

STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NUMBER
F 2025(030)

CSJ: 0113-08-091

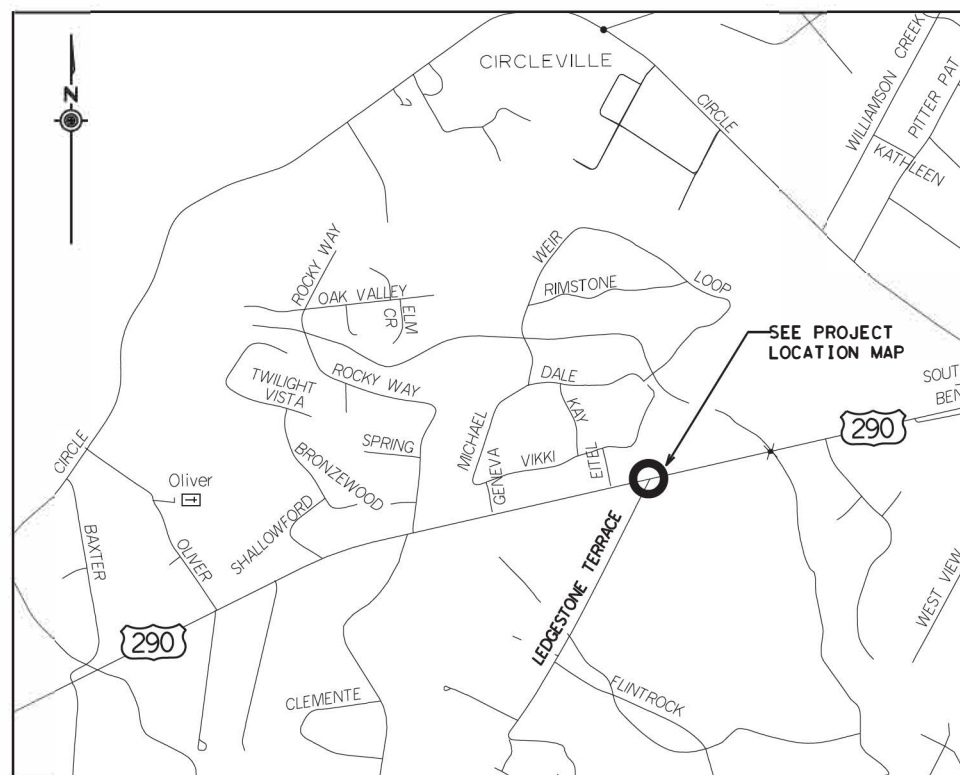
NET LENGTH OF PROJECT = 460.00 FEET = 0.0871 MILES — } ROADWAY = 460.00 FEET = 0.0871 MILES
BRIDGE = 0.00 FEET = 0.000 MILES

TRAVIS COUNTY US 290

FROM: AT LEDGESTONE TERRACE
TO: .

FOR THE CONSTRUCTION OF: SAFETY IMPROVEMENTS

CONSISTING OF: INTERSECTION SAFETY IMPROVEMENT - ADD RIGHT TURN LANE



LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

| | | | |
|------|--------|-----|-----------|
| CONT | SECT | JOB | HIGHWAY |
| 0113 | 08 | 091 | US 290 |
| DIST | COUNTY | | SHEET NO. |
| AUS | TRAVIS | | 1 |

DESIGN SPEED

MAIN LANES: 45 MPH

A. D. T.

2022: 39,366 VPD
2042: 55,112 VPD

FINAL PLANS

DATE OF LETTING: _____

DATE WORK BEGAN: _____

DATE WORK COMPLETED AND ACCEPTED: _____

FINAL CONTRACT COST: \$ _____

CONTRACTOR: _____

LIST OF APPROVED CHANGE ORDERS:

I CERTIFY THAT THIS PROJECT WAS CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE FINAL AS-BUILT PLANS AND SPECIFICATIONS.

_____, P. E. _____ DATE

RECOMMENDED FOR LETTING: 6/21/2024

DocuSigned by:
Susana Ceballos P.E.
E1816167B5C7414...
DISTRICT DESIGN ENGINEER

SUBMITTED FOR LETTING: 5/20/2024

DocuSigned by:
W. S. P.
917B7C376B3C4D5...
AREA ENGINEER

APPROVED FOR LETTING: 6/21/2024

DocuSigned by:
Heather Ashley Ng
8912AF18F45A416...
DIRECTOR OF TRANSPORTATION
PLANNING & DEVELOPMENT

FILE: \$FILE\$ DATE: \$DATE\$ \$TIMES\$

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION ON SEPTEMBER 1, 2024 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 23, 2023).

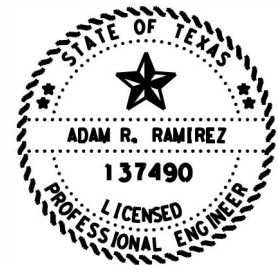
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

DocuSigned by:

BF55380D15C549F...

5/20/2024

| | | | | |
|---|------|------|--------|-----------|
| Austin District South Travis Area Office | | | | |
| Texas Department of Transportation | | | | |
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| © 2024 | CONT | SECT | JOB | HIGHWAY |
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DATE: \$DATES \$TIME\$
 FILE: \$FILES

**Austin District
 South Travis Area Office**

**US 290
 LOCATION
 MAP**

| | | | | |
|--------|------|------|--------|-----------|
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GENERAL NOTES: Version: May 13, 2024

| Item | Description | **Rate |
|----------|--|---------------|
| 341, 344 | Dense-Graded Hot-Mix Asphalt and Superpave | 110 LB/SY/IN |
| 342 | Permeable Friction Course (PFC) | 90.0 LB/SY/IN |
| 341/3084 | Bonding Course | 0.09 GAL/SY |
| 342/3085 | UnderSeal Course | 0.20 GAL/SY |
| | Tack Coat | 0.08 GAL/SY |

** For Informational Purposes Only

GENERAL

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

South Austin Tanli.Sun@txdot.gov
South Austin Shane.Swimm@txdot.gov

Questions and requests for documents will be accepted via the Letting Pre-Bid Q&A web page. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

<https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors>

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

References to manufacturer’s trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved.

If work is performed at Contractor’s option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed will be free of organic material prior to placing any section of the pavement structure.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Intelligent Transportation Systems (ITS) Infrastructure may exist within the limits of this project and that the system must remain operational throughout construction. The exact location of ITS Infrastructure is not known. Contact the TxDOT Area Engineer's or Inspection Team's Office for the location(s) at least 72 hours before commencing any work that might affect present ITS Infrastructure. In the event of system damage, notify TxDOT/CTECC at (512) 974-0883 within one hour of occurrence. Refer to Item 6000 for additional details.

Provide a smooth, clean sawcut along the existing asphalt or concrete pavement structure, as directed. Consider subsidiary to the pertinent Items.

Construct all manholes/valves to final pavement elevations prior to the placement of final surface. If the manholes/valves are going to be exposed to traffic, place temporary asphalt around the manhole/valve to provide a 50:1 taper. The asphalt taper is subsidiary to the ACP work.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Engineer.

Damage to existing pipes and SET’s due to Contractor operations will be repaired at Contractor’s expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

Coordinate and obtain approval for all bridgework over existing roadways.

Remove and dispose of off the ROW the audible/profile markings, reflectorized markings, and raised markers. Blade pavement edges to remove vegetation. Any areas with excessive asphalt or aggregate will be removed. Continue sweeping excess aggregate off the roadway, riprap, and shoulder up to two weeks after completing the work. This work is subsidiary.

Bridge Vertical Clearance and Traffic Handling.

Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures (including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at AUS_BRG_Notify@txdot.gov.

During evacuation periods for Hurricane events the Contractor will cooperate with Department for the restricting of Lane Closures and arranging for Traffic Control to facilitate Coastal Evacuation Efforts.

ITEM 5 – CONTROL OF THE WORK

Place construction stakes at intervals of no more than 100 ft. This work is subsidiary.

Precast Alternate Proposals.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with “Standard Operating Procedure for Alternate Precast Proposal Submission” found online at [Alternate Precast Proposal Submission \(txdot.gov\)](#).

Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Thermoplastic Pipe Alternate Proposals

When a reinforced concrete or corrugated metal pipe is included in the plans, a thermoplastic polypropylene pipe alternate may be submitted in a 2-phase process. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Phase 1 submit an official request to TxDOT PM with a summary of proposed locations, max depth of placement for each location, cover depth, and pipe diameters. TxDOT goal is to review and respond within 10 days. Phase 1 approval does not guarantee Phase 2 approval.

Phase 2 submit the following documents with all documents signed and sealed by a licensed Engineer in the state of Texas. 1-Provide a redline or revised set of drainage plans reflecting the revised locations. 2-Provide certification that the use of the alternate pipe and proposed bedding are adequate for the proposed application, depth, etc. 3-Provide a completed thermoplastic pipe installation drawing using the following,

<https://ftp.txdot.gov/pub/txdot/brg/thermoplastic-pipe-installation-drawing.pdf>
<https://ftp.txdot.gov/pub/txdot/brg/thermoplastic-pipe-installation-drawing.dgn>

For all uses of thermoplastic pipe as an alternate, furnish, install, and inspect the thermoplastic pipe in accordance with Item 468 or latest thermoplastic pipe special specification at time of letting. Minimum values, such as cover depth, required by the specification, installation drawing, etc. will not be waived. Use granular backfill unless flowable fill or CSB is required by the alternate design. Backfill locations shown in the bid plans using flowable fill or CSB must use the backfill per the bid plans.

Electronic Shop Drawing Submittals.

Submit electronic shop drawing submittals according to the current Guide to Electronic Shop Drawing Submittal which can be found online at,
<https://www.txdot.gov/business/resources/highway/bridge/shop-drawing-submittal-cycle.html>.

Pre-approved producers can be found online at,
<https://www.txdot.gov/business/resources/materials/material-producer-list.html>.

Use the following contact list for all submittals that are not required to be sent to Bridge Division and to copy the Engineer for all submittals to the Bridge Division.

Submittal Contact List

South Austin Tanli.Sun@txdot.gov AUS_SA-ShopReview@txdot.gov

Alignment and Profile.

Unless shown in the plans, profile and alignment data for roadways being overlaid or widened are for design verification only. Provide survey and construct the roadway in accordance with the typical section. Bid items and data may be provided to adjust cross slope and super elevations.

ITEM 6 - CONTROL OF MATERIALS

Give a minimum of 1 business day notice for materials, which require inspection at the Plant.

For structures with paint containing hazardous materials, provide locations of material removal 60 days prior to begin removal. For metal elements to be removed, mechanical shear or unbolting for removal and disposal does not require paint abatement but requires 60-day advance notice.

For removal, tie, or tap of asbestos concrete (AC) pipe, contact TxDOT and the local utility company 60 days prior to performing the work. Expose the AC pipe to provide a minimum of 1 ft. of clearance around the top and sides. A minimal amount of soil may remain around the AC pipe to avoid disturbance. The local utility company will be responsible for the demo notice to DSHS and removal of the AC pipe. Tie or tap into existing AC pipe may require removing an entire section of pipe from collar to collar and replacement of pipe with new pipe using existing bid items.

For Federally Funded Contracts, comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, by submitting an 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, located at the following link, for clarification on material categorization. [Buy America material classification sheet \(txdot.gov\)](https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html)

Storage of Material Near Structures

Do not store equipment or flammable material within 100 ft. of bridges, culverts, or near their openings (portals). Flammable materials include all material that is not metal or aluminum.

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES

Roadway closures during key dates and/or special events are prohibited. See notes for Item 502 for the key dates and/or special events.

Refer to the Environmental Permits, Issues and Commitments (EPIC) plan sheets for additional requirements and permits.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.

Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

PSL in Edwards Aquifer Recharge and Contributing Zone.

Obtain written approval from the Engineer for all on or off right of way PSLs not specifically addressed in the plans. Provide a signed sketch of the location 30 business days prior to use of the PSL. Include a list of materials, equipment and portable facilities that will be stored at the PSL. TxDOT will coordinate with the necessary agencies. Approval of the PSL is not guaranteed. Un approved PSL is not a compensable impact.

Work within a USACE Jurisdictional Area.

Do not initiate activities within a U.S. Army Corps of Engineers (USACE) jurisdictional area that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Obtain written approval from the Engineer for activities not specifically addressed in the plans. Provide a signed sketch and description of the location 60 business days prior to begin work at the location. Complete and return any forms provided by TxDOT. Approval of the work is not guaranteed. Un approved work is not a compensable impact.

DSHS Asbestos and Demolition Notification.

Complete and provide the Texas Department of State Health Services (DSHS) notification form to the Engineer and email to AUS_BRG_Notify@txdot.gov at least 30 calendar days prior to bridge removal or renovation for each phase or step of work. Notify the Engineer via email of any changes to the work start and end dates.

Vehicle Idle Restrictions

With in the limits of City of Austin, Bastrop County, and Travis County, on road vehicles may not idle more than 5 minutes except for following exemptions: vehicle 14,000 pounds or less, vehicles over 14,000 pounds are certified clean ideal as defined by the EPA, or other exemptions as listed in TAC Title 30, Part 1, Chapter 114, Subchapter J, Division 2, 114.517.

Migratory Birds and Bats.

Migratory birds and bats may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 16 and February 28. Prevent migratory birds from re-nesting between March 1 and September 15. Prevention shall include all areas within 25 ft. of proposed work. All methods used for the removal of old nesting areas and the prevention of re-nesting must be submitted to TxDOT 30 business days prior to begin work. This work is subsidiary.

If active nests are encountered on-site during construction, all construction activity within 25 ft. of the nest must stop. Contact the Engineer to determine how to proceed.

Tree and Brush Trimming and Removal.

Work will be conducted September 16 thru February 28. Work conducted outside this timeframe will require a bird survey. Submit a survey request to TxDOT 30 business days prior to begin work.

If within the removal time period, removal work may be conducted during delayed start period using proper traffic control per TCP standards.

Upon begin removal operations, all removal work for the project must be completed within 21 calendar days. Completion of removal includes removing from ROW or mulching of all debris.

No extension of time or compensation will be granted for a delay or suspension due to the above bird, bat, and tree/brush requirements.

Law Enforcement Personnel.

Submit charge summary and invoices using the Department forms.

Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides and the rear of the vehicle. Lights will be high intensity and visible from all angles.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site. A minimum number of hours is not guaranteed. Payment is for work performed. If the Contractor has a field office, provide an office location for a supervisory officer when event requires a supervising officer. This work is subsidiary.

A maximum combined rate of \$85 per hour for the law enforcement personnel and the patrol vehicle will be allowed. Any scheduling fee is subsidiary per Standard Specification 502.4.2. Cancel law enforcement personnel when the event is canceled. Cancellation, minimums or "show up" fees will not be paid when cancellation is made 12 hours prior to beginning of the event. Failure to cancel within 12 hours will not be cause for payment for cancellation, minimums, or "show up" time. Payment of actual "show up" time to the event site due to cancellation will be on a case-by-case basis at a maximum of 2 hours per officer.

Alterations to the cancellation and maximum rate must be approved by the Engineer or pre-determined by official policy of the officer's governing authority.

Back Up Alarm.

For hours 9 P to 5 A, utilize a non-intrusive, self-adjusting noise level reverse signal alarm. This is not applicable to hotmix or seal coat operations. This is subsidiary.

ITEM 8 – PROSECUTION AND PROGRESS

Working days will be charged in accordance with 8.3.1.4, “Standard Work Week.”

Lane Closure Assessment Fee.

The monthly estimate will be deducted a fee per 15-minute interval according to the following schedule for each closure or obstruction that extends beyond the allowable closure time. Fee will be based on Annual Average Daily Traffic (AADT) of the roadway. Use AADT information as shown on the plans. If AADT is not found on the plans please use TxDOT – Statewide Planning Map [TxDOT - Statewide Planning Map](#). If the roadway has a peak direction of traffic, the Engineer may reduce the fee by 25 percent for off-peak direction of traffic for up to 30 minutes.

| AADT | | Lane Closure Assessment Fee (per lane per 15 minutes) |
|------------------------|------------------|---|
| More than | To and Including | |
| 0 | 10000 | \$150.00 |
| 10000 | 20000 | \$300.00 |
| 20000 | 40000 | \$600.00 |
| 40000 | 60000 | \$900.00 |
| 60000 | 80000 | \$1,200.00 |
| 80000 | 100000 | \$1,500.00 |
| 100000 | | \$1,800.00 |
| All of IH 35 Mainlanes | | \$2,000.00 |

ITEM 100 - PREPARING RIGHT OF WAY

Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas. Backfill material will be Type B Embankment using ordinary compaction.

Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush.

Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas within 30 ft. of edge of pavement under construction. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following: sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 14 ft. vertical clearance under all trees. This work is subsidiary.

ITEM 105 – REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT

Existing typical is based on information available. This typical may not account for all maintenance work such as overlays or pavement repairs. A change in material type or thickness does not warrant additional payment. Payment is full compensation for removing all material to the depth specified.

ITEM 110 – EXCAVATION

The Engineer will define unsuitable material.

ITEM 132 – ALL EMBANKMENT

At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one lift. At no time will the embankment adjacent to the retaining wall backfill exceed the wall backfill by any elevation. Embankment placed over the area of MSE backfill must meet the same backfill requirements for the type specified under Item 423.

The Engineer will define unsuitable material. Material which the Contractor might deem to be unsuitable due to moisture content will not be considered unsuitable material.

Prior to begin embankment of existing area, correct or replace unstable material to a depth of 6 in. below existing grade. Embankment areas will be inspected prior to beginning work.

Rock or broken concrete produced by the project is allowed in earth embankments. The size of the rock or broken concrete will not exceed the layer thickness requirements in Section 132.3.4., “Compaction Methods.” The material will not be placed vertically within 5 ft. of the finished subgrade elevation.

Embankment placed vertically within 5 ft. of the finished subgrade elevation or within the edges of the subgrade and treated with lime, cement, or other calcium-based additives must have a sulfate content less than 3000 ppm. Allow 5 business days for testing. Treatment of sulfate material 3000 ppm to 7000 ppm requires 7 days of mellowing and continuous water curing, in accordance TxDOT guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures (9/2005). Material over 7000 ppm is not allowed.

ITEM 134 - BACKFILLING PAVEMENT EDGES

If seal coat is final surface, install backfill prior to placing seal coat.

If scope is overlay or mill & inlay, Place Ty A Backfill at a frequency sufficient to complete backfill immediately following overlay / inlay operation.

For all backfill, compact using a light pneumatic roller, install at 3:1 slope to tie into existing terrain, and apply at rate of 0.12 GAL/SY a typical erosion control material per Item 300.

For TY A backfill, furnish flexible base meeting the requirement for any type or grade, except Grade 4, in accordance with Item 247. Compressive strengths and wet ball mill for flexible base are waived for this item. Alternate materials include RAP, salvaged material from Item 105, and salvaged material from Item 351. The alternate materials are not required to be tested but visually verified as 100% passing a 2.5 in. sieve.

The use of excavated material produced by Item 351 – “FLEXIBLE PAVEMENT STRUCTURE REPAIR” and Item 354 “PLANING AND TEXTURING PAVEMENT” will be allowed for use as Ty A Backfill as approved by the Engineer. The contractor retains ownership of salvaged materials not used for backfill.

ITEM 300s – SURFACE COURSES AND PAVEMENTS

For seal coat applications: Asphalt cements, cutback, performance-graded asphalt season is May 1 thru September 15. Emulsified asphalt season is April 1 thru October 15.

The latest work start date for asphalt season is August 1 when a date is required per special provision to Item 8.1.

Overlay and seal coat projects must include placement of surface material on the existing mailbox turnouts, including turnouts that are worn paths without a pavement structure. Apply a new surface and material as necessary to create a mailbox turnout with a cross slope that matches the adjacent pavement. Payment of work will be in accordance with the item for the type of material placed.

ITEM 320 - EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT

Use of motor grader is allowed for placement of mixtures greater than 10 inches from the riding surface, when hot-mix is used in lieu of flexible base, or as allowed.

ITEMS 341, 344, & THRU 348 - HOT-MIX ASPHALT PAVEMENT

Core holes may be filled with an Asphaltic patching material meeting the requirements of DMS-9203 or with SCM meeting requirements of DMS-9202.

Remove and dispose of off the ROW the audible/profile markings, reflectorized markings, and raised markers.

Install transverse butt joints with 50 ft. H: 1 in. V transition from the new ACP to the existing surface. Install a butt joint with 24 in. H: 1 in. V transition from the new ACP to a driveway, pullout or intersection. Saw cut the existing pavement at the butt joints. This work is subsidiary.

Use a device to create a maximum 3H:1V notched wedge joint on all longitudinal joints of 2 in. or greater. This work is subsidiary.

Prior to milling, core the existing pavement to verify thickness. This work is subsidiary.

Ensure placement sequence to avoid excess distance of longitudinal joint lap back not to exceed one day's production rates.

Submit any proposed adjustments or changes to a JMF before production of the new JMF.

Tack every layer. Do not dilute tack coat. Apply it evenly through a distributor spray bar. Provide a minimum transition of 10' for intersections, 10' for commercial driveways, and 6' for residential driveways unless otherwise shown on the plans.

Irregularities will require the replacement of a full lane width using an asphalt paver. Replace the entire subplot if the irregularities are greater than 40% of the subplot area.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

When using RAP or RAS, include the management methods of processing, stockpiling, and testing the material in the QCP submitted for the project. If RAP and RAS are used in the same mix, the QCP must document that both of these materials have dedicated feeder bins for each recycled material. Blending of RAP and RAS in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP and RAS stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

No RAS is allowed in surface courses.

Department approved warm-mix additives is required for all surface mix application when RAP is used. Dosage rates will be approved during JMF approval.

The Hamburg Wheel Test will have a minimum rut depth of 3mm except for SMA with HPG or PG 76.

ITEMS 341 - DENSE-GRADED HOT-MIX ASPHALT

Use the SGC for design and production testing of all mixtures. Design all Type D mixtures as a surface mix, maximum 15% RAP and no RAS. Contractor may not use a substitute PG binder for 76-22. When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

The Hamburg Wheel minimum number of passes for PG 64 or lower is reduced to 7,000. The Engineer may accept Hamburg Wheel test results for production and placement if no more than 1 of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

ITEM 342 - PERMEABLE FRICTION COURSE (PFC)

For SAC A, blending SAC B aggregate with an RSSM greater than the SAC A rating or 10, whichever is greater, is prohibited.

The use of RAP is prohibited.

Submit the A-R binder design to the District Laboratory for approval.

Permeability test shall not exceed 20 seconds.

Install a butt joint when the edge is adjacent to a driveway or intersection. The taper for the butt joint shall be 24H:1V beyond the normal edge line of the PFC. This work is subsidiary.

ITEM 354 - PLANING AND TEXTURING PAVEMENT

Contractor retains ownership of salvaged materials.

Unless shown on the plans, mill and resurface the work area during each shift on roadways with ADT greater than 20,000 or if milling will expose the flex base or subgrade per the typical section.

Unless shown on the plans, mill and resurface a work area within 5 days for roadways with ADT 20,000 or less.

Taper permanent transverse faces 50 ft. per 1 in. Taper temporary transverse faces 25 ft. per 1 in. Taper permanent longitudinal faces 6 ft. per 1 in. HMA may be used as temporary tapers. Provide minimum 1 in. butt joints at bridge ends and paving ends. This work is subsidiary. Milled surfaces directly covered by a mat thickness of 1 in. or less shall produce a milled texture with a ridge to valley depth (RVD) no greater than 0.25 in. (6.5 mm).

The use of excavated material produced by Item 351 – “FLEXIBLE PAVEMENT STRUCTURE REPAIR” and Item 354 “PLANING AND TEXTURING PAVEMENT” will be allowed for use as Ty A Backfill as approved by the Engineer. The contractor retains ownership of salvaged materials not used for backfill.

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES

Unless shown on the plans, the following backfill will apply to cutting and restoring flexible pavement. Backfill with cement-stabilized backfill. The cement-stabilized backfill is subsidiary.

Cap the backfill with Type B hot-mix to a depth equal to the adjacent hot-mix. At locations where the backfill surface is final, place 1-1/2 in. Type D for the surface. The minimum hot-mix depth will be 4 in.

Unless shown on the plans, flowable fill option 1 item will be used for pavement widening.

Saw-cut the pavement at the edge of the excavation. This work is subsidiary.

Backfill the bridge ends in accordance with the limits shown on TxDOT “CSAB” Standard. Use material in accordance with “CSAB” or Item 423, Type BS. The “CSAB” optional bond breaker materials are allowed. This work is subsidiary.

ITEM 432 – RIPRAP

Mow strip riprap will be 4 in. and all other riprap will be 5 in. unless otherwise shown on the plans. Mow strip for cable barrier may be placed monolithically with the barrier foundations if using concrete in accordance with Item 543. Fiber reinforcement is not allowed except in mow strip for cable barrier if foundation and mow strip are placed monolithically. GFRP is allowed reinforcement for all applications.

Saw-cut existing riprap then epoxy 12 in. long No. 3 or No. 4 bars 6 in. deep at a maximum spacing of 18 in. in each direction to tie new riprap to existing riprap. This work is subsidiary.

Provide Type A Grade 3 or 5 flexible base for cement stabilized riprap. Compressive strengths for flexible base are waived.

SGT approach taper, paid for using mow strip item, will be installed using concrete, flexible base coated with SS-1 at a rate of 0.12 GAL/SY, or HMA Type B/C/D. Placement will be ordinary compaction and does not require placement using an asphalt paver.

ITEM 467 - SAFETY END TREATMENT

Field adjust pipe end to maintain the necessary slope. Field cutting of pipe end is allowed. Coat all metal field cuts or exposed reinforcement with asphalt paint.

For all Type II SETs, provide riprap apron shown in the cast-in-place standards and precast riprap detail standard. This work is subsidiary.

Cast-in-place or precast will be allowed unless stated otherwise.

ITEM 496 - REMOVING STRUCTURES

Submit a demolition plan to the Engineer. Have the plan signed and sealed by a licensed professional engineer when the structure will continue to accommodate traffic after removal has begun and the removal impacts any part of the structure below the deck or riding surface. If applicable, the plan must detail requirements for meeting the U.S. Army Corps of Engineers’ Section 404 Permit. The demolition plan must detail handling of roadway and waterway traffic. Waterway traffic must be maintained at all times unless a closure is approved by the Engineer.

No debris is allowed to fall into a body of water. Debris that falls into the water must be removed at the end of each workday. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event.

No debris is allowed to fall directly onto existing pavement. Existing pavement must be protected from damage by debris with a minimum of 1 ft. sand cushion. Submit an alternate roadway protection or cushion material to Engineer for approval. If existing pavement is PFC, use a vacuum truck to remove embedded sand after removal of sand cushion and debris. This work is subsidiary.

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

| <u>Table 1</u> | | |
|----------------|-------------------------|-------------------------------|
| <u>Roadway</u> | <u>Limits</u> | <u>Allowable Closure Time</u> |
| US 290 W | IH 35 to Nutty Brown Rd | 8 P to 5 A |

| <u>Table 3 (Mobile Operations)</u> | | |
|------------------------------------|--|------------------------------------|
| <u>Roadway</u> | <u>Allowable Sun Night thru Fri Noon</u> | <u>Allowable Sat thru Sun Morn</u> |
| Within Austin City Limits | 10 A to 2 P and 7 P to 6 A | 7 P to 10 A |
| Outside Austin City Limits | 9 A to 3 P and 7 P to 7 A | 6 P to 11 A |
| IH 35 main lanes | 10 P to 5 A | 9 P to 9 A |
| AADT over 50,000 | 8 P to 6 A | 8 P to 10 A |

Daytime or Friday night lane closures will not be allowed unless otherwise shown on the plans. One lane in each direction will remain open at all times for all roadways unless otherwise shown on the plans.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend.

No closures will be allowed 1 P.M. to 11 P.M. the Sunday of the Super Bowl.

Time charges will not be suspended during the large and special events listed below. These events are provided in the contract to allow scheduling of work around these lane closure restrictions.

All lanes will be open by noon of the day before the large events listed in below table. No closures will be allowed on Friday and the weekends for projects within 20 miles of these large events:

Table 4 (Large Events)

| Event | City | Dates |
|-------------------|---------|------------------------------|
| Formula 1 @ COTA | Austin | Annually (See Event Website) |
| Moto GP @ COTA | Austin | Annually (See Event Website) |
| ACL Fest | Austin | Annually (See Event Website) |
| SXSW | Austin | Annually (See Event Website) |
| ROT Rally | Bastrop | Annually (See Event Website) |
| UT Football Games | Austin | Annually (See Event Website) |
| Sales Tax Holiday | All | Annually (See Event Website) |
| Rodeo Austin | Austin | Annually (See Event Website) |

All lanes will be open by noon of the day before the special events listed in below table. No closures will be allowed on Friday and the weekends for projects within 10 miles of these special events:

Table 5 (Special Events)

| Event | City | Dates |
|--------------------------------|------------------------------------|---|
| Eaker BBQ Competition | Fredericksburg | March 10, 2024 |
| Sherwood Forest Faire | McDade / Paige | Weekends in March and April |
| Smithville Jamboree | Smithville | April 4-6, 2024 |
| Wiener Dog Races | Buda | April 29-30, 2023 |
| Founders Day Festival | Dripping Springs | April 28-30, 2023 |
| Red Poppy Festival | Georgetown | April 26-28, 2024 |
| Crawfish Open | Llano | 3 rd Friday and Saturday in April |
| Fair and Rodeo | Liberty Hill | May 18, 2023 |
| Founders Day Ceremony | Fredericksburg | 2 nd Weekend in May |
| Crawfish Festival | Fredericksburg | Saturday before Memorial Day |
| Lakefest Boat Races | Marble Falls | June 10-11, 2023 |
| Watermelon Thump | Luling | Last Full Weekend in June |
| Pie in the Sky | Kyle | Sept 1-2, 2023 |
| Wine and Music Festival | Georgetown | Last Saturday of September |
| Deer Season Opening Weekend | All Counties in Burnet Area Office | 1 st Friday and Saturday of Season |
| Christmas Nights of FBG Lights | Fredericksburg | Nov 21, 2023 |
| Christmas on Mercer | Dripping Springs | Dec 2, 2023 |
| Lady of Guadalupe Procession | Fredericksburg | Dec 12, 2023 |
| Texas State Graduation Fall | San Marcos | TBD |
| Texas State Graduation Spring | San Marcos | TBD |

All the large and special events listed in the above tables occur annually. Coordinate with the Department and review the city/event website to plan around the future events.

To account for directional traffic volumes, begin and end times of closures may be shifted equally by the Engineer. The closure duration will remain. Added compensation is not allowed.

One-way traffic control, including work performed under Item 510, must be set up to provide a maximum of 20 minutes of delay to the traveling public.

Submit an emailed request for a lane closure (LCN) to TxDOT. The email will be submitted in the format provided. Receive concurrence prior to implementation. Submit a cancellation of lane closures a minimum of 18 hours prior to implementation. Blanket requests for extended periods are not allowed. Max duration of a request is 2 weeks prior to requiring resubmittal.

Provide 2-hour notice prior to implementation and immediately upon removal of the closure.

For roadways listed in Table 1: Submit the request 96 hours prior to implementation.

For all roadways: Submit request for traffic detours and full roadway closures 168 hours prior to implementation. Submit request for nighttime work 96 hours to implementation date.

Cancellations of accepted closures (not applicable to full closures or detours) due to weather will not require resubmission in accordance with the above restrictions if the work is completed during the next allowable closure time.

Closures that conflict with adjacent contractor will be prioritized according to critical path work per latest schedule. Conflicting critical path or non-critical work will be approved for first LCN submitted. Denial of a closure due to prioritization or other reasons will not be reason for time suspension, delay, overhead, etc.

Meet with the Engineer prior to lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Take immediate action to modify current and future traffic control, if at any time the queue becomes greater than 20 minutes.

Consider inclement weather prior to implementing the lane closures. Do not set up traffic control when the pavement is wet.

Cover, relocate, or remove existing small, large, and overhead signs that conflict with traffic control. Cover large and overhead signs to remain using latest standard TS-CD. This work is subsidiary.

Install all permanent signs, delineation, and object markers required for the operation of the roadway before opening to traffic. Use of temporary mounts is allowed or may be required until the permanent mounts are installed or not impacted by construction. Maintain the temporary mounts. This work is subsidiary.

Place a 28-inch cone, meeting requirements of BC (10) and Ty III barricades, on top of foundations that have protruding studs. This work is subsidiary.

Vertical panels used on roadways with speed limit 55mph or greater must be round in shape or have a self-righting mechanism. The “flat” or “oblong” shaped vertical panels are not allowed.

A series of sequential flashing warning lights, per BC(7), must be installed in a merging taper for long term stationary TCP. This includes all TCP setups, such as those shown on the plans or TCP setups per the standards.

Edge condition treatment types must be in accordance with the TxDOT standard. Installation and removal of a safety slope is subsidiary.

To determine a speed limit or an advisory speed limit, submit a request to TxDOT 60 business days prior to manufacture of the sign.

For non-site-specific signal projects, 2 months of barricades will be paid per work order location.

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.

ITEM 504 - FIELD OFFICE AND LABORATORY

All labs and offices will include cleaning at least once a week. The cleaning will include sweeping and mopping of floors, cleaning the toilet and lavatory, and emptying wastebaskets. Space heaters are not considered adequate heating.

Projects with HMA, furnish a Type D structure for the Engineer’s exclusive use. The structure will include high speed internet service with WIFI signal, one desk, two chairs, and one file cabinet. Provide a minimum of three 120-volt circuits with 20-amp breakers and at most two grounded convenience outlets per circuit.

ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENV CONTROLS

If SW3P plan sheets are not provided, place the control measures as directed.

Install, maintain, remove control measures in areas of the right of way utilized by the Contractor that are outside the limits of disturbance required for construction. Permanently stabilize the area. This work is subsidiary.

Erosion control measures must be initiated immediately in areas where construction activities have ceased and will not resume for a period exceeding 14 calendar days. Vertical track all exposed soil, stockpiles, and slopes. Re-track after each rain event or every 14 days, whichever occurs first. Sheep foot roller is allowed for vertical tracking. This work is subsidiary.

For routine or anticipated dewatering, notify the engineer 72 hours before beginning dewatering. Notify the Engineer within 1 hour of beginning emergency or recent rainfall dewatering. Water located within the ROW that will leave the ROW must appear free of pollutants such as suspended sediment, oil sheen, floating solids, etc. Dirty water must pass thru adequate BMPs prior to leaving the ROW to prevent discharge of dirty water. Bypass pumping of water found in a navigable waterway that enters from outside the ROW and is discharged downstream of the ROW will not require the use of BMPs. Dewatering BMPs will be paid for in conformance with the applicable bid items. However, if the necessary BMP item is not included in the Contract, payment for the BMP will be in accordance with Article 9.7., “Payment for Extra Work and Force Account Method.” The act of dewatering and the equipment used to dewater will not be paid for directly but will be subsidiary to pertinent bid items.

Unless a specific pay item is provided in the plans, the installation of the 6:1 or flatter for RFD side slopes in the safety zone will be subsidiary to pertinent bid items.

Cover small waste containers (100 gallons or less) at all times. This work is subsidiary. Large waste containers (more than 100 gallons) must have a secondary discharge containment system around the container using erosion control logs. Installation of the log for each container location will be paid using existing bid items. Repair, remove, or replace of the log will not be paid. Revisions, repairs, remove or replace of the log during exchange of empty/full containers at the same location will not be paid.

Portable restrooms must be located more than 50 ft. from a waterway. Tie or stake down portable restrooms to prevent tipping due to vandalism or weather. This work is subsidiary.

Provide a designated location for disposal when excess and waste, including waste generated from cleaning of all equipment used for mixing, hauling, and transfer concrete is disposed in the ROW or PSL. Manufactured disposal containers must be metal or a plastic material with minimum 10 mil thickness. Paper, earthen berms, or pits must be lined with minimum 10 mill thickness polyethylene sheeting. Disposal locations must be located a minimum of 50 ft. from a waterway, tree, or sensitive feature. The disposal location must have a minimum height of 6 in. Maintain a minimum 4 in. of freeboard at all times. Disposal locations are not required for cleaning of small hand tools. Hardened concrete waste may be used as embankment if placed in accordance with Item 132.

Dust Control

Stockpiles that will be inactive for greater than 14 days must be treated to contain dust by covering with chemical dust suppressant, soil blanket, vertical tracking, or method other than sprinkling with water. Stockpiles that are actively being used must be treated to contain dust by vertical tracking or a method determined by the Contractor. This work is subsidiary.

Provide designated construction traffic routes when feasible. Construction site traffic must be directed to use designated routes.

ITEMS 540, 542, & 544 - METAL BEAM GUARD FENCE AND GUARDRAIL END TREATMENTS

Furnish round timber posts for guard fence. Steel posts for low fill culvert applications is subsidiary including use of low fill culvert application due to other concrete structures such as inlets. Long span application at inlets may be used as an alternate to low fill culvert. Unless otherwise specified on the plans, use of low fill culvert or long span at inlets will be subsidiary to pertinent items. Stake the locations for approval before installation. Adjust the limits of the fence to meet field conditions. Install delineators before opening the road to traffic.

Retain all materials. Existing materials that are structurally sound and dent free may be reused. All reused material will be from this project and in compliance with current standards. Structurally sound rust spots with the largest dimension of 4 in. may be cleaned and repaired in accordance with Section 540.3.5. Punch or field drill holes in the metal rail element to accommodate post spacing. Additional holes for splice or connections are not allowed. Space the field holes in accordance with the latest standard but no closer than the minimum spacing shown on the current standard.

Remove, replace, and install mow strip block out material. Construct new block outs and backfill unused block outs with class B concrete. This work is subsidiary.

Repair of mow strip damage, not caused by contractor negligence, and installation of new mow strip will be paid with appropriate bid items. Backfill and shoulder up of area around fence and mow strip will be paid using embankment item.

ITEM 585 - RIDE QUALITY FOR PAVEMENT SURFACES

Use Surface Test Type B Pay Schedule 3 to evaluate ride quality of travel lanes, including service roads.

ITEM 658 – DELINEATOR AND OBJECT MARKER ASSEMBLIES

All delineator post and supports, excluding metal components, must be manufactured in the same color that matches the color of the reflector. Field painting is not allowed.

Flexible posts YFLX and WFLX must be tubular in shape. The “flat” flexible posts are not allowed.

Installation and maintenance of portable CTB reflectors will be subsidiary to the barrier.

CTB delineators must be placed on top of the CTB.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS

Notify the Engineer at least 24 hours in advance of work for this item.

Maintain removable and short-term markings daily. Remove within 48 hours after permanent striping has been completed.

Item 668 is not allowed for use as Item 662.

Paint will be allowed for this item.

Use WK ZN MRK SHT TERM REMOV on milled surfaces only.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS

Notify the Engineer at least 24 hr. before beginning work.

All projects, including resurfacing, must increase center-to-center width for center line markings to 18 in. unless the plans or existing is greater than 18 in.

Place longitudinal markings nightly for IH 35 main lanes or roadways with AADT greater than 100,000. Use of temporary flexible reflective roadway marker tabs is subsidiary and at the Contractor's option. Replace missing or damaged tabs nightly. If using tabs, place longitudinal markings weekly by 5 AM Friday for all weekday work and by 5 AM Monday for all weekend work. Failure to maintain tabs or place longitudinal markings by deadline will require nightly placement of longitudinal markings.

Place longitudinal markings no later than 7 calendar days after placement of the surface for roadways with AADT greater than 20,000.

When the raised portion of a profile marking is placed as a separate operation from the pavement marking, the raised portion must be placed first then covered with TY I.

When using black shadow to cover existing stripe apply a non-retroreflective angular abrasive bead drop. The marking color shall be adjusted to resemble the pavement color. If Item 677 is not used prior to placement of black shadow, scrape the top of the marking with a blade or large piece of equipment unless surface is a seal coat. The scraping of the marking is subsidiary.

ITEM 672 – RAISED PAVEMENT MARKERS

Place Type I-C and II-C-R markers at 40 ft. spacing for all lane lines.

ITEM 341/3084 – BONDING COURSE

The minimum application rates are listed in Table BC. Miscellaneous Tack is allowed for use with dense-graded Type B HMA. If a tack bid item is not provided, use bonding course item.

The target shear bond strengths are listed in Table BCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table BC

| Material | Minimum Application Rate (gal. per square yard) |
|----------------------------------|--|
| TRAIL – Emulsified Asphalt | 0.06 |
| TRAIL – Hot Asphalt | 0.12 |
| Spray Applied Underseal Membrane | 0.10 |

Table BCS (For Informational Tests)

| Material | Target Shear Bond Strength (Tex-249-F psi) |
|---------------------------------|---|
| SMA – Stone-Matrix Asphalt | 60.0 |
| PFC – Permeable Friction Course | N/A |
| All Other Materials | 40.0 |

ITEM 342/3085 – UNDERSEAL COURSE

No emulsified asphalt material allowed under PFC or SMA, except for use with Item 316, on roadways with ADT greater than 100,000.

The minimum application rates are listed in Table UC. The target shear bond strengths are listed in Table UCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table UC

| Material | Minimum Application Rate (mat >1” gal. per square yard) | Minimum Application Rate (mat ≤ 1” gal. per square yard) |
|----------------------------------|--|---|
| TRAIL – Hot Asphalt | 0.15 | 0.10 |
| Spray Applied Underseal Membrane | 0.15 | 0.15 |
| Seal Coat – Tier II emulsion | 0.25 | 0.25 |
| Seal Coat – Tier II asphalt | 0.23 | 0.23 |

Table UCS

| Material | Minimum Shear Strength (psi) |
|---------------------------------|---------------------------------|
| SMA – Stone-Matrix Asphalt | 60.0 |
| PFC – Permeable Friction Course | 40.0 |
| All Other Materials | 40.0 |

ITEM 503/6001 – PORTABLE CHANGEABLE MESSAGE SIGN

Provide 2 PCMS. Provide a replacement within 12 hours. PCMS will be available for traffic control, event notices, roadway conditions, service announcements, etc.

Place PCMS 10 calendar days prior to begin work stating “Road Work Begin Soon, Contact 832-7000 For Info”.

Place PCMS at time of LCN request. Place the PCMS at the expected end of queue caused by the closure. When the closure is active, revise the message to reflect the actual condition during the closure, such as “RIGHT LN CLOSED XXX FT”.

ITEM 505/6185 – TRUCK MOUNTED ATTENUATOR AND TRAILER ATTENUATOR

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

The contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMA/TA required for the work. TMA/TAs paid by the day is full compensation for all worksite locations during an entire day.

TMA/TAs used to protect damaged attenuators will be paid by the day using the force account item for the repair.



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0113-08-091

DISTRICT Austin
HIGHWAY US 290

COUNTY Travis

| CONTROL SECTION JOB | | | | 0113-08-091 | | TOTAL EST. | TOTAL FINAL |
|---------------------|----------|--|------|-------------|-------|------------|-------------|
| PROJECT ID | | | | A00197414 | | | |
| COUNTY | | | | Travis | | | |
| HIGHWAY | | | | US 290 | | | |
| ALT | BID CODE | DESCRIPTION | UNIT | EST. | FINAL | | |
| | 100-7002 | PREPARING ROW | STA | 3.000 | | 3.000 | |
| | 104-7004 | REMOV CONC (MOWSTRIP) | CY | 8.000 | | 8.000 | |
| | 105-7008 | RMV (8"-12") TRT/UNTRT BASE & ASPH PAV | SY | 89.000 | | 89.000 | |
| | 112-7001 | SUBGR WIDEN (OC) | STA | 3.000 | | 3.000 | |
| | 132-7015 | EMBANK (VEH)(OC)(TY B) | CY | 10.000 | | 10.000 | |
| | 134-7001 | BACKFILL (TY A) | STA | 3.000 | | 3.000 | |
| | 341-7003 | D-GR HMA TY-B PG64-22 (EXEMPT) | TON | 224.000 | | 224.000 | |
| | 341-7065 | D-GR HMA TY-D PG 76-22 (EXEMPT) | TON | 23.000 | | 23.000 | |
| | 342-7001 | PFC-C PG76-22 SAC-A | TON | 85.000 | | 85.000 | |
| | 354-7018 | PLANE & TEXT ASPH CONC PAV(1.5") | SY | 1,250.000 | | 1,250.000 | |
| | 400-7008 | CUT & RESTORE ASPH PAVING | SY | 34.000 | | 34.000 | |
| | 400-7010 | CEM STABIL BKFL | CY | 7.000 | | 7.000 | |
| | 432-7013 | RIPRAP (MOW STRIP)(4 IN) | CY | 8.000 | | 8.000 | |
| | 464-7041 | RC PIPE (ARCH)(CL III)(DES 2) | LF | 52.000 | | 52.000 | |
| | 467-7426 | SET (TY II) (DES 2) (RCP) (6: 1) (P) | EA | 2.000 | | 2.000 | |
| | 496-7004 | REMOV STR (SET) | EA | 2.000 | | 2.000 | |
| | 496-7007 | REMOV STR (PIPE) | LF | 50.000 | | 50.000 | |
| | 500-7001 | MOBILIZATION | LS | 1.000 | | 1.000 | |
| | 502-7001 | BARRICADES, SIGNS AND TRAFFIC HANDLING | MO | 2.000 | | 2.000 | |
| | 503-7001 | PORTABLE CHANGEABLE MESSAGE SIGN | DAY | 84.000 | | 84.000 | |
| | 505-7001 | TMA (STATIONARY) | DAY | 64.000 | | 64.000 | |
| | 505-7002 | TMA (MOBILE OPERATION) | HR | 16.000 | | 16.000 | |
| | 506-7039 | TEMP SEDMT CONT FENCE (INSTALL) | LF | 460.000 | | 460.000 | |
| | 506-7041 | TEMP SEDMT CONT FENCE (REMOVE) | LF | 460.000 | | 460.000 | |
| | 506-7044 | BIODEG EROSN CONT LOGS (INSTL) (12") | LF | 250.000 | | 250.000 | |
| | 506-7046 | BIODEG EROSN CONT LOGS (REMOVE) | LF | 250.000 | | 250.000 | |
| | 540-7001 | MTL W-BEAM GD FEN (TIM POST) | LF | 162.500 | | 162.500 | |
| | 540-7015 | DOWNSTREAM ANCHOR TERMINAL SECTION | EA | 1.000 | | 1.000 | |
| | 542-7001 | REMOVE METAL BEAM GUARD FENCE | LF | 162.500 | | 162.500 | |
| | 542-7003 | REMOVE DOWNSTREAM ANCHOR TERMINAL | EA | 1.000 | | 1.000 | |
| | 544-7001 | GUARDRAIL END TREATMENT (INSTALL) | EA | 1.000 | | 1.000 | |
| | 544-7003 | GUARDRAIL END TREATMENT (REMOVE) | EA | 1.000 | | 1.000 | |
| | 658-7019 | INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI) | EA | 5.000 | | 5.000 | |
| | 662-7001 | WK ZN PAV MRK NON-REMOV (W)4"(BRK) | LF | 230.000 | | 230.000 | |
| | 662-7004 | WK ZN PAV MRK NON-REMOV (W)4"(SLD) | LF | 810.000 | | 810.000 | |
| | 662-7012 | WK ZN PAV MRK NON-REMOV (W)8"(SLD) | LF | 175.000 | | 175.000 | |
| | 662-7017 | WK ZN PAV MRK NON-REMOV (W)24"(SLD) | LF | 16.000 | | 16.000 | |

| | | | |
|----------|--------|-------------|-------|
| DISTRICT | COUNTY | CCSJ | SHEET |
| Austin | Travis | 0113-08-091 | 5 |



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0113-08-091

DISTRICT Austin
HIGHWAY US 290

COUNTY Travis

| CONTROL SECTION JOB | | | | 0113-08-091 | | TOTAL EST. | TOTAL FINAL |
|---------------------|-----------|--|------|-------------|-------|------------|-------------|
| PROJECT ID | | | | A00197414 | | | |
| COUNTY | | | | Travis | | | |
| HIGHWAY | | | | US 290 | | | |
| ALT | BID CODE | DESCRIPTION | UNIT | EST. | FINAL | | |
| | 662-7018 | WK ZN PAV MRK NON-REMOV (W)(ARROW) | EA | 1.000 | | 1.000 | |
| | 662-7030 | WK ZN PAV MRK NON-REMOV(W)(WORD) | EA | 1.000 | | 1.000 | |
| | 662-7112 | WK ZN PAV MRK SHT TERM (TAB)TY W | EA | 56.000 | | 56.000 | |
| | 662-7115 | WK ZN PAV MRK SHT TERM RMV (W)(4") | LF | 140.000 | | 140.000 | |
| | 666-7023 | REFL PAV MRK TY I (W)8"(SLD)(090MIL) | LF | 175.000 | | 175.000 | |
| | 666-7035 | REFL PAV MRK TY I (W)24"(SLD)(090MIL) | LF | 16.000 | | 16.000 | |
| | 666-7041 | REFL PAV MRK TY I (W)(ARROW)(090MIL) | EA | 1.000 | | 1.000 | |
| | 666-7065 | REFL PAV MRK TY I (W)(WORD)(090MIL) | EA | 1.000 | | 1.000 | |
| | 666-7263 | RE PROFILE PM TY I(W)4"(SLD)(090MIL) | LF | 405.000 | | 405.000 | |
| | 666-7283 | TY I HIGH PERF PM (W)4"(BRK)(090MIL) | LF | 115.000 | | 115.000 | |
| | 672-7002 | REFL PAV MRKR TY I-C | EA | 20.000 | | 20.000 | |
| | 3006-7001 | UNDERSEAL COURSE | GAL | 250.000 | | 250.000 | |
| | 3007-7001 | BONDING COURSE | GAL | 25.000 | | 25.000 | |
| | 18 | EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART) | LS | 1.000 | | 1.000 | |
| | | LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PART) | LS | 1.000 | | 1.000 | |
| | | SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PART) | LS | 1.000 | | 1.000 | |
| | | CONTRACTOR FORCE ACCOUNT WORK (PART) | LS | 1.000 | | 1.000 | |

| SUMMARY OF ROADWAY ITEMS | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------------|-----------------------|--|------------------|--------------------------|-----------------|--------------------------------|---------------------------------|----------------|---------------------|------------------|----------------------------------|---------------------------|-------------------|---------------------------|------------------------------|------------------------------------|-------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---|
| CATEGORY OF WORK: ROADWAY | 100 7002 | 104 7004 | 105 7008 | 112 7001 | 132 7015 | 134 7001 | 341 7003 | 341 7065 | 3007 7001 | 342 7001 | 3006 7001 | 354 7018 | 400 7008 | 401 7001 | 432 7013 | 540 7001 | 540 7015 | 542 7001 | 542 7003 | 544 7001 | 544 7003 | 658 7019 |
| | PREPARING ROW | REMOV CONC (MOWSTRIP) | RMV (8"-12") TRT/UNTRT BASE & ASPH PAV | SUBGR WIDEN (OC) | EMBANK (VEH) (OC) (TY B) | BACKFILL (TY A) | D-GR HMA TY-B PG64-22 (EXEMPT) | D-GR HMA TY-D PG 76-22 (EXEMPT) | BONDING COURSE | PFC-C PG76-22 SAC-A | UNDERSEAL COURSE | PLANE & TEXT ASPH CONC PAV(1.5") | CUT & RESTORE ASPH PAVING | FLOWABLE BACKFILL | RIPRAP (MOW STRIP) (4 IN) | MTL W-BEAM GD FEN (TIM POST) | DOWNSTREAM ANCHOR TERMINAL SECTION | REMOVE METAL BEAM GUARD FENCE | REMOVE DOWNSTREAM ANCHOR TERMINAL | GUARDRAIL END TREATMENT (INSTALL) | GUARDRAIL END TREATMENT (REMOVE) | INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI) |
| | STA | CY | SY | STA | CY | STA | TON | TON | GAL | TON | GAL | SY | SY | CY | CY | LF | EA | LF | EA | EA | EA | EA |
| PROJECT TOTALS | 3 | 8 | 89 | 3 | 10 | 3 | 224 | 23 | 25 | 85 | 250 | 1250 | 34 | 7 | 8 | 162.5 | 1 | 162.5 | 1 | 1 | 1 | 5 |

| SUMMARY OF PAVEMENT MARKING ITEMS | | | | | | | |
|-----------------------------------|---------------------------------------|---|---------------------------------------|--------------------------------------|---|--|----------------------|
| CATEGORY OF WORK: PAVEMARKING(S) | 666 7023 | 666 7035 | 666 7041 | 666 7065 | 666 7263 | 666 7283 | 672 7002 |
| | REFL PAV MRK TY I (W)8" (SLD) (90MIL) | REFL PAV MRK TY I (W)24" (SLD) (090MIL) | REFL PAV MRK TY I (W) (ARROW) (90MIL) | REFL PAV MRK TY I (W) (WORD) (90MIL) | RE PROFILE PM TY I (W)4" (SLD) (090MIL) | TY I HIGH PERF PM (W)4" (BRK) (090MIL) | REFL PAV MRKR TY I-C |
| | LF | LF | EA | EA | LF | LF | EA |
| PROJECT TOTALS | 175 | 16 | 1 | 1 | 405 | 115 | 20 |

| SUMMARY OF WORK ZONE TRAFFIC CONTROL ITEMS | | | | | | | | | | | |
|--|----------------------------------|------------------|------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|------------------------------------|----------------------------------|-------------------------------------|
| CATEGORY OF WORK: WORK ZONE | 503 7001 | 505 7001 | 505 7002 | 662 7001 | 662 7004 | 662 7012 | 662 7017 | 662 7018 | 662 7030 | 662 7112 | 662 7115 |
| | PORTABLE CHANGEABLE MESSAGE SIGN | TMA (STATIONARY) | TMA (MOBILE OPERATION) | WK ZN PAV MRK NON-REMOV (W)4" (BRK) | WK ZN PAV MRK NON-REMOV (W)4" (SLD) | WK ZN PAV MRK NON-REMOV (W)8" (SLD) | WK ZN PAV MRK NON-REMOV (W)24" (SLD) | WK ZN PAV MRK NON-REMOV (W) (ARROW) | WK ZN PAV MRK NON-REMOV (W) (WORD) | WK ZN PAV MRK SHT TERM (TAB)TY W | WK ZN PAV MRK SHT TERM RMV (W) (4") |
| | DAY | DAY | HR | LF | LF | LF | LF | EA | EA | EA | LF |
| PROJECT TOTALS | 84 | 64 | 16 | 230 | 810 | 175 | 16 | 1 | 1 | 56 | 140 |

| SUMMARY OF EROSION CONTROL ITEMS | | | | |
|----------------------------------|---------------------------------|--------------------------------|--------------------------------------|---------------------------------|
| CATEGORY OF WORK: EROSION | 506 7039 | 506 7041 | 506 7044 | 506 7046 |
| | TEMP SEDMT CONT FENCE (INSTALL) | TEMP SEDMT CONT FENCE (REMOVE) | BIODEG EROSN CONT LOGS (INSTL) (12") | BIODEG EROSN CONT LOGS (REMOVE) |
| | LF | LF | LF | LF |
| PROJECT TOTALS | 460 | 460 | 250 | 250 |

| SUMMARY OF DRAINAGE ITEMS | | | | |
|----------------------------|---------------------------------|-------------------------------------|-----------------|------------------|
| CATEGORY OF WORK: DRAINAGE | 464 7041 | 467 7426 | 496 7004 | 496 7007 |
| | RC PIPE (ARCH) (CL III) (DES 2) | SET (TY II) (DES 2) (RCP) (6:1) (P) | REMOV STR (SET) | REMOV STR (PIPE) |
| | LF | EA | EA | LF |
| PROJECT TOTALS | 52 | 2 | 2 | 50 |

| SUMMARY OF MOBILIZATION & BARRICADE ITEMS | | |
|---|--------------|--|
| CATEGORY OF WORK: MOBILIZATION & BARRICADES | 500 7001 | 502 7001 |
| | MOBILIZATION | BARRICADES, SIGNS AND TRAFFIC HANDLING |
| | LS | MO |
| PROJECT TOTALS | 1.00 | 2.00 |

DATE: \$DATES \$TIME\$
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**Austin District
South Travis Area Office**

QUANTITY
SUMMARY

| | | | | |
|--------|-------------|------|-----------|---------|
| © 2024 | CONT | SECT | JOB | HIGHWAY |
| | 0113 | 08 | 091 | US 290 |
| | DIST COUNTY | | SHEET NO. | |
| | AUS TRAVIS | | 6 | |

US 290


SUMMARY OF PARALLEL DRAINAGE

| LOCATION | DESCRIPTION | DISPOSITION | 432-7013 | 464-7041 | 467-7426 | 496-7004 | 496-7007 | | | | | | | | | | | |
|---------------|------------------|--|---------------------------------|---|--|-----------------------|------------------------|--|--|--|--|--|--|--|--|--|--|--|
| | | | RIPRAP (MOW STRIP) (4 in) | RC PIPE (ARCH) (CL 11) (DES 2) | SET (TY 11) (DES 2) (RCP) (6:1) (P) | REMOV STR (SET) | REMOV STR (PIPE) | | | | | | | | | | | |
| | | | CY | LF | EA | EA | LF | | | | | | | | | | | |
| STA 182+00 RT | @LEDGESTONE TER. | REMOVE 50' EXISTING CMP PIPE & 2 SET/ ADD 52' RCP (DES II) & 2-SET | 8 | 52 | 2 | 2 | 50 | | | | | | | | | | | |
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NOT TO SCALE

Austin District
South Travis Area Office



SUMMARY OF
PARALLEL DRAINAGE

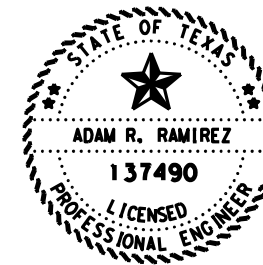
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| © 2024 | CONT | SECT | JOB | HIGHWAY |
| | 0113 | 08 | 091 | US 290 |
| | DIST | | COUNTY | SHEET NO. |
| | AUS | | TRAVIS | 7 |

SEQUENCE OF WORK

- INSTALL PERIMETER BARRICADES.
- INSTALL APPLICABLE TCP DAILY.
- BEGIN WIDENING (NOTCH & WIDEN) OPERATIONS. UTILIZE APPLICABLE STANDARD TCP AS NEEDED OR AS DIRECTED BY THE ENGINEER. (SEE PROPOSED TYPICAL SECTIONS FOR MORE DETAILS). USE WK ZN REMOVABLE AND WK ZN NON-REMOVE PAVEMENT MARKINGS AS NEEDED OR AS DIRECTED.
- UPON COMPLETION OF WIDENING WORK (WITH ALL MBGF WORK COMPLETE / INSTALLED) UTILIZE TCP (2-4)-18 TO COMPLETE ROADWAY PLANING OPERATION, ENSURING COMPLETE REMOVAL OF EXISITNG PFC. USE WK ZN REMOVABLE TAPE AND WK ZN NON-REMOVE STRIPE AS NEEDED OR AS DIRECTED.
- UPON COMPLETION OF PFC MILLING OPERATIONS, UTILIZE APPLICABLE TCP STANDARD AND SEQUENCE SHOWN ON CUT & RESTORE DETAIL (SHEET 11, "US 290 PLAN VIEW") TO PERFORM CUT & RESTORE, DRAINAGE REMOVAL, & REPLACE OF PARALELL DRAINAGE AT LEDGSTONE TERRACE.
- UPON COMPLETION OF CUT & RESTORE OPERATIONS, UTILIZE TCP (2-4)-18 TO PERFORM UNDERSEAL & PFC INLAY OPERATIONS (FINAL SURFACE), & BACKFILL TY A. PLACE WK ZN REMOVABLE TABS AND WK ZN NON-REMOVE STRIPE AS NEEDED OR AS DIRECTED.
- PLACE EDGE LINES, FINAL TY I PAVEMENT MARKINGS AND BUTTONS.
- REMOVE PERIMETER BARRICADES.

NOTES:

- PLAN OPERATIONS AND TCP SEQUENCE SUCH THAT NO THRU TRAFFIC TRAVELS ON MILLED SURFACE. ONLY OPEN MILL & FILL AREA TO TRAFFIC UPON PLACEMENT / COMPLETION OF FINAL PFC SURFACE. (APPLICABLE TO US 290 ONLY)
- SEE LOCATION SPECIFIC INFORMATION PERTAINING TO WORK RESTRICTIONS IN ITEM 8 AND ITEM 502 OF THE GENERAL NOTES.



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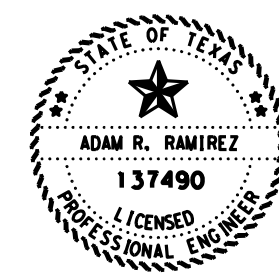
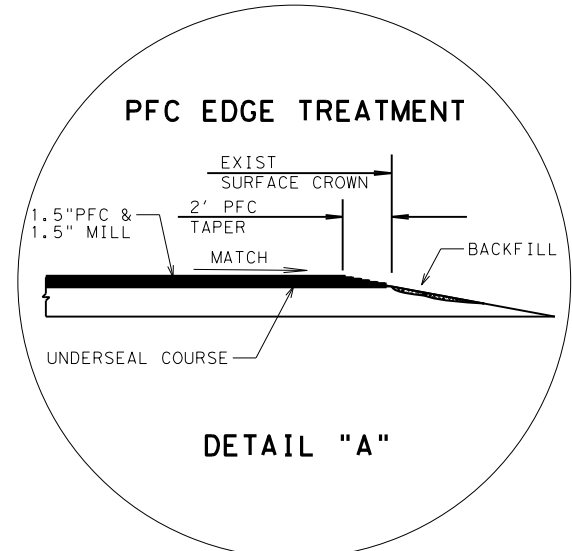
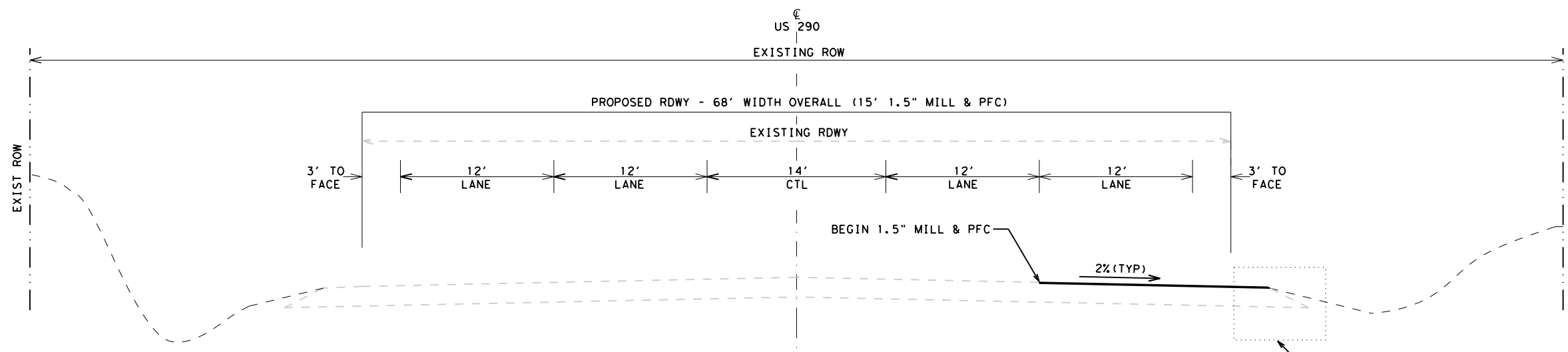
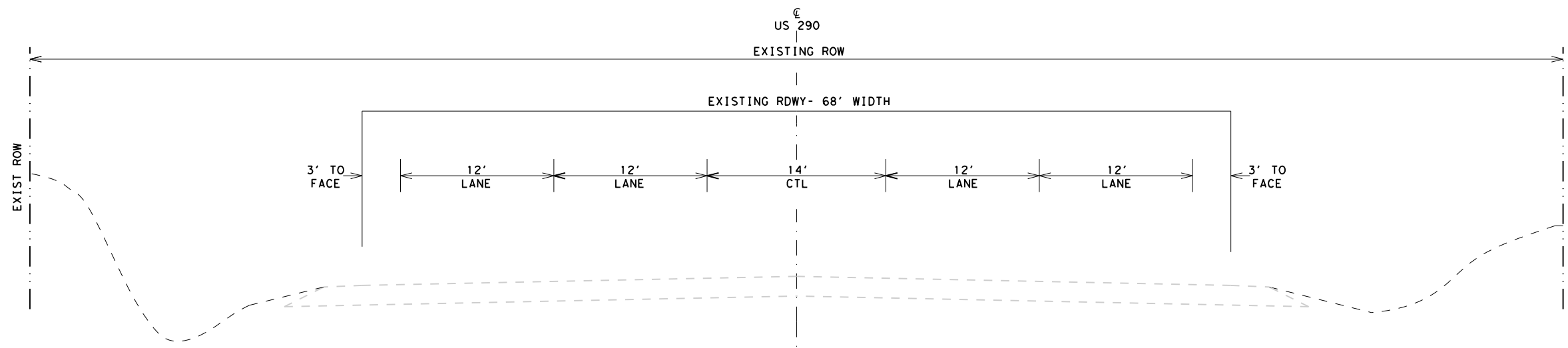
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**Austin District
South Travis Area Office**



SEQUENCE OF WORK

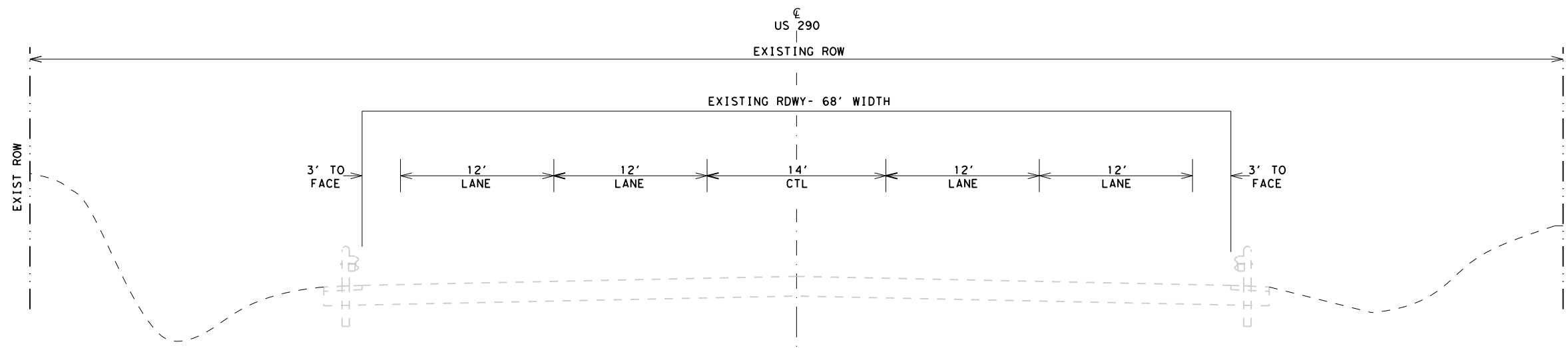
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| | 0113 | 08 | 091 | US 290 |
| | DIST | | COUNTY | SHEET NO. |
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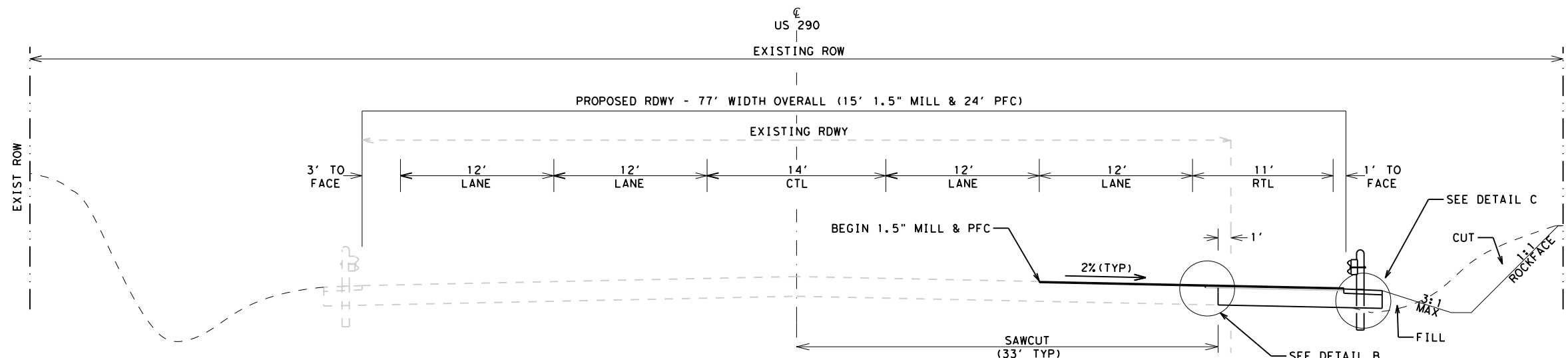
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| Austin District South Travis Area Office | | | |
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| US 290 TYPICAL SECTIONS | | | |
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| DIST | COUNTY | | SHEET NO. |
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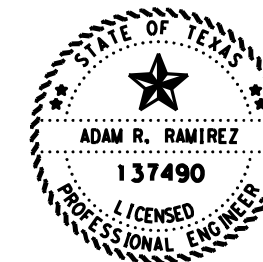
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EXISTING ROADWAY SECTION
STA 179+25 TO 182+00



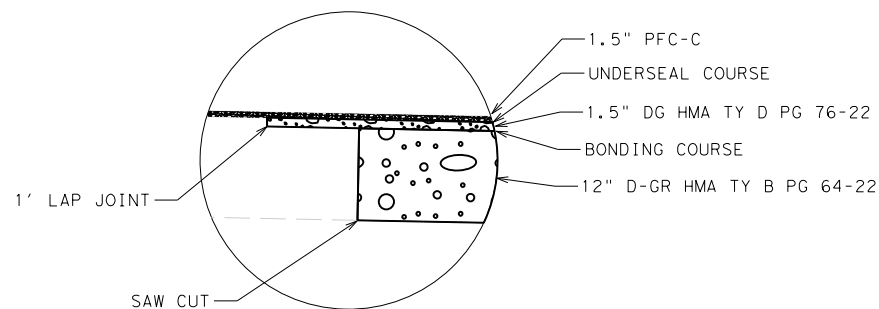
PROPOSED ROADWAY SECTION
STA 179+25 TO 182+00
(100' TAPER STA 179+25 TO 180+25)



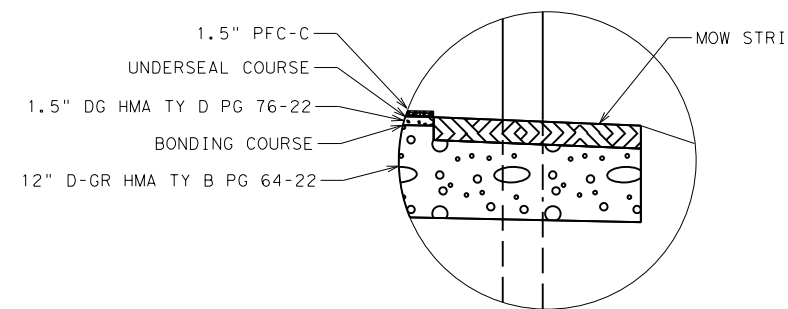
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NOTES:

- 1) EXCAVATION AND EMBANKMENT BEYOND THE EDGE OF THE SUBGRADE THAT IS REQUIRED TO CONSTRUCT ROADWAY ACCORDING TO THE TYPICAL SECTION WILL BE SUBSIDIARY TO SUBGRADE WIDENING.
- 2) TOKEN QTY OF ITEM 132 IS ADDED TO THE PLANS FOR INCIDENTAL WORK AND WILL ONLY BE USED IF NEEDED AND AS DIRECTED BY THE ENGINEER.
- 2) CONTRACTOR WILL ENSURE PROPOSED DITCH GEOMETRY IS CONSISTENT WITH THE EXISTING GEOMETRY TO MAINTAIN EXISTING HYDRAULIC CAPACITY.



DETAIL "B"



DETAIL "C"

**Austin District
South Travis Area Office**

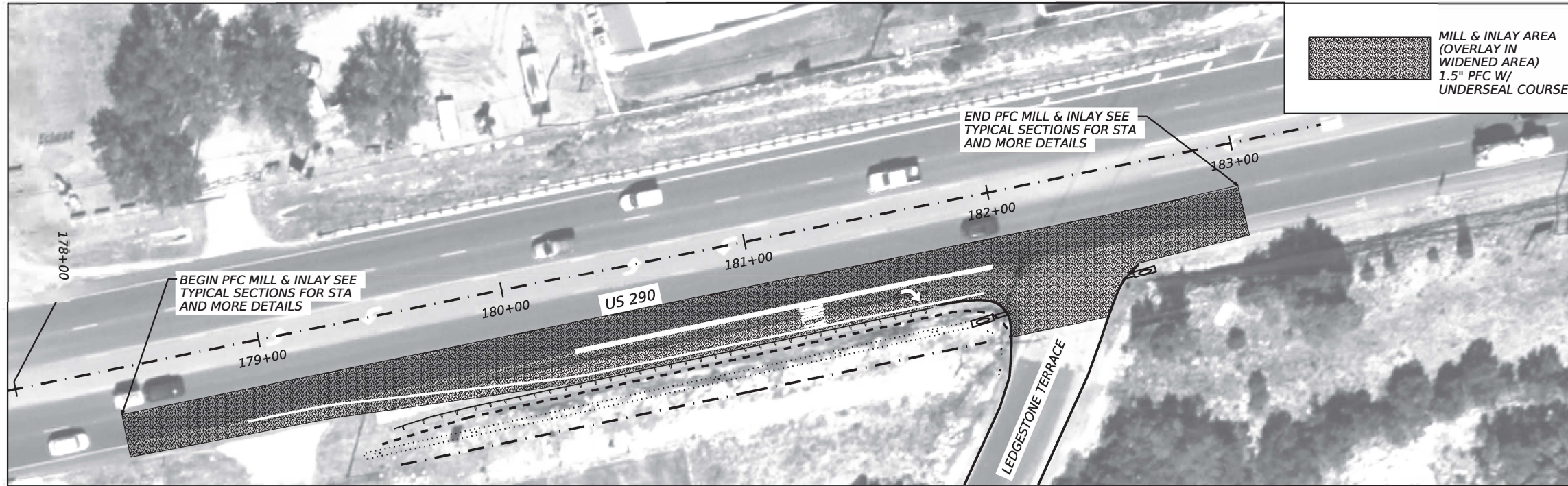
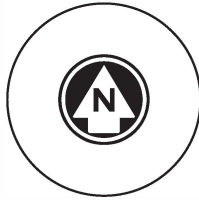
Texas Department of Transportation

US 290
TYPICAL SECTIONS

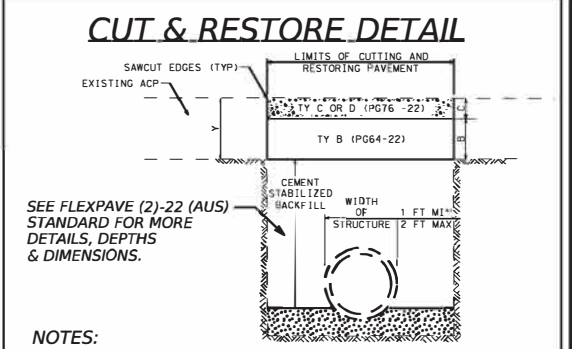
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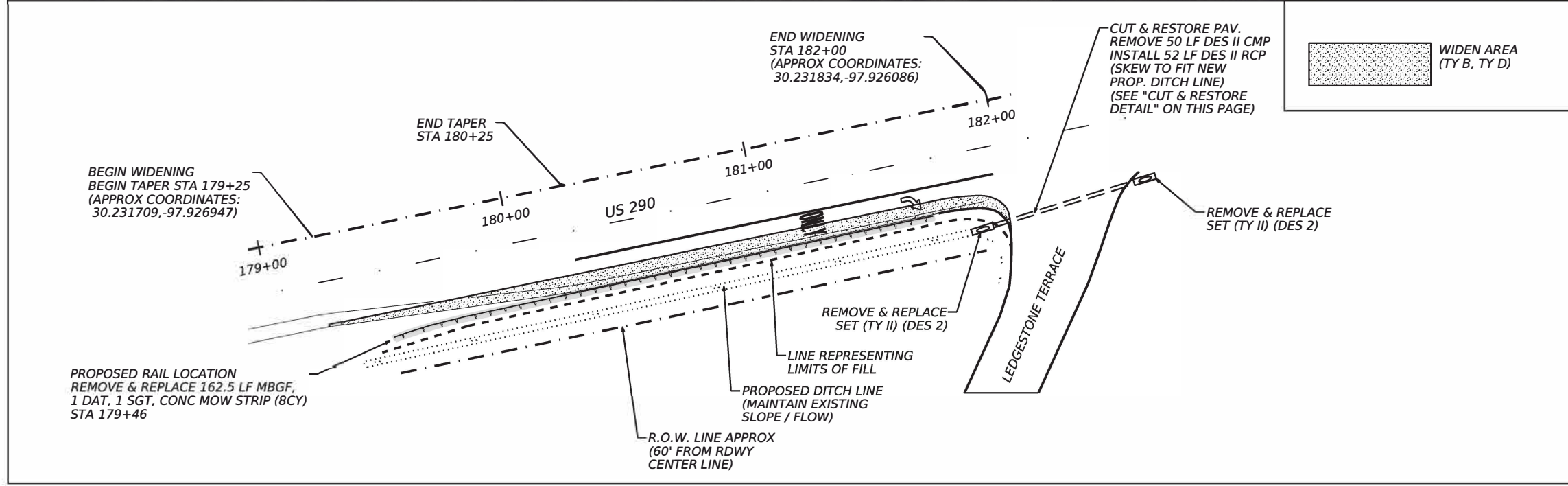
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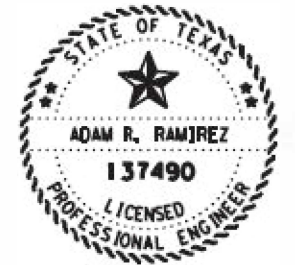
**MILL & INLAY AREA
(OVERLAY IN
WIDENED AREA)
1.5" PFC W/
UNDERSEAL COURSE**



- NOTES:**
- 1) SEE FLEXPAVE (2)-22 (AUS) FOR DETAILS, DEPTHS AND DIMENSIONS.
 - 2) PLACEMENT OF HMA TY D IS SUBSIDIARY TO CUT & RESTORE PAV ITEM.
- SEQUENCE AS FOLLOWS:
- 1) CONDUCT ONE-WAY TRAFFIC CONTROL.
 - 2) REMOVE EXISTING CMP AND INSTALL RCP <LEFT>. RCP WILL BE TEMPORARILY PLUGGED AS APPROVED BY THE ENGINEER.
 - 3) REPAIR ROADWAY & ADJUST TRAFFIC CONTROL ACCORDINGLY.
 - 4) REMOVE EXISTING CMP AND INSTALL RCP <RIGHT>.
 - 5) SWITCH TRAFFIC BACK TO TWO-WAY TRAFFIC.



**WIDEN AREA
(TY B, TY D)**



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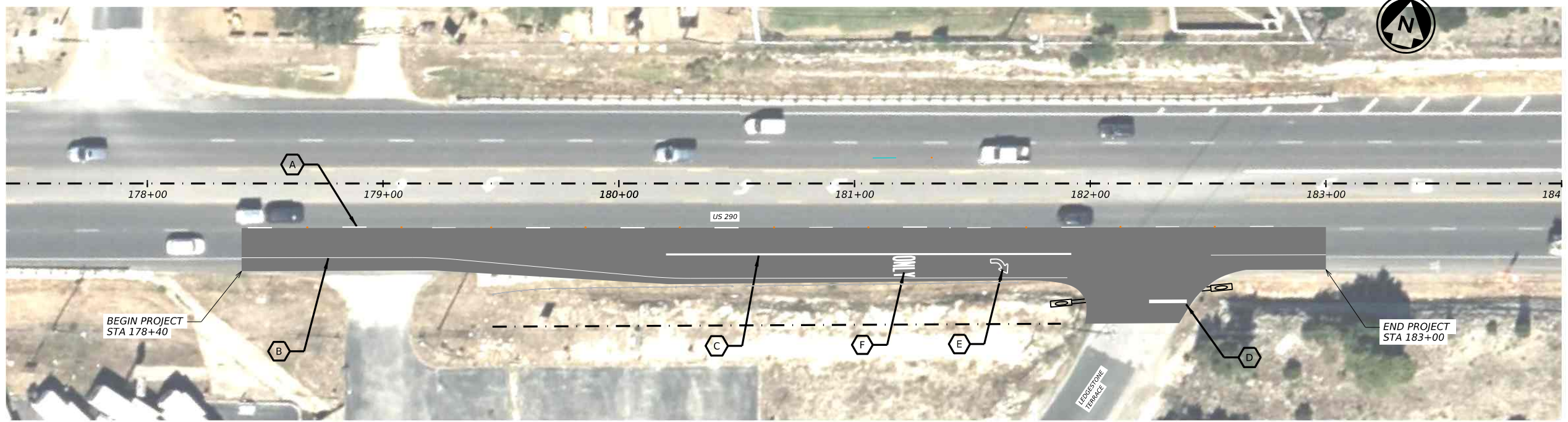
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South Travis Area Office**

Texas Department of Transportation

**US 290
PLAN VIEW
(MISC. DETAILS)**

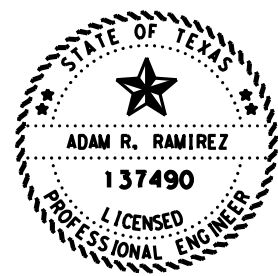
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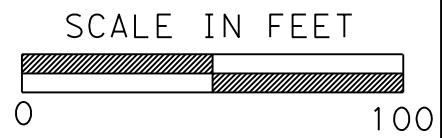


| ITEM 662 - WK ZN NON-REMOVE | | | | | |
|--|--|--|---|--|---|
| A | B | C | D | E | F |
| 662-7001 | 662-7004 | 662-7012 | 662-7017 | 662-7018 | 662-7030 |
| WK ZN PAV MRK NON- REMOV (W)4"(BRK) | WK ZN PAV MRK NON- REMOV (W)4"(SLD) | WK ZN PAV MRK NON- REMOV (W)8"(SLD) | WK ZN PAV MRK NON- REMOV (W)24"(SLD) | WK ZN PAV MRK NON- REMOV (W)(ARROW) | WK ZN PAV MRK NON- REMOV (W)(WORD) |


| ITEM 666 - TY I PAV MARKINGS | | | | | |
|--|---|--|---|--|---|
| A | B | C | D | E | F |
| 666-7283 | 666-7263 | 666-7023 | 666-7035 | 666-7041 | 666-7065 |
| TY I HIGH PERF PM (W)4"(BRK) (090MIL) | RE PROFILE PM TY I (W)4"(SLD) (090MIL) | REFL PAV MRK TY I (W)8"(SLD) (090MIL) | REFL PAV MRK TY I (W)24"(SLD) (090MIL) | REFL PAV MRK TY I (W)(ARROW) (090MIL) | REFL PAV MRK TY I (W)(WORD) (090MIL) |



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**Austin District
South Travis Area Office**

 **Texas Department of Transportation**

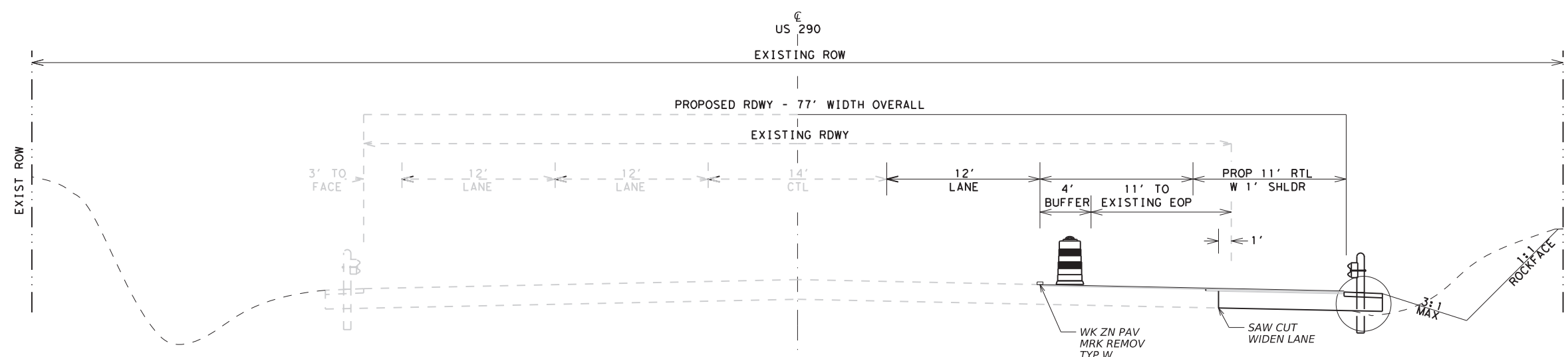
**US 290
STRIPING
LAYOUT**

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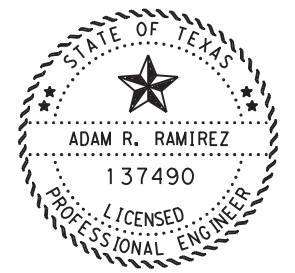
NOTES:

1. NO PLAN VIEW TCP PROVIDED. UTILIZE TCP STANDARDS FOR TRAFFIC CONTROL SETUP AS DIRECTED.
2. USE 3:1 SAFETY SLOPES FOR ALL DROPOFFS GREATER THAN 2-INCHES AT THE END OF WORKSHIFT, CONSIDER THIS SUBSIDIARY TO ITEM 502.
3. MAINTAIN A 1 FT CLEARZONE BETWEEN EDGE OF TRAVEL LANE AND TRAFFIC BARREL.
4. REFER TO BC STANDARDS FOR CHANNELIZING DEVICE SPACING REQUIREMENTS.
5. REFER TO TYPICAL SECTIONS (PROPOSED) FOR DETAILS ON CONSTRUCTION MATERIAL.



TRAFFIC CONTROL PLAN
TYPICAL SECTION

** SEE GENERAL NOTES FOR ALLOWABLE CLOSURE TIME **



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5/30/2024

Austin District
South Travis Area Office



US 290
TCP
TYPICAL SECTION

| | | | |
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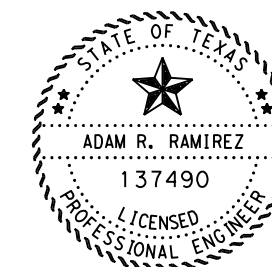
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• HORIZONTAL CURVE DATA

| HORIZONTAL CURVES | | | | | | | SUPERELEVATION RATE, e |
|-------------------|------------|------------|--------------|-------------|-----------|---------|------------------------|
| PC (STA) | PI (STA) | PT (STA) | DELTA | DEGREE | LENGTH | TANGENT | EXISTING |
| 139+65.195 | 146+70.391 | 153+68.529 | 14°02'00.02" | 1°00'00.00" | 1,403.334 | 705.196 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

* US 290 HORIZONTAL CURVE DATA
 INFORMATION TAKEN FROM CSJ: 0113-08-011, DATED OCT. 1995
 (THIS INFORMATION IS ALSO FOUND IN CSJ: 0113-08-064)

THIS PROJECT MEETS THE BASIC SAFETY REQUIREMENTS OF THE 3R DESIGN CRITERIA. GUARD FENCE (INCLUDING CONNECTIONS TO STRUCTURES, POST SPACING AND END TREATMENTS), SIGNING, AND PAVEMENT MARKINGS MEET CURRENT STANDARDS. CROSS DRAINAGE BOX AND PIPE CULVERTS, PARALLEL AND DRIVEWAY CULVERTS, MAILBOX SUPPORTS, LUMINAIRE SUPPORTS AND SIGN SUPPORTS WITHIN THE REQUIRED OBSTRUCTION CLEARANCE OF 16 FEET HAVE BEEN TREATED OR UPGRADED TO STANDARD.



DocuSigned by:

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 5/20/2024

** VERTICAL CURVE DATA

| VERTICAL CURVES | | | | | | | |
|-----------------|-----------|-------------------|--------|--------|--------|-----|---------------|
| PI (STA) | ELEV (FT) | LENGTH (FT) | e (FT) | G1 (%) | G2 (%) | K | K60 MPH (MIN) |
| 149+80 | 1110.67 | NO VERTICAL CURVE | | | 0.34 | | |
| 159+00 | 1113.07 | 1600 | 10.08 | 0.34 | -4.7 | 317 | 190 |
| 175+50 | 1035.52 | 300 | 0.68 | -4.7 | -2.9 | 167 | 120 |
| 182+50 | 1015.96 | NO VERTICAL CURVE | | -2.9 | | | |
| | | | | | | | |
| | | | | | | | |

** US 290 VERTICAL CURVE DATA
 INFORMATION TAKEN FROM CSJ: 0113-08-064, DATED APR. 2001

Austin District
 South Travis Area Office



CURVE DATA

| | | | | |
|--------|------|--------|-----|-----------|
| © 2024 | CONT | SECT | JOB | HIGHWAY |
| | 0113 | 08 | 091 | US 290 |
| | DIST | COUNTY | | SHEET NO. |
| | AUS | TRAVIS | | 14 |

DATE: \$DATE\$ \$TIME\$
 FILE: \$FILES\$

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

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

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

0113-08-091

1.2 PROJECT LIMITS:

From: AT LEDGESTONE TERRACE

To: _____

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 30.2317291, (Long) -97.9275050

END: (Lat) 30.2320097, (Long) -97.9259195

1.4 TOTAL PROJECT AREA (Acres): 0.31

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.11

1.6 NATURE OF CONSTRUCTION ACTIVITY:

Intersection Safety Improvement

Add right turn lane at Ledgestone Terrace

1.7 MAJOR SOIL TYPES:

| Soil Type | Description |
|-----------|---|
| BID | Brackett-Rock outcrop complex, 1 to 12 percent slopes |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

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

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

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

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

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

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

Other: _____

Other: _____

Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

1.11 RECEIVING WATERS:

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

| Tributaries | Classified Waterbody |
|-----------------|----------------------|
| SLAUGHTER CREEK | 1427A |
| | |
| | |
| | |
| | |
| | |

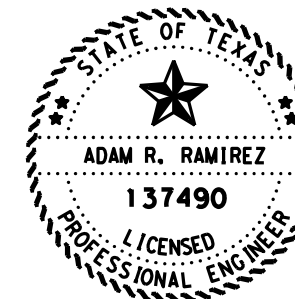
* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: _____
- Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: _____
- Other: _____



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Adam R. Ramirez

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7/23/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

© 2023 July 2023 Sheet 1 of 2

Texas Department of Transportation

| | | | | |
|-------------------|-------------|--------|-------------|-----------|
| FED. RD. DIV. NO. | PROJECT NO. | | | SHEET NO. |
| | F 2025(030) | | | 15 |
| STATE | STATE DIST. | COUNTY | | |
| TEXAS | AUS | TRAVIS | | |
| CONT. | SECT. | JOB | HIGHWAY NO. | |
| 0113 | 08 | 091 | US 290 | |

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

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

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

Other: _____

Other: _____

Other: _____

Other: _____

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

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

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

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

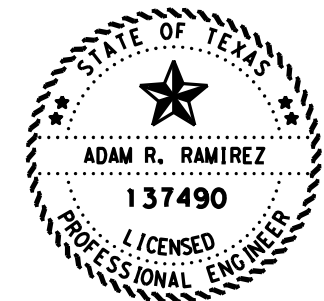
Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment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

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.



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 7/23/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

© 2023 July 2023 Sheet 2 of 2
 Texas Department of Transportation

| | | | | |
|-------------------|-------------|--------|-------------|-----------|
| FED. RD. DIV. NO. | PROJECT NO. | | | SHEET NO. |
| | F 2025(030) | | | 16 |
| STATE | STATE DIST. | COUNTY | | |
| TEXAS | AUS | TRAVIS | | |
| CONT. | SECT. | JOB | HIGHWAY NO. | |
| 0113 | 08 | 091 | US 290 | |

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DATE: FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.
2.
 No Action Required Required Action

Action No.

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

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
 Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
 Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
 Individual 404 Permit Required
 Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

| | | |
|---|--|--|
| Erosion | Sedimentation | Post-Construction TSS |
| <input type="checkbox"/> Temporary Vegetation | <input checked="" type="checkbox"/> Silt Fence | <input type="checkbox"/> Vegetative Filter Strips |
| <input type="checkbox"/> Blankets/Matting | <input type="checkbox"/> Rock Berm | <input type="checkbox"/> Retention/Irrigation Systems |
| <input type="checkbox"/> Mulch | <input type="checkbox"/> Triangular Filter Dike | <input type="checkbox"/> Extended Detention Basin |
| <input type="checkbox"/> Sodding | <input type="checkbox"/> Sand Bag Berm | <input type="checkbox"/> Constructed Wetlands |
| <input type="checkbox"/> Interceptor Swale | <input type="checkbox"/> Straw Bale Dike | <input type="checkbox"/> Wet Basin |
| <input type="checkbox"/> Diversion Dike | <input type="checkbox"/> Brush Berms | <input type="checkbox"/> Erosion Control Compost |
| <input type="checkbox"/> Erosion Control Compost | <input type="checkbox"/> Erosion Control Compost | <input type="checkbox"/> Mulch Filter Berm and Socks |
| <input type="checkbox"/> Mulch Filter Berm and Socks | <input type="checkbox"/> Mulch Filter Berm and Socks | <input type="checkbox"/> Compost Filter Berm and Socks |
| <input checked="" type="checkbox"/> Compost Filter Berm and Socks | <input type="checkbox"/> Compost Filter Berm and Socks | <input type="checkbox"/> Vegetation Lined Ditches |
| | <input type="checkbox"/> Stone Outlet Sediment Traps | <input type="checkbox"/> Sand Filter Systems |
| | <input type="checkbox"/> Sediment Basins | <input type="checkbox"/> Grassy Swales |

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required Required Action

Action No.

1.
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required Required Action

Action No.

1.
2.
3.
4.

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

- No Action Required Required Action

Action No.

1.
2.
3.
4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

| | |
|---|---|
| BMP: Best Management Practice | SPCC: Spill Prevention Control and Countermeasure |
| CGP: Construction General Permit | SW3P: Storm Water Pollution Prevention Plan |
| DSHS: Texas Department of State Health Services | PCN: Pre-Construction Notification |
| FHWA: Federal Highway Administration | PSL: Project Specific Location |
| MOA: Memorandum of Agreement | TCEQ: Texas Commission on Environmental Quality |
| MOU: Memorandum of Understanding | TPDES: Texas Pollutant Discharge Elimination System |
| MS4: Municipal Separate Stormwater Sewer System | TPWD: Texas Parks and Wildlife Department |
| MBTA: Migratory Bird Treaty Act | TxDOT: Texas Department of Transportation |
| NOT: Notice of Termination | T&E: Threatened and Endangered Species |
| NWP: Nationwide Permit | USACE: U.S. Army Corps of Engineers |
| NOI: Notice of Intent | USFWS: U.S. Fish and Wildlife Service |

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

1.
2.
3.


VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required Required Action

Action No.

1.
2.
3.

| | | | |
|---|-----------|---------------------------------|-----------|
|  Texas Department of Transportation | | <i>Design Division Standard</i> | |
| ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS | | | |
| EPIC | | | |
| FILE: epic.dgn | DN: TxDOT | CK: RG | DW: VP |
| ©TxDOT: February 2015 | CONT | SECT | JOB |
| 12-12-2011 (DS) REVISIONS | 0113 | 08 | 091 |
| 05-07-14 ADDED NOTE SECTION IV. | DIST | COUNTY | SHEET NO. |
| 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES. | AUS | TRAVIS | 17 |

DATE: 4/26/2024 12:09:16 PM
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- 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:


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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

- Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
- Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

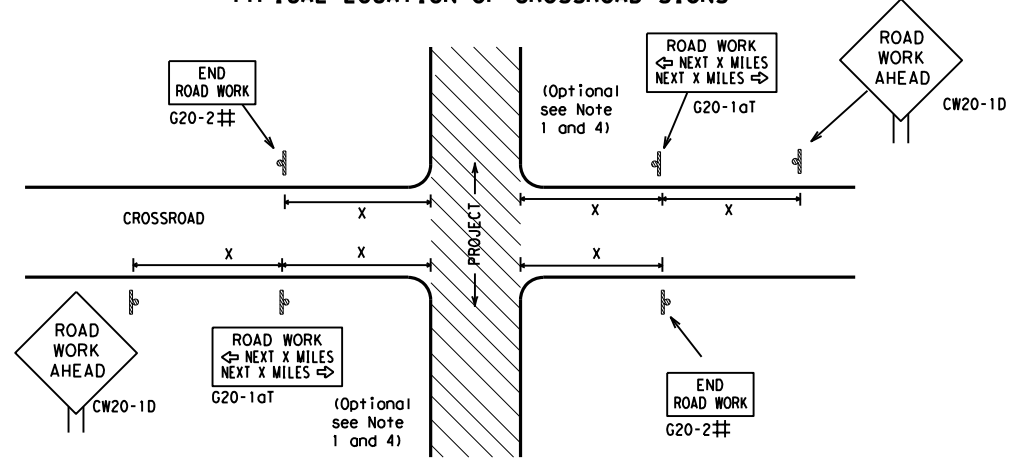
| |
|---|
| THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov |
| COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD) |
| DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) |
| MATERIAL PRODUCER LIST (MPL) |
| ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)" |
| STANDARD HIGHWAY SIGN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

SHEET 1 OF 12

| | | | |
|--|---------------|----------------------------------|-----------|
|  Texas Department of Transportation | | Traffic Safety Division Standard | |
| BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS | | | |
| BC (1) - 21 | | | |
| FILE: | bc-21.dgn | DN: | TxDOT |
| © TxDOT | November 2002 | CK: | TxDOT |
| | | DW: | TxDOT |
| | | CK: | TxDOT |
| | | CONT | SECT |
| | | 0113 | 08 |
| | | JOB | HIGHWAY |
| | | 091 | US 290 |
| 4-03 | 7-13 | DIST | COUNTY |
| 9-07 | 8-14 | | |
| 5-10 | 5-21 | AUS | TRAVIS |
| | | | SHEET NO. |
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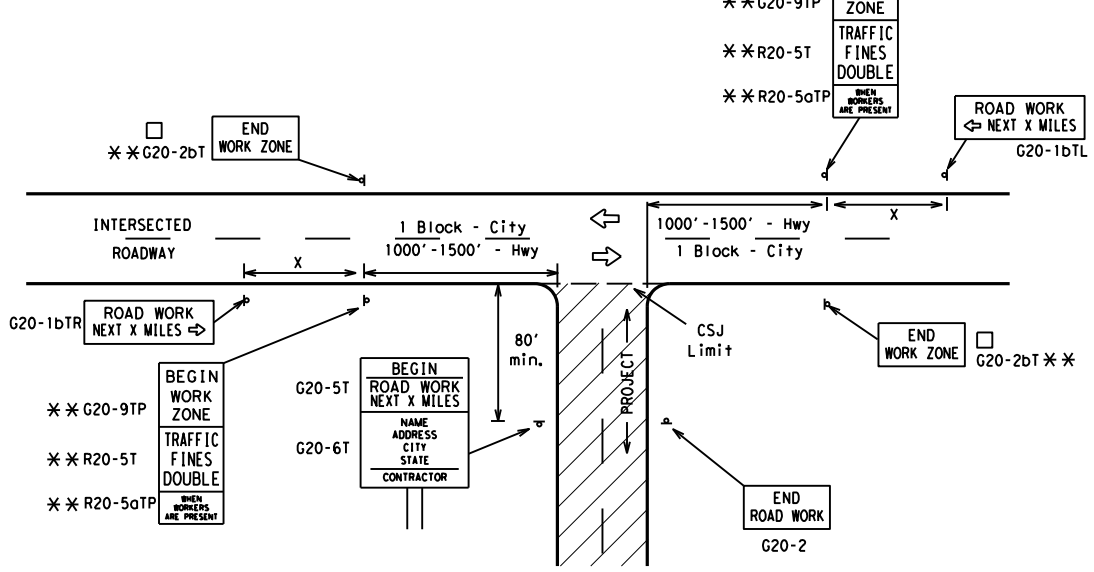
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
 - 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.
 - 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.
 - 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.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - 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

- 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.
- 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}

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

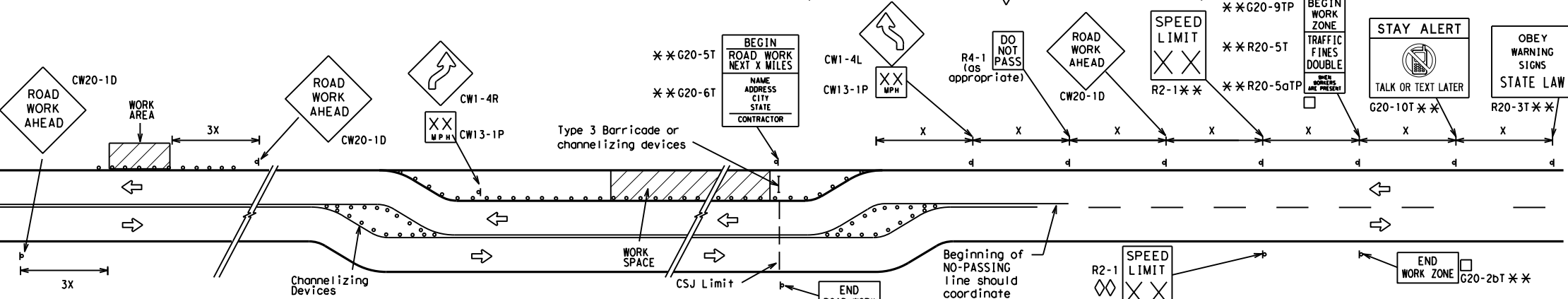
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

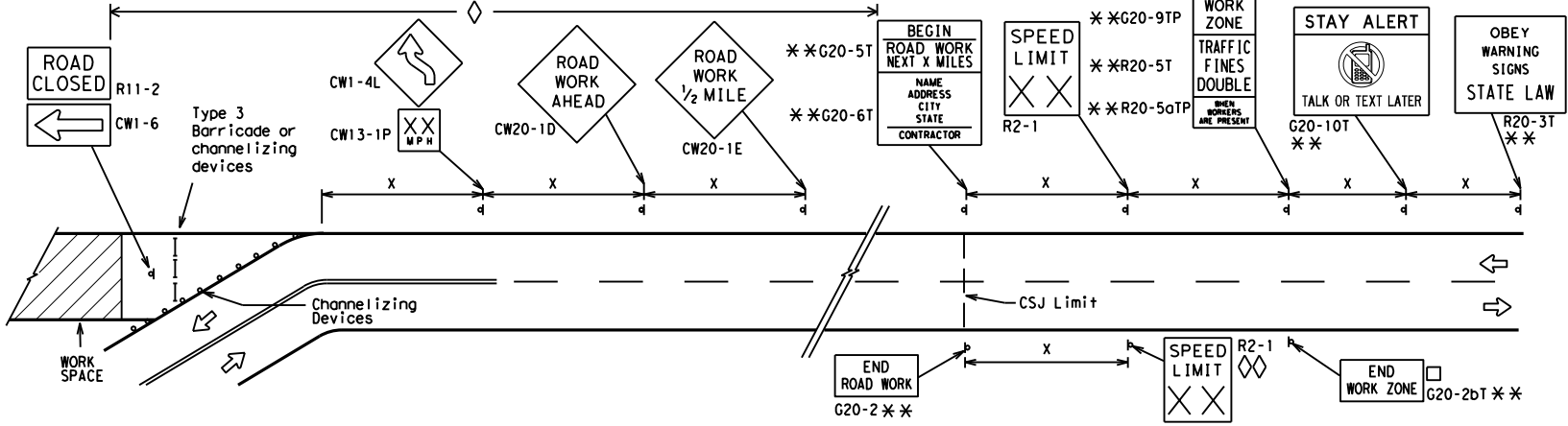
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be 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".
- Only diamond shaped warning sign sizes are indicated.
- 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

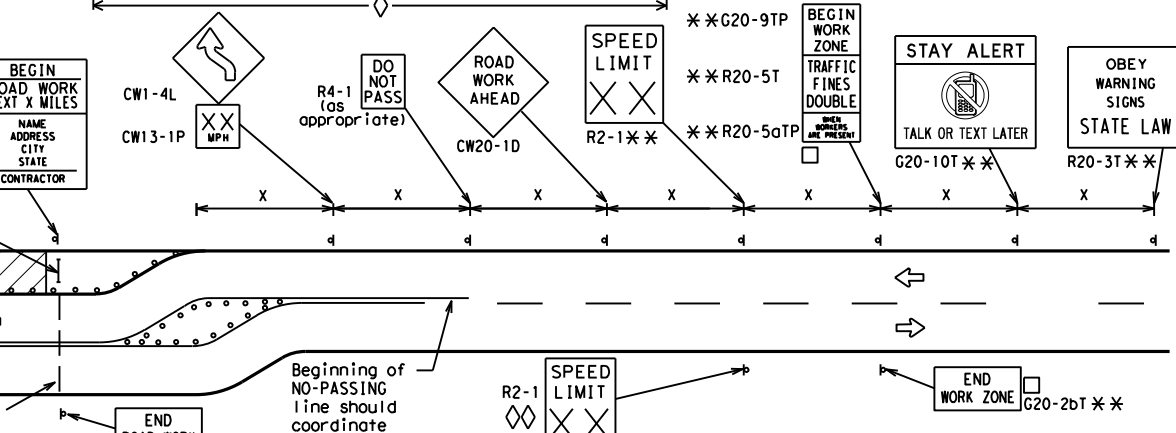


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

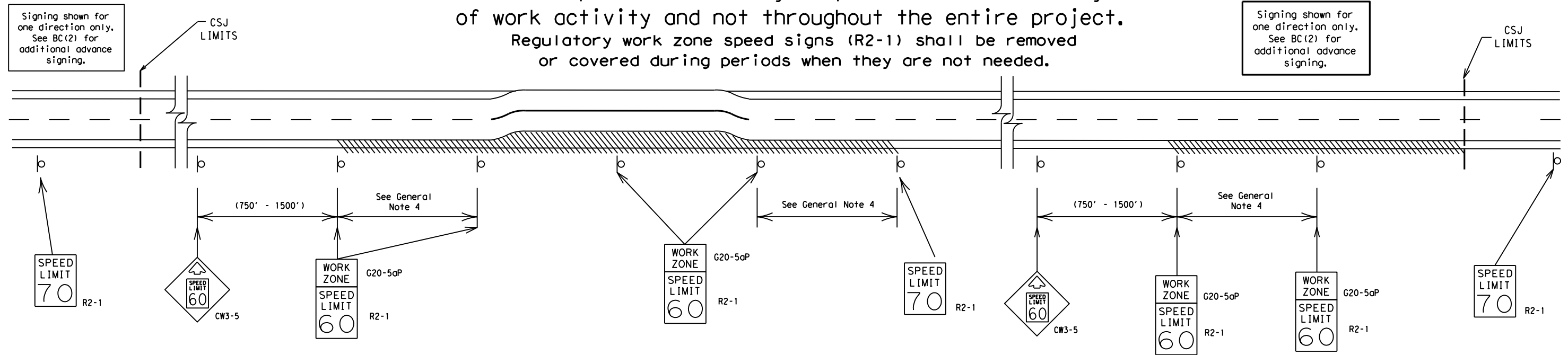
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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 |
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



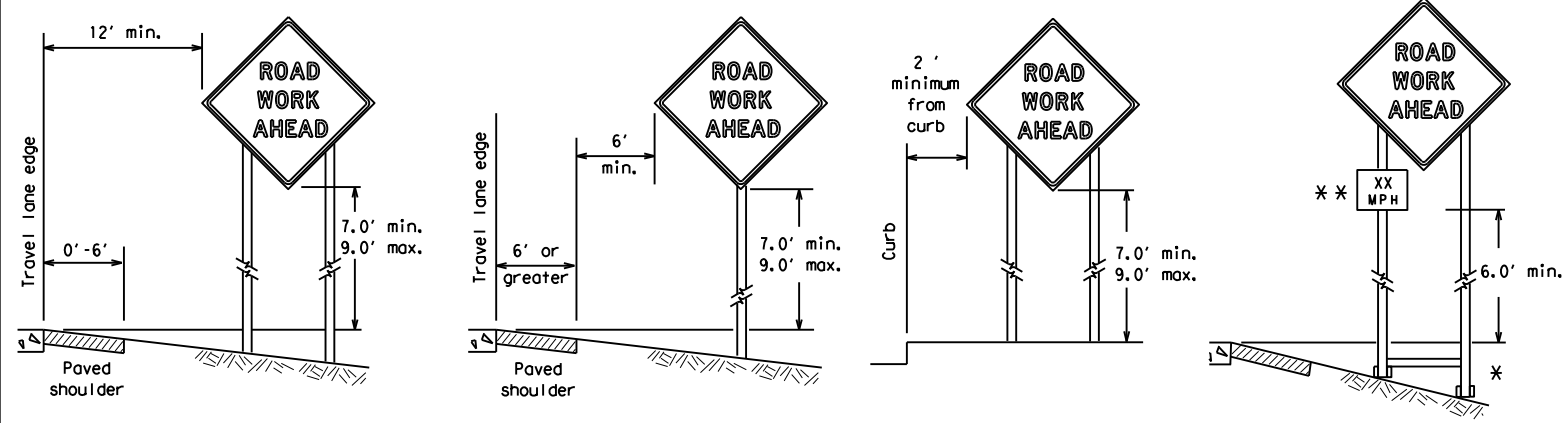
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

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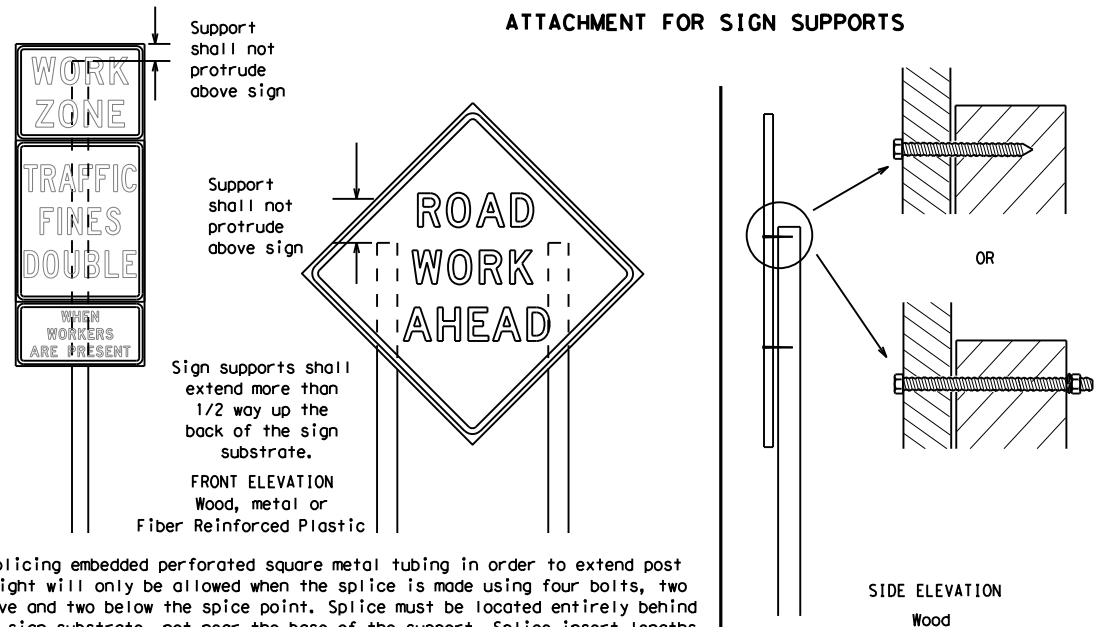
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice 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.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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)

- 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.
 - Long-term stationary - work that occupies a location more than 3 days.
 - 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.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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

- 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

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- 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

- 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).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- 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

- 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

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- 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.
- 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.
- 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.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

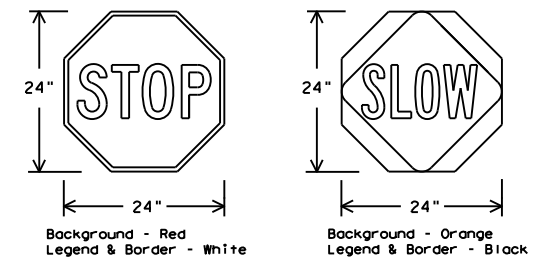
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- 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.
- 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.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- 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.

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- 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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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.



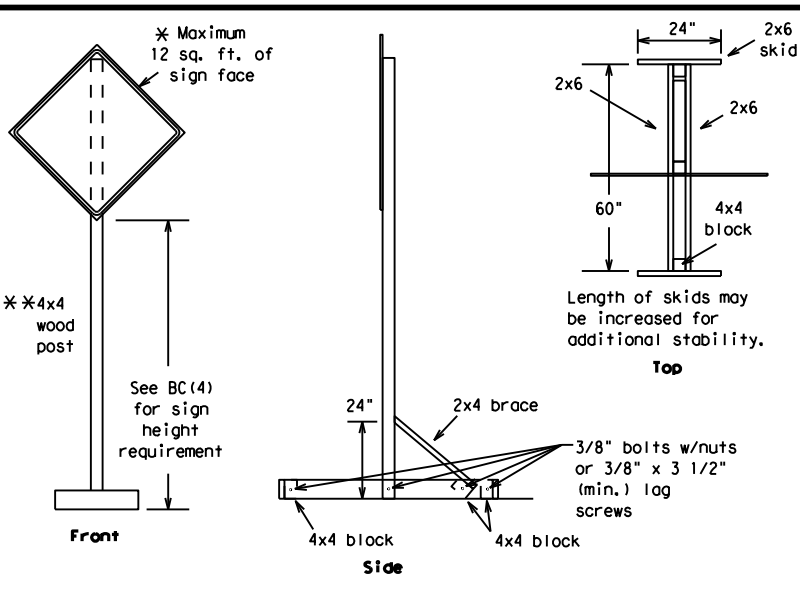
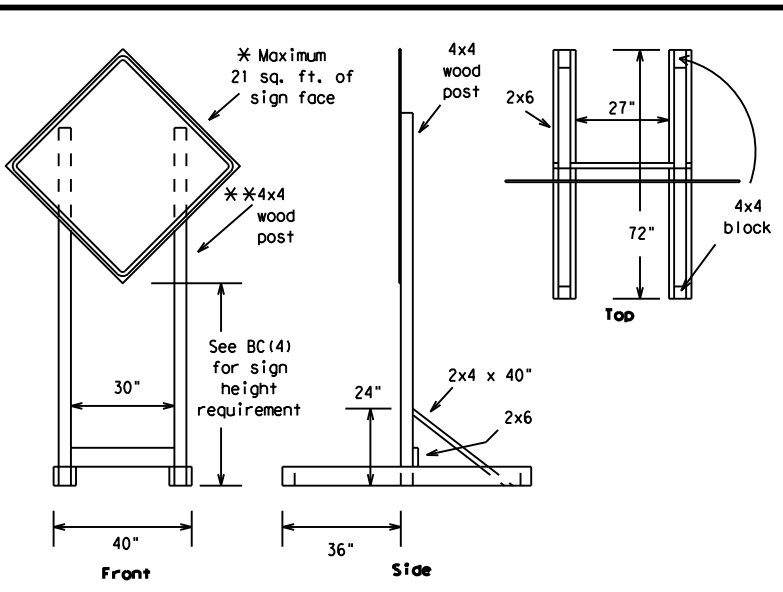
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

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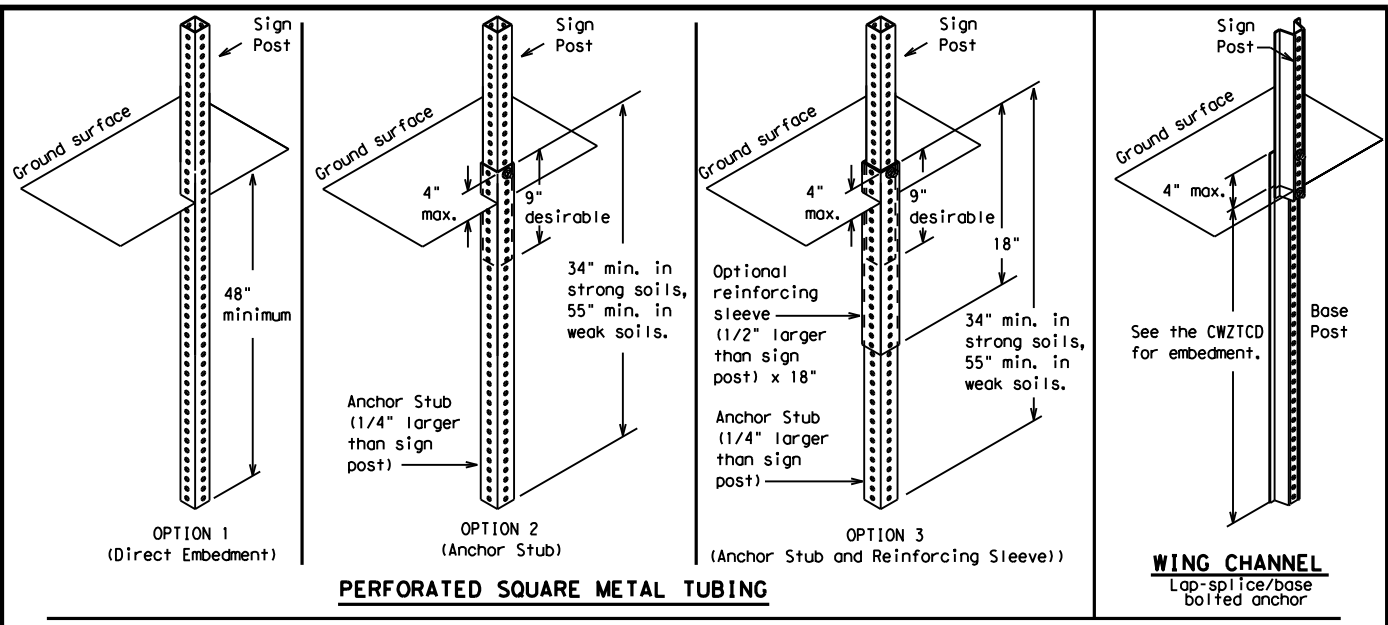
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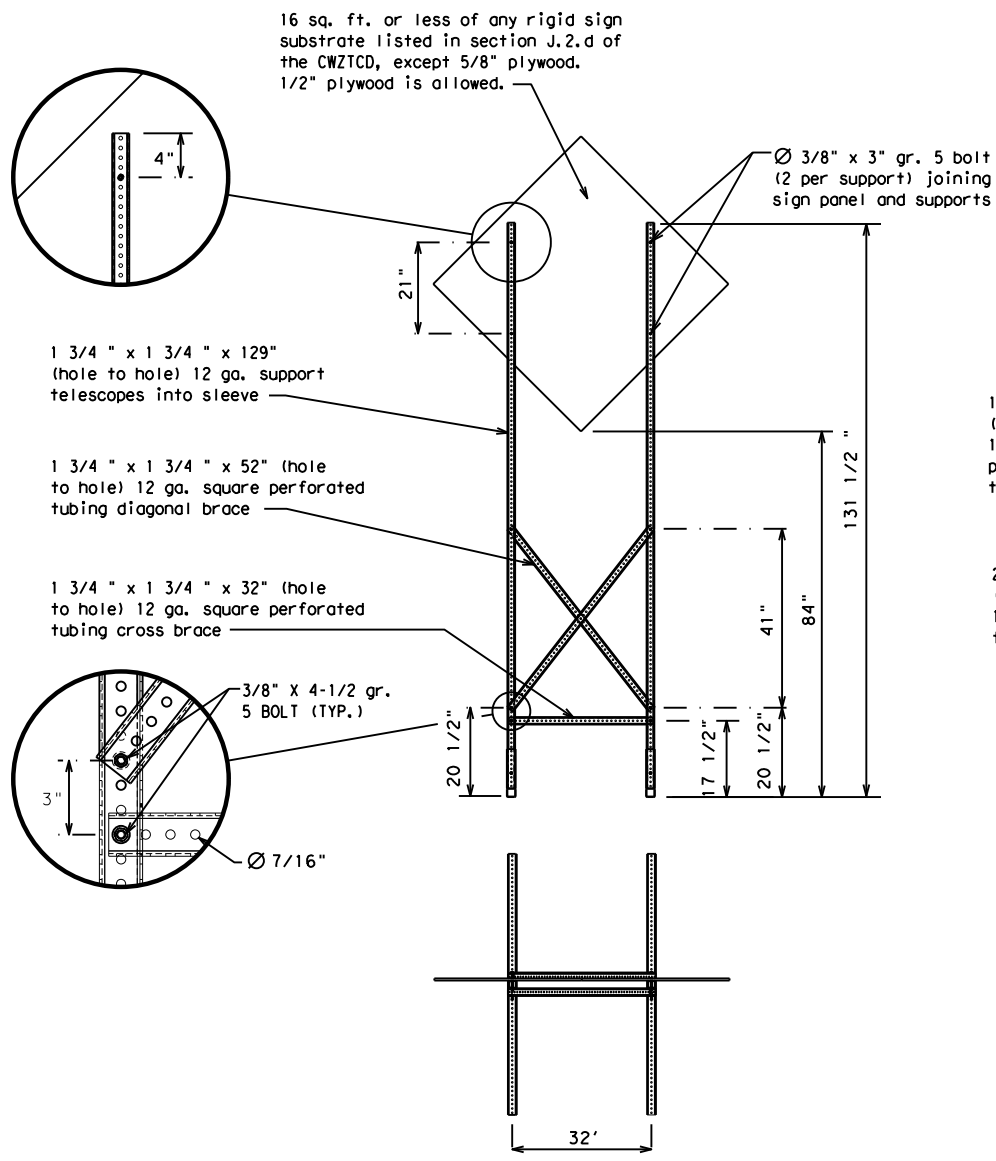
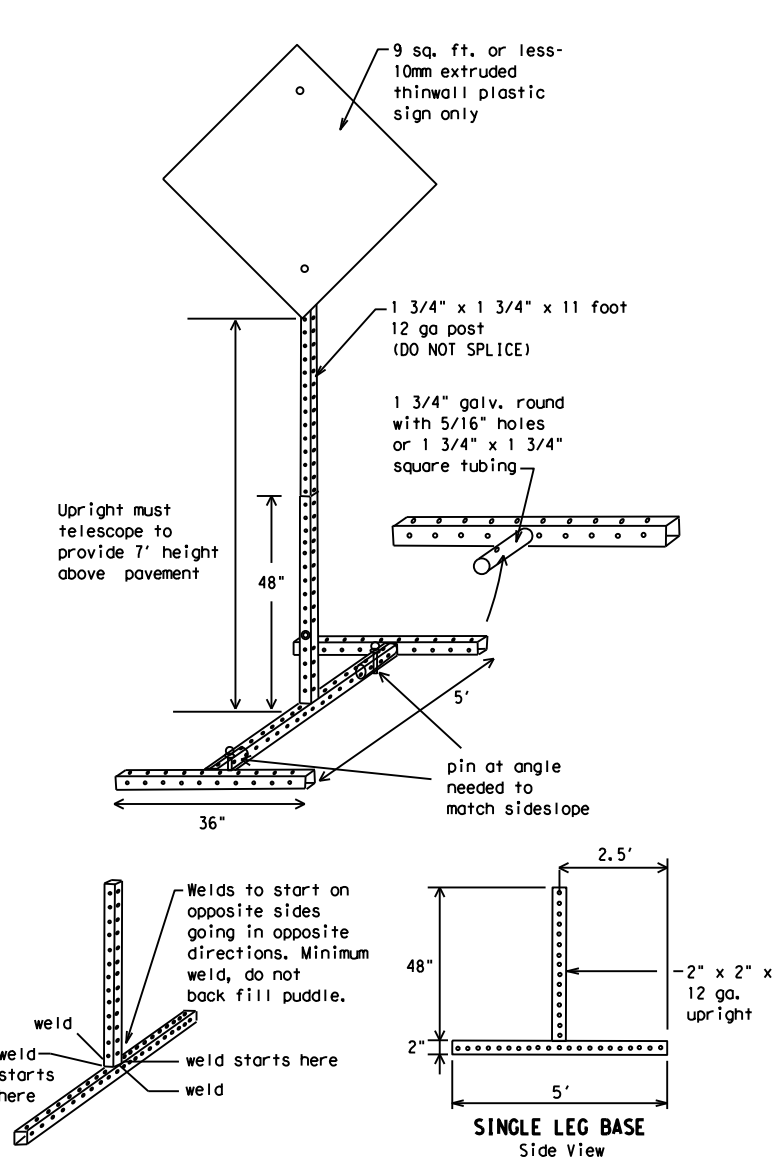
SKID MOUNTED WOOD SIGN SUPPORTS

* 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**
- Nails may be used in the assembly of wooden sign supports, but 3/8 inch bolts with nuts or 3/8 inch x 3 1/2 inch lag screws must be used on every joint for final connection.
 - No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
 - 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.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- 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.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

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 |
| XXXXXXXXX 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 |
| XXXXXXXXX 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

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- 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

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.

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| WORD OR PHRASE | ABBREVIATION | WORD OR PHRASE | ABBREVIATION |
|------------------------|--------------|----------------|--------------|
| Access Road | ACCS RD | Major | MAJ |
| Alternate | ALT | Miles | MI |
| Avenue | AVE | Miles Per Hour | MPH |
| Best Route | BEST RTE | Minor | MNR |
| Boulevard | BLVD | Monday | MON |
| Bridge | BRDG | Normal | NORM |
| Canal | CANT | North | N |
| Center | CTR | Northbound | (route) N |
| Construction Ahead | CONST AHD | Parking | PKING |
| CROSSING | XING | Road | RD |
| Detour Route | DETOUR RTE | Right Lane | RT LN |
| Do Not | DONT | Saturday | SAT |
| East | E | Service Road | SERV RD |
| Eastbound | (route) E | Shoulder | SHLDR |
| Emergency | EMER | Slippery | SLIP |
| Emergency Vehicle | EMER VEH | South | S |
| Entrance, Enter | ENT | Southbound | (route) S |
| Express Lane | EXP LN | Speed | SPD |
| Expressway | EXPWY | Street | ST |
| XXXX Feet | XXXX FT | Sunday | SUN |
| Fog Ahead | FOG AHD | Telephone | PHONE |
| Freeway | FRWY, FWY | Temporary | TEMP |
| Freeway Blocked | FWY BLKD | Thursday | THURS |
| Friday | FRI | To Downtown | TO DWNTN |
| Hazardous Driving | HAZ DRIVING | Traffic | TRAF |
| Hazardous Material | HAZMAT | Travelers | TRVLR |
| High-Occupancy Vehicle | HOV | Tuesday | TUES |
| Highway | Hwy | Time Minutes | TIME MIN |
| Hour(s) | HR, HRS | Upper Level | UPR LEVEL |
| Information | INFO | Vehicles (s) | VEH, VEHS |
| It Is | ITS | Warning | WARN |
| Junction | JCT | Wednesday | WED |
| Left | LFT | Weight Limit | WT LIMIT |
| Left Lane | LFT LN | West | W |
| Lane Closed | LN CLOSED | Westbound | (route) W |
| Lower Level | LWR LEVEL | Wet Pavement | WET PVMT |
| Maintenance | MAINT | Will Not | WONT |

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



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

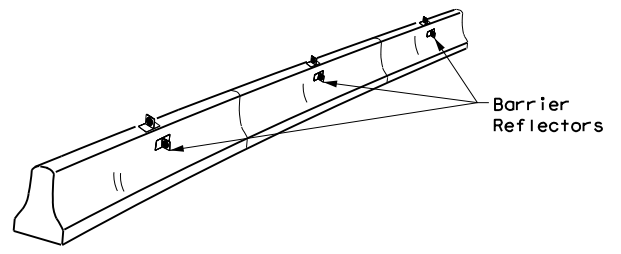
BC (6) - 21

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| REVISIONS | 0113 | 08 | 091 | US 290 |
| 9-07 8-14 | DIST | COUNTY | SHEET NO. | |
| 7-13 5-21 | AUS | TRAVIS | 23 | |

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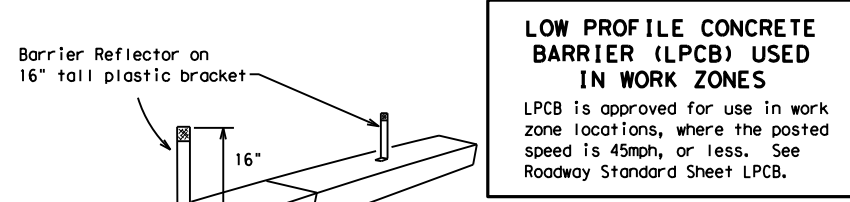
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



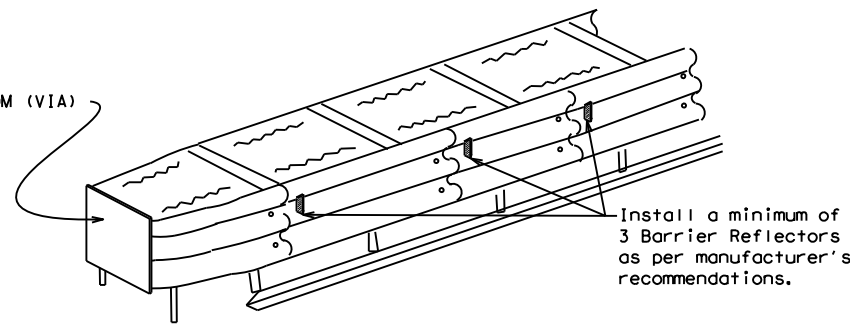
CONCRETE TRAFFIC BARRIER (CTB)

- 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



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 appropriate 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

WARNING LIGHTS

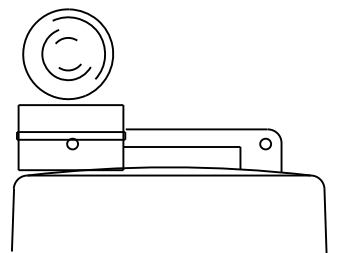
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

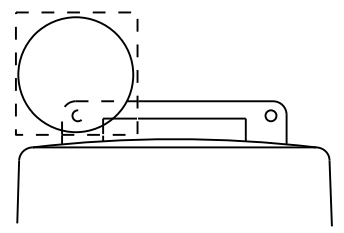
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 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

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



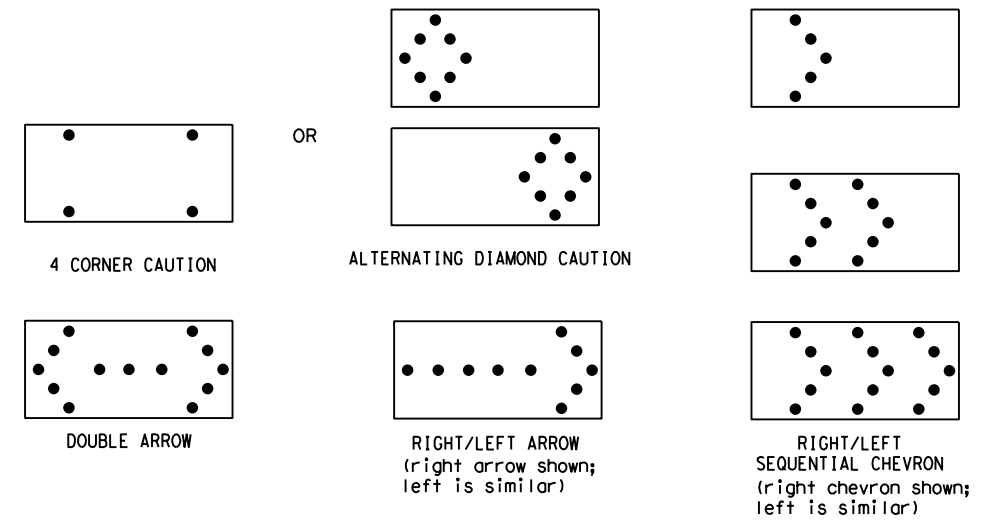
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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.



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

BC (7) -21

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- 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).
- 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.
- 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

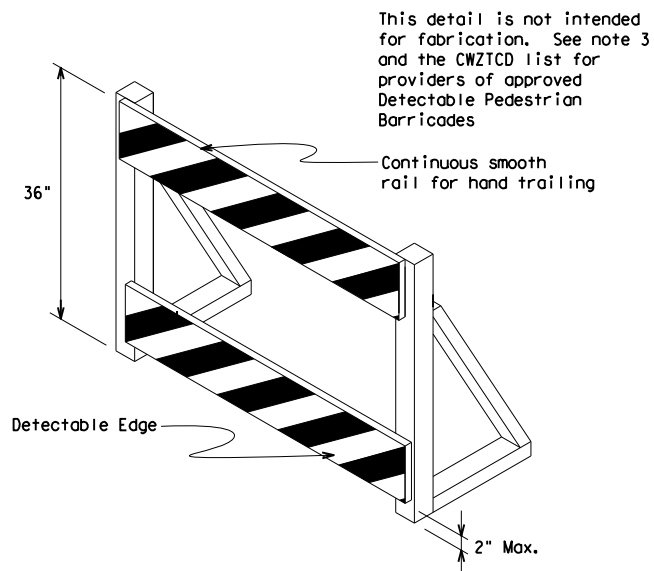
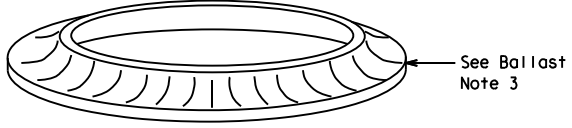
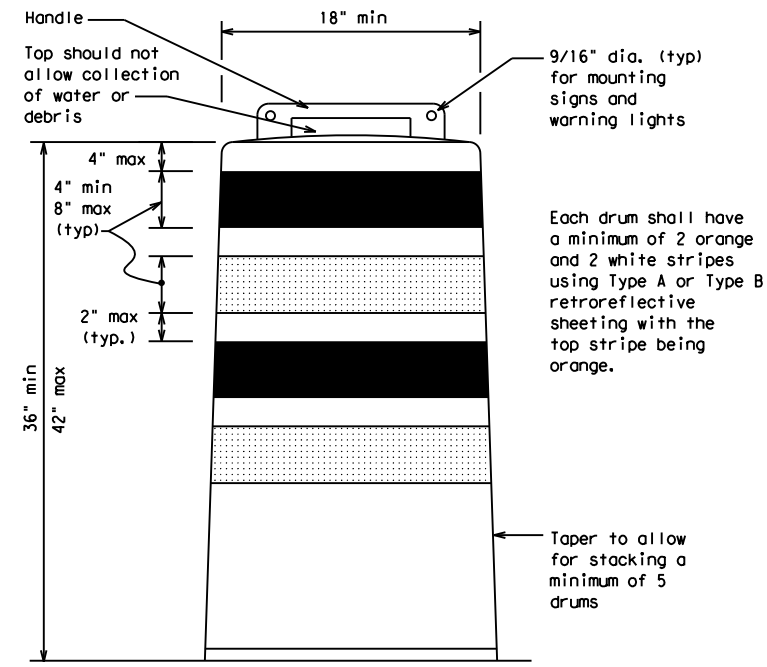
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
 - The body and base shall lock together in such a manner that the body separates from the base when impacted 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.
 - 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.
 - 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.
 - 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.
 - 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.
 - 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.
 - Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
 - Drum body shall have a maximum unballasted weight of 11 lbs.
 - Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- 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.
- 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.

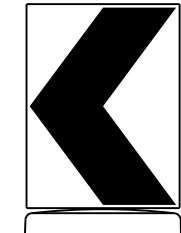
BALLAST

- 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.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

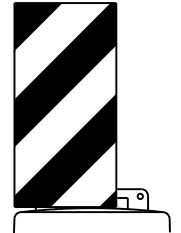


DETECTABLE PEDESTRIAN BARRICADES

- 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.
- 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.
- 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.
- 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.
- Warning lights shall not be attached to detectable pedestrian barricades.
- 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

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- 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.
- 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.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- 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.

SHEET 8 OF 12



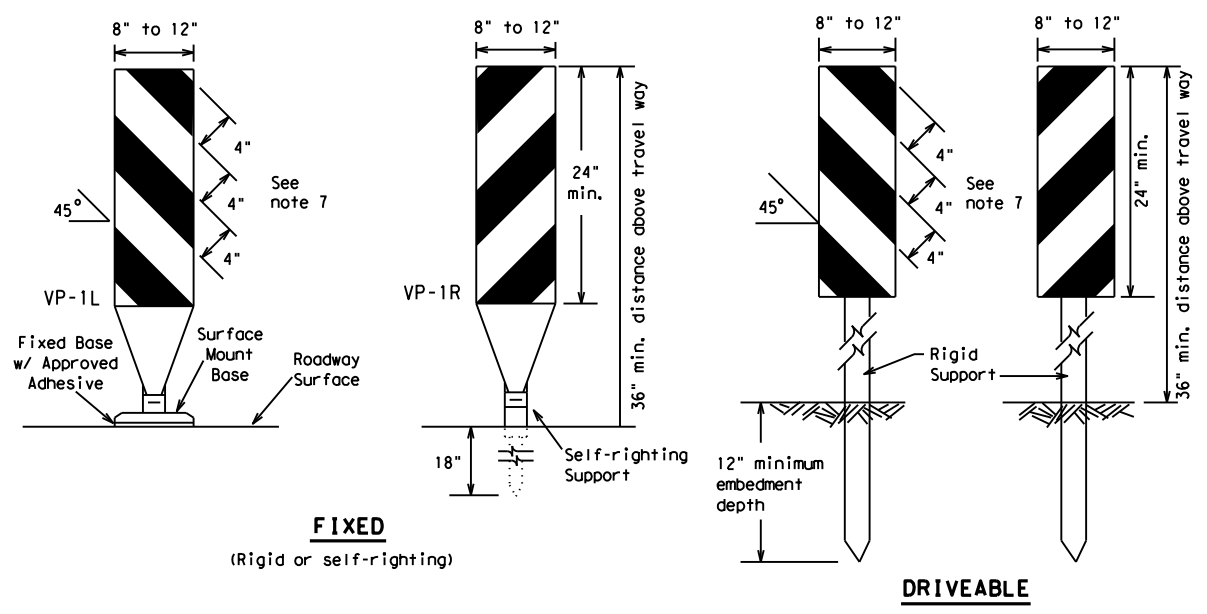
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

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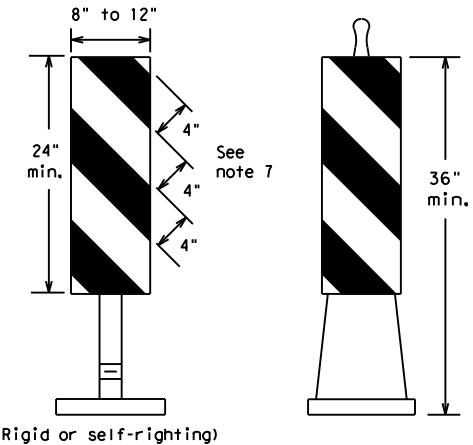
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FIXED
(Rigid or self-righting)

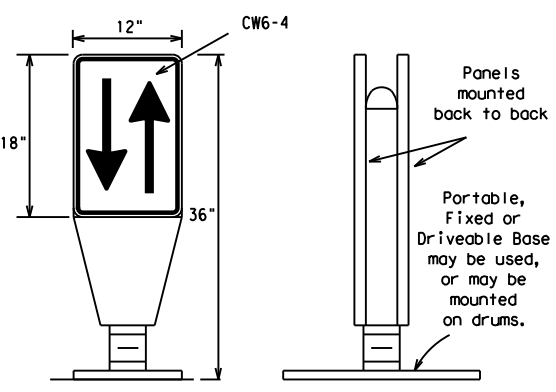
DRIVEABLE



PORTABLE

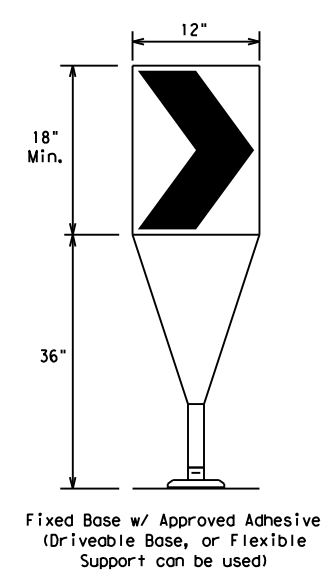
VERTICAL PANELS (VPs)

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 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.
- 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.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- 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)

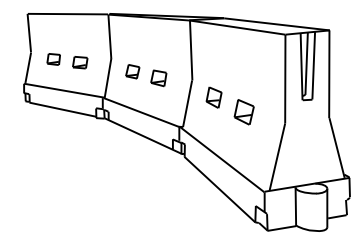
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 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)

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- 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.
- 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)

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 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

- 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.
- 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.
- 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.
- 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.
- 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

- 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).
- 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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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 * * | | | Suggested Maximum Spacing of Channelizing Devices | |
|--------------|--------------------------|-------------------------------------|------------|------------|---|--------------|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent |
| 30 | L = 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



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

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TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.

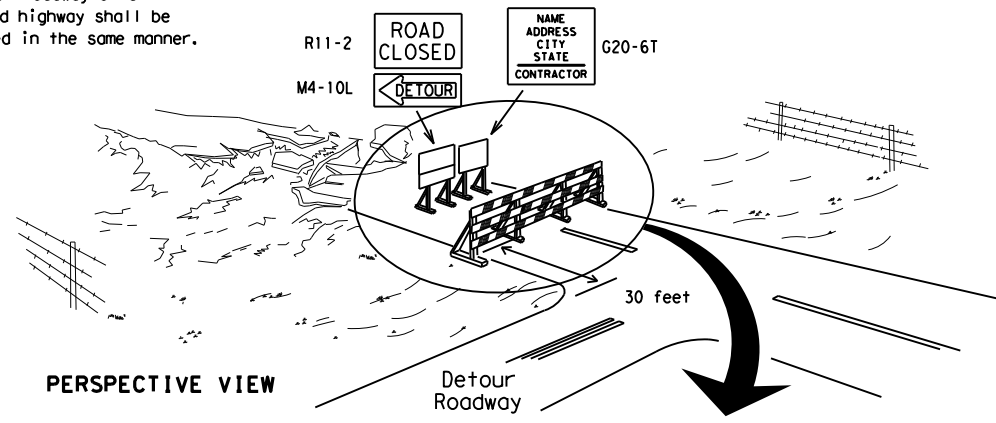


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



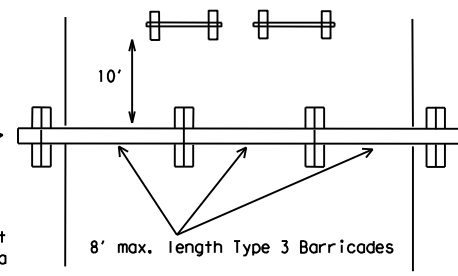
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

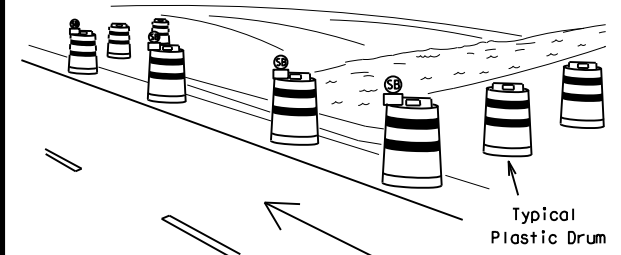
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



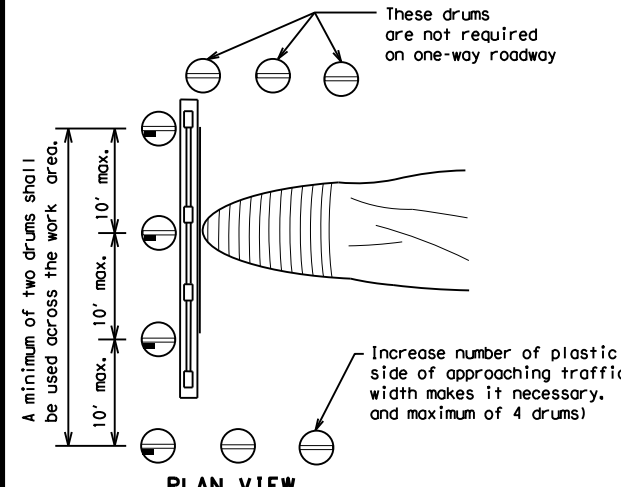
PLAN VIEW

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

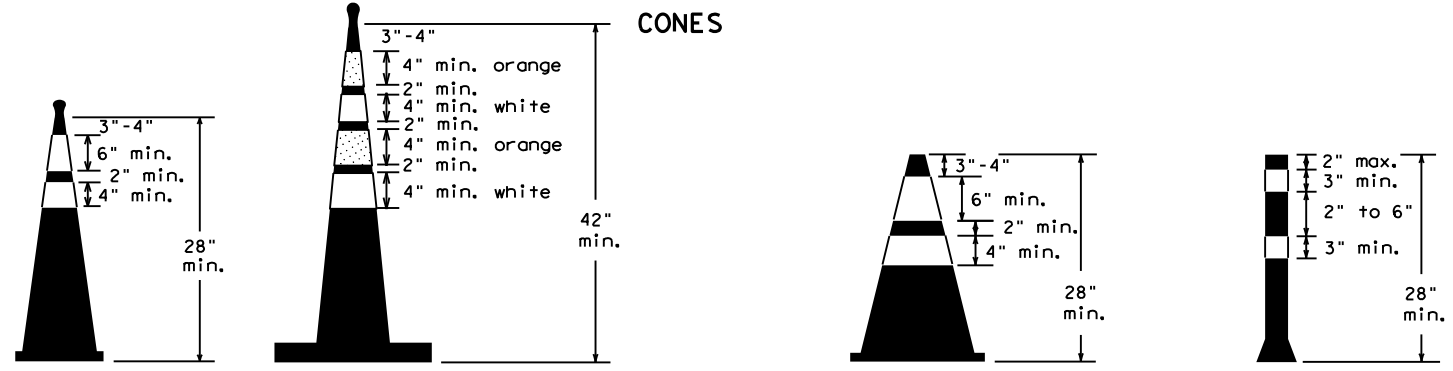


PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

1. Where positive redirection 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 |
| | Steady burn warning light or yellow warning reflector |

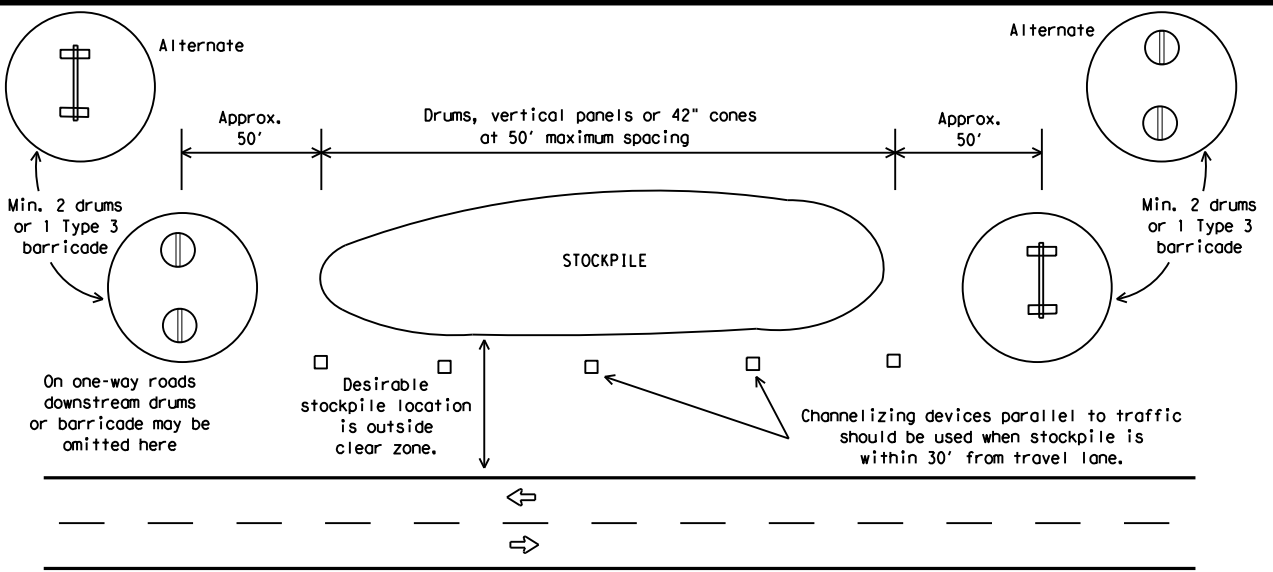


Two-Piece cones

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.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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.



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) -21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

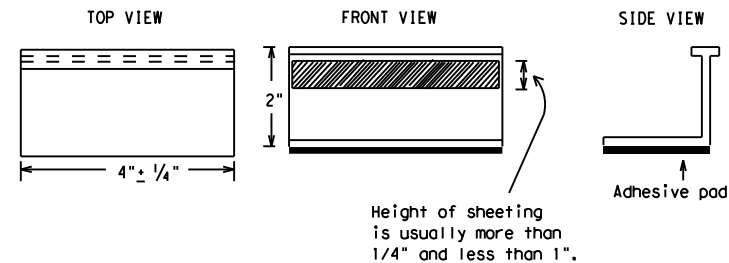
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
 - 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.
 - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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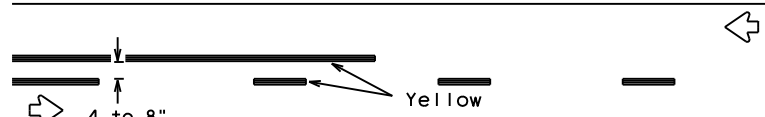
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PAVEMENT MARKING PATTERNS

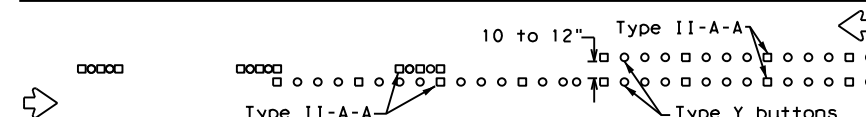


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

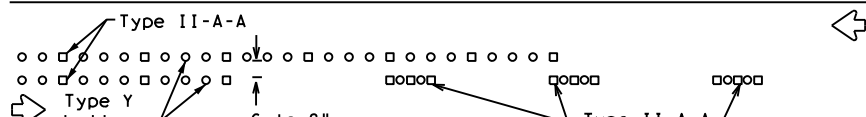


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.



RAISED PAVEMENT MARKERS - PATTERN A



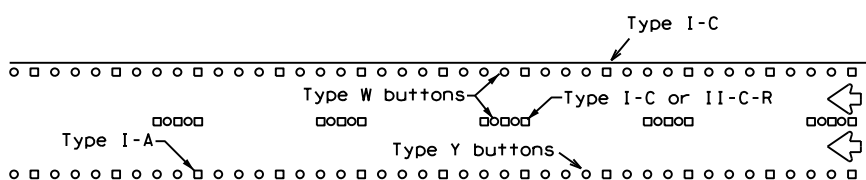
RAISED PAVEMENT MARKERS - PATTERN B

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



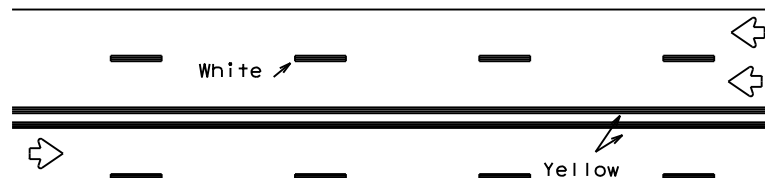
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



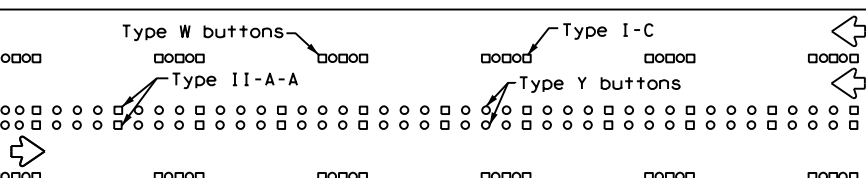
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



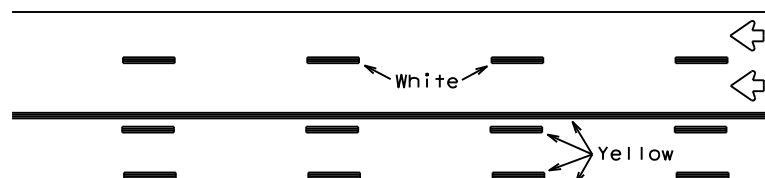
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



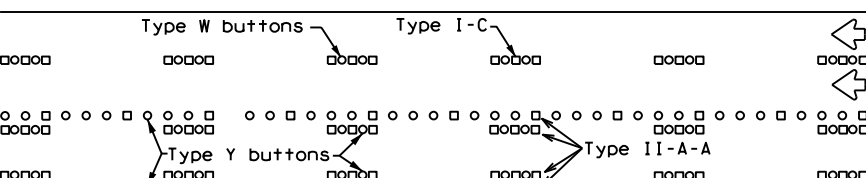
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

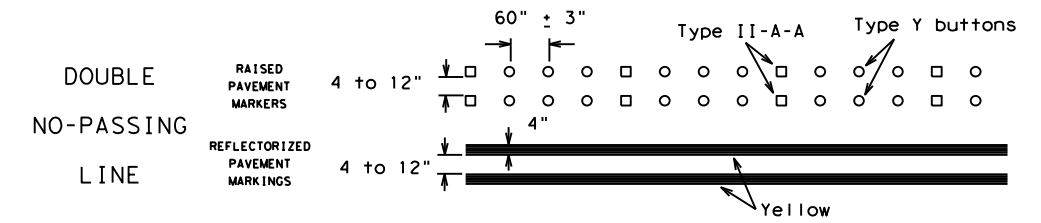
Prefabricated markings may be substituted for reflectORIZED pavement markings.



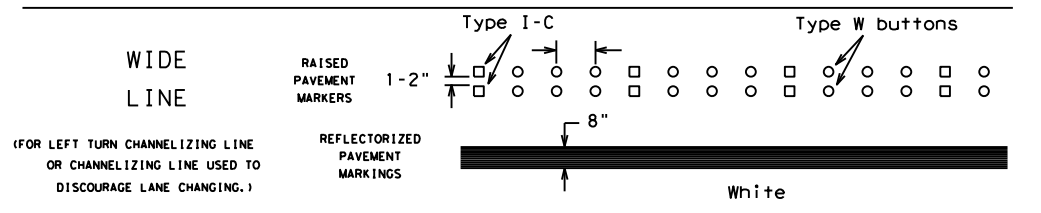
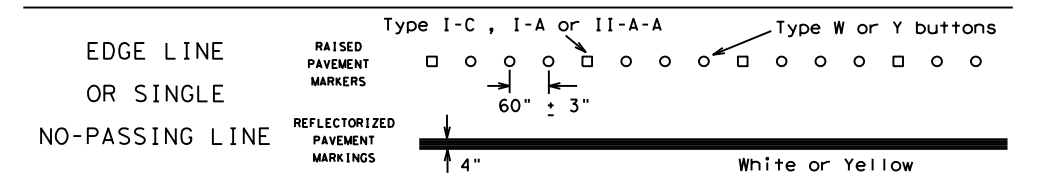
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

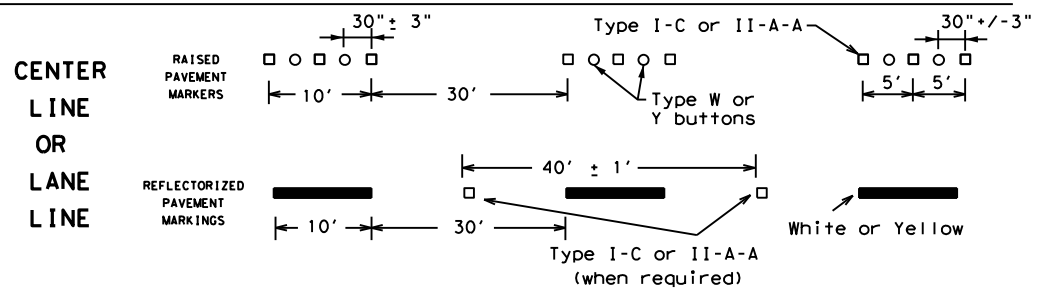
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



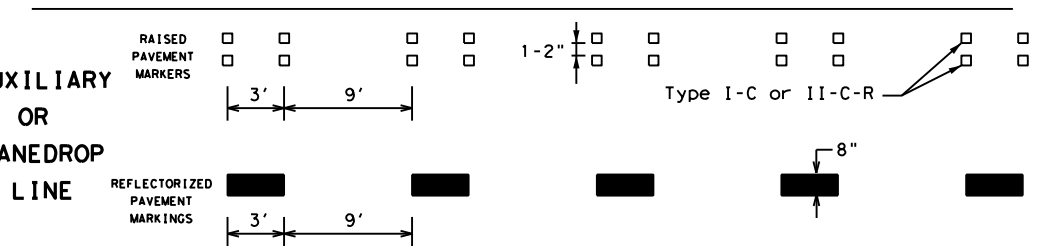
SOLID LINES



BROKEN LINES

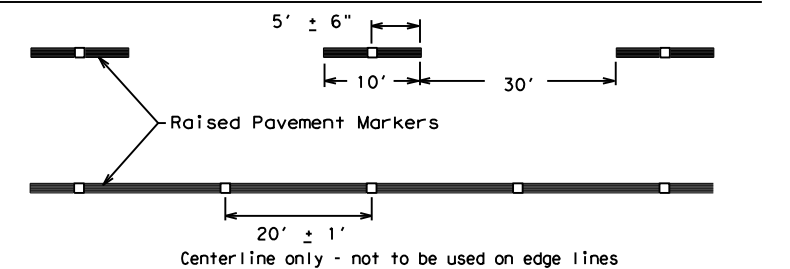


AUXILIARY OR LANEDROP LINE



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.



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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."

| | | | | |
|----------------------|-----------|-----------|-----------|--------------|
| FILE: bc-21.dgn | DN: TxDOT | CK: TxDOT | OW: TxDOT | CK: TxDOT |
| ©TxDOT February 1998 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| 1-97 9-07 5-21 | | | | |
| 2-98 7-13 | | | | |
| 11-02 8-14 | AUS | | TRAVIS | SHEET NO. 29 |

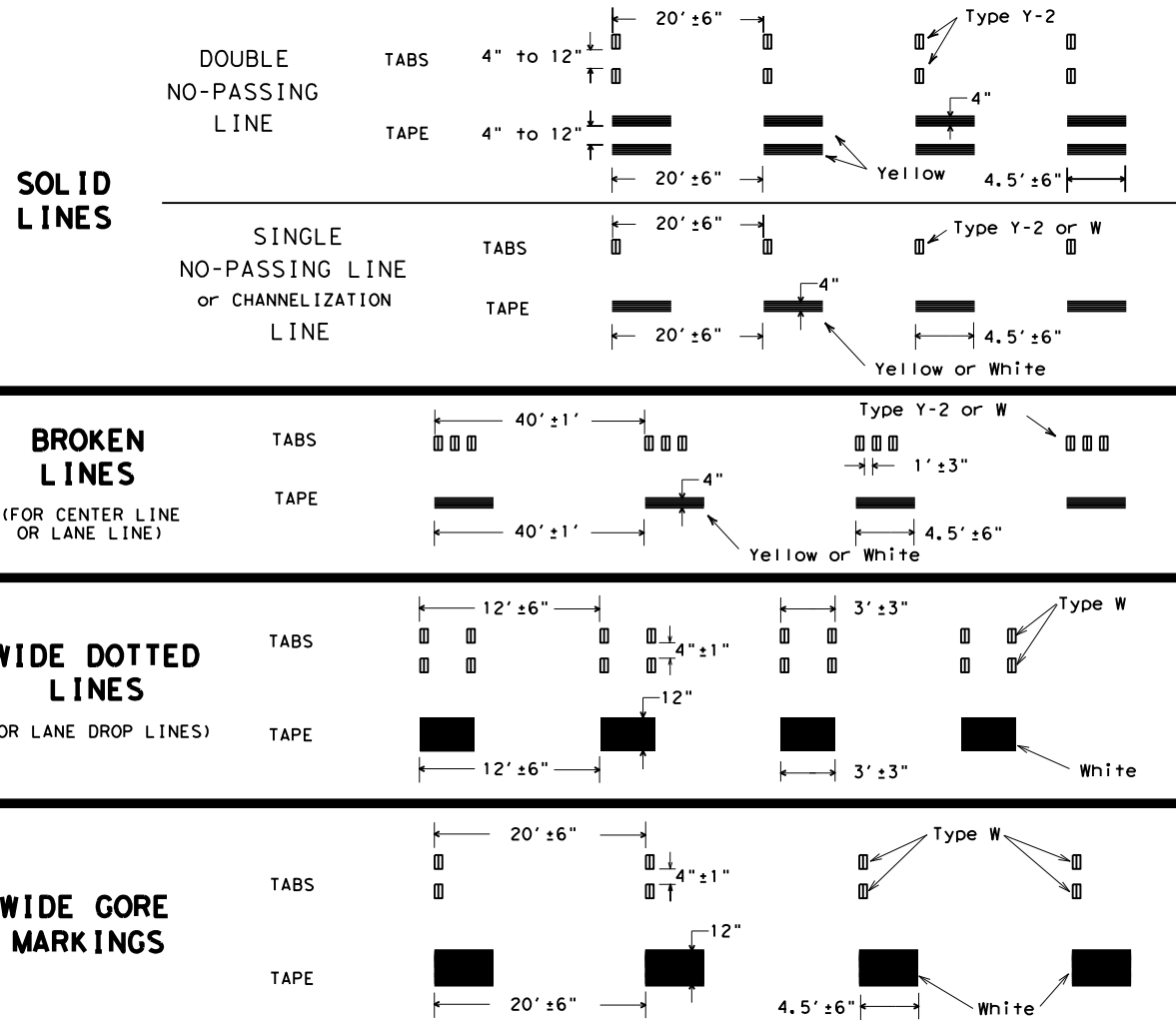
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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



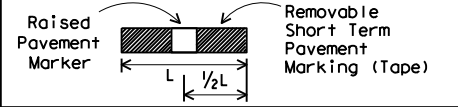
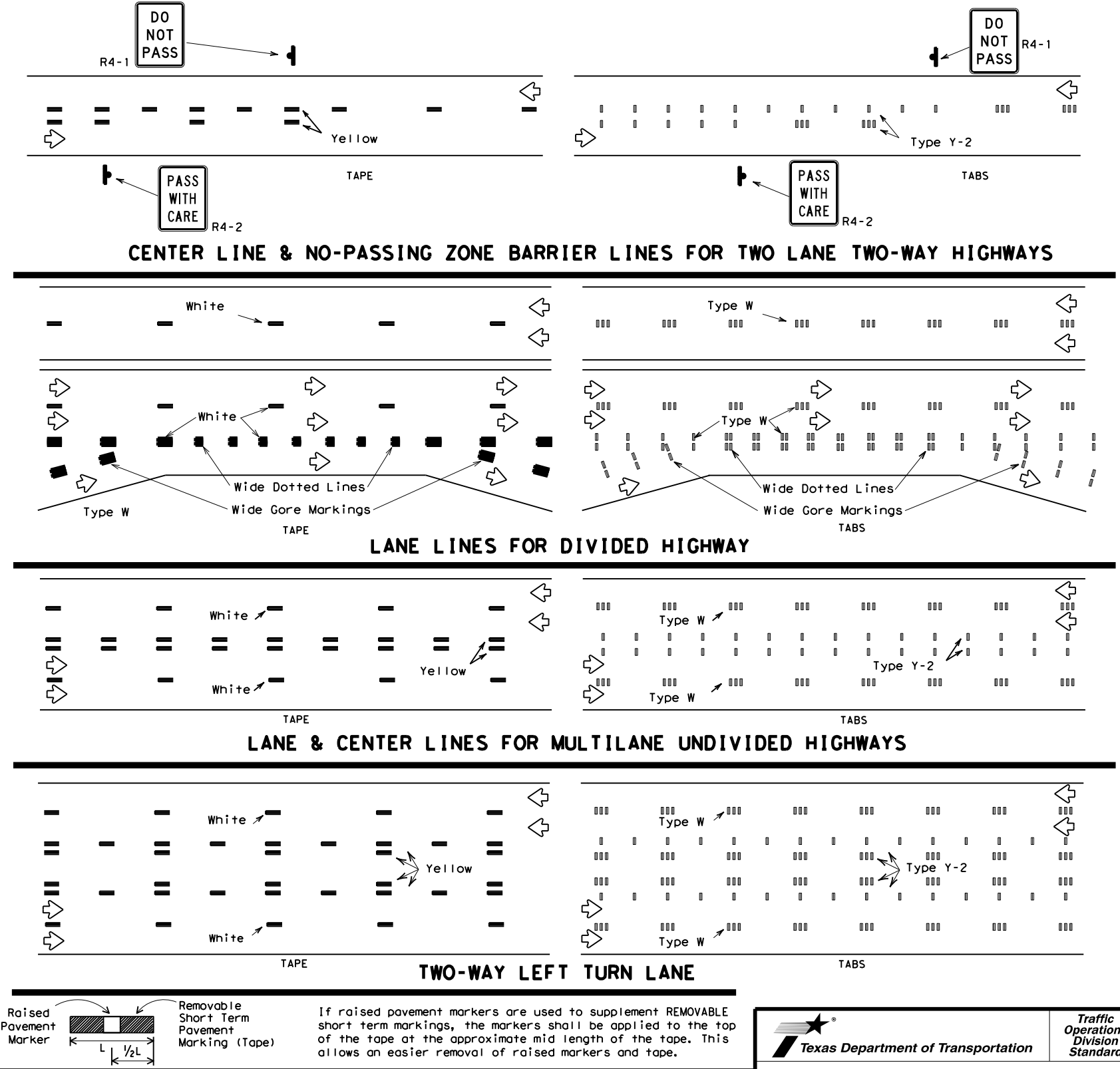
NOTES:

- Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
- Short term pavement markings shall NOT be used to simulate edge lines.
- 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.
- 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.
- 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.
- 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.
- 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).
- 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)

- 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).
- Tabs shall meet requirements of Departmental Material Specification DMS-8242.
- 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.
- 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



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

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

RAISED PAVEMENT MARKERS

- 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)

- 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



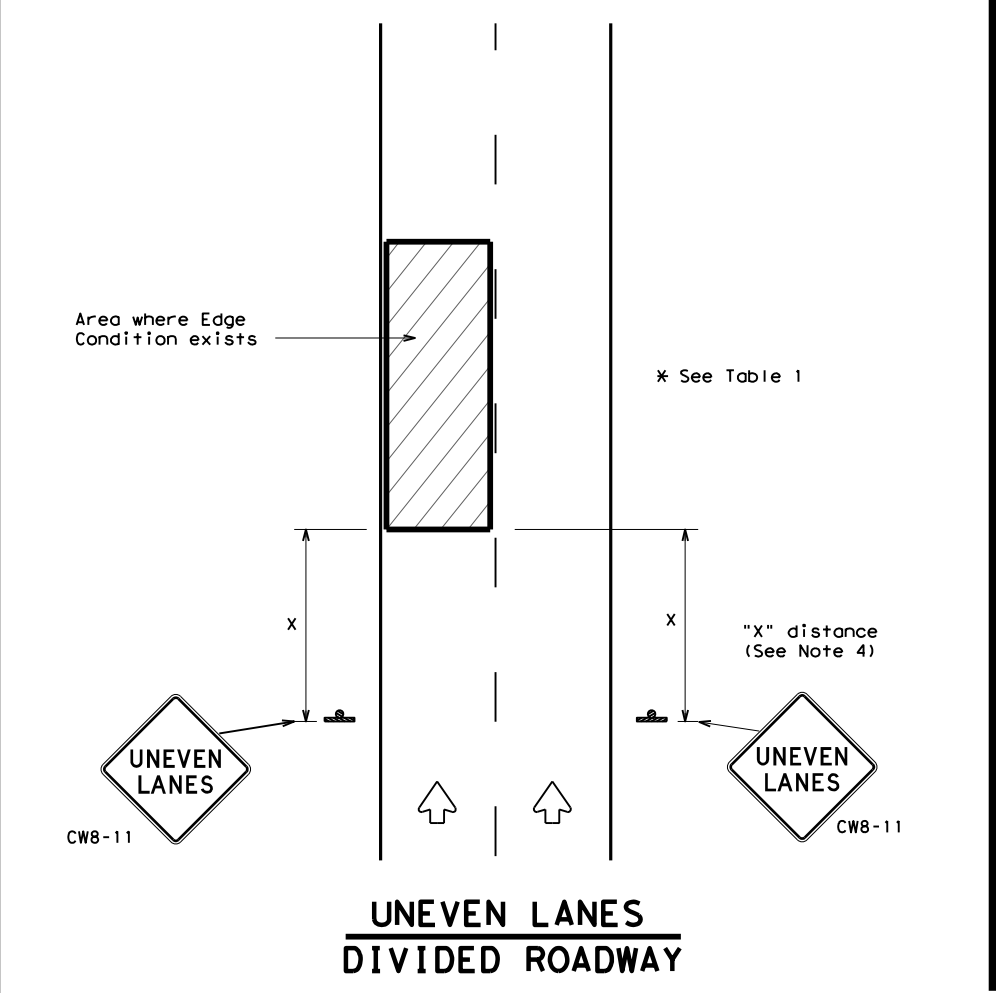
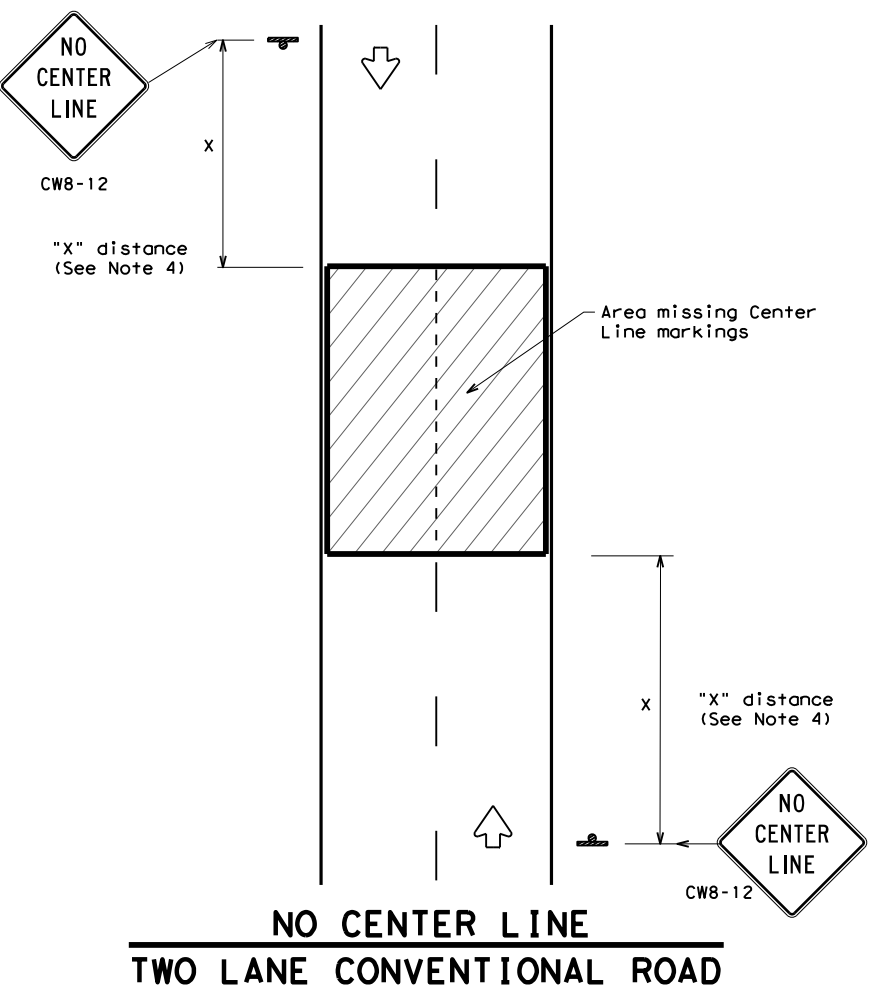
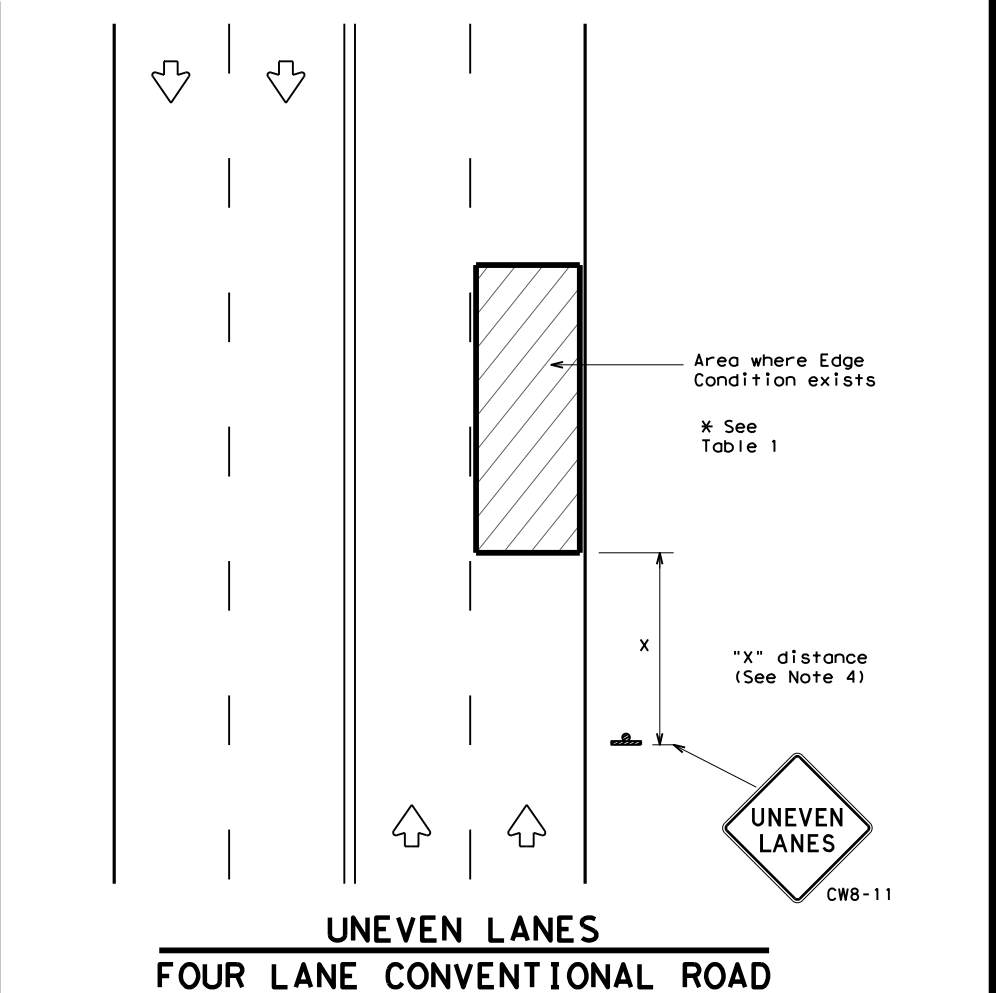
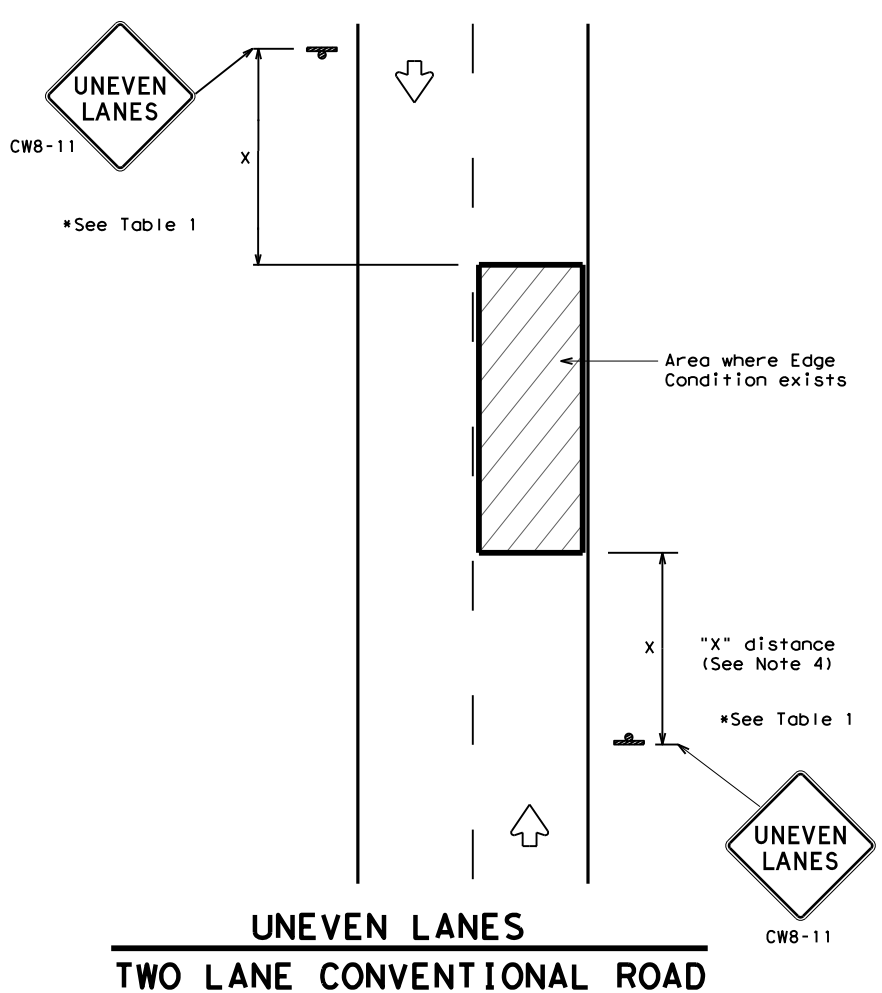
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ (STPM) - 13

| | | | | | | | | | |
|------------|---------------|-------|-------|---------|--------|------------|-------|-----|-------|
| FILE: | wzstpm-13.dgn | DN: | TxDOT | CK: | TxDOT | DW: | TxDOT | CK: | TxDOT |
| © TxDOT | April 1992 | CONT: | 0113 | SECT: | 08 | JOB: | 091 | US | 290 |
| REVISIONS: | | DIST: | AUS | COUNTY: | TRAVIS | SHEET NO.: | 30 | | |

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| 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

- 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.
- 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.
- 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.
- Signs shall be spaced at the distances recommended as per BC standards.
- 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."
- 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.
- Short term markings shall not be used to simulate edge lines.
- 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: 1/4" (maximum-planing) 1/2" (typical-overlay) | Sign: CW8-11 |
| ② | Less than or equal to 3" | Sign: CW8-11 |
| ③ | 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" |



SIGNING FOR UNEVEN LANES

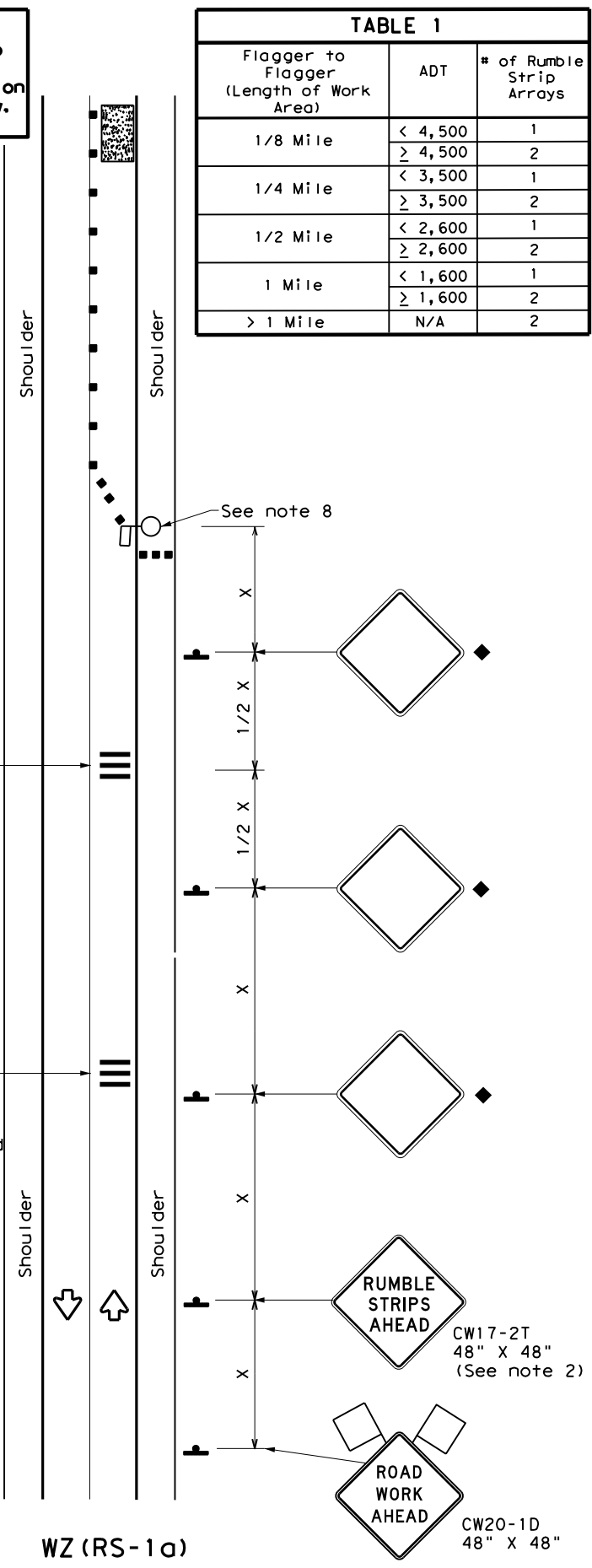
WZ (UL) - 13

| | | | | |
|-------------------|------------|-----------|-----------|-----------|
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| © TxDOT | APRIL 1992 | CONT | SECT | JOB |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| 8-95 2-98 7-13 | DIST | COUNTY | SHEET NO. | |
| 1-97 3-03 | AUS | TRAVIS | 31 | |

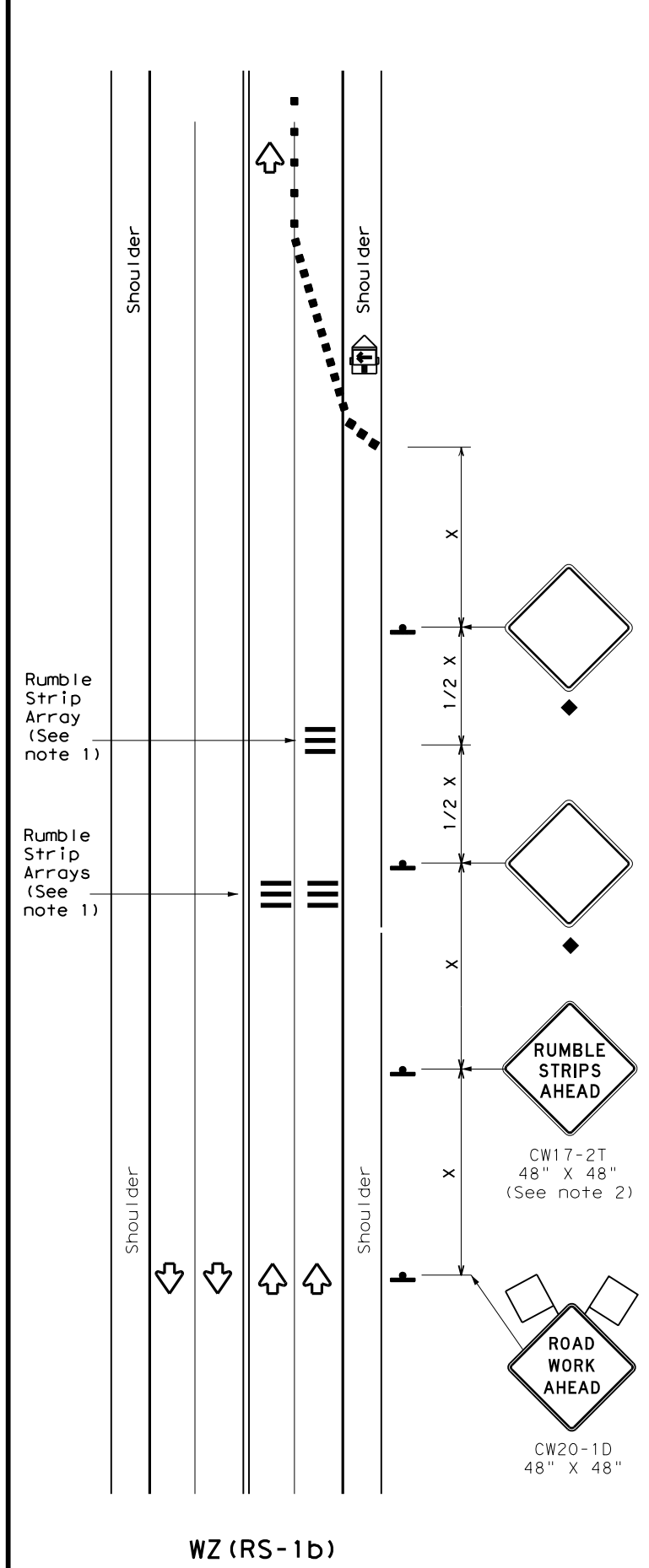
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Warning sign and rumble strip sequence in opposite direction is same as below.

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



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

- 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.
- 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.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Remove Temporary Rumble Strips before removing the advanced warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
- Replace defective Temporary Rumble Strips as directed by the Engineer.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

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

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

| Posted Speed * | Formula | Minimum Desirable Taper Lengths ** | | | Suggested Maximum Spacing of Channelizing Devices | | Minimum Sign Spacing "X" Distance | Suggested Longitudinal Buffer Space "B" |
|----------------|-----------|------------------------------------|------------|------------|---|--------------|-----------------------------------|---|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent | | |
| 30 | L = WS/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)

| 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.

Texas Department of Transportation
 Traffic Safety Division Standard

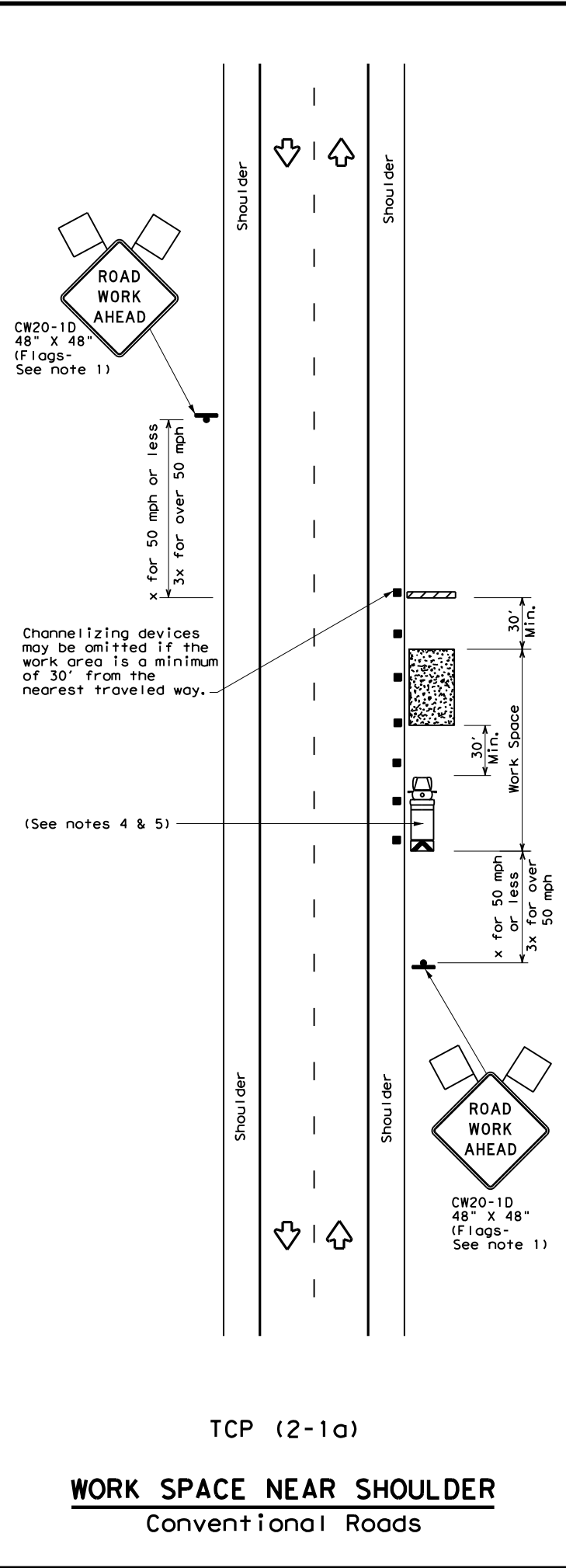
TEMPORARY RUMBLE STRIPS

WZ (RS) - 22

| | | | | |
|-----------------------|-----------|-----------|-----------|-----------|
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| © TxDOT November 2012 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| 2-14 1-22 4-16 | DIST | COUNTY | SHEET NO. | |
| | AUS | TRAVIS | 32 | |

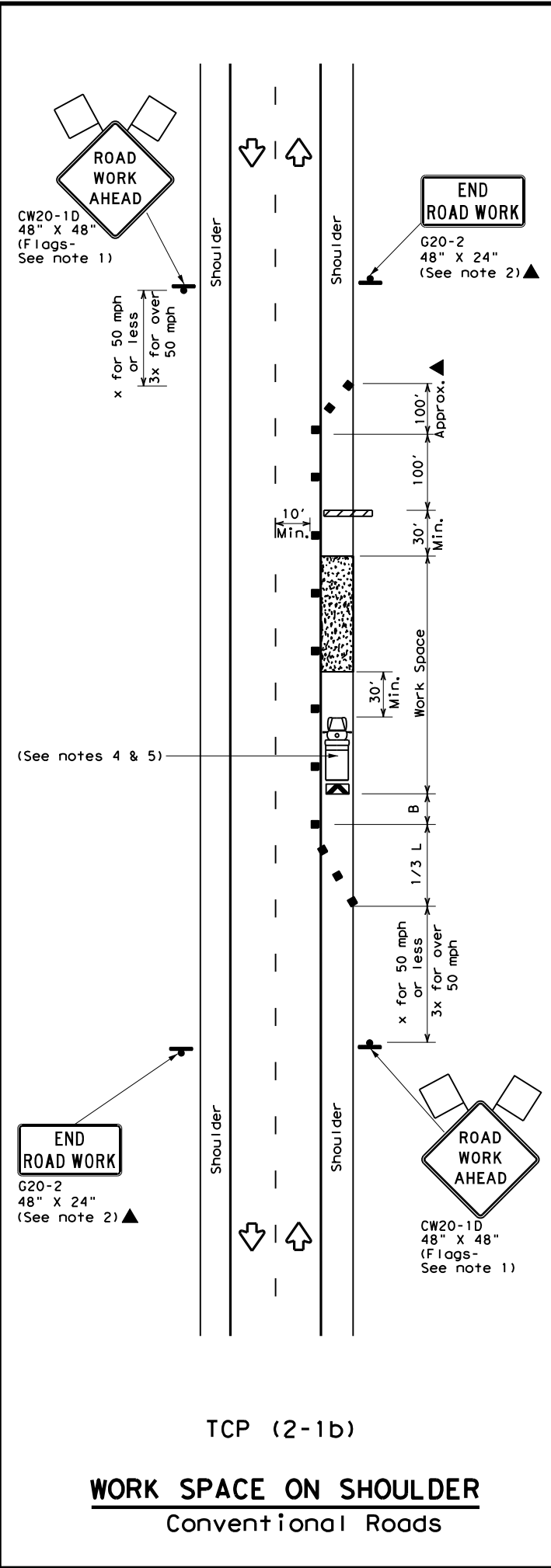
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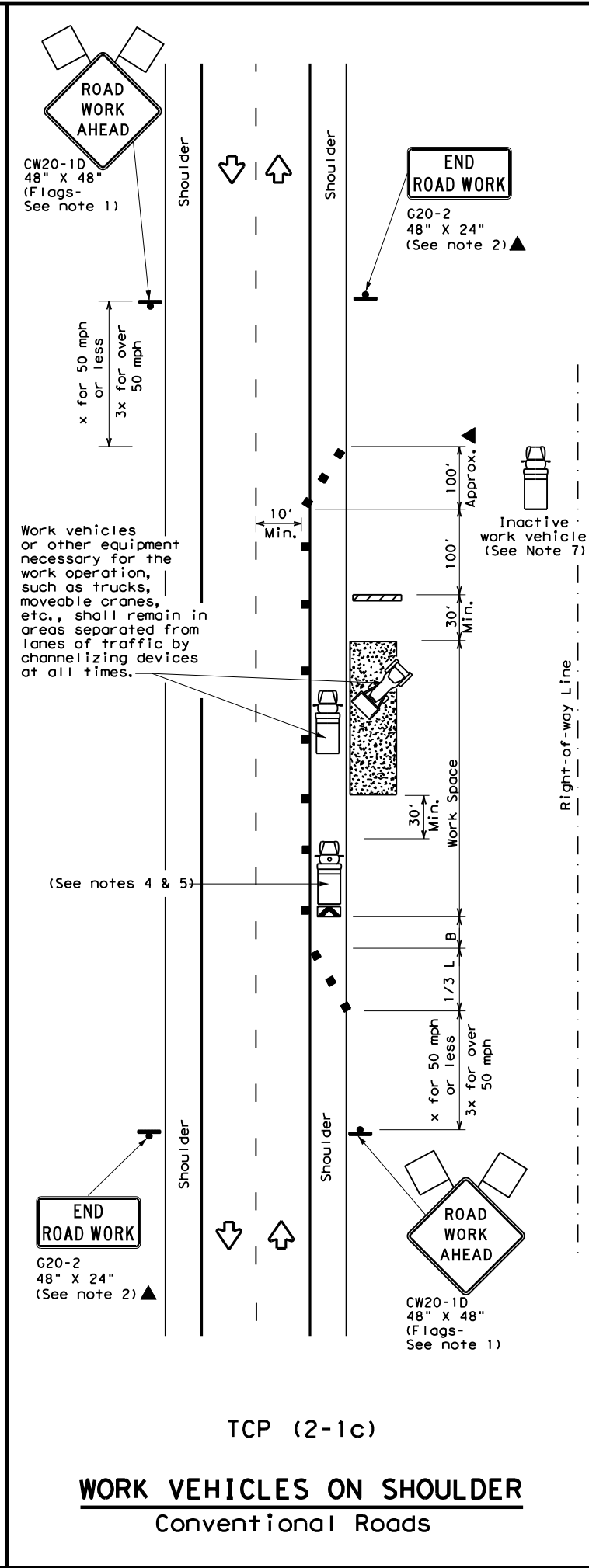
TCP (2-1a)

WORK SPACE NEAR SHOULDER
 Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
 Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
 Conventional Roads

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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
 - Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - Additional work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.



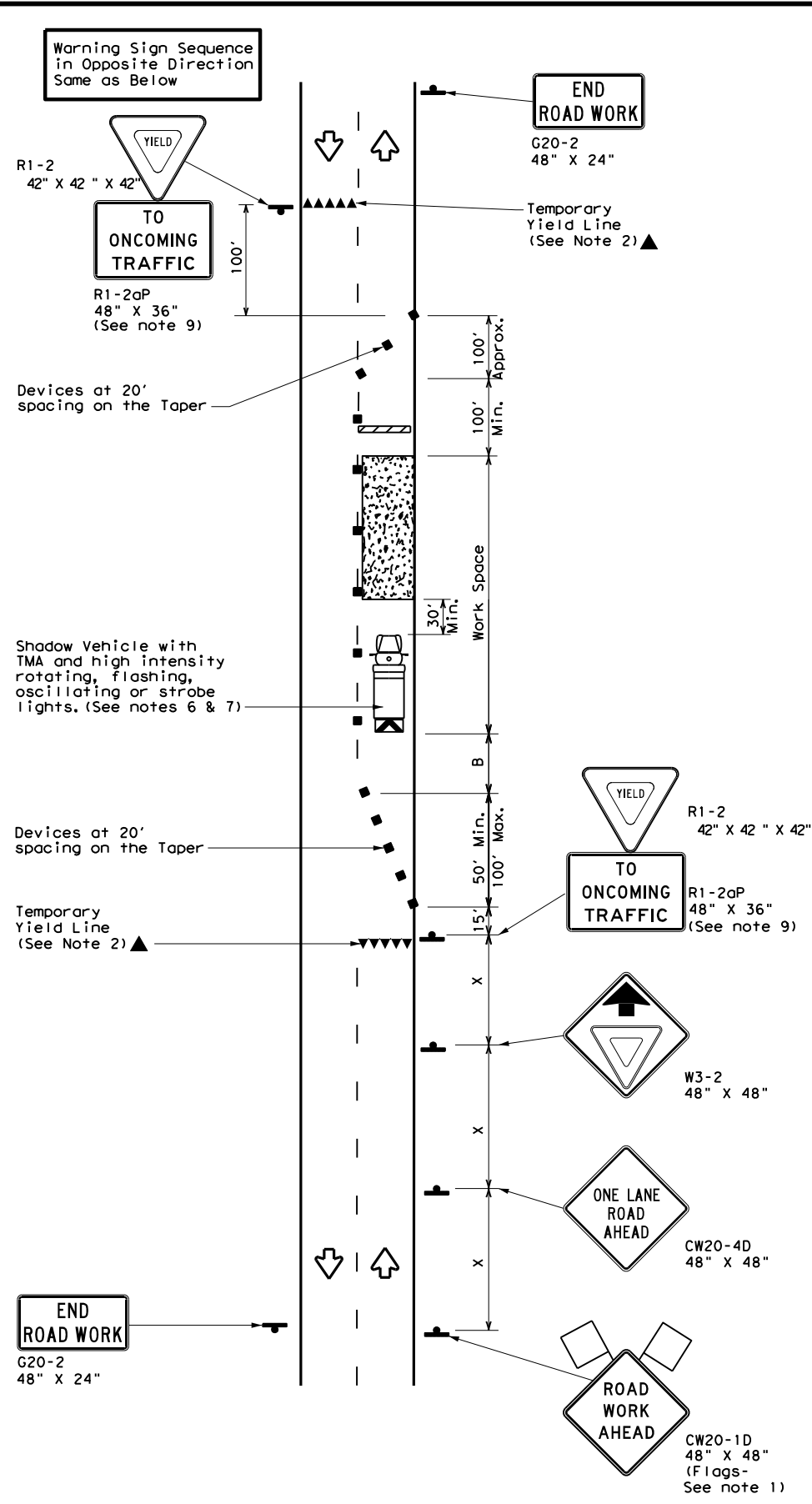
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

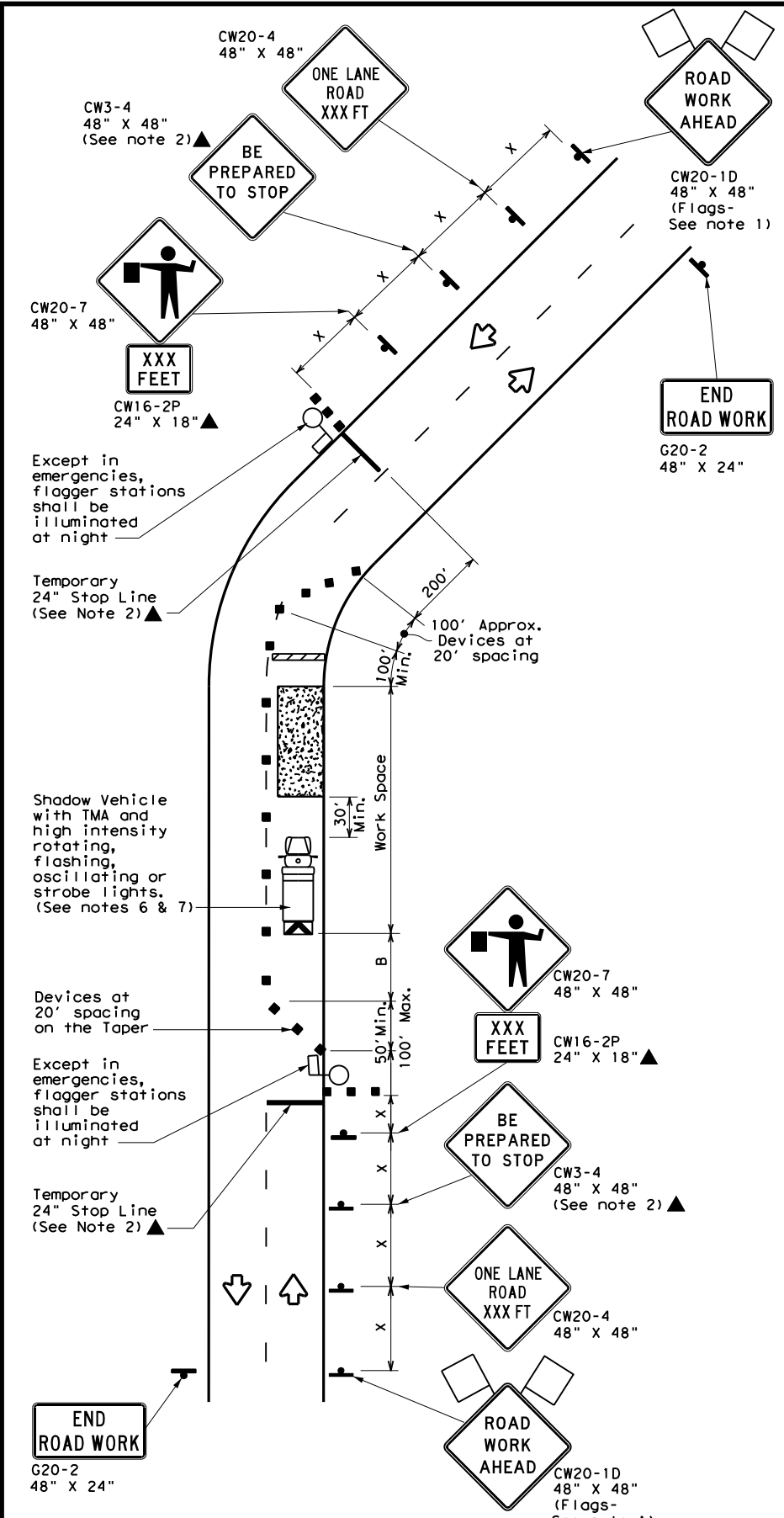
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| © TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
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| 2-94 4-98 | DIST | COUNTY | SHEET NO. | |
| 8-95 2-12 | AUS | TRAVIS | 33 | |
| 1-97 2-18 | | | | |

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



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

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

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

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

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

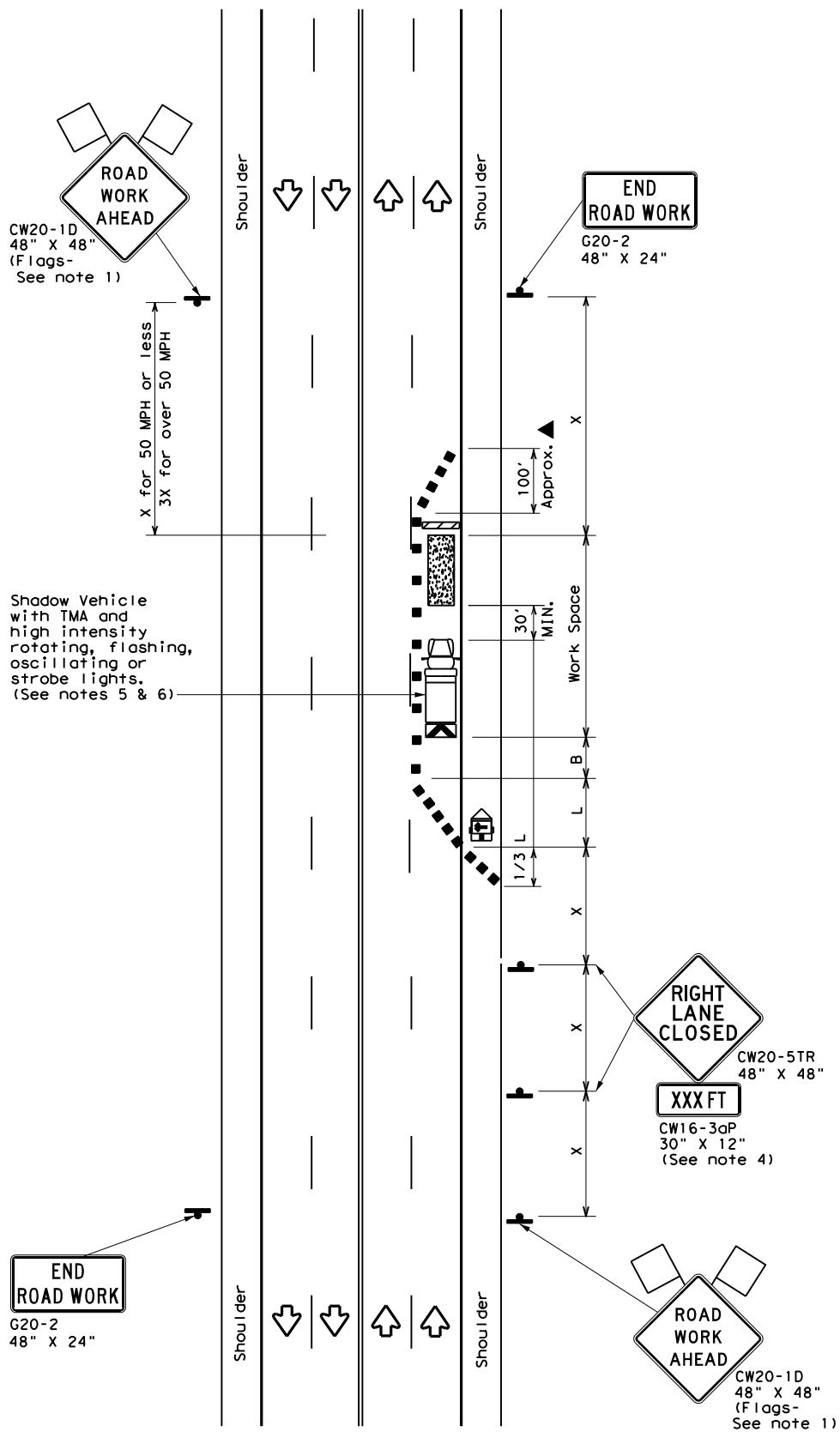
GENERAL NOTES

- Flags attached to signs where shown, are REQUIRED.
 - 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.
 - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
 - Flaggers should use two-way radios or other methods of communication to control traffic.
 - Length of work space should be based on the ability of flaggers to communicate.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-2a)**
- The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
 - The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.
- TCP (2-2b)**
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
 - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
 - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

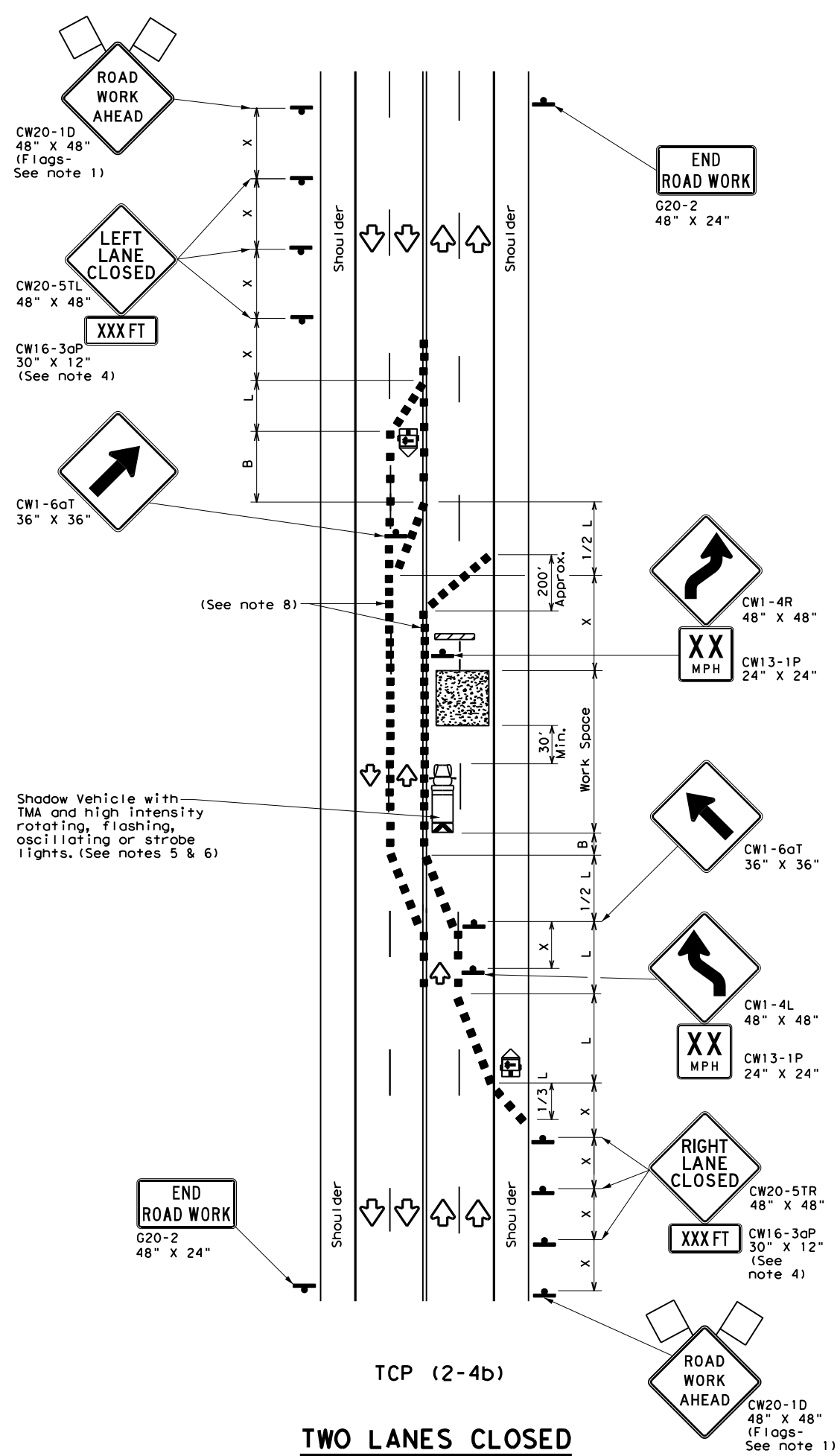
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|--|---------------|--------------------------------------|------------|
| | | Traffic Operations Division Standard | |
| TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL | | | |
| TCP (2-2) - 18 | | | |
| FILE: | tcp2-2-18.dgn | DN: | CK: |
| © TxDOT | REVISIONS | CON: | SECT: |
| 8-95 | 3-03 | 0113 | 08 |
| 1-97 | 2-12 | | |
| 4-98 | 2-18 | | |
| | | DIST: | COUNTY: |
| | | AUS | TRAVIS |
| | | JOB: | HIGHWAY: |
| | | 091 | US 290 |
| | | | SHEET NO.: |
| | | | 34 |

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TCP (2-4a)
ONE LANE CLOSED



TCP (2-4b)
TWO LANES CLOSED

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

| Posted Speed * | Formula | Minimum Desirable Taper Lengths ** | | | Suggested Maximum Spacing of Channelizing Devices | | Minimum Sign Spacing "x" Distance | Suggested Longitudinal Buffer Space "B" |
|----------------|--------------------------|------------------------------------|------------|------------|---|--------------|-----------------------------------|---|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent | | |
| 30 | L = 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

- Flags attached to signs where shown, are REQUIRED.
- 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.
- The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
- For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
- 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.
- 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.

TCP (2-4a)

- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

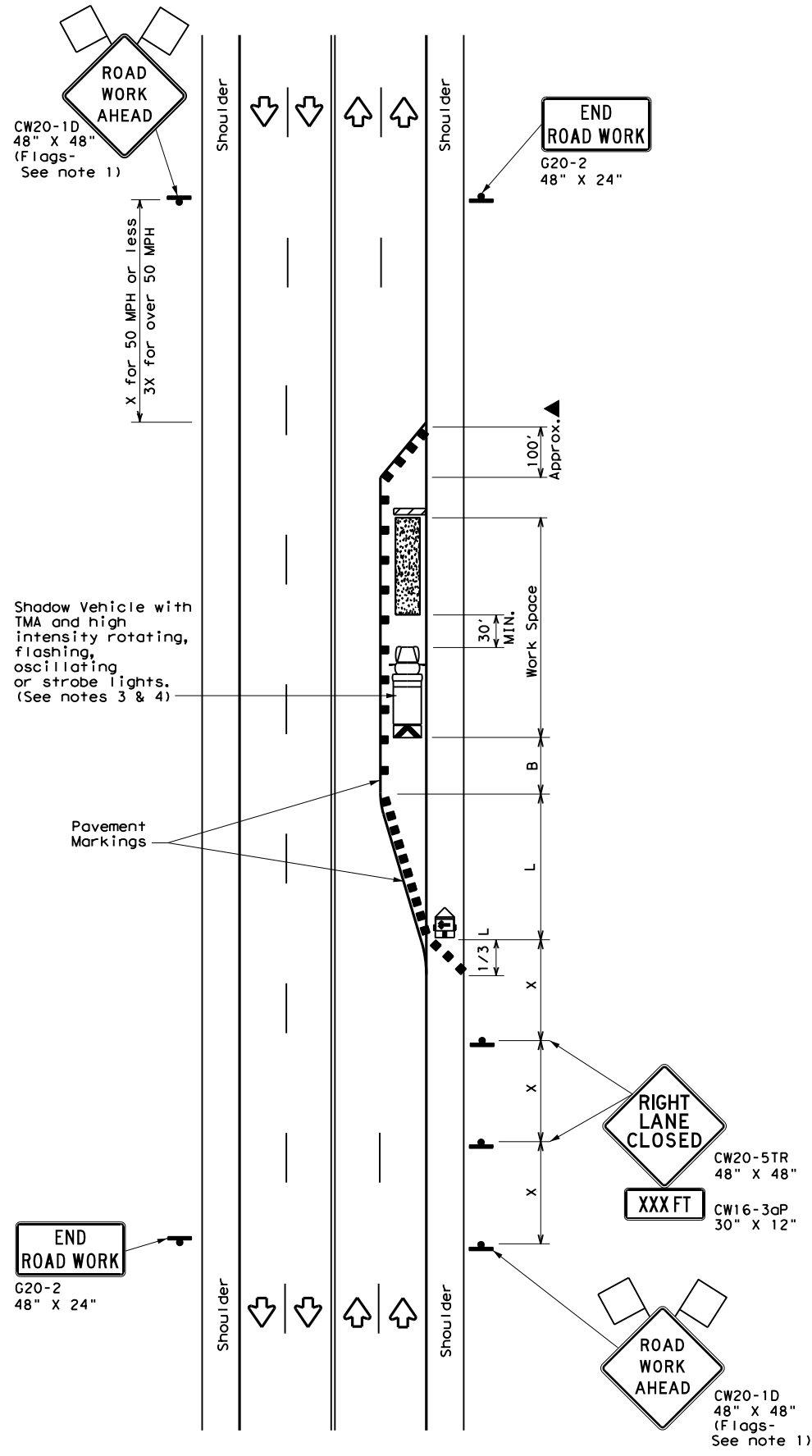
TCP (2-4b)

- For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

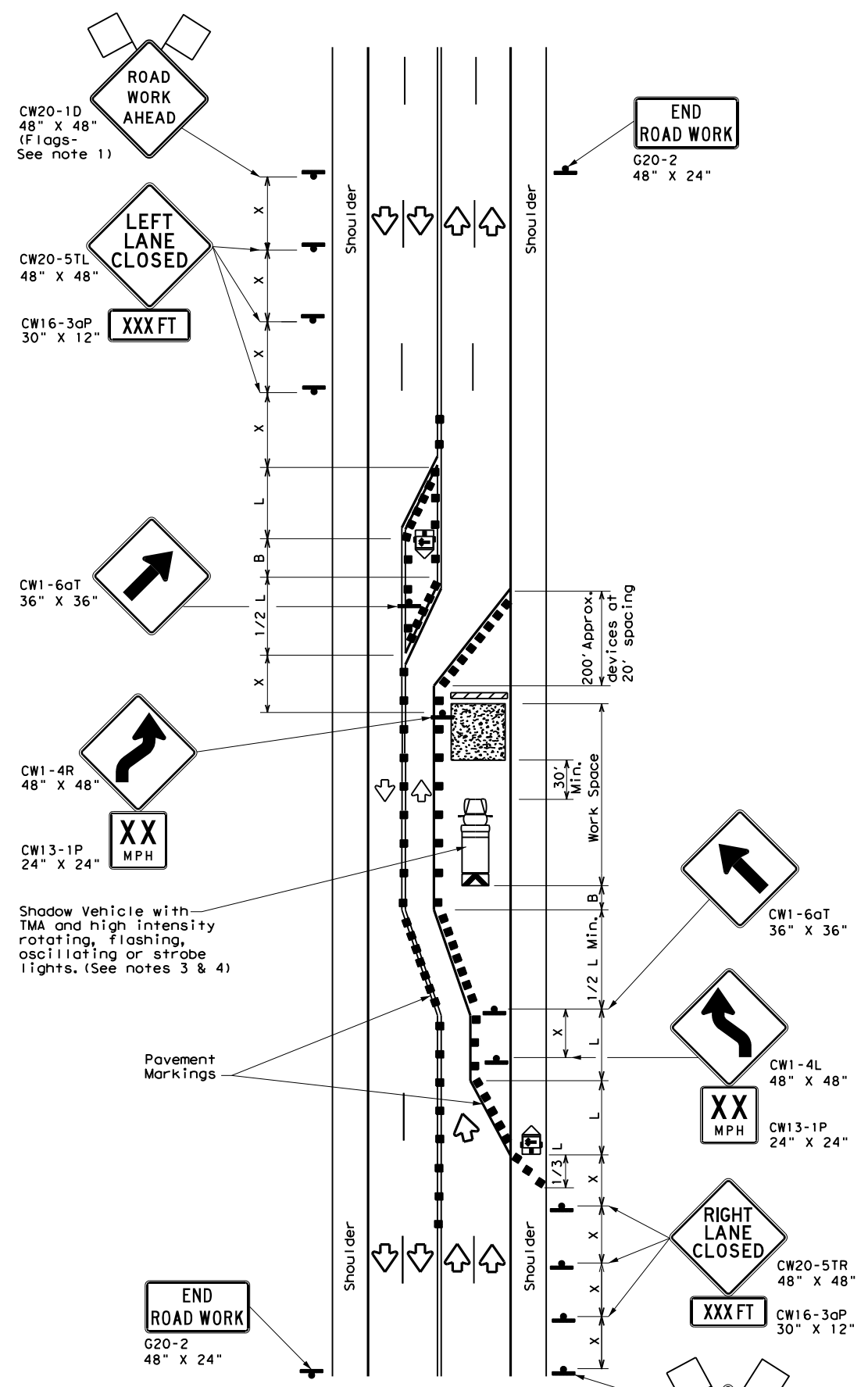
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|---|---------------|--------------------------------------|-----------------|
| | | Traffic Operations Division Standard | |
| TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS | | | |
| TCP (2-4) - 18 | | | |
| FILE: | tcp2-4-18.dgn | DN: | CK: |
| © TxDOT | December 1985 | CONT | SECT |
| REVISIONS | | 0113 | 08 |
| 8-95 | 3-03 | JOB | US 290 |
| 1-97 | 2-12 | DIST | COUNTY |
| 4-98 | 2-18 | AUS | TRAVIS |
| | | | SHEET NO. 35 |

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TCP (2-5a)
ONE LANE CLOSED



TCP (2-5b)
TWO LANES CLOSED

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

| Posted Speed * | Formula | Minimum Desirable Taper Lengths X X | | | Suggested Maximum Spacing of Channelizing Devices | | Minimum Sign Spacing "X" Distance | Suggested Longitudinal Buffer Space "B" |
|----------------|--------------------------|-------------------------------------|------------|------------|---|--------------|-----------------------------------|---|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent | | |
| 30 | L = 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**
- Flags attached to signs where shown, are REQUIRED.
 - 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.
 - 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.
 - 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.
 - The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

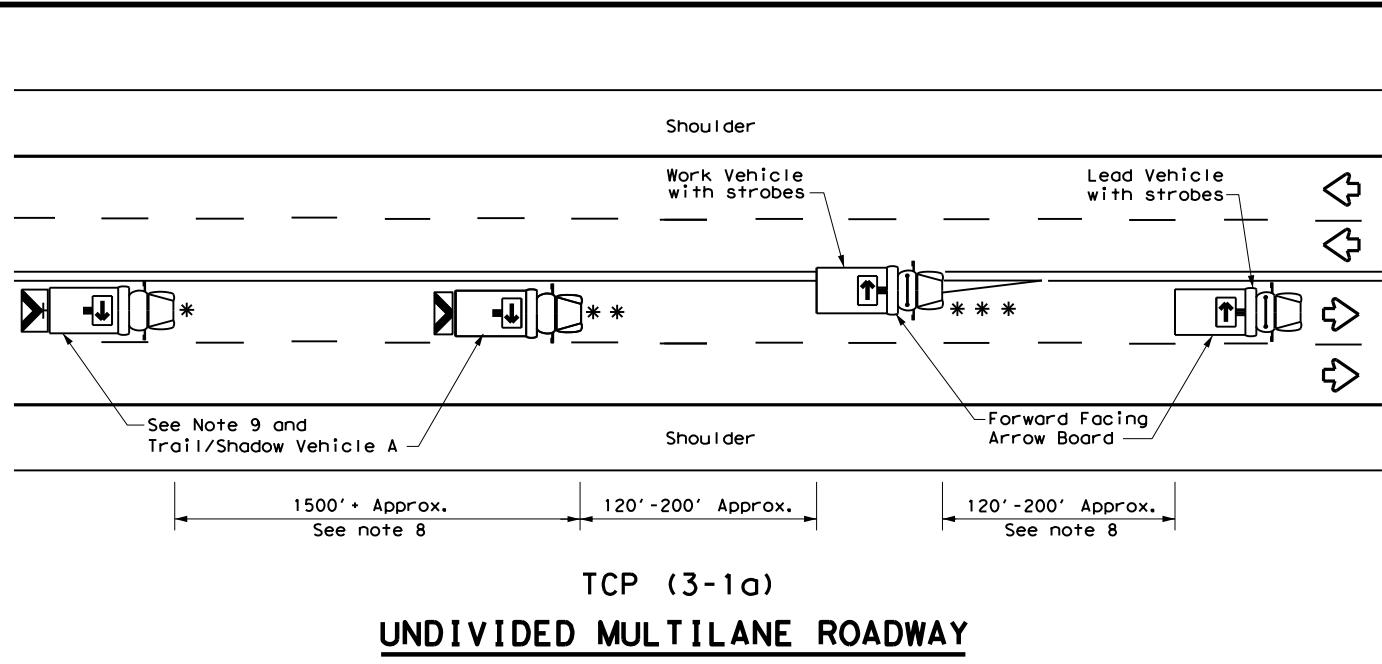
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-5b)

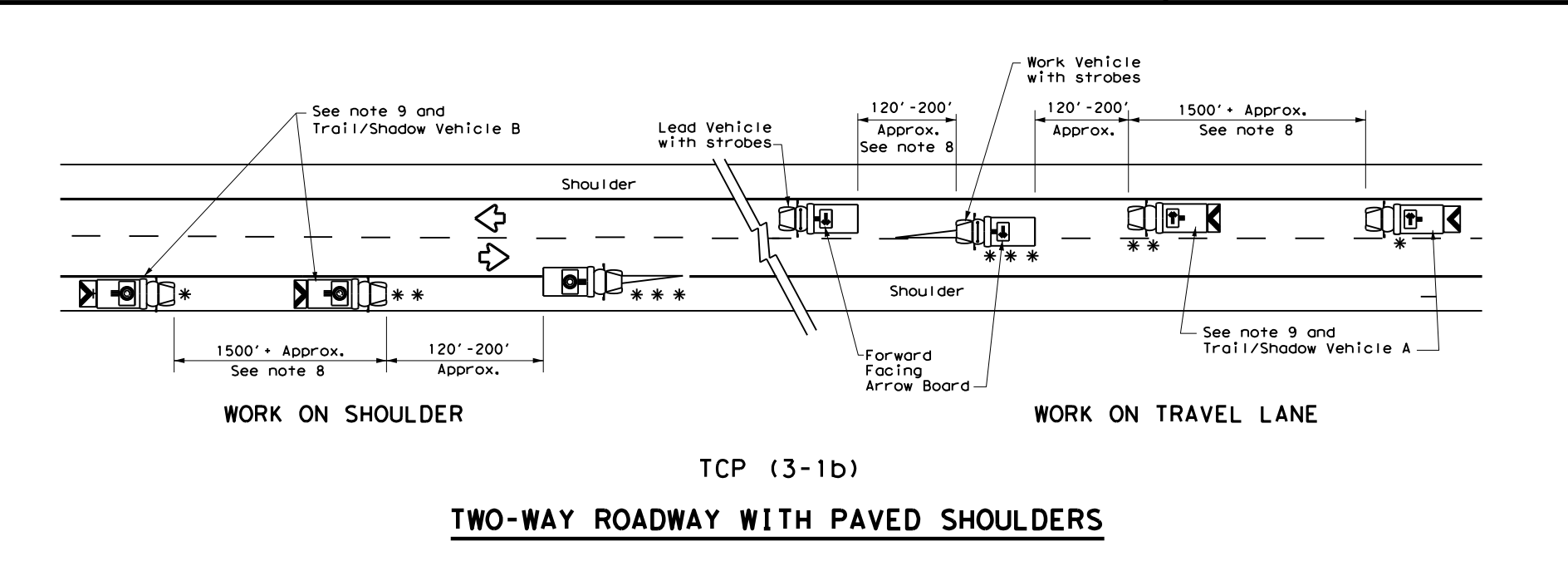
- Conflicting pavement markings shall be removed for long-term projects.

| | | | |
|------------------------------------|-----------|--------------------------------------|----------------|
| | | Traffic Operations Division Standard | |
| TRAFFIC CONTROL PLAN | | | |
| LONG TERM LANE CLOSURES | | | |
| MULTILANE CONVENTIONAL RDS. | | | |
| TCP (2-5) - 18 | | | |
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| © TxDOT December 1985 | CONT 0113 | SECT 08 | JOB 091 |
| 8-95 2-12 | REVISIONS | | HIGHWAY US 290 |
| 1-97 3-03 | DIST AUS | COUNTY TRAVIS | SHEET NO. 36 |
| 4-98 2-18 | | | |

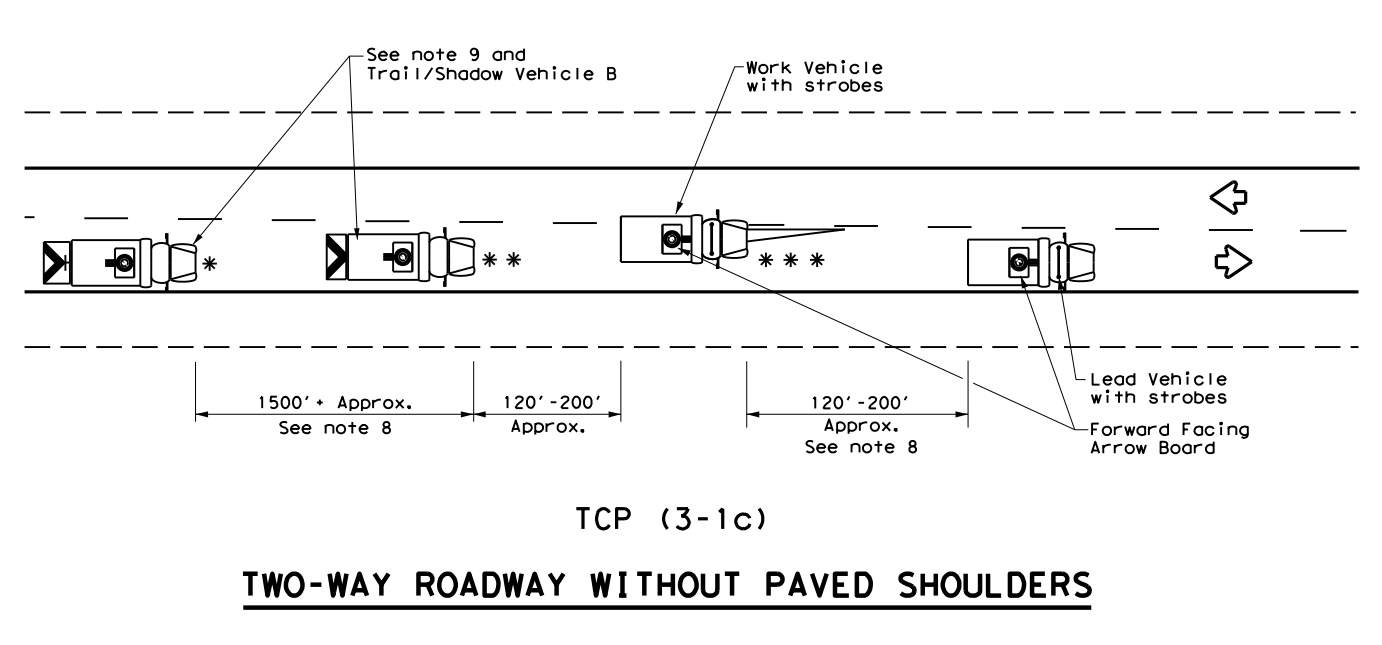
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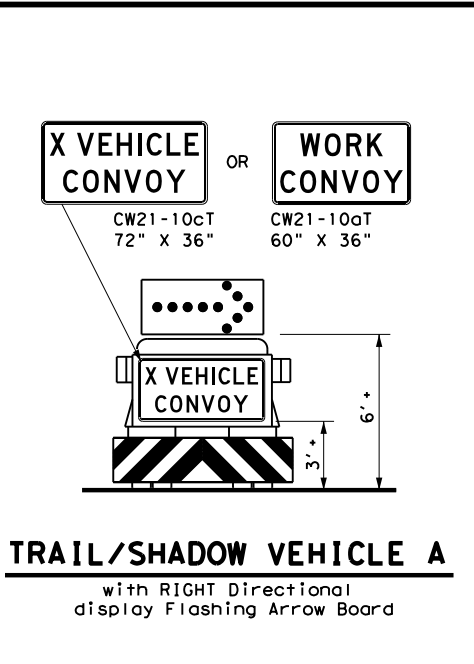
TCP (3-1a)
UNDIVIDED MULTILANE ROADWAY



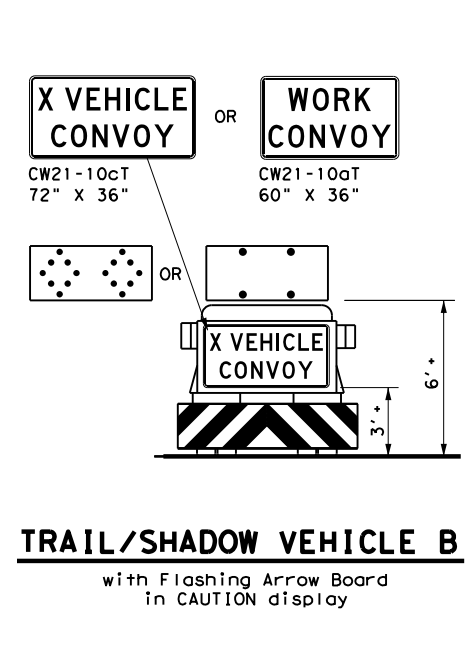
TCP (3-1b)
TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)
TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE A
with RIGHT Directional display Flashing Arrow Board



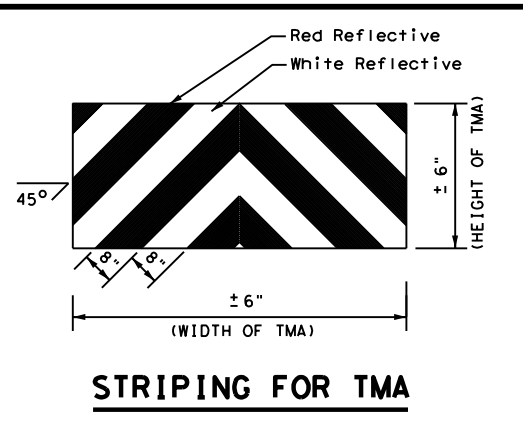
TRAIL/SHADOW VEHICLE B
with Flashing Arrow Board in CAUTION display

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

| TYPICAL USAGE | | | | |
|-------------------------------------|--------------------------|--------------------------|------------------------------|--------------------------|
| MOBILE | SHORT DURATION | SHORT TERM STATIONARY | INTERMEDIATE TERM STATIONARY | LONG TERM STATIONARY |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

GENERAL NOTES

- TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
- 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.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
- 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.
- 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.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
- "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.
- On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

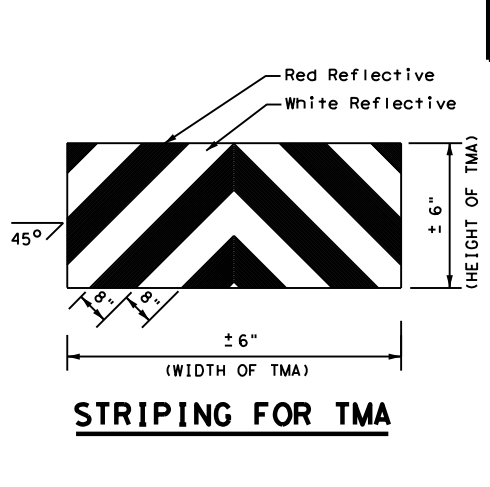
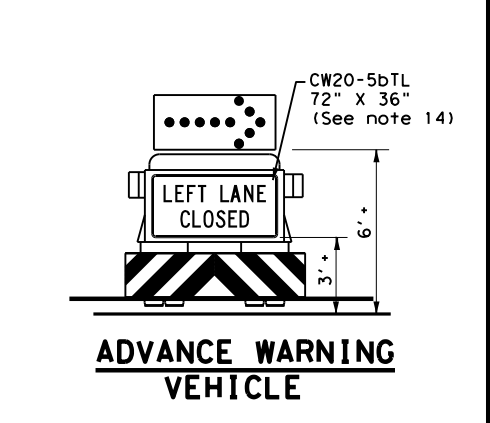
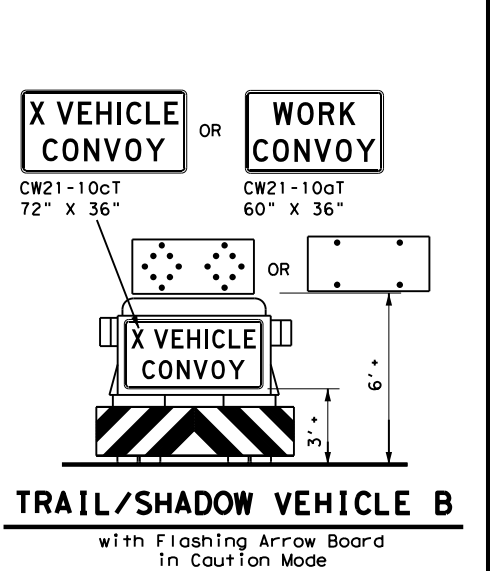
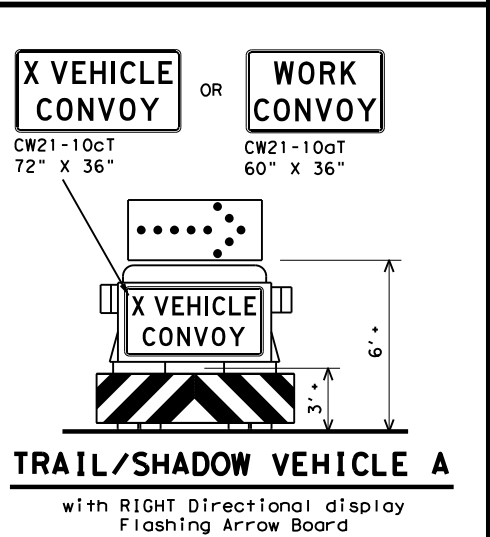
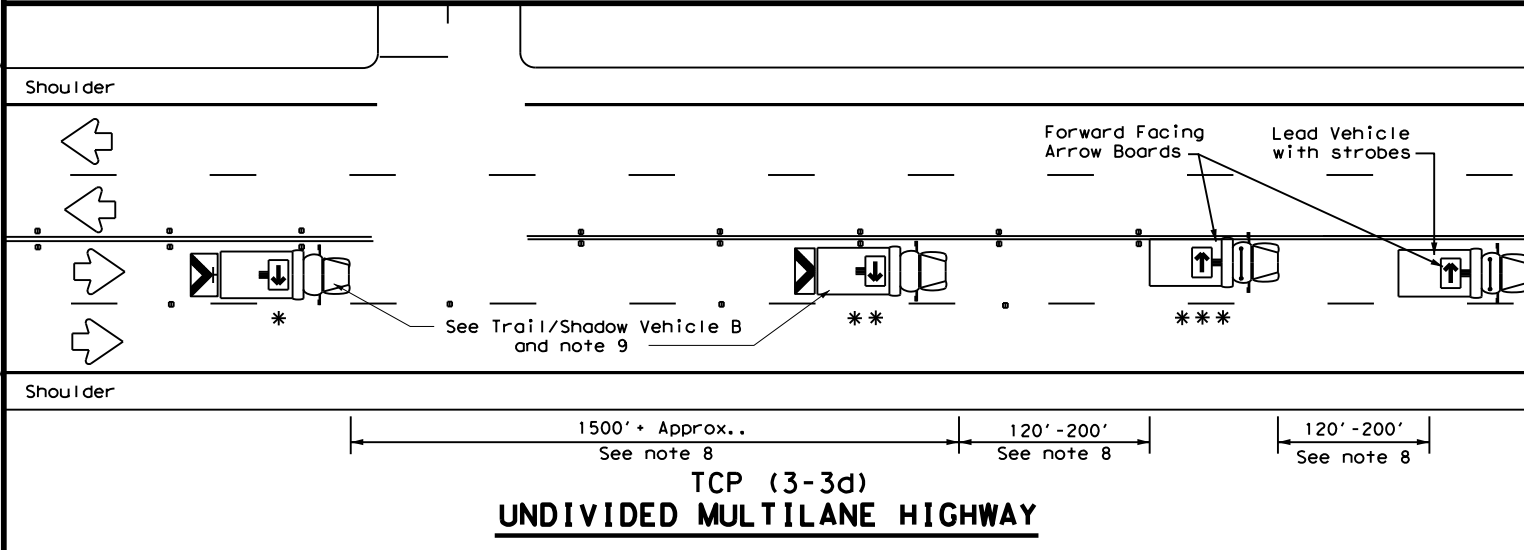
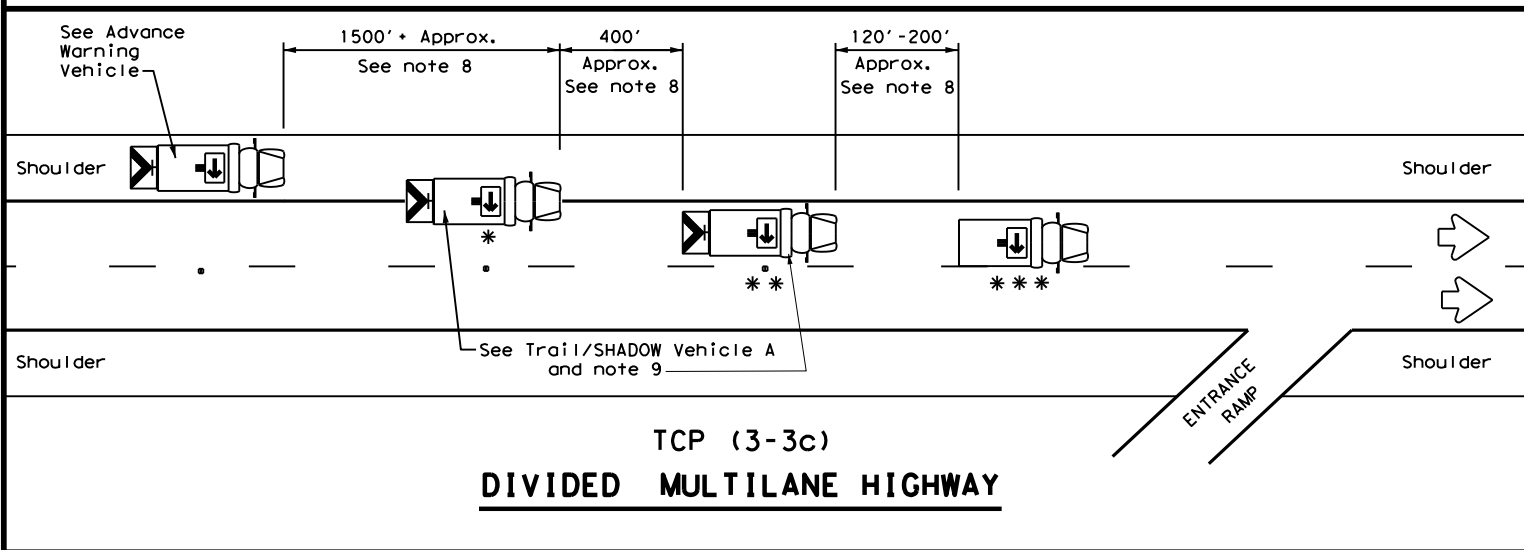
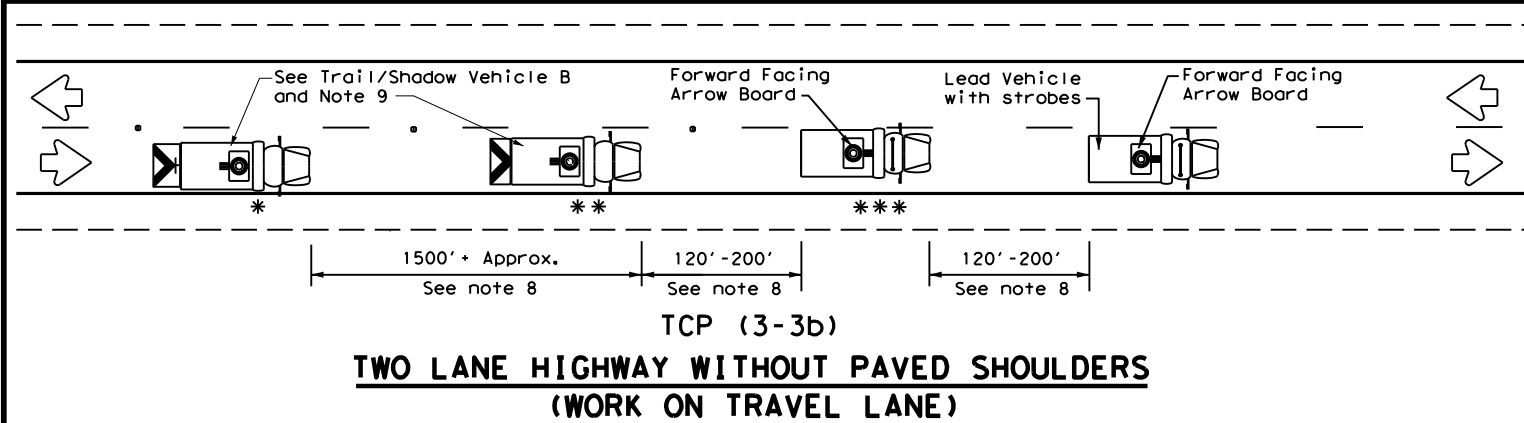
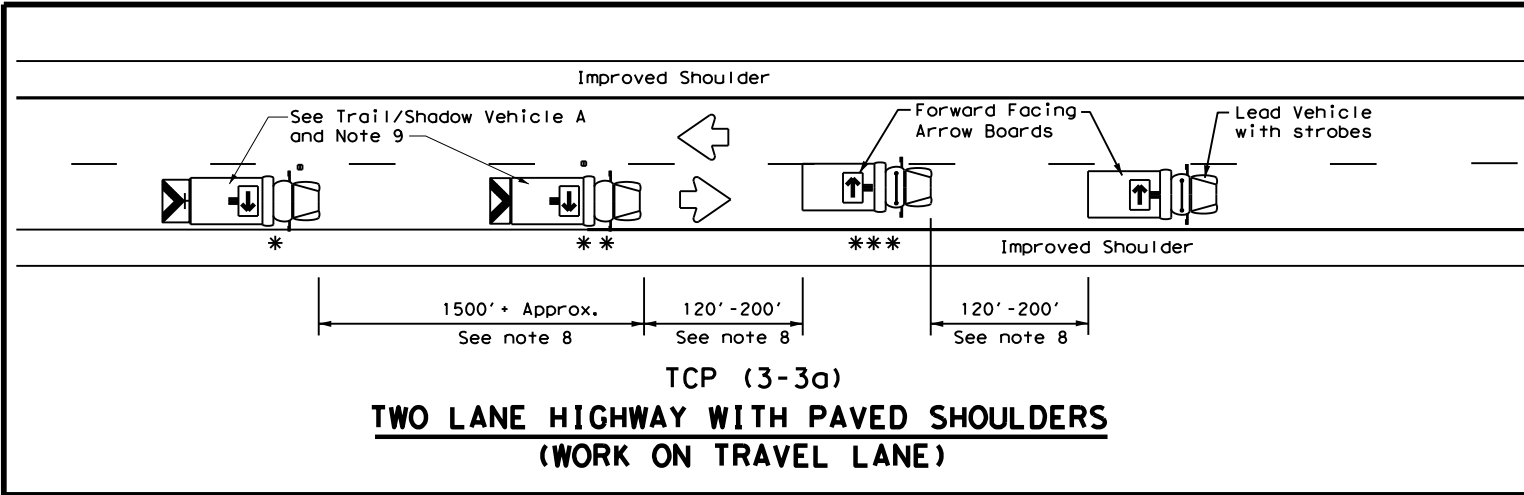
Texas Department of Transportation
 Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
 MOBILE OPERATIONS
 UNDIVIDED HIGHWAYS

TCP (3-1) - 13

| | | | | |
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| FILE: tcp3-1.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
| © TxDOT December 1985 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| 2-94 4-98 | | | | |
| 8-95 7-13 | | | | |
| 1-97 | | | | |
| | DIST | COUNTY | | SHEET NO. |
| | AUS | TRAVIS | | 37 |

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| LEGEND | | |
|-------------------|---------------------|---|
| * Trail Vehicle | ARROW BOARD DISPLAY | |
| ** Shadow Vehicle | | |
| *** Work Vehicle | | RIGHT Directional |
| | | LEFT Directional |
| | | Double Arrow |
| | | CAUTION (Alternating Diamond or 4 Corner Flash) |

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

GENERAL NOTES

- 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.
- 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.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
- 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.
- 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.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- 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.
- 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.
- 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.
- A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
- For divided highways with three or four lanes in each direction, use TCP(3-2).
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
- On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

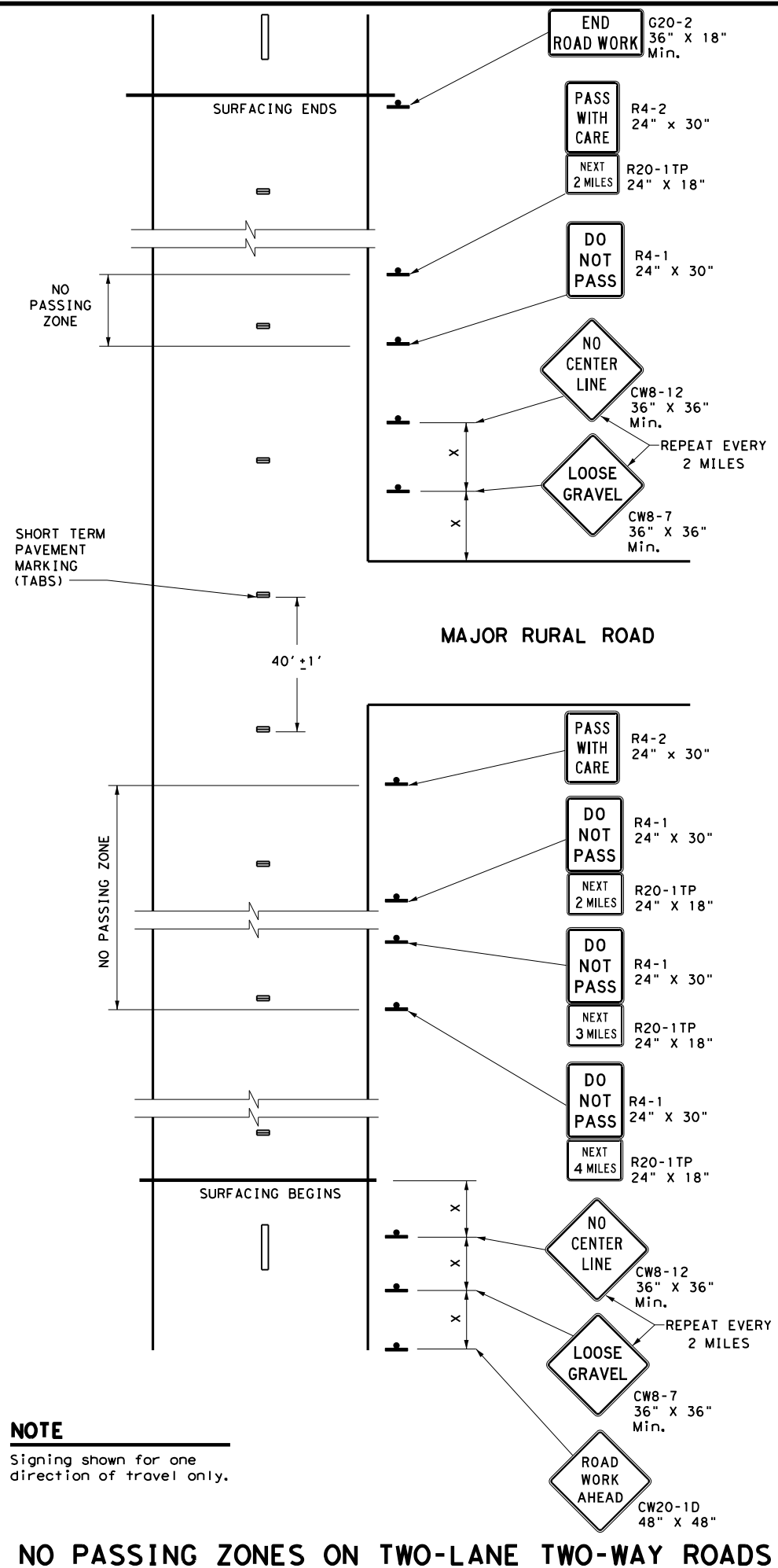
Texas Department of Transportation

Traffic Operations Division Standard

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

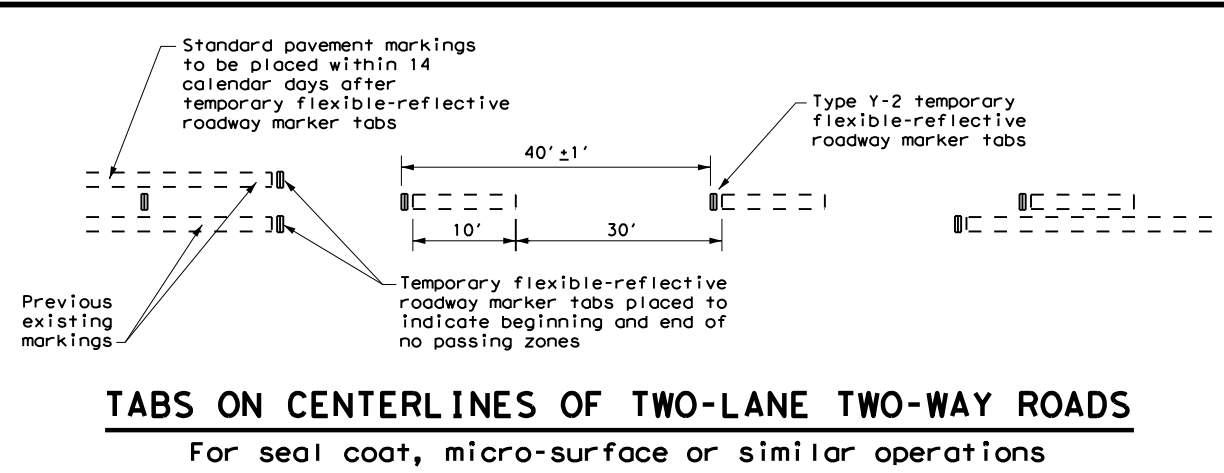
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| © TxDOT September 1987 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| 2-94 4-98 | DIST | COUNTY | SHEET NO. | |
| 8-95 7-13 | AUS | TRAVIS | 38 | |
| 1-97 7-14 | | | | |

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NOTE
 Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS
 For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

- Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.
- At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.
- Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.
- R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

- Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.
- At the time construction activity obliterates the existing center line markings (low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.
- The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

- When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.
- The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

- Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.
- Tabs shall not be used to simulate edge lines.
- Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

- The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.
- Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T) sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

| Posted Speed * | Minimum Sign Spacing "X" Distance |
|----------------|-----------------------------------|
| 30 | 120' |
| 35 | 160' |
| 40 | 240' |
| 45 | 320' |
| 50 | 400' |
| 55 | 500' |
| 60 | 600' |
| 65 | 700' |
| 70 | 800' |
| 75 | 900' |

* Conventional Roads Only

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

GENERAL NOTES

- The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
- The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
- Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
- When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
- Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

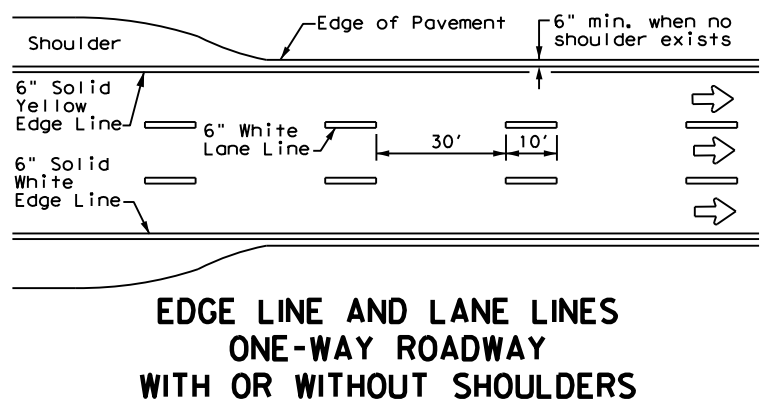


TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS
TCP (7-1) - 13

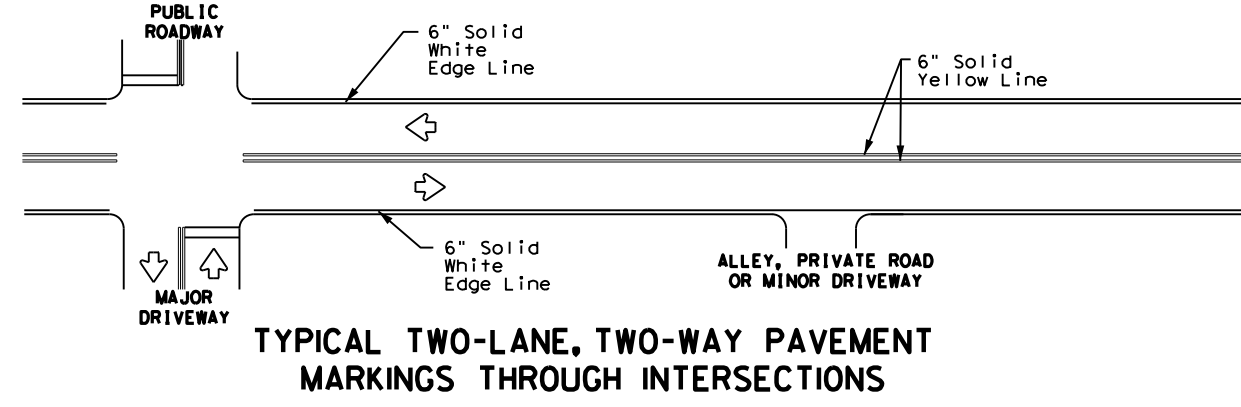
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| © TxDOT | March 1991 | CONT: | 0113 | SECT: | 08 | JOB: | 091 | HIGHWAY: | US 290 |
| 4-92 | 4-98 | DIST: | AUS | COUNTY: | TRAVIS | SHEET NO.: | 39 | | |
| 1-97 | 7-13 | | | | | | | | |

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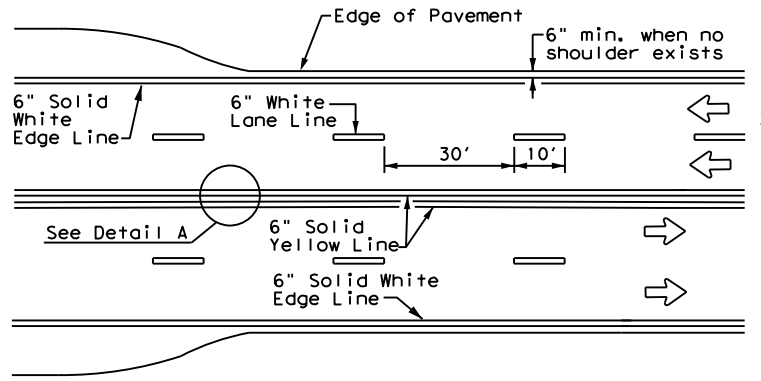
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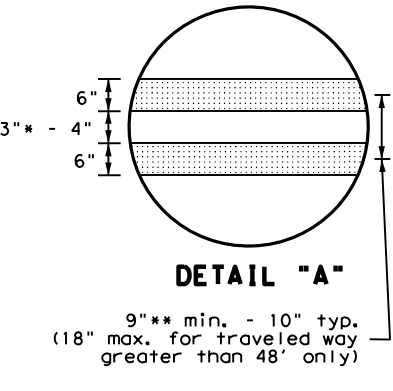
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**

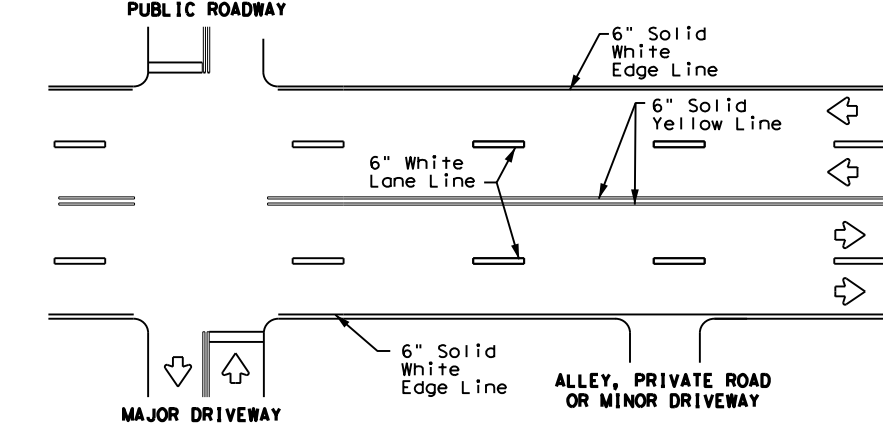


**CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**

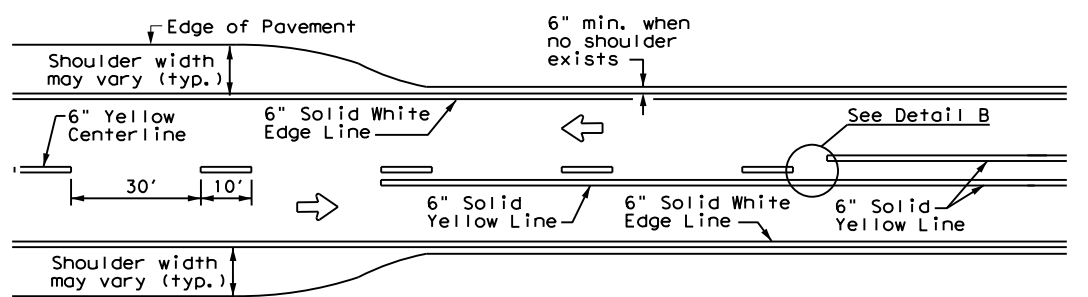


DETAIL "A"
9" min. - 10" typ.
(18" max. for traveled way
greater than 48' only)

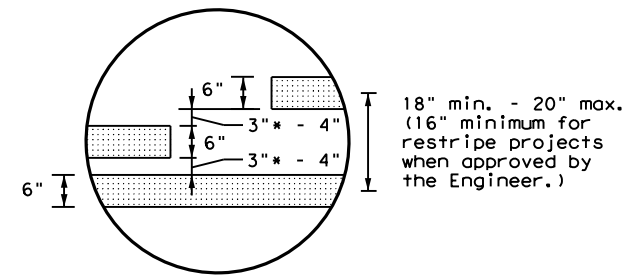
* 2" minimum for restripe projects when approved by the Engineer.
** 8" minimum for restripe projects when approved by the Engineer.



**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**

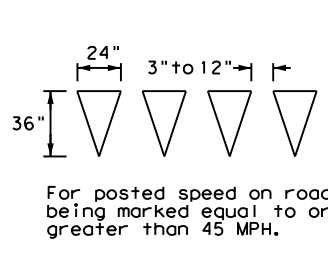


**TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**

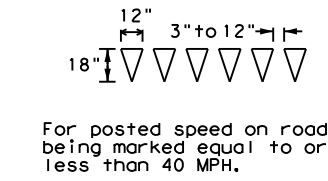


DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.



YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.

NOTES

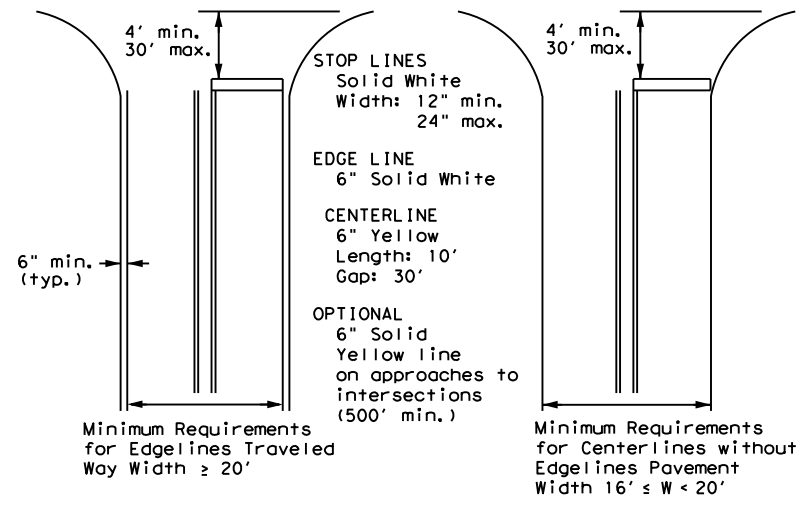
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
- 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

- Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

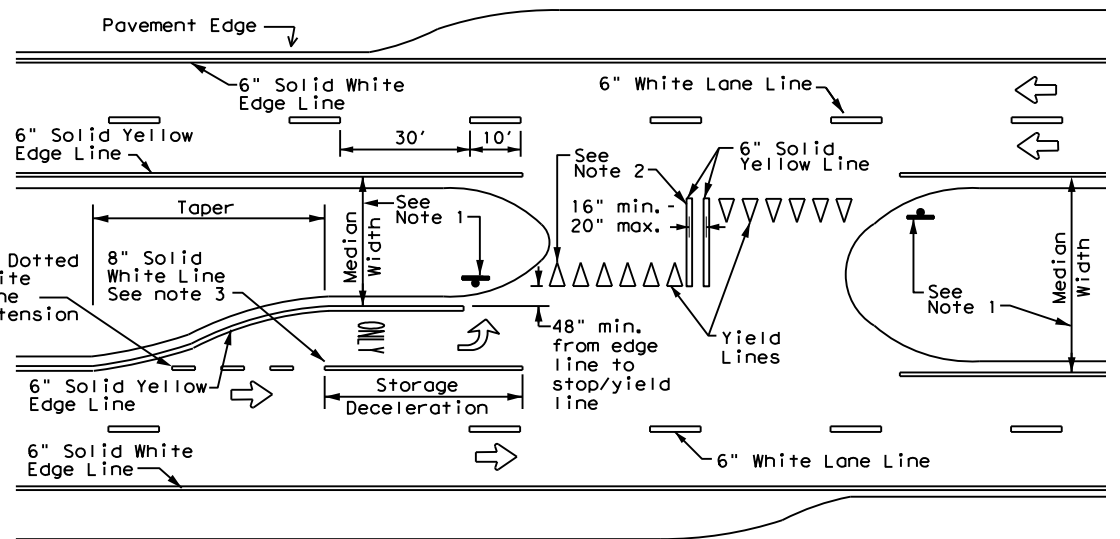
| MATERIAL SPECIFICATIONS | |
|---|----------|
| PAVEMENT MARKERS (REFLECTORIZED) | DMS-4200 |
| EPOXY AND ADHESIVES | DMS-6100 |
| BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS | DMS-6130 |
| TRAFFIC PAINT | DMS-8200 |
| HOT APPLIED THERMOPLASTIC | DMS-8220 |
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

**GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE**
Based on Traveled Way and Pavement Widths
for Undivided Roadways



FOUR LANE DIVIDED ROADWAY CROSSOVERS

Texas Department of Transportation
 Traffic Safety Division Standard

**TYPICAL STANDARD
PAVEMENT MARKINGS**

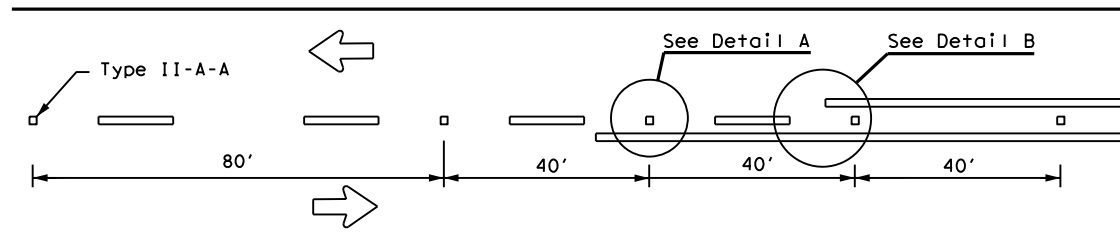
PM(1) - 22

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| © TxDOT December 2022 | CONT: 0113 | SECT: 08 | JOB: 091 |
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| 11-78 | 8-00 | 6-20 | |
| 8-95 | 3-03 | 12-22 | |
| 5-00 | 2-12 | | |
| DIST: AUS | | COUNTY: TRAVIS | SHEET NO.: 40 |

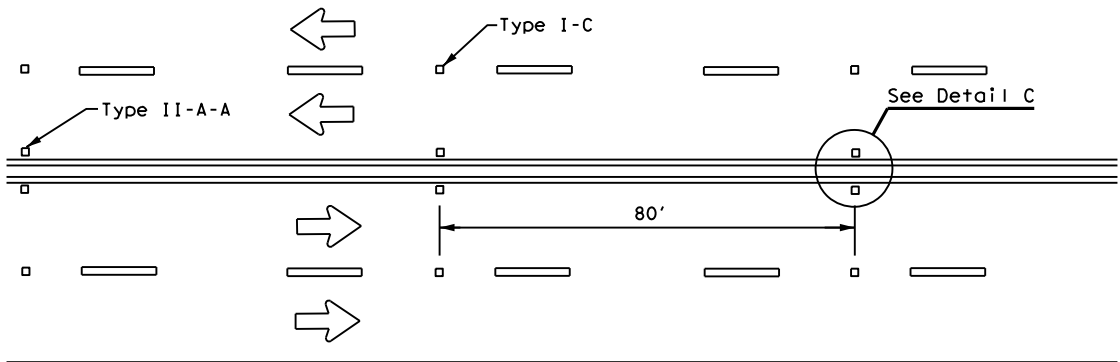
22A

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

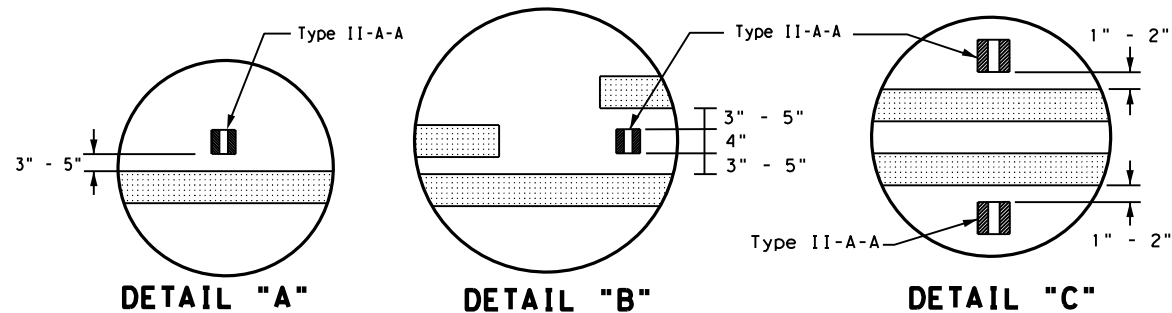
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CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



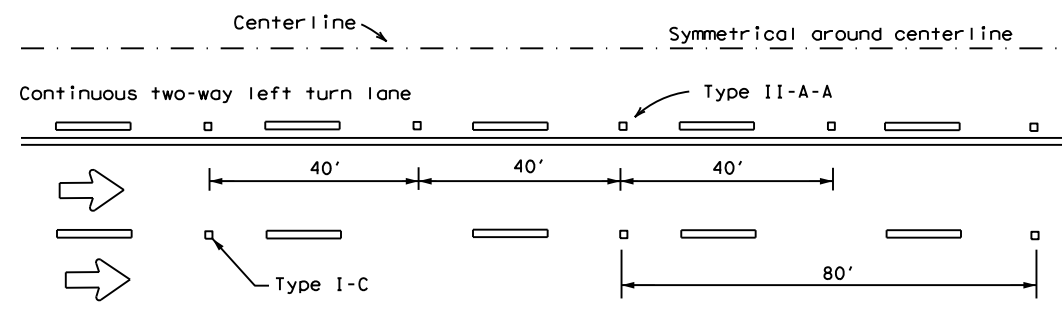
**CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY ROADWAYS**



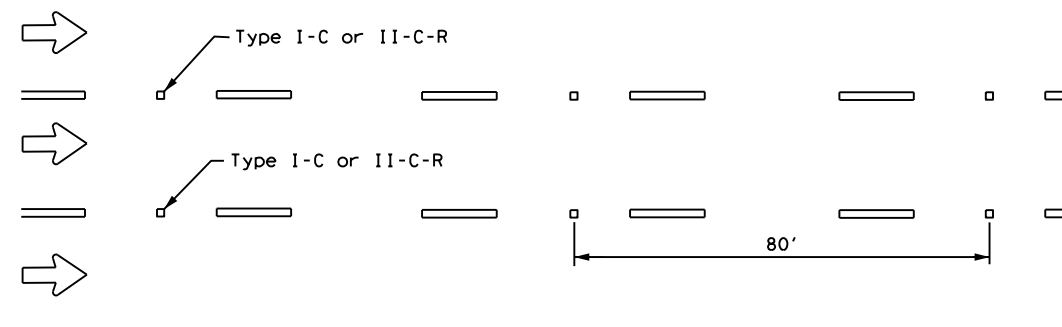
DETAIL "A"

DETAIL "B"

DETAIL "C"

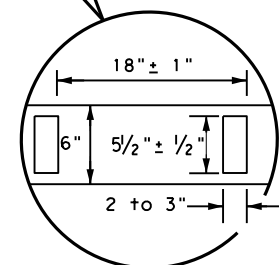
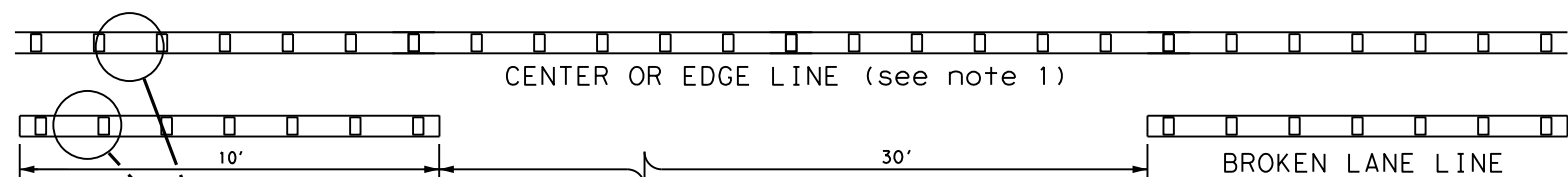


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

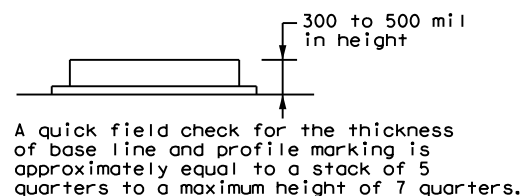
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.
 See Note 3.



**REFLECTORIZED PROFILE
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

6" EDGE LINE, 6" CENTERLINE
OR 6" LANE LINE



NOTES

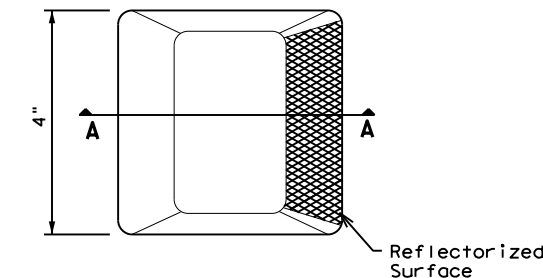
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

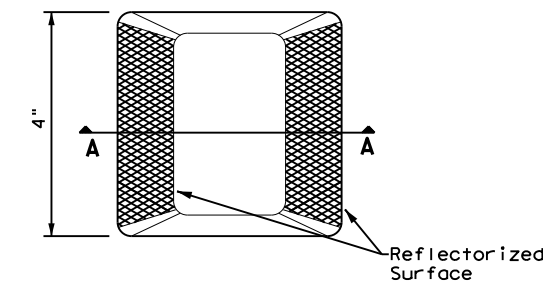
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

| 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 |

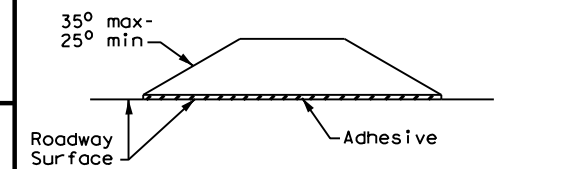
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

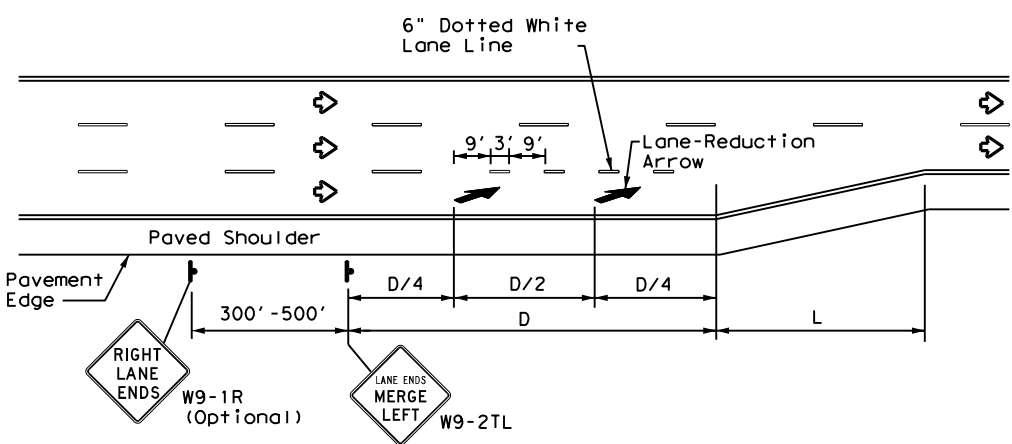


**POSITION GUIDANCE USING
RAISED MARKERS
REFLECTORIZED PROFILE
MARKINGS
PM(2) - 22**

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| © TxDOT December 2022 | CONT | SECT | JOB | HIGHWAY |
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| 4-77 8-00 6-20 | DIST | COUNTY | SHEET NO. | |
| 4-92 2-10 12-22 | AUS | TRAVIS | 41 | |
| 5-00 2-12 | | | | |

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LANE REDUCTION

NOTES

- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
- Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
- For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

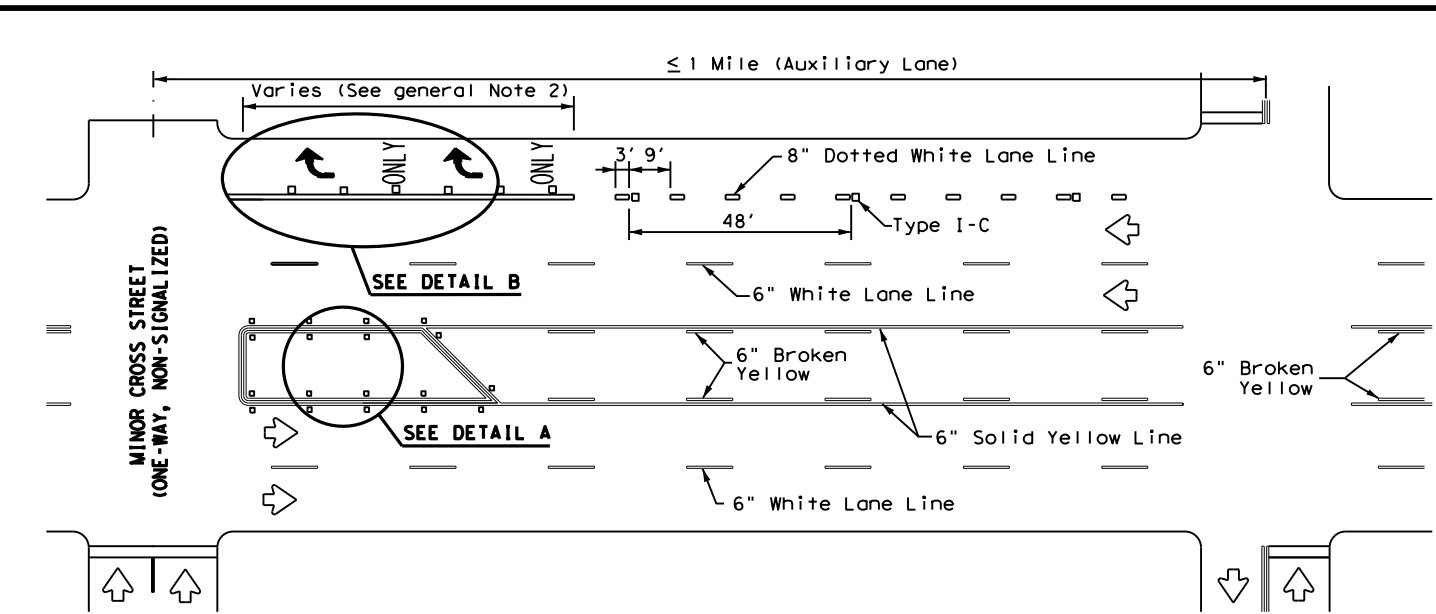
| ADVANCED WARNING SIGN DISTANCE (D) | | |
|------------------------------------|--------|-----------------------|
| Posted Speed | D (ft) | L (ft) |
| 30 MPH | 460 | $L = \frac{WS^2}{60}$ |
| 35 MPH | 565 | |
| 40 MPH | 670 | |
| 45 MPH | 775 | L=WS |
| 50 MPH | 885 | |
| 55 MPH | 990 | |
| 60 MPH | 1,100 | |
| 65 MPH | 1,200 | |
| 70 MPH | 1,250 | |
| 75 MPH | 1,350 | |

GENERAL NOTES

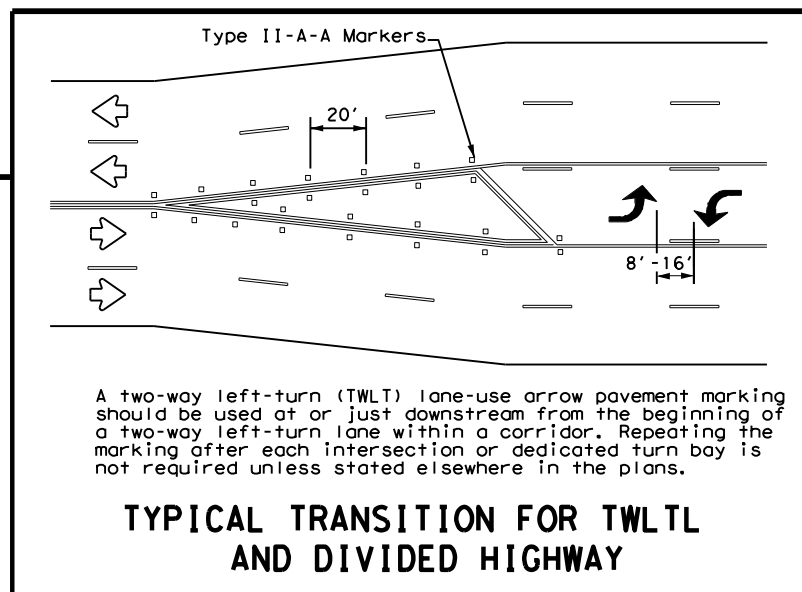
- Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
- When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
- Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

| MATERIAL SPECIFICATIONS | |
|---|----------|
| PAVEMENT MARKERS (REFLECTORIZED) | DMS-4200 |
| EPOXY AND ADHESIVES | DMS-6100 |
| BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS | DMS-6130 |
| TRAFFIC PAINT | DMS-8200 |
| HOT APPLIED THERMOPLASTIC | DMS-8220 |
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |

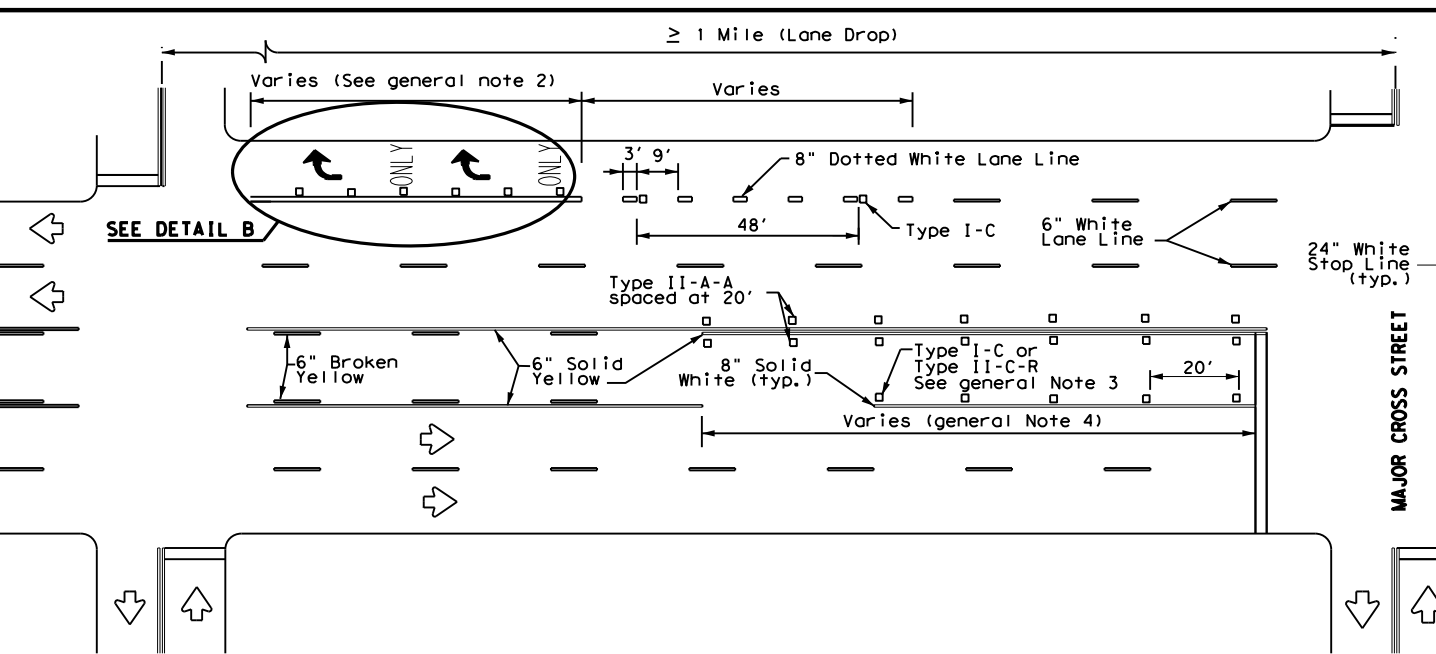
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



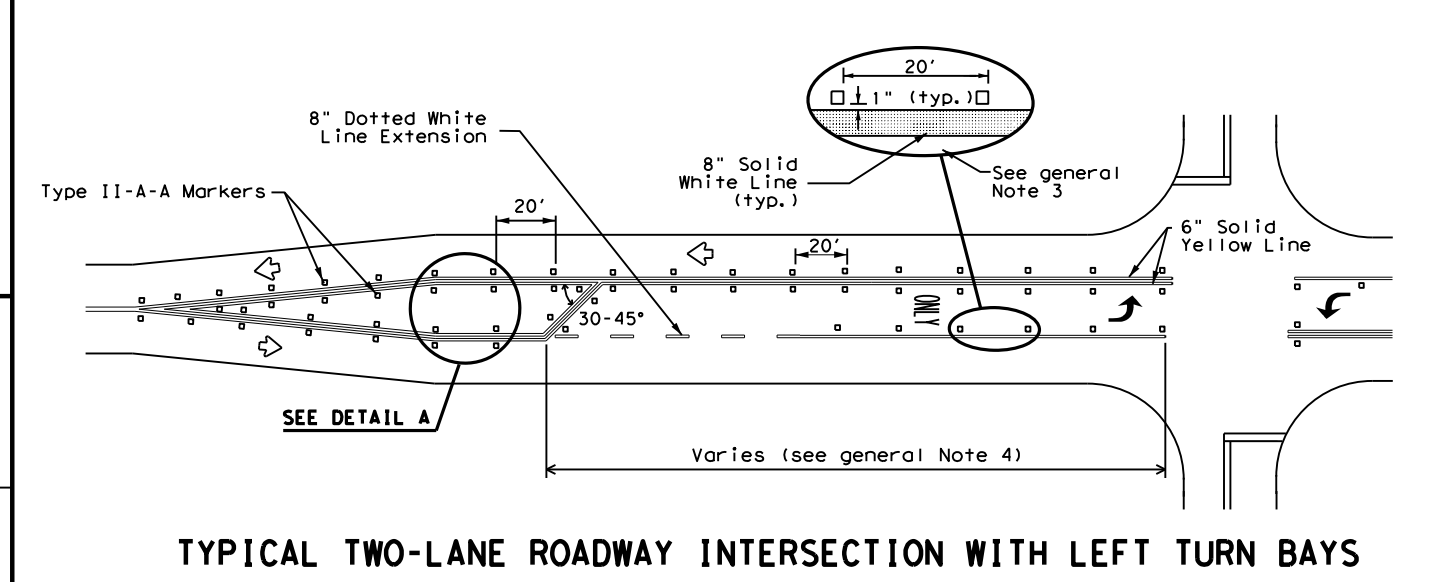
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



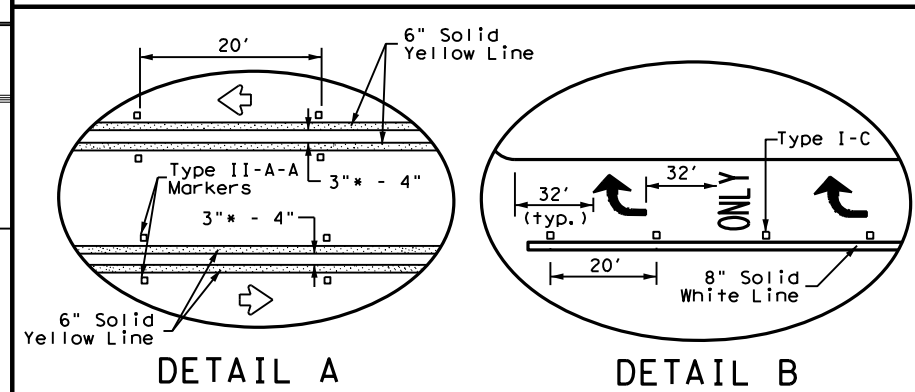
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A

DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

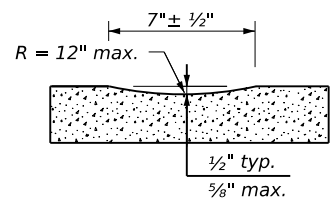
Texas Department of Transportation
 Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3) - 22

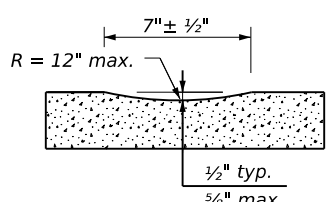
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| 4-98 3-03 6-20 | | |
| 5-00 2-10 12-22 | | |
| 8-00 2-12 | | |
| DIST | COUNTY | SHEET NO. |
| AUS | TRAVIS | 42 |

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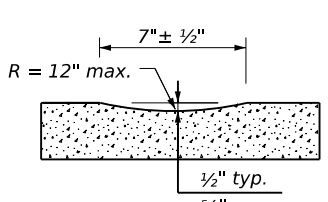
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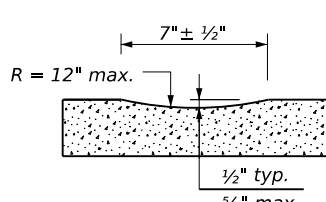
PROFILE VIEW
OPTION 1



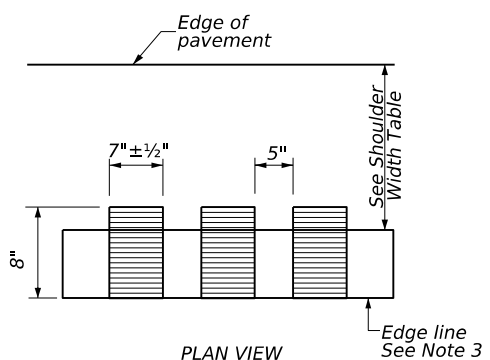
PROFILE VIEW
OPTION 2



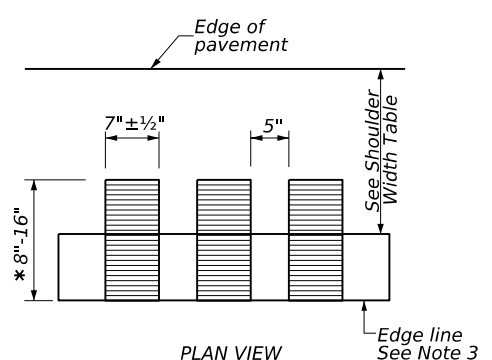
PROFILE VIEW
OPTION 3



PROFILE VIEW
OPTION 4

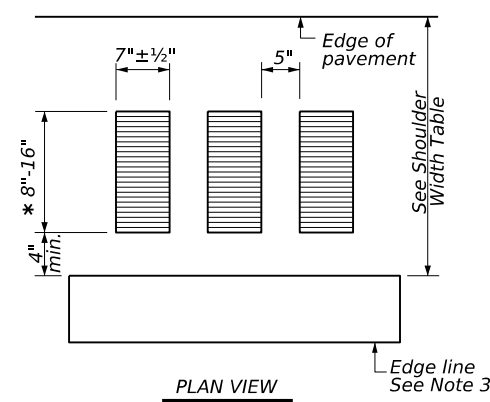


PLAN VIEW



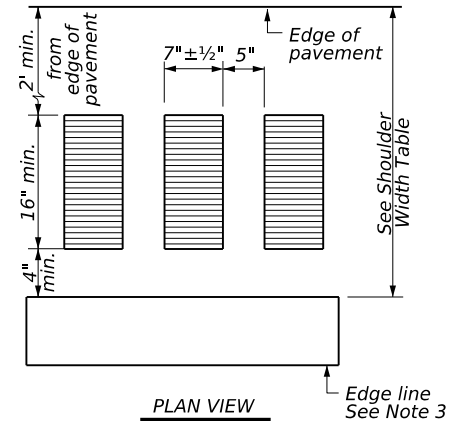
PLAN VIEW

* This distance may vary based on width of shoulder



PLAN VIEW

* This distance may vary based on width of shoulder



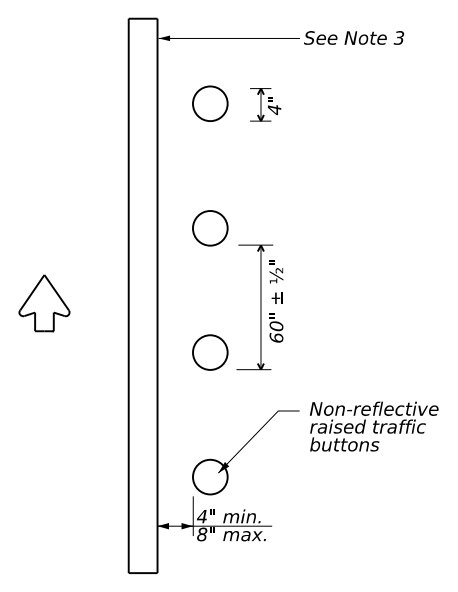
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

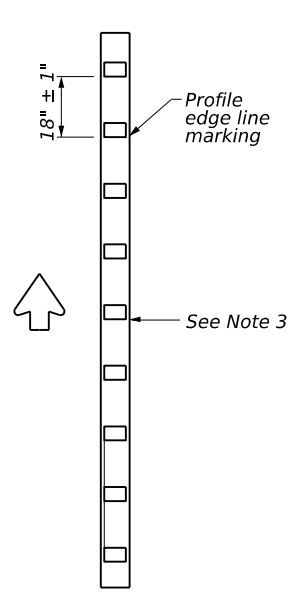
CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



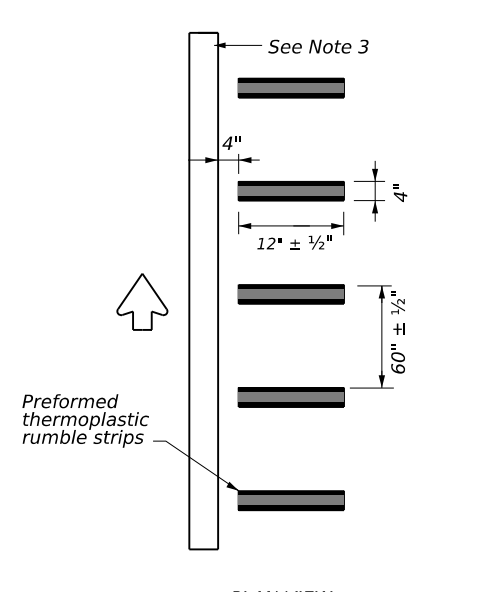
PLAN VIEW
OPTION 5



PLAN VIEW
OPTION 6

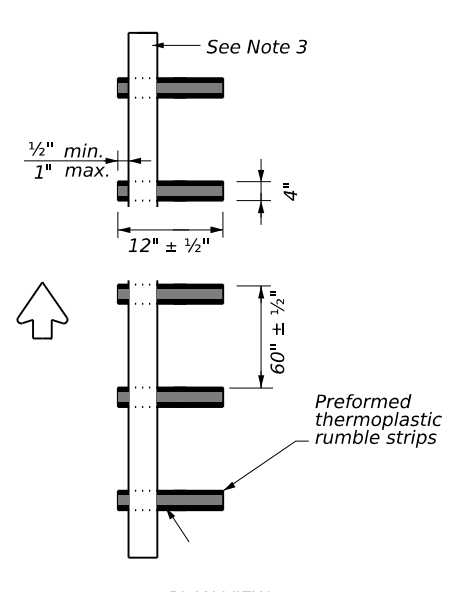
RAISED EDGE LINE (Rumble Strips)

PROFILE EDGE LINE MARKINGS (Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

| 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, 6 or 8 | Option 1, 2, 3, 5, 6 or 7 | Option 2, 4, 5, 6 or 7 |

GENERAL NOTES

- Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
- 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.
- Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
- See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
- Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
- Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
- Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
- Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

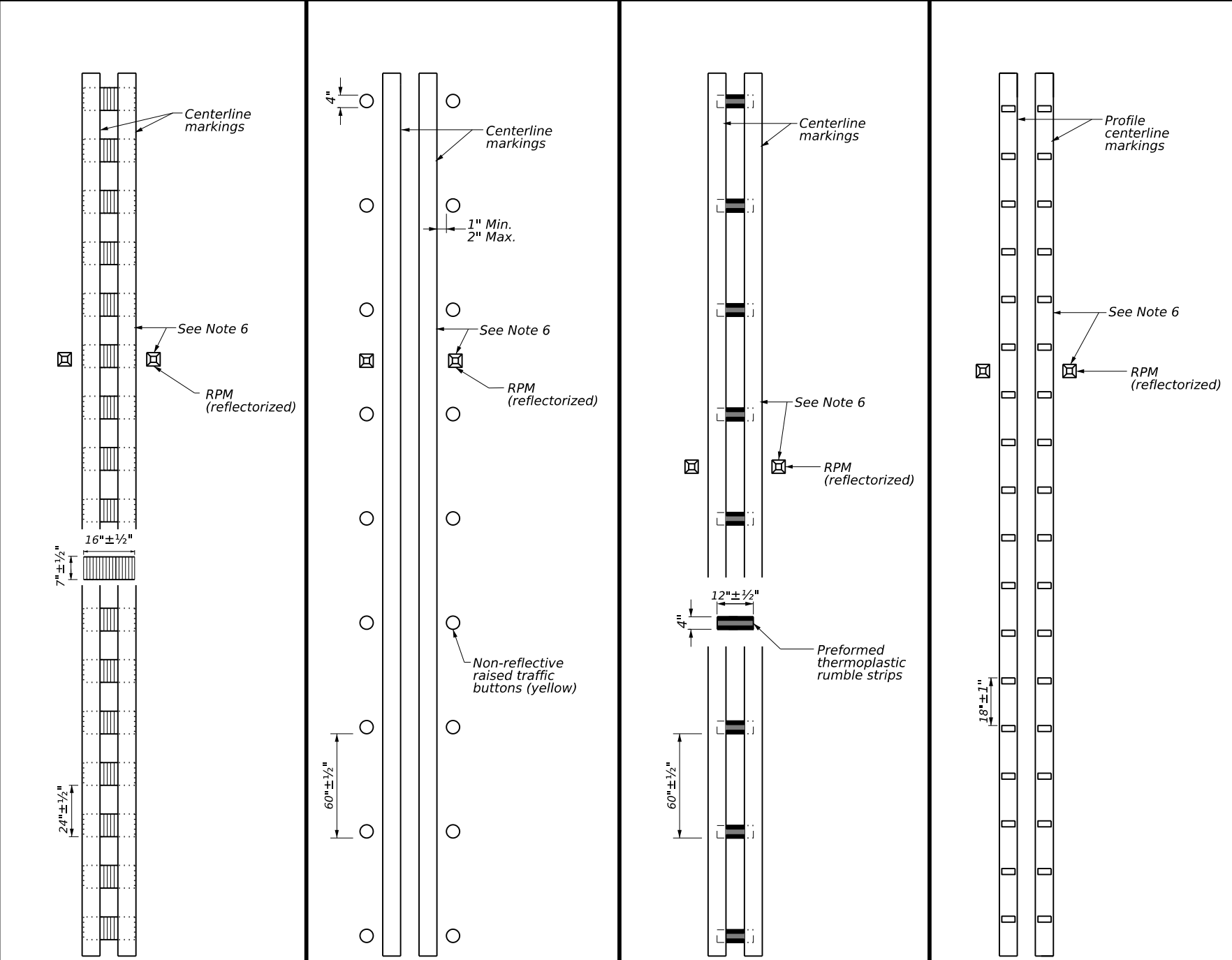
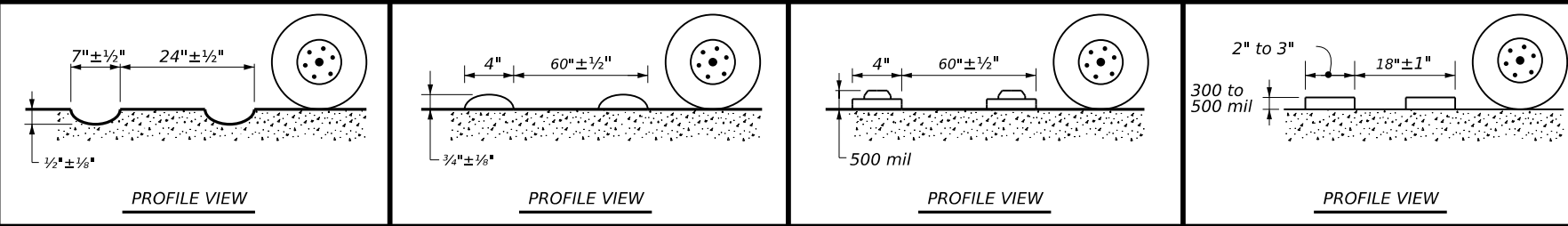
- See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
- Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

- 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.
- Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line 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.
- 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.
- The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
- Raised profile thermoplastic markings used as edge lines may substitute for buttons.

| | | | |
|---|--------------|------------------------|----------------|
| | | | |
| EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23 | | | |
| FILE: rs(2)-23.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT |
| © TxDOT | January 2023 | CONTRACT SECT: 0113 08 | JOB: 091 |
| 10-13 1-23 | | DIST: AUS | COUNTY: TRAVIS |
| | | | SHEET NO: 43 |

CENTERLINE RUMBLE STRIPS



PLAN VIEW OPTION 1
MILLED CENTERLINE RUMBLE STRIPS

PLAN VIEW OPTION 2
RAISED CENTERLINE RUMBLE STRIPS

PLAN VIEW OPTION 3
PREFORMED THERMOPLASTIC RUMBLE STRIPS

PLAN VIEW OPTION 4
PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(2).

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**MULTILANE UNDIVIDED
 HIGHWAY WITH
 SHOULDER**

Texas Department of Transportation

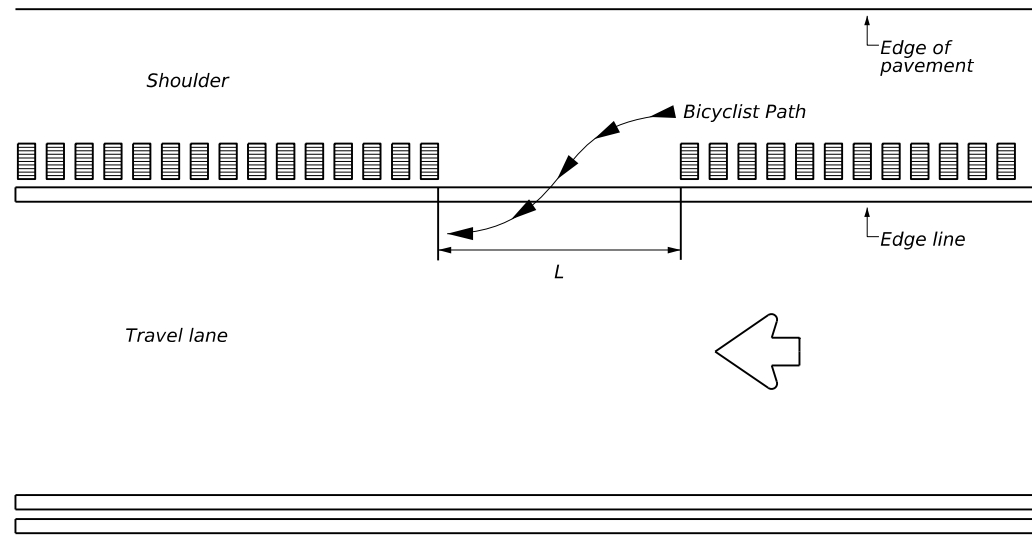
CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS

RS(3)-23

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| © TxDOT | January 2023 | CONT | SECT | JOB |
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| 10-13 | | DIST | COUNTY | SHEET NO. |
| 1-23 | | AUS | TRAVIS | 44 |

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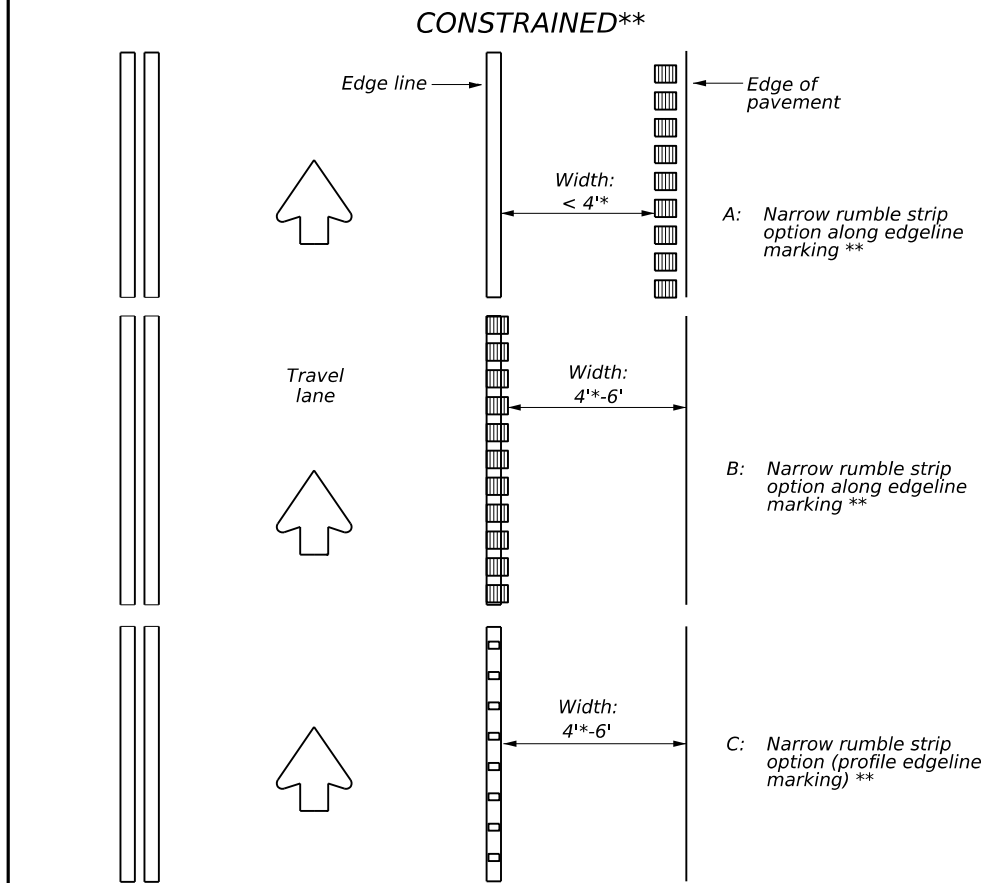
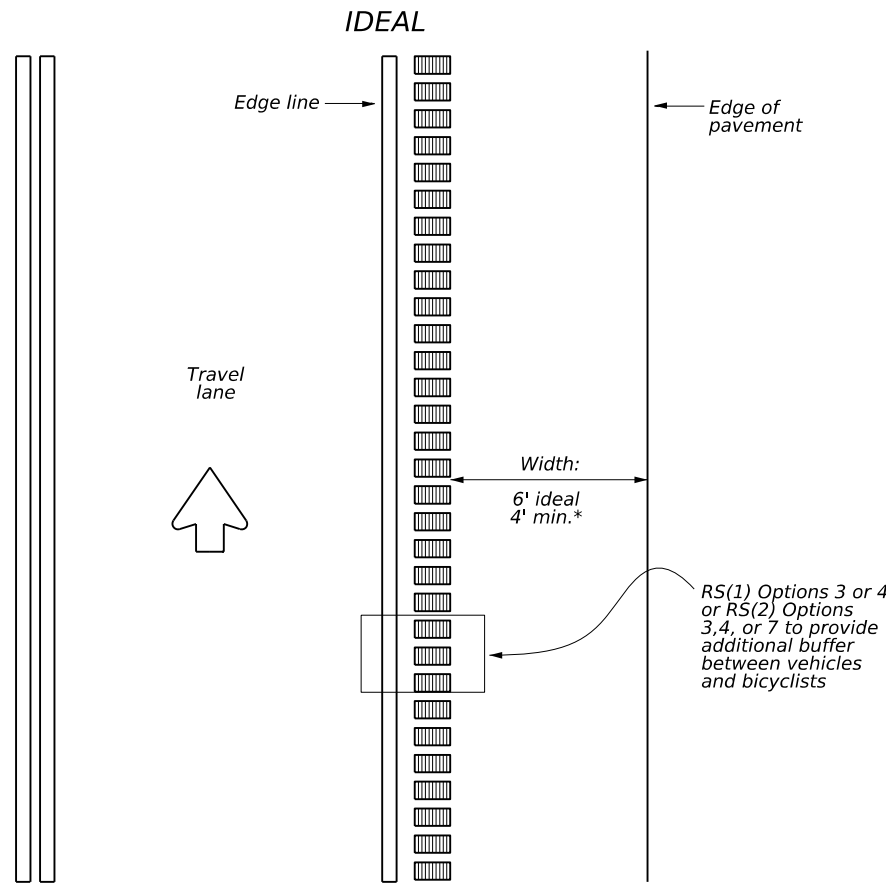
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RUMBLE STRIP GAP SPACING

| GAP LENGTH TABLE (L) | |
|--------------------------------|-------------|
| BICYCLISTS OPERATING <= 20 MPH | >= 15 FEET |
| BICYCLISTS OPERATING > 20 MPH | >= 20 FEET* |

* Or the rumble strips should be located on the right side of the shoulder to allow bicyclists to avoid them if they encounter a need to enter the travel lane (e.g. a downhill location).



* 5' minimum if adjacent to curb, guardrail, vertical element, or obstacle.
 ** Options A-C for consideration of horizontal placement using engineering judgment. See RS(1) and RS(2) for rumble strip device options. Care should be taken to consider bicycles in applying the tables by shoulder width. Narrow rumble strip options include RS(1) Options 1, 2, and 6 and RS(2) Options 1, 2, 6, and 8.

RUMBLE STRIP HORIZONTAL PLACEMENT

GENERAL NOTES

- The Engineer must consider accommodating bicycles during the planning and implementation of all construction and rehabilitation projects. See the TxDOT Roadway Design Manual (RDM) Bicycle Facilities section for applicable policies, references, and guidance; including additional detail regarding rumble strip gap and horizontal placement, as well as explanation of desirable, minimum, and constrained values.
- For non-freeway facilities with bike lanes, buffered bike lanes, or bike-accessible shoulders, the Engineer shall place rumble strips considering the safety of and crash risk for bicyclists. The Engineer shall include a detail of rumble strip gap spacing, horizontal spacing from the edge line, and material / installation method in the plans.
- See RS(5) General Note 8 regarding bicycle safety with transverse (in-line rumble strips).

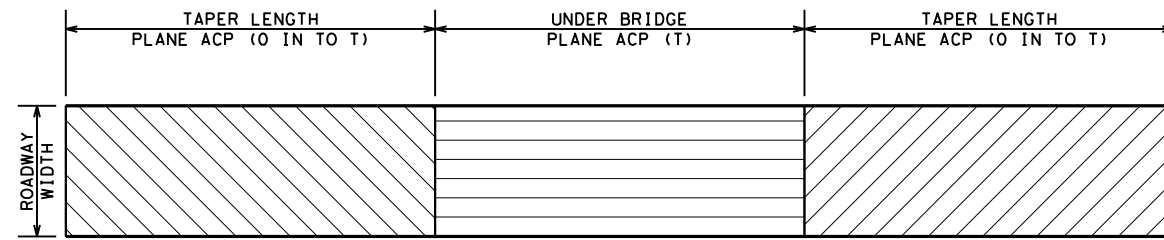
GAPS

- Rumble strip gaps to allow bicyclists to safely enter or exit a shoulder, as needed. In addition to gaps provided for vehicles (e.g. at cross-streets), the Engineer shall ensure gaps are available every 40 to 60 feet. See Gap Spacing detail. The Engineer should consider significant grades as they affect bicycle speeds in applying the Gap Length Table, for example downhill versus uphill bicycle speeds.

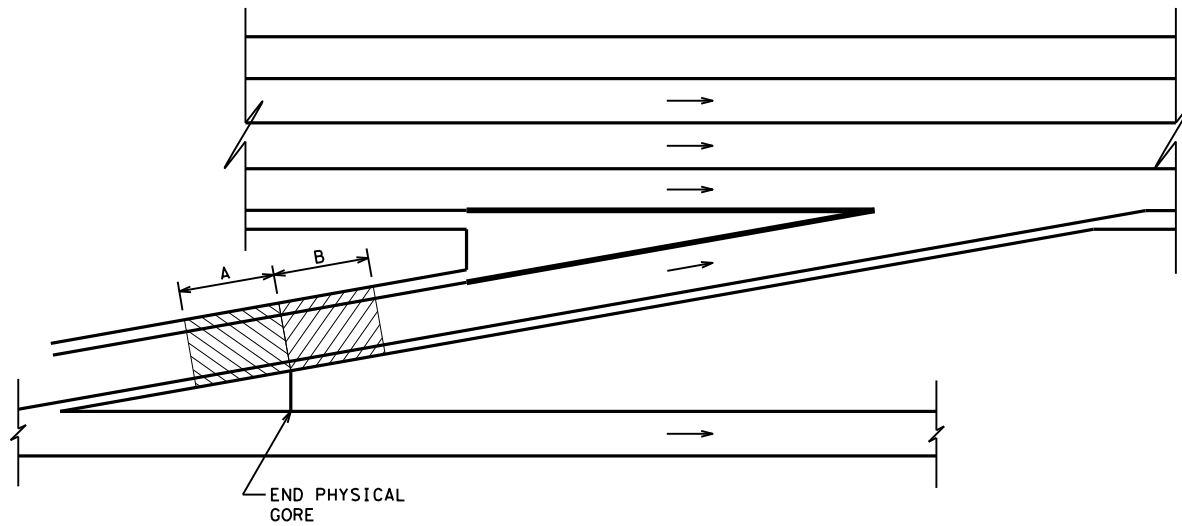
HORIZONTAL SPACING

- Rumble strip horizontal spacing considerations affect bicyclist safety and mobility. The Engineer shall consider desirable, minimum, and constrained widths, as shown in the horizontal placement detail. The Engineer shall apply engineering judgment to choose placement and material options in the Shoulder Width Tables on each RS sheet to optimize safety for all users. Horizontal width for bikes does not include standard drainage inlets, rumble strips, or raised pavement markers (RPMs).

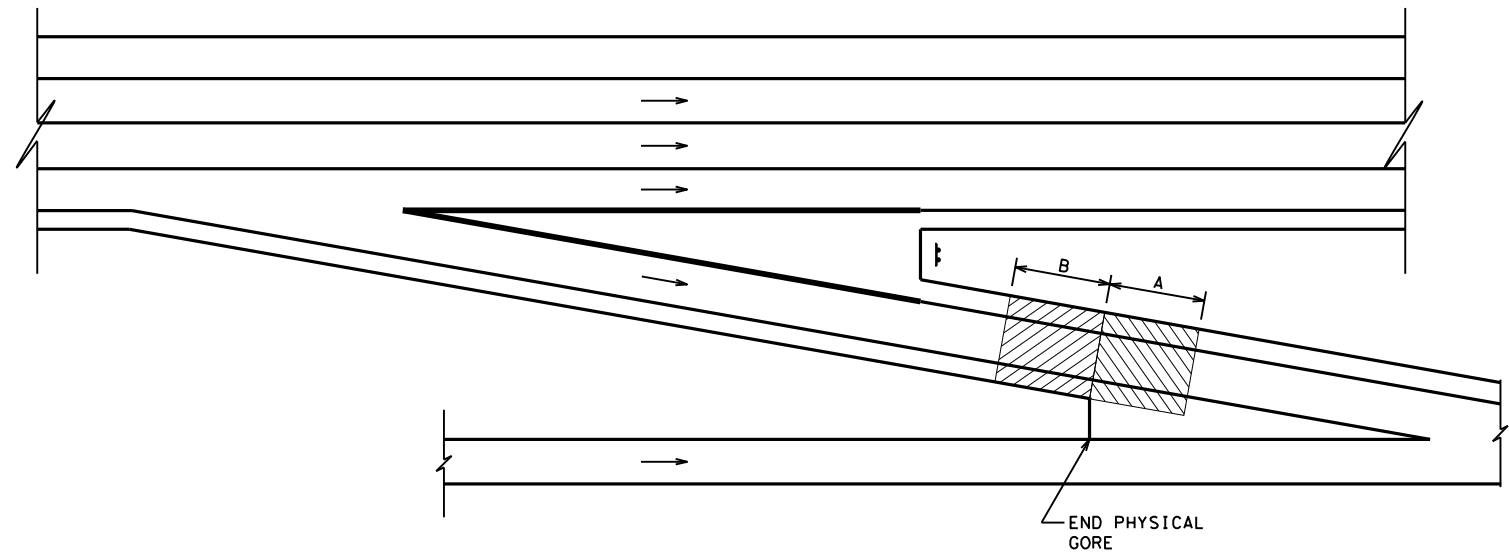
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| | | | | Traffic Safety Division Standard | |
| RUMBLE STRIP BICYCLE CONSIDERATIONS FOR NON-FREEWAY FACILITIES RS(6)-23 | | | | | |
| FILE: rs(6)-23.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT | |
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| 1-23 | REVISIONS | DIST: AUS | COUNTY: TRAVIS | SHEET NO. 45 | |



BRIDGE UNDERPASS MILLING DETAIL



ENTRANCE RAMP MILLING DETAIL



EXIT RAMP MILLING DETAIL

LEGEND



A = LOCATION OF PLANE ACP TAPER WHEN FRONTAGE ROADS ARE OVERLAID (0 IN TO T)



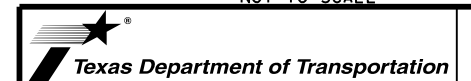
B = LOCATION OF PLANE ACP TAPER WHEN FREEWAY MAINLNAES ARE OVERLAID (0 IN TO T)

NOTES

T = OVERLAY/INLAY THICKNESS (IN)
TAPER LENGTH = 100 FT PER 1 INCH OF T

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NOT TO SCALE



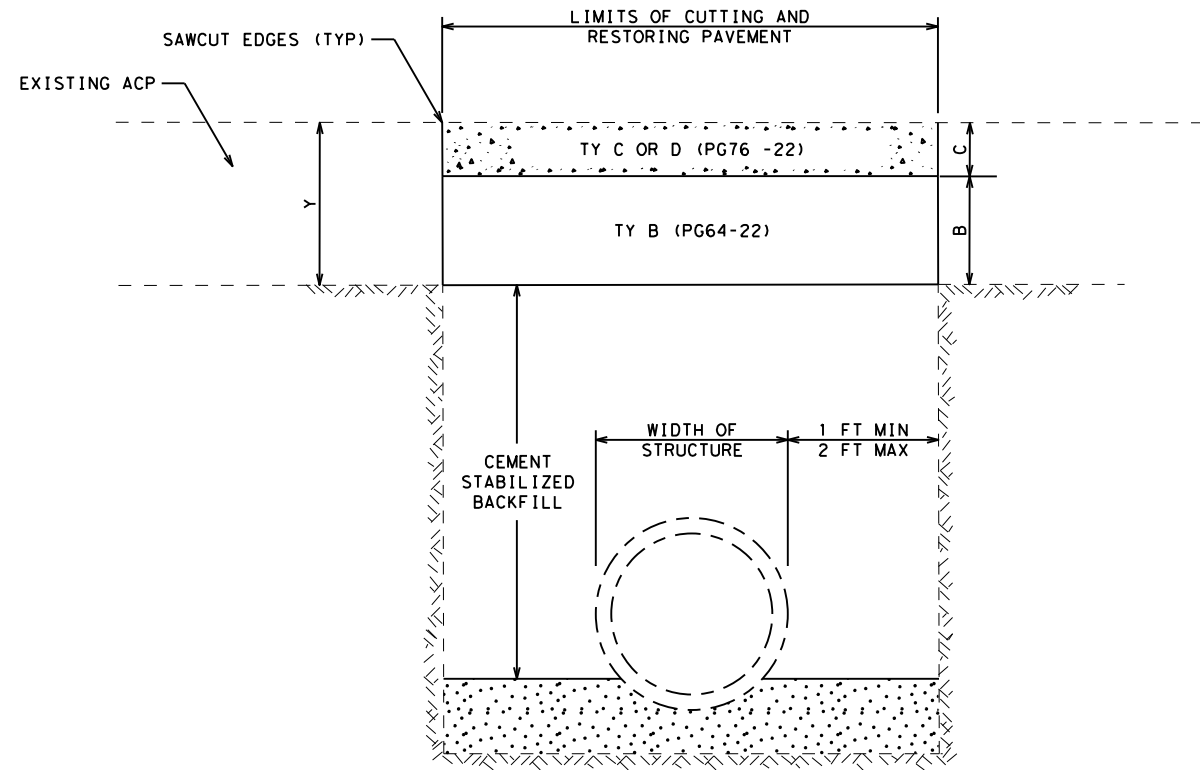
Austin District Standard

FLEXIBLE PAVEMENT DETAILS

FLEXPAVE (1) -22 (AUS)

| | | | | |
|-------------|------|--------|-----------|---------|
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| | 0113 | 08 | 091 | US 290 |
| | DIST | COUNTY | SHEET NO. | |
| | AUS | TRAVIS | 46 | |

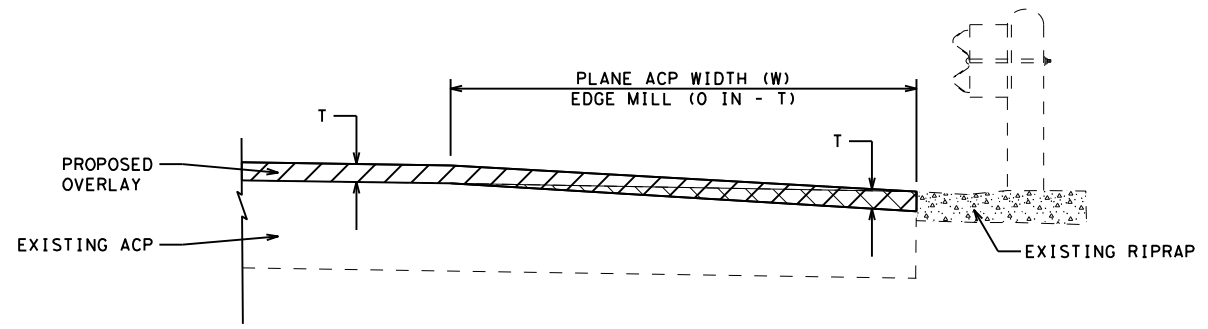
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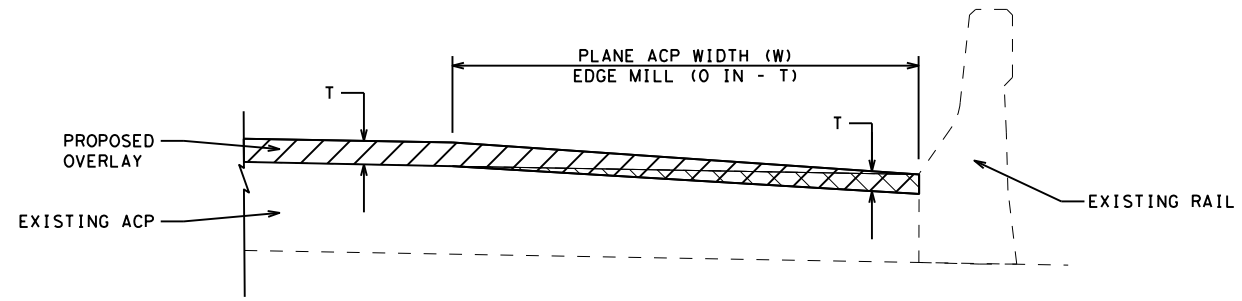
CUTTING AND RESTORING PAVEMENT DETAIL

CUT AND RESTORE NOTES

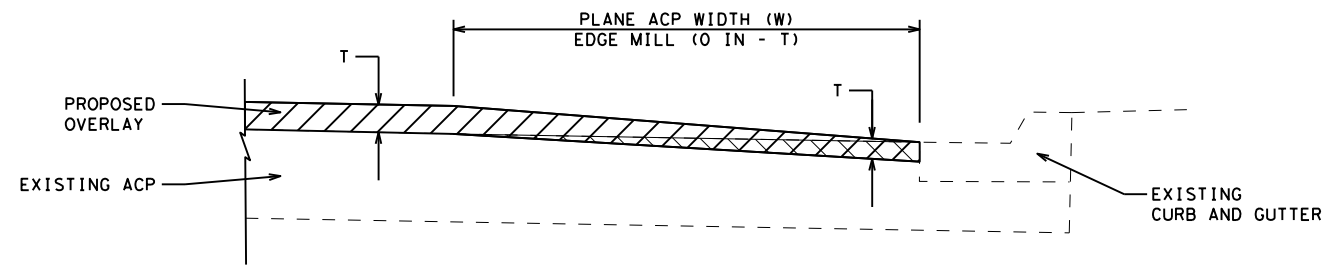
- Y = DEPTH OF EXISTING ACP (IN)
- Y = C + B
- C = MIN 2 IN AND MAX 4 IN THICKNESS
- CUTTING AND RESTORING PAVEMENT PER ITEM 400
- HMA MAY BE BLADE LAID
- ALL ACP PER ITEM 3076
- THE FOLLOWING WORK IS SUBSIDIARY:
- CEMENT STABILIZED BACKFILL
- SAWCUT EDGES
- TACK ALL ACP SURFACES IN CUT AND RESTORE



MOWSTRIP OR RIPRAP EDGE MILL DETAIL



RAIL EDGE MILL DETAIL

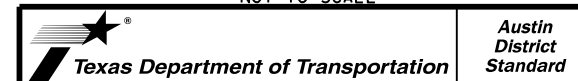


CURB EDGE MILL DETAIL

EDGE REPAIR NOTES

- T = OVERLAY/INLAY THICKNESS (IN)
- W = FULL LANE WIDTH OR MINIMUM 10 FT

NOT TO SCALE



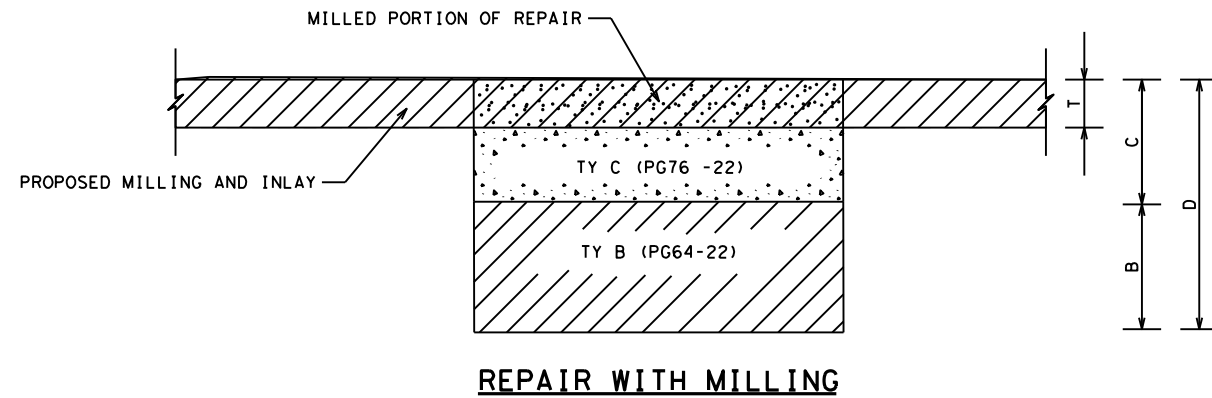
**FLEXIBLE PAVEMENT
 DETAILS**

FLEXPAVE (2) -22 (AUS)

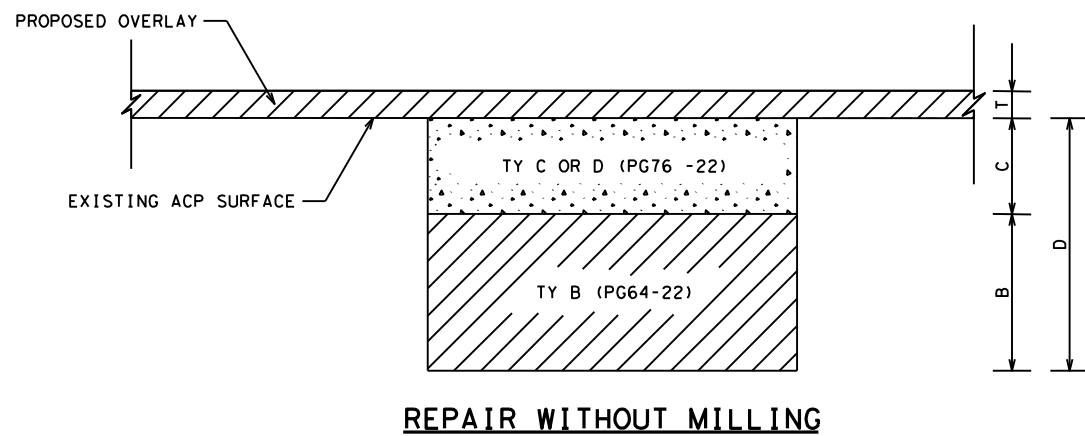
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| ©TxDOT 2024 | CONT | SECT | JOB | HIGHWAY |
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| | DIST | COUNTY | SHEET NO. | |
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| REPAIR DEPTH W/ MILLING | T = 1 IN | | T = 1.5 IN | | T = 2 IN | |
|----------------------------|----------|------|------------|------|----------|------|
| | TY C | TY B | TY C | TY B | TY C | TY B |
| <= 4 | 4 | 0 | 4 | 0 | 4 | 0 |
| 5 | 5 | 0 | 5 | 0 | 5 | 0 |
| 6 | 6 | 0 | 6 | 0 | 6 | 0 |
| 7 | 3 | 4 | 4 | 3 | 4 | 3 |
| 8 | 4 | 4 | 4 | 4 | 4 | 4 |
| >= 9 | 4 | D-4 | 4 | D-4 | 4 | D-4 |

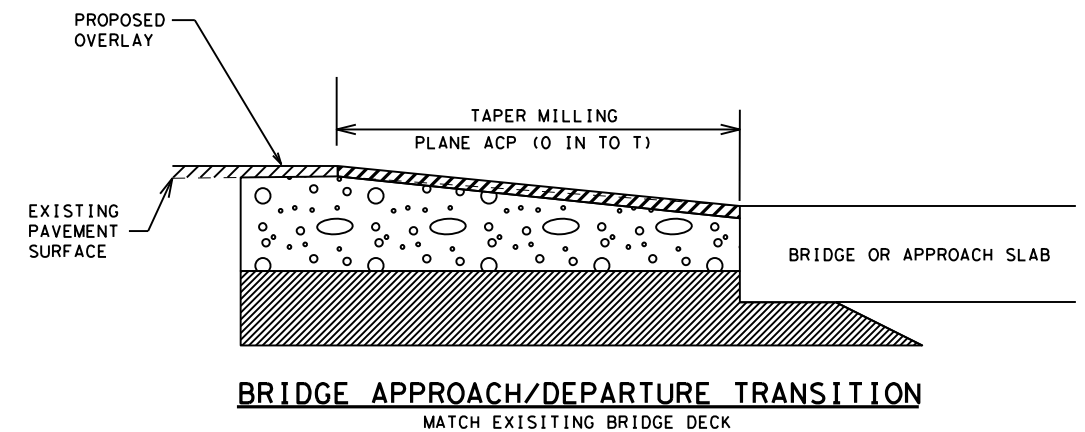
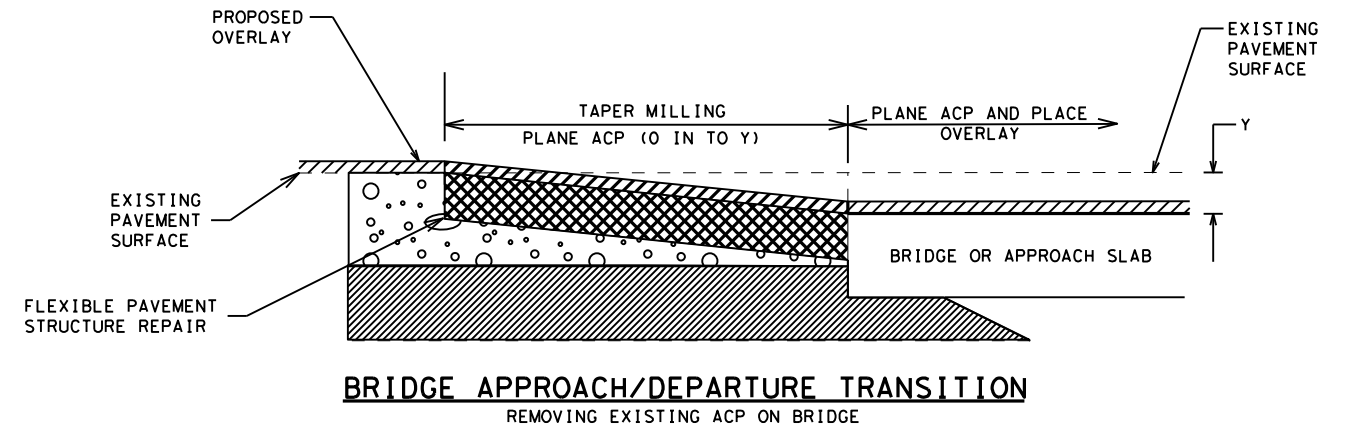
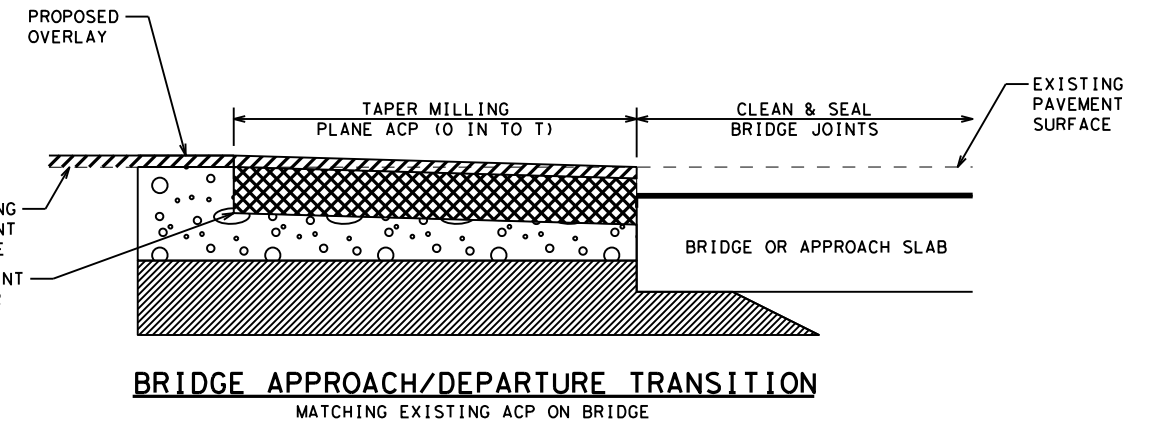


| REPAIR DEPTH W/O MILLING | TY D | TY C | TY B |
|-----------------------------|------|------|------|
| 2 | 2 | 0 | 0 |
| 3 | 0 | 3 | 0 |
| 4 | 0 | 4 | 0 |
| 5 | 0 | 5 | 0 |
| 6 | 0 | 6 | 0 |
| 7 | 2 | 0 | 5 |
| 8 | 2 | 0 | 6 |
| >= 9 | 2 | 0 | D-4 |



FLEX PAV REPAIR NOTES

- T = OVERLAY/INLAY THICKNESS (IN)
- D = REPAIR DEPTH
- C = TY C/D ACP DEPTH
- B = TY B ACP DEPTH
- TY B MAY BE BLADE LAID.
- TY C/D MUST BE PAVER LAID.
- TY C/D MAX LIFT THICKNESS 3 IN
- TY B MAX LIFT THICKNESS 5 IN
- ALL ACP PER ITEM 3076.
- FOLLOWING WORK IS SUBSIDIARY:
 - SAW CUT ALL EDGES
 - TACK ALL ACP SURFACES AND LAYERS



BRIDGE APPROACH MILLING NOTES

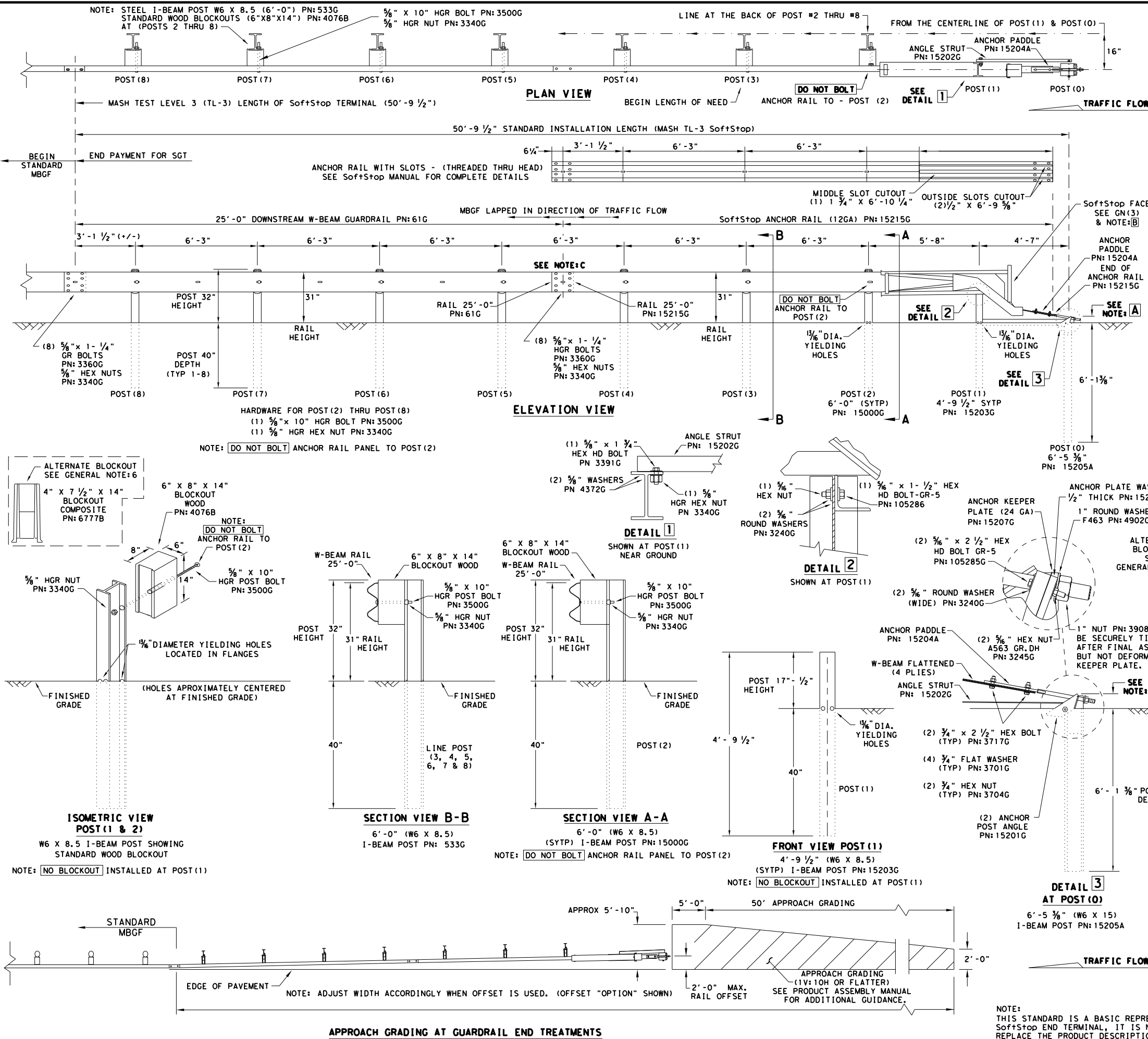
- T = OVERLAY/INLAY THICKNESS (IN)
- Y = DEPTH OF MILLING ON BRIDGE
- TAPER LENGTH = 100 FT PER 1 IN OF T OR Y
- ENGINEER SHOULD INCLUDE WORK TO ADJUST MBGF TO MEET STANDARD HEIGHT. ADJUSTMENT TO MBGF WILL BE PAID USING APPROPRIATE BID ITEMS.
- ENGINEER MUST INCLUDE WORK TO ADJUST MOWSTRIP TO ELIMINATE PONDING.

NOT TO SCALE

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| | | Austin District Standard | |
| FLEXIBLE PAVEMENT DETAILS | | | |
| FLEXPAVE (3) -22 (AUS) | | | |
| ©TxDOT 2024 | CONT | SECT | JOB |
| | 0113 | 08 | 091 |
| | DIST | COUNTY | HIGHWAY |
| | AUS | TRAVIS | US 290 |
| | | | SHEET NO. |
| | | | 48 |

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GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
- FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN:620237B
- 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.
- FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
- HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- A COMPOSITE MATERIAL BLOCKOUT 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.
- IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
- DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
- UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
- 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.

| | |
|---------------|---|
| NOTE:A | THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE. |
| NOTE:B | PART PN:5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN:5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) |
| NOTE:C | W-BEAM SPLICE LOCATED BETWEEN LINE POST (4) AND LINE POST (5) GUARDRAIL PANEL 25'-0" PN:61G ANCHOR RAIL 25'-0" PN:15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW. |

| PART | QTY | MAIN SYSTEM COMPONENTS |
|---------|-----|--|
| 620237B | 1 | PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.) |
| 15208A | 1 | SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH) |
| 15215G | 1 | SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS |
| 61G | 1 | SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'-0") |
| 15205A | 1 | POST #0 - ANCHOR POST (6'-5 3/8") |
| 15203G | 1 | POST #1 - (SYTP) (4'-9 1/2") |
| 15000G | 1 | POST #2 - (SYTP) (6'-0") |
| 533G | 6 | POST #3 THRU #8 - I-BEAM (W6 X 8.5) (6'-0") |
| 4076B | 7 | BLOCKOUT - WOOD (ROUTED) (6" X 8" X 14") |
| 6777B | 7 | BLOCKOUT - COMPOSITE (4" X 7 1/2" X 14") |
| 15204A | 1 | ANCHOR PADDLE |
| 15207G | 1 | ANCHOR KEEPER PLATE (24 GA) |
| 15206G | 1 | ANCHOR PLATE WASHER (1/2" THICK) |
| 15201G | 2 | ANCHOR POST ANGLE (10" LONG) |
| 15202G | 1 | ANGLE STRUT |

| HARDWARE | | |
|----------|----|---|
| 4902G | 1 | 1" ROUND WASHER F436 |
| 3908G | 1 | 1" HEAVY HEX NUT A563 GR.DH |
| 3717G | 2 | 3/4" X 2 1/2" HEX BOLT A325 |
| 3701G | 4 | 3/4" ROUND WASHER F436 |
| 3704G | 2 | 3/4" HEAVY HEX NUT A563 GR.DH |
| 3360G | 16 | 5/8" X 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR |
| 3340G | 25 | 5/8" W-BEAM RAIL SPLICE NUTS HGR |
| 3500G | 7 | 5/8" X 10" HGR POST BOLT A307 |
| 3391G | 1 | 5/8" X 1 3/4" HEX HD BOLT A325 |
| 4489G | 1 | 5/8" X 9" HEX HD BOLT A325 |
| 4372G | 4 | 5/8" WASHER F436 |
| 105285G | 2 | 5/8" X 2 1/2" HEX HD BOLT GR-5 |
| 105286G | 1 | 5/8" X 1 1/2" HEX HD BOLT GR-5 |
| 3240G | 6 | 5/8" ROUND WASHER (WIDE) |
| 3245G | 3 | 5/8" HEX NUT A563 GR.DH |
| 5852B | 1 | HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B |

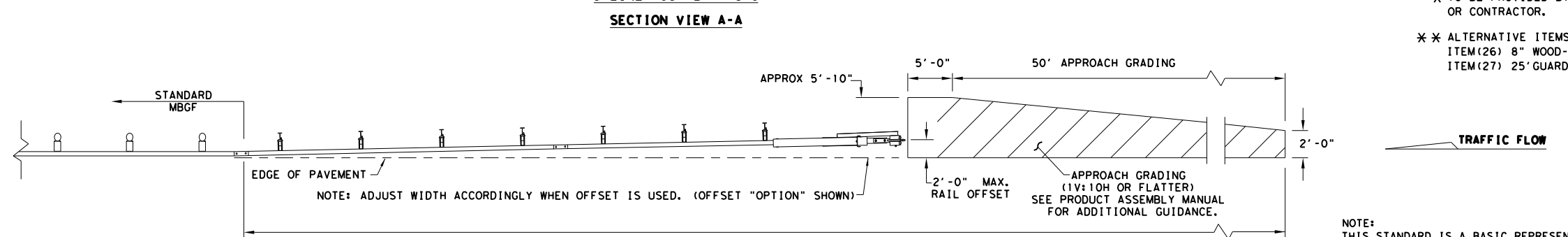
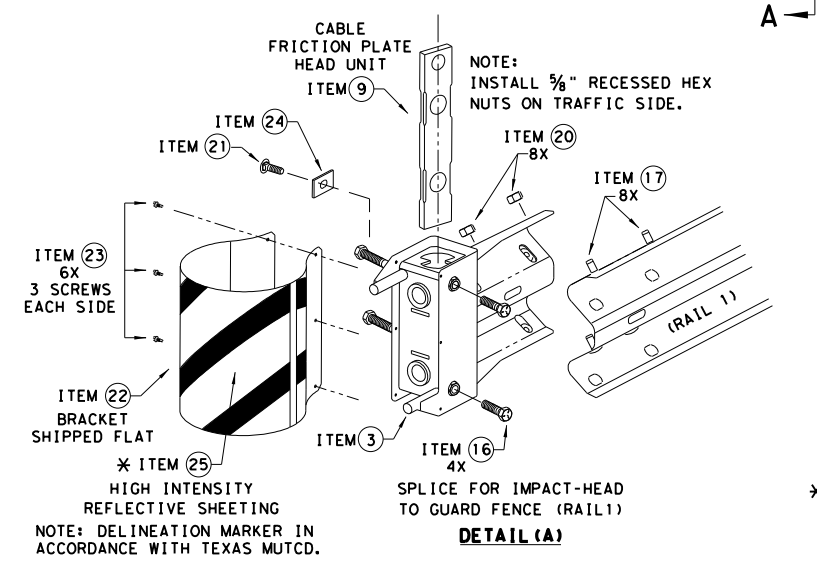
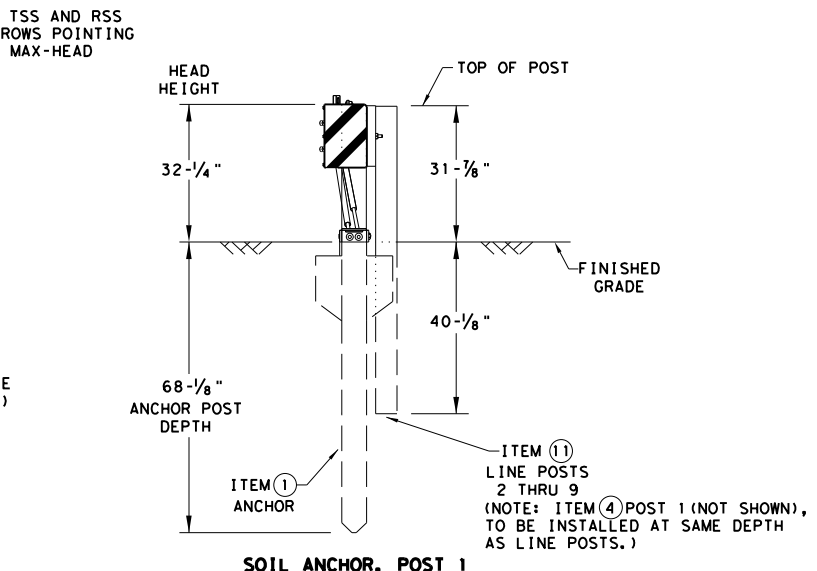
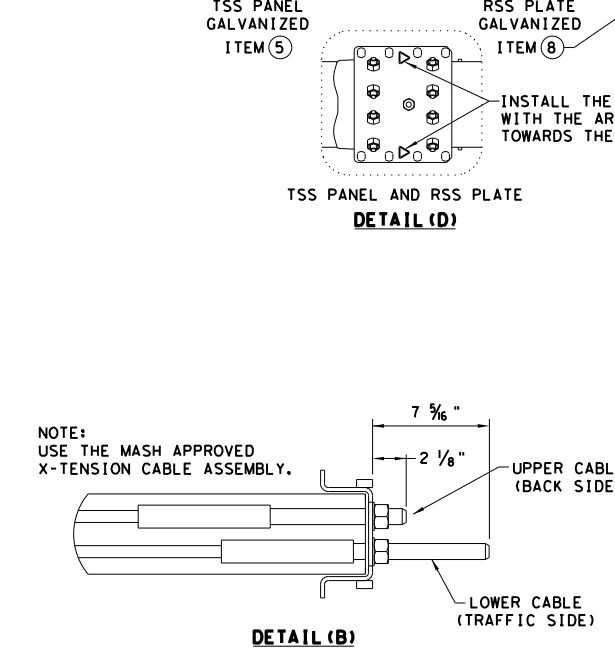
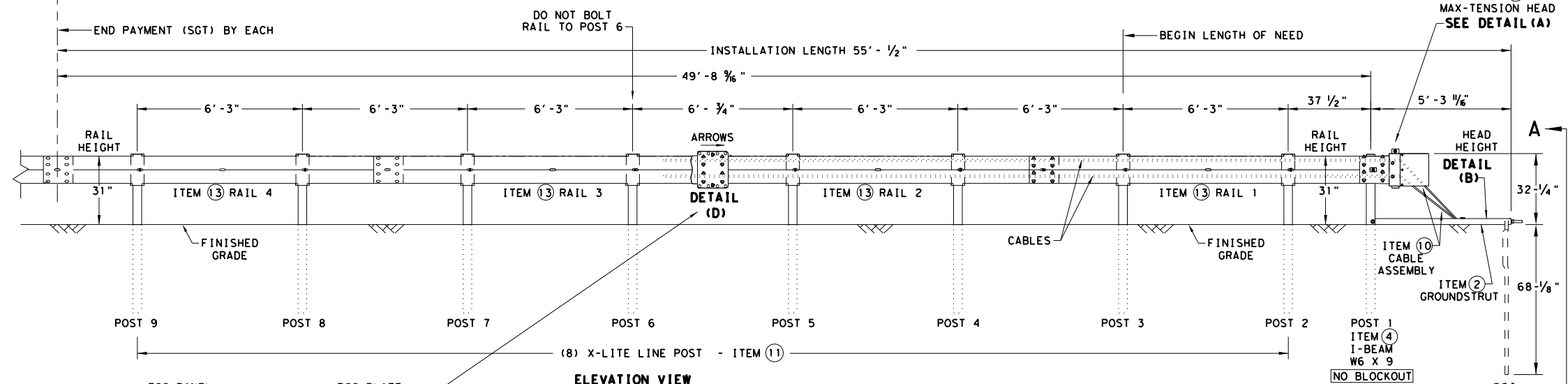
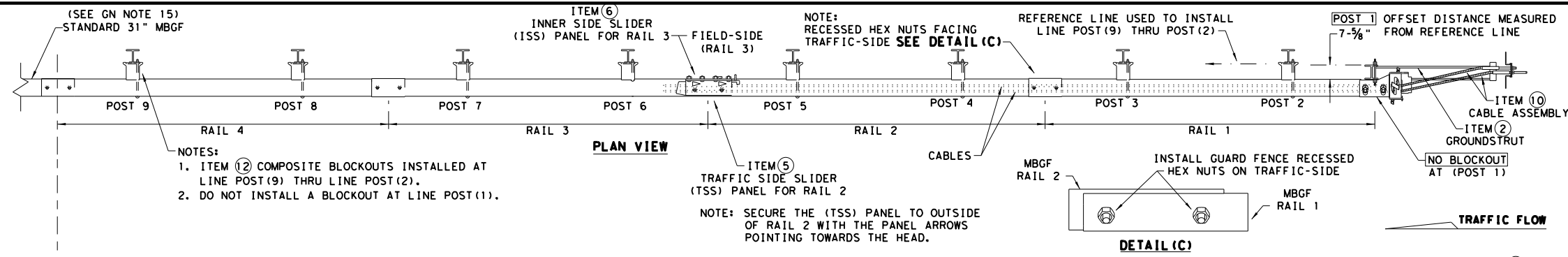
Design Division Standard

**TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT (10S)31-16**

| | | | | |
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| ©2024 JULY 2016 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| DIST | COUNTY | SHEET NO. | | |
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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 any kind of units or for the use of any format or for incorrect results or damages resulting from its use.

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

| ITEM # | PART NUMBER | DESCRIPTION | QTY |
|--------|-----------------|--|-----|
| 1 | BSI-1610060-00 | SOIL ANCHOR - GALVANIZED | 1 |
| 2 | BSI-1610061-00 | GROUND STRUT - GALVANIZED | 1 |
| 3 | BSI-1610062-00 | MAX-TENSION IMPACT HEAD | 1 |
| 4 | BSI-1610063-00 | W6x9 I-BEAM POST 6FT.-GALVANIZED | 1 |
| 5 | BSI-1610064-00 | TSS PANEL - TRAFFIC SIDE SLIDER | 1 |
| 6 | BSI-1610065-00 | ISS PANEL - INNER SIDE SLIDER | 1 |
| 7 | BSI-1610066-00 | TOOTH - GEOMET | 1 |
| 8 | BSI-1610067-00 | RSS PLATE - REAR SIDE SLIDER | 1 |
| 9 | B061058 | CABLE FRICTION PLATE - HEAD UNIT | 1 |
| 10 | BSI-1610069-00 | CABLE ASSEMBLY - MASH X-TENSION | 2 |
| 11 | BSI-1012078-00 | X-LITE LINE POST-GALVANIZED | 8 |
| 12 | B090534 | 8" W-BEAM COMPOSITE-BLOCKOUT XT110 | 8 |
| 13 | BSI-4004386 | 12'-6" W-BEAM GUARD FENCE PANELS 12GA. | 4 |
| 14 | BSI-1102027-00 | X-LITE SQUARE WASHER | 1 |
| 15 | BSI-2001886 | 3/8" X 7" THREAD BOLT HH (GR.5)GEOMET | 1 |
| 16 | BSI-2001885 | 3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET | 4 |
| 17 | 4001115 | 5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL | 48 |
| 18 | 2001840 | 5/8" X 10" GUARD FENCE BOLTS MGAL | 8 |
| 19 | 2001636 | 5/8" WASHER F436 STRUCTURAL MGAL | 2 |
| 20 | 4001116 | 5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL | 59 |
| 21 | BSI-2001888 | 3/8" X 2" ALL THREAD BOLT (GR.5)GEOMET | 1 |
| 22 | BSI-1701063-00 | DELINEATION MOUNTING (BRACKET) | 1 |
| 23 | BSI-2001887 | 1/4" X 3/4" SCREW SD HH 410SS | 7 |
| 24 | 4002051 | GUARDRAIL WASHER RECT AASHTO FWRO3 | 1 |
| 25 | SEE NOTE BELOW | HIGH INTENSITY REFLECTIVE SHEETING | 1 |
| 26 | 4002337 | 8" W-BEAM TIMBER-BLOCKOUT, PDB01B | 8 |
| 27 | BSI-4004431 | 25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA. | 2 |
| 28 | MANMAX Rev- (D) | MAX-TENSION INSTALLATION INSTRUCTIONS | 1 |

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

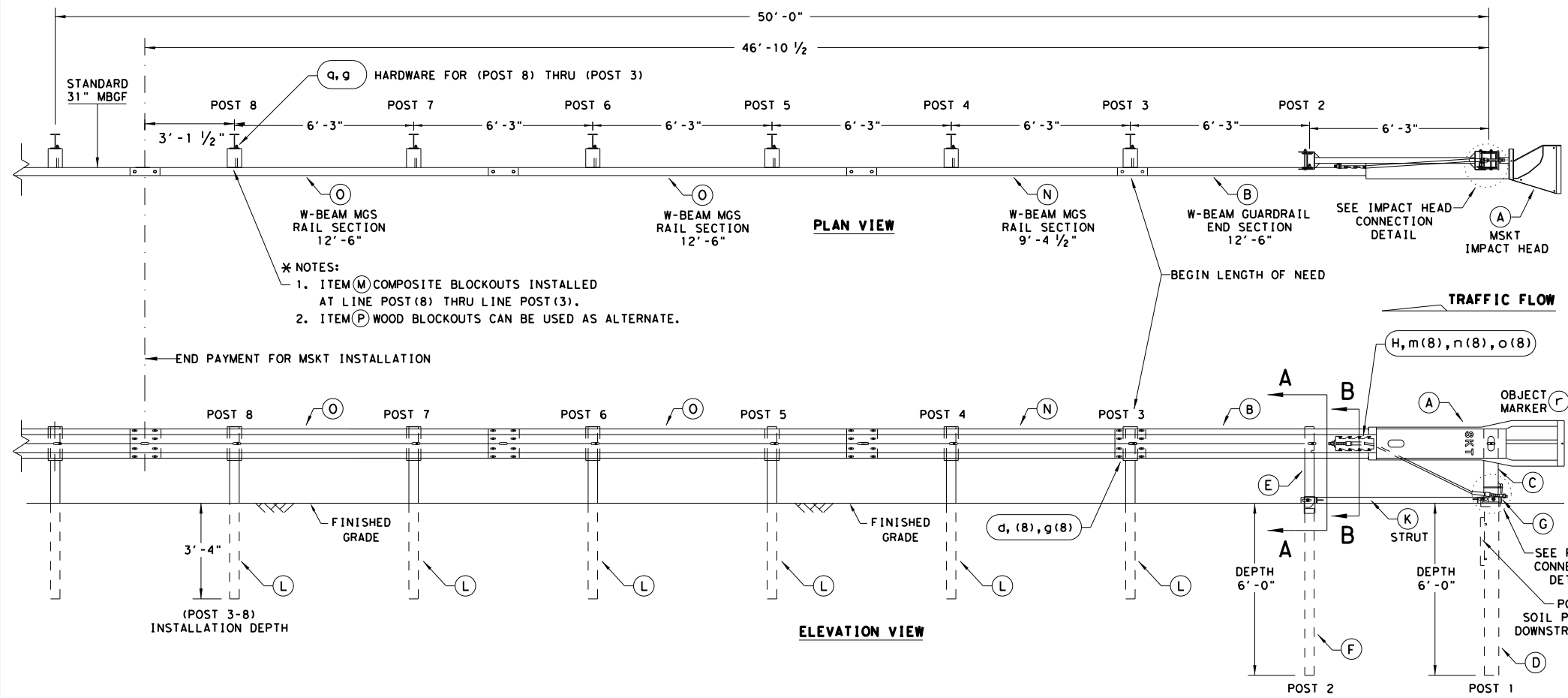
Texas Department of Transportation
Design Division Standard

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

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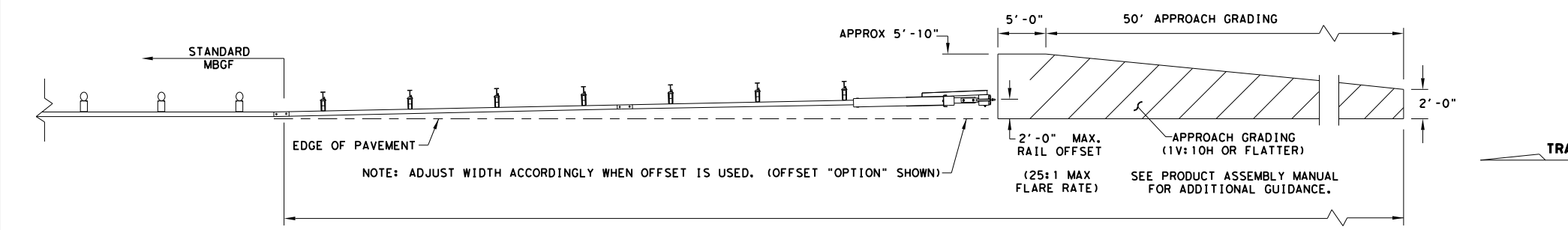
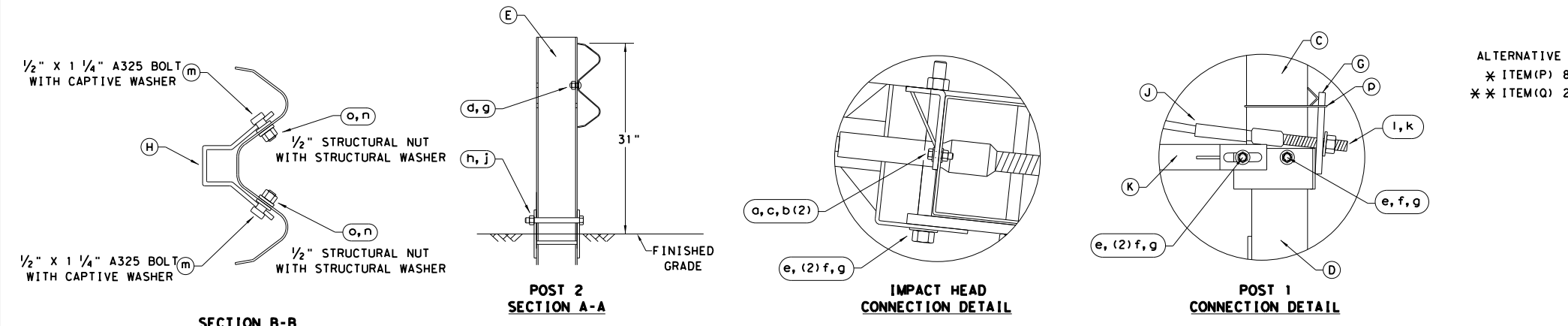
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. THE USE OF THIS STANDARD ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM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

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- GENERAL NOTES**
- 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
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
 - 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.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
 - 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.
 - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBSGF STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBSGF.
 - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
 - 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.
 - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBSGF PANELS, ONE 25'-0" MBSGF PANEL IS ALSO ALLOWED IN ITS PLACE.
 - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

| ITEM | QTY | MAIN SYSTEM COMPONENTS | ITEM NUMBERS |
|----------------|-----|---|--------------|
| A | 1 | MSKT IMPACT HEAD | MS3000 |
| B | 1 | W-BEAM GUARDRAIL END SECTION, 12 Go. | SF1303 |
| C | 1 | POST 1 - TOP (6" X 6" X 1/8" TUBE) | MTPHP1A |
| D | 1 | POST 1 - BOTTOM (6' W6X15) | MTPHP1B |
| E | 1 | POST 2 - ASSEMBLY TOP | UHP2A |
| F | 1 | POST 2 - ASSEMBLY BOTTOM (6' W6X9) | HP2B |
| G | 1 | BEARING PLATE | E750 |
| H | 1 | CABLE ANCHOR BOX | S760 |
| J | 1 | BCT CABLE ANCHOR ASSEMBLY | E770 |
| K | 1 | GROUND STRUT | MS785 |
| L | 6 | W6X9 OR W6X8.5 STEEL POST | P621 |
| M | 6 | COMPOSITE BLOCKOUTS | CBSP-14 |
| N | 1 | W-BEAM MGS RAIL SECTION (9'-4 1/2") | G12025 |
| O | 2 | W-BEAM MGS RAIL SECTION (12'-6") | G1203A |
| P | 6 | WOOD BLOCKOUT 6" X 8" X 14" | P675 |
| Q | 1 | W-BEAM MGS RAIL SECTION (25'-0") | G1209 |
| SMALL HARDWARE | | | |
| a | 2 | 5/8" x 1" HEX BOLT (GRD 5) | B5160104A |
| b | 4 | 5/8" WASHER | W0516 |
| c | 2 | 5/8" HEX NUT | N0516 |
| d | 25 | 5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2) | B580122 |
| e | 2 | 5/8" Dia. x 9" HEX BOLT (GRD A449) | B580904A |
| f | 3 | 5/8" WASHER | W050 |
| g | 33 | 5/8" Dia. H.G.R NUT | N050 |
| h | 1 | 3/4" Dia. x 8 1/2" HEX BOLT (GRD A449) | B340854A |
| j | 1 | 3/4" Dia. HEX NUT | N030 |
| k | 2 | 1 ANCHOR CABLE HEX NUT | N100 |
| l | 2 | 1 ANCHOR CABLE WASHER | W100 |
| m | 8 | 1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER | SB12A |
| n | 8 | 1/2" STRUCTURAL NUTS | N012A |
| o | 8 | 1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS | W012A |
| p | 1 | BEARING PLATE RETAINER TIE | CT-100ST |
| q | 6 | 5/8" x 10" H.G.R. BOLT | B581002 |
| r | 1 | OBJECT MARKER 18" X 18" | E3151 |



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.

Design Division Standard

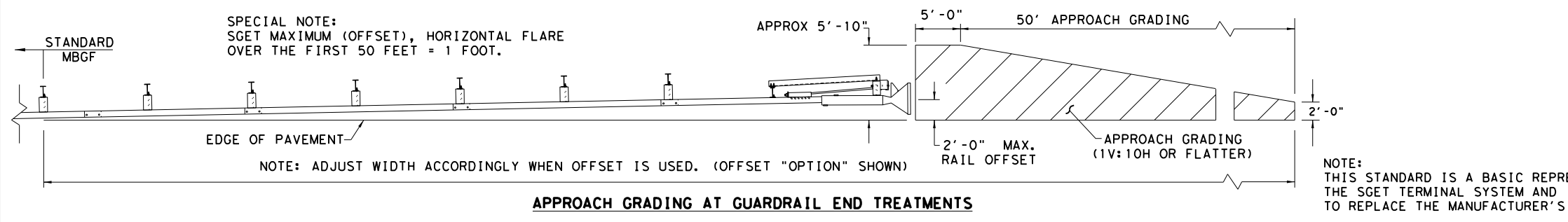
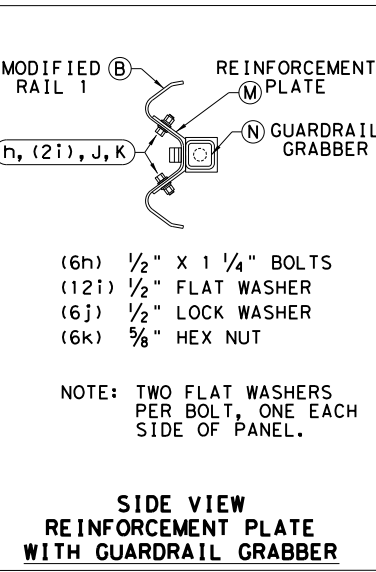
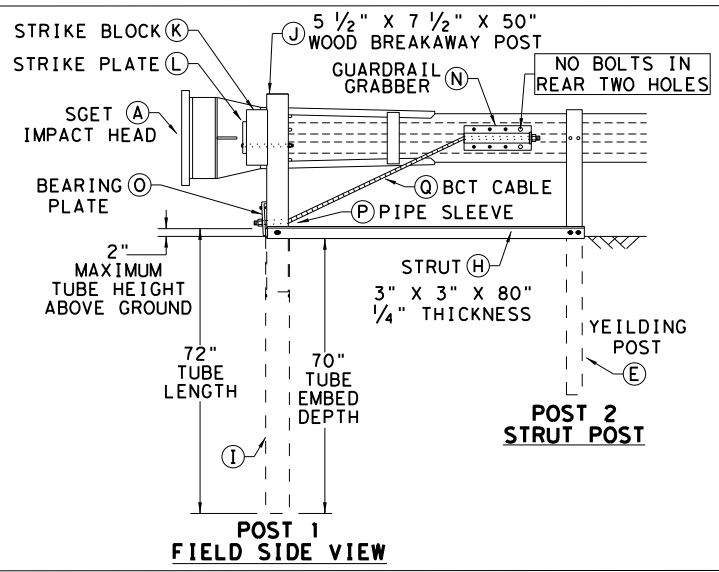
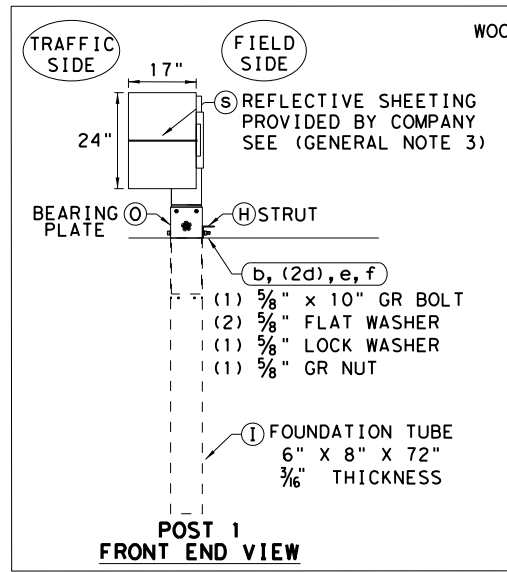
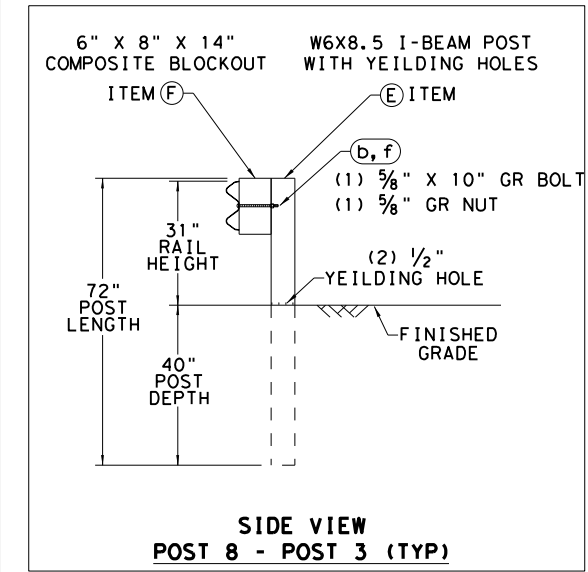
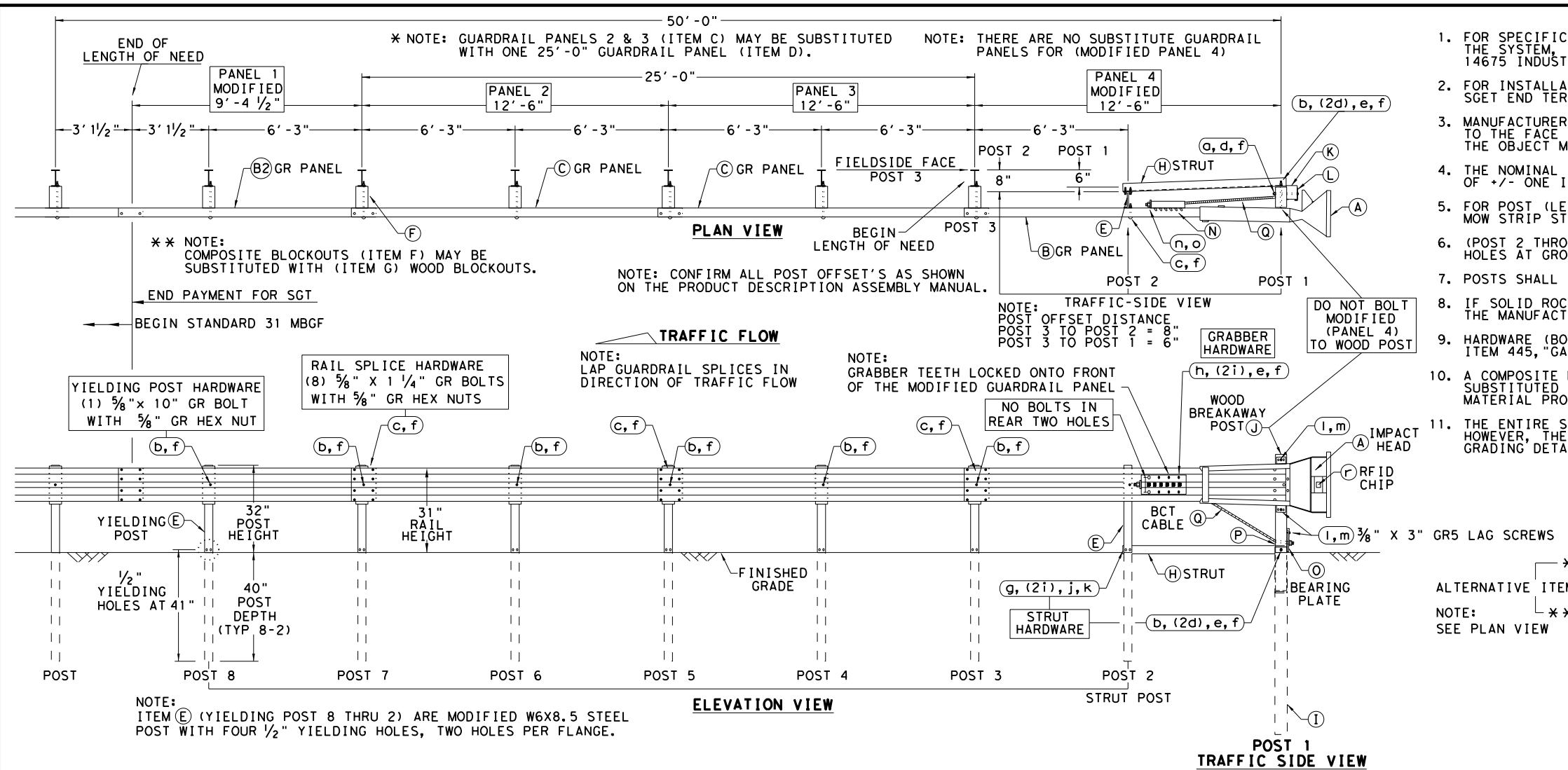
SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT (12S) 31-18

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 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.



- ### GENERAL NOTES
- 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
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
 - 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.
 - THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - 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.
 - 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 | WSBK14 |
| 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 | | | |
| o | 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 A563HD 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 |

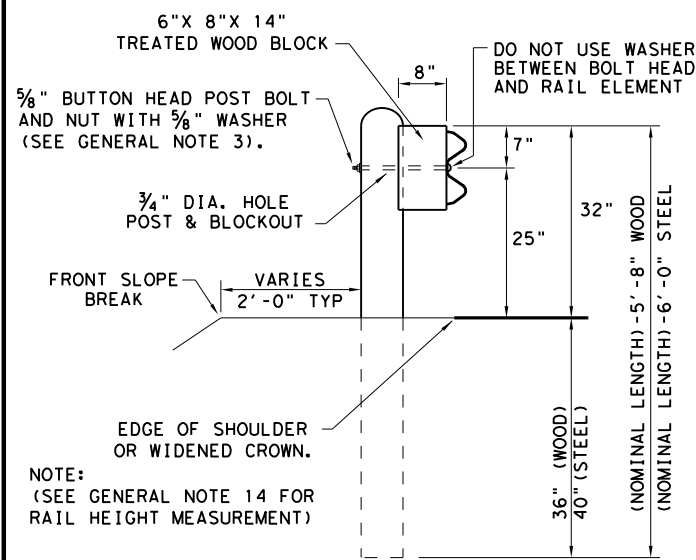
SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT (15)31-20

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| REVISIONS | | | | |
| DIST: AUS | COUNTY: TRAVIS | | | SHEET NO.: 52 |

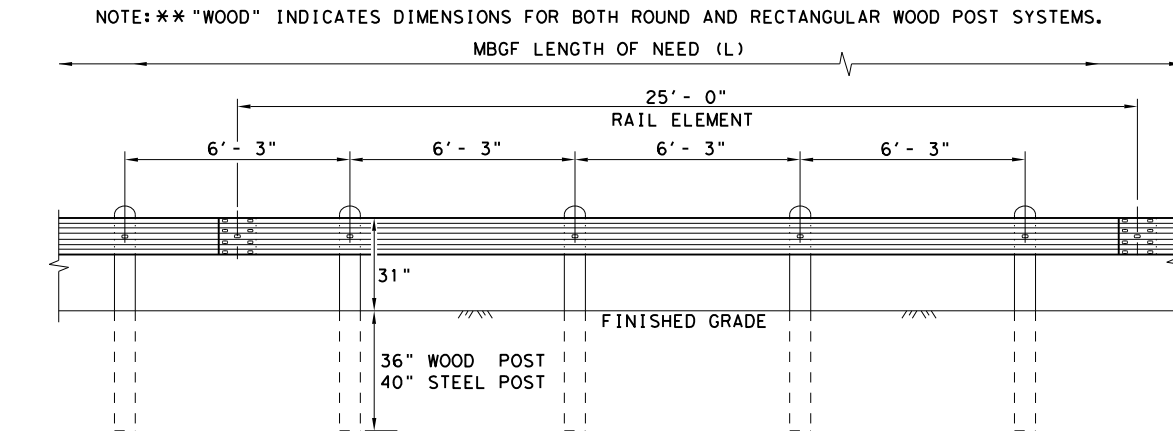
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

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

DATE: 4/26/2024
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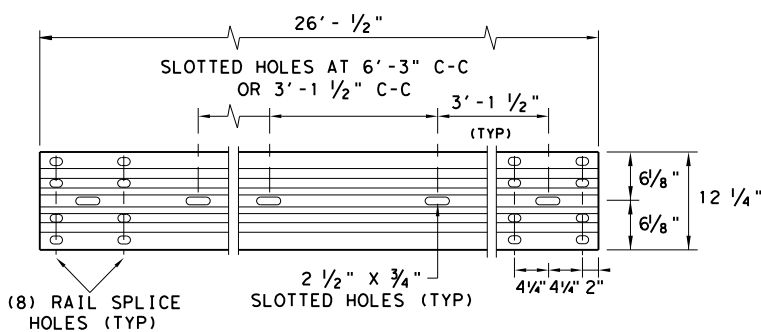


TYPICAL POST PLACEMENT



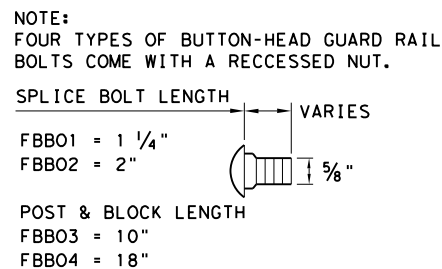
ELEVATION MID-SPAN RAIL SPLICE

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



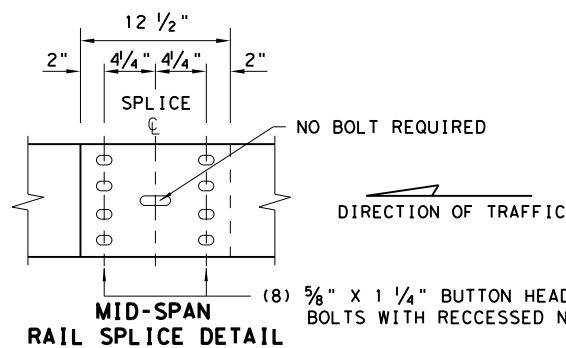
ELEVATION 25' - 0" (NOM.) W-BEAM SECTION

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



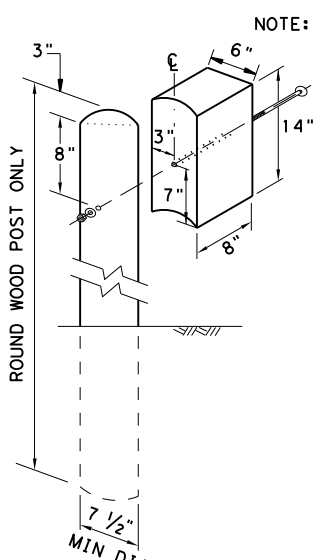
BUTTON HEAD BOLT

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



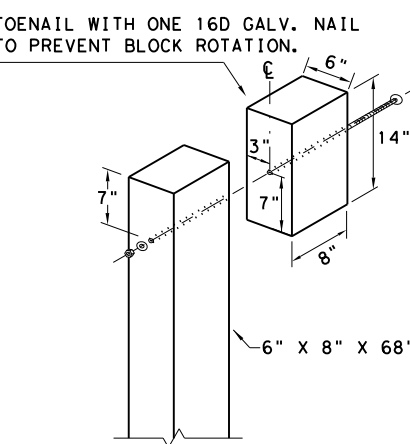
MID-SPAN RAIL SPLICE DETAIL

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



WOOD BLOCK TO ROUND WOOD POST

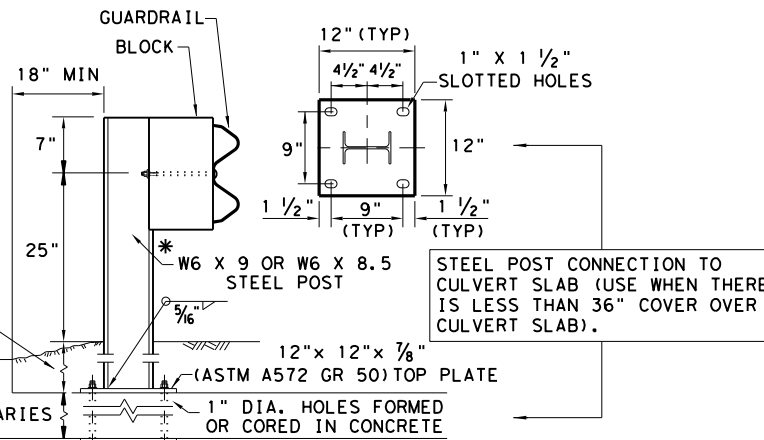
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



WOOD BLOCK TO RECTANGULAR WOOD POST

ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



LOW FILL CULVERT POST

12" x 12" x 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

NOTE: TWO INSTALLATION OPTIONS.

- BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
- EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" 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 1/4" MIN. BEYOND NUT.

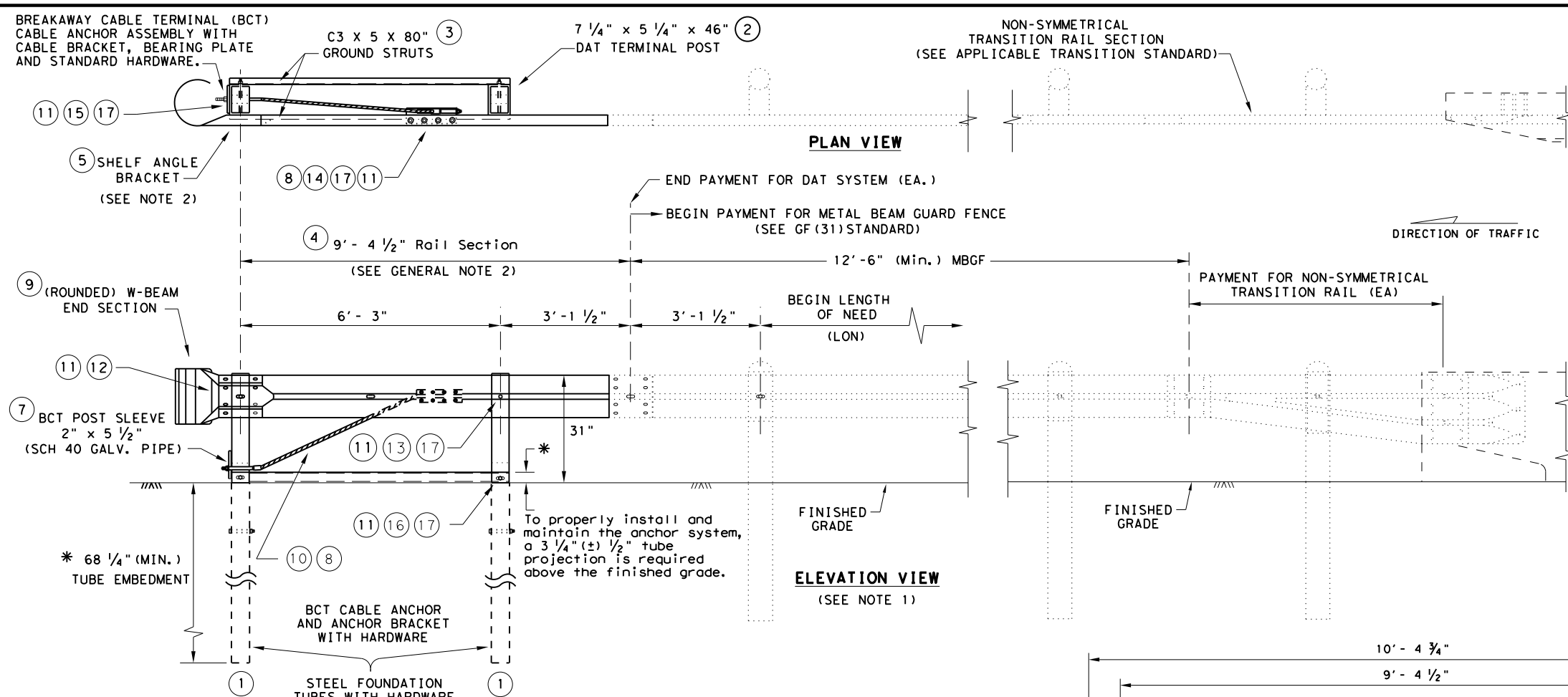
NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

GENERAL NOTES

- 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."
- 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 1/2" 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.
- 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 5/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
- THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
- 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.
- 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.
- 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.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
- 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.

| | | | |
|--|-----------|--------------------------|---------|
| | | Design Division Standard | |
| METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT GF (31) - 19 | | | |
| FILE: gf3119.dgn | DN: TXDOT | CK: KM | DW: VP |
| ©2024 NOVEMBER 2019 | CONT SECT | JOB | HIGHWAY |
| REVISIONS | 0113 08 | 091 | US 290 |
| DIST | COUNTY | SHEET NO. | |
| AUS | TRAVIS | 53 | |

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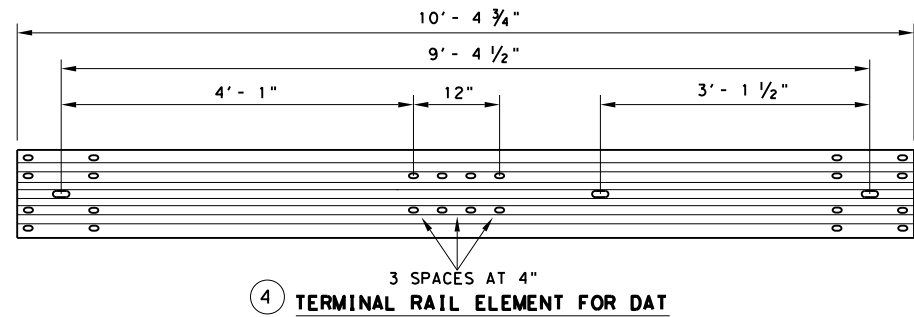
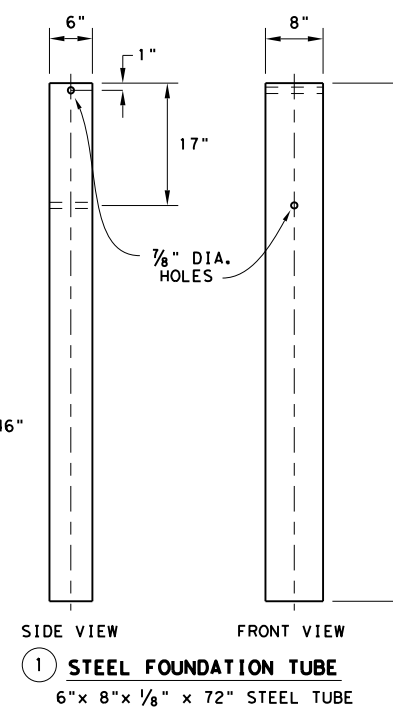
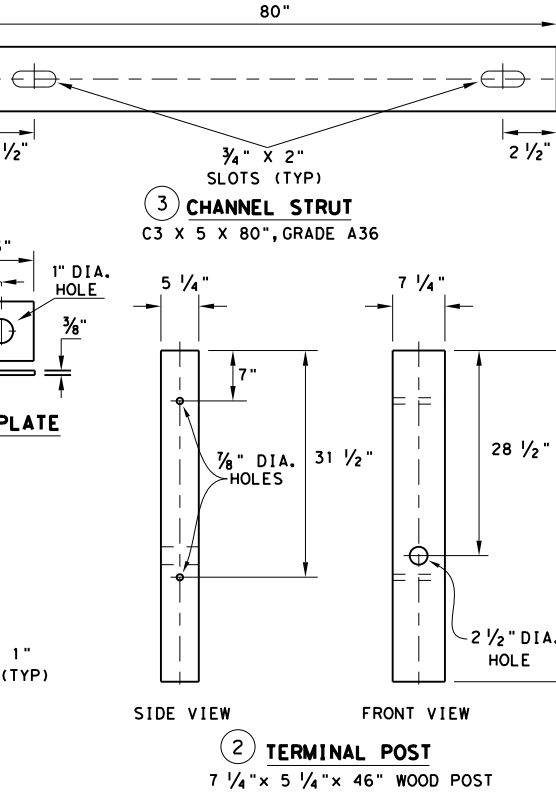
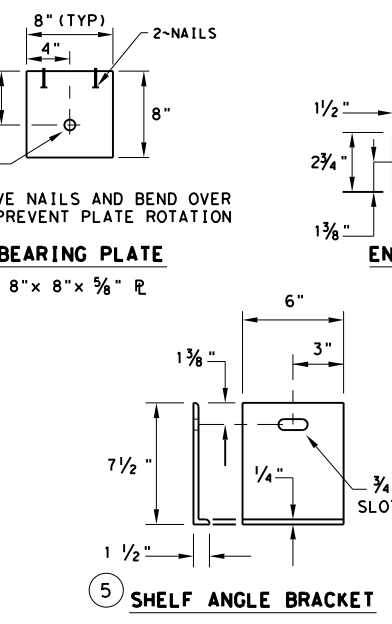
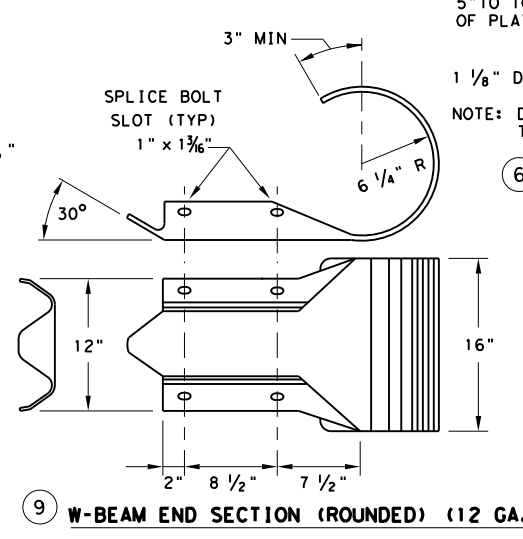
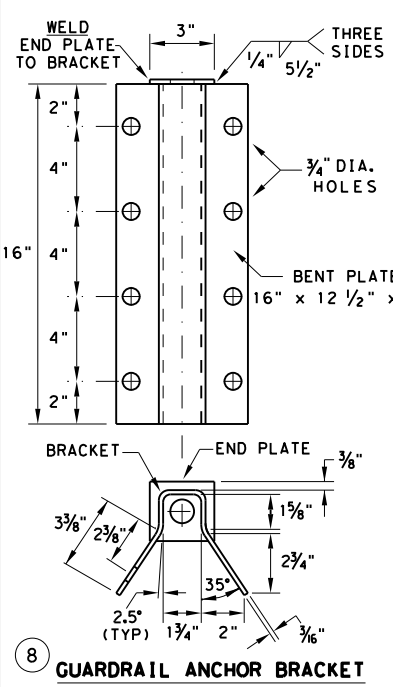


DOWNSTREAM ANCHOR TERMINAL (DAT)
 NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- 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 |



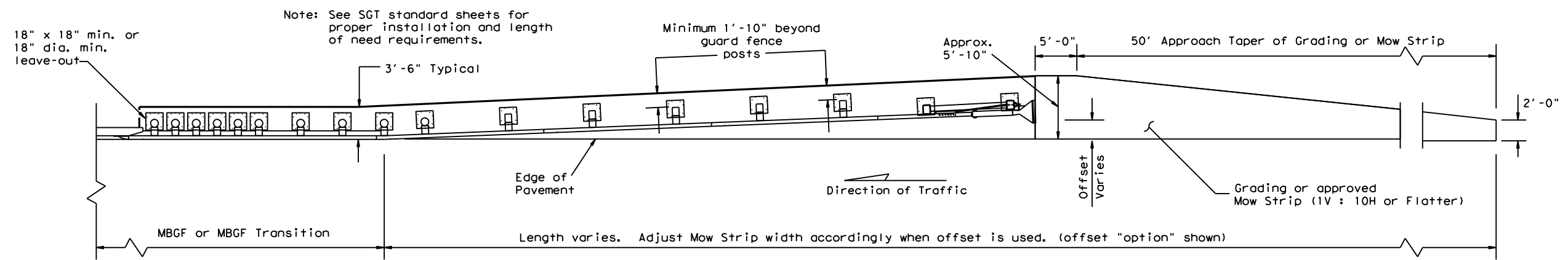
Design Division Standard

**METAL BEAM GUARD FENCE
 (DOWNSTREAM ANCHOR TERMINAL)
 TL-3 MASH COMPLIANT
 GF (31) DAT-19**

| | | | | |
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| FILE: gf31dat19.dgn | DN: TXDOT | CK: KM | DW: VP | CK: CGL/AG |
| © TXDOT: NOVEMBER 2019 REVISIONS | CONT | SECT | JOB | HIGHWAY |
| | 0113 | 08 | 091 | US 290 |
| | DIST | COUNTY | SHEET NO. | |
| | AUS | TRAVIS | 54 | |

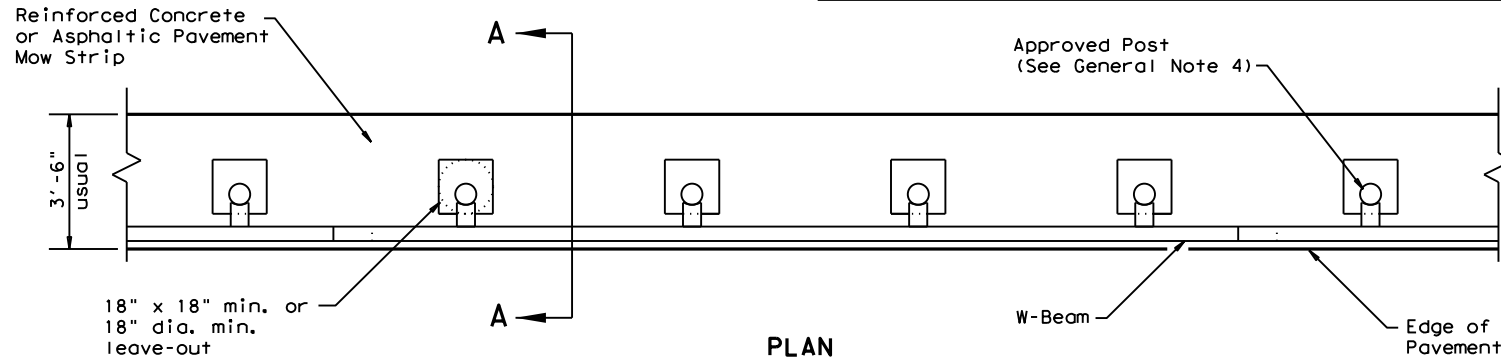
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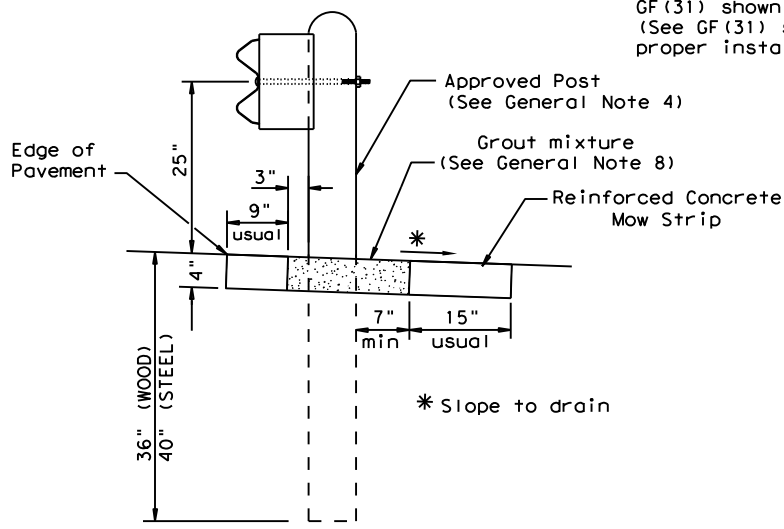
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

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.



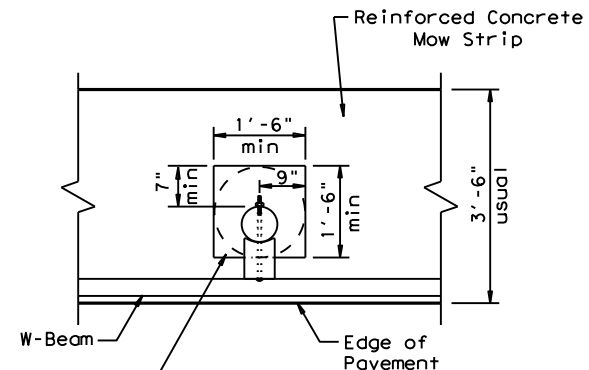
PLAN

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



SECTION A-A

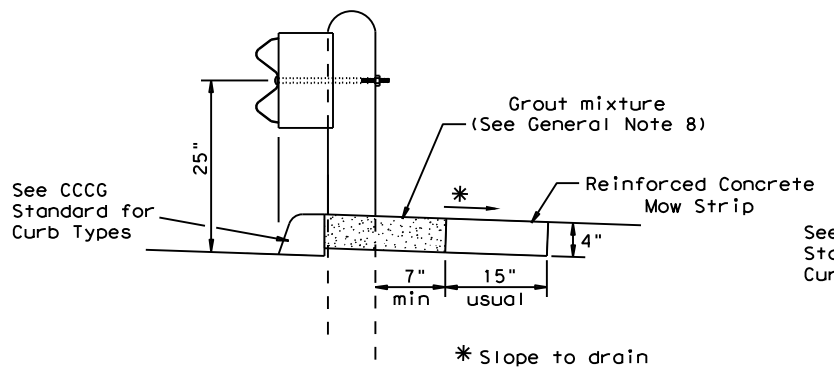
Typical



MOW STRIP DETAIL

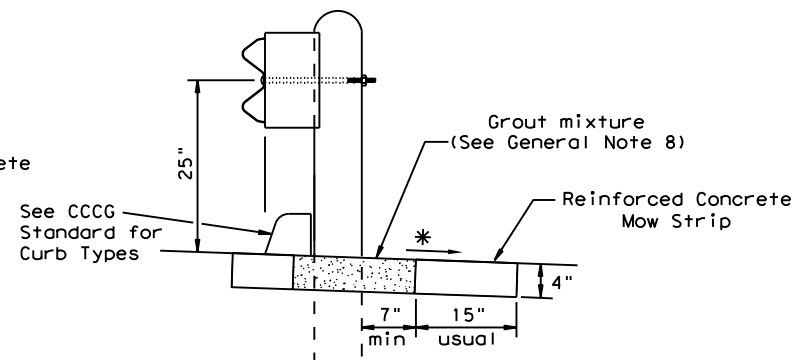
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

- 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 1/2" 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.



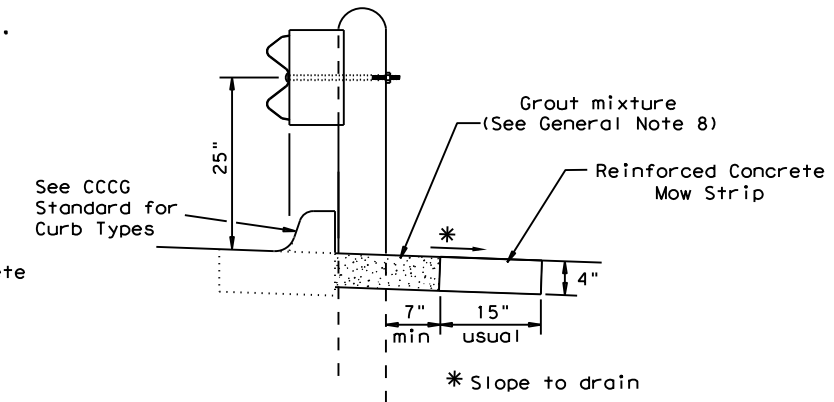
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

| | | | |
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| | | 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 |
| ©2024 NOVEMBER 2019 | CONT SECT | JOB | HIGHWAY |
| REVISIONS | 0113 08 | 091 | US 290 |
| DIST | COUNTY | SHEET NO. | |
| AUS | TRAVIS | 55 | |

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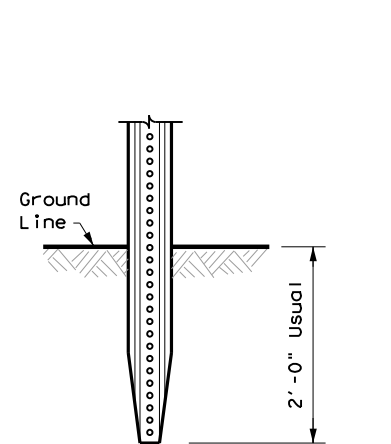
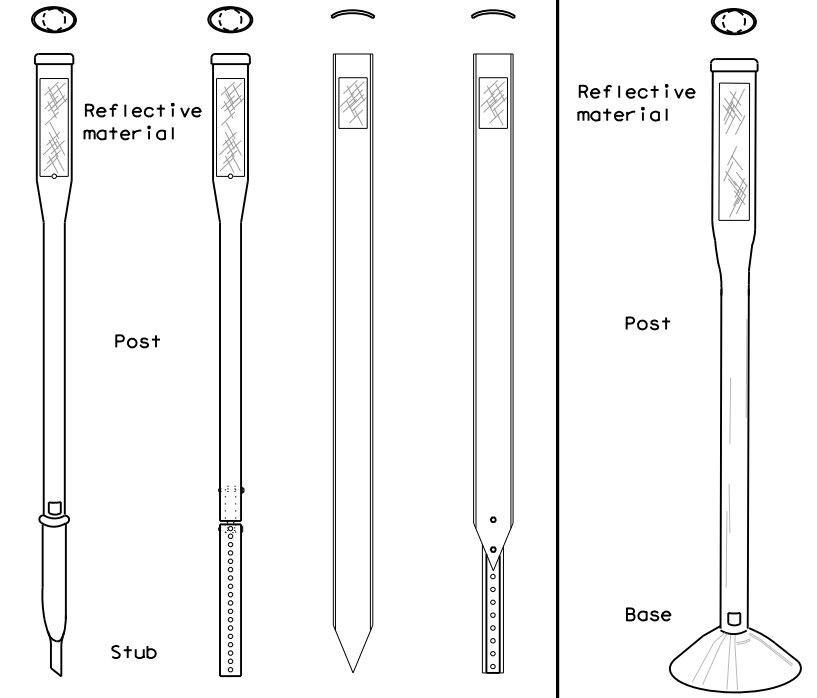
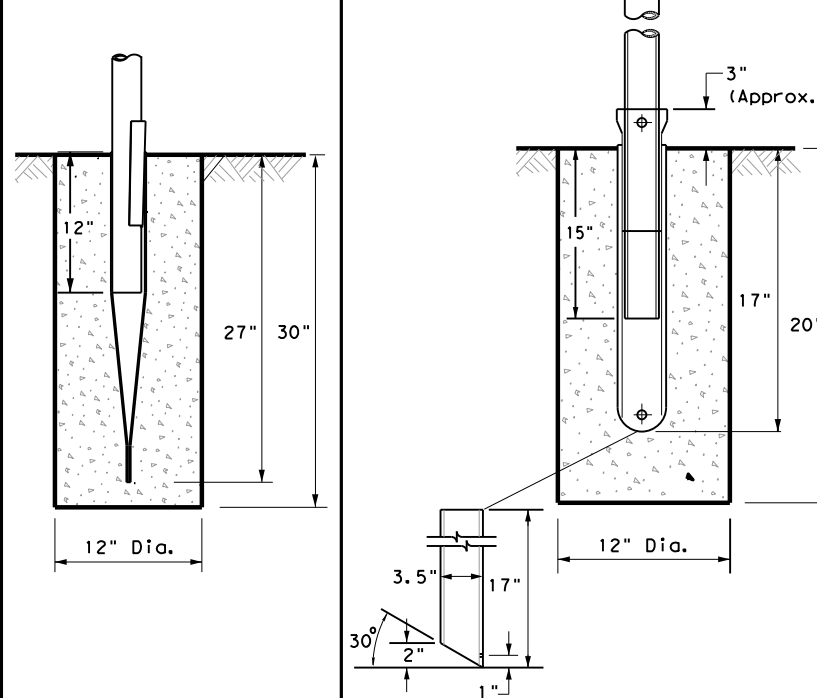
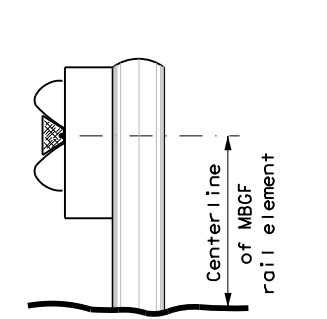
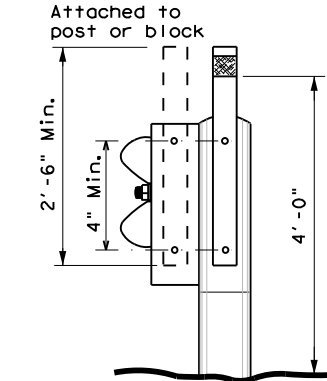
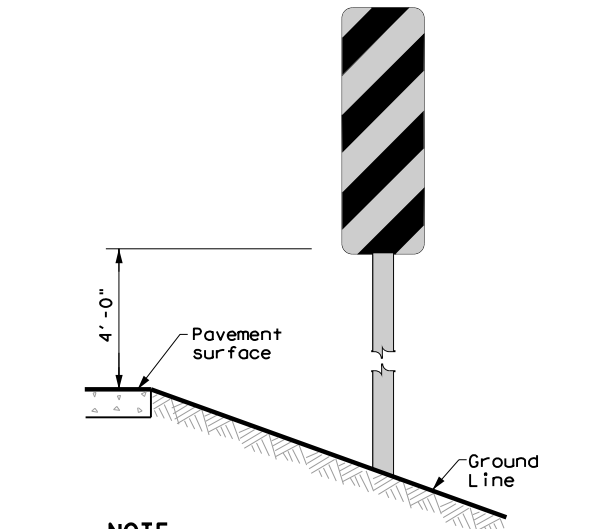
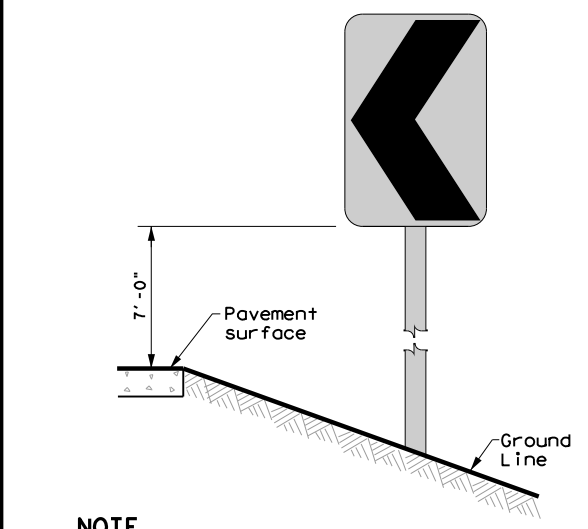
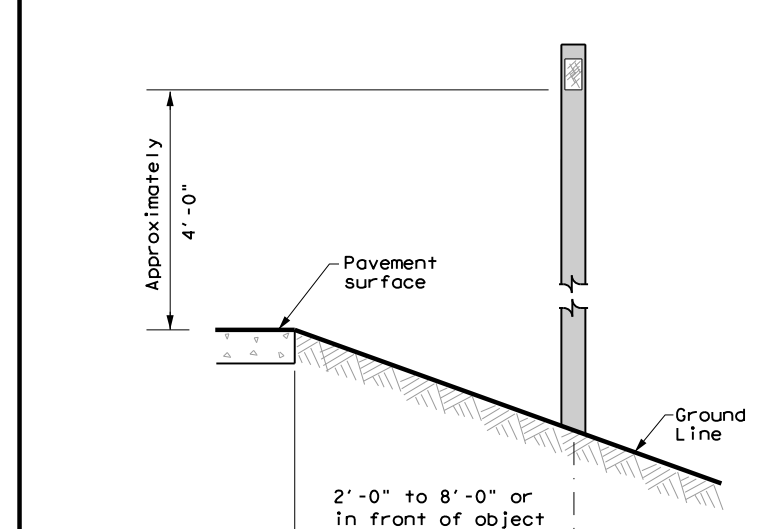
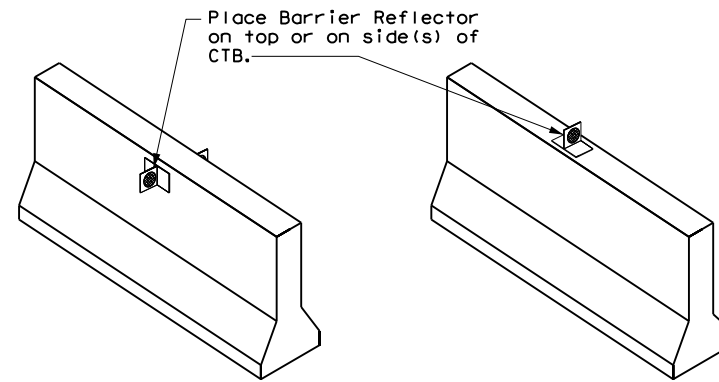

| REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS | | | | DELINEATORS | | | | D & OM DESCRIPTIVE CODES | |
|--|--------|--------|--------|---|--------|--|--------|---|--|
| DEVICE | SIZE 1 | SIZE 2 | SIZE 3 | SIZE 4 | SINGLE | | DOUBLE | | INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX) NUMBER OF REFLECTORS 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 BRFL = 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 |
| | | | | | | | | | |
| SHEETING: Yellow, White or Red Type B or C reflective sheeting | | | | SHEETING: Yellow, White or Red Type B or C Reflective Sheetting | | | | 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 unit (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 | |
| NOTE | | | | POST TYPE | | | | DIRECTION | |
| | | | | MOUNT TYPE | | | | | |

| OBJECT MARKERS | | | | | | | | |
|----------------|---|---------------|-------|---|---------------|-------|---|--|
| DEVICE | 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 |
| | | | | | | | | SHEETING: Yellow-Type B _{FL} or C _{FL} Sheeting POST TYPE: TWT MOUNT TYPE: WAS, WAP |
| | SHEETING: Yellow - Type B or C Sheeting | | | SHEETING: Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting | | | SHEETING: Red -Type B _{FL} or C _{FL} Sheeting | 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 |
| | POST TYPE: WC | | | POST TYPE: WFLX | | | POST TYPE: TWT | |
| | MOUNT TYPE: GND | | | MOUNT TYPE: GND, SRF | | | MOUNT TYPE: WAS, WAP | |

| BARRIER REFLECTORS (BRF) | | | CHEVRONS | | | | ONE DIRECTION LARGE ARROW | | 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. |
|---|-----|-----|--|------|--|--|--|------|--|
| DEVICE | GF1 | GF2 | CTB | W1-8 | | | | W1-6 | |
| | | | | | | | | | DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20 |
| SHEETING: Yellow, White, Red | | | SHEETING: Yellow, White, Red | | | | SHEETING: Yellow, White, Red | | Texas Department of Transportation Traffic Safety Division Standard |
| NOTE: 1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov. | | | NOTE: 1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6). | | | | NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches. | | |
| SIZE (W x L) | | | SIZE (W x L) | | | | SIZE (W x L) | | FILE: dom1-20.dgn DNE: TxDOT CK: TxDOT DW: TxDOT CK: TxDOT |
| MOUNTING HEIGHT | | | MOUNTING HEIGHT | | | | MOUNTING HEIGHT | | © TxDOT August 2004 REVISIONS 0113 08 091 US 290 |
| DIST | | | DIST | | | | DIST | | 10-09 3-15 4-10 7-20 AUS TRAVIS SHEET NO. 56 |

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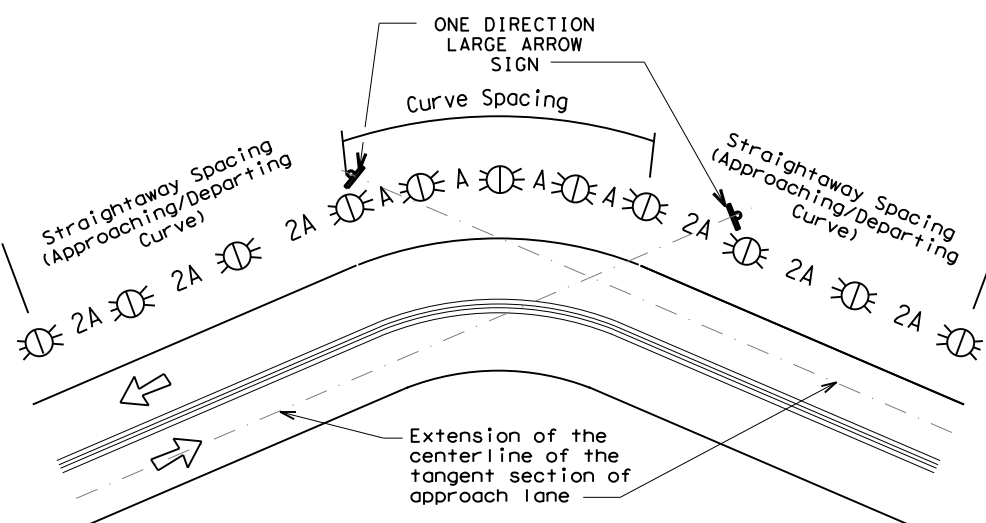
| POST TYPE AND SUPPORT FOUNDATION DETAILS | | | | TYPE OF BARRIER MOUNTS | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|-----------|-----------|-----------|-----------|---------------------|------|------|-----|---------|-----------|------|----|-----|--------|------------|------|--------|--|-----------|-----------|-----|--------|--|----|
| WING CHANNEL (WC) | FLEXIBLE POSTS (YFLX, WFLX) | | WEDGE ANCHOR SYSTEMS | | GUARD FENCE ATTACHMENT | | | | | | | | | | | | | | | | | | | | | | | | | |
| GND | GND | SRF | WAS | WAP | GF 1 | GF 2 | | | | | | | | | | | | | | | | | | | | | | | | |
|  <p style="text-align: center;">Ground Line</p> <p style="text-align: center;">2'-0" Usual</p> |  <p style="text-align: center;">Reflective material</p> <p style="text-align: center;">Post</p> <p style="text-align: center;">Stub</p> <p style="text-align: center;">Base</p> | |  <p style="text-align: center;">12" Dia.</p> <p style="text-align: center;">27" 30"</p> <p style="text-align: center;">12" Dia.</p> <p style="text-align: center;">17" 20"</p> <p style="text-align: center;">3" (Approx.)</p> <p style="text-align: center;">3.5" 17"</p> <p style="text-align: center;">30° 2" 1"</p> | |  <p style="text-align: center;">Centerline of MBCF rail element</p> |  <p style="text-align: center;">Attached to post or block</p> <p style="text-align: center;">2'-6" Min.</p> <p style="text-align: center;">4" Min.</p> <p style="text-align: center;">4'-0"</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| | EMBEDDED | | SURFACE MOUNT | | STEEL | | PLASTIC | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | | | 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. | | | NOTE 1. Install per manufacturer's recommendations. | | | | | | | | | | | | | | | | | | | | | | | | |
| TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS | | CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN | | DELINEATORS AND TYPE 2 OBJECT MARKERS | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  <p style="text-align: center;">4'-0"</p> <p style="text-align: center;">Pavement surface</p> <p style="text-align: center;">Ground Line</p> | |  <p style="text-align: center;">7'-0"</p> <p style="text-align: center;">Pavement surface</p> <p style="text-align: center;">Ground Line</p> | |  <p style="text-align: center;">Approximately 4'-0"</p> <p style="text-align: center;">Pavement surface</p> <p style="text-align: center;">Ground Line</p> <p style="text-align: center;">2'-0" to 8'-0" or in front of object being marked</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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) | | 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. | | NOTE See general notes 1, 2 and 3. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONCRETE TRAFFIC BARRIER (CTB) | | | | | |  <p style="text-align: center;">Place Barrier Reflector on top or on side(s) of CTB.</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL NOTES | | | | | | <ol style="list-style-type: none"> Place delineators on a section of roadway at a consistent distance from the edge of pavement. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 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. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane. | | | | | | | | | | | | | | | | | | | | | | | | |
|  <p style="text-align: center;">Texas Department of Transportation</p> <p style="text-align: right;">Traffic Safety Division Standard</p> | | | | | | DELINEATOR & OBJECT MARKER INSTALLATION D & OM(2)-20 | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>FILE: dom2-20.dgn</td> <td>DW: TxDOT</td> <td>CK: TxDOT</td> <td>OW: TxDOT</td> <td>CR: TxDOT</td> </tr> <tr> <td>© TxDOT August 2004</td> <td>CONT</td> <td>SECT</td> <td>JOB</td> <td>HIGHWAY</td> </tr> <tr> <td>REVISIONS</td> <td>0113</td> <td>08</td> <td>091</td> <td>US 290</td> </tr> <tr> <td>10-09 3-15</td> <td>DIST</td> <td>COUNTY</td> <td></td> <td>SHEET NO.</td> </tr> <tr> <td>4-10 7-20</td> <td>AUS</td> <td>TRAVIS</td> <td></td> <td>57</td> </tr> </table> | | | | | | FILE: dom2-20.dgn | DW: TxDOT | CK: TxDOT | OW: TxDOT | CR: TxDOT | © TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY | REVISIONS | 0113 | 08 | 091 | US 290 | 10-09 3-15 | DIST | COUNTY | | SHEET NO. | 4-10 7-20 | AUS | TRAVIS | | 57 |
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| © TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 10-09 3-15 | DIST | COUNTY | | SHEET NO. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4-10 7-20 | AUS | TRAVIS | | 57 | | | | | | | | | | | | | | | | | | | | | | | | | | |

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MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

| Amount by which Advisory Speed is less than Posted Speed | Curve Advisory Speed | |
|--|--|---|
| | Turn (30 MPH or less) | Curve (35 MPH or more) |
| 5 MPH & 10 MPH | • RPMs | • RPMs |
| 15 MPH & 20 MPH | • RPMs and One Direction Large Arrow sign | • RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons. |
| 25 MPH & more | • RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons | • RPMs and Chevrons |

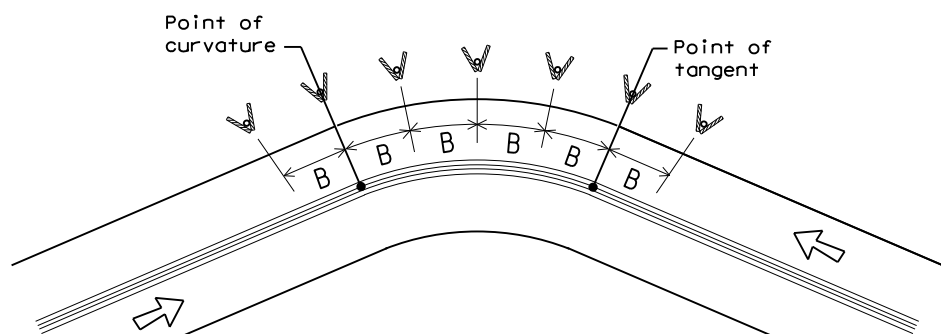
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

| WHEN DEGREE OF CURVE OR RADIUS IS KNOWN | | | | |
|---|-----------------|------------------|-------------------------|--------------------------|
| Degree of Curve | FEET | | | |
| | Radius of Curve | Spacing in Curve | Spacing in Straightaway | Chevron Spacing in Curve |
| | | A | 2A | B |
| 1 | 5730 | 225 | 450 | — |
| 2 | 2865 | 160 | 320 | — |
| 3 | 1910 | 130 | 260 | 200 |
| 4 | 1433 | 110 | 220 | 160 |
| 5 | 1146 | 100 | 200 | 160 |
| 6 | 955 | 90 | 180 | 160 |
| 7 | 819 | 85 | 170 | 160 |
| 8 | 716 | 75 | 150 | 160 |
| 9 | 637 | 75 | 150 | 120 |
| 10 | 573 | 70 | 140 | 120 |
| 11 | 521 | 65 | 130 | 120 |
| 12 | 478 | 60 | 120 | 120 |
| 13 | 441 | 60 | 120 | 120 |
| 14 | 409 | 55 | 110 | 80 |
| 15 | 382 | 55 | 110 | 80 |
| 16 | 358 | 55 | 110 | 80 |
| 19 | 302 | 50 | 100 | 80 |
| 23 | 249 | 40 | 80 | 80 |
| 29 | 198 | 35 | 70 | 40 |
| 38 | 151 | 30 | 60 | 40 |
| 57 | 101 | 20 | 40 | 40 |

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

| WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN | | | |
|---|------------------|-------------------------|--------------------------|
| Advisory Speed (MPH) | Spacing in Curve | Spacing in Straightaway | Chevron Spacing in Curve |
| | A | 2xA | B |
| 65 | 130 | 260 | 200 |
| 60 | 110 | 220 | 160 |
| 55 | 100 | 200 | 160 |
| 50 | 85 | 170 | 160 |
| 45 | 75 | 150 | 120 |
| 40 | 70 | 140 | 120 |
| 35 | 60 | 120 | 120 |
| 30 | 55 | 110 | 80 |
| 25 | 50 | 100 | 80 |
| 20 | 40 | 80 | 80 |
| 15 | 35 | 70 | 40 |

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

| CONDITION | REQUIRED TREATMENT | MINIMUM SPACING |
|--|---|---|
| Frwy./Exp. Tangent | RPMs | See PM-series and FPM-series standard sheets |
| Frwy./Exp. Curve | Single delineators on right side | See delineator spacing table |
| Frwy/Exp. Ramp | Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4)) | 100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves) |
| Acceleration/Deceleration Lane | Double delineators (see Detail 3 on D&OM(4)) | 100 feet (See Detail 3 on D & OM (4)) |
| Truck Escape Ramp | Single red delineators on both sides | 50 feet |
| Bridge Rail (steel or concrete) and Metal Beam Guard Fence | Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction | Equal spacing (100' max) but not less than 3 delineators |
| Concrete Traffic Barrier (CTB) or Steel Traffic Barrier | Barrier reflectors matching the color of the edge line | Equal spacing 100' max |
| Cable Barrier | Reflectors matching the color of the edge line | Every 5th cable barrier post (up to 100' max) |
| Guard Rail Terminus/Impact Head | Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end | Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6) |
| Bridges with no Approach Rail | Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail | See D & OM(5) |
| Reduced Width Approaches to Bridge Rail | Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge | Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) |
| Culverts without MBGF | Type 2 Object Markers | See Detail 2 on D & OM(4) |
| Crossovers | Double yellow delineators and RPMs | See Detail 1 on D & OM (4) |
| Pavement Narrowing (lane merge) on Freeways/Expressway | Single delineators adjacent to affected lane for full length of transition | 100 feet |

NOTES

- 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

| LEGEND | |
|--------|---------------------------|
| | Bi-directional Delineator |
| | Delineator |
| | Sign |

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

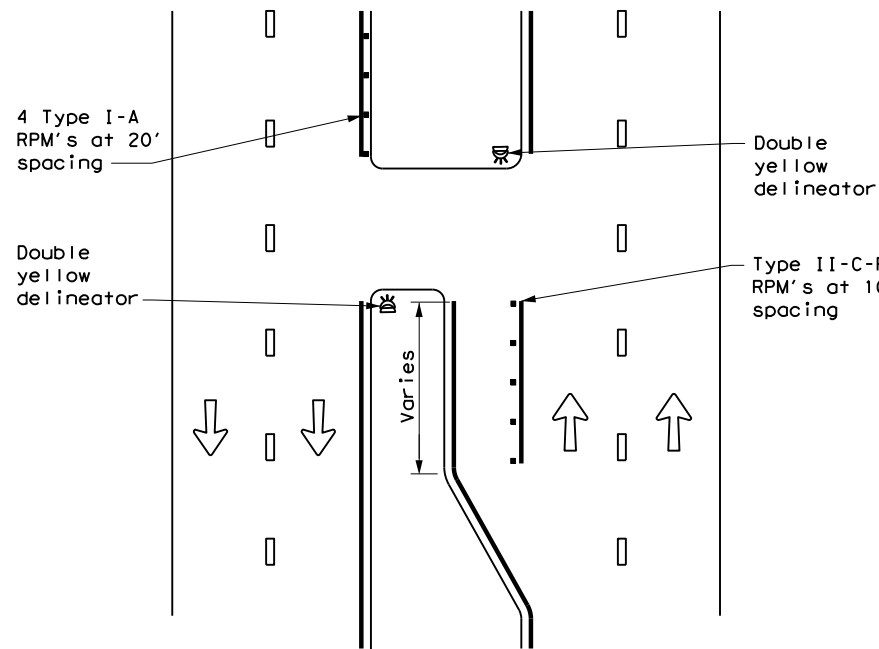
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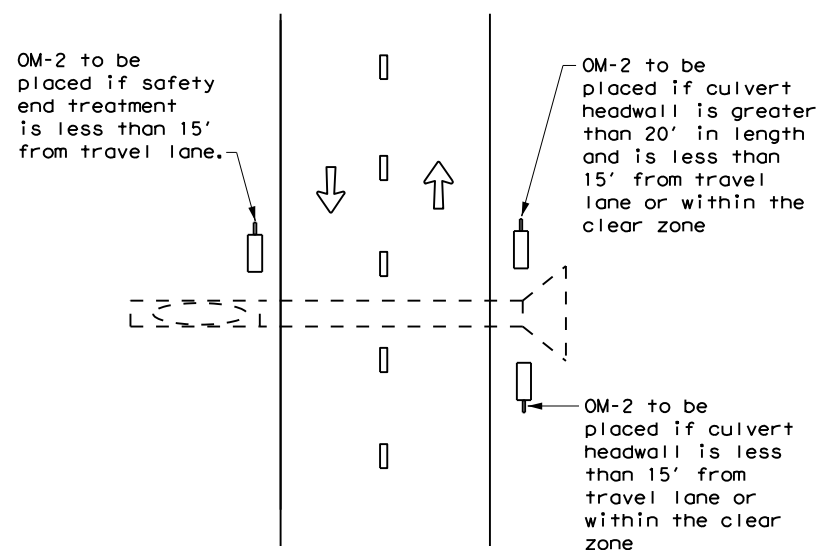
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CROSSOVERS



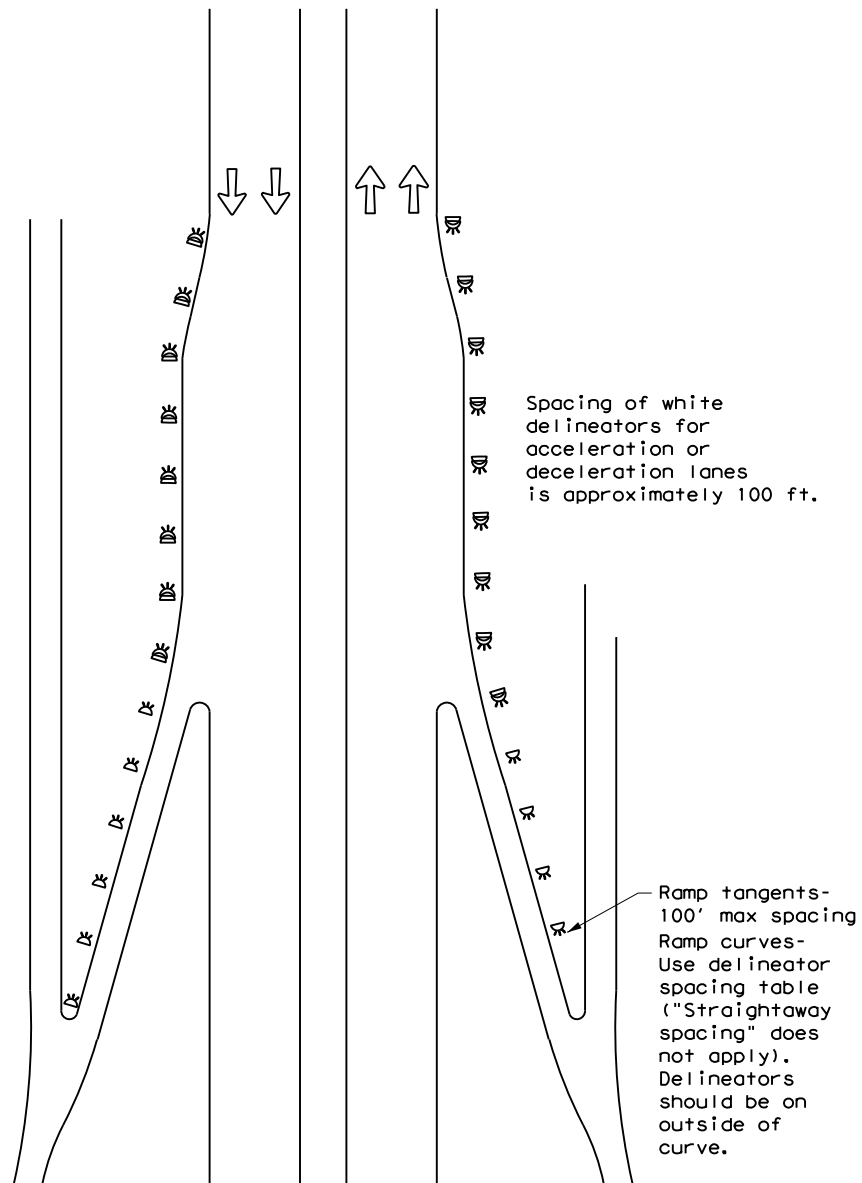
DETAIL 1

FOR CULVERTS WITHOUT MBGF



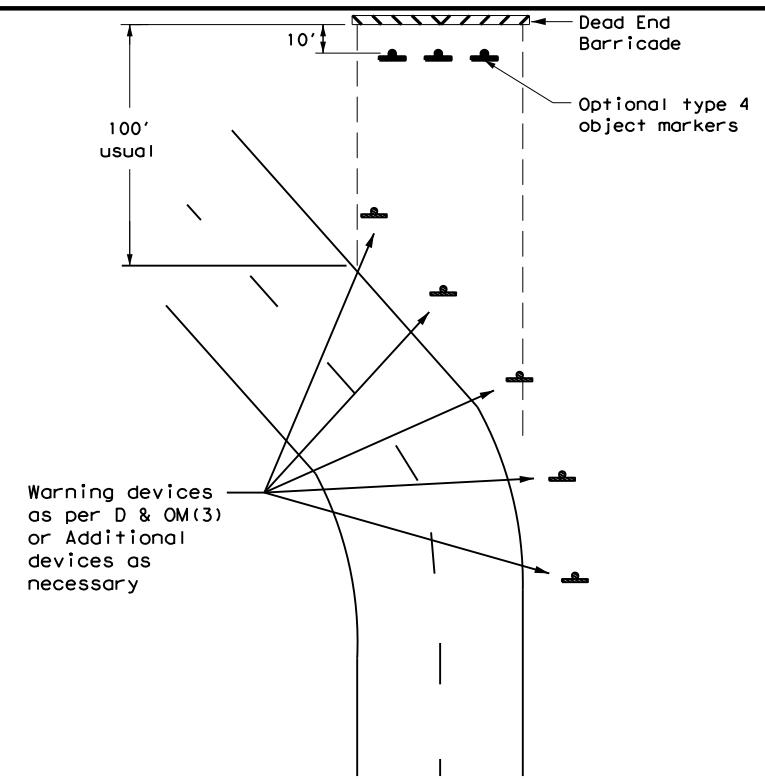
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



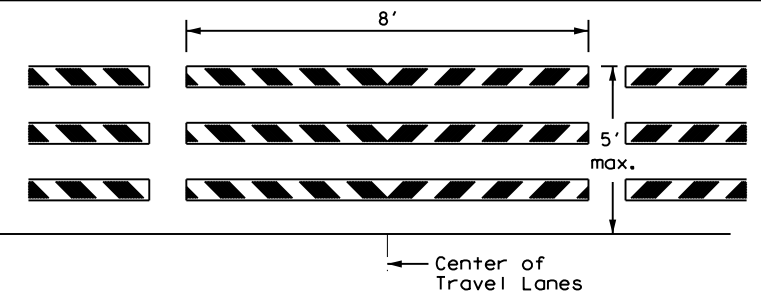
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- 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 |

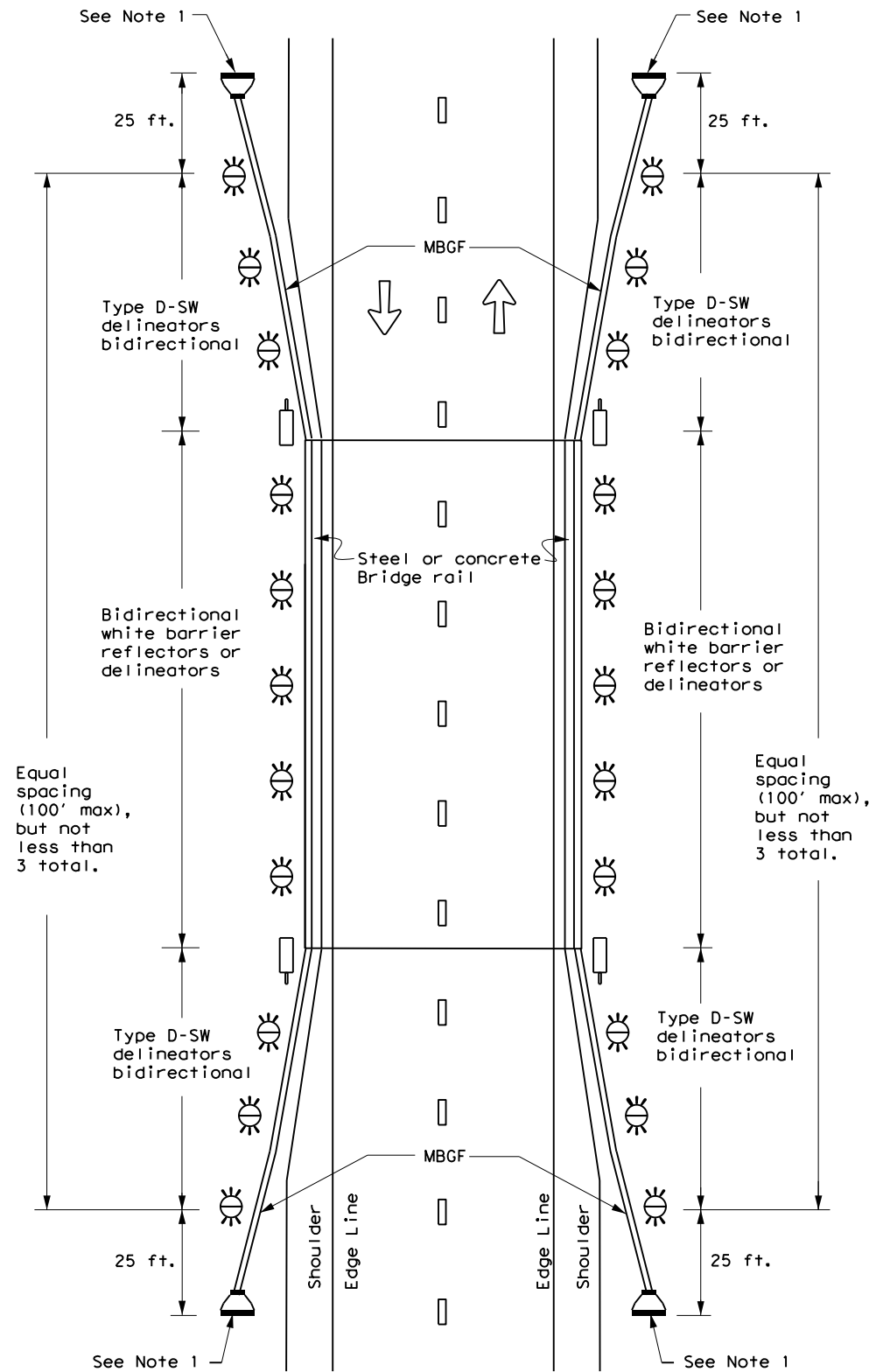


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4) -20

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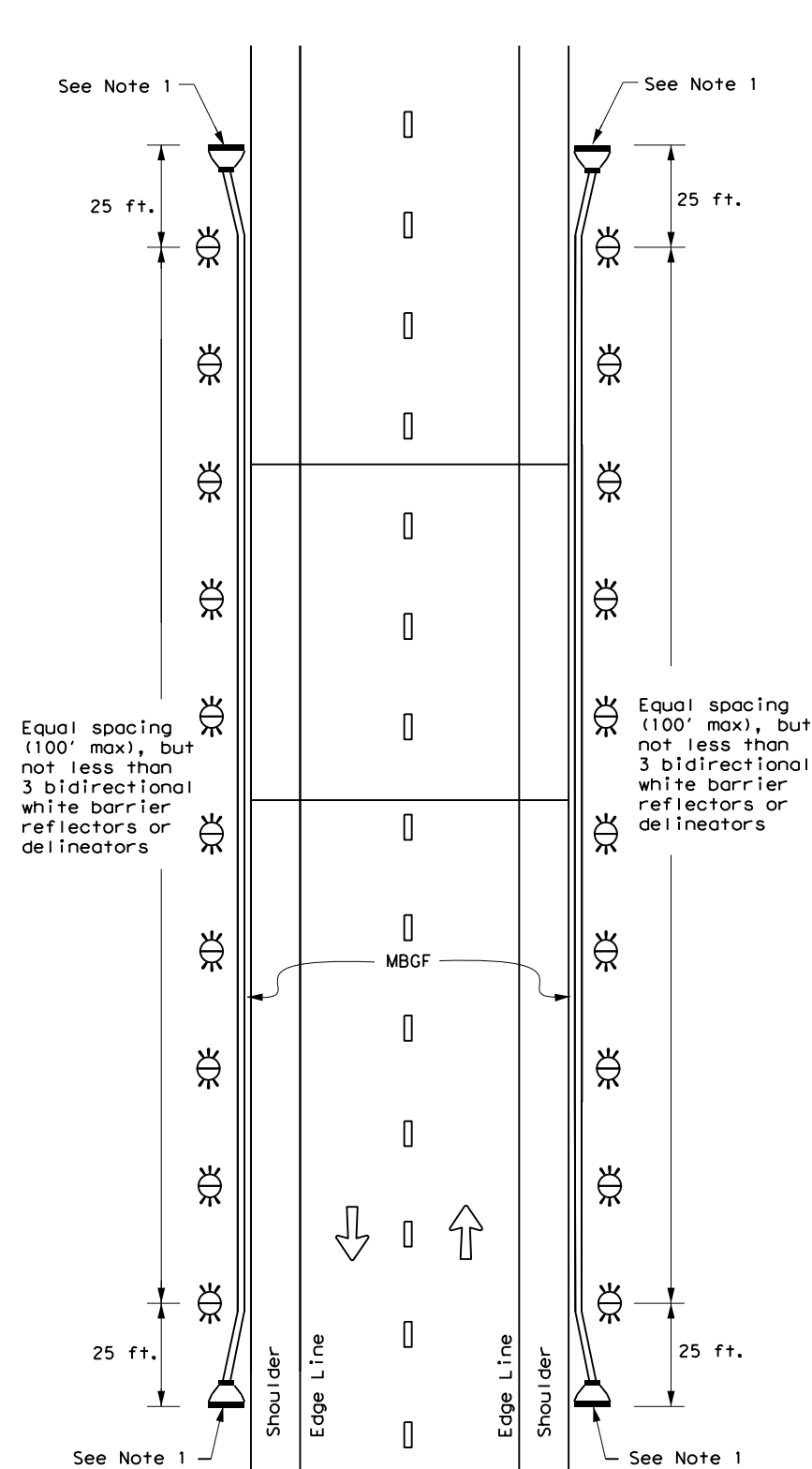
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

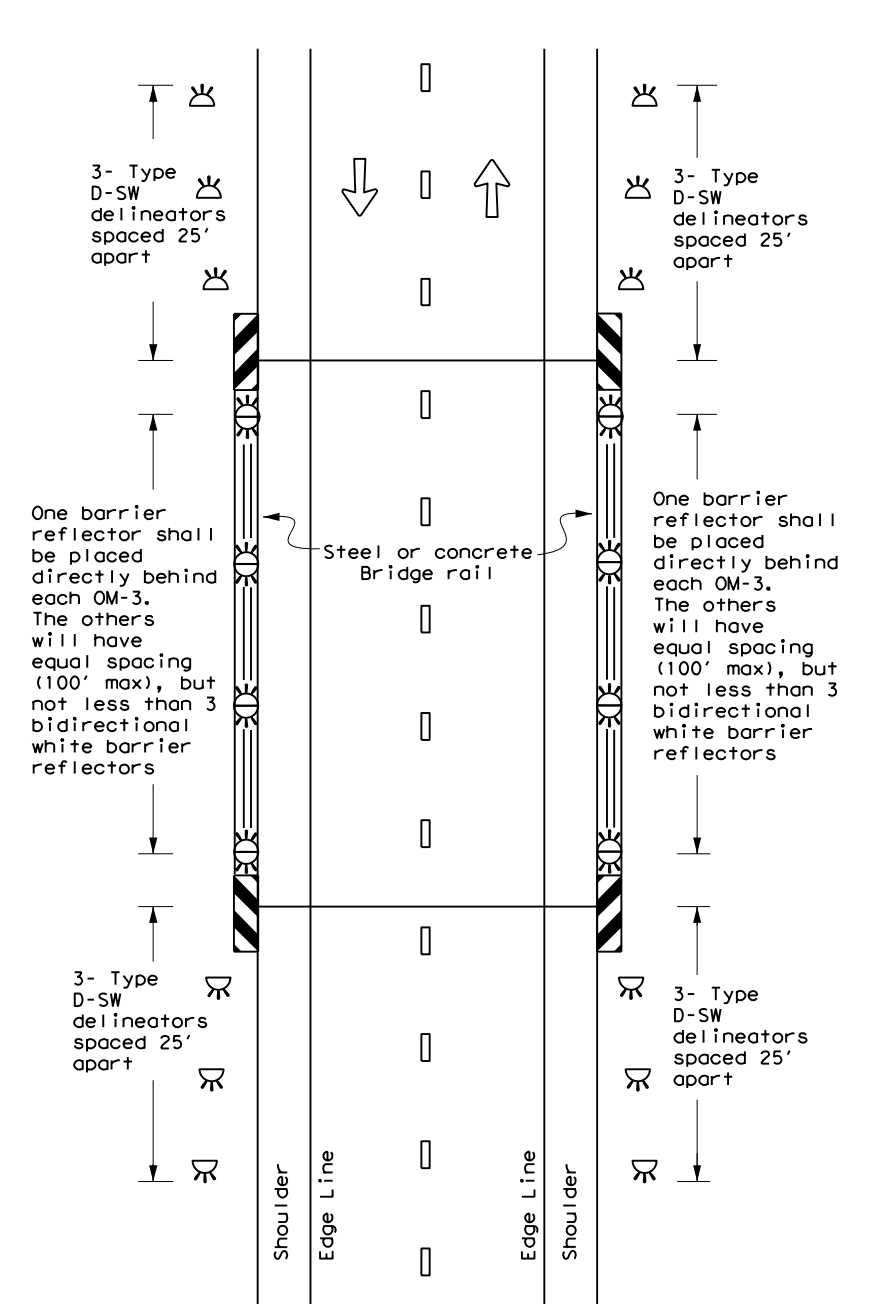
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

**TWO-WAY, TWO LANE ROADWAY
BRIDGE WITH NO APPROACH RAIL**



LEGEND

| | |
|--|--------------------------|
| | Bidirectional Delineator |
| | Delineator |
| | OM-3 |
| | OM-2 |
| | Terminal End |
| | Traffic Flow |



**DELINEATOR &
OBJECT MARKER
PLACEMENT DETAILS**

D & OM(5)-20

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| 7-20 | DIST | COUNTY | SHEET NO. | |
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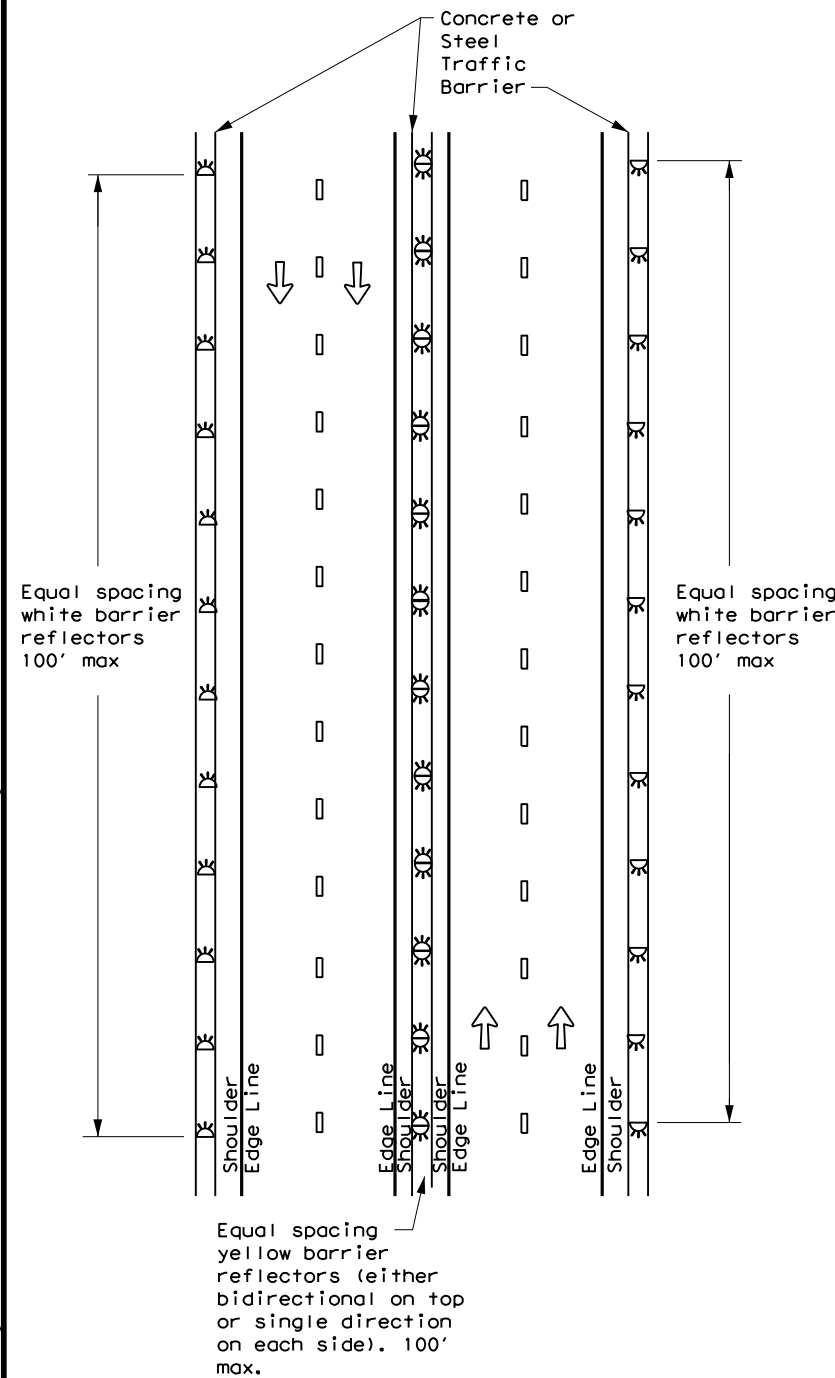
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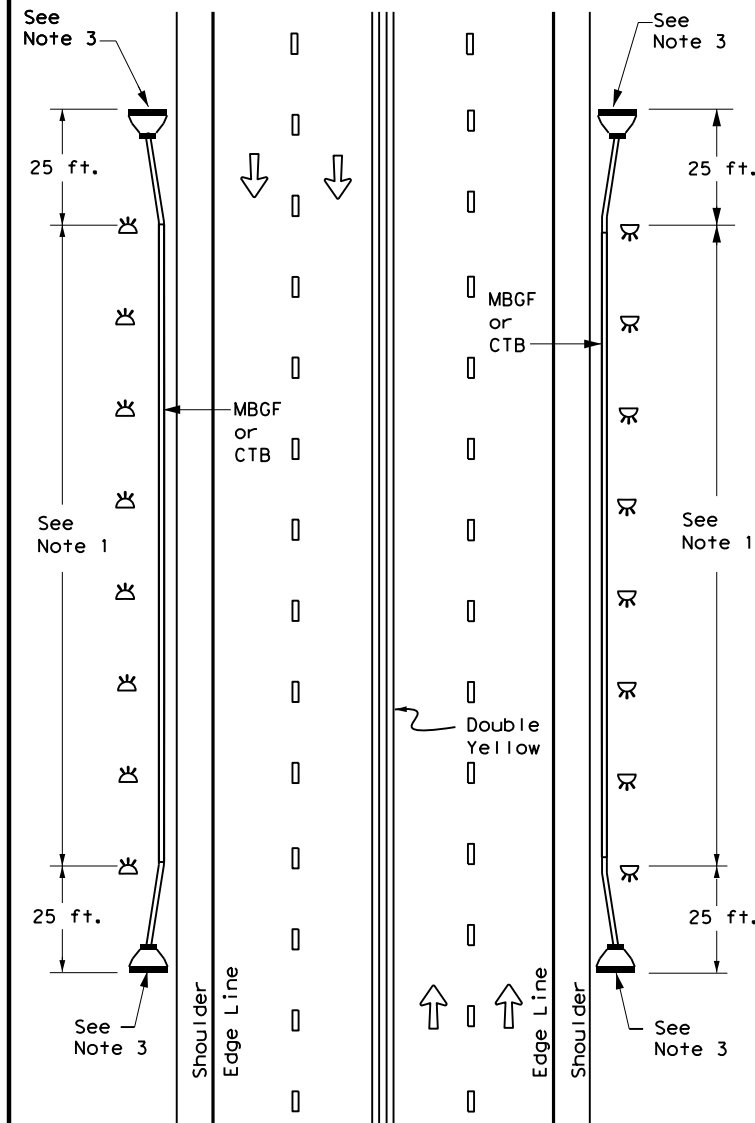
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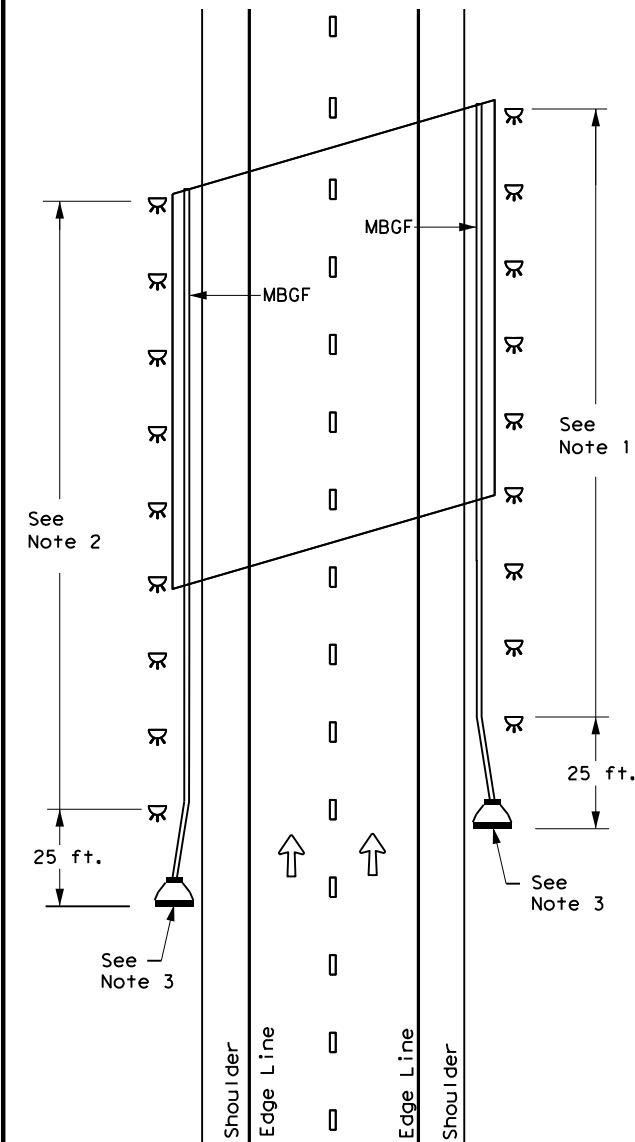
CONTINUOUS CONCRETE OR STEEL BARRIER



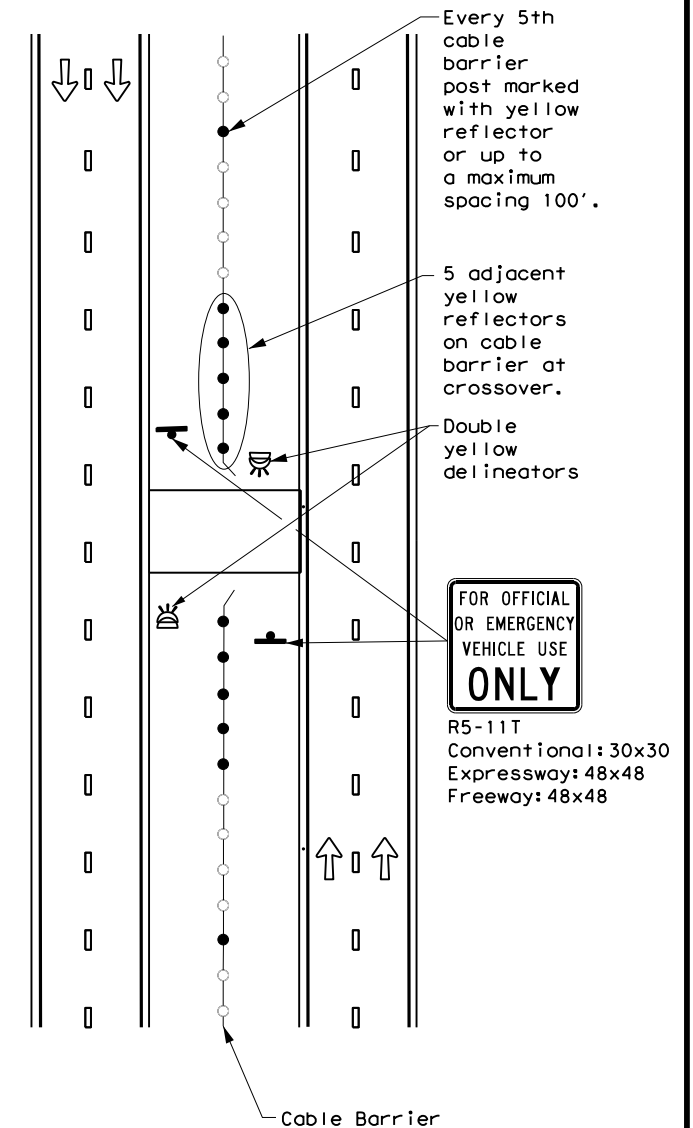
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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 Continuous 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 |

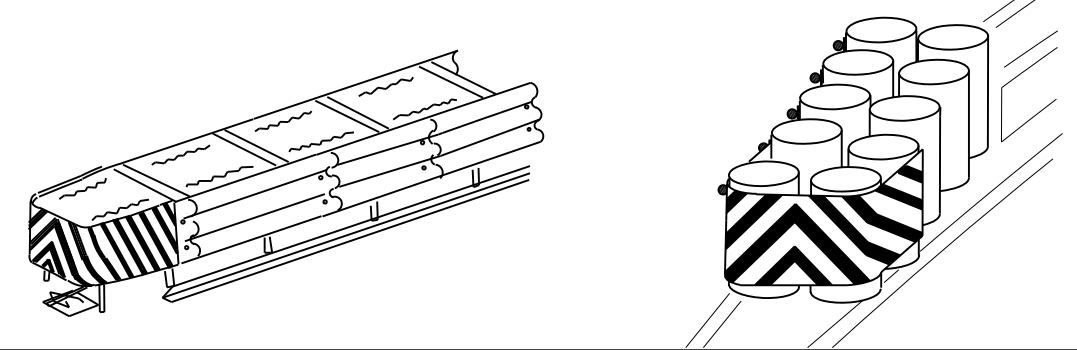
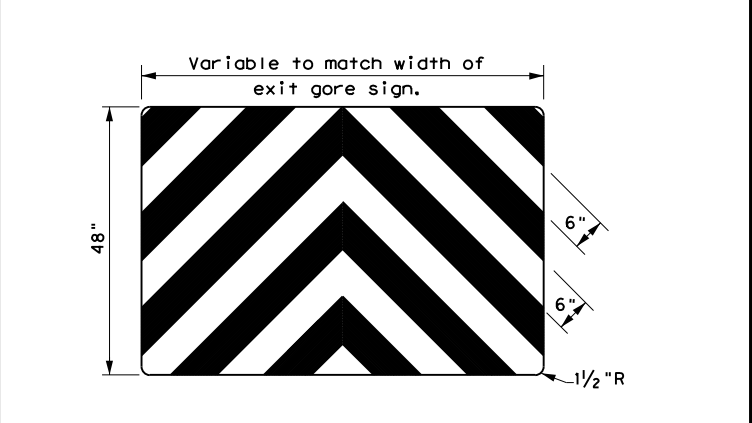
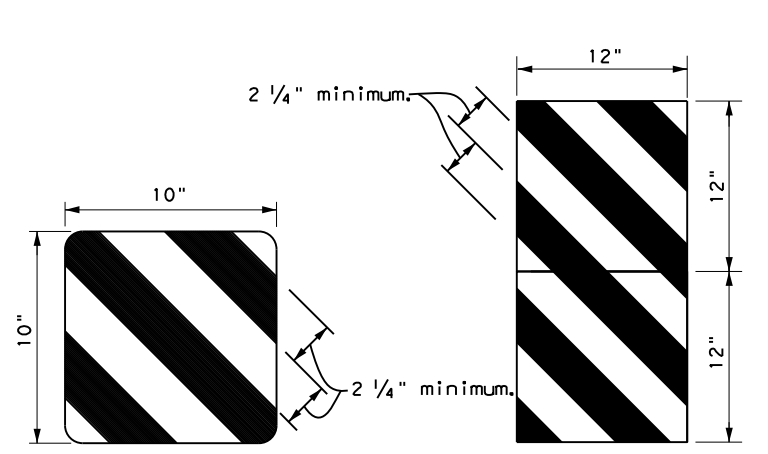
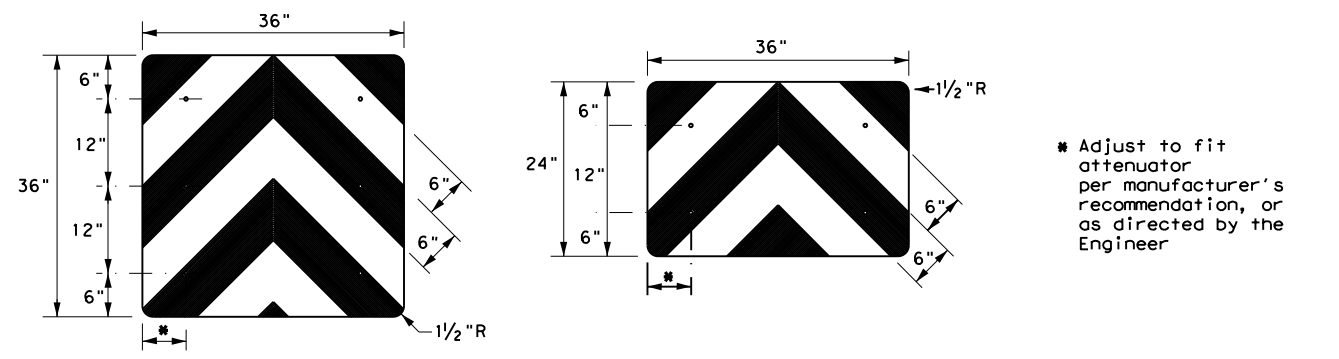
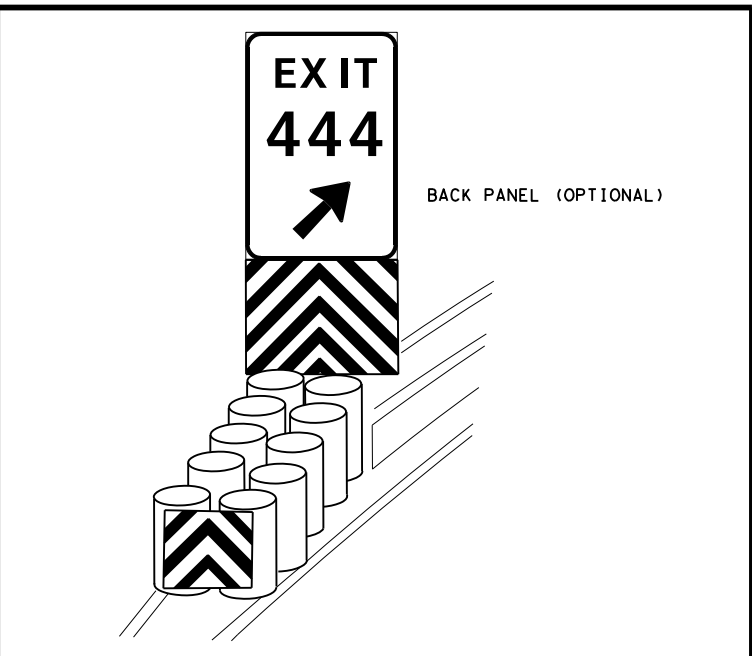
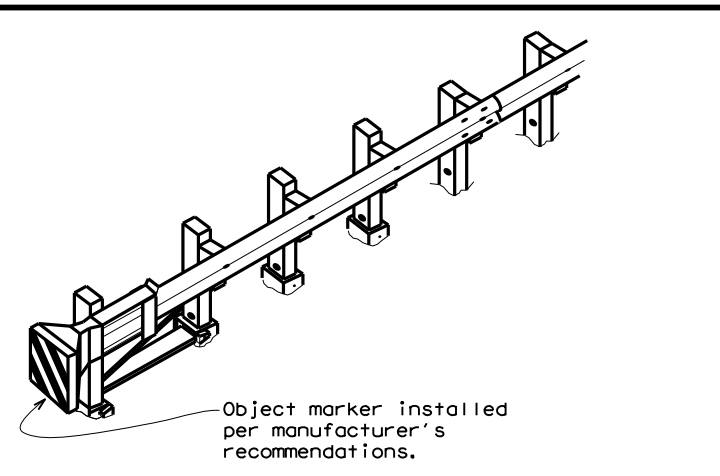
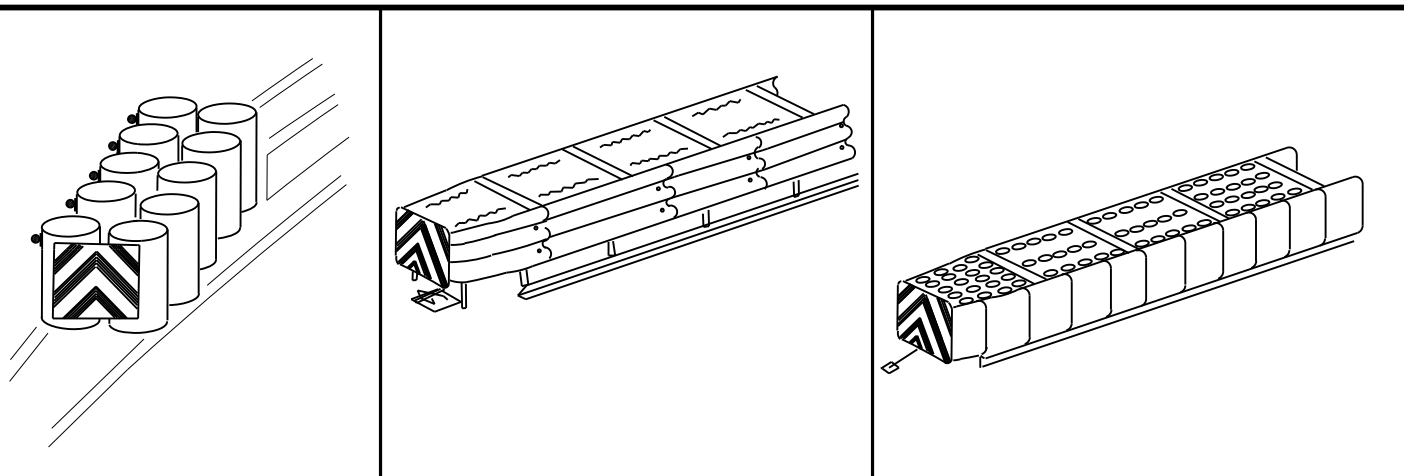
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

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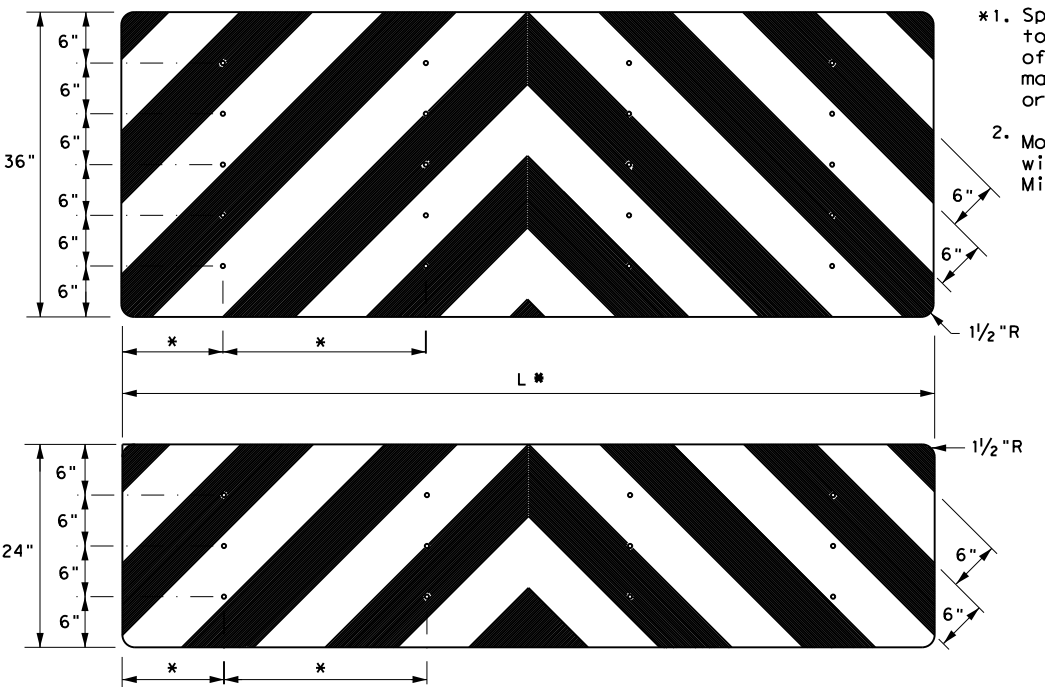
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OBJECT MARKERS SMALLER THAN 3 FT²

- NOTES**
- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
 - Mounting should be flush with top of attenuator. Minimum size 96" x 24".

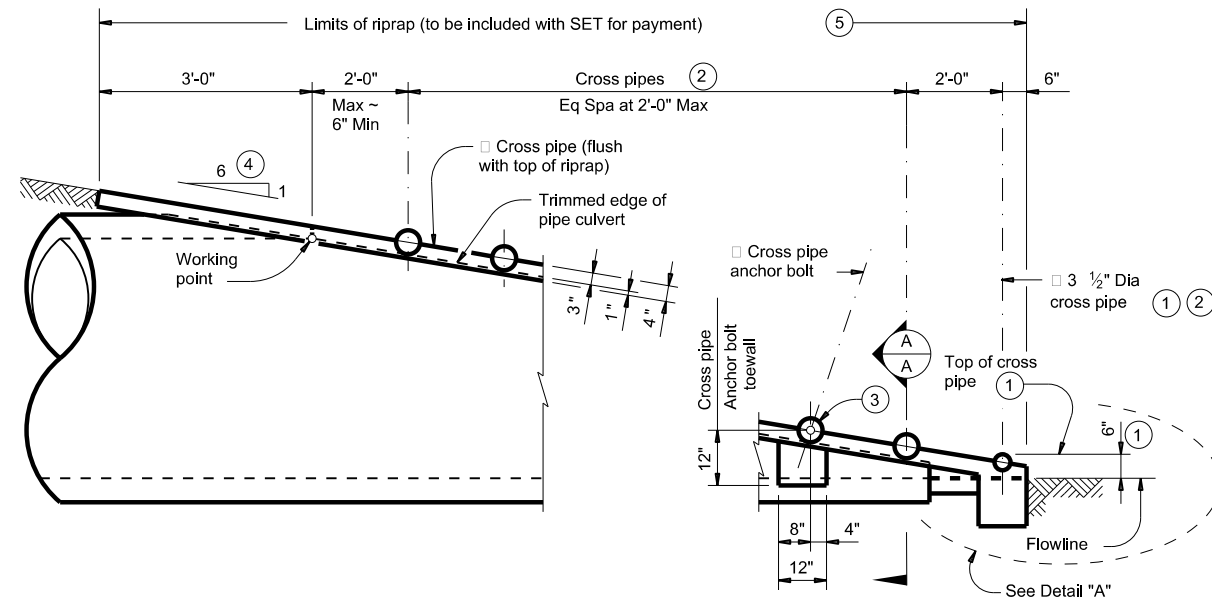


NOTES

- 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.
- 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.
- 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 1/4".
- 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.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

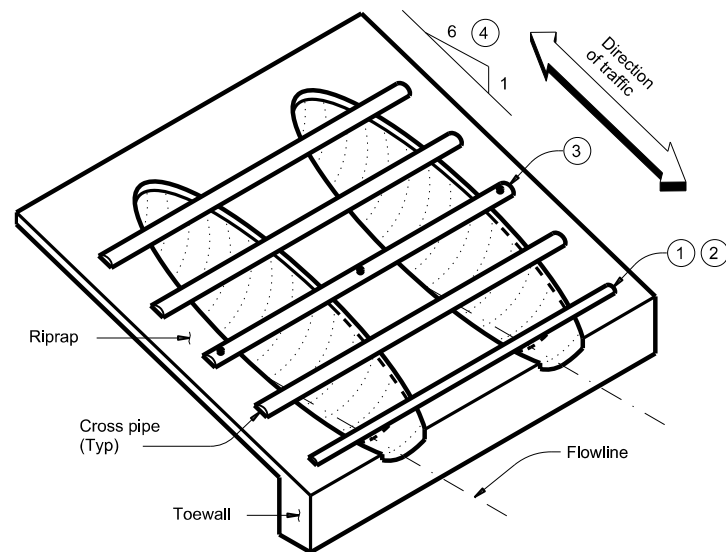
| | | | |
|--|-----------|-----------|-----------|
| | | | |
| DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) -20 | | | |
| FILE: domvia20.dgn | DN: TXDOT | CK: TXDOT | DW: TXDOT |
| © TXDOT December 1989 | CONT | SECT | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 |
| 4-92 8-04 | DIST | COUNTY | SHEET NO. |
| 8-95 3-15 | AUS | TRAVIS | 62 |
| 4-98 7-20 | | | |

DATE: 4/26/2024 12:09:29 PM
 FILE: C:\Users\sgreece\Desktop\US 290 @ Ledgestone Standards\Standard DGN\065116 - Riprap Arch Pipe Culverts.dgn
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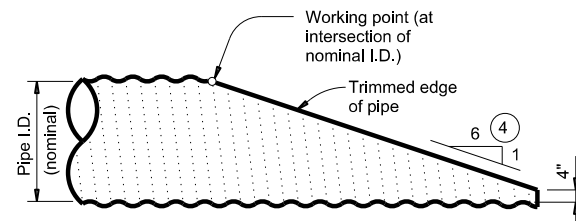


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION



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

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES

②

| Corrugated Metal Pipe (CMP) Culverts | | | | | | | | | |
|---|--------------------|-------------------|-------------------|----------------------|--------------------|-------------------|-------------|-----------------------------------|--------------------------|
| Design | Conc Riprap (CY) ⑥ | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for Use of Cross Pipes | Cross Pipe Sizes |
| 1 | 0.6 | 17" | 13" | 1' - 0" | N/A | 2' - 8" | 2' - 5" | 3 or more pipe culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 21" | 15" | 1' - 2" | N/A | 3' - 1" | 2' - 11" | | 3 1/2" Std (4.000" O.D.) |
| 3 | 0.9 | 28" | 20" | 1' - 5" | N/A | 3' - 9" | 3' - 9" | | 4" Std (4.500" O.D.) |
| 4 | 1.0 | 35" | 24" | 1' - 8" | 4' - 4" | 4' - 6" | 4' - 7" | All pipe culverts | 5" Std (5.563" O.D.) |
| 5 | 1.2 | 42" | 29" | 1' - 11" | 4' - 11" | 5' - 2" | 5' - 5" | | |
| 6 | 1.4 | 49" | 33" | 2' - 2" | 5' - 6" | 5' - 11" | 6' - 3" | All pipe culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 57" | 38" | 2' - 5" | 6' - 2" | 6' - 8" | 7' - 2" | | |
| 8 | 1.8 | 64" | 43" | 2' - 10" | 6' - 9" | 7' - 6" | 8' - 2" | | |
| 9 | 1.9 | 71" | 47" | 3' - 2" | 7' - 4" | 8' - 3" | 9' - 1" | | |
| Reinforced Concrete Pipe (RCP) Culverts | | | | | | | | | |
| Design | Conc Riprap (CY) ⑥ | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for Use of Cross Pipes | Cross Pipe Sizes |
| 1 | 0.6 | 22" | 13 1/2" | 1' - 0" | N/A | 3' - 1" | 2' - 10" | 3 or more pipe culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 26" | 15 1/2" | 1' - 2" | N/A | 3' - 6" | 3' - 4" | | 3 1/2" Std (4.000" O.D.) |
| 3 | 0.9 | 28 1/2" | 18" | 1' - 5" | N/A | 3' - 10" | 3' - 9 1/2" | | 4" Std (4.500" O.D.) |
| 4 | 1.0 | 36 1/4" | 22 1/2" | 1' - 8" | 4' - 5" | 4' - 7" | 4' - 8 1/4" | All pipe culverts | 5" Std (5.563" O.D.) |
| 5 | 1.2 | 43 3/4" | 26 b" | 1' - 11" | 5' - 1" | 5' - 4" | 5' - 6 3/4" | | |
| 6 | 1.4 | 51 5/8" | 31 5/8" | 2' - 2" | 5' - 8" | 6' - 1" | 6' - 5 1/4" | All pipe culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 58 1/2" | 36" | 2' - 5" | 6' - 4" | 6' - 10" | 7' - 3 1/2" | | |
| 8 | 1.8 | 65" | 40" | 2' - 10" | 6' - 10" | 7' - 7" | 8' - 3" | | |
| 9 | 1.9 | 73" | 45" | 3' - 2" | 7' - 6" | 8' - 5" | 9' - 3" | | |

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

MATERIAL NOTES:

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

GENERAL NOTES:

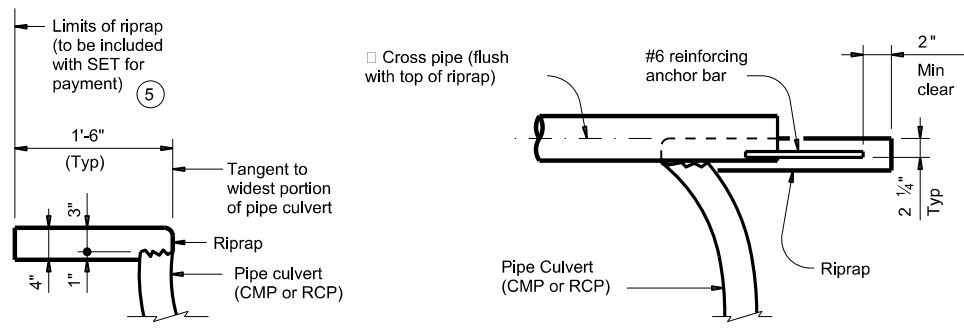
Pipe runners are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
 Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.
 Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".
 Payment for riprap and toewall is included in the price bid for each safety end treatment.

SHEET 1 OF 2

| | | | | | |
|---|---------|-----------|---------|---------------------------------|--|
| | | | | Bridge Division Standard | |
| SAFETY END TREATMENT FOR DESIGN 1 TO 9 ARCH PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE | | | | | |
| SETP-PD-A | | | | | |
| FILE: setppase-20.dgn | DN: GAF | CK: TxDOT | DW: JRP | CK: GAF | |
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY | |
| REVISIONS | 0113 | 08 | 091 | US 290 | |
| | DIST | COUNTY | | SHEET NO. | |
| | AUS | TRAVIS | | 63 | |

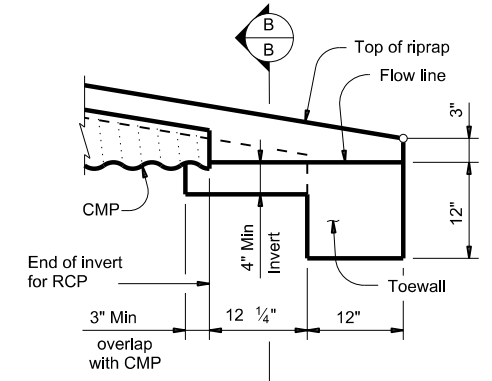
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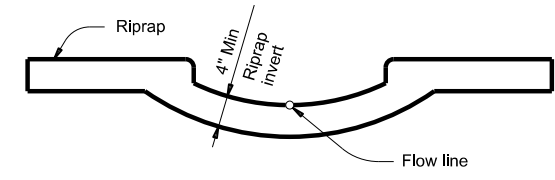


SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR

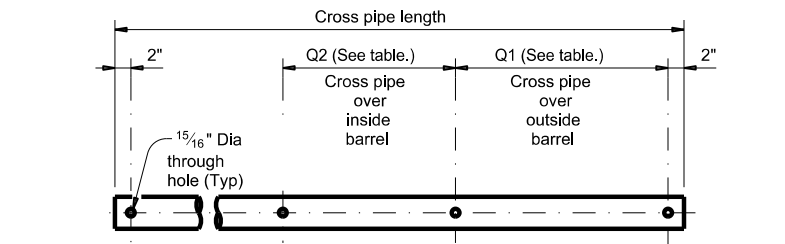


(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

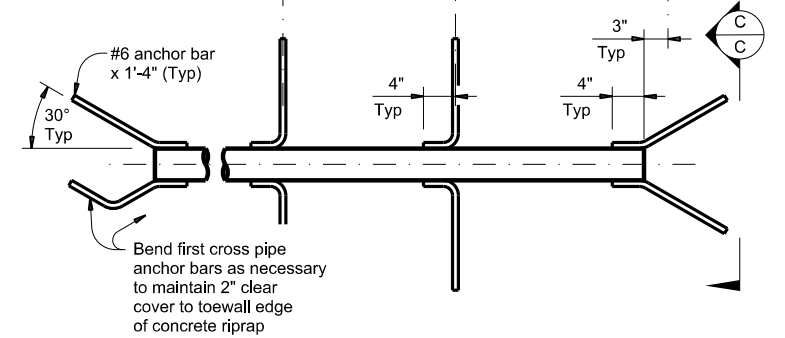


SECTION B-B

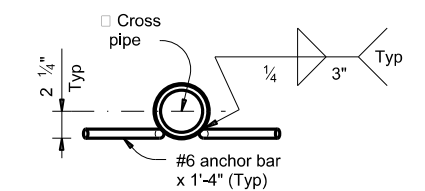
(Cross pipes not shown for clarity.)



PIPE WITH BOLTED ANCHOR

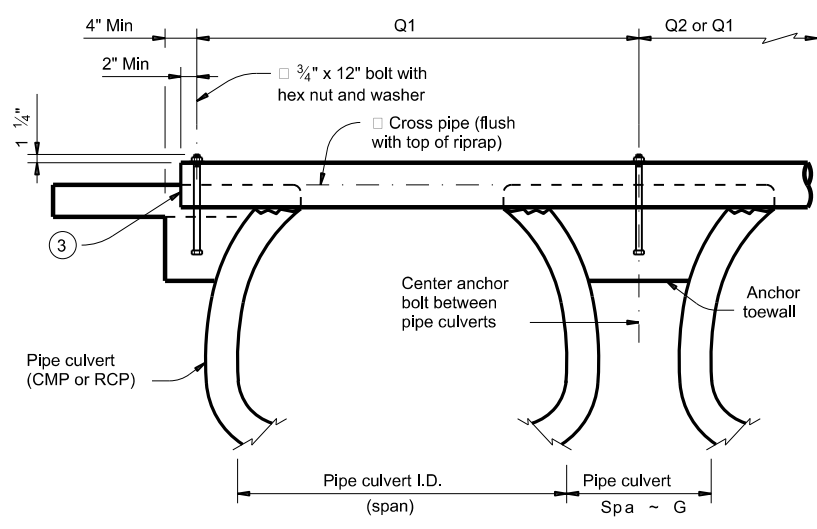


PIPE WITH ANCHOR BARS



SECTION C-C

CROSS PIPE DETAILS



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

SHEET 2 OF 2



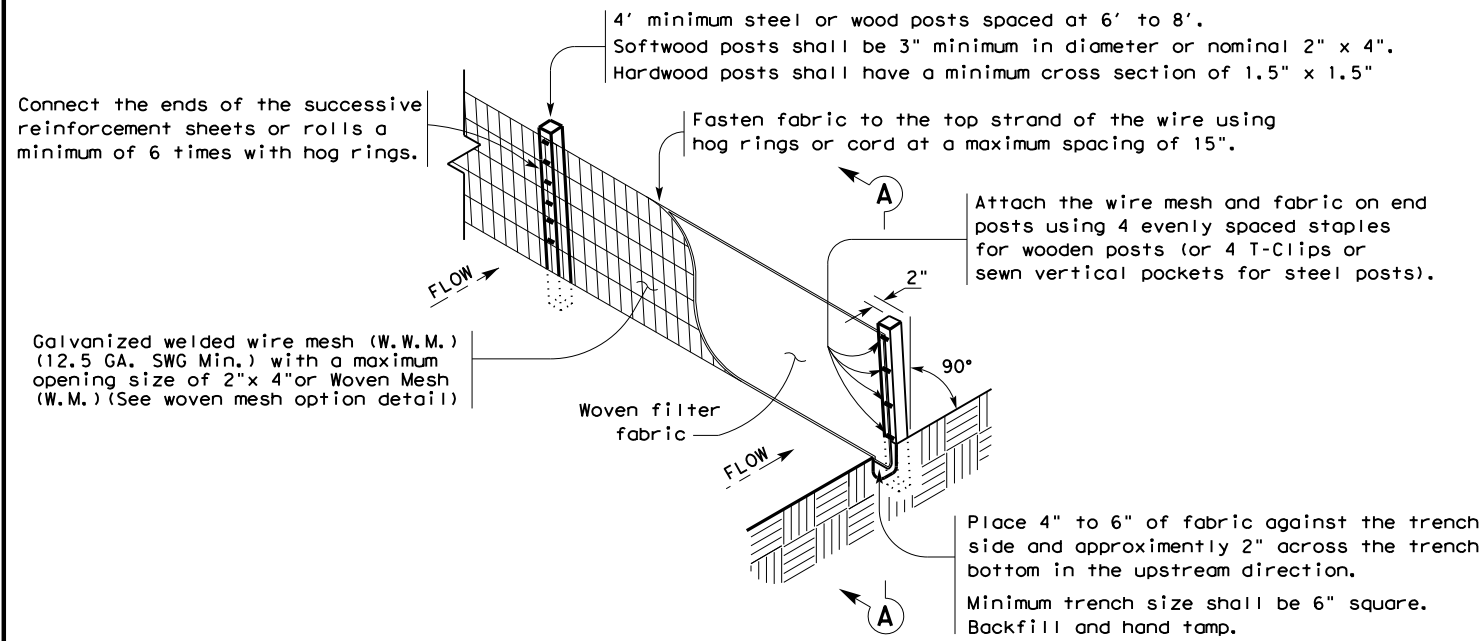
SAFETY END TREATMENT
 FOR DESIGN 1 TO 9
 ARCH PIPE CULVERTS
 TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

| | | | | |
|-----------------------|---------|-----------|-----------|---------|
| FILE: setppase-20.dgn | DN: GAF | CK: TxDOT | DW: JRP | CK: GAF |
| ©TxDOT February 2020 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0113 | 08 | 091 | US 290 |
| DIST | COUNTY | | SHEET NO. | |
| AUS | TRAVIS | | 64 | |

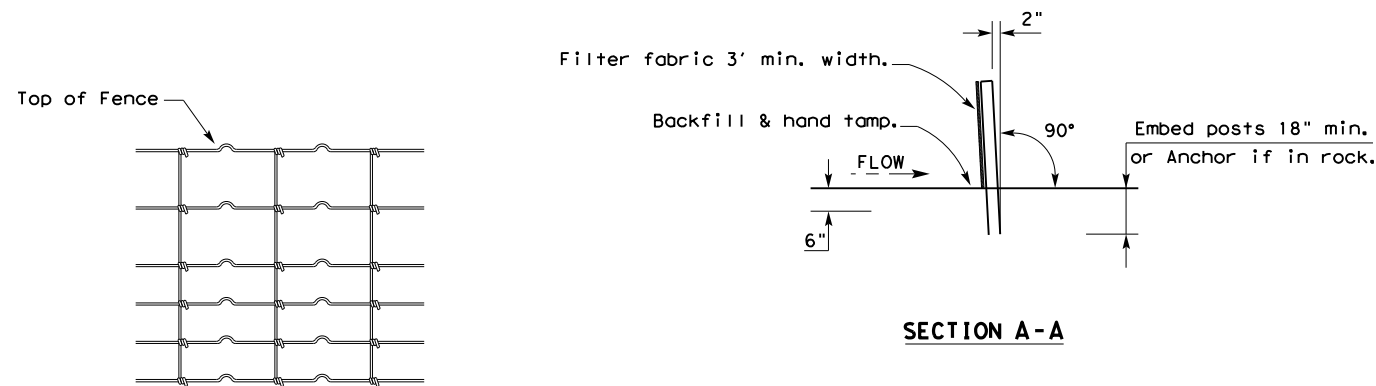
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TEMPORARY SEDIMENT CONTROL FENCE

SCF



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/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

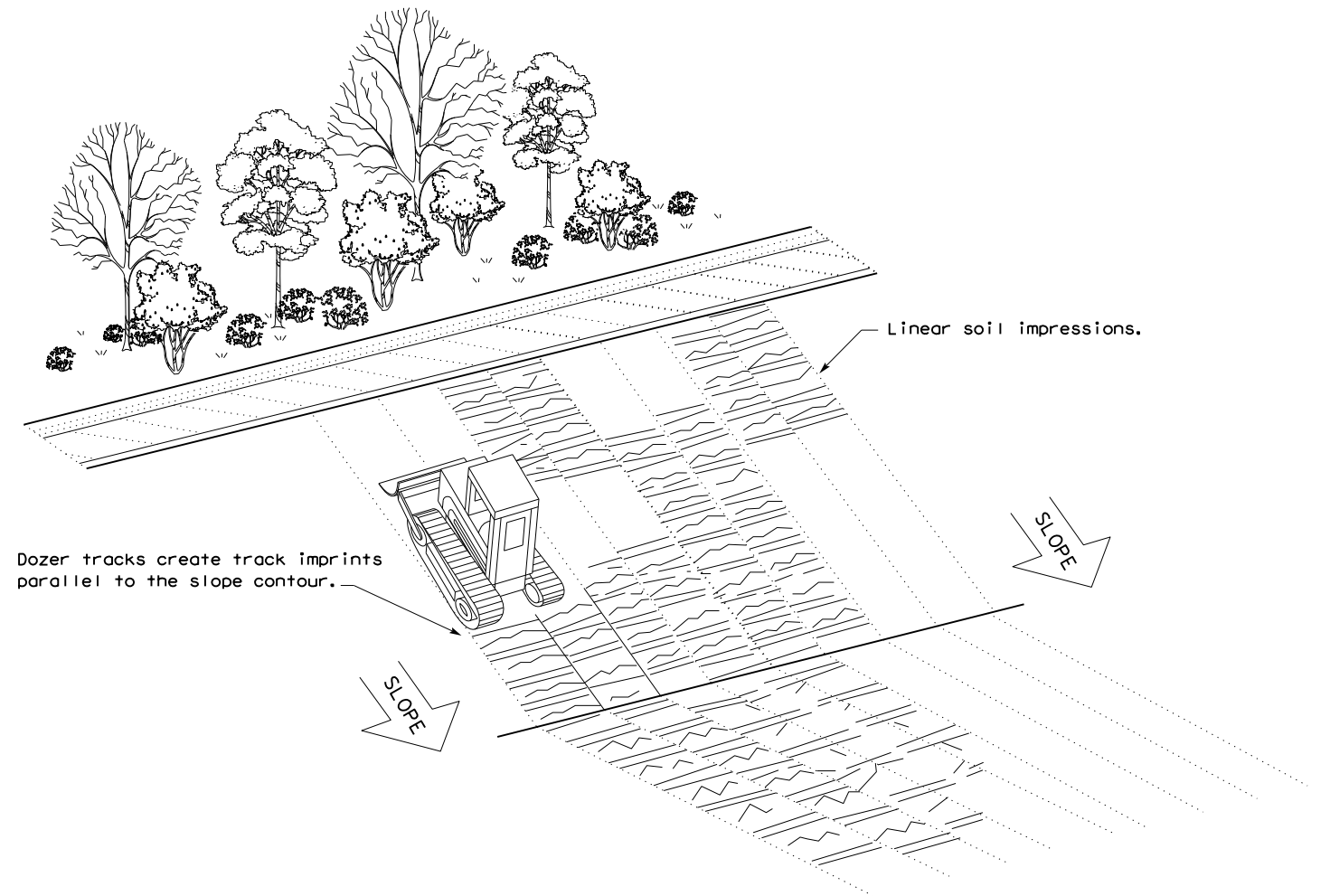
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

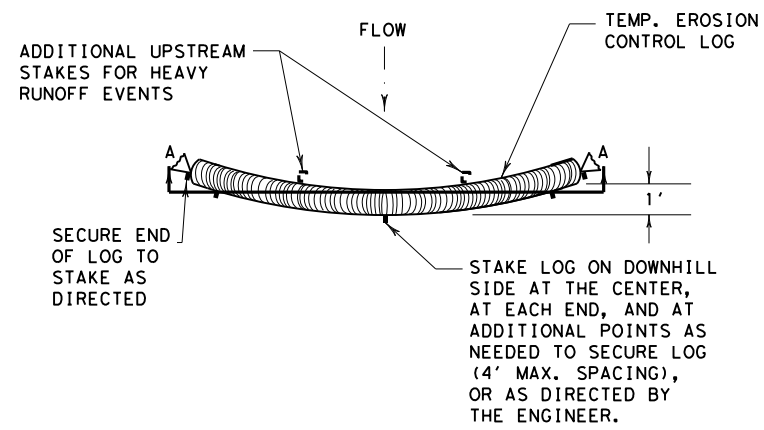
1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum 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 continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



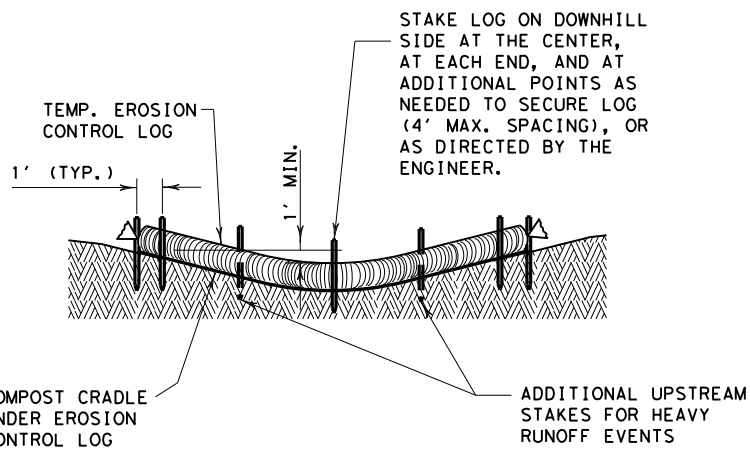
VERTICAL TRACKING

| | | | | | |
|--|-----------|--------|--------|--------------------------|-----------|
| | | | | 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 | |
| © 2024 | JULY 2016 | CONT | SECT | JOB | HIGHWAY |
| | REVISIONS | 0113 | 08 | 091 | US 290 |
| | | DIST | COUNTY | | SHEET NO. |
| | | AUS | TRAVIS | | 65 |

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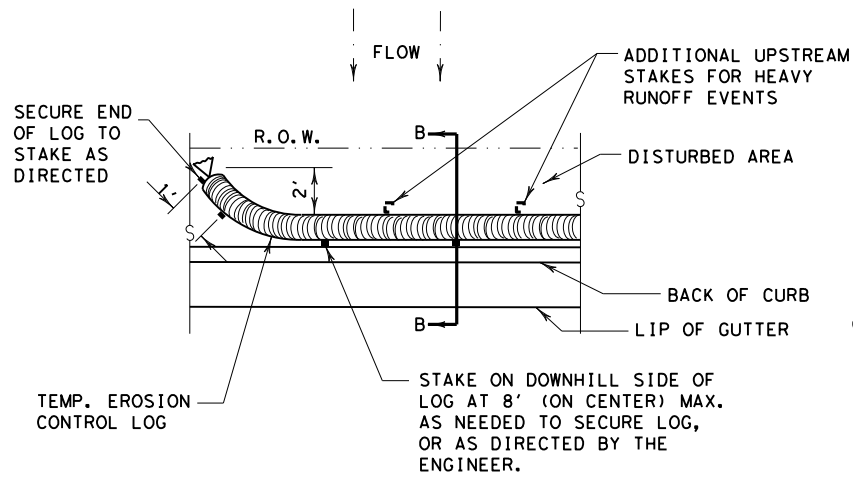
PLAN VIEW



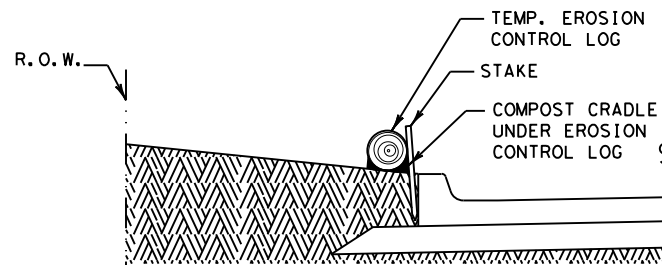
SECTION A-A

EROSION CONTROL LOG DAM

CL-D



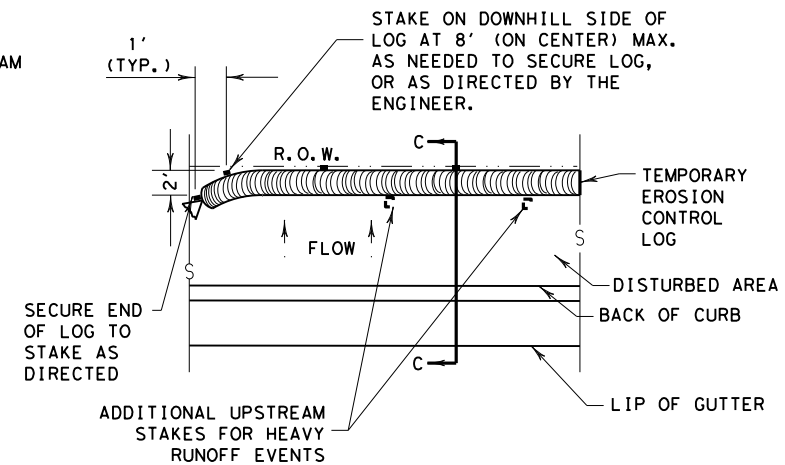
PLAN VIEW



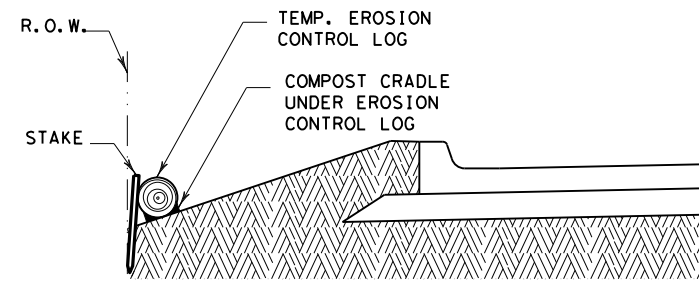
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



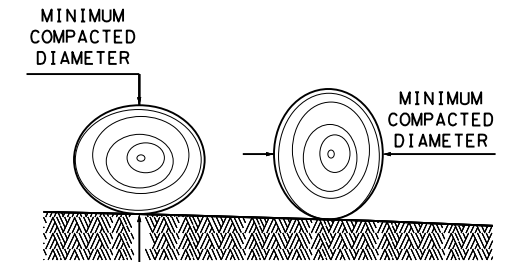
PLAN VIEW



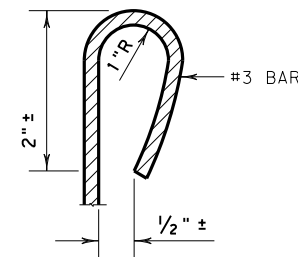
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS



REBAR STAKE DETAIL

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.

GENERAL NOTES:

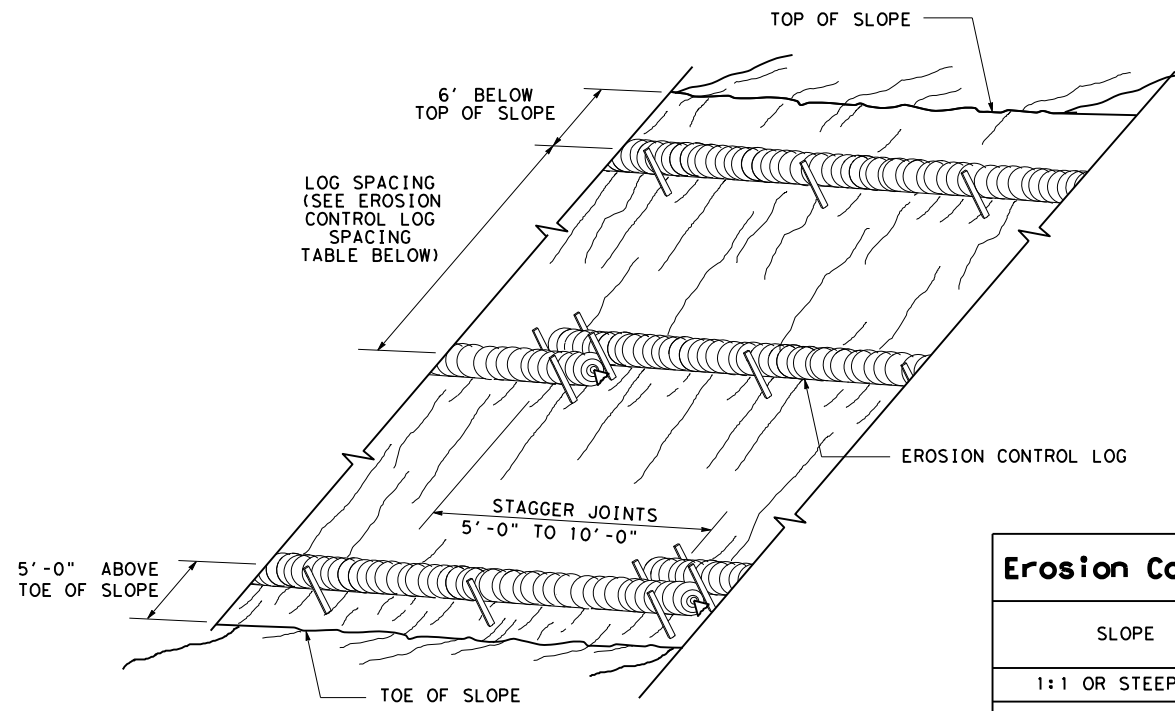
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE 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.

SHEET 1 OF 3

| | | | |
|---|------------|---------------------------------|-----------------|
| | | <i>Design Division Standard</i> | |
| TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16 | | | |
| FILE: ec916 | DW: TxDOT | CK: KM | DW: LS/PT |
| © TxDOT: JULY 2016 | CONT: 0113 | SECT: 08 | JOB: 091 |
| REVISIONS | | | HIGHWAY: US 290 |
| | DIST: AUS | COUNTY: TRAVIS | SHEET NO.: 66 |

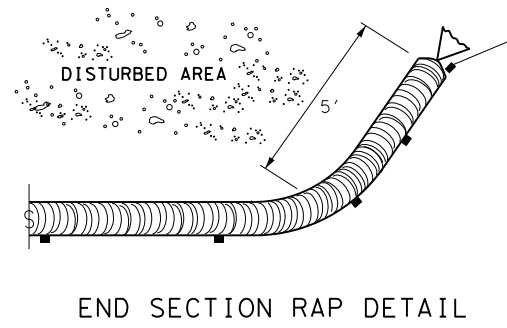
- CL-D EROSION CONTROL LOG DAM
- CL-BOC EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI EROSION CONTROL LOG AT DROP INLET
- CL-CI EROSION CONTROL LOG AT CURB INLET
- CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET

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EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

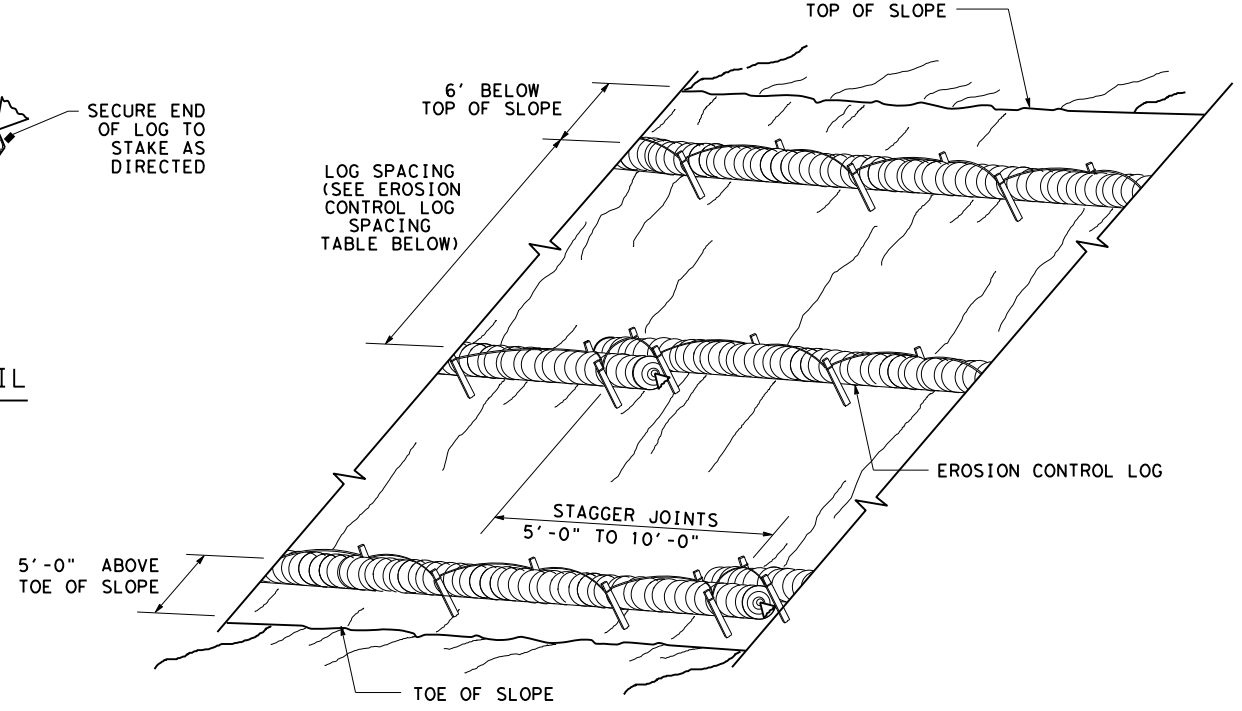
CL-SST



END SECTION RAP DETAIL

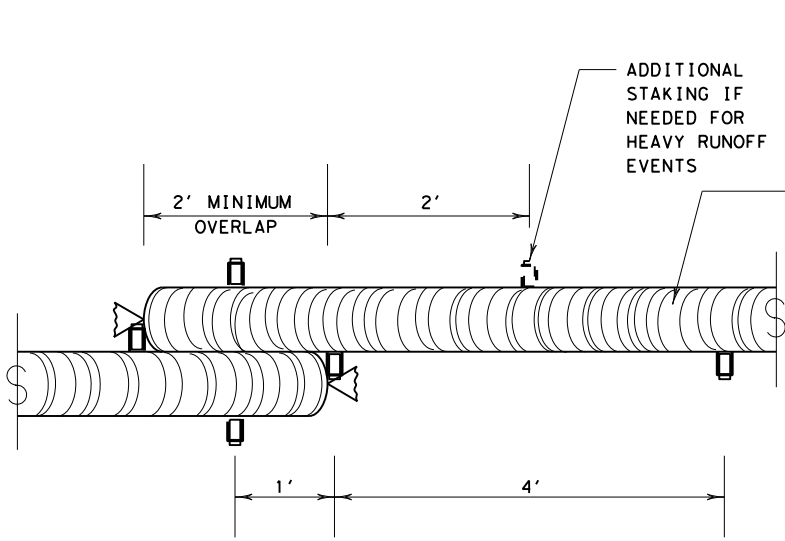
| SLOPE | LOG DIAMETER | | | |
|----------------|--------------|-----|-----|-----|
| | 6" | 8" | 12" | 18" |
| 1:1 OR STEEPER | 5' | 10' | 15' | 20' |
| 2:1 | 10' | 20' | 30' | 40' |
| 3:1 | 15' | 30' | 45' | 60' |
| 4:1 OR FLATTER | 20' | 40' | 60' | 80' |

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



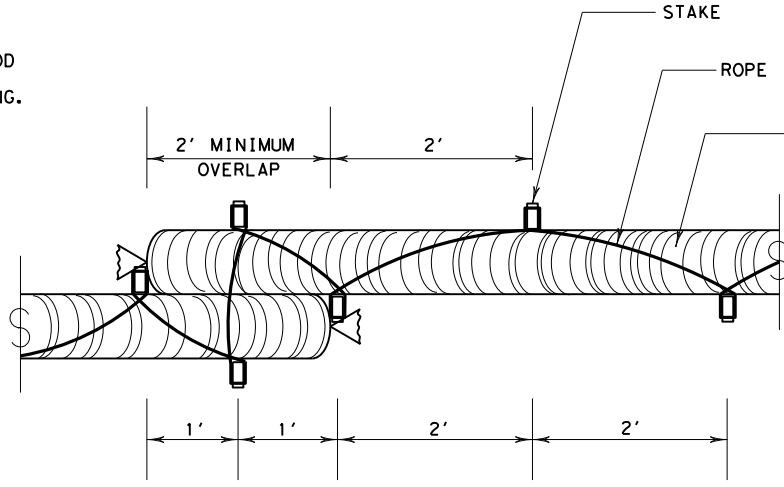
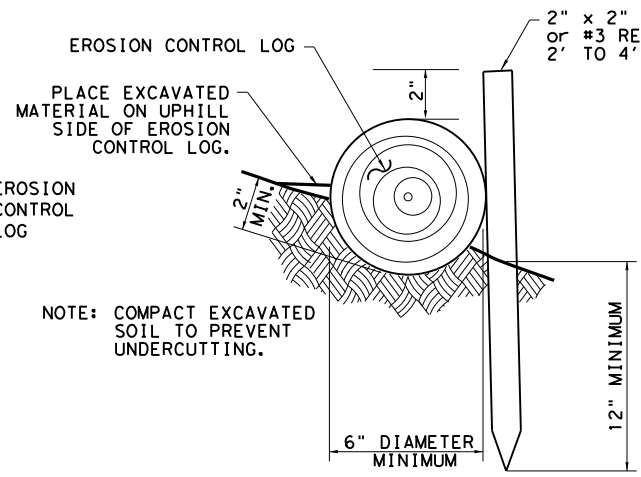
EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

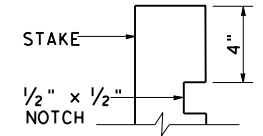


STAKE AND LASHING ANCHORING DETAIL

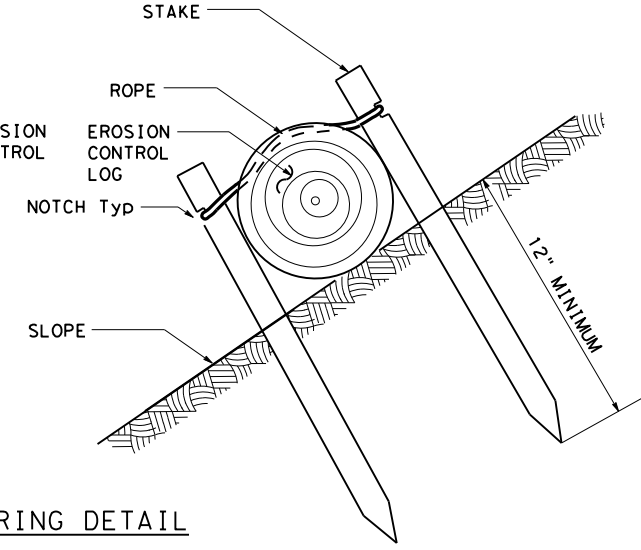
CL-SSL

| LOG DIAMETER | DEPTH |
|--------------|-------|
| 6" | 2" |
| 8" | 3" |
| 12" | 4" |
| 18" | 5" |

TRENCH DEPTH TABLE



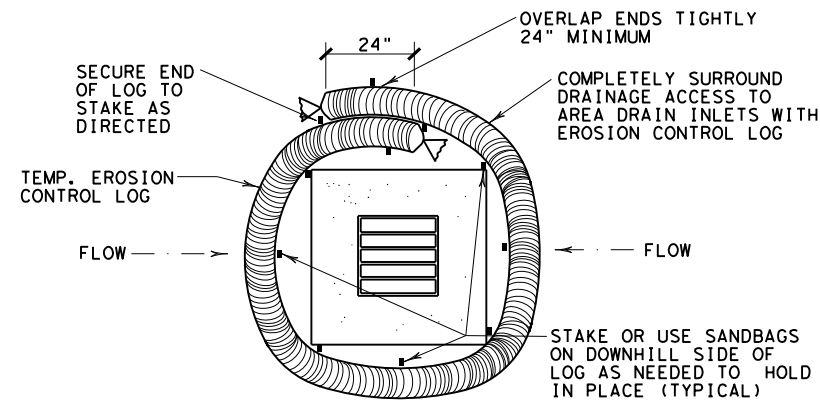
STAKE NOTCH DETAIL



SHEET 2 OF 3

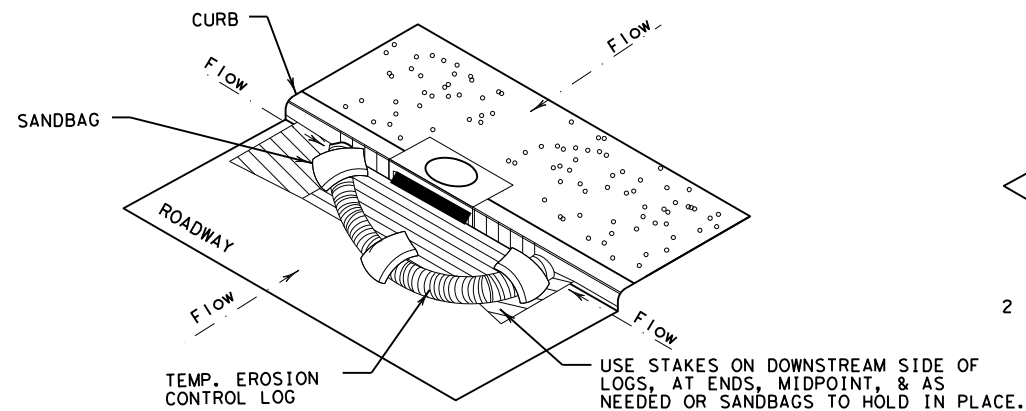
| | | | |
|---|-----------|--------------------------|-----------|
| | | Design Division Standard | |
| TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16 | | | |
| FILE: ec116 | DN: TxDOT | CK: KM | DW: LS/PT |
| © TxDOT: JULY 2016 | CONT SECT | JOB | HIGHWAY |
| REVISIONS | 0113 08 | 091 | US 290 |
| DIST | COUNTY | SHEET NO. | |
| AUS | TRAVIS | 67 | |

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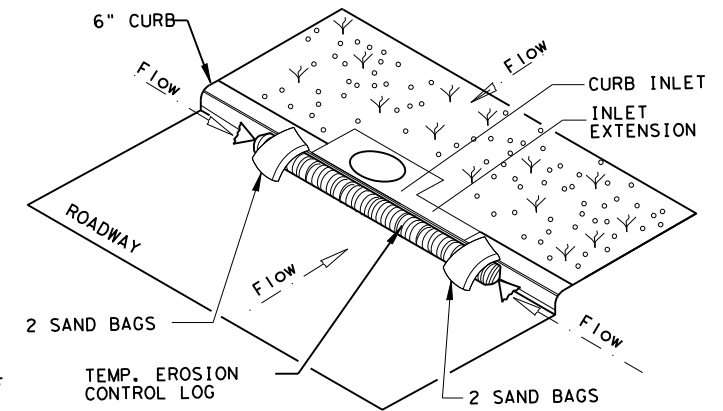
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

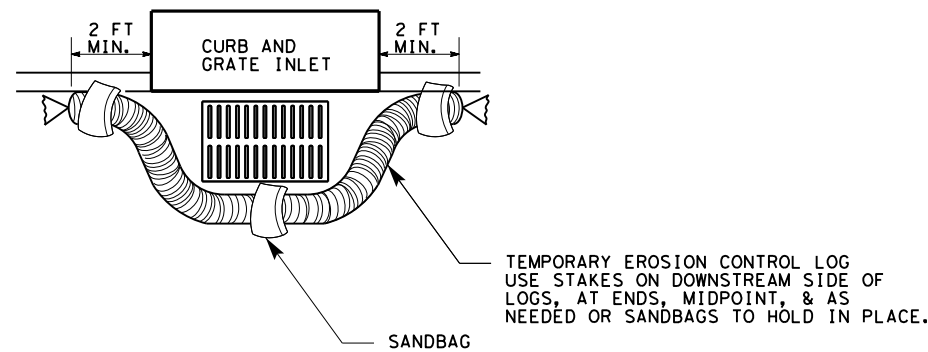
CL-CI



EROSION CONTROL LOG AT CURB INLET

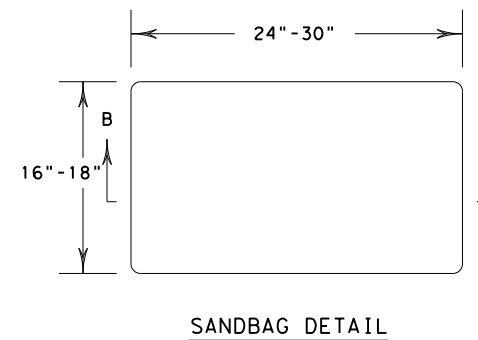
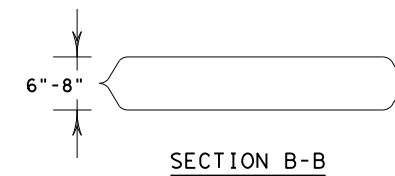
CL-CI

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



SHEET 3 OF 3

| | | | |
|---|-----------|---------------------------------|-----------|
| | | <i>Design Division Standard</i> | |
| TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16 | | | |
| FILE: ec916 | DN: TxDOT | CK: KM | DW: LS/PT |
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| REVISIONS | 0113 | 08 | 091 |
| DIST | COUNTY | | SHEET NO. |
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