 | LBB | GARZA | | 38 |

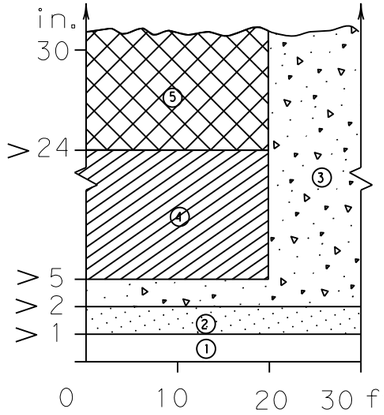
# DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

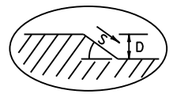


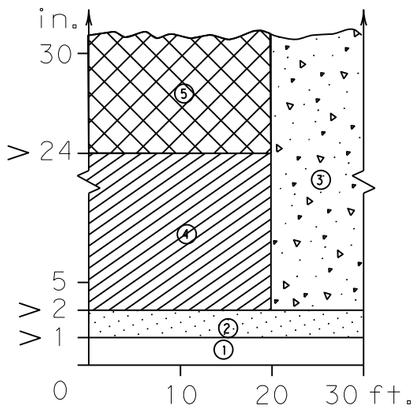

Edge Condition I
S = (3:1) (or flatter)



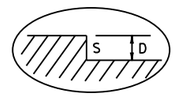



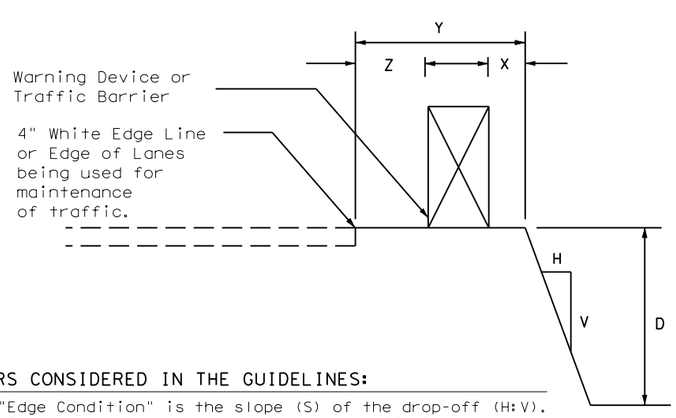

Edge Condition II
S = ((2.99):1) to (1:1)




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




## FACTORS CONSIDERED IN THE GUIDELINES:

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

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

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

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

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

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

## Edge Condition Notes:

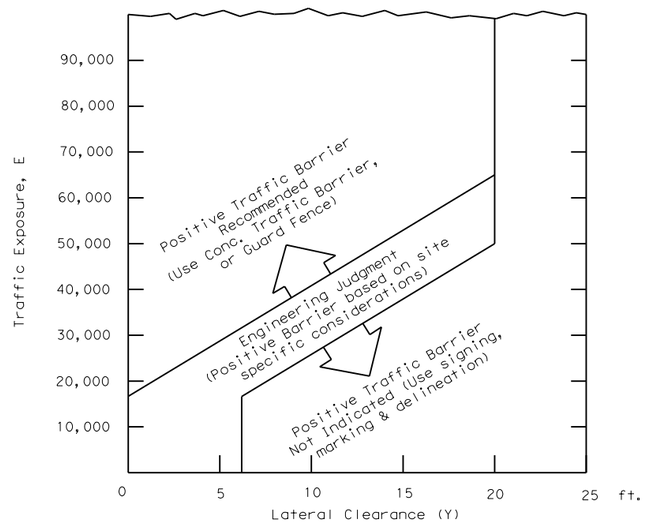
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

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

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




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

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

3. An approved end treatment should be provided for any positive barrier end located within the clear zone.

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

Engineer's Seal

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

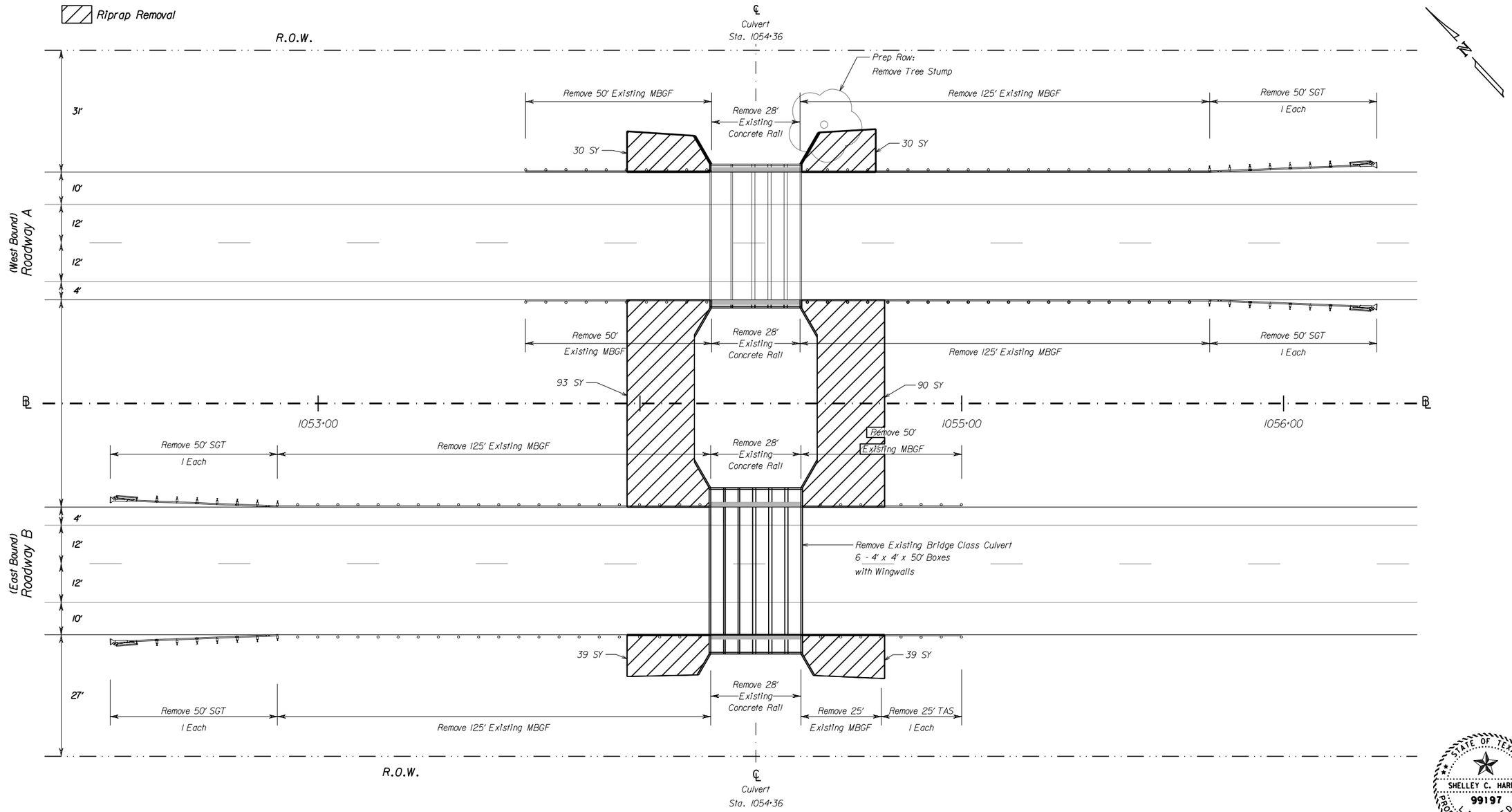
Texas Department of Transportation

Traffic Safety Division Standard

# TREATMENT FOR VARIOUS EDGE CONDITIONS

| FILE: edgecon.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| ©TxDOT August 2000 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 03-01 08-01 9-21 | DIST | COUNTY | | SHEET NO. |
| | LBB | GRAZA | | 39 |

DATE: $DATE$2022 $TIME$ PM
FILE: DOCUMENT NAME




**REMOVALS SUMMARY**

| Item | | | 0100 | 0104 | 0104 | 0496 | 0542 | 0542 | 0544 |
|---|---|---|---|---|---|---|---|---|---|
| Code | | | 6006 | 6009 | 6037 | 6009 | 6001 | 6002 | 6003 |
| Item | | | PREP ROW (TREEXLESS THAN 24" DIA) | REMOVE RIPRAP | REMOVE CONCRETE RAIL | REMOV STR (BRIDGE 0 - 99 FT LENGTH) | REMOVE METAL BEAM GUARD FENCE | REMOVE TERMINAL ANCHOR SECTION | GUARDRAIL END TREATMENT (REMOVE) |
| Unit of Measure | | | EA | SY | LF | EA | LF | EA | EA |
| Description | Station Start | Station End | | | | | | | |
| Unit | STA | STA | | | | | | | |
| Roadway A | 1053+64.40 | 1056+29.05 | 1 | 60 | 56 | | 350 | | 2 |
| Roadway B | 1052+35.41 | 1055+00.00 | | 78 | 56 | 1 | 325 | 1 | 2 |
| Center Median | 1053+93.00 | 1054+80.00 | | 183 | | | | | |
| | | | | | | | | | |
| TOTAL | | | 1 | 321 | 112 | 1 | 675 | 1 | 4 |

# REMOVAL LAYOUT

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

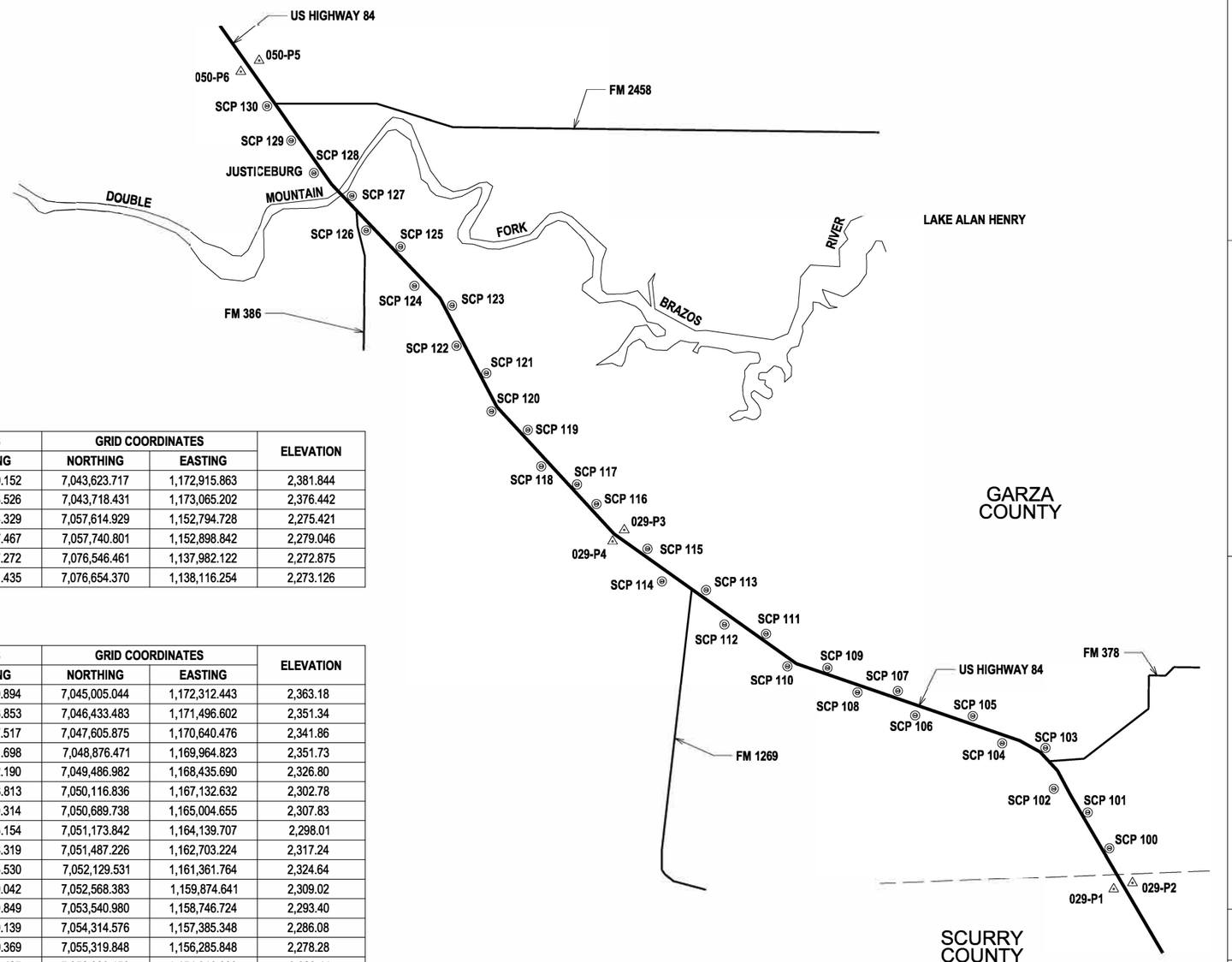
Shelley C. Harris, P.E.
11/4/2022


Texas Department of Transportation

No Scale Sheet 1 of 1

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 40 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US0084_RDW_REMOVAL_LAYOUT.dgn | | |

DATE: @DATE@ @TIME@
FILE: @FILE@




| PRIMARY CONTROL | | SURFACE COORDINATES | | GRID COORDINATES | | ELEVATION |
|---|---|---|---|---|---|---|
| POINT NUMBER | COUNTY | NORTHING | EASTING | NORTHING | EASTING | |
| 029-P1 | SCURRY | 7,045,264.881 | 1,173,189.152 | 7,043,623.717 | 1,172,915.863 | 2,381.844 |
| 029-P2 | SCURRY | 7,045,359.617 | 1,173,338.526 | 7,043,718.431 | 1,173,065.202 | 2,376.442 |
| 029-P3 | GARZA | 7,059,259.353 | 1,153,063.329 | 7,057,614.929 | 1,152,794.728 | 2,275.421 |
| 029-P4 | GARZA | 7,059,385.255 | 1,153,167.467 | 7,057,740.801 | 1,152,898.842 | 2,279.046 |
| 050-P5 | GARZA | 7,078,195.296 | 1,138,247.272 | 7,076,546.461 | 1,137,982.122 | 2,272.875 |
| 050-P6 | GARZA | 7,078,303.230 | 1,138,381.435 | 7,076,654.370 | 1,138,116.254 | 2,273.126 |

| SECONDARY CONTROL | | SURFACE COORDINATES | | GRID COORDINATES | | ELEVATION |
|---|---|---|---|---|---|---|
| POINT NUMBER | COUNTY | NORTHING | EASTING | NORTHING | EASTING | |
| SCP 100 | GARZA | 7,046,732.479 | 1,172,599.894 | 7,045,005.044 | 1,172,312.443 | 2,363.18 |
| SCP 101 | GARZA | 7,048,161.268 | 1,171,783.853 | 7,046,433.483 | 1,171,496.602 | 2,351.34 |
| SCP 102 | GARZA | 7,049,333.948 | 1,170,927.517 | 7,047,605.875 | 1,170,640.476 | 2,341.86 |
| SCP 103 | GARZA | 7,050,604.856 | 1,170,251.698 | 7,048,876.471 | 1,169,964.823 | 2,351.73 |
| SCP 104 | GARZA | 7,051,215.516 | 1,168,722.190 | 7,049,486.982 | 1,168,435.690 | 2,326.80 |
| SCP 105 | GARZA | 7,051,845.525 | 1,167,418.813 | 7,050,116.836 | 1,167,132.632 | 2,302.78 |
| SCP 106 | GARZA | 7,052,418.567 | 1,165,290.314 | 7,050,689.738 | 1,165,004.655 | 2,307.83 |
| SCP 107 | GARZA | 7,052,902.790 | 1,164,425.154 | 7,051,173.842 | 1,164,139.707 | 2,298.01 |
| SCP 108 | GARZA | 7,053,216.251 | 1,162,988.319 | 7,051,487.226 | 1,162,703.224 | 2,317.24 |
| SCP 109 | GARZA | 7,053,858.713 | 1,161,646.530 | 7,052,129.531 | 1,161,361.764 | 2,324.64 |
| SCP 110 | GARZA | 7,054,297.673 | 1,160,159.042 | 7,052,568.383 | 1,159,874.641 | 2,309.02 |
| SCP 111 | GARZA | 7,055,270.508 | 1,159,030.849 | 7,053,540.980 | 1,158,746.724 | 2,293.40 |
| SCP 112 | GARZA | 7,056,044.294 | 1,157,669.139 | 7,054,314.576 | 1,157,385.348 | 2,286.08 |
| SCP 113 | GARZA | 7,057,049.812 | 1,156,569.369 | 7,055,319.848 | 1,156,285.848 | 2,278.28 |
| SCP 114 | GARZA | 7,057,819.306 | 1,155,195.487 | 7,056,089.153 | 1,154,912.303 | 2,280.41 |
| SCP 115 | GARZA | 7,058,683.786 | 1,154,277.264 | 7,056,953.421 | 1,153,994.305 | 2,284.82 |
| SCP 116 | GARZA | 7,060,462.233 | 1,152,143.072 | 7,058,731.432 | 1,151,860.636 | 2,240.56 |
| SCP 117 | GARZA | 7,061,357.857 | 1,151,283.977 | 7,059,626.836 | 1,151,001.751 | 2,236.16 |
| SCP 118 | GARZA | 7,062,272.448 | 1,150,147.981 | 7,060,541.203 | 1,149,866.034 | 2,245.40 |
| SCP 119 | GARZA | 7,063,422.067 | 1,149,291.178 | 7,061,690.540 | 1,149,009.441 | 2,254.72 |
| SCP 120 | GARZA | 7,064,473.825 | 1,148,208.793 | 7,062,742.041 | 1,147,927.321 | 2,271.05 |
| SCP 121 | GARZA | 7,065,915.293 | 1,147,625.934 | 7,064,183.155 | 1,147,344.605 | 2,287.74 |
| SCP 122 | GARZA | 7,067,098.014 | 1,146,821.438 | 7,065,365.586 | 1,146,540.306 | 2,279.41 |
| SCP 123 | GARZA | 7,068,496.633 | 1,146,246.240 | 7,066,763.863 | 1,145,965.249 | 2,274.63 |
| SCP 124 | GARZA | 7,069,605.721 | 1,145,172.521 | 7,067,872.679 | 1,144,891.794 | 2,281.69 |
| SCP 125 | GARZA | 7,070,859.819 | 1,144,195.548 | 7,069,126.469 | 1,143,915.060 | 2,282.12 |
| SCP 126 | GARZA | 7,071,770.882 | 1,143,103.709 | 7,070,037.309 | 1,142,823.489 | 2,255.15 |
| SCP 127 | GARZA | 7,072,996.172 | 1,142,168.115 | 7,071,262.298 | 1,141,888.124 | 2,247.86 |
| SCP 128 | GARZA | 7,074,021.555 | 1,141,065.387 | 7,072,287.430 | 1,140,785.666 | 2,245.70 |
| SCP 129 | GARZA | 7,075,419.885 | 1,140,154.996 | 7,073,685.417 | 1,139,875.499 | 2,248.08 |
| SCP 130 | GARZA | 7,076,789.326 | 1,139,251.420 | 7,075,054.523 | 1,138,972.144 | 2,258.31 |

NOT TO SCALE

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A SURFACE ADJUSTMENT OF 1.000233 (GRID X 1.000233 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

DATE SET: MARCH 8, 2022

LEGEND:

- PRIMARY CONTROL
- SECONDARY CONTROL
- UTILITY POLE
- FENCE
- SIGN
- TELEPHONE RISER
- MAILBOX
- POST
- VALVE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED AS
BRIAN K. KIDD
6494
PROFESSIONAL
LAND SURVEYOR

BRIAN K. KIDD
RPLS NO. 6494

DATE: 4/29/2022

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

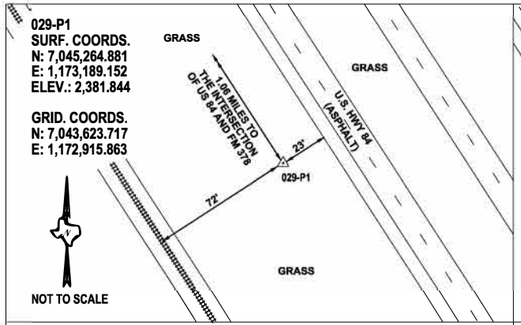
2022 © TEXAS DEPARTMENT OF TRANSPORTATION

# CONTROL INDEX SHEET

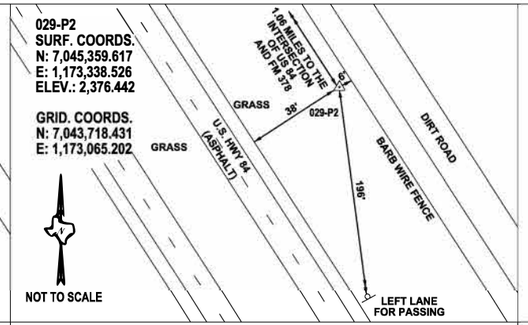
SCALE:N.T.S.

SHEET 1 OF 1

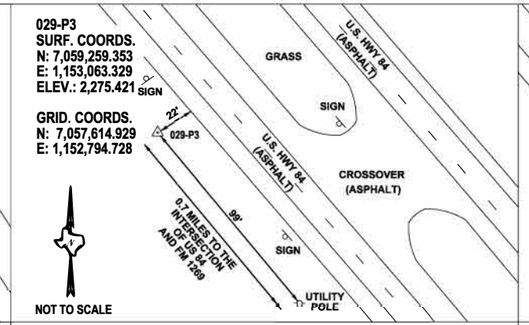
| FED. RD. DIV. NO. | FEDERAL AND PROJECT NO. | | | HIGHWAY NO. |
|---|---|---|---|---|
| 6 | | | | US 84 |
| STATE | DIST. | COUNTY | | SHEET NO. |
| TEXAS | LUB | GARZA - SCURRY | | 41 |
| CONTROL | SECTION | JOB | FUNCTION | |
| 0053 | 06 | 031 | 160 | |



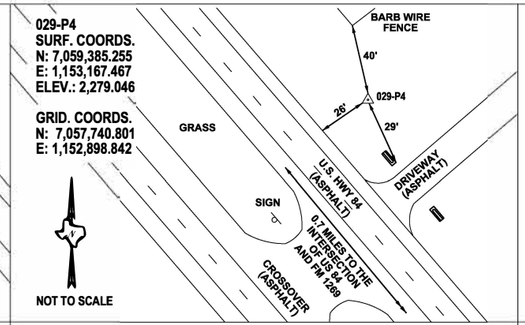

MONUMENT 029-P1 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN SCURRY COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 1.06 MILE SOUTHEAST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 378. +/- 23' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 72' NORTHEAST OF THE CENTER OF RAILROAD TRACKS.




MONUMENT 029-P2 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN SCURRY COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 1.06 MILE SOUTHEAST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 378. +/- 38' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 72' SOUTHWEST OF A BARB WIRE FENCE.




MONUMENT 029-P3 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 0.7 MILE NORTHWEST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 1269. +/- 22' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 99' NORTHWEST OF A UTILITY POLE.



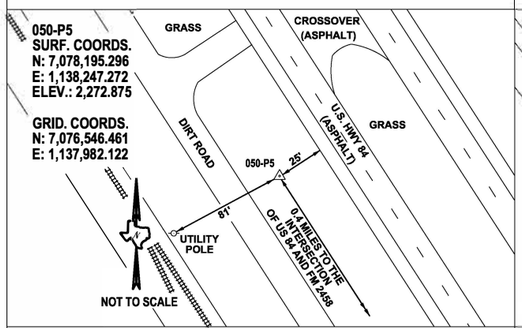

MONUMENT 029-P4 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 0.7 MILE NORTHWEST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 1269. +/- 26' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 40' SOUTHEAST OF A BARB WIRE FENCE CORNER. +/- 29' NORTHWEST OF THE SOUTHEAST CORNER OF A SAFETY END TREAMENT.

**NOTES:**
**HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A SURFACE ADJUSTMENT OF 1.000233 (GRID X 1.000233 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.**

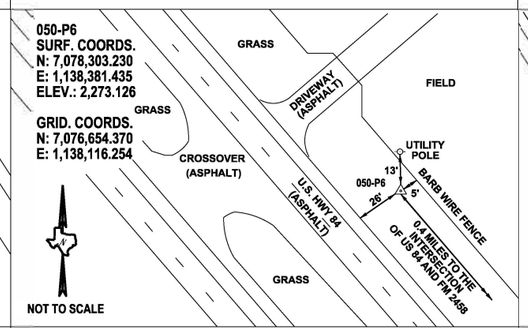
**ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.**

**GEOID 2018**

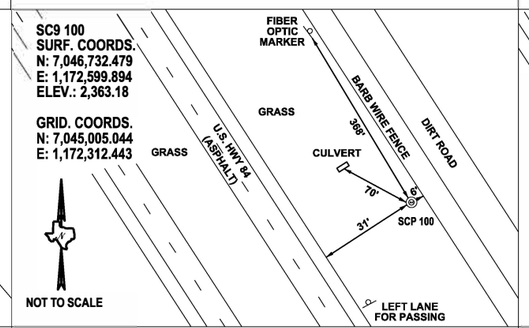
**DATE SET: MARCH 8, 2022**



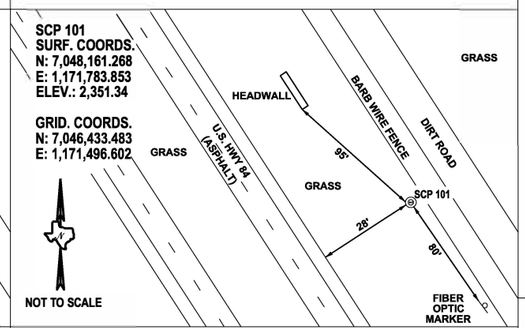

MONUMENT 029-P5 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 0.4 MILE NORTHWEST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 2458. +/- 25' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 81' NORTHEAST OF A UTILITY POLE.




MONUMENT 029-P6 IS A TXDOT 3 1/2 " ALUMINUM DISK SET (TYPE II CONSTRUCTION). LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 0.4 MILE NORTHWEST OF THE INTERSECTION OF U.S. HIGHWAY 84 AND FM 2458. +/- 26' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 5' SOUTHWEST OF A BARB WIRE FENCE. +/- 13' SOUTH OF A UTILITY POLE.



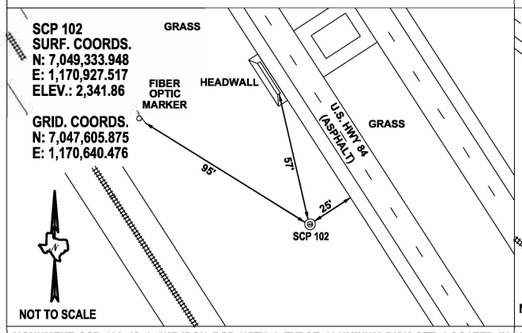

MONUMENT SCP 100 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 70' SOUTHEAST OF A CULVERT. +/- 31' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 6' SOUTHWEST OF A BARB WIRE FENCE.



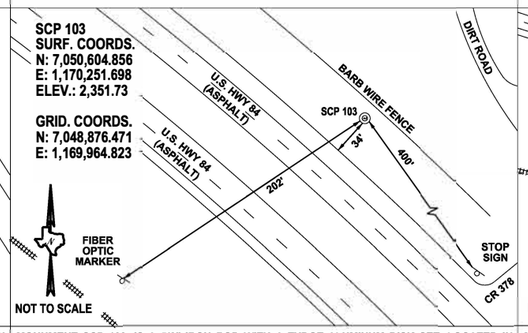

MONUMENT SCP 101 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 95' SOUTHEAST OF A HEADWALL. +/- 28' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 80' NORTHWEST OF A FIBER OPTIC MARKER.

**LEGEND:**

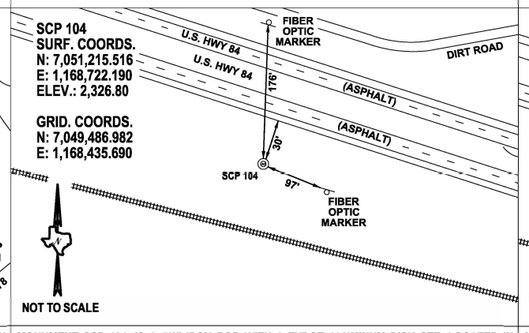
| | |
|---|---|
| PRIMARY CONTROL | △ |
| SECONDARY CONTROL | ◎ |
| UTILITY POLE | ○ |
| FENCE | ——— |
| SIGN | ⊘ |
| TELEPHONE RISER | T |
| MAILBOX | ▢ |
| POST | ◐ |
| VALVE | ⋈ |



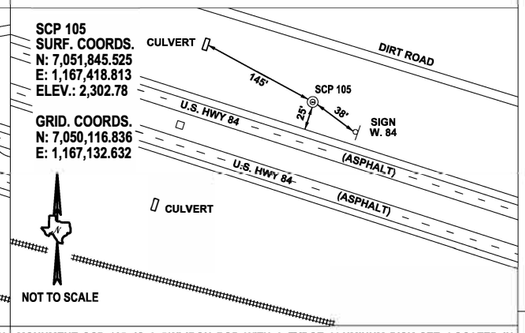

MONUMENT SCP 102 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 57' SOUTHEAST OF A HEADWALL. +/- 25' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 95' SOUTHEAST OF A FIBER OPTIC MARKER.



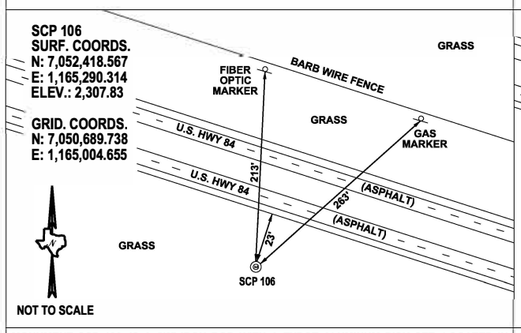

MONUMENT SCP 103 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 95' NORTHWEST OF A STOP SIGN. +/- 34' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 202' NORTHEAST OF A FIBER OPTIC MARKER.



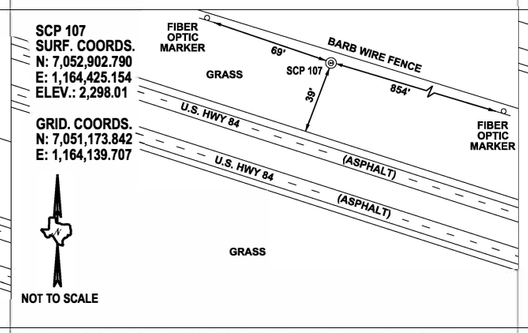

MONUMENT SCP 104 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 30' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 176' SOUTH OF A FIBER OPTIC MARKER. +/- 97' NORTHWEST OF A FIBER OPTIC MARKER.



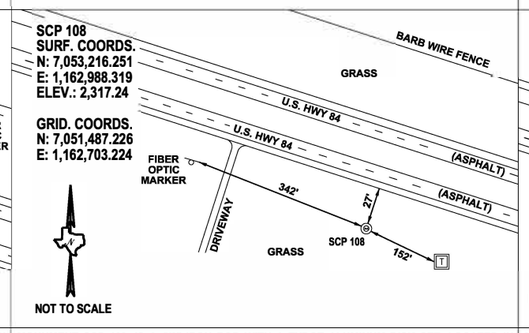

MONUMENT SCP 105 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 25' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 38' WEST OF A US 84 SIGN. +/- 145' EAST OF A CULVERT.



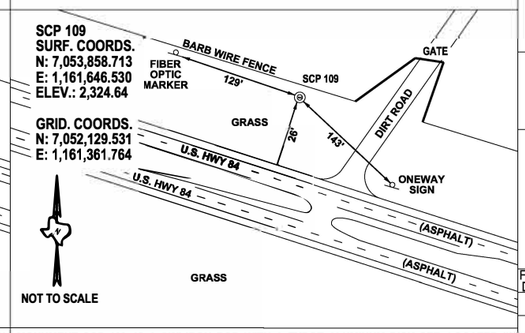

MONUMENT SCP 106 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 23' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 213' SOUTH OF A FIBER OPTIC MARKER. +/- 263 ' NORTHWEST OF A FIBER OPTIC MARKER.




MONUMENT SCP 107 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 23' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 213' NORTHWEST OF A FIBER OPTIC MARKER. +/- 263' SOUTHEAST OF A FIBER OPTIC MARKER.




MONUMENT SCP 108 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 23' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 213' SOUTH OF A FIBER OPTIC MARKER. +/- 263' NORTHWEST OF A FIBER OPTIC MARKER.




MONUMENT SCP 109 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 26' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 143' NORTHWEST OF A ONEWAY SIGN. +/- 129' SOUTHEAST OF A FIBER OPTIC MARKER.

**I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.**

STATE OF TEXAS · REGISTERED · BRIAN K. KIDD · 6494 · PROFESSIONAL LAND SURVEYOR

**BRIAN K. KIDD** **DATE: 4/29/2022**
**RPLS NO. 6494**

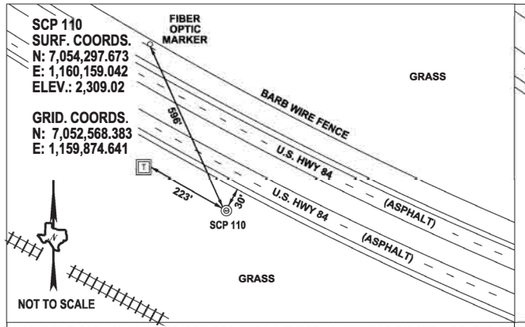
CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

2022 © TEXAS DEPARTMENT OF TRANSPORTATION

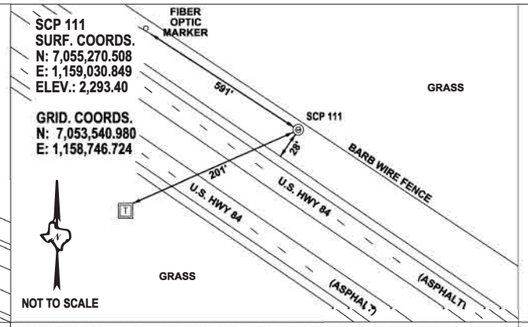
# HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 1 OF 3

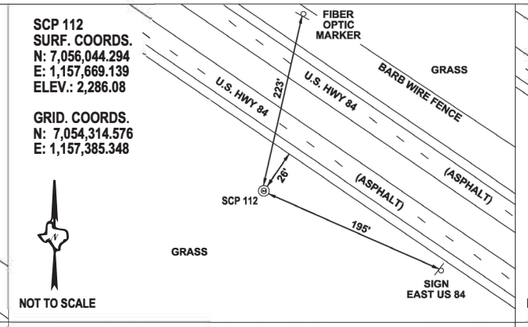
| FED. RD. DIV. NO. | FEDERAL AND PROJECT NO. | | | HIGHWAY NO. |
|---|---|---|---|---|
| 6 | | | | US 84 |
| STATE | DIST. | COUNTY | | SHEET NO. |
| TEXAS | LUB | GARZA - SCURRY | | |
| CONTROL | SECTION | JOB | FUNCTION | 42 |
| 0053 | 06 | 031 | 160 | |



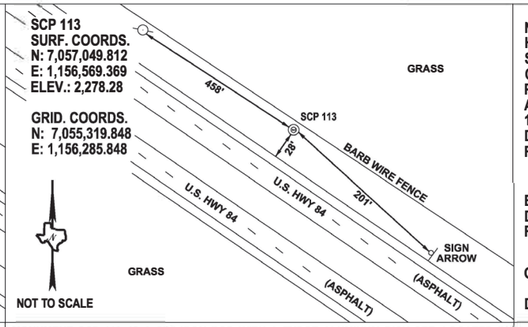

MONUMENT SCP 110 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 30' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 596' SOUTHEAST OF A FIBER OPTIC MARKER. +/- 223' SOUTHEAST OF A TELEPHONE RISER.




MONUMENT SCP 111 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 28' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 143' NORTHEAST OF A TELEPHONE RISER. +/- 591' SOUTHEAST OF A FIBER OPTIC MARKER.




MONUMENT SCP 112 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 26' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 223' SOUTHWEST OF A FIBER OPTIC MARKER. +/- 195' NORTHWEST OF A US 84 SIGN.




MONUMENT SCP 113 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 28' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 201' NORTHWEST OF A ARROW SIGN. +/- 458' SOUTHEAST OF A UTILITY POLE.

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A SURFACE ADJUSTMENT OF 1.000233 (GRID X 1.000233 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

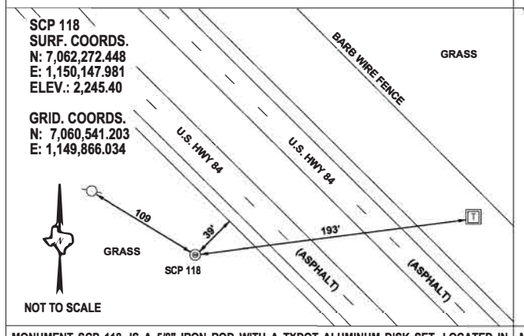
ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

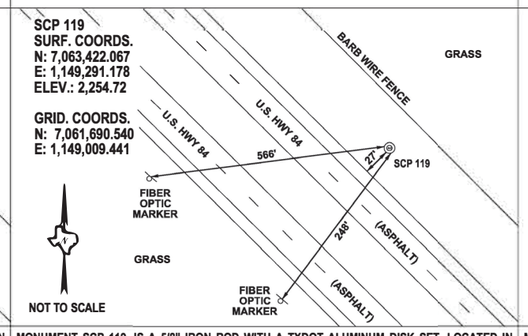
DATE SET: MARCH 8, 2022

LEGEND:

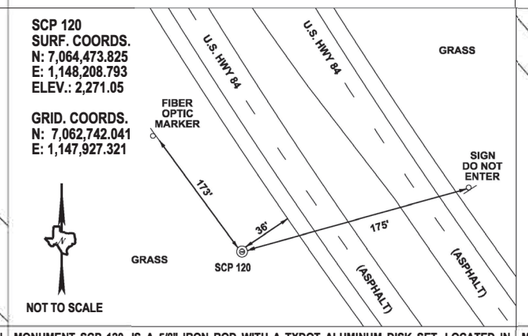
| | |
|---|---|
| PRIMARY CONTROL | △ |
| SECONDARY CONTROL | ◎ |
| UTILITY POLE | ○ |
| FENCE | —— |
| SIGN | ⟋ |
| TELEPHONE RISER | T |
| MAILBOX | ⌂ |
| POST | ◐ |
| VALVE | ⋈ |



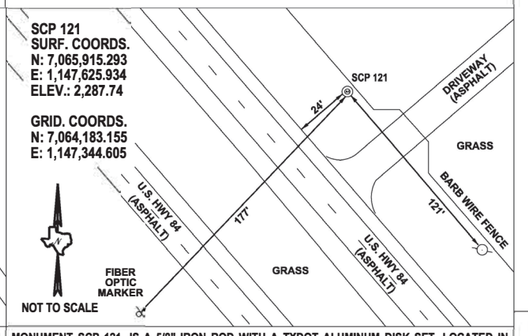

MONUMENT SCP 114 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 27' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 102' SOUTHEAST OF A UTILITY POLE. +/- 25' SOUTHEAST OF A TELEPHONE RISER.




MONUMENT SCP 115 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 28' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 161' NORTHWEST OF A UTILITY POLE. +/- 112' SOUTHEAST OF A UTILITY POLE.




MONUMENT SCP 116 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 28' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 427' NORTHEAST OF A FIBER OPITC MARKER. +/- 186' NORTHEAST OF A UTILITY POLE.




MONUMENT SCP 117 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 38' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 21' EAST OF THE OF THE NORTHEAST CORNER OF RIPRAP. +/- 4' SOUTHEAST OF A BARB WIRE FENCE.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED
BRIAN K. KIDD
6494
PROFESSIONAL
LAND SURVEYOR




MONUMENT SCP 118 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 39' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 109' SOUTHEAST OF A UTILITY POLE. +/- 193' SOUTHWEST OF A TELEPHONE RISER.




MONUMENT SCP 119 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 27' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 566' NORTHEAST OF A FIBER OPITC MARKER. +/- 248' NORTHEAST OF A FIBER OPITC MARKER.




MONUMENT SCP 120 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 36' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 173' SOUTHEAST OF A FIBER OPTIC MARKER. +/- 175' SOUTHWEST OF A DO NOT ENTER SIGN.




MONUMENT SCP 121 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 24' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 177' NORTHEAST OF A FIBER OPITC MARKER. +/- 121' NORTHEAST OF A UTILITY POLE.

BRIAN K. KIDD
RPLS NO. 6494

DATE: 4/29/2022

CP&Y an STV Company

TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305




MONUMENT SCP 122 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 23' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 342' SOUTHEAST OF A FIBER OPTIC MARKER. +/- 292' NORTHEAST OF A FIBER POTIC MARKER.




MONUMENT SCP 123 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 18' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 165' NORTHEAST OF A FIBER OPITC MARKER. +/- 380' NORTHEAST OF A FIBER OPITC MARKER.




MONUMENT SCP 124 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 22' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 178' NORTHWEST OF A FIBER OPTIC MARKER. +/- 274' WEST OF A SIGN.




MONUMENT SCP 125 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 25' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 523' NORTHEAST OF A FIBER OPITC MARKER. +/- 625' SOUTHEAST OF A US 84 SIGN.

TEXAS DEPARTMENT OF TRANSPORTATION

2022 ©

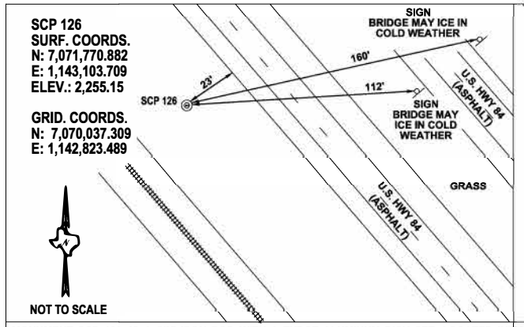
# HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 2 OF 3

| FED. RD. DIV. NO. | FEDERAL AND PROJECT NO. | | | HIGHWAY NO. |
|---|---|---|---|---|
| 6 | | | | US 84 |
| STATE | DIST. | COUNTY | | SHEET NO. |
| TEXAS | LUB | GARZA - SCURRY | | 43 |
| CONTROL | SECTION | JOB | FUNCTION | |
| 0053 | 06 | 031 | 160 | |

**SCP 126**
**SURF. COORDS.**
**N: 7,071,770.882**
**E: 1,143,103.709**
**ELEV.: 2,255.15**

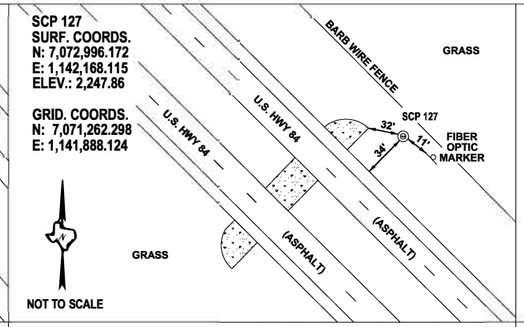
**GRID. COORDS.**
**N: 7,070,037.309**
**E: 1,142,823.489**




MONUMENT SCP 126 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 23' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 160' SOUTHWEST OF A BRIDGE MAY ICE IN COLD WEATHER SIGN. +/- 112' SOUTHWEST OF A BRIDGE MAY ICE IN COLD WEATHER SIGN.

**SCP 127**
**SURF. COORDS.**
**N: 7,072,996.172**
**E: 1,142,168.115**
**ELEV.: 2,247.86**

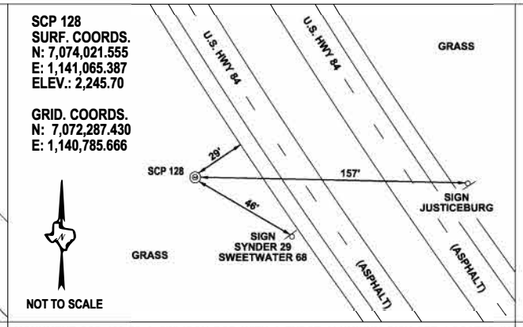
**GRID. COORDS.**
**N: 7,071,262.298**
**E: 1,141,888.124**




MONUMENT SCP 127 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE NORTHEAST SIDE OF US HIGHWAY 84. +/- 34' NORTHEAST OF THE NORTHEAST EDGE OF ASPHALT PAVEMENT. +/- 32' EAST OF THE OF THE NORTHEAST CORNER OF RIPRAP. +/- 11' SOUTHEAST OF A FIBER OPTIC MARKER.

**SCP 128**
**SURF. COORDS.**
**N: 7,074,021.555**
**E: 1,141,065.387**
**ELEV.: 2,245.70**

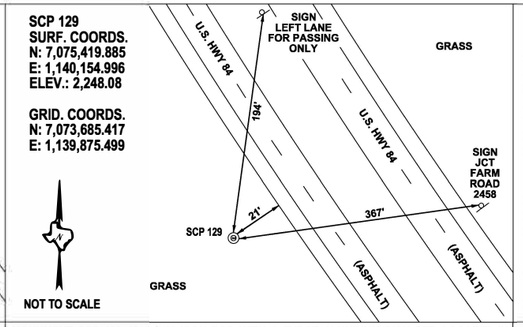
**GRID. COORDS.**
**N: 7,072,287.430**
**E: 1,140,785.666**




MONUMENT SCP 128 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 29' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 157' WEST OF A JUSTICEBURG SIGN. +/- 46' NORTHWEST OF A SYNDER 29 SWEETWATER 68 SIGN.

**SCP 129**
**SURF. COORDS.**
**N: 7,075,419.885**
**E: 1,140,154.996**
**ELEV.: 2,248.08**

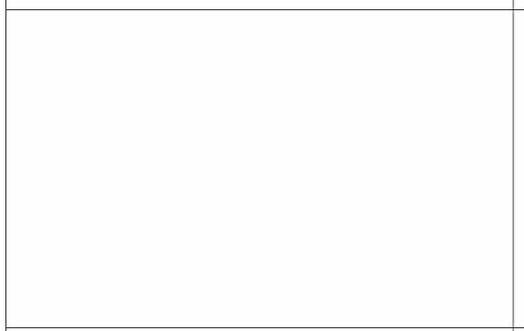
**GRID. COORDS.**
**N: 7,073,685.417**
**E: 1,139,875.499**




MONUMENT SCP 129 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 21' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 367' SOUTHWEST OF A JCT FARM ROAD 2458 SIGN. +/- 194' SOUTHWEST OF A LEFT LANE FOR PASSING ONLY SIGN.

**SCP 130**
**SURF. COORDS.**
**N: 7,076,789.326**
**E: 1,139,251.420**
**ELEV.: 2,258.31**

**GRID. COORDS.**
**N: 7,075,054.523**
**E: 1,138,972.144**




MONUMENT SCP 130 IS A 5/8" IRON ROD WITH A TXDOT ALUMINUM DISK SET. LOCATED IN GARZA COUNTY, TX., ON THE SOUTHWEST SIDE OF US HIGHWAY 84. +/- 21' SOUTHWEST OF THE SOUTHWEST EDGE OF ASPHALT PAVEMENT. +/- 158' SOUTHWEST OF A WEST US 84 SIGN. +/- 88' SOUTHEAST OF A JUSTICEBURG SIGN.

**NOTES:**
**HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A SURFACE ADJUSTMENT OF 1.000233 (GRID X 1.000233 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.**

**ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.**

**GEOID 2018**

**DATE SET: MARCH 8, 2022**

**LEGEND:**

| | |
|---|---|
| PRIMARY CONTROL | △ |
| SECONDARY CONTROL | ◎ |
| UTILITY POLE | ○ |
| FENCE | —— |
| SIGN | ⊿ |
| TELEPHONE RISER | T |
| MAILBOX | ⌂ |
| POST | ◐ |
| VALVE | ⋈ |

**I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.**

STATE OF TEXAS
REGISTERED
BRIAN K. KIDD
6494
PROFESSIONAL
LAND SURVEYOR

**BRIAN K. KIDD**
**RPLS NO. 6494**

**DATE: 4/29/2022**

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305


TEXAS DEPARTMENT OF TRANSPORTATION

# HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S.

SHEET 3 OF 3

| FED. RD. DIV. NO. | FEDERAL AND PROJECT NO. | | | HIGHWAY NO. |
|---|---|---|---|---|
| 6 | | | | US 84 |
| STATE | DIST. | COUNTY | | SHEET NO. |
| TEXAS | LUB | GARZA - SCURRY | | 44 |
| CONTROL | SECTION | JOB | FUNCTION | |
| 0053 | 06 | 031 | 160 | |

Horizontal Alignment Review Report

Report Created: Thursday, November 3, 2022
Time: 4:39:55 PM

**Project:** Default
**Description:**
**File Name:** c:\txdot\pw_online\txdot2\israa.alkhazraji\d0629188\2D - Alignment.dgn
**Last Revised:** 10/20/2022 16:54
**Note:** All units in this report are in feet unless specified otherwise.

**Alignment Name:** BL CL-10
**Alignment Description:**
**Alignment Style:** Alignment\Baseline

| | | Station | Northing | Easting |
|---|---|---|---|---|
| Element: Linear | | | | |
| PT | ( ) | 986+91.47 R1 | 7057600.05 | 1152948.43 |
| PC | ( ) | 1066+07.11 R1 | 7052982.99 | 1159378.05 |
| Tangential Direction: | | S54°19'05.40"E | | |
| Tangential Length: | | 7915.64 | | |

*Alignment data is for information only*

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED
PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

# HORIZONTAL ALIGNMENT DATA

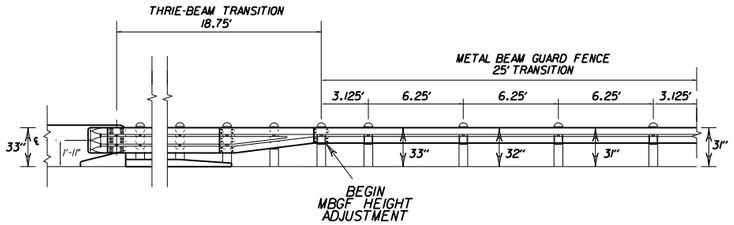


Texas Department of Transportation

No Scale Sheet 1 of 1

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 45 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | USB4_RDW_HORIZONTAL_ALIGN.DGN | | |

DATE: &DATE&
FILE: &FILE&
&TIME&




ELEVATION VIEW

TRANSITION FROM 33" THRIE BEAM/NON-SYMMETRICAL
TRANSITION TO 31" METAL BEAM GUARD FENCE




Metal Beam Guard Fence (Steel Post) = 450 LF
Thrie Beam Transition (Steel Post) = 2 EA
Single Guardrail Terminal = 2 EA
Non-Symmetrical Transition 2 EA
DAT Terminal = 2 EA
4" Conc. Mow Strip + Toewall = 44.9 CY + 5.2 CY = 50.1 CY
TY 551 RAIL = Paid on the Structure Summary as Bridge Item




**Toewall Detail**

NOTES:

ALL CONCRETE RIPRAP SHALL BE 4" THICK EXCEPT THE RIPRAP BETWEEN THE WINGWALLS AND TOEWALL. AND SHALL BE PAID FOR AS 4" RIPRAP CONC.

CONCRETE AND HOTMIX INTERFACE WILL BE SEALED.

♪ PAID ON THE STRUCTURE SUMMARY

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022



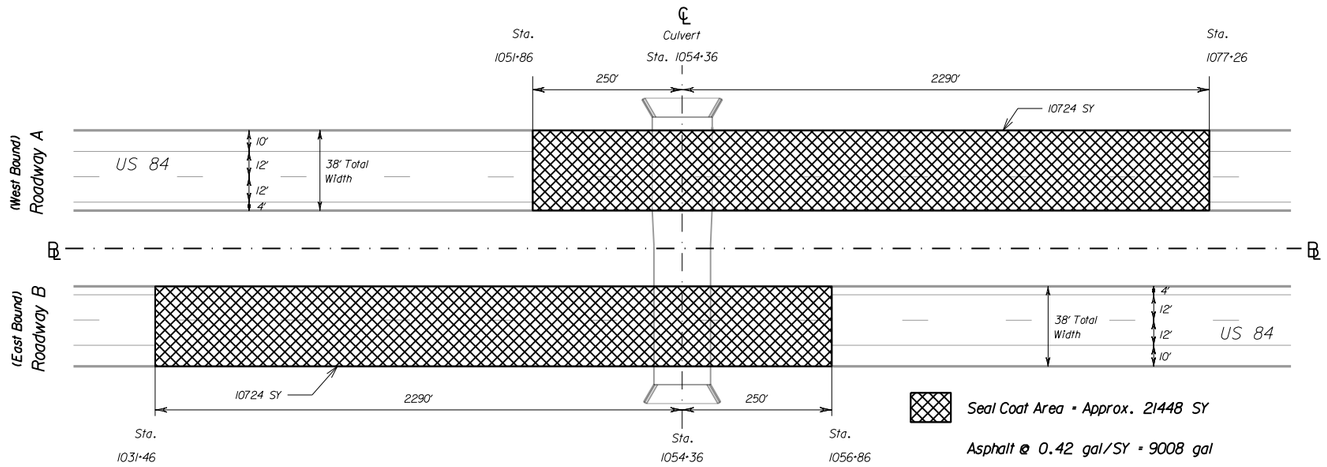
Texas Department of Transportation

No Scale Sheet 1 of 1

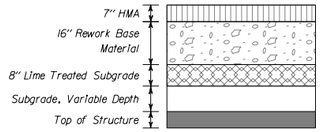
| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 46 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_ROW_GUARDRAIL & RIPRAP LAYOUT.dgn | | |

# GUARDRAIL & RIPRAP LAYOUT

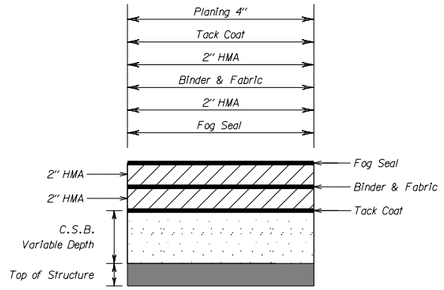
DATE: &DATE&
FILE: &FILE&
&TIME&




## Seal Coat Detail



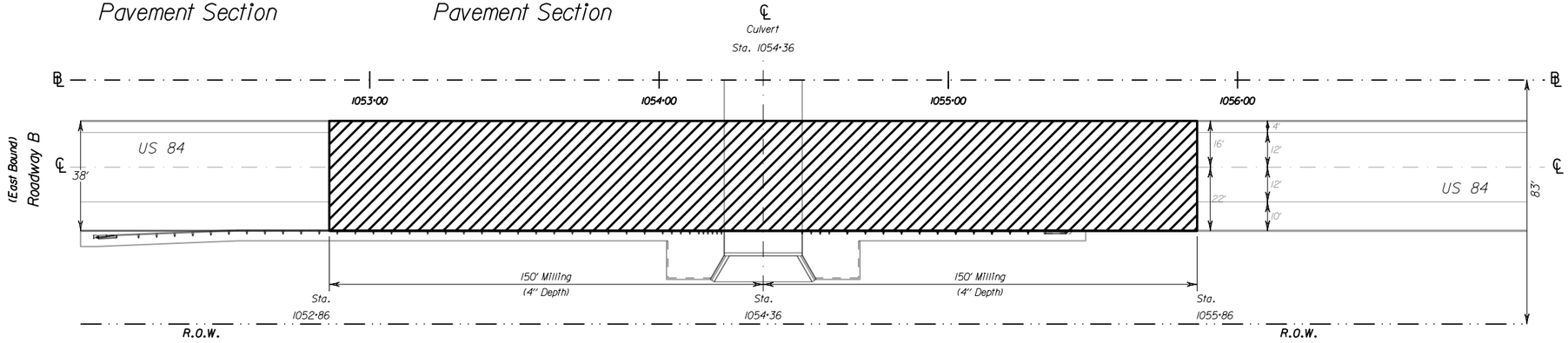

Existing
Pavement Section




Proposed
Pavement Section

### Planing Summary

| ITEM | | 0354 | 3032 | 3032 | 3076 | 3076 | 0315 |
|---|---|---|---|---|---|---|---|
| CODE | | 6057 | 6001 | 6004 | 6066 | 6085 | 6004 |
| ITEM | | PLANE ASPH CONC PAV (4") | REINFORCED FAB FOR ASPH PVMNT OVERLAYS | ASPH FOR REINF FAB (PG76-28) | TACK COAT | D-GR HMA TY-C PG 76-28 (EXEMPT) | FOG SEAL (CSS-1H) |
| UNIT OF MEASURE | | SY | SY | GAL | GAL | TON | GAL |
| RATE | | | | 0.15 gal/SY | 0.14 gal/SY | 460 lb/SY | 0.30 gal/SY |
| Begin STA | End STA | | | | | | |
| 1052+86 | 1055+86 | | | | | | |
| ROADWAY B TOTAL | | 1267 | 1267 | 190 | 177 | 291 | 380 |




## Planing Detail

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED
PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

# ROADWAY PLANING & SEAL COAT DETAILS



Texas Department of Transportation

No Scale — Sheet 1 of 1

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 47 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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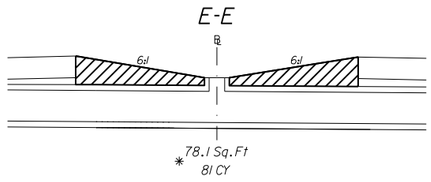
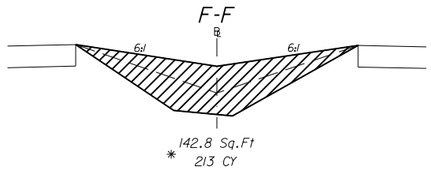
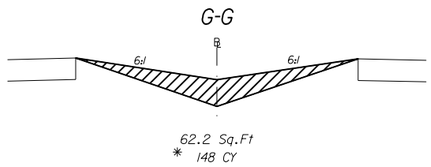
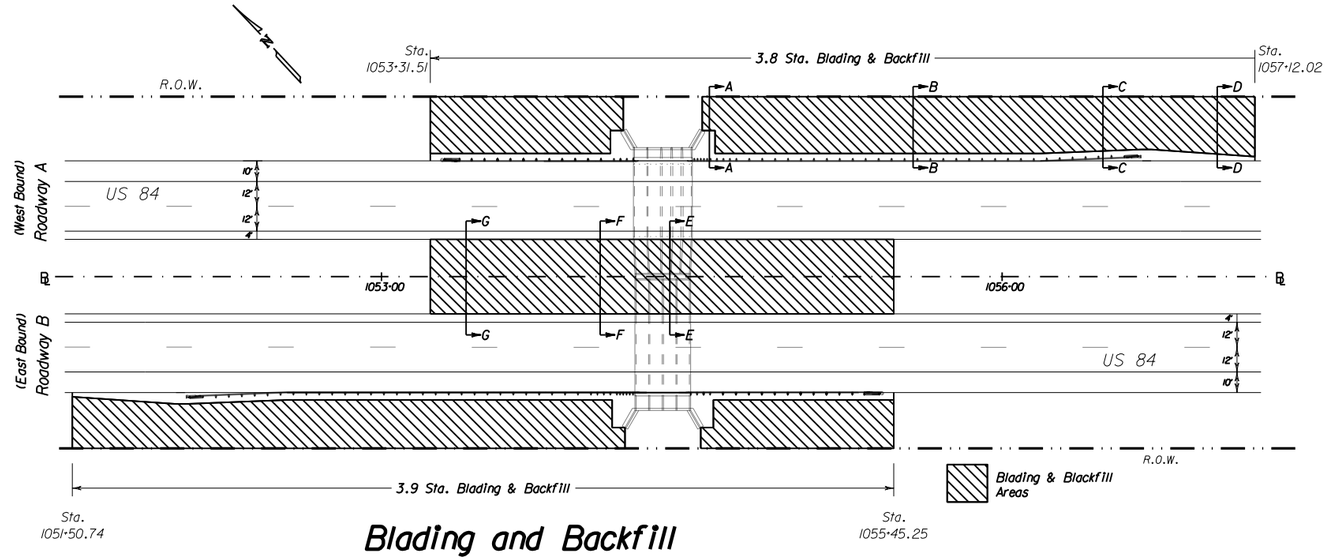


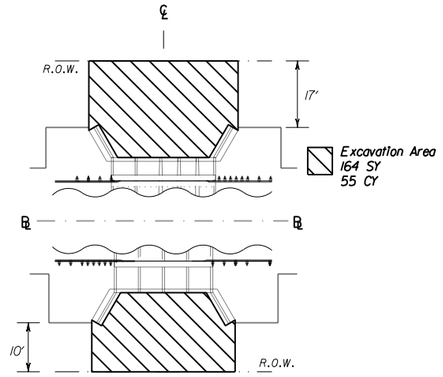

TOTAL OUTSIDE
BACKFILL: 1928 CY*
QTY INCLUDES 20% EXTRA
FOR COMPACTION




*Details A-A through G-G
For Contractor Information Purposes
ONLY




## Blading and Backfill




## Channel Excavation

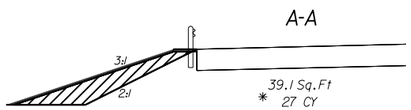
NOTES:

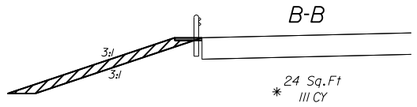
Clean existing culvert by removing all silt and debris inside barrels.

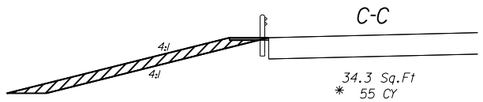
Excavate silt and soil built up on each end of the culvert. The excavation area is shown above. Excavate down to a level plane at the same elevation as the culvert flowline. The plan quantities are calculated using a 1.0' average depth of excavation over the entire excavation area.

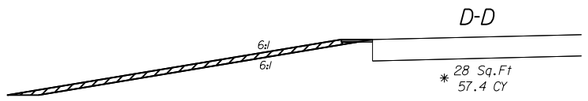
Draw is a water of the U.S., therefore excavation must be accomplished with a Gradall by scooping up and loading into a truck to haul off. The excavated material cannot be pushed into a pile and then scooped up.

TOTAL OUTSIDE
BACKFILL: 786 CY*
QTY INCLUDES 20% EXTRA
FOR COMPACTION





Shelley C. Harris, P.E.
11/4/2022



Texas Department of Transportation

# BLADING, BACKFILL, & EXCAVATION

No Scale Sheet 1 of 1

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 48 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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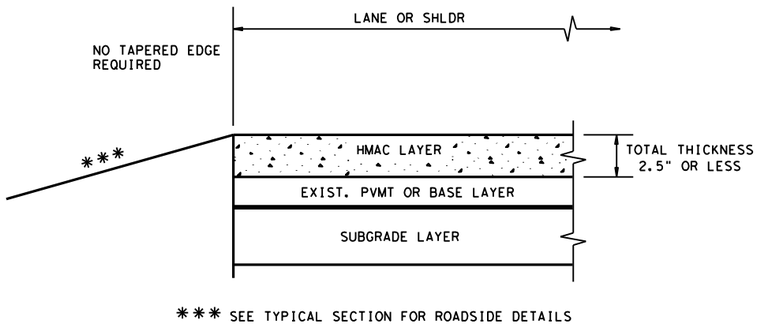
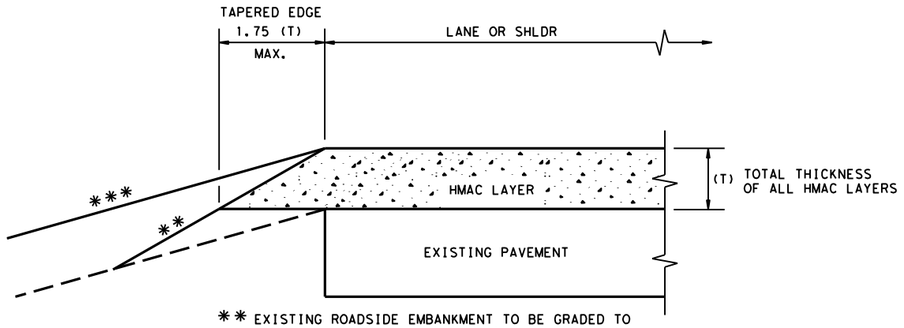
#TIME#




*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

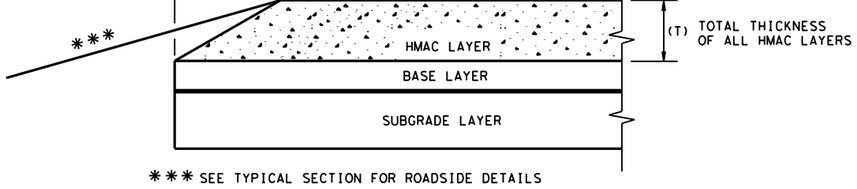
## CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS




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

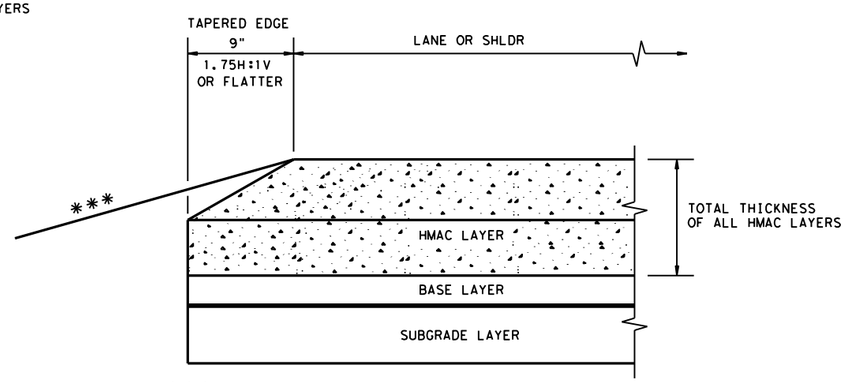
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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




*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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




*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

## GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

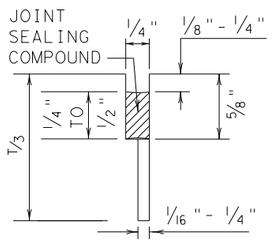
# TAPERED EDGE DETAILS HMAC PAVEMENT

## TE(HMAC)-11

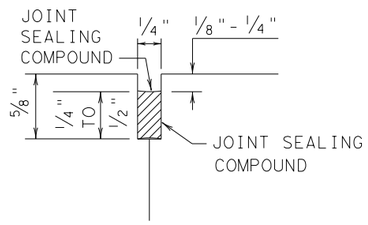
| | | | | | | |
|---|---|---|---|---|---|---|
| FILE: tehmac11.dgn | DN: TxDOT | CK: RL | DW: KB | CK: | | |
| © TxDOT January 2011 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | SHEET NO. | |
| | LBB | GARZA | | | 49 | |

DATE: $DATE$
FILE: $FILE$

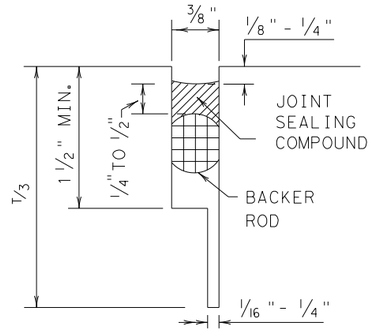
## METHOD B: JOINT SEALING COMPOUND



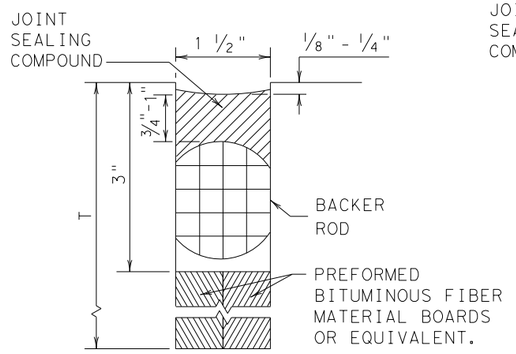

LONGITUDINAL SAWED
CONTRACTION JOINT



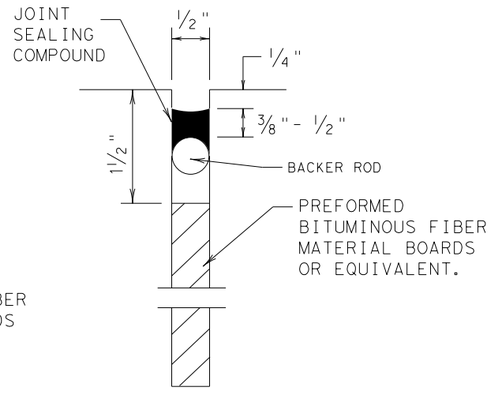

LONGITUDINAL OR TRANSVERSE
CONSTRUCTION JOINT




TRANSVERSE SAWED
CONTRACTION JOINT

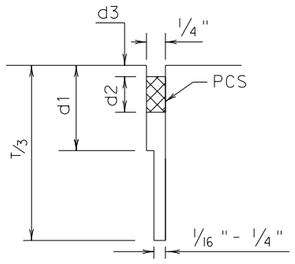



TRANSVERSE FORMED
EXPANSION JOINT

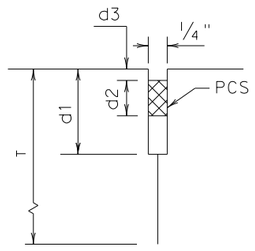



FORMED
ISOLATION JOINT

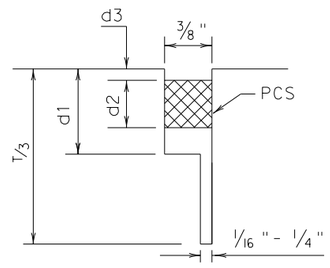
## METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



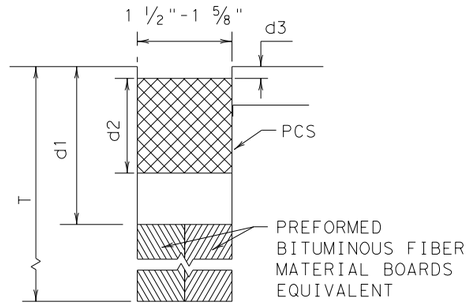

LONGITUDINAL SAWED
CONTRACTION JOINT




LONGITUDINAL
CONSTRUCTION JOINT




TRANSVERSE SAWED
CONTRACTION JOINT




TRANSVERSE FORMED
EXPANSION JOINT

## GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation | Design Division Standard

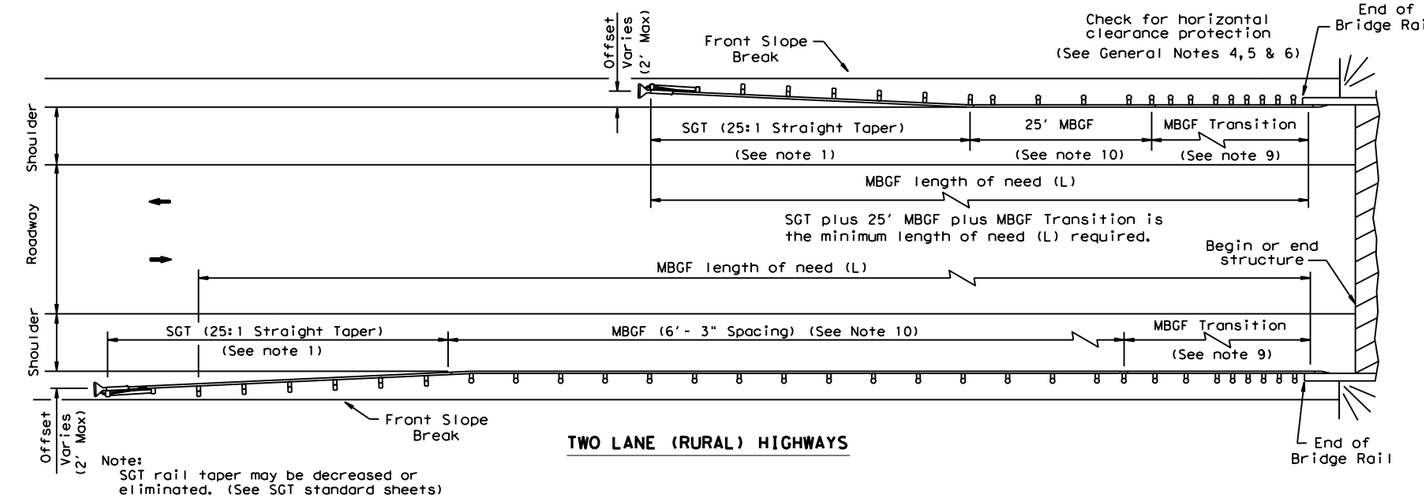
# CONCRETE PAVING DETAILS

## JOINT SEALS

## JS-14

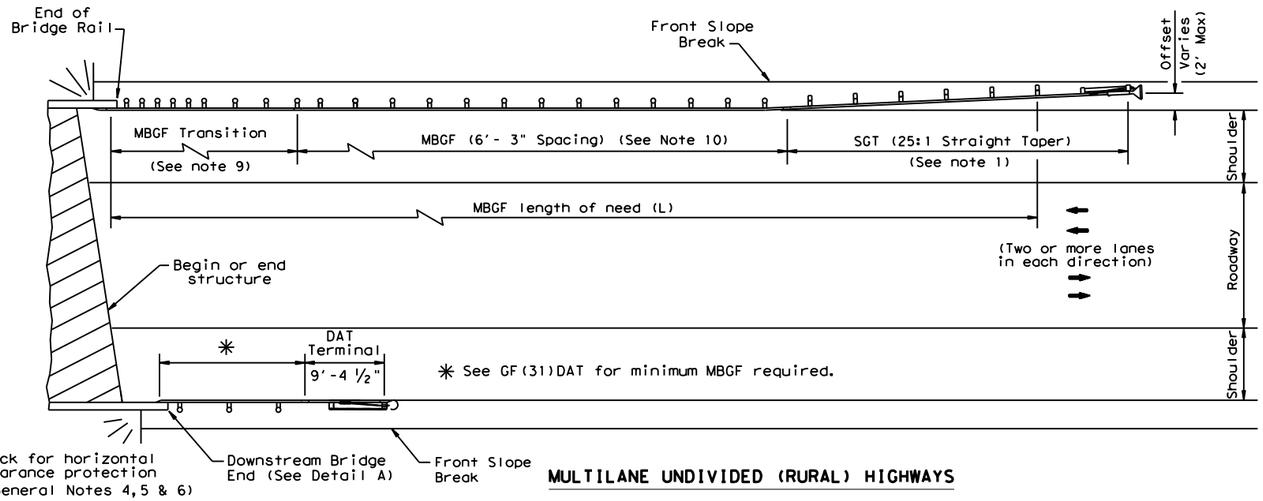
| | | | | | | |
|---|---|---|---|---|---|---|
| FILE: js14.dgn | DN: TxDOT | | DN: HC | DW: HC | | CK: AN |
| ©TxDOT: DECEMBER 2014 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | | SHEET NO. |
| | LBB | GARZA | | | | 50 |

DATE: $DATE$
FILE: $FILE$

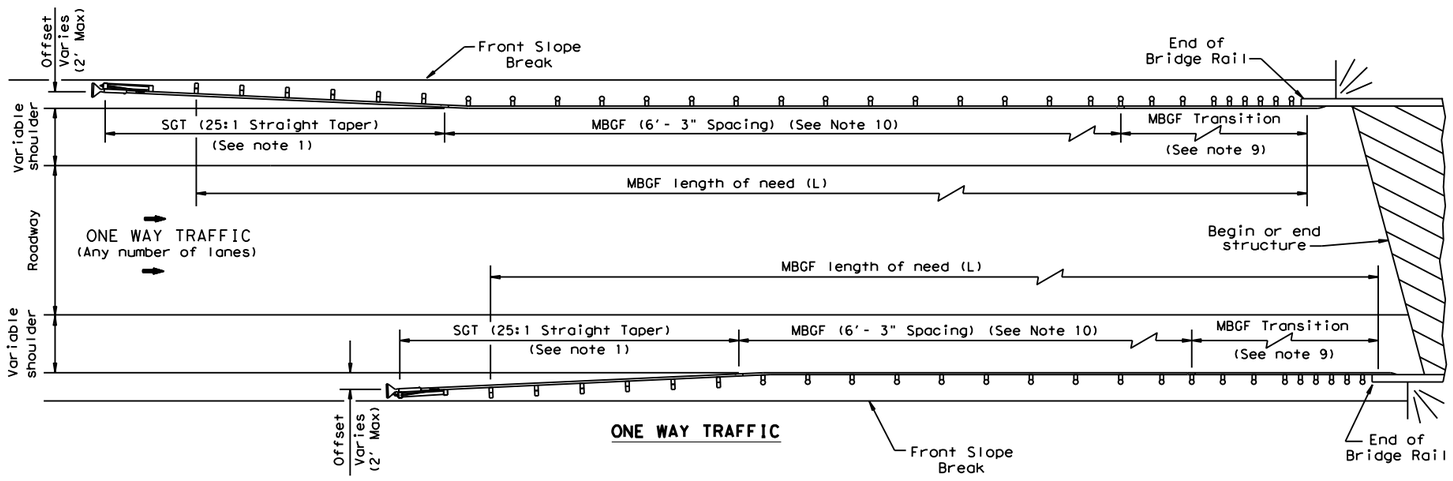



**TWO LANE (RURAL) HIGHWAYS**

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



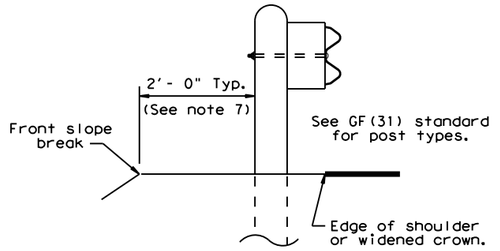

**MULTILANE UNDIVIDED (RURAL) HIGHWAYS**




**ONE WAY TRAFFIC**

## GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.




**TYPICAL CROSS SECTION AT MBGF**




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

**DETAIL A**

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

# BRIDGE END DETAILS

## (METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

# BED-14

| FILE: bed14.dgn | DN: TxDOT | CK: AM | DW: BD/VP | CK: CGL |
|---|---|---|---|---|
| © TxDOT: December 2011 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| REVISED APRIL 2014 SEE (MEMO 0414) | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 51 |

DATE: $DATE$ $TIME$
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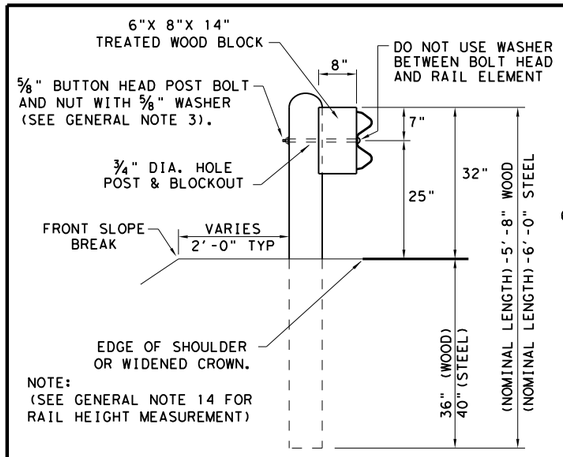
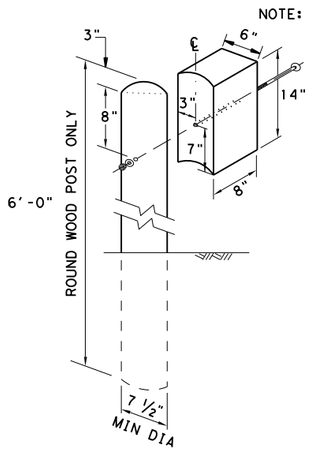
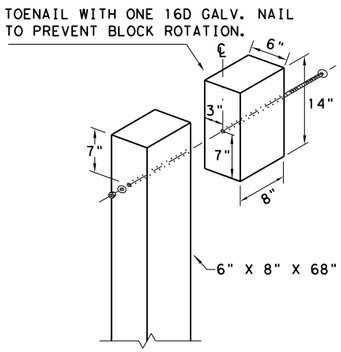



**TYPICAL POST PLACEMENT**

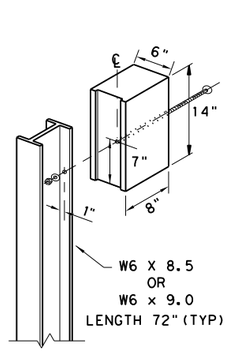



**WOOD BLOCK TO ROUND WOOD POST**

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

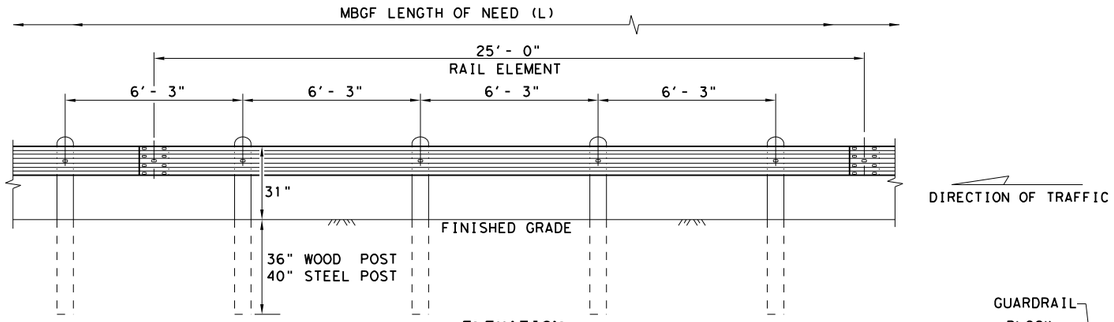



**WOOD BLOCK TO RECTANGULAR WOOD POST**



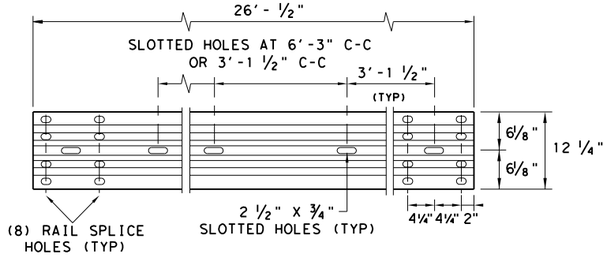

**ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

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




**ELEVATION**
**MID-SPAN RAIL SPLICE**

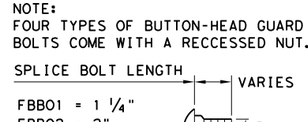
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)




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

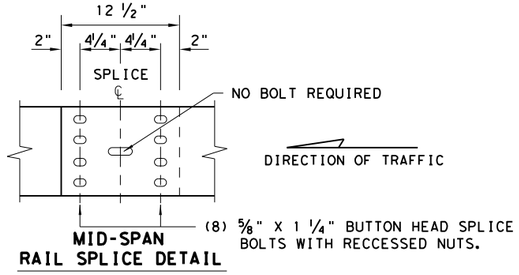
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



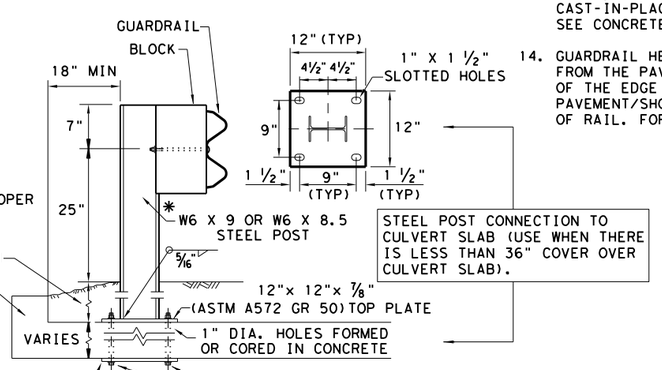

**BUTTON HEAD BOLT**

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




**MID-SPAN RAIL SPLICE DETAIL**

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




**LOW FILL CULVERT POST**

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

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

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

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

## GENERAL NOTES

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

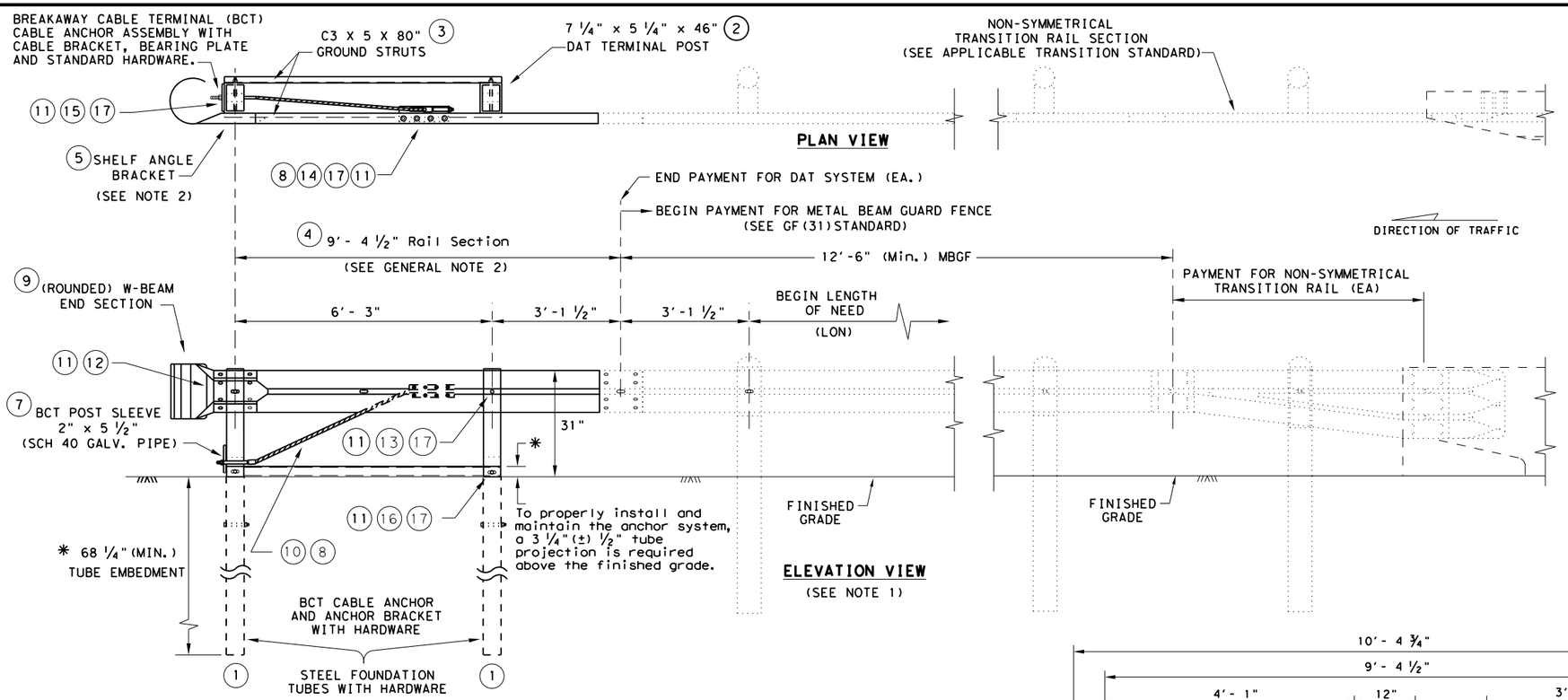
Texas Department of Transportation

Design Division Standard

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

| FILE: gf3119.dgn | DN: TxDOT | CK: KM | DW: VP | CK: CGL/AG |
|---|---|---|---|---|
| ©TxDOT: NOVEMBER 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 52 |

DATE: $DATE$
FILE: $FILE$




## DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

## GENERAL NOTES

1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

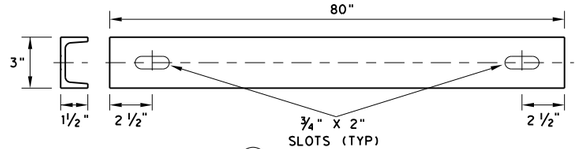
## MOW STRIP INSTALLATION

IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

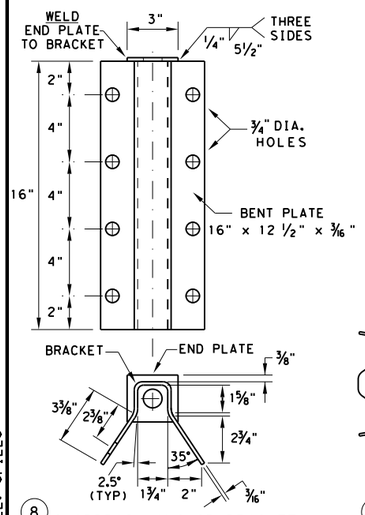
| # | (DAT) PARTS LIST | QTY |
|---|---|---|
| (1) | STEEL FOUNDATION TUBE | 2 |
| (2) | DAT TERMINAL POST | 2 |
| (3) | CHANNEL STRUT | 2 |
| (4) | TERMINAL RAIL ELEMENT | 1 |
| (5) | SHELF ANGLE BRACKET | 1 |
| (6) | BCT BEARING PLATE | 1 |
| (7) | BCT POST SLEEVE | 1 |
| (8) | GUARDRAIL ANCHOR BRACKET | 1 |
| (9) | (ROUNDED) W-BEAM END SECTION | 1 |
| (10) | BCT CABLE ANCHOR | 1 |
| (11) | RECESSED NUT, GUARDRAIL | 20 |
| (12) | 1 1/4" BUTTON HEAD BOLT | 4 |
| (13) | 10" BUTTON HEAD BOLT | 2 |
| (14) | 5/8" X 2" HEX HEAD BOLT | 8 |
| (15) | 5/8" X 8" HEX HEAD BOLT | 4 |
| (16) | 5/8" X 10" HEX HEAD BOLT | 2 |
| (17) | 5/8" FLAT WASHER | 18 |



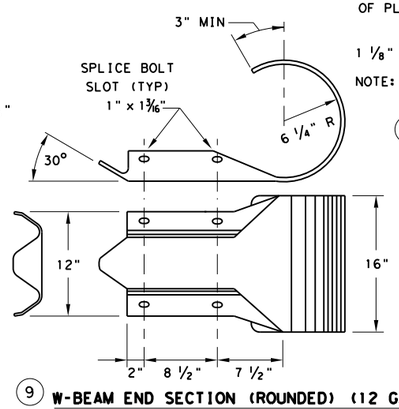

(4) TERMINAL RAIL ELEMENT FOR DAT



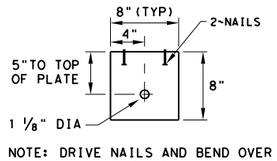

(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36




(8) GUARDRAIL ANCHOR BRACKET

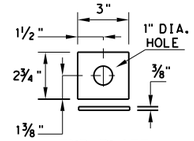



(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

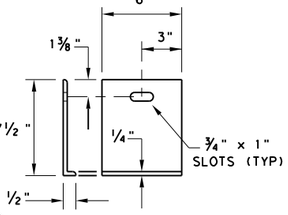



NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

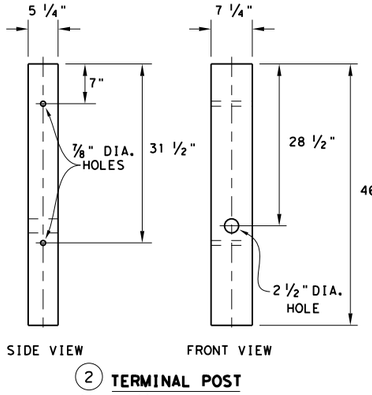
(6) BEARING PLATE
8"x 8"x 5/8" R



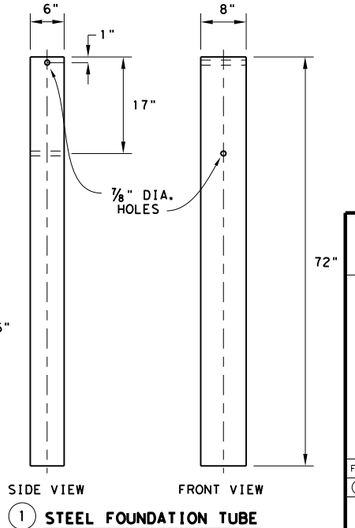

END PLATE




(5) SHELF ANGLE BRACKET




(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST




(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation — Design Division Standard

# METAL BEAM GUARD FENCE
## (DOWNSTREAM ANCHOR TERMINAL)
## TL-3 MASH COMPLIANT

# GF(31)DAT-19

| FILE: gf31dat19.dgn | DN: TxDOT | CK: KM | DW: VP | CK: CGL/AG |
|---|---|---|---|---|
| ©TxDOT: NOVEMBER 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 53 |

DATE: $DATE$
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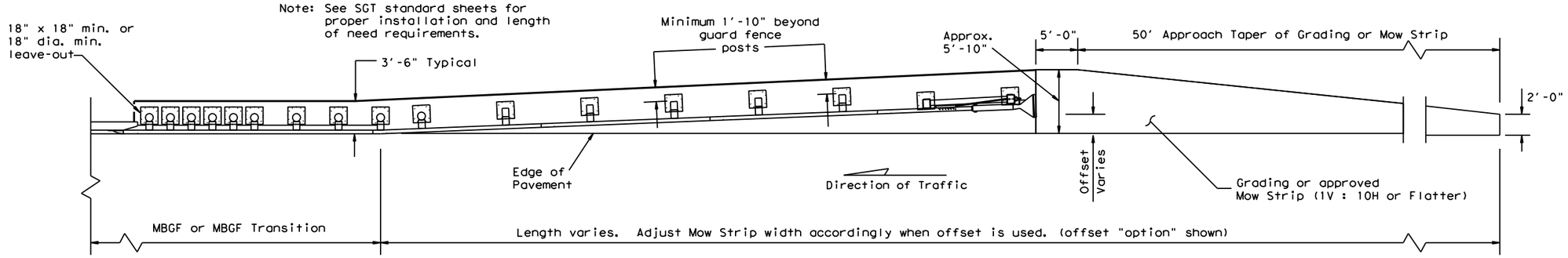
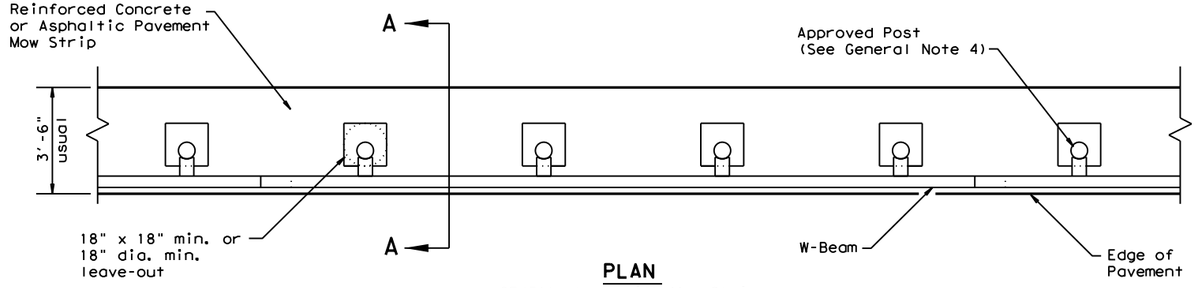
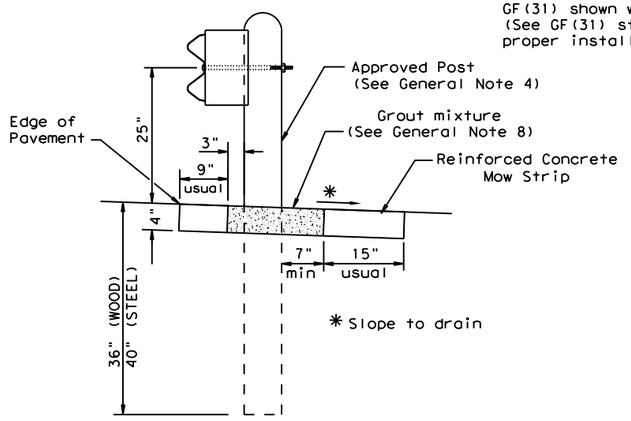



## GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



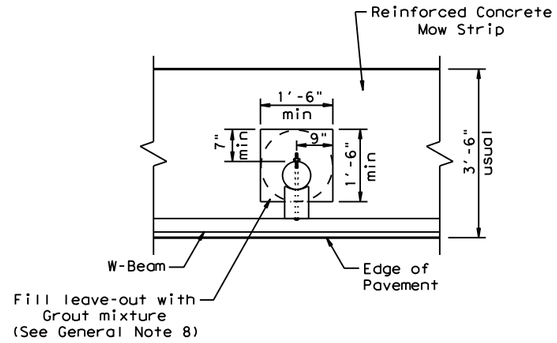

### PLAN

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



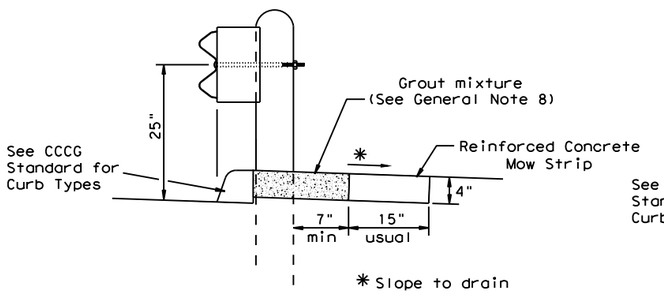

### SECTION A-A

Typical



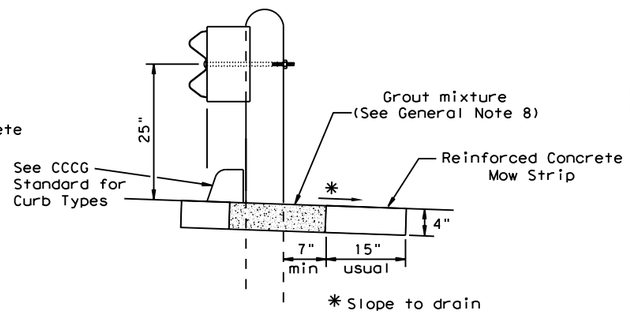

### MOW STRIP DETAIL

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



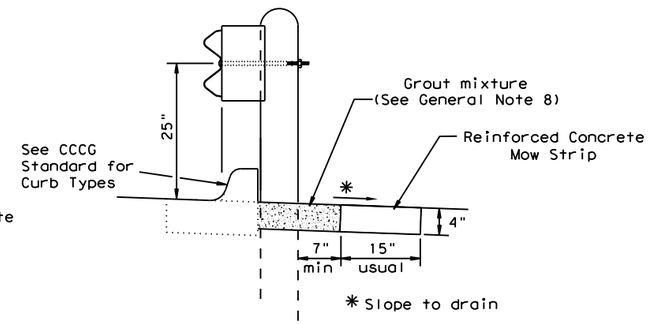

### CURB OPTION (1)

This option will increase the post embedment throughout the system.




### CURB OPTION (2)

Curb shown on top of mow strip




### CURB OPTION (3)

Note: Site Condition(s)

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

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

## GENERAL NOTES

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

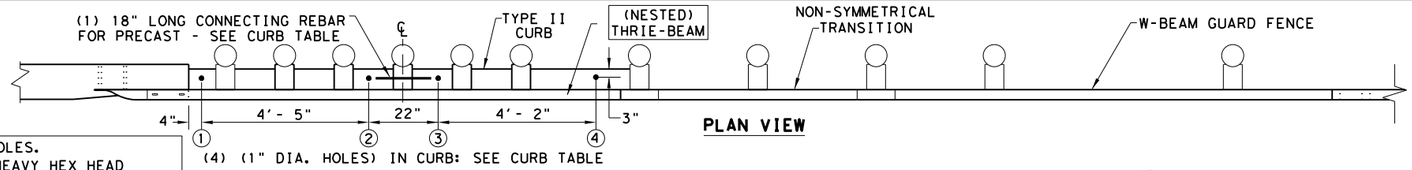
Texas Department of Transportation

Design Division Standard

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

# GF(31)MS-19

| | | | | | | |
|---|---|---|---|---|---|---|
| FILE: gf31ms19.dgn | DN: TxDOT | CK: KM | DW: VP | CK: CGL/AG | | |
| ©TxDOT: NOVEMBER 2019 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | SHEET NO. | |
| | LBB | GARZA | | | 54 | |




PLAN VIEW

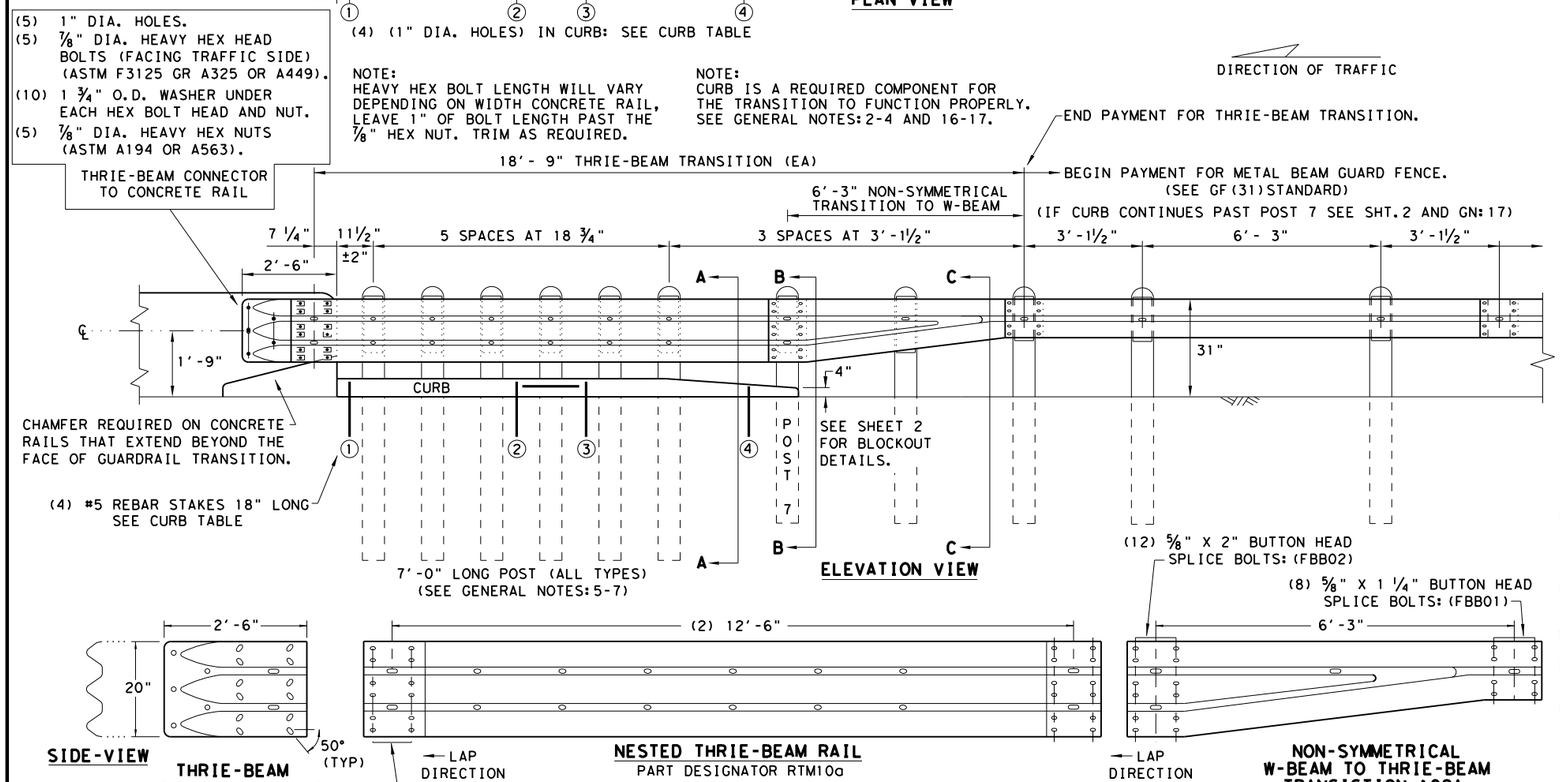
(4) (1" DIA. HOLES) IN CURB: SEE CURB TABLE

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

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

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

DIRECTION OF TRAFFIC




ELEVATION VIEW




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




SIDE-VIEW

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

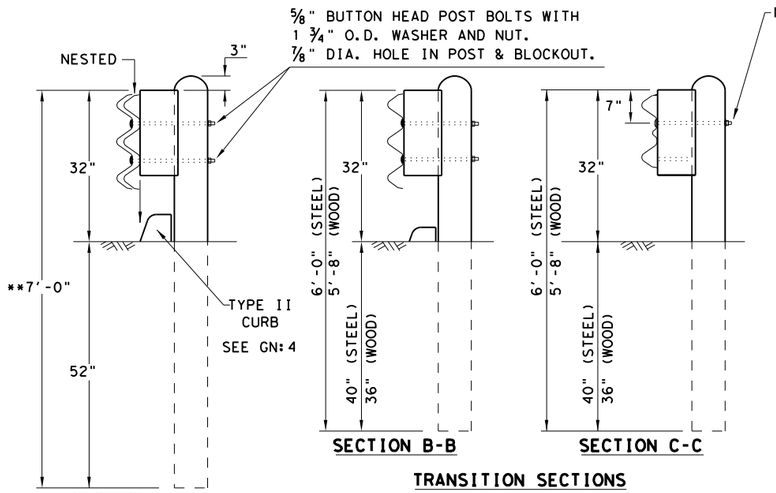



NESTED THRIE-BEAM RAIL
PART DESIGNATOR RTM10a

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

PLATE WASHER INSTRUCTIONS

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




SECTION A-A

SECTION B-B

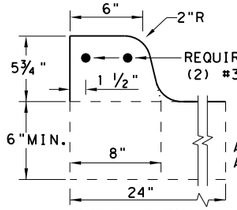
SECTION C-C

TRANSITION SECTIONS

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

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

| THRIE-BEAM TERMINAL - CURB TABLE |
|---|
| PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS. |
| CURB (1) LENGTH 5'- 8" |
| CURB (2) LENGTH 6'- 6" |
| TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7 |
| CONNECTING PRECAST CURB SECTIONS (1) & (2): |
| FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS. |
| SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: |
| FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE. |




TYPE II CURB

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

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

TYPE II CURB DETAILS

## GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16g) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

**HIGH-SPEED TRANSITION**

**SHEET 1 OF 2**

Texas Department of Transportation — Design Division Standard

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

# GF(31)TR TL3-20

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| ©TxDOT: NOVEMBER 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 55 |

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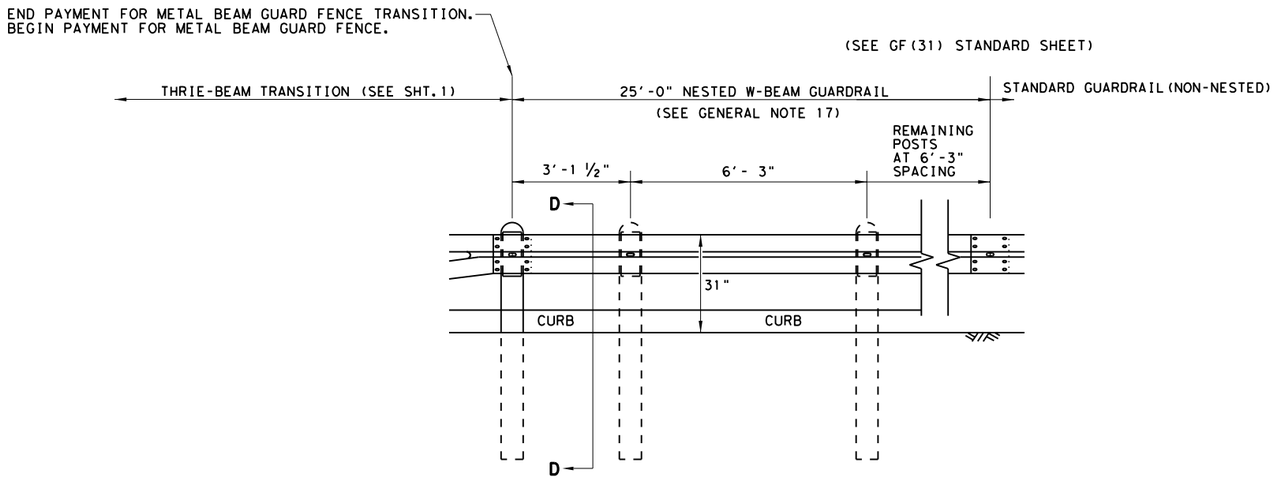
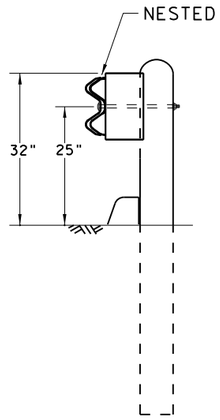
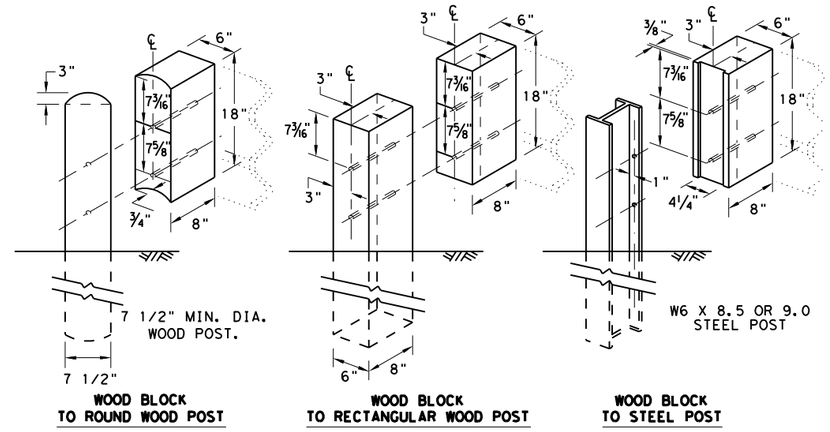
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)




ELEVATION VIEW




SECTION D-D




THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

## GF(31)TR TL3-20

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| FILE: gf31tr1320.dgn | DN: TxDOT | CK: KM | DW: KM | CK: CGL/AG | | |
| ©TxDOT: NOVEMBER 2020 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | SHEET NO. | |
| | LBB | GARZA | | | 56 | |

DATE: $DATE$
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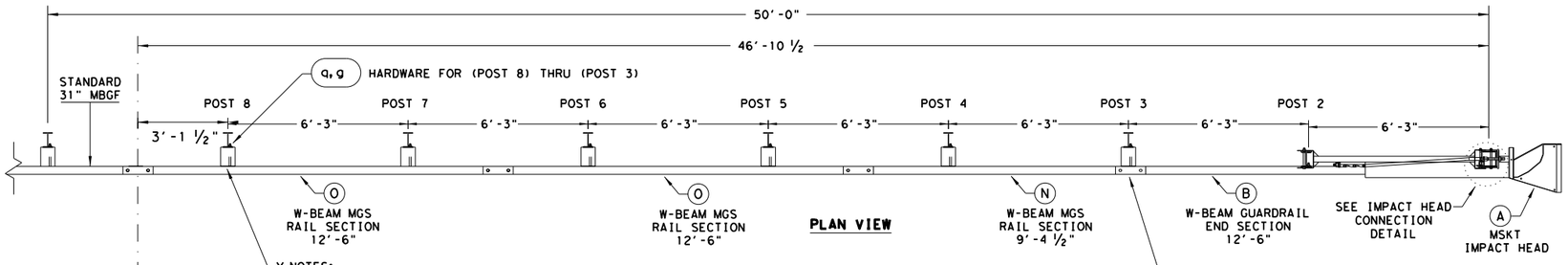
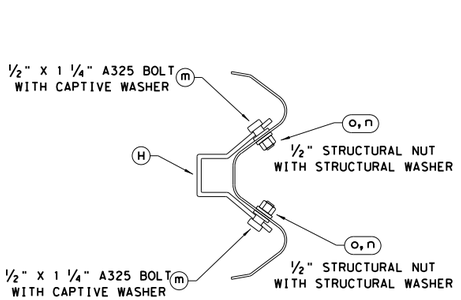
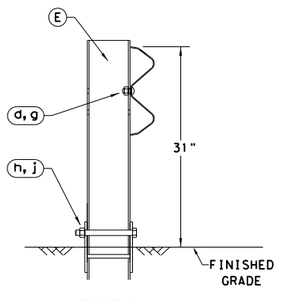


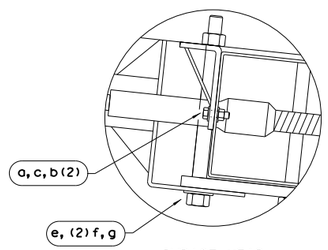

NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



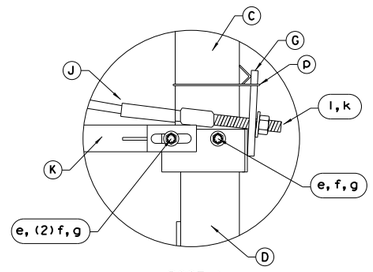

SECTION B-B
ANCHOR BRACKET




POST 2
SECTION A-A




IMPACT HEAD
CONNECTION DETAIL




POST 1
CONNECTION DETAIL

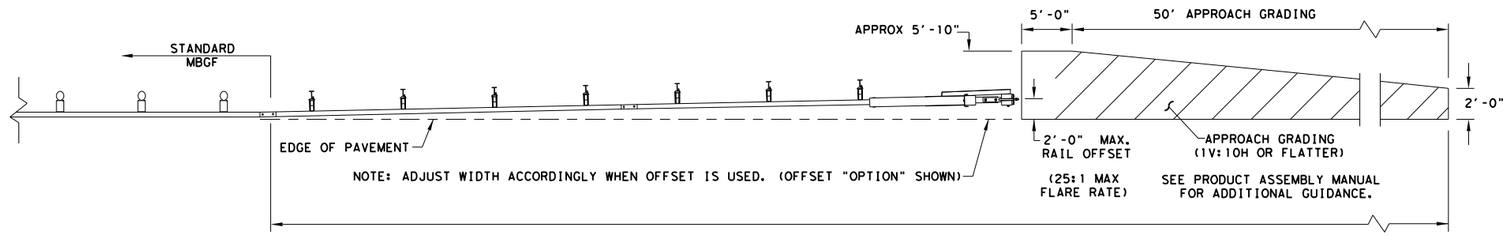
## GENERAL NOTES

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

SEE NOTES: *

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

| ITEM | QTY | MAIN SYSTEM COMPONENTS | ITEM NUMBERS |
|---|---|---|---|
| A | 1 | MSKT IMPACT HEAD | MS3000 |
| B | 1 | W-BEAM GUARDRAIL END SECTION, 12 Ga. | SF1303 |
| C | 1 | POST 1 - TOP (6" X 6" X ⅛" TUBE) | MTPHP1A |
| D | 1 | POST 1 - BOTTOM (6' W6X15) | MTPHP1B |
| E | 1 | POST 2 - ASSEMBLY TOP | UHP2A |
| F | 1 | POST 2 - ASSEMBLY BOTTOM (6' W6X9) | HP2B |
| G | 1 | BEARING PLATE | E750 |
| H | 1 | CABLE ANCHOR BOX | S760 |
| J | 1 | BCT CABLE ANCHOR ASSEMBLY | E770 |
| K | 1 | GROUND STRUT | MS785 |
| L | 6 | W6x9 OR W6x8.5 STEEL POST | P621 |
| M | 6 | COMPOSITE BLOCKOUTS | CBSP-14 |
| N | 1 | W-BEAM MGS RAIL SECTION (9'-4 ½") | G12025 |
| O | 2 | W-BEAM MGS RAIL SECTION (12'-6") | G1203A |
| P | 6 | WOOD BLOCKOUT 6" X 8" X 14" | P675 |
| Q | 1 | W-BEAM MGS RAIL SECTION (25'-0") | G1209 |
| | | **SMALL HARDWARE** | |
| a | 2 | ⅝" x 1" HEX BOLT (GRD 5) | B5160104A |
| b | 4 | ⅝" WASHER | W0516 |
| c | 2 | ⅝" HEX NUT | N0516 |
| d | 25 | ⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2) | B580122 |
| e | 2 | ⅝" Dia. x 9" HEX BOLT (GRD A449) | B580904A |
| f | 3 | ⅝" WASHER | W050 |
| g | 33 | ⅝" Dia. H.G.R NUT | N050 |
| h | 1 | ¾" Dia. x 8 ½" HEX BOLT (GRD A449) | B340854A |
| j | 1 | ¾" Dia. HEX NUT | N030 |
| k | 2 | 1 ANCHOR CABLE HEX NUT | N100 |
| l | 2 | 1 ANCHOR CABLE WASHER | W100 |
| m | 8 | ½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER | SB12A |
| n | 8 | ½" STRUCTURAL NUTS | N012A |
| o | 8 | 1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS | W012A |
| p | 1 | BEARING PLATE RETAINER TIE | CT-100ST |
| q | 6 | ⅝" x 10" H.G.R. BOLT | B581002 |
| r | 1 | OBJECT MARKER 18" X 18" | E3151 |




TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

DATE: $DATE$
FILE: $FILE$

Texas Department of Transportation

Design Division Standard

# SINGLE GUARDRAIL TERMINAL
# MSKT-MASH-TL-3
# SGT(12S)31-18

| FILE: sgt12s3118.dgn | DN: TxDOT | CK: KM | DW: VP | CK: CL |
|---|---|---|---|---|
| © TxDOT: APRIL 2018 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 57 |

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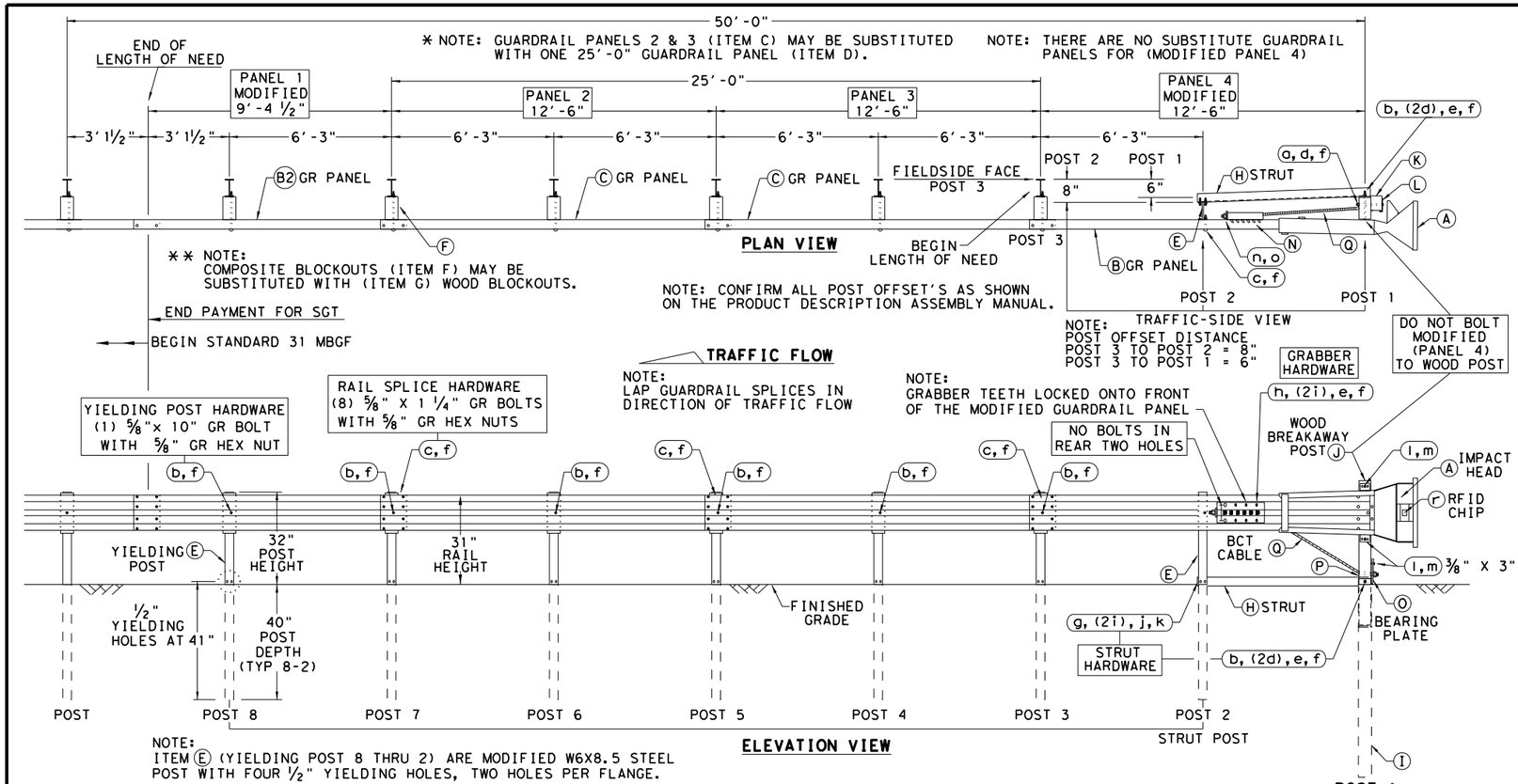
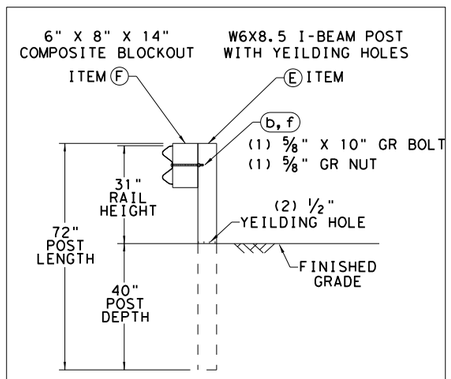



## GENERAL NOTES

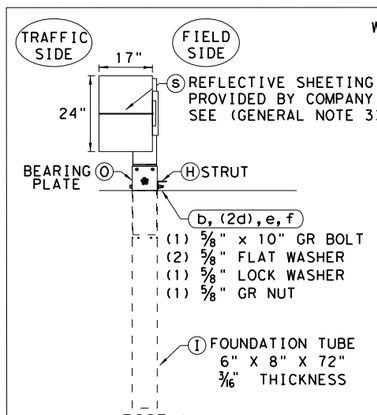
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

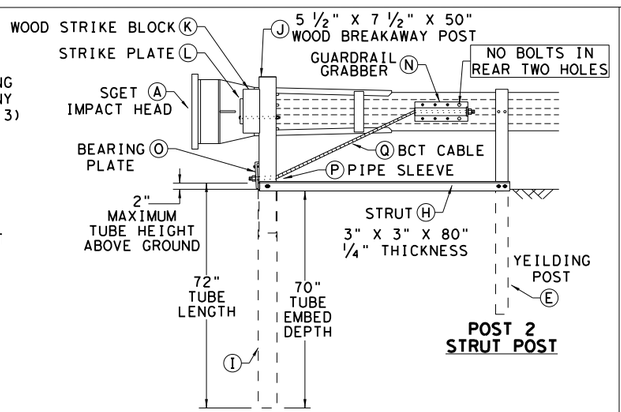
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



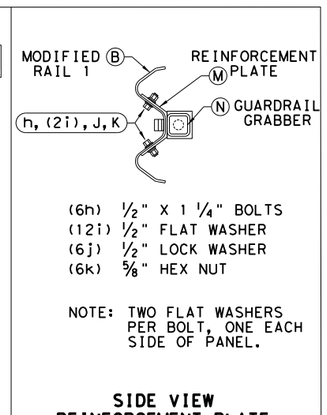

SIDE VIEW
POST 8 - POST 3 (TYP)



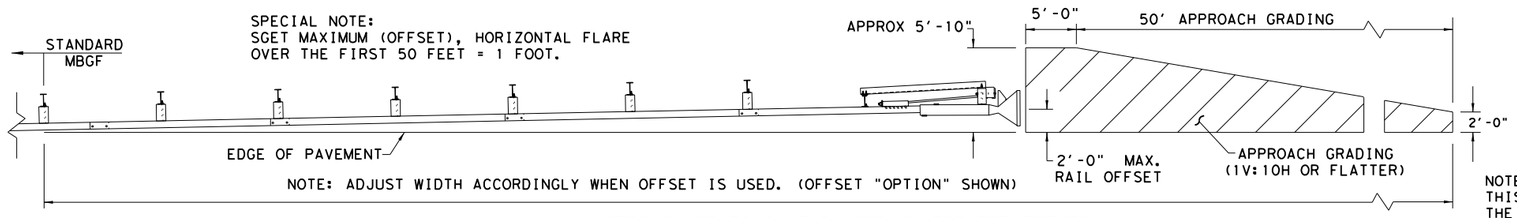

POST 1
FRONT END VIEW




POST 1
FIELD SIDE VIEW




SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



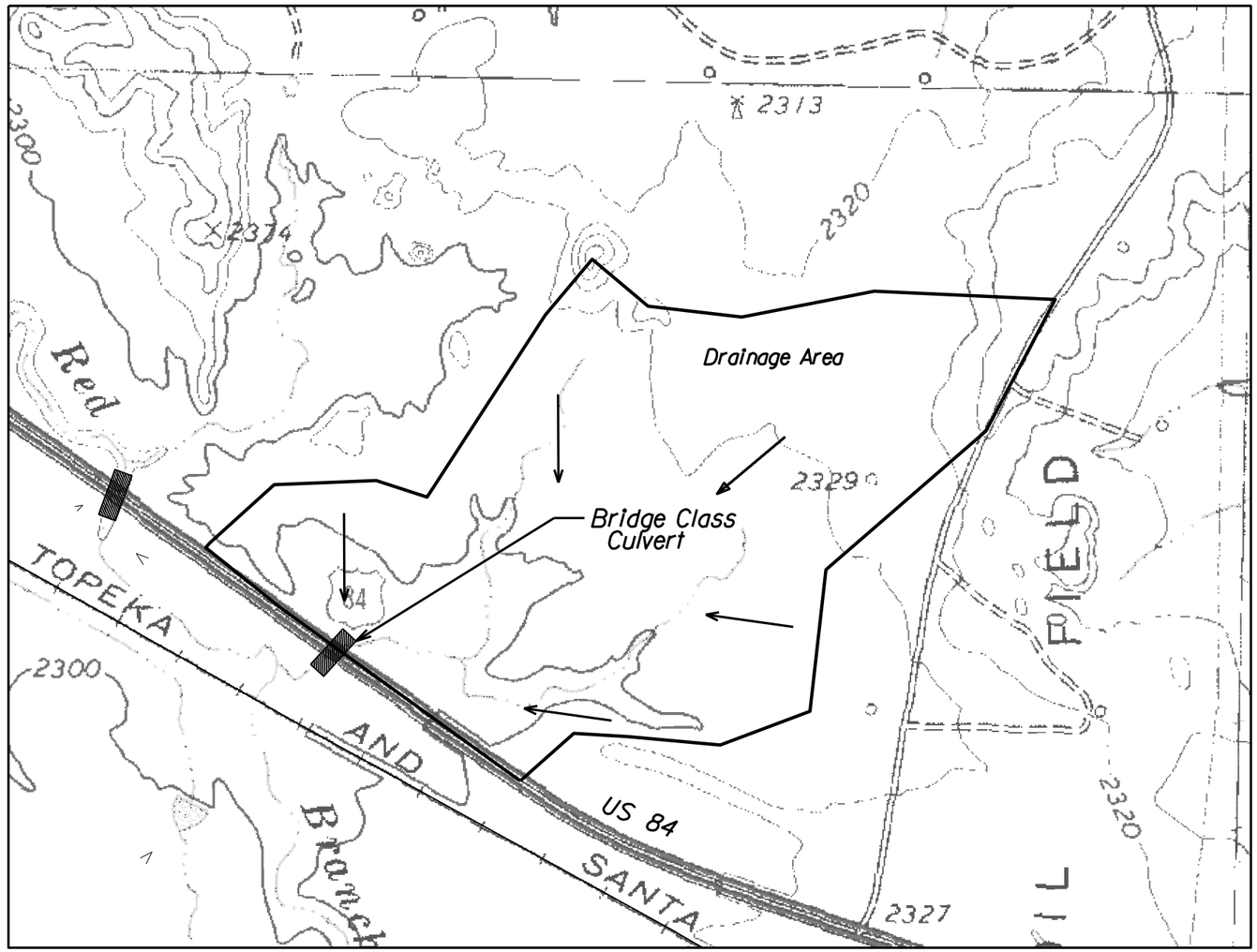

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

| | | | | | | |
|---|---|---|---|---|---|---|
| FILE: sgt153120.dgn | DN: TxDOT | CK: KM | DW: VP | CK: VP | | |
| ©TxDOT: APRIL 2020 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | SHEET NO. | |
| | LBB | GARZA | | | 58 | |




Flow Arrow

| HYDROLOGIC DATA | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| STR. NO. | D.A. (Sq. Mi.) | Tc (Hours) | CN | R-10 (in.) | qu-10 (ft3/s/mi2/in) | R-25 (in.) | qu-25 (ft3/s/mi2/in) | Q-25 (cfs) | R-100 (in.) | qu-100 (ft3/s/mi2/in) | Q-100 (cfs) |
| 17 | 0.27 | 0.56 | 83.0 | 1.53 | 448.66 | 2.35 | 467.20 | 297.04 | 3.88 | 485.98 | 510.71 |

*Calculations based on SCS-TR55 Method
*10-yr, 25-yr, & 100-yr (24-hr) Storm event

| Rainfall Design Storms | | | |
|---|---|---|---|
| Design: | 10-Year | 25-Year | 100-Year |
| Rainfall, P(in): | 4.6 | 5.75 | 7.7 |

NOTES:

1. Used USGS contour maps from year 2022,to delineate the drainage area.
2. Used ARC-GIS to get the total drainage area.
3. From USGS maps, rainfall data was collected by using NOAA Atlas 14, Volume 11, Version 2.
4. Used HEC-RAS Vol. 5.0.6 to model water surface elevation.
5. The structure is not located in the FEMA FLOODPLAIN ZONE AREA in Garza county.
6. Terrain type used Arid and Semi-arid Rangelands from curve numbers table in the Hydraulic Design Manual.

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11-14-22

# DRAINAGE AREA


Texas Department of Transportation

Scale: 1"=800' Sheet 1 of 1

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 59 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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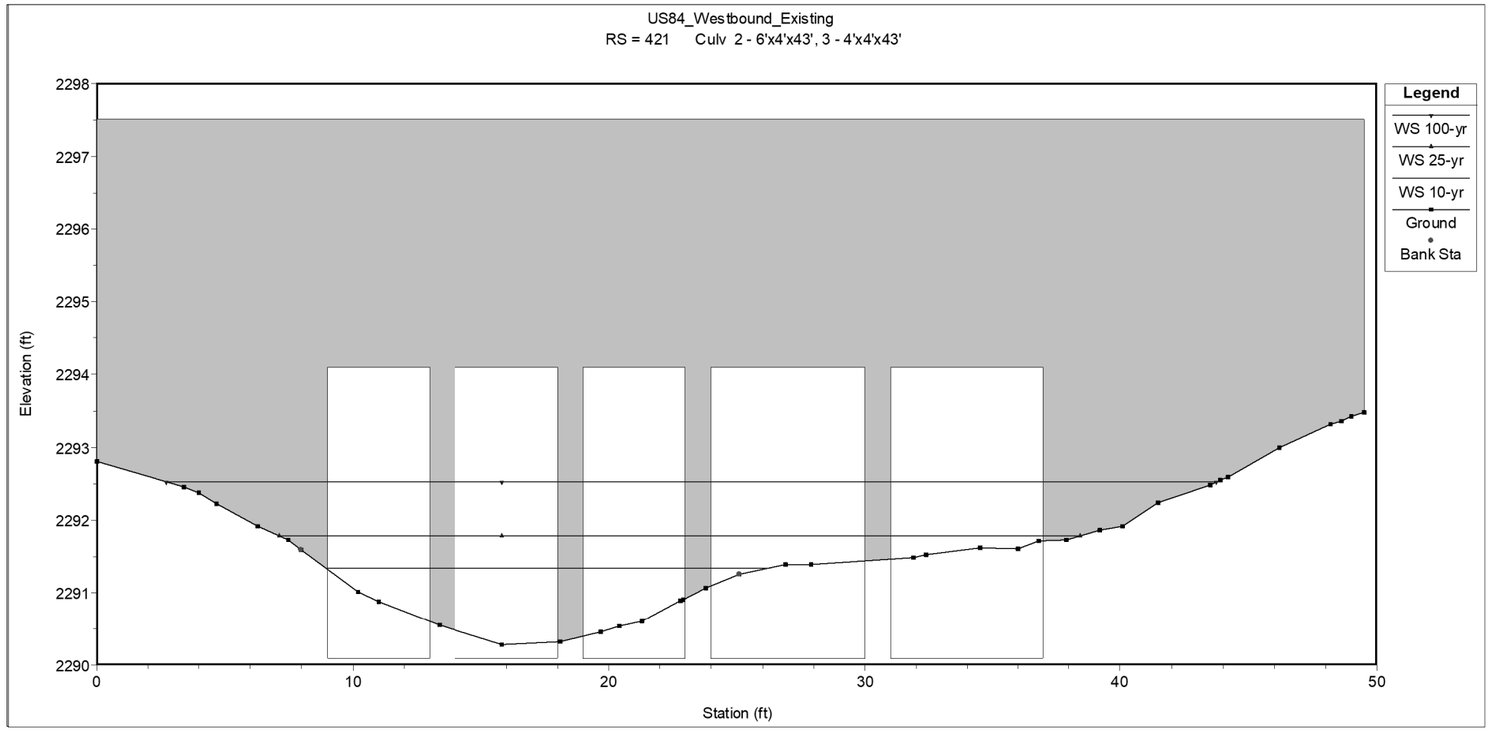


US 84 Westbound Existing Hydraulic Summary

| River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 614 | 10-yr | 186.34 | 2290.17 | 2292.82 | | 2293.1 | 0.003712 | 4.56 | 47.52 | 39.43 |
| 614 | 25-yr | 297.04 | 2290.17 | 2293.26 | | 2293.64 | 0.003998 | 5.45 | 67.32 | 54.04 |
| 614 | 100-yr | 510.71 | 2290.17 | 2294.01 | | 2294.4 | 0.003137 | 5.81 | 115.69 | 69.2 |
| | | | | | | | | | | |
| 576 | 10-yr | 186.34 | 2289.9 | 2292.89 | 2292.32 | 2292.97 | 0.00113 | 2.74 | 94.24 | 83.8 |
| 576 | 25-yr | 297.04 | 2289.9 | 2293.41 | | 2293.49 | 0.000918 | 2.85 | 137.66 | 83.8 |
| 576 | 100-yr | 510.71 | 2289.9 | 2294.15 | | 2294.26 | 0.000843 | 3.21 | 199.85 | 83.8 |
| | | | | | | | | | | |
| 527 | 10-yr | 186.34 | 2290.28 | 2292.19 | 2292.19 | 2292.68 | 0.008904 | 6.02 | 35.91 | 36.37 |
| 527 | 25-yr | 297.04 | 2290.28 | 2292.57 | 2292.57 | 2293.2 | 0.008699 | 6.94 | 50.88 | 41.87 |
| 527 | 100-yr | 510.71 | 2290.28 | 2293.37 | 2293.14 | 2293.98 | 0.005691 | 7.11 | 87.27 | 48.64 |
| | | | | | | | | | | |
| 421 | | Culvert | | | | | | | | |
| | | | | | | | | | | |
| 367 | 10-yr | 186.34 | 2288.59 | 2291.35 | | 2291.44 | 0.000977 | 2.71 | 85.3 | 54.69 |
| 367 | 25-yr | 297.04 | 2288.59 | 2291.88 | | 2292 | 0.001014 | 3.16 | 114.95 | 57.5 |
| 367 | 100-yr | 510.71 | 2288.59 | 2292.71 | | 2292.87 | 0.001032 | 3.78 | 164.59 | 62.77 |
| | | | | | | | | | | |
| 337 | 10-yr | 186.34 | 2288.09 | 2290.83 | 2290.83 | 2291.34 | 0.006226 | 6.16 | 38.34 | 39.57 |
| 337 | 25-yr | 297.04 | 2288.09 | 2291.58 | | 2291.92 | 0.003326 | 5.54 | 74.5 | 56.11 |
| 337 | 100-yr | 510.71 | 2288.09 | 2292.53 | | 2292.82 | 0.002163 | 5.42 | 139.4 | 81.3 |
| | | | | | | | | | | |
| 308 | 10-yr | 186.34 | 2287.75 | 2290.56 | 2290.41 | 2291.08 | 0.009558 | 5.78 | 32.27 | 23.94 |
| 308 | 25-yr | 297.04 | 2287.75 | 2291.02 | 2290.93 | 2291.73 | 0.010197 | 6.76 | 43.92 | 26.95 |
| 308 | 100-yr | 510.71 | 2287.75 | 2291.84 | 2291.84 | 2292.66 | 0.007802 | 7.32 | 75.34 | 60.69 |

*NOTES:*

- *Used HEC-RAS Vol. 5.0.6 to model the existing water surface elevation for the 10 yr, 25 yr & 100 yr storm event.*
- *Used the critical depth for upstream and downstream boundary condtion.*

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11-14-22

# HYDRAULIC DATA (Westbound Existing)


Texas Department of Transportation

No Scale Sheet 1 of 8

| STATE DIST. NO. | COUNTY | | | SHEET NO. |
|---|---|---|---|---|
| 05 | GARZA | | | 60 |
| CONT. | SECT. | JOB | HIGHWAY NO. | |
| 0053 | 06 | 031 | US 84 | |
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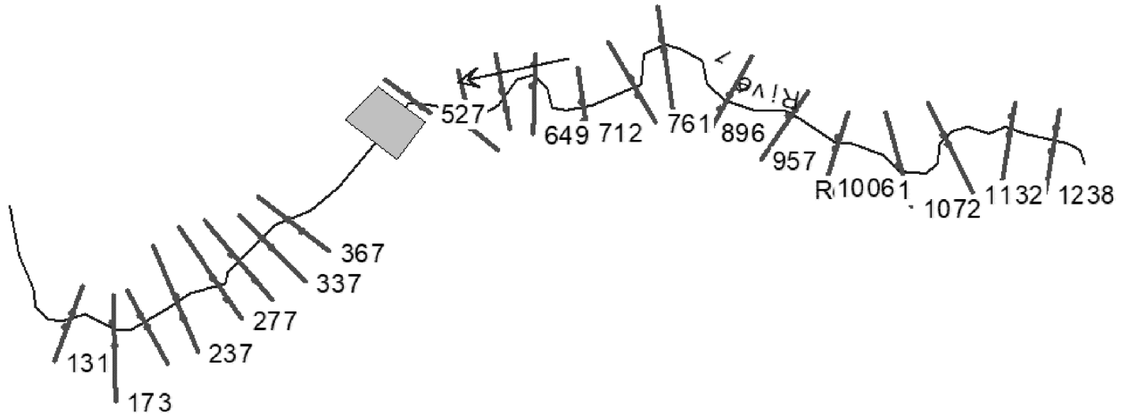


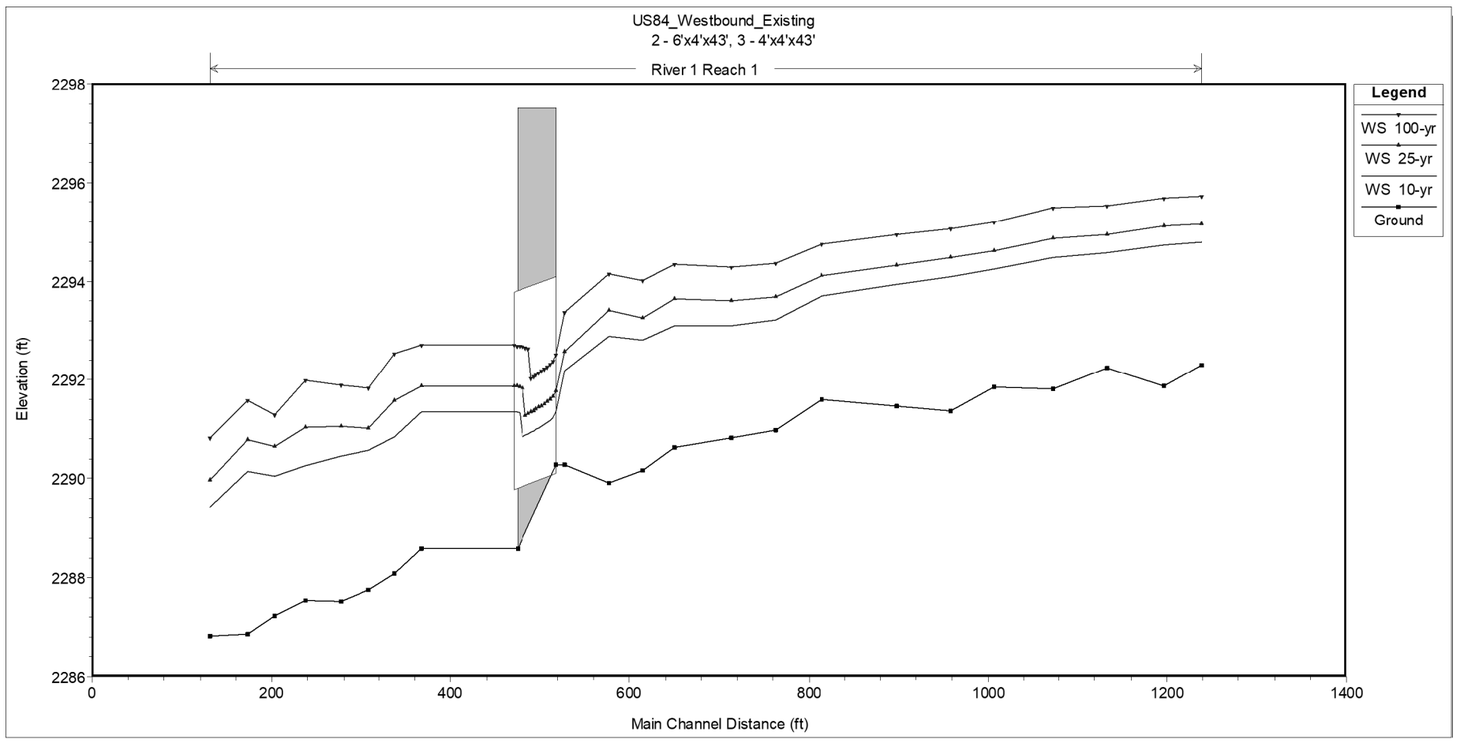


NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the existing water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

# HYDRAULIC DATA (Westbound Existing)

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11-14-22



Texas Department of Transportation

No Scale Sheet 2 of 8

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 61 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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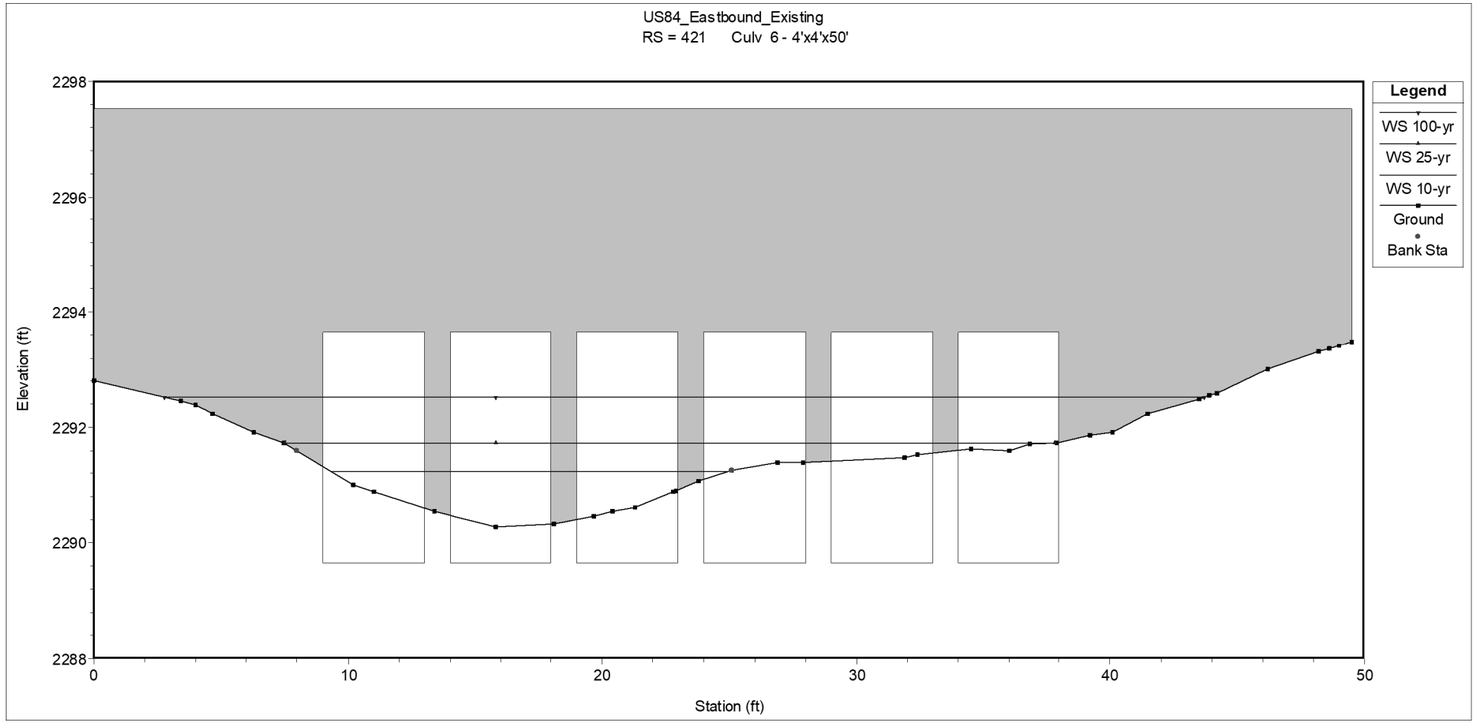


US 84 Eastbound Existing Hydraulic Summary

| River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) |
| 614 | 10-yr | 186.34 | 2290.17 | 2292.82 | | 2293.1 | 0.003712 | 4.56 | 47.52 | 39.43 |
| 614 | 25-yr | 297.04 | 2290.17 | 2293.26 | | 2293.64 | 0.003998 | 5.45 | 67.32 | 54.04 |
| 614 | 100-yr | 510.71 | 2290.17 | 2294.01 | | 2294.4 | 0.00312 | 5.8 | 115.91 | 69.2 |
| | | | | | | | | | | |
| 576 | 10-yr | 186.34 | 2289.9 | 2292.89 | 2292.32 | 2292.97 | 0.00113 | 2.74 | 94.24 | 83.8 |
| 576 | 25-yr | 297.04 | 2289.9 | 2293.41 | | 2293.49 | 0.000918 | 2.85 | 137.66 | 83.8 |
| 576 | 100-yr | 510.71 | 2289.9 | 2294.15 | | 2294.26 | 0.00084 | 3.21 | 200.06 | 83.8 |
| | | | | | | | | | | |
| 527 | 10-yr | 186.34 | 2290.28 | 2292.19 | 2292.19 | 2292.68 | 0.008904 | 6.02 | 35.91 | 36.37 |
| 527 | 25-yr | 297.04 | 2290.28 | 2292.57 | 2292.57 | 2293.2 | 0.008699 | 6.94 | 50.88 | 41.87 |
| 527 | 100-yr | 510.71 | 2290.28 | 2293.14 | 2293.14 | 2293.95 | 0.008304 | 8.09 | 76.33 | 47.06 |
| | | | | | | | | | | |
| 421 | | Culvert | | | | | | | | |
| | | | | | | | | | | |
| 367 | 10-yr | 186.34 | 2288.59 | 2291.35 | | 2291.44 | 0.000977 | 2.71 | 85.3 | 54.69 |
| 367 | 25-yr | 297.04 | 2288.59 | 2291.88 | | 2292 | 0.001014 | 3.16 | 114.95 | 57.5 |
| 367 | 100-yr | 510.71 | 2288.59 | 2292.71 | | 2292.87 | 0.001032 | 3.78 | 164.59 | 62.77 |
| | | | | | | | | | | |
| 337 | 10-yr | 186.34 | 2288.09 | 2290.83 | 2290.83 | 2291.34 | 0.006226 | 6.16 | 38.34 | 39.57 |
| 337 | 25-yr | 297.04 | 2288.09 | 2291.58 | | 2291.92 | 0.003326 | 5.54 | 74.5 | 56.11 |
| 337 | 100-yr | 510.71 | 2288.09 | 2292.53 | | 2292.82 | 0.002163 | 5.42 | 139.4 | 81.3 |
| | | | | | | | | | | |
| 308 | 10-yr | 186.34 | 2287.75 | 2290.56 | 2290.41 | 2291.08 | 0.009558 | 5.78 | 32.27 | 23.94 |
| 308 | 25-yr | 297.04 | 2287.75 | 2291.02 | 2290.93 | 2291.73 | 0.010197 | 6.76 | 43.92 | 26.95 |
| 308 | 100-yr | 510.71 | 2287.75 | 2291.84 | 2291.84 | 2292.66 | 0.007802 | 7.32 | 75.34 | 60.69 |

NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the existing water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

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# HYDRAULIC DATA (Eastbound Existing)


Texas Department of Transportation

No Scale Sheet 3 of 8

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 62 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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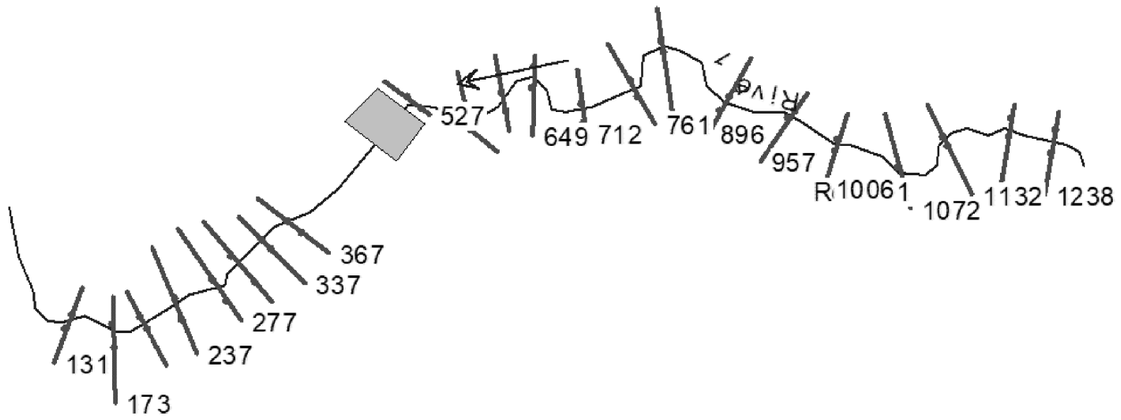


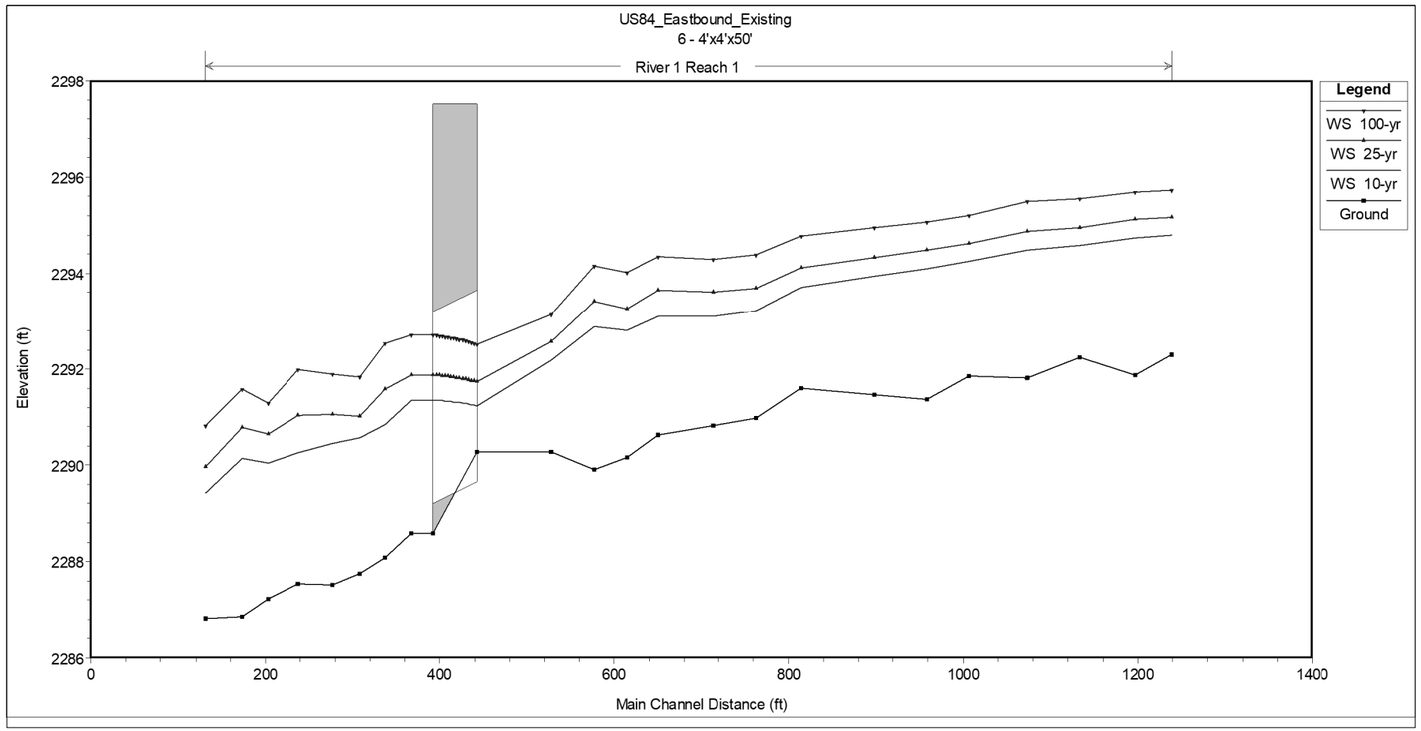


NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the existing water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

# HYDRAULIC DATA (Eastbound Existing)

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11-14-22



Texas Department of Transportation

No Scale Sheet 4 of 8

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 63 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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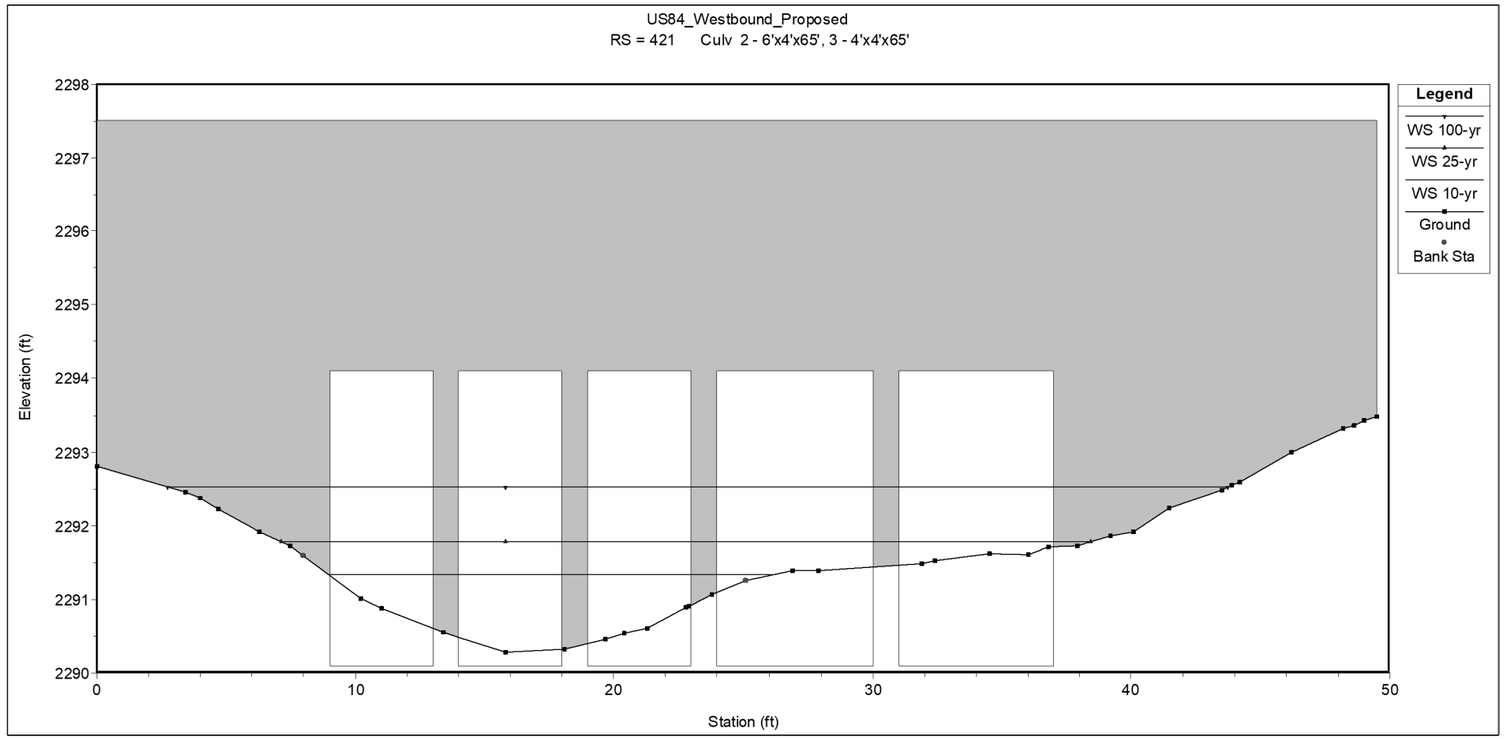


US 84 Westbound Proposed Hydraulic Summary

| River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 614 | 10-yr | 186.34 | 2290.17 | 2292.82 | | 2293.1 | 0.003712 | 4.56 | 47.52 | 39.43 |
| 614 | 25-yr | 297.04 | 2290.17 | 2293.26 | | 2293.64 | 0.003998 | 5.45 | 67.32 | 54.04 |
| 614 | 100-yr | 510.71 | 2290.17 | 2294.01 | | 2294.4 | 0.003137 | 5.81 | 115.69 | 69.2 |
| | | | | | | | | | | |
| 576 | 10-yr | 186.34 | 2289.9 | 2292.89 | 2292.32 | 2292.97 | 0.00113 | 2.74 | 94.24 | 83.8 |
| 576 | 25-yr | 297.04 | 2289.9 | 2293.41 | | 2293.49 | 0.000918 | 2.85 | 137.66 | 83.8 |
| 576 | 100-yr | 510.71 | 2289.9 | 2294.15 | | 2294.26 | 0.000843 | 3.21 | 199.85 | 83.8 |
| | | | | | | | | | | |
| 527 | 10-yr | 186.34 | 2290.28 | 2292.19 | 2292.19 | 2292.68 | 0.008904 | 6.02 | 35.91 | 36.37 |
| 527 | 25-yr | 297.04 | 2290.28 | 2292.57 | 2292.57 | 2293.2 | 0.008699 | 6.94 | 50.88 | 41.87 |
| 527 | 100-yr | 510.71 | 2290.28 | 2293.37 | 2293.14 | 2293.98 | 0.005691 | 7.11 | 87.27 | 48.64 |
| | | | | | | | | | | |
| 421 | | Culvert | | | | | | | | |
| | | | | | | | | | | |
| 367 | 10-yr | 186.34 | 2288.59 | 2291.35 | | 2291.44 | 0.000977 | 2.71 | 85.3 | 54.69 |
| 367 | 25-yr | 297.04 | 2288.59 | 2291.88 | | 2292 | 0.001014 | 3.16 | 114.95 | 57.5 |
| 367 | 100-yr | 510.71 | 2288.59 | 2292.71 | | 2292.87 | 0.001032 | 3.78 | 164.59 | 62.77 |
| | | | | | | | | | | |
| 337 | 10-yr | 186.34 | 2288.09 | 2290.83 | 2290.83 | 2291.34 | 0.006226 | 6.16 | 38.34 | 39.57 |
| 337 | 25-yr | 297.04 | 2288.09 | 2291.58 | | 2291.92 | 0.003326 | 5.54 | 74.5 | 56.11 |
| 337 | 100-yr | 510.71 | 2288.09 | 2292.53 | | 2292.82 | 0.002163 | 5.42 | 139.4 | 81.3 |
| | | | | | | | | | | |
| 308 | 10-yr | 186.34 | 2287.75 | 2290.56 | 2290.41 | 2291.08 | 0.009558 | 5.78 | 32.27 | 23.94 |
| 308 | 25-yr | 297.04 | 2287.75 | 2291.02 | 2290.93 | 2291.73 | 0.010197 | 6.76 | 43.92 | 26.95 |
| 308 | 100-yr | 510.71 | 2287.75 | 2291.84 | 2291.84 | 2292.66 | 0.007802 | 7.32 | 75.34 | 60.69 |

NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the proposed water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

# HYDRAULIC DATA (Westbound Proposed)

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11-14-22



Texas Department of Transportation

No Scale Sheet 5 of 8

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 64 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
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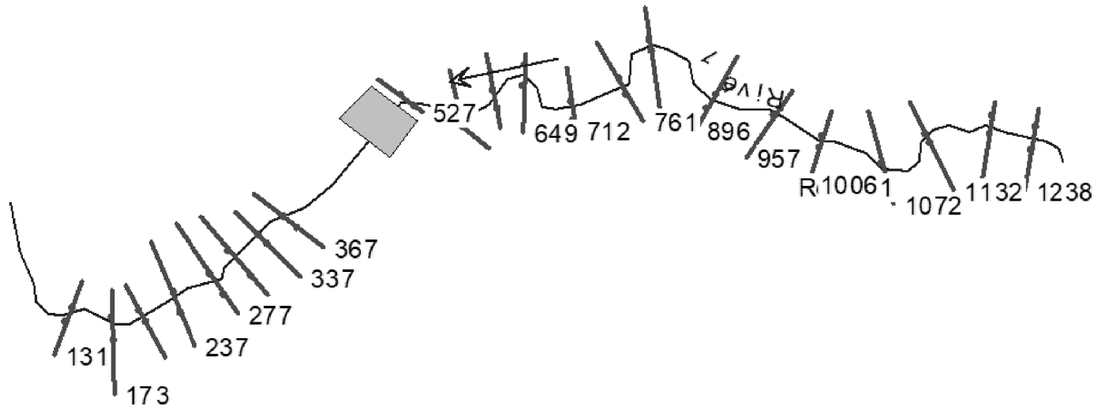
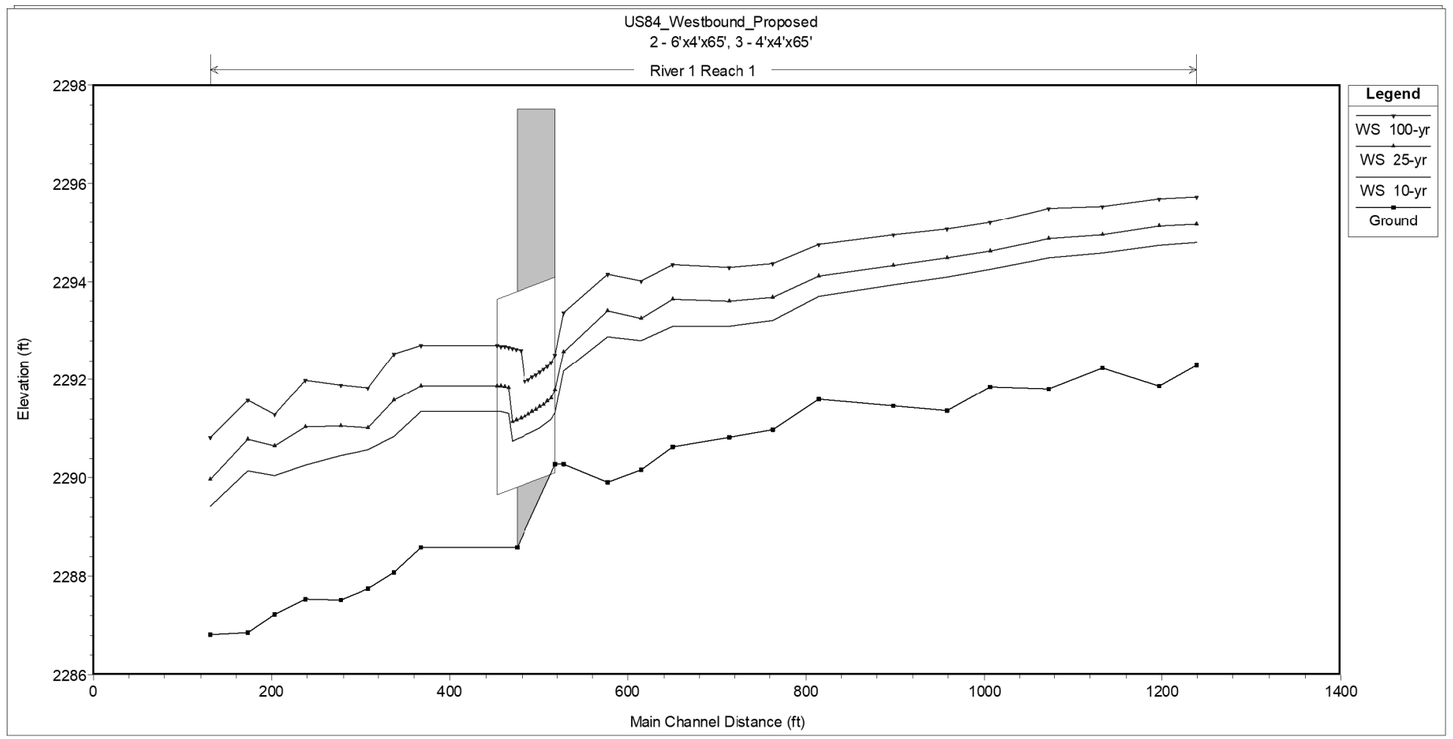
&TIME&




NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the proposed water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

# HYDRAULIC DATA (Westbound Proposed)

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Texas Department of Transportation

No Scale — Sheet 6 of 8

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 65 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_DRG_HYDRAULICS_PROPOSED.dgn | | |

DATE: %DATE% %TIME%
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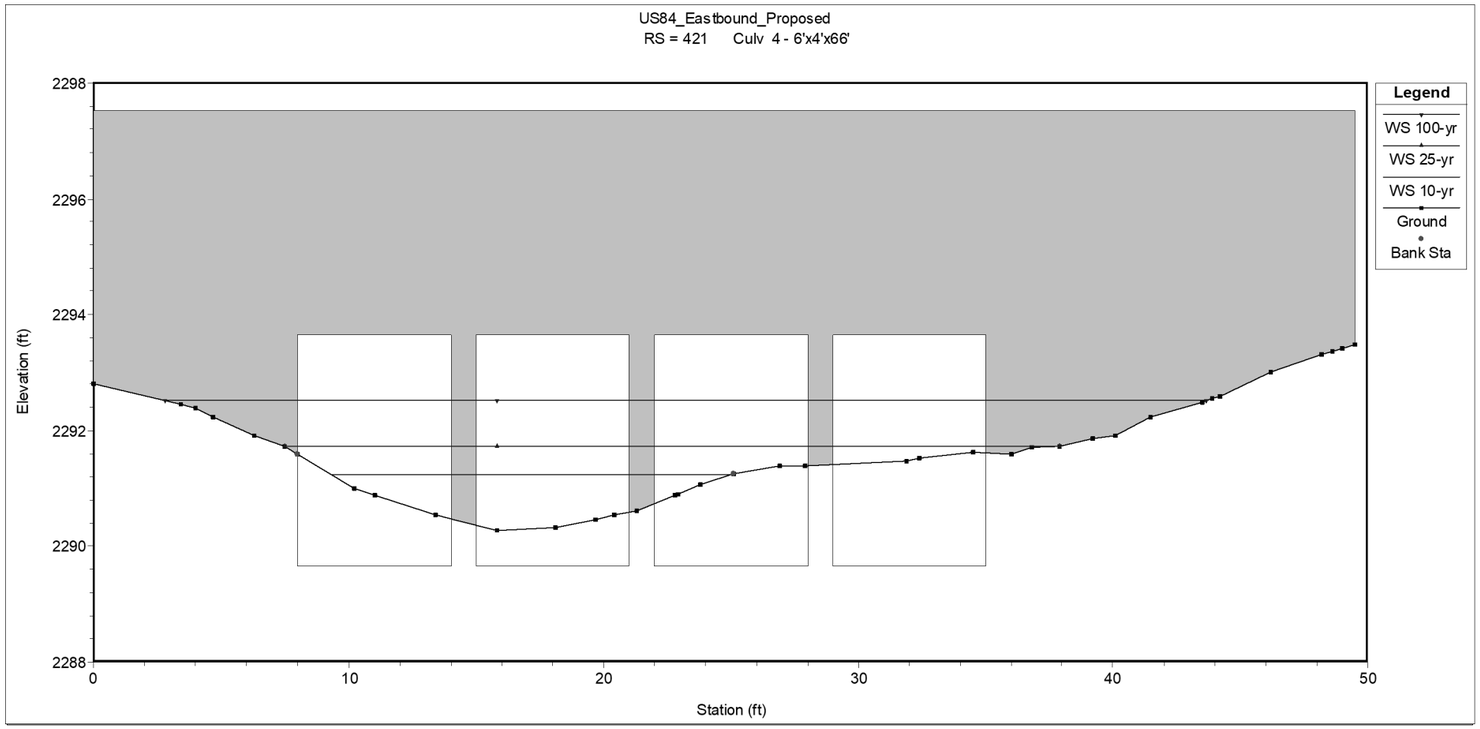


US 84 Eastbound Proposed Hydraulic Summary

| River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (cfs) | (ft) | (ft) | (ft) | (ft) | (ft/ft) | (ft/s) | (sq ft) | (ft) |
| 614 | 10-yr | 186.34 | 2290.17 | 2292.82 | | 2293.1 | 0.003712 | 4.56 | 47.52 | 39.43 |
| 614 | 25-yr | 297.04 | 2290.17 | 2293.26 | | 2293.64 | 0.003998 | 5.45 | 67.32 | 54.04 |
| 614 | 100-yr | 510.71 | 2290.17 | 2294.01 | | 2294.4 | 0.00312 | 5.8 | 115.91 | 69.2 |
| | | | | | | | | | | |
| 576 | 10-yr | 186.34 | 2289.9 | 2292.89 | 2292.32 | 2292.97 | 0.00113 | 2.74 | 94.24 | 83.8 |
| 576 | 25-yr | 297.04 | 2289.9 | 2293.41 | | 2293.49 | 0.000918 | 2.85 | 137.66 | 83.8 |
| 576 | 100-yr | 510.71 | 2289.9 | 2294.15 | | 2294.26 | 0.00084 | 3.21 | 200.06 | 83.8 |
| | | | | | | | | | | |
| 527 | 10-yr | 186.34 | 2290.28 | 2292.19 | 2292.19 | 2292.68 | 0.008904 | 6.02 | 35.91 | 36.37 |
| 527 | 25-yr | 297.04 | 2290.28 | 2292.57 | 2292.57 | 2293.2 | 0.008699 | 6.94 | 50.88 | 41.87 |
| 527 | 100-yr | 510.71 | 2290.28 | 2293.14 | 2293.14 | 2293.95 | 0.008304 | 8.09 | 76.33 | 47.06 |
| | | | | | | | | | | |
| 421 | | Culvert | | | | | | | | |
| | | | | | | | | | | |
| 367 | 10-yr | 186.34 | 2288.59 | 2291.35 | | 2291.44 | 0.000977 | 2.71 | 85.3 | 54.69 |
| 367 | 25-yr | 297.04 | 2288.59 | 2291.88 | | 2292 | 0.001014 | 3.16 | 114.95 | 57.5 |
| 367 | 100-yr | 510.71 | 2288.59 | 2292.71 | | 2292.87 | 0.001032 | 3.78 | 164.59 | 62.77 |
| | | | | | | | | | | |
| 337 | 10-yr | 186.34 | 2288.09 | 2290.83 | 2290.83 | 2291.34 | 0.006226 | 6.16 | 38.34 | 39.57 |
| 337 | 25-yr | 297.04 | 2288.09 | 2291.58 | | 2291.92 | 0.003326 | 5.54 | 74.5 | 56.11 |
| 337 | 100-yr | 510.71 | 2288.09 | 2292.53 | | 2292.82 | 0.002163 | 5.42 | 139.4 | 81.3 |
| | | | | | | | | | | |
| 308 | 10-yr | 186.34 | 2287.75 | 2290.56 | 2290.41 | 2291.08 | 0.009558 | 5.78 | 32.27 | 23.94 |
| 308 | 25-yr | 297.04 | 2287.75 | 2291.02 | 2290.93 | 2291.73 | 0.010197 | 6.76 | 43.92 | 26.95 |
| 308 | 100-yr | 510.71 | 2287.75 | 2291.84 | 2291.84 | 2292.66 | 0.007802 | 7.32 | 75.34 | 60.69 |

*NOTES:*

- *Used HEC-RAS Vol. 5.0.6 to model the proposed water surface elevation for the 10 yr, 25 yr & 100 yr storm event.*
- *Used the critical depth for upstream and downstream boundary condtion.*

# HYDRAULIC DATA (Eastbound Proposed)

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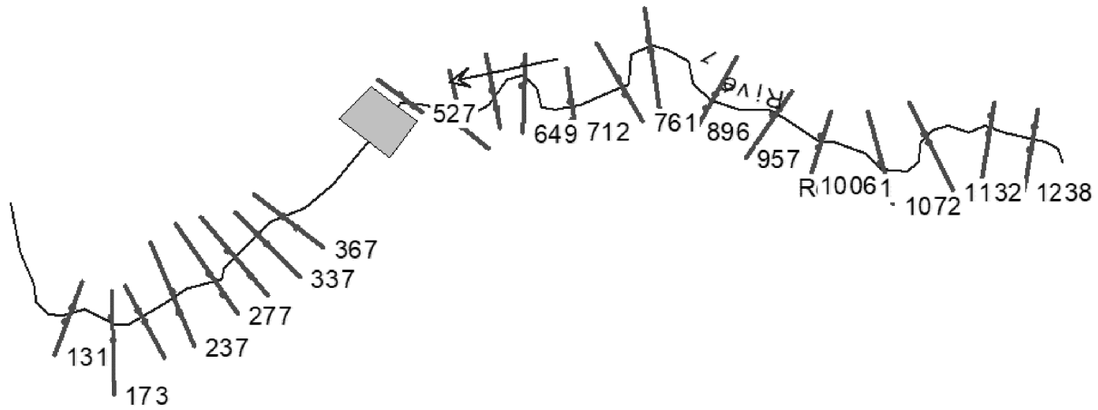
11-14-22

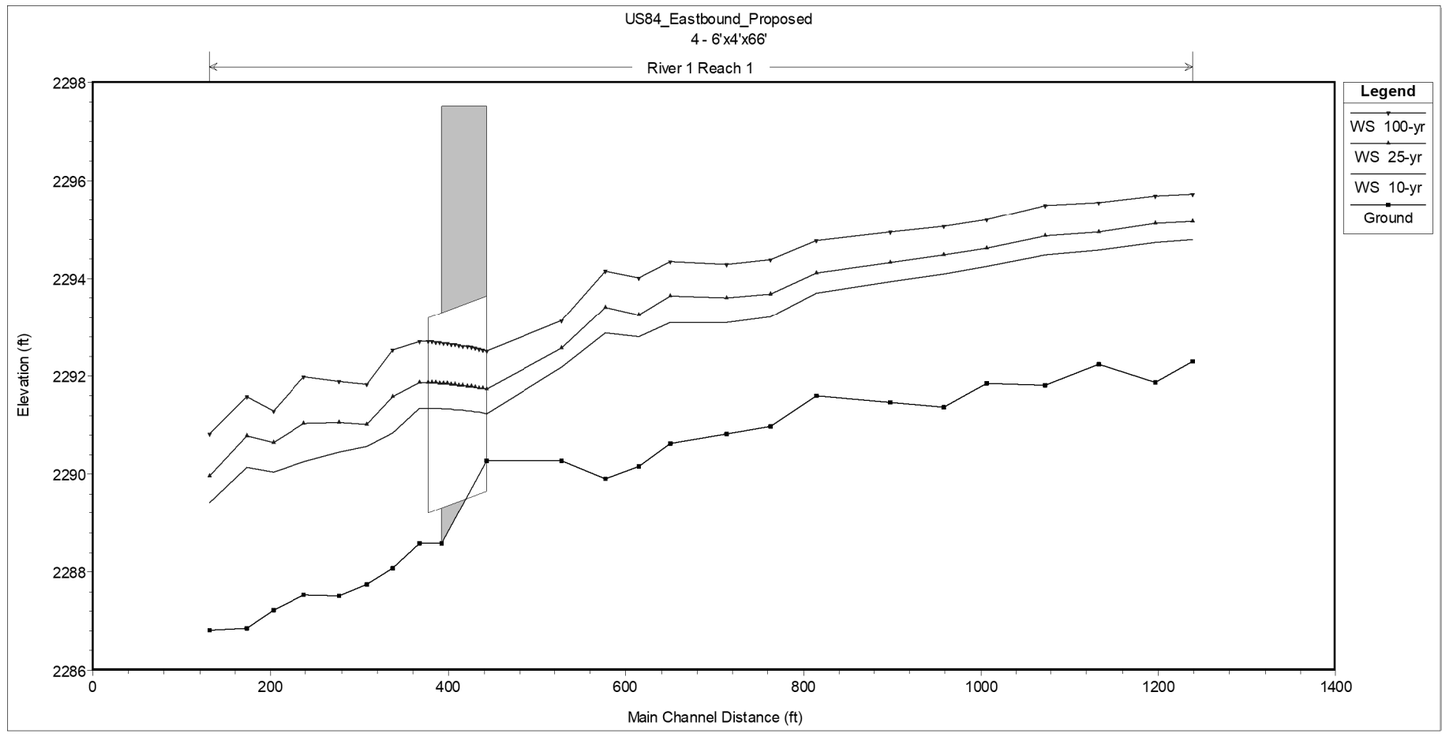

Texas Department of Transportation

No Scale Sheet 7 of 8

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 66 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_DRG_HYDRAULICS_PROPOSED.dgn | | |

DATE: &DATE&
FILE: &FILE&
&TIME&




NOTES:

- Used HEC-RAS Vol. 5.0.6 to model the proposed water surface elevation for the 10 yr, 25 yr & 100 yr storm event.
- Used the critical depth for upstream and downstream boundary condtion.

# HYDRAULIC DATA (Eastbound Proposed)

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Texas Department of Transportation

No Scale — Sheet 8 of 8

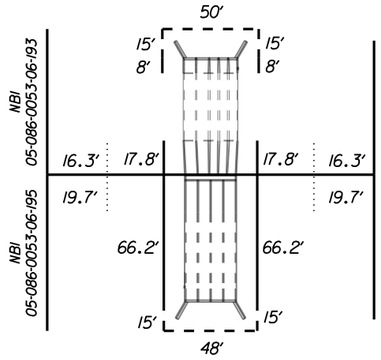
| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 67 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_DRG_HYDRAULICS_PROPOSED.dgn | | |

DATE: &DATE&
FILE: &FILE&
&TIME&

## BRIDGE SUMMARY - CSJ 53-6-31

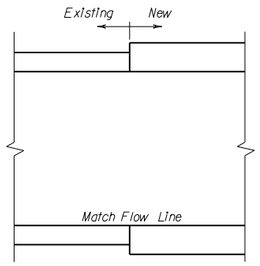
| NBI NO. | STRUCTURE | | | WORK DESCRIPTION | | PAY ITEMS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CEMENT STABIL. BACKFILL ITEM 400-6005 | TRENCH EXCAVATION PROTECTION ITEM 402-6001 | TEMPORARY SPL SHORING (COFFERDAM) ITEM 403-6006 | CL C CONC. (CULV.) ITEM 420-6051 | CL C CONC. RAIL FOUNDATION ITEM 420-6066 | ♪ RIPRAP (5 IN) ITEM 432-6002 | RIPRAP (CL B) ITEM 432-6006 | RAIL (TY T551) ITEM 450-6014 | INLET (COMPL) (DROPXSPL) ITEM 465-6372 | WINGWALL (FW-0) (HW=5FT) ITEM 466-6152 | CLEAN EXIST. CULVERTS ITEM 480-6001 |
| | Station | Description | Location | Extension L.F. | Proposed Str. L.F. | C.Y. | L.F. | S.F. | C.Y. | C.Y. | C.Y. | C.Y. | L.F. | EA. | EA. | EA. |
| 05-086-0-00 53-06-193 | 1054+36 | Rdwy. A: Exist 2 - 6'x4'x43' Conc. Boxes Back, 3 - 4'x4'x43' Conc. Boxes Fwd. | Left | 8.00 | | 109.8 | 51.6 | 480.0 | 18.2 | 5.8 | 6.0 | 6.6 | 28.0 | | 1 | 1 |
| | | | Right | 18.00 | | | | | 37.4 | | | | | | | |
| **Bridge Totals** | | | | **26.00** | | **109.8** | **51.6** | **480.0** | **55.6** | **5.8** | **6.0** | **6.6** | **28.0** | | **1** | **1** |
| 05-086-0-00 53-06-195 | 1054+36 | Rdwy. B: Proposed 4 - 6'x4'x66' | Left | | 66.00 | 374.5 | 132.4 | | 128.2 | | 4.0 | 15.9 | | 1 | | 1 |
| | | | Right | | | | | 468.0 | | 7.0 | | | 27.0 | | 1 | |
| **Bridge Totals** | | | | | **66.00** | **374.5** | **132.4** | **468.0** | **128.2** | **7.0** | **4.0** | **15.9** | **27.0** | **1** | **1** | **1** |
| **Project Totals** | | | | **26.00** | **66.00** | **484.3** | **184.0** | **948.0** | **183.8** | **12.8** | **10.0** | **22.5** | **56.0** | **1** | **2** | **2** |

♪ INCLUDES RAC PAVEMENT RIPRAP

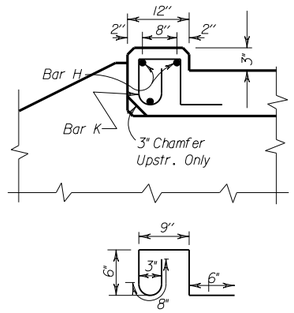



**SHORING & TRENCHING DETAIL**

- – – Temporary Shoring
- —— Trench Protection
- ····· Cofferdam in the Median




**BOX CULVERT EXTENSION DETAIL SIDE VIEW**




**BARS K**

**MODIFIED CURB SECTION**
For Concrete Box Culverts

### GENERAL NOTES:

All exposed steel shall be galvanized unless otherwise shown on plans. Galvanizing damaged during transport and construction shall be repaired in accordance with the specifications.

All break backs are measured from the outside of the original headwall. Do not measure from a broken edge.

When connecting to an existing box with different dimensions than the current standards, match the inside edges of walls and match flow lines unless otherwise directed by the Engineer.

Existing longitudinal bars in box and wingwalls shall be utilized to achieve required lap with new reinforcing steel. Wings and apron shall be broken back as necessary to install the extension.

Exposed reinforcing steel required for lap shall be cleaned and field bent to lap with new reinforcing steel.

All box culvert concrete shall be Class "C". Chamfer exposed corners 3/4 " except as otherwise noted.

In areas of conflict between reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Reinforcing shall be Grade 60.

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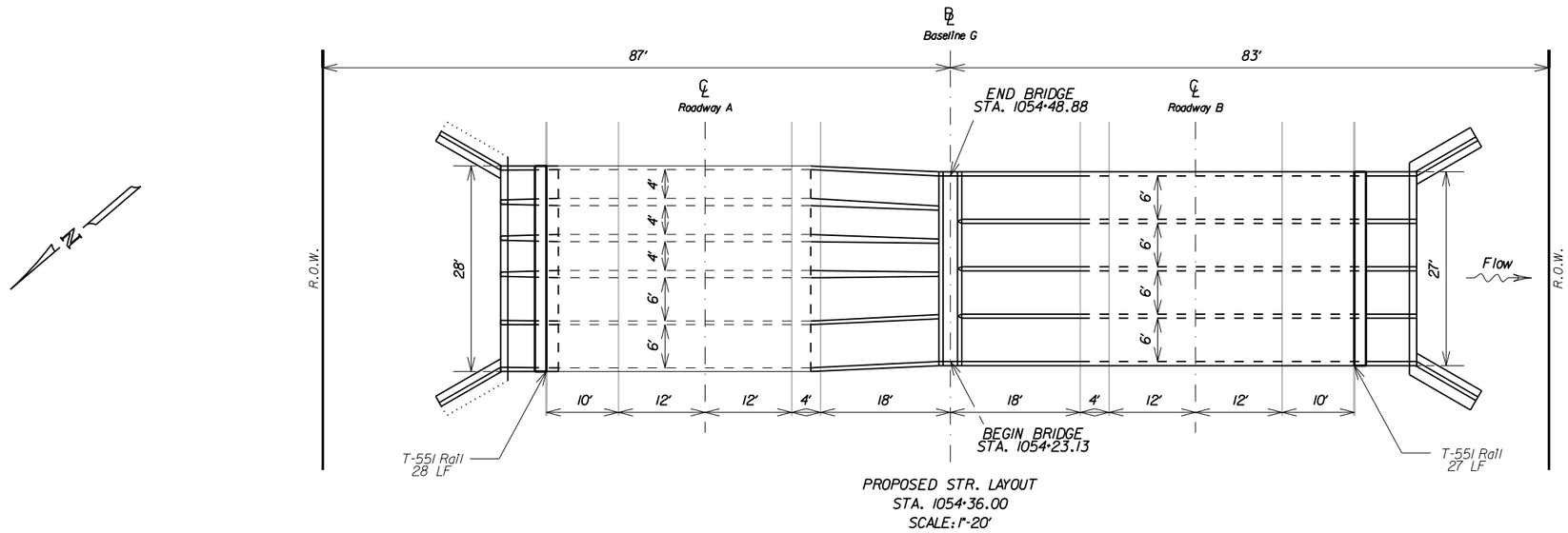
No Scale Sheet 1 of 1

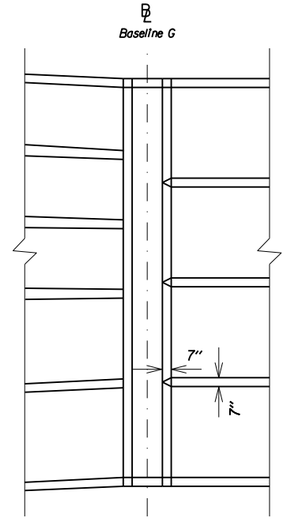
| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 68 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_BRG_BRIDGE_SUMMARY.dgn | | |

# BRIDGE SUMMARY

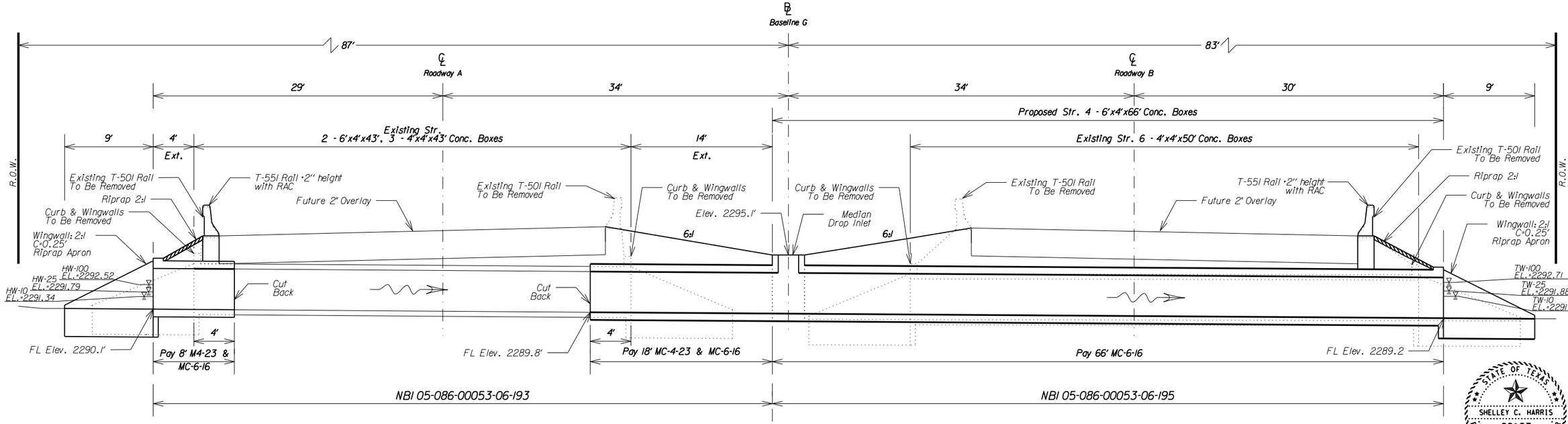
DATE: &DATE&
FILE: &FILE&
&TIME&




PROPOSED STR. LAYOUT
STA. 1054+36.00
SCALE: 1"=20'




**TAPERED WALL ENDS AT THE INLET**




**PROPOSED STR. SECTION**
**NBI: 05-086-0-0053-06-193**
**NBI: 05-086-0-0053-06-195**
STA. 1054+36.00

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11-14-22



Texas Department of Transportation
Scale: 1"=10' Sheet 1 of 1

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 69 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_BRG_BRIDGE_CLASS_CULVERT.dgn | | |

# BRIDGE-CLASS CULVERT

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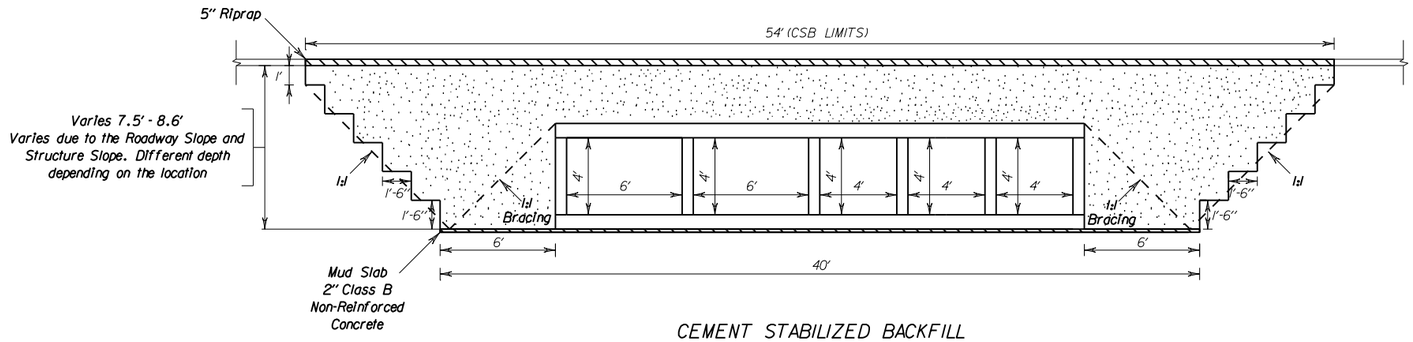
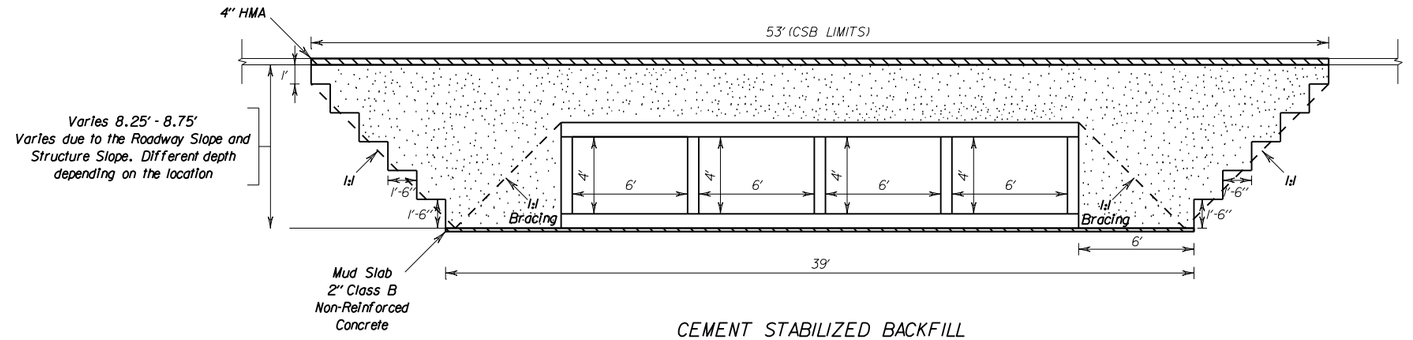
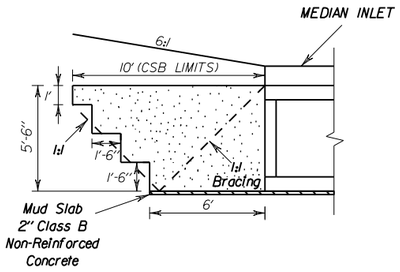
FILE: *FILE*
*TIME*



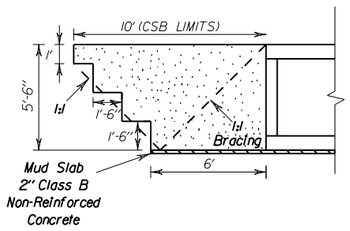

CEMENT STABILIZED BACKFILL
(ROADWAY A)




CEMENT STABILIZED BACKFILL
(ROADWAY B)

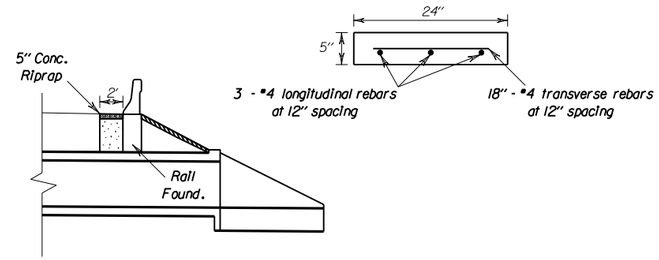



CEMENT STABILIZED BACKFILL
(MEDIAN)



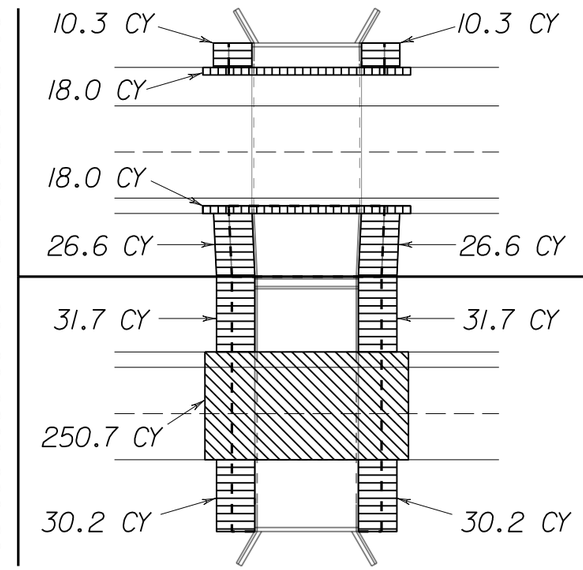

CEMENT STABILIZED BACKFILL
(OUTSIDE ROADWAY LIMITS)

NOTE:
ANY OVEREXCAVATION BEYOND DIMENSIONS
SHOWN IN DETAIL IS THE CONTRACTOR'S COST.




RAC Pavement Detail

NBI 05-086-0053-06-193




NBI 05-086-0053-06-195

| RDWY A |
|---|
| CSB (109.8 CY) |
| MUD SLAB (6.6 CY) |
| RIPRAP (2.6 CY) |
| **RDWY B** |
| CSB (374.5 CY) |
| MUD SLAB (15.9 CY) |
| RIPRAP (0.83 CY) |

## PAY LIMIT ITEMS

**(HATCHED AREAS ABOVE SHOW CSB CY)**

CSB ROADWAY A

CSB MEDIAN & OUTSIDE ROADWAY LIMITS

CSB ROADWAY B

MUD SLAB LIMITS

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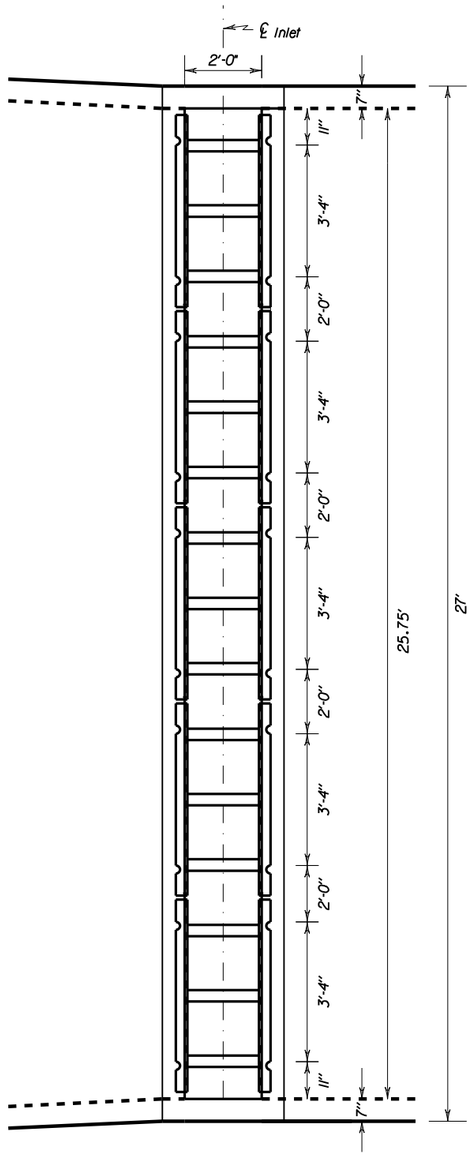
Texas Department of Transportation

No Scale Sheet 1 of 1

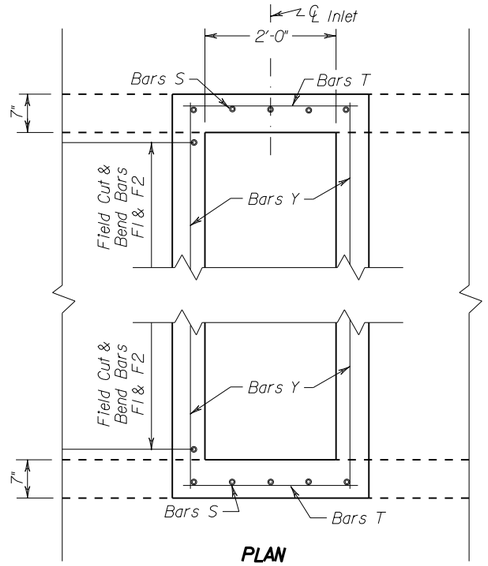
| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 70 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_BRG_CEMENT_STABILIZED_BACKFILL.dgn | | |

# CEMENT STABILIZED BACKFILL

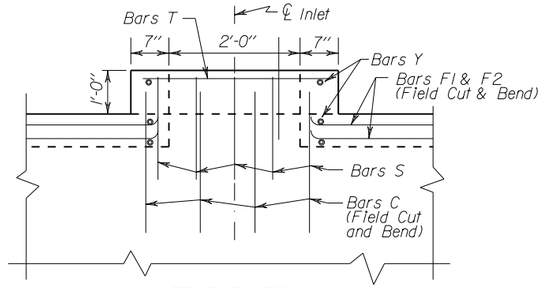
DATE: %DATE%
FILE: %FILE%
%TIME%



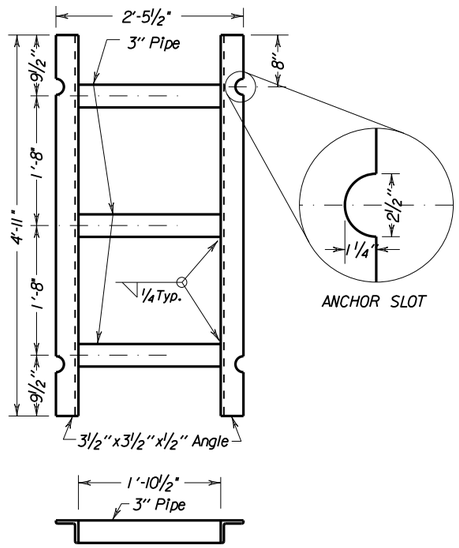

GRATE PLAN




PLAN



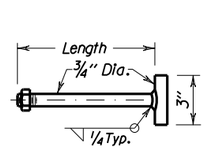

INLET ELEVATION



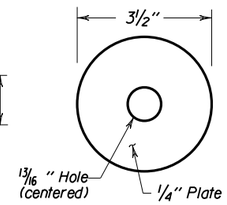

ANCHOR SLOT

GRATE

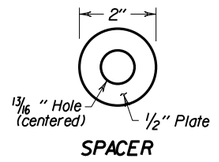
Est. Wt. = 152 lb.




ANCHOR BOLT



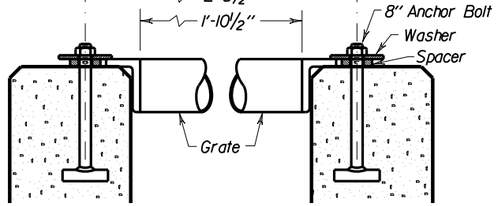

WASHER




SPACER

## QUANTITIES
### ONE INLET
All Bars are #4

| BAR | NO. | SPAC. | LENGTH |
|---|---|---|---|
| S | 10 | 8" | 1'-5" |
| T | 2 | ~ | 2'-8" |
| Y | 4 | ~ | 5'-10" |
| Concrete | | | 0.54 C.Y. |
| Reinf. Steel | | | 29 Lb. |
| Grate | | | 1 Ea. |




GRATE ANCHOR

## GENERAL NOTES:

Inlet will be paid using Item 465-6372 INLET (COMPL)(DROP)(SPL)

All concrete shall be Class "C". Chamfer exposed corners ¾" except as otherwise noted.

All dimensions relating to reinforcing bars are to center of bars. All bolts, nuts and washers, lugs, grates, concrete, and reinforcing are considered parts of the inlet for payment.

Pipe shall be 3" Schedule 40 steel pipe. Bolts and nuts shall conform to ASTM A307. Steel plate and angle shall conform to ASTM A36.

All exposed steel shall be galvanized unless otherwise shown on plans. Galvanizing damaged during transport and construction shall be repaired in accordance with the specifications.

Bend and adjust reinforcing as needed to construct inlet. Replace damaged reinforcing.

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No Scale Sheet 1 of 1

| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 71 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_BRG_MEDIAN_DROP_INLET.dgn | | |

# MEDIAN DROP INLET

DATE: #DATE#
FILE: #FILE#
#TIME#

| 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 Offset 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sta. 1054+36 NBI 05-086-0-0053-06-193 (Back) (Lt) | 2 ~ 6'x4' | 5 | MC-6-16 | FW-0 | 0 | 2:1 | 9 | 7 | 0.250 | 4.750 | 8.333 | 5.100 | 10.200 | N/A | N/A | 2.5 | 0.1 | 3.5 | 52 |
| Sta. 1054+36 NBI 05-086-0-0053-06-193 (Fwd.) (Lt) | 3 ~ 4'x4' | 5 | MC-4-23 | FW-0 | 0 | 2:1 | 9 | 7 | 0.250 | 4.750 | 8.333 | 5.100 | 10.200 | N/A | N/A | 2.6 | 0.1 | 3.5 | 52 |
| Sta. 1054+36 NBI 05-086-0-0053-06-195 (Rt) | 4 ~ 6'x4' | 5 | MC-6-16 | FW-0 | 0 | 2:1 | 9 | 7 | 0.250 | 4.750 | 8.333 | 5.100 | 10.200 | N/A | N/A | 4.6 | 0.2 | 3.5 | 52 |

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

♪ See Guardrail & Riprap Layout, and Structure Summary for actual Riprap Apron quantity.

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

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

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

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

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED
PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

SPECIAL NOTE:

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

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

Texas Department of Transportation

Bridge Division Standard

# BOX CULVERT SUPPLEMENT
## WINGS AND END TREATMENTS

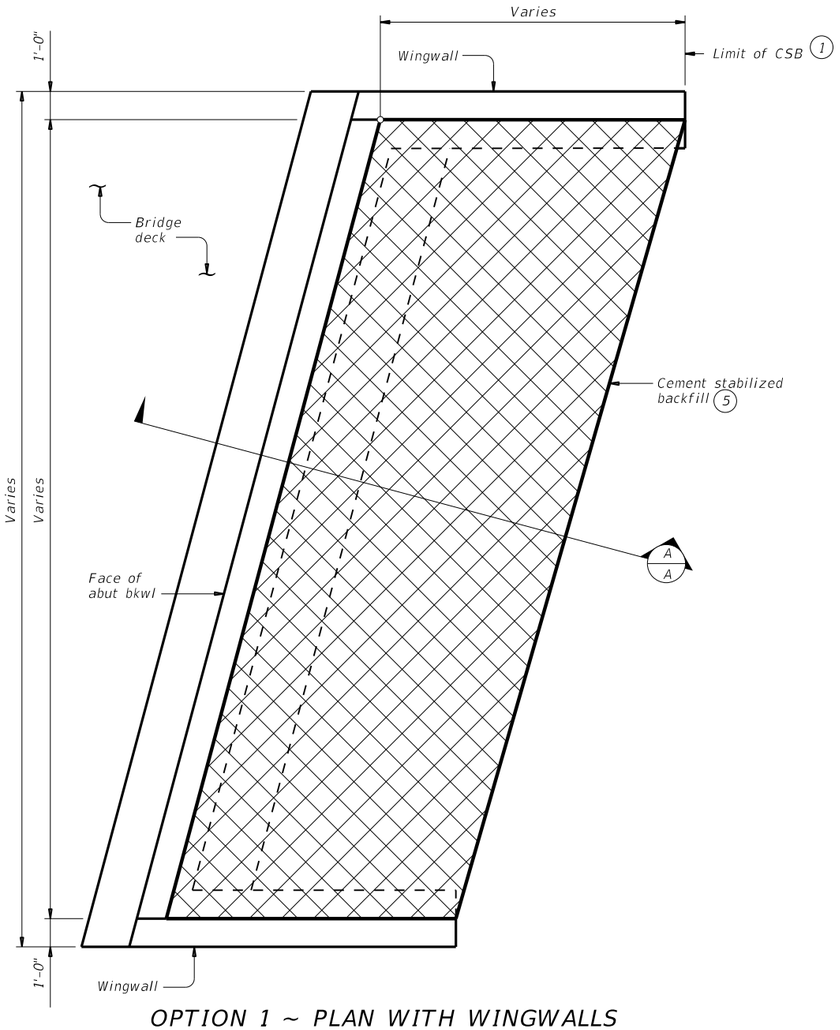
BCS

| FILE: bcsstde1-20.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | 05 | GARZA | | 72 |



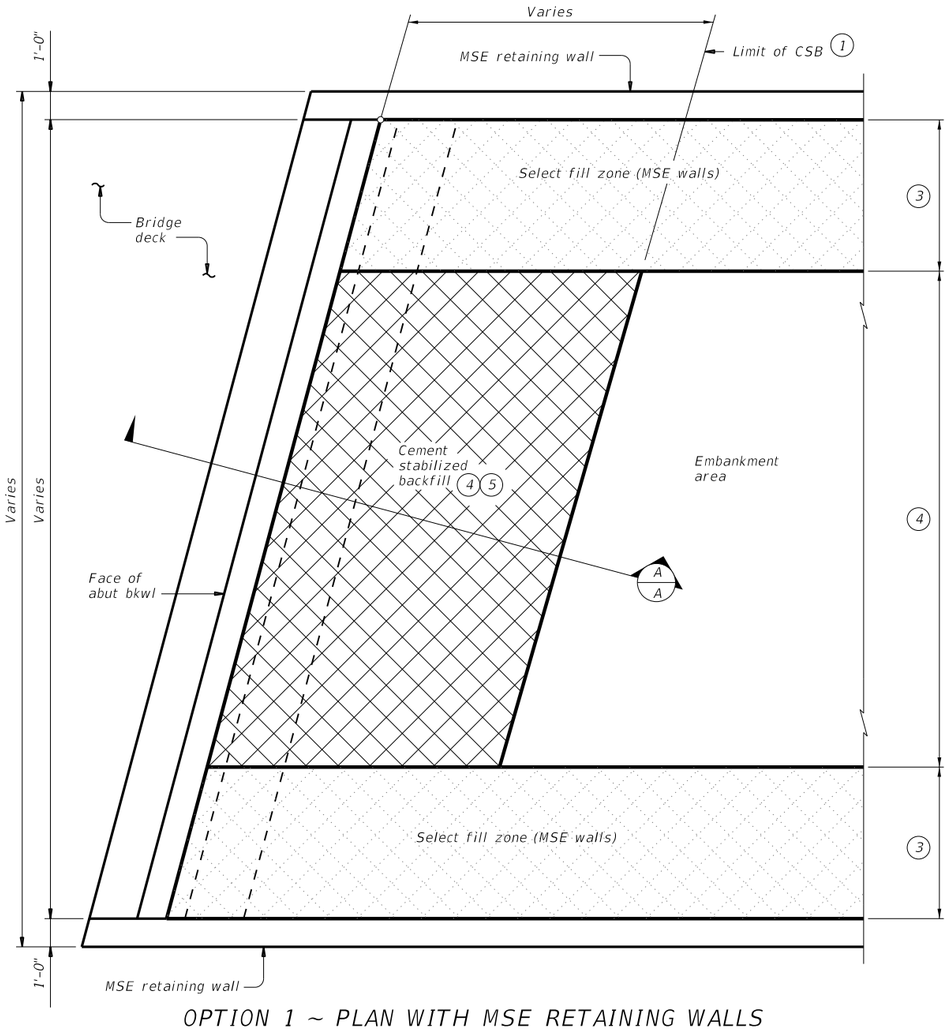
DATE:
FILE:

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

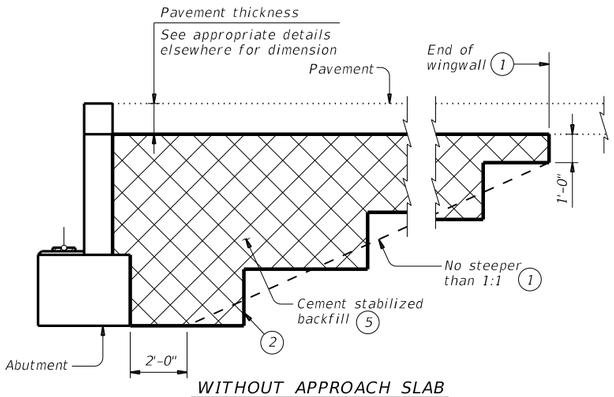



OPTION 1 ~ PLAN WITH WINGWALLS

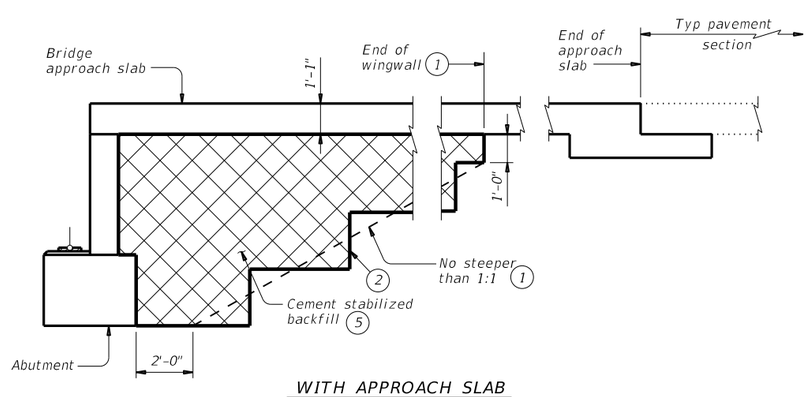
Cast-in-place retaining walls similar.




OPTION 1 ~ PLAN WITH MSE RETAINING WALLS




WITHOUT APPROACH SLAB




WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.

Texas Department of Transportation

Bridge Division Standard

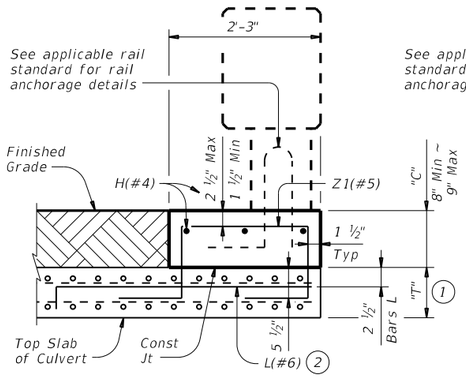
# CEMENT STABILIZED ABUTMENT BACKFILL

## BRIDGE ABUTMENT

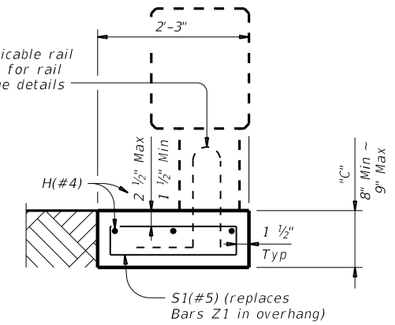
## CSAB

| FILE: csabste1-20.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT April 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 02-20: Added Option 2. | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 73 |

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



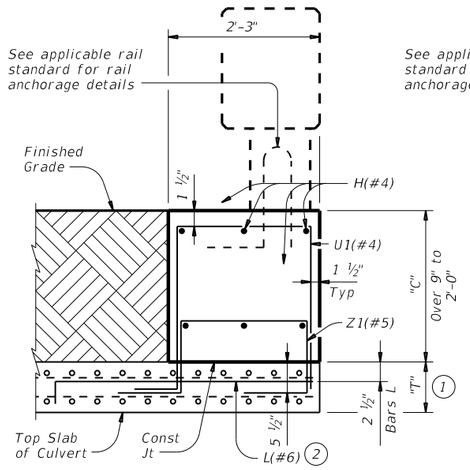

SECTION A-A



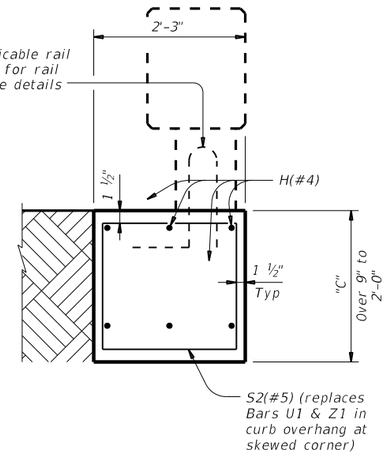

SECTION B-B

## TYPE 1 CURB

Used for curbs from 8" to 9" (Showing "C" = 9"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



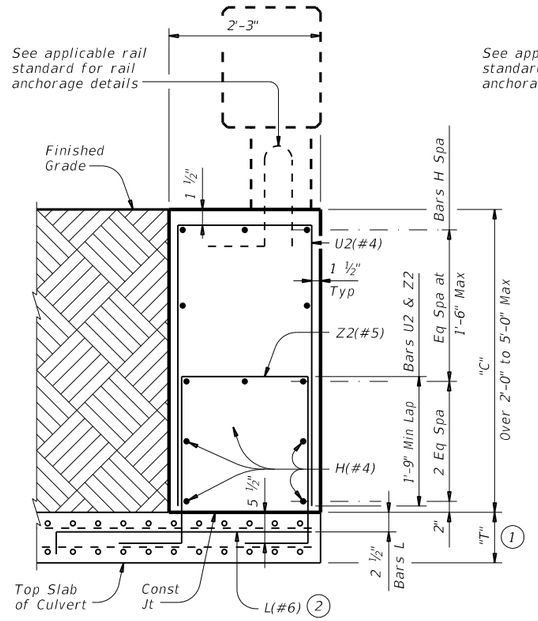

SECTION A-A



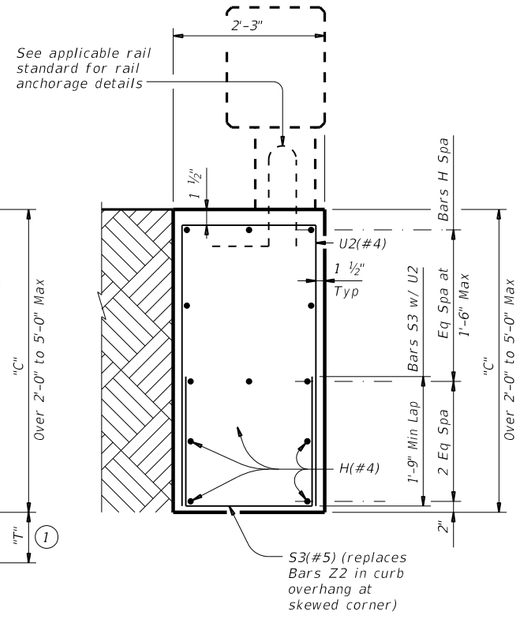

SECTION B-B

## TYPE 2 CURB

Used for curbs over 9" to 2'-0" (Showing "C" = 2'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



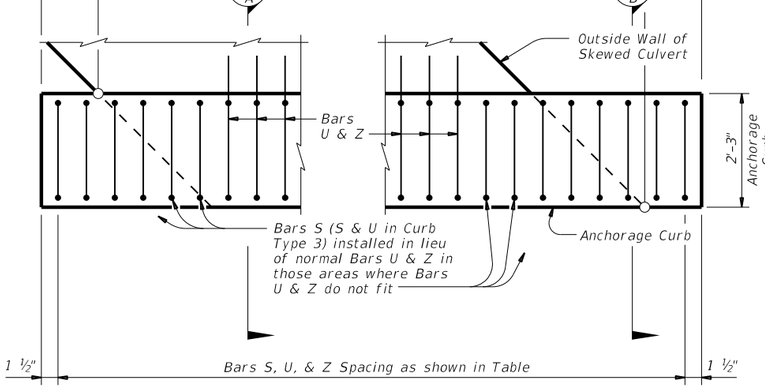

SECTION A-A




SECTION B-B

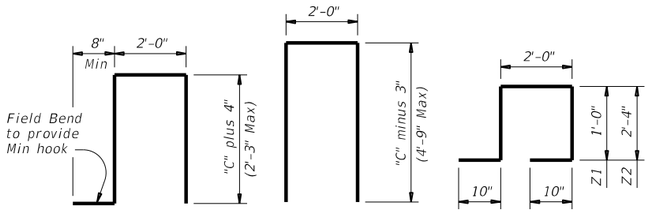
## TYPE 3 CURB

Used for curbs over 2'-0" to 5'-0" (Showing "C" = 4'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.

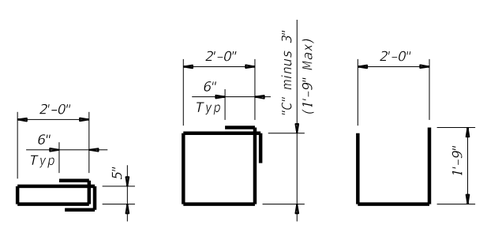



## TYPICAL CURB PLAN

Showing typical installation on skewed culvert. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.




BARS U1 (#4) | BARS U2 (#4) | BARS Z (#5) | BARS L (#6) 2 Spaced at 6" Max | OPTIONAL BARS L (#6) 3 2 Spaced at 6" Max




BARS S1 (#5) | BARS S2 (#5) | BARS S3 (#5)

| TABLE OF REINFORCING SPACING | | |
|---|---|---|
| Curb Height "C" | Section Type | Bars S, U, & Z Spa |
| 8" to 9" | 1 | 12" |
| Over 9" to 2'-0" | 2 | 9" |
| Over 2'-0" to 3'-0" | 3 | 7" |
| Over 3'-0" to 5'-0" | 3 | 5" |

| TABLE OF ESTIMATED QUANTITIES 4 | | | |
|---|---|---|---|
| Curb Height "C" | Section Type | Reinf Steel (Lb/LF) | Class "C" Concrete (CY/LF) |
| 8" | 1 | 21.5 | 0.056 |
| 9" | 1 | 21.5 | 0.063 |
| 1'-0" | 2 | 29.7 | 0.083 |
| 1'-6" | 2 | 30.6 | 0.125 |
| 2'-0" | 2 | 31.5 | 0.167 |
| 3'-0" | 3 | 44.6 | 0.250 |
| 4'-0" | 3 | 56.8 | 0.333 |
| 5'-0" | 3 | 60.0 | 0.417 |

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 Tilt Bars L hook as necessary to maintain cover.

3 Optional Bars L are to be used only for Precast Box Culverts with 3'-0" closure pours.

4 Quantities shown are for Contractor's information only. Quantities are per Linear Foot of curb length. The values for each section type in table can be interpolated for intermediate values of Curb Height, "C".

### CONSTRUCTION NOTES:

When using this anchorage curb, omit normal culvert curb reinforcing bars K and H shown on the culvert standard sheets.

For vehicle safety, the top of the curb must be flush with the finished grade.

### MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Galvanize all reinforcing steel if required elsewhere.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-11"

Provide Class "C" concrete (f'c=3,600 psi). Provide Class "C" (HPC) concrete if shown elsewhere in the plans.

### GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The rail anchorage curb details have sufficient strength for use with all standard rail types.

See appropriate rail standard for approved design speed restrictions, notes and details not shown.

This anchorage curb is considered part of the Box Culvert for payment.

These details are for use with curbs that are 8" to 5'-0" tall only. Curb heights that are less than or greater than those shown will require special design.

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

SHEET 1 OF 1

Texas Department of Transportation

Bridge Division Standard

# RAIL ANCHORAGE CURB
## BOX CULVERT
## RAIL MOUNTING DETAILS
(CURBS 8" TO 5'-0" TALL ONLY)

## RAC

| FILE: racste01-20.dgn | DN: GAF | CK: TxDOT | DW: TxDOT | CK: GAF |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 74 |

DATE: $DATE$
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°)

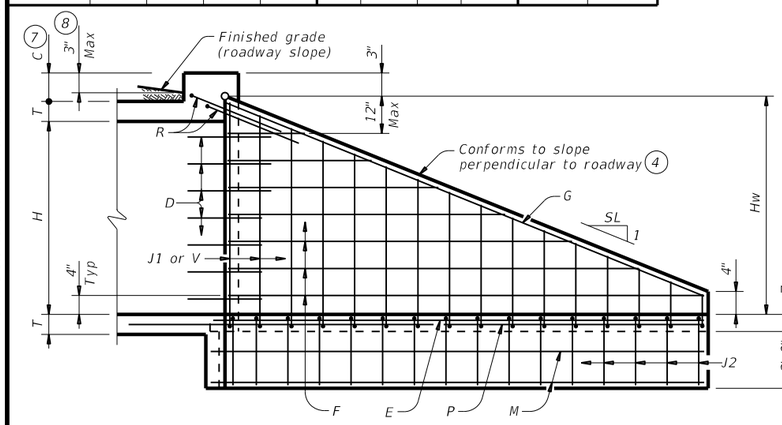
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

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

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

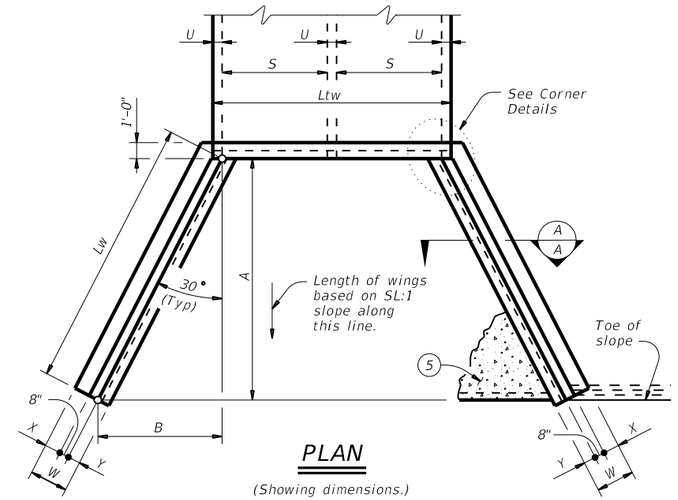
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



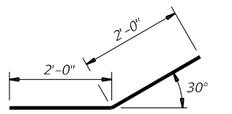

INSIDE ELEVATION

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

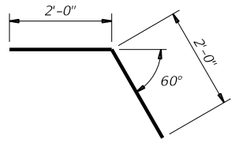



PLAN

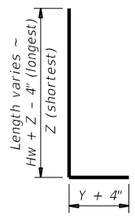
(Showing dimensions.)



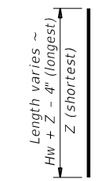

BARS D



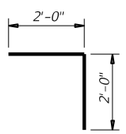

BARS R



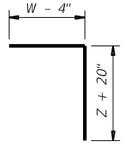

BARS J1



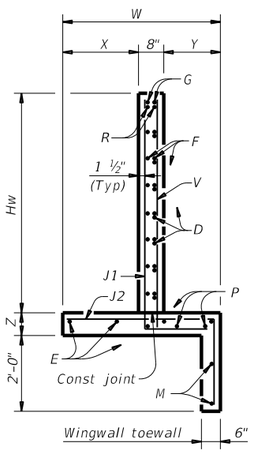

BARS V



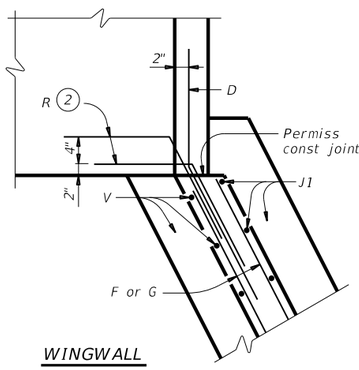

BARS L



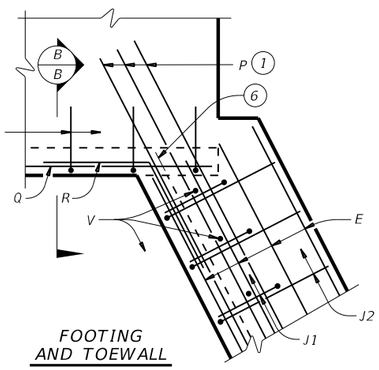

BARS J2




SECTION A-A



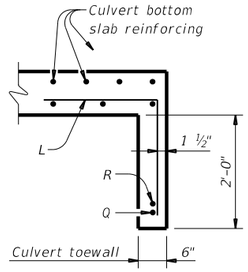

WINGWALL




FOOTING AND TOEWALL

CORNER DETAILS

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




SECTION B-B (5)

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

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation

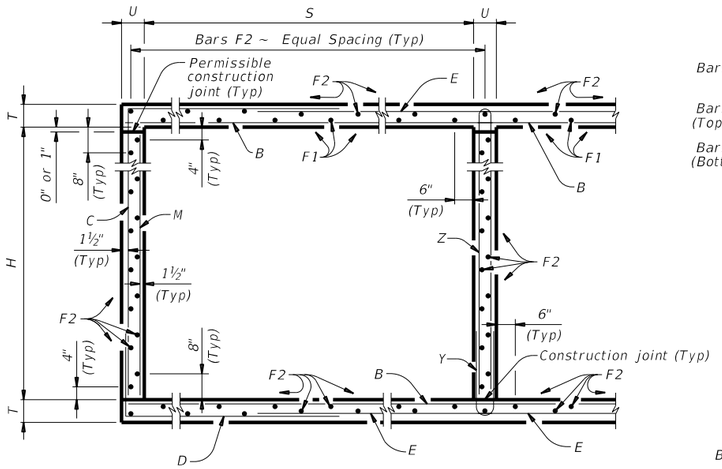
Bridge Division Standard

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

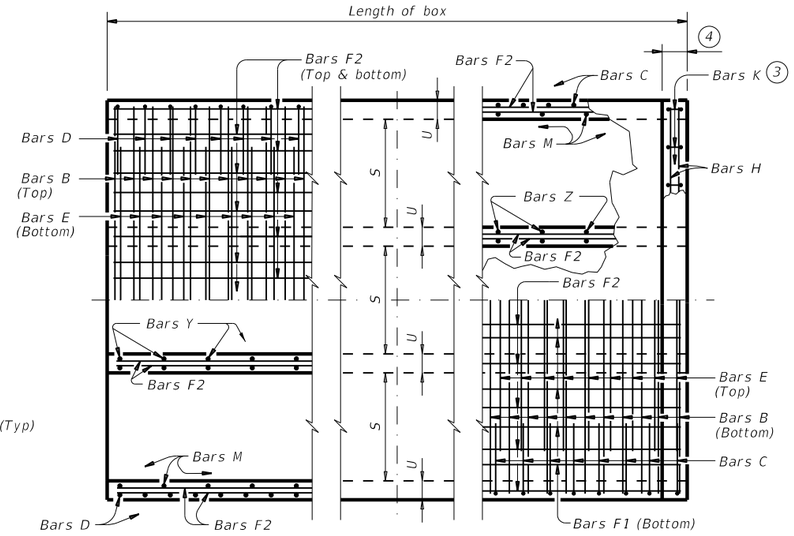
FW-0

| FILE: fw-0std-20.dgn | DN: GAF | CK: CAT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 75 |

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

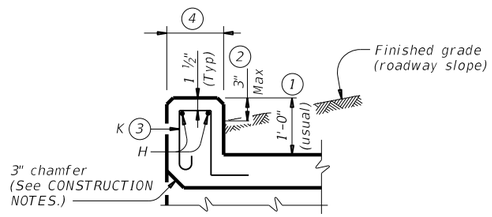



TYPICAL SECTION



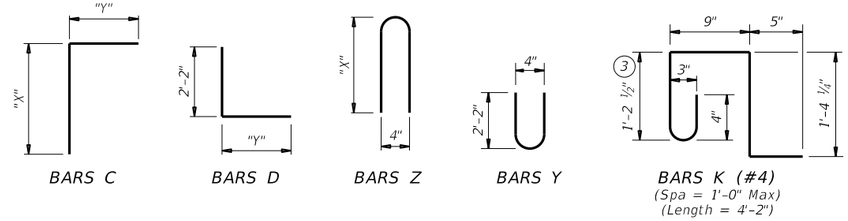

BOTTOM SLAB TOP SLAB

PART PLANS




SECTION THRU CURB

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




BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

## CONSTRUCTION NOTES:

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

## MATERIAL NOTES:

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

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

## GENERAL NOTES:

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

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

Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

# MULTIPLE BOX CULVERTS CAST-IN-PLACE
## 4'-0" SPAN
## 0' TO 23' FILL
## FOR LENGTHENING ONLY
## MC-4-23

| FILE: mc423ste-20.dgn | DN: TBE | CK: TAR | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 76 |

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

| NUMBER OF SPANS | SECTION DIMENSIONS | | | | BILLS OF REINFORCING STEEL (For Box Length = 40 feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | QUANTITIES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bars B | | | | | Bars C & D | | | | | | | Bars E | | | | | Bars F1 ~ #4 | | | | Bars F2 ~ #4 | | | | Bars M ~ #4 | | | | Bars Y & Z ~ #4 | | | | | | | Bars H 4 ~ #4 | | Bars K | | Per Foot of Barrel | | Curb | | Total | |
| | S | H | T | U | No. | Size | Spa | Length | Wt | No. | Size | Spa | Bars C | | Bars D | | No. | Size | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Bars Y | | Bars Z | | Length | Wt | No. | Wt | Conc (CY) | Renf (Lb) | Conc (CY) | Renf (Lb) | Conc (CY) | Renf (Lb) |
| | | | | | | | | | | | | | Length | Wt | Length | Wt | | | | | | | | | | | | | | | | | | | | | Length | Wt | Length | Wt | | | | | | | | | | |
| 2 | 4' – 0" | 2' – 0" | 8" | 7" | 108 | #5 | 9" | 9' – 6" | 1,070 | 162 | #4 | 6" | 5' – 8" | 613 | 5' – 4" | 577 | 108 | #5 | 9" | 7' – 4" | 826 | 6 | 18" | 39' – 9" | 159 | 36 | 18" | 39' – 9" | 956 | 108 | 9" | 2' – 0" | 144 | 54 | 9" | 4' – 7" | 165 | 5' – 3" | 189 | 9' – 6" | 25 | 22 | 61 | 0.611 | 117.5 | 0.7 | 86 | 25.2 | 4,785 |
| 3 | 4' – 0" | 2' – 0" | 8" | 7" | 108 | #5 | 9" | 14' – 1" | 1,586 | 162 | #4 | 6" | 5' – 8" | 613 | 5' – 4" | 577 | 108 | #5 | 9" | 11' – 11" | 1,342 | 9 | 18" | 39' – 9" | 239 | 51 | 18" | 39' – 9" | 1,354 | 108 | 9" | 2' – 0" | 144 | 108 | 9" | 4' – 7" | 331 | 5' – 3" | 379 | 14' – 1" | 38 | 32 | 89 | 0.881 | 164.1 | 1.1 | 127 | 36.3 | 6,692 |
| 4 | 4' – 0" | 2' – 0" | 8" | 7" | 108 | #5 | 9" | 18' – 8" | 2,103 | 162 | #4 | 6" | 5' – 8" | 613 | 5' – 4" | 577 | 108 | #5 | 9" | 16' – 6" | 1,859 | 12 | 18" | 39' – 9" | 319 | 66 | 18" | 39' – 9" | 1,752 | 108 | 9" | 2' – 0" | 144 | 162 | 9" | 4' – 7" | 496 | 5' – 3" | 568 | 18' – 8" | 50 | 40 | 111 | 1.150 | 210.8 | 1.4 | 161 | 47.4 | 8,592 |
| 5 | 4' – 0" | 2' – 0" | 8" | 7" | 108 | #5 | 9" | 23' – 3" | 2,619 | 162 | #4 | 6" | 5' – 8" | 613 | 5' – 4" | 577 | 108 | #5 | 9" | 21' – 1" | 2,375 | 15 | 18" | 39' – 9" | 398 | 81 | 18" | 39' – 9" | 2,151 | 108 | 9" | 2' – 0" | 144 | 216 | 9" | 4' – 7" | 661 | 5' – 3" | 758 | 23' – 3" | 62 | 50 | 139 | 1.420 | 257.4 | 1.7 | 201 | 58.5 | 10,497 |
| 6 | 4' – 0" | 2' – 0" | 8" | 7" | 108 | #5 | 9" | 27' – 10" | 3,135 | 162 | #4 | 6" | 5' – 8" | 613 | 5' – 4" | 577 | 108 | #5 | 9" | 25' – 8" | 2,891 | 18 | 18" | 39' – 9" | 478 | 96 | 18" | 39' – 9" | 2,549 | 108 | 9" | 2' – 0" | 144 | 270 | 9" | 4' – 7" | 827 | 5' – 3" | 947 | 27' – 10" | 74 | 58 | 161 | 1.689 | 304.0 | 2.1 | 235 | 69.6 | 12,396 |
| 2 | 4' – 0" | 3' – 0" | 8" | 7" | 108 | #5 | 9" | 9' – 6" | 1,070 | 162 | #4 | 6" | 6' – 8" | 721 | 5' – 4" | 577 | 108 | #5 | 9" | 7' – 4" | 826 | 6 | 18" | 39' – 9" | 159 | 42 | 18" | 39' – 9" | 1,115 | 108 | 9" | 3' – 0" | 216 | 54 | 9" | 4' – 7" | 165 | 7' – 3" | 262 | 9' – 6" | 25 | 22 | 61 | 0.676 | 127.8 | 0.7 | 86 | 27.8 | 5,197 |
| 3 | 4' – 0" | 3' – 0" | 8" | 7" | 108 | #5 | 9" | 14' – 1" | 1,586 | 162 | #4 | 6" | 6' – 8" | 721 | 5' – 4" | 577 | 108 | #5 | 9" | 11' – 11" | 1,342 | 9 | 18" | 39' – 9" | 239 | 59 | 18" | 39' – 9" | 1,567 | 108 | 9" | 3' – 0" | 216 | 108 | 9" | 4' – 7" | 331 | 7' – 3" | 523 | 14' – 1" | 38 | 32 | 89 | 0.967 | 177.6 | 1.1 | 127 | 39.7 | 7,229 |
| 4 | 4' – 0" | 3' – 0" | 8" | 7" | 108 | #5 | 9" | 18' – 8" | 2,103 | 162 | #4 | 6" | 6' – 8" | 721 | 5' – 4" | 577 | 108 | #5 | 9" | 16' – 6" | 1,859 | 12 | 18" | 39' – 9" | 319 | 76 | 18" | 39' – 9" | 2,018 | 108 | 9" | 3' – 0" | 216 | 162 | 9" | 4' – 7" | 496 | 7' – 3" | 785 | 18' – 8" | 50 | 40 | 111 | 1.258 | 227.4 | 1.4 | 161 | 51.7 | 9,255 |
| 5 | 4' – 0" | 3' – 0" | 8" | 7" | 108 | #5 | 9" | 23' – 3" | 2,619 | 162 | #4 | 6" | 6' – 8" | 721 | 5' – 4" | 577 | 108 | #5 | 9" | 21' – 1" | 2,375 | 15 | 18" | 39' – 9" | 398 | 93 | 18" | 39' – 9" | 2,469 | 108 | 9" | 3' – 0" | 216 | 216 | 9" | 4' – 7" | 661 | 7' – 3" | 1,046 | 23' – 3" | 62 | 50 | 139 | 1.549 | 277.1 | 1.7 | 201 | 63.7 | 11,283 |
| 6 | 4' – 0" | 3' – 0" | 8" | 7" | 108 | #5 | 9" | 27' – 10" | 3,135 | 162 | #4 | 6" | 6' – 8" | 721 | 5' – 4" | 577 | 108 | #5 | 9" | 25' – 8" | 2,891 | 18 | 18" | 39' – 9" | 478 | 110 | 18" | 39' – 9" | 2,921 | 108 | 9" | 3' – 0" | 216 | 270 | 9" | 4' – 7" | 827 | 7' – 3" | 1,308 | 27' – 10" | 74 | 58 | 161 | 1.841 | 326.9 | 2.1 | 235 | 75.7 | 13,309 |
| 2 | 4' – 0" | 4' – 0" | 8" | 7" | 108 | #5 | 9" | 9' – 6" | 1,070 | 162 | #4 | 6" | 7' – 8" | 830 | 5' – 4" | 577 | 108 | #5 | 9" | 7' – 4" | 826 | 6 | 18" | 39' – 9" | 159 | 42 | 18" | 39' – 9" | 1,115 | 108 | 9" | 4' – 0" | 289 | 54 | 9" | 4' – 7" | 165 | 9' – 3" | 334 | 9' – 6" | 25 | 22 | 61 | 0.741 | 134.1 | 0.7 | 86 | 30.4 | 5,451 |
| 3 | 4' – 0" | 4' – 0" | 8" | 7" | 108 | #5 | 9" | 14' – 1" | 1,586 | 162 | #4 | 6" | 7' – 8" | 830 | 5' – 4" | 577 | 108 | #5 | 9" | 11' – 11" | 1,342 | 9 | 18" | 39' – 9" | 239 | 59 | 18" | 39' – 9" | 1,567 | 108 | 9" | 4' – 0" | 289 | 108 | 9" | 4' – 7" | 331 | 9' – 3" | 667 | 14' – 1" | 38 | 32 | 89 | 1.053 | 185.7 | 1.1 | 127 | 43.2 | 7,555 |
| 4 | 4' – 0" | 4' – 0" | 8" | 7" | 108 | #5 | 9" | 18' – 8" | 2,103 | 162 | #4 | 6" | 7' – 8" | 830 | 5' – 4" | 577 | 108 | #5 | 9" | 16' – 6" | 1,859 | 12 | 18" | 39' – 9" | 319 | 76 | 18" | 39' – 9" | 2,018 | 108 | 9" | 4' – 0" | 289 | 162 | 9" | 4' – 7" | 496 | 9' – 3" | 1,001 | 18' – 8" | 50 | 40 | 111 | 1.366 | 237.3 | 1.4 | 161 | 56.0 | 9,653 |
| 5 | 4' – 0" | 4' – 0" | 8" | 7" | 108 | #5 | 9" | 23' – 3" | 2,619 | 162 | #4 | 6" | 7' – 8" | 830 | 5' – 4" | 577 | 108 | #5 | 9" | 21' – 1" | 2,375 | 15 | 18" | 39' – 9" | 398 | 93 | 18" | 39' – 9" | 2,469 | 108 | 9" | 4' – 0" | 289 | 216 | 9" | 4' – 7" | 661 | 9' – 3" | 1,335 | 23' – 3" | 62 | 50 | 139 | 1.679 | 288.8 | 1.7 | 201 | 68.9 | 11,754 |
| 6 | 4' – 0" | 4' – 0" | 8" | 7" | 108 | #5 | 9" | 27' – 10" | 3,135 | 162 | #4 | 6" | 7' – 8" | 830 | 5' – 4" | 577 | 108 | #5 | 9" | 25' – 8" | 2,891 | 18 | 18" | 39' – 9" | 478 | 110 | 18" | 39' – 9" | 2,921 | 108 | 9" | 4' – 0" | 289 | 270 | 9" | 4' – 7" | 827 | 9' – 3" | 1,668 | 27' – 10" | 74 | 58 | 161 | 1.992 | 340.4 | 2.1 | 235 | 81.8 | 13,851 |

Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

# MULTIPLE BOX CULVERTS
## CAST-IN-PLACE
## 4'-0" SPAN
## 0' TO 23' FILL
## FOR LENGTHENING ONLY
## MC-4-23

| FILE: mc423ste-20.dgn | DN: TBE | CK: BMP | DW: TxDOT | CK: TxDOT |
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| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 77 |

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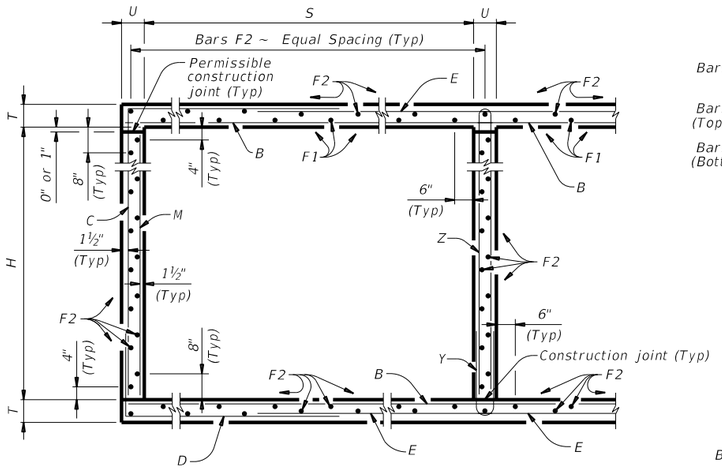
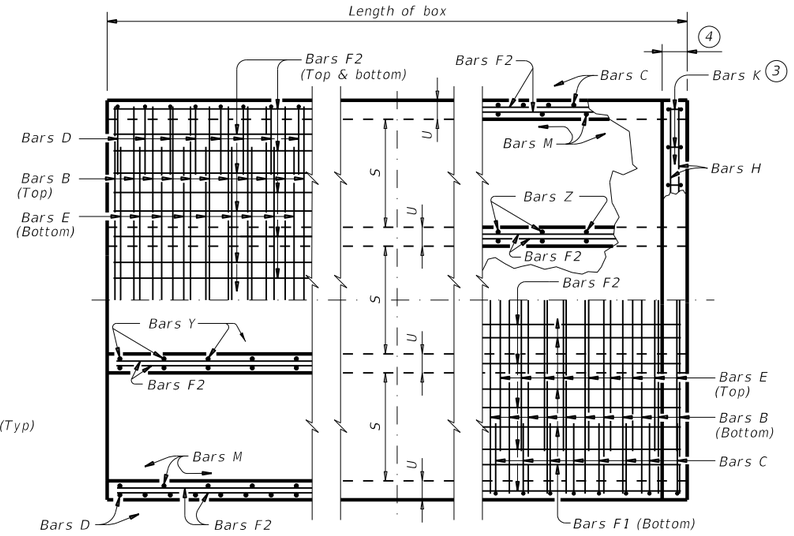
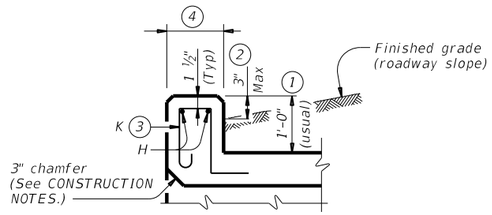



## TYPICAL SECTION



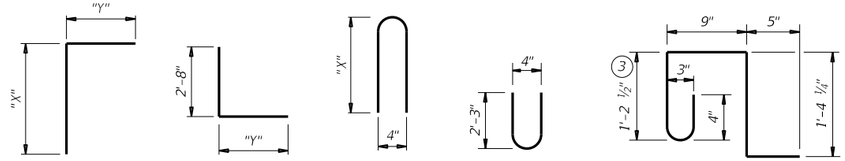

BOTTOM SLAB TOP SLAB

## PART PLANS




## SECTION THRU CURB

| TABLE OF BAR DIMENSIONS | | |
|---|---|---|
| H | "X" | "Y" |
| 2'-0" | 2'-7 ½" | 4'-1" |
| 3'-0" | 3'-7 ½" | 4'-1" |
| 4'-0" | 4'-7 ½" | 4'-1" |
| 5'-0" | 5'-7 ½" | 4'-1" |
| 6'-0" | 6'-7 ½" | 4'-1" |




BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

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

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

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

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

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

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

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

### CONSTRUCTION NOTES:

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

### MATERIAL NOTES:

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

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

### GENERAL NOTES:

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

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

# MULTIPLE BOX CULVERTS CAST-IN-PLACE 6'-0" SPAN 0' TO 16' FILL

# MC-6-16

| FILE: mc616ste-20.dgn | DN: TBE | CK: BMP | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 78 |

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

| NUMBER OF SPANS | SECTION DIMENSIONS | | | | BILLS OF REINFORCING STEEL (For Box Length = 40 feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | QUANTITIES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bars B | | | | | Bars C & D | | | | | | | Bars E | | | | | Bars F1 ~ #4 | | | | Bars F2 ~ #4 | | | | Bars M ~ #4 | | | | Bars Y & Z ~ #4 | | | | | | | Bars H 4 ~ #4 | | Bars K | | Per Foot of Barrel | | Curb | | Total | |
| | S | H | T | U | No. | Size | Spa | Length | Wt | No. | Size | Spa | Bars C Length | Bars C Wt | Bars D Length | Bars D Wt | No. | Size | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Spa | Bars Y Length | Bars Y Wt | Bars Z Length | Bars Z Wt | Length | Wt | No. | Wt | Conc (CY) | Renf (Lb) | Conc (CY) | Renf (Lb) | Conc (CY) | Renf (Lb) |
| 2 | 6' – 0" | 2' – 0" | 9" | 7" | 108 | #6 | 9" | 13' – 6" | 2,190 | 108 | #5 | 9" | 6' – 8" | 751 | 6' – 9" | 760 | 108 | #6 | 9" | 10' – 2" | 1,649 | 10 | 18" | 39' – 9" | 266 | 44 | 18" | 39' – 9" | 1,168 | 108 | 9" | 2' – 0" | 144 | 54 | 9" | 4' – 9" | 171 | 5' – 5" | 195 | 13' – 6" | 36 | 30 | 84 | 0.894 | 182.4 | 1.0 | 120 | 36.8 | 7,414 |
| 3 | 6' – 0" | 2' – 0" | 9" | 7" | 108 | #6 | 9" | 20' – 1" | 3,258 | 108 | #5 | 9" | 6' – 8" | 751 | 6' – 9" | 760 | 108 | #6 | 9" | 16' – 9" | 2,717 | 15 | 18" | 39' – 9" | 398 | 63 | 18" | 39' – 9" | 1,673 | 108 | 9" | 2' – 0" | 144 | 108 | 9" | 4' – 9" | 343 | 5' – 5" | 391 | 20' – 1" | 54 | 44 | 122 | 1.302 | 260.9 | 1.5 | 176 | 53.6 | 10,611 |
| 4 | 6' – 0" | 2' – 0" | 9" | 7" | 108 | #6 | 9" | 26' – 8" | 4,326 | 108 | #5 | 9" | 6' – 8" | 751 | 6' – 9" | 760 | 108 | #6 | 9" | 23' – 4" | 3,785 | 20 | 18" | 39' – 9" | 531 | 82 | 18" | 39' – 9" | 2,177 | 108 | 9" | 2' – 0" | 144 | 162 | 9" | 4' – 9" | 514 | 5' – 5" | 586 | 26' – 8" | 71 | 56 | 156 | 1.711 | 339.4 | 2.0 | 227 | 70.4 | 13,801 |
| 5 | 6' – 0" | 2' – 0" | 9" | 7" | 108 | #6 | 9" | 33' – 3" | 5,394 | 108 | #5 | 9" | 6' – 8" | 751 | 6' – 9" | 760 | 108 | #6 | 9" | 29' – 11" | 4,853 | 25 | 18" | 39' – 9" | 664 | 101 | 18" | 39' – 9" | 2,682 | 108 | 9" | 2' – 0" | 144 | 216 | 9" | 4' – 9" | 685 | 5' – 5" | 782 | 33' – 3" | 89 | 70 | 195 | 2.120 | 417.9 | 2.5 | 284 | 87.3 | 16,999 |
| 6 | 6' – 0" | 2' – 0" | 9" | 7" | 108 | #6 | 9" | 39' – 10" | 6,462 | 108 | #5 | 9" | 6' – 8" | 751 | 6' – 9" | 760 | 108 | #6 | 9" | 36' – 6" | 5,921 | 30 | 18" | 39' – 9" | 797 | 120 | 18" | 39' – 9" | 3,186 | 108 | 9" | 2' – 0" | 144 | 270 | 9" | 4' – 9" | 857 | 5' – 5" | 977 | 39' – 10" | 106 | 82 | 228 | 2.529 | 496.4 | 3.0 | 334 | 104.1 | 20,189 |
| 2 | 6' – 0" | 3' – 0" | 9" | 7" | 108 | #6 | 9" | 13' – 6" | 2,190 | 108 | #5 | 9" | 7' – 8" | 864 | 6' – 9" | 760 | 108 | #6 | 9" | 10' – 2" | 1,649 | 10 | 18" | 39' – 9" | 266 | 50 | 18" | 39' – 9" | 1,328 | 108 | 9" | 3' – 0" | 216 | 54 | 9" | 4' – 9" | 171 | 7' – 5" | 268 | 13' – 6" | 36 | 30 | 84 | 0.958 | 192.8 | 1.0 | 120 | 39.3 | 7,832 |
| 3 | 6' – 0" | 3' – 0" | 9" | 7" | 108 | #6 | 9" | 20' – 1" | 3,258 | 108 | #5 | 9" | 7' – 8" | 864 | 6' – 9" | 760 | 108 | #6 | 9" | 16' – 9" | 2,717 | 15 | 18" | 39' – 9" | 398 | 71 | 18" | 39' – 9" | 1,885 | 108 | 9" | 3' – 0" | 216 | 108 | 9" | 4' – 9" | 343 | 7' – 5" | 535 | 20' – 1" | 54 | 44 | 122 | 1.389 | 274.4 | 1.5 | 176 | 57.1 | 11,152 |
| 4 | 6' – 0" | 3' – 0" | 9" | 7" | 108 | #6 | 9" | 26' – 8" | 4,326 | 108 | #5 | 9" | 7' – 8" | 864 | 6' – 9" | 760 | 108 | #6 | 9" | 23' – 4" | 3,785 | 20 | 18" | 39' – 9" | 531 | 92 | 18" | 39' – 9" | 2,443 | 108 | 9" | 3' – 0" | 216 | 162 | 9" | 4' – 9" | 514 | 7' – 5" | 803 | 26' – 8" | 71 | 56 | 156 | 1.819 | 356.1 | 2.0 | 227 | 74.7 | 14,469 |
| 5 | 6' – 0" | 3' – 0" | 9" | 7" | 108 | #6 | 9" | 33' – 3" | 5,394 | 108 | #5 | 9" | 7' – 8" | 864 | 6' – 9" | 760 | 108 | #6 | 9" | 29' – 11" | 4,853 | 25 | 18" | 39' – 9" | 664 | 113 | 18" | 39' – 9" | 3,000 | 108 | 9" | 3' – 0" | 216 | 216 | 9" | 4' – 9" | 685 | 7' – 5" | 1,070 | 33' – 3" | 89 | 70 | 195 | 2.250 | 437.7 | 2.5 | 284 | 92.5 | 17,790 |
| 6 | 6' – 0" | 3' – 0" | 9" | 7" | 108 | #6 | 9" | 39' – 10" | 6,462 | 108 | #5 | 9" | 7' – 8" | 864 | 6' – 9" | 760 | 108 | #6 | 9" | 36' – 6" | 5,921 | 30 | 18" | 39' – 9" | 797 | 134 | 18" | 39' – 9" | 3,558 | 108 | 9" | 3' – 0" | 216 | 270 | 9" | 4' – 9" | 857 | 7' – 5" | 1,338 | 39' – 10" | 106 | 82 | 228 | 2.681 | 519.3 | 3.0 | 334 | 110.2 | 21,107 |
| 2 | 6' – 0" | 4' – 0" | 9" | 7" | 108 | #6 | 9" | 13' – 6" | 2,190 | 108 | #5 | 9" | 8' – 8" | 976 | 6' – 9" | 760 | 108 | #6 | 9" | 10' – 2" | 1,649 | 10 | 18" | 39' – 9" | 266 | 50 | 18" | 39' – 9" | 1,328 | 108 | 9" | 4' – 0" | 289 | 54 | 9" | 4' – 9" | 171 | 9' – 5" | 340 | 13' – 6" | 36 | 30 | 84 | 1.023 | 199.2 | 1.0 | 120 | 41.9 | 8,089 |
| 3 | 6' – 0" | 4' – 0" | 9" | 7" | 108 | #6 | 9" | 20' – 1" | 3,258 | 108 | #5 | 9" | 8' – 8" | 976 | 6' – 9" | 760 | 108 | #6 | 9" | 16' – 9" | 2,717 | 15 | 18" | 39' – 9" | 398 | 71 | 18" | 39' – 9" | 1,885 | 108 | 9" | 4' – 0" | 289 | 108 | 9" | 4' – 9" | 343 | 9' – 5" | 679 | 20' – 1" | 54 | 44 | 122 | 1.475 | 282.6 | 1.5 | 176 | 60.5 | 11,481 |
| 4 | 6' – 0" | 4' – 0" | 9" | 7" | 108 | #6 | 9" | 26' – 8" | 4,326 | 108 | #5 | 9" | 8' – 8" | 976 | 6' – 9" | 760 | 108 | #6 | 9" | 23' – 4" | 3,785 | 20 | 18" | 39' – 9" | 531 | 92 | 18" | 39' – 9" | 2,443 | 108 | 9" | 4' – 0" | 289 | 162 | 9" | 4' – 9" | 514 | 9' – 5" | 1,019 | 26' – 8" | 71 | 56 | 156 | 1.927 | 366.1 | 2.0 | 227 | 79.1 | 14,870 |
| 5 | 6' – 0" | 4' – 0" | 9" | 7" | 108 | #6 | 9" | 33' – 3" | 5,394 | 108 | #5 | 9" | 8' – 8" | 976 | 6' – 9" | 760 | 108 | #6 | 9" | 29' – 11" | 4,853 | 25 | 18" | 39' – 9" | 664 | 113 | 18" | 39' – 9" | 3,000 | 108 | 9" | 4' – 0" | 289 | 216 | 9" | 4' – 9" | 685 | 9' – 5" | 1,359 | 33' – 3" | 89 | 70 | 195 | 2.380 | 449.5 | 2.5 | 284 | 97.7 | 18,264 |
| 6 | 6' – 0" | 4' – 0" | 9" | 7" | 108 | #6 | 9" | 39' – 10" | 6,462 | 108 | #5 | 9" | 8' – 8" | 976 | 6' – 9" | 760 | 108 | #6 | 9" | 36' – 6" | 5,921 | 30 | 18" | 39' – 9" | 797 | 134 | 18" | 39' – 9" | 3,558 | 108 | 9" | 4' – 0" | 289 | 270 | 9" | 4' – 9" | 857 | 9' – 5" | 1,698 | 39' – 10" | 106 | 82 | 228 | 2.832 | 533.0 | 3.0 | 334 | 116.2 | 21,652 |
| 2 | 6' – 0" | 5' – 0" | 9" | 7" | 108 | #6 | 9" | 13' – 6" | 2,190 | 108 | #5 | 9" | 9' – 8" | 1,089 | 6' – 9" | 760 | 108 | #6 | 9" | 10' – 2" | 1,649 | 10 | 18" | 39' – 9" | 266 | 56 | 18" | 39' – 9" | 1,487 | 108 | 9" | 5' – 0" | 361 | 54 | 9" | 4' – 9" | 171 | 11' – 5" | 412 | 13' – 6" | 36 | 30 | 84 | 1.088 | 209.6 | 1.0 | 120 | 44.5 | 8,505 |
| 3 | 6' – 0" | 5' – 0" | 9" | 7" | 108 | #6 | 9" | 20' – 1" | 3,258 | 108 | #5 | 9" | 9' – 8" | 1,089 | 6' – 9" | 760 | 108 | #6 | 9" | 16' – 9" | 2,717 | 15 | 18" | 39' – 9" | 398 | 79 | 18" | 39' – 9" | 2,098 | 108 | 9" | 5' – 0" | 361 | 108 | 9" | 4' – 9" | 343 | 11' – 5" | 824 | 20' – 1" | 54 | 44 | 122 | 1.562 | 296.2 | 1.5 | 176 | 64.0 | 12,024 |
| 4 | 6' – 0" | 5' – 0" | 9" | 7" | 108 | #6 | 9" | 26' – 8" | 4,326 | 108 | #5 | 9" | 9' – 8" | 1,089 | 6' – 9" | 760 | 108 | #6 | 9" | 23' – 4" | 3,785 | 20 | 18" | 39' – 9" | 531 | 102 | 18" | 39' – 9" | 2,708 | 108 | 9" | 5' – 0" | 361 | 162 | 9" | 4' – 9" | 514 | 11' – 5" | 1,235 | 26' – 8" | 71 | 56 | 156 | 2.035 | 382.7 | 2.0 | 227 | 83.4 | 15,536 |
| 5 | 6' – 0" | 5' – 0" | 9" | 7" | 108 | #6 | 9" | 33' – 3" | 5,394 | 108 | #5 | 9" | 9' – 8" | 1,089 | 6' – 9" | 760 | 108 | #6 | 9" | 29' – 11" | 4,853 | 25 | 18" | 39' – 9" | 664 | 125 | 18" | 39' – 9" | 3,319 | 108 | 9" | 5' – 0" | 361 | 216 | 9" | 4' – 9" | 685 | 11' – 5" | 1,647 | 33' – 3" | 89 | 70 | 195 | 2.509 | 469.3 | 2.5 | 284 | 102.8 | 19,056 |
| 6 | 6' – 0" | 5' – 0" | 9" | 7" | 108 | #6 | 9" | 39' – 10" | 6,462 | 108 | #5 | 9" | 9' – 8" | 1,089 | 6' – 9" | 760 | 108 | #6 | 9" | 36' – 6" | 5,921 | 30 | 18" | 39' – 9" | 797 | 148 | 18" | 39' – 9" | 3,930 | 108 | 9" | 5' – 0" | 361 | 270 | 9" | 4' – 9" | 857 | 11' – 5" | 2,059 | 39' – 10" | 106 | 82 | 228 | 2.983 | 555.9 | 3.0 | 334 | 122.3 | 22,570 |
| 2 | 6' – 0" | 6' – 0" | 9" | 7" | 108 | #6 | 9" | 13' – 6" | 2,190 | 108 | #5 | 9" | 10' – 8" | 1,202 | 6' – 9" | 760 | 108 | #6 | 9" | 10' – 2" | 1,649 | 10 | 18" | 39' – 9" | 266 | 62 | 18" | 39' – 9" | 1,646 | 108 | 9" | 6' – 0" | 433 | 54 | 9" | 4' – 9" | 171 | 13' – 5" | 484 | 13' – 6" | 36 | 30 | 84 | 1.153 | 220.0 | 1.0 | 120 | 47.1 | 8,921 |
| 3 | 6' – 0" | 6' – 0" | 9" | 7" | 108 | #6 | 9" | 20' – 1" | 3,258 | 108 | #5 | 9" | 10' – 8" | 1,202 | 6' – 9" | 760 | 108 | #6 | 9" | 16' – 9" | 2,717 | 15 | 18" | 39' – 9" | 398 | 87 | 18" | 39' – 9" | 2,310 | 108 | 9" | 6' – 0" | 433 | 108 | 9" | 4' – 9" | 343 | 13' – 5" | 968 | 20' – 1" | 54 | 44 | 122 | 1.648 | 309.7 | 1.5 | 176 | 67.4 | 12,565 |
| 4 | 6' – 0" | 6' – 0" | 9" | 7" | 108 | #6 | 9" | 26' – 8" | 4,326 | 108 | #5 | 9" | 10' – 8" | 1,202 | 6' – 9" | 760 | 108 | #6 | 9" | 23' – 4" | 3,785 | 20 | 18" | 39' – 9" | 531 | 112 | 18" | 39' – 9" | 2,974 | 108 | 9" | 6' – 0" | 433 | 162 | 9" | 4' – 9" | 514 | 13' – 5" | 1,452 | 26' – 8" | 71 | 56 | 156 | 2.144 | 399.4 | 2.0 | 227 | 87.7 | 16,204 |
| 5 | 6' – 0" | 6' – 0" | 9" | 7" | 108 | #6 | 9" | 33' – 3" | 5,394 | 108 | #5 | 9" | 10' – 8" | 1,202 | 6' – 9" | 760 | 108 | #6 | 9" | 29' – 11" | 4,853 | 25 | 18" | 39' – 9" | 664 | 137 | 18" | 39' – 9" | 3,638 | 108 | 9" | 6' – 0" | 433 | 216 | 9" | 4' – 9" | 685 | 13' – 5" | 1,936 | 33' – 3" | 89 | 70 | 195 | 2.639 | 489.1 | 2.5 | 284 | 108.0 | 19,849 |
| 6 | 6' – 0" | 6' – 0" | 9" | 7" | 108 | #6 | 9" | 39' – 10" | 6,462 | 108 | #5 | 9" | 10' – 8" | 1,202 | 6' – 9" | 760 | 108 | #6 | 9" | 36' – 6" | 5,921 | 30 | 18" | 39' – 9" | 797 | 162 | 18" | 39' – 9" | 4,302 | 108 | 9" | 6' – 0" | 433 | 270 | 9" | 4' – 9" | 857 | 13' – 5" | 2,420 | 39' – 10" | 106 | 82 | 228 | 3.134 | 578.9 | 3.0 | 334 | 128.3 | 23,488 |

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

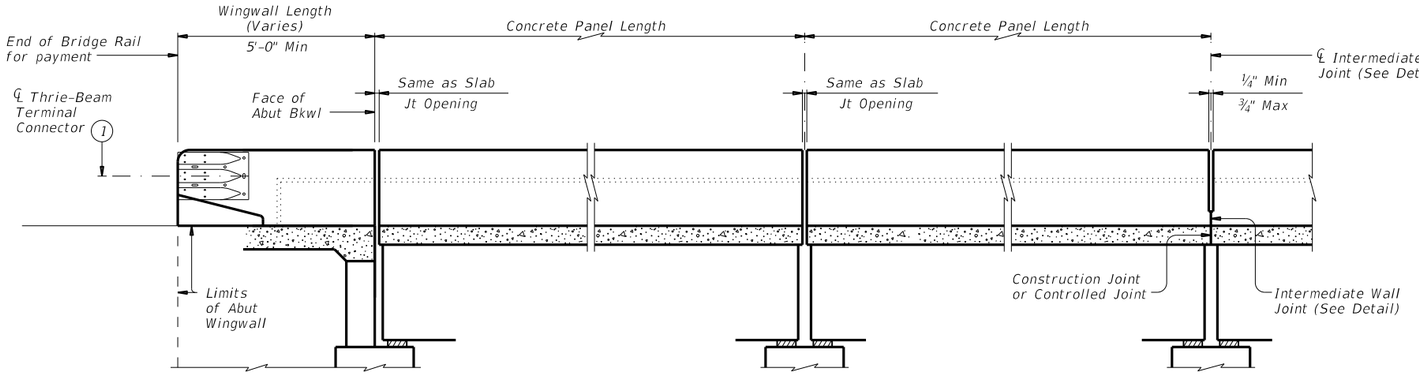
Bridge Division Standard

# MULTIPLE BOX CULVERTS
## CAST-IN-PLACE
### 6'-0" SPAN
### 0' TO 16' FILL

## MC-6-16

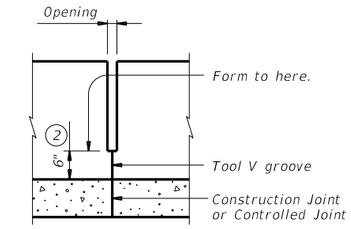
| FILE: mc616ste-20.dgn | DN: TBE | CK: BMP | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 79 |

DATE:
FILE:



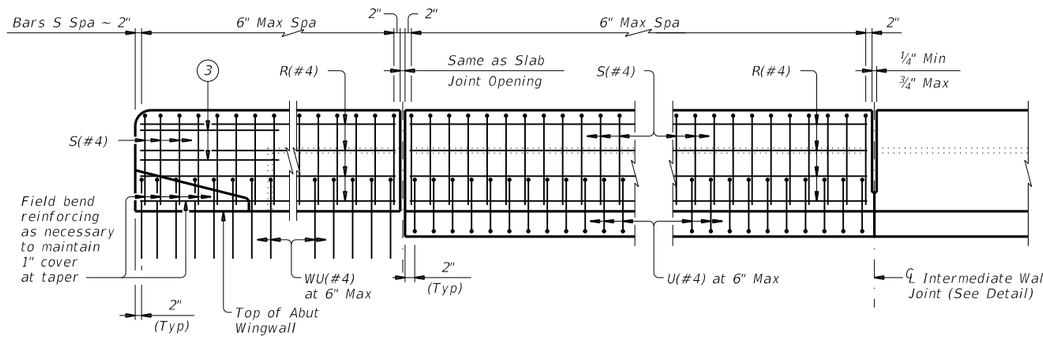

AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

## ROADWAY ELEVATION OF RAIL

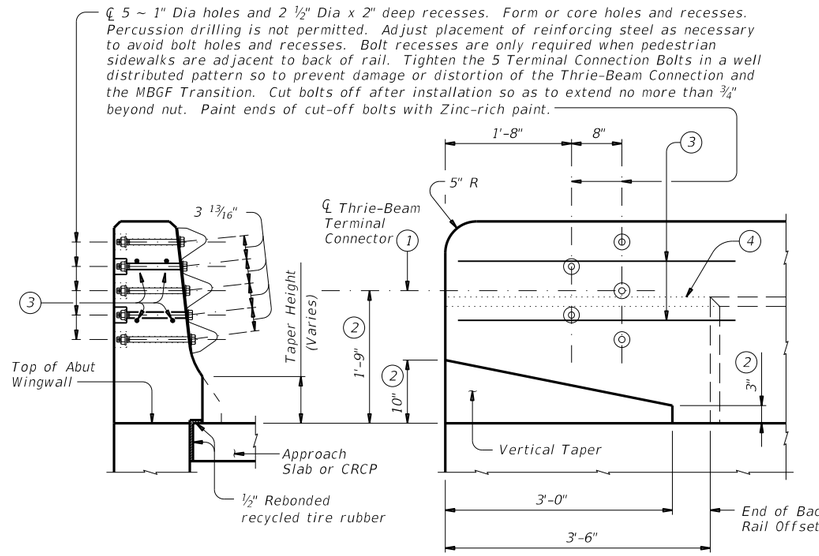



## INTERMEDIATE WALL JOINT DETAIL

*Provide at all interior bents without slab expansion joints.*

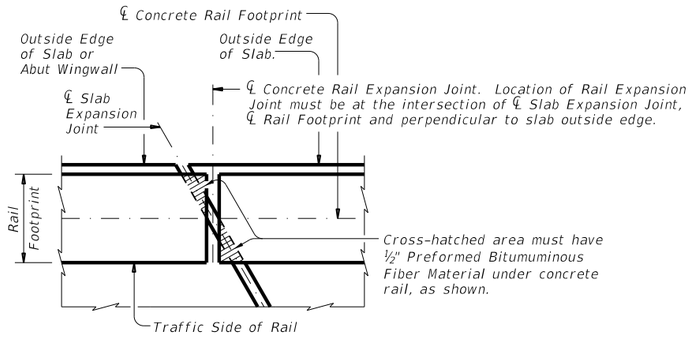



## ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT




SECTION | ELEVATION

## TERMINAL CONNECTION DETAILS




## PLAN OF RAIL AT EXPANSION JOINTS

*Example showing Slab Expansion Joints without breakbacks.*

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

(2) *Increase 2" for structures with overlay.*

(3) *Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.*

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



Texas Department of Transportation

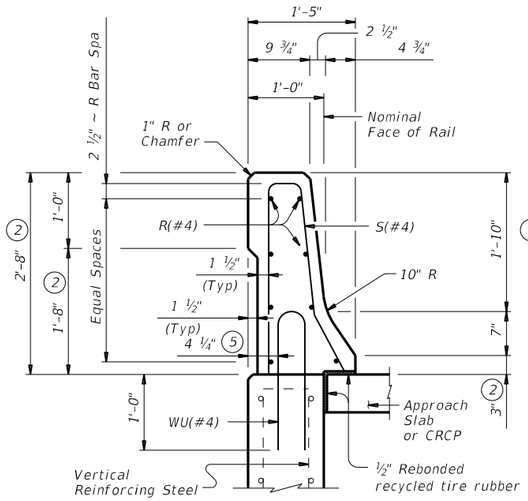
Bridge Division Standard

# TRAFFIC RAIL

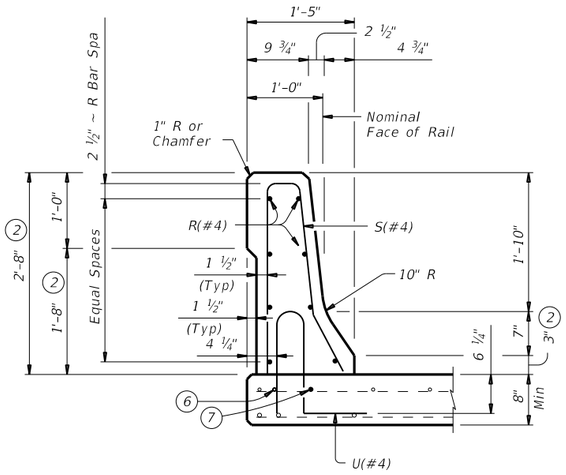
## TYPE T551

| FILE: rlstd009-19.dgn | DN: TxDOT | CK: TxDOT | DW: JTR | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT September 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | 05 | GARZA | | 80 |

DATE:
FILE:

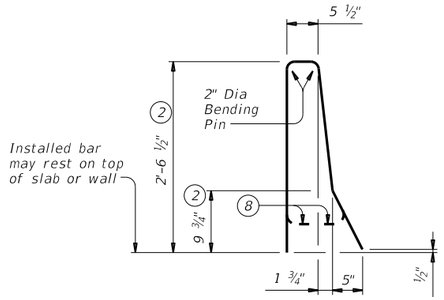



ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

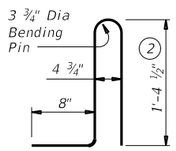



ON BRIDGE SLAB

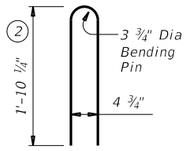
## SECTIONS THRU RAIL



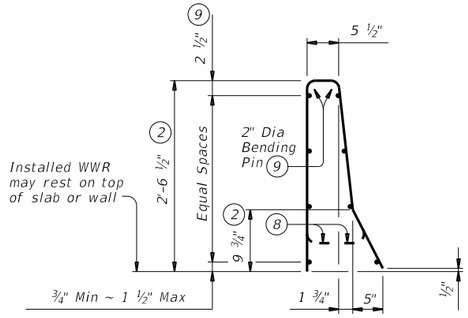

BARS S (#4)




BARS U (#4)

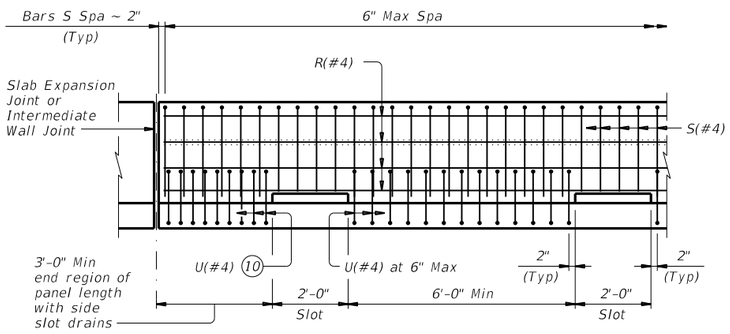



BARS WU (#4)



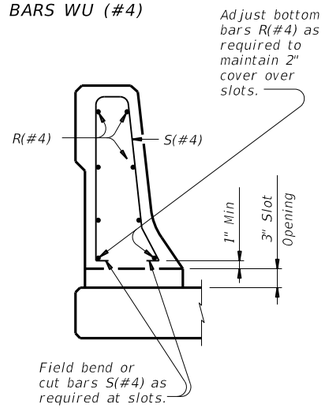

OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

| DESCRIPTION | LONGITUDINAL WIRES | VERTICAL WIRES |
|---|---|---|
| Minimum (Cumulative Total) Wire Area | 1.067 Sq In. | 0.267 Sq In. per Ft |
| | No. of Wires | Spacing |
| Minimum | 8 | 4" |
| Maximum | 10 | 8" |
| Maximum Wire Size Differential | The smaller wire must have an area of 40% or more of the larger wire. | |




## OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. If continuous slots at 8 ft c-c are required, then details as on standard Type T552 should apply. Do not place drains over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.




## SECTION THRU OPTIONAL SIDE SLOT DRAIN

2 Increase 2" for structures with overlay.

5 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

6 As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars will be furnished at the Contractor's expense.

7 Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

8 Bend or cut as required to clear drain slots.

9 No longitudinal wires may be in top center of cage.

10 Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

### CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown on the plans or approved by the Engineer.

### MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

### GENERAL NOTES:

This rail has been evaluated and accepted to be of equal strength to railings with like geometry, which have been crash tested to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

Average weight of railing with no overlay is 382 plf.

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

# TRAFFIC RAIL

# TYPE T551

| FILE: | r1std009-19.dgn | DN: TxDOT | CK: TxDOT | DW: JTR | CK: TxDOT |
|---|---|---|---|---|---|
| ©TxDOT | September 2019 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | | 0053 | 06 | 031 | US 84 |
| | | DIST | COUNTY | | SHEET NO. |
| | | 05 | GARZA | | 81 |

LEGEND

OM-2

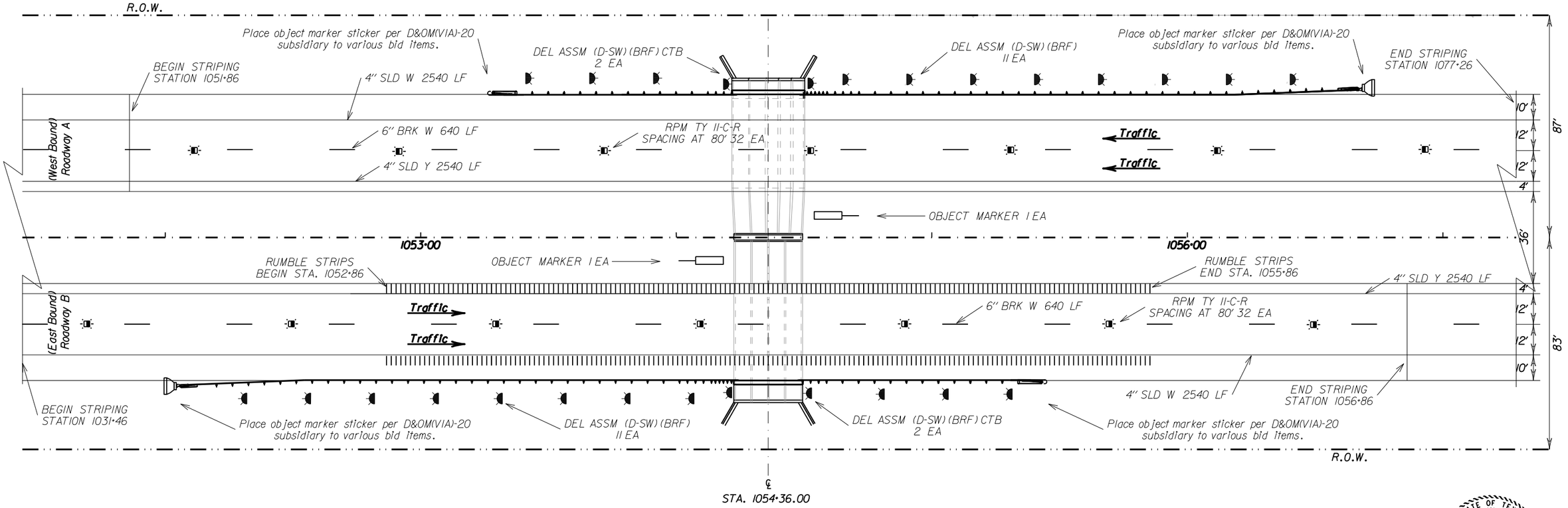
Delineator

RPM TY II-C-R

Traffic flow

Terminal End

N




## SUMMARY OF PAVEMENT MARKING ITEMS

| LOCATION | 533 6001 | 658 6013 | 658 6061 | 658 6099 | 666 6303 | 666 6306 | 666 6315 | 672 6010 |
|---|---|---|---|---|---|---|---|---|
| | RUMBLE STRIPS (SHOULDER) | INSTL DEL ASSM (D-SW)SZ (BRF)CTB | INSTL DEL ASSM (D-SW)SZ (BRF)GF2 | INSTL OM ASSM (OM-2Z)WF LX)GND | RE PM W/RET REQ TY I (W)4"(SLD) (100MIL) | RE PM W/RET REQ TY I (W)6"(BRK) (100MIL) | RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL) | REFL PAV MRKR TY II-C-R |
| | LF | EA | EA | EA | LF | LF | LF | EA |
| ROADWAY A | | 2 | 11 | 1 | 2540 | 640 | 2540 | 32 |
| ROADWAY B | 600 | 2 | 11 | 1 | 2540 | 640 | 2540 | 32 |
| **PROJECT TOTALS** | **600** | **4** | **22** | **2** | **5080** | **1280** | **5080** | **64** |

STATE OF TEXAS
SHELLEY C. HARRIS
99197
LICENSED PROFESSIONAL ENGINEER

Shelley C. Harris, P.E.
11/4/2022

# STRIPING & DELINEATION LAYOUT



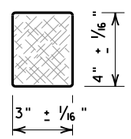
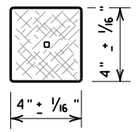
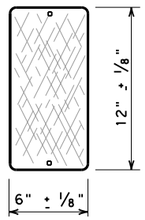
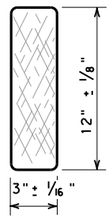
Texas Department of Transportation

No Scale Sheet 1 of 1

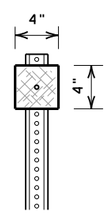
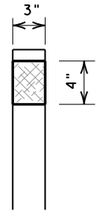
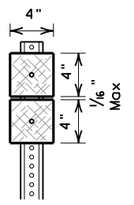
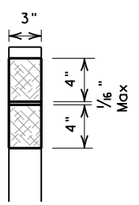
| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 82 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_TRF_STR_DEL_LAY.DGN | | |

DATE: &DATE&
FILE: &FILE&
&TIME&

## 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

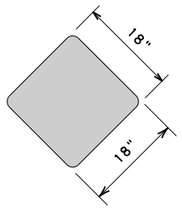
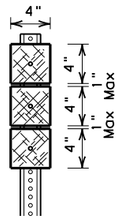
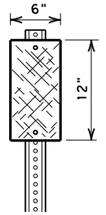
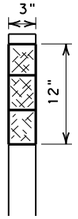
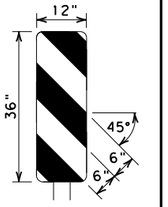
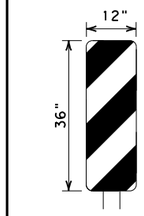
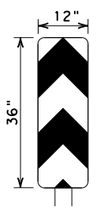
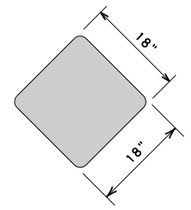
**NUMBER OF REFLECTORS OR DIRECTION**
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

**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

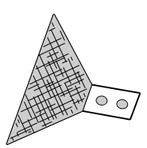
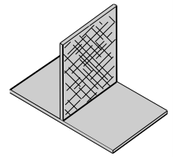
## OBJECT MARKERS

| | 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

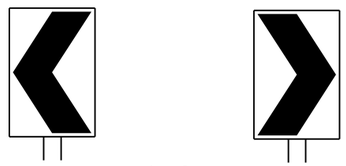
| | |
|---|---|
| FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES) | DMS-4400 |
| SIGN FACE MATERIALS | DMS-8300 |
| DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS | DMS-8600 |

## 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

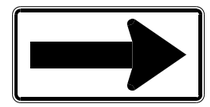



| SIZE (W x L) | 18"x 24" (Conventional) | 24"x 30" (Conventional Oversize) | 30"x 36" (Expressway) | 36" x 48" (Freeway) |
|---|---|---|---|---|
| MOUNTING HEIGHT | 4'-0" or 7'-0" | | 7'-0" Only | |

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

## ONE DIRECTION LARGE ARROW

DEVICE




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

## NOTE:

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

Texas Department of Transportation

Traffic Safety Division Standard

# DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

# D & OM(1)-20

| FILE: dom1-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| ©TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. |
| 4-10 7-20 | LBB | GARZA | | 83 |

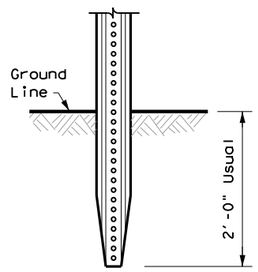
20A

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

# POST TYPE AND SUPPORT FOUNDATION DETAILS

## WING CHANNEL (WC)

### GND

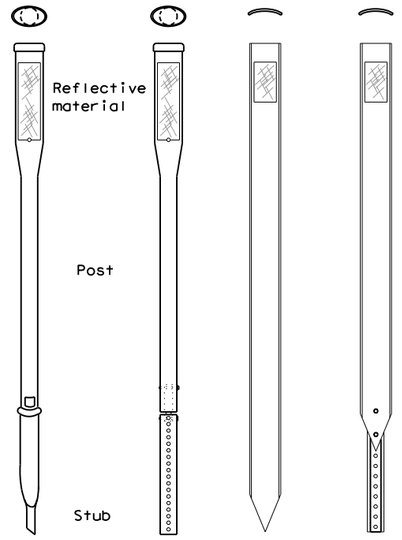



**NOTES**

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.

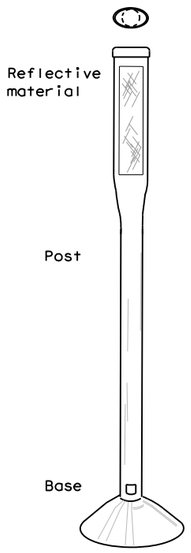
## FLEXIBLE POSTS (YFLX, WFLX)

### GND




EMBEDDED

### SRF



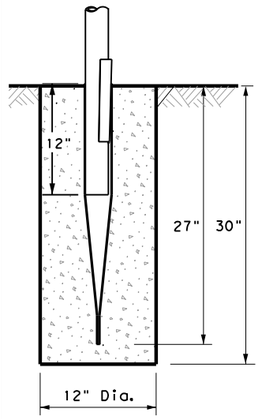

SURFACE MOUNT

**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.

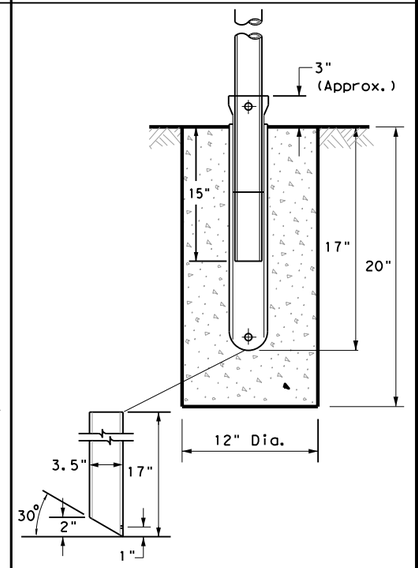
## WEDGE ANCHOR SYSTEMS

### WAS




STEEL

### WAP




PLASTIC

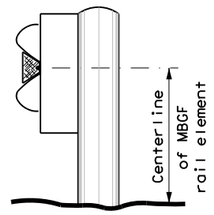
**NOTE**

1. Install per manufacturer's recommendations.

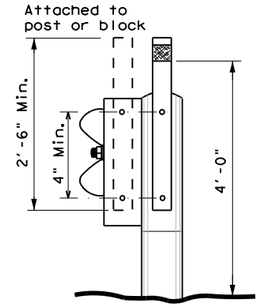
# TYPE OF BARRIER MOUNTS

## GUARD FENCE ATTACHMENT

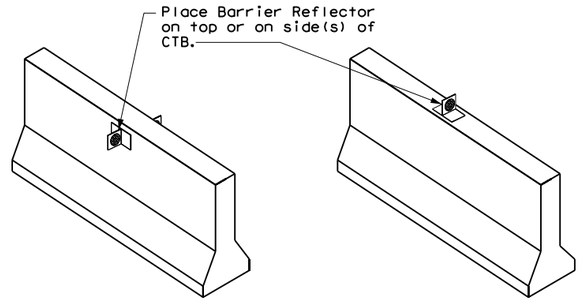
### GF1




### GF2



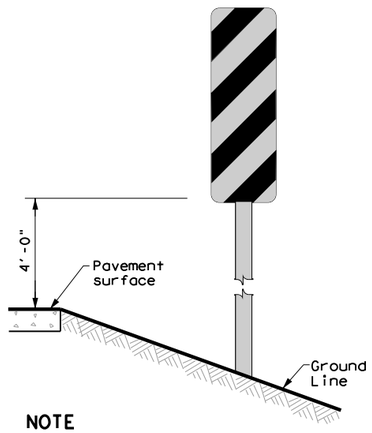

## CONCRETE TRAFFIC BARRIER (CTB)




**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.

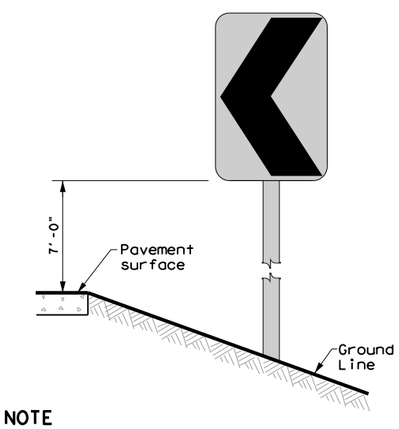
## TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS




**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)

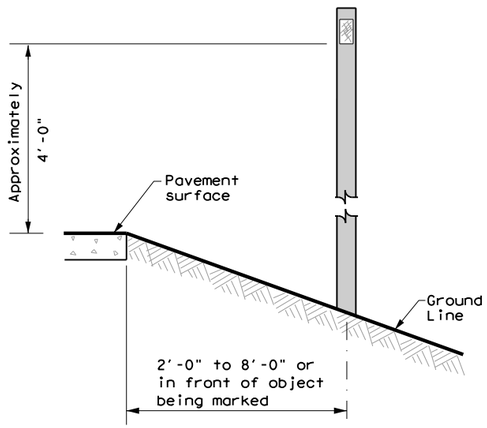
## CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN




**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

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# 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 | 0053 | 06 | 031 | US 84 |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. |
| 4-10 7-20 | LBB | GARZA | | 84 |

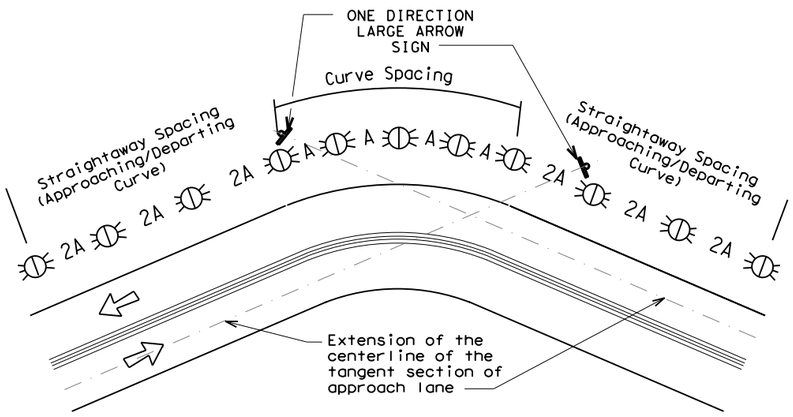
20B

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

## MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

| Amount by which Advisory Speed is less than Posted Speed | Curve Advisory Speed | |
|---|---|---|
| | Turn (30 MPH or less) | Curve (35 MPH or more) |
| 5 MPH & 10 MPH | • RPMs | • RPMs |
| 15 MPH & 20 MPH | • RPMs and One Direction Large Arrow sign | • RPMs and Chevrons; or<br>• RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons. |
| 25 MPH & more | • RPMs and Chevrons; or<br>• RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons | • RPMs and Chevrons |

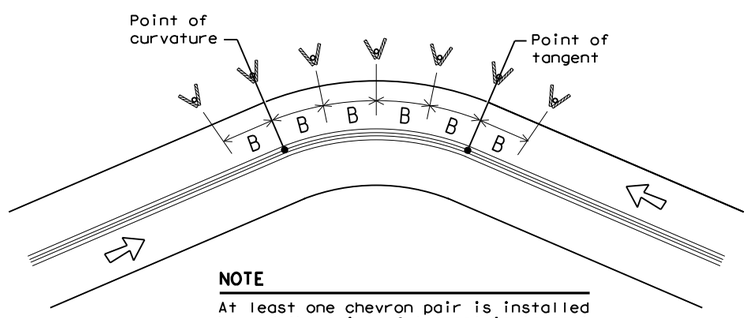
## SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES




**NOTE**

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

## SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES




**NOTE**

At least one chevron pair is installed beyond the point of tangent in tangent section.

## DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

| Degree of Curve | FEET | | | |
|---|---|---|---|---|
| | Radius of Curve | Spacing in Curve | Spacing in Straightaway | Chevron Spacing in Curve |
| | | A | 2A | B |
| 1 | 5730 | 225 | 450 | — |
| 2 | 2865 | 160 | 320 | — |
| 3 | 1910 | 130 | 260 | 200 |
| 4 | 1433 | 110 | 220 | 160 |
| 5 | 1146 | 100 | 200 | 160 |
| 6 | 955 | 90 | 180 | 160 |
| 7 | 819 | 85 | 170 | 160 |
| 8 | 716 | 75 | 150 | 160 |
| 9 | 637 | 75 | 150 | 120 |
| 10 | 573 | 70 | 140 | 120 |
| 11 | 521 | 65 | 130 | 120 |
| 12 | 478 | 60 | 120 | 120 |
| 13 | 441 | 60 | 120 | 120 |
| 14 | 409 | 55 | 110 | 80 |
| 15 | 382 | 55 | 110 | 80 |
| 16 | 358 | 55 | 110 | 80 |
| 19 | 302 | 50 | 100 | 80 |
| 23 | 249 | 40 | 80 | 80 |
| 29 | 198 | 35 | 70 | 40 |
| 38 | 151 | 30 | 60 | 40 |
| 57 | 101 | 20 | 40 | 40 |

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

## DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

| Advisory Speed (MPH) | Spacing in Curve | Spacing in Straightaway | Chevron Spacing in Curve |
|---|---|---|---|
| | A | 2xA | B |
| 65 | 130 | 260 | 200 |
| 60 | 110 | 220 | 160 |
| 55 | 100 | 200 | 160 |
| 50 | 85 | 170 | 160 |
| 45 | 75 | 150 | 120 |
| 40 | 70 | 140 | 120 |
| 35 | 60 | 120 | 120 |
| 30 | 55 | 110 | 80 |
| 25 | 50 | 100 | 80 |
| 20 | 40 | 80 | 80 |
| 15 | 35 | 70 | 40 |

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

## DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

| CONDITION | REQUIRED TREATMENT | MINIMUM SPACING |
|---|---|---|
| Frwy./Exp. Tangent | RPMs | See PM-series and FPM-series standard sheets |
| Frwy./Exp. Curve | Single delineators on right side | See delineator spacing table |
| Frwy/Exp.Ramp | Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4)) | 100 feet on ramp tangents<br>Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves) |
| Acceleration/Deceleration Lane | Double delineators (see Detail 3 on D&OM(4)) | 100 feet (See Detail 3 on D & OM (4)) |
| Truck Escape Ramp | Single red delineators on both sides | 50 feet |
| Bridge Rail (steel or concrete)and Metal Beam Guard Fence | Bi-Directional Delineators when undivided with one lane each direction<br>Single Delineators when multiple lanes each direction | Equal spacing (100'max) but not less than 3 delineators |
| Concrete Traffic Barrier (CTB) or Steel Traffic Barrier | Barrier reflectors matching the color of the edge line | Equal spacing 100' max |
| Cable Barrier | Reflectors matching the color of the edge line | Every 5th cable barrier post (up to 100'max) |
| Guard Rail Terminus/Impact Head | Divided highway - Object marker on approach end<br>Undivided 2-lane highways - Object marker on approach and departure end | Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end<br>See D & OM (5) and D & OM (6) |
| Bridges with no Approach Rail | Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail | See D & OM(5) |
| Reduced Width Approaches to Bridge Rail | Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge | Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end<br>See D & OM (5) |
| Culverts without MBGF | Type 2 Object Markers | See Detail 2 on D & OM(4) |
| Crossovers | Double yellow delineators and RPMs | See Detail 1 on D & OM (4) |
| Pavement Narrowing (lane merge) on Freeways/Expressway | Single delineators adjacent to affected lane for full length of transition | 100 feet |

### NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

### LEGEND

| | |
|---|---|
| | Bi-directional Delineator |
| | Delineator |
| | Sign |

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# DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

# D & OM(3)-20

| FILE: dom3-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| © TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
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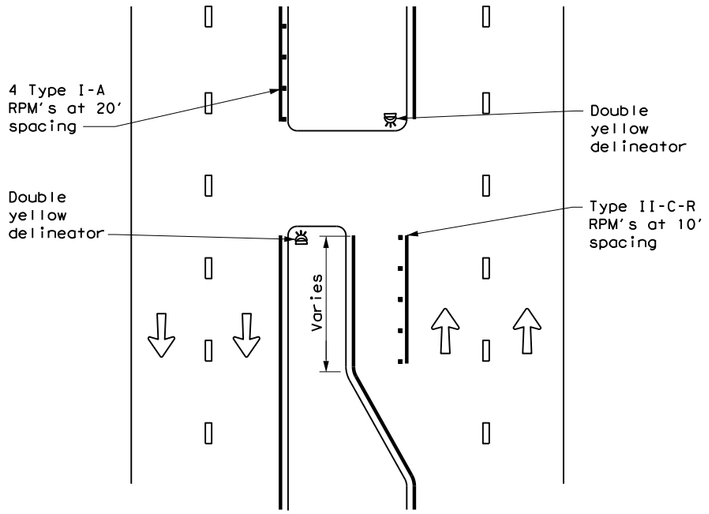
| 3-15 8-15 | DIST | COUNTY | | SHEET NO. |
| 8-15 7-20 | LBB | GARZA | | 85 |

20C

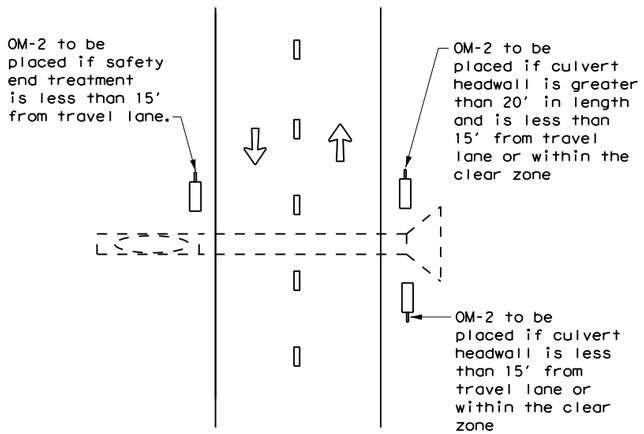
DATE: $DATE$ $TIME$
FILE: $FILE$

## CROSSOVERS



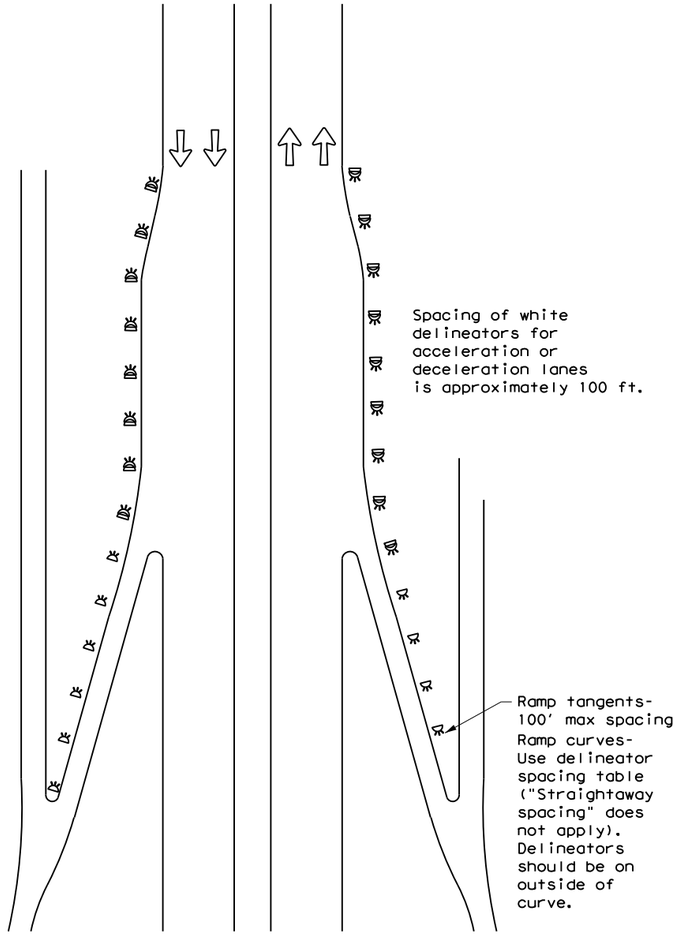

DETAIL 1

## FOR CULVERTS WITHOUT MBGF



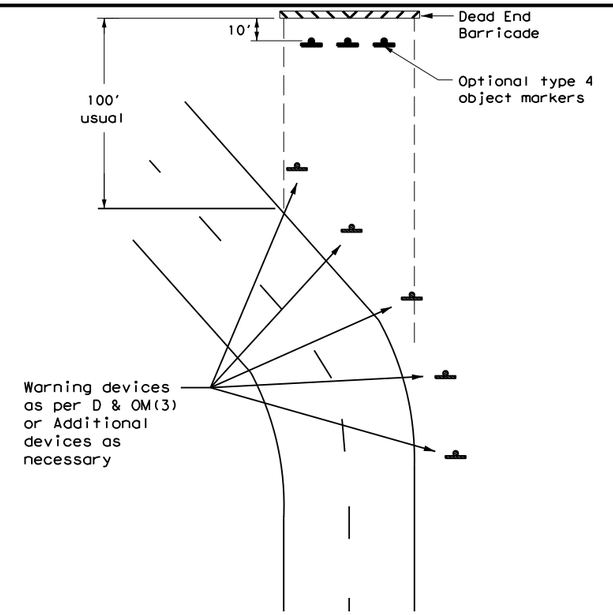

DETAIL 2

## FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



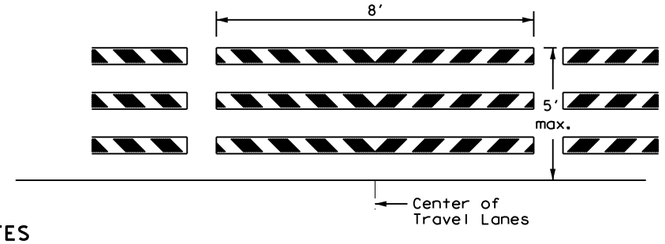

DETAIL 3

## 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 |

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# DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

# D & OM(4)-20

| FILE: dom4-20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
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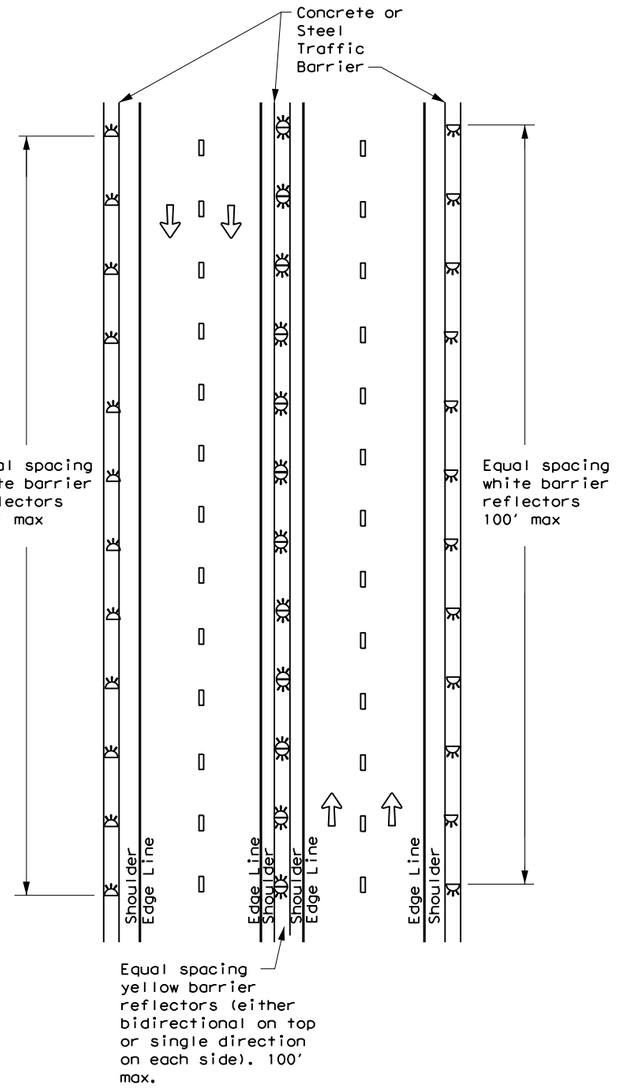
| 3-15 | DIST | COUNTY | | SHEET NO. |
| 7-20 | LBB | GARZA | | 86 |

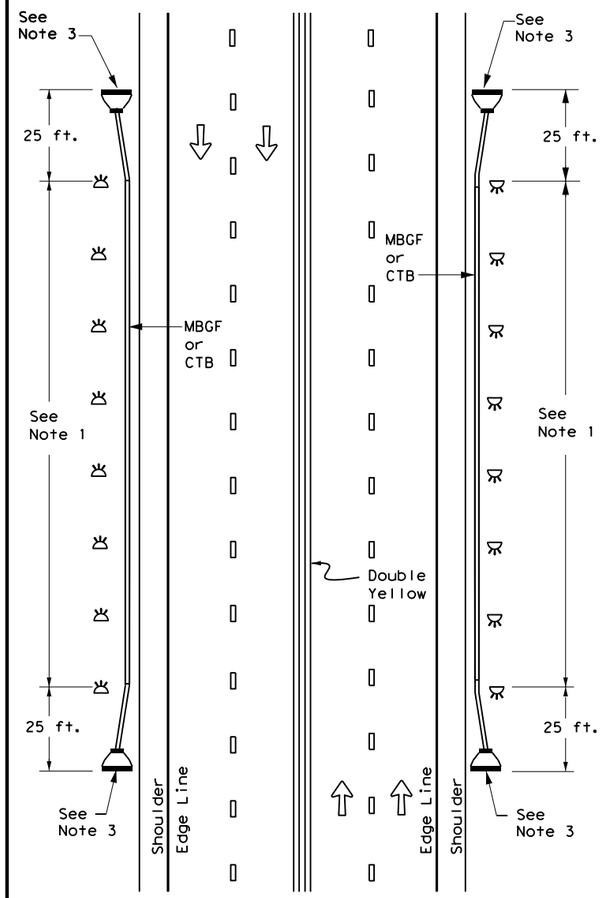
20D

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

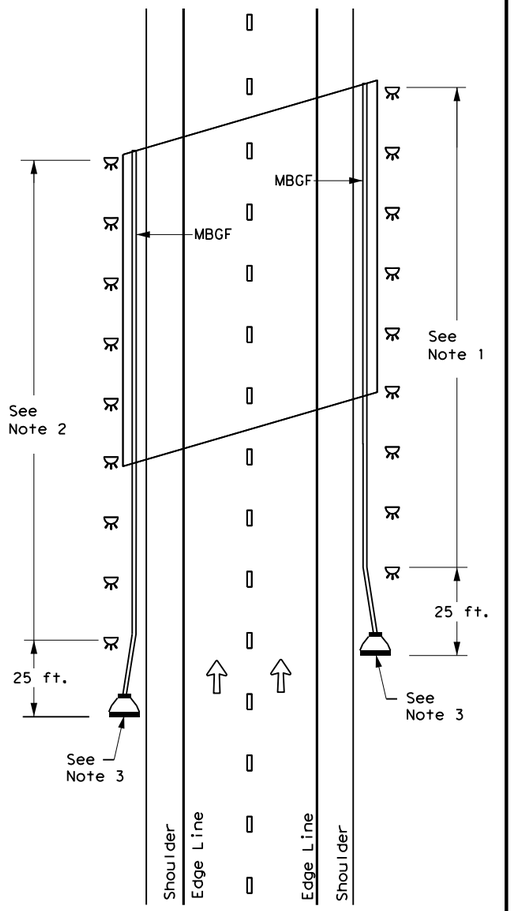
## CONTINUOUS CONCRETE OR STEEL BARRIER



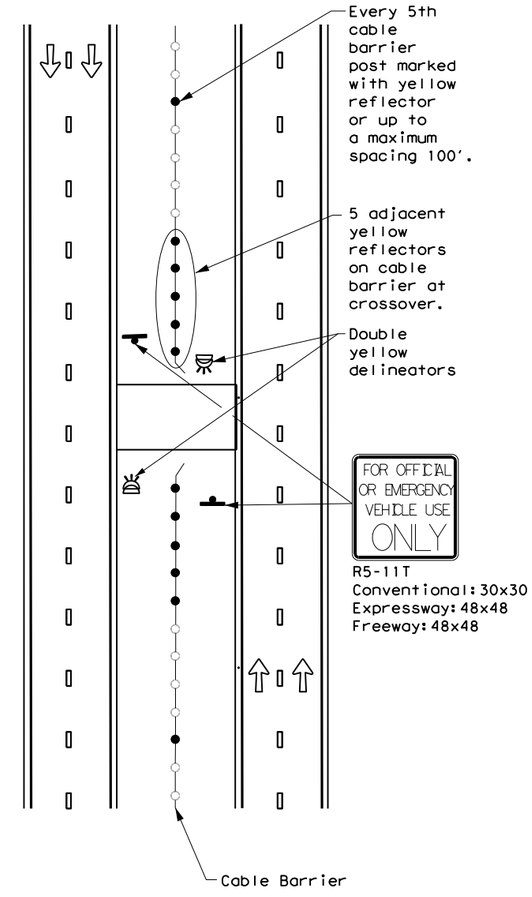

## MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)




## DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)




## EMERGENCY CROSSOVER




## NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

## LEGEND

| | |
|---|---|
| | Bidirectional Delineator |
| | Delineator |
| | OM-3 |
| | OM-2 |
| | Terminal End |
| | Traffic Flow |

Texas Department of Transportation

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# DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

# D & OM(6)-20

| FILE: dom6-20.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
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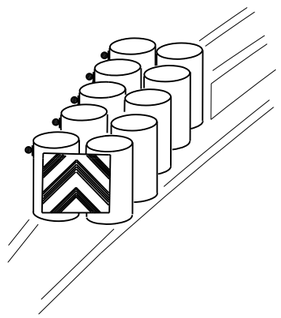
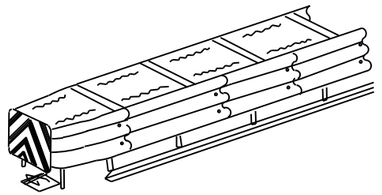
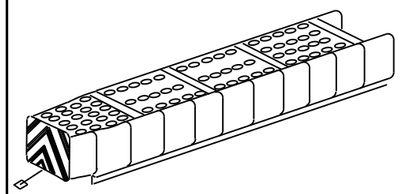
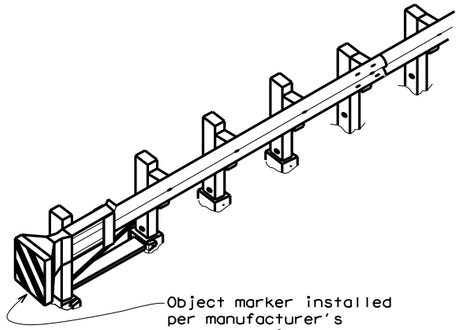
| 7-20 | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 87 |

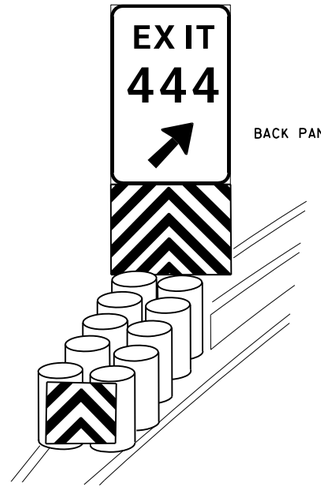
DATE: $DATE$ $TIME$
FILE: $FILE$

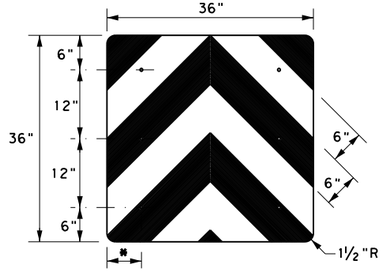


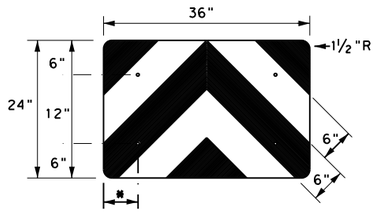




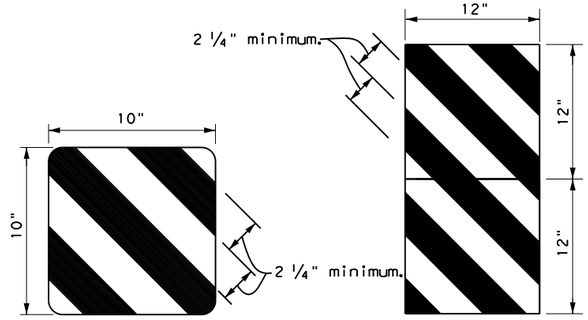


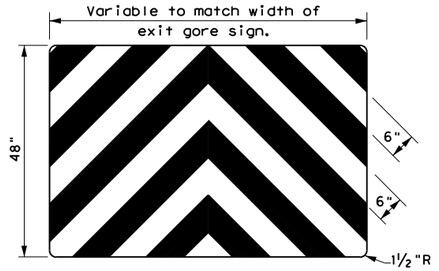



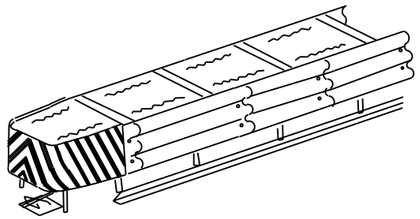



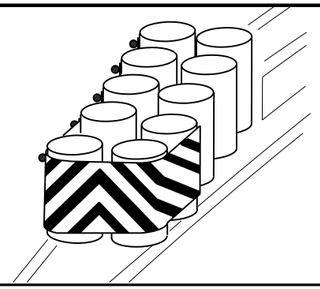

* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

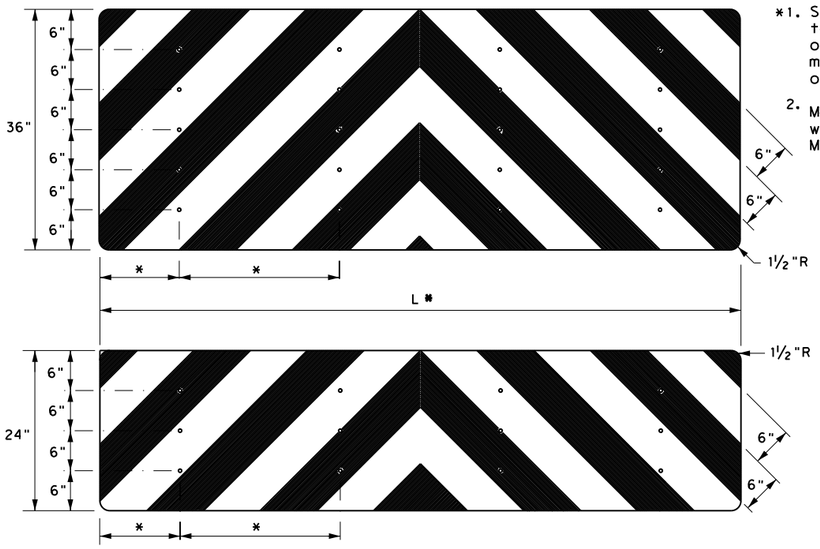



OBJECT MARKERS SMALLER THAN 3 FT$^2$








## NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

## NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

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# DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

# D & OM(VIA)-20

| FILE: domvia20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
|---|---|---|---|---|
| © TxDOT December 1989 | CONT | SECT | JOB | HIGHWAY |
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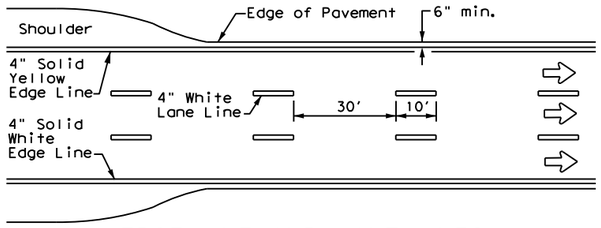
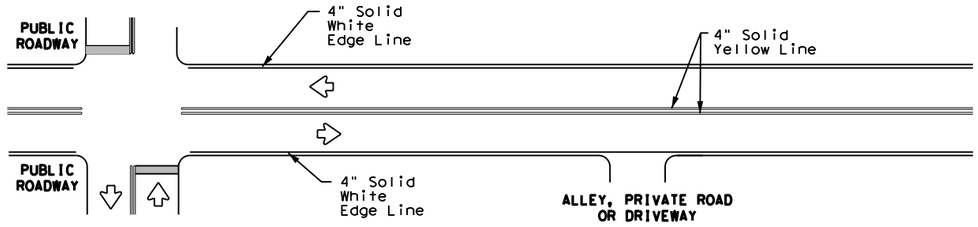
| 4-92 8-04 | DIST | COUNTY | | SHEET NO. |
| 8-95 3-15 | LBB | GARZA | | 88 |
| 4-98 7-20 | | | | |

20G

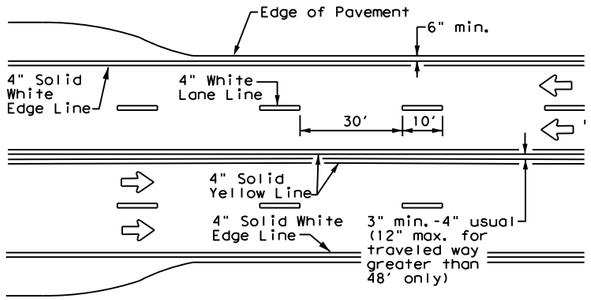
DATE: $DATE$ $TIME$
FILE: $FILE$



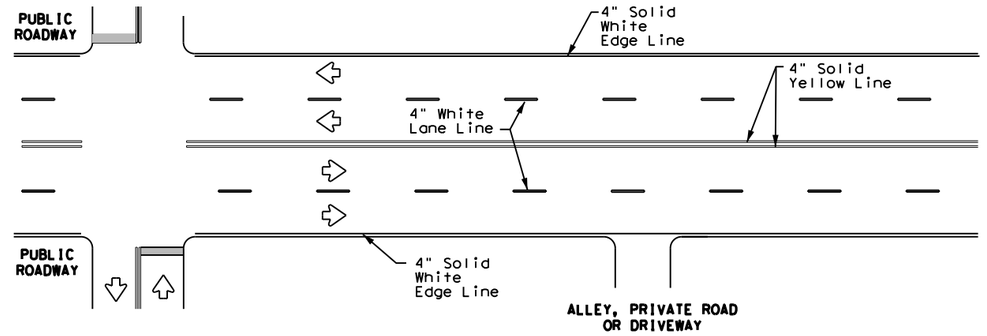

## EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



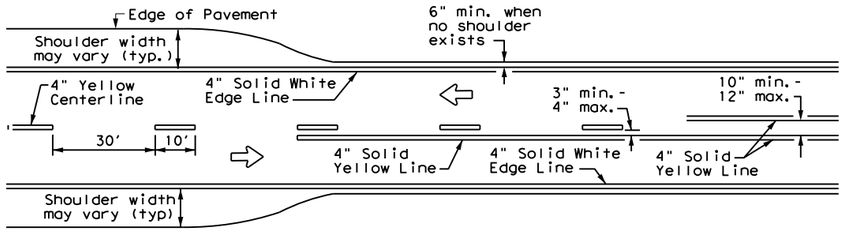

## TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



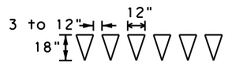

## CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



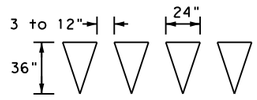

## TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS




## TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

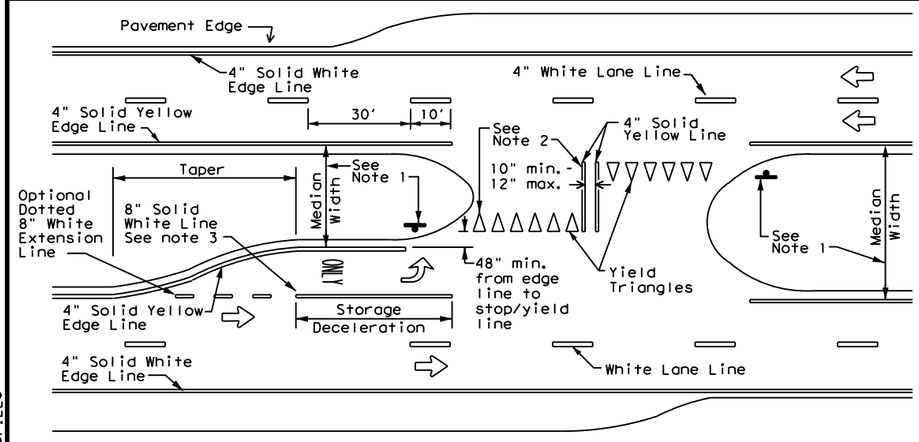



For posted speed on road being marked equal to or less than 40 MPH.




For posted speed on road being marked equal to or greater than 45 MPH.

## YIELD LINES




## FOUR LANE DIVIDED ROADWAY CROSSOVERS

### NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

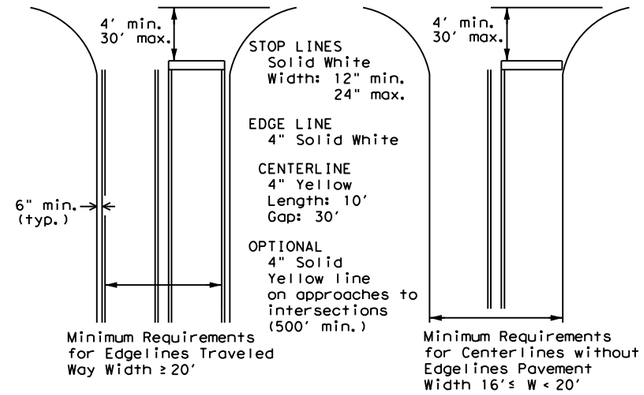
### GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

| MATERIAL SPECIFICATIONS | |
|---|---|
| PAVEMENT MARKERS (REFLECTORIZED) | DMS-4200 |
| EPOXY AND ADHESIVES | DMS-6100 |
| BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS | DMS-6130 |
| TRAFFIC PAINT | DMS-8200 |
| HOT APPLIED THERMOPLASTIC | DMS-8220 |
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.




## GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

# TYPICAL STANDARD PAVEMENT MARKINGS

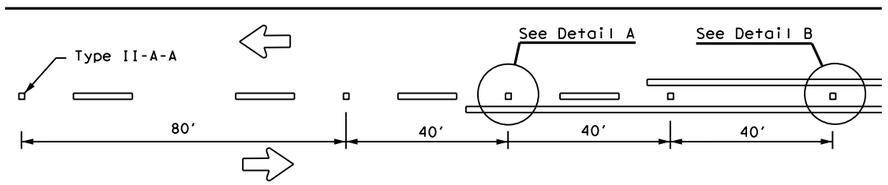
# PM(1)-20

| FILE: pm1-20.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| © TxDOT November 1978 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 8-95 3-03 | 0053 | 06 | 031 | US 84 |
| 5-00 2-12 | DIST | COUNTY | | SHEET NO. |
| 8-00 6-20 | LBB | GARZA | | 89 |

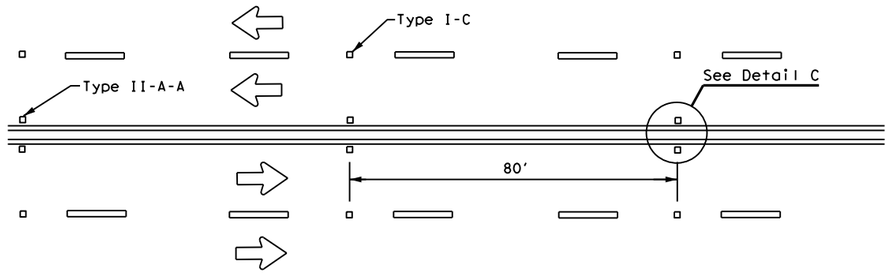
22A

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

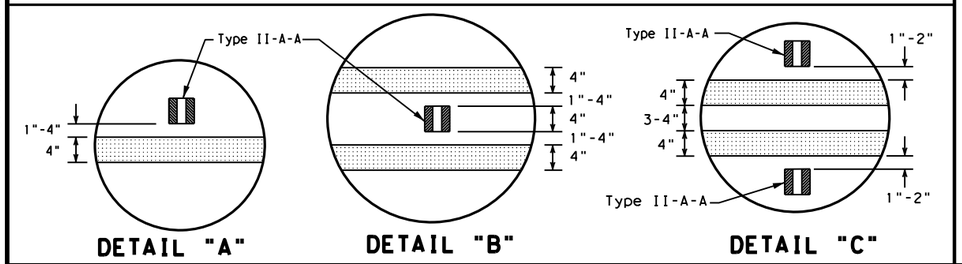
# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



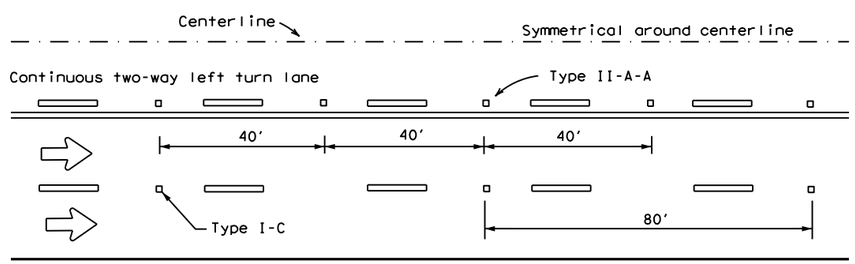

## CENTERLINE FOR ALL TWO LANE ROADWAYS



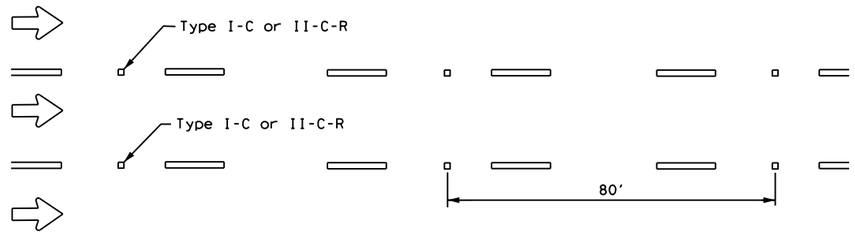

## CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS




**DETAIL "A"** **DETAIL "B"** **DETAIL "C"**

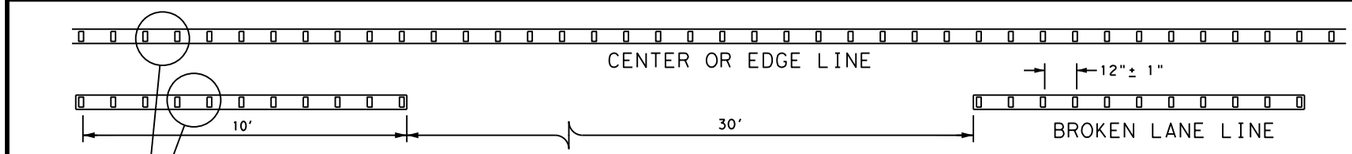



## CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



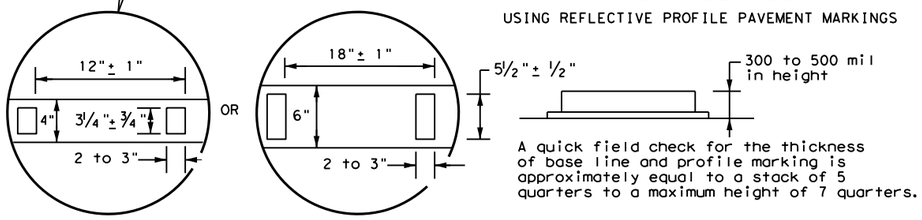

## LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.




## REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS




4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

### NOTE

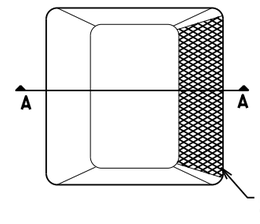
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

### GENERAL NOTES

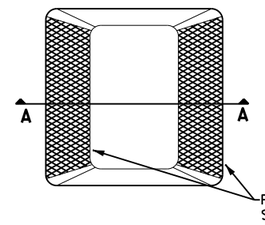
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

| MATERIAL SPECIFICATIONS | |
|---|---|
| PAVEMENT MARKERS (REFLECTORIZED) | DMS-4200 |
| EPOXY AND ADHESIVES | DMS-6100 |
| BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS | DMS-6130 |
| TRAFFIC PAINT | DMS-8200 |
| HOT APPLIED THERMOPLASTIC | DMS-8220 |
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |

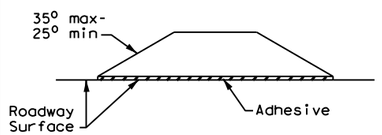
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.




Type I (Top View)




Type II (Top View)




SECTION A

## RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

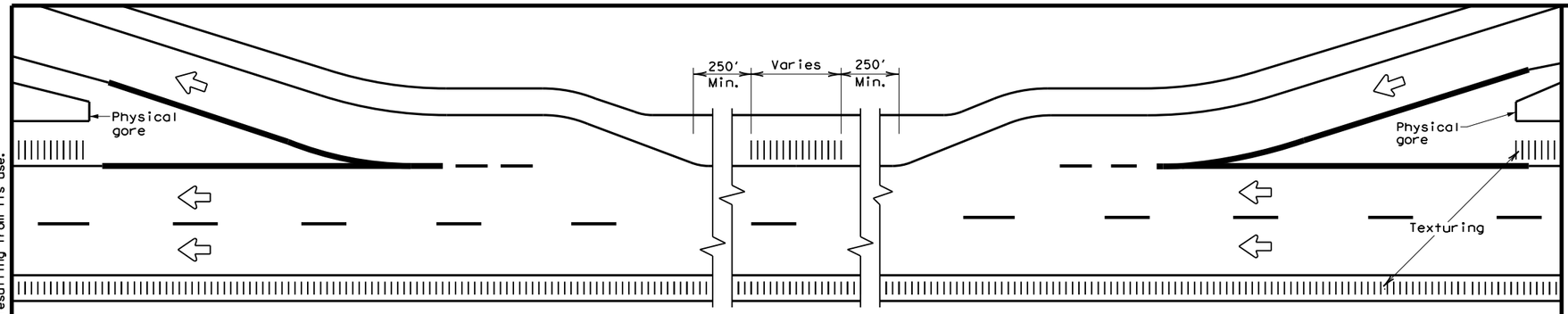
# POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

| FILE: pm2-20.dgn | DN: | CK: | DW: | CK: |
|---|---|---|---|---|
| ©TxDOT April 1977 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 4-92 2-10 | 0053 | 06 | 031 | US 84 |
| 5-00 2-12 | DIST | COUNTY | | SHEET NO. |
| 8-00 6-20 | LBB | GARZA | | 90 |

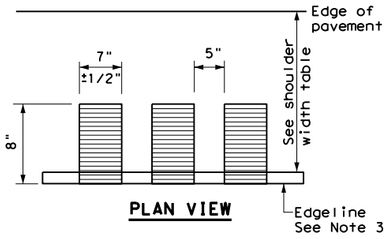
22B



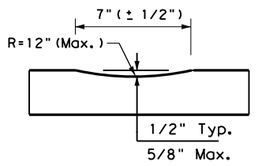
DATE: $DATE$ $TIME$
FILE: $FILE$




# TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS

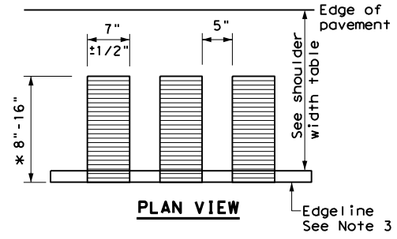



PLAN VIEW



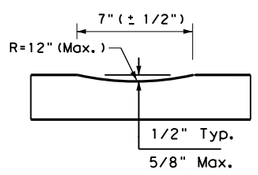

PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



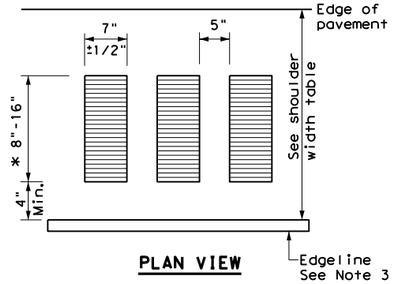

PLAN VIEW

* This distance may vary based on width of shoulder



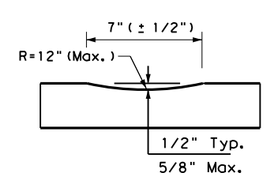

PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



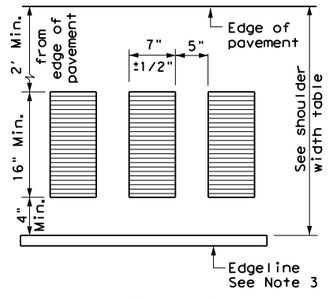

PLAN VIEW

* This distance may vary based on width of shoulder

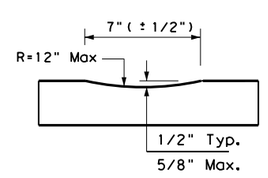



PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)




PLAN VIEW




PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

## GENERAL NOTES

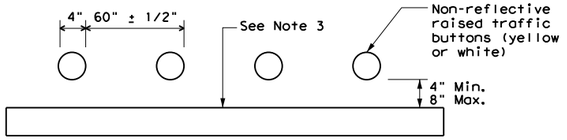
1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

**WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:**

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

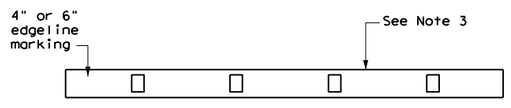
**WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:**

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.




PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS




PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

| SHOULDER WIDTH TABLE | | |
|---|---|---|
| EQUAL TO OR LESS THAN 2 FEET | GREATER THAN 2 FEET LESS THAN 4 FEET | EQUAL TO OR GREATER THAN 4 FEET |
| Option 1, 5 OR 6 | Option 1, 2, 3, 5 or 6 | Option 2, 4, 5 OR 6 |

Texas Department of Transportation

Traffic Operations Division Standard

# EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS

# RS(1)-13

| FILE: rs(1)-13.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT April 2006 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 2-10 10-13 | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 91 |

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

STORM WATER POLLUTION PREVENTION PLAN (SW3P):

This SW3P has been developed in accordance with TPDES General Permit TXR150000. The operator, the Texas Department of Transportation, provides project specifications for the development of adequate BMPs. The contractor shares responsibility for implementing the BMPs described herein. The contactor shall implement changes approved by the Project Engineer to the SW3P within the time specified in the SW3P or in the TPDES Construction General Permit. See EPIC sheet for a list of the MS4 Operators.

1. SITE OR PROJECT DESCRIPTION:

a. NATURE OF THE CONSTRUCTION ACTIVITY:
TxDOT (Lubbock District) for the construction of a bridge replacement and extension.

b. POTENTIAL POLLUTANTS AND SOURCES:

| | |
|---|---|
| Sediment laden storm water | Storm water conveyance over disturbed areas |
| Fuels, oils, and lubricants | Construction vehicles and storage areas |
| Construction debris and waste | Various construction activities |
| Sanitary waste | Restroom facilities |
| Trash | Construction site and receptacles |
| Concrete Washout Water | Concrete Trucks, Concrete Pump Trucks, Paving Equipment |

Potential pollutants will primarily be from sediments leaving the right-of-way and petroleum products. Principle sources of pollutants will be: disturbed soil from grading, excavation, embankment, and other roadway construction activities; litter and debris from construction activities; gasoline, oil, and grease from asphalt distributor vehicles, scrappers, trucks, rollers, compactors, and fuel trucks during daily, routine operations.

c. SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:
Consisting of culvert work, ditch grading, mbgf, riprap, pavement repair, sealcoat, and striping

d. AREAS:
TOTAL AREA OF PROJECT: 17.87 ACRES
TOTAL AREA OF SOIL DISTURBANCE: 1.37 ACRES
TOTAL AREA OF OFF-SITE PSL: To be determined when construction begins.

e. DATA DESCRIBING THE SOIL:
The area's predominate soil type is sandy, loamy, and clay soils support grass, small mesquite, and thorny scrubs and cacti. The soils are friable and in dry weather condtions may be picked up by regional winds. The local climate is semi-arid (18.9" average annual rain).

WATER QUALITY ASSESSMENT: A site (visual & odor) assessment of water quality will be performed once construction begins.

f. GENERAL LOCATION MAP: SEE TITLE SHEET TO PROJECT PLANS.

g. DETAILED SITE MAP: SEE SW3P PLAN SHEET AND/OR TYPICAL SECTIONS, PLAN SHEETS, AND DRAINAGE AREA MAP

h. THE LOCATION AND DESCRIPTIONS OF SUPPORT ACTIVITIES AUTHORIZED UNDER THE PERMITEE'S NOI: There are no asphalt or concrete batch plants providing support to the project authorized under the Lubbock District's (TxDOT) NOI.

I. NAME OF RECEIVING WATERS: Tributaries of the Red Branch that flows into the receiving water of the South Fork Double Mountain Fork Brazos River--In the Brazos River Basin. ID * 1241D

j. A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SW3P FILE.

k. A COPY OF THE NOI, ACKNOWLEDGEMENT CERTIFICATE AND/OR CONSTRUCTION SITE NOTICE IS IN THE PROJECT SW3P FILE

2. DESCRIPTION OF BMPs USED TO MINIMIZE POLLUTION IN RUNOFF:

EROSION AND SEDIMENT CONTROLS: If it is necessary to pump water, BMP's shall be used to reduce the off-site transport of sediment. BMP's shall be installed per the manufacturer specifications or as directed by the Engineer.

GENERAL SCHEDULE FOR IMPLEMENTATION OF SW3P CONTROLS

| CONTROL | IMPLEMENTATION SCHEDULE AND DESCRIPTION | REMOVAL SCHEDULE |
|---|---|---|
| general, various controls | control measures are to be provided at a time and in a manner that will minimize impacts to receiving waters | at final stabilization; at the resumption of construction (temporary measures); at the direction of the SW3P plan; at the direction of the project manager |
| rock filter dams | to be installed prior to soil disturbing activities in the surrounding areas | at final stabilization or as directed by the project engineer |
| sandbag berms | to be installed prior to the start of construction; sandbag berms are to serve as water velocity dissipaters, as ditch blocks, as sedimentation basins, in support of other control devices, and as a final multiple control for water leaving the construction zone | at final stabilization or as directed by the project engineer |
| silt fence | silt fence will be installed prior to the start of construction along right-of-way lines<br>silt fence will be installed as quickly as feasible (where it is reasonable to do so) at the toe of header bank and other slopes<br>silt fence may be installed at the start of construction, during construction as appropriate, and during construction to support other controls as needed | at final stabilization or as directed by the project engineer at final stabilization or as directed by the project engineer at the removal of the construction exit, at final stabilization, or as directed by the project engineer |
| tackifiers | soil tackifiers may be used to control dust | erosion controls that are designed to remain in-place for a indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal (CGP, page 23) |
| water | to be used to suppress dust and compact dirt on an as needed schedule | erosion controls that are designed to remain in-place for a indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal (CGP, page 23) |
| seed, temporary | to be installed, when apprpropriate, in disturbed areas where construction has temporarily ceased for 21 days | erosion controls that are designed to remain in-place for a indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal (CGP, page 23) |
| seed, permanent | to be installed as a final stabilization measure where construction is complete or as directed by the Engineer | erosion controls that are designed to remain in-place for a indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal (CGP, page 23) |
| construction exits | to be installed at all construction vehicle exit points to publicly traveled ways prior to the use of these exits by construction vehicles | as directed by construction conditions or by the Engineer |
| erosion control logs | to be installed prior to the start of construction; erosion control logs are to serve as water velocity dissipaters, as ditchblocks, as sedimentation basins, and in support of other control devices. | as directed by construction conditions or by the Engineer |
| soil retention blankets | to be installed as a final stabilization measure where construction is complete or as directed by the Engineer | erosion controls that are designed to remain in-place for a indefinite period, such as mulches and fiber mats, are not required to be removed or scheduled for removal (CGP, page 23) |
| inlet protectors | to be installed to cover curb inlets with support from sandbags or as directed by the Engineer | as directed by construction conditions or by the Engineer |
| compost socks | to be installed as channel blocks, inlet protectors, and to support sandbag berms, silt fences or as directed by the Engineer | as directed by construction conditions or by the Engineer |

Note: this is a general schedule for the installation of and removal of SW3P best management practice controls, the final determination of the implementation and removal of controls is at the discretion of the project engineer.

Note: control measures must be properly selected, installed, and maintained according to the manufacturer's or designer's specifications. If periodic inspections or other information indicates control has been used incorrectly, or that the control is performing inadequately, the operator must replace or modify the control as soon as practicable after the discovery that the control has been used incorrectly, is performing inadequately, or is damaged.

Note: sediment must be removed from traps and sedimentation ponds no later than the time that design capacity has been reduced by 50 percent.

Note: if sediment escapes the site, accumulations must be removed at a frequency to minimize further negative effects, and whenever feasible, prior to the next rain event.

Note: controls must be developed to limit, to the extent practicable, the off-site transport of litter, construction debris, and construction materials.

Note: erosion and sediment controls must be designed to retain sediment on-site to the extent practicable with consideration for local topography, soil type, and rainfall. Controls must also be designed and utilized to reduce the off-site transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water.

STABILIZATION PRACTICES: The SW3P must include a description of interim and permanent stabilization practices, including a schedule describing when these practices will be implemented.
1. Water: water will be used to temporarily suppress dust and compact dirt.
2. Tackifiers: tackifiers such as asphalt emulsion, guar, (and other natural tackifiers), and synthetic tackifiers will be used to control air (dust) & water erosion.
3. Existing Vegetation & Vegetative Buffers: to the extent practicable, existing vegetation will not be disturbed by construction activities; where feasible (especially at storm water discharge sites) existing vegetation will remain undisturbed to form a vegetative buffer between construction areas and areas undisturbed by construction.
4. Riprap: concrete riprap can be installed as a permanent stabilization measure at locations where construction is complete and permanent stabilization is required.

Environmental documentation to be uploaded to ProjectWise

The Lubbock District of the Texas Department of Transportation uses Site Manager, a computer based construction record-keeping system. Documentation describing major grading activities, temporary or permanent cessation of construction, and temporary and permanent stabilization measures is a part of this system and is incorporated by reference into this SW3P.

Storm Water Pollution Plans (SW3P) are a part of a highway project's construction plans, and construction plans contain information that supplement a project's SW3P. Project plans provide information on changes in elevations, on the locations where dirt has been removed and the locations where dirt has been added; on construction sequencing and scheduling and other data that might be important to a full understanding of TCEQ storm water pollution prevention requirements and a project's SW3P.

Contractor's construction schedule is incorporated into the project's SW3P by reference.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construcion activities have ceased and will not resume for a period exceeding 14 calendar days. Stabilization measures that provide a protective cover must be initiated immediately in portions of the site where construction activities have permanently ceased (CGP Part III Sect. F2(b)III page 33)

SEDIMENT CONTROL PRACTICES:
1. Sandbags: the purpose of a sandbag is to intercept sediment laden storm water from disturbed areas, create a detention pond, detain sediment and release water in a sheet flow. Sandbag berms are a general purpose sediment control device and will be used throughout the project to detain sediment on site. Sandbags will be placed in ditches and channels to form sedimentation basins. Sandbags will also be used where runoff exits the construction site to enter receiving waters and to support other storm water controls.
2. Silt fence: silt fence is to be installed with construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This is a general use control that will be used to create detention basins that retain sediment on-site; they will also be used in support of other controls such as construction exits and rock filter dams.
Silt fence will be used along playa lakes to reduce the loss of sediment from roadway front slopes; it may be used in ditches, channels, discharge points to support sandbag berms; may be used to support stabilized construction exits.
3. Rock Filter Dams: the purpose of a rock filter dam is to intercept and slow sediment laden water runoff from disturbed areas, retain the sediment and release the water in sheet flow. Rock filter dams will generally be used in high water velocity flow channels.
4. Stabilized Construction Exit: the purpose of the stabilized exit is to reduce the tracking of sediment and dirt onto public roadways beyond the construction zone. Stabilized Construction Exits are to be in-place at exit points to streets and thoroughfares in urban areas and are to be used by all construction vehicles regardless of size. They are to be supported where appropriate with silt fence and mechanized brooms.

Sediment basins are required where feasible for common drainage locations that serve an area with 10 or more acres disturbed at one time. Temporary or permanent sediment basins that provide water storage capacity are located on the project; the following controls provide, where feasible, structural controls / sediment basins:
1. Sandbag Berm as a Sediment Basin: a temporary basin designed to intercept sediment-laden storm water runoff and to trap sediment on-site.
2. Vegetative Buffer Strip: vegetative buffer strips reduce water velocity which reduces the potential of water erosion and allows sediments to fall out of the storm water.
3. Silt Fence will be used to reduce the loss of sediment from roadway front slopes adjacent to playa lakes by filtering out silt laden storm water from construction area.

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# SW3P NARRATIVE



Texas Department of Transportation

Sheet 1 of 2

| STATE DIST.NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 92 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | SW3Pnarrative.dgn | | |

DATE: &DATE&
FILE: &FILE&
&TIME&

3. DESCRIPTION OF PERMANENT STORM WATER CONTROLS

PERMANENT STORM WATER CONTROLS: A description of controls that will stay in-place after construction is completed must be included in the SW3P.

1. Riprap: concrete riprap can be installed as a permanent stabilization measure at locations where construction is completed must be included in SW3P.
2. Existing Vegetation & Vegetative Buffers: to the extent practicable, existing vegetation will not be disturbed by construction activities; and, where feasible (especially at storm water discharge sites), existing vegetation will remain undisturbed to form a vegetative buffer between construction areas and areas undisturbed by construction.
3. Permanent Sodding/Seeding & Plantings: this is the establishment of permanent perennial vegetation. Permanent vegetation stabilizes soil by holding soil particles in-place. Vegetation filters sediments, helps soil absorb water, improves wildlife habitat, and enhances aesthetics of the site. Permanent vegetation will remain in vegetated channels.

4. OTHER REQUIRED CONTROLS AND BMPs

(a) Tracking and Dust: Off-site tracking and generation of dust must be minimized.
1. Stabilized Construction Exit: a stabilized pad of stone, timber, or other stabilized surface located at points where construction traffic will leave the construction zone to enter a public roadway. The purpose of the stabilized exit is to reduce the tracking of sediment and dirt onto public roadways beyond the construction zone. Stabilized Construction Exits will be placed as needed.
2. Water: water will be used to temporarily suppress dust and compact dirt.
3. Tackifiers: tackifiers such as asphalt emulsion, guar, (and other natural tackifiers), and synthetic tackifiers will be used to control air (dust) & water erosion.
4. Existing Vegetation & Vegetative Buffers: to the extent practicable, existing vegetation will not be disturbed by construction activities; where feasible (especially at storm water discharge sites), existing vegetation will remain undisturbed to form a vegetative buffer between construction areas and areas undisturbed by construction.
5. Cleaning and Sweeping: clean and sweep curb and gutter sections twice a month to reduce dirt and trash or as directed.

(b) On-Site Storage of Construction and Waste Materials:
Storage of construction and waste materials on-site shall be temporary; the contractor shall maintain a clean and orderly construction site; and construction waste such as trash, rubble, litter, scrap, and vegetation shall be stored / disposed of in lidded dumpsters or in a manner approved by the project engineer. Disposal methods must meet federal, state, and local waste management requirements. No construction waste shall be buried or burned on-site. Spoils of disposal, material storage, and waste materials from the demolition of existing roads and structures shall be stored in areas designated by the project engineer, and prevented from becoming a pollutant source with appropriate BMPs. Construction and waste materials that might be temporarily stored on-site include concrete and steel pipe; steel reinforcing bar, forms and frames; sand and gravel; wire, concrete and steel beams; wood and steel building units; and controls, construction signs and barricades. A list of construction and waste materials stored on site and controls will be presented to the Project Engineer.

Contractor shall design and utilize appropriate controls to minimize the offsite transport of suspended sediments and other pollutants, if it is necessary to pump or channel standing water from the site.

Litter, construction debris, and construction material exposed to stormwater shall be managed in a manner that prevents this material from becoming a pollutant. A regular sweep of the project shall be made to pick up litter. No construction material of any kind (including dirt) shall be discharged to a water of the United States (ephemeral streams and playa lakes) without a permit from the Corps of Engineers.

Oil, gasoline, grease, solvents, and other petroleum products are not to be stored on-site. Major vehicle maintenance shall occur on-site only under emergency conditions, and when this maintenance type is necessary, a plastic cover shall be used (and properly disposed of) to prevent petroleum products from contaminating the surrounding soil.

(c) Potential Pollutant Sources from Areas Other than Construction:

oil, grease, and other petroleum fluids construction traffic at concrete plant and field office
sediment laden stormwater disturbed soil from concrete batch plant and field office
litter, motorists driving through the project

All best management practices available to this construction project are available to control non-construction generated pollutants including sand bag berms, silt fence, stabilized construction exits, sedimentation basins, and litter management programs among other controls listed in this document.

Storage tanks that are above ground, regardless of whether they are used to store petroleum products, hazardous waste, or other hazardous material must follow the Summary of Federal Requirements.

Aboveground storage tanks (ASTs) used for the storage of petroleum products is regulated primarily under 40 CFR 112. These containers are used for purposes including, but not limited to, the storage of oil prior to use, while being used, or prior to further distribution in commerce.

A bulk storage container is 55 gal. or greater and may be aboveground, partially buried, bunkered, or completely buried. AST's include mobile storage containers such as trailers and tanked vehicles. Oil-filled electrical, operating, or manufacturing equipment is not a bulk storage container.

All bulk storage container installations must be constructed so a secondary means of containment is provided for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. Diked areas must be sufficiently impervious to contain discharged oil.

Mobile/Portable AST:

Mobile or portable oil bulk storage containers must be positioned or located to prevent a discharge and furnished with a secondary means of containment, such as a dike or catchment basin, sufficient to contain the capacity of the largest single compartment or container with sufficient freeboard to contain precipitation.

5. DOCUMENTATION OF COMPLIANCE WITH APPROVED STATE AND LOCAL PLANS:

SW3P must comply with Part III.F.5 of Construction General Permit.

6. MAINTENANCE REQUIREMENTS

Control measures shall be properly installed and maintained according to the manufacturer's specifications. Sediment must be removed from BMP's as directed by the SW3P plan requirements, and as directed by the manufacturer's recommendations, but no later than the time at which the capacity of the BMP has been reduced by 50 percent. If sediment or other pollutants escape the site, accumulations will be removed to reduce further negative effects. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must modify or replace the control as soon as practicable after the problem is discovered. Controls shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively, maintenance shall be performed as necessary to continue the effectiveness of the controls. Controls that have been intentionally disabled, run over, removed, or otherwise made ineffective, must be corrected or replaced at discovery.

7. INSPECTION OF CONTROLS

Lubbock District: an informal inspection of controls shall occur every work day; a formal inspection of controls accompanied by an inspection report using Form 2118 shall occur every seven calendar days.

Inspectors must inspect disturbed areas that have not been finally stabilized, areas that are used for storage of materials and that are exposed to rain, discharge locations and structural controls for evidence of, or the potential for, pollutants entering the drainage system.

The SW3P must be modified based on the results of inspections to better control pollutants in runoff. Revisions to the SW3P must be completed within seven calendar days following inspection. If existing BMPs are modified or if additional BMPs are necessary, an implementation schedule must be described in the SW3P and wherever possible those changes implemented before the next storm event.

*Determination of Reportable Quantities*

A list of each substance designated as hazardous in 40 CFR Part 116 is found in the project's SW3P folder. The 40 CFR 116 registration applies to quantities, when discharged into or upon the Waters of the United States, adjoining shorelines, into or upon the contiguous zone, or beyond the contiguous zone as provided in the Act.

*Litter and Construction Debris*

The project contractor shall establish a schedule for the regular removal of litter and construction debris; this schedule shall be approved by the project engineer; and, once approved, implemented by the contractor. As needed, the project engineer shall direct the contractor to establish good housekeeping measures consistent with the TCEQ's Construction General Permit.

*Concrete Truck Wash-Outs*

Concrete truck wash-out is allowed provided:
(a) wash-out of concrete trucks to surface waters in the state, including storm sewer drains and inlets, is prohibited;
(b) wash-out shall be to a structural control;
(c) the direct discharge of wash-out water is prohibited at all times;
(d) the discharge shall not contribute to groundwater contamination;
(e) wash-out areas must be shown on the site map.
(f) wash-out pits shall be bermed and lined with plastic.

404 PERMIT REQUIRED: _X_ YES ___ NO
401 WATER QUALITY CERTIFICATION AND BMPs REQUIRED: _X_ YES ___ NO
401 (401) BMPs - INTERIM (ITM) BMPs - PERMANENT (PER) BMPs

| EROSION CONTROLS | 401 | ITM | PER |
|---|---|---|---|
| * temporary vegetation | ____ | ____ | ____ |
| * blankets / matting | ____ | ____ | ____ |
| * mulch | ____ | ____ | ____ |
| * sod | ____ | ____ | ____ |
| * interceptor swales | ____ | ____ | ____ |
| * diversion dikes | ____ | ____ | ____ |
| * erosion control compost | ____ | ____ | ____ |
| * mulch filter berms & socks | ____ | ____ | ____ |
| * compost filter berms & socks | _X_ | _X_ | _X_ |
| * 401 BMP not required | ____ | ____ | ____ |

| SEDIMENT CONTROLS | 401 | ITM | PER |
|---|---|---|---|
| * sandbag berm | ____ | ____ | ____ |
| * silt fence | _X_ | _X_ | _X_ |
| * triangular filter dikes | ____ | ____ | ____ |
| * rock berms | _X_ | _X_ | _X_ |
| * hay bale dikes | ____ | ____ | ____ |
| * brush berms | ____ | ____ | ____ |
| * stone outlet sediment trap | ____ | ____ | ____ |
| * sediment basins | ____ | ____ | ____ |
| * erosion control compost | ____ | ____ | ____ |
| * mulch filter berms & socks | ____ | ____ | ____ |
| * compost filter berms & socks | _X_ | _X_ | _X_ |
| * 401 BMP not required | ____ | ____ | ____ |

POST - CONTSTRUCTION TOTAL SUSPENDED SOLIDS (TSS)

| | 401 | ITM | PER |
|---|---|---|---|
| * retention / irrigation | ____ | ____ | ____ |
| * vegetation filter strips | ____ | ____ | ____ |
| * wet basin | ____ | ____ | ____ |
| * grassy swale | ____ | ____ | ____ |
| * extended detention basin | ____ | ____ | ____ |
| * erosion control compost | ____ | ____ | ____ |
| * 401 BMP not required | ____ | ____ | ____ |

| | 401 | ITM | PER |
|---|---|---|---|
| * detention basin | ____ | ____ | ____ |
| * constructed wetland | ____ | ____ | ____ |
| * vegetation lined drainage ditch | _X_ | _X_ | _X_ |
| * sand filter system | ____ | ____ | ____ |
| * mulch filter berms & socks | ____ | ____ | ____ |
| * compost filter berms & socks | ____ | ____ | ____ |

Note: The best management practices listed in the SW3P may or may not be incorporated into the project design depending on the demands placed by weather and project construction. Should any best management practice not currently listed above be incorporated into the project SW3P design, a description of that best best management practice will be added to the Project SW3P File.

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# SW3P NARRATIVE


Texas Department of Transportation



| STATE DIST. NO. | COUNTY | | SHEET NO. |
|---|---|---|---|
| 05 | GARZA | | 93 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | SW3Pnarrative.dgn | | |

DATE: %DATE%
FILE: %FILE%
%TIME%

| EROSION CONTROL LOGS | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Approx. Station** | **Lt or Rt** | **Description** | **Pay Unit (Ft)** | **Date Installed** | **Date Removed** |
| 1 | 1051+50 | LEFT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 2 | 1051+50 | MEDIAN | PERPENDICULAR TO THE ROADWAY | 30 | | |
| 3 | 1051+50 | RIGHT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 4 | 1052+90 | LEFT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 5 | 1052+91 | MEDIAN | PERPENDICULAR TO THE ROADWAY | 30 | | |
| 6 | 1052+92 | RIGHT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 7 | 1054+36 | MEDIAN | INLET | 80 | | |
| 8 | 1055+80 | LEFT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 9 | 1055+80 | MEDIAN | PERPENDICULAR TO THE ROADWAY | 30 | | |
| 10 | 1055+80 | RIGHT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 11 | 1057+25 | LEFT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| 12 | 1057+25 | MEDIAN | PERPENDICULAR TO THE ROADWAY | 30 | | |
| 13 | 1057+25 | RIGHT | PERPENDICULAR TO THE ROADWAY | 20 | | |
| Replacement | | | | 720 | | |
| **TOTAL** | | | | **1080** | | |

| DRILL SEEDING & EMULSION | | | | |
|---|---|---|---|---|
| **Approx. Station** | **to Approx. Station** | **Lt or Rt** | **Drill Seeding (SY)** | **Emulsion (GAL) .22 GAL/SY** |
| 1051+46 | 1054+36 | LEFT | 913 | 201 |
| 1051+46 | 1054+36 | MEDIAN | 1583 | 348 |
| 1051+46 | 1054+36 | RIGHT | 736 | 162 |
| 1054+36 | 1057+28 | LEFT | 864 | 190 |
| 1054+36 | 1057+28 | MEDIAN | 1096 | 241 |
| 1054+36 | 1057+28 | RIGHT | 786 | 173 |
| | | **TOTAL** | **5978** | **1315** |

| SEDIMENT CONTROL FENCE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **No.** | **Approx. Station** | **to Approx. Station** | **Lt or Rt** | **Description** | **Length of Silt Fence** | **Date Installed** | **Date Removed** |
| 14 | 1052+90 | 1055+80 | LEFT | Along ROW | 286 | | |
| 15 | 1052+90 | 1055+80 | RIGHT | Along ROW | 286 | | |
| Replacement | | | | | 572 | | |
| **TOTAL** | | | | | **1144** | | |

| ROCK FILTER DAM | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Approx. Station** | **Lt or Rt** | **Description** | **Pay Unit (Ft)** | **Date Installed** | **Date Removed** |
| 16 | 1054+36 | LEFT | ALONG THE ROW | 50 | | |
| 17 | 1054+36 | RIGHT | ALONG THE ROW | 50 | | |
| | | | **TOTAL** | **100** | | |

## SUMMARY OF EROSION CONTROL ITEMS

| STATION FROM | STATION TO | 164 6035 DRILL SEEDING (PERM) (RURAL) (CLAY) | 314 6013 EMULS ASPH (EROSN CONT)(CSS-1H) | 506 6001 ROCK FILTER DAMS (INSTALL) (TY 1) | 506 6011 ROCK FILTER DAMS (REMOVE) | 506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1) | 506 6024 CONSTRUCTION EXITS (REMOVE) | 506 6038 TEMP SEDMT CONT FENCE (INSTALL) | 506 6039 TEMP SEDMT CONT FENCE (REMOVE) | 506 6042 BIODEG EROSN CONT LOGS (INSTL) (18") | 506 6043 BIODEG EROSN CONT LOGS (REMOVE) | 730 6107 FULL - WIDTH MOWING | 734 6002 LITTER REMOVAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SY | GAL | LF | LF | SY | SY | LF | LF | LF | LF | CYC | CYC |
| 1051+46 | 1057+28 | 5978 | 1315 | 100 | 100 | 900 | 900 | 572 | 286 | 1080 | 540 | 2 | 2 |
| **PROJECT TOTALS** | | **5978** | **1315** | **100** | **100** | **900** | **900** | **572** | **286** | **1080** | **540** | **2** | **2** |

1 CYCLE = 1.3 ACRES

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Texas Department of Transportation

No Scale Sheet 1 of 1

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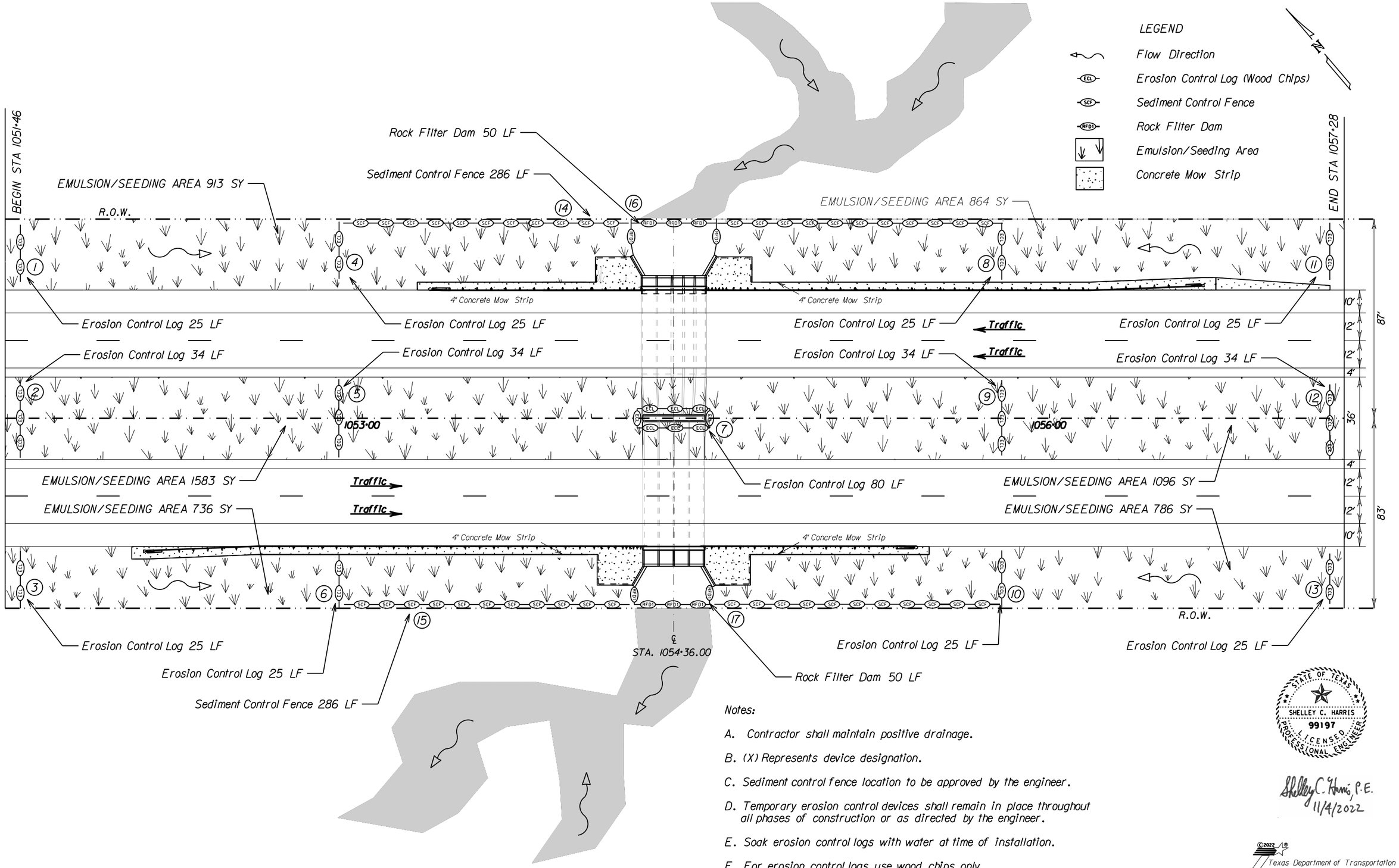
| 05 | GARZA | | 94 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_ENV_SW3P_SUM.DGN | | |

# SW3P SUMMARY

DATE: &DATE&
FILE: &FILE&
&TIME&




Notes:

A. Contractor shall maintain positive drainage.

B. (X) Represents device designation.

C. Sediment control fence location to be approved by the engineer.

D. Temporary erosion control devices shall remain in place throughout all phases of construction or as directed by the engineer.

E. Soak erosion control logs with water at time of installation.

F. For erosion control logs use wood chips only.

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|---|---|---|---|
| 05 | GARZA | | 95 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_ENV_SW3P_LAYOUT.DGN | | |

# SW3P LAYOUT

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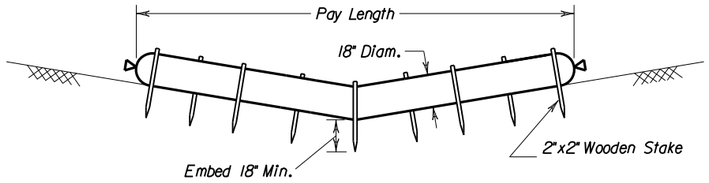
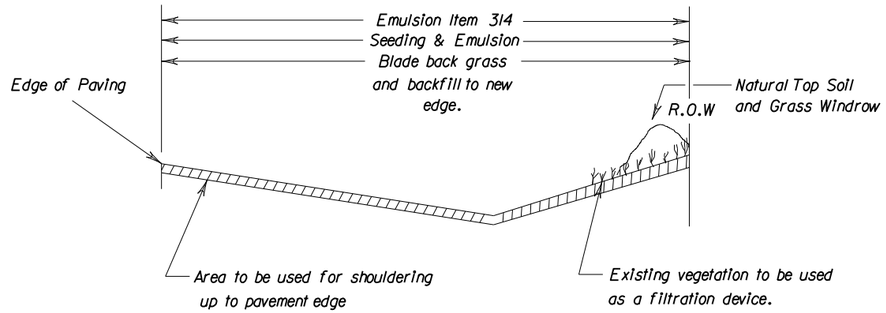
FILE: %FILE%
%TIME%



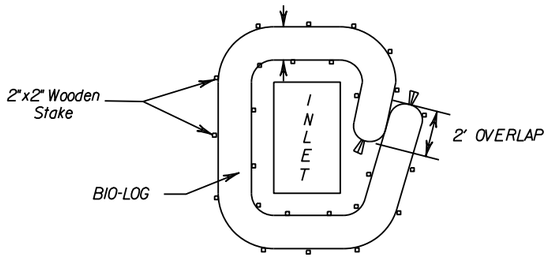

## BIODEGRADABLE EROSION CONTROL LOG DETAIL

Stake as necessary to hold log in place.
Use wooden stakes only, no rebar allowed.

NOTE: Soak erosion control log with water at installation to help hold log in place.

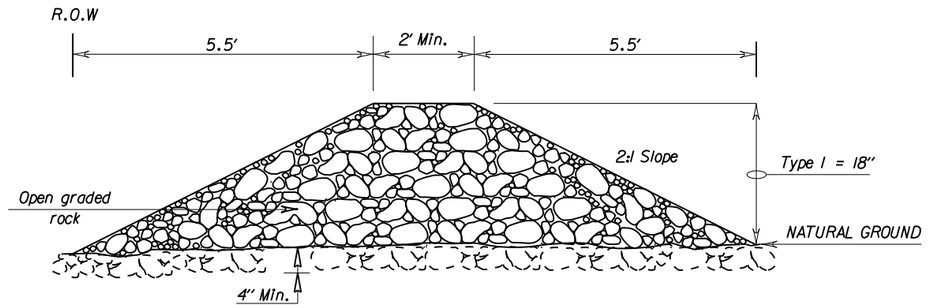



## DITCH DETAIL




## EROSION CONTROL LOG DETAIL FOR MEDIAN INLET

Stake as necessary to hold log in place.




## ROCK FILTER DAM

MISC. NOTES:

Sediment basins are not feasible on the project because right-of-way is limited and the construction of a sedimentation basin would be within the boundaries of the roadway's clear zone and for the safety of motorists, sedimentation basins cannot be constructed within the clear zone. Since sediment basins are not feasible due to the lack of right-of-way, mathematical calculations have not been developed.

Construction exits shall be approximately 30' wide by 30' long.

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No Scale Sheet 1 of 1

| STATE DIST. NO. | COUNTY | | SHEET NO. |
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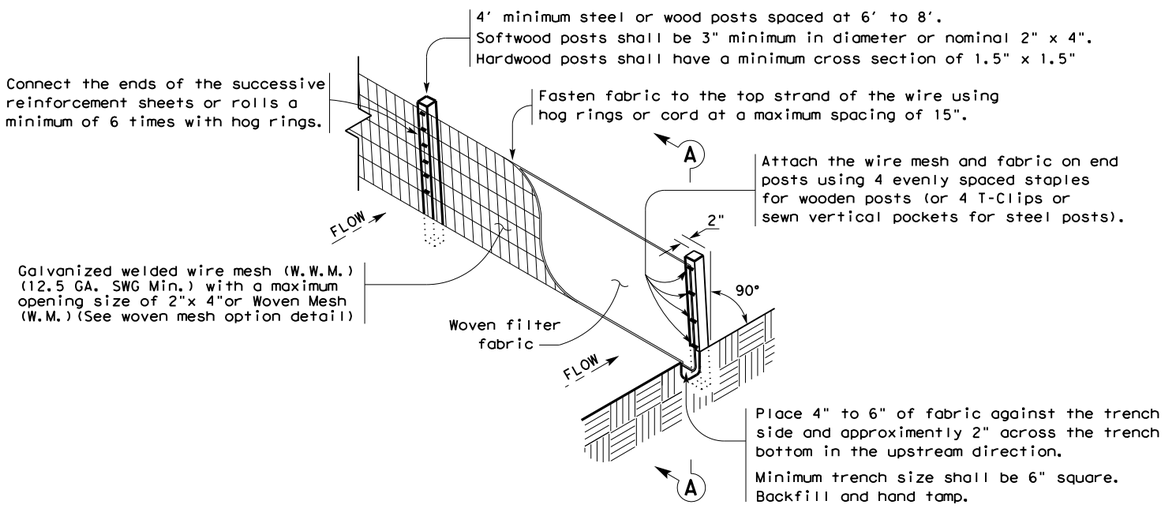
| 05 | GARZA | | 96 |
| CONT. | SECT. | JOB | HIGHWAY NO. |
| 0053 | 06 | 031 | US 84 |
| FILE | US84_ENV_SW3P_DETAILS.DGN | | |

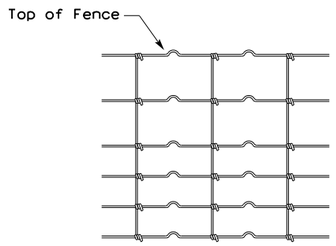
# SW3P DETAILS

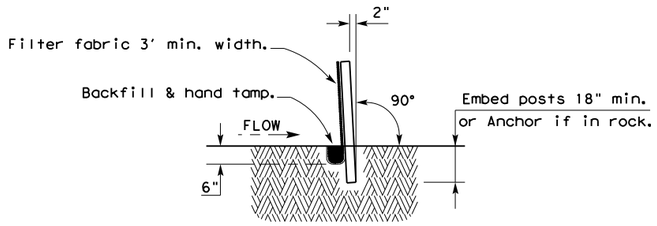
DATE: &DATE& &TIME&
FILE: &FILE&




## TEMPORARY SEDIMENT CONTROL FENCE

SCF




## SECTION A-A

## HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

### SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT$^2$. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

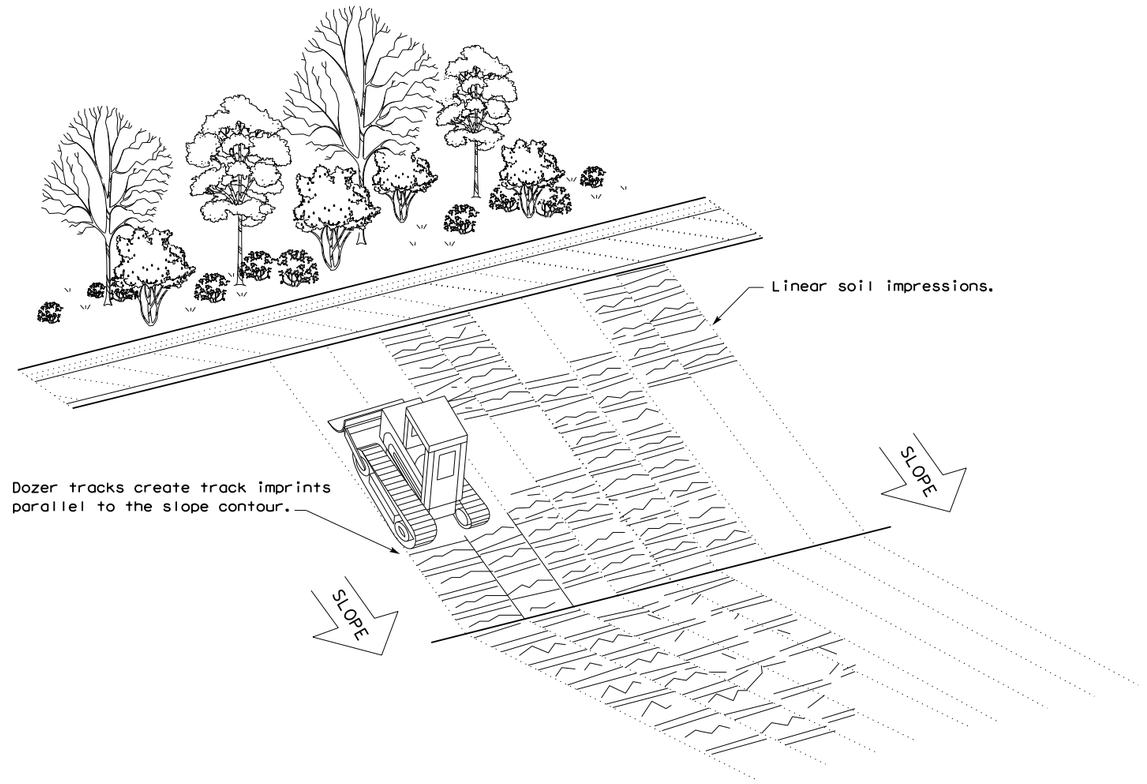
### LEGEND

Sediment Control Fence

SCF

## GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.




## VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

## FENCE & VERTICAL TRACKING

## EC(1)-16

| | | | | | | |
|---|---|---|---|---|---|---|
| FILE: ec116 | DN: TxDOT | | CK: KM | | DW: VP | DN/CK: LS |
| © TxDOT: JULY 2016 | CONT | SECT | JOB | | HIGHWAY | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | |
| | DIST | COUNTY | | | SHEET NO. | |
| | LBB | GARZA | | | 97 | |

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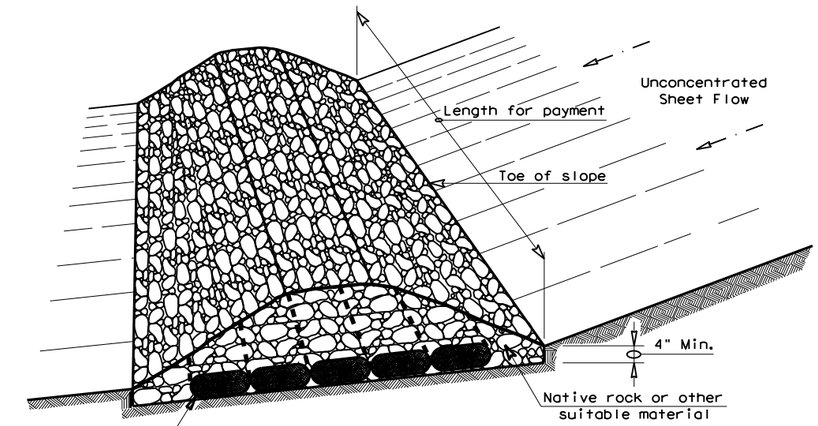
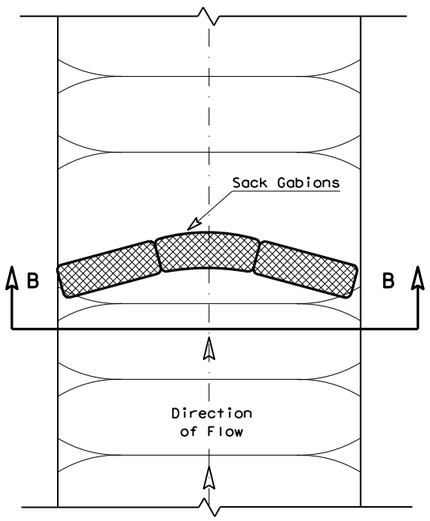
DATE: $DATE$
FILE: $FILE$

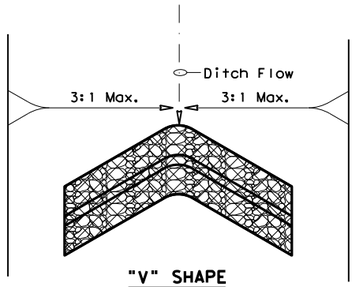



## FILTER DAM AT TOE OF SLOPE

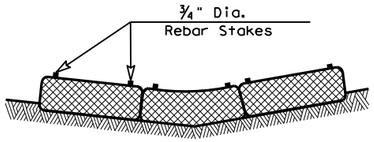
RFD1



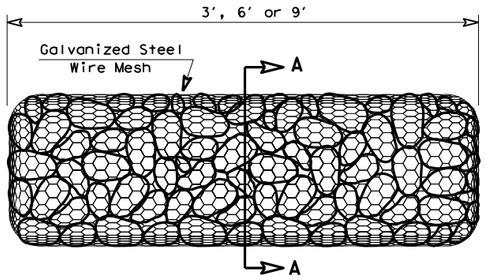

## PLAN VIEW




## "V" SHAPE PLAN VIEW

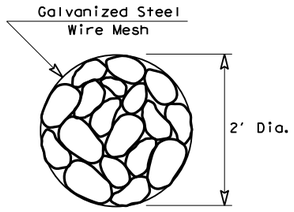



## SECTION B-B

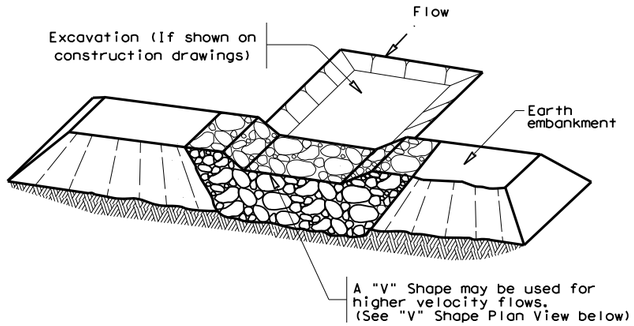



## TYPE 4 (SACK GABIONS)

RFD4

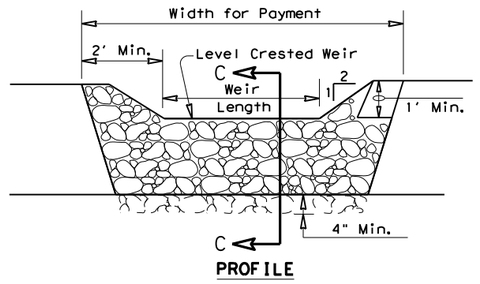



## SECTION A-A

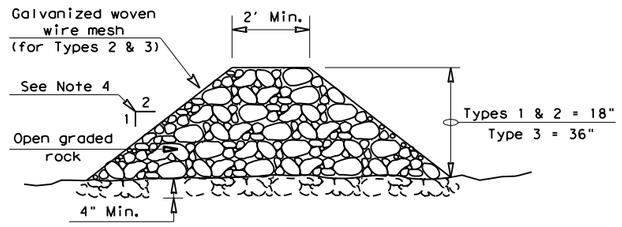



## FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2




## PROFILE




## SECTION C-C

## ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT$^2$ of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

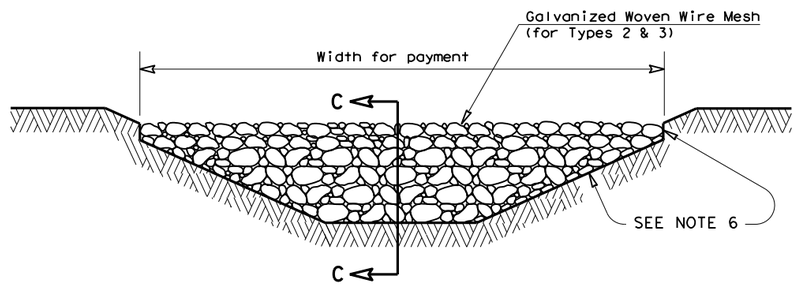
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.




## FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

## GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

## PLAN SHEET LEGEND

| | |
|---|---|
| Type 1 Rock Filter Dam | RFD1 |
| Type 2 Rock Filter Dam | RFD2 |
| Type 3 Rock Filter Dam | RFD3 |
| Type 4 Rock Filter Dam | RFD4 |

Texas Department of Transportation — Design Division Standard

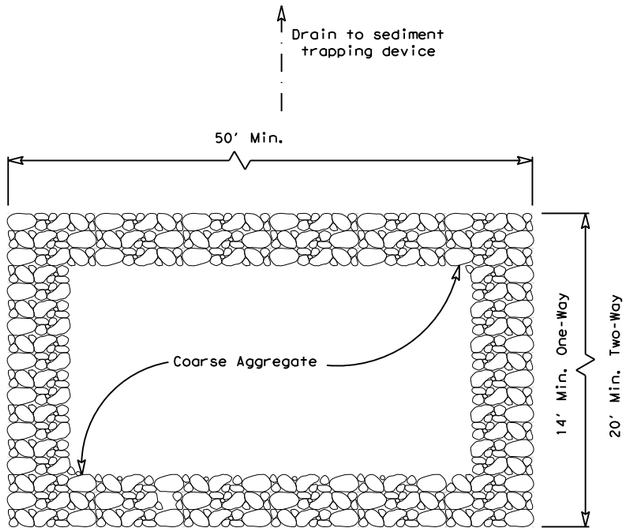
# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

## ROCK FILTER DAMS

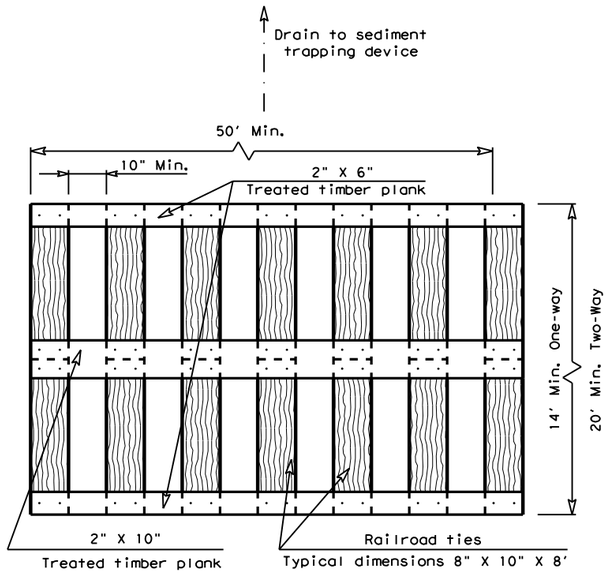
## EC(2)-16

| FILE: ec216 | DN: TxDOT | CK: KM | DW: VP | DN/CK: LS |
|---|---|---|---|---|
| © TxDOT: JULY 2016 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 98 |

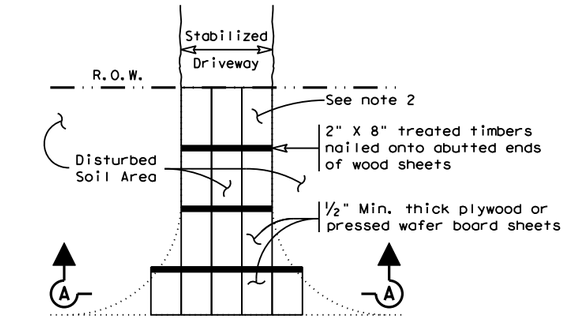
DATE: $DATE$
FILE: $FILE$



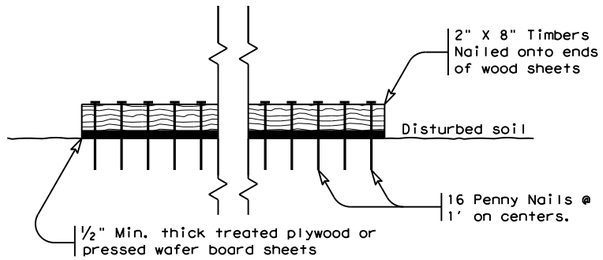

**PLAN VIEW**




**PLAN VIEW**



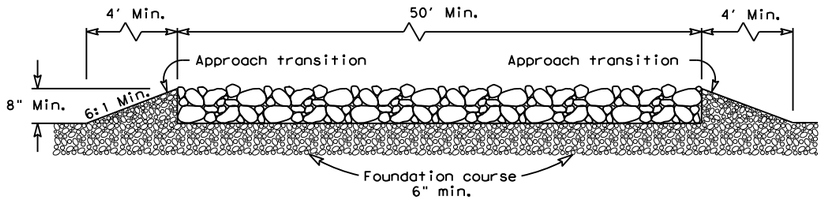

**PLAN VIEW**




**SECTION A-A**

**CONSTRUCTION EXIT (TYPE 3)**

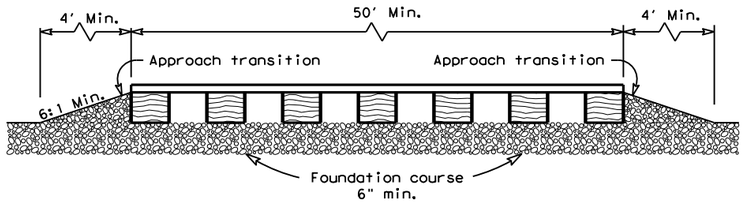
**SHORT TERM**




**ELEVATION VIEW**

**CONSTRUCTION EXIT (TYPE 1)**

**ROCK CONSTRUCTION (LONG TERM)**




**ELEVATION VIEW**

**CONSTRUCTION EXIT (TYPE 2)**

**TIMBER CONSTRUCTION (LONG TERM)**

## GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

## GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

## GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

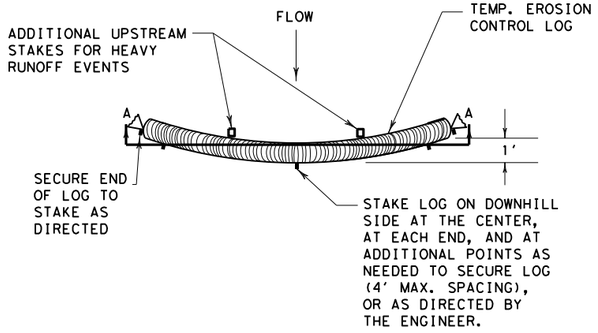
# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

## CONSTRUCTION EXITS

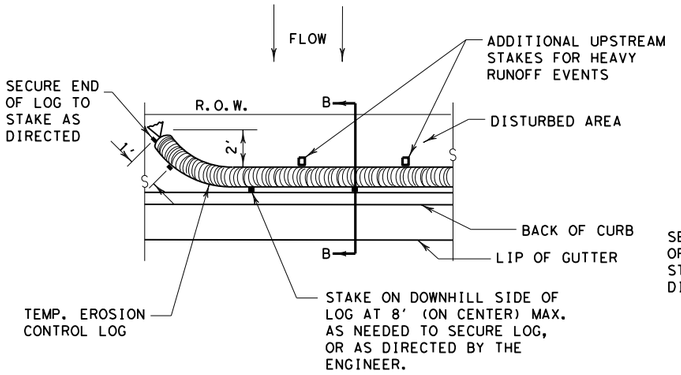
## EC(3)-16

| FILE: ec316 | DN: TxDOT | CK: KM | DW: VP | DN/CK: LS |
|---|---|---|---|---|
|  | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 99 |

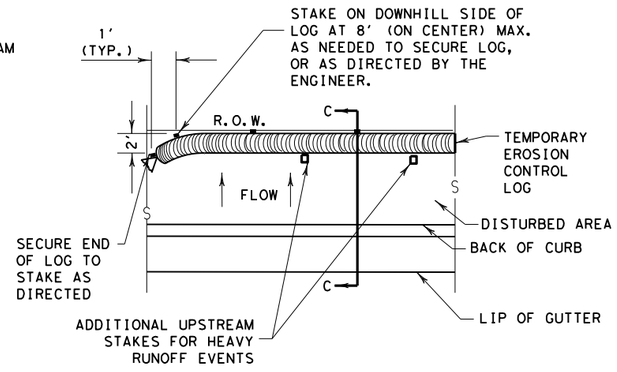
DATE:
FILE:



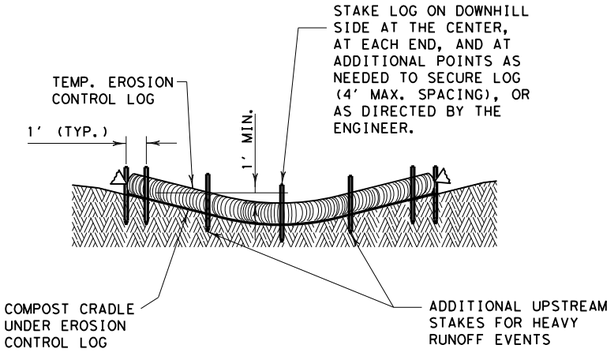

PLAN VIEW




PLAN VIEW



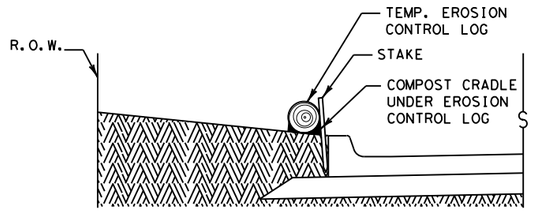

PLAN VIEW




SECTION A-A

EROSION CONTROL LOG DAM

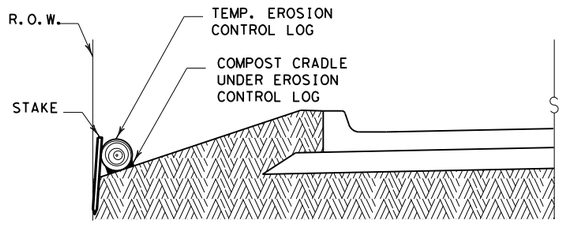
CL-D




SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

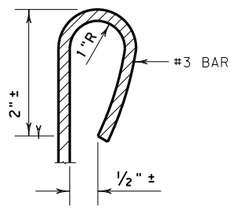
CL-BOC




SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



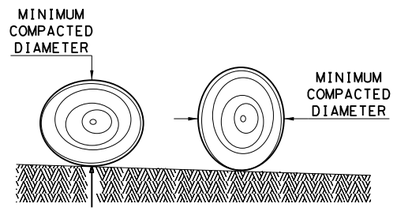

REBAR STAKE DETAIL

## LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

## GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.




DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

## SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



Texas Department of Transportation

Design Division Standard

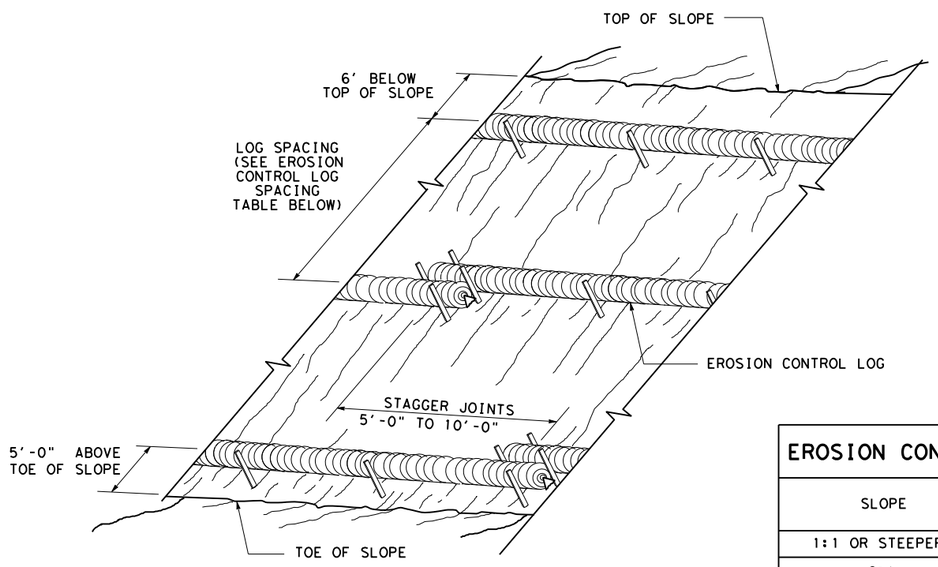
# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

## EROSION CONTROL LOG

## EC(9)-16

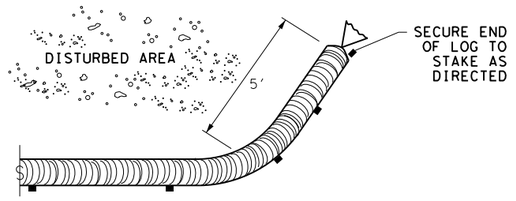
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FILE: ec916 | DN: TxDOT | | CK: KM | | DW: LS/PT | | CK: LS |
| © TxDOT: JULY 2016 | CONT | SECT | JOB | | HIGHWAY | | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | | |
| | DIST | COUNTY | | | | | SHEET NO. |
| | LBB | GARZA | | | | | 100 |

DATE:
FILE:




## EROSION CONTROL LOGS ON SLOPES
## STAKE AND TRENCHING ANCHORING

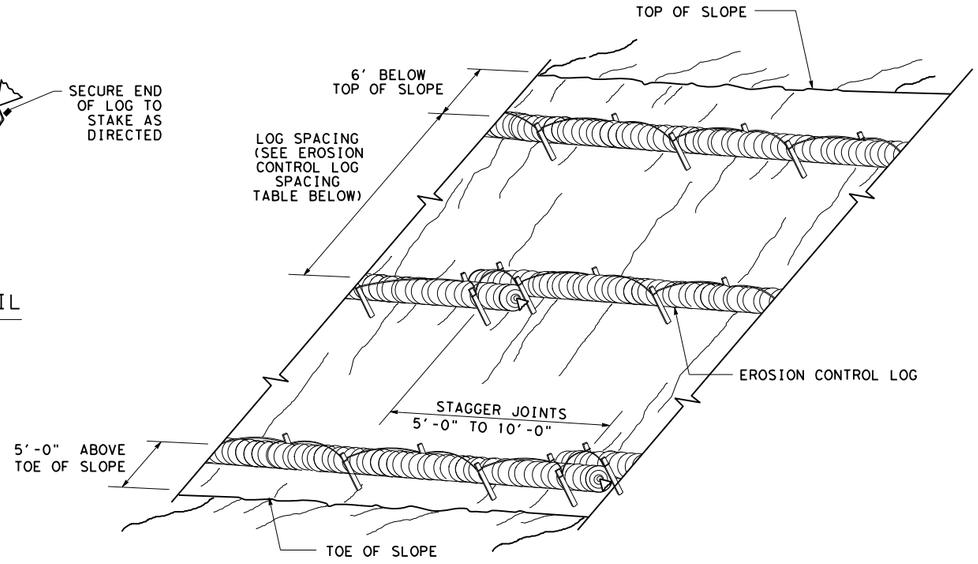
CL-SST




END SECTION RAP DETAIL

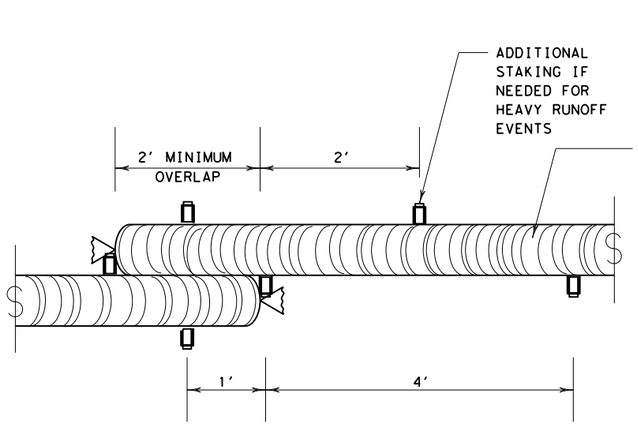
| EROSION CONTROL LOG SPACING TABLE | | | | |
|---|---|---|---|---|
| SLOPE | LOG DIAMETER | | | |
| | 6" | 8" | 12" | 18" |
| 1:1 OR STEEPER | 5' | 10' | 15' | 20' |
| 2:1 | 10' | 20' | 30' | 40' |
| 3:1 | 15' | 30' | 45' | 60' |
| 4:1 OR FLATTER | 20' | 40' | 60' | 80' |

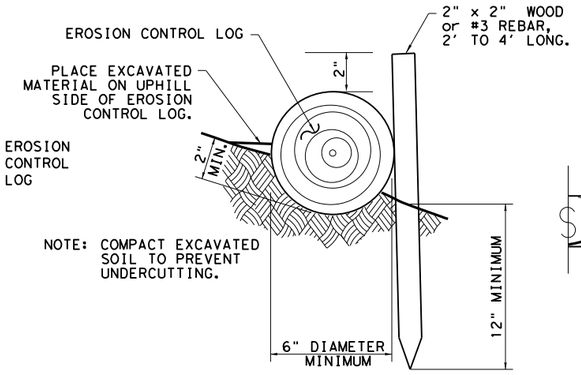
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART




## EROSION CONTROL LOGS ON SLOPES
## STAKE AND LASHING ANCHORING

CL-SSL

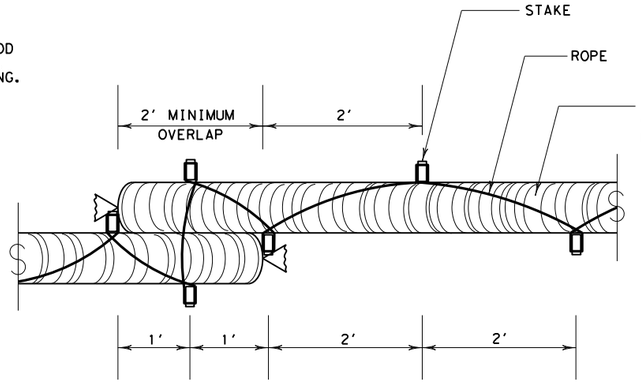


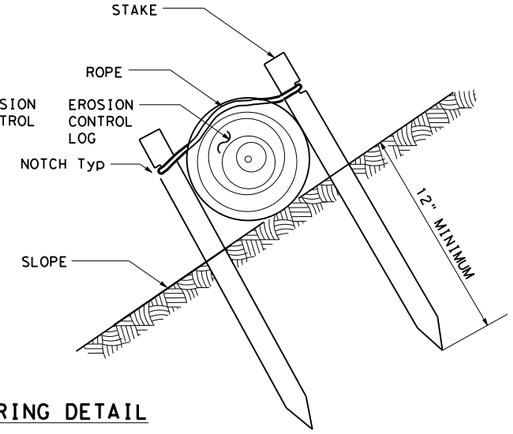




## STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

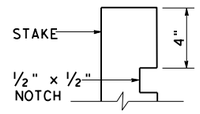
| TRENCH DEPTH TABLE | |
|---|---|
| LOG DIAMETER | DEPTH |
| 6" | 2" |
| 8" | 3" |
| 12" | 4" |
| 18" | 5" |




## STAKE AND LASHING ANCHORING DETAIL

CL-SSL




## STAKE NOTCH DETAIL



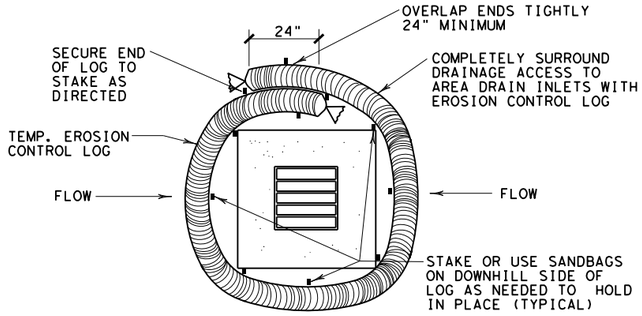
Texas Department of Transportation

Design Division Standard

# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
## EROSION CONTROL LOG
## EC(9)-16

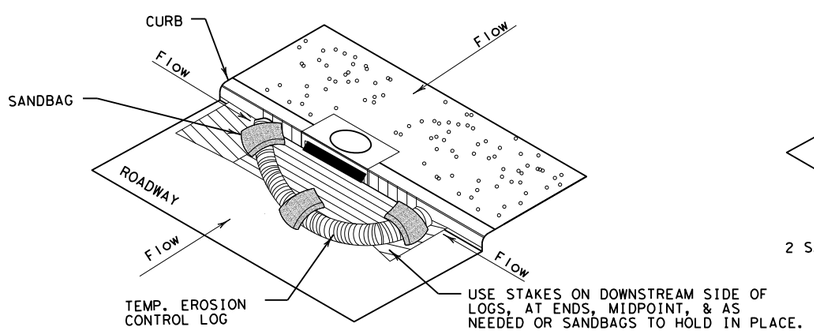
| FILE: ec116 | DN: TxDOT | CK: KM | DW: LS/PT | CK: LS |
|---|---|---|---|---|
| © TxDOT: JULY 2016 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 101 |

DATE:
FILE:



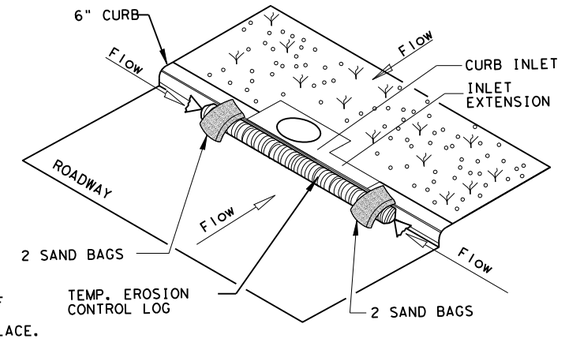

## EROSION CONTROL LOG AT DROP INLET

CL-DI




## EROSION CONTROL LOG AT CURB INLET

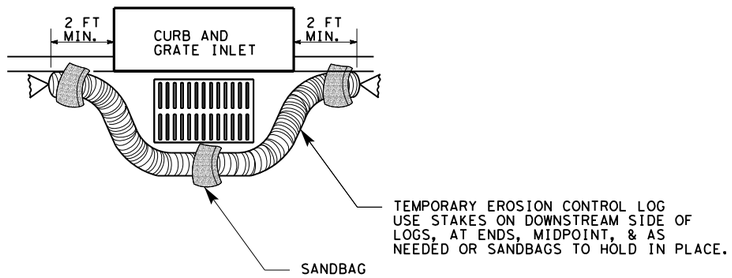
CL-CI




## EROSION CONTROL LOG AT CURB INLET

CL-CI

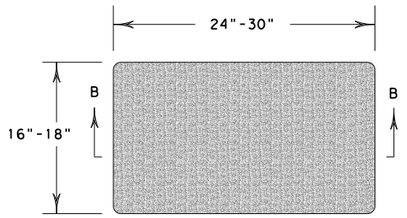
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.




## EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI


SECTION B-B




SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

# TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

## EROSION CONTROL LOG

## EC(9)-16

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FILE: ec916 | DN: TxDOT | | CK: KM | | DW: LS/PT | | CK: LS |
| © TxDOT: JULY 2016 | CONT | SECT | JOB | | HIGHWAY | | |
| REVISIONS | 0053 | 06 | 031 | | US 84 | | |
| | DIST | COUNTY | | | | SHEET NO. | |
| | LBB | GARZA | | | | 102 | |

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## I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. None

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

## II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Red Branch Draw
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

| Erosion | Sedimentation | Post-Construction TSS |
|---|---|---|
| ☐ Temporary Vegetation | ☒ Silt Fence | ☐ Vegetative Filter Strips |
| ☐ Blankets/Matting | ☒ Rock Berm | ☐ Retention/Irrigation Systems |
| ☐ Mulch | ☐ Triangular Filter Dike | ☐ Extended Detention Basin |
| ☐ Sodding | ☐ Sand Bag Berm | ☐ Constructed Wetlands |
| ☐ Interceptor Swale | ☐ Straw Bale Dike | ☐ Wet Basin |
| ☐ Diversion Dike | ☐ Brush Berms | ☐ Erosion Control Compost |
| ☐ Erosion Control Compost | ☐ Erosion Control Compost | ☐ Mulch Filter Berm and Socks |
| ☐ Mulch Filter Berm and Socks | ☐ Mulch Filter Berm and Socks | ☐ Compost Filter Berm and Socks |
| ☒ Compost Filter Berm and Socks | ☒ Compost Filter Berm and Socks | ☒ Vegetation Lined Ditches |
| | ☐ Stone Outlet Sediment Traps | ☐ Sand Filter Systems |
| | ☐ Sediment Basins | ☐ Grassy Swales |

## III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

## IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Executive Order 13112 on Invasive Plant Species.
2. Comply with TxDOT Executive Memorandum on beneficial landscaping.
3. Comply with temporary and permanent vegetation stabilization protocols of the SW3P.

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

☐ No Action Required ☒ Required Action

Action No.

1. Do not handle or harm Texas horned lizards, prairie dogs, barn swallows or burrowing owls.
2. No prairie dog towns can be damaged or crossed with equipment without approval of the Engineer.
3. No nests of burrowing owls (in prairie dog holes) can be disturbed or damaged (See General Notes).
4. No nests of barn swallows (likely on structures such as bridges) can be disturbed or damaged (See General Notes).
5. Obey the Bald and Golden Eagle Protect act. Do not handle, harm, capture, disturb, or kill the species. do not handle, harm, or take nests, eggs, feathers, bones or eagles.
6. Obey the Migratory Bird Treaty Act of 1916, of which details there cannot be any handling or harming of migratory bird species; including their eggs. nests, or feathers.

## VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

### LIST OF ABBREVIATIONS

| | | | |
|---|---|---|---|
| BMP: | Best Management Practice | SPCC: | Spill Prevention Control and Countermeasure |
| CGP: | Construction General Permit | SW3P: | Storm Water Pollution Prevention Plan |
| DSHS: | Texas Department of State Health Services | PCN: | Pre-Construction Notification |
| FHWA: | Federal Highway Administration | PSL: | Project Specific Location |
| MOA: | Memorandum of Agreement | TCEQ: | Texas Commission on Environmental Quality |
| MOU: | Memorandum of Understanding | TPDES: | Texas Pollutant Discharge Elimination System |
| MS4: | Municipal Separate Stormwater Sewer System | TPWD: | Texas Parks and Wildlife Department |
| MBTA: | Migratory Bird Treaty Act | TxDOT: | Texas Department of Transportation |
| NOT: | Notice of Termination | T&E: | Threatened and Endangered Species |
| NWP: | Nationwide Permit | USACE: | U.S. Army Corps of Engineers |
| NOI: | Notice of Intent | USFWS: | U.S. Fish and Wildlife Service |

## VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

## VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. Maintain equipment muffler systems and work hour restrictions to reduce traffic noise.
2. No PSL's may be located in the prairie dog towns, playa lakes (wet or dry) or stream beds (wet or dry).
3. No dumping of construction material in playa lakes or stream beds regardless of property owner requests.
4. Contractor must obtain historical and archaeological clearances for off-site PSL's.
5. Contractor is responsible for air quality permits for concrete and asphalt batch and similar plants.
6. Contractor is responsible for water appropriation or impoundment TCEQ permits.
7. Contractor will protect environmentally sensitive areas with fencing, work sequencing or scheduling as directed.
8. PSL's beyond the project right-of-way have "individual operator" status under the TPDES Construction General Permit and the Contractor is responsible for the SW3P and any TCEQ permits.
9. No waste material of any type may be placed at any location where it could be washed into a water of the U.S. or a surface water of Texas.
10. Flood elevations will not be increased to a level that would violate flood plain regulations or ordinances.
11. Contractor shall remove all construction debris daily from the waterway by close of business, where applicable.
13. The SWP3, including best management practices, must be in-place prior to disturbing soil.

Texas Department of Transportation

Design Division Standard

# ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

# EPIC

| FILE: epic.dgn | DN: TxDOT | CK: RG | DW: VP | CK: AR |
|---|---|---|---|---|
| © TxDOT: February 2015 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS<br>12-12-2011 (DS)<br>05-07-14 ADDED NOTE SECTION IV.<br>01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES. | 0053 | 06 | 031 | US 84 |
| | DIST | COUNTY | | SHEET NO. |
| | LBB | GARZA | | 103 |