FHWA TEXAS DIVISION	STATE PROJECT NO.		SHEET NO.
	C 2465-1-20		1
STATE	DISTRICT	COUNTY	
TEXAS	2	JOHNSON	
CONTROL	SECTION	JOB	HIGHWAY NO.
2465	01	020	FM 2280

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT NO. C 2465-1-20

FM 2280
JOHNSON COUNTY

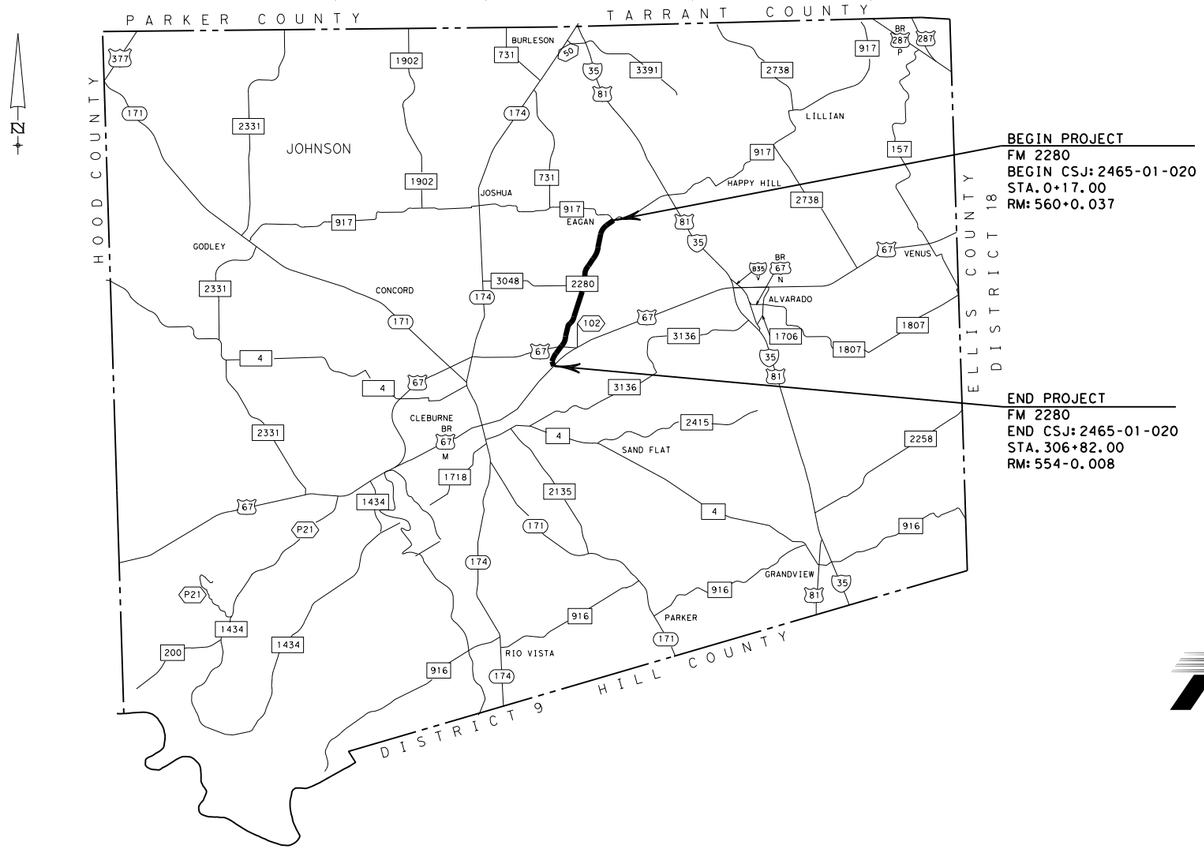
LIMITS:
FROM: BU 67
TO: FM 917

NET LENGTH OF ROADWAY= 30,578.90 FT.= 5.792 MI.
NET LENGTH OF BRIDGE CLASS CULVERTS = 86.10 FT.= 0.016 MI.
NET LENGTH OF PROJECT= 30,665.00 FT.= 5.808 MI.

FOR THE CONSTRUCTION OF OVERLAY WORK

CONSISTING OF OVERLAY, MILL AND INLAY, REPAIR BASE FAILURES, PAVEMENT MARKINGS, AND MBGF

INDEX OF SHEETS



EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS: UNION PACIFIC RAILROAD 114' EAST OF BEGINNING OF PROJECT ALIGNMENT

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

POSTED SPEED = 45 MPH (LOWEST) MAIN LANES
A.D.T. (2025) = 10,200
A.D.T. (2045) = 13,800
A.D.T. (2055) = 15,600

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)-21 THRU BC (12)-21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

STATE OF TEXAS
ABULKHAIR M. ZOBAYED
87951
LICENSED
PROFESSIONAL ENGINEER

10/19/2023

Abulkhair M. Zobayed

PROJECT MANAGER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000---008).

Texas Department of Transportation

SUBMITTED FOR LETTING: 10/20/2023

AREA ENGINEER

RECOMMENDED FOR LETTING: 10/23/2023

DocuSigned by:
7879B0B9EE5D400...
DIRECTOR, T.P.&D.

APPROVED FOR LETTING: 10/23/2023

DocuSigned by:
David M Salazar, P.E.
B741E64FAD82411...
DISTRICT ENGINEER

10/19/2023 8:57:42 AM
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SHEET NO.	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3, 3A-3H	GENERAL NOTES
4, 4A-4B	ESTIMATE AND QUANTITY
5	SUMMARY OF QUANTITIES - ROADWAY
6	SUMMARY OF QUANTITIES - PAVEMENT MARKING
7	SUMMARY OF QUANTITIES - TRAFFIC SIGNAL
8	HORIZONTAL ALIGNMENT DATA
9-15	HORIZONTAL AND VERTICAL CONTROL INDEX SHEET
16-18	HORIZONTAL AND VERTICAL CONTROL DETAIL SHEET
19-20	EXISTING TYPICAL SECTIONS
21-22	PROPOSED TYPICAL SECTIONS
	TRAFFIC CONTROL PLAN
23	TRAFFIC CONTROL PLAN AND WORK SEQUENCE
	TRAFFIC CONTROL PLAN STANDARDS
24-35	* BC(1)-21 THRU BC(12)-21
36	* TCP(2-1)-18
37	* TCP(2-2)-18
38	* TCP(2-3)-23
39	* TCP(3-1)-13
40	* TCP(3-3)-14
41	* TCP(3-4)-13
42	* TCP(7-1)-13
43	* WZ(RS)-22
44-45	* WZ(BTS-1)-13 AND WZ(BTS-2)-13
46	* WZ(STPM)-23
47	* WZ(UL)-13
48	* WZ(TD)-17
49	* WZ(RCD)-13
50-51	* SSCB(2)-10
52	* SSCB(5)-10
53	* ABSORB(M)-19
54	* SLED-19
55	* TREATMENT FOR VARIOUS EDGE CONDITIONS
56	* TEMPORARY CRASH CUSHION SUMMARY SHEET
	ROADWAY DETAILS
57-70	PAVING PLANS
71	MISCELLANEOUS DETAILS
	ROADWAY DETAILS STANDARDS
72	* TE(HMAC)-11
73	* MBGF-19
74	* MBGF(SR)-19
75	* GF(31)-19
76-78	* SRG(TL-3)-21
79	* GF(31)MS-19
80	* SGT(12S)31-18
81	* SGT(15)31-20
82	* RAIL-ADJ(B)-19
	TRAFFIC ITEMS
83-96	PAVEMENT MARKING LAYOUT
	TRAFFIC ITEMS STANDARDS
97-99	+ PM(1),(2),(3)-22
100	+ PM(4)-22A
101-103	+ RS(3),(4),(5)-23
104-108	+ D & OM(1,2,5,6,VIA)-20
109	+ RCD(1)-22

SHEET NO.	DESCRIPTION
	TRAFFIC SIGNAL
110	FM 2280 @ FM 3048 TRAFFIC SIGNAL EXISTING LAYOUT
111	FM 2280 @ FM 3048 TRAFFIC SIGNAL PROPOSED LAYOUT
112	FM 2280 @ FM 3048 SIGNAL SUMMARY
113	FM 2280 @ FM 3048 TERMINATION & PHASING
114	SUMMARY OF SMALL SIGNS
115	SMALL SIGN DETAILS
	TRAFFIC SIGNAL STANDARDS
116	# ED(1)-14
117	# ED(3)-14
118	# ED(4)-14
119	# TS-BP-20
120	# LD(1)-03
121	# LD(2)-03
122	□ SMD(GEN)-08
123	□ (MOD) SMD(SLIP-1)-08
124	□ SMD(SLIP-2)-08
125	□ SMD(SLIP-3)-08
126	□ TSR(4)-13
127	# RVDS-18 (DAL)
	ENVIRONMENTAL ISSUES
128-129	STORMWATER POLLUTION PREVENTION PLAN (SWP3)
130	EPIC
	ENVIRONMENTAL ISSUES STANDARDS
131	* EC(1)-16
132	* EC(2)-16
133-135	* EC(9)-16
	MISCELLANEOUS ITEMS
136	RAILROAD SCOPE OF WORK - PROJECT SPECIFIC DETAILS
137-138	RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

STATE OF TEXAS — SUCHITA POTTA — 142658 — REGISTERED PROFESSIONAL ENGINEER

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

Suchita Potta , P.E. 1/4/2024

SUCHITA POTTA
TxDOT
DATE

STATE OF TEXAS — CHRISTOPHER A. BOLES — 109725 — REGISTERED PROFESSIONAL ENGINEER

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

Christopher Boles , P.E. 1/4/2024

CHRISTOPHER A. BOLES
VRX, INC. TBPE# F-9690
DATE

STATE OF TEXAS — PAUL E. WILLIAMS — 73822 — LICENSED PROFESSIONAL ENGINEER

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

Paul E. Strelliams, P.E. , P.E. 1/4/2024

PAUL E. WILLIAMS
THE PRIORITY GROUP TBPE# F-14194
DATE

STATE OF TEXAS — RHETT DOLLINS — 100298 — LICENSED PROFESSIONAL ENGINEER

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

Rhett Dollins , P.E. 1/4/2024

RHETT DOLLINS
MALDONADO-BURKETT, LLP TBPE# F-10258
DATE

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

INDEX OF SHEETS

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	2
CONTROL	SECTION	JOB	
2465	01	020	

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GENERAL NOTES:

Specification Data

Basis of Estimate

Item	Description	Rate	Unit
166	Fert (16-8-8)	600 lb/acre**	Ton
168	Vegetative Watering	169,400 gal/acre	MG
300	CRS-2 or CRS-2H (Surface Trt)	0.20 gal/SY* **	Gal
3077	SP Mixes	115 lbs/SY/in	Ton
3077	Tack Coat – CSS-1P	0.20 gal./sq. yd.	Gal.
3077	Tack Coat - Trackless Tack	0.15-0.22 gal./sq. yd.	Gal.

* Based On 50% Asphalt Residue.

** Non-Pay, for Contractor's Information Only.

Special Notes:

Contractor Responsibilities

Contractor shall field verify all existing materials prior to beginning work on pertinent bid items.

Electronic Files

All files in the FTP site are subject to the License Agreement Shown on the FTP site.

Electronic files containing answered pre-letting questions and other project related design information will be placed in the following FTP site periodically.

Check this site for new information. Notices of new postings will not be sent out by the Engineer.

The data located in these files is for non-construction purposes only and can be found at

TxDOT's public FTP site at https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting Responses/.

Access is read-only.

All files in the FTP site are subject to the License Agreement shown on the FTP site.

To obtain a copy of the project plans free of charge, submit a request from the following site:

http://www.txdot.gov/business/letting-bids/plans-online.html

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

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Area Engineer: Daniel Poole
Area Engineer Assistant: Peter Ross
Design Manager: Suchita Potta

AE Email: daniel.poole@txdot.gov
AE Assistant Email: peter.ross@txdot.gov
Design Manager Email: suchita.potta@txdot.gov

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

"For Q&A's on Proposals navigate to https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors. Use 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."

Test Data

Calculating, Recording and Reporting Test Data - Use appropriate TxDOT Excel templates to calculate and record all test data. These forms are available on the TxDOT website at: http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html under the "Site Manager Forms" heading. Submit test results by email or Dropbox within 24 hours of test completion.

Lane Closures

Single lane closures, except as otherwise shown in the plans, will be restricted to off-peak hours as defined in the following table:

Peak Hours		Off-Peak Hours	
6 to 9 AM Monday through Friday	3 to 7 PM Monday through Friday	9 AM to 3 PM and 7 PM to 6 AM Monday through Friday	All day Saturday and Sunday

Work that requires closure of multiple travel lanes in the same direction, except as otherwise shown in the plans, will be performed at night between the hours of 9 PM and 6 AM.

The following Holiday/Event Lane closure restriction requirements apply to this project: No work that restricts or interferes with traffic shall be allowed between 3 PM on the day preceding a Holiday or Event and 9 AM on the day after the Holiday or Event.

Holiday Lane Closure Restrictions

New Year's Eve and New Year's Day (December 31 through January 1) 3 PM December 30 through 9 AM January 2

Easter Holiday Weekend (Friday through Sunday)	3PM Thursday through 9 AM Monday
Memorial Day Weekend (Friday through Monday)	3 PM Thursday through 9 AM Tuesday
Independence Day (July 3 through July 5)	3 PM July 2 through 9 AM July 6
Labor Day Weekend (Friday through Monday)	3 PM Thursday through 9 AM Tuesday
Thanksgiving Holiday (Wednesday through Sunday)	3 PM Tuesday through 9 AM Monday
Christmas Holiday (December 23 through December 26)	3 PM December 22 through 9 AM December 27

Plan work schedules around the appropriate dates above to ensure productive work is performed without lane closures.

Modifications to Lane Closure / Work Restrictions:

Submit a request in writing for approval by the Engineer a minimum of 10 days in advance of implementing a change to lane closure restrictions.

When deemed necessary, the Engineer will lengthen, shorten, or otherwise modify lane closure restrictions as traffic conditions warrant.

When deemed necessary, the Engineer will modify the list of major events when new events develop, existing events are rescheduled, or when warranted.

Special Events/ Special Situations will be handled on a case by case basis. No work restricting lane closures is allowed from 3 PM a day before to 9 AM the day after the Special Event or Special Situation.

Nighttime Work.

Perform no nighttime work on this project except when directed or allowed to do so by the Engineer in writing.

If nighttime work is allowed/required, provide Multi-Directional Lighting Device with the following quality requirements:

Provide a 2000 watt (minimum) SIROCCO lighting balloon, Airstar lighting or equivalent.

It is the intent of the MDLD lighting to supplement the Portable Road Light and Power Unit used to illuminate work hours.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Provide MDLD units which can self-inflate and capable of illuminating approximately 15,000 sq ft.

Provide MDLD units of 1.1 meter horizontal diameter and capable of withstanding 60 mph winds when fully inflated and operating.

Provide MDLD units with two (2) 1,000 watt halogen bulbs recommended by the manufacture.

Night Time Work Safety Clothing Department approved safety hats and vests (Class 3 with retro-reflective striping) shall be worn by all workers and visitors at all times when at the work sites. When work is approved by the Engineer to be performed at night, pants (Class 3 with retro-reflective striping) shall be worn by all workers and visitors when at the work sites.

Ingress and Egress

Provide all-weather surface for temporary ingress and egress to adjacent property, as directed. Materials, labor, equipment and incidentals necessary to provide temporary ingress and egress will not be paid for directly, but will be subsidiary to the various bid items.

Cross Slopes

In those instances where necessary, governing slopes indicated herein may be varied from the limits shown, to the extent approved. where necessary.

Driveways

Take care that existing curb and curb and gutter is not discolored or damaged during construction operations. In the event of discoloration or damage, clean or repair as directed.

Remove the grass from the crown of shoulders or pavement edges by blading or other approved methods. Payment for this work will not be made directly but shall be considered subsidiary to the various items of the contract.

Drainage

Provide temporary drain openings at all low points or other drainage structures, as required, at the Contractor's expense.

Remove any obstructions to existing drainage due to the contractor's operations, as required, at the Contractor's expense.

Item 4 – Scope of Work

Reimbursement for project overhead will not be considered until project completion has extended beyond the original Contract Time.

Item 5. Control of the Work

Perform construction surveying to record and re-establish the road profile, cross slopes and super-elevations in accordance with Article 5.9.3.

Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear Department approved safety hats and safety vests, 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 nighttime work.

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

Item 7. Legal Relations and Responsibilities

All contractor employees must wear hard hats and safety vests at all times when they are on site.

No significant traffic generator events identified.

This contract requires work to be done on railroad property. Cooperate with the railroads and comply with all of their requirements including obtaining any required training before performing work on railroad property.

Submit to the Engineer, an original railroad liability insurance policy.

Do not initiate activities in a project specific location (PSL) associated with a U.S. Army Corps of Engineers (USACE) permit 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. “Associated” as defined here means materials are delivered to or from the PSL. The permit area includes all waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. The contractor shall be responsible for any and all consultations with the USACE regarding activities, including project specific locations (PSLs) that have not been previously evaluated by the USACE. Provide the Department with a copy of all consultation(s) or approval(s) from the USACE prior to initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self determination has been made that the PSL is non jurisdictional or proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The contractor is solely responsible for documenting any determination(s) that their activities do not affect a USACE permit area. Maintain copies of their determination(s) for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, prior to any excavation hauled from or embankment hauled into a USACE permit area by either (1) or (2) below.

(1) Restricted Use of Materials for Previously Evaluated Permit Areas. Document both the project specific location (PSL) and its authorization. Maintain copies for review by the Department or any regulatory agency when an area within the project limits has been evaluated by the USACE as part of the permit process for this project:

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in Item 110 is used for permanent or temporary fill (Item 132, Embankment) within a USACE permit area;

b. Suitable embankment (Item 132) from within the USACE permit area is used as fill within a USACE evaluated area; and,

c. Unsuitable excavation or excess excavation [“Waste”] (Item 110) that is disposed of at a location approved by the Engineer within a USACE evaluated area.

(2) Contractor Materials from Areas Other than Previously Evaluated Areas. Provide the Department with a copy of all USACE coordination or approval(s) prior to initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:

a. Item 132, Embankment, used for temporary or permanent fill within a USACE permit area; and,

b. Unsuitable excavation or excess excavation [“Waste”] (Item 110, Excavation) that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is 1.3 acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on bridges, culverts, vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1. When practicable, schedule construction operations outside of the preferred nesting season. Otherwise, avoid nests containing migratory birds and perform no work in the nesting areas until the young birds have fledged.

Structures

Do not begin bridge and culvert construction operations until swallow nesting prevention is implemented, until after October 1 if it’s determined that swallow nesting is actively occurring, or until it’s determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier.

If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer
2. will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.

2. By February 15 place a nesting deterrent (which prevents access to the bridge and culvert by swallows) on the entire bridge (except deck and railing) and culverts.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by nesting swallows. This work is subsidiary to the various bid items.

Item 8. Prosecution and Progress

Working days will be computed and charged in accordance with Article 8.3.1.1 Five-Day Workweek.

Prepare the progress schedule as a CPM schedule, include all planned work activities and sequences and show Contract completion within the number of working days specified. Submit an updated hard copy when changes to the schedule occur or when requested.

Item 110. Excavation

Review proposed waste sites to determine if any site is located in a "Base Floodplain" or "Floodway" as defined by the Federal Emergency Management Agency (FEMA).

If waste material from this project is placed in a base floodplain as defined by FEMA, a permit will have to be obtained from the local community responsible for enforcing National Flood Insurance Program (NFIP) regulations. The Contractor is responsible for ensuring that the owner of the property receiving the waste has obtained the necessary permit.

Item 132. Embankment

Provide Type B embankment material with a Plasticity Index (PI) no higher than 35.

Furnish test results per Test Procedures Tex-104, 105, and 106-E (PIs), Tex-113 or 114-E (M-D Curves), and Tex-145 and/or Tex-146-E (Sulfates) for each material sample provided by the Engineer. Perform field density tests (Tex-115-E, Part I) at a frequency for each worked section to produce passing results prior to testing by the Engineer per Tex-115-E, Part I.

At all locations where guardrail is shown to flare, widen the embankment as necessary to accommodate the guardrail.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Item 134. Backfilling Pavement Edge

Backfill the pavement edge with salvaged asphaltic pavement from RAP, planning, or other material specified by the Engineer. Salvaged material must pass through a 2 in sieve. Place salvaged material as shown on the plans and treat with CRS-2 or CRS-2H emulsified asphalt at the rate of 0.2 gal/SY. Surface treat will not be paid for separately and is subsidiary to Item 134.

Item 164. Seeding for Erosion Control

Apply seeding required between December 1 and January 31 using seed types and mixtures as shown in Item 164.2.A, Table 3. If, in the opinion of the Engineer, this does not provide an effective vegetative cover, apply "straw or hay mulch" as specified in Item 164.3.E as soon as possible. After February 1 apply warm season seeding in order to establish a permanent protective vegetative cover.

Item 166. Fertilizer

Fertilize all areas of project to be seeded or sodded.

Item 168. Vegetative Watering

Furnish and install an approved rain gauge at the project site, as directed. Furnishing and installation of the rain gauge will not be paid for directly, but will be considered subsidiary to Item 168.

Apply vegetative watering for an establishment period of thirteen weeks following application of seed or installation of sod, at a rate of ½" of water depth per week (approximately 13,030 gallons per acre). During the first four weeks after seeding, apply watering twice per week, on non-consecutive days, at half the weekly application rate. For the remainder of the establishment period, apply vegetative watering once per week during the months of January through June or September through December, at the weekly application rate; apply watering twice per week, on non-consecutive days during the months of July and August, at one-half the weekly application rate.

Average weekly rainfall rates for the Fort Worth District

January – 0.39"	April – 0.86"	July – 0.48"	October – 0.68"
February – 0.46"	May – 1.00"	August – 0.47"	November – 0.46"
March – 0.48"	June – 0.63"	September – 0.74"	December – 0.37"

Item 180. Wildflower Seeding

Provide wildflower seeding in addition to "seeding for erosion control" in the areas as shown in the plans. For this project, wildflower seeding shall be as follows:

Wildflower Seeding

Common Name	Botanical Name	Rate (lb/acre)	P.L.S.
Indian Blanket	Gaillardia Pulchella	10	50

Common Name	Botanical Name	Rate (lb/acre)	P.L.S.
Alamo Fire / Maroon Bluebonnet	Lupinus Texensis	25	70
Texas Bluebonnet	Lupinus Texensis	25	70

Perform wildflower seeding between September 15 and October 15.

Item 301. Asphalt Antistripping Agent

Furnish a liquid antistripping agent unless directed.

Item 354. Planning and Texturing Pavement

Contractor to contact the Johnson County Maintenance office for exact stockpile locations 48 hours prior to delivering the HMAC millings from the project. All remaining asphalt millings not accepted by TxDOT, will become the property of the contractor.

Intent is to remove all HMAC from existing concrete in one pass. Repair damaged concrete paving caused by Contractor's operations at the expense of the Contractor as directed by the Engineer.

Take precaution to avoid damage to existing bridge decks and bridge joints including but not limited to armor joints, header joints, relieve joints, etc.. Repair any damage to the bridge decks and/or joints as approved. This work will not be paid directly, but will be performed at the Contractor's expense.

Item 432. Riprap

The quantities for riprap at the location indicated may be varied to the extent necessary to ensure proper functioning for the purpose intended.

All concrete riprap will be 4" (.33') in thickness, unless otherwise shown on the plans, and must be reinforced.

Item 502. Barricades, Signs, and Traffic Handling

The contractor force account "safety contingency" that has been established for this project is intended to be utilized for work zone enhancements to improve the effectiveness of the traffic control plan that could not be foreseen in the project's 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.

Maintenance of roadways, not paid as "constructing detours", and designated in the traffic control plan to carry traffic, will be the responsibility of the Contractor and will be paid for by "Contractor Force Account or Agreed Unit Price".

Permanent signs may be installed when construction in an area is complete and they will not be in conflict with the traffic control plan for the remainder of the job.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Existing signs are to remain as long as they do not interfere with construction and they do not conflict with the traffic control plan.

Any sign not detailed in the plans but called for in the layout shall be as shown in the current "Standard Highway Sign Designs for Texas".

When traffic is obstructed, arrange warning devices in accordance with arrangements indicated in the latest edition of the "Texas Manual on Uniform Traffic Control Devices".

Cover or remove any work zone signs when work or condition referenced is not occurring.

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide **two (2)** additional shadow vehicle(s) with TMA . These will only be used when approved and authorized by the Engineer.

Therefore, **6** total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time determine the total number of TMAs needed for the project.

Do not place barricades, signs, or any other traffic control devices where they interfere with sight distance at driveways or side streets. Provide access to all driveways during all phases of construction unless otherwise noted in the plans or as directed.

All traffic control signs shall meet the latest version of the TMUTCD & Sign Crew Field Book requirements.

Item 506. Temporary Erosion, Sedimentation, and Environmental Controls

The SW3P for this project shall consist of using the following items as directed:

* Temporary sediment control fence
* Biodegradable Erosion Control Logs

Remove accumulated sediment and/or replace SW3P controls when the capacity has been reduced by 50% or when the depth of sediment at the control structure exceeds one foot.

Item 512. Portable Concrete Traffic Barrier

"*Furnish and Install*" barrier in compliance with Single-Slope Concrete Barrier (SSCB), standards as shown on the plans.

Provide the hardware assemblies to join barrier sections.

Provide welded tie bar assembly at the assembly joints when using slotted-end PCTB as shown on Fort Worth Standard PCTB(1)-03(FW) joint tie details.

Connection hardware will remain the property of the State upon completion of the project and will not be paid for directly but will be subsidiary to Item 512," Portable Concrete Traffic Barrier". Deliver hardware to the location specified by the Engineer.

Delineate all barriers in accordance with Barricade and Construction (BC) Standard sheets. Barrier delineation will not be paid for directly, but will be subsidiary to Item 512,"Portable Concrete Traffic Barrier".

Remove and replace traffic barrier damaged by the traveling public and no longer serviceable as directed. Replace traffic barrier with Department-furnished barrier from designated stockpile as directed. Additional payment will be provided as compensation to remove and replace the traffic barrier damaged by the traveling public in accordance with Item 512. Return the damaged traffic barrier to the stockpile site as directed.

Item 540. Metal Beam Guard Fence

The locations and lengths of guard fence shown on the plans are approximate. Actual lengths and locations are to be determined in the field.

The tops of timber posts shall be domed. Beveled tops will not be permitted for timber or steel posts.

When holes for timber posts are drilled below bottom of post elevation, backfill the excessive depth with an acceptable sand. The furnishing and installation of the sand backfill will not be paid for directly but shall be considered subsidiary to this Item.

When guardrail posts are placed in a finished surface, backfill the top 4 inches with an asphaltic material, domed to carry water away from the posts or as shown on the plans. The furnishing and installation of the asphaltic material backfill will not be paid for directly but shall be considered subsidiary to this Item.

Item 542. Removing Metal Beam Guard Fence
Remove existing metal beam guard fence only when authorized.

Item 585. Ride Quality for Pavement Surfaces

Use Surface Test Type B pay adjustment schedule 3 to evaluate ride quality of the travel lanes in accordance with Item 585, "Ride Quality for Pavement Surfaces."

Item 618. Conduit

After installing conduit and pulling conductor, leave a high tensile strength polyester fiber pull tape in the conduit for future use.

Item 620. Electrical Conductors

Clearly and permanently mark each illumination conductor installed in a signal pole as "ILLUMINATION" where it can be clearly seen from the hand hole. Use plastic zip ties with labeling plate to mark conductor.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Item 624. Ground Boxes

Slack conductors required by Standard Sheet ED(3)-14 will be subsidiary to Item 624. Concrete removal required for installation of ground boxes will be subsidiary to Item 624.

Item 628. Electrical Services

Before installing any electrical service, consult with the appropriate utility company before beginning work and verify all metering equipment requirements with the provider have been met. Provide a commercial grade, meter base with by-pass switch if required by the utility company.

Contractor shall obtain 911 address and EISD from electric utility company then contact the TXDOT Signal Shop to receive the Contract Request for Electrical Service Meter form to complete and return. TXDOT will make application to the Electric Utility Company for service, unless otherwise maintained by the following Cities: Arlington, Bedford, Colleyville, Euless, Fort Worth, Grand Prairie, Grapevine, Hurst, Mansfield, North Richland Hills, and Weatherford.

Item 644. Small Roadside Sign Supports and Assemblies

Supply shop drawings for all signs requiring fabrication in this contract. Fabricate and install signs only after approval of shop drawings by Fort Worth District Traffic Office.

All signs shall meet the latest version of the TMUTCD & Sign Crew Field Book requirements.

Item 656. Foundations for Traffic Control Devices

Contractor shall stake foundation as shown on plans. Engineer or Engineers designee will verify and approve staked locations before installing foundations.

For traffic signal controller foundation, use reinforcing bars or deformed Welded Wire Reinforcing (WWR). Provide #3 reinforcing bars spaced at 16" Spaced Center-Center. Provide deformed Welded Wire Reinforcing (WWR) as 6x6-D3xD3. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.

Item 658. Delineators and Object Markers

Only Recycled Rubber posts will be accepted on this project.

Item 662. Work Zone Pavement Markings

Paint and Beads may be used for non-removable work zone pavement markings, if TxDOT approved materials are used.

When buttons are used for Removable Markings, on finished pavement surfaces, hot applied thermo adhesive must be used on concrete and bituminous adhesive on asphalt.

Buttons may not be used for stop bar markings or symbols.

Items 666. Reflectorized Pavement Markings with Retroreflective Requirements

Collection of retro-reflectivity readings using a mobile retro-reflectometer is the required method. A TxDOT inspector must witness collection of all retro-reflectivity data.

Where replication of existing pavement markings and markers is required, no layout or plan may be provided. Prior to removal or demolition of pavement markings, record the beginning and ending locations of each type of pavement marking to be replaced. Use the recorded information to establish guides as required by Article 666.4.1 of the Standard Specifications to re-create the original markings on the final pavement surface.

Use pavement marking standard drawings for pavement marking layout where existing pavement markings contradict the standard drawings in the plans.

Notify Engineer 48 hours prior to installation of pavement markings.

All testing is waived from Type I Pavement Markings for locations with less than 1000 LF per bid item.

Item 680. Installation of Highway Traffic Signals

Contractor shall contact Fort Worth District TMC 817-370-3661 prior to starting any signal modifications. Provide qualified personnel reachable by telephone and available to receive calls on a 24-hour basis. Respond to reported calls and make field assessment within 2 hours and make appropriate repairs within 24 hours.

Furnish and install all required materials, incidentals and equipment necessary for a fully operational traffic signal. The proposed equipment shall be compatible with the existing systems in the area.

Provide all illumination fixtures to be installed in this contract. Use 250W equivalent LED luminaires.

Where work requires the removal of power from the controller and cabinet assembly, erect temporary stop signs. Remove the stop signs after the traffic signals are in operation.

Deliver the cabinet, controller, accessories, and three complete sets of signal construction plans to the operating agency Signal Shop for testing. Notify the Signal Shop two working days prior to delivery of the cabinet.

Wire the signal installation to operate in accordance with phase diagrams in these plans. Timing and phasing will be maintained by the operating agency. Deliver a copy of all revisions to the

original timing and phasing plans to the TxDOT Signal Shop. One copy is to stay in the controller cabinet at the completion of the project and two supplied to the operating agency Signal Shop.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Project Inspection. Contact the TxDOT Signal Shop in advance of needed inspections. At the time of the final electrical inspection, the Inspector will create a discrepancy list to be corrected and repaired before signal is put into flash mode.

Signal Flash. Upon the satisfactory completion of repairs or corrections, contact the TxDOT Signal Shop at least one week prior to placing in flash. Schedule signal flash for Monday thru Thursday between 9:00 AM – 12:00 PM. Operate the signal in flash mode for 2-3 days prior to turning on to full actuation. The TxDOT signal inspector and technician must be present when the signals are placed in flash.

Signal Turn-On. Upon completion of the signal flash, schedule the date and time for the turn on of the traffic signal on Monday thru Thursday between 9:00 AM – 12:00 PM. Place the traffic signal into full operation only after all required striping is complete and all conflicting signing is removed. The TxDOT signal inspector and technician must be present when the signals are placed in full color operation.

Test Period. During the 30-day test period, the Contractor will be the first responders to all trouble calls. They will, in turn contact the TxDOT Signal Shop. Provide qualified personnel to respond to these and all trouble calls. Provide a local telephone number, not subject to frequent changes and available to receive calls on a 24-hour basis. Respond to reported calls within a maximum of two hours. Make appropriate repairs within 24 hours or at engineer's direction.

Place a logbook in each controller cabinet and keep a record of each trouble call reported. Notify the Engineer of each trouble call. The error log in the conflict monitor shall not be cleared during the thirty-day test period without approval. If it is necessary to replace equipment, such as a controller, in order to return the signals to normal operation, TxDOT will provide temporary replacement equipment until the original equipment is repaired and/or replaced at the Engineer's direction.

Removal. Salvageable signal controllers and related equipment shall remain the property of TXDOT. Deliver to the TXDOT Signal Shop at 2501 SW Loop 820, Fort Worth.

Item 682. Vehicle and Pedestrian Signal Heads

Vehicle signal heads shall be yellow aluminum with 5 inch, black, aluminum, vented back plates unless otherwise shown on plans.

Signal heads shall be installed level and plumb and aimed as directed. Cover all signal faces until placed in operation.

All new mast arm mounted signal heads to be mounted horizontally.

Item 684. Traffic Signal Cables

Any work within 500 feet of a TxDOT traffic signal, illumination system, and/or ITS system will require the contractor to contact the TxDOT Fort Worth Signal Shop at 817-370-3664.

Any work within 500 feet of a TxDOT traffic signal, illumination system, and/or ITS system will require the contractor to contact the TxDOT Fort Worth Signal Shop at 817-370-3664.

Clearly and permanently mark each cable as shown on the plans (CABLE 1, etc.) at each signal head, ground box, terminal block, pole base and controller. Use plastic zip ties with labeling plate to mark cable.

Provide an extra 10’ for each cable terminating in the controller cabinet and coil an extra 5’ of cable in each ground box.

Terminate all electrical conductors from the controller (including spares) at the termination block in the signal pole hand hole.

Item 686. Traffic Signal Pole Assemblies (Steel)

Provide all signal poles from the same manufacturer.

Plug any unused openings in the mast arms or poles with an approved material.

Item 3077. Superpave Mixtures

Provide aggregate with a Surface Aggregate Classification (SAC) A for the travel lanes, ramps, and shoulders.

No blending of aggregate to meet SAC A will be allowed for surface mixes.

Provide a PG 70-28 asphalt for the surface course and levelup course, if applicable.

Furnish a CSS-1P with greater than 50% asphalt residue for the tack coat on this project. A trackless tack can be used in lieu of CSS-1P tack coat or as directed by the Engineer. The Engineer will set the rate at time of application.

Warm Mix Asphalt (WMA) is not permitted in any mix type on this project.

RAP is not permitted in any surface and levelup mixes on this project.

A pre-paving meeting with the Engineer is required for this project.

Provide a mix design with the gradation curve below the restricted zone.

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Use the Boil Test, Test Procedure Tex-530-C, and provide only mixes that produce zero percent (0%) stripping for design verification and during production.

Include the approved mix design number on each delivery ticket.

Use a Material Transfer Device (MTD) unless otherwise directed.

Stop production after Lot 1. Review all test data and confirm any changes with the Engineer. Do not start production and placement on subsequent Lots until approved by the Engineer.

Shoulders, crossovers, and other areas listed on the Plan sheets or as directed are not subject to in-place air void determination for this project.

Use Surface Test Type B for this project.

Item 6001. Portable Changeable Message Signs

Provide portable changeable message signs and arrow panels with a photoelectric device to allow for automatic dimming of operations to approximately 50% of their normal brightness when ambient light drops to approximately five footcandles, and then increase back again for daytime operations.

Four (4) electronic portable changeable message sign unit(s) will be required. Individual or collective use of signs will be required by Engineer when deemed necessary to supplement the traffic control plan.

Program each sign in its permanent memory the following 15 messages:

1. Exit Closed Ahead
2. Use Other Routes
3. Right Lane
4. Left Lane
5. Closed Ahead
6. Two Lane
7. Detour Ahead
8. Thru Traffic
9. Prepare To Stop
10. Merging Traffic
11. Expect 15 Minute Delay
12. Max Speed ** MPH
13. Merge Right
14. Merge Left
15. No Exit Next ** Miles

Control: 2465-01-020

County: JOHNSON

Highway: FM 2280

Item 6185. Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide two (2) additional shadow vehicle(s) with TMA for TCP (_-_)-_ as detailed on General Note of this standard sheet.

Therefore, 6 total shadow vehicles with TMA will be required for this type of work. Determine if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Item 6045. Radar Advance Detection Devices (Installation Only)

Mount detector as directed by the engineer or engineer designee.

Contact the TxDOT Signal Shop for assistance provide 48 hours prior to installation. Provide a factory certified representative for set up, programming, and testing of the equipment at the time of signal flash and turn on.

Installation of radar cable, all other hardware, and programming/setup is subsidiary.

Item 6046. Radar Presence Detection Devices (Installation Only)

Mount detector as directed by the engineer or engineer designee.

Contact the TxDOT Signal Shop for assistance provide 48 hours prior to installation. Provide a factory certified representative for set up, programming, and testing of the equipment at the time of signal flash and turn on.

Installation of radar cable, all other hardware, and programming/setup is subsidiary.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2465-01-020 **DISTRICT** Fort Worth **COUNTY** Johnson
HIGHWAY FM 2280

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2465-01-020**			
		PROJECT ID		**A00062241**			
		COUNTY		**Johnson**			
		HIGHWAY		**FM 2280**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	110-6001	EXCAVATION (ROADWAY)	CY	100.000		100.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	250.000		250.000	
	134-6002	BACKFILL (TY B)	STA	306.650		306.650	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	2,073.000		2,073.000	
	168-6001	VEGETATIVE WATERING	MG	72.500		72.500	
	180-6001	WILDFLOWER SEEDING	AC	0.430		0.430	
	351-6037	FLEX PAVEMENT STRUCTURE REPAIR (4"-5")	SY	12,541.000		12,541.000	
	354-6002	PLAN & TEXT ASPH CONC PAV(0" TO 2")	SY	54,645.000		54,645.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	425.000		425.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000		8.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	9,312.000		9,312.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	9,312.000		9,312.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	200.000		200.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	200.000		200.000	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF	510.000		510.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	120.000		120.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF	510.000		510.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	40,811.000		40,811.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	18,669.000		18,669.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	4,537.500		4,537.500	
	540-6014	SHORT RADIUS	LF	407.000		407.000	
	540-6015	DRIVEWAY TERMINAL ANCHOR SECTION	EA	16.000		16.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF	75.000		75.000	
	540-6035	MTL BM GD FEN TRANS (31"-28")	EA	14.000		14.000	
	540-6048	TL-3 31" SHORT RADIUS (COMPLETE)	EA	2.000		2.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	5,462.500		5,462.500	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	15.000		15.000	
	542-6003	REMOVE DOWNSTREAM ANCHOR TERMINAL	EA	1.000		1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	40.000		40.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	38.000		38.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	610-6102	REPLACE LUMINAIRE W/LED (250W EQ)	EA	3.000		3.000	
	618-6016	CONDT (PVC) (SCH 40) (1")	LF	200.000		200.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	5.000		5.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2465-01-020 **DISTRICT** Fort Worth **COUNTY** Johnson
HIGHWAY FM 2280

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2465-01-020**			
		PROJECT ID		**A00062241**			
		COUNTY		**Johnson**			
		HIGHWAY		**FM 2280**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		2.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	1.000		1.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	1.000		1.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	110.000		110.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	134.000		134.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	5,726.000		5,726.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	2,664.000		2,664.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	172.000		172.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	862.000		862.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	32.000		32.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	22.000		22.000	
	666-6093	REFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	1.000		1.000	
	666-6102	REF PAV MRK TY I(W)36"(YLD TRI)(100MIL)	EA	29.000		29.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	59,642.000		59,642.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	4,637.000		4,637.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	58,795.000		58,795.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	818.000		818.000	
	672-6007	REFL PAV MRKR TY I-C	EA	143.000		143.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,428.000		1,428.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	6.000		6.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2.000		2.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	6.000		6.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	1.000		1.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	6.000		6.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	1.000		1.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	6.000		6.000	
	682-6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	1.000		1.000	
	684-6028	TRF SIG CBL (TY A)(14 AWG)(2 CONDR)	LF	200.000		200.000	
	690-6024	REMOVAL OF SIGNAL HEAD ASSM	EA	7.000		7.000	
	690-6086	REMOVE VID IMAGE VEH DET SYS (VIVDS)	EA	3.000		3.000	
	690-6102	REPLACE VEHICLE LOOP DETECTOR	LF	5,000.000		5,000.000	
	3077-6027	SP MIXES SP-C SAC-A PG70-28	TON	18,539.000		18,539.000	
	3077-6075	TACK COAT	GAL	32,190.000		32,190.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	4.000		4.000	
	6027-6003	CONDUIT (PREPARE)	LF	1,000.000		1,000.000	
	6027-6008	GROUND BOX (PREPARE)	EA	24.000		24.000	
	6045-6001	INSTALL OF (RADD) VEHICLE DETECTORS	EA	3.000		3.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2465-01-020 **DISTRICT** Fort Worth **COUNTY** Johnson
HIGHWAY FM 2280

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2465-01-020**			
		PROJECT ID		**A00062241**			
		COUNTY		**Johnson**			
		HIGHWAY		**FM 2280**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6046-6001	INSTALL OF (RPD) VEHICLE DETECTORS	EA	3.000		3.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF	320.000		320.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000	
	6185-6002	TMA (STATIONARY)	DAY	356.000		356.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	42.000		42.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

ROADWAY	CSJ	0110 6001 [1]	0132 6004 [1]	0134 6002	0164 6023 [1]	0168 6001 [1]	0180 6001 [1]	0351 6037 [1]	0354 6002	0432 6045	0502 6001
		EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)	BACKFILL (TY B)	CELL FBR MLCH SEED(PERM) (RURAL)(CLAY)	VEGETATIVE WATERING	WILDFLOWER SEEDING	FLEX PAVEMENT STRUCTURE REPAIR (4"-5")	PLAN & TEXT ASPH CONC PAV(0" TO 2")	RIPRAP (MOW STRIP) (4 IN)	BARRICADES, SIGNS AND TRAFFIC HANDLING
		CY	CY	STA	SY	MG	AC	SY	SY	CY	MO
FM 2280	2465-01-020	100	250	306.65	2,073	72.5	0.43	12,541	54,645	425	8
	TOTAL	100	250	306.65	2,073	72.5	0.43	12,541	54,645	425	8

ROADWAY	CSJ	0506 6038	0506 6039	0506 6041 [1]	0506 6043 [1]	0512 6001	0512 6025	0512 6049	0540 6001	0540 6014 [2]	0540 6015
		TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)	PORT CTB (FUR & INST) (SGL SLOPE) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	MTL W-BEAM GD FEN (TIM POST)	SHORT RADIUS	DRIVEWAY TERMINAL ANCHOR SECTION
		LF	LF	LF	LF	LF	LF	LF	LF	LF	EA
FM 2280	2465-01-020	9,312	9,312	200	200	510	120	510	4,537.5	407	16
	TOTAL	9,312	9,312	200	200	510	120	510	4,537.5	407	16

ROADWAY	CSJ	0540 6020	0540 6035	540 6048	0542 6001	0542 6002	0542 6003	0544 6001	0544 6003	0545 6003	0545 6005
		MTL W-BEAM GD FEN (LOW FILL CULVERT)	MTL BM GD FEN TRANS (31"-28")	TL-3 31" SHORT RADIUS (COMPLETE)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	REMOVE DOWNSTREAM ANCHOR TERMINAL	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)
		LF	EA	EA	LF	EA	EA	EA	EA	EA	EA
FM 2280	2465-01-020	75.0	14	2	5,462.5	15	1	40	38	2	2
	TOTAL	75.0	14	2	5,462.5	15	1	40	38	2	2

ROADWAY	CSJ	0545 6019	0662 6109	0662 6111	3077 6027	3077 6075	6001 6002	6185 6002	6185 6005
		CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK SHT TERM (TAB) TY W	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	SP MIXES SP-C SAC-A PG70-28	TACK COAT	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
		EA	EA	EA	TON	GAL	EA	DAY	DAY
FM 2280	2465-01-020	2	134	5,726	18,539	32,190	4	356	42
	TOTAL	2	134	5,726	18,539	32,190	4	356	42

1 - APPROXIMATE QUANTITY - EXACT LOCATION, LIMITS AND QUANTITY TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

2 - HEIGHT PER STANDARD MBGF-19

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
SUMMARY OF QUANTITIES
ROADWAY

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	5
CONTROL	SECTION	JOB	
2465	01	020	

CSJ:2465-01-020											
533 6003	533 6004	644 6001	644 6004	644 6030	644 6033	658 6062	666 6036	666 6042	666 6048	666 6054	666 6078
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL SM RD SN SUP&AM TY 10 BWG(1)SA(P)	INSTL SM RD SN SUP&AM TY 10 BWG(1)SA(T)	INSTL SM RD SN SUP&AM TY S80 (1)SA(T)	INSTL SM RD SN SUP&AM TY S80 (1)SA(U)	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)12"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)
LF	LF	EA	EA	EA	EA	EA	LF	LF	LF	EA	EA
40,811	18,669	5	2	1	1	110	2,664	172	862	32	22

CSJ:2465-01-020								
666 6093	666 6102	666 6309	666 6318	666 6321	666 6343	672 6007	672 6009	6056 6001
REFL PAV MRK TY I (W) (RR XING) (100MIL)	REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 6" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 6" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 6" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 6" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	EA	LF	LF	LF	LF	EA	EA	LF
1	29	59,642	4,637	58,795	818	143	1,428	320

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

FM 2280
SUMMARY OF QUANTITIES
PAVEMENT MARKING

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	6
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

DN: RND	CK: MBY	DW: EG	CK: RND

SUMMARY OF FM 2280 TRAFFIC SIGNAL UPGRADE QUANTITIES													
ITEM NO.	610	618	682	682	682	682	682	682	682	682	684	690	690
DESC. CODE	6102	6016	6001	6002	6003	6004	6005	6006	6054	6055	6028	6024	6086
DESCRIPTION	REPLACE LUMINAIRE W/LED(250W EA)	CONDT (PVC)(SCH40) (1")	VEH SIG SEC (12")LED (GRN)	VEH SIG SEC (12")LED (GRN ARW)	VEH SIG SEC (12")LED (YEL)	VEH SIG SEC (12")LED (YEL ARW)	VEH SIG SEC (12")LED (RED)	VEH SIG SEC (12")LED (RED ARW)	BACKPLATE W/REF BRDR (3SEC) (VENT)ALUM	BACKPLATE W/REF BRDR (4SEC) (VENT)ALUM	TRF SIG CBL (TYA) (14AWG) (2 CNDR)	REMOVAL OF SIGNAL HEAD ASSM	REMOVE VID IMAGE VEH DET SYS (VIVDS)
UNIT	EA	LF	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA
FM 2280 AT 3048	3		6	2	6	1	6	1	6	1		7	3
FM 2280 AT W HILLCREST		100									100		
FM 2280 AT W 4TH ST		100									100		
PROJECT TOTAL	3	200	6	2	6	1	6	1	6	1	200	7	3

SUMMARY OF FM 2280 TRAFFIC SIGNAL UPGRADE QUANTITIES						
ITEM NO.	690	6027	6027	6045	6046	6058
DESC. CODE	6102	6003	6008	6001	6001	6001
DESCRIPTION	REPLACE VEHICLE LOOP DETECTOR	CONDUIT (PREPARE)	GROUND BOX (PREPARE)	INSTALL OF (RADD) VEHICLE DETECTORS	INSTALL OF (RPD) VEHICLE DETECTORS	BBU SYSTEM (EXTERNAL BATT CABINET)
UNIT	LF	LF	EA	EA	EA	EA
FM 2280 AT 3048				3	3	1
FM 2280 AT W HILLCREST ST	2500	500	12			
FM 2280 AT W 4TH ST	2500	500	12			
PROJECT TOTAL	5000	1000	24	3	3	1

MALDONADO - BURKETT
Engineers | Surveyors | Contractors
TBPE # 10258 TBPLS # 10194235
www.maldonado-burkett.com

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

FM 2280

SUMMARY OF QUANTITIES

TRAFFIC SIGNAL

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	7
CONTROL	SECTION	JOB	
2465	01	020	

Beginning chain FM2280 description

Point 49 N 6,850,650.4902 E 2,338,856.1428 Sta 0+00.00

Course from 49 to PC FM22801 S 55° 44′ 01.60" W Dist 1,600.0918

	Curve Data				
Curve FM22801					
P.I. Station	27+49.25	N	6,849,102.5548	E	2,336,584.0782
Delta =	43° 42′ 42.15"	(LT)			
Degree =	1° 59′ 59.47"				
Tangent =	1,149.1593				
Length =	2,185.7465				
Radius =	2,865.0000				
External =	221.8741				
Long Chord =	2,133.1231				
Mid. Ord. =	205.9266				
P.C. Station	16+00.09	N	6,849,749.5762	E	2,337,533.7783
P.T. Station	37+85.84	N	6,847,978.5995	E	2,336,344.7216
C.C.		N	6,847,381.8531	E	2,339,146.8848
Back = S	55° 44′ 01.60" W				
Ahead = S	12° 01′ 19.45" W				
Chord Bear = S	33° 52′ 40.53" W				

Course from PT FM22801 to PC FM22802 S 12° 01′ 19.45" W Dist 3,244.0421

	Curve Data				
Curve FM22802					
P.I. Station	76+23.43	N	6,844,225.1766	E	2,335,545.3957
Delta =	23° 24′ 32.59"	(RT)			
Degree =	1° 59′ 59.47"				
Tangent =	593.5490				
Length =	1,170.5388				
Radius =	2,865.0000				
External =	60.8376				
Long Chord =	1,162.4144				
Mid. Ord. =	59.5725				
P.C. Station	70+29.88	N	6,844,805.7075	E	2,335,669.0251
P.T. Station	82+00.42	N	6,843,741.5451	E	2,335,201.3012
C.C.		N	6,845,402.4539	E	2,332,866.8619
Back = S	12° 01′ 19.45" W				
Ahead = S	35° 25′ 52.04" W				
Chord Bear = S	23° 43′ 35.74" W				

Course from PT FM22802 to PC FM22803 S 35° 25′ 52.04" W Dist 2,806.7510

	Curve Data				
Curve FM22803					
P.I. Station	115+78.87	N	6,840,988.7384	E	2,333,242.7321
Delta =	33° 19′ 37.10"	(LT)			
Degree =	2° 59′ 59.20"				
Tangent =	571.7009				
Length =	1,110.9809				
Radius =	1,910.0000				
External =	83.7257				
Long Chord =	1,095.3852				
Mid. Ord. =	80.2096				
P.C. Station	110+07.17	N	6,841,454.5678	E	2,333,574.1607
P.T. Station	121+18.15	N	6,840,417.4229	E	2,333,221.7414
C.C.		N	6,840,347.2953	E	2,335,130.4536
Back = S	35° 25′ 52.04" W				
Ahead = S	2° 06′ 14.93" W				
Chord Bear = S	18° 46′ 03.49" W				

Course from PT FM22803 to PC FM22804 S 2° 06′ 14.93" W Dist 1,116.2376

	Curve Data				
Curve FM22804					
P.I. Station	136+83.00	N	6,838,853.6293	E	2,333,164.2864
Delta =	17° 47′ 54.96"	(RT)			
Degree =	1° 59′ 59.47"				
Tangent =	448.6111				
Length =	889.9955				
Radius =	2,865.0000				
External =	34.9098				
Long Chord =	886.4213				
Mid. Ord. =	34.4896				
P.C. Station	132+34.39	N	6,839,301.9380	E	2,333,180.7576
P.T. Station	141+24.38	N	6,838,431.8129	E	2,333,011.5681
C.C.		N	6,839,407.1295	E	2,330,317.6894
Back = S	2° 06′ 14.93" W				
Ahead = S	19° 54′ 09.89" W				
Chord Bear = S	11° 00′ 12.41" W				

Course from PT FM22804 to PC FM22805 S 19° 54′ 09.89" W Dist 6,471.5375

	Curve Data				
Curve FM22805					
P.I. Station	210+28.69	N	6,831,939.8853	E	2,330,661.1710
Delta =	17° 10′ 47.00"	(RT)			
Degree =	1° 59′ 59.47"				
Tangent =	432.7720				
Length =	859.0494				
Radius =	2,865.0000				
External =	32.5018				
Long Chord =	855.8350				
Mid. Ord. =	32.1372				
P.C. Station	205+95.92	N	6,832,346.8086	E	2,330,808.4973
P.T. Station	214+54.97	N	6,831,594.6335	E	2,330,400.2252
C.C.		N	6,833,322.1252	E	2,328,114.6186
Back = S	19° 54′ 09.89" W				
Ahead = S	37° 04′ 56.89" W				
Chord Bear = S	28° 29′ 33.39" W				

Course from PT FM22805 to PC FM22806 S 37° 04′ 56.89" W Dist 799.6973

	Curve Data				
Curve FM22806					
P.I. Station	227+96.93	N	6,830,524.0596	E	2,329,591.0712
Delta =	21° 26′ 07.35"	(LT)			
Degree =	1° 59′ 59.47"				
Tangent =	542.2635				
Length =	1,071.8477				
Radius =	2,865.0000				
External =	50.8660				
Long Chord =	1,065.6078				
Mid. Ord. =	49.9787				
P.C. Station	222+54.67	N	6,830,956.6603	E	2,329,918.0366
P.T. Station	233+26.52	N	6,830,001.8918	E	2,329,444.8166
C.C.		N	6,829,229.1686	E	2,332,203.6432
Back = S	37° 04′ 56.89" W				
Ahead = S	15° 38′ 49.54" W				
Chord Bear = S	26° 21′ 53.22" W				

Course from PT FM22806 to PC FM22807 S 15° 38′ 49.54" W Dist 1,562.6489

	Curve Data				
Curve FM22807					
P.I. Station	253+41.78	N	6,828,061.3126	E	2,328,901.2774
Delta =	21° 21′ 35.40"	(RT)			
Degree =	2° 23′ 14.37"				
Tangent =	452.6135				
Length =	894.7186				
Radius =	2,400.0000				
External =	42.3061				
Long Chord =	889.5465				
Mid. Ord. =	41.5732				
P.C. Station	248+89.17	N	6,828,497.1528	E	2,329,023.3524
P.T. Station	257+83.88	N	6,827,699.8723	E	2,328,628.8441
C.C.		N	6,829,144.4601	E	2,326,712.2935
Back = S	15° 38′ 49.54" W				
Ahead = S	37° 00′ 24.94" W				
Chord Bear = S	26° 19′ 37.24" W				

Course from PT FM22807 to PC FM22808 S 37° 00′ 24.94" W Dist 2,865.1297

	Curve Data				
Curve FM22808					
P.I. Station	290+75.40	N	6,825,071.3870	E	2,326,647.6400
Delta =	21° 11′ 07.57"	(LT)			
Degree =	2° 30′ 46.70"				
Tangent =	426.3905				
Length =	843.0428				
Radius =	2,280.0000				
External =	39.5277				
Long Chord =	838.2485				
Mid. Ord. =	38.8541				
P.C. Station	286+49.01	N	6,825,411.8865	E	2,326,904.2894
P.T. Station	294+92.06	N	6,824,661.1499	E	2,326,531.3884
C.C.		N	6,824,039.5281	E	2,328,725.0124
Back = S	37° 00′ 24.94" W				
Ahead = S	15° 49′ 17.37" W				
Chord Bear = S	26° 24′ 51.15" W				

Course from PT FM22808 to PC FM22809 S 15° 49′ 17.37" W Dist 191.3215

	Curve Data				
Curve FM22809					
P.I. Station	299+26.25	N	6,824,243.4040	E	2,326,413.0090
Delta =	17° 15′ 45.91"	(LT)			
Degree =	3° 34′ 51.55"				
Tangent =	242.8735				
Length =	482.0670				
Radius =	1,600.0000				
External =	18.3286				
Long Chord =	480.2457				
Mid. Ord. =	18.1210				
P.C. Station	296+83.38	N	6,824,477.0765	E	2,326,479.2263
P.T. Station	301+65.44	N	6,824,000.6073	E	2,326,419.1177
C.C.		N	6,824,040.8507	E	2,328,018.6116
Back = S	15° 49′ 17.37" W				
Ahead = S	1° 26′ 28.54" E				
Chord Bear = S	7° 11′ 24.41" W				

Course from PT FM22809 to PC FM228010 S 1° 26′ 28.54" E Dist 66.6127

	Curve Data				
Curve FM228010					
P.I. Station	304+51.16	N	6,823,714.9840	E	2,326,426.3040
Delta =	24° 42′ 59.62"	(LT)			
Degree =	5° 43′ 46.48"				
Tangent =	219.1010				
Length =	431.3854				
Radius =	1,000.0000				
External =	23.7213				
Long Chord =	428.0482				
Mid. Ord. =	23.1716				
P.C. Station	302+32.06	N	6,823,934.0157	E	2,326,420.7932
P.T. Station	306+63.44	N	6,823,518.3226	E	2,326,522.8937
C.C.		N	6,823,959.1678	E	2,327,420.4768
Back = S	1° 26′ 28.54" E				
Ahead = S	26° 09′ 28.16" E				
Chord Bear = S	13° 47′ 58.35" E				

Course from PT FM228010 to 50 S 26° 09′ 28.16" E Dist 63.4624

Point 50 N 6,823,461.3598 E 2,326,550.8708 Sta 307+26.91

Ending chain FM2280 description

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

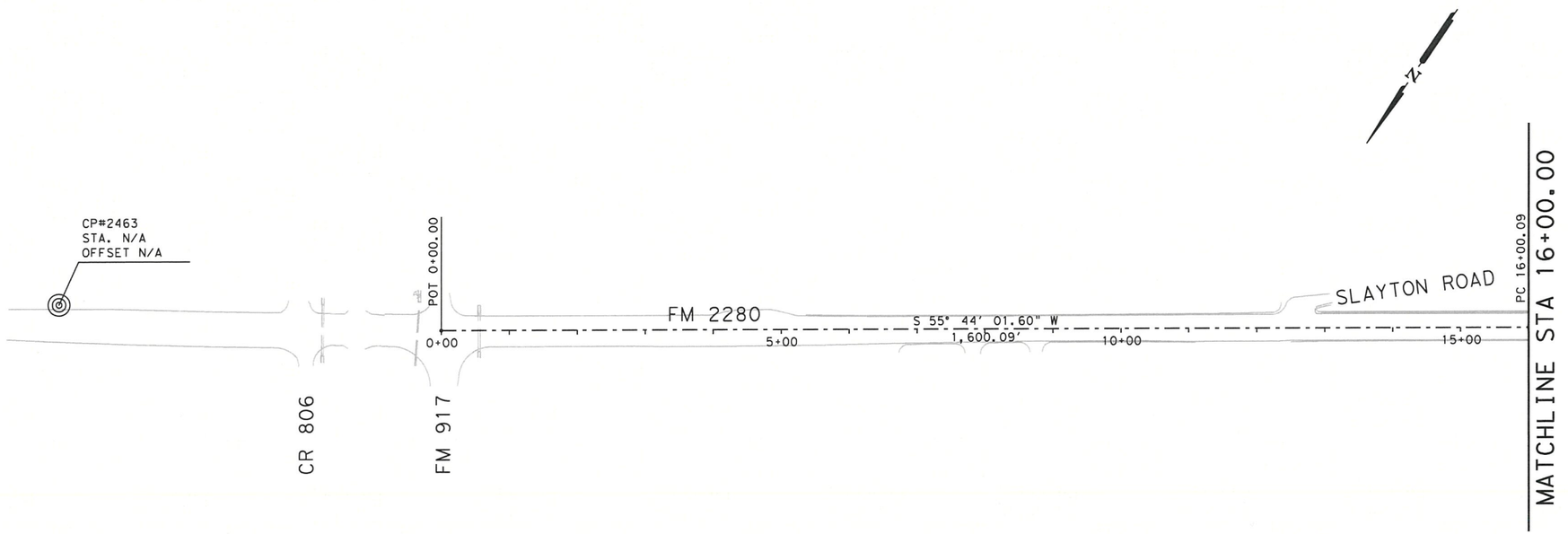
VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

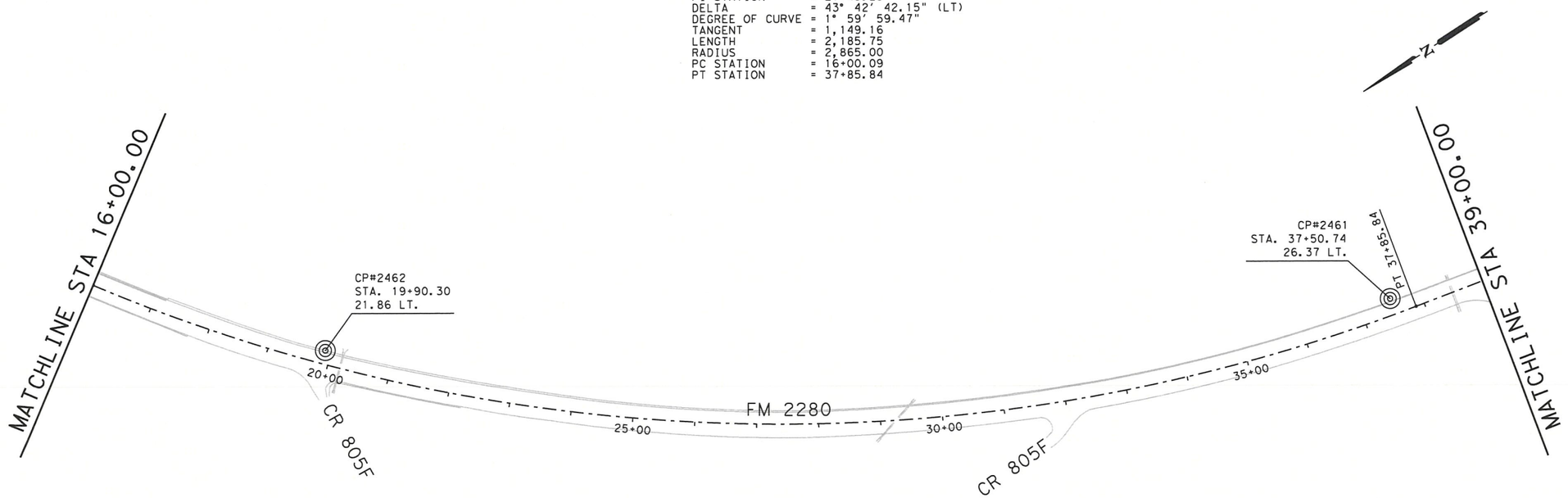
FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	8
CONTROL	SECTION	JOB	
2465	01	020	



1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

PI STATION = 27+49.25
DELTA = 43° 42' 42.15" (LT)
DEGREE OF CURVE = 1° 59' 59.47"
TANGENT = 1,149.16
LENGTH = 2,185.75
RADIUS = 2,865.00
PC STATION = 16+00.09
PT STATION = 37+85.84



STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR

3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX
VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

SHEET 1 OF 7

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	9
CONTROL	SECTION	JOB	
2465	01	020	

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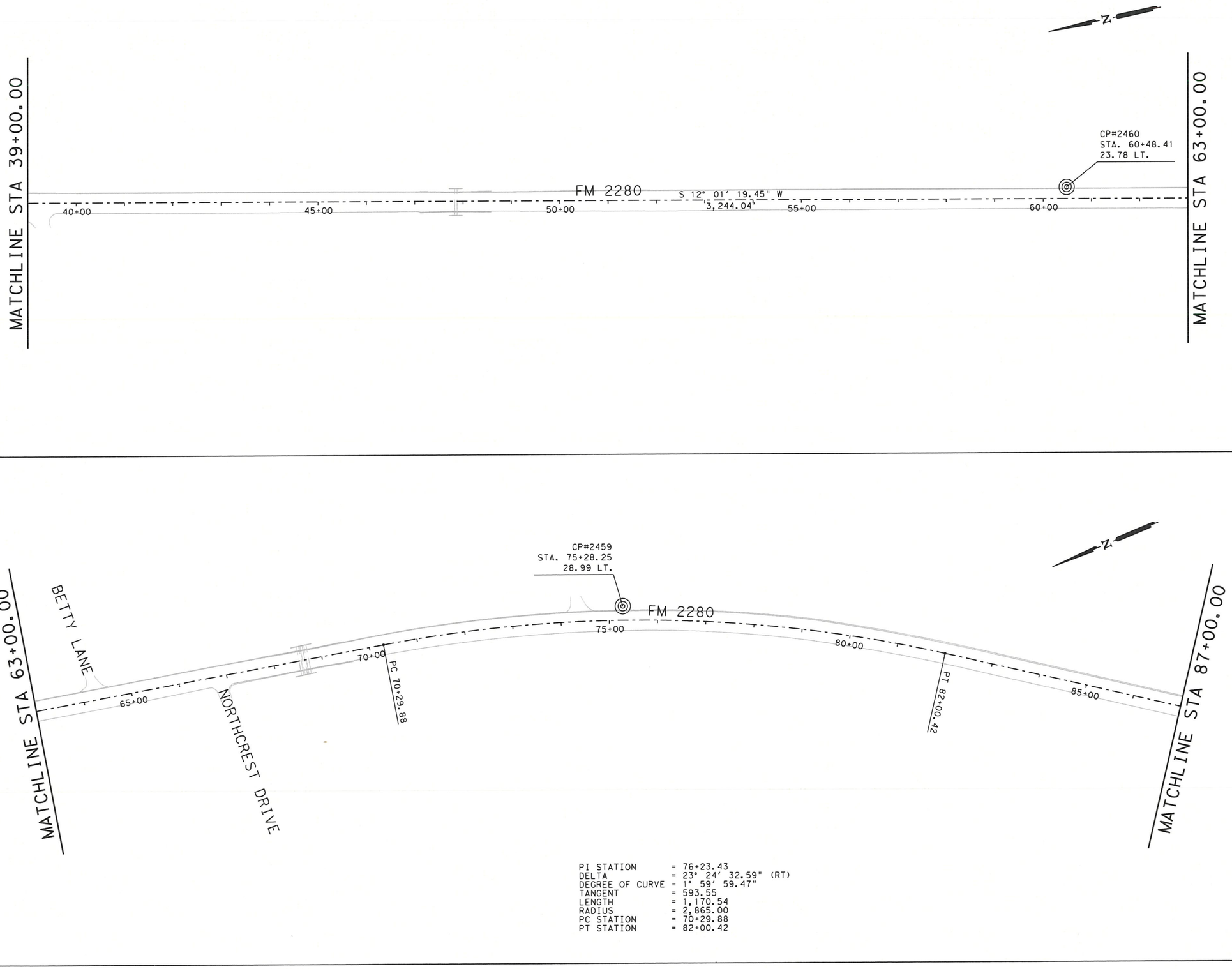


PI STATION = 76+23.43
DELTA = 23° 24' 32.59" (RT)
DEGREE OF CURVE = 1° 59' 59.47"
TANGENT = 593.55
LENGTH = 1,170.54
RADIUS = 2,865.00
PC STATION = 70+29.88
PT STATION = 82+00.42

1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR
3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

Texas Department of Transportation

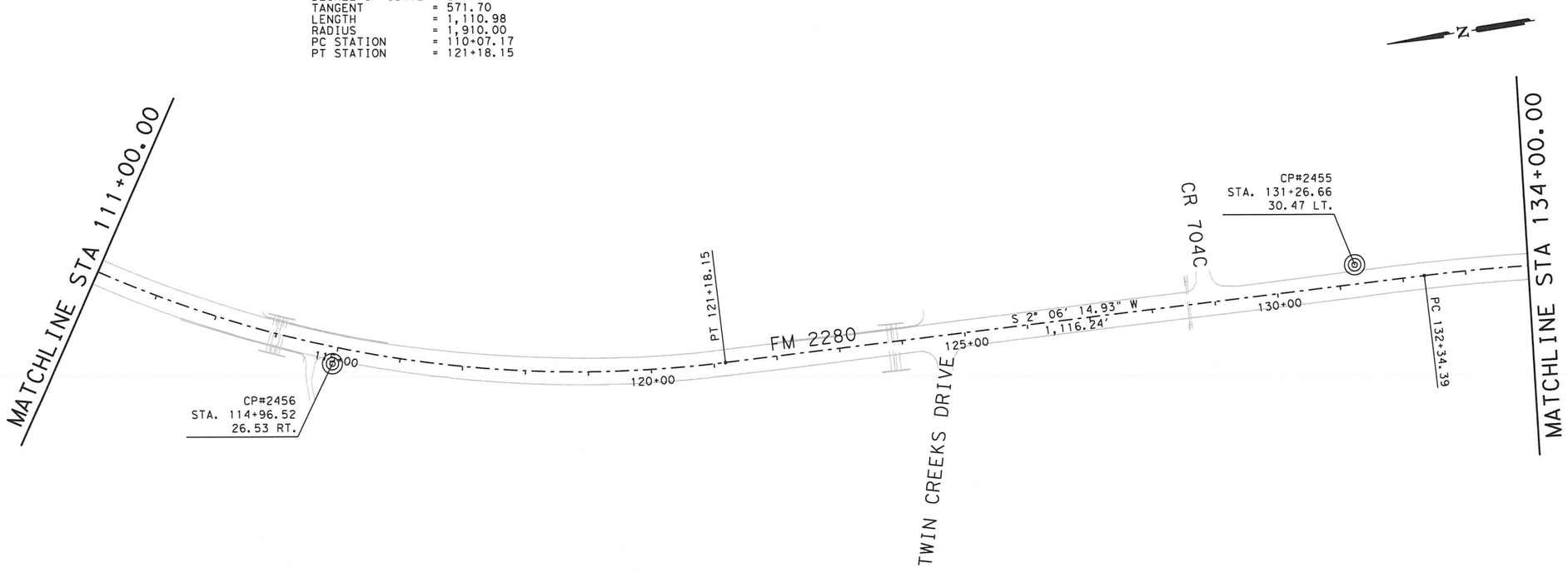
HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

SHEET 2 OF 7

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	10
CONTROL	SECTION	JOB	
2465	01	020	

3/9/2022
246500020_510.dgn
11:30:48 AM

PI STATION = 115+78.87
DELTA = 33° 19' 37.10" (LT)
DEGREE OF CURVE = 2° 59' 59.20"
TANGENT = 571.70
LENGTH = 1,110.98
RADIUS = 1,910.00
PC STATION = 110+07.17
PT STATION = 121+18.15



1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR
3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

SHEET 3 OF 7

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	11
CONTROL	SECTION	JOB	
2465	01	020	

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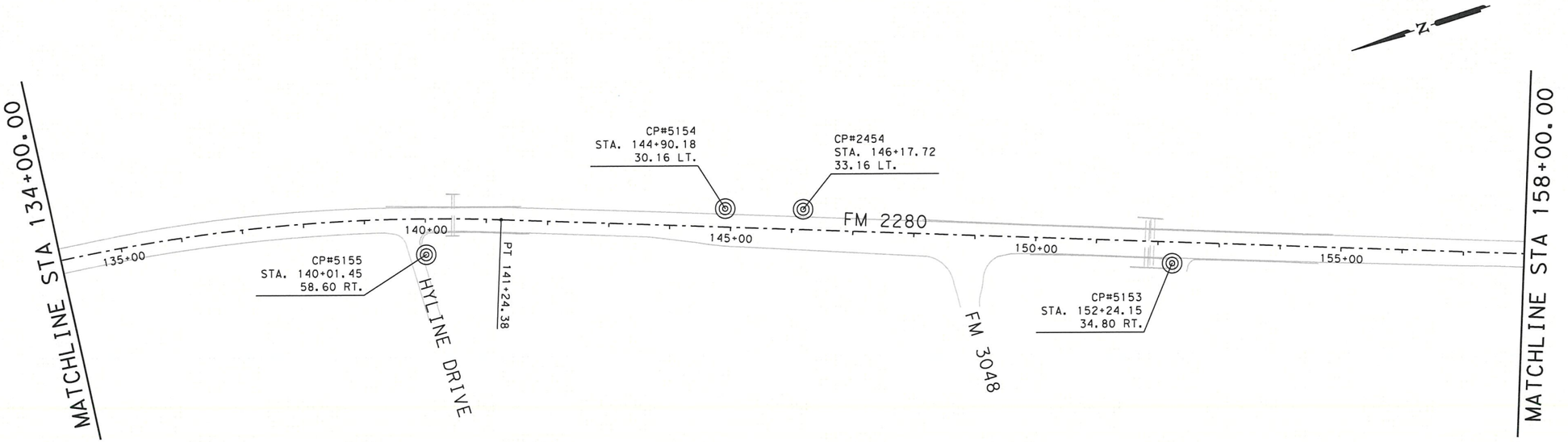
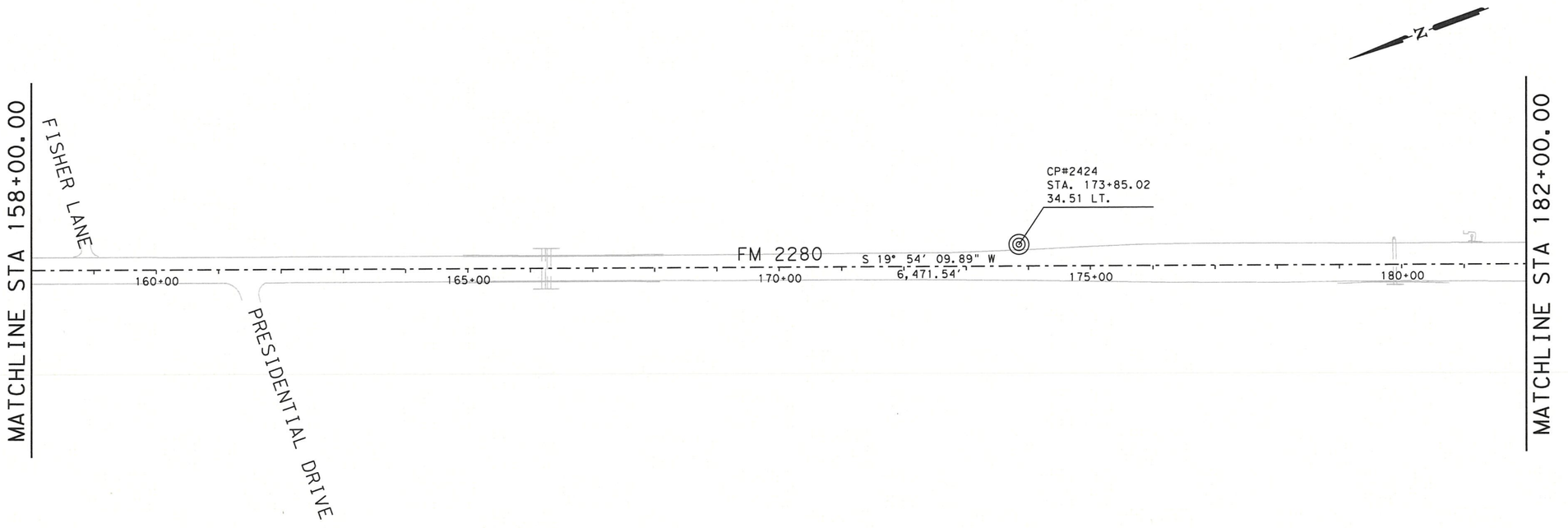


PI STATION = 136+83.00
DELTA = 17° 47' 54.96" (RT)
DEGREE OF CURVE = 1° 59' 59.47"
TANGENT = 448.61
LENGTH = 890.00
RADIUS = 2,865.00
PC STATION = 132+34.39
PT STATION = 141+24.38



1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011) (EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR

3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

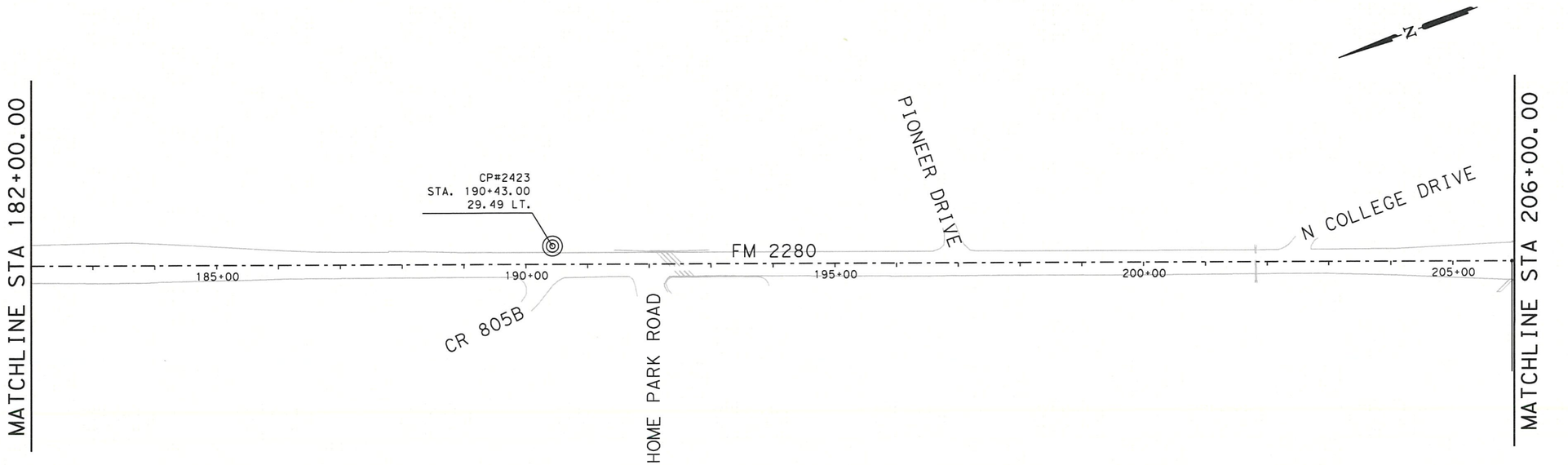
Texas Department of Transportation

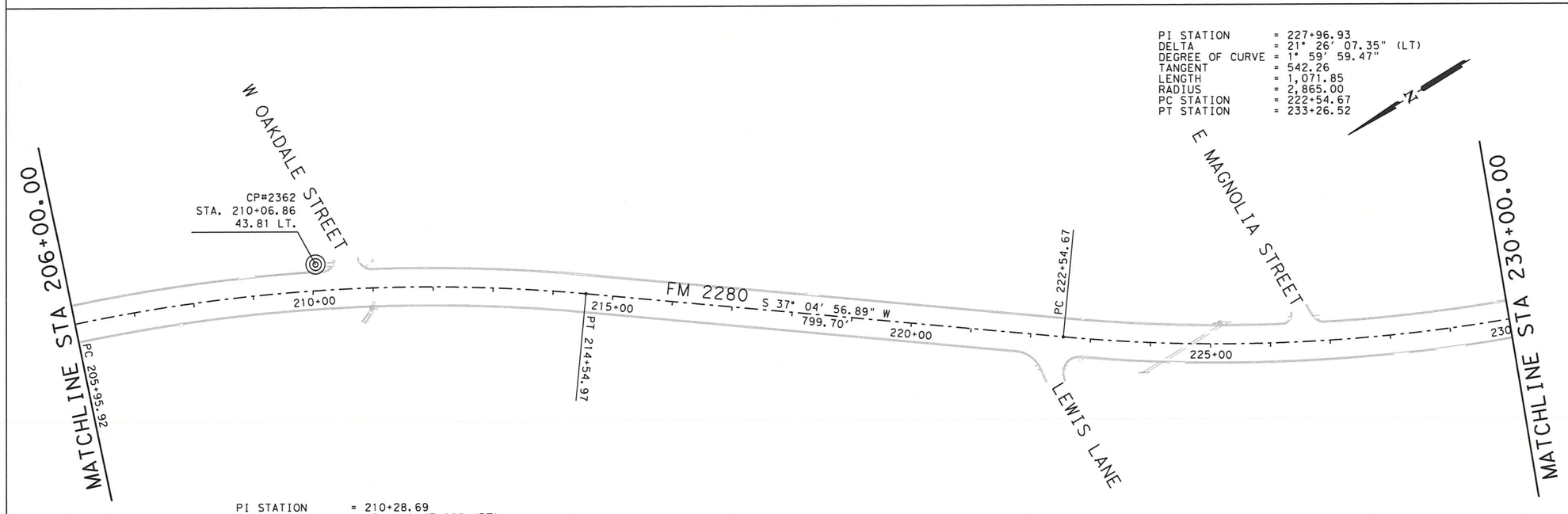
HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

SHEET 4 OF 7

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	12
CONTROL	SECTION	JOB	
2465	01	020	

3/9/2022 11:30:50 AM
24650020_sht2.dgn





1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR

3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

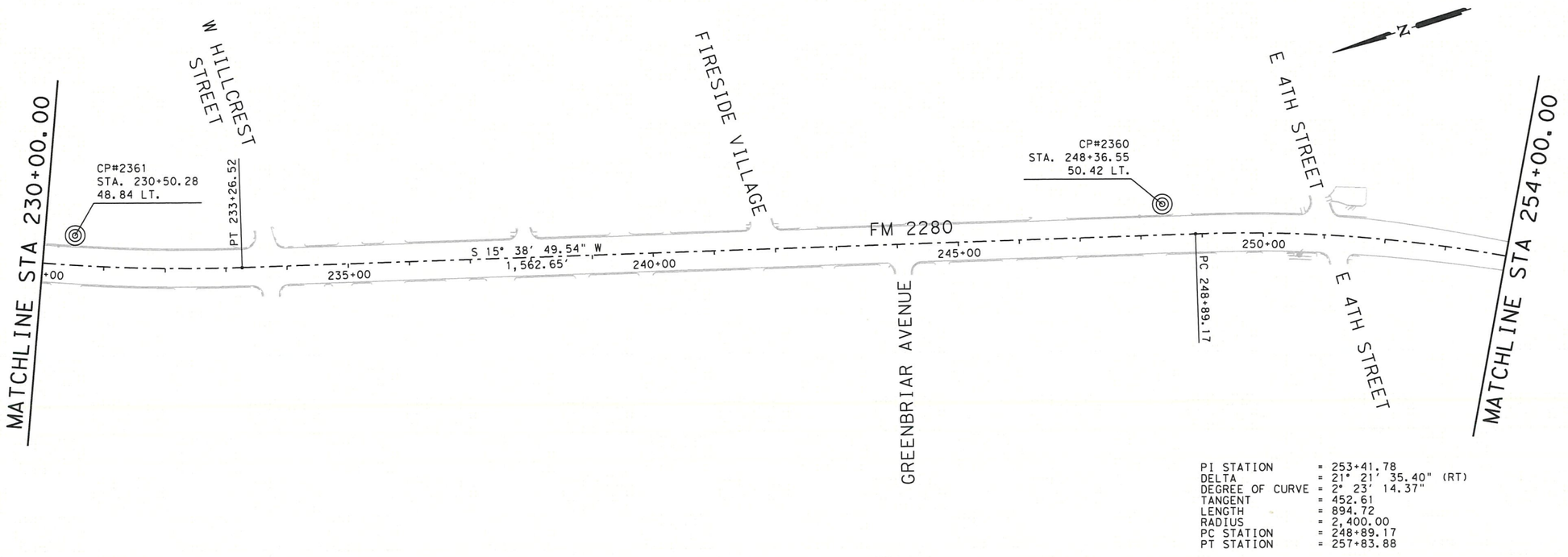
Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

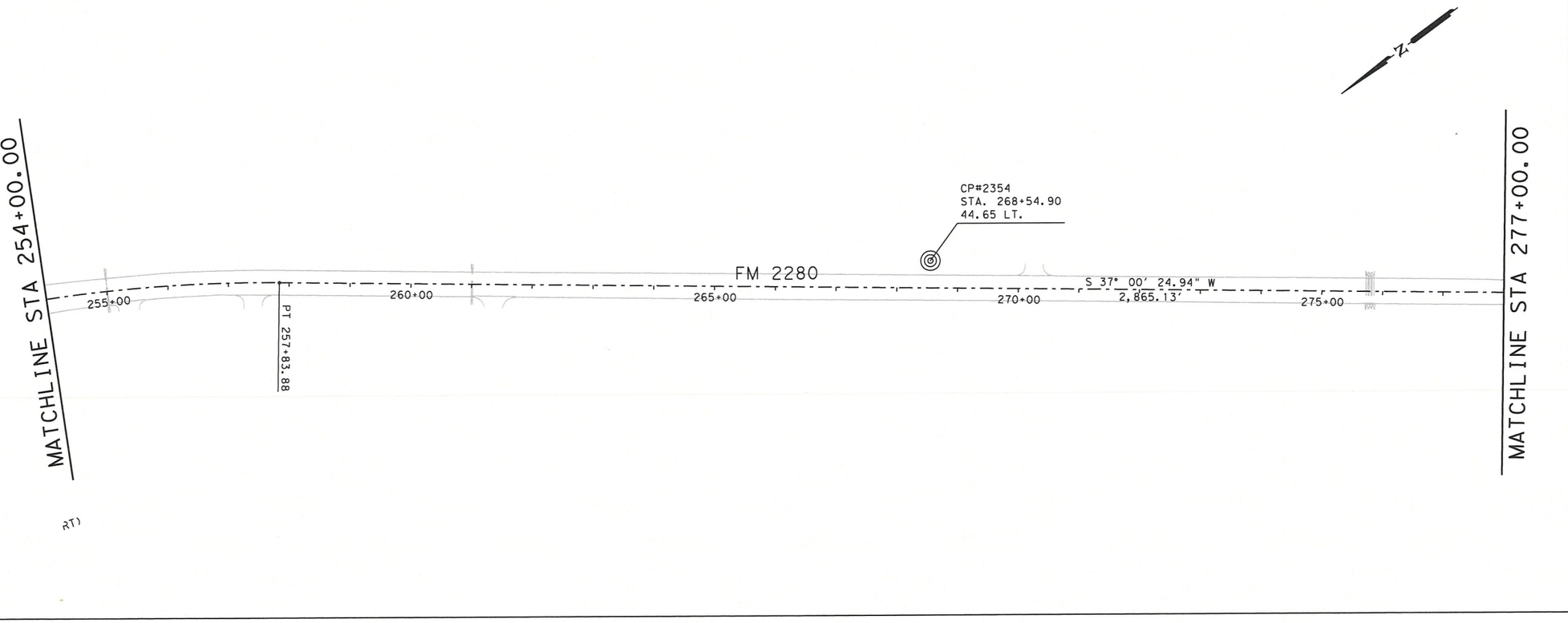
SHEET 5 OF 7

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	13
CONTROL	SECTION	JOB	
2465	01	020	

3/9/2022 11:30:51 AM
2465l0l020_SI3.dgn



PI STATION = 253+41.78
DELTA = 21° 21' 35.40" (RT)
DEGREE OF CURVE = 2° 23' 14.37"
TANGENT = 452.61
LENGTH = 894.72
RADIUS = 2,400.00
PC STATION = 248+89.17
PT STATION = 257+83.88



1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR
3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

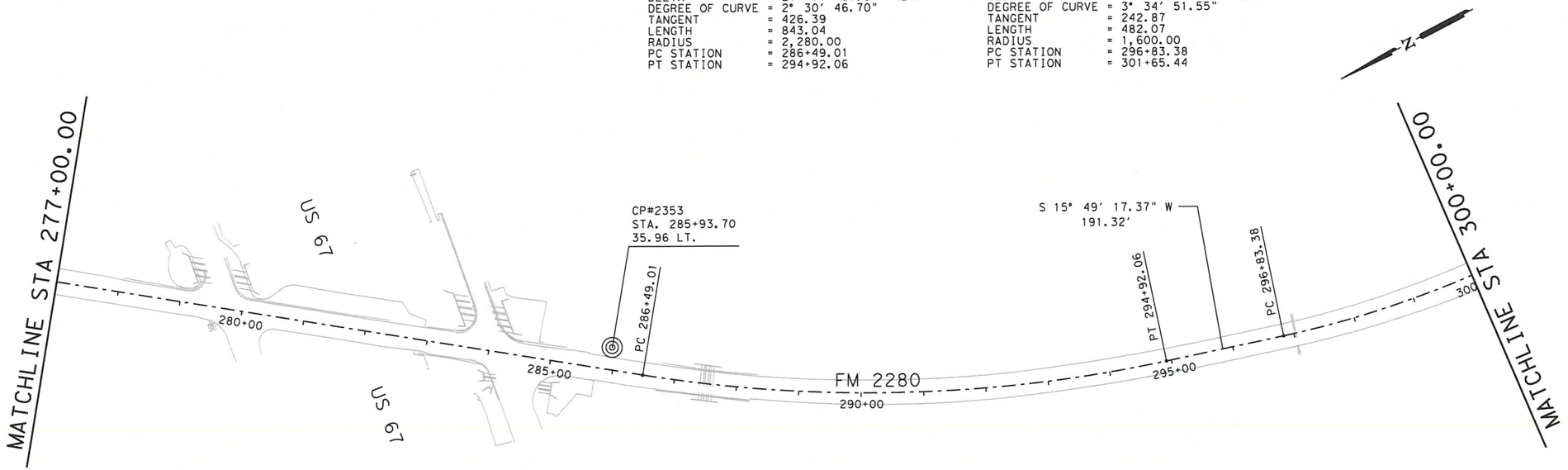
SHEET 6 OF 7

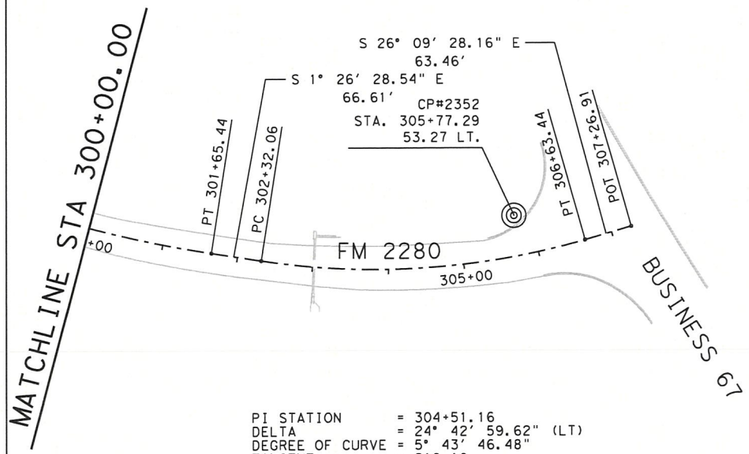
FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	14
CONTROL	SECTION	JOB	
2465	01	020	

3/9/2022 11:30:52 AM
2465001020_S14.dgn

PI STATION	= 290+75.40
DELTA	= 21° 11' 07.57" (LT)
DEGREE OF CURVE	= 2° 30' 46.70"
TANGENT	= 426.39
LENGTH	= 843.04
RADIUS	= 2,280.00
PC STATION	= 286+49.01
PT STATION	= 294+92.06

PI STATION	= 299+26.25
DELTA	= 17° 15' 45.91" (LT)
DEGREE OF CURVE	= 3° 34' 51.55"
TANGENT	= 242.87
LENGTH	= 482.07
RADIUS	= 1,600.00
PC STATION	= 296+83.38
PT STATION	= 301+65.44





PI STATION	= 304+51.16
DELTA	= 24° 42' 59.62" (LT)
DEGREE OF CURVE	= 5° 43' 46.48"
TANGENT	= 219.10
LENGTH	= 431.39
RADIUS	= 1,000.00
PC STATION	= 302+32.06
PT STATION	= 306+63.44

1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 100 200
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR

3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

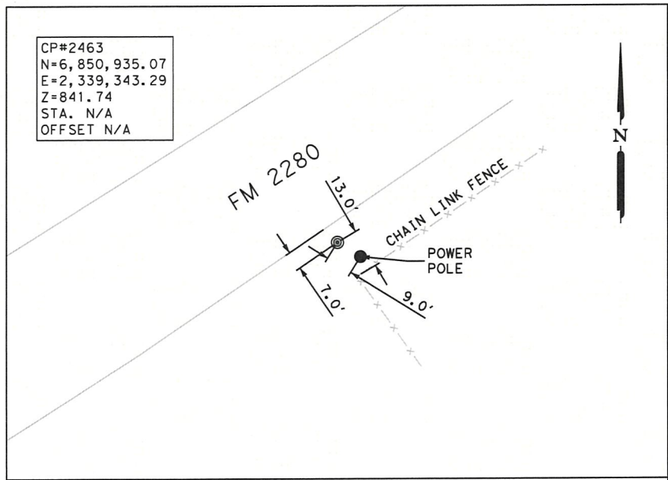
GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

HORIZONTAL AND VERTICAL CONTROL INDEX SHEET

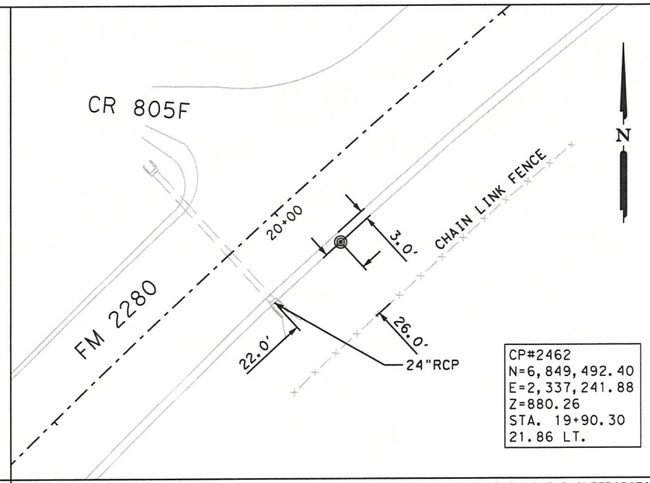
SHEET 7 OF 7

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	15
CONTROL	SECTION	JOB	
2465	01	020	

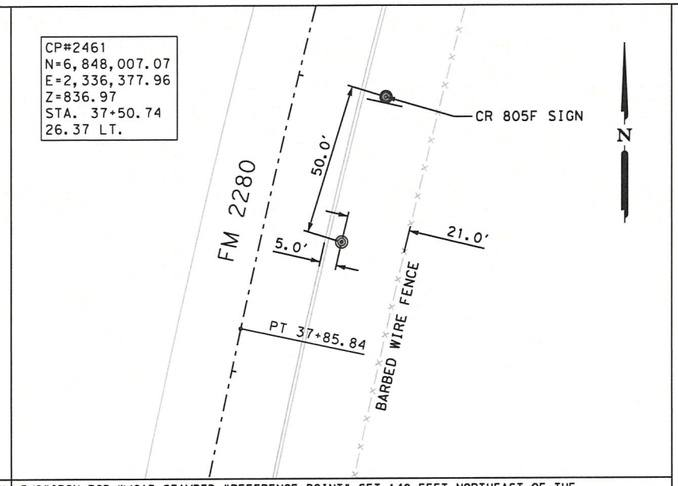
3/9/2022 11:30:52 AM
246501020_515.dgn



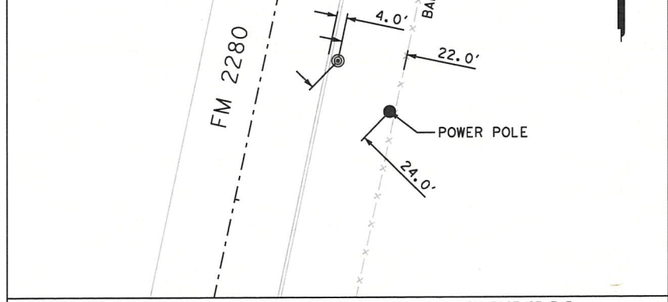
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 360 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH COUNTY ROAD 806 AND LOCATED 7.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 13.0 FEET NORTHWEST OF A CHAIN LINK FENCE CORNER, AND 9.0 FEET NORTHWEST OF A POWER POLE.



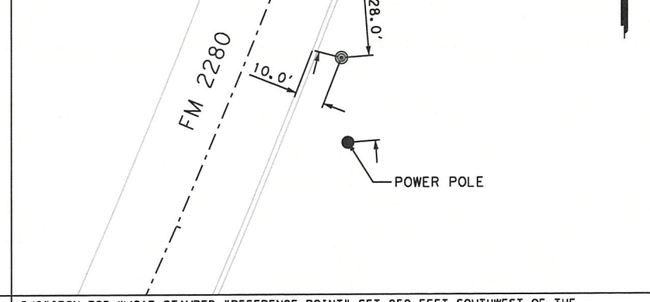
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 25 FEET SOUTHWEST OF THE INTERSECTION OF FM 2280 WITH COUNTY ROAD 805F AND LOCATED 3.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 26.0 FEET NORTHWEST OF A CHAIN LINK FENCE, AND 22.0 FEET NORTHEAST OF THE END OF A 24 INCH RCP.



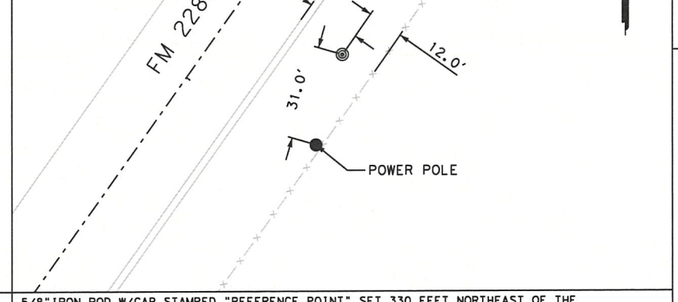
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 140 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH COUNTY ROAD 805B AND LOCATED 5.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 21.0 FEET NORTHWEST OF A BARBED WIRE FENCE, AND 50.0 FEET SOUTHWEST OF A CR 805F SIGN.



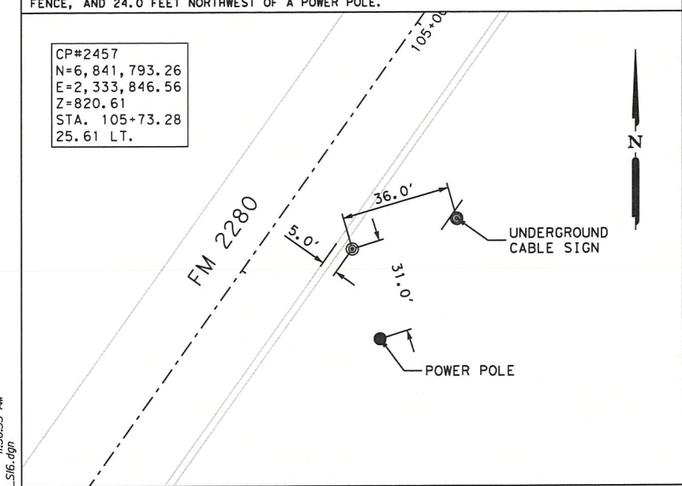
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 640 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH NORTHCREST DRIVE (NORTH END) AND LOCATED 4.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 22.0 FEET NORTHWEST OF A BARBED WIRE FENCE, AND 24.0 FEET NORTHWEST OF A POWER POLE.



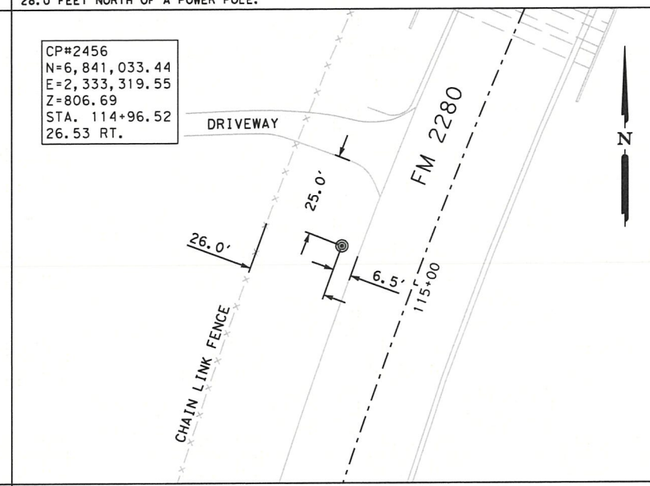
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 850 FEET SOUTHWEST OF THE INTERSECTION OF FM 2280 WITH NORTHCREST DRIVE (NORTH END) AND LOCATED 10.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 26.0 FEET SOUTHWEST OF A MAIL BOX, AND 28.0 FEET NORTH OF A POWER POLE.



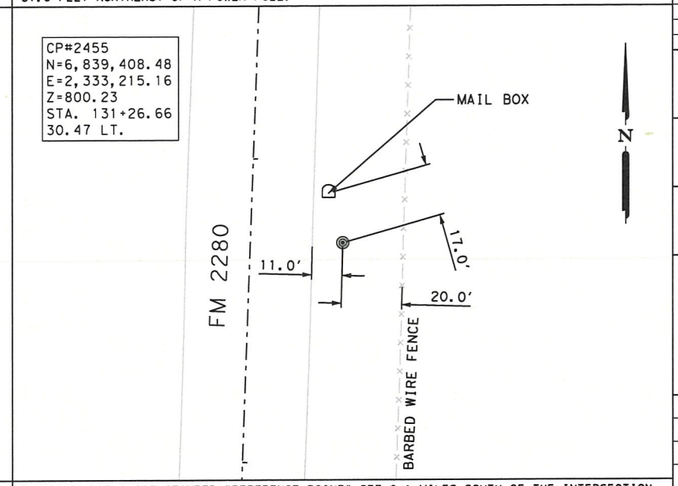
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 330 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH NORTHCREST DRIVE (SOUTH END) AND LOCATED 16.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 12.0 FEET NORTHWEST OF A METAL FENCE, AND 31.0 FEET NORTHEAST OF A POWER POLE.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 0.2 MILES SOUTHWEST OF THE INTERSECTION OF FM 2280 WITH NORTHCREST DRIVE (SOUTH END) AND LOCATED 5.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 31.0 FEET NORTHWEST OF A POWER POLE, AND 36.0 FEET SOUTHWEST OF AN UNDERGROUND CABLE SIGN.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 0.2 MILES NORTHEAST OF THE INTERSECTION OF FM 2280 WITH TWIN CREEKS DRIVE AND LOCATED 6.5 FEET NORTHWEST OF THE NORTHWEST EDGE OF FM 2280, 26.0 FEET SOUTHEAST OF A CHAIN LINK FENCE, AND 25.0 FEET SOUTHWEST OF A DRIVEWAY.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 0.1 MILES SOUTH OF THE INTERSECTION OF FM 2280 WITH TWIN CREEKS DRIVE AND LOCATED 11.0 FEET EAST OF THE EAST EDGE OF FM 2280, 20.0 FEET WEST OF A BARBED WIRE FENCE, AND 17.0 FEET SOUTHEAST OF A MAIL BOX.

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3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 25 50
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR
3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

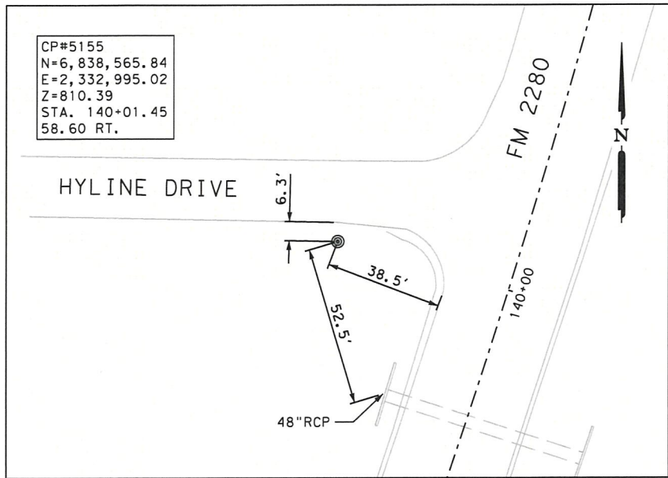
Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL DETAIL SHEET

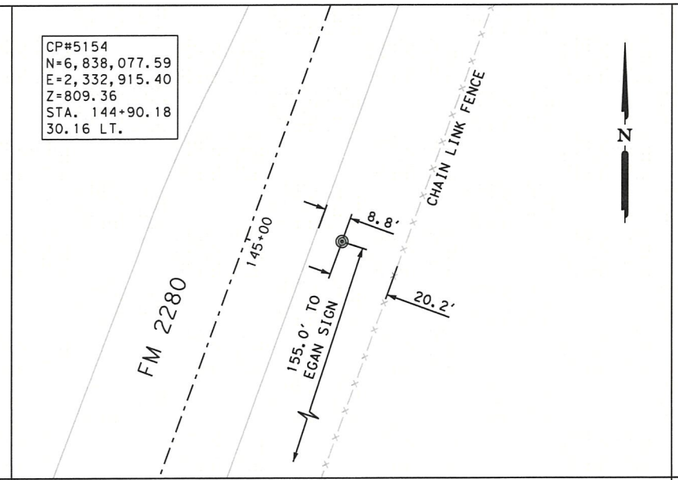
SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	16
CONTROL	SECTION	JOB	
2465	01	020	

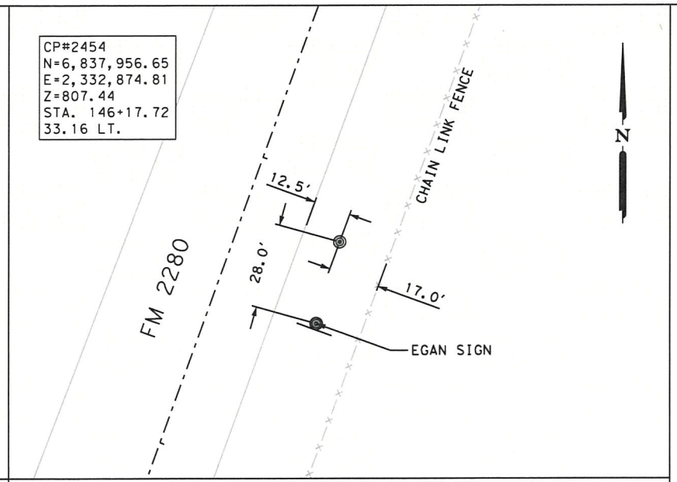
3/9/2022 11:30:55 AM
2465l0l020_SI6.dgn



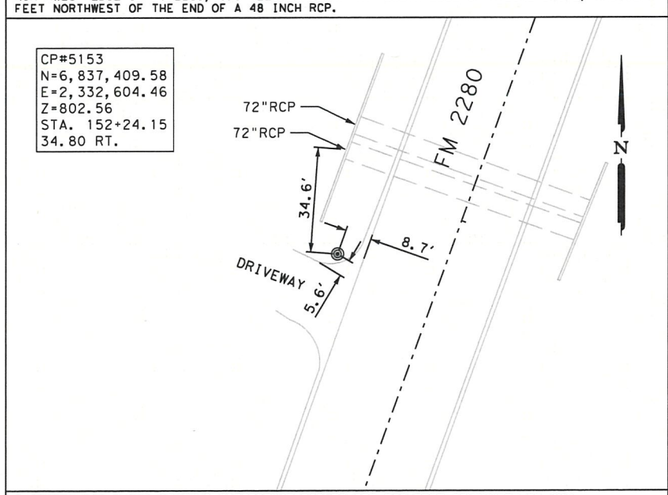
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET AT THE SOUTHWEST CORNER OF THE INTERSECTION OF FM 2280 WITH HYLINE DRIVE AND LOCATED 38.5 FEET NORTHWEST OF THE NORTHWEST EDGE OF FM 2280, 6.3 FEET SOUTH OF THE SOUTH EDGE OF HYLINE DRIVE, AND 52.5 FEET NORTHWEST OF THE END OF A 48 INCH RCP.



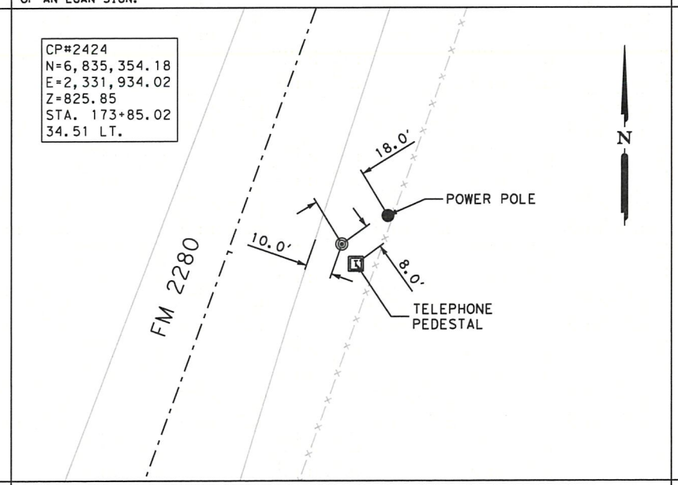
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 390 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH FM 3048 AND LOCATED 8.8 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 20.2 FEET NORTHWEST OF A CHAIN LINNK FENCE, AND 155.0 FEET NORTHEAST OF AN EGAN SIGN.



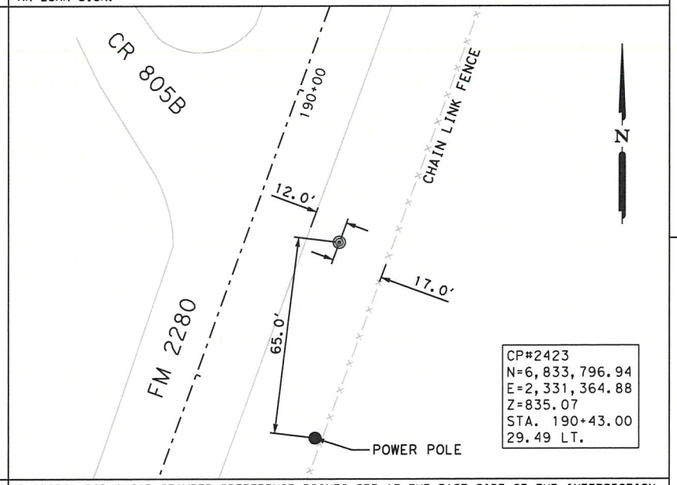
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 260 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH FM 3048 AND LOCATED 12.5 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 17.0 FEET NORTHWEST OF A CHAIN LINK FENCE, AND 28.0 FEET NORTHEAST OF AN EGAN SIGN.



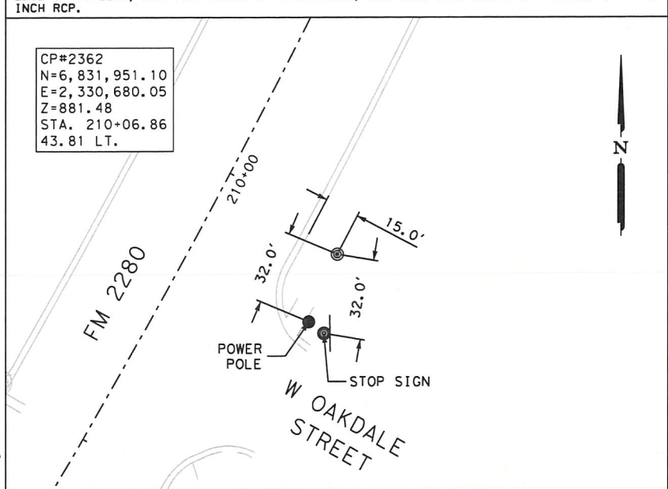
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 360 FEET SOUTHWEST OF THE INTERSECTION OF FM 2280 WITH FM 3048 AND LOCATED 8.7 FEET NORTHWEST OF THE NORTHWEST EDGE OF FM 2280, 5.6 FEET NORTH OF A DRIVEWAY, AND 34.6 FEET SOUTH OF THE END OF A 72 INCH RCP.



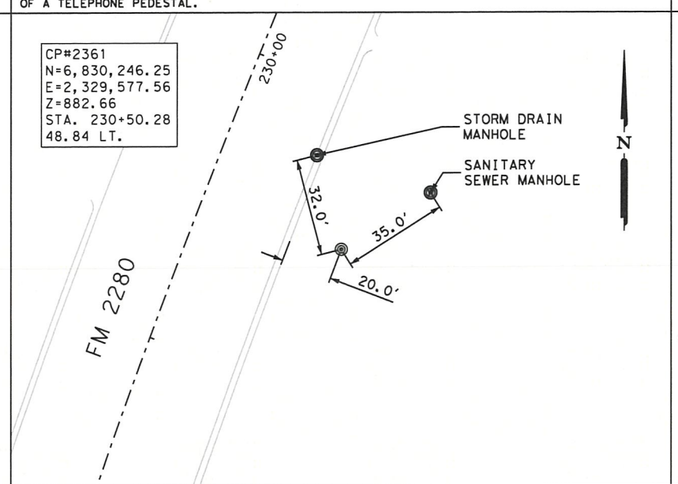
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 0.3 MILES NORTHEAST OF THE INTERSECTION OF FM 2280 WITH COUNTY ROAD 805B AND LOCATED 10.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 18.0 FEET SOUTHWEST OF A POWER POLE, AND 8.0 FEET NORTHWEST OF A TELEPHONE PEDESTAL.



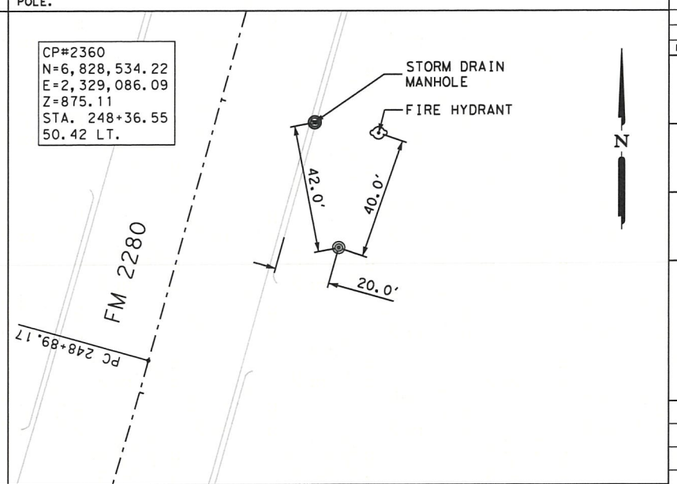
5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET AT THE EAST SIDE OF THE INTERSECTION OF FM 2280 WITH COUNTY ROAD 805B AND LOCATED 12.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 17.0 FEET NORTHWEST OF A CHAIN LINK FENCE, AND 65.0 FEET NORTH OF A POWER POLE.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET AT THE NORTHEAST CORNER OF THE INTERSECTION OF FM 2280 WITH W OAKDALE STREET AND LOCATED 15.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 32.0 FEET NORTH OF A STOP SIGN, AND 32.0 FEET NORTHEAST OF A POWER POLE.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 300 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH E HILLCREST DRIVE AND LOCATED 20.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 32.0 FEET SOUTHEAST OF A STORM DRAIN MANHOLE, AND 35.0 FEET SOUTHWEST OF A SANITARY SEWER MANHOLE.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 270 FEET NORTHEAST OF THE INTERSECTION OF FM 2280 WITH E 4TH STREET AND LOCATED 20.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 42.0 FEET SOUTHEAST OF A STORM DRAIN MANHOLE, AND 40.0 FEET SOUTHWEST OF A FIRE HYDRANT.

1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 25 50
HORIZ. SCALE IN FEET

STATE OF TEXAS
REGISTERED
CURTIS SMITH
5494
PROFESSIONAL
LAND SURVEYOR
3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL DETAIL SHEET

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	17
CONTROL	SECTION	JOB	
2465	01	020	

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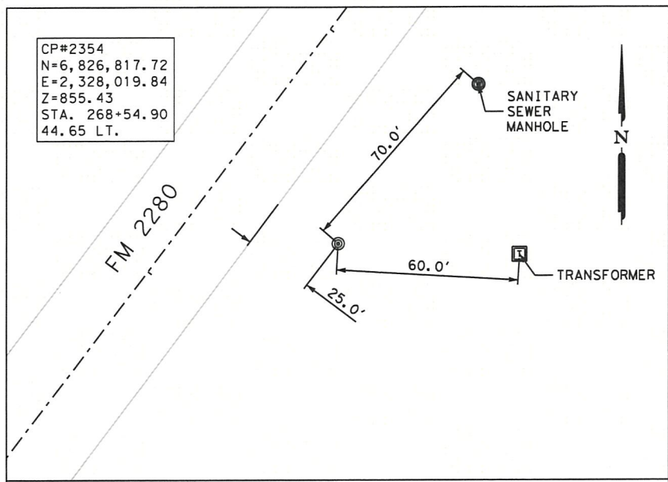
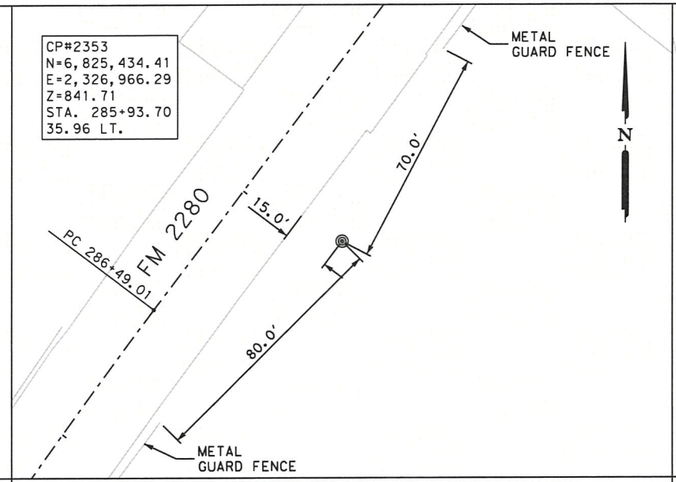
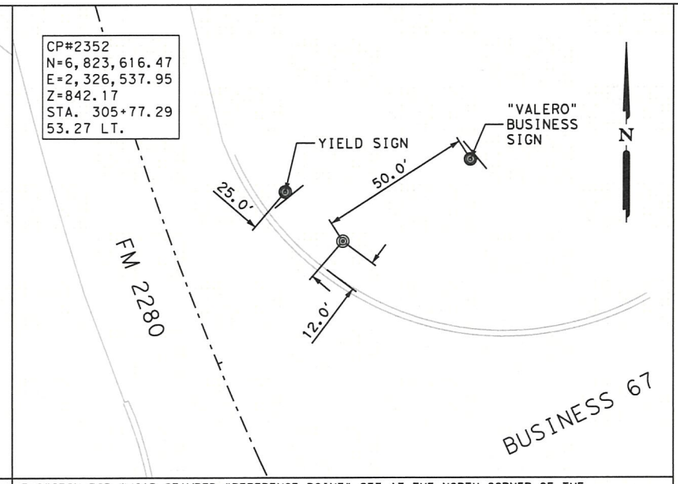


5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 0.3 MILES NORTHEAST OF THE INTERSECTION OF FM 2280 WITH US 67 AND LOCATED 25.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 70.0 FEET SOUTHWEST OF A SANITARY SEWER MANHOLE, AND 60.0 FEET WEST OF A TRANSFORMER.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET 380 FEET SOUTHWEST OF THE INTERSECTION OF FM 2280 WITH US 67 AND LOCATED 15.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF FM 2280, 70.0 FEET SOUTHWEST OF THE END OF A METAL GUARD FENCE, AND 80.0 FEET NORTHEAST OF THE END OF A METAL GUARD FENCE.



5/8"IRON ROD W/CAP STAMPED "REFERENCE POINT" SET AT THE NORTH CORNER OF THE INTERSECTION OF FM 2280 WITH BUSINESS 67 AND LOCATED 12.0 FEET NORTHEAST OF THE NORTHEAST EDGE OF FM 2280, 50.0 FEET SOUTHWEST OF A "VALERO" BUSINESS SIGN, AND 25.0 FEET SOUTHEAST OF A YIELD SIGN.

1. COORDINATES AND DISTANCES ARE US SURVEY FEET DISPLAYED IN SURFACE VALUES USING A SURFACE FACTOR OF 1.00012.
2. HORIZONTAL CONTROL IS BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM NAD83(2011)(EPOCH2010.00) NORTH CENTRAL ZONE (4202).
3. ALL ELEVATIONS ARE BASED ON GPS DERIVED ELLIPSOID HEIGHTS UTILIZING NAVD 88, GEOID 12B.

0 25 50
HORIZ. SCALE IN FEET

STATE OF TEXAS REGISTERED CURTIS SMITH 5494 PROFESSIONAL LAND SURVEYOR

3-9-22

CURTIS SMITH
REGISTERED PROFESSIONAL LAND SURVEYOR
NO. 5494 TEXAS FIRM No. 10106900

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TEXAS 76137
TEXAS REGISTERED SURVEYING FIRM 10106900

HORIZONTAL AND VERTICAL CONTROL DETAIL SHEET

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	18
CONTROL	SECTION	JOB	
2465	01	020	

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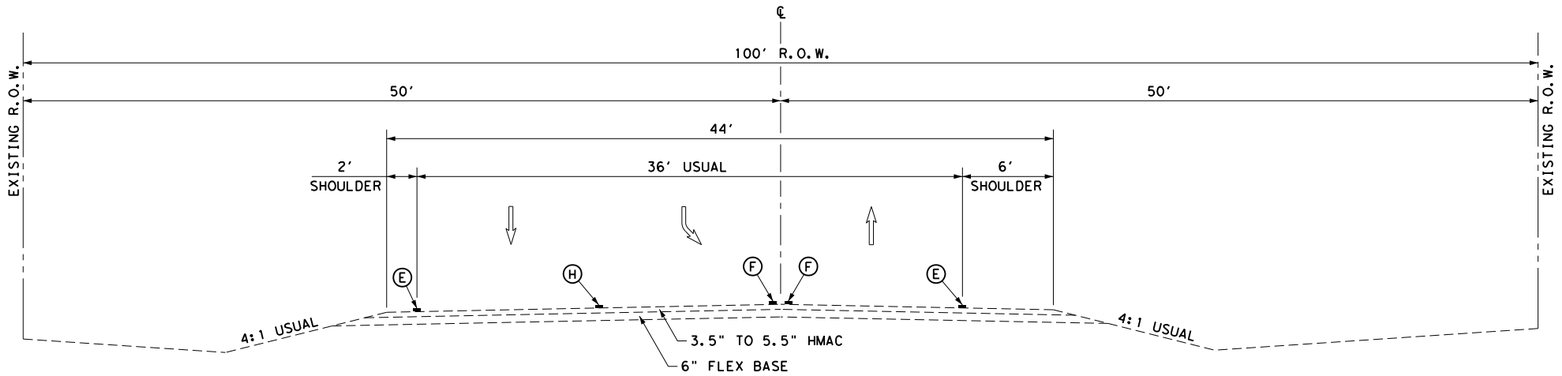
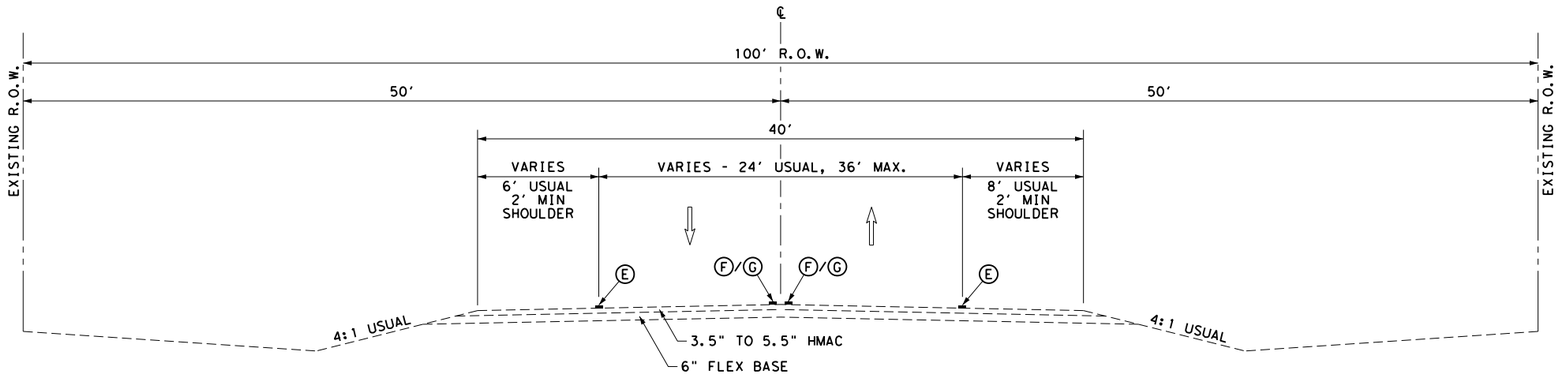


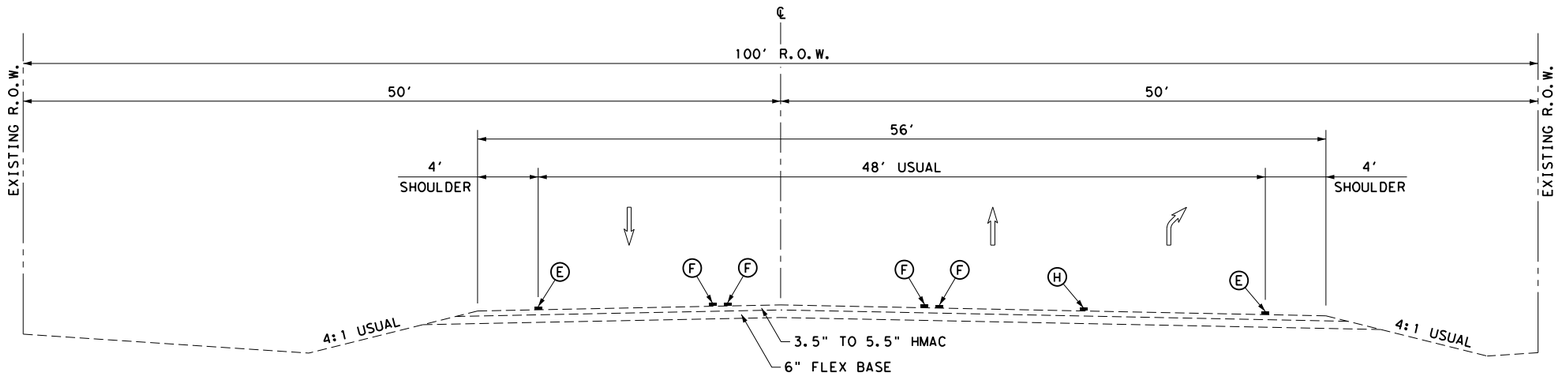
EXISTING TYPICAL SECTION

BEGIN (STA 0+17) TO STA 7+00
N.T.S.



EXISTING TYPICAL SECTION

STA 7+00 TO STA 143+70 ,STA 149+60 TO 172+75
STA 186+25 TO 205+90, STA 251+70 TO 302+20
N.T.S.



EXISTING TYPICAL SECTION

STA 143+70 TO 149+60
N.T.S.

LEGEND:

- Ⓓ (W) 4" (BRK)
- Ⓔ (W) 4" (SLD)
- Ⓕ (Y) 4" (SLD)
- Ⓖ (Y) 4" (BRK)
- Ⓗ (W) 8" (SLD)

NOTE:

1. CONTRACTOR SHALL VERIFY LANE AND SHOULDER WIDTH IN THE FIELD.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED
PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

FM 2280
EXISTING TYPICAL SECTIONS

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	19
CONTROL	SECTION	JOB	
2465	01	020	

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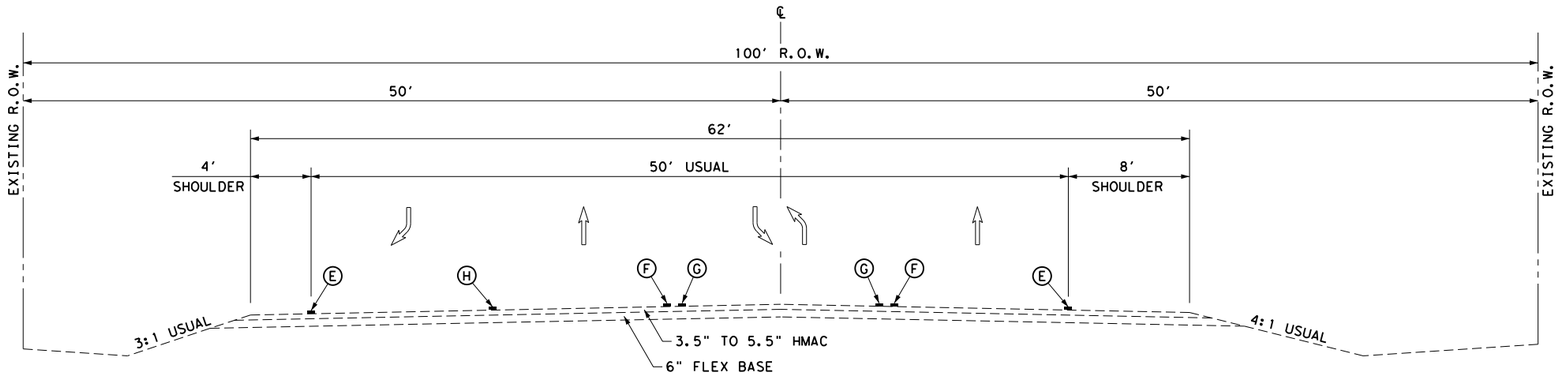
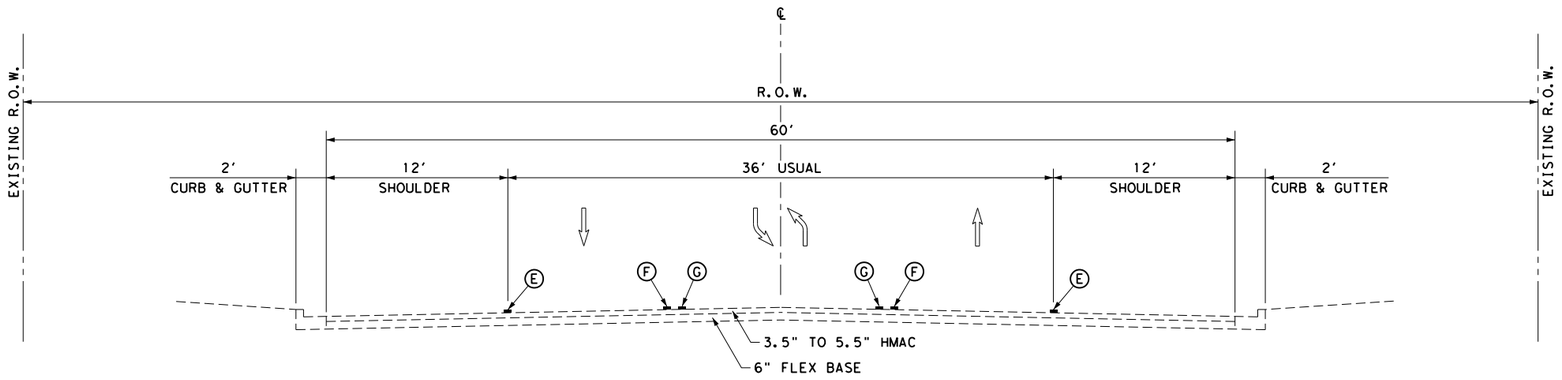


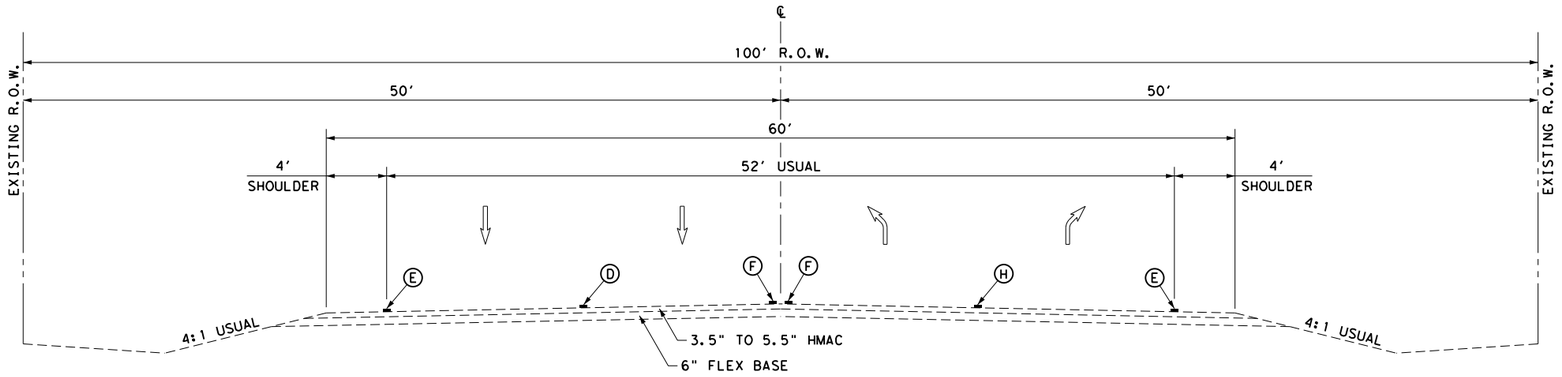
EXISTING TYPICAL SECTION

STA 172+75 TO 186+25
N.T.S.



EXISTING TYPICAL SECTION

STA 205+90 TO 251+70
N.T.S.



EXISTING TYPICAL SECTION

STA 302+20 TO END (STA 306+82)
N.T.S.

LEGEND:

- Ⓓ (W) 4" (BRK)
- Ⓔ (W) 4" (SLD)
- Ⓕ (Y) 4" (SLD)
- Ⓖ (Y) 4" (BRK)
- Ⓗ (W) 8" (SLD)

NOTE:

1. CONTRACTOR SHALL VERIFY LANE AND SHOULDER WIDTH IN THE FIELD.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

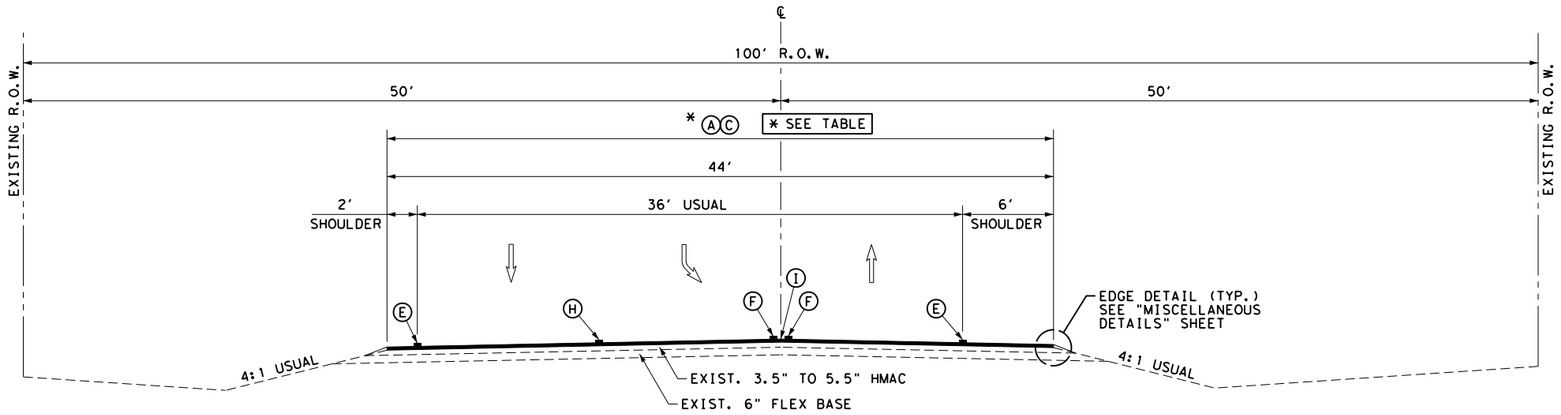
VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
EXISTING TYPICAL SECTIONS

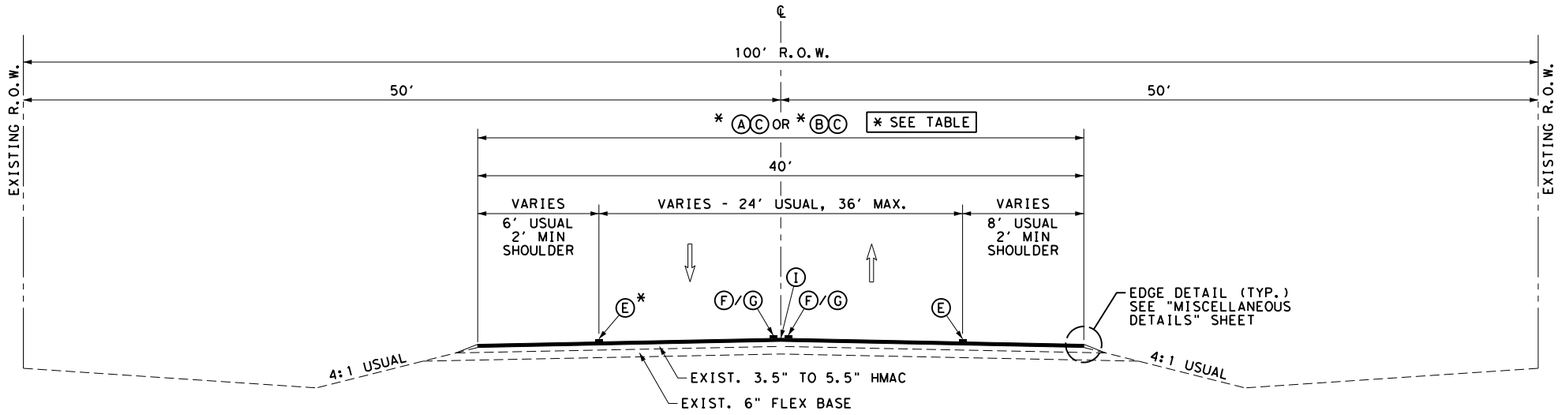
SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	20
CONTROL	SECTION	JOB	
2465	01	020	



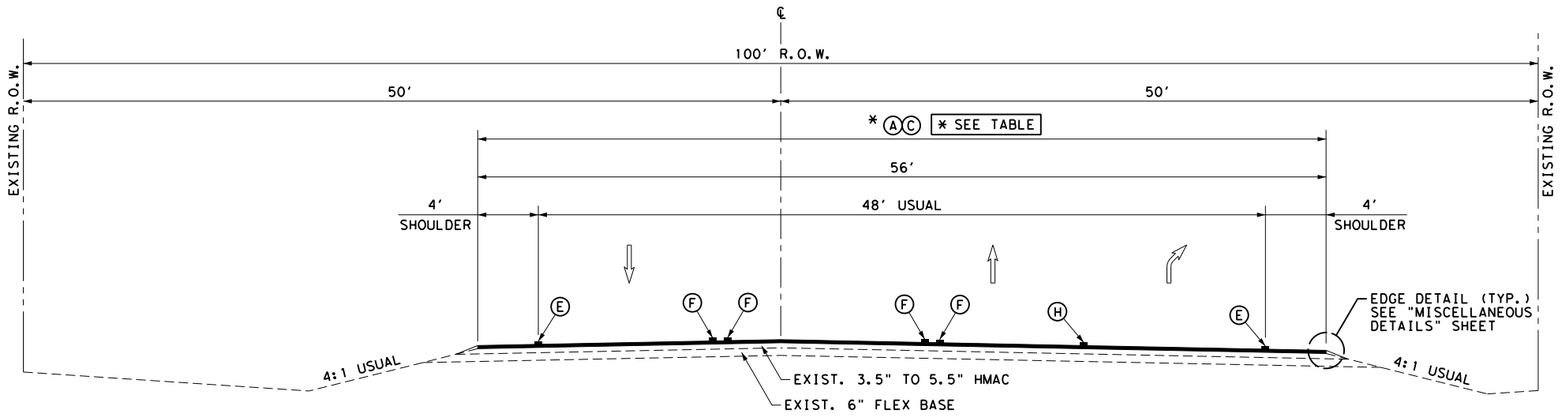
PROPOSED TYPICAL SECTION

BEGIN (STA 0+17) TO STA 7+00
N.T.S.



PROPOSED TYPICAL SECTION

STA 7+00 TO STA 143+70 ,STA 149+60 TO 172+75
STA 186+25 TO 205+90, STA 251+70 TO 302+20
N.T.S.



PROPOSED TYPICAL SECTION

STA 143+70 TO 149+60
N.T.S.

LEGEND:

- (A) 2" SP-C SAC-A PG 70-28 (OVERLAY)
- (B) 2" SP-C SAC-A PG 70-28 (INLAY)
- (C) TACK COAT
- (D) (W)4"(BRK)
- (E) (W)4"(SLD)(SEE NOTE 7)
- (F) (Y)4"(SLD)
- (G) (Y)4"(BRK)
- (H) (W)8"(SLD)
- (I) RUMBLE STRIP

* (A) OVERLAY LIMITS		
DEPTH	FROM	TO
2"	BEGIN	STA 72+94
2"	STA 78+15	STA 205+90
2"	STA 256+65	STA 278+10

* (B) MILL AND INLAY LIMITS		
DEPTH	FROM	TO
2"	STA 72+94	STA 78+15
2"	STA 205+90	STA 256+65
2"	STA 278+10	END

NOTES:

1. EXISTING SHOULDERS SHALL ALSO RECEIVE 2" OVERLAY OR 2" MILL AND INLAY.
2. THE CONTRACTOR SHALL REFERENCE ALL EXISTING PAVEMENT MARKINGS BEFORE PLANING OR OVERLAY.
3. COURSE AGGREGATE TO BE USED IN SURFACE COURSES SHALL HAVE A MINIMUM SURFACE AGGREGATE CLASSIFICATION OF "SAC-A" AS SPECIFIED.
4. CONTRACTOR TO MATCH EXISTING SLOPES.
5. CONTRACTOR SHALL VERIFY LANE AND SHOULDER WIDTH IN THE FIELD AND INSTALL PAVEMENT MARKINGS ACCORDINGLY OR AS DIRECTED BY THE ENGINEER.
6. REPAIR PAVEMENT FAILURES IN ACCORDANCE WITH DETAIL ON "MISCELLANEOUS DETAILS" SHEET FOR FLEXIBLE PAVEMENT REPAIR AND/OR AS DIRECTED BY THE ENGINEER. EXTENTS AND LOCATIONS WILL BE AS DIRECTED/DETERMINED BY THE ENGINEER.
7. REFER TO PAVEMENT MARKING LAYOUT SHEETS FOR DETAILS AND LIMITS OF RAISED PROFILE MARKING, RUMBLE STRIPS AND OTHER PAVEMENT MARKING ITEMS.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Christopher Boles

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
PROPOSED TYPICAL SECTIONS

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	21
2465	01	020	

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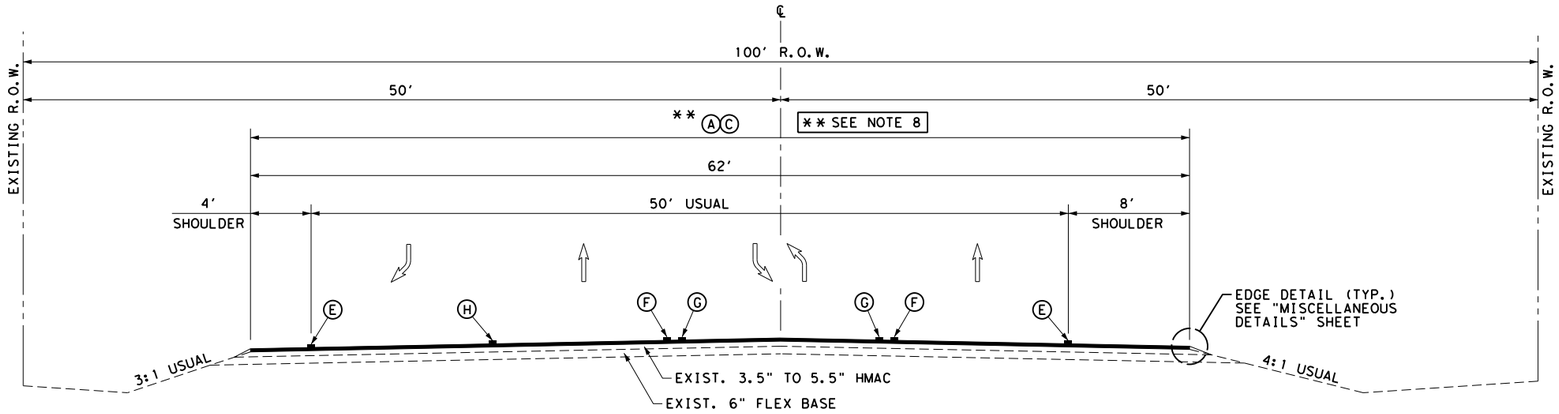
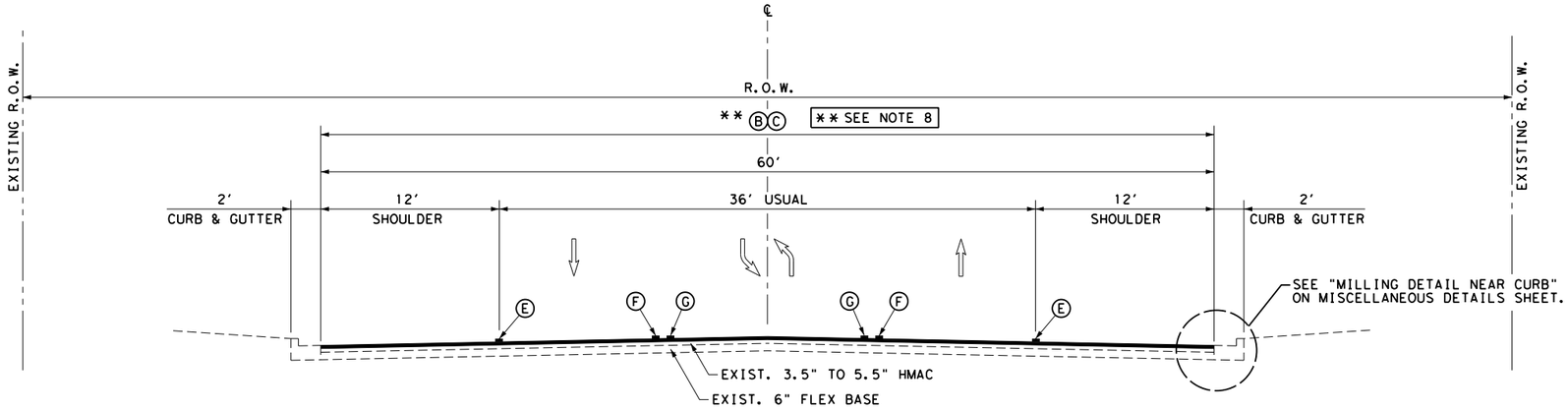


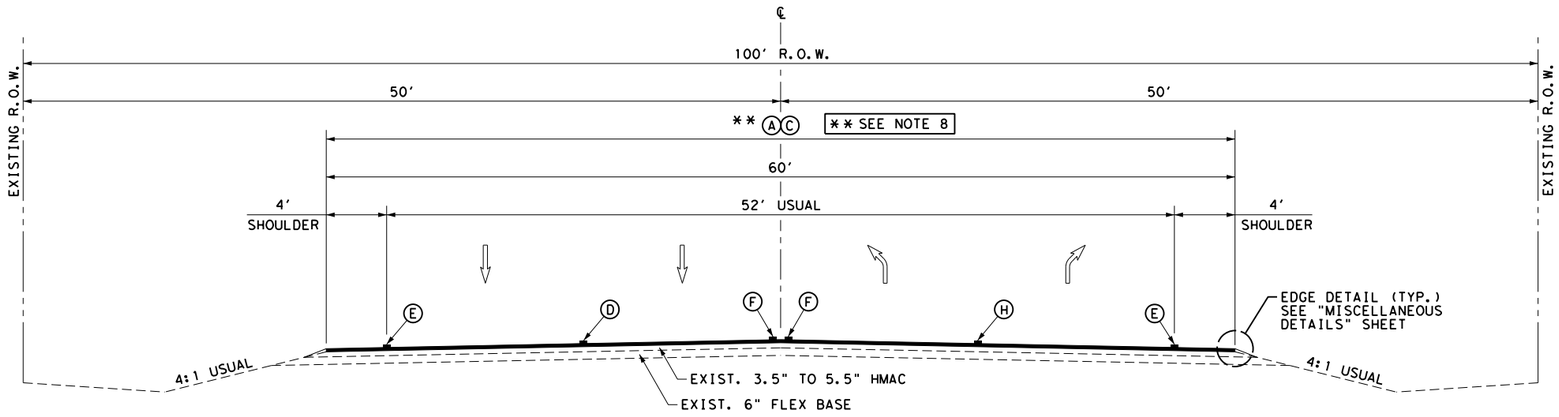
PROPOSED TYPICAL SECTION

STA 172+75 TO 186+25
N.T.S.



PROPOSED TYPICAL SECTION

STA 205+90 TO 251+70
N.T.S.



PROPOSED TYPICAL SECTION

STA 302+20 TO END (STA 306+82)
N.T.S.

LEGEND:

- (A) 2" SP-C SAC-A PG 70-28 (OVERLAY)
- (B) 2" SP-C SAC-A PG 70-28 (INLAY)
- (C) TACK COAT
- (D) (W)4"(BRK)
- (E) (W)4"(SLD)(SEE NOTE 7)
- (F) (Y)4"(SLD)
- (G) (Y)4"(BRK)
- (H) (W)8"(SLD)
- (I) RUMBLE STRIP

NOTES:

1. EXISTING SHOULDERS SHALL ALSO RECEIVE 2" OVERLAY OR 2" MILL AND INLAY.
2. THE CONTRACTOR SHALL REFERENCE ALL EXISTING PAVEMENT MARKINGS BEFORE PLANING OR OVERLAY.
3. COURSE AGGREGATE TO BE USED IN SURFACE COURSES SHALL HAVE A MINIMUM SURFACE AGGREGATE CLASSIFICATION OF "SAC-A" AS SPECIFIED.
4. CONTRACTOR TO MATCH EXISTING SLOPES.
5. CONTRACTOR SHALL VERIFY LANE AND SHOULDER WIDTH IN THE FIELD AND INSTALL PAVEMENT MARKINGS ACCORDINGLY OR AS DIRECTED BY THE ENGINEER.
6. REPAIR PAVEMENT FAILURES IN ACCORDANCE WITH DETAIL ON "MISCELLANEOUS DETAILS" SHEET FOR FLEXIBLE PAVEMENT REPAIR AND/OR AS DIRECTED BY THE ENGINEER. EXTENTS AND LOCATIONS WILL BE AS DIRECTED/DETERMINED BY THE ENGINEER.
7. REFER TO PAVEMENT MARKING LAYOUT SHEETS FOR DETAILS AND LIMITS OF RAISED PROFILE MARKING, RUMBLE STRIPS AND OTHER PAVEMENT MARKING ITEMS.
8. REFER TO PROPOSED TYPICAL SECTIONS SHEET 1 OF 2 FOR MILL & INLAY/OVERLAY LIMITS TABLE.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Christopher Boles

1/5/2024

NO.	DATE	REVISION	APPROVED

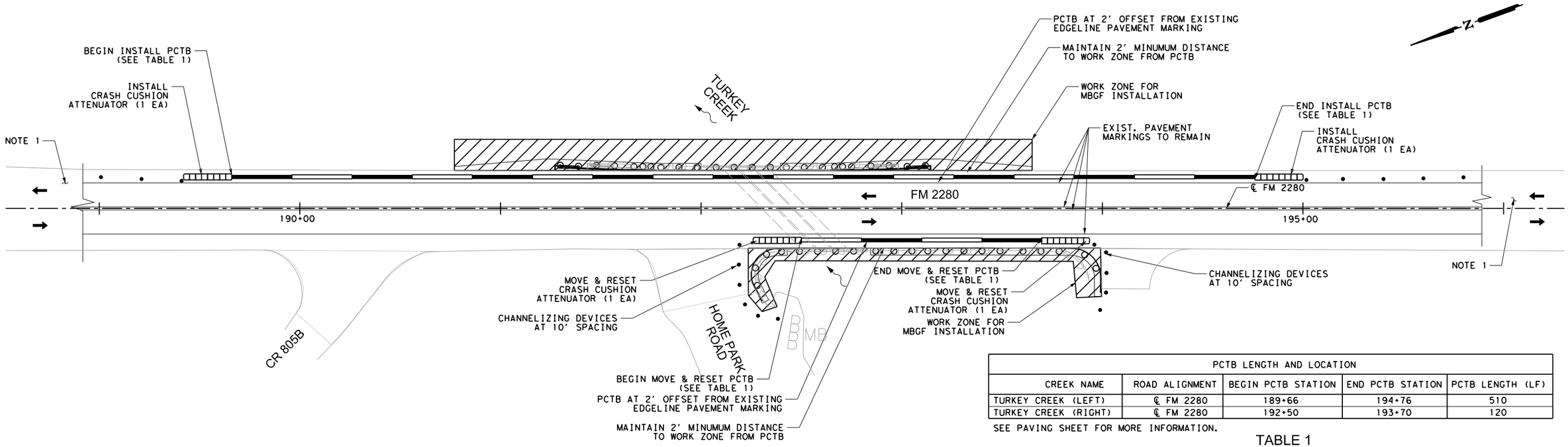
VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
PROPOSED TYPICAL SECTIONS

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	22
CONTROL	SECTION	JOB	
2465	01	020	



PCTB LENGTH AND LOCATION				
CREEK NAME	ROAD ALIGNMENT	BEGIN PCTB STATION	END PCTB STATION	PCTB LENGTH (LF)
TURKEY CREEK (LEFT)	℄ FM 2280	189+66	194+76	510
TURKEY CREEK (RIGHT)	℄ FM 2280	192+50	193+70	120

SEE PAVING SHEET FOR MORE INFORMATION.

TABLE 1

TCP DETAILS FOR MBGF INSTALLATION AT TURKEY CREEK

NOTE 1:

FOLLOW TCP(2-1)-18 STANDARD FOR ADDITIONAL SIGNS, PAVEMENT MARKINGS, TCP DEVICES, PLACEMENTS, SPACINGS, AND OTHER REQUIREMENTS. FOR ANY CHANGE AND ADDITIONAL INFORMATION, CONTACT THE ENGINEER FOR APPROVAL. EXCEPT FOR PCTB AND CRASH CUSHION, PAYMENT FOR THIS WORK IS SUBSIDIARY TO ITEM 502.

TCP NOTES:

BELOW PHASING IS A GUIDELINE FOR THE CONTRACTOR.

CONTRACTOR SHALL SUBMIT DETAILED PLANS SHOWING WORK SEQUENCE AND RELEVANT TXDOT STANDARDS TO GET APPROVAL FROM THE ENGINEER BEFORE BEGINNING WORK.

MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.

FOLLOW TXDOT STANDARDS FOR LANE CLOSURES UNLESS MENTIONED OTHERWISE, PAYMENT FOR ALL ITEMS SHOWN IN STANDARDS IS SUBSIDIARY TO ITEM 502.

FOR FM 2280 @ FM 917 AND FM 2280 @ BUS 67, KEEP ALL MOVEMENTS (TURNING AND THRU) OPEN UNLESS APPROVED OTHERWISE BY THE ENGINEER.

PLACE ADVANCE WARNING SIGNS IN ACCORDANCE WITH BC (2)-21.

SIGN AND TREAT EDGE CONDITIONS IN ACCORDANCE WITH WZ(UL)-13 & TXDOT STANDARDS "WORKSHEET FOR EDGE CONDITION TREATMENT TYPES".

PLACE WK ZN PAVEMENT MARKINGS IN ACCORDANCE WITH BC (11)-21 & BC (12)-21 , & WZ(STPM)-13 ON FINAL SURFACE.

LANE(S) UNDER CONSTRUCTION DURING DAY TIME SHALL BE OPEN FOR TRAFFIC DURING NIGHT TIME OR DURING TIMES WHEN CONSTRUCTION OPERATIONS ARE NOT ACTIVE. OVERLAY AND PROVIDE TEMPORARY STRIPING IN SUCH A MANNER AS TO COMPLETE A SEGMENT OF ROADWAY PER DAY.

UNLESS OTHERWISE SHOWN ALL "CW"SIGNS SHALL BE 48"X48".

CONTRACTOR SHALL NOT PLACE ANY SIGN OR TRAFFIC CONTROL DEVICES WITHIN RAILROAD ROW. COORDINATE WITH THE ENGINEER FOR PLACEMENT OF SIGNS AND TRAFFIC CONTROL DEVICES AT/AROUND RAILROAD ROW. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH ADJACENT PROJECTS (CONTRACTORS) TO ENSURE NO CONFLICTING SIGNS ARE PLACED.

ALL CONTRACTOR EMPLOYEES MUST WEAR HARD HATS AND SAFETY VESTS AT ALL TIMES WHEN THEY ARE ON SITE.

PHASE 1:

1. PLACE NECESSARY SIGNS & TRAFFIC CONTROL DEVICES PER TXDOT STANDARDS AND AS APPROVED/DIRECTED BY THE ENGINEER.
2. PLACE NECESSARY EROSION AND SEDIMENT CONTROL DEVICES.
3. PERFORM FULL DEPTH REPAIR AS DIRECTED BY THE ENGINEER.
4. WEDGE MILL AGAINST CURB AND GUTTER SECTION. MILL WHERE APPLICABLE ACCORDING TO PLAN SHEETS. CONTRACTOR SHALL NOT MILL MORE THAN WHAT CAN BE COVERED IN A DAY'S OPERATION. CONTRACTOR TO PROVIDE TEMPORARY STRIPING BY THE END OF THE DAY'S OPERATION.
5. APPLY TACK COAT
6. OVERLAY OR INLAY AREA.
7. RECONSTRUCT DRIVEWAYS ALONG OVERLAY AREAS ACCORDING TO PLAN SHEETS OR AS DIRECTED BY THE ENGINEER. CONSTRUCT MAIL BOX TURNOUTS AS SHOWN ON MISCELLANEOUS DETAIL SHEET AND AS DIRECTED BY THE ENGINEER.
8. BACKFILL PAVEMENT EDGES.
9. PERFORM TRAFFIC SIGNAL WORK AT THE INTERSECTION OF FM 3048 AS SHOWN IN THE PLANS.
10. PLACE PCTB & CRASH CUSHION ATTENUATORS AS SHOWN IN TCP DETAIL ABOVE. CONTRACTOR MUST GET ENGINEER'S APPROVAL BEFORE PLACING AND MOVING PCTB AND CRASH CUSHION ATTENUATORS.
11. INSTALL ROADSIDE SAFETY ELEMENTS, MOW STRIPS, SIGNS AND DELINEATORS.
12. CLOSE OFF AND PERFORM ALL ROADWAY SURFACING ACTIVITIES IN SUCH A MANNER AS TO COMPLETE A SECTION OF ROADWAY AT A TIME. CONTRACTOR TO INSTALL TEMPORARY STRIPING UNTIL PERMANENT STRIPING IS INSTALLED IN PHASE 2.

PHASE 2:

1. REPEAT STEPS OF PHASE 1 UNTIL CONSTRUCTION IS COMPLETE.
2. PLACE PERMANENT PAVEMENT MARKINGS & MARKERS.
3. INSTALL RUMBLE STRIPS.
4. PLACE SEEDING AND WATERING AS DIRECTED BY THE ENGINEER.
5. REMOVE TRAFFIC CONTROL DEVICES, SIGNS, CONSTRUCTION DEBRIS & EROSION CONTROL DEVICES.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

FM 2280
TRAFFIC CONTROL PLAN AND WORK SEQUENCE

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	23
CONTROL	SECTION	JOB	
2465	01	020	

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DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	2465	01	020	FM 2280
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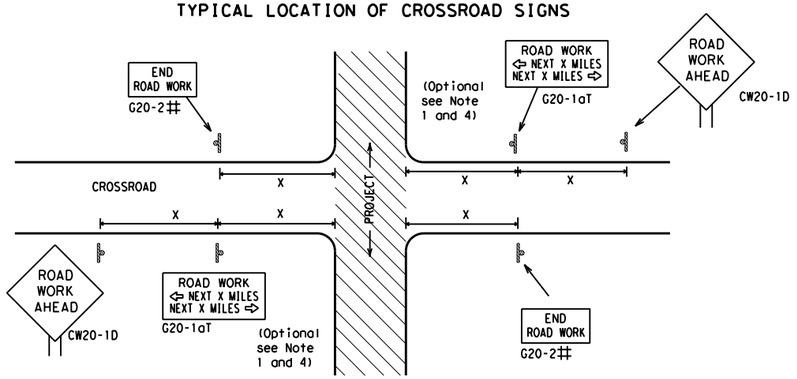
	FTW	JOHNSON		24

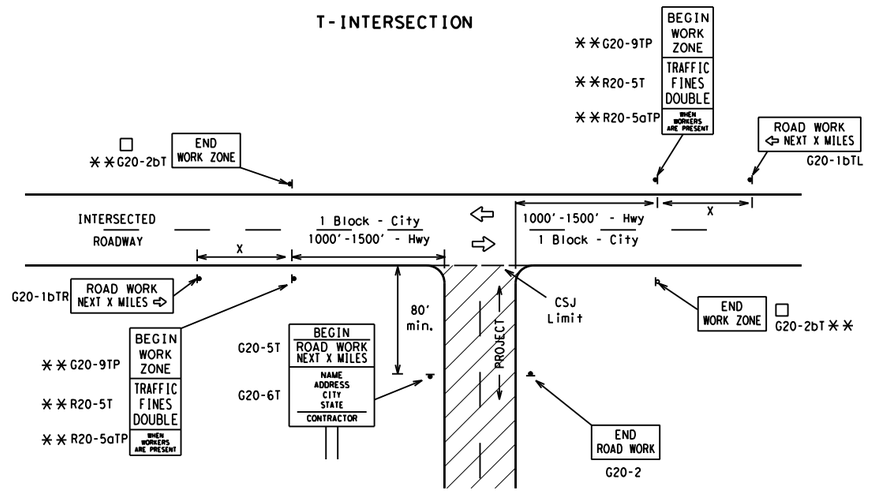
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

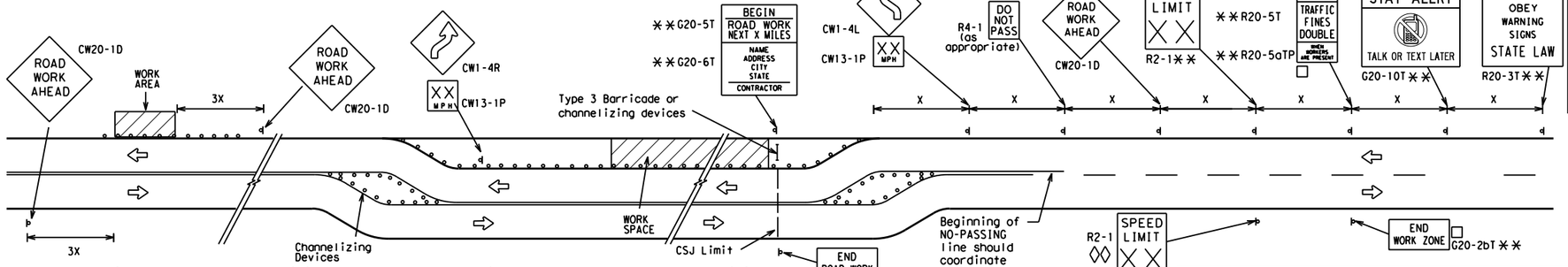
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

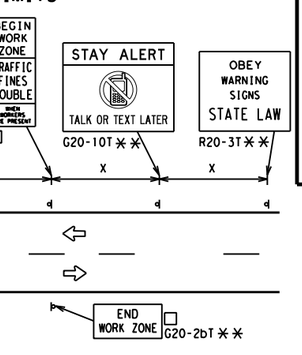
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

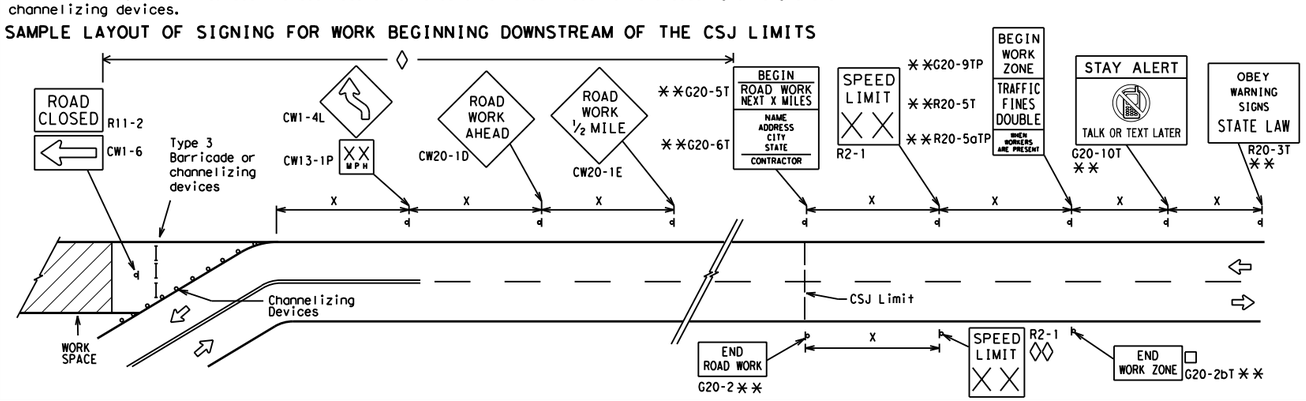


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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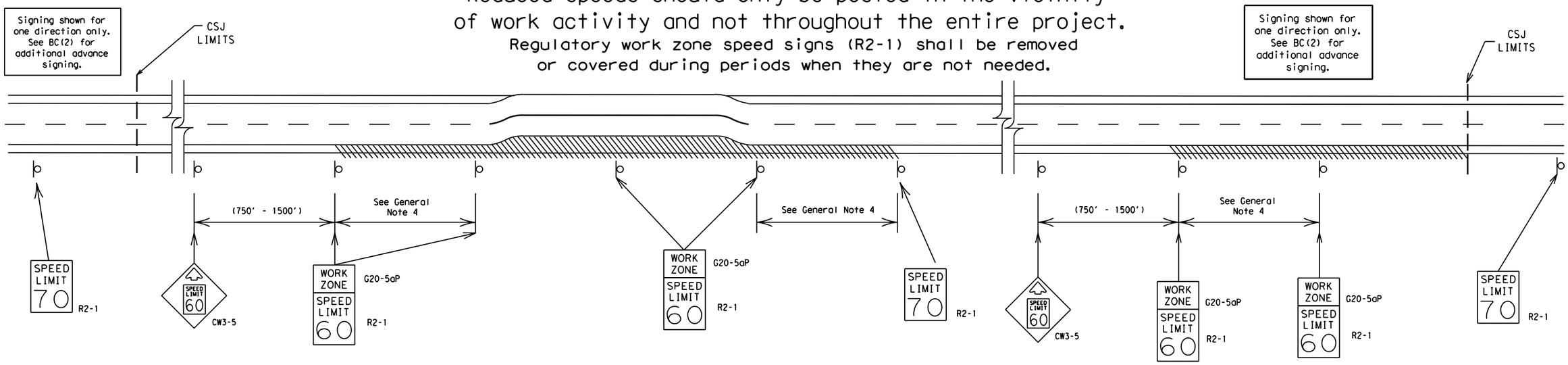
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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DATE:
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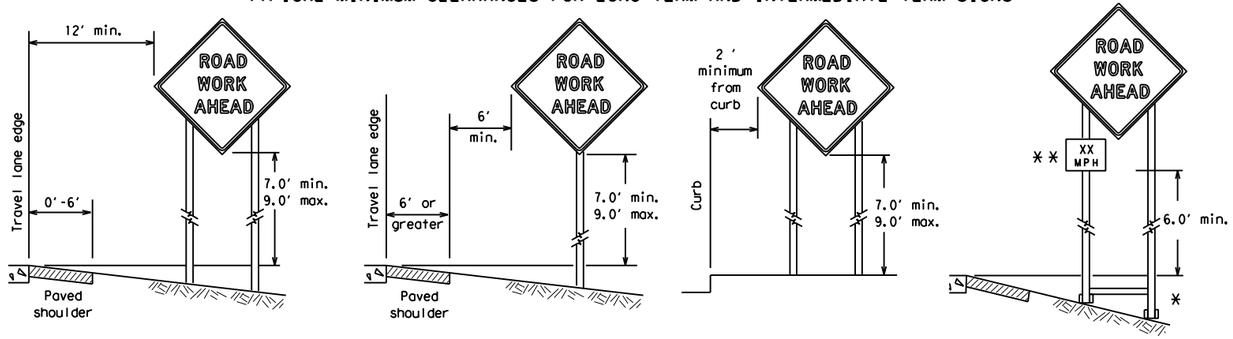
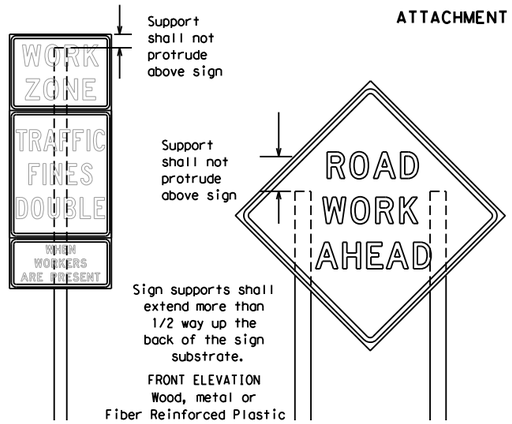
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

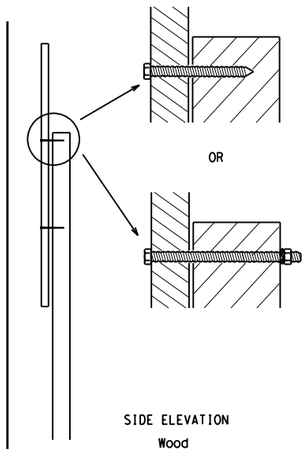


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





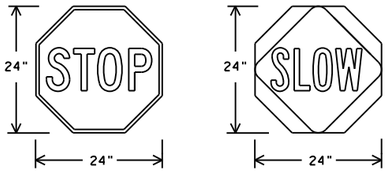
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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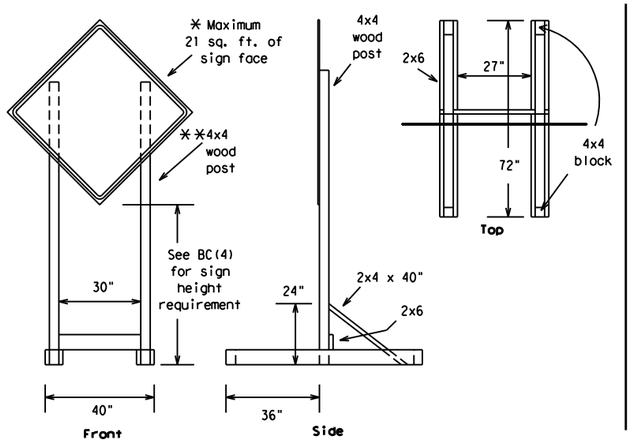
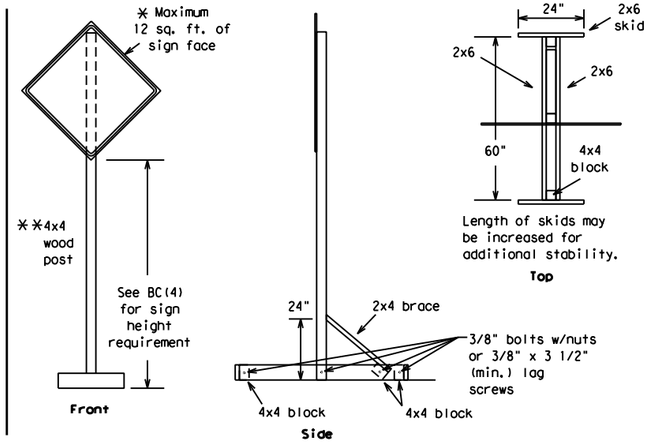
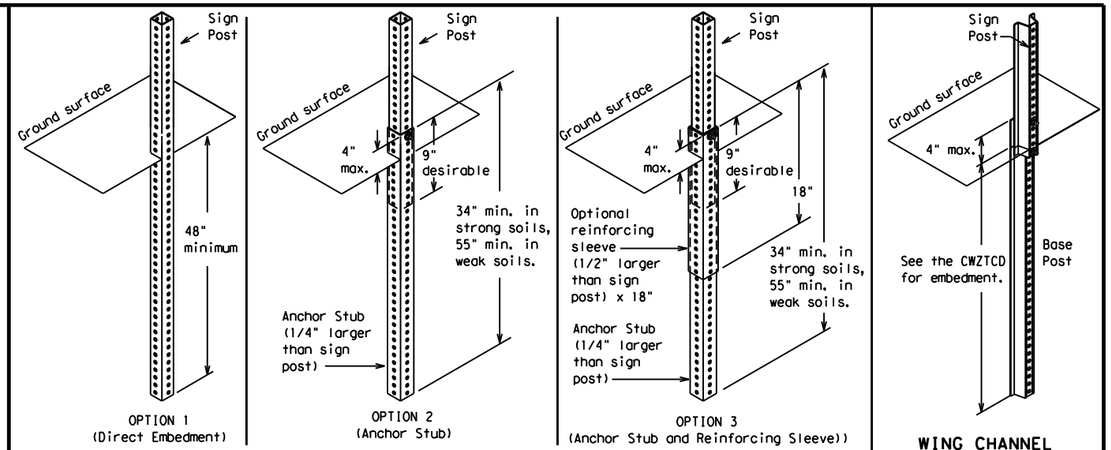
7-13 5-21	FTW	JOHNSON		27





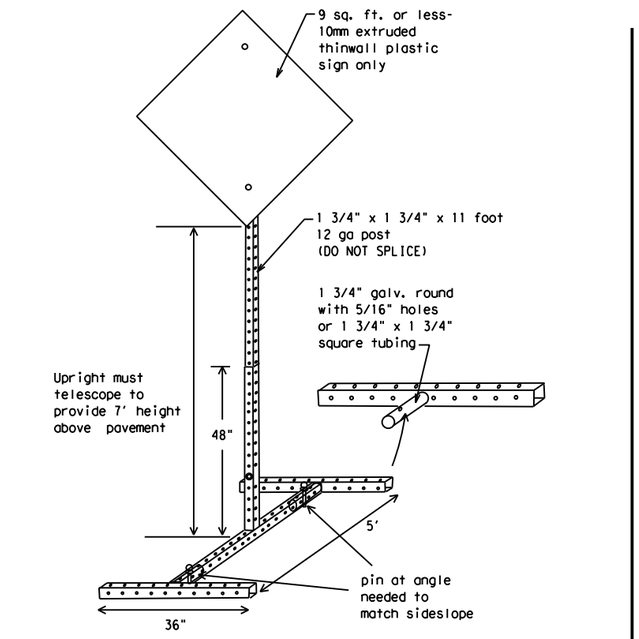
SKID MOUNTED WOOD SIGN SUPPORTS

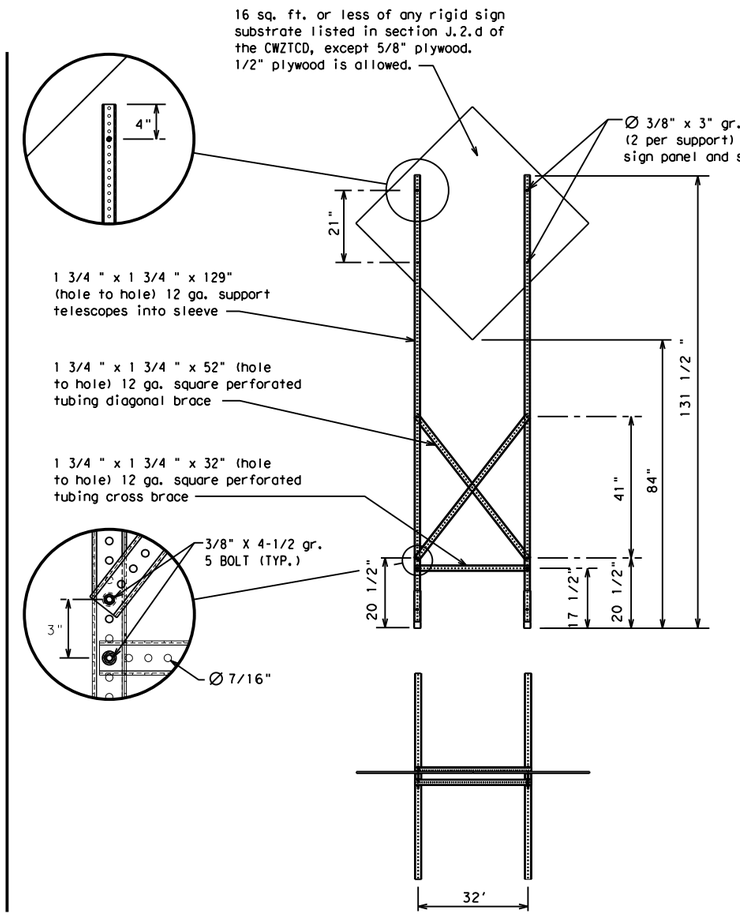
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

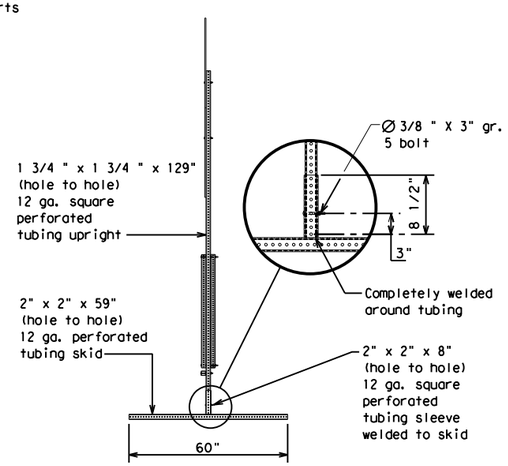


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2465	01	020	FM 2280
9-07 8-14	DIST	COUNTY		SHEET NO.
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	JOHNSON		29

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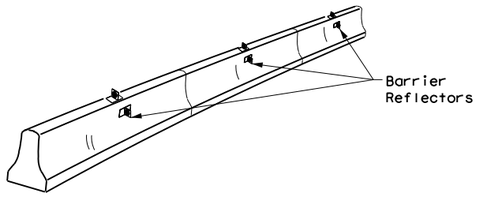
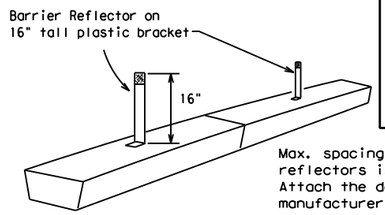
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

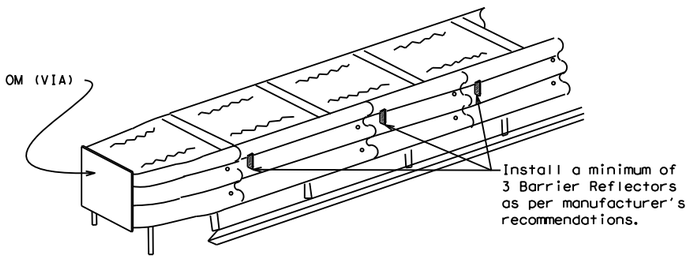


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

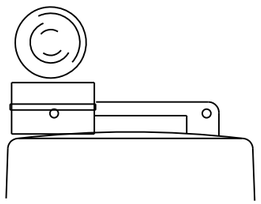


DELINEATION OF END TREATMENTS

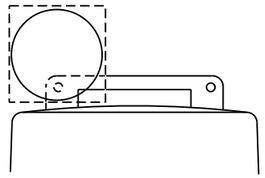
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

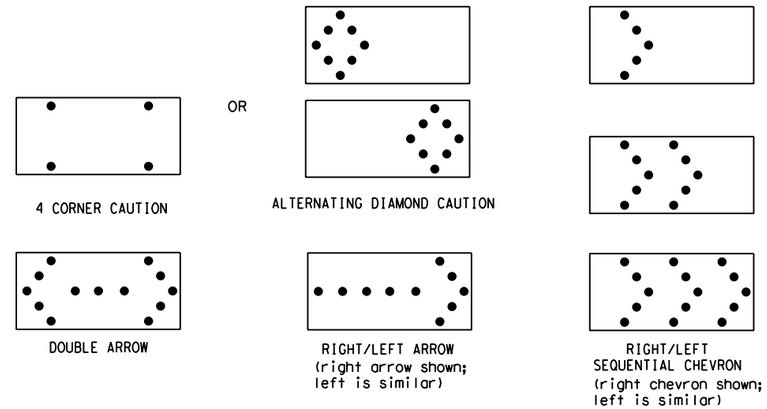
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	JOHNSON		30

101

DATE:
FILE:

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

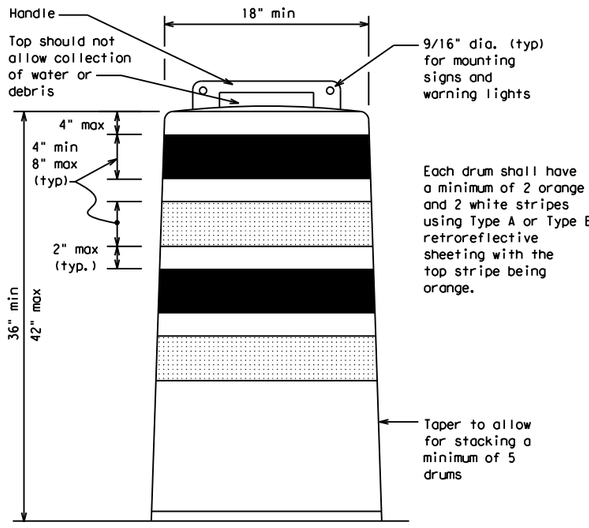
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

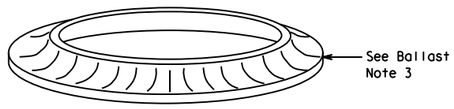
RETROREFLECTIVE SHEETING

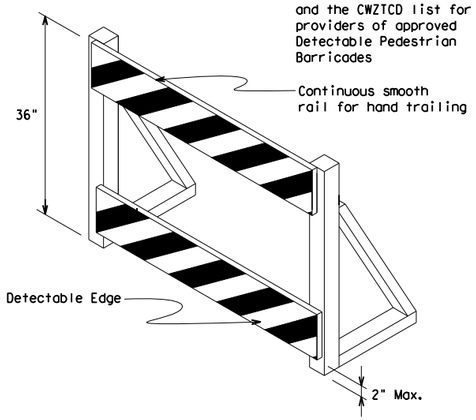
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

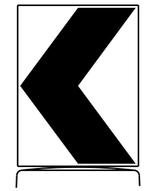




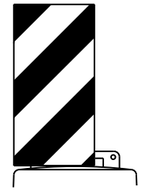


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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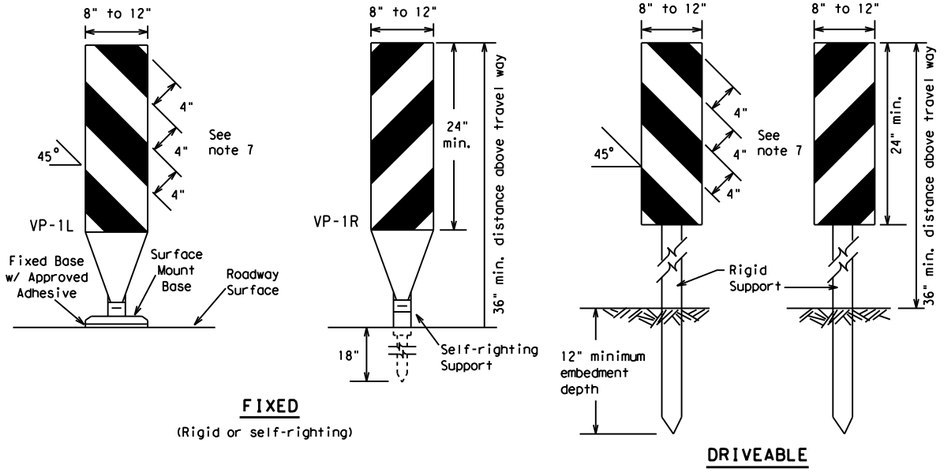
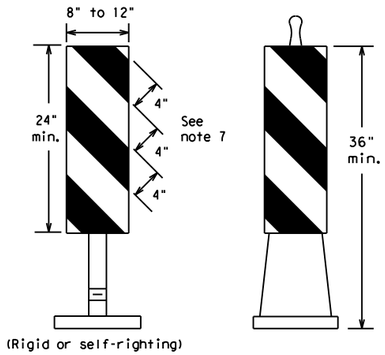


FIXED
(Rigid or self-righting)

DRIVEABLE

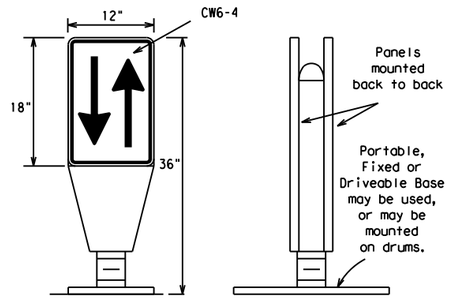


(Rigid or self-righting)

PORTABLE

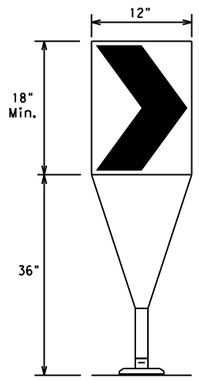
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



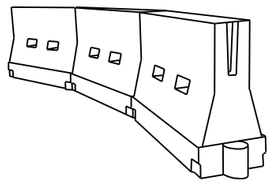
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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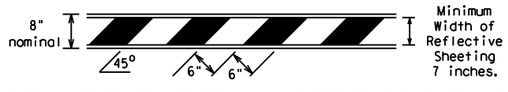
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	JOHNSON		32

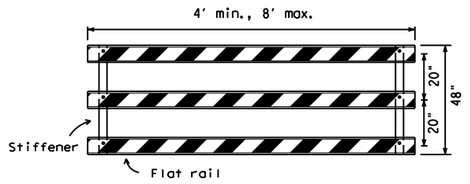
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



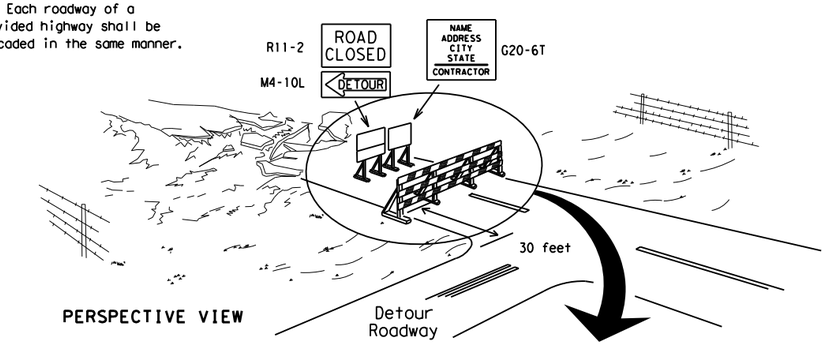
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

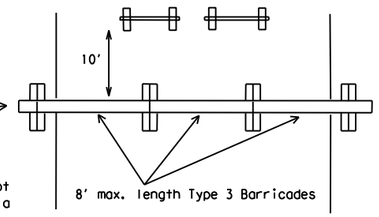
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

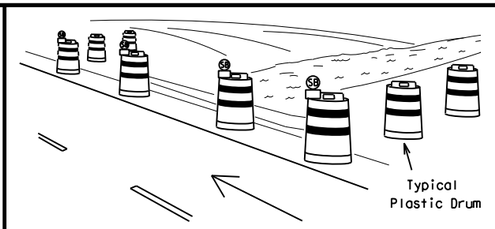
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

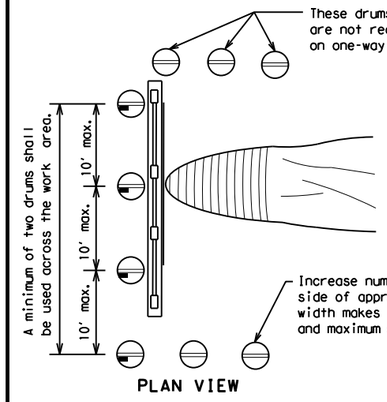
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

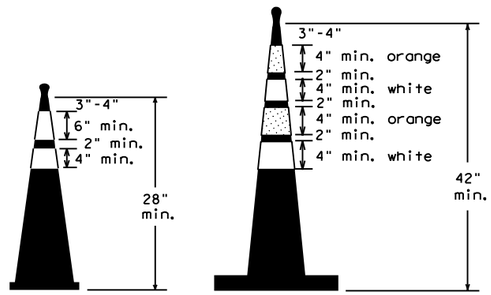
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



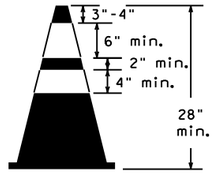
PLAN VIEW

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

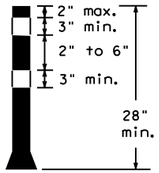
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

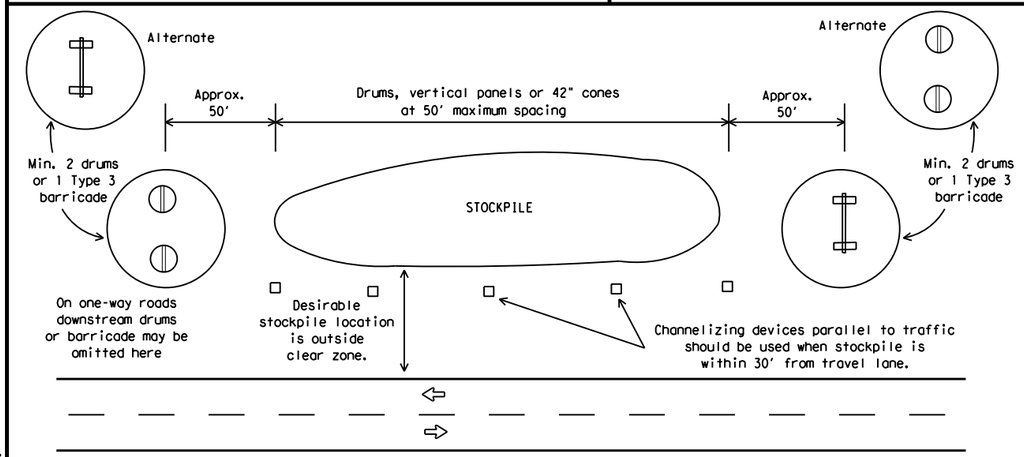


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	FTW	JOHNSON		33

DATE:
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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

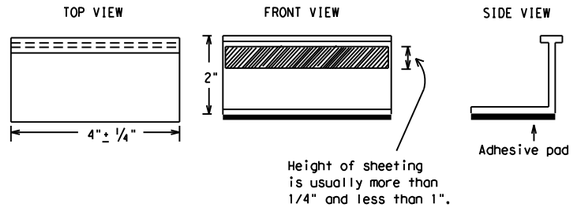
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

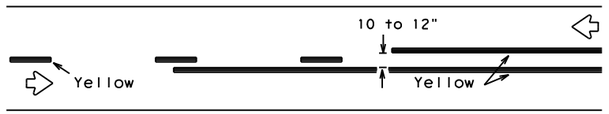
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

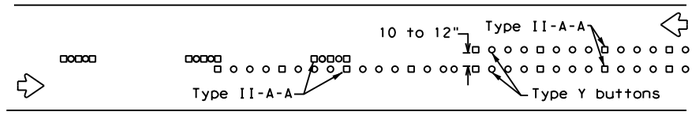
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21 1-02 7-13 11-02 8-14	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		34

DATE:
FILE:

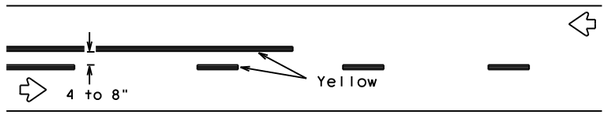
PAVEMENT MARKING PATTERNS



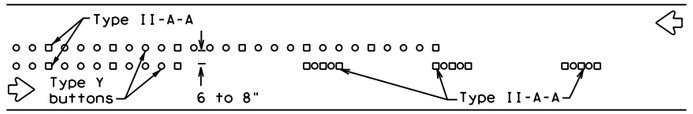
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



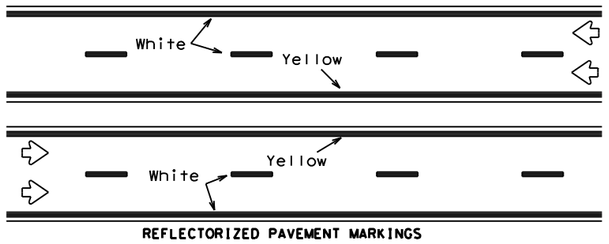
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



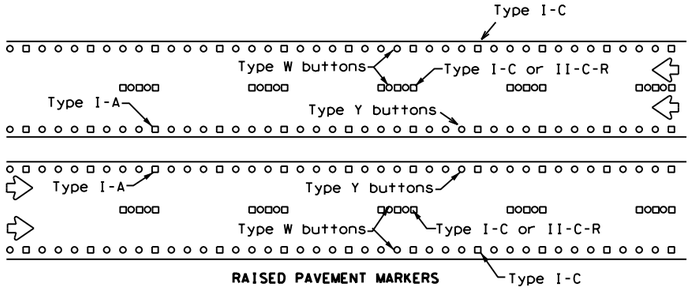
RAISED PAVEMENT MARKERS - PATTERN B

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

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



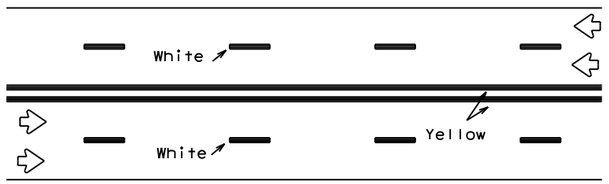
REFLECTORIZED PAVEMENT MARKINGS



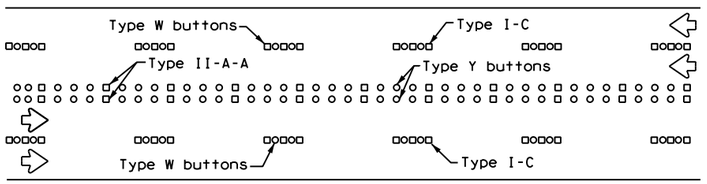
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



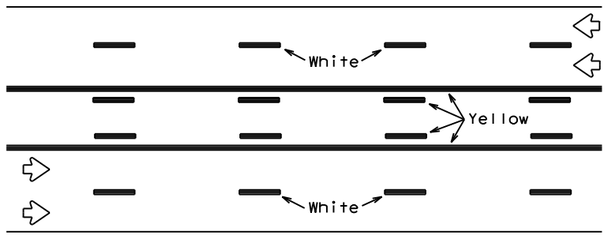
REFLECTORIZED PAVEMENT MARKINGS



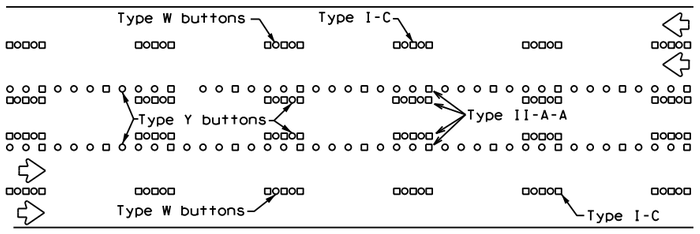
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

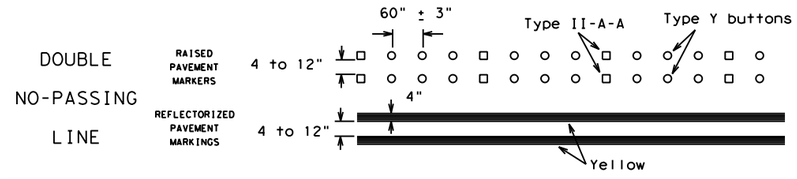
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

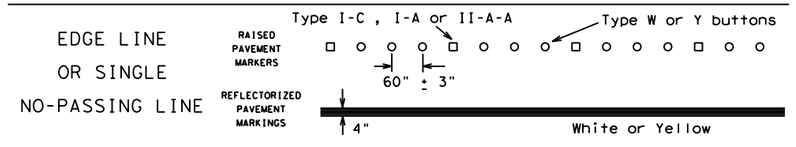
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

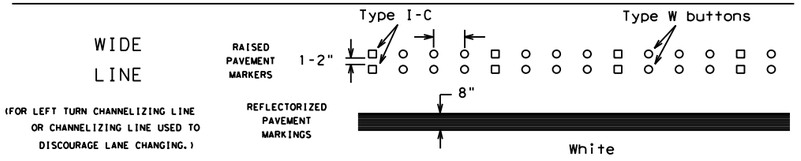


EDGE LINE OR SINGLE NO-PASSING LINE



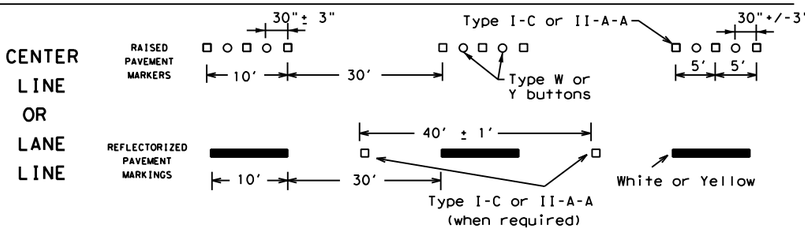
WIDE LINE

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

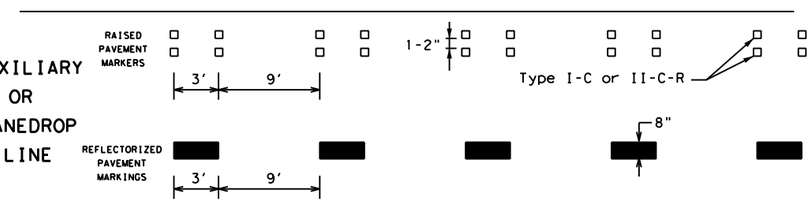


BROKEN LINES

CENTER LINE OR LANE LINE

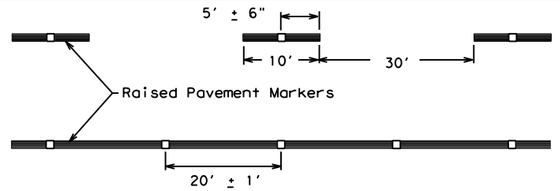


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

SHEET 12 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		35

106

DATE:
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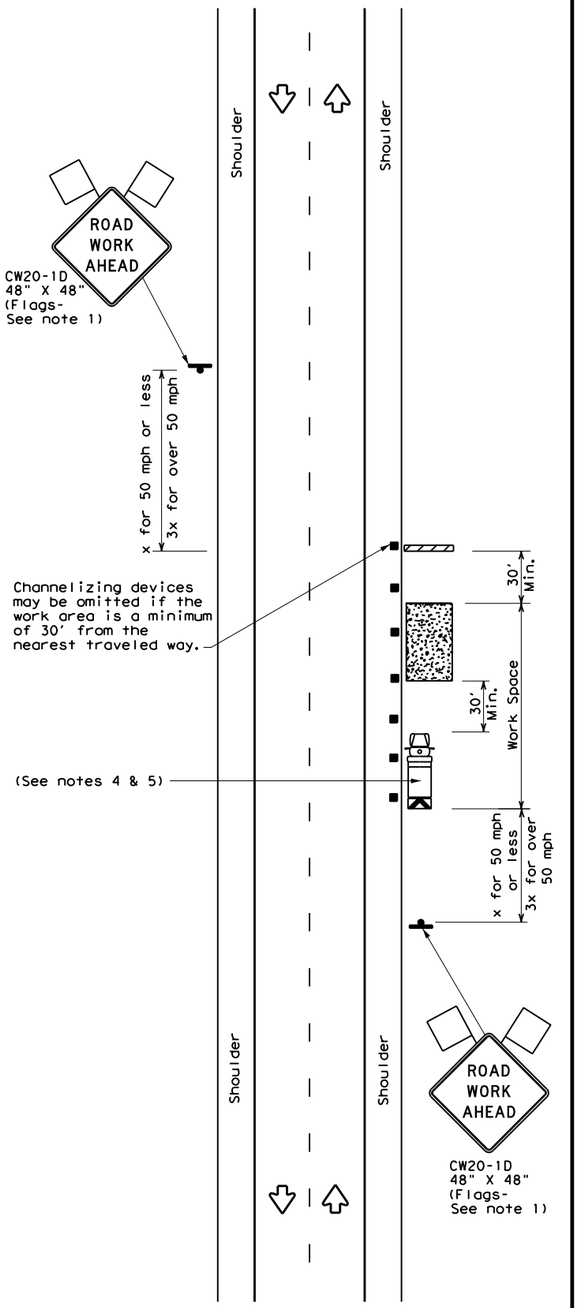
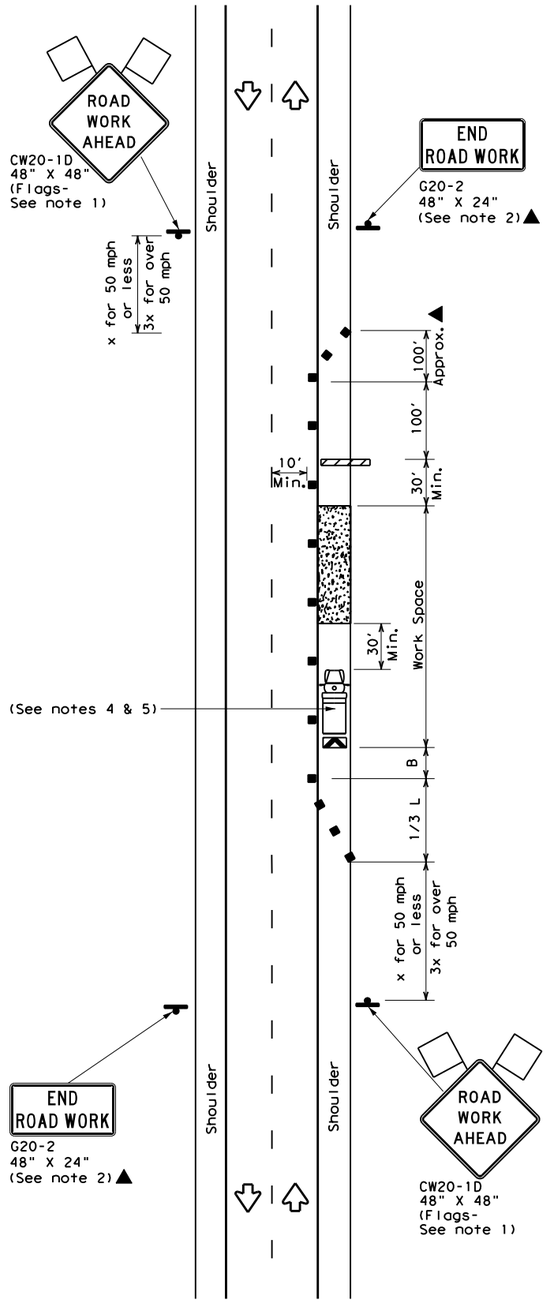


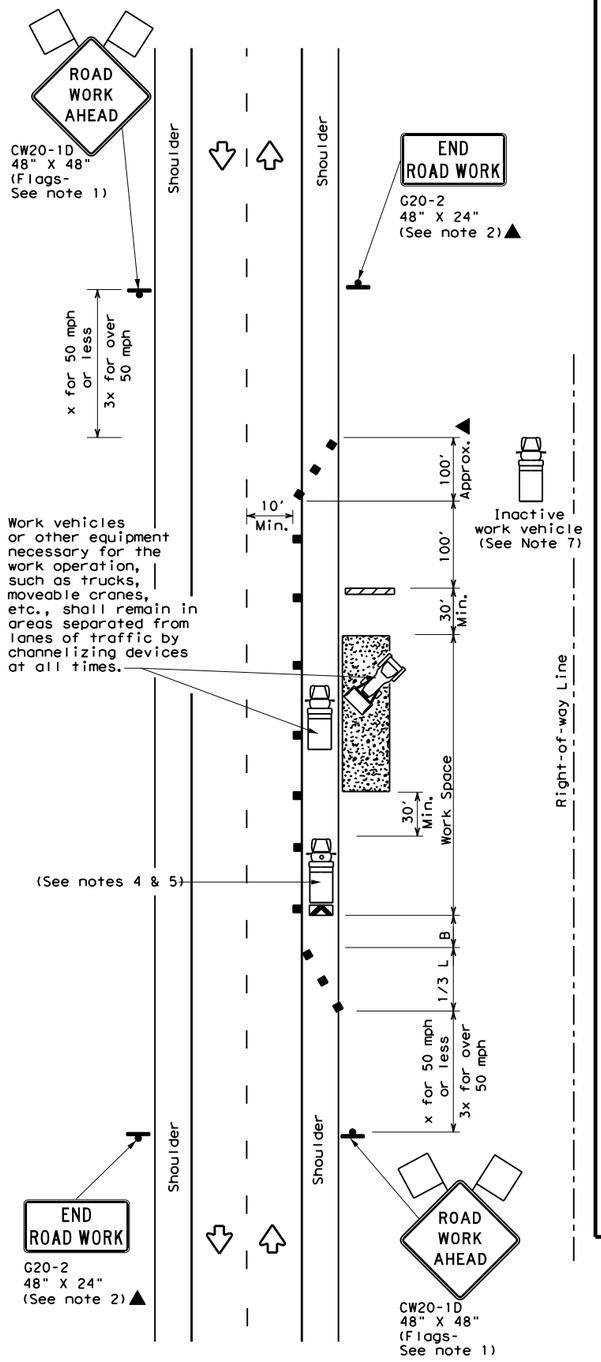
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	FTW	JOHNSON		36
1-97 2-18				

DATE:
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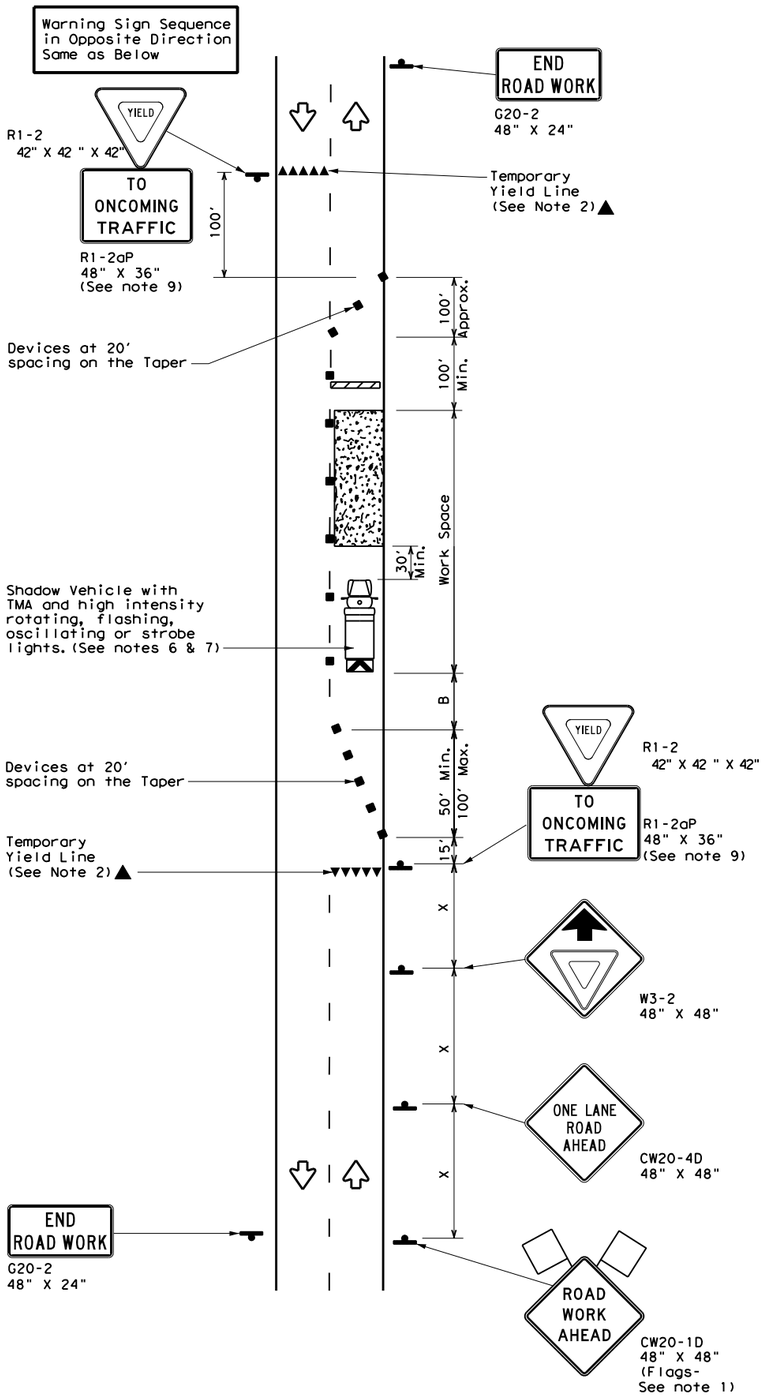
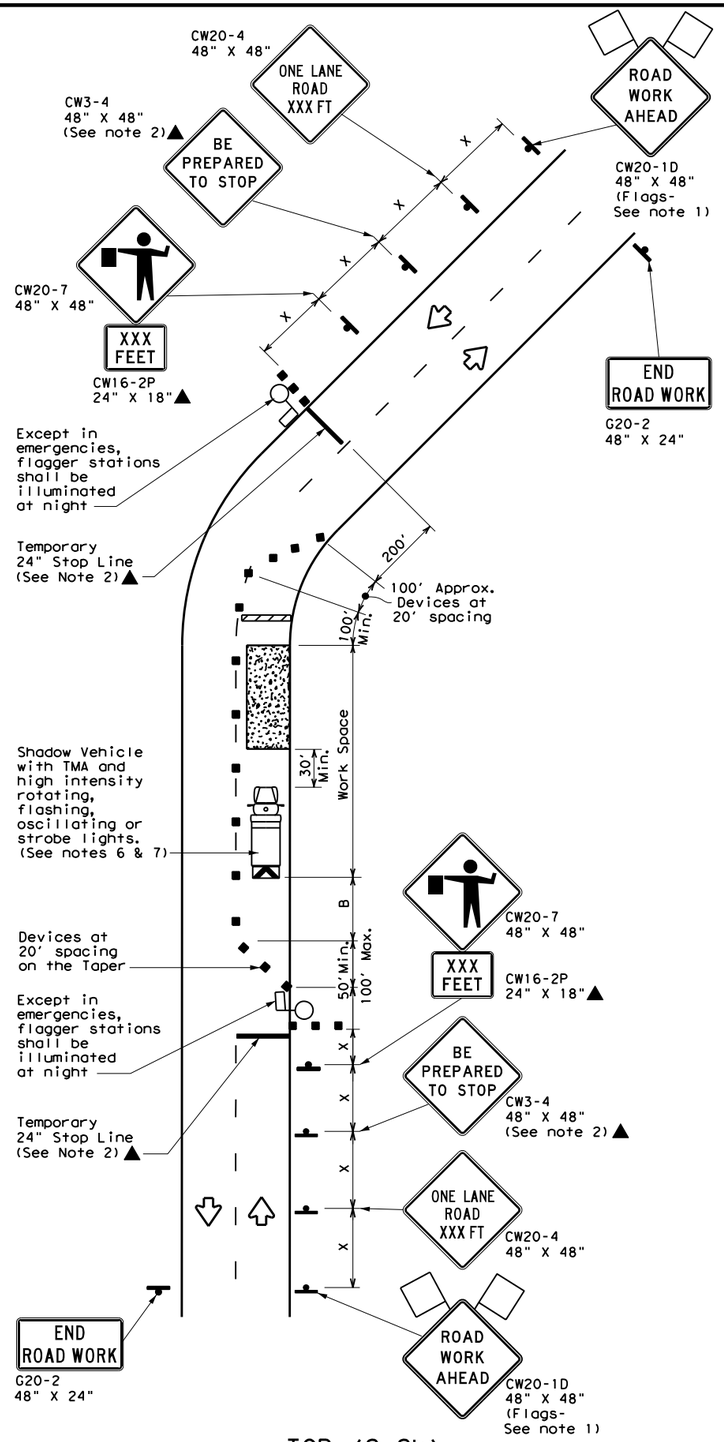


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

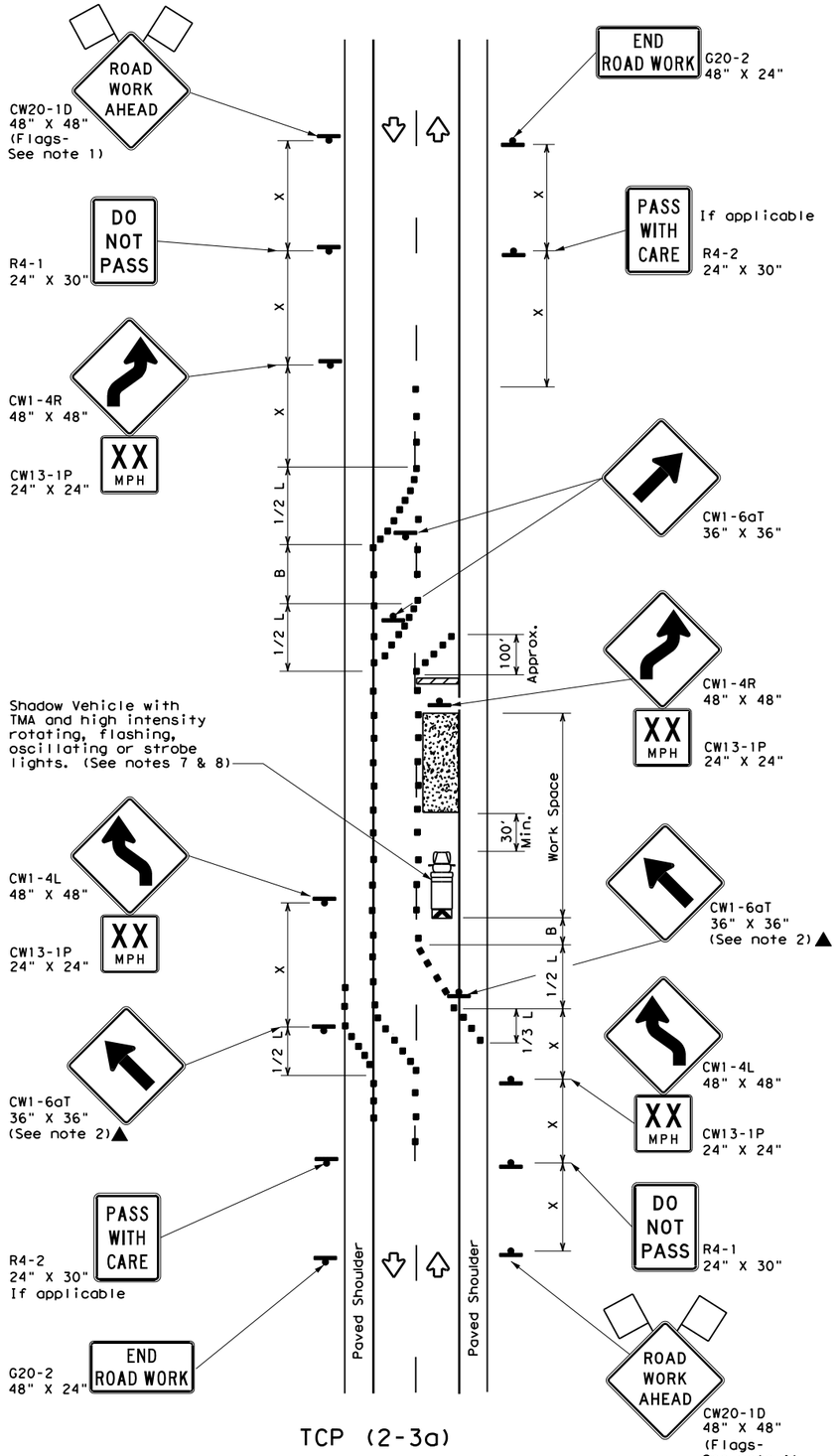
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

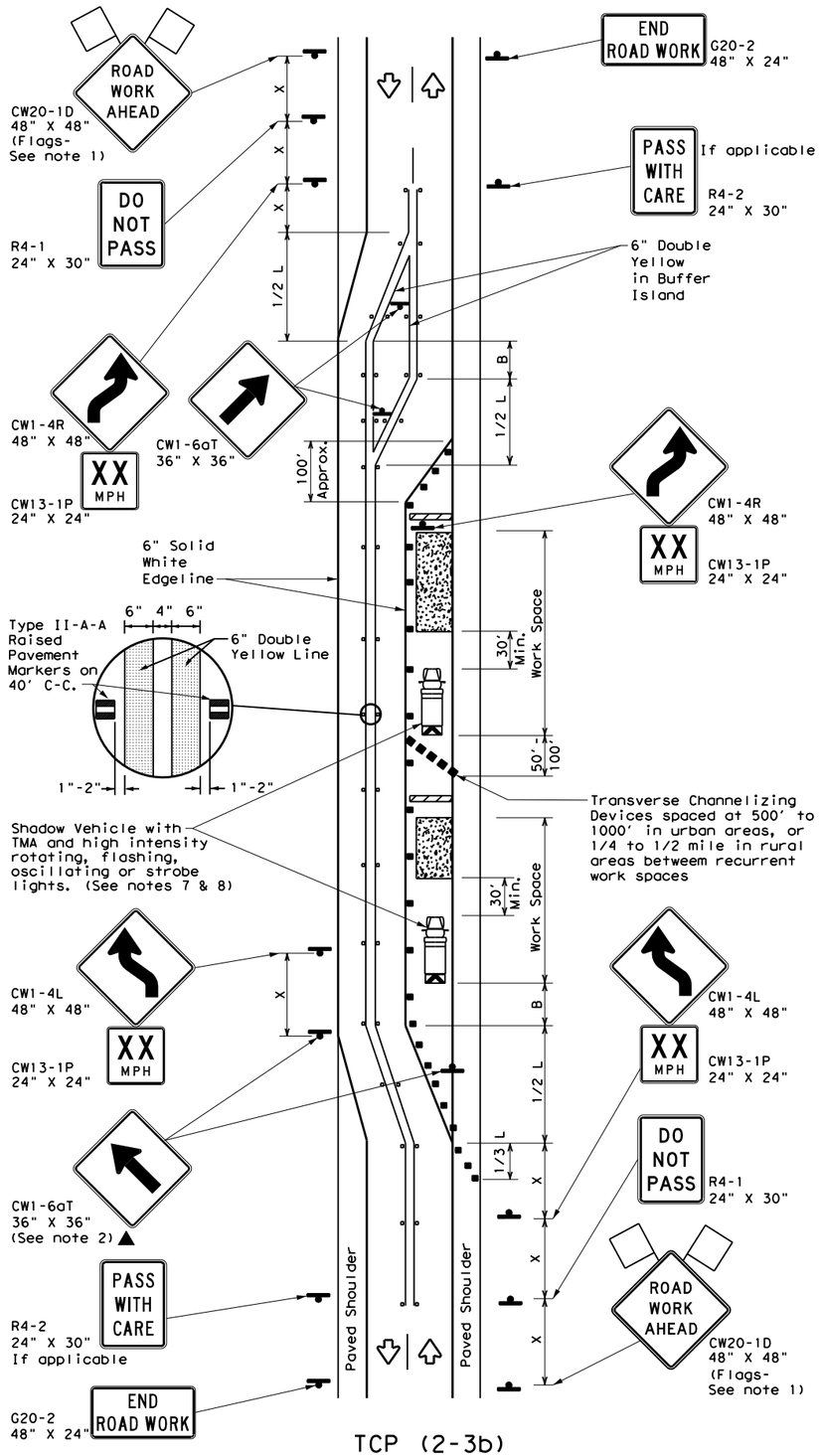
FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	FTW	JOHNSON		37
4-98 2-18				

DATE:
FILE:



TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	• • • •	Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

* Conventional Roads Only

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
				TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. 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 (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. 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 device spacing is intended for the area of the conflicting markings, not the entire work zone.

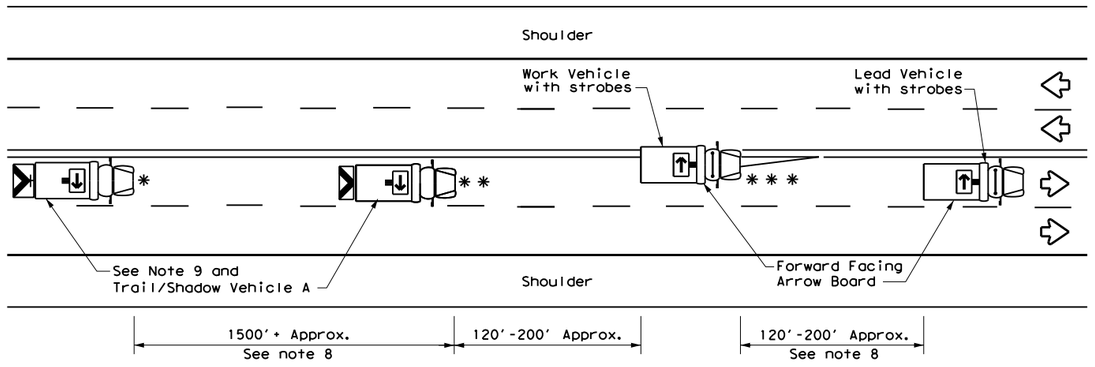
Texas Department of Transportation | Traffic Safety Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-23

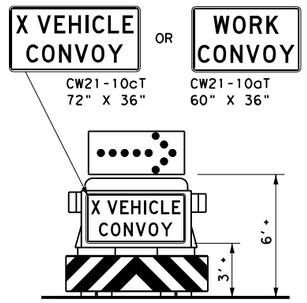
FILE: tcp(2-3)-23.dgn	DN:	CK:	DW:	CK:
©TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18	2465	01	020	FM 2280
8-95 3-03 4-23	DIST	COUNTY		SHEET NO.
1-97 2-12	FTW	JOHNSON		38

DATE:
FILE:



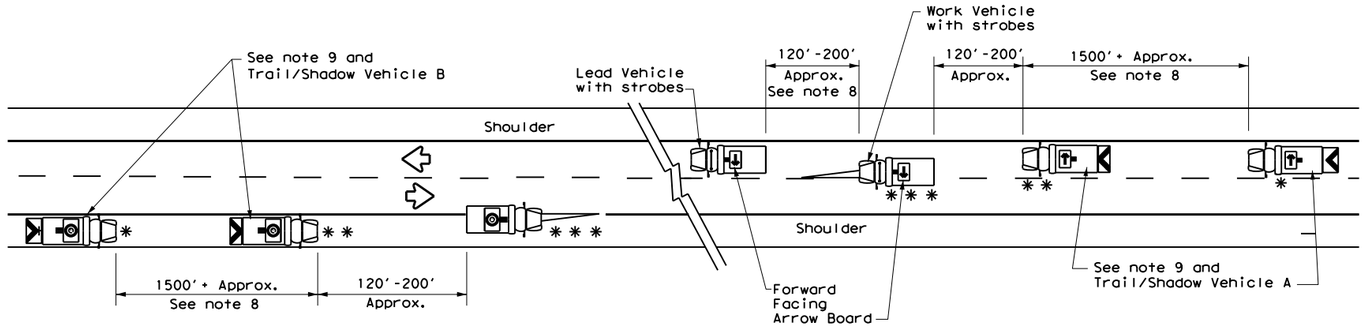
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

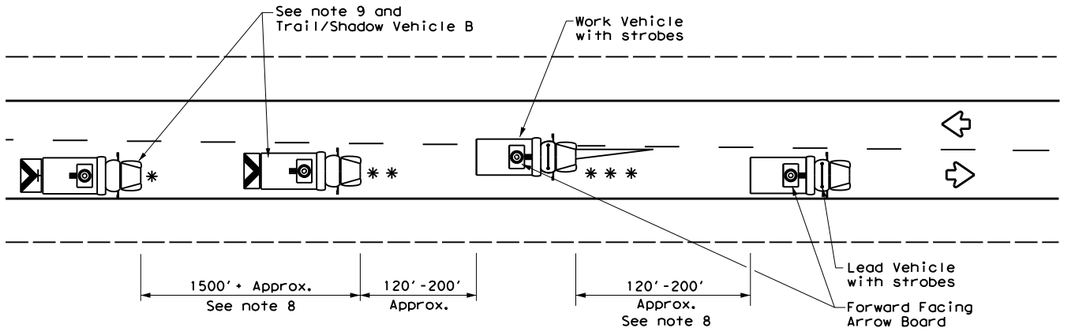


WORK ON SHOULDER

WORK ON TRAVEL LANE

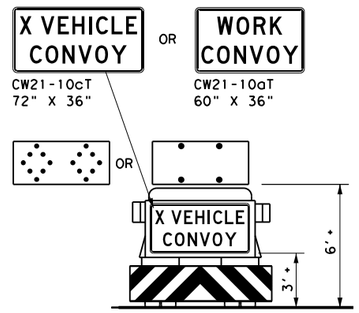
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

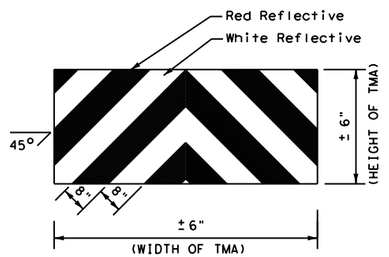
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		39

DATE:
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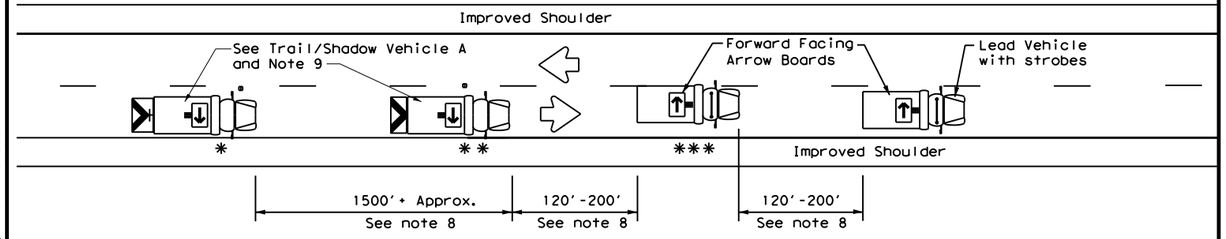
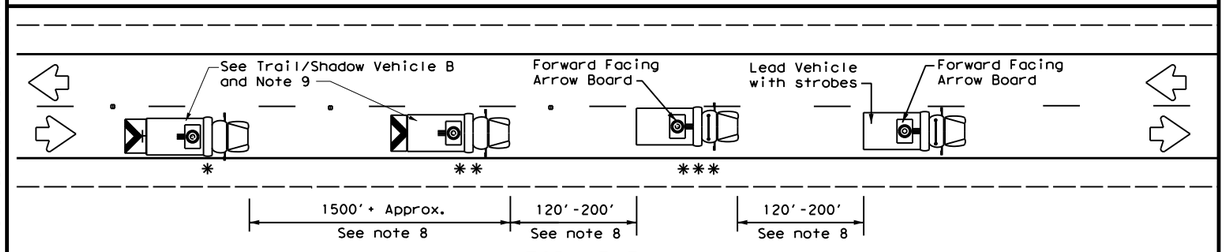


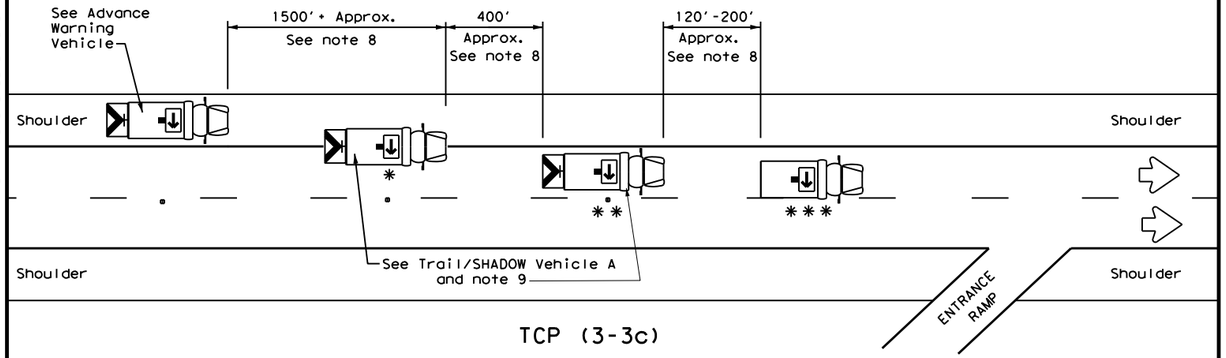
TCP (3-3a)

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



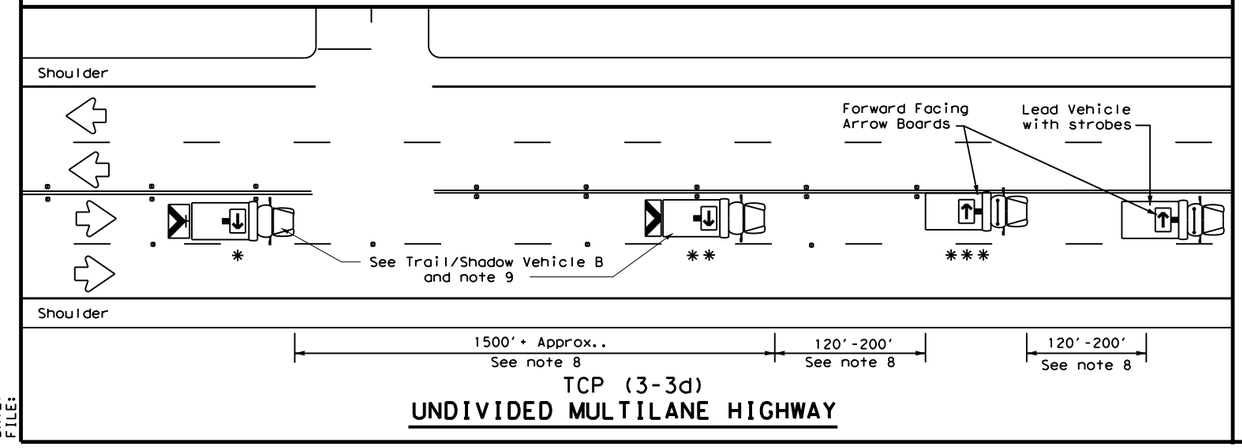
TCP (3-3b)

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



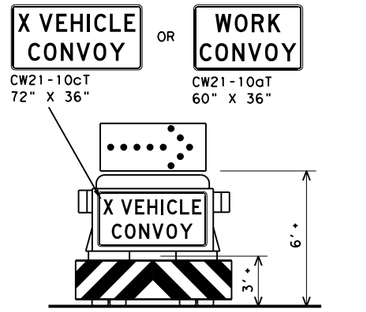
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



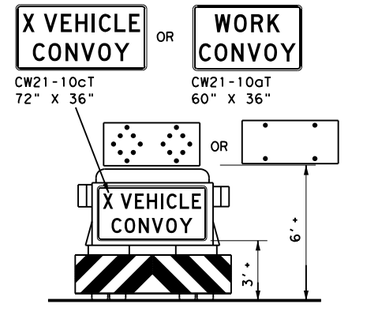
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



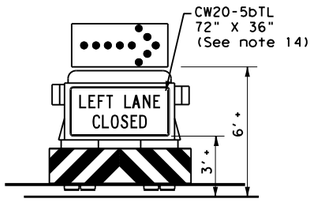
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

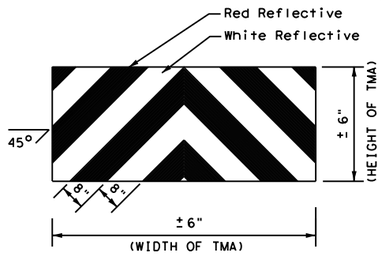


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	FTW	JOHNSON		40
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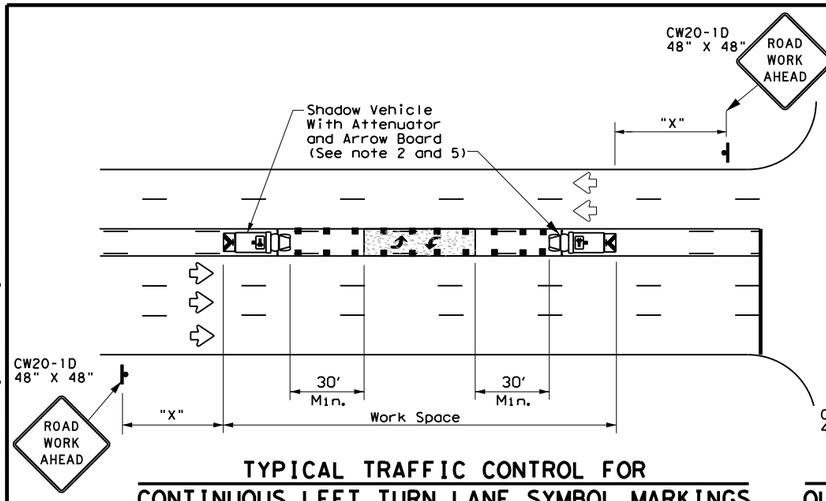
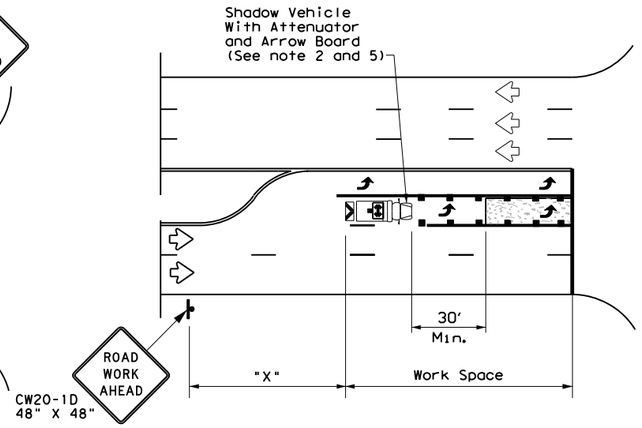
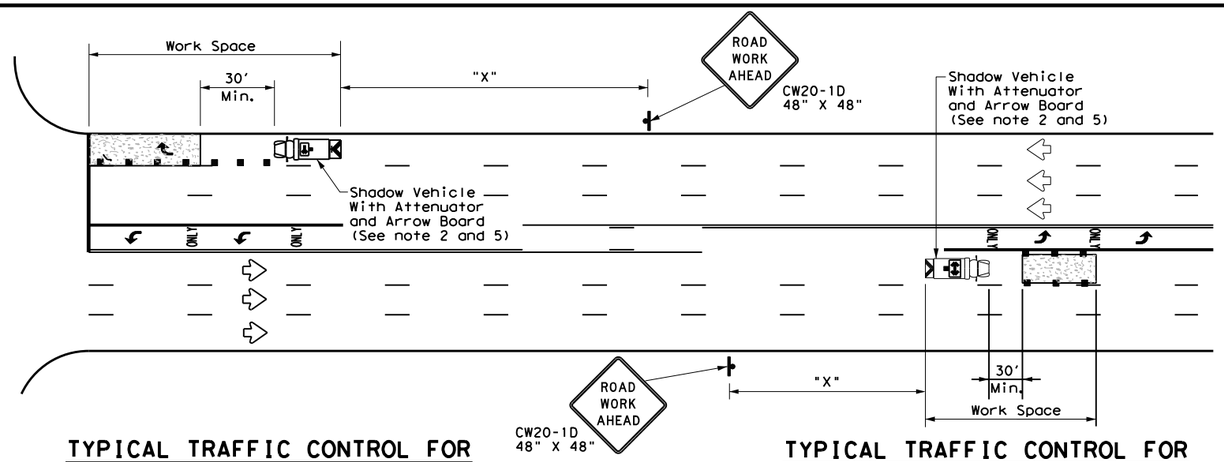


TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

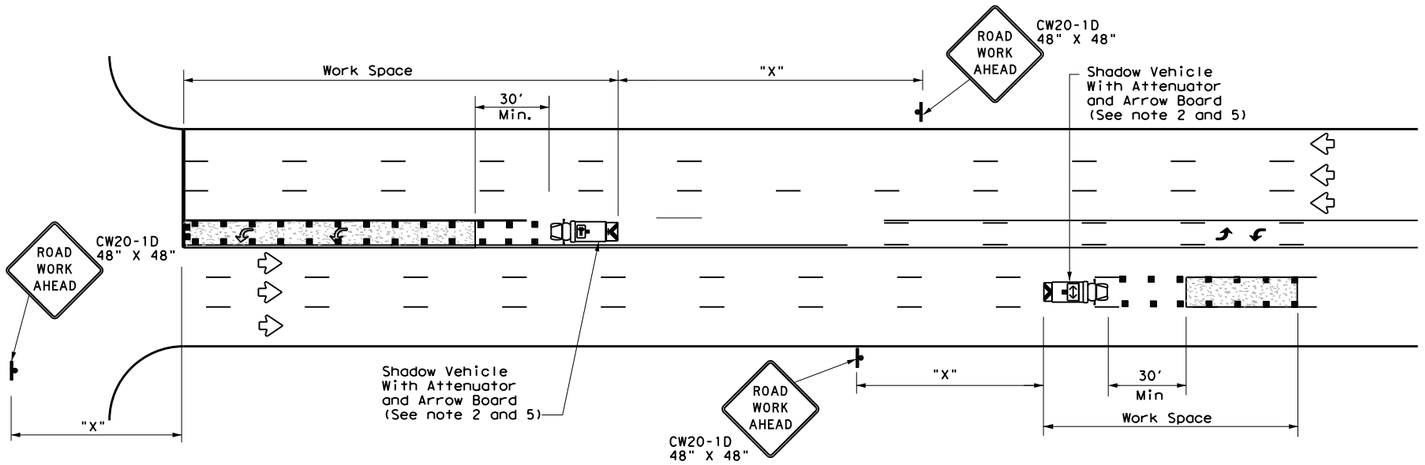


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

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	■ ■ ■	Channelizing Devices

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

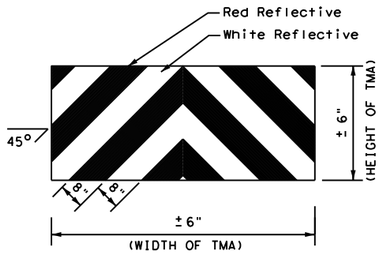
* Conventional Roads Only

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

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

GENERAL NOTES

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		41

DATE:
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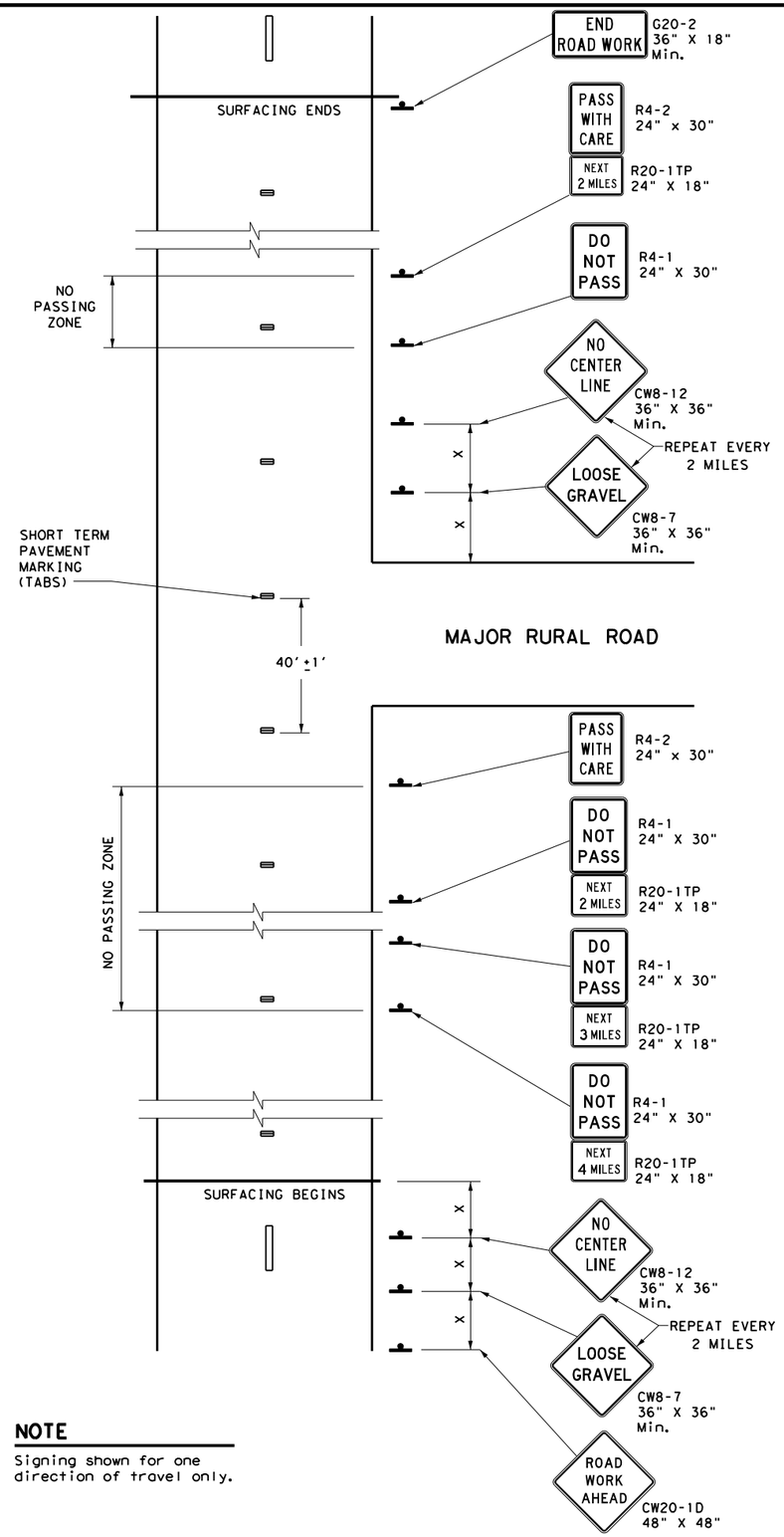
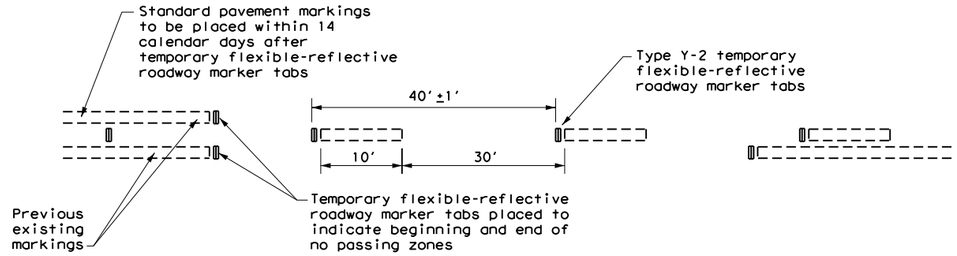


NOTE

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

A. 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.

B. 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.

C. 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.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. 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.

B. 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.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. 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.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. 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.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. 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.

B. 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

1. 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.
2. 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.
3. 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.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. 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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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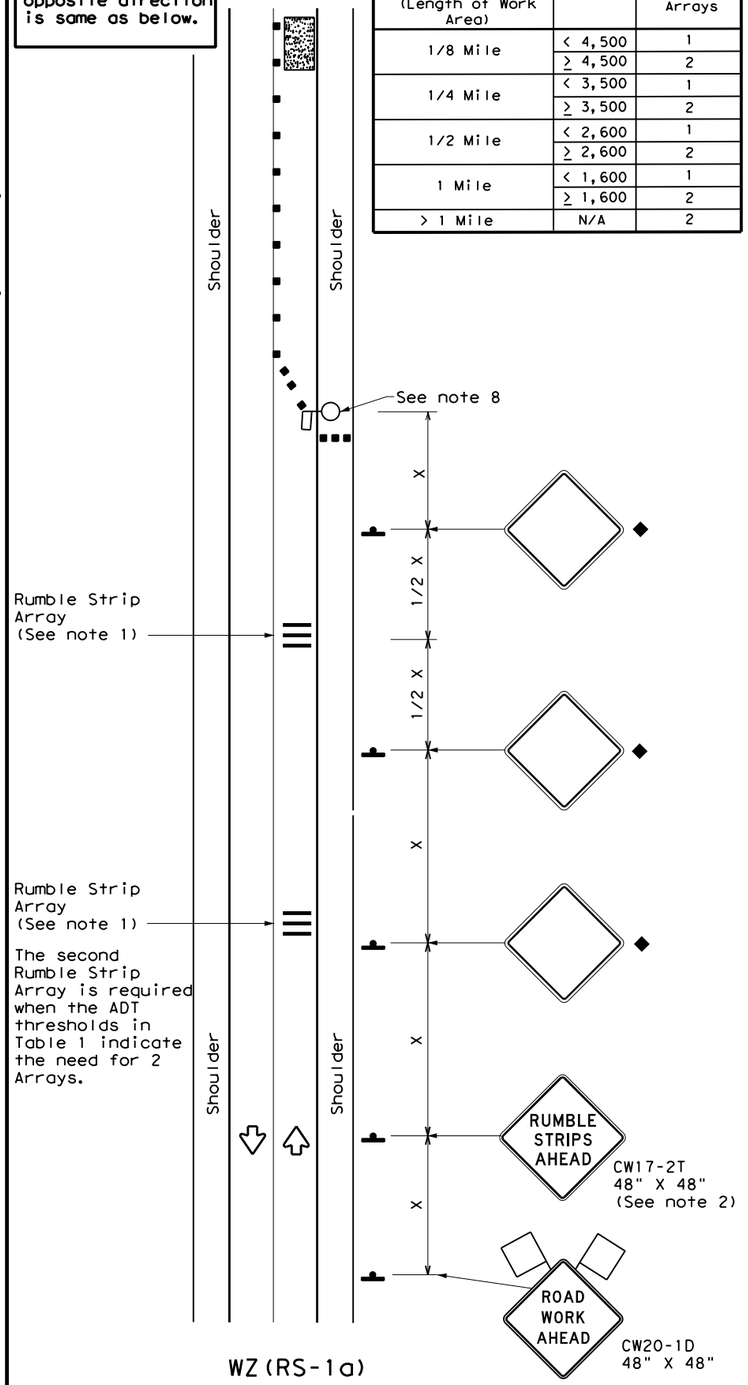
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	FTW	JOHNSON		42

210

DATE:
FILE:

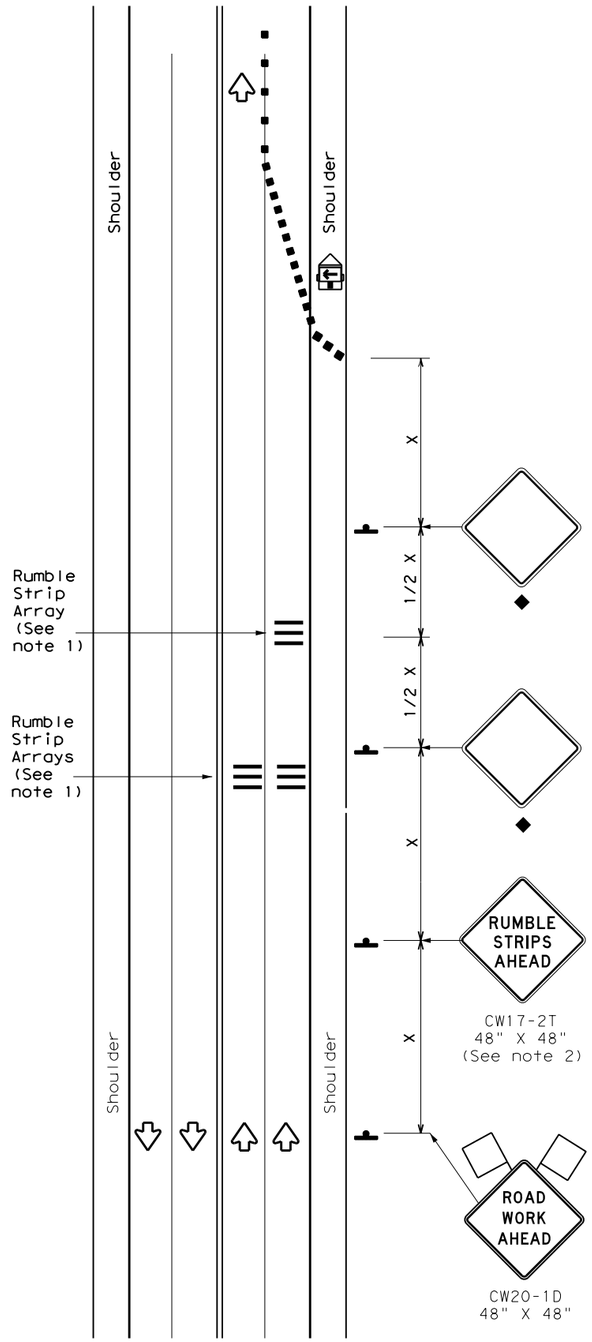
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
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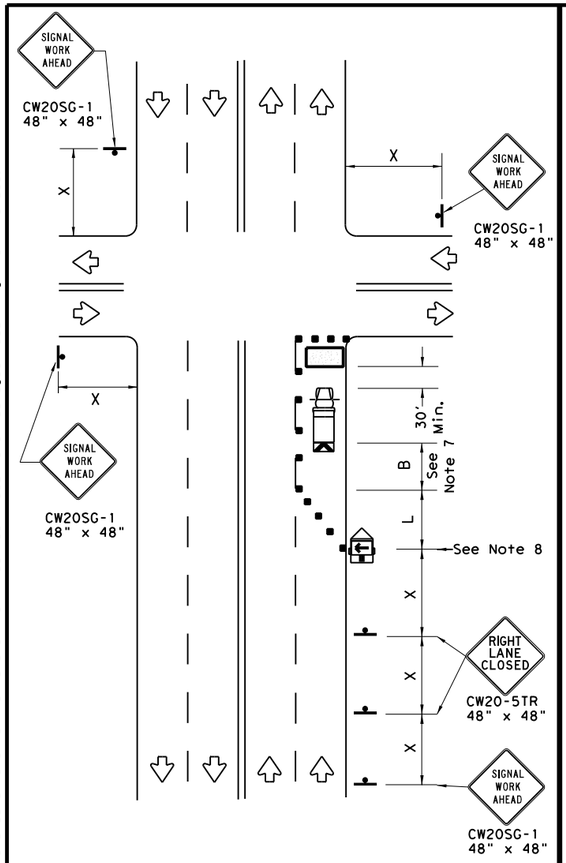
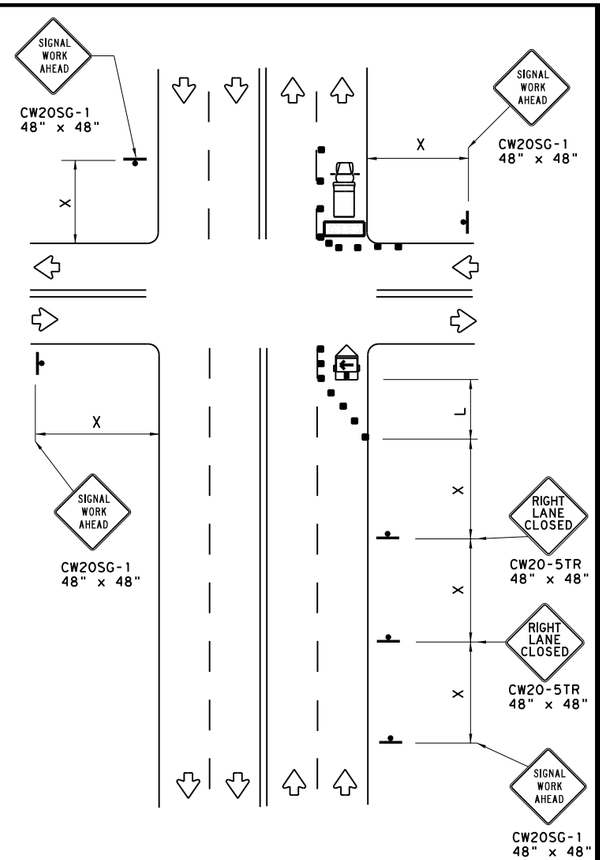


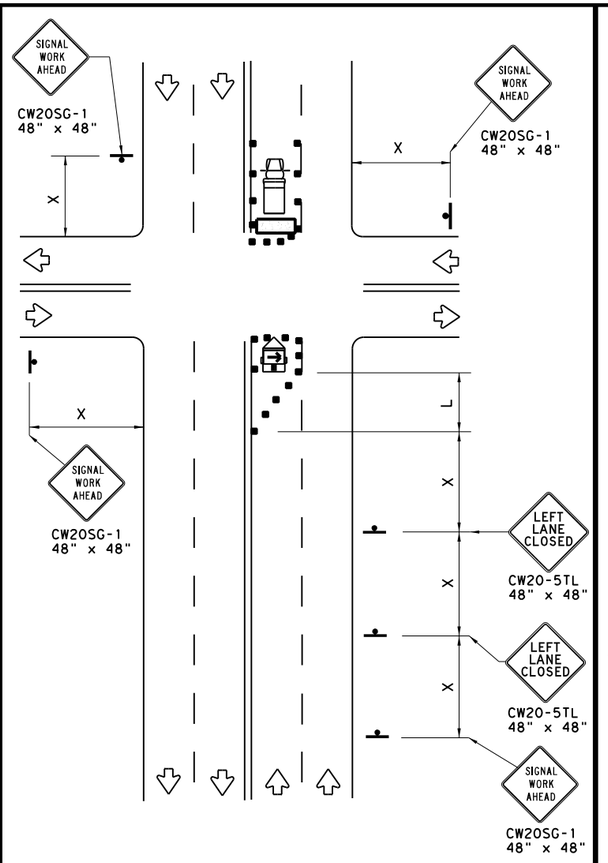
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



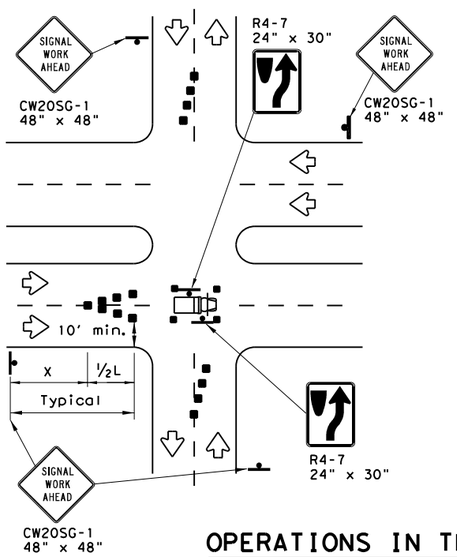
FAR SIDE RIGHT LANE CLOSURE

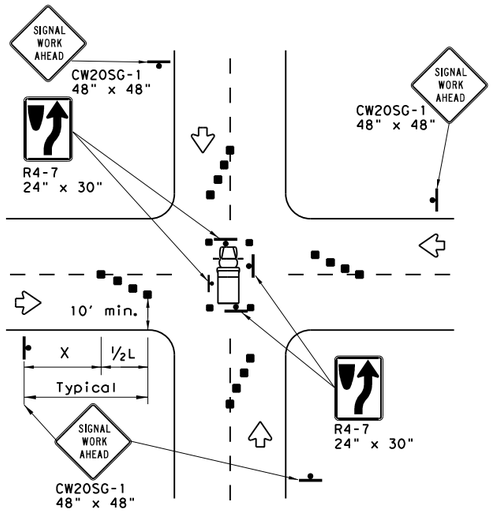
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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

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

* Conventional Roads Only

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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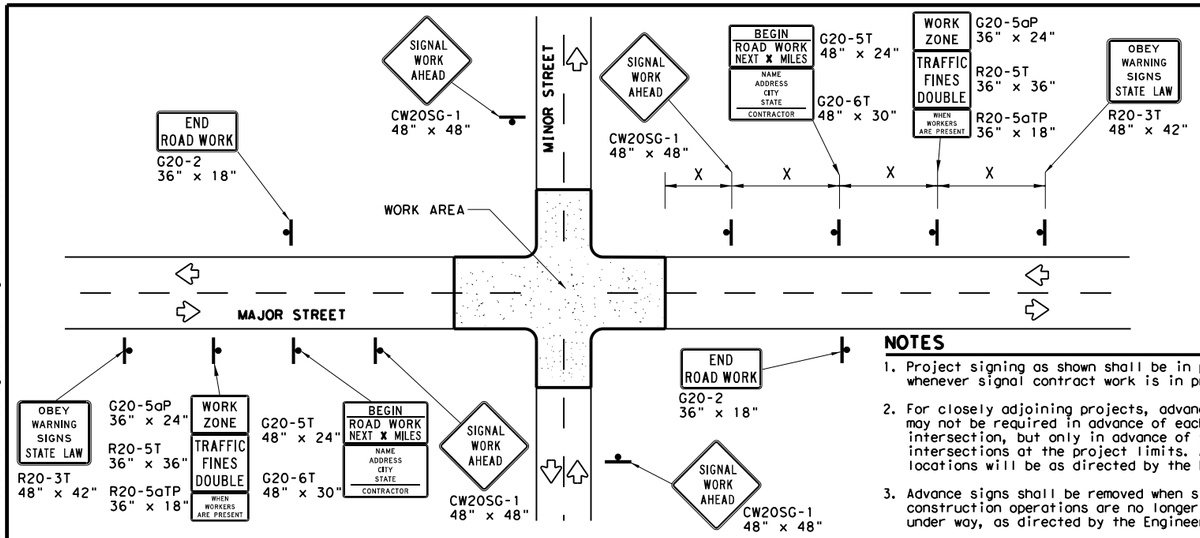


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

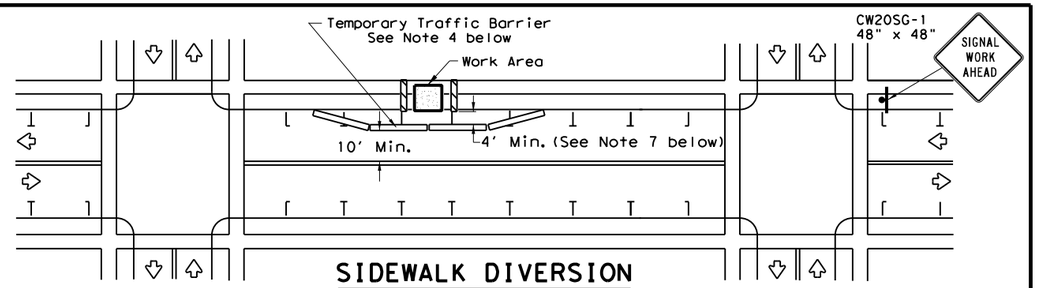
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

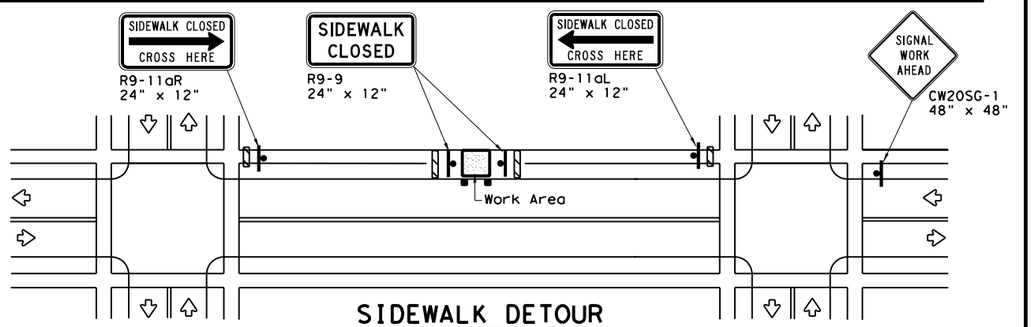
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

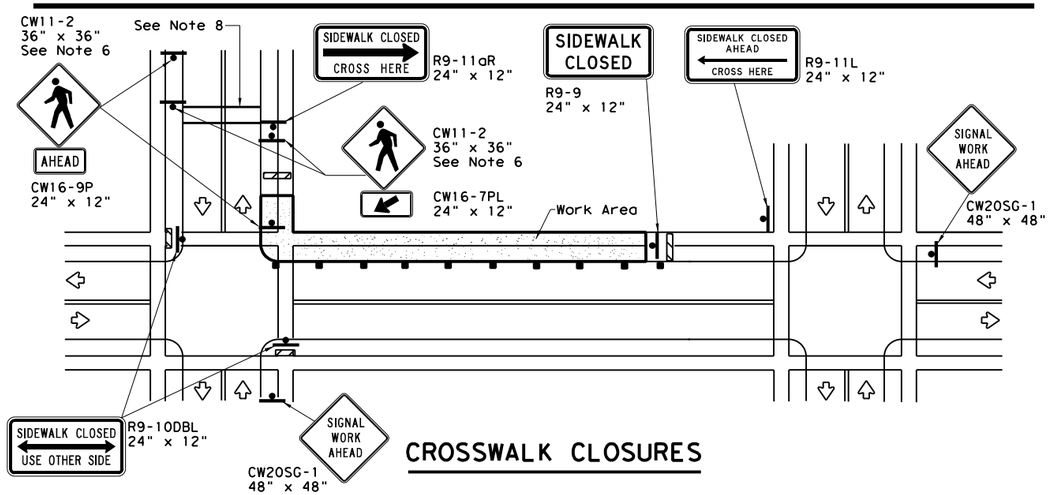
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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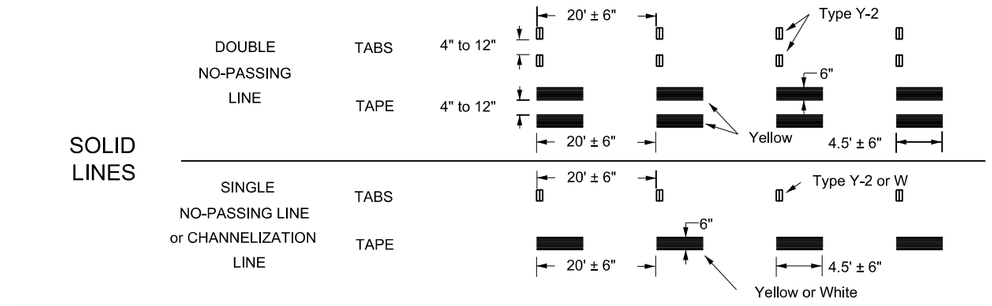
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	FTW	JOHNSON		45

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



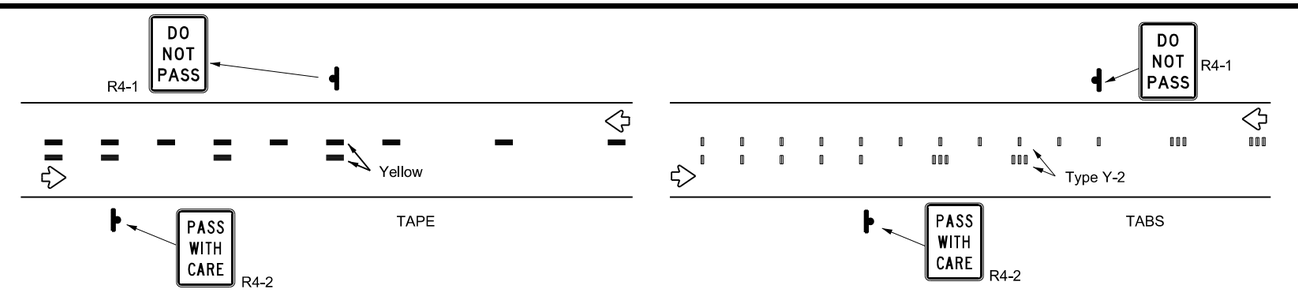
NOTES:

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

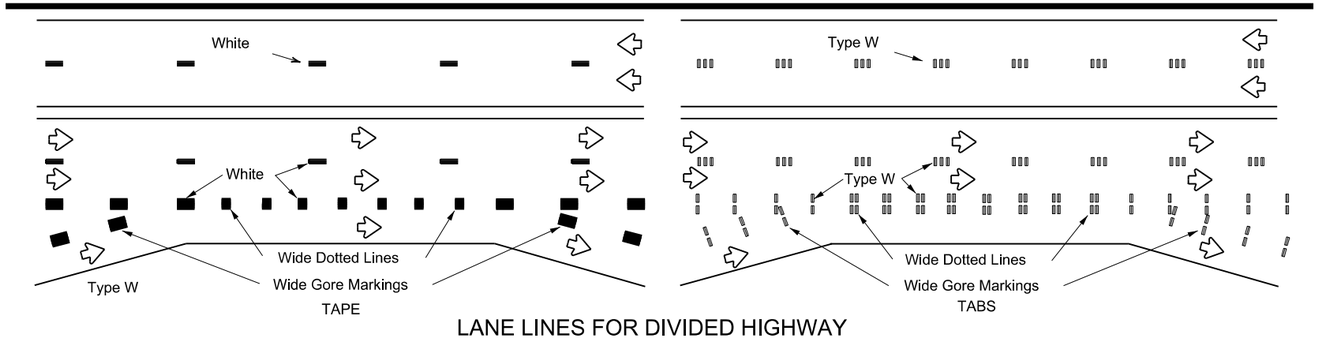
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

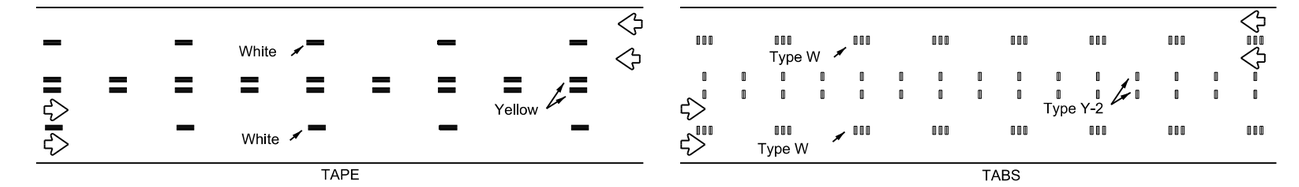
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



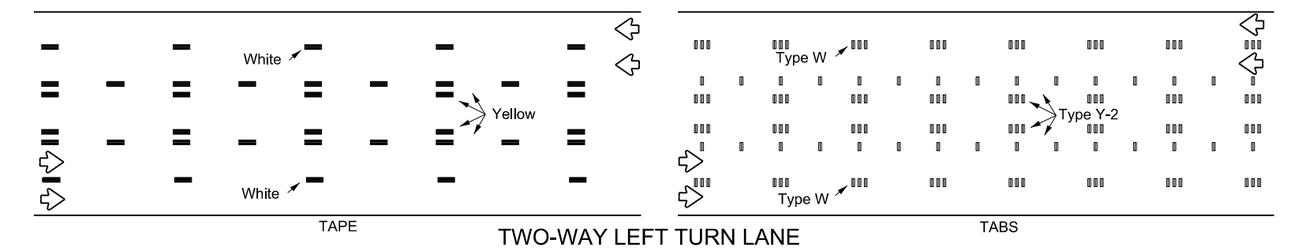
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



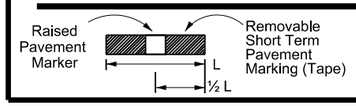
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
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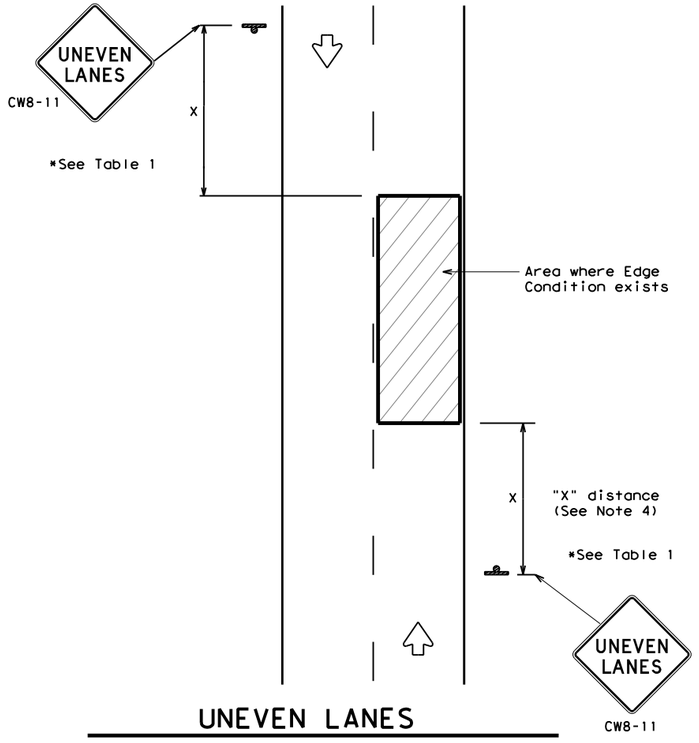
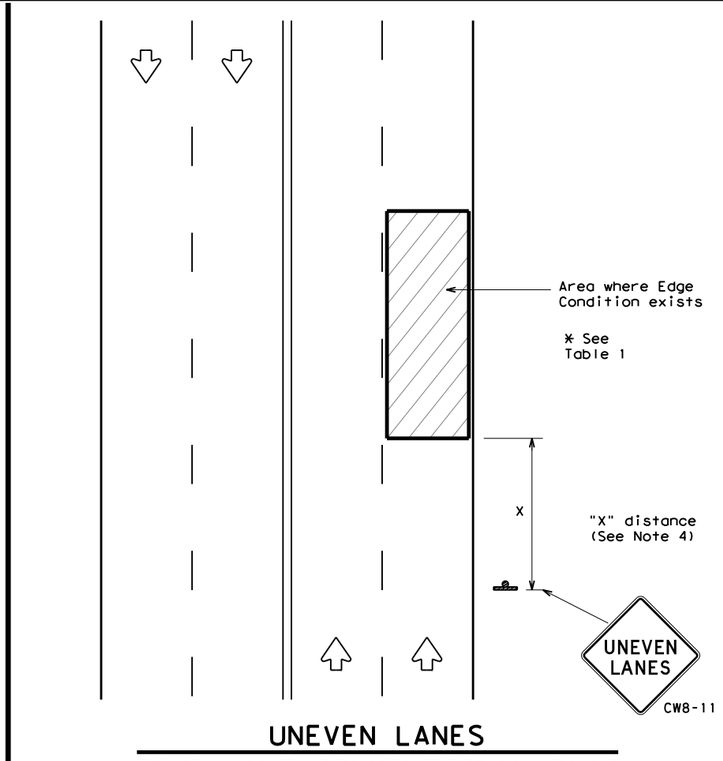
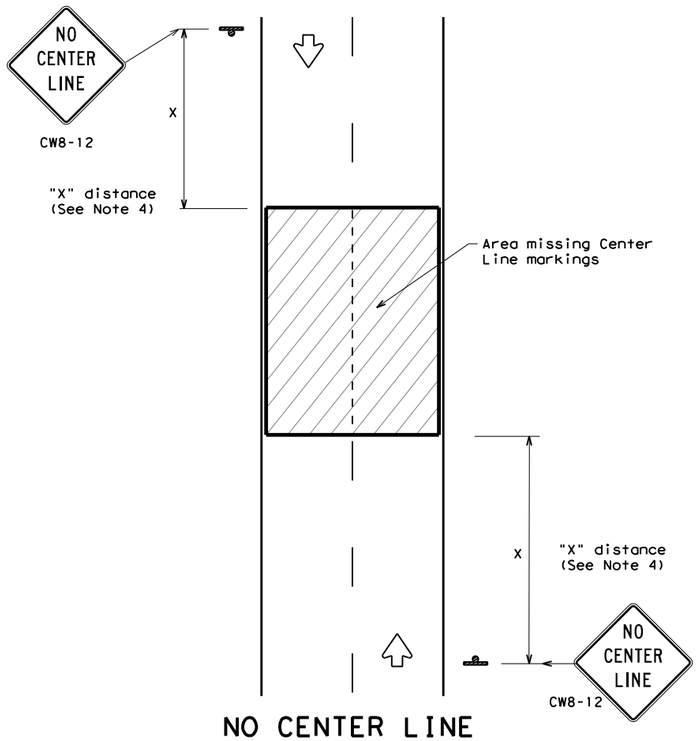


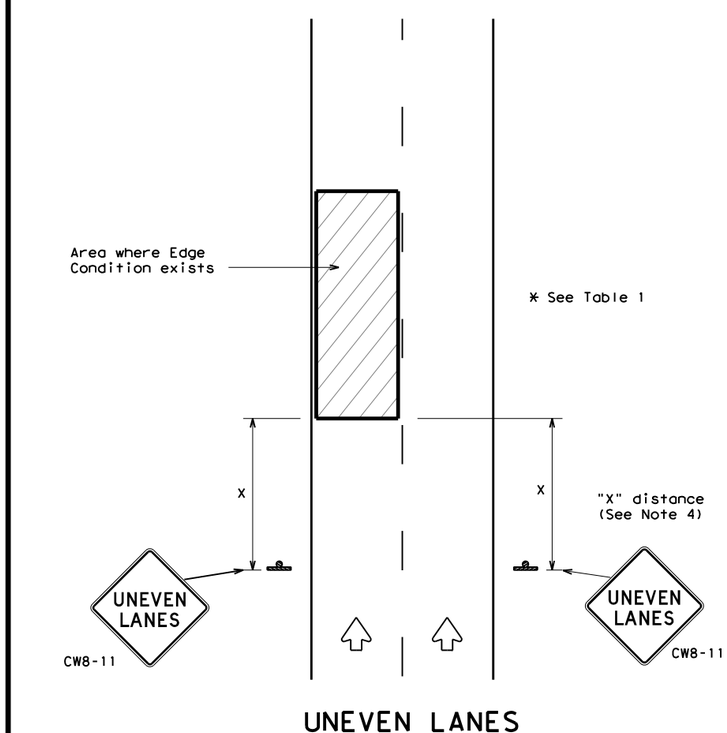
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

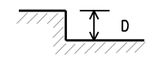
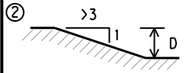
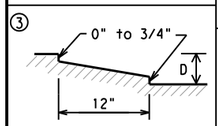
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

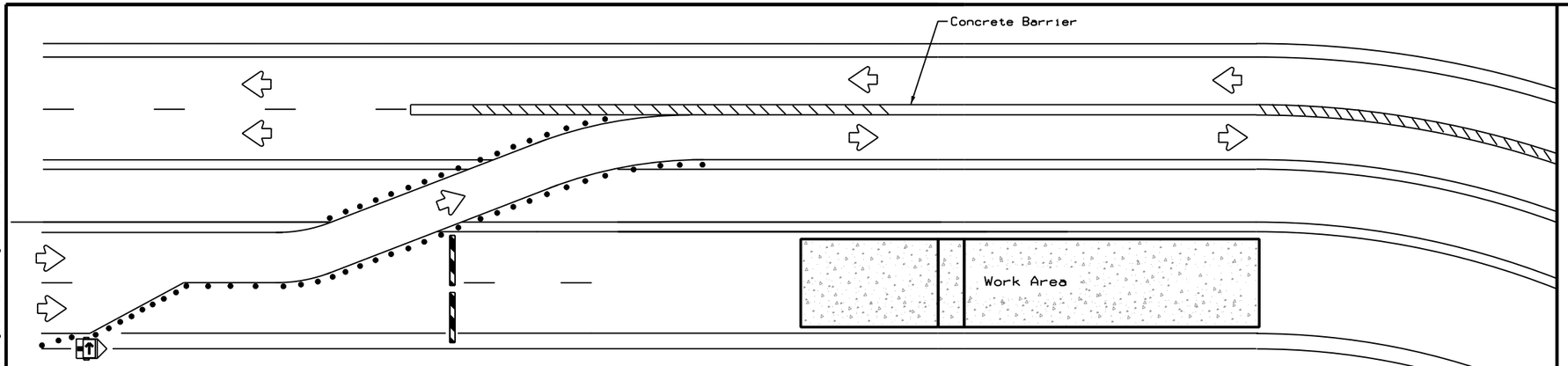
Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	FTW	JOHNSON		47



NOTES:

1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
3. Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

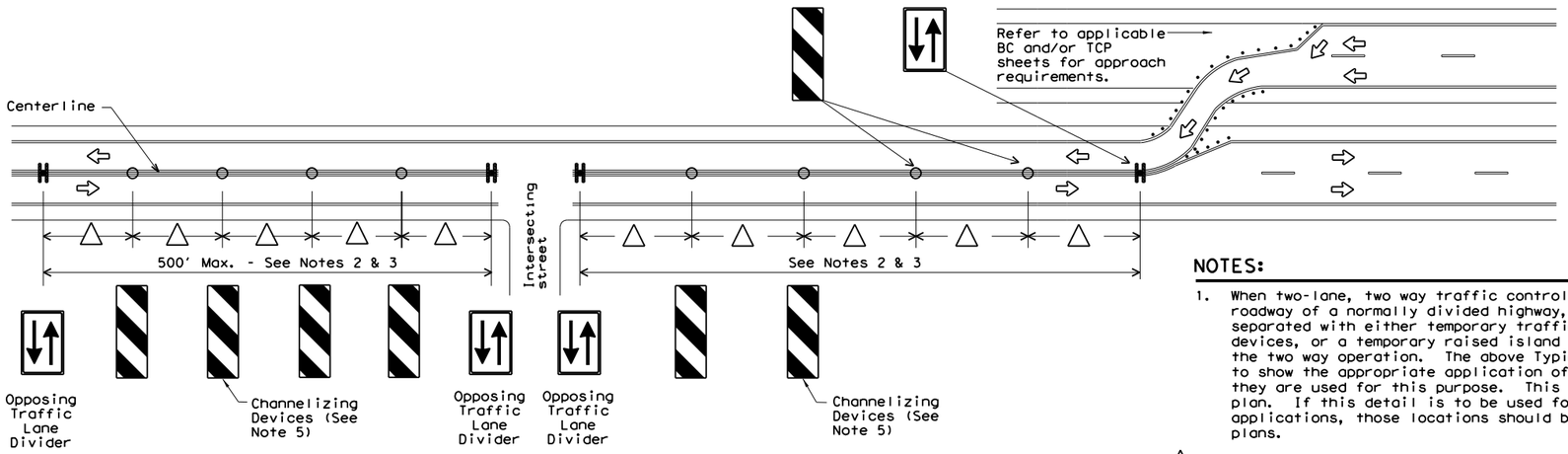
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

LEGEND	
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD)describes pre-qualified products and their sources and may be found at the following web address:

http://www.txdot.gov/business/resources/producer-list.html



VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD)
SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

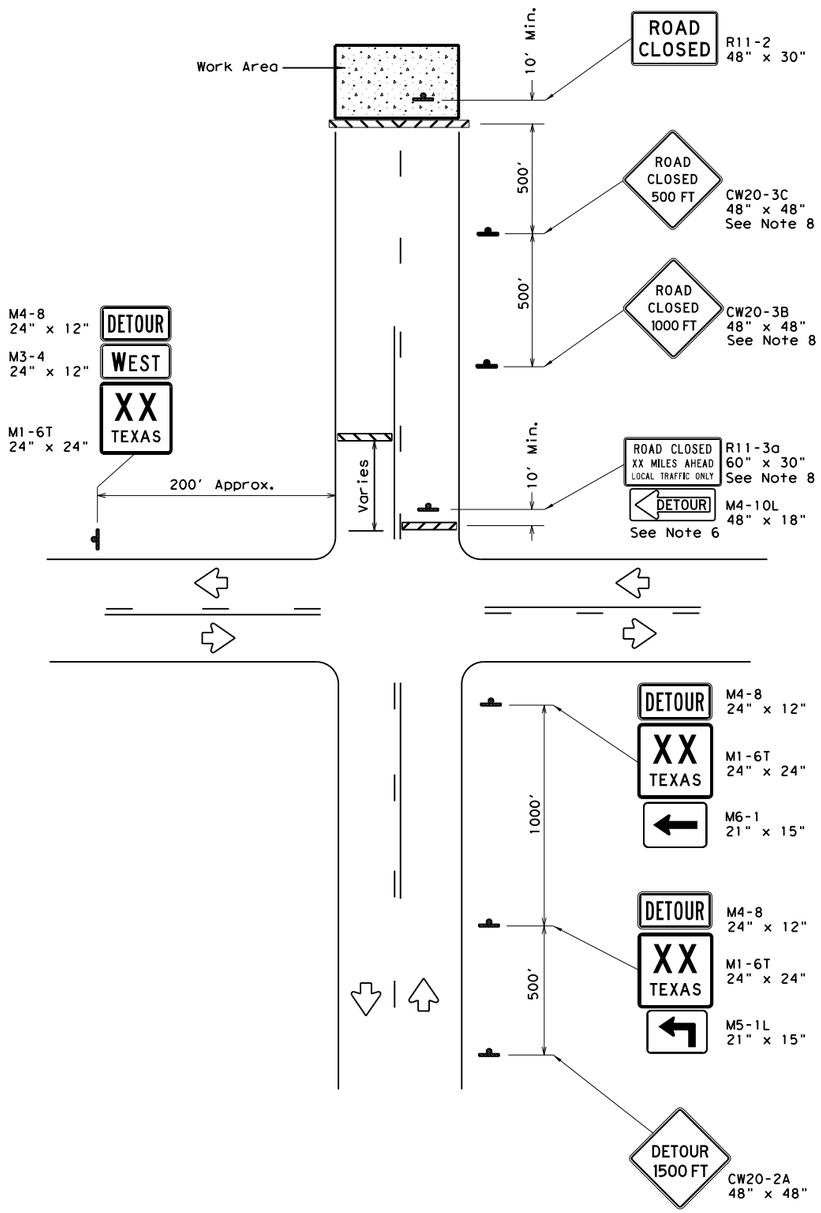
TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		48

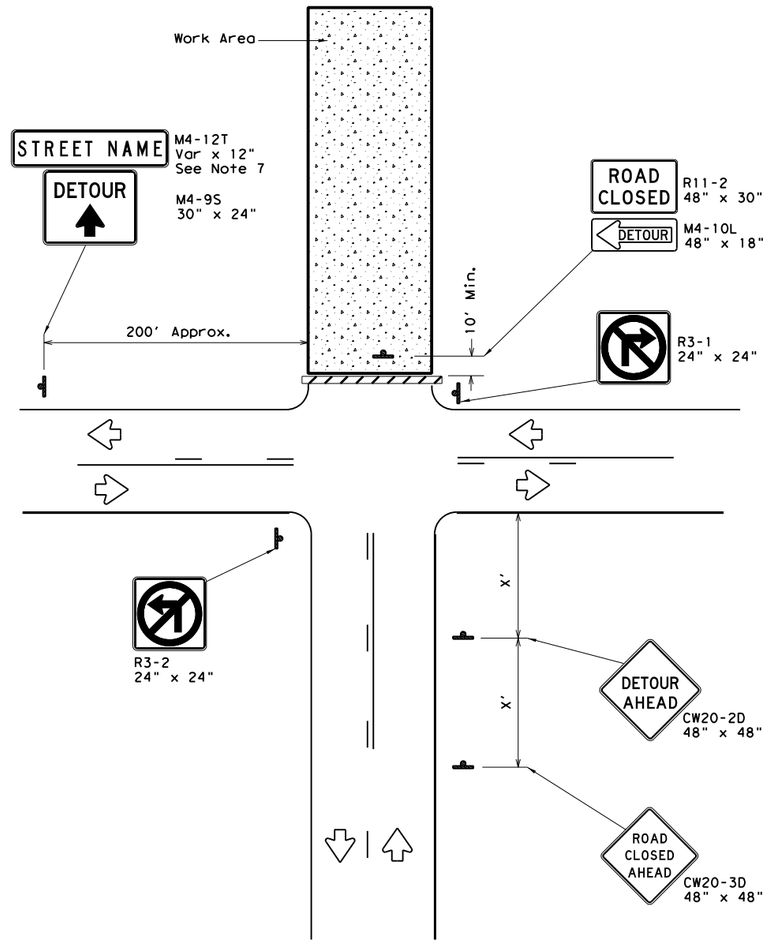
DATE:
FILE:

DATE:
FILE:



ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

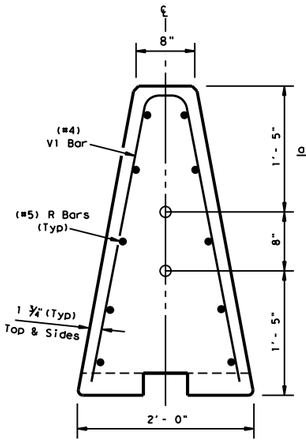
Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

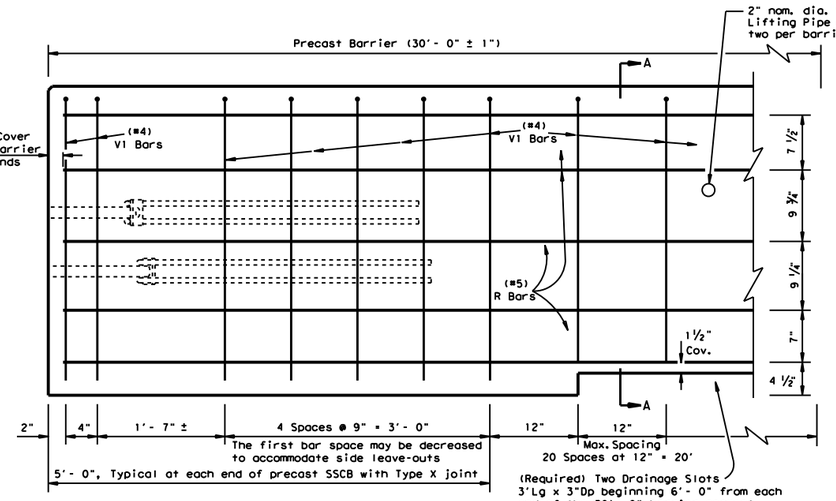
FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	FTW	JOHNSON		49

DATE:
FILE:



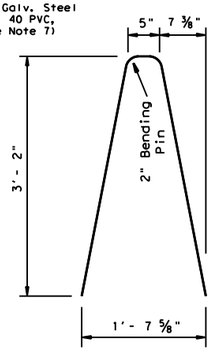
End View Precast Barrier

Pipe locations for Joint Type X connection



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

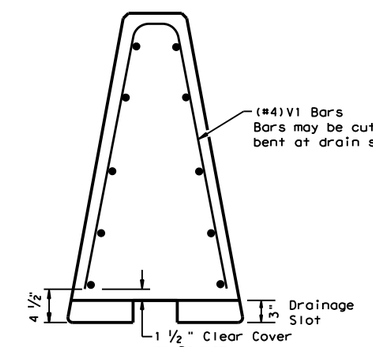
Showing reinforcement for Joint Connection (Type X)



V1 Bar

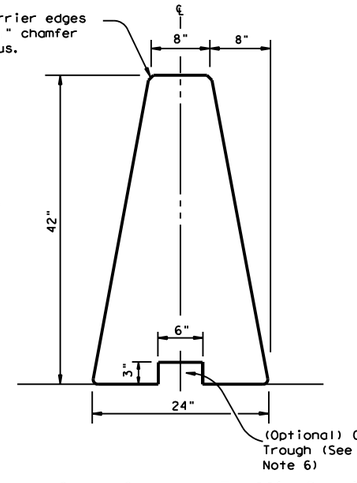
#4 Rebar

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



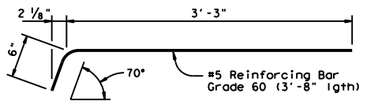
Section A-A

Steel Placement at (Required) Drainage Slots



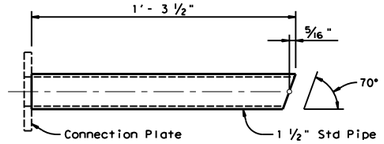
Single Slope Concrete Traffic Barrier

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



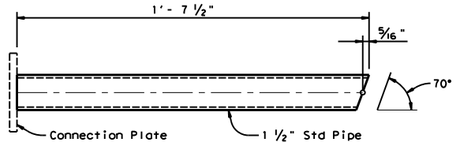
DEFORMED BAR ANCHOR DETAILS

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



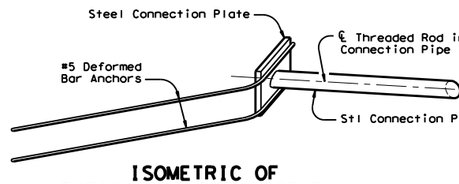
UPPER CONNECTION PIPE DETAILS

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



LOWER CONNECTION PIPE DETAILS

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

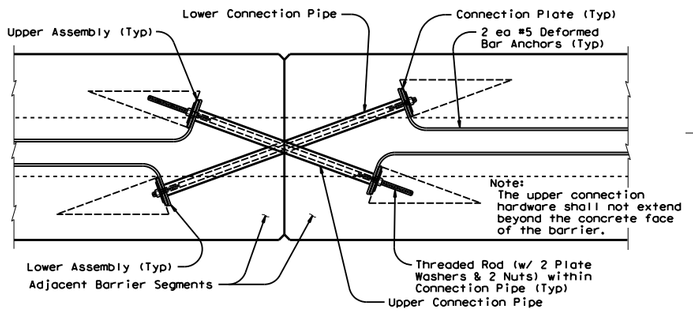


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

General Notes

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



TYPE X JOINT INSTALLATION DETAIL

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

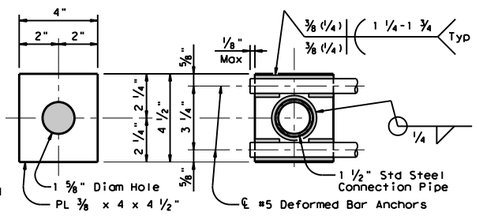
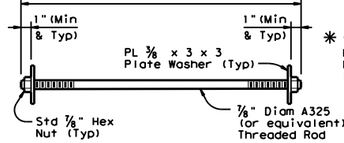


PLATE DIMENSIONS — WELDING DETAILS

CONNECTION PLATE DETAILS

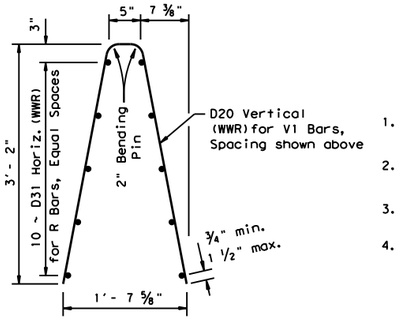
One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



CONNECTION BOLT OR THREADED ROD DETAIL

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

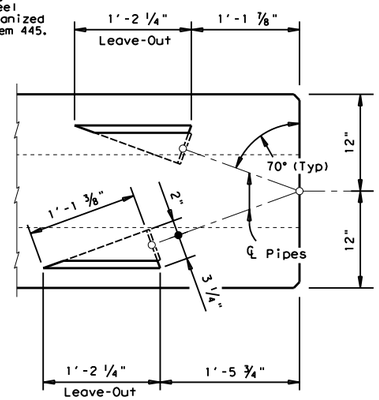
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



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

(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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	FTW	JOHNSON		50

DATE:
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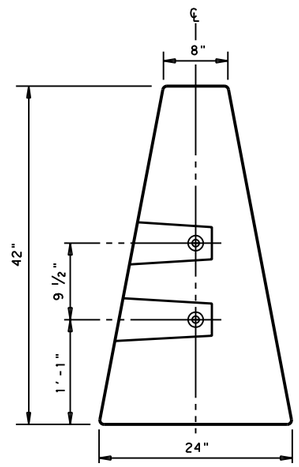
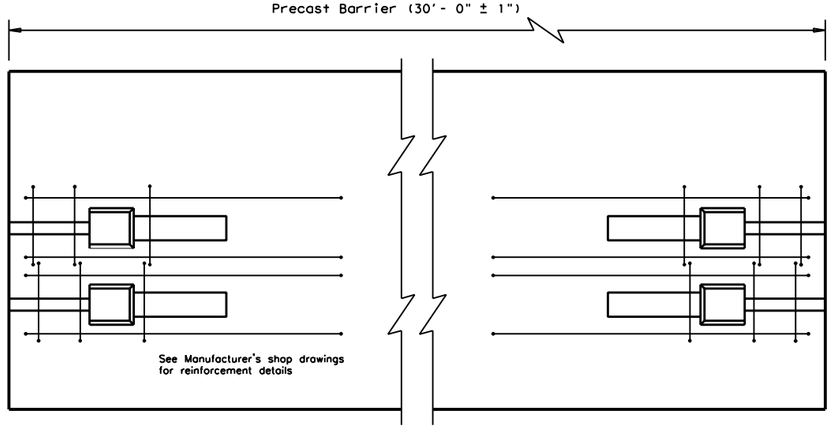
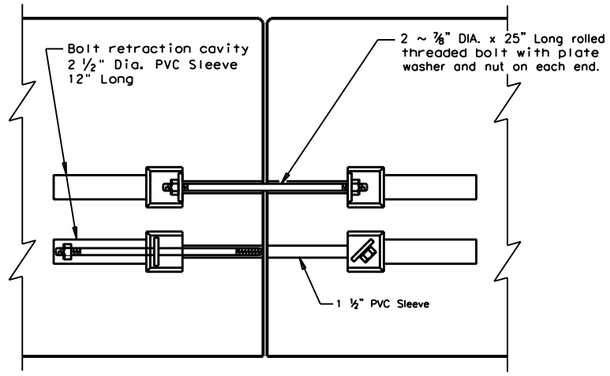


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

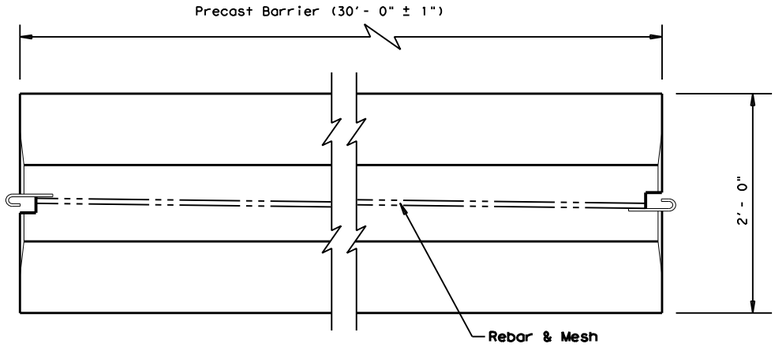


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

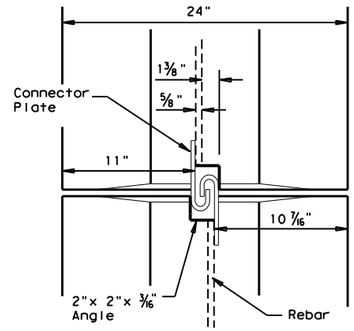


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

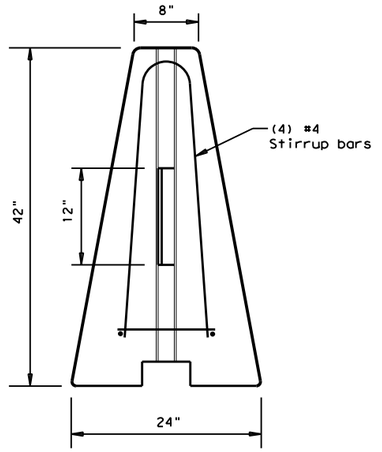
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



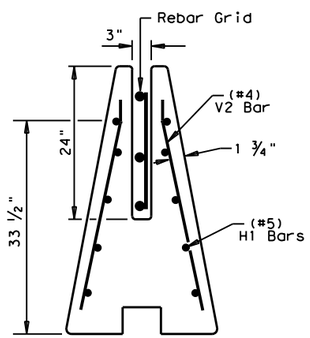
END VIEW

Proprietary Joint Connections (SSCB)

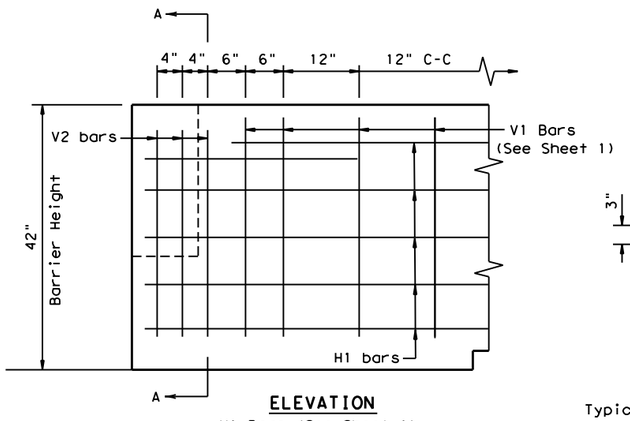
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

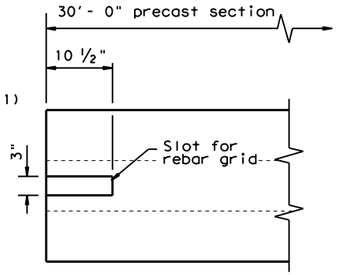
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



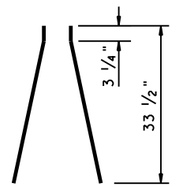
SECTION A-A
Showing (Type R) Rebar Grid



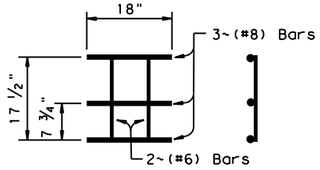
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



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



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

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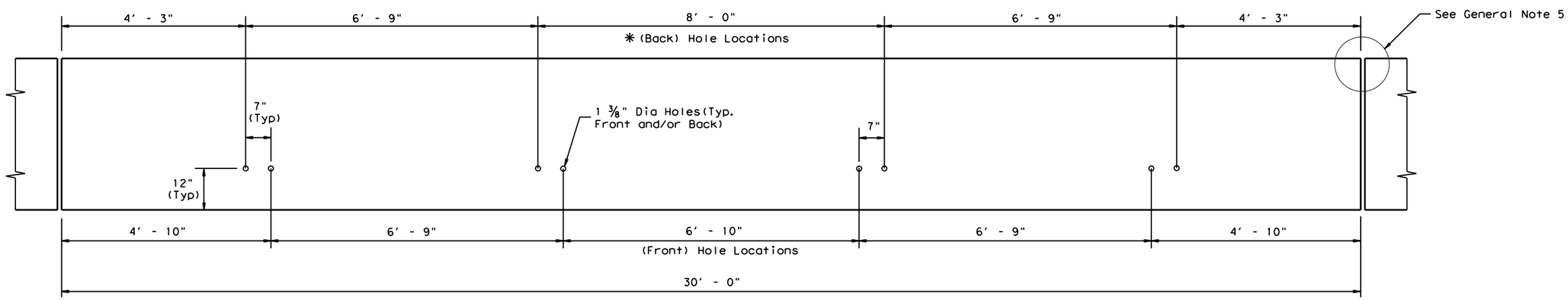
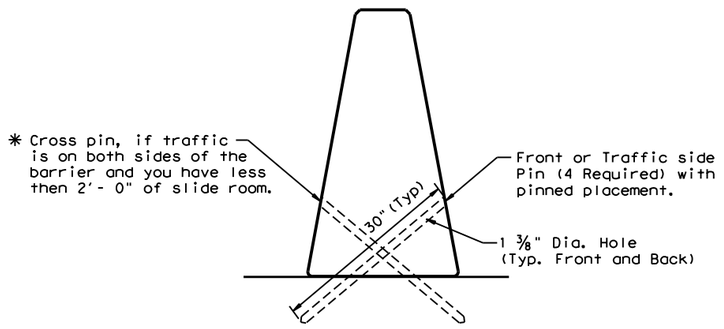


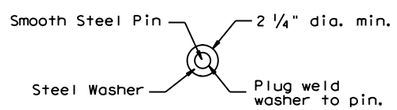
DETAIL 1

Precast SSCB(42")
Showing hole locations

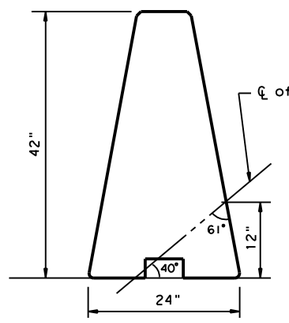


DETAIL 2

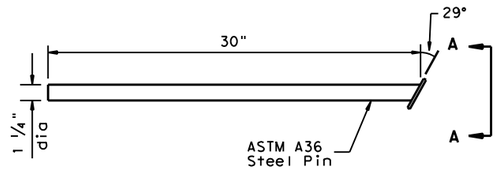
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



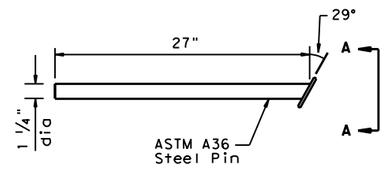
VIEW A-A



HOLE LOCATION DETAIL



(30") PIN DETAIL
See Detail 2

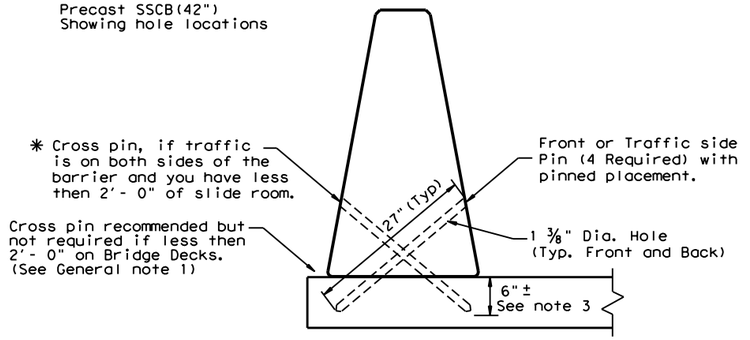


(27") PIN DETAIL
See Detail 3

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

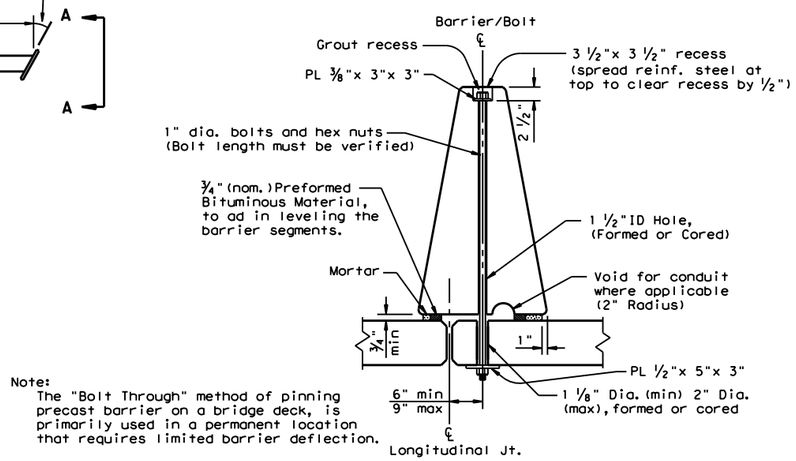
DETAIL 3

Bridge Deck or CRCP
(27" Pin required).



CORE DRILLING EXISTING BARRIER

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



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

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

SSCB(5)-10

FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
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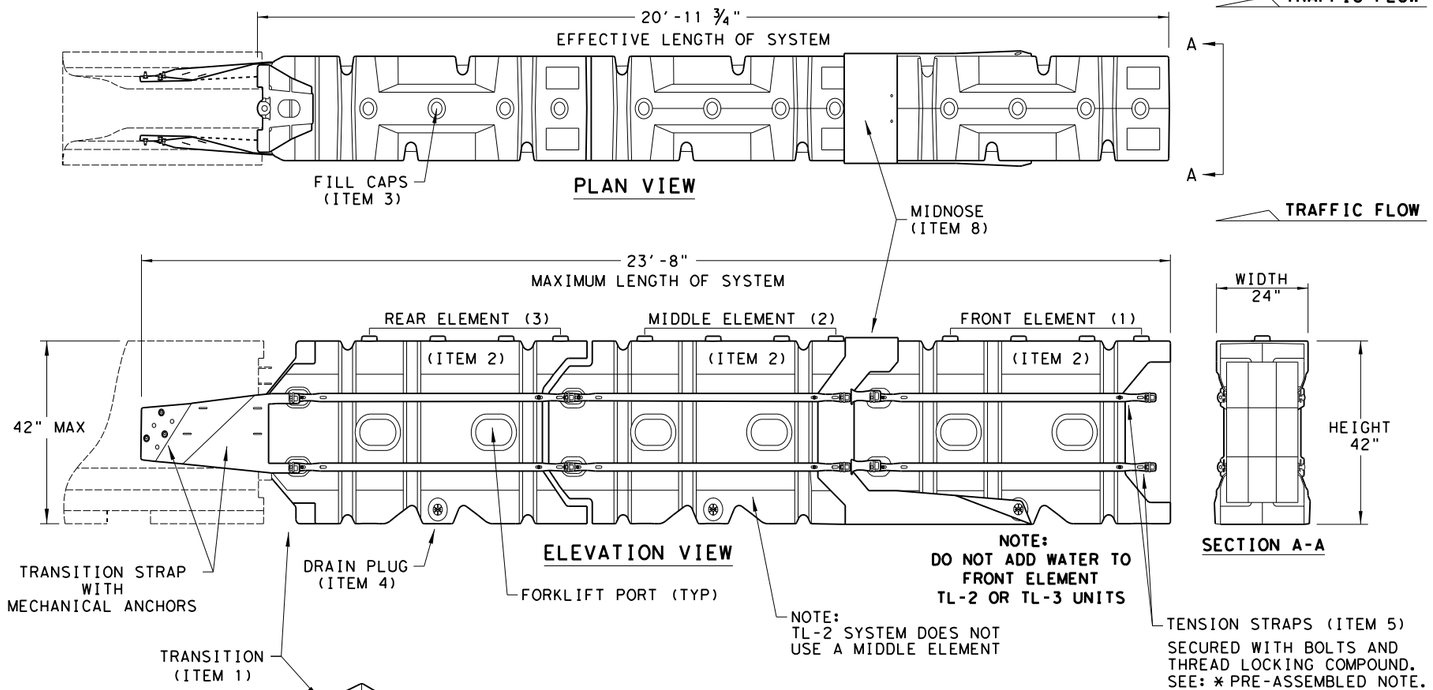
FILE:

SYSTEM SHOWN - ABSORB-M TL-3



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

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

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

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

GENERAL NOTES

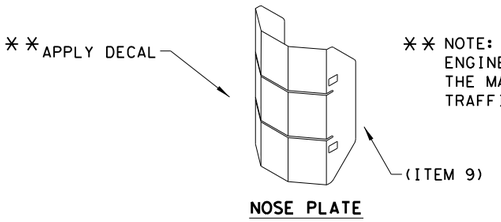
1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

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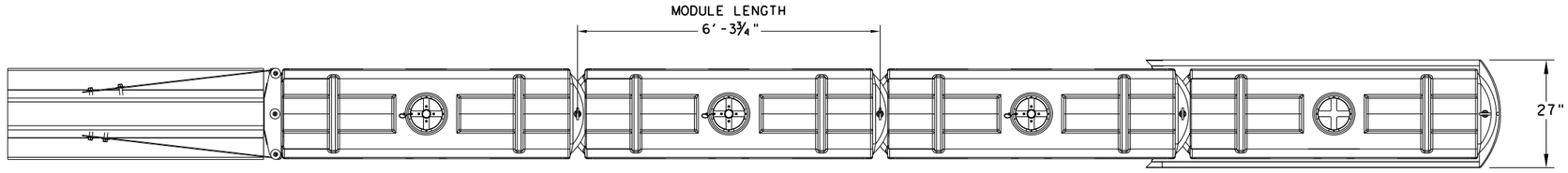
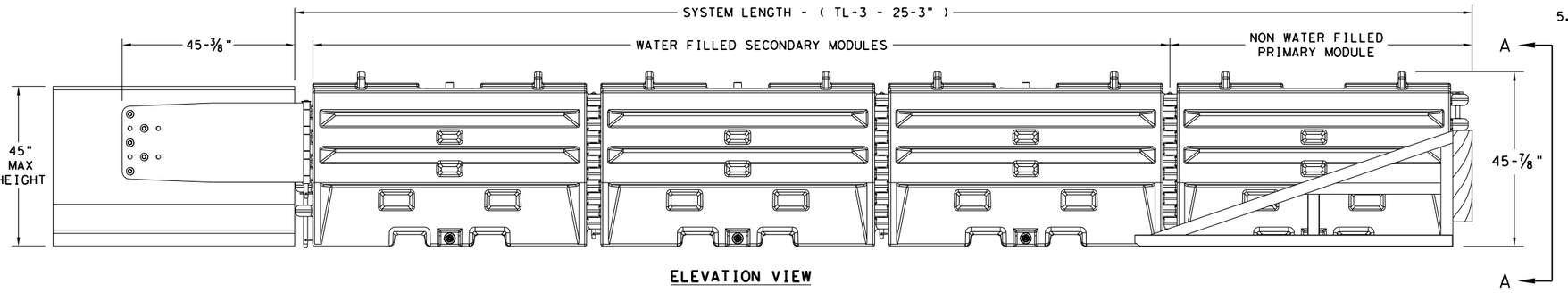


PLAN VIEW



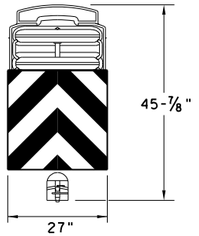
ELEVATION VIEW

GENERAL NOTES

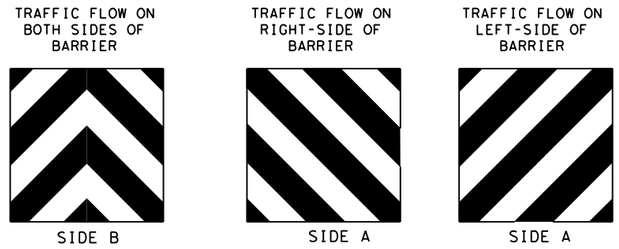
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE,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

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

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



SECTION A-A

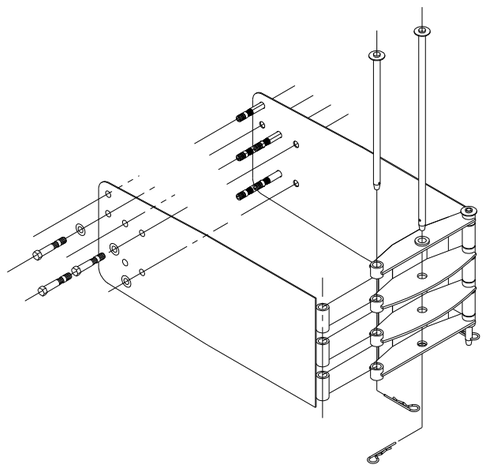


NOSE SHEETING PANEL DELINEATION

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

BILL OF MATERIAL

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

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

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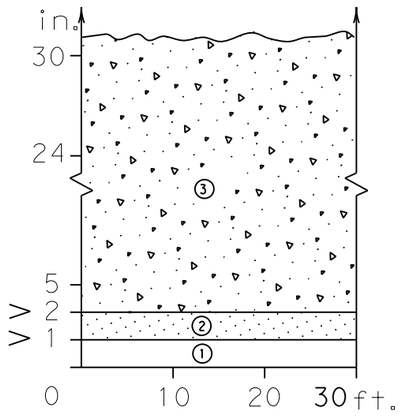
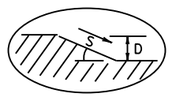
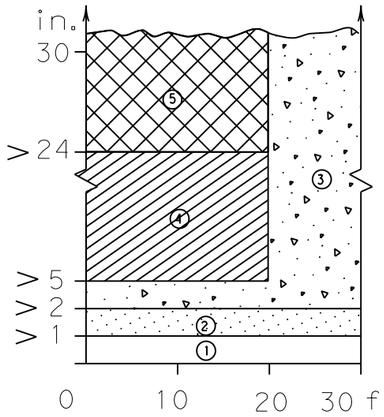
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

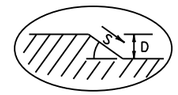


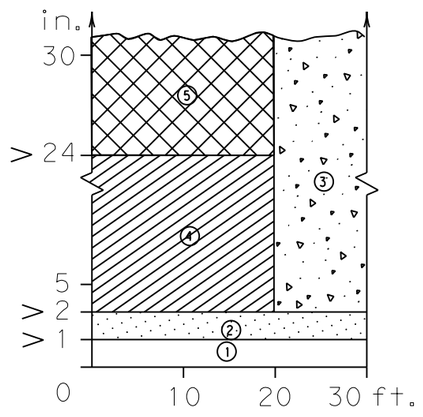
Edge Condition I
S = (3:1) (or flatter)



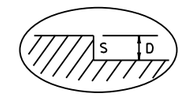


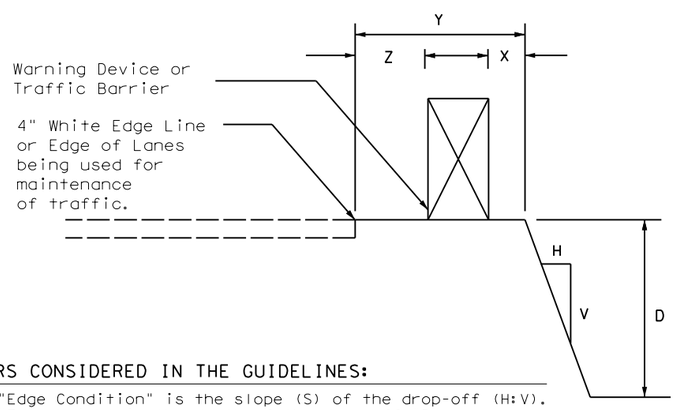
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

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

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

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

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

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

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

Edge Condition Notes:

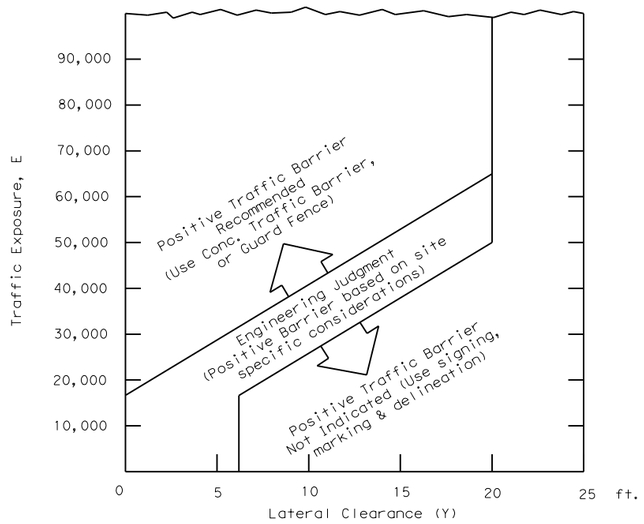
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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

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

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

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



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

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

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

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

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Date 1/5/2024

Christopher Boles

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		55

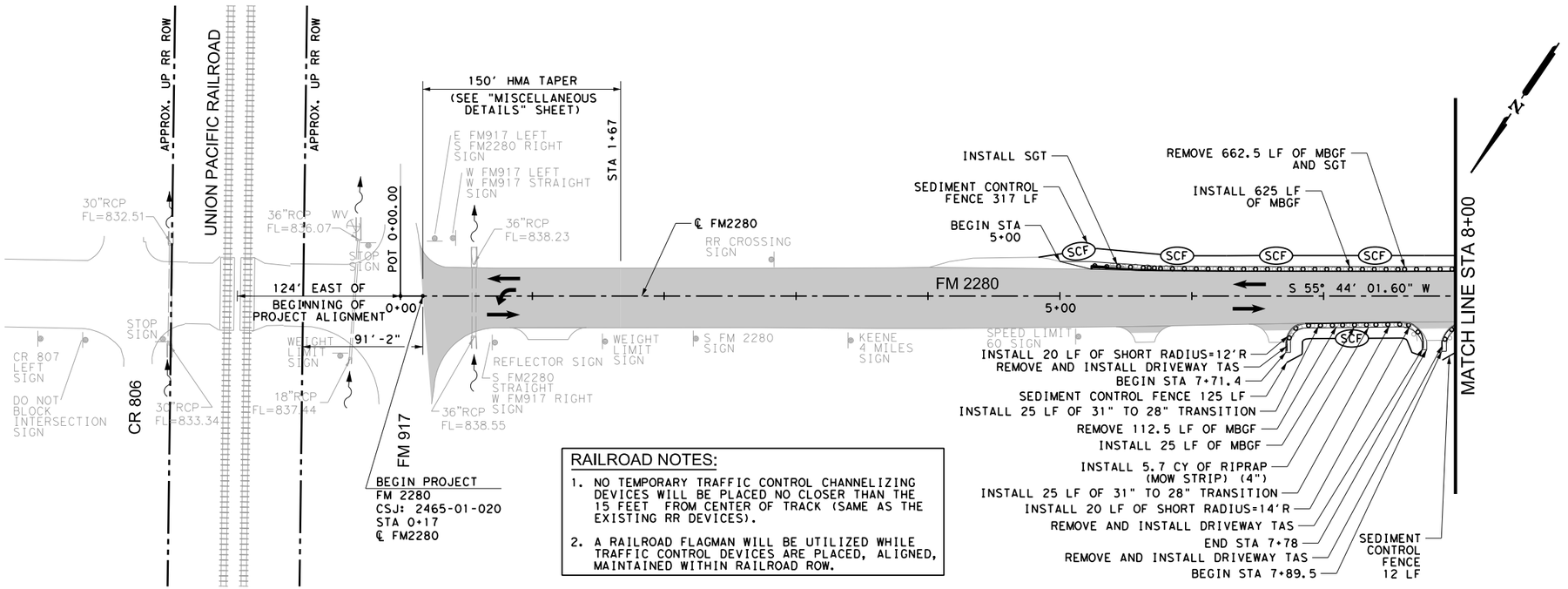
LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
1	1	70	℄ FM 2280 (LT)	192+42	TL-3	BI	EXIST		SSCB	24"	42"		2								2	
2	1	70	℄ FM 2280 (RT)	192+42	TL-3	BI	EXIST		SSCB	24"	42"			2	2	1					2	
												TOTALS	2	2	2							

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

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

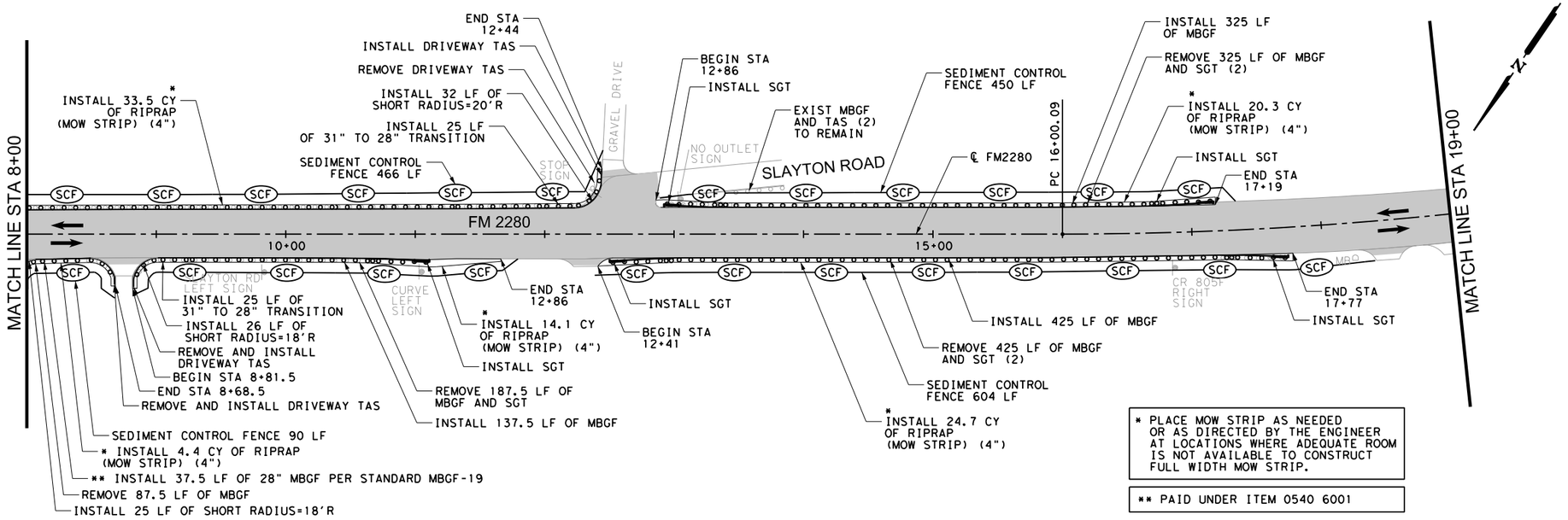
TEMPORARY CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		
	FTW	JOHNSON		
	FEDERAL AID PROJECT			SHEET NO.
	SEE TITLE SHEET			56



RAILROAD NOTES:

1. NO TEMPORARY TRAFFIC CONTROL CHANNELIZING DEVICES WILL BE PLACED NO CLOSER THAN THE 15 FEET FROM CENTER OF TRACK (SAME AS THE EXISTING RR DEVICES).
2. A RAILROAD FLAGMAN WILL BE UTILIZED WHILE TRAFFIC CONTROL DEVICES ARE PLACED, ALIGNED, MAINTAINED WITHIN RAILROAD ROW.



* PLACE MOW STRIP AS NEEDED OR AS DIRECTED BY THE ENGINEER AT LOCATIONS WHERE ADEQUATE ROOM IS NOT AVAILABLE TO CONSTRUCT FULL WIDTH MOW STRIP.

** PAID UNDER ITEM 0540 6001

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- OVERLAY LIMITS
- MILL AND INLAY LIMITS

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STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

FM 2280
PAVING PLAN

SHEET 1 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	57
2465	01	020	

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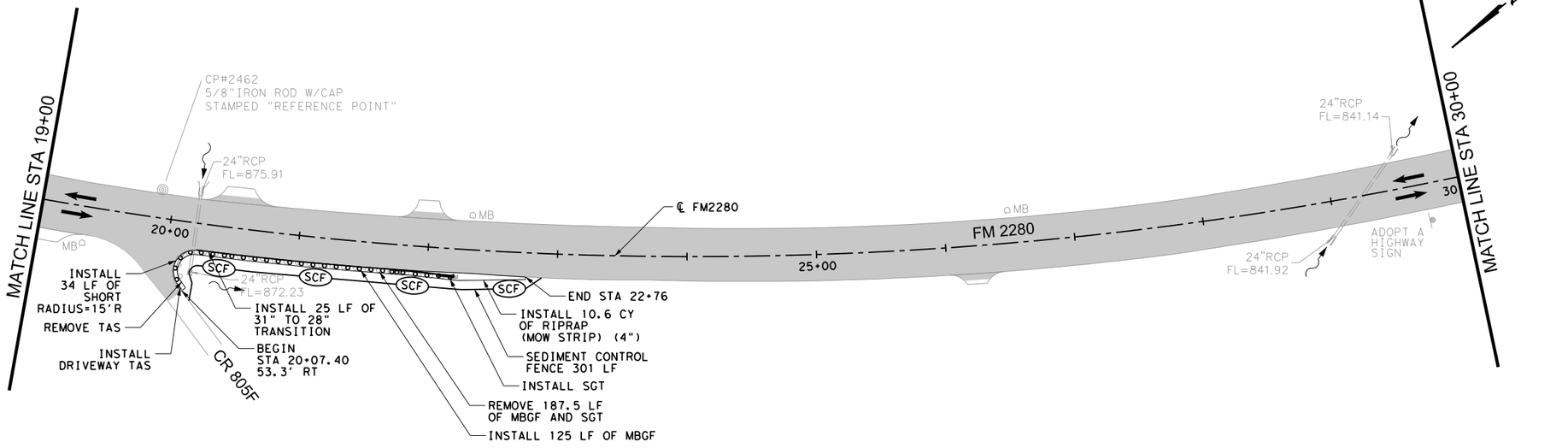

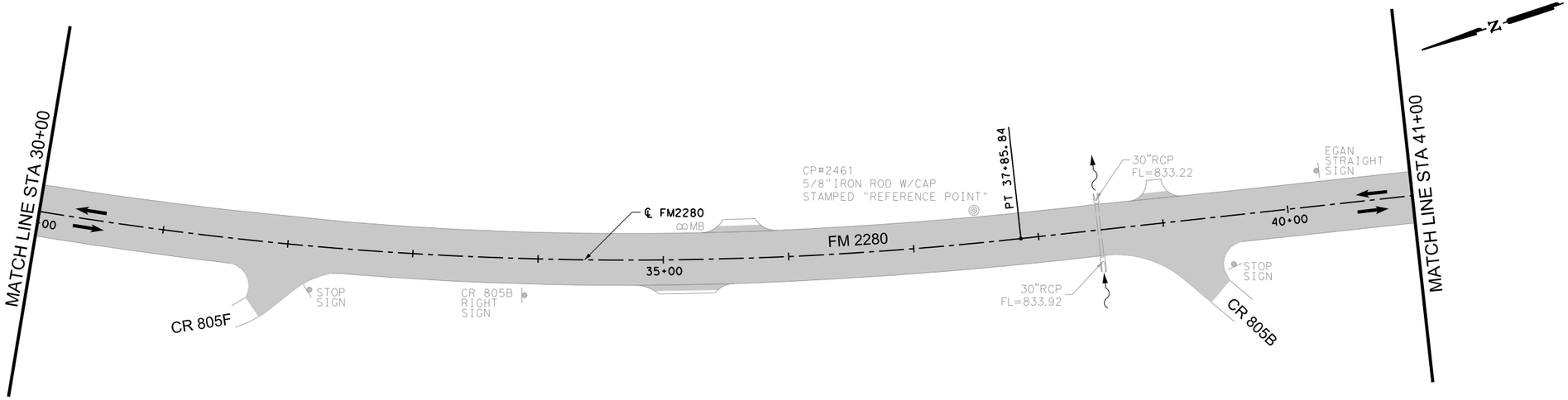

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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Texas Department of Transportation

FM 2280
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SHEET 2 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	58
CONTROL	SECTION	JOB	
2465	01	020	

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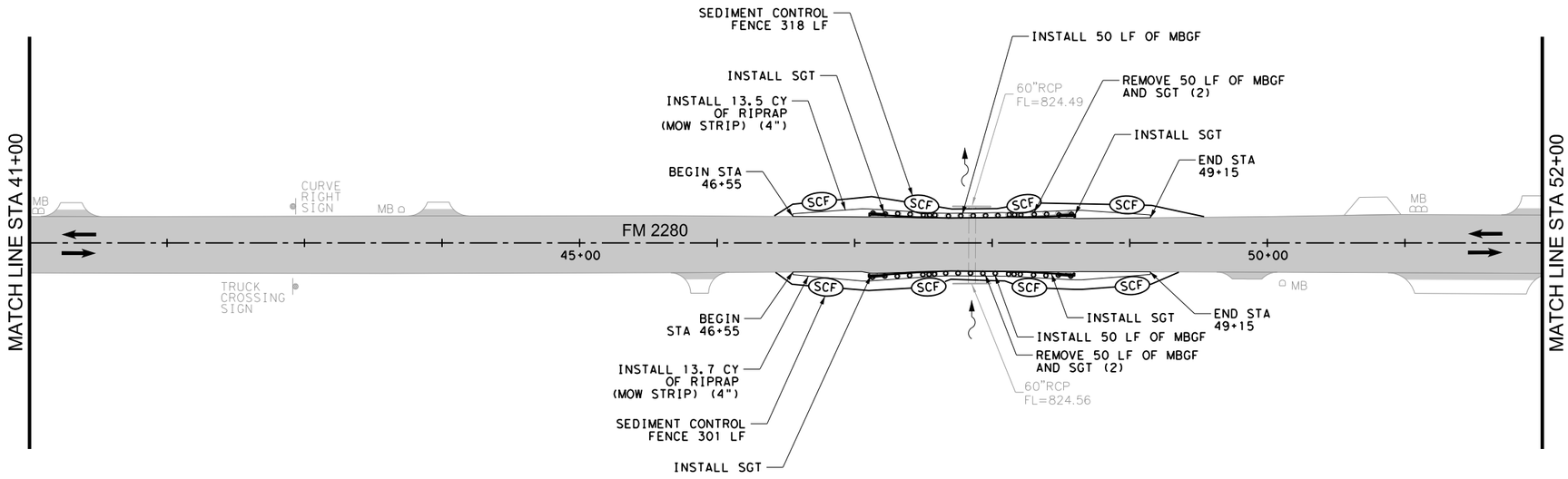

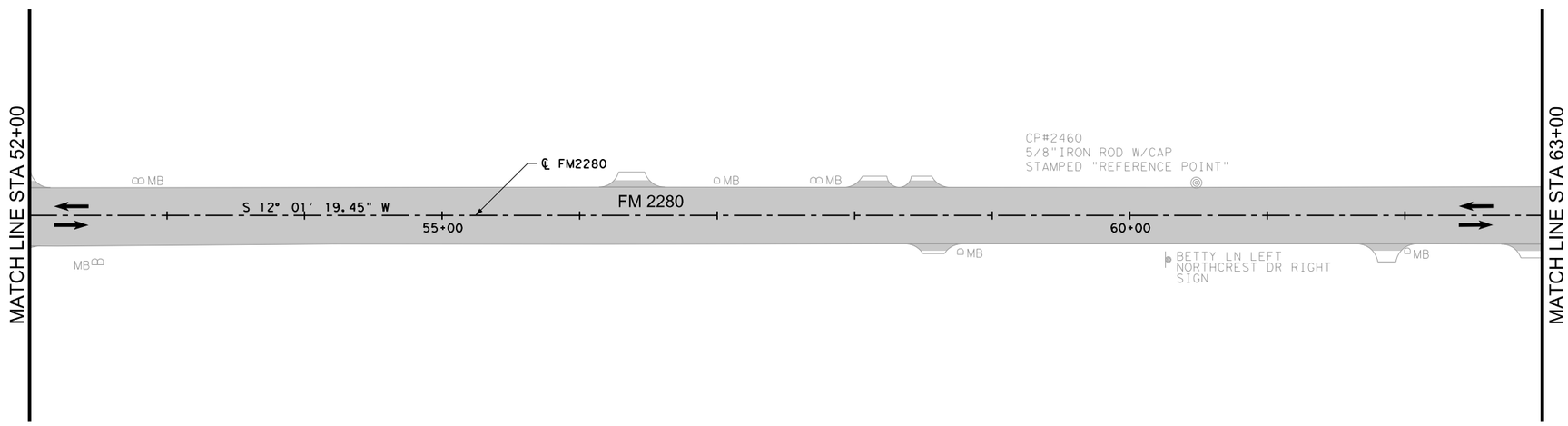

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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Texas Department of Transportation

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SHEET 3 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	59
CONTROL	SECTION	JOB	
2465	01	020	

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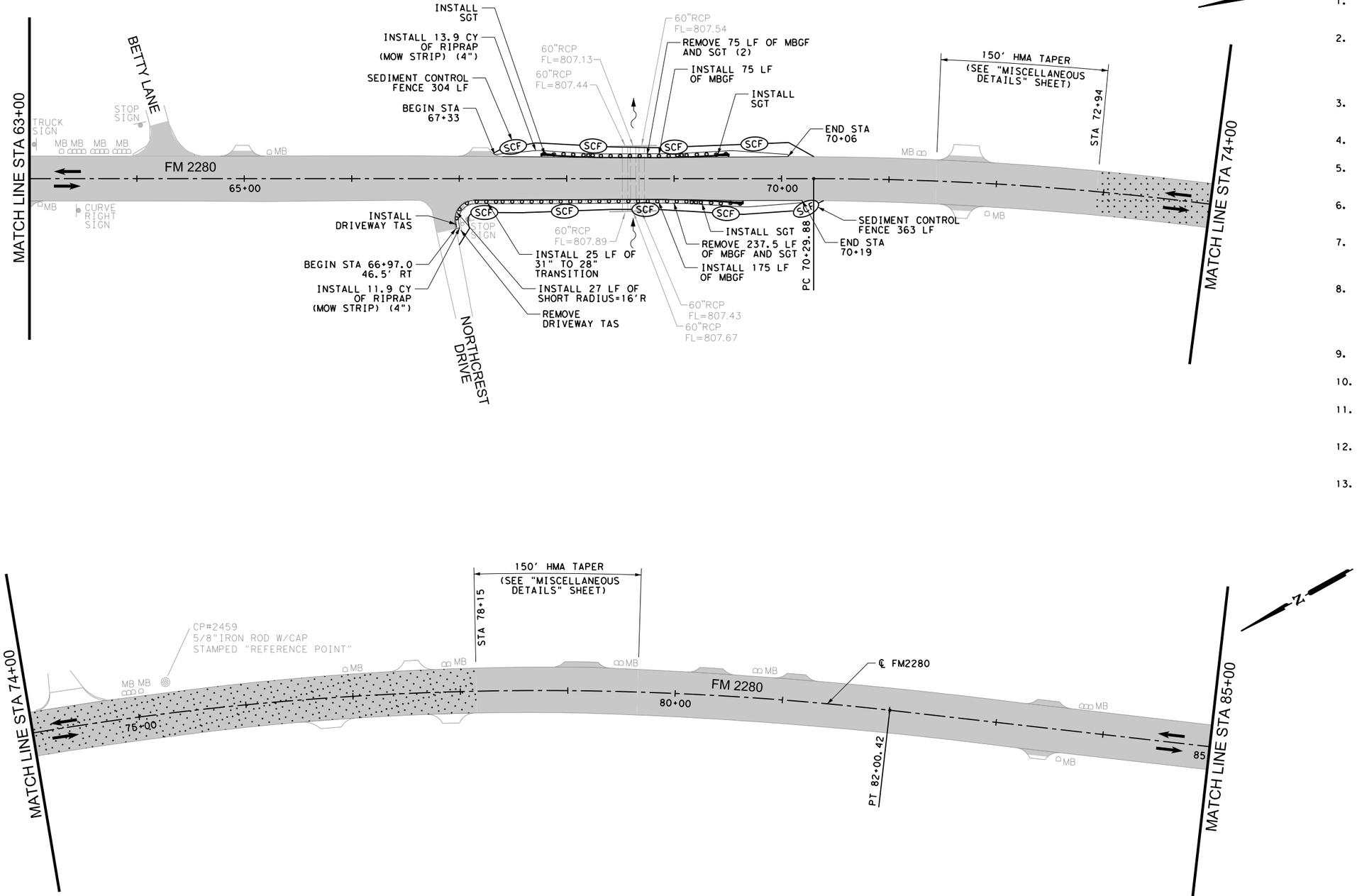

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
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Christopher Boles

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX

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Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 4 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	60
CONTROL	SECTION	JOB	
2465	01	020	

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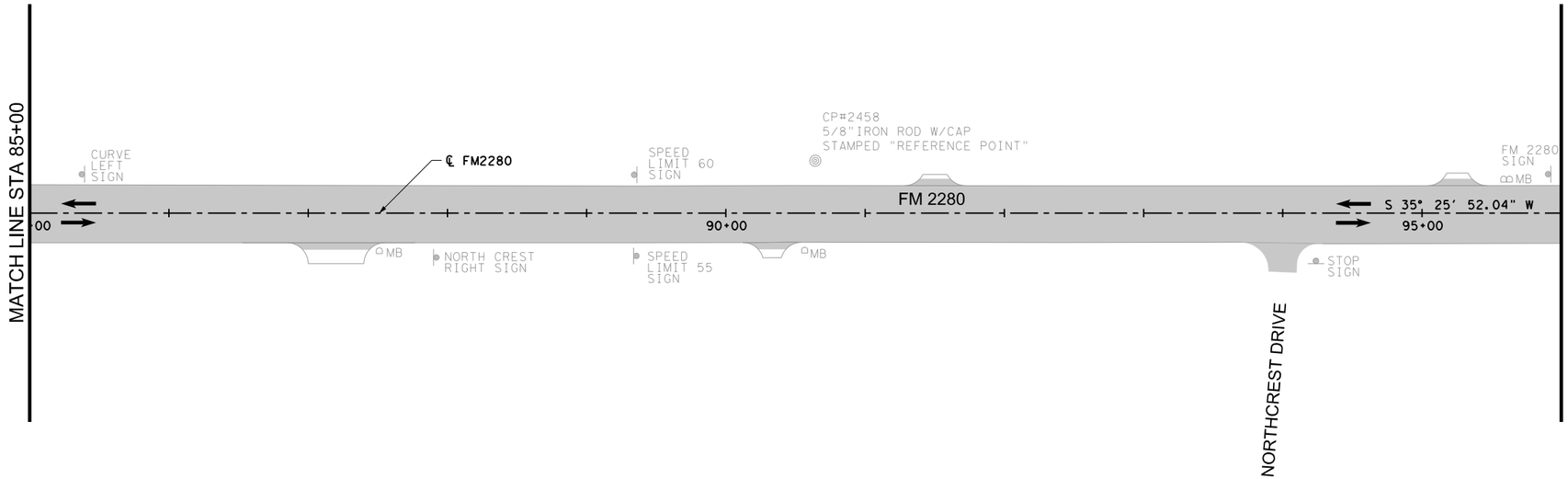

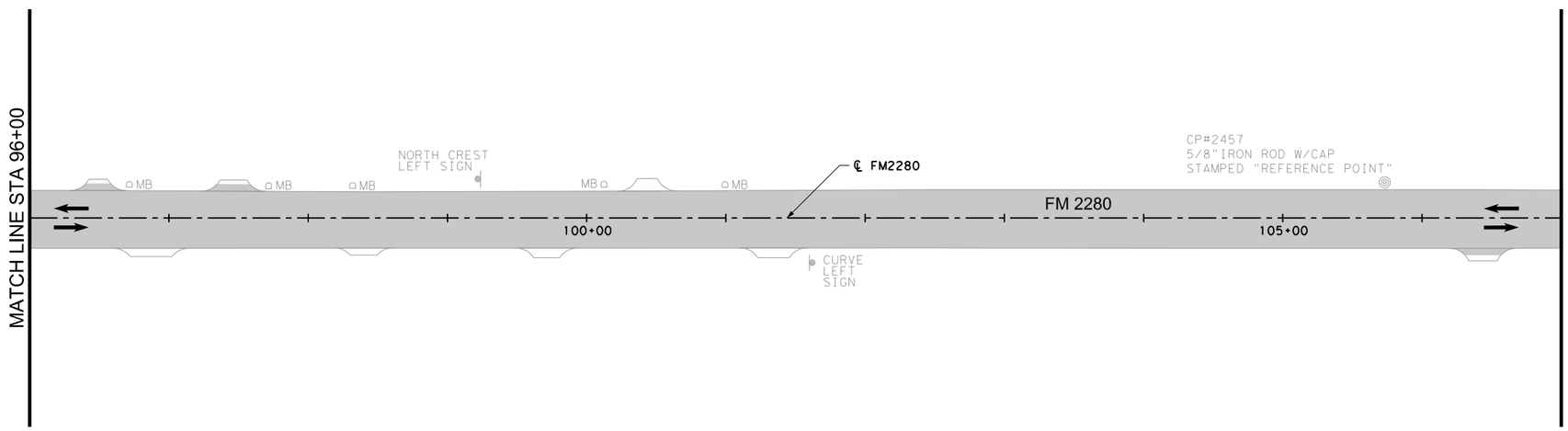

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HORIZ. SCALE IN FEET

LEGEND:

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Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 5 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	61
CONTROL	SECTION	JOB	
2465	01	020	

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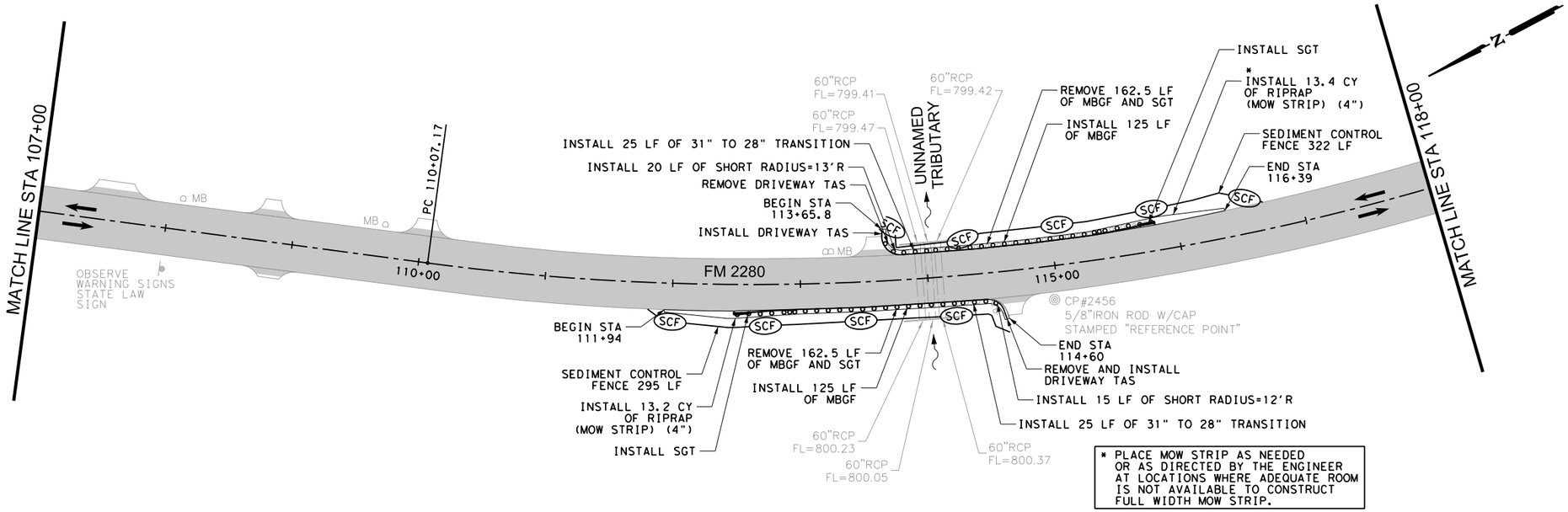

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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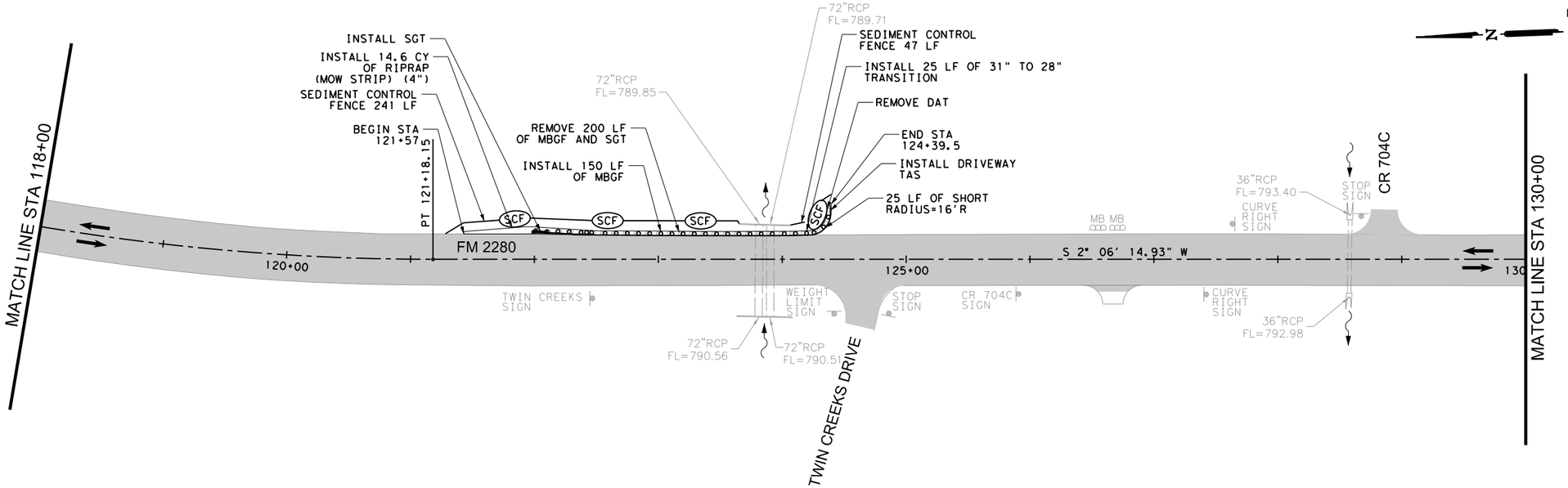

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FM 2280
PAVING PLAN

SHEET 6 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	62
2465	01	020	

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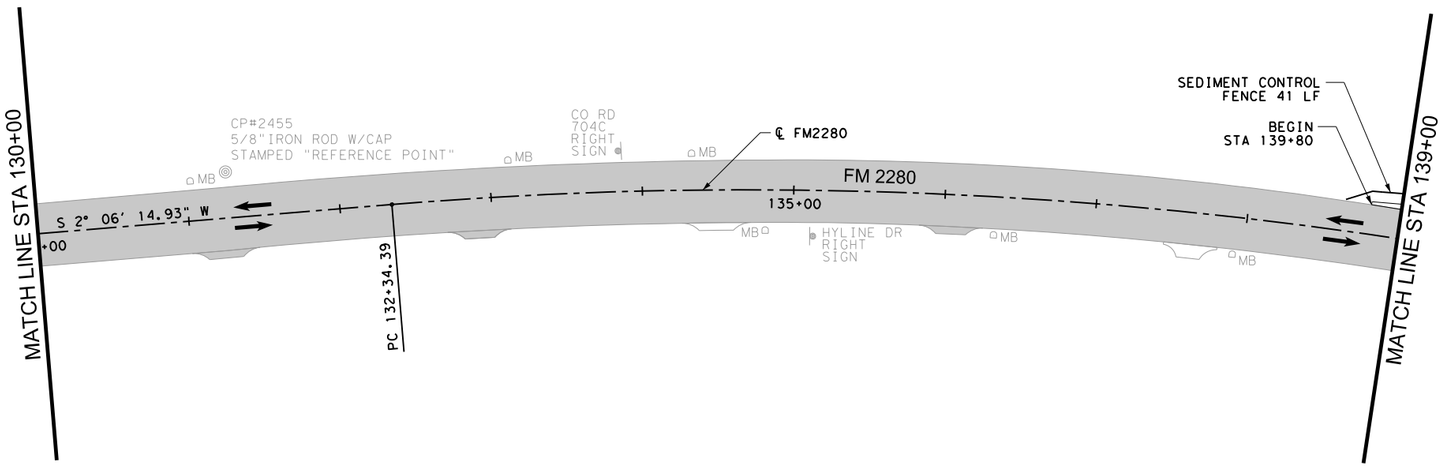

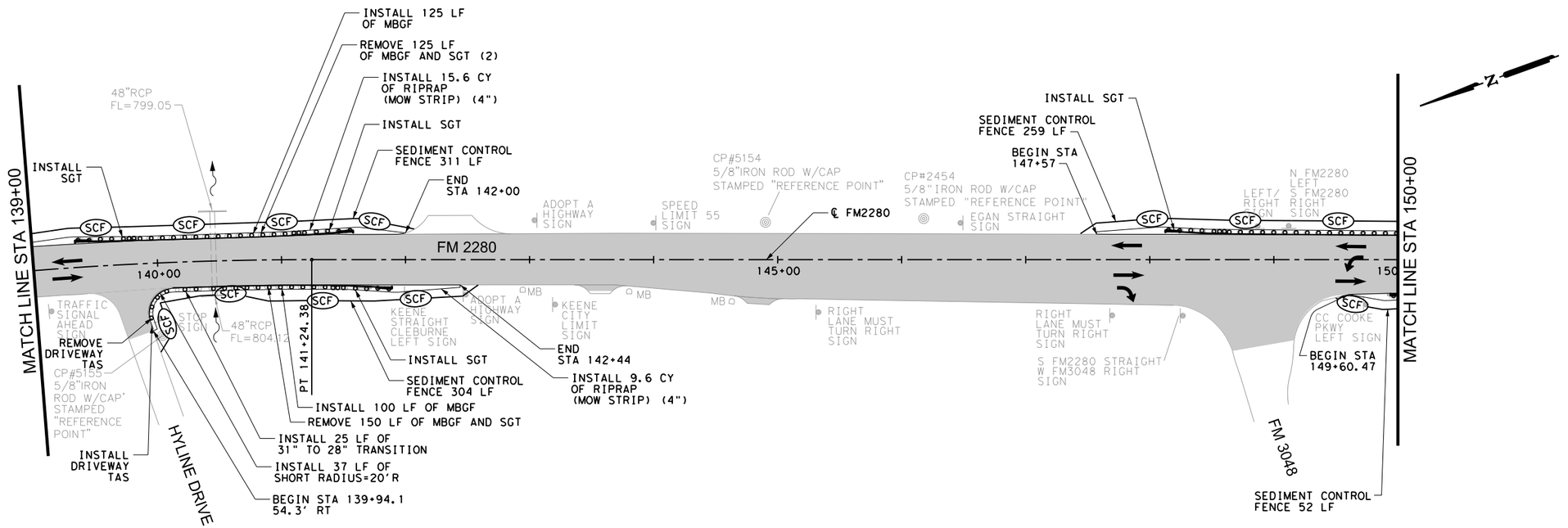

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HORIZ. SCALE IN FEET

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED
PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 7 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	63
2465	01	020	

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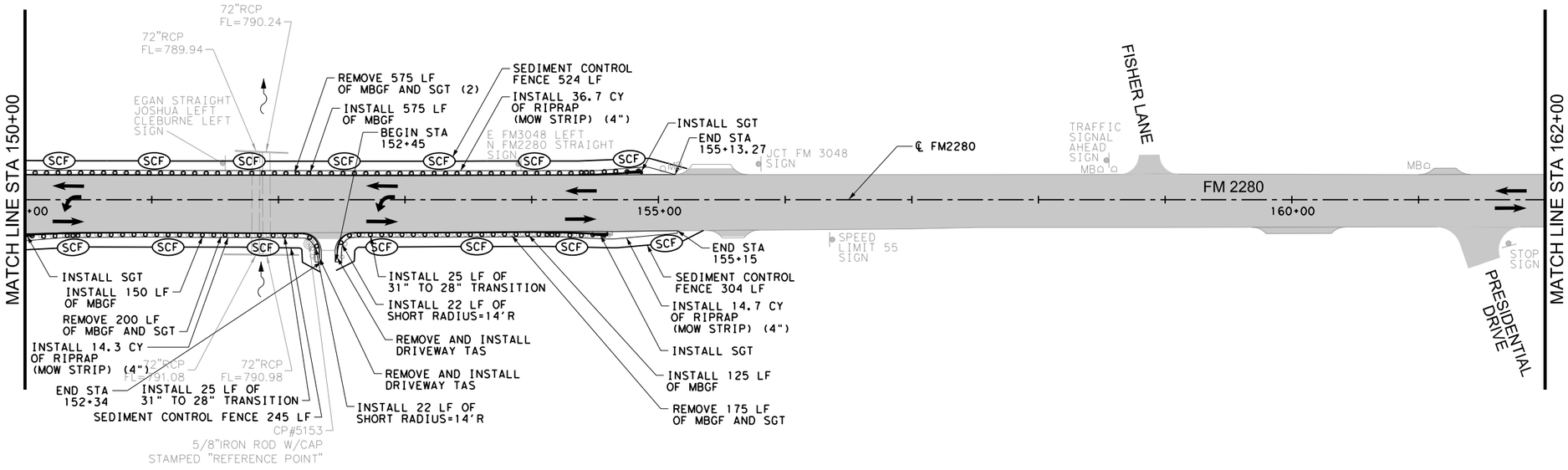

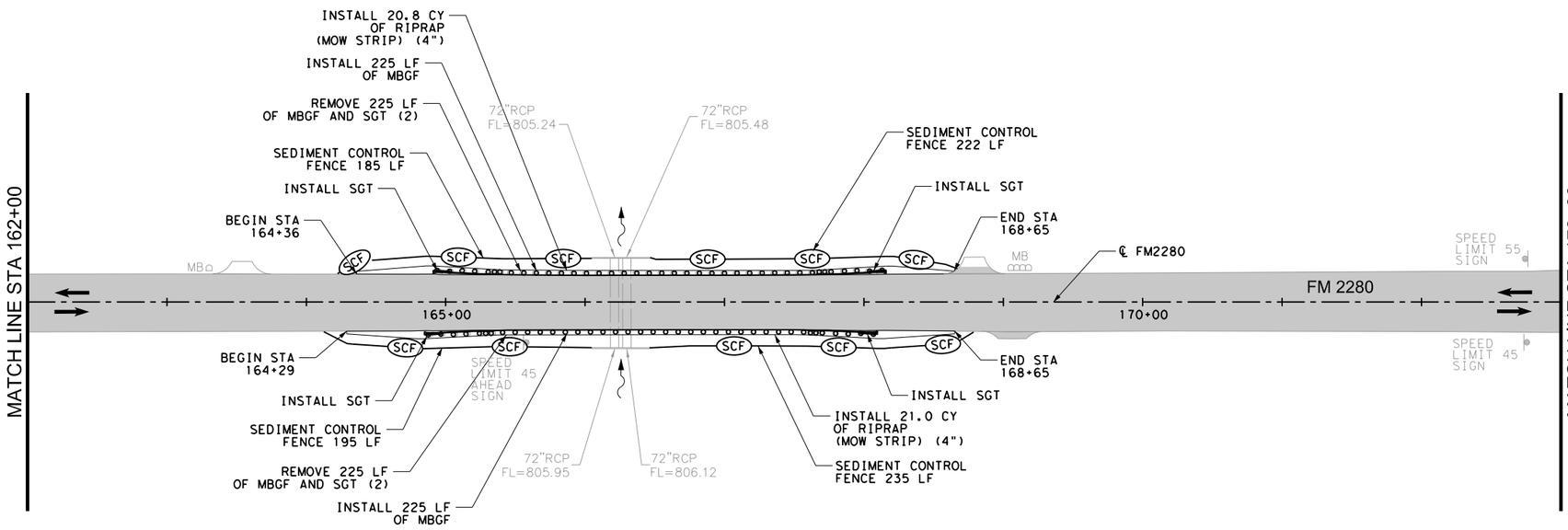

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HORIZ. SCALE IN FEET

LEGEND:

- OVERLAY LIMITS
- MILL AND INLAY LIMITS

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Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 8 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	64
CONTROL	SECTION	JOB	
2465	01	020	

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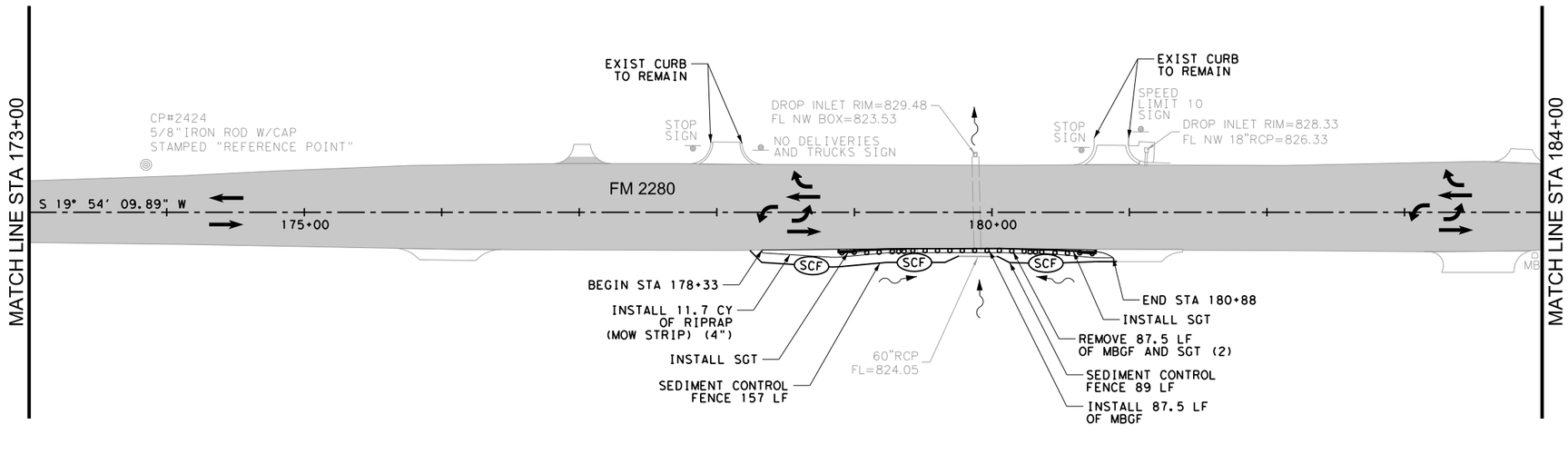

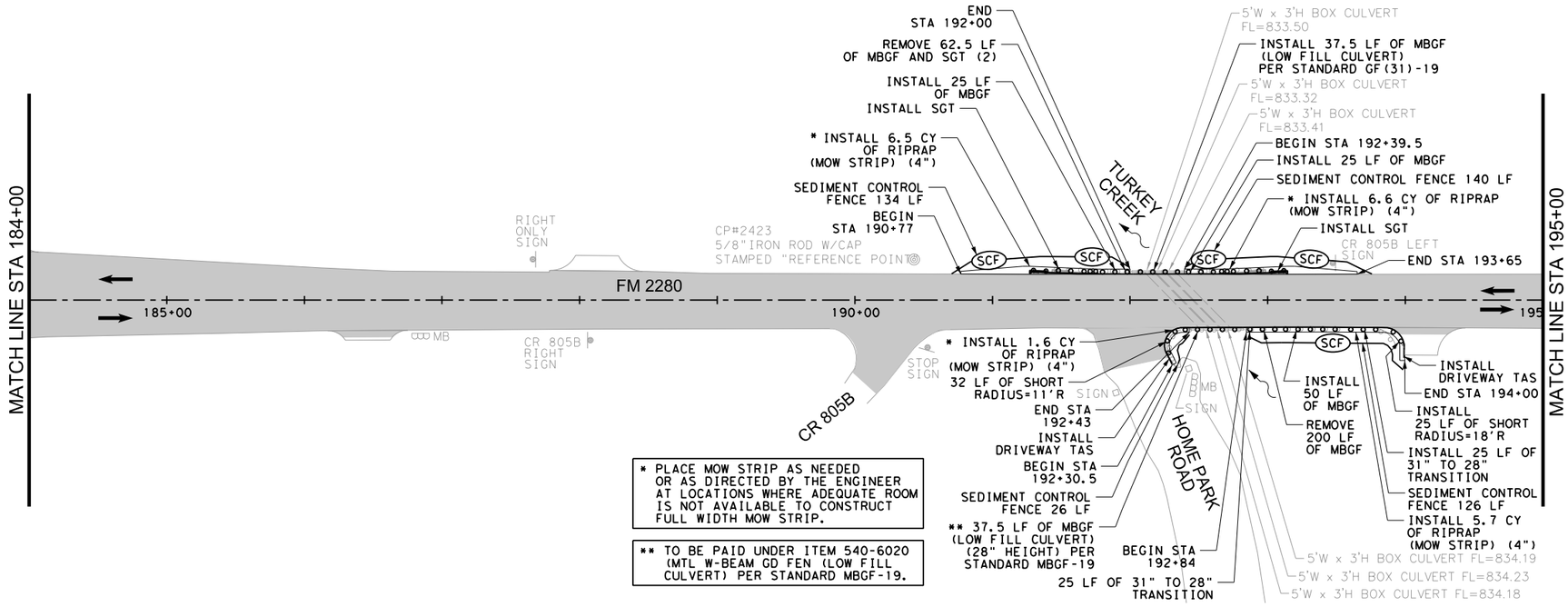

* PLACE MOW STRIP AS NEEDED OR AS DIRECTED BY THE ENGINEER AT LOCATIONS WHERE ADEQUATE ROOM IS NOT AVAILABLE TO CONSTRUCT FULL WIDTH MOW STRIP.

** TO BE PAID UNDER ITEM 540-6020 (MTL W-BEAM GD FEN (LOW FILL CULVERT) PER STANDARD MBGF-19.

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

OVERLAY LIMITS

MILL AND INLAY LIMITS

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FM 2280
PAVING PLAN

SHEET 9 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	65
CONTROL	SECTION	JOB	
2465	01	020	

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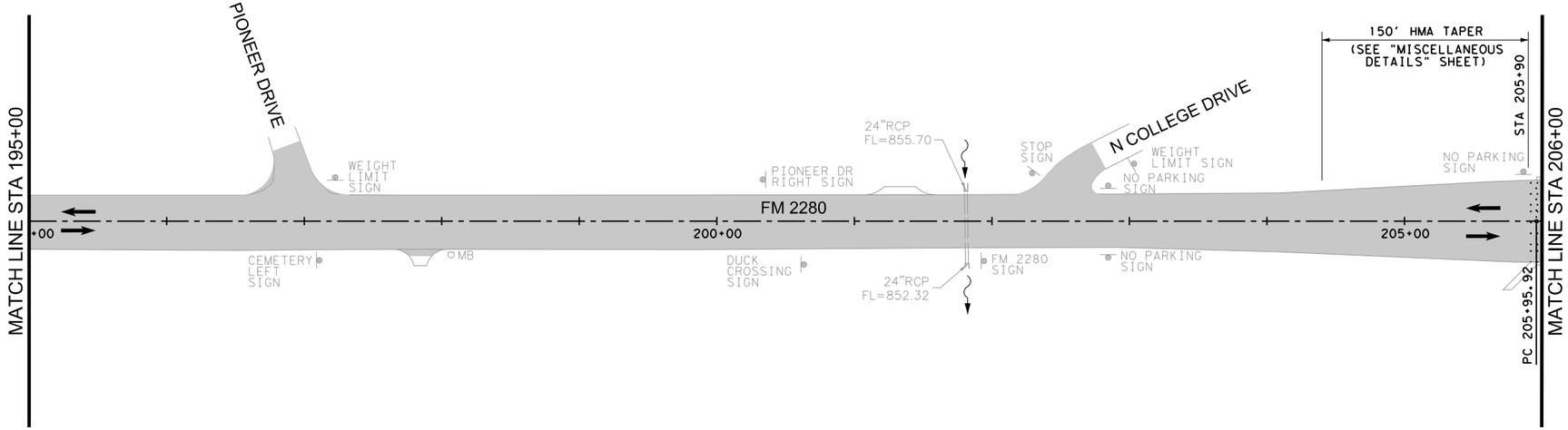

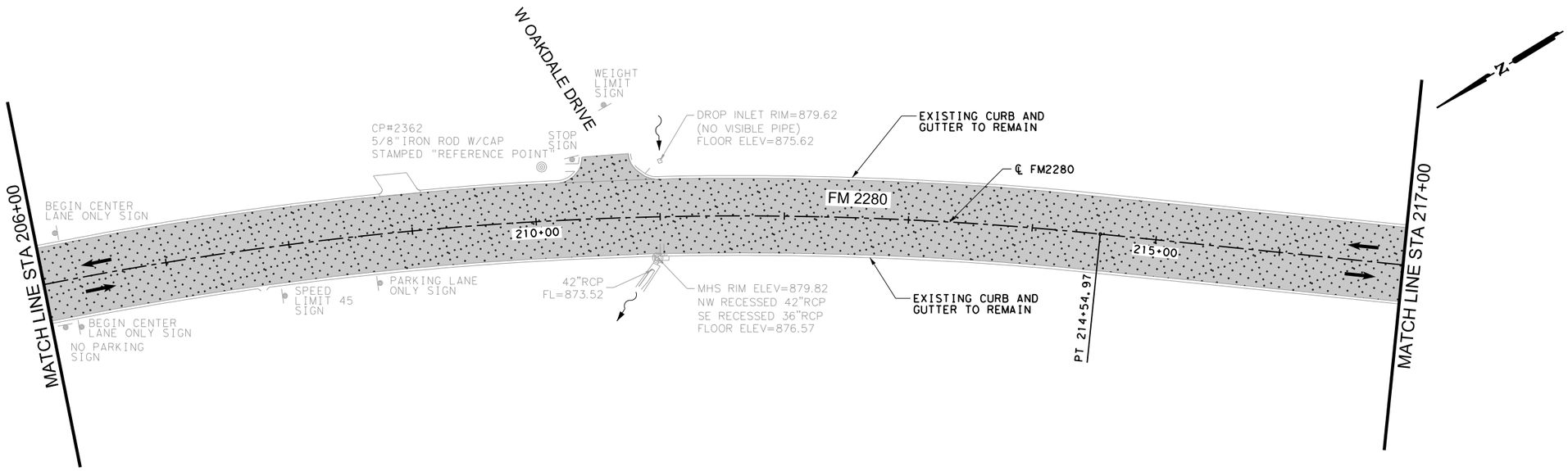

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HORIZ. SCALE IN FEET

LEGEND:

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SHEET 10 OF 14

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6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	66
CONTROL	SECTION	JOB	
2465	01	020	

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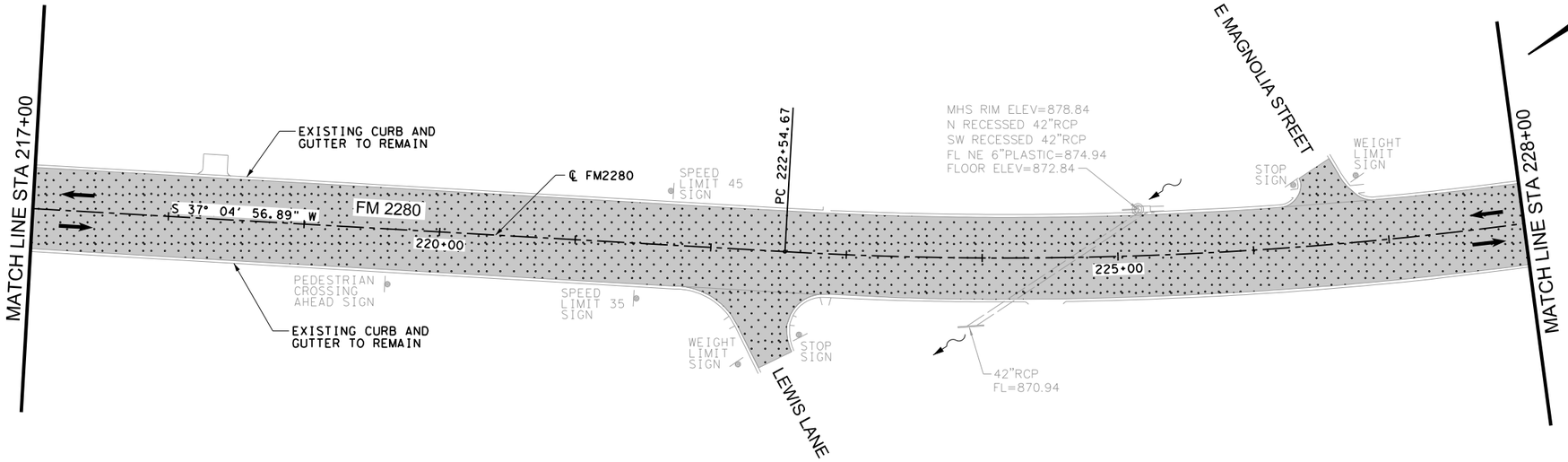

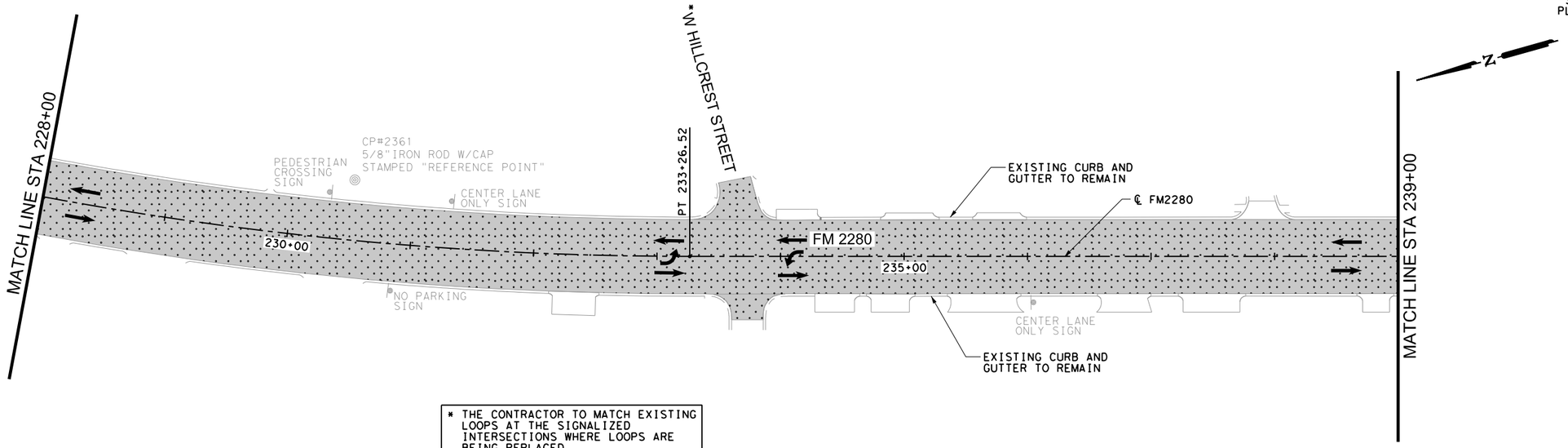

* THE CONTRACTOR TO MATCH EXISTING LOOPS AT THE SIGNALIZED INTERSECTIONS WHERE LOOPS ARE BEING REPLACED.

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FM 2280
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SHEET 11 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	67
CONTROL	SECTION	JOB	
2465	01	020	

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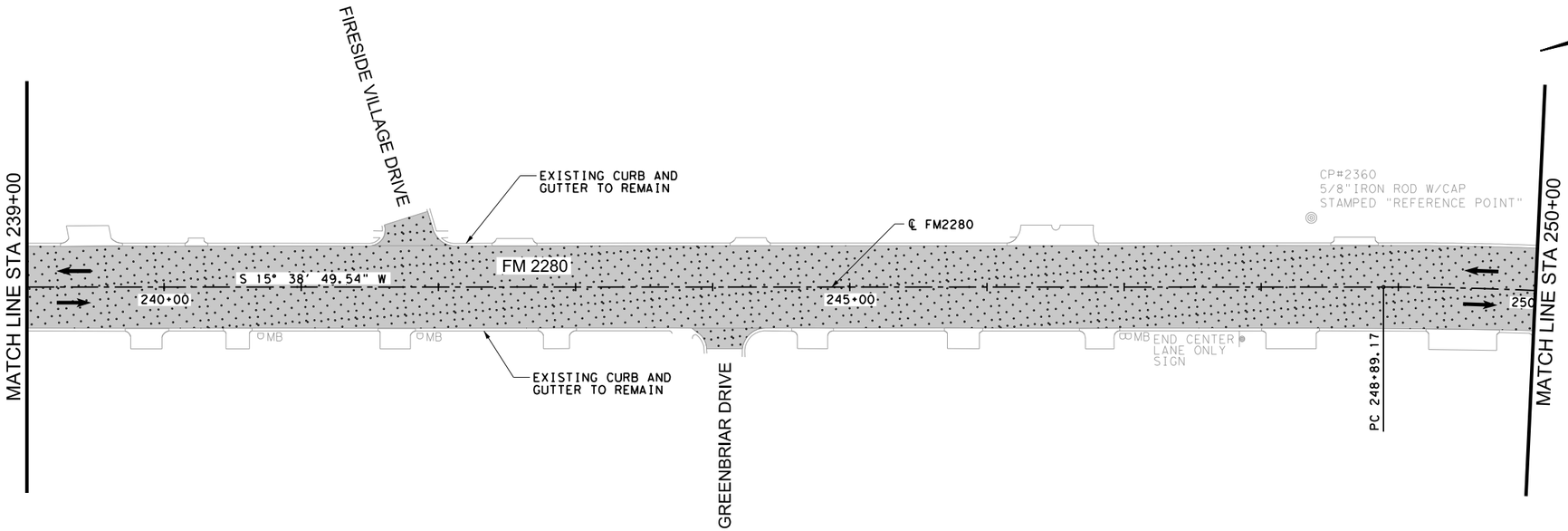

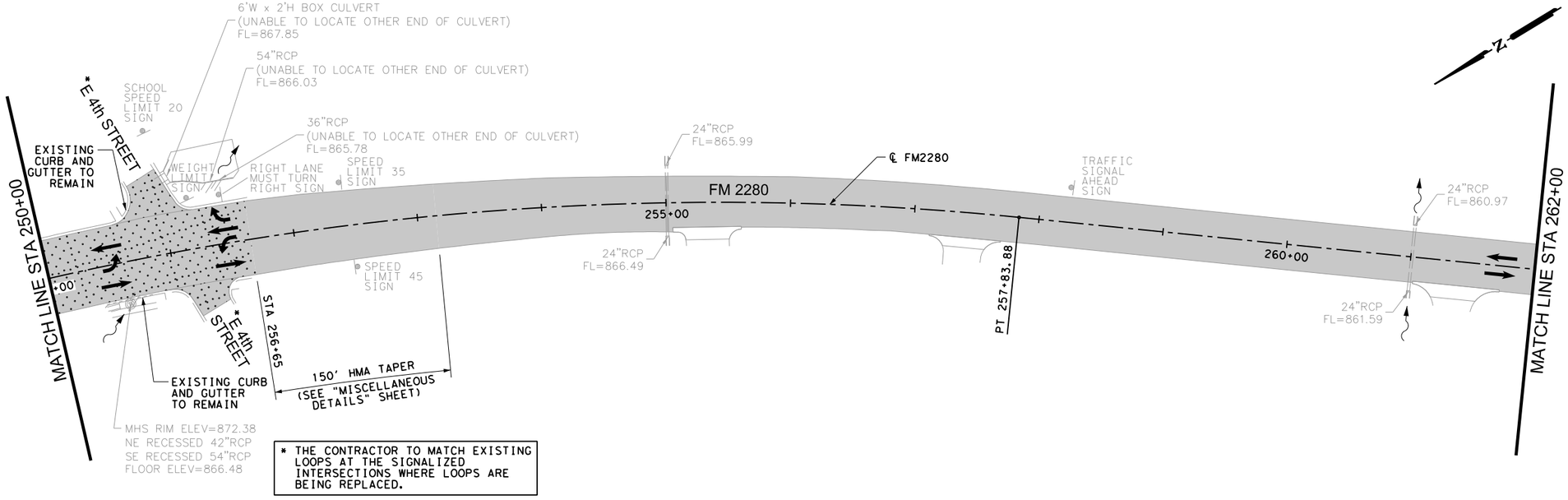

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Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 12 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	68
2465	01	020	

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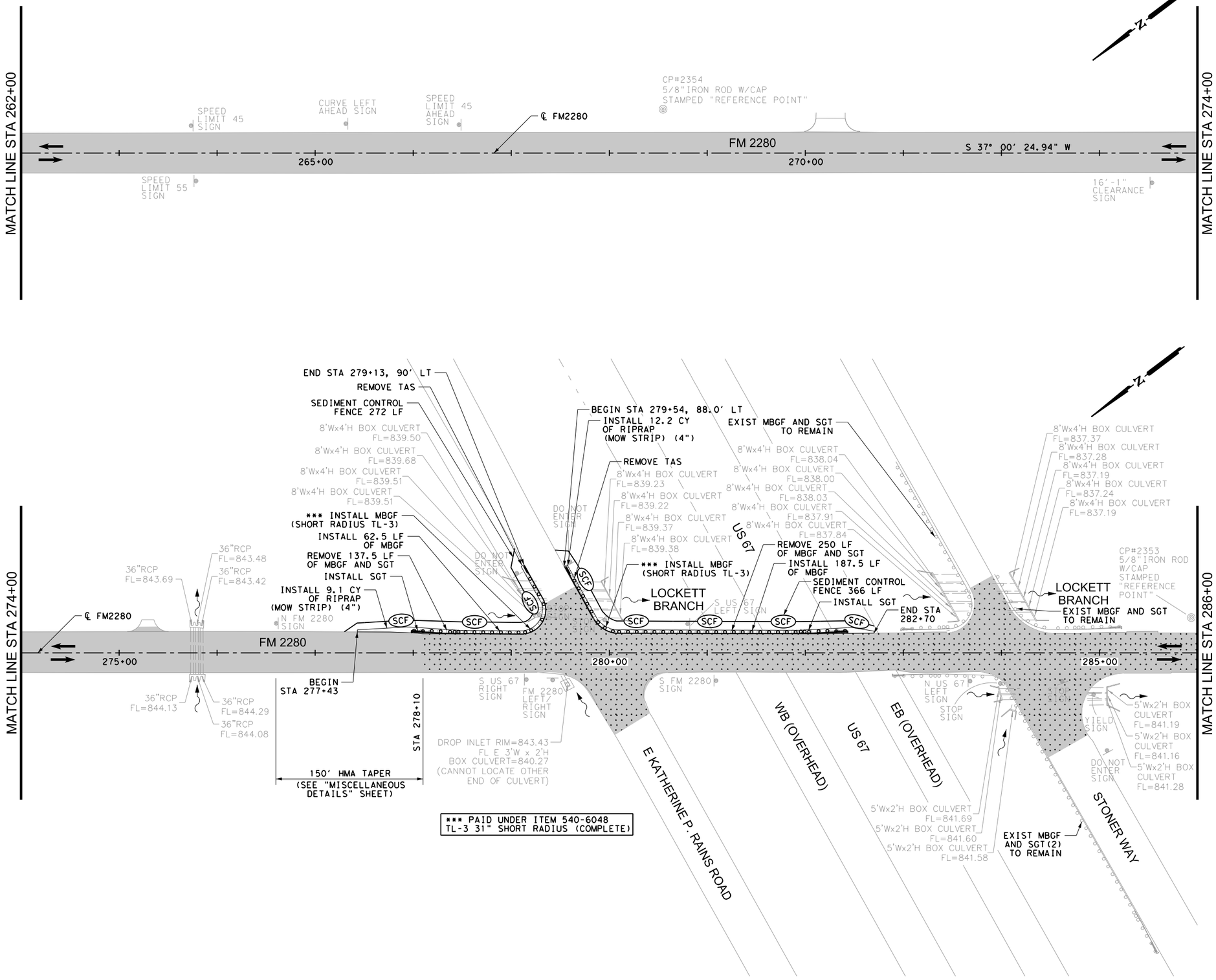

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HORIZ. SCALE IN FEET

LEGEND:

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- MILL AND INLAY LIMITS

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FM 2280
PAVING PLAN

SHEET 13 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	69
CONTROL	SECTION	JOB	
2465	01	020	

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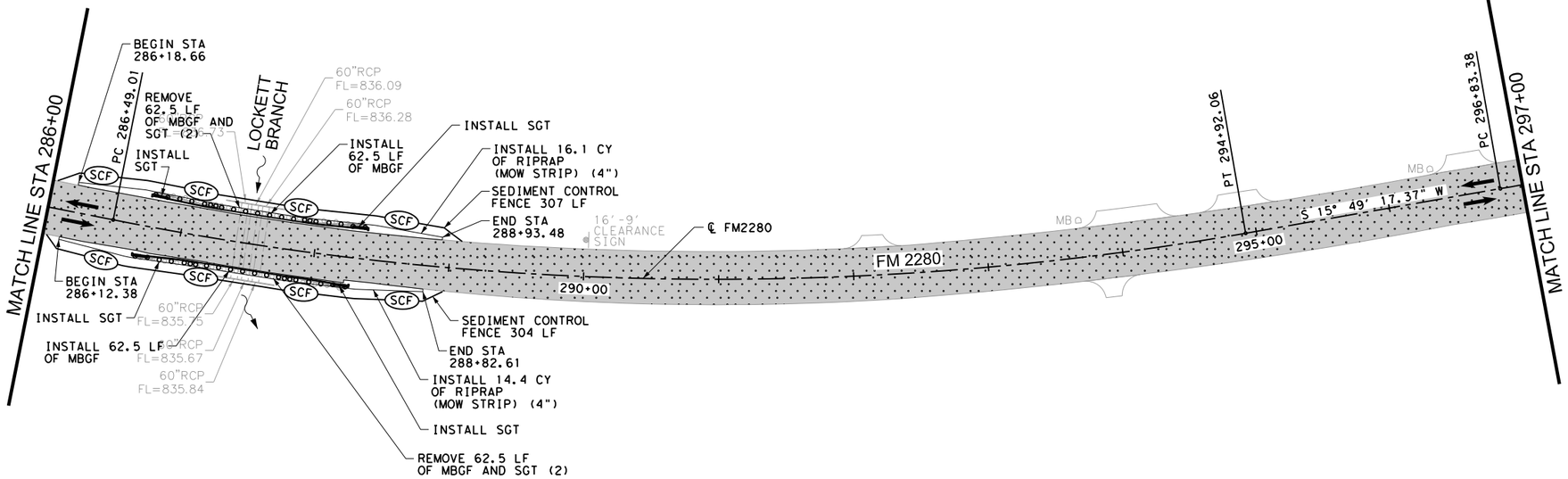

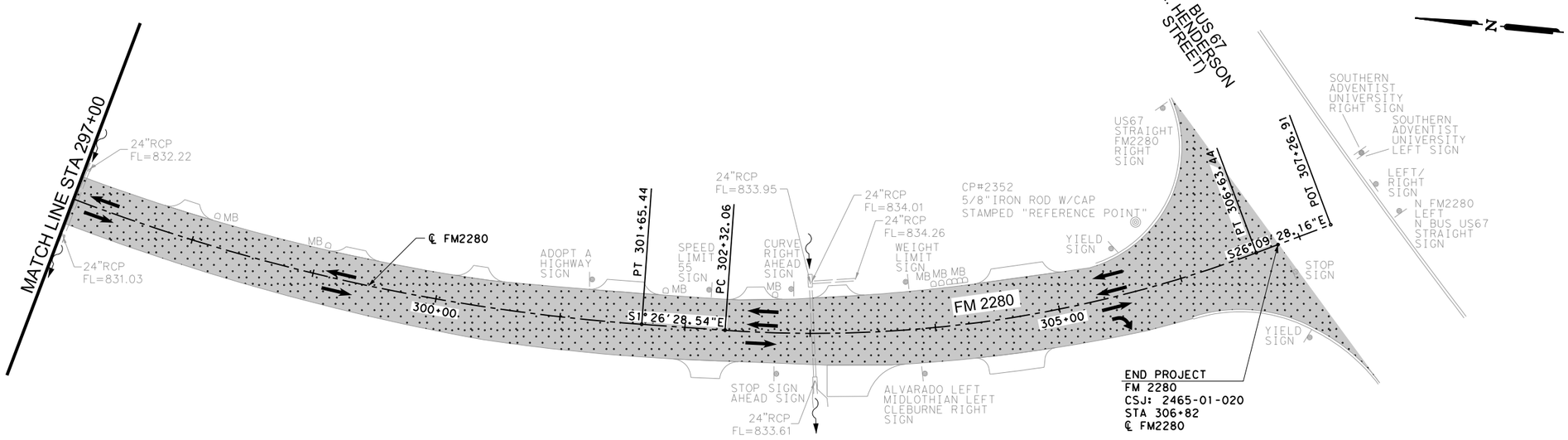

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HORIZ. SCALE IN FEET

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3. CONTRACTOR SHALL MEASURE AND RECORD ALL EXISTING PAVEMENT MARKINGS PRIOR TO CONSTRUCTION.
4. CONTRACTOR SHALL MEASURE AND RECORD EXISTING CROSS SLOPE.
5. CONTRACTOR SHALL MAINTAIN EXISTING GRADES AND SLOPES EXCEPT AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER.
6. CONTRACTOR SHALL PERFORM WORK IN A WAY TO MINIMIZE THE TRAPPING OF WATER AND SHALL MAINTAIN POSITIVE DRAINAGE.
7. CONTRACTOR SHALL CREATE TAPERED FEATHERED BUTT JOINTS TO ALLOW A TRANSITIONED GRADE CHANGE AT THE END OF WORKING SHIFTS AND PRIOR TO OPENING TRAFFIC.
8. DRIVEWAYS ALONG INLAY/OVERLAY AREAS ARE NOT TO BE RECONSTRUCTED UNLESS DIRECTED BY THE ENGINEER. ASPHALT/FLEX BASE DRIVEWAYS SHALL HAVE OVERLAY TRANSITION. SEE DRIVEWAY OVERLAY TRANSITION DETAILS ON "MISCELLANEOUS DETAILS" SHEET.
9. THE INSTALLATION OF SW3P ELEMENTS WILL BE AS DIRECTED BY THE ENGINEER.
10. ALL SW3P QUANTITIES WILL BE ADJUSTED IN THE FIELD OR AS DIRECTED BY THE ENGINEER.
11. REMOVAL OF DRIVEWAY TERMINAL ANCHOR SECTION (TAS) IS TO BE PAID UNDER ITEM 542-6002 (REMOVE TERMINAL ANCHOR SECTION).
12. ANY SIGN REMOVAL, RELOCATION AND INSTALLATION IS SUBSIDIARY TO OTHER PERTINENT PAY ITEMS UNLESS SHOWN OTHERWISE ON PLANS.
13. SHORT RADIUS SHALL BE PAID UNDER ITEM 540-6014 "SHORT RADIUS" UNLESS SHOWN OTHERWISE ON THE PLANS.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Christopher Boles

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

Texas Department of Transportation

FM 2280
PAVING PLAN

SHEET 14 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	70
CONTROL	SECTION	JOB	
2465	01	020	

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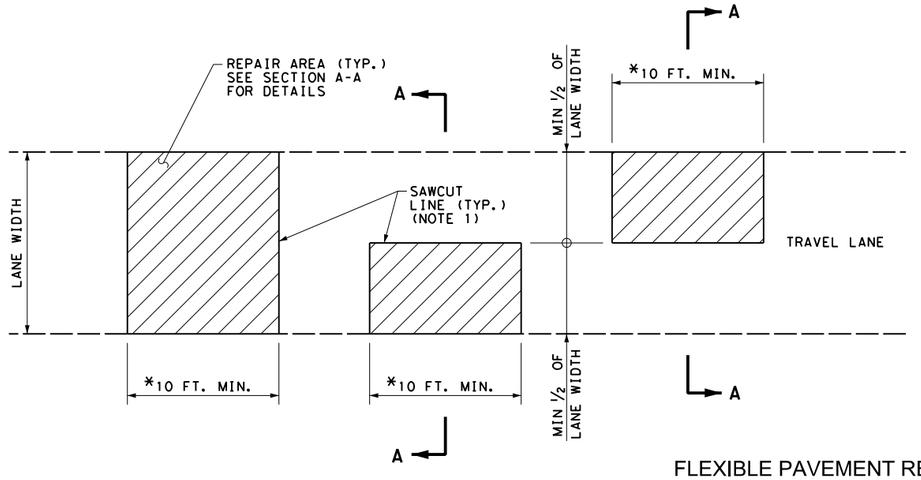
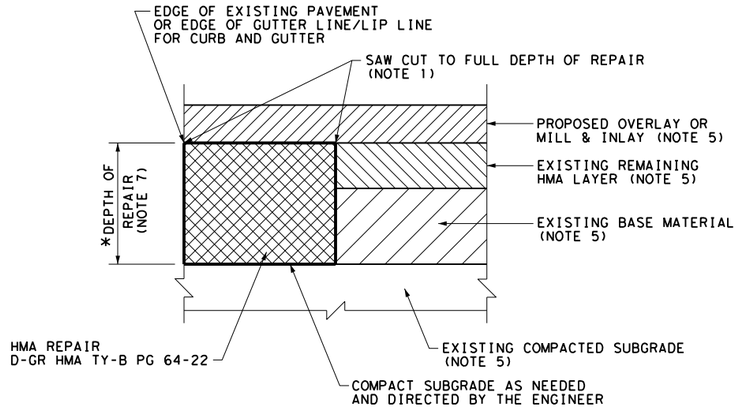




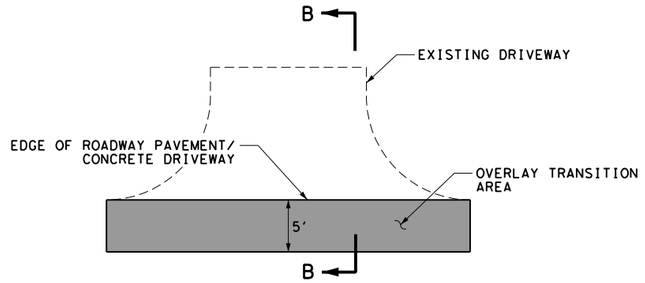
SECTION A-A

FLEXIBLE PAVEMENT REPAIR DETAIL

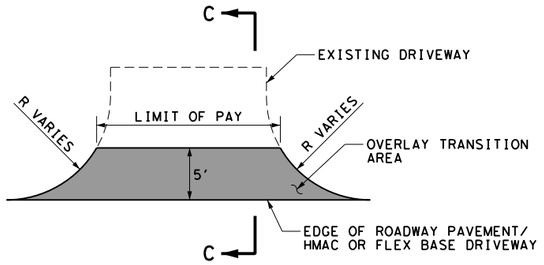
*ACTUAL LOCATION AND EXTENT MAY VARY. ADJUST AS PER ENGINEER'S DIRECTION.
N.T.S.

NOTES:

1. LEAVE NO SAWCUT REPAIR JOINTS UNDER WHEEL PATH.
2. EXTENT OF DRIVEWAY OVERLAY TRANSITION VARIES PER DETAILS SHOWN ON THIS SHEET OR AS DIRECTED BY THE ENGINEER.
3. EXTENT OF SIDE STREETS RECONSTRUCTION SHALL BE UP TO CURB RETURN OR AS SHOWN ON PAVING SHEETS. EXACT SIDE STREET LIMITS AND TYPE OF IMPROVEMENTS TO BE DETERMINED IN THE FIELD AS DIRECTED BY THE ENGINEER.
4. CONTRACTOR SHALL NOT WORK/DAMAGE ANY DRIVEWAY/SIDE STREET CULVERTS/PIPES. TO AVOID DAMAGE, CONSTRUCTION LIMIT SHALL BE ADJUSTED PER ENGINEER'S DIRECTION.
5. SEE TYPICAL SECTIONS FOR DETAILS.
6. DRILL AND GROUT WITH TYPE III, CLASS C EPOXY. FOLLOW MANUFACTURER'S DIRECTION FOR INSTALLING THE EPOXY DOWEL BARS.
7. DEPTH OF REPAIR IS 4"-5" UNLESS DIRECTED OTHERWISE BY THE ENGINEER. FULL DEPTH LOCATIONS TO BE PROVIDED BY THE ENGINEER IN THE FIELD. TO BE PAID UNDER ITEM 351-6037 FLEX PAVEMENT STRUCTURE REPAIR (4"-5").
8. ITEM CRS-2 OR 2H IS NOT PAID FOR SEPARATELY AND IS SUBSIDIARY TO ITEM 134.
9. THE LOCATION AND AREA OF EXISTING MAILBOX TURNOUT SHOWN ARE APPROXIMATE. CONTRACTOR TO COORDINATE WITH THE ENGINEER AND ADJUST THE QUANTITY AND LOCATION IN THE FIELD WITH APPROVAL FROM THE ENGINEER. THE ITEM WILL BE PAID AS 2" SP-C SAC-A PG70-28 (ITEM 3077 6027).

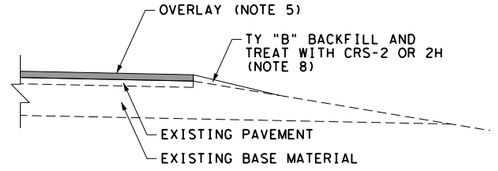


PLAN VIEW

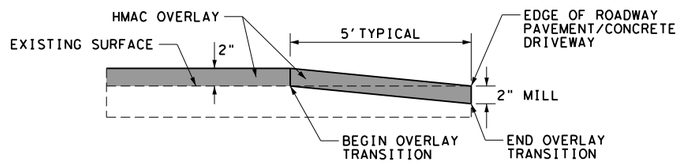


PLAN VIEW

FM 2280				
APPROXIMATE LOCATION OF EXISTING MAILBOX TURNOUTS (NOTE 9)				
STATION	LOCATION (LT OR RT)	LENGTH	WIDTH	SY
18+44	RT	66	4	30
19+50	RT	22	3	8
50+18	RT	30	2	7
52+24	RT	40	3	14
58+70	RT	30	2	7
61+90	RT	30	2	7
62+55	RT	30	2	7
71+32	RT	30	2	7
82+79	RT	30	2	7
90+55	RT	30	2	7
136+30	RT	30	2	7
142+98	RT	30	2	7
143+81	RT	30	3	10
198+10	RT	30	1	4
22+40	LT	30	2	7
43+76	LT	30	1	4
51+10	LT	30	2	7
63+22	LT	50	3	17
65+20	LT	30	1.5	5
77+11	LT	30	2	7
78+00	LT	30	1	4
82+95	LT	30	1	4
95+67	LT	30	1	4
96+86	LT	30	1	4
108+10	LT	30	2	7
113+20	LT	30	1	4
158+60	LT	50	2	12
161+10	LT	52	4	24
293+59	LT	30	2	7
296+06	LT	30	1	4
299+10	LT	30	1	4
			TOTAL AREA (SY) =	254.00
TOTAL 3077 6027 (SP MIXES SP-C SAC-A PG70-28) (TON) =				29.21

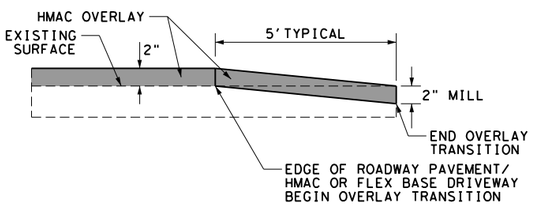


EDGE DETAIL
N.T.S.



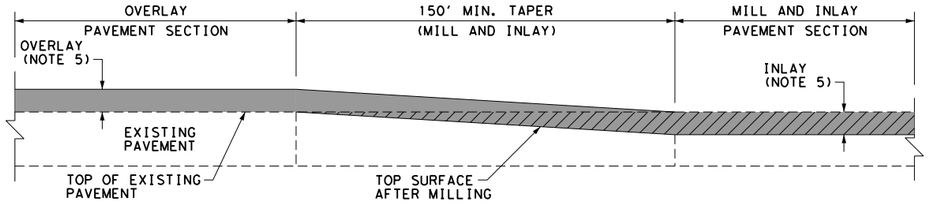
SECTION B-B

CONCRETE DRIVEWAY
OVERLAY TRANSITION DETAIL
N.T.S.

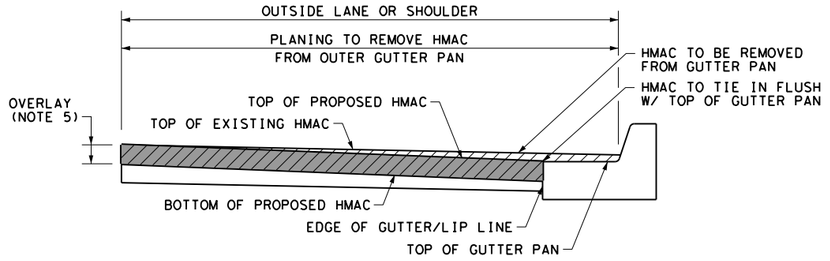


SECTION C-C

HMAC/FLEX BASE DRIVEWAY
OVERLAY TRANSITION DETAIL
N.T.S.



HMA TAPER DETAIL (BETWEEN OVERLAY AND MILL/INLAY SECTION)
LONGITUDINAL SECTION
N.T.S.



MILLING DETAIL NEAR CURB
N.T.S.

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

1/5/2024

NO.	DATE	REVISION	APPROVED

VRX, INC. | 2500 N. DALLAS PARKWAY, SUITE 450 | PLANO, TX 75093 | FIRM # F-9690

MISCELLANEOUS DETAILS

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	71
CONTROL	SECTION	JOB	
2465	01	020	

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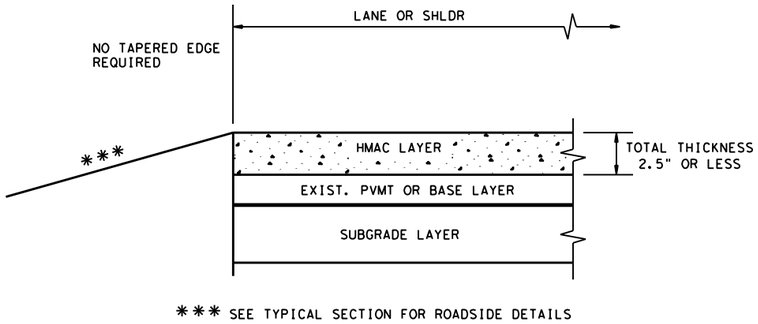
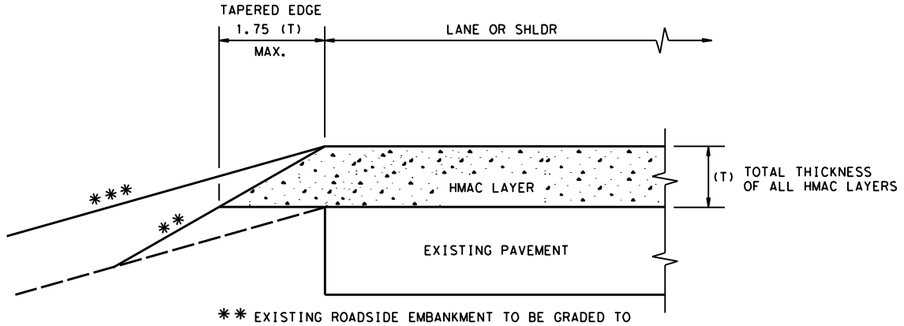


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

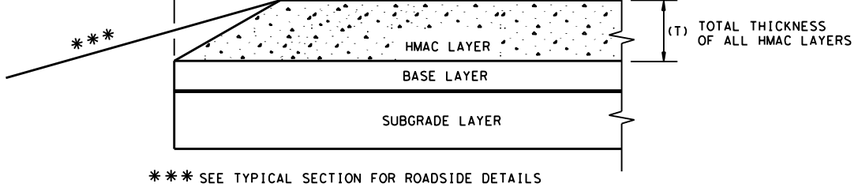
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

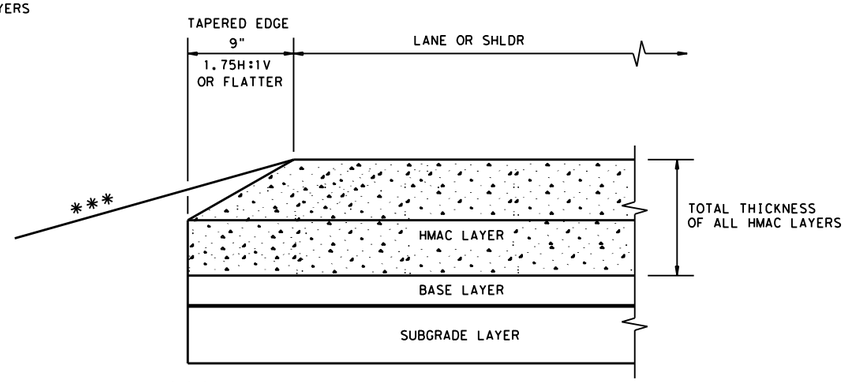
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

GENERAL NOTES

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

(NOT TO SCALE)

Texas Department of Transportation

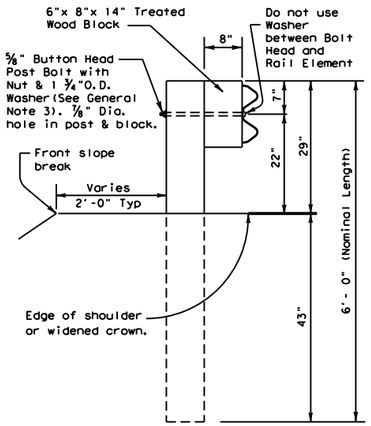
Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

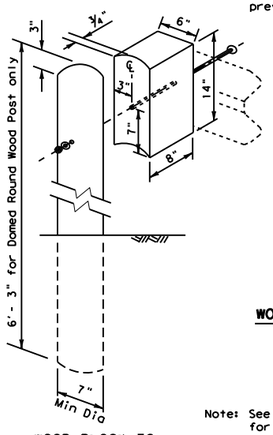
TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		72

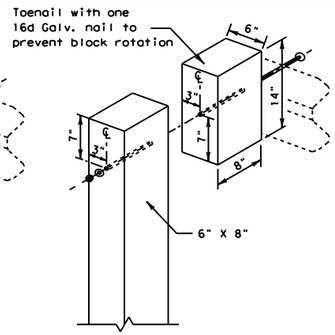
DATE:
FILE:



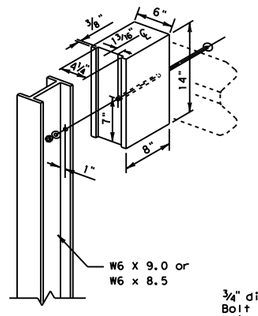
TYPICAL POST



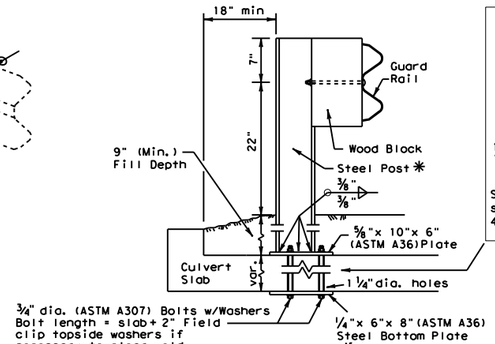
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST

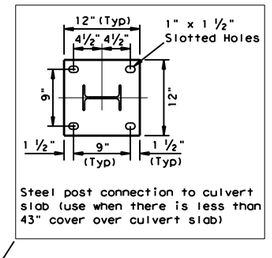


WOOD BLOCK TO STEEL POST

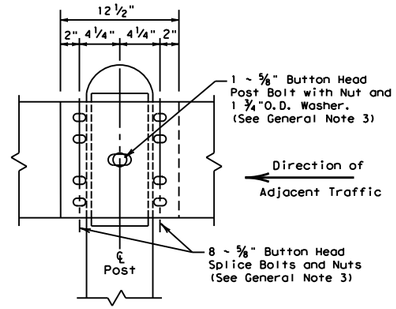


* LOW FILL CULVERT POST

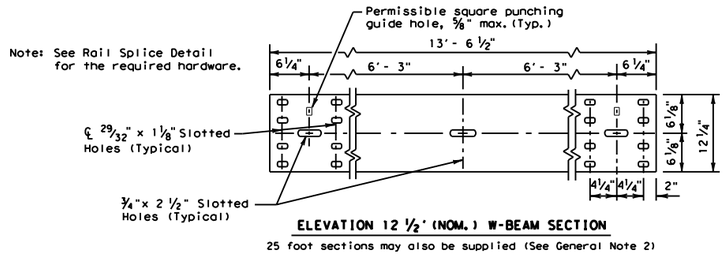
FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY



* Post(s) may require field modifications to ensure proper guardrail height.

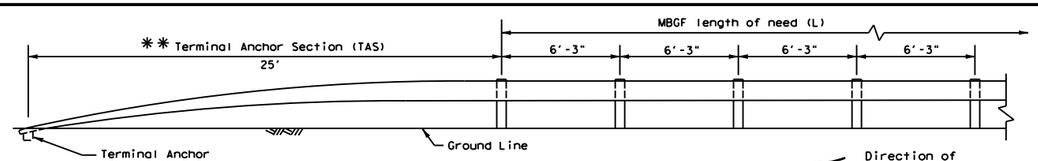


RAIL SPLICE DETAIL



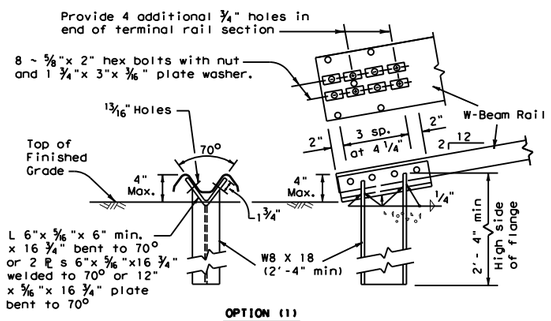
ELEVATION 12½' (NOM.) W-BEAM SECTION

25 foot sections may also be supplied (See General Note 2)



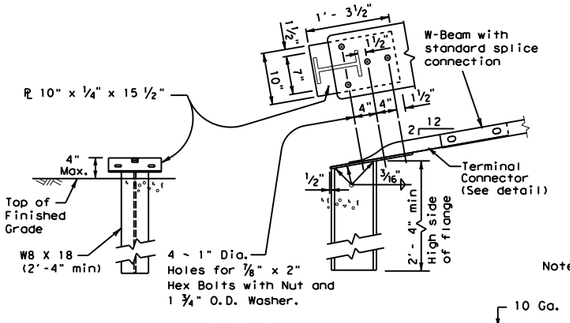
** TERMINAL ANCHOR SECTION (TAS)

Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



OPTION (1)

Note: This anchor post requires four additional ¾" holes (shop or field) in the rail member with eight ⅝" hex bolts with nut and plate washer.

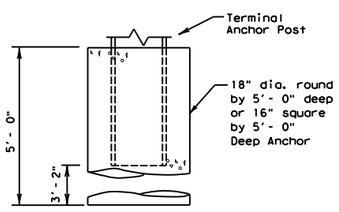


OPTION (2)

Note: This anchor post requires the use of the 10 ga. terminal connector with four ⅞" hex bolts with nut and washer.

TERMINAL ANCHOR POST OPTIONS

(See General Note 11)



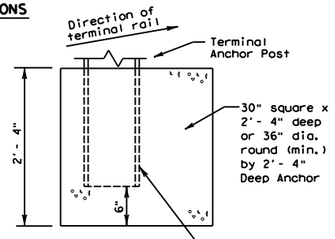
Notes:

Either concrete anchor may be used with either post option above.

No construction joint is allowed in the concrete anchor.

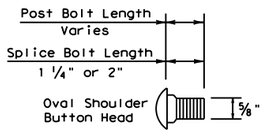
Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.

If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.



TERMINAL CONCRETE ANCHOR OPTIONS

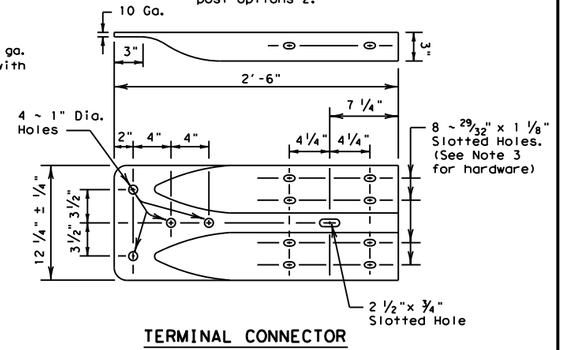
(See General Note 11)



BUTTON HEAD BOLT

Post and Splice Bolts (See General Note 3)

Note: Terminal Connector to be used with terminal anchor post options 2.



TERMINAL CONNECTOR

For connection hardware to concrete rails, see the MBGF transition standards.

GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12½ or 25 foot nominal lengths.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1¾" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
5. Crown shall be widened to accommodate the Metal Beam Guard Fence.
6. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
7. 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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
8. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
9. Posts shall not be set in concrete, of any depth.
10. Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
11. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421, "Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
12. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

Texas Department of Transportation

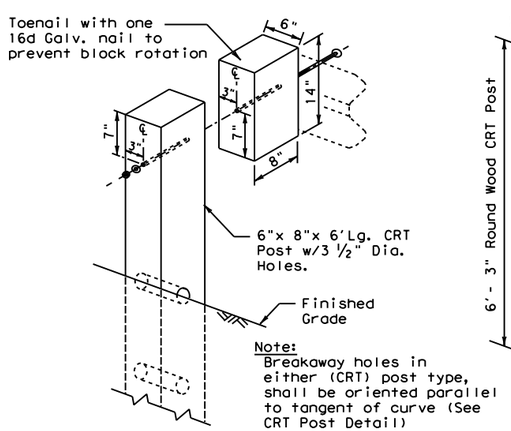
Design Division Standard

METAL BEAM GUARD FENCE

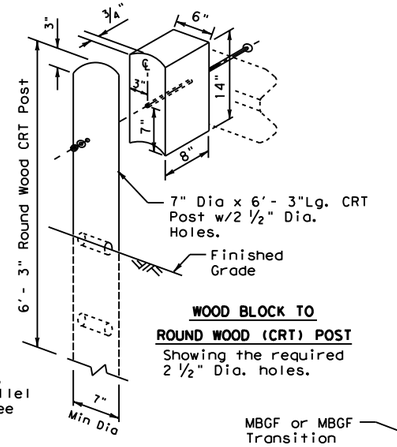
MBGF-19

FILE: mbgf19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		73

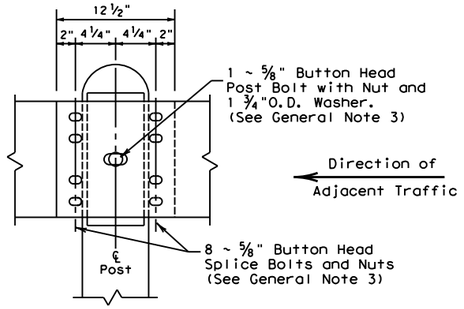
DATE:
FILE:



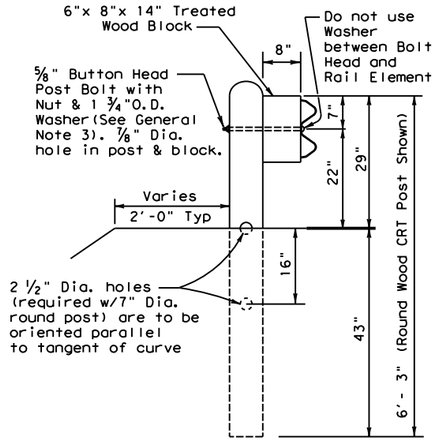
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST
Showing the required 3 ½" Dia. holes.



WOOD BLOCK TO ROUND WOOD (CRT) POST
Showing the required 2 ½" Dia. holes.

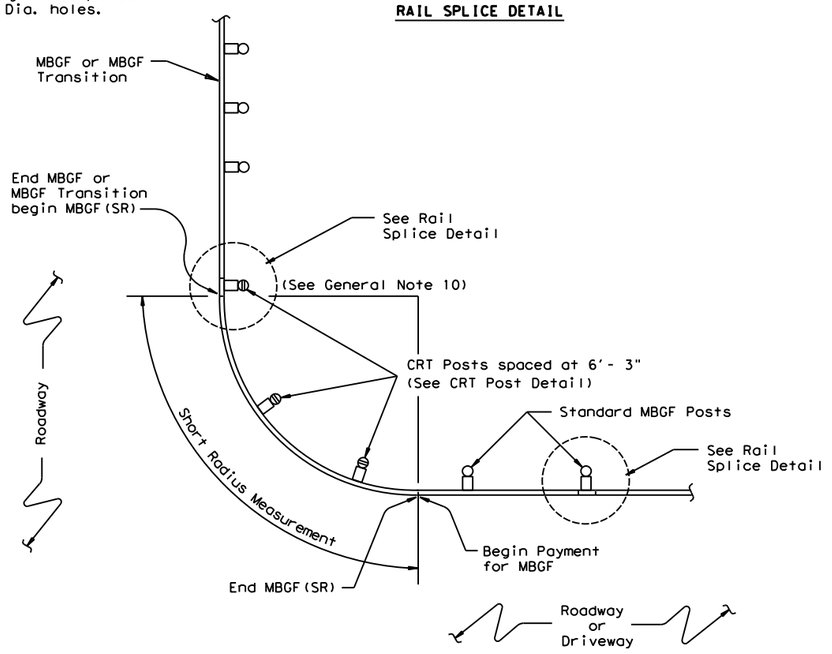


RAIL SPLICE DETAIL



(CRT) POST DETAIL
CONTROLLED RELEASE TERMINAL POST

Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



PLAN VIEW
SHOWING TYPICAL RADIUS

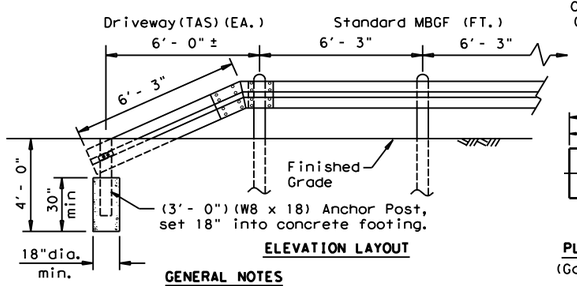
The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 ½ or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
8. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or 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 can furnish composite material posts and/or blocks.

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.



ELEVATION LAYOUT

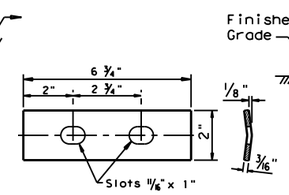
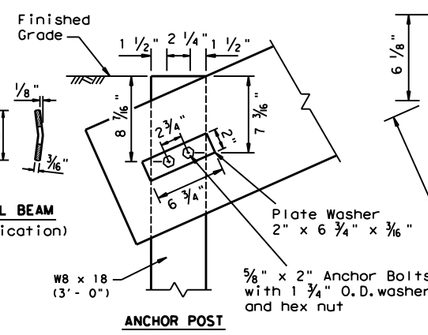
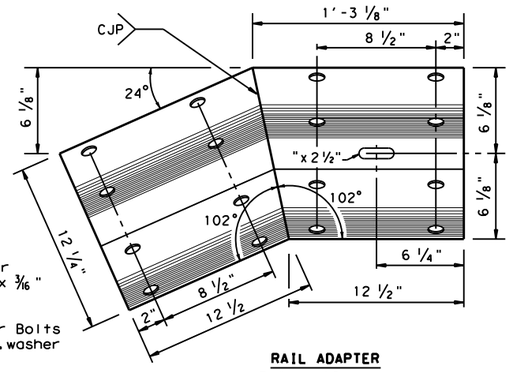


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)



ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

GENERAL NOTES

1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft.(TAS)Terminal Anchor Section,is too long.
2. Terminal anchor post shall be set in Class A concrete.
3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

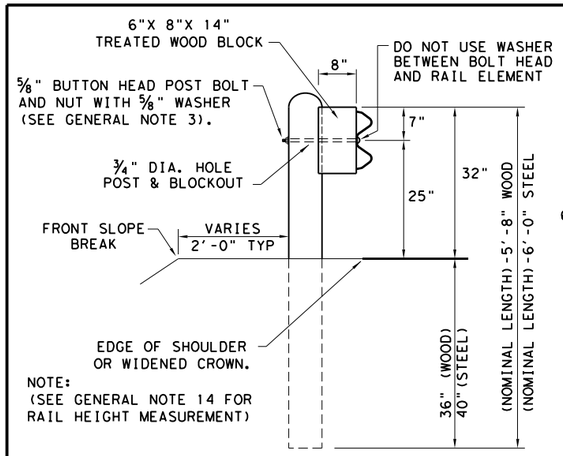
Texas Department of Transportation

Design Division Standard

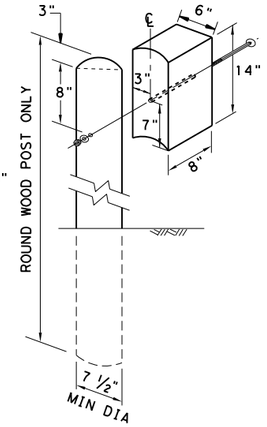
METAL BEAM GUARD FENCE
(SHORT RADIUS)
MBGF(SR)-19

FILE: mbgfsr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		74

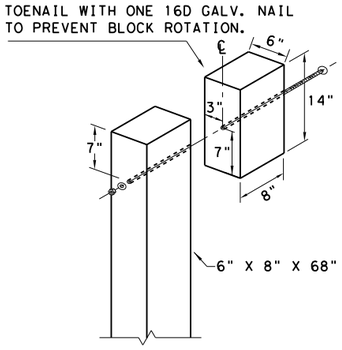
DATE:
FILE:



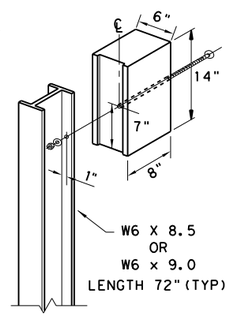
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

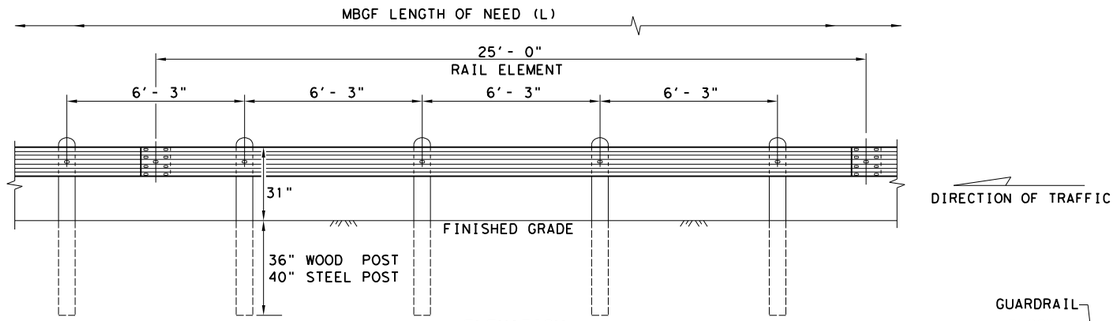


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

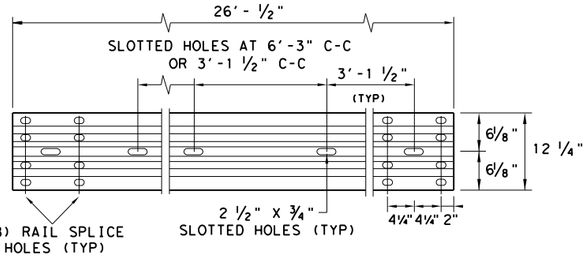
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

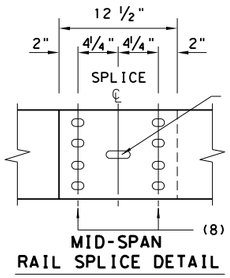
ELEVATION
MID-SPAN RAIL SPLICE

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.



DIRECTION OF TRAFFIC

MID-SPAN
RAIL SPLICE DETAIL

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

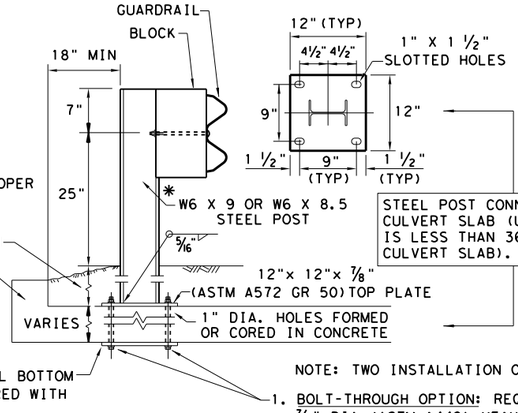
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH — VARIES
FBBO1 = 1 ¼"
FBBO2 = 2"
⅝"

POST & BLOCK LENGTH
FBBO3 = 10"
FBBO4 = 18"

BUTTON HEAD BOLT

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2465	01	020	FM 2280	
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	FTW	JOHNSON		75	

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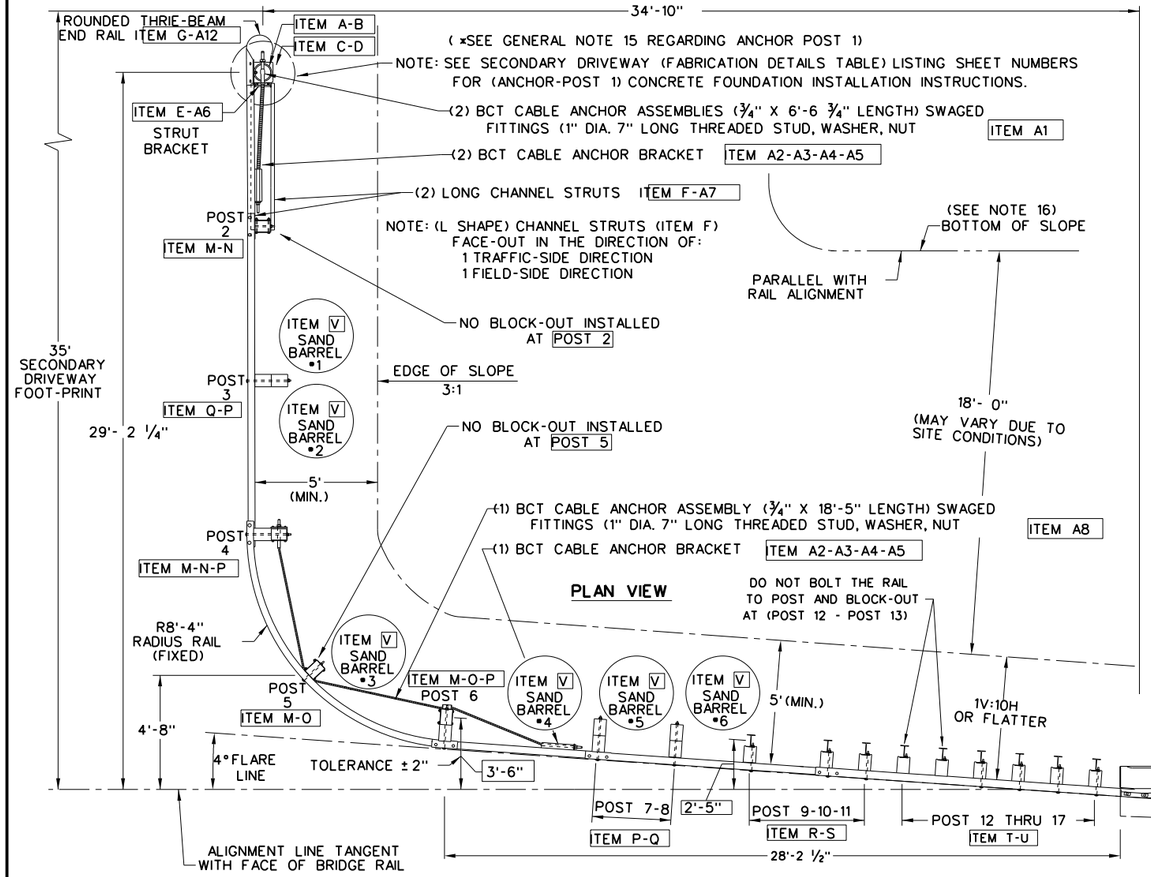
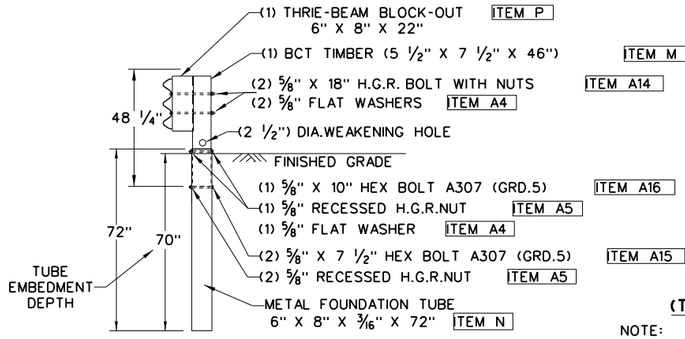
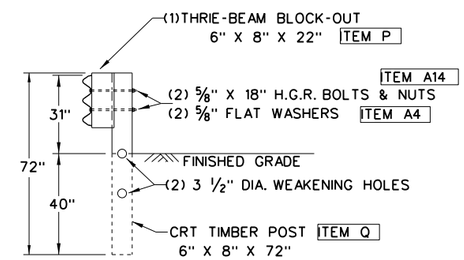




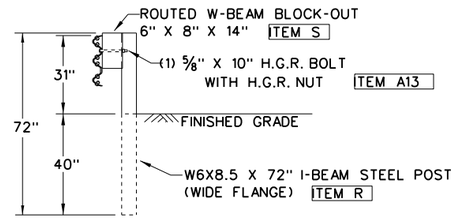
SECTION VIEW (A-A)
TIMBER POST WITH METAL FOUNDATION TUBE
(TYP) BCT POSTS 2-4-5-6

NOTE:
NO BLOCK-OUTS INSTALLED AT BCT POST 2 - POST 5

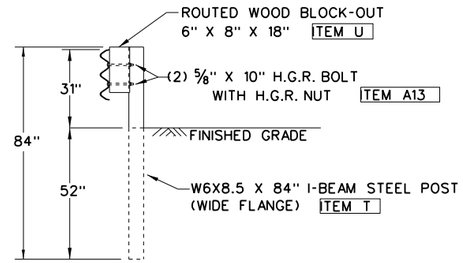


SECTION VIEW (B-B)
(TYP) CRT TIMBER POSTS 3-7-8

NOTE:
SEE SPECIAL APPLICATION NOTES ON SHEET 3 OF 3.
CRT POST WILL REQUIRE AN ADDITIONAL ¾" HOLE TO ACCOMMODATE THE 22" LONG BLOCKOUT.



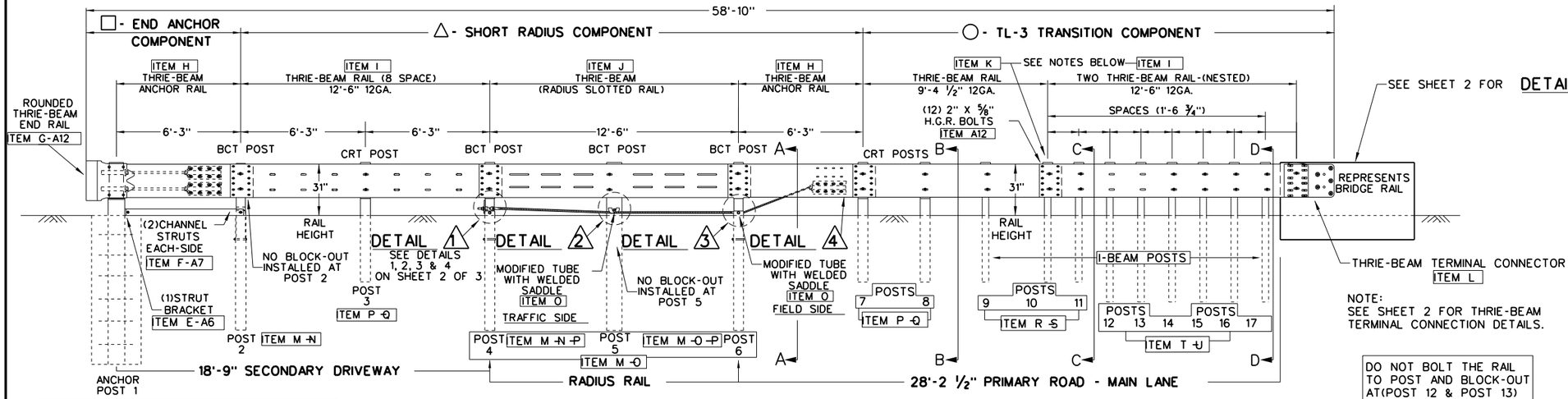
SECTION VIEW C-C
(TYP) AT POSTS 9-10-11



* SECTION VIEW D-D
(TYP) AT POSTS 12-13-14-15-16-17

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT(POST 12 & POST 13)

NOTE: FOR POST 12 & 13



NOTE:
SEE SHEET 2 FOR THRIE-BEAM TERMINAL CONNECTION DETAILS.

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT(POST 12 & POST 13)

NOTE: FOR POST 12 & 13

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

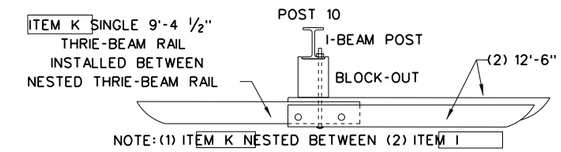
SHEET 1 OF 3

ANCHOR POST 1 FABRICATION DETAILS	
SHEET DESCRIPTION	SHEET NUMBER
ANCHOR POST	SHEET 1 OF 8
ANCHOR SLEAVE	SHEET 2 OF 8
RADIUS RAIL	SHEET 3 OF 8
THRIE-BEAM RAILS	SHEET 4 OF 8
BCT TIMBER POST	SHEET 5 OF 8
STRUT RADIUS ANCHOR	SHEET 6 OF 8
FOUNDATION TUBE	SHEET 7 OF 8
ANCHOR CABLE	SHEET 8 OF 8

FULL-LENGTH ELEVATION VIEW

NOTE: ALL CABLE BRACKET ASSEMBLIES ARE LOCATED ON THE FIELD-SIDE. SHOWN HERE FOR CLARITY.

NOTE: FOR BCT POSTS 2-4-5-6 INSTALL (1) OR (2) ITEM A15-A4-A5 BOLT ASSEMBLIES TO PREVENT TIMBER POST SLIDING DOWN FOUNDATION TUBE.



NOTE: (1) ITEM K NESTED BETWEEN (2) ITEM I

NESTED-GUARDRAIL SPLICE AT POST 10

Texas Department of Transportation

Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT
SRG(TL-3)-21

FILE: srgtl321	TxDOT	CK:KM	DN: VP	CK:CGL
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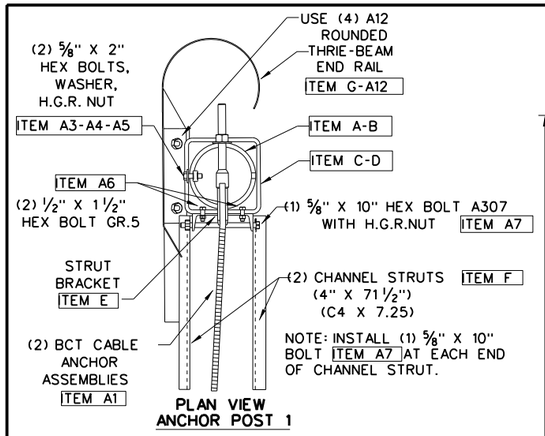
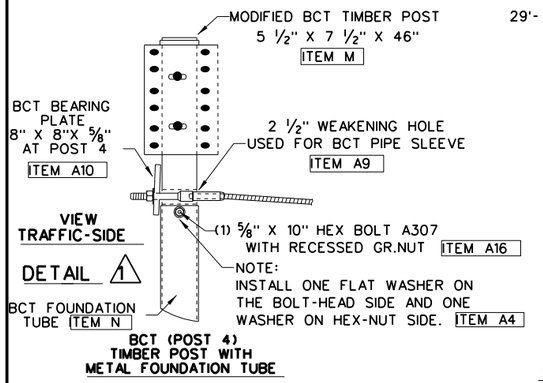
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		76

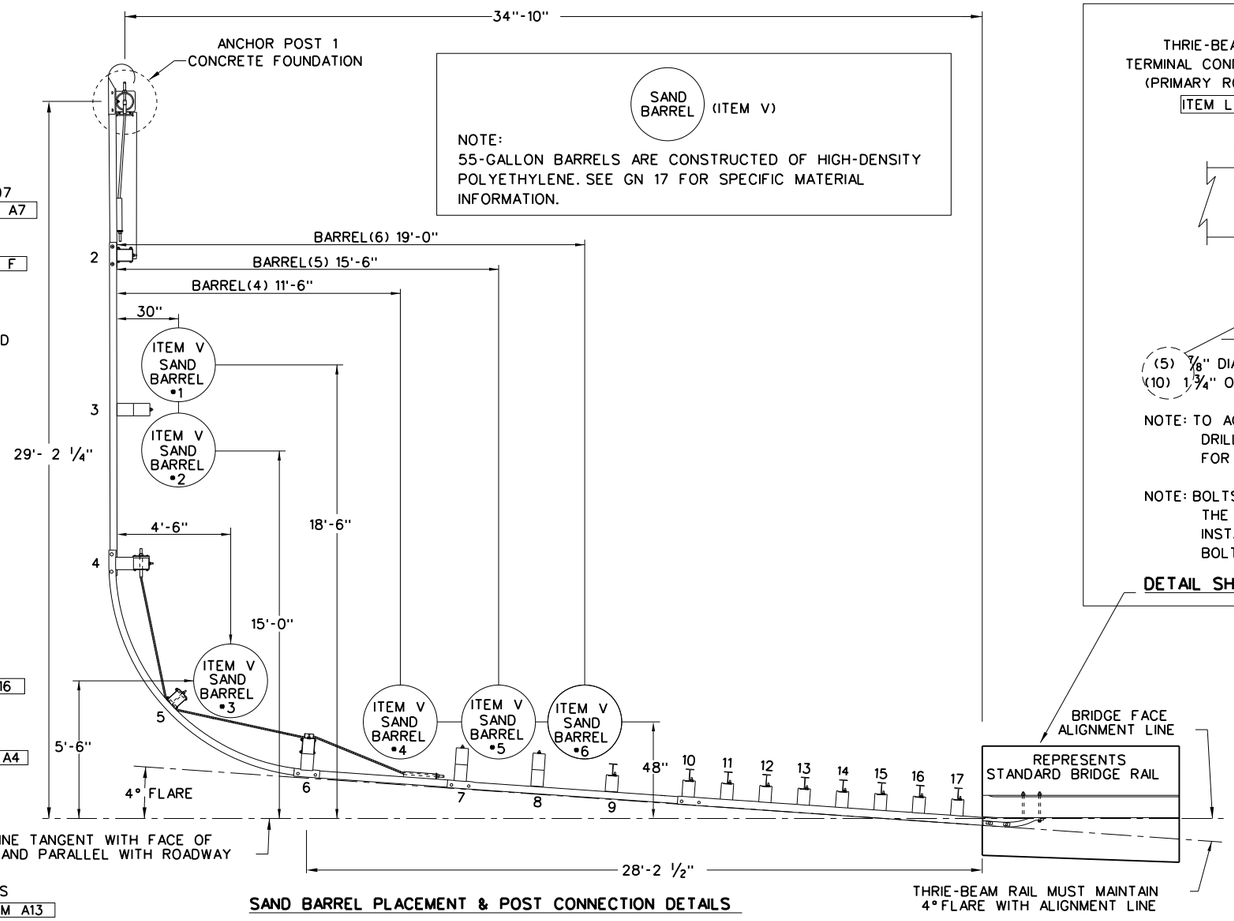
DATE:
FILE:



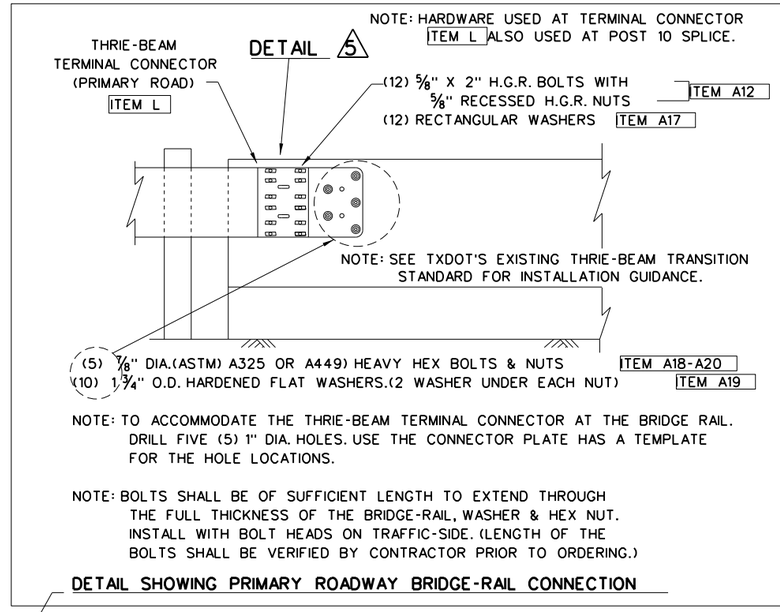
PLAN VIEW ANCHOR POST 1



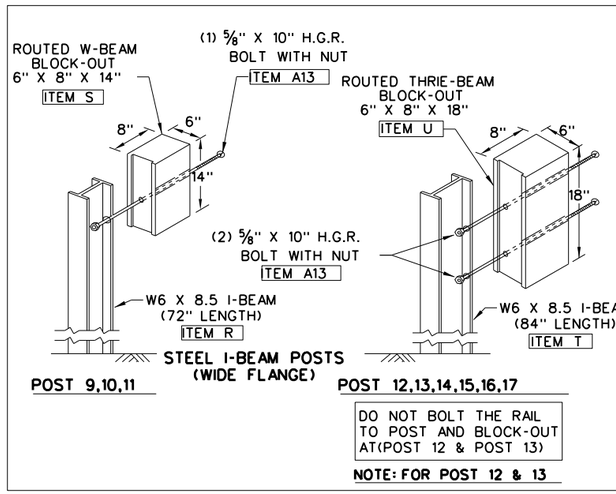
BCT (POST 4) TIMBER POST WITH METAL FOUNDATION TUBE

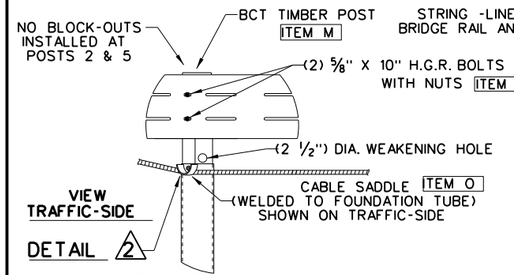


SAND BARREL PLACEMENT & POST CONNECTION DETAILS

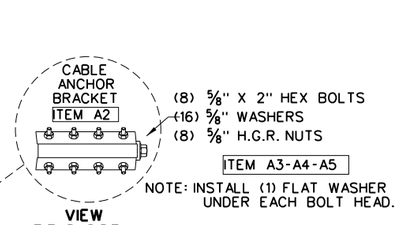


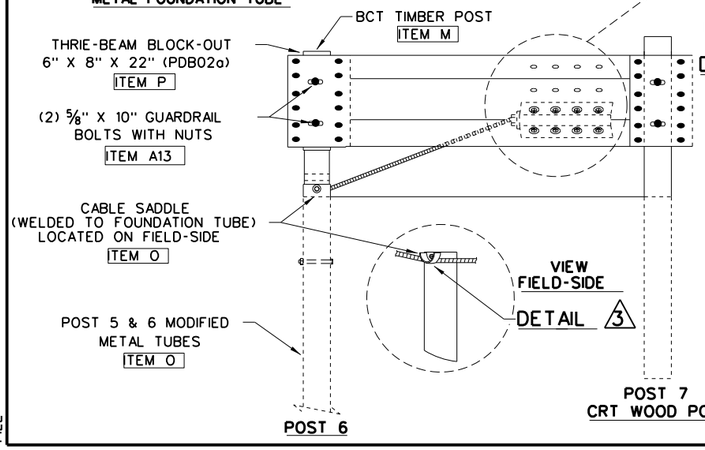
DETAIL SHOWING PRIMARY ROADWAY BRIDGE-RAIL CONNECTION

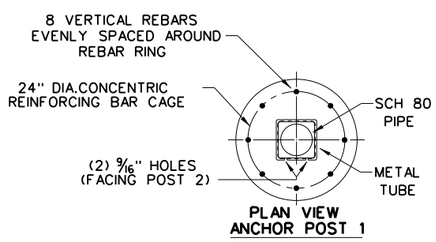




BCT (POST 5) TIMBER POST WITH METAL FOUNDATION TUBE

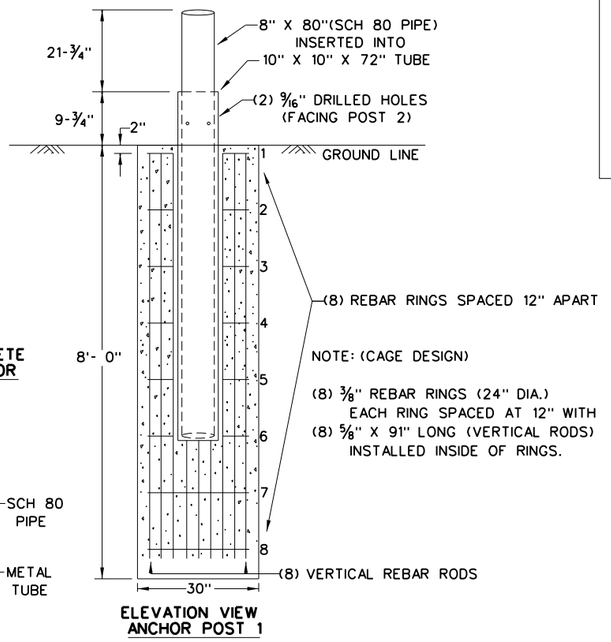






POST 1 REINFORCED CONCRETE FOUNDATION ANCHOR

PLAN VIEW ANCHOR POST 1



ELEVATION VIEW ANCHOR POST 1

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

SRG(TL-3)-21

FILE: srgtl321	TxDOT	CK:KM	DN: VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		77

DATE:
FILE:

ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS	END ANCHOR (POST 1 & POST 2) □ ITEM	QTY	TL-3 SHORT RADIUS (POST 2 TO POST 7) △ ITEM	QTY	TL-3 TRANSITION (POST 7 TO POST 17) ○ ITEM	QTY	TL-3 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM ITEM	TOTAL QTY
A	POST 1 TOP (SCH.80 PIPE) (8" X 80" LENGTH)	A	1					A	1
B	POST 1 TOP (WELDED SUPPORT COLLAR 10" X 10" X ½" ASTM A36)	B	1					B	1
C	POST 1 TUBE (HSS 10" X 10" X ½" X 72" LENGTH) A500 GR.B	C	1					C	1
D	POST 1 (WELDED PLATE 9 ¼" X 9 ¼" X ⅛") A36	D	1					D	1
E	POST 1 STRUT BRACKET (C8 X 11.50 A36)	E	1					E	1
F	(POST 1 & 2) CHANNEL STRUTS (4" X 71 ½")(C4 X 7.25)A36	F	2					F	2
G	THRIE-BEAM RAIL (END ANCHOR - ROUNDED TYPE) 12GA. (RTE02a)	G	1					G	1
H	THRIE-BEAM RAIL (ANCHOR) (6'-3" LENGTH) 12GA. (RWM14a)	H	1	H	1			H	2
I	THRIE-BEAM RAIL (8 SPACE) (12'-6" LENGTH) 12GA. (RTM08)			I	1	I	2	I	3
J	THRIE-BEAM RAIL (RADIUS 8'-4 ½") (SLOTTED) 12GA.			J	1			J	1
K	THRIE-BEAM RAIL (3 SPACE) (9'-4 ½" LENGTH) 12GA.					K	1	K	1
L	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)					L	1	L	1
M	POST 2,4,5,6 BCT TIMBER (5 ½" X 7 ½" X 46") (PDF04)			M	4			M	4
N	POST 2,4, BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)			N	2			N	2
O	POST 5,6 MODIFIED BCT TUBES (FOR WELDED CABLE SADDLES)			O	2			O	2
P	POST 3,4,6,7,8 THRIE-BEAM BLOCK-OUT (6" X 8" X 22")(PDB02a)			P	4	P	1	P	5
Q	POST 3,7,8 CRT TIMBER POSTS (6" X 8" X 72" LENGTH)(PDE09)			Q	2	Q	1	Q	3
R	POST 9,10,11 I-BEAM POSTS (W6X8.5 X 72" LENGTH) (PWE01)					R	3	R	3
S	POST 9,10,11 ROUTED W-BEAM BLOCK-OUT(6" X 8" X 14")(PDB01b)					S	3	S	3
T	POST 12 THRU 17 I-BEAM POSTS (W6X8.5 X 84" LENGTH) (PWE07)					T	6	T	6
U	POST 12 THRU 17 ROUTED BLOCK-OUT (6" X 8" X 18") (PDB??)					U	6	U	6
V	SAND BARRELS 700-715 LBS							V	6
A1	BCT CABLE ANCHOR ASSEMBLIES (¾" X 6'-6 ¾" LENGTH) (FCA01)	A1	2					A1	2
A2	BCT CABLE ANCHOR BRACKET (FPA01)	A2	2	A2	1			A2	3
A3	⅝" X 2" HEX BOLT A307 GRD.5 (FOR CABLE BRACKETS)	A3	18	A3	8			A3	26
A4	⅝" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT HEAD & 1 NUT)	A4	36	A4	40			A4	76
A5	⅝" RECESSED H.G.R NUT (NUTS FOR HEX BOLTS)	A5	22	A5	20			A5	42
A6	STRUT BRACKET HARDWARE (½" X 1 ½") HEX BOLT A307 GRD.5	A6	2					A6	2
A7	CHANNEL STRUT HARDWARE (⅝" X 10") HEX BOLT A307 GRD.5	A7	2					A7	2
A8	BCT CABLE ANCHOR ASSEMBLY (FCA02) (¾" X 18'-5" LENGTH)			A8	1			A8	1
A9	BCT POST SLEEVE (FMM02a) (POST 4 ONLY)			A9	1			A9	1
A10	BCT CABLE BEARING PLATE (⅝" X 8" X 8" (FPB01) (POST 4 ONLY)			A10	1			A10	1
A11	⅝" X 1 ¼" H.G.R. BOLTS (FBB01) (SPLICES AT POST 2,4,6,7)			A11	48			A11	48
A12	⅝" X 2" H.G.R. BOLTS (FBB02)(ROUND TERM-POST 10-END SPLICE)	A12	4			A12	24	A12	28
A13	⅝" X 10" H.G.R. BOLTS (FBB03) (I-BEAM POSTS RAIL & BLOCKOUT)					A13	18	A13	18
A14	⅝" X 18" H.G.R. BOLTS (FBB04) (POSTS 3,4,6,7,8)			A14	8	A14	2	A14	10
A15	⅝" X 7 ½" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A15	8			A15	8
A16	⅝" X 10" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A16	4			A16	4
A17	RECTANGULAR WASHERS (FWR03) (FOR TERMINAL CONNECTOR RTE01b)					A17	12	A17	12
A18	⅞" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5					A18	5	A18	5
A19	1 ¾" O.D. HARDENED FLAT WASHER A325					A19	10	A19	10
A20	⅞" HEX NUT GR.5 A325					A20	5	A20	5

GENERAL NOTES

1. FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION,(TXDOT'S DESIGN DIVISION).(512) 416-2678. THE EXACT POSITION OF MBGF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.
2. STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.
3. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 ½" OR 25 FOOT NOMINAL LENGTHS.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
7. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.
8. IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.
9. GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
10. SPECIAL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).
11. ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND BARRELS, AND OTHER PARTS.
12. ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.
13. THE BCT BEARING PLATE INSTALLED AT POST 4 SHOULD BE ORIENTED SUCH THAT THE 3" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE BOTTOM AND 5" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE TOP.
14. FOUNDATION AT POST 1 SHALL BE CLASS C CONCRETE.
15. POST (1) IS NOT A CRASHWORTHY TERMINAL. THE DESIGN AND PLACEMENT OF POST (1) MUST BE OUTSIDE OF THE CLEAR ZONE OF THE SECONDARY ROADWAY USING THE RESPECTIVE CLEAR ZONE CRITERIA. PLEASE CONTACT THE DESIGN DIVISION (512) 416-2678 FOR ASSISTANCE IN DETERMINING THE APPROPRIATE USE AND/OR PLACEMENT OF THE SYSTEM IN CONSTRAINED LOCATIONS. THE PAYMENT OF THE COMPLETE SYSTEM WILL BE WITH BID ITEMS: 540 XXXX TL-3 31" SHORT RADIUS (COMPLETE).
16. TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE,THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.
17. THE BARRELS ARE ENERGY ABSORPTION ENERGITE III, MODEL 640 FILLED WITH 715 LB (+/-15) SAND; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE BARREL IS 41" (+/-).
18. ALTERNATE METHODS TO TERMINATE THE SRG ALONG THE PRIMARY ROADWAY ARE AVAILABLE WHEN SITE CONDITIONS DICTATE. CONTACT DESIGN DIVISION FOR DETAILS: 512 416-2678

NOTE: SEE SHEET 1 OF 3.

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SPECIAL APPLICATION NOTES.

1. THIS IS A MASH COMPLIANT TL-3 SHORT RADIUS GUARDRAIL SYSTEM WITH A TOP RAIL HEIGHT OF 31". AVAILABLE FOR USE ON ANY SPEED ROADWAY. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 34'-10" ALONG THE PRIMARY ROAD AND A 35'-0" ALONG SECONDARY DRIVEWAY.
2. IT IS CRITICAL THAT THE PRIMARY GUARDRAIL MAINTAIN A (4 DEGREE FLARE) WITH THE SECONDARY DRIVEWAY.
3. THE SYSTEM REQUIRES A MINIMUM 5' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM WITH A SLOPE AT 1V:10H OR FLATTER FROM THERE A MAXIMUM 3:1 SLOPE IS RECOMMENDED. SEE SHEET 1 OF 3 FOR FLARE AND SLOPE DETAILS.
4. NOTE FOR INSTALLER: THE THREE (3) CRT POSTS ITEM (Q), AT POST LOCATIONS, 3, 7, & 8.), REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A ¾" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-⅞" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT.

   OPTION FOR ADDITIONAL ¾" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO ¾" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM ¾" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM ¾" HOLE.

Texas Department of Transportation — Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

SRG(TL-3)-21

FILE: srgtl3321	TxDOT	CK:KM	DN: VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		78

DATE:
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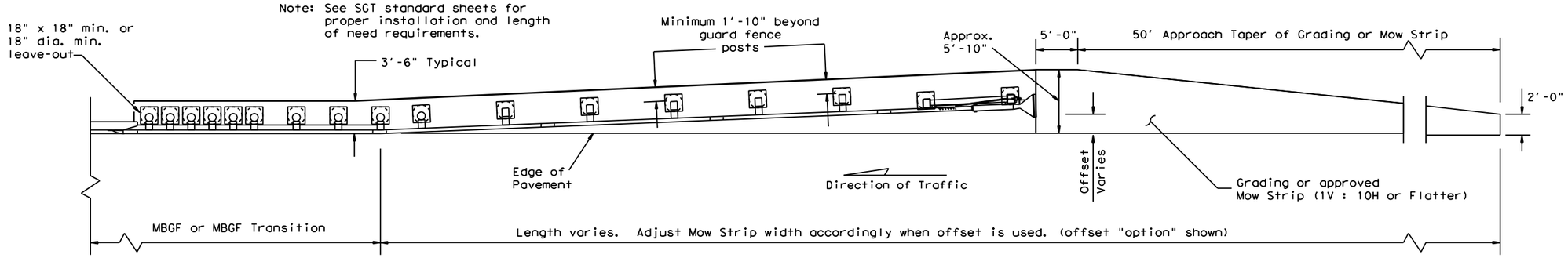
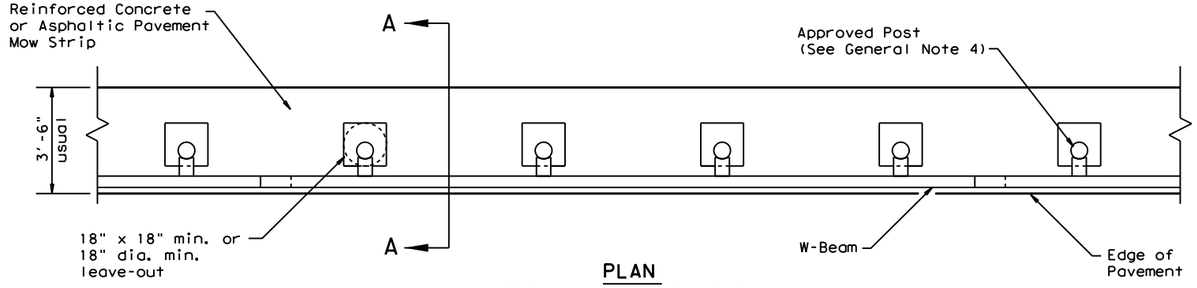
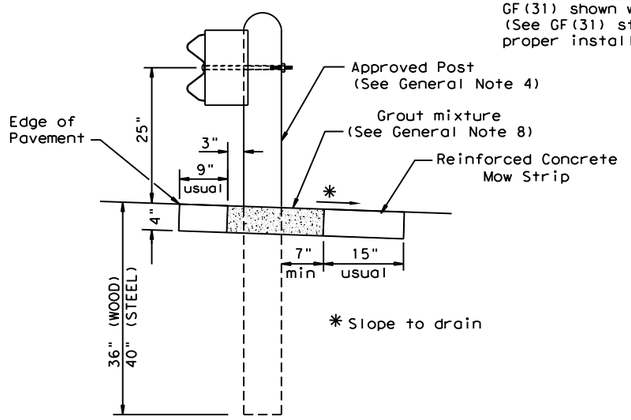


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



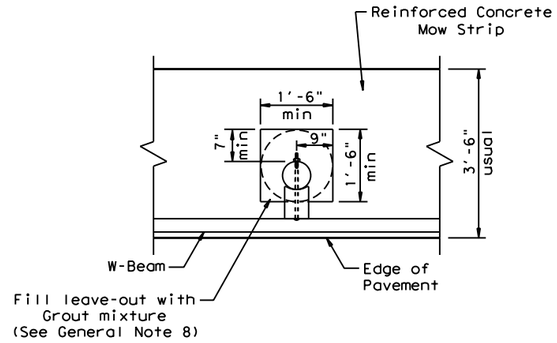
PLAN

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



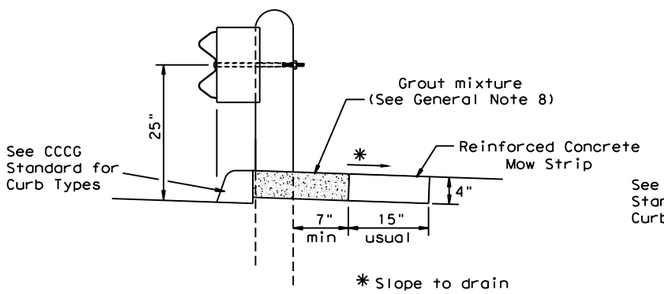
SECTION A-A

Typical



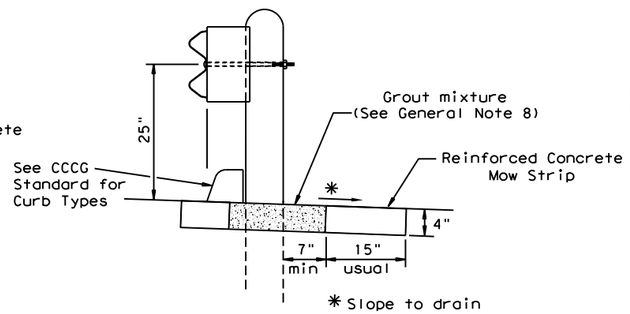
MOW STRIP DETAIL

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



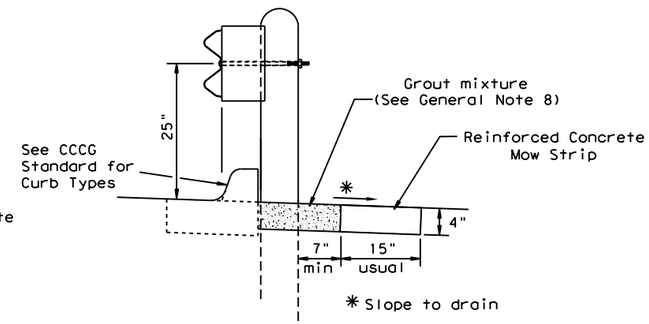
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation

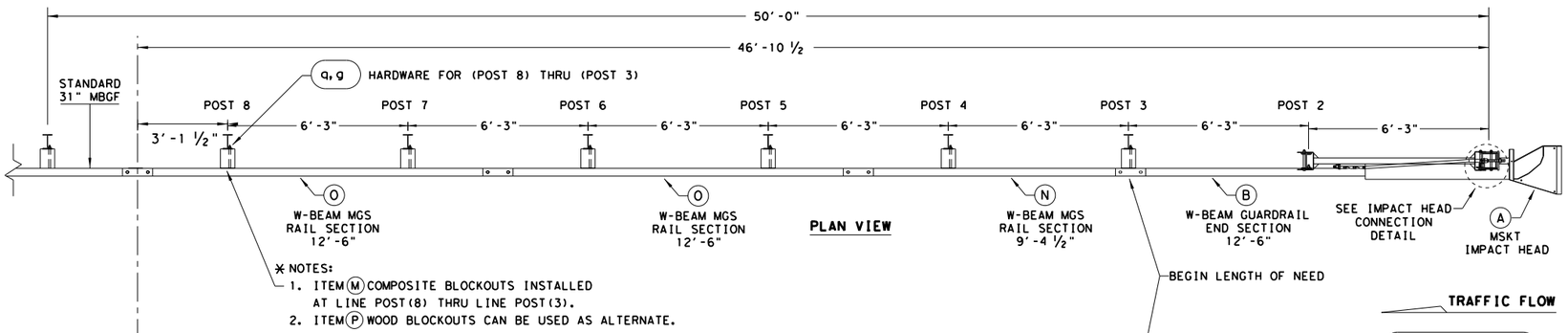
Design Division Standard

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

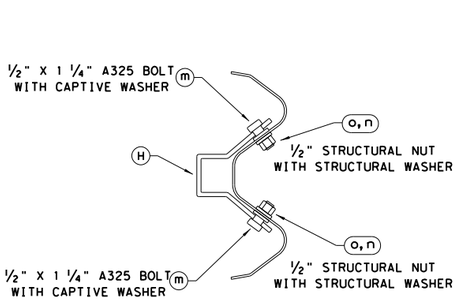
GF(31)MS-19

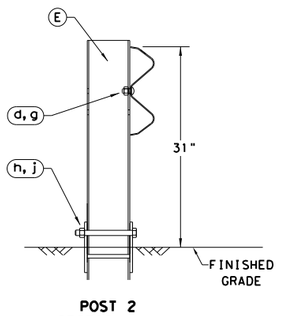
FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		79

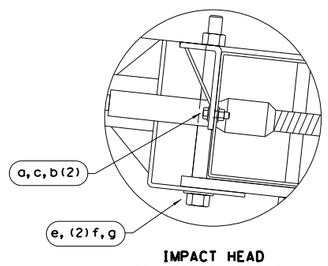
DATE:
FILE:

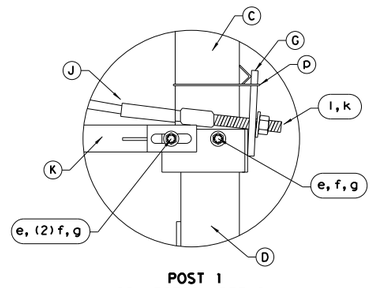


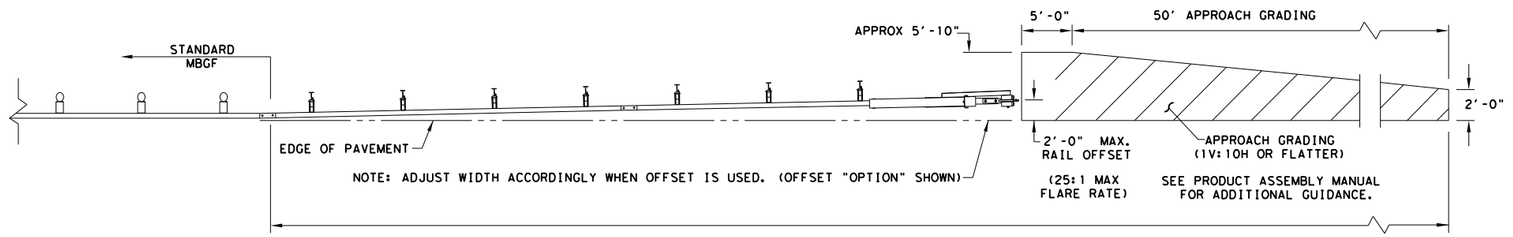
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.











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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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

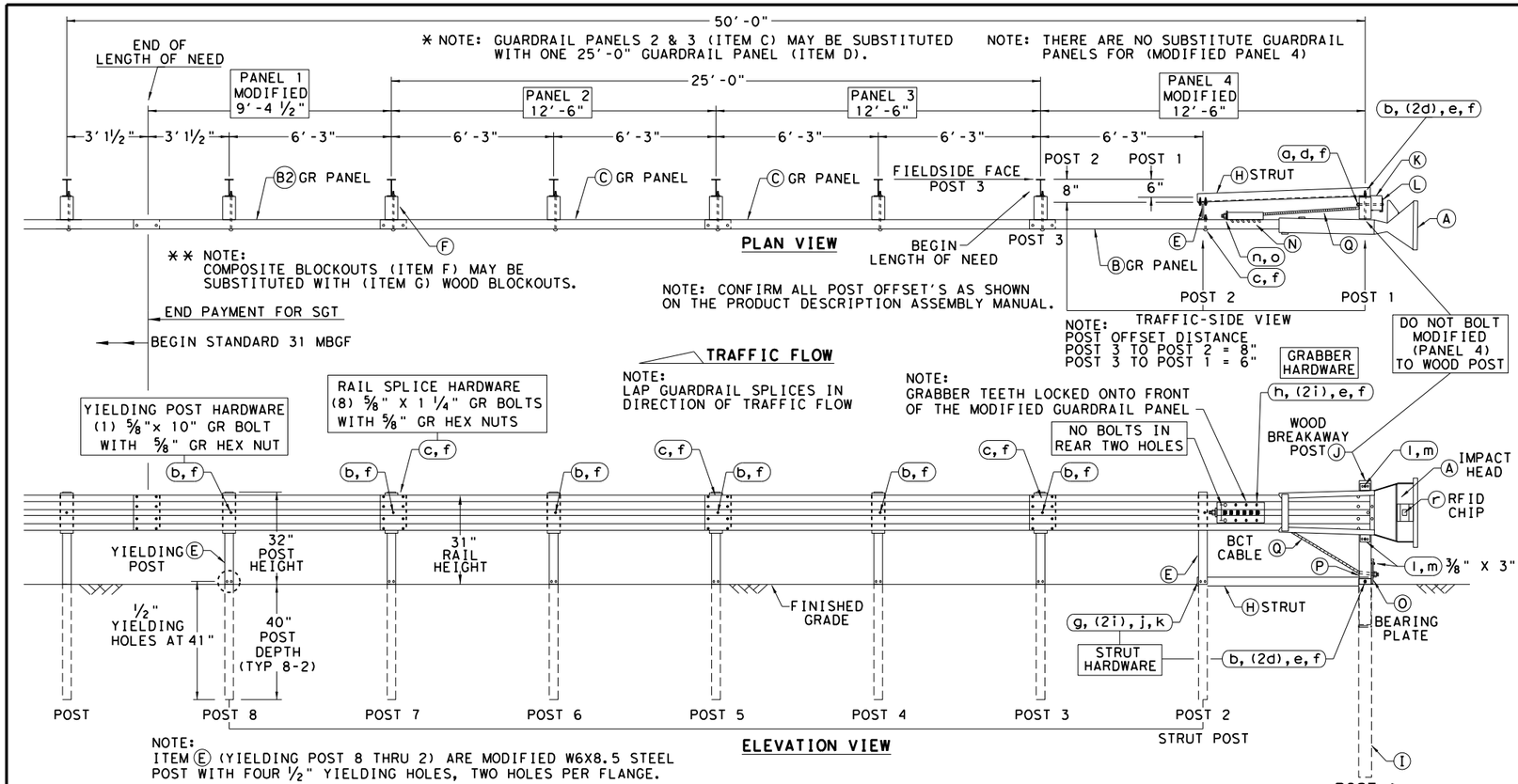
Texas Department of Transportation

Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2465	01	020	FM 2280	
	DIST	COUNTY		SHEET NO.	
	FTW	JOHNSON		80	

DATE:
FILE:

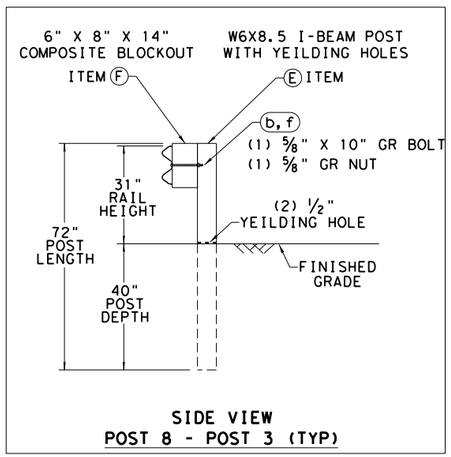


GENERAL NOTES

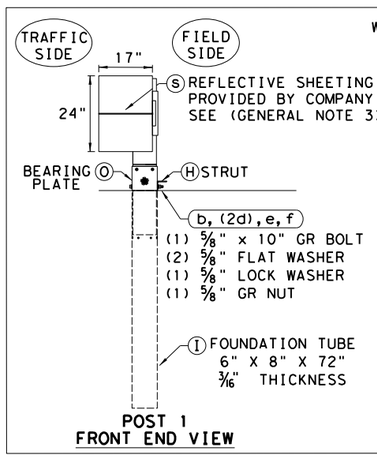
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

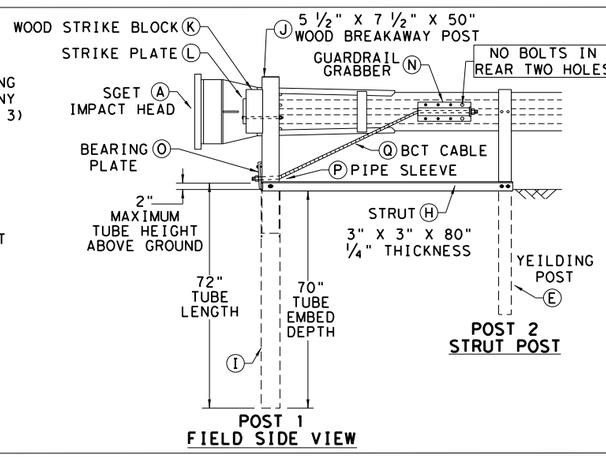
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



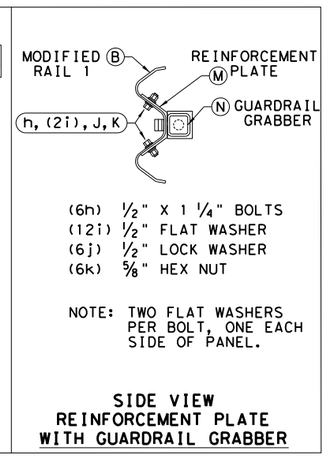
SIDE VIEW
POST 8 - POST 3 (TYP)



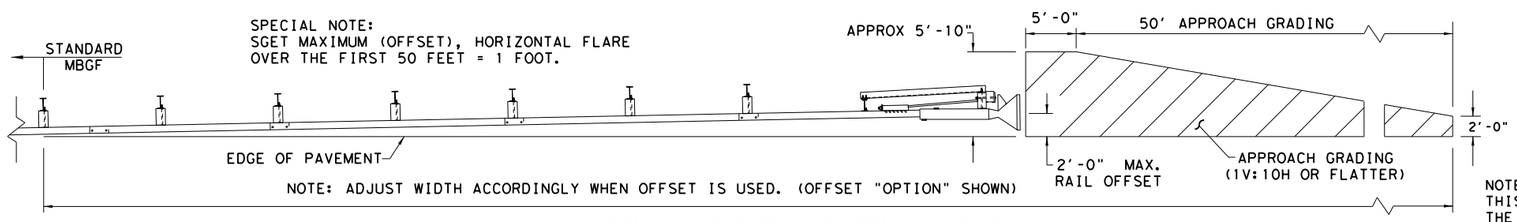
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt15320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2465	01	020		FM 2280	
	DIST	COUNTY			SHEET NO.	
	FTW	JOHNSON			81	

DATE:
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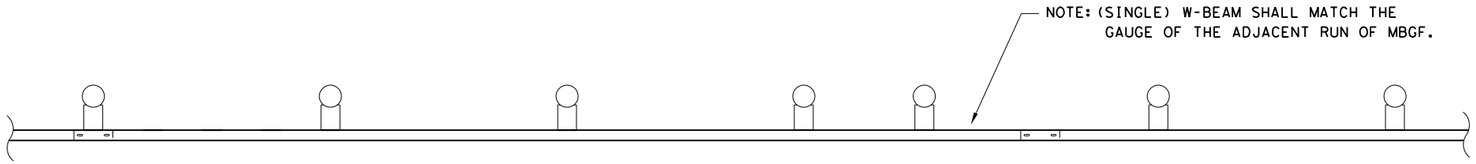
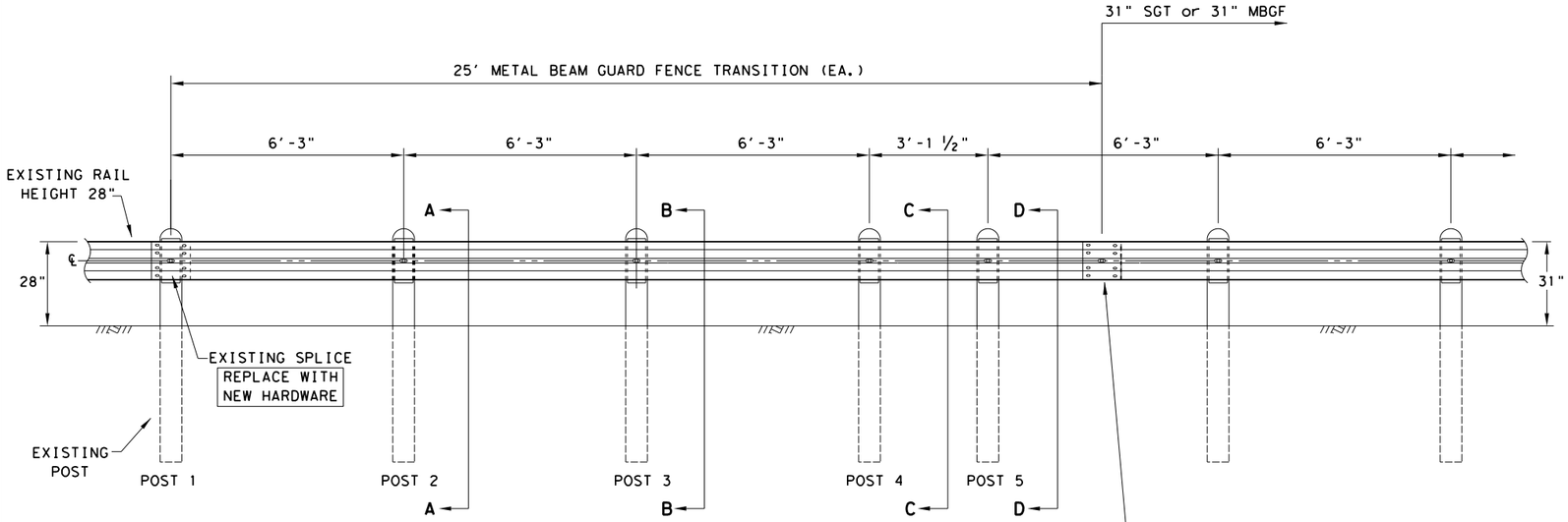
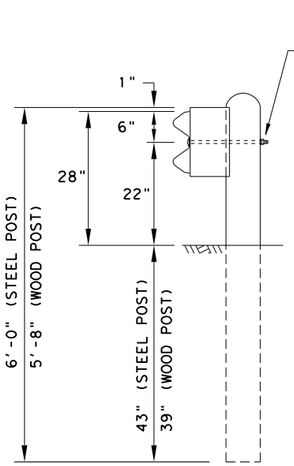


PLAN VIEW

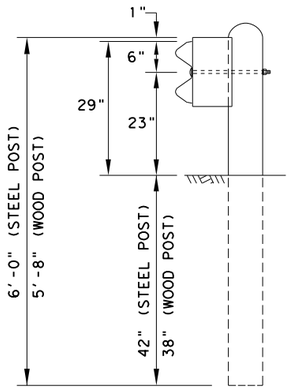


ELEVATION VIEW

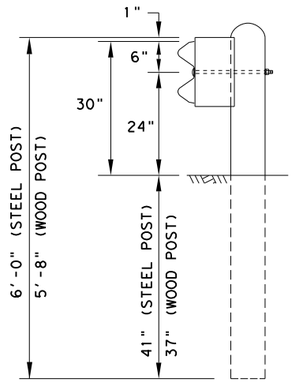
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



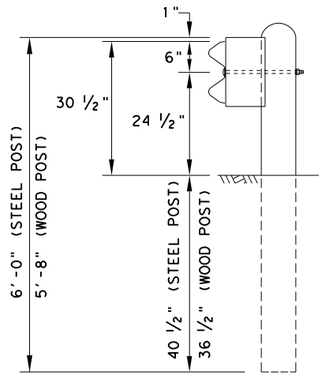
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT 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 TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. 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.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.

POST AND BLOCK-OUT TYPES AVAILABLE

HARDWARE LIST	
QTY	DESCRIPTION
1	25'-0" W-BEAM RAIL ELEMENT 12GA. (TYP)
5	7 1/2" DIA X 6'-0" DOMED ROUND WOOD POSTS (TYP)
5	6" X 8" X 68" RECTANGULAR WOOD POSTS (TYP)
5	W6 X 8.5 OR W6 X 9 X 72" STEEL POSTS (TYP)
5	6" X 8" X 14" WOOD BLOCKS OR COMPOSITE (TYP)
FOR WOOD POST 5	5/8" X 18" GUARDRAIL BOLTS AND NUTS (FBB04)
5	5/8" ROUND WASHERS (ASTM F436) (FWC16a)
FOR STEEL POST 5	5/8" X 10" GUARDRAIL BOLTS AND NUTS (FBB03)
16	5/8" X 1- 1/4" GUARDRAIL SPLICE BOLTS WITH DOUBLE RECESSED NUTS (ASTM A563) (FBB01)

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

GUARDRAIL POST BOLTS (ASTM A307 GR. A)
GUARDRAIL ROUND WASHERS (ASTM F436)
GUARDRAIL DOUBLE RECESSED NUTS (ASTM A563)
GUARDRAIL SPLICE BOLTS (ASTM A307 GR. A)
GUARDRAIL SPLICE NUTS (ASTM A563)

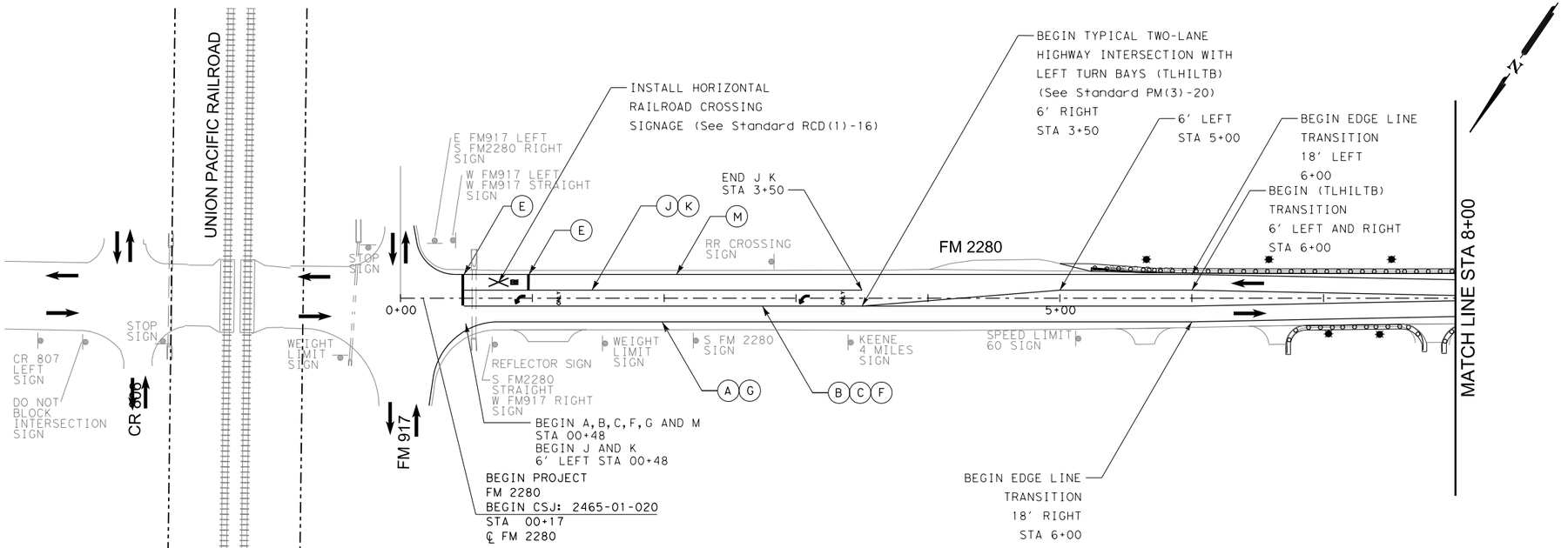
Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE RAIL HEIGHT ADJUSTMENT (28" TO 31") TL-3 MASH COMPLIANT

RAIL-ADJ(B)-19

FILE: railadjb19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		82



533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
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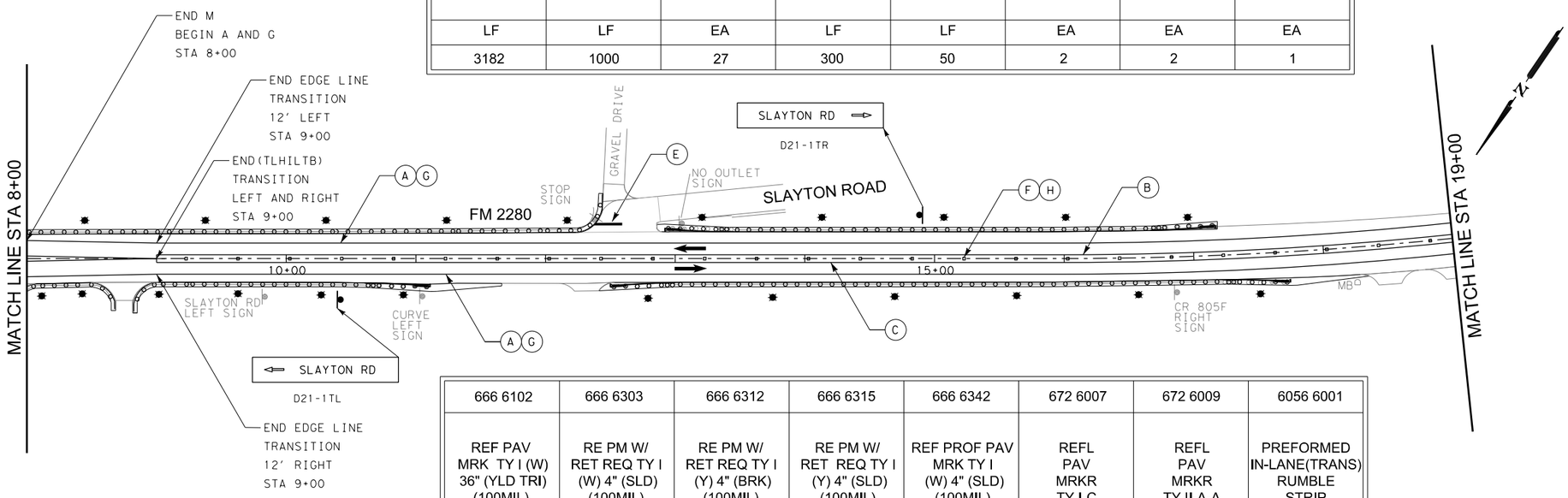

666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	3,182	0	4,252	818	15	233	0

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22,PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
6. EXISTING SIGNS TO REMAIN UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL COORDINATE WTH THE ENGINEER FOR ALL PROPOSED SIGN FINAL LOCATIONS.
7. IN-LINE TRANSVERSE RUMBLE STRIPS SHALL BE PLACED IN AN ALTERNATE PATTERN. SEE STANDARD RS(5)-23.

STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
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FM 2280 PAVEMENT MARKING LAYOUT

SHEET 1 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.	HIGHWAY NO.
6	SEE TITLE SHEET	FM 2280
STATE	DISTRICT / COUNTY	SHEET NO.
TEXAS	FTW / JOHNSON	83
CONTROL	SECTION / JOB	
2465	01 / 020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
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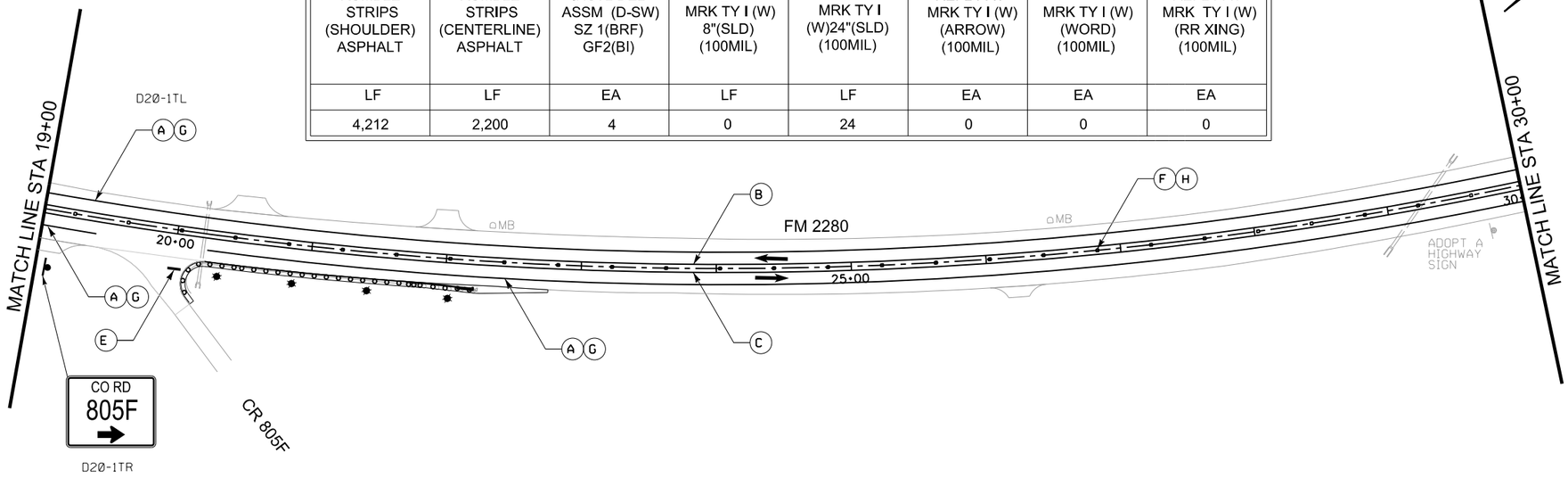

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REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
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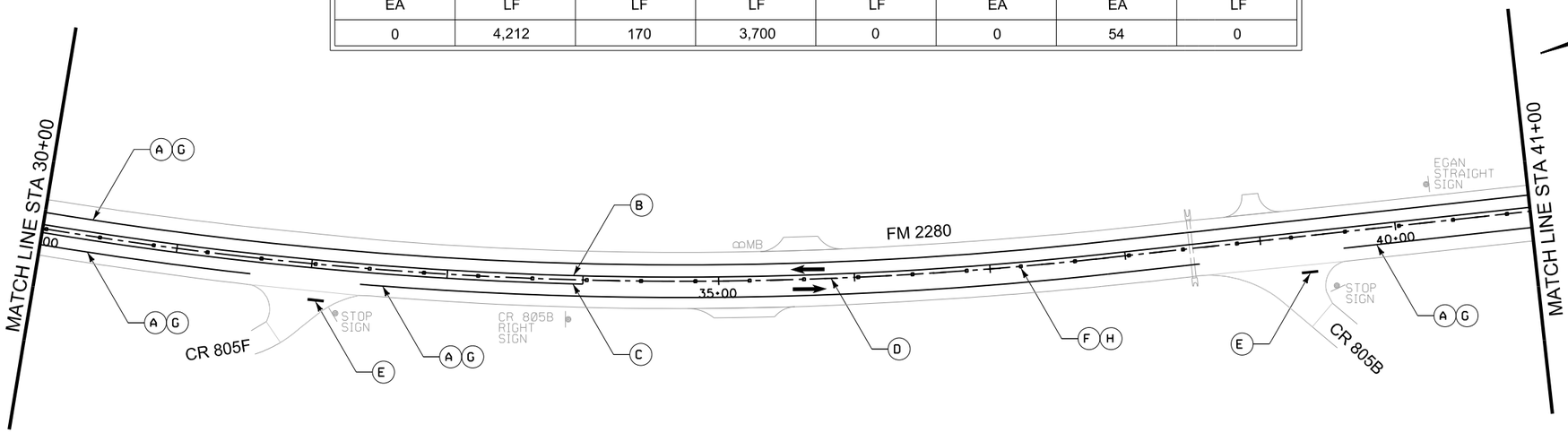

0 50 100
HORIZ. SCALE IN FEET

N

LEGEND:

- (A) RE PM W/RET REQ TY I(W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I(Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I(W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I(W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I(W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I(W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I(W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22,PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
6. EXISTING SIGNS TO REMAIN UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL COORDINATE WTH THE ENGINEER FOR ALL PROPOSED SIGN FINAL LOCATIONS.
7. IN-LINE TRANSVERSE RUMBLE STRIPS SHALL BE PLACED IN AN ALTERNATE PATTERN. SEE STANDARD RS(5)-23.

STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E. Williams, P.E 1/5/2024

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
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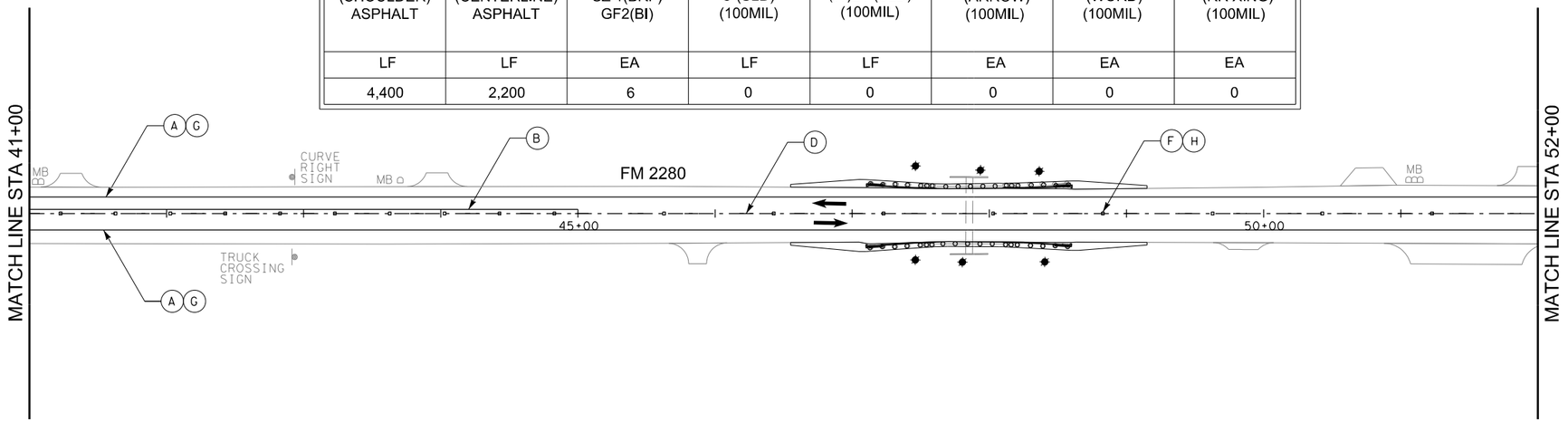
FM 2280 PAVEMENT MARKING LAYOUT

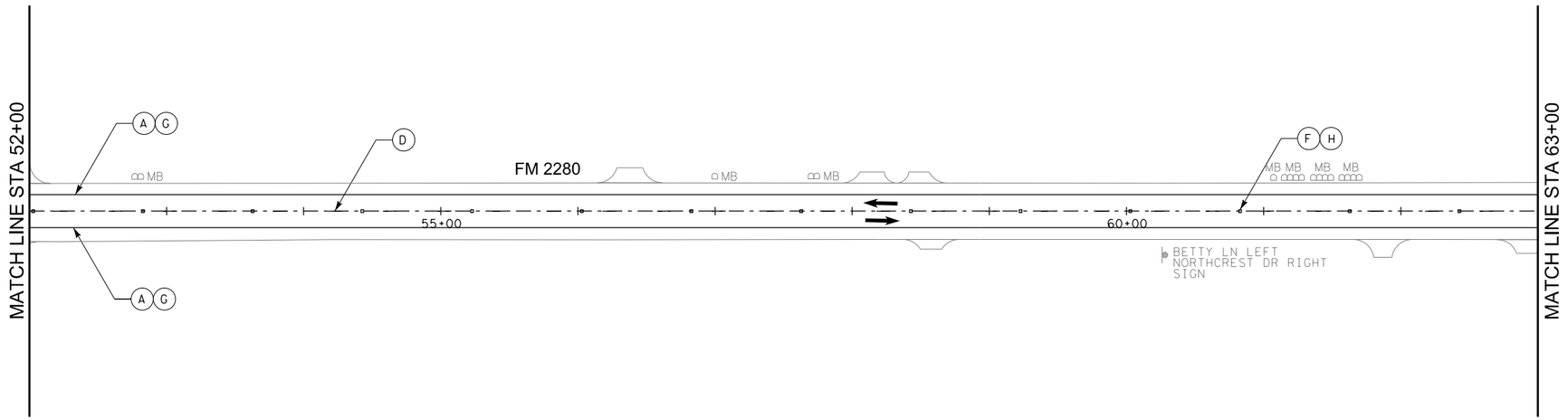
SHEET 2 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	84
CONTROL	SECTION	JOB	
2465	01	020	

533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
4,400	2,200	6	0	0	0	0	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,400	550	400	0	0	32	0



HORIZ. SCALE IN FEET
0 50 100

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
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3. SEE STANDARDS PM(1)-22, PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

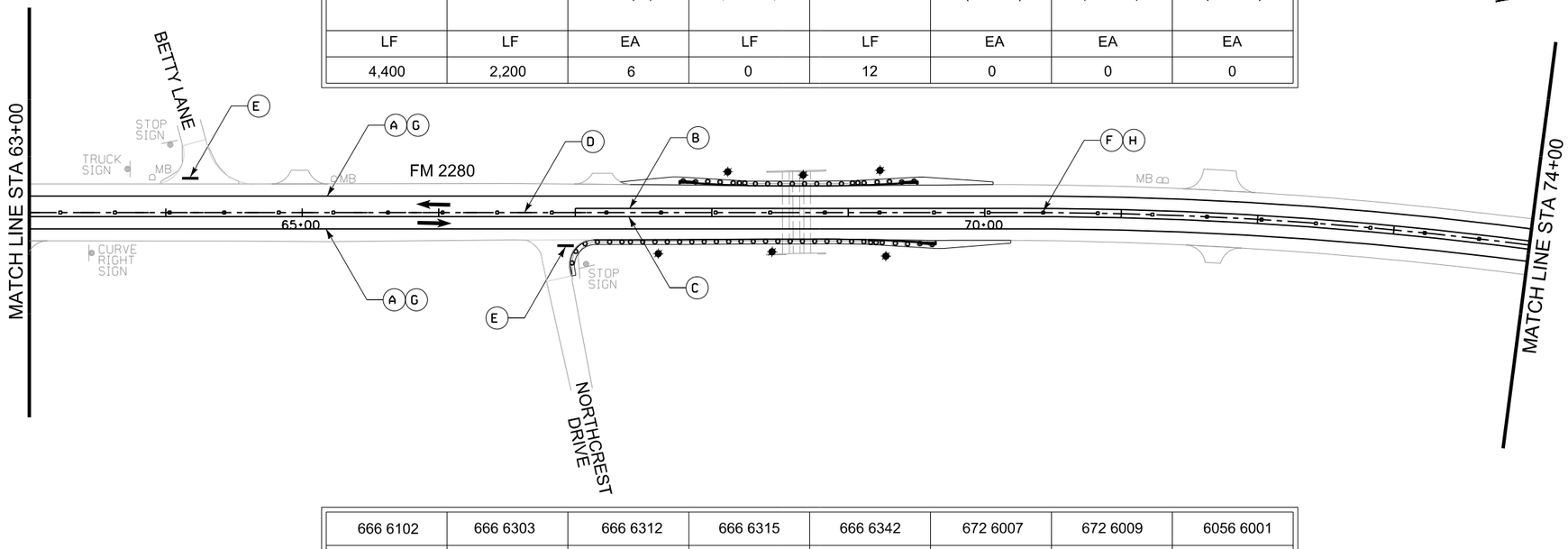
FM 2280 PAVEMENT MARKING LAYOUT

SHEET 3 OF 14

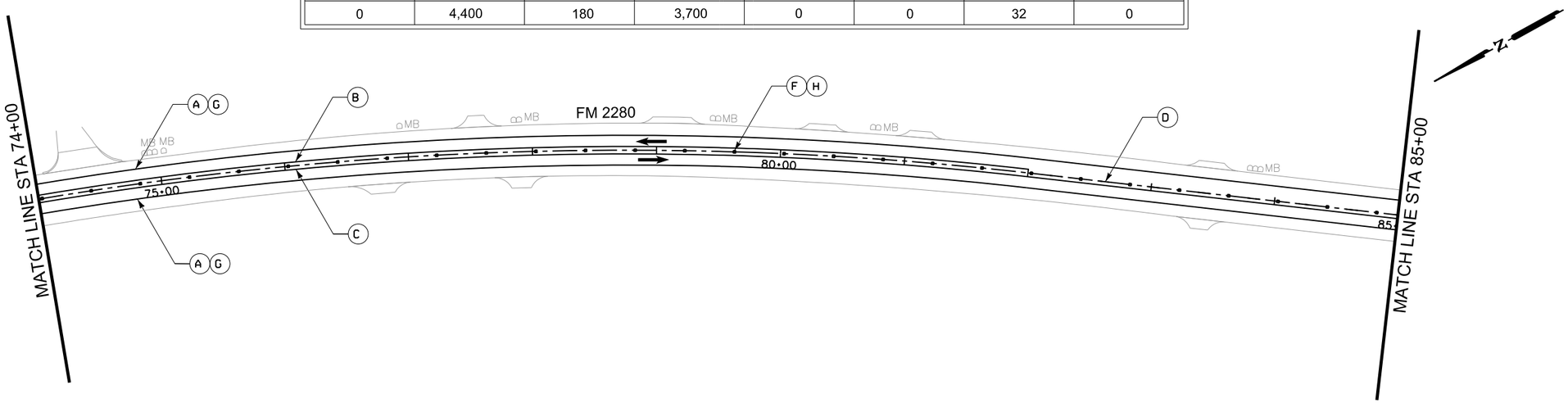
FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	85
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
4,400	2,200	6	0	12	0	0	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,400	180	3,700	0	0	32	0



0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- (A) RE PM W/RET REQ TY I(W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I(Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I(W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I(W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I(W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I(W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I(W)(12")(SLD)(100MIL)
- BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22,PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E Williams, P.E 1/5/2024

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
© 2023

FM 2280
PAVEMENT MARKING
LAYOUT

SHEET 4 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	86
CONTROL	SECTION	JOB	
2465	01	020	

1/5/2024 12:20:01 PM
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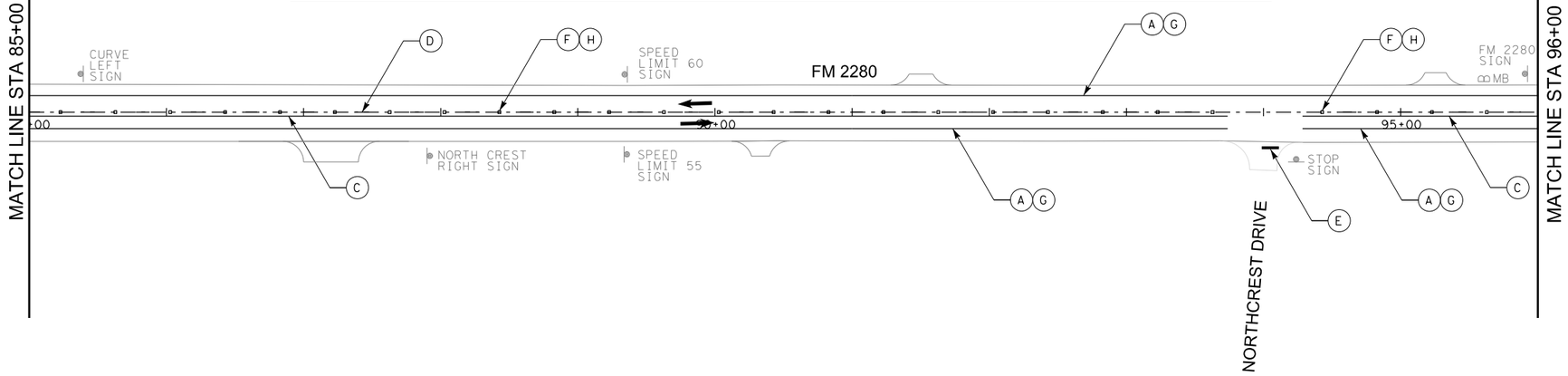
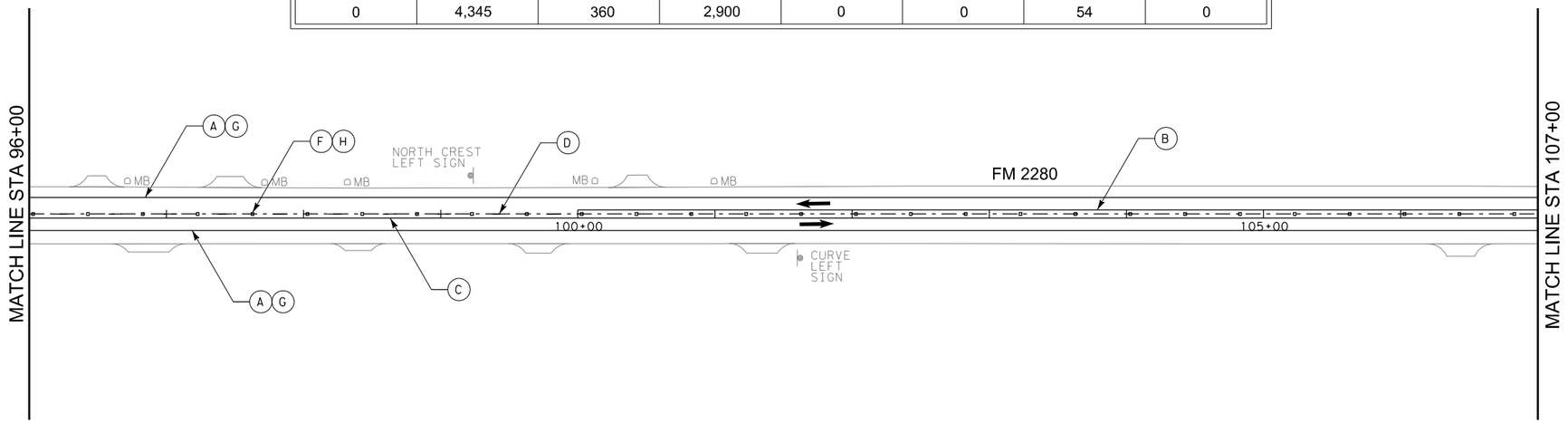
533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
4,345	2,145	0	0	12	0	0	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,345	360	2,900	0	0	54	0



HORIZ. SCALE IN FEET
0 50 100

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

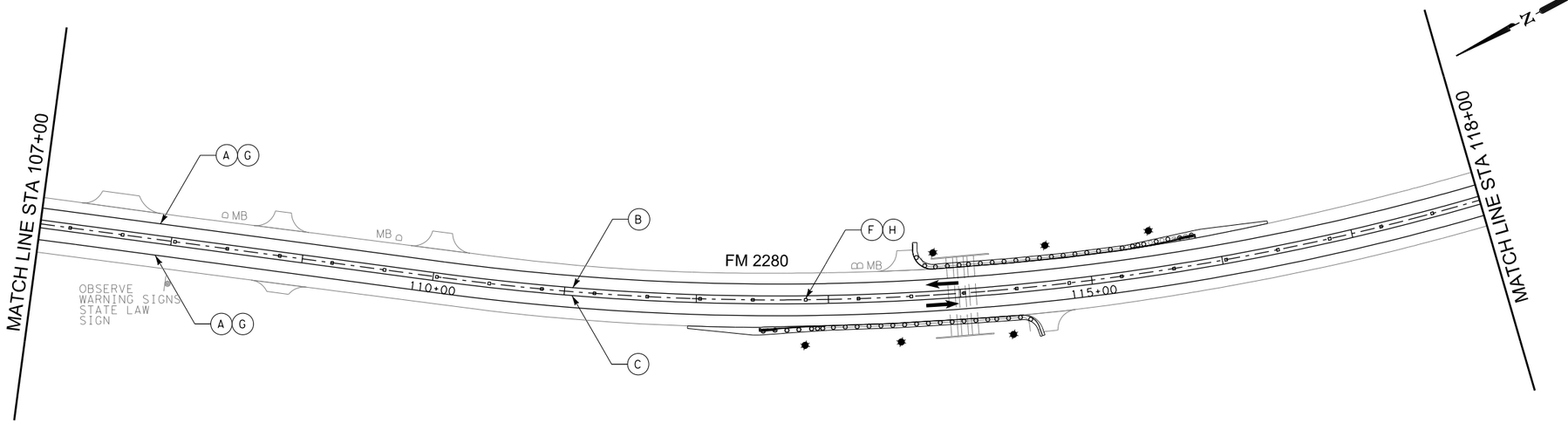
PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

FM 2280 PAVEMENT MARKING LAYOUT

SHEET 5 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	87
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$



0 50 100
HORIZ. SCALE IN FEET

N

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

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533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
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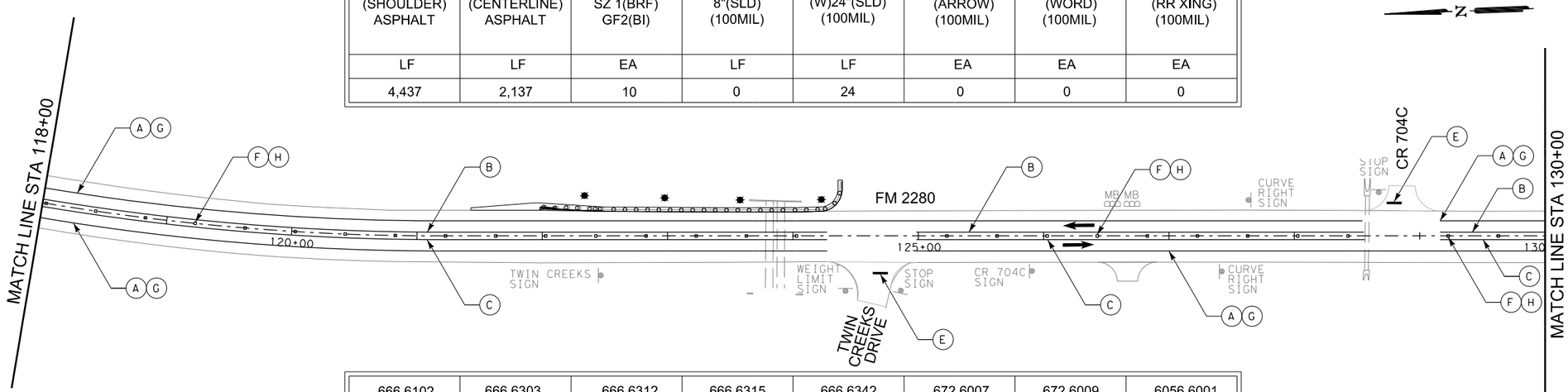
LF	LF	EA	LF	LF	EA	EA	EA
4,437	2,137	10	0	24	0	0	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,437	0	4,600	0	0	54	0

STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
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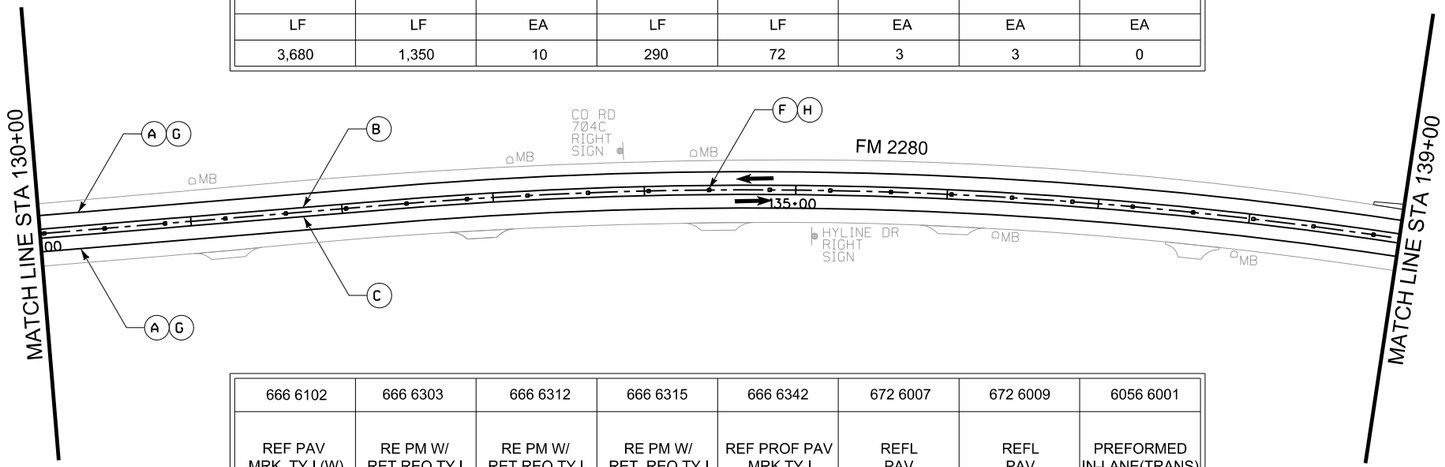
FM 2280 PAVEMENT MARKING LAYOUT

SHEET 6 OF 14

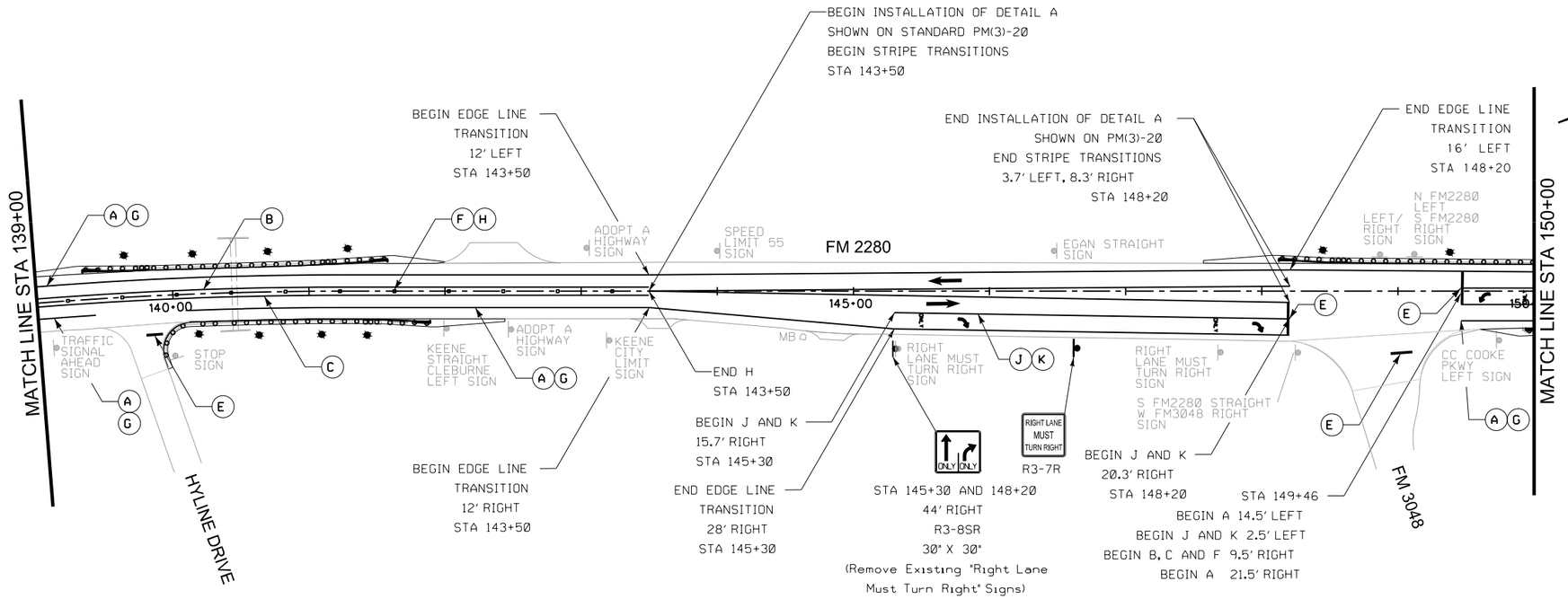
FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	88
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
3,680	1,350	10	290	72	3	3	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	3,680	0	4,580	0	15	128	0



0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- (A) RE PM W/RET REQ TY I(W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I(Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I(W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
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- (J) REFL. PAV MRK TY I(W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I(W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I(W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I(W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22,PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
6. EXISTING SIGNS TO REMAIN UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL COORDINATE WTH THE ENGINEER FOR ALL PROPOSED SIGN FINAL LOCATIONS.
7. IN-LINE TRANSVERSE RUMBLE STRIPS SHALL BE PLACED IN AN ALTERNATE PATTERN. SEE STANDARD RS(5)-23.

STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E Williams, P.E. 1/5/2024

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
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FM 2280 PAVEMENT MARKING LAYOUT

SHEET 7 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	89
CONTROL	SECTION	JOB	
2465	01	020	

1/5/2024 11:35:06 AM
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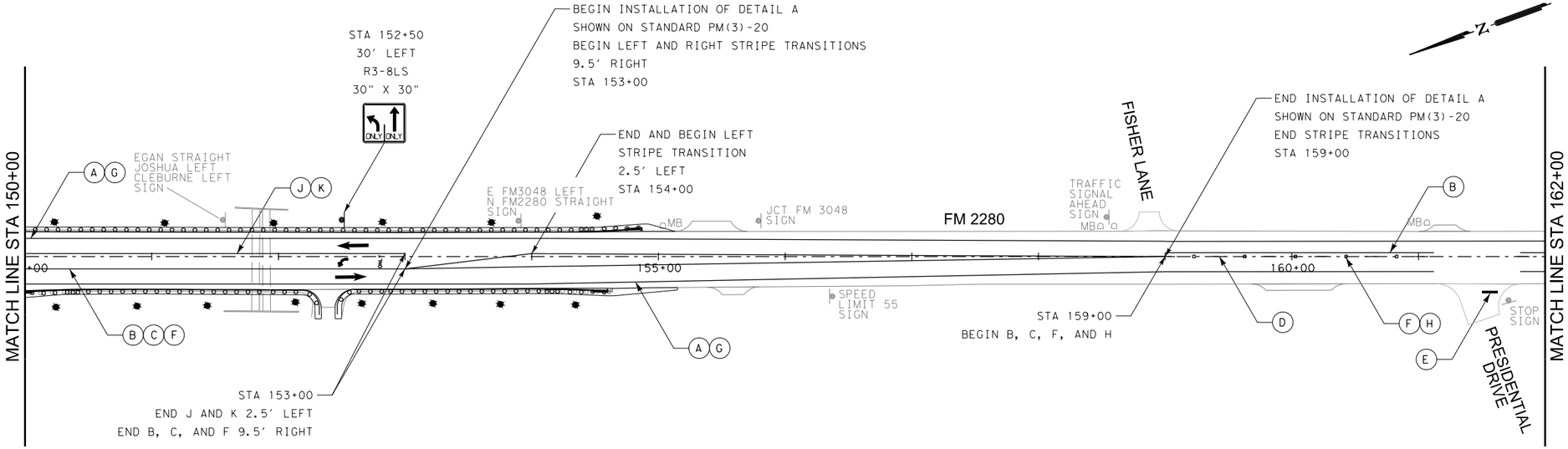
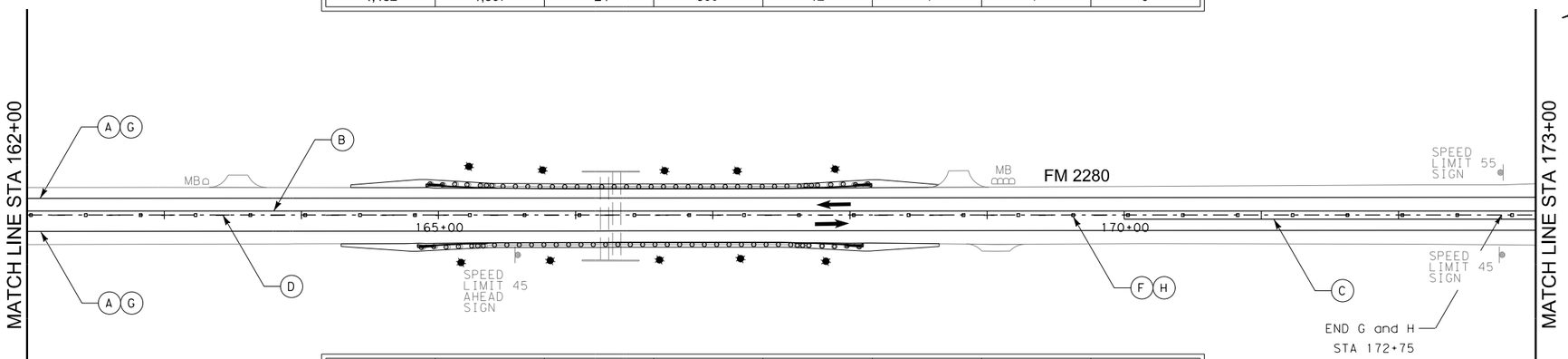


533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
4,482	1,307	24	300	12	1	1	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,532	280	7,100	0	15	305	0

HORIZ. SCALE IN FEET
0 50 100

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

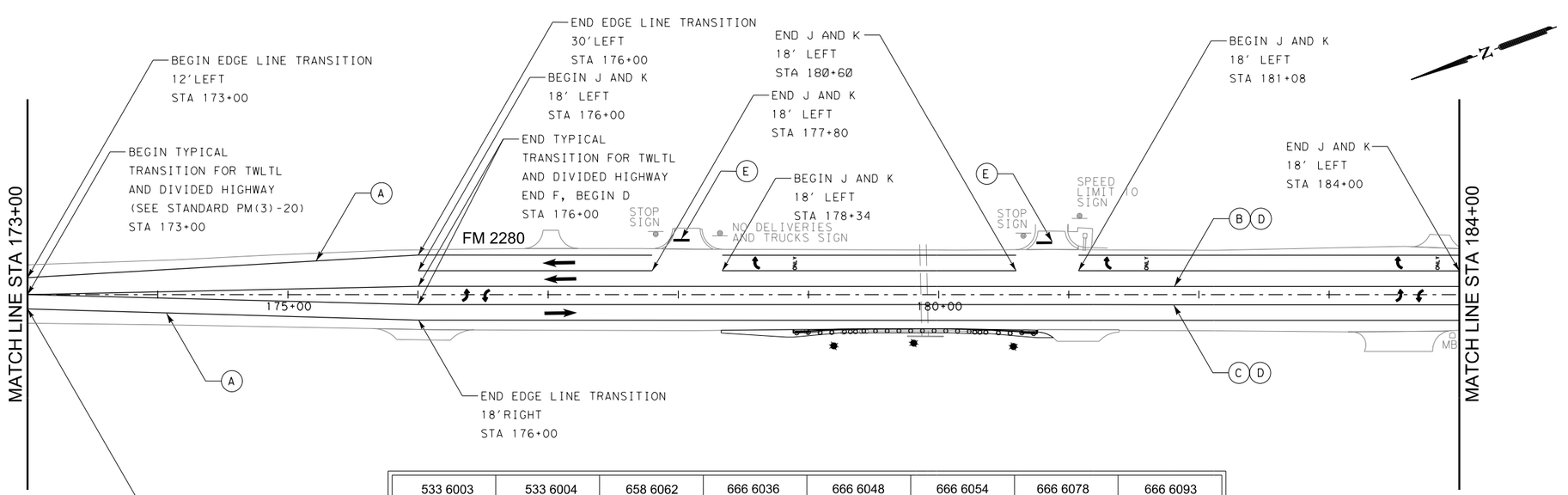
Texas Department of Transportation

FM 2280
PAVEMENT MARKING LAYOUT

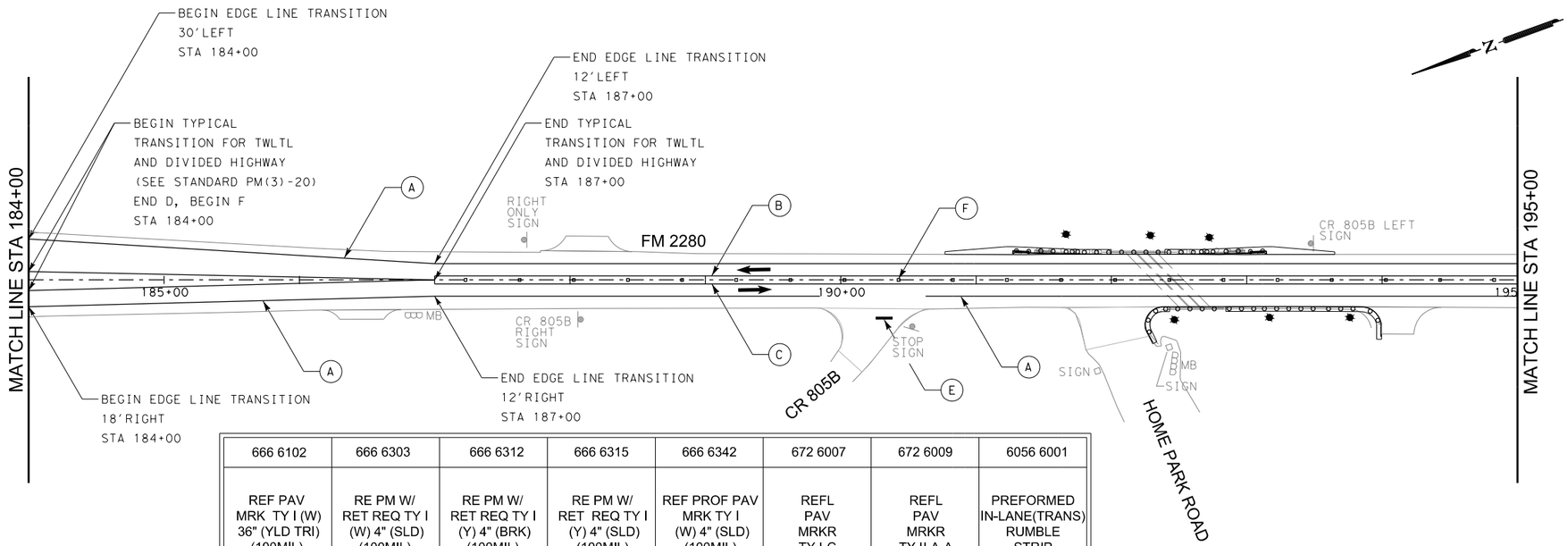
SHEET 8 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	90
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$



533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
0	0	9	697	36	7	3	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,245	530	6,800	0	35	140	0

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

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3. SEE STANDARDS PM(1)-22,PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED
PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
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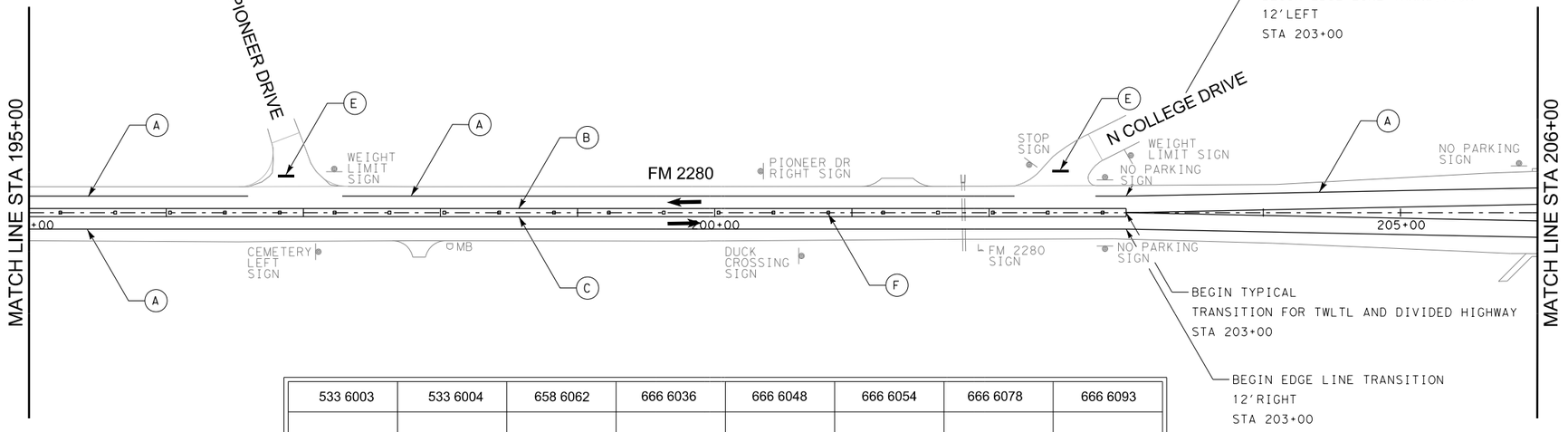
FM 2280
PAVEMENT MARKING LAYOUT

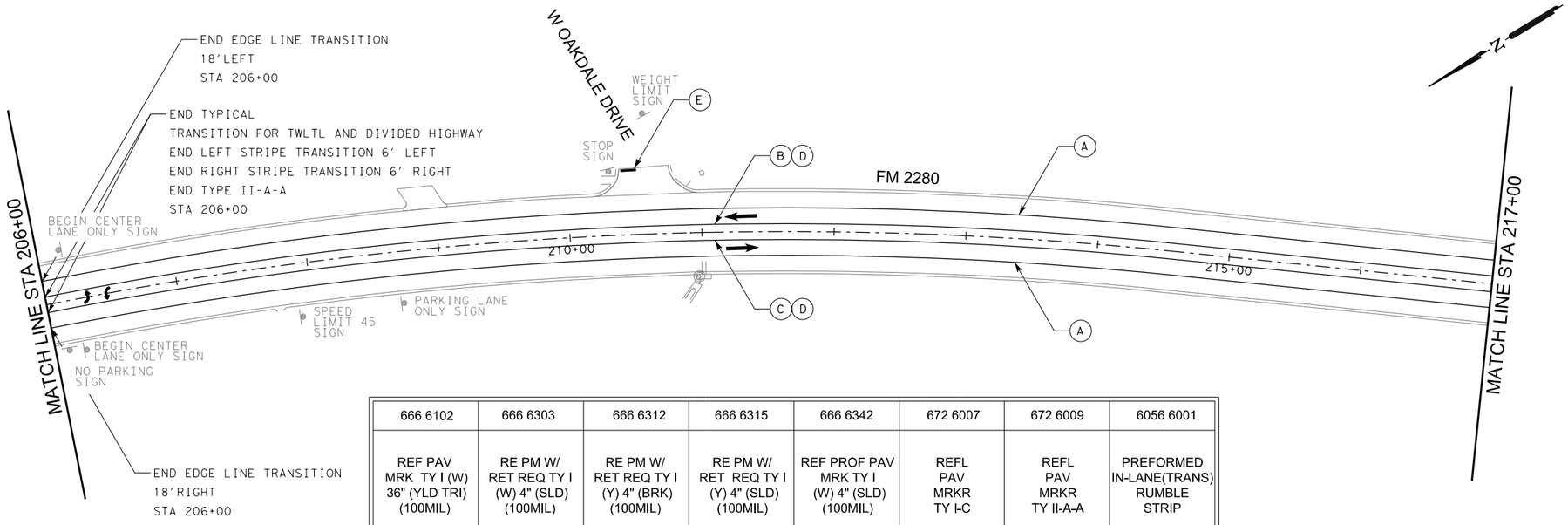
SHEET 9 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	91
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$



533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
0	0	0	0	24	0	2	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,272	370	5,000	0	0	80	0

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
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NOTES:

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HORIZ. SCALE IN FEET 0 50 100

STATE OF TEXAS · PAUL E. WILLIAMS · 73822 · LICENSED PROFESSIONAL ENGINEER

Paul E Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

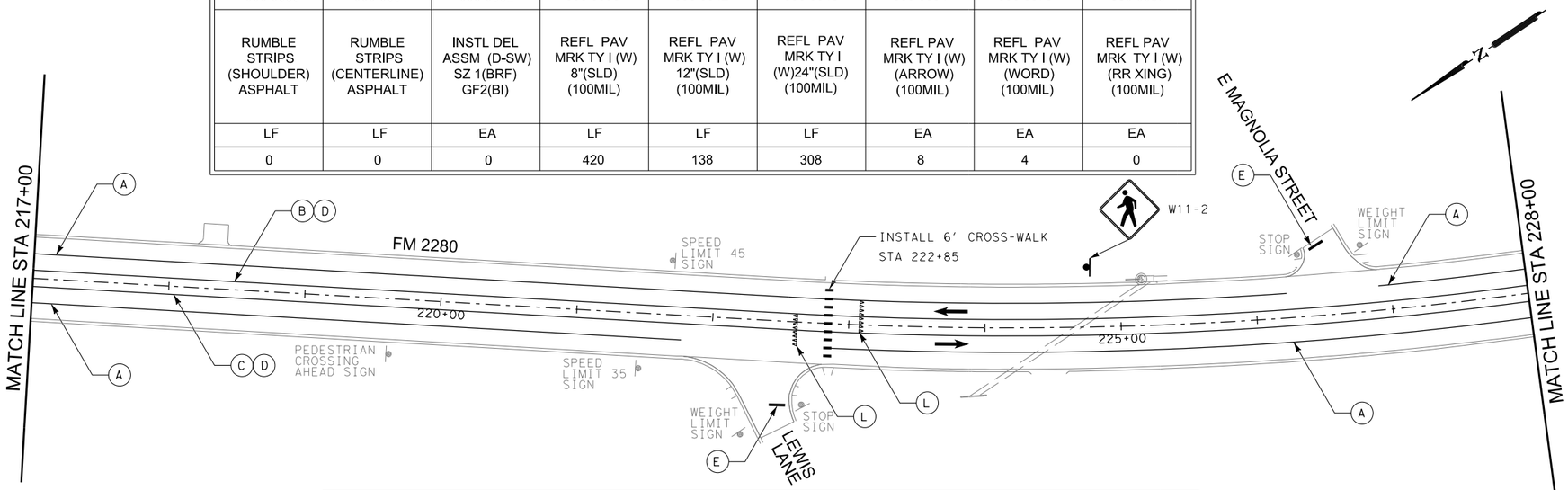
FM 2280 PAVEMENT MARKING LAYOUT

SHEET 10 OF 14

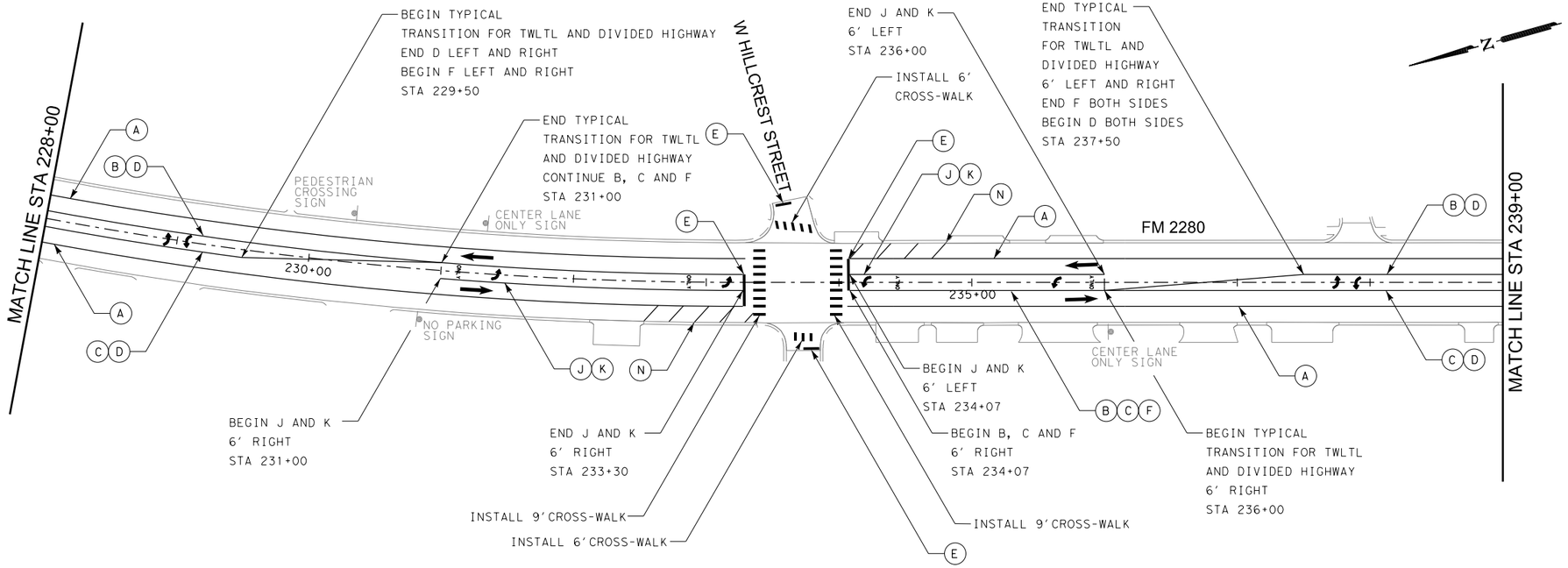
FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	92
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6042	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W) 12"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	LF	EA	EA	EA
0	0	0	420	138	308	8	4	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
16	4,060	940	4,538	0	21	88	0



0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
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- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

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Texas Department of Transportation
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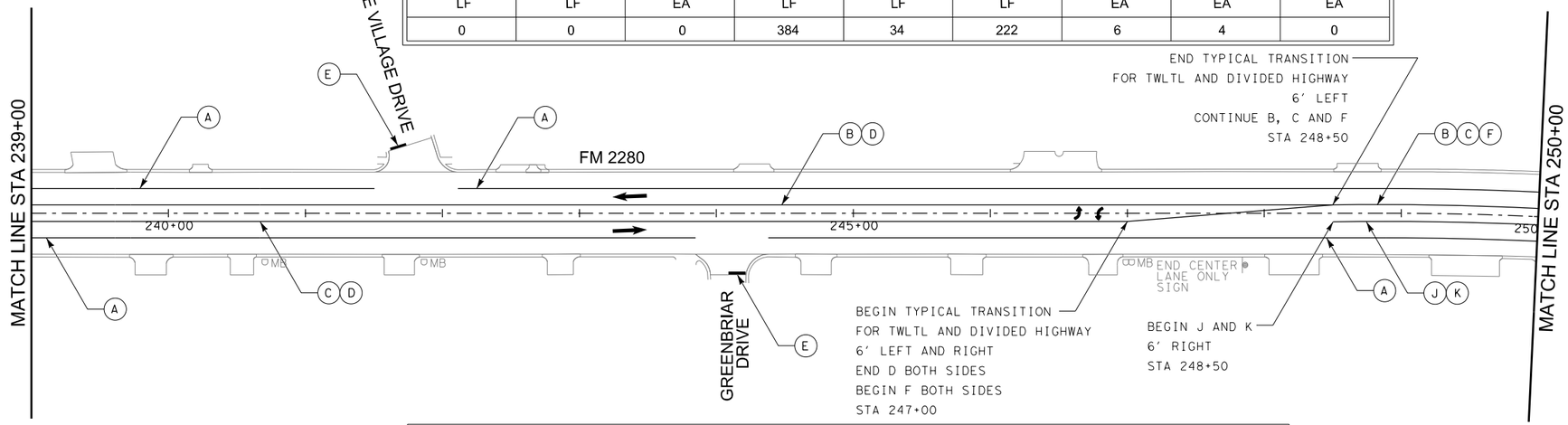
FM 2280 PAVEMENT MARKING LAYOUT

SHEET 11 OF 14

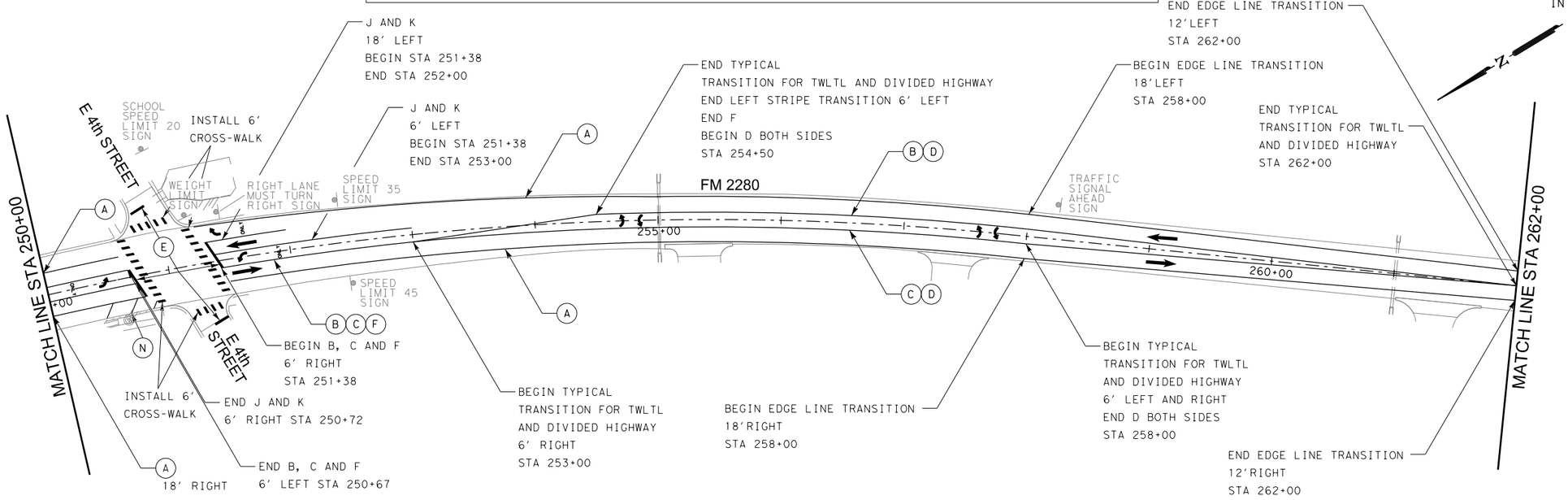
FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	93
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6042	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W) 12"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	LF	EA	EA	EA
0	0	0	384	34	222	6	4	0



666 6102	666 6303	666 6312	666 6315	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
0	4,107	767	5,840	0	20	110	0



0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22, PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
6. EXISTING SIGNS TO REMAIN UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL COORDINATE WTH THE ENGINEER FOR ALL PROPOSED SIGN FINAL LOCATIONS.
7. IN-LINE TRANSVERSE RUMBLE STRIPS SHALL BE PLACED IN AN ALTERNATE PATTERN. SEE STANDARD RS(5)-23.

STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

Texas Department of Transportation
© 2023

FM 2280 PAVEMENT MARKING LAYOUT

SHEET 12 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	94
CONTROL	SECTION	JOB	
2465	01	020	

$TIME$
$DATE$
$FILE$

533 6003	533 6004	658 6062	666 6036	666 6048	666 6054	666 6078	666 6093
RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
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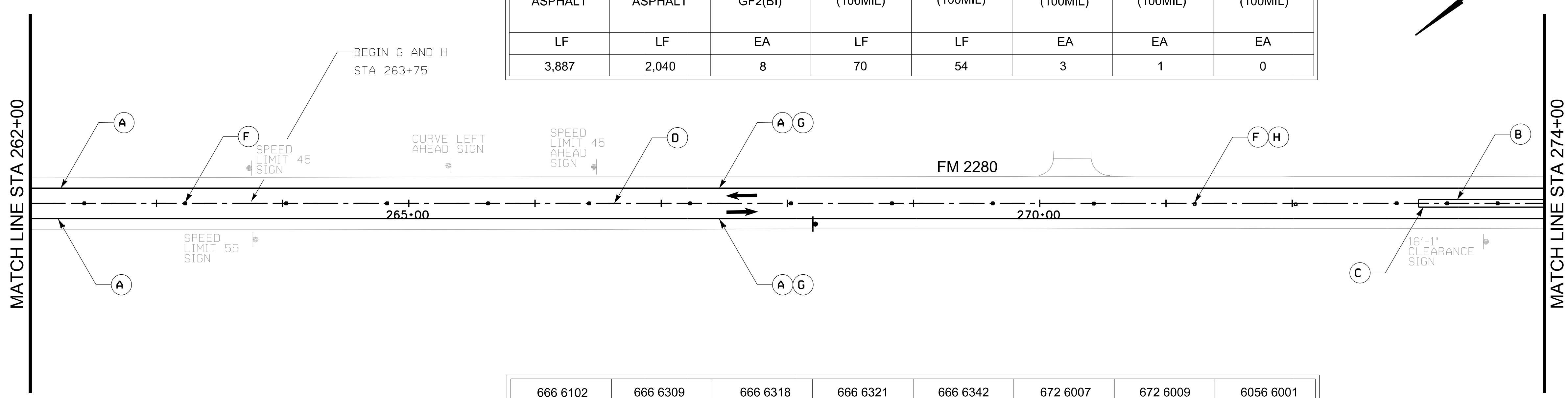

666 6102	666 6309	666 6318	666 6321	666 6342	672 6007	672 6009	6056 6001
REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 6" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 6" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 6" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
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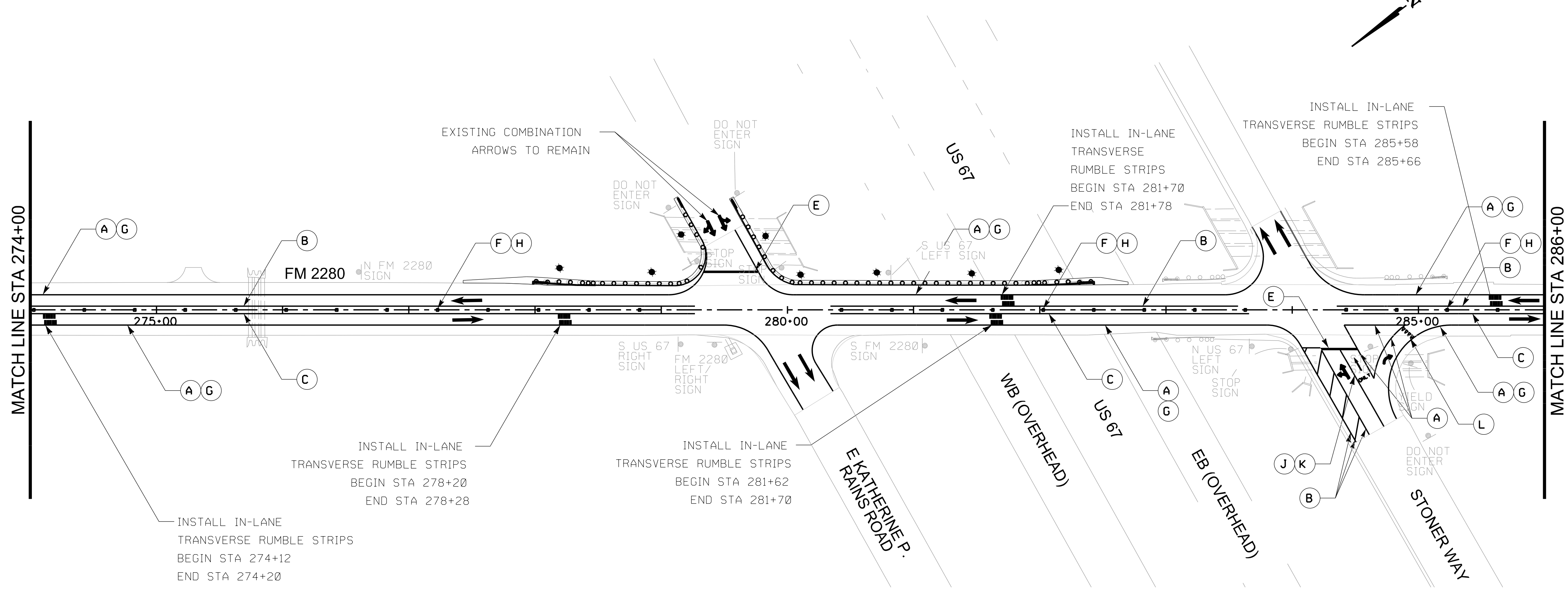

HORIZ. SCALE IN FEET (0 50 100)

LEGEND:

- (A) RE PM W/RET REQ TY I(W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I(Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I(Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I(W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I(W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I(W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I(W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I(W)(12")(SLD)(100MIL)
- ✱ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22, PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
5. SEE DELINEATOR AND OBJECT MARKER STANDARDS FOR DELINEATOR PLACEMENT DETAILS.
6. EXISTING SIGNS TO REMAIN UNLESS OTHERWISE DIRECTED. THE CONTRACTOR WILL COORDINATE WTH THE ENGINEER FOR ALL PROPOSED SIGN FINAL LOCATIONS.
7. IN-LINE TRANSVERSE RUMBLE STRIPS SHALL BE PLACED IN AN ALTERNATE PATTERN. SEE STANDARD RS(5)-23.

STATE OF TEXAS — PAUL E. WILLIAMS — 73822 — LICENSED PROFESSIONAL ENGINEER

Paul E. Williams, P.E. 1/5/2024

NO.	DATE	REVISION	APPROVED

PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

FM 2280 PAVEMENT MARKING LAYOUT

SHEET 13 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	95
CONTROL	SECTION	JOB	
2465	01	020	

1/5/2024 12:21:03 PM C:\Users\Display\OneDrive\VRX-33\5-36-IDP5052-8274\WA *2\5-FM 2280 (2465-01-020)\DGN\05_FM2280_PMRK(3)(002) - Copy.dgn

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RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)
LF	LF	EA	LF	LF	EA	EA	EA
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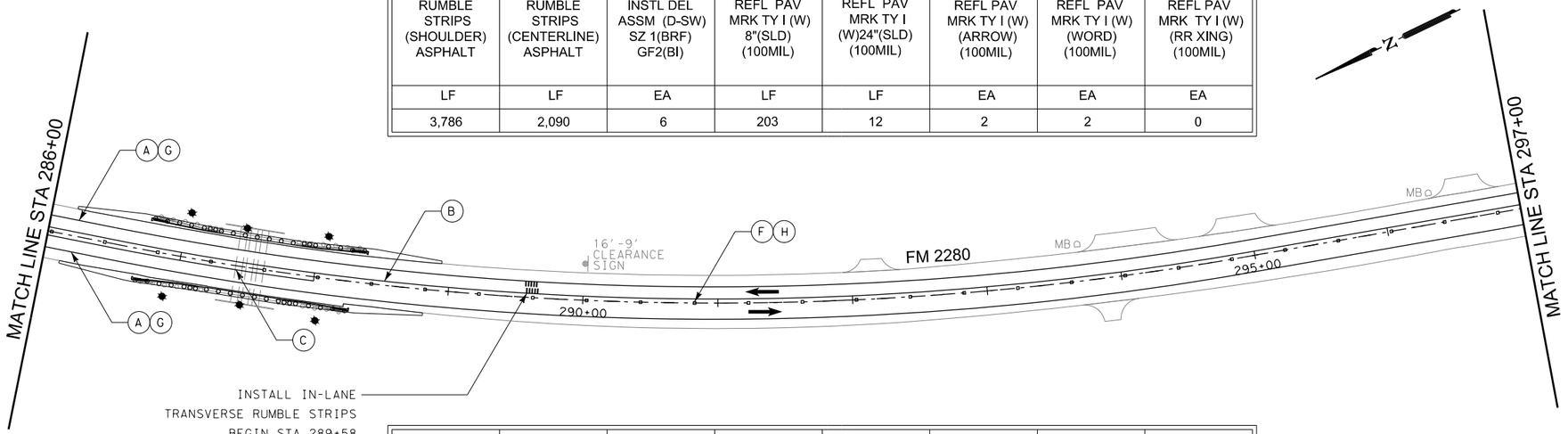

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REF PAV MRK TY I (W) 36" (YLD TRI) (100MIL)	RE PM W/ RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/ RET REQ TY I (Y) 4" (SLD) (100MIL)	REF PROF PAV MRK TY I (W) 4" (SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	PREFORMED IN-LANE(TRANS) RUMBLE STRIP
EA	LF	LF	LF	LF	EA	EA	LF
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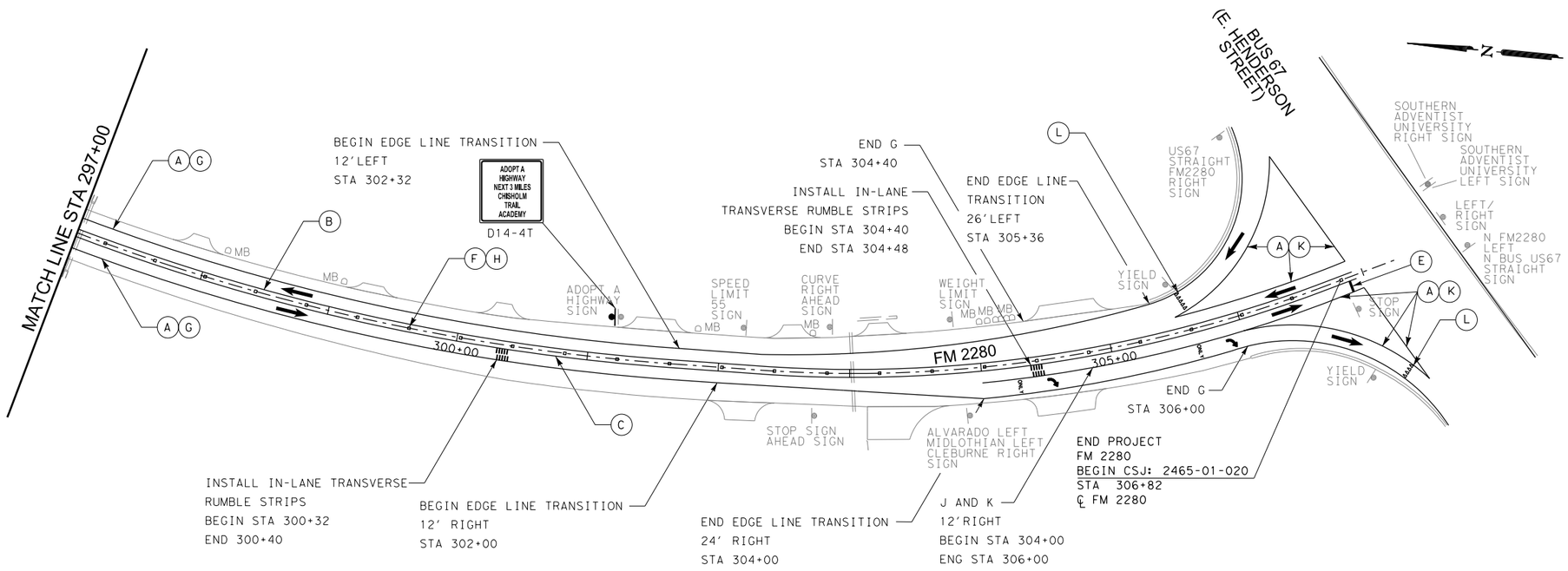

0 50 100
HORIZ. SCALE IN FEET

LEGEND:

- (A) RE PM W/RET REQ TY I (W)(6")(SLD)(100MIL)
- (B) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-LT
- (C) RE PM W/RET REQ TY I (Y)(6")(SLD)(100MIL)-RT
- (D) RE PM W/RET REQ TY I (Y)(6")(BRK)(100MIL)-CTR
- (E) REFL. PAV. MRK. TY I (W)(24")(SLD)(100MIL)
- (F) REFL. PAV. MRK. TY II-A-A
- (G) RUMBLE STRIPS (SHOULDER) ASPHALT
- (H) RUMBLE STRIPS (CENTERLINE) ASPHALT
- (J) REFL. PAV MRK TY I (W)(8")(SLD)(100MIL)
- (K) REFL. PAV. MRK. TY I-C
- (L) REF. PAV. MRK. TY I (W)36"(YLD (TRI)(100MIL)
- (M) REF. PROF. PAV. MRK. TY I (W) 6"(SLD)(100MIL)
- (N) REFL. PAV MRK TY I (W)(12")(SLD)(100MIL)
- ✸ BIDIRECTIONAL DELINEATOR (GF2)

NOTES:

1. SEE STANDARDS RS(3)-23 AND RS(4)-23 FOR RUMBLE STRIP DETAILS. WHERE APPLICABLE, ALL SHOULDER RUMBLE STRIPS SHALL BEGIN AND END AT X-STREET CURB RETURNS.
2. EDGE STRIPE SHALL NOT BE INSTALLED ACROSS CROSS STREETS.
3. SEE STANDARDS PM(1)-22, PM(2)-22 AND PM(3)-22 FOR STRIPING INSTALLATION DETAILS.
4. SEE TYPICAL SECTIONS FOR PROPOSED LANE WIDTHS.
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STATE OF TEXAS
PAUL E. WILLIAMS
73822
LICENSED PROFESSIONAL ENGINEER

Paul E Williams, P.E. 10-19-2023

NO.	DATE	REVISION	APPROVED

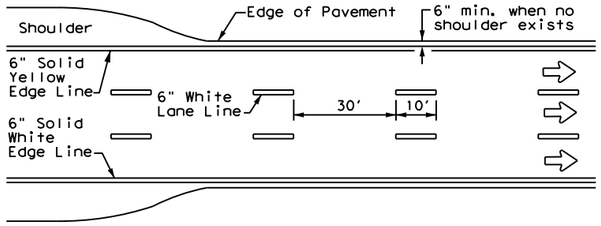
PRIORITY GROUP, INC.
3939 E US HWY 80, STE 143P, MESQUITE, TX 75150 | FIRM # F-14194

FM 2280 PAVEMENT MARKING LAYOUT

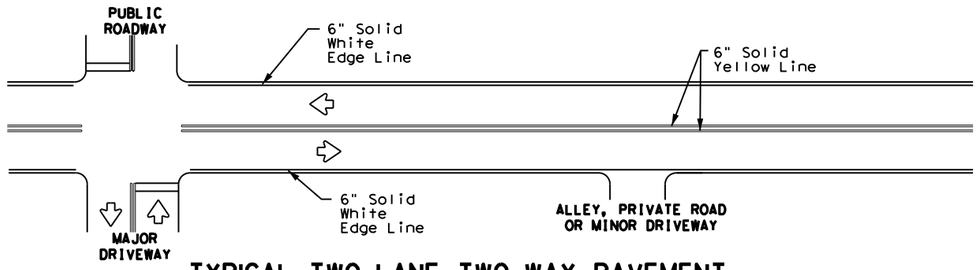
SHEET 14 OF 14

FED.RD. DIV.NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	96
CONTROL	SECTION	JOB	
2465	01	020	

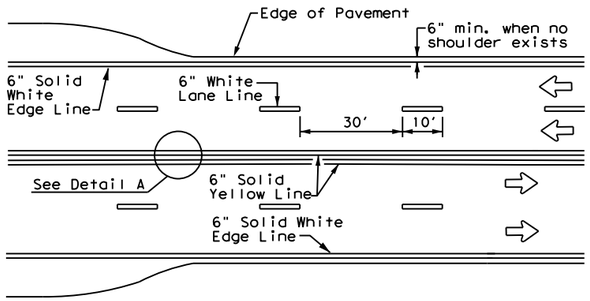
$TIME$
$DATE$
$FILE$

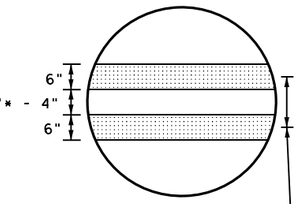


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

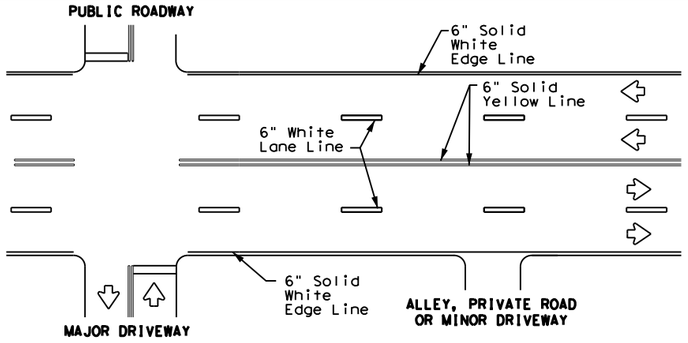




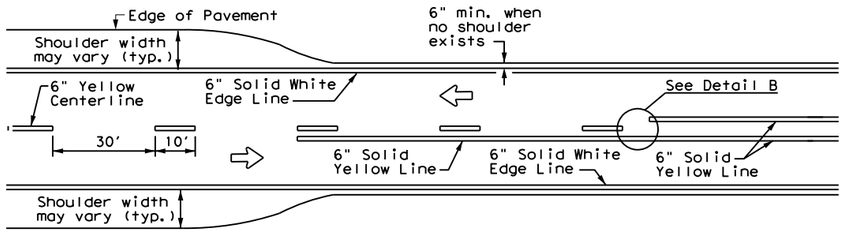
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

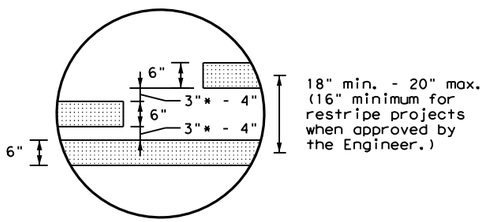
** 8" minimum for restripe projects when approved by the Engineer.



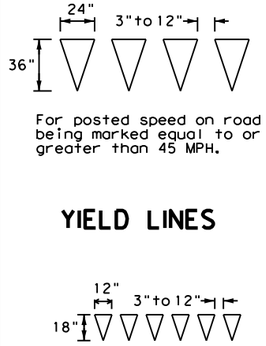
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

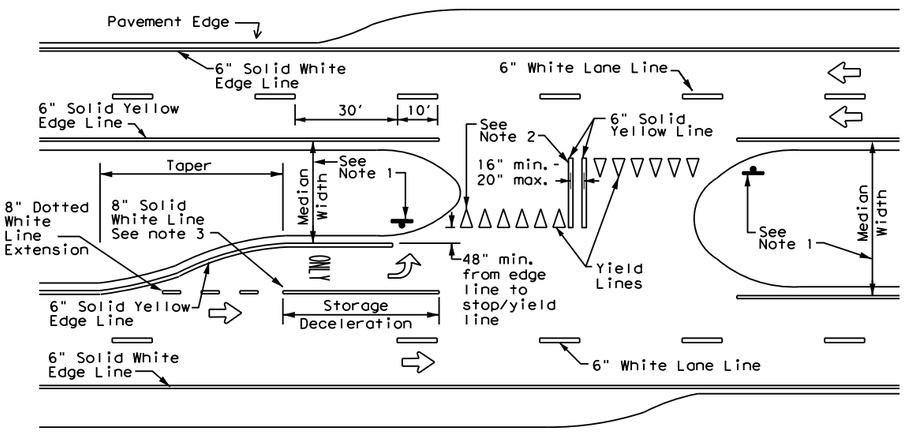


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

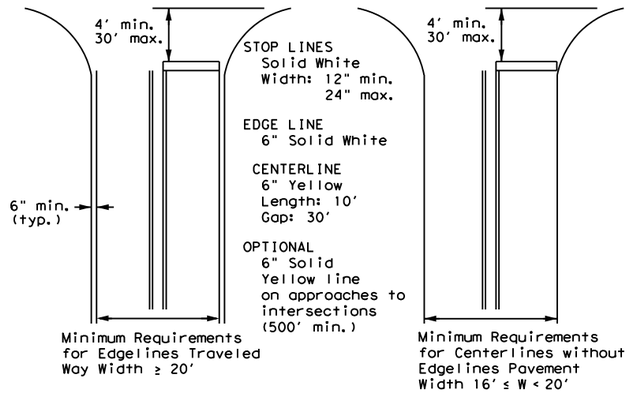
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. 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.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. 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.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the 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

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

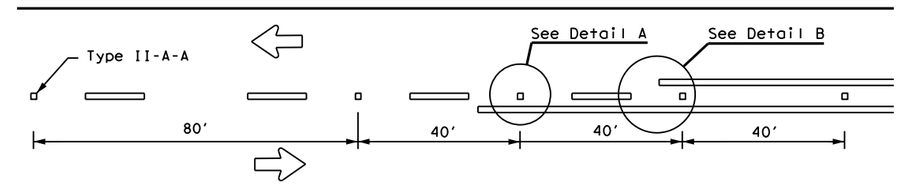
PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	2465	01	020	FM 2280
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	FTW	JOHNSON		97

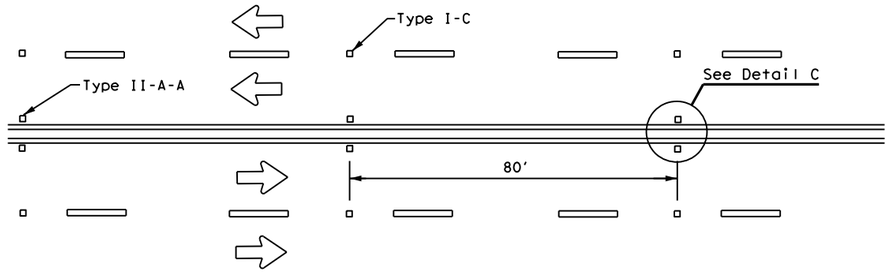
22A

DATE:
FILE:

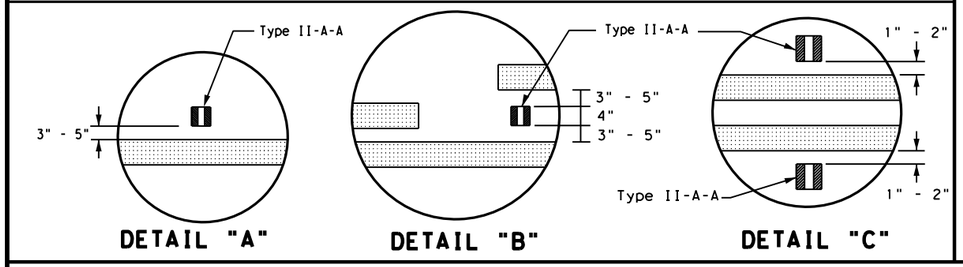
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

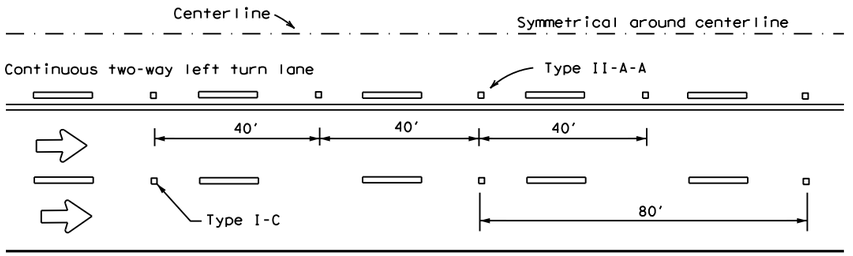


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

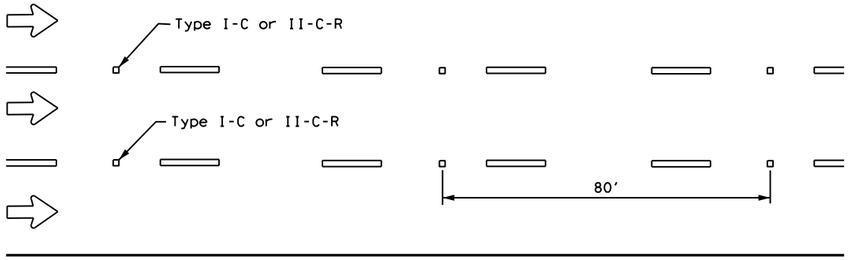


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





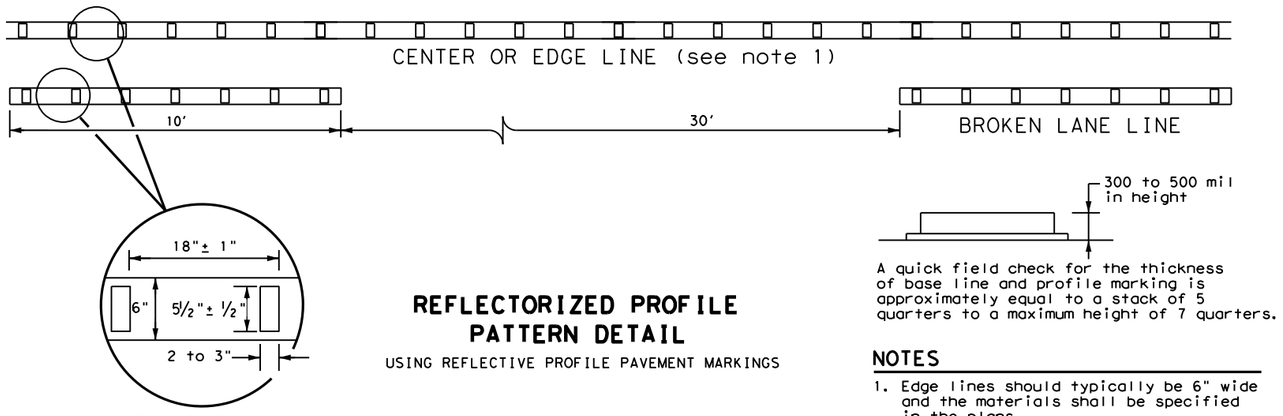
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

NOTES

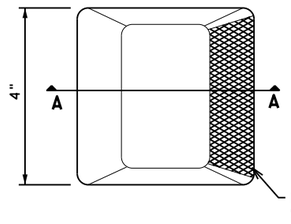
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

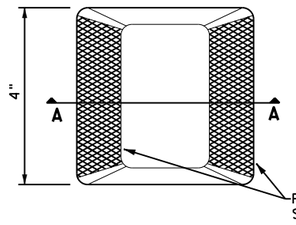
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians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

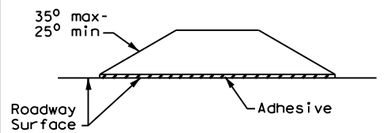
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

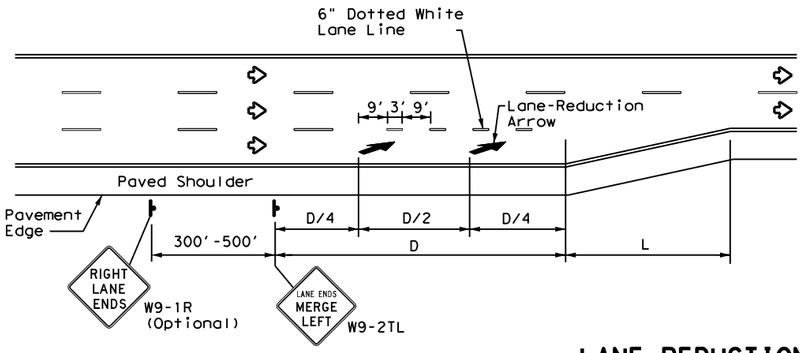
Traffic Safety Division Standard

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

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		98

22B

DATE:
FILE:

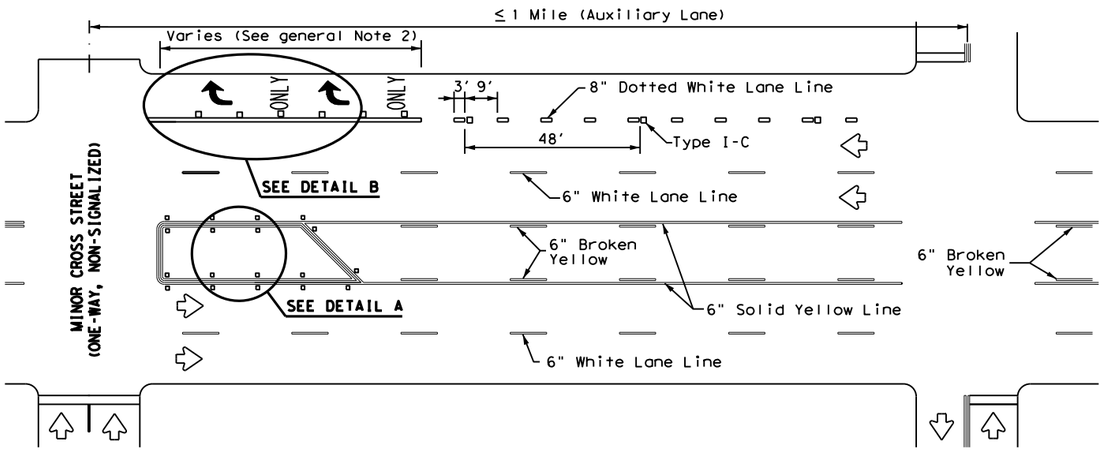


LANE REDUCTION

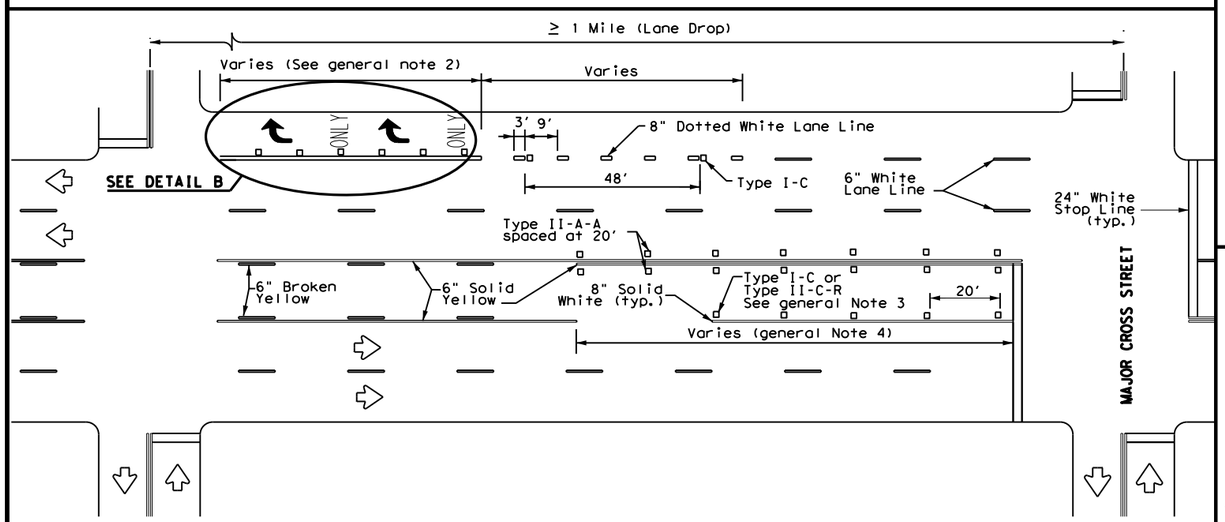
NOTES

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

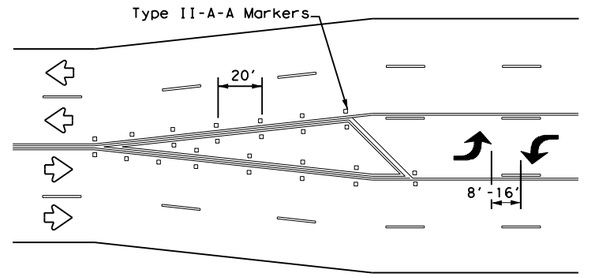
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	



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

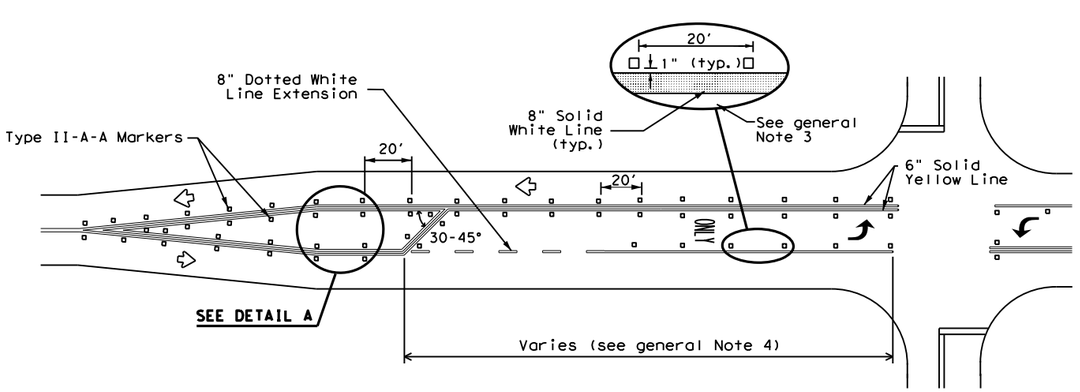


TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP

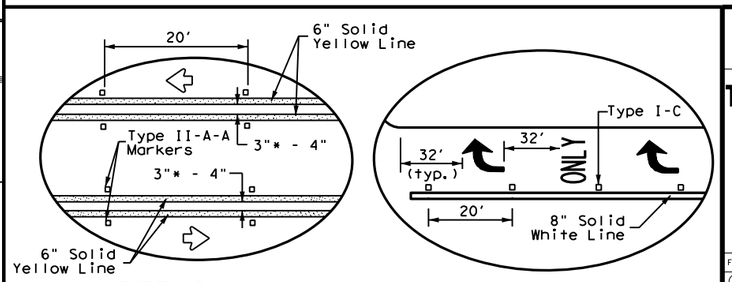


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



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

GENERAL NOTES

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

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

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		99

22C

DATE:
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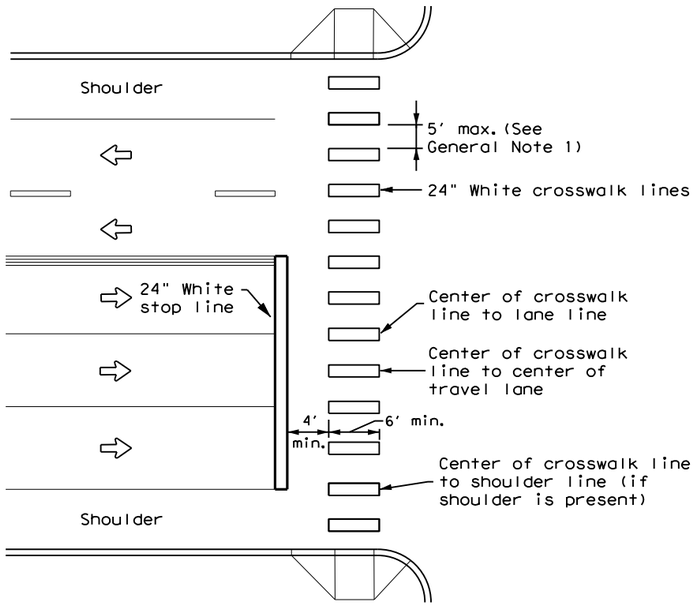


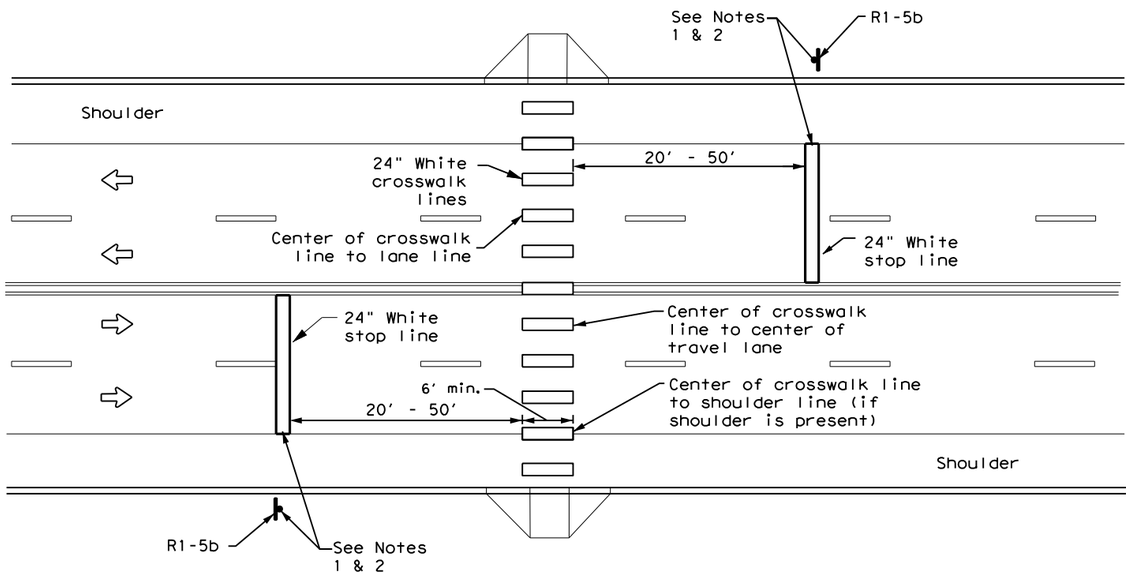
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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.



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
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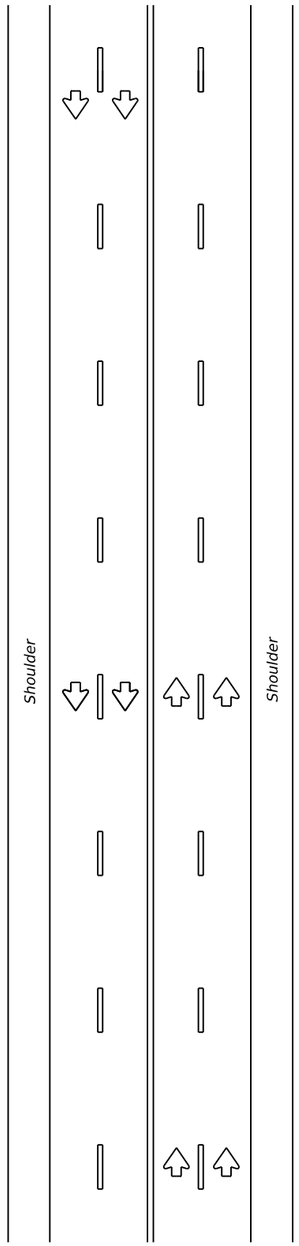
REVISIONS	2465	01	020	FM 2280
6-20	DIST	COUNTY		SHEET NO.
6-22	FTW	JOHNSON		100
12-22				

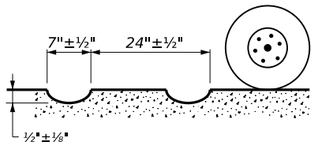
22D

DATE:
FILE:

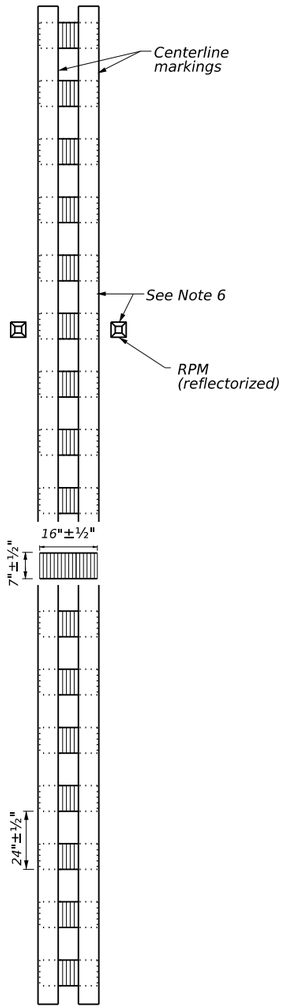
CENTERLINE RUMBLE STRIPS



MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER

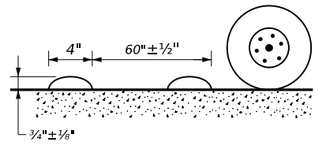


PROFILE VIEW

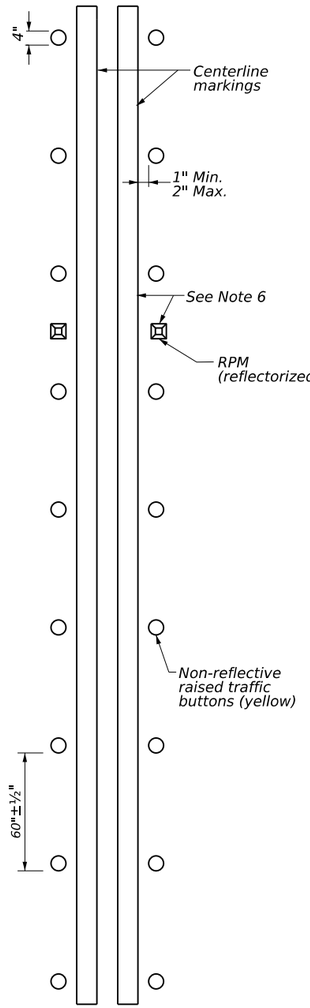


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

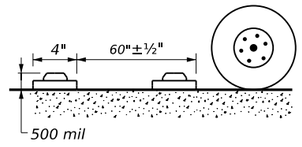


PROFILE VIEW

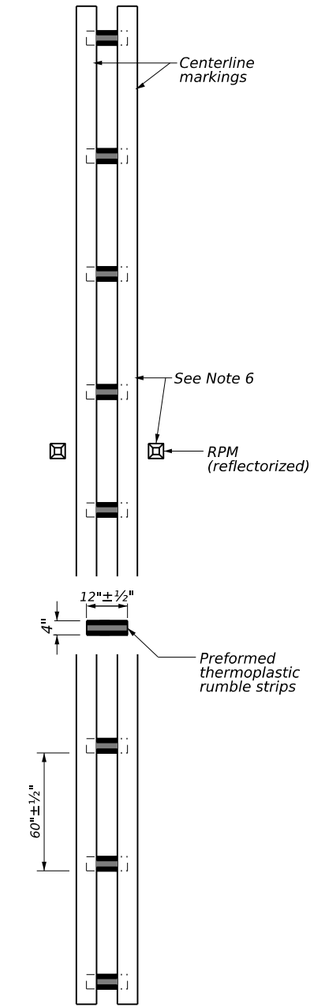


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

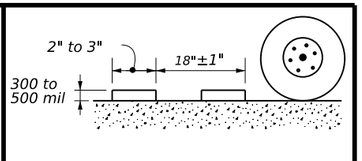


PROFILE VIEW

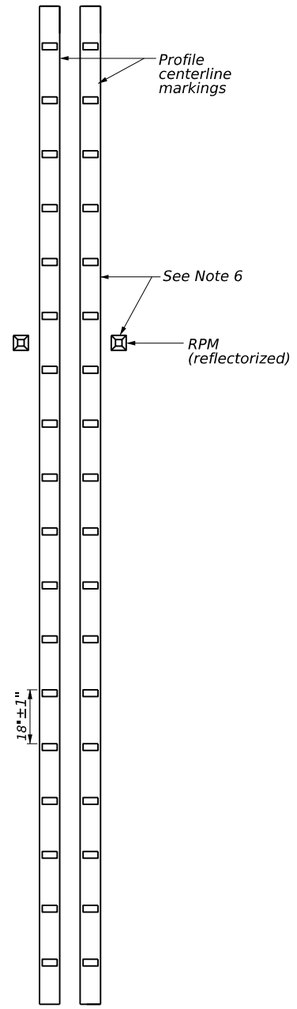


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



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 placedon 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 beused if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and nomore than 150 feet in advance of bridges, railroad crossing, intersections ordriveways 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).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS RS(3)-23

FILE: rs(3)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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10-13 1-23	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		101

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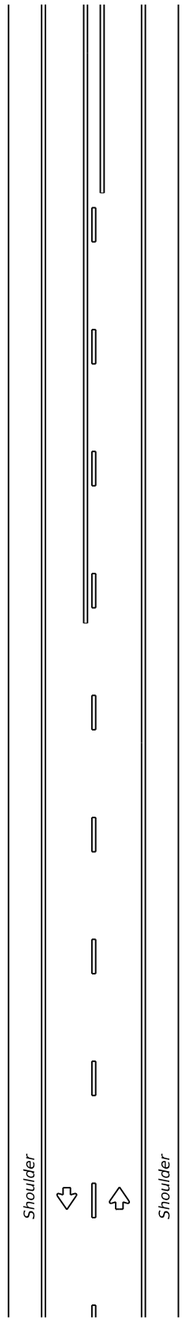
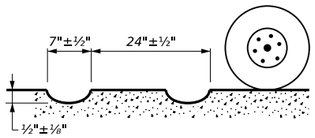
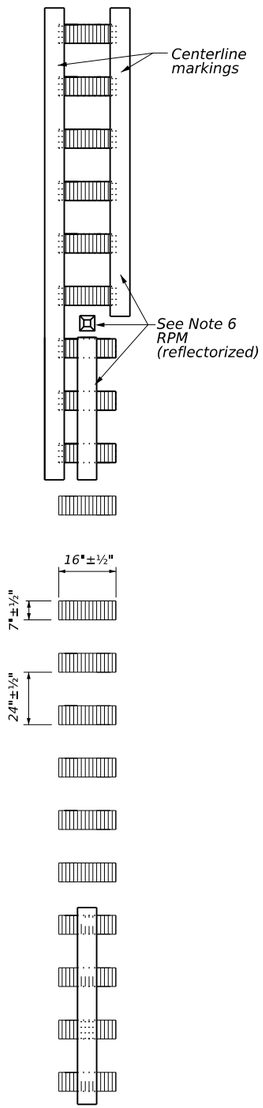
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

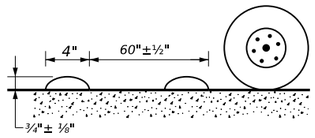


PROFILE VIEW

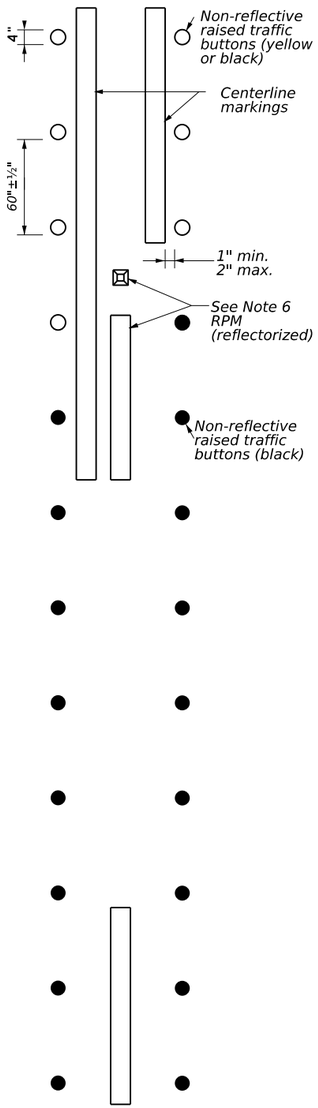


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

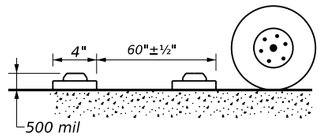


PROFILE VIEW

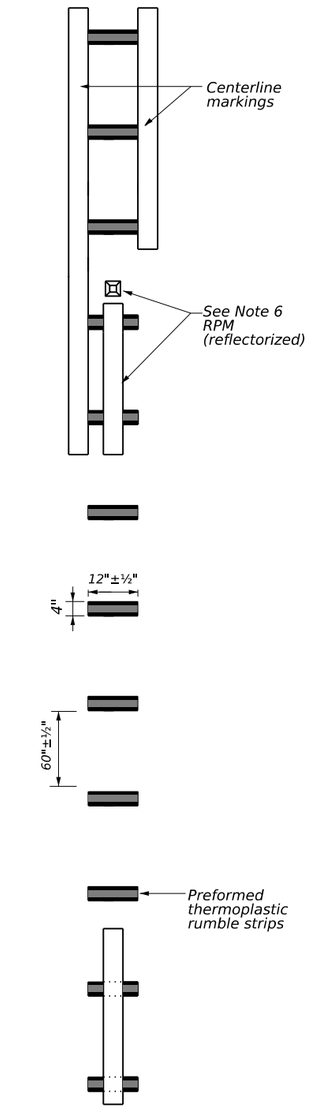


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

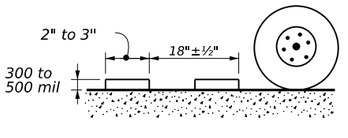


PROFILE VIEW

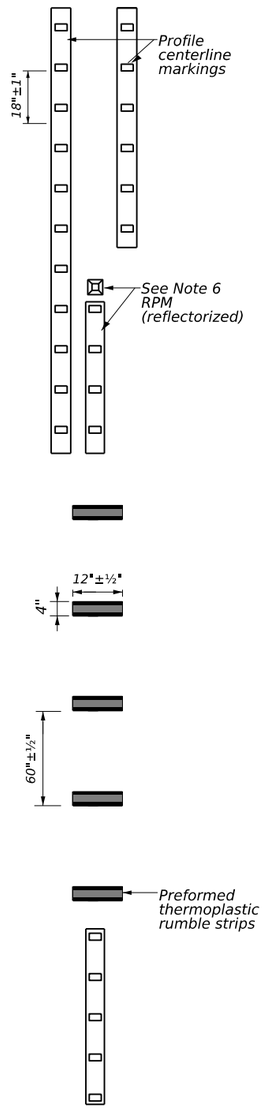


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and 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 crossings, 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.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

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

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

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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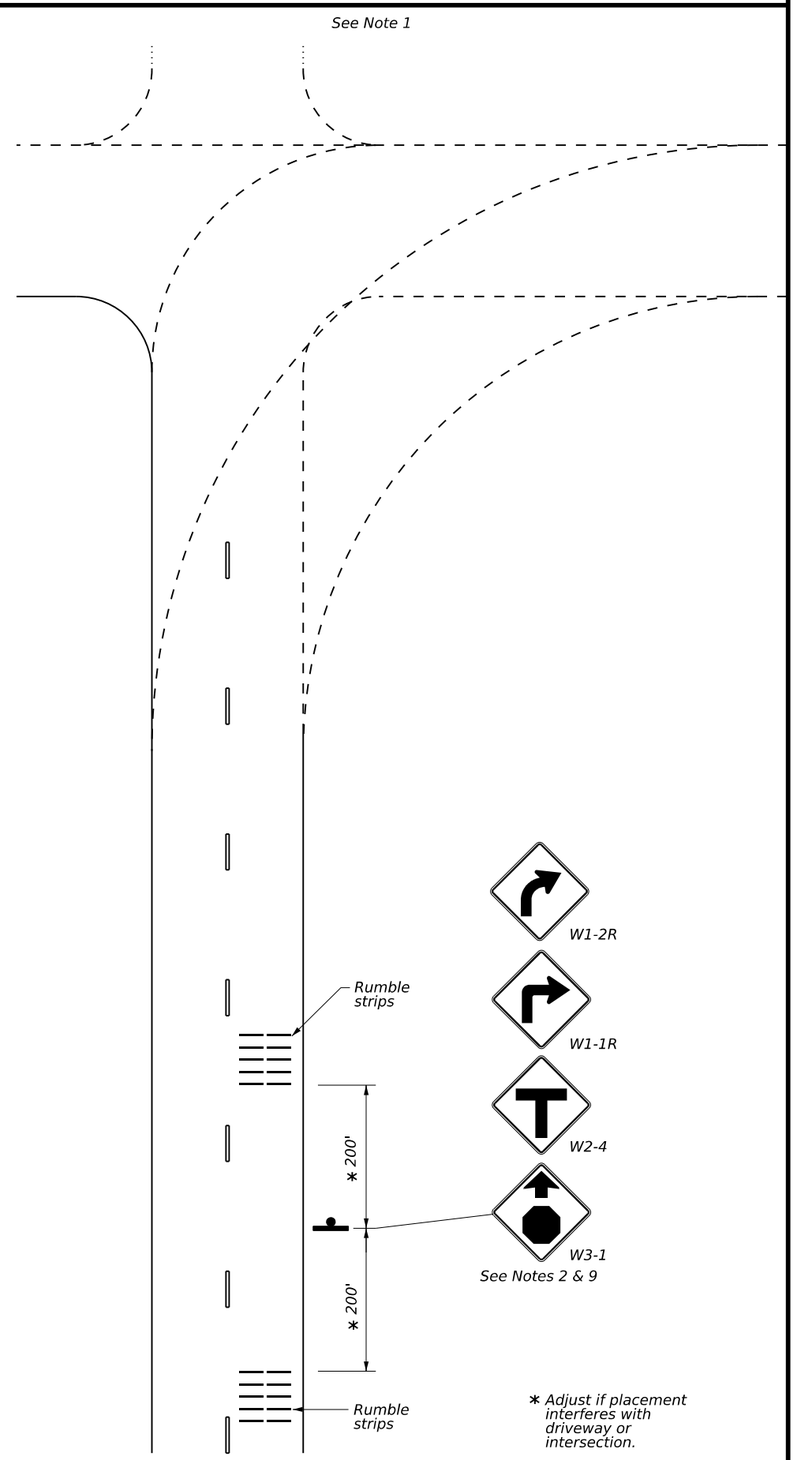
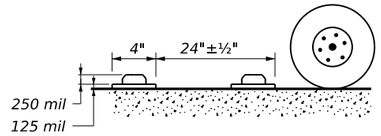
10-13 1-23	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		102

DATE:
FILE:

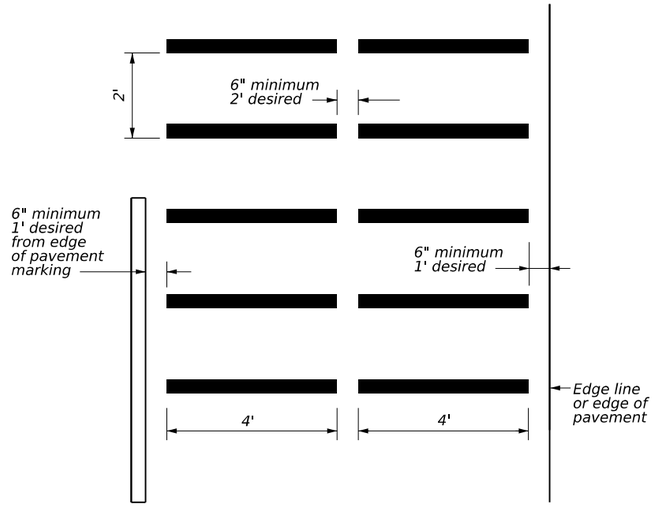
RUMBLE STRIP TYPICAL APPLICATION





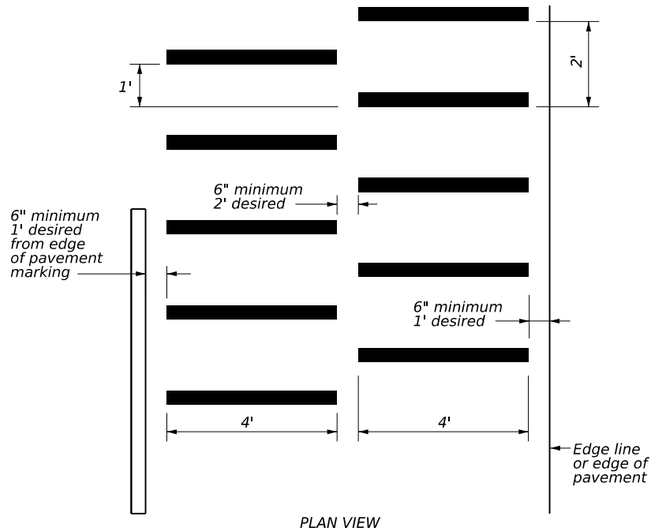
PROFILE VIEW

RUMBLE STRIP STANDARD PATTERN



PLAN VIEW

RUMBLE STRIP ALTERNATIVE PATTERN



PLAN VIEW

GENERAL NOTES

1. *Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or stop-controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.*
2. *When used, the rumble strips shall be placed 200 feet upstream and downstream of the warning sign.*
3. *The use of rumble strips should not be widespread or indiscriminate.*
4. *Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.*
5. *Please reference the TxDOT Material Producers List for approved rumble strips (transverse): http://www.txdot.gov/*
6. *Consideration should be given to noise levels when in-lane or transverse rumble strips are to be installed near residential areas, schools, churches, etc.*
7. *The RUMBLE STRIPS AHEAD (W17-2T) sign may be used in advance of in-lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the Guidelines for Advance Placement of Warning Signs table of the Texas Manual on Uniform Traffic Control Devices.*

W17-2T

8. *Consideration shall be given to bicyclists. See RS(6).*
9. *Other signs can be used as conditions warrant.*

Texas Department of Transportation

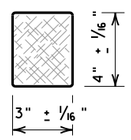
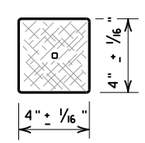
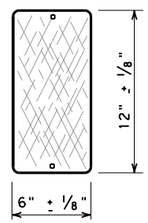
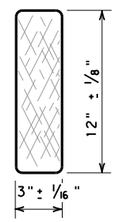
Traffic Safety Division Standard

TRANSVERSE OR IN-LANE RUMBLE STRIPS

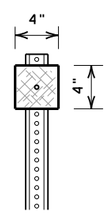
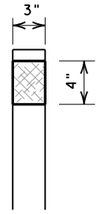
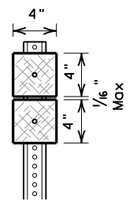
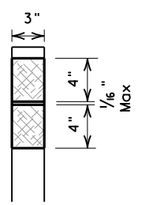
RS(5)-23

FILE: rs(5)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-06 1-12 2-10 10-13	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		103

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

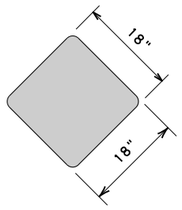
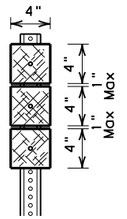
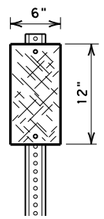
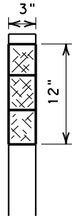
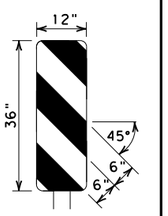
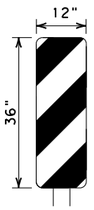
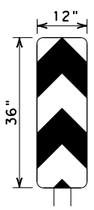
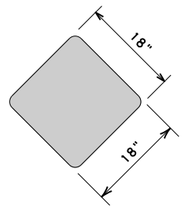
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

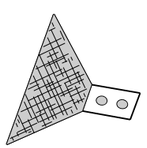
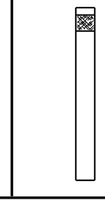
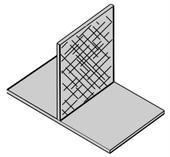
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
	Yellow-Type B_{FL} or C_{FL} Sheeting	3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit	Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
SHEETING		Yellow - Type B or C Sheeting						
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

BARRIER REFLECTORS (BRF)

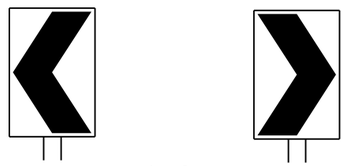
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING: Yellow, White, Red

NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

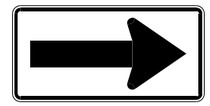
CHEVRONS

DEVICE:  W1-8

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

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

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

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

NOTE:

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

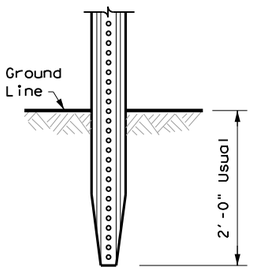
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	JOHNSON		104

DATE:
FILE:

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

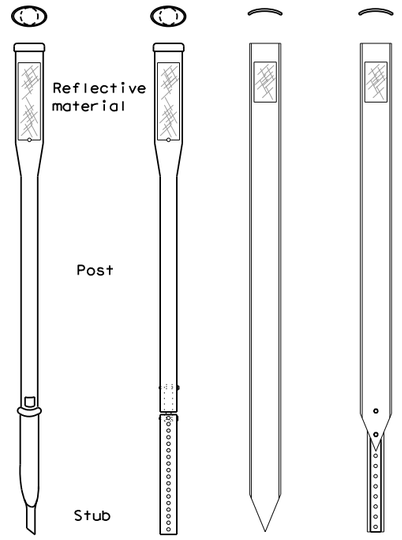


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

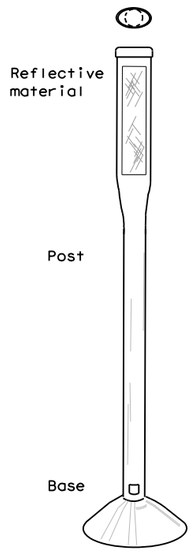
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



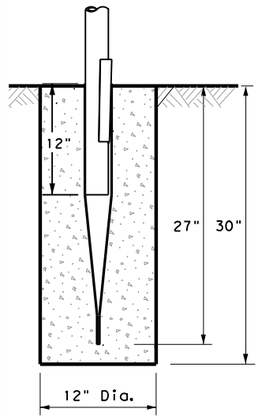
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

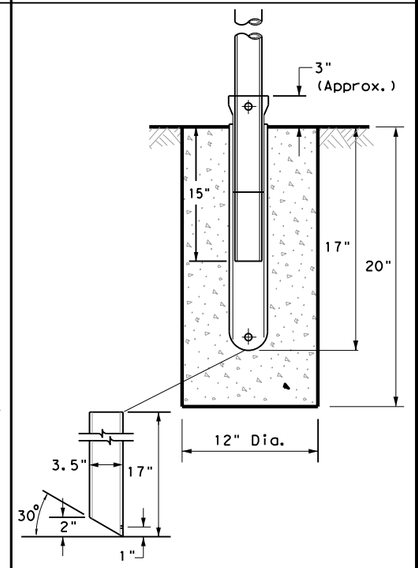
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

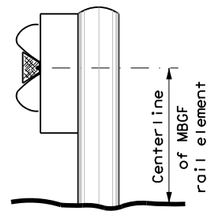
NOTE

1. Install per manufacturer's recommendations.

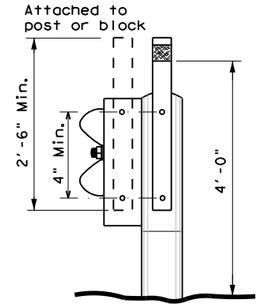
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

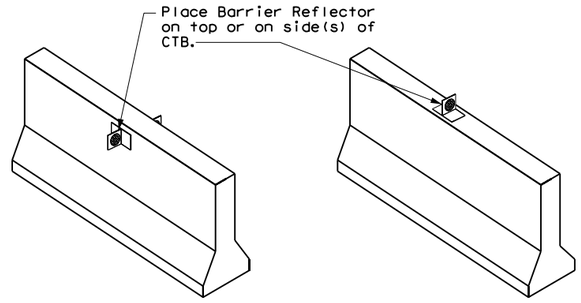
GF1



GF2



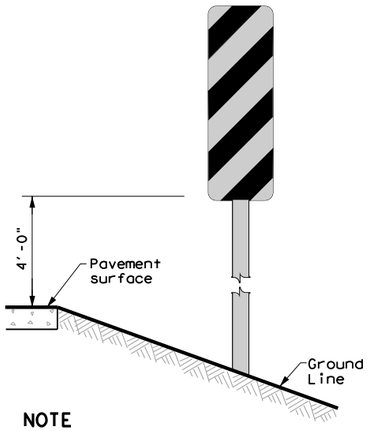
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

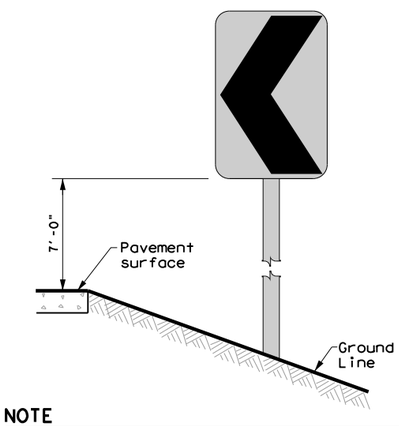
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

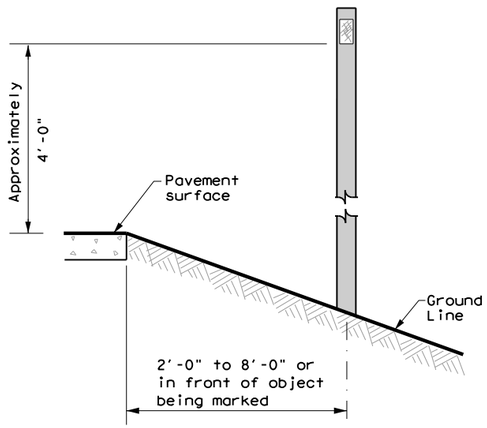
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

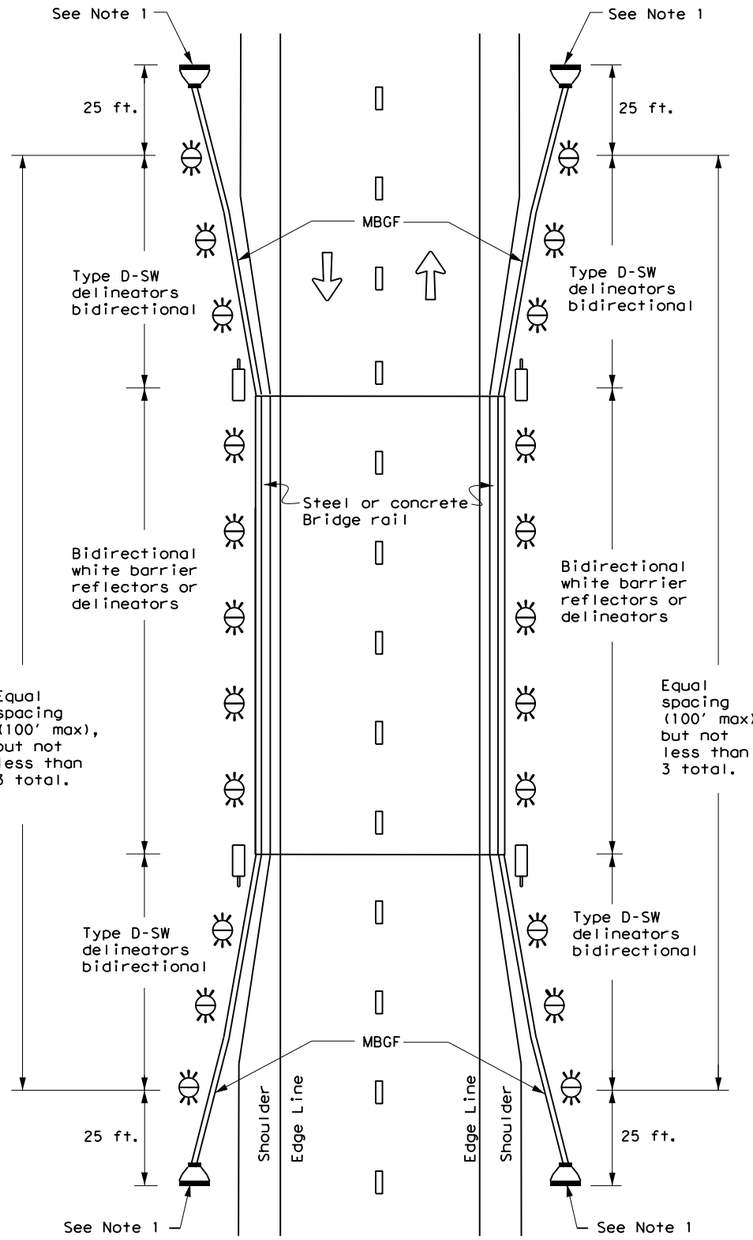
D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	FTW	JOHNSON		105

20B

DATE:
FILE:

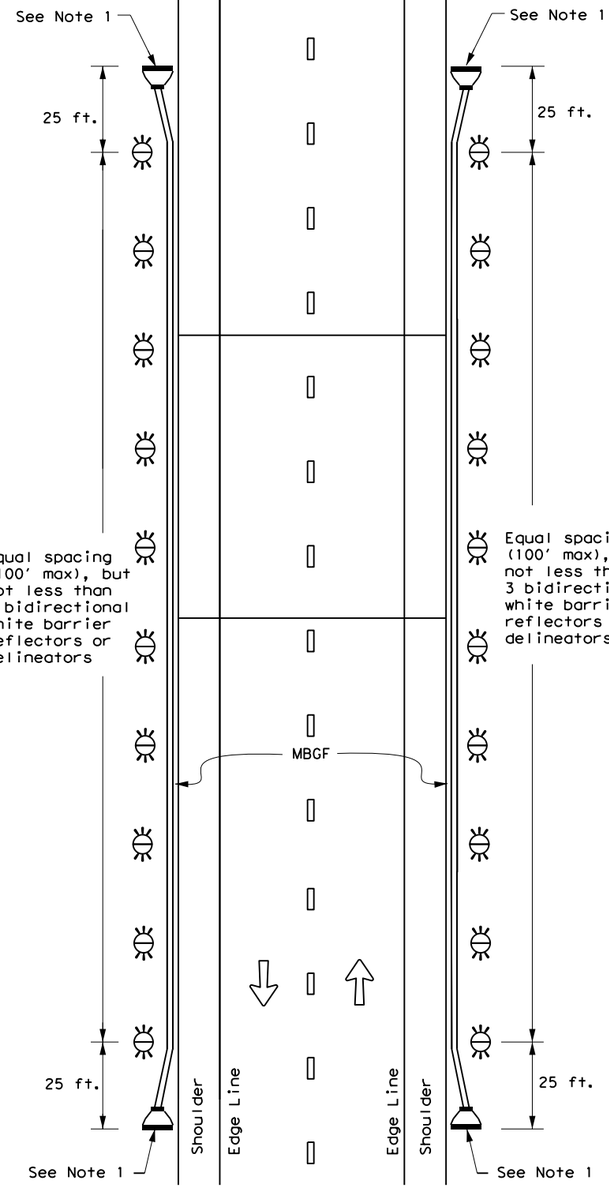
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

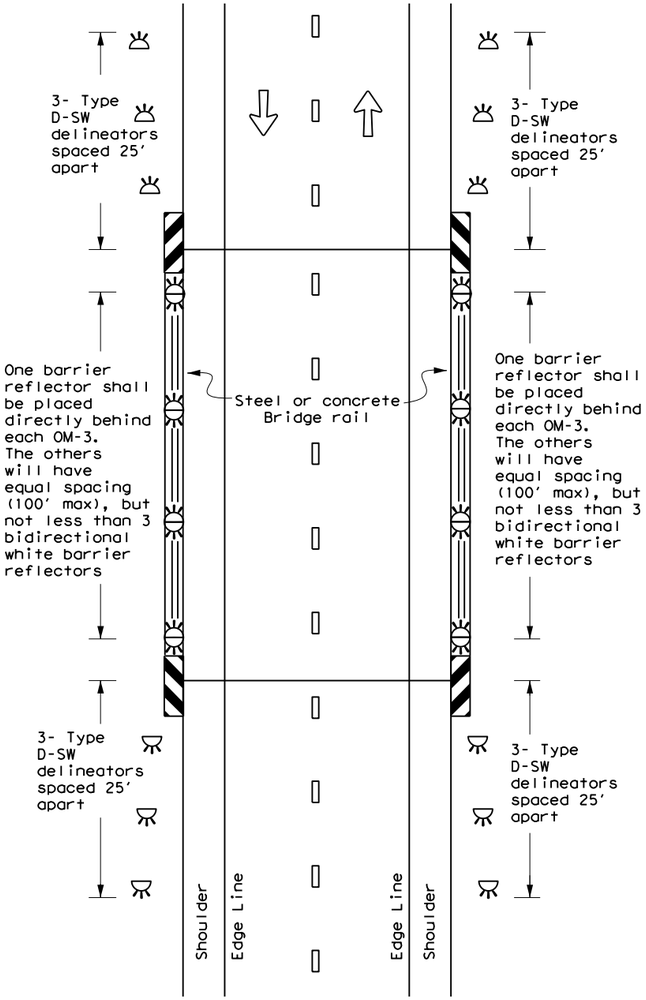
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

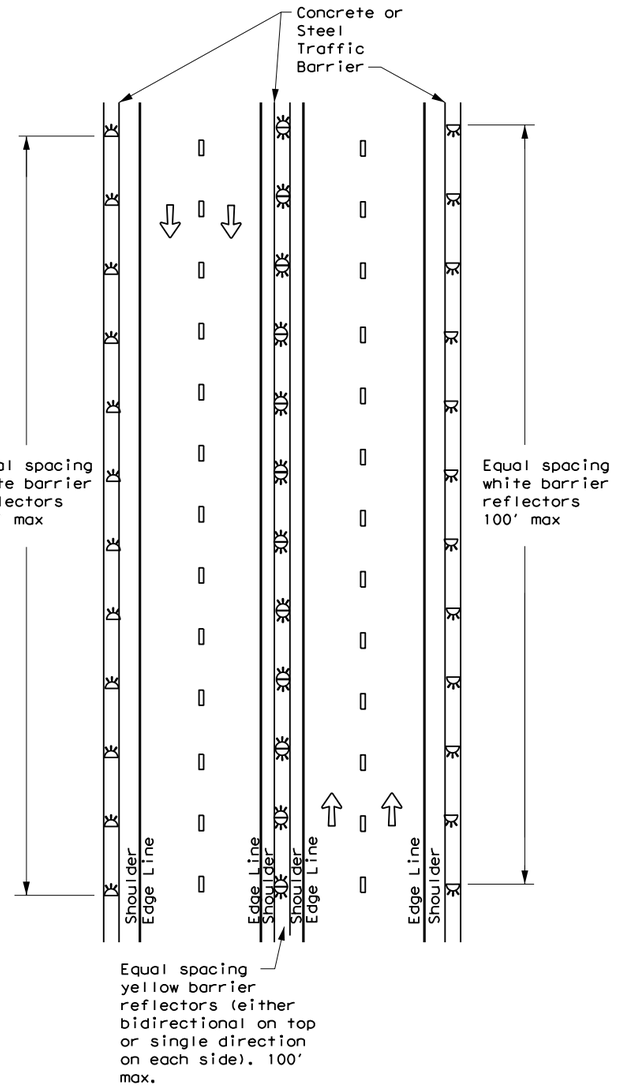
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
7-20	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		106

DATE:
FILE:

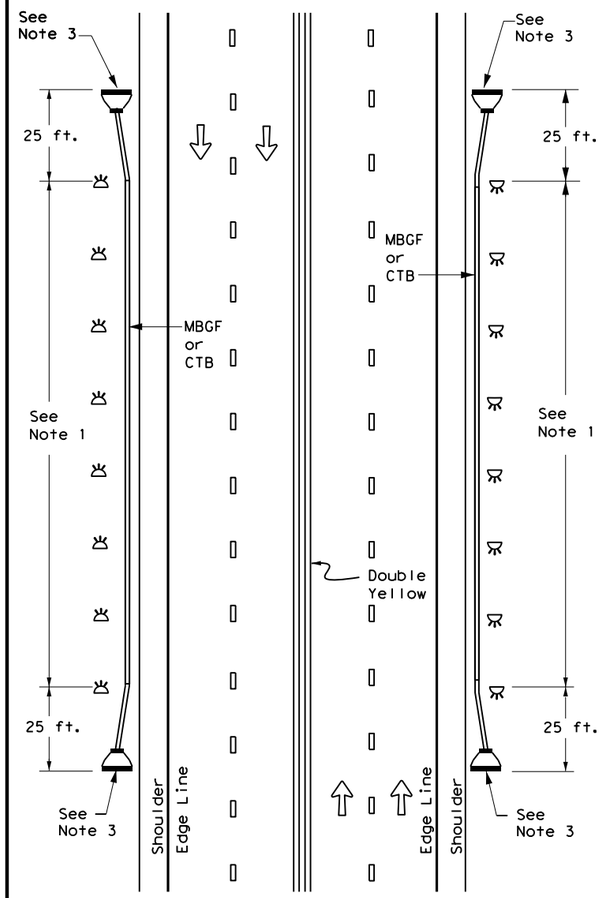
20E

DATE:
FILE:

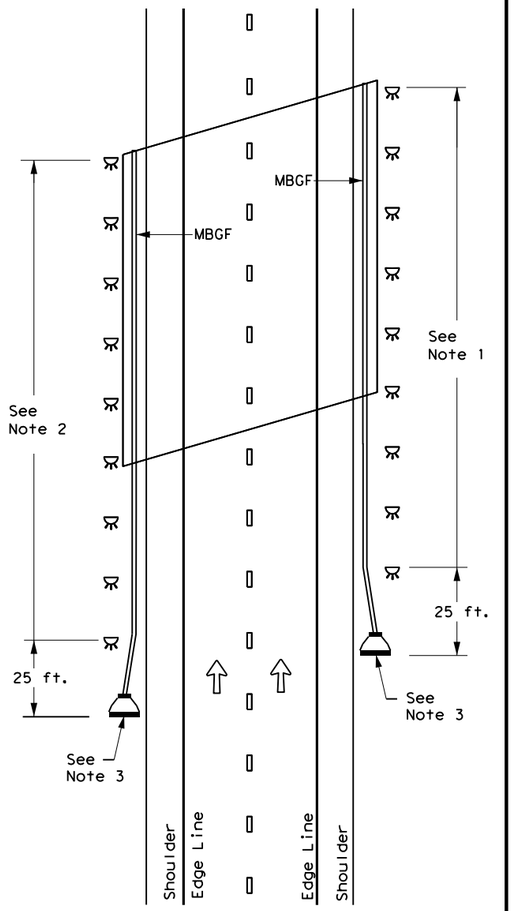
CONTINUOUS CONCRETE OR STEEL BARRIER



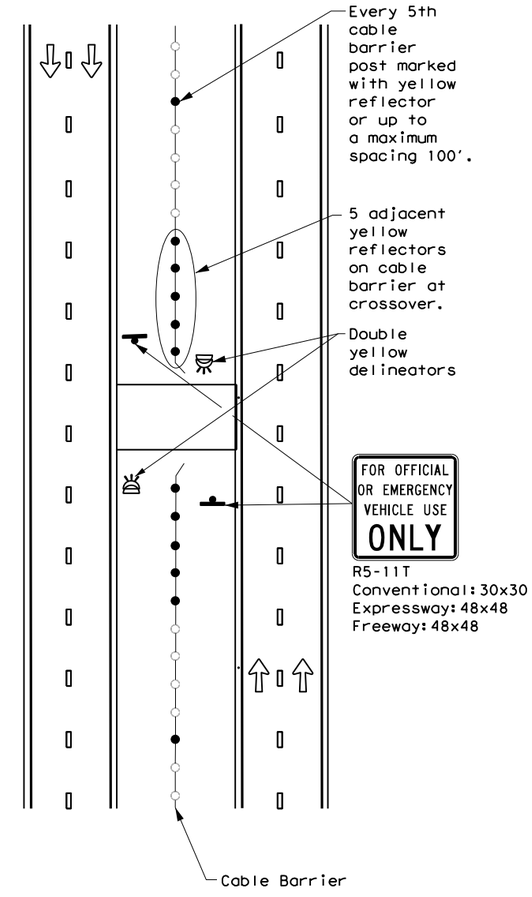
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

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

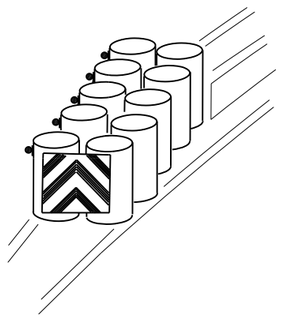
Texas Department of Transportation

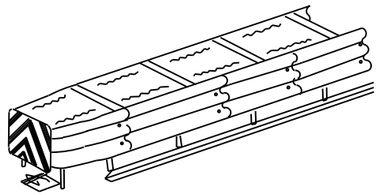
Traffic Safety Division Standard

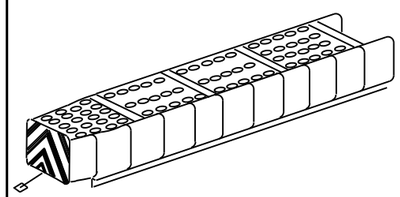
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

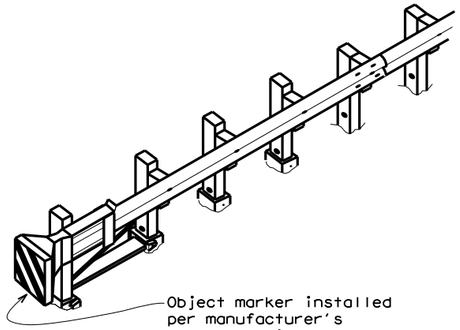
D & OM(6)-20

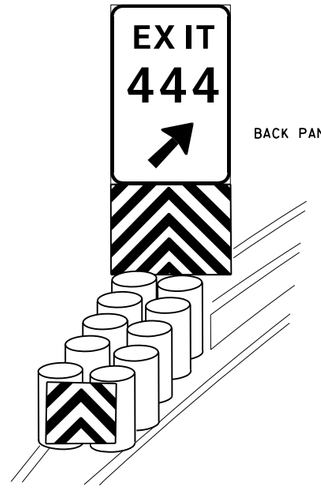
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
7-20	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		107

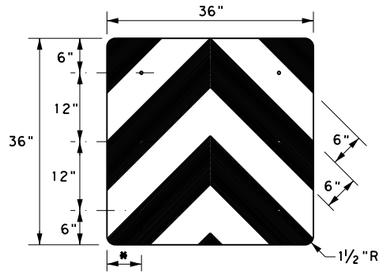


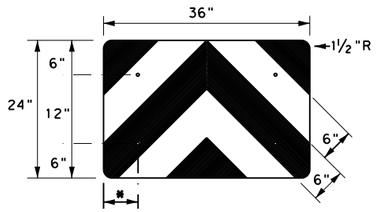




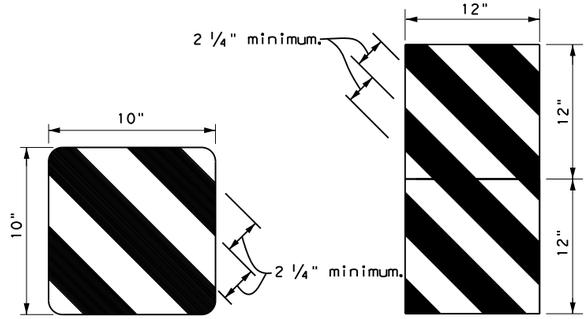




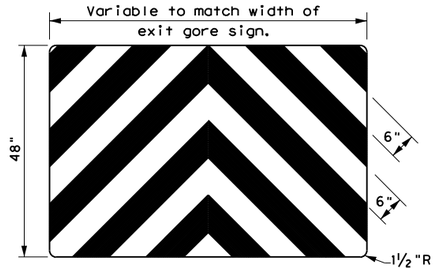


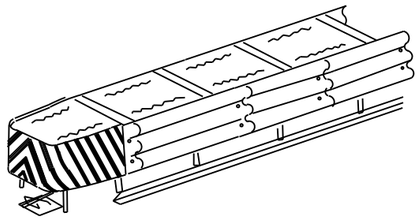


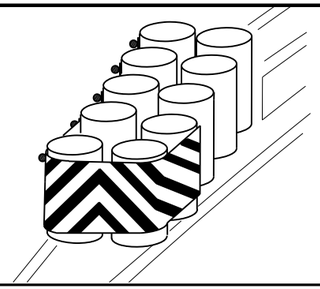
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

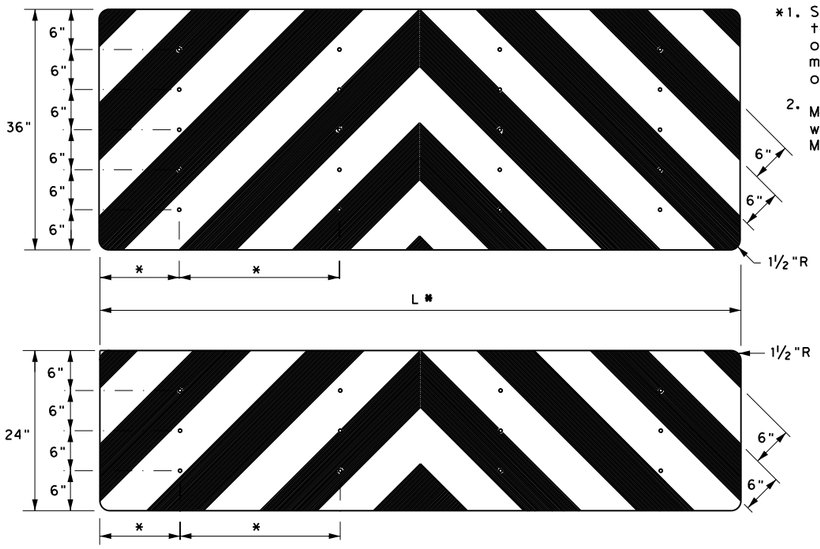


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

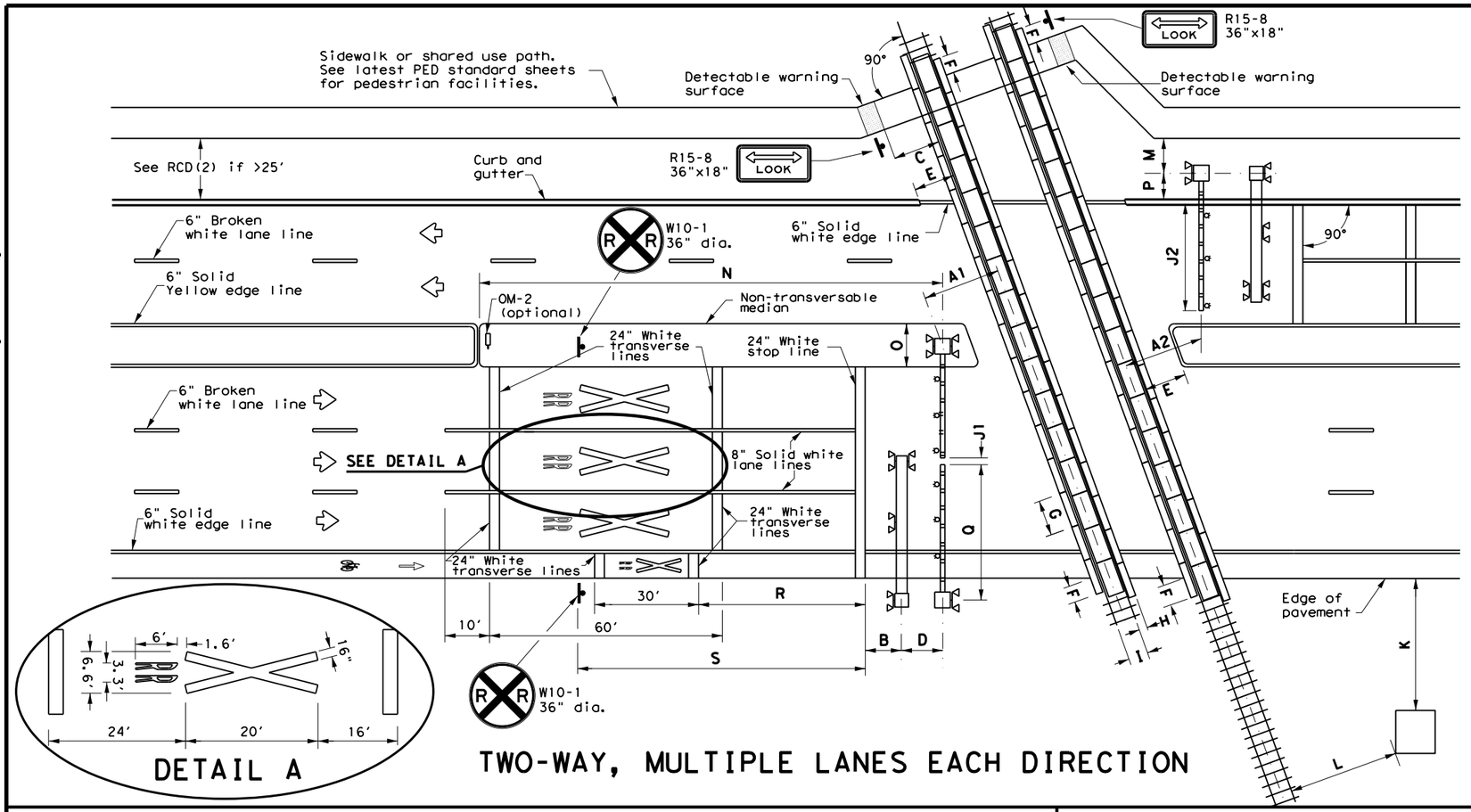
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	FTW	JOHNSON		108
4-98 7-20				

206

DATE:
FILE:



NOTES

A1: Center of RR mast to center of rail: 12' minimum, 15' typical.

A2: Tip of gate to center of rail: 12' minimum, 15' typical.

B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).

C: Near edge of detectable warning surface to nearest rail: 12' minimum.

D: Center of gate mast to center of cantilever mast: 6' typical.
NOTE: Cantilever may be located in front or behind gates.

E: Edge of median or curb to nearest rail: 10' typical.
NOTE: Design median edge to be parallel with rail.

F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum.
NOTE: Field panels need not be in line with gauge panels.

G: Length of panels along rail: 8' typical.

H: Width of field panel: 2' typical (check with railroad company).

I: Distance between rails: 4'- 8'1/2".

J1: Tip of gate to tip of gate: 2' maximum.

J2: 90% of traveled roadway to be covered by gate.

K: Nearest edge of RR cabinet from edge of pavement: 30' typical.
NOTE: Cabinet not required to be parallel to edge of pavement.

L: Nearest edge of RR cabinet from nearest rail: 25' typical.

M: Center of RR mast to edge of sidewalk: 6' minimum.

N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60'will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.

O: Width of median for RR gate assembly: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

P: Center of RR mast to face of curb: 5'-3" minimum.
Center of RR mast to edge of pavement (with shoulder): 7' minimum.
Center of RR mast to edge of pavement (no shoulder): 9'-3" minimum.
NOTE: Final location determined by the railroad company.

Q: Gate length: 28' or less typical, but railroad company may allow up to 32' under special circumstances.

R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.

S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.

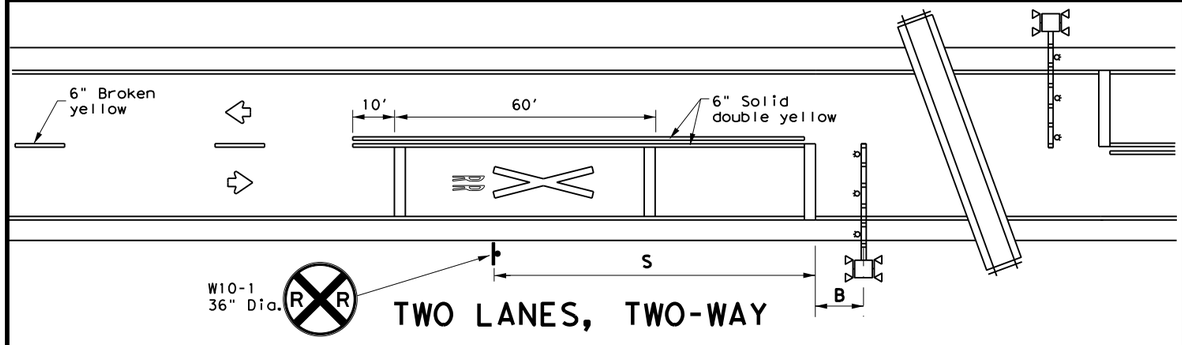
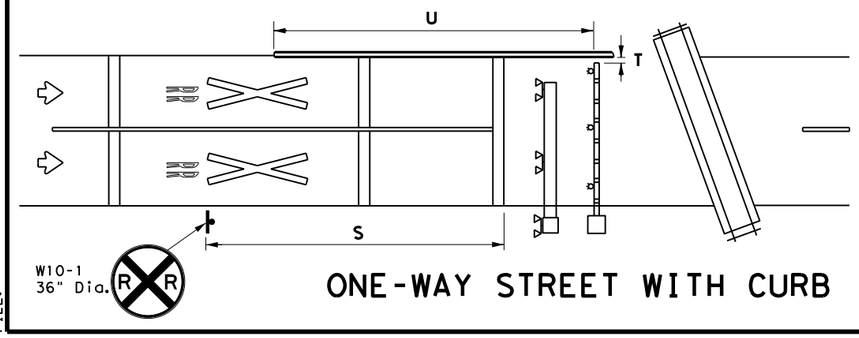


TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

LEGEND	
	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	Mast Flasher Pair

GENERAL NOTES

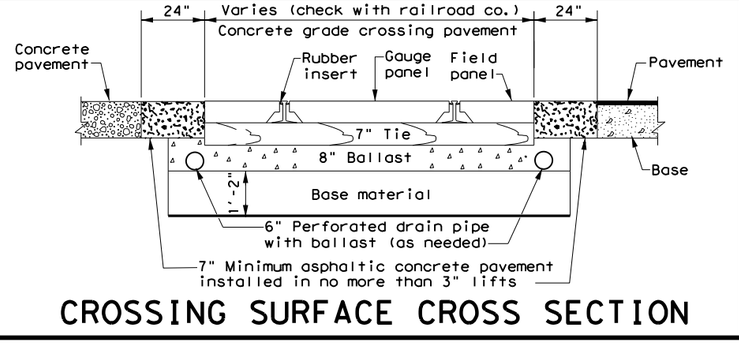
1. Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
2. Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
3. Medians preferred whenever possible to prevent vehicles from driving around gates.
4. Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
5. See SMD standard sheets for sign mounting details.
6. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.



NOTES

T: Tip of gate to edge of curb: 1' maximum for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations.

U: Non-traversable curb length from gate: 100' minimum for a Quiet Zone SSM, 10' minimum for all other locations.



Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT RCD(1)-22

FILE:	rcd1-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	November 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS		2465	01	020	FM 2280
2-16		DIST	COUNTY		SHEET NO.
11-22		FTW	JOHNSON		109

DATE:
FILE:

pdf.pltcfg

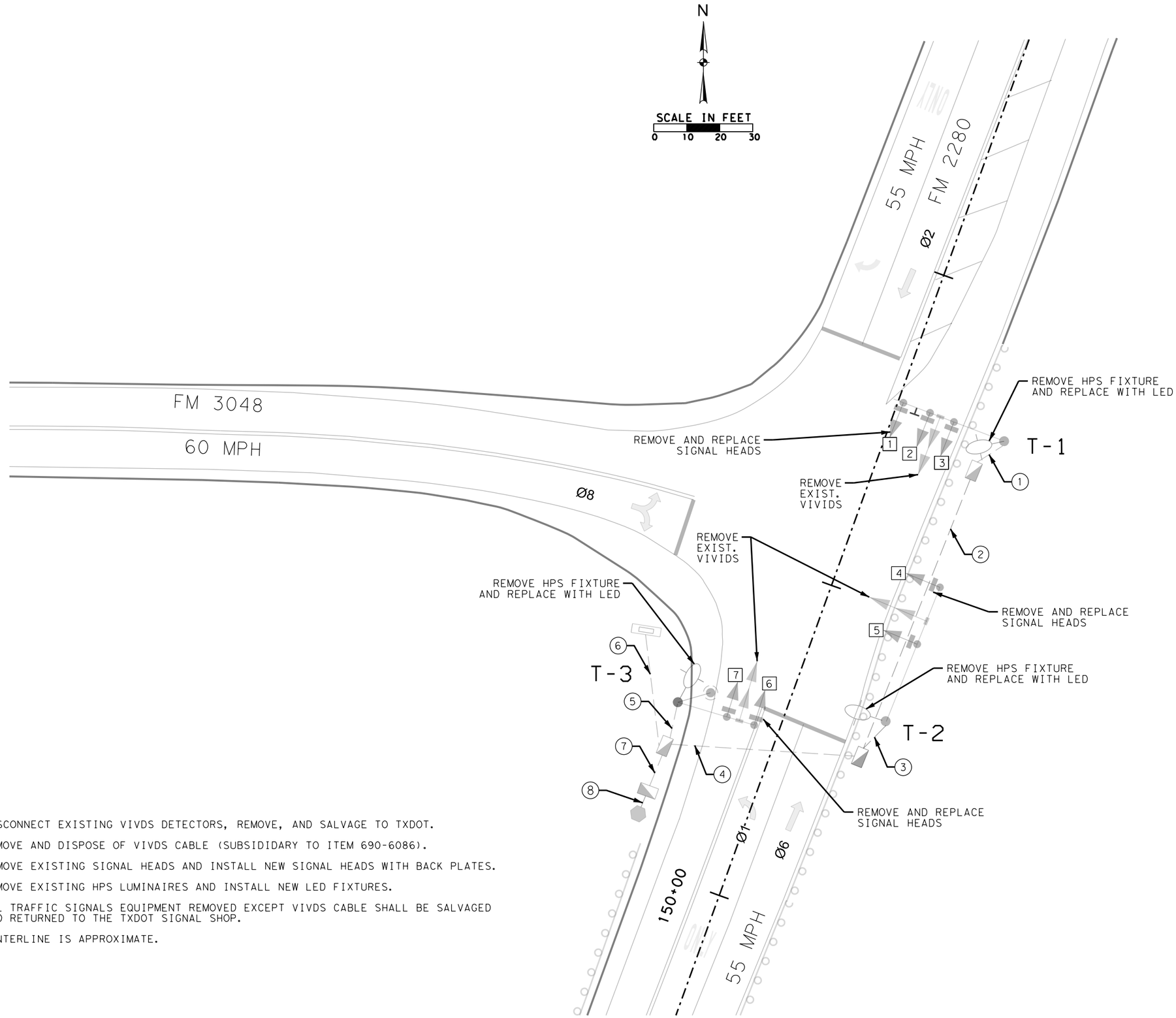
10:37:37 AM 10/5/2023 Austin

S:\4.0.0.0.0. Engineering Operations\4.2.0.0.0. Project Files\MB 582.2 - VRX SH 171 and IH35W SPM, TCP, SW3P\cadsheets\FM2280 & 3048_TrafficSignal_1 - Existing.dgn

DN: RMD	CK: MBY	DN: EG	CK: RMD

N

SCALE IN FEET
0 10 20 30



LEGEND

- EXIST. LUMINAIRE
- EXIST. GROUND BOX
- EXIST. TRAFFIC SIGNAL POLE
- T-1 EXIST. POLE NUMBERS
- 1 EXIST. SIGNAL HEAD NUMBER
- EXIST. MAST ARM MOUNTED SIGN
- EXIST. VIVDS DETECTOR
- EXIST. ELECTRICAL SERVICE
- EXIST. CONTROLLER
- EXIST. YAGI ANTENNA
- EXIST. CONDUIT
- (1) EXIST. CONDUIT RUN NUMBER
- EXIST. TRAFFIC SIGNAL HEAD
- EXIST. OMNI RADIO

NOTES:

1. DISCONNECT EXISTING VIVDS DETECTORS, REMOVE, AND SALVAGE TO TXDOT.
2. REMOVE AND DISPOSE OF VIVDS CABLE (SUBSIDIDARY TO ITEM 690-6086).
3. REMOVE EXISTING SIGNAL HEADS AND INSTALL NEW SIGNAL HEADS WITH BACK PLATES.
4. REMOVE EXISTING HPS LUMINAIRES AND INSTALL NEW LED FIXTURES.
5. ALL TRAFFIC SIGNALS EQUIPMENT REMOVED EXCEPT VIVDS CABLE SHALL BE SALVAGED AND RETURNED TO THE TXDOT SIGNAL SHOP.
6. CENTERLINE IS APPROXIMATE.

STATE OF TEXAS
RHETT DOLLINS
100298
LICENSED PROFESSIONAL ENGINEER

10/5/2023

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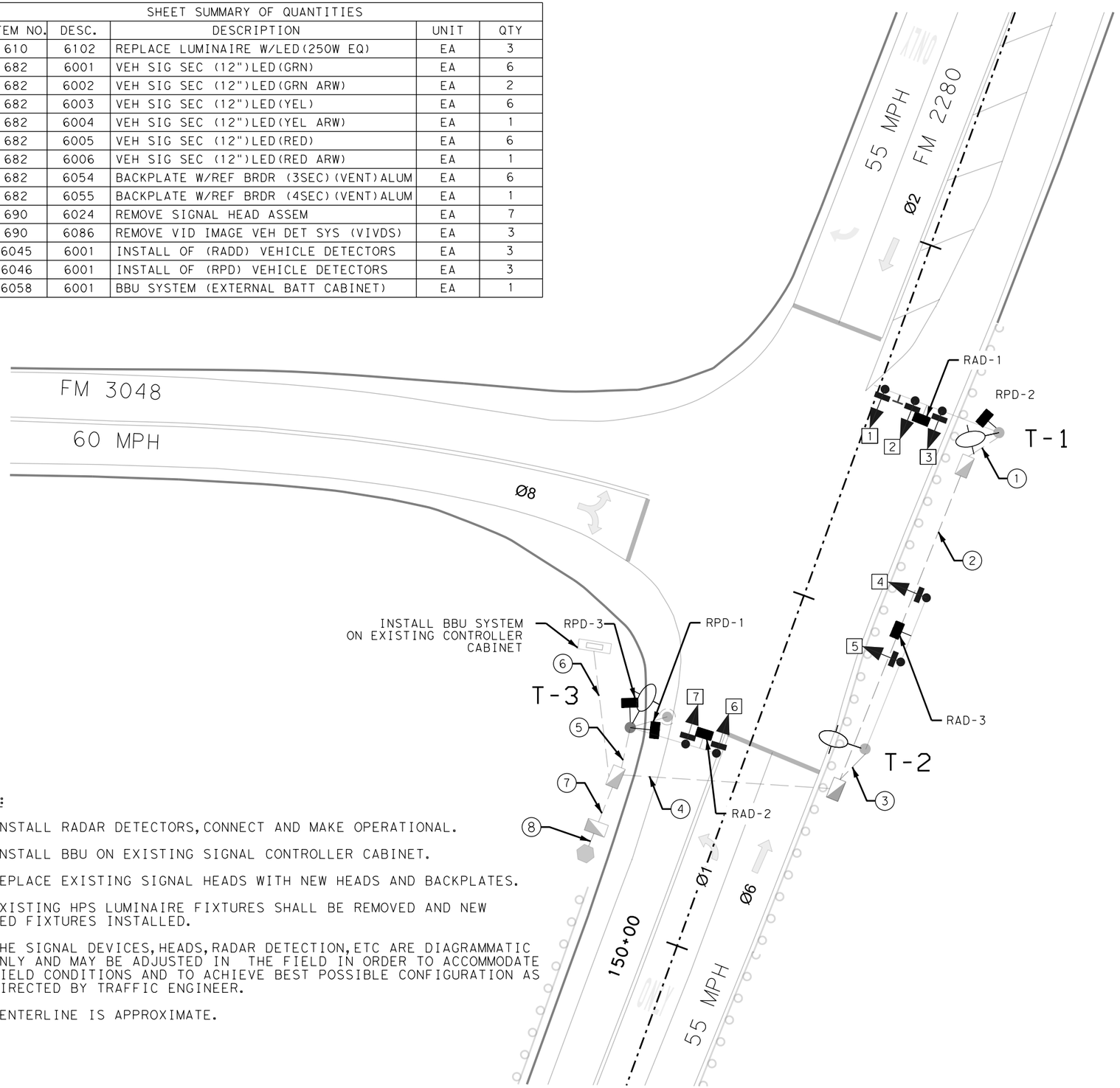
FM 2280 @ FM 3048 TRAFFIC SIGNAL EXISTING LAYOUT

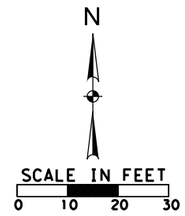
SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	110
CONTROL	SECTION	JOB	
2465	01	020	

DN: RND	CK: MBY	DW: EG	CK: RND

SHEET SUMMARY OF QUANTITIES				
ITEM NO.	DESC.	DESCRIPTION	UNIT	QTY
610	6102	REPLACE LUMINAIRE W/LED(250W EQ)	EA	3
682	6001	VEH SIG SEC (12")LED(GRN)	EA	6
682	6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2
682	6003	VEH SIG SEC (12")LED(YEL)	EA	6
682	6004	VEH SIG SEC (12")LED(YEL ARW)	EA	1
682	6005	VEH SIG SEC (12")LED(RED)	EA	6
682	6006	VEH SIG SEC (12")LED(RED ARW)	EA	1
682	6054	BACKPLATE W/REF BRDR (3SEC)(VENT)ALUM	EA	6
682	6055	BACKPLATE W/REF BRDR (4SEC)(VENT)ALUM	EA	1
690	6024	REMOVE SIGNAL HEAD ASSEM	EA	7
690	6086	REMOVE VID IMAGE VEH DET SYS (VIVDS)	EA	3
6045	6001	INSTALL OF (RADD) VEHICLE DETECTORS	EA	3
6046	6001	INSTALL OF (RPD) VEHICLE DETECTORS	EA	3
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1





LEGEND

- PROPOSED RADAR DETECTOR (RPD (PRESENCE), RAD (ADVANCE))
- PROP. LUMINAIRE
- EXIST. GROUND BOX
- EXIST. TRAFFIC SIGNAL POLE
- T-1 EXIST. POLE NUMBERS
- 1 EXIST. SIGNAL HEAD NUMBER
- EXIST. MAST ARM MOUNTED SIGN
- EXIST. VIVDS DETECTOR
- EXIST. ELECTRICAL SERVICE
- EXIST. CONTROLLER
- EXIST. YAGI ANTENNA
- EXIST. CONDUIT
- (1) EXIST. CONDUIT RUN NUMBER
- PROPOSED TRAFFIC SIGNAL HEAD
- EXIST. OMNI RADIO

NOTES:

1. INSTALL RADAR DETECTORS, CONNECT AND MAKE OPERATIONAL.
2. INSTALL BBU ON EXISTING SIGNAL CONTROLLER CABINET.
3. REPLACE EXISTING SIGNAL HEADS WITH NEW HEADS AND BACKPLATES.
4. EXISTING HPS LUMINAIRE FIXTURES SHALL BE REMOVED AND NEW LED FIXTURES INSTALLED.
5. THE SIGNAL DEVICES, HEADS, RADAR DETECTION, ETC ARE DIAGRAMMATIC ONLY AND MAY BE ADJUSTED IN THE FIELD IN ORDER TO ACCOMMODATE FIELD CONDITIONS AND TO ACHIEVE BEST POSSIBLE CONFIGURATION AS DIRECTED BY TRAFFIC ENGINEER.
6. CENTERLINE IS APPROXIMATE.

10/5/2023

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FM 2280 @ FM 3048 TRAFFIC SIGNAL PROPOSED LAYOUT

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	
CONTROL	SECTION	JOB	111
2465	01	020	

DN: RND	CK: MBY	DW: EG	CK: RND

CONDUIT & CONDUCTOR RUN CHART

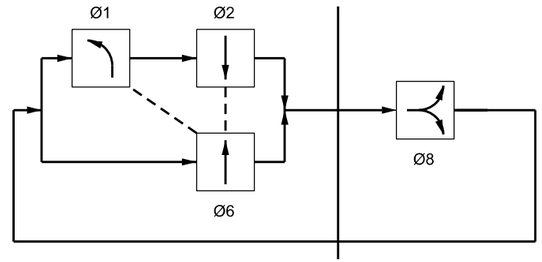
RUN NO.	EXISTING CONDUIT			PROPOSED		REMOVE	EXISTING				
	SIZE (IN)	TYPE	LENGTH (FT)	ADVANCED RADAR*	PRESENCE RADAR*	VIDEO CABLE**	16 C #14 AWG	TRAY CABLE 4C#12 AWG	1C#6 XHHW	BARE 1C#6 XHHW	COAX CABLE (SSR)
1	3"	T	10	1	1	1	1	1		1	
2	4"	T	90	1	1	1	1	1		1	
3	3"	T	10	1		1	1	2		1	
4	4"	B	60	2	1	2	2	1		1	
5	3"	T	14	1	2	1	1	2		1	1
6	4"	T	35	3	3	3	3		2	1	1
7	2"	T	15					2	2	1	
8	2"	T	10					2	2	1	
ESTIMATED TOTALS (LF)				349 #	293 #	349					

NOTES:

*RAD AND RPD CABLES TO BE FURNISHED BY TXDOT AND INSTALLED BY THE CONTRACTOR. PAYMENT SHALL BE SUBSIDIARY TO ITEMS 6045 AND 6046

** VIVDS CABLE REMOVAL SUBSIDIARY TO ITEM 690-6086.

PHASE SEQUENCE



-- COMPATIBLE PHASE

CABLE INSIDE POLE (LF)

POLE	PRESENCE RADAR DETECTOR	ADVANCED RADAR DETECTOR
T-1	20	42
T-2		53
T-3	40	40
TOTAL	60 #	135 #

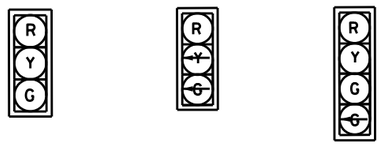
FOR INFORMATION ONLY.
CABLE SUPPLIED TO CONTRACTOR BY TXDOT

SIGNAL HEAD CHART

SIGNAL HEAD NUMBER	SIGNAL HEAD TYPE	STATUS	12" LED SIGNAL INDICATION							
			BACKPLATE		LED SIGNAL LAMPS					
			3 SEC	4 SEC	R	Y	G	← R	← Y	← G
			EA	EA	EA	EA	EA	EA	EA	EA
1	H3LT	I	1					1	1	1
2	H3	I	1		1	1	1			
3	H3	I	1		1	1	1			
4	H4LT	I		1	1	1	1			1
5	H3	I	1		1	1	1			
6	H3	I	1		1	1	1			
7	H3	I	1		1	1	1			
TOTAL			6	1	6	6	6	1	1	2

STATUS: I = INSTALL

EXISTING SIGNAL HEADS

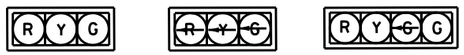


V3
2, 3, 5, 6, 7

V3LT
1

V4LT
4

PROPOSED SIGNAL HEADS



H3
2, 3, 5, 6, 7

H3LT
1

H4LT
4

10/5/2023

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FM 2280 @ FM 3048
SIGNAL SUMMARY

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	112
CONTROL	SECTION	JOB	
2465	01	020	

DN: RND	CK: MBY	DW: EG	CK: RND

CABLE TERMINATION CHART				
	CNDR COLOR	CABLE 1 FROM T-1 TO CNTRL 16 CNDR	CABLE 2 FROM T-2 TO CNTRL 16 CNDR	CABLE 3 FROM T-3 TO CNTRL 16 CNDR
1	BLACK	SPARE	SPARE	SPARE
2	WHITE	S. COMMON	S. COMMON	S. COMMON
3	RED	SH 2, 3 Ø6 R	SH 4, 5 Ø8 R	SH 6, 7 Ø2 R
4	GREEN	SH 2, 3 Ø6 G	SH 4, 5 Ø8 G/~~G~~	SH 6, 7 Ø2 G
5	ORANGE	SH 2, 3 Ø6 Y	SH 4, 5 Ø8 Y	SH 6, 7 Ø2 Y
6	BLUE	SPARE	SPARE	SPARE
7	WHITE/BLACK	SPARE	SPARE	SPARE
8	RED/ BLACK	SH 1 Ø1 ~~R~~	SPARE	SPARE
9	GREEN/ BLACK	SH 1 Ø1 ~~G~~	SPARE	SPARE
10	ORANGE/ BLACK	SH 1 Ø1 ~~Y~~	SPARE	SPARE
11	BLUE/ BLACK	SPARE	SPARE	SPARE
12	BLACK/ WHITE	SPARE	SPARE	SPARE
13	RED/ WHITE	SPARE	SPARE	SPARE
14	GREEN/ WHITE	SPARE	SPARE	SPARE
15	BLUE/ WHITE	SPARE	SPARE	SPARE
16	BLACK/ RED	SPARE	SPARE	SPARE

RADAR DETECTION ZONE DETAILS			
	RADAR NO.	MOUNTING LOCATION	ZONE(S)
PROPOSED	RPD-1	POLE T-3	Ø6 & & Ø1 STOPBAR
	RPD-2	POLE T-1	Ø2 STOPBAR
	RPD-3	POLE T-3	Ø8 STOPBAR
	RAD-1	POLE T-1	Ø6 ADVANCED
	RAD-2	POLE T-3	Ø2 ADVANCED
	RAD-3	POLE T-2	Ø8 ADVANCED

NOTE:

MOUNTING HEIGHT AND ZONE LOCATIONS FOR RADARS WILL BE DETERMINED BY THE CONTRACTOR AND CONFIRMED BY THE INSPECTOR

RPD PRESENSE AND RAD ADVANCED DETECTION								
Click 656								
SPLITØ Intersection								
SENSOR 1	Ø1, Ø6	RPD						
SENSOR 2	Ø2	RPD						
SENSOR 3	Ø8	RPD						
SENSOR 4	Ø8	RAD						
SENSOR 5	Ø2	RAD						
SENSOR 6	Ø6	RAD						
CONTROLLER (BIU 9)								
DETECTOR CHANNEL	1	2	3	4	5	6	7	8
PHASE ASSIGNMENT	Ø1	Ø2L				Ø6		Ø8
MATRIX OUTPUT CHANNEL	1	2				6		8
DETECTOR CHANNEL	9	10	11	12	13	14	15	16
PHASE ASSIGNMENT		Ø2R				Ø6		Ø8
MATRIX OUTPUT CHANNEL		10				14		16
CONTROLLER (BIU 10)								
DETECTOR CHANNEL	17	18	19	20	21	22	23	24
HIGH SPEED 150' TO 700'		Ø2				Ø6		Ø8
ADVANCE OUTPUT CHANNEL		18				22		24
DETECTOR CHANNEL	25	26	27	28	29	30	31	32
LOW SPEED 50' TO 150'		Ø2				Ø6		Ø8
ADVANCE OUTPUT CHANNEL		26				30		32

STATE OF TEXAS
RHETT DOLLINS
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PROFESSIONAL ENGINEER

10/5/2023

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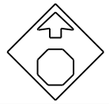
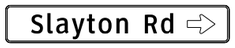
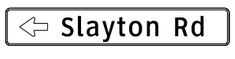
FM 2280 @ FM 3048
TERMINATION & PHASING

SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2280
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	FTW	JOHNSON	113
CONTROL	SECTION	JOB	
2465	01	020	

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
89		R3-8TR		30"x30"	A		10BWG	1	SA	P		
90		R3-8LT		30"x30"	A		10BWG	1	SA	P		
96		W3-1		30"x30"	A		10BWG	1	SA	P		
81		D21-1TR		72"x12"	A		10BWG	1	SA	T		
81		D21-1TL		72"x12"	A		10BWG	1	SA	T		
91		W11-2		36"x36"	A		S80	1	SA	T		
82		D20-1TR		24"x24"	A		10BWG	1	SA	P		
87		R3-7R		30"x30"	A		10BWG	1	SA	P		
94		D14-4T-2		48"x48"	A		S80	1	SA	U		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

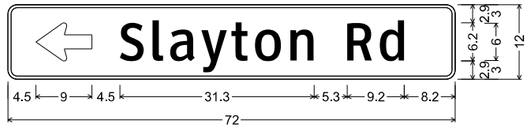
SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		2465	01	020	FM 2280
4-16		DIST	COUNTY		SHEET NO.
8-16		FTW	JOHNSON		114

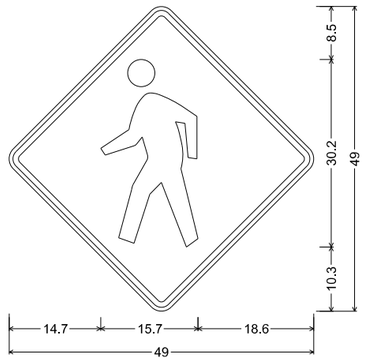
18

DATE: $DATE$ $TIME$
FILE: $FILE$

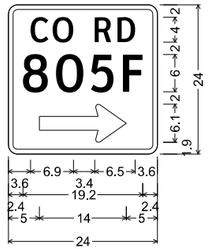
D21-1TR_VARx12;
1.5" Radius, 0.5" Border, White on Green;
"Slayton Rd", ClearviewHwy-3-W;
Standard Arrow Custom 9.0" X 6.1" 0°;



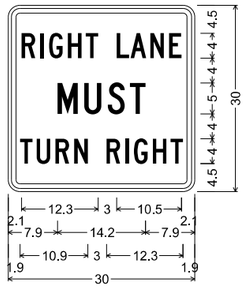
D21-1TL_VARx12;
1.5" Radius, 0.5" Border, White on Green;
Standard Arrow Custom 9.0" X 6.1" 180°;
"Slayton Rd", ClearviewHwy-3-W;



W11-2_36x36;
36.0" across sides 2.3" Radius, 0.9" Border, 0.6" Indent, Black on Yellow;
Symbol W11-2;



D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on Green;
"CO RD", ClearviewHwy-3-W;
"805F", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0°;



R3-7R_30x30;
1.9" Radius, 0.8" Border, 0.5" Indent, Black on White;
"RIGHT LANE", C;
"MUST", C;
"TURN RIGHT", C;

D14-4T-2_48x48;

3.0" Radius, 1.0" Border, White on Blue;
"ADOPT A", C; "HIGHWAY", C;
"NEXT X MILES", C;

3.0" Radius, 1.0" Border, White on Blue;
"GROUP", C; "NAME", C;

STATE OF TEXAS
FEDERICO MEDINA HERNANDEZ
106050
LICENSED
PROFESSIONAL ENGINEER

_____, PE

10/16/2023
DATE

SMALL SIGN DETAILS

SHEET 01 OF 01

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
2465	01	020	FM 2280
DIST	COUNTY		SHEET NO.
FTW	JOHNSON		115

DATE:
FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
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REVISIONS		2465	01	020	FM 2280
		DIST	COUNTY		SHEET NO.
		FTW	JOHNSON		116

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

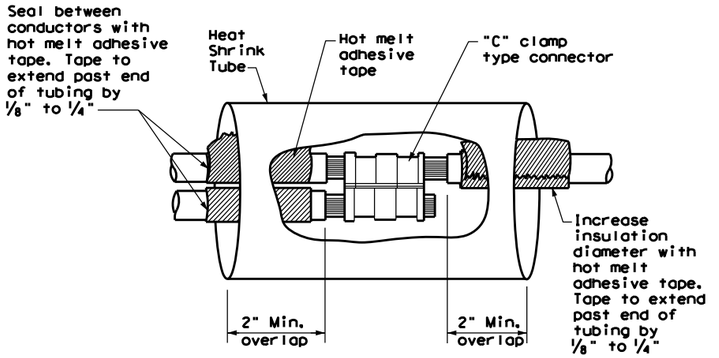
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

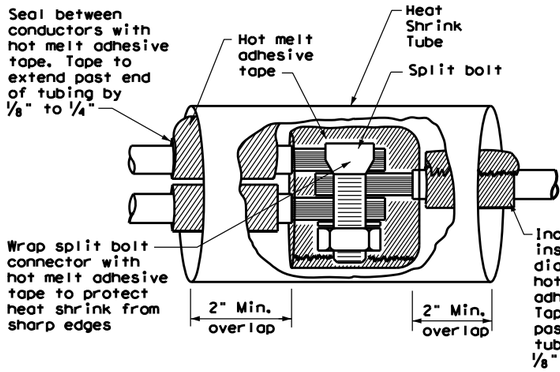
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

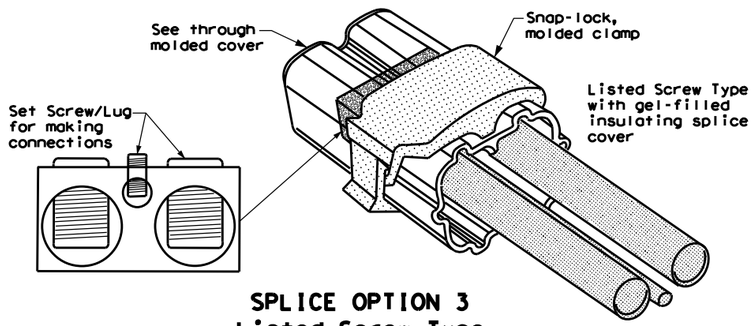
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUCTORS

ED(3)-14

FILE:	ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS		2465	01	020	FM 2280
		DIST	COUNTY		SHEET NO.
		FTW	JOHNSON		117

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DATE:
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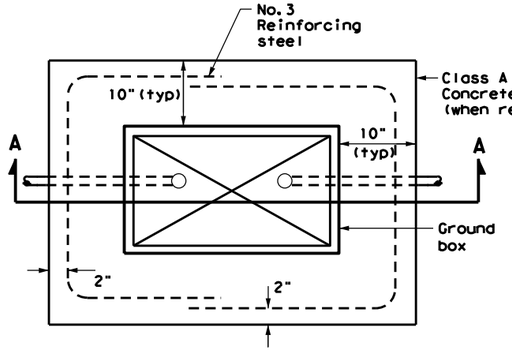
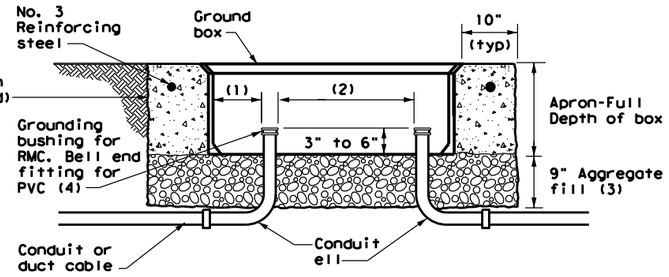


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

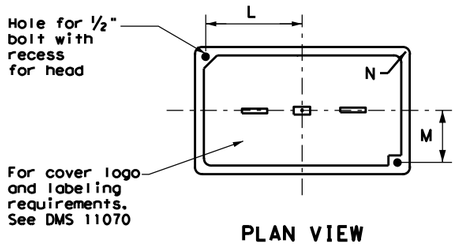
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

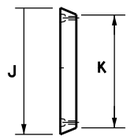
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

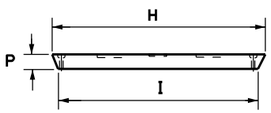
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

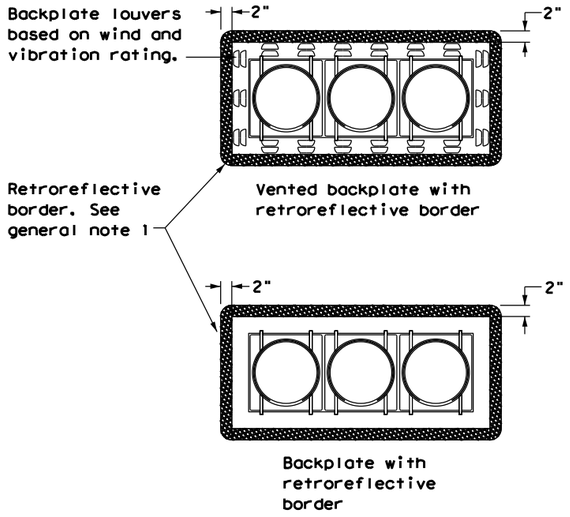
Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

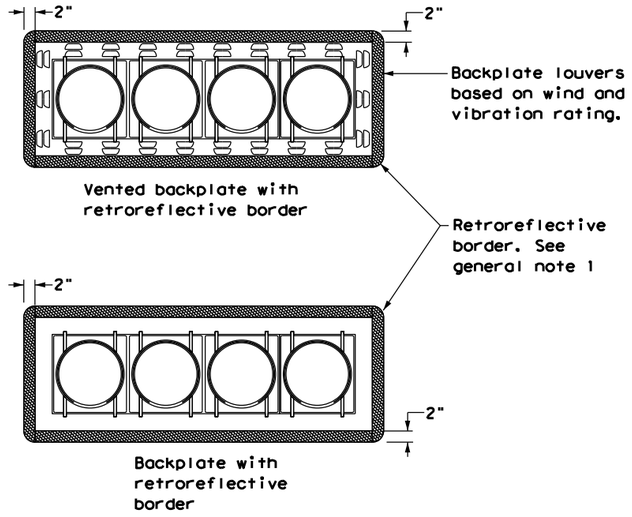
ED(4)-14

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		118

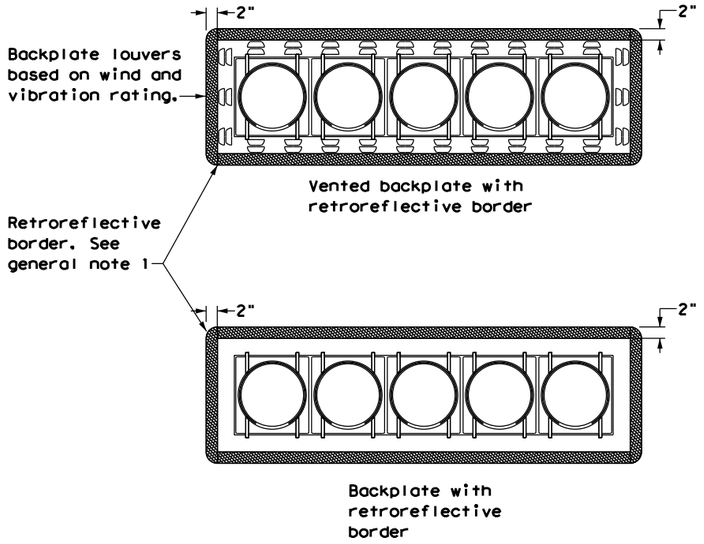
DATE:
FILE:



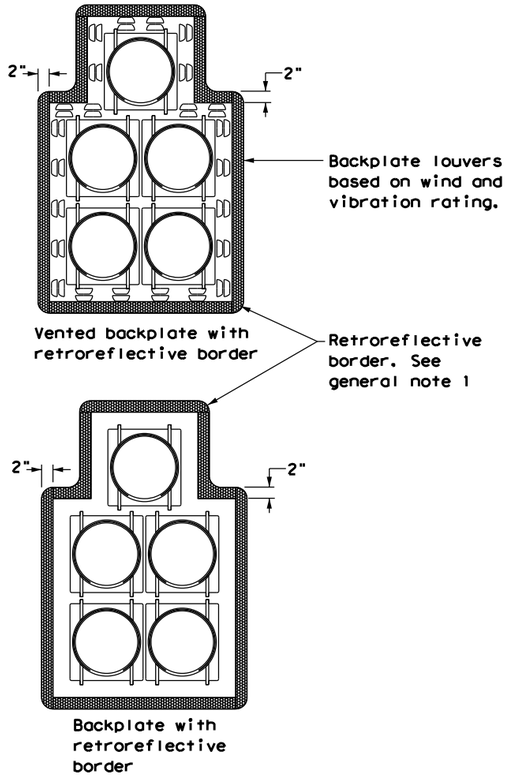
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



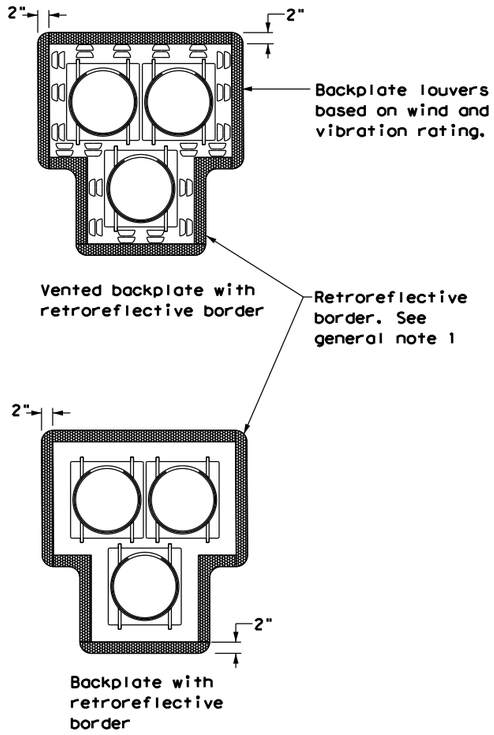
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

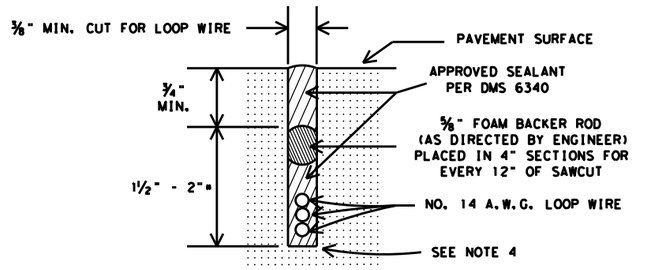
1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

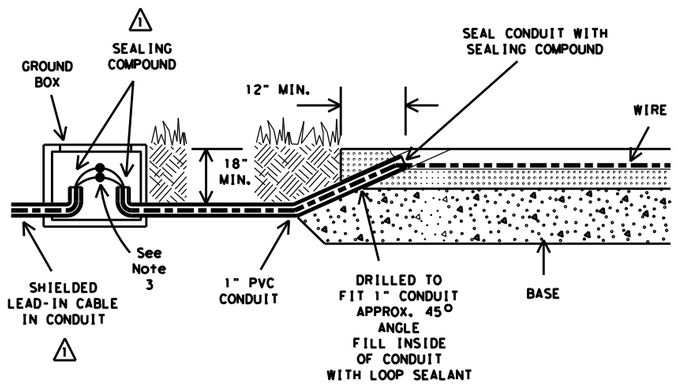
TRAFFIC SIGNAL HEAD WITH BACKPLATE
TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		119

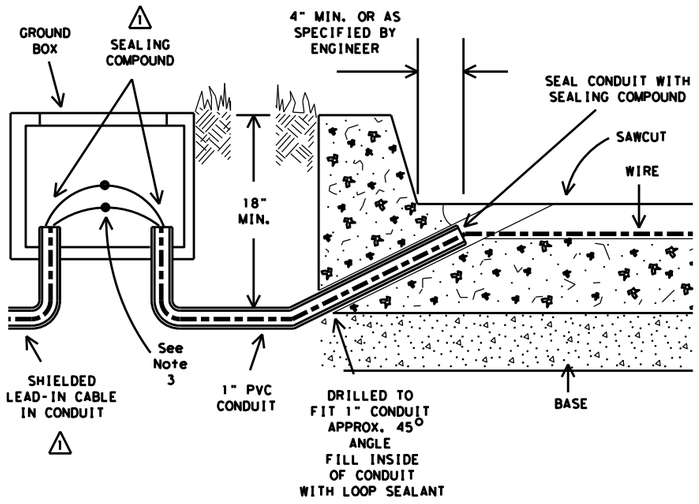


LOOP SAW CUT CROSS-SECTION

▪ SAWCUTS IN BRIDGE DECKS ARE TYPICALLY 1" DEPTH MAXIMUM
SAWCUTS IN BRIDGE DECKS AND ACROSS EXPANSION JOINTS
SHALL BE AS APPROVED BY ENGINEER



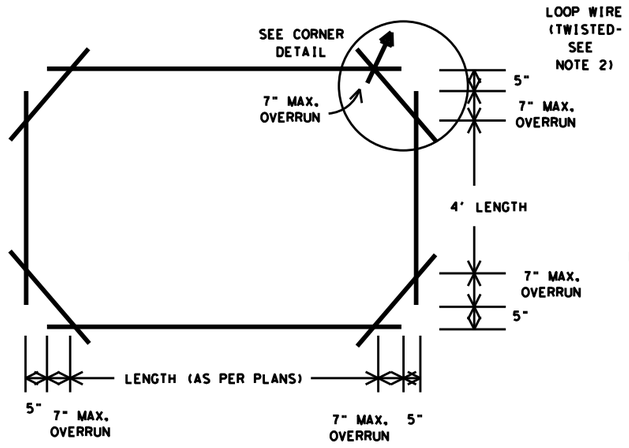
TYPICAL LEAD IN CONFIGURATION (WITHOUT CURBING)



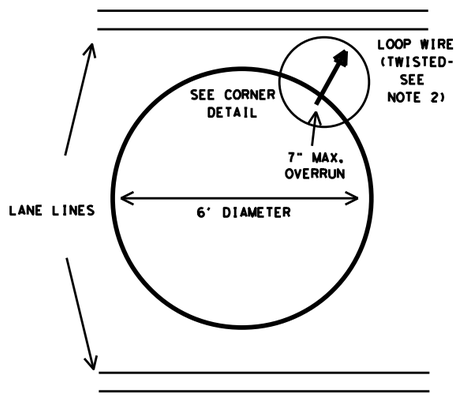
TYPICAL LEAD IN CONFIGURATION (WITH CURBING)

TYPICAL LOOP DETECTOR LAYOUTS

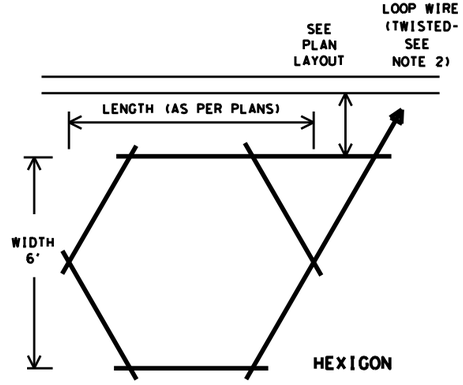
(AS SPECIFIED IN PLANS)



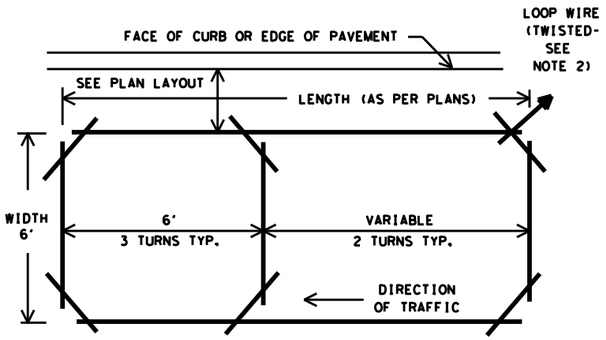
RECTANGULAR



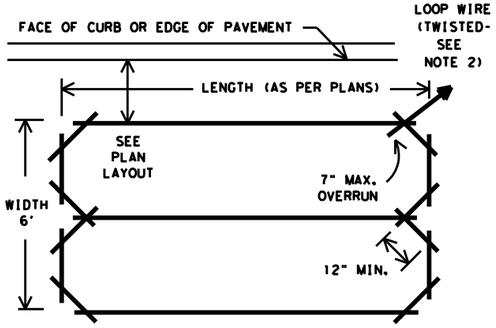
CIRCULAR



HEXIGON



POWER HEADER



QUADRAPOLE

GENERAL NOTES:

1. The pavement cut is to be made with a concrete saw to neat lines and loose material removed. The cut shall be clean and dry when the wire and sealing compound is placed.
2. Loop wire shall be 14 AWG Stranded Type XHHW. Wire from the loop to the ground box shall be twisted a minimum of 5 turns per foot. No splices shall be permitted in the loop or in the run to the ground box.
3. The home run cable from the pull box to the controller shall be IMSA 50-2 shielded cable and shall be soldered to the loop wire. The solder joints shall be sealed with Scotchcast or other method acceptable to the Engineer. The shield shall be grounded only at the controller end. Loop home run cable shall be two conductor 14 AWG shielded, Type XHHW.
4. All wire placed in the saw cut shall be sealed by fully encapsulating it in a sealant acceptable to the Engineer. Sealing compound shall be in accordance with DMS 6340.
5. The loop location, configuration and number of turns shall be as indicated on the plans or as directed by the Engineer.

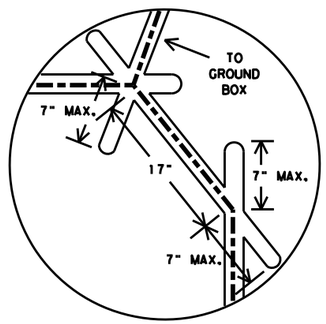
Recommended Number of Turns for Loop Detectors

LOOP PERIMETER SIZE (FT.)	NUMBER OF TURNS	APPROXIMATE LOOP SIZES INCLUDED
24' or Less	3 or 4	5' x 5', 6' x 6'
25' - 110'	2 or 3	6' x 10', 6' x 45'
110' or More	1 or 2	6' x 50' or Longer

6. A separate saw cut shall be made from each loop to the edge of pavement or as specified by the Engineer.
7. Splices between the loop lead-in cable and loop detector shall be made only in the ground box near the loop it is serving.
8. Circular loops may use prewound loops encased in continuous pvc tubing. Sawcut width may be adjusted to accommodate tubing.
9. The lead-in wire in the circular loop shall be coiled at the 3 inch drilled corner to reduce bending stress.
10. Loop duct may be used as specified by Engineer.

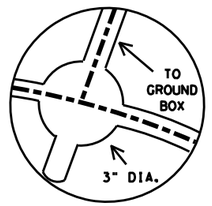
For additionnal information refer to "Texas Traffic Signal Detector" manual, TTI Report 1163-1.

TYPICAL CORNER DETAILS

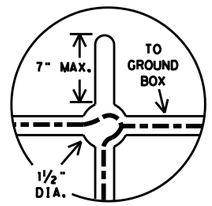


RECTANGULAR & HEXIGON LOOP
SAWCUT CORNER DETAIL

7" OVERRUN BASED ON 24" DIAMETER SAW BLADE



CIRCULAR LOOP
DRILLED CORNER DETAIL



RECTANGULAR & HEXIGON LOOP (ALT.)
DRILLED CORNER DETAIL

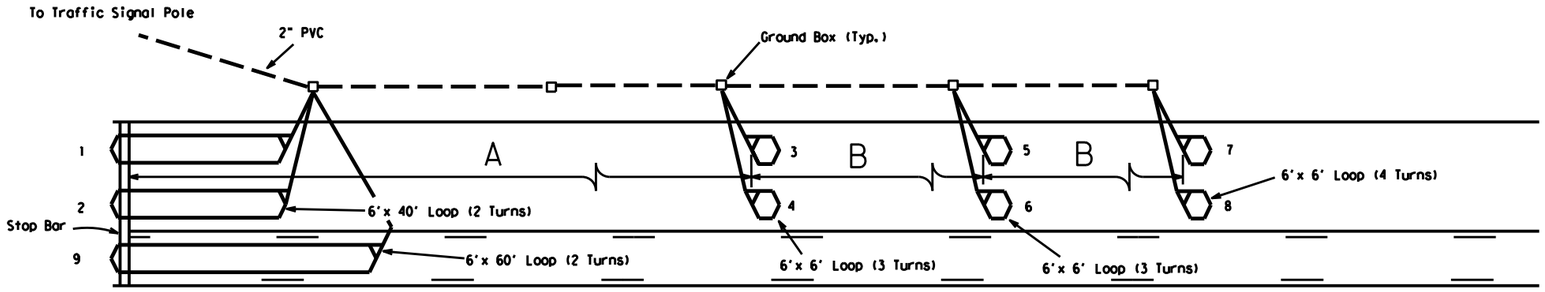
Texas Department of Transportation
Traffic Operations Division

LOOP DETECTOR INSTALLATION DETAILS

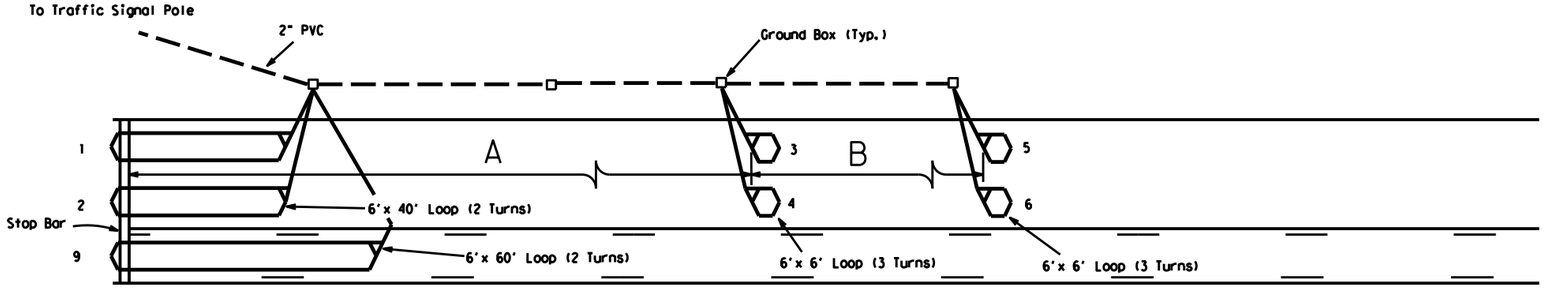
LD(1)-03

© TxDOT December 1998	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
2-99	2465	01	020	FM 2280
1-03	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		120

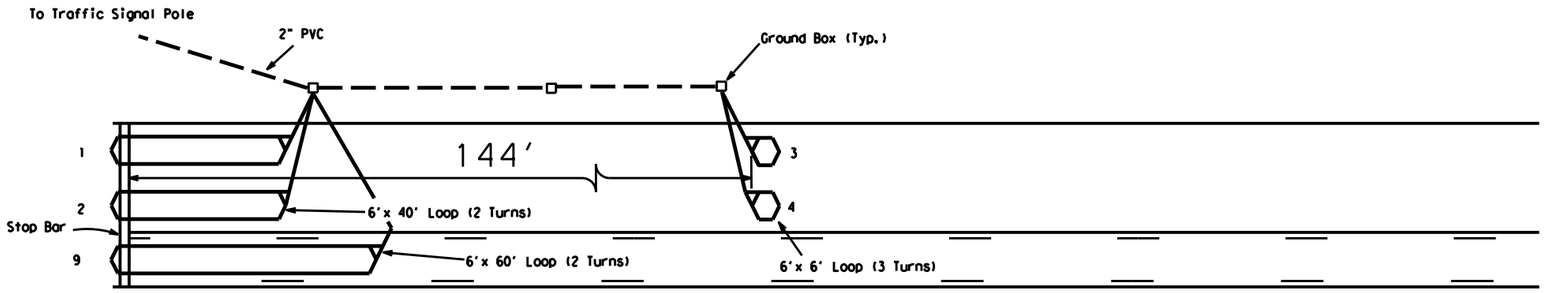
DATE:
FILE:



55 MPH (A=225', B=95') 60 MPH (A=275', B=100')
65 MPH (A=320', B=110') 70 MPH (A=350', B=125')



35 MPH (A=90', B=100') 40 MPH (A=110', B=130')
45 MPH (A=175', B=115') 50 MPH (A=220', B=130')



30 MPH

GENERAL NOTES:

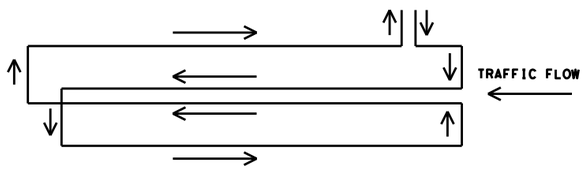
Loops 1 and 2 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

Loops 3 thru 6 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

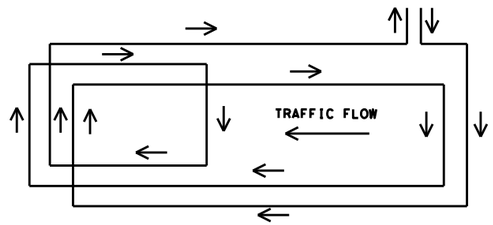
Loops 7 and 8 shall be connected to the controller cabinet by means of the same loop lead-in (2/C #14 AWG).

Loop 9 shall be connected to the controller cabinet by means of a loop lead-in (2/C #14 AWG). Loop 9 shall be placed only when a left turn lane exists.

LOOP WINDING DETAILS



QUADRAPOLE LOOP



POWER HEADER LOOP

Texas Department of Transportation
Traffic Operations Division

LOOP DETECTOR PLACEMENT DETAILS

LD(2)-03

REVISIONS

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

CONT	SECT	JOB	HIGHWAY
2465	01	020	FM 2280
DIST	COUNTY		SHEET NO.
FTW	JOHNSON		121

DATE:
FILE:

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

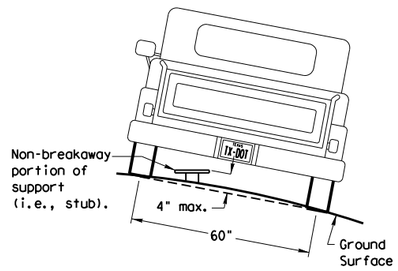
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

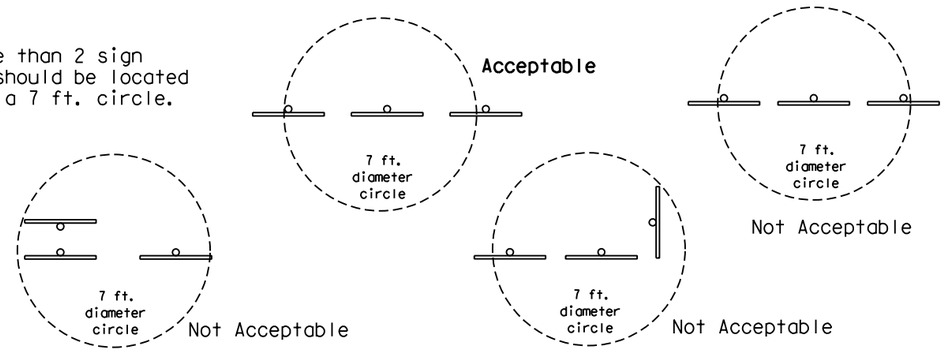
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



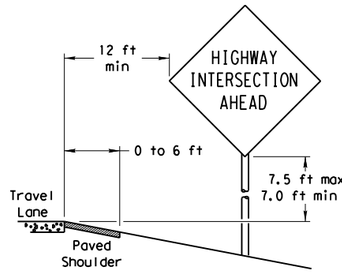
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



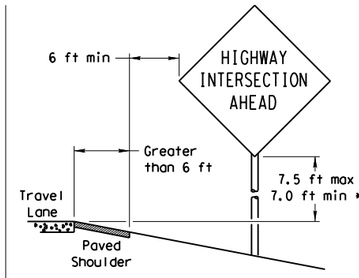
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

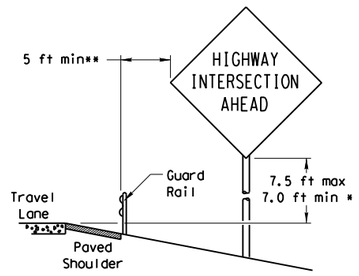
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



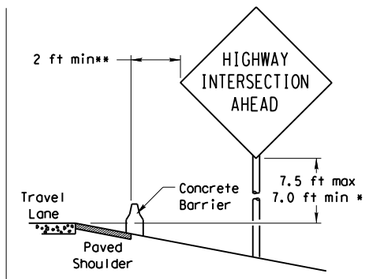
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



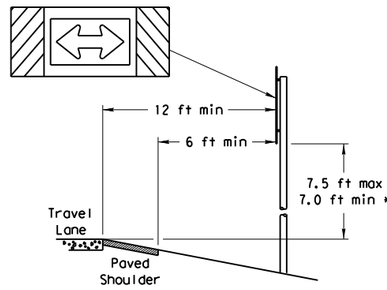
BEHIND GUARDRAIL



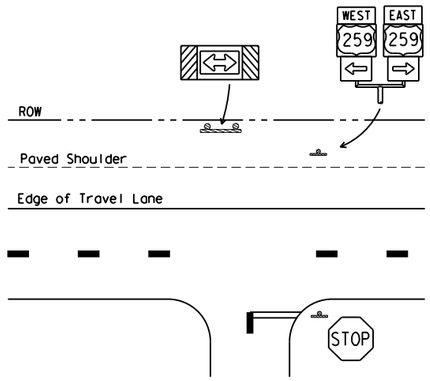
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

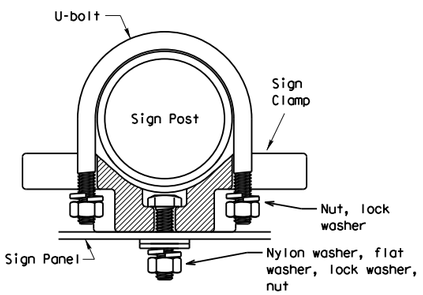
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

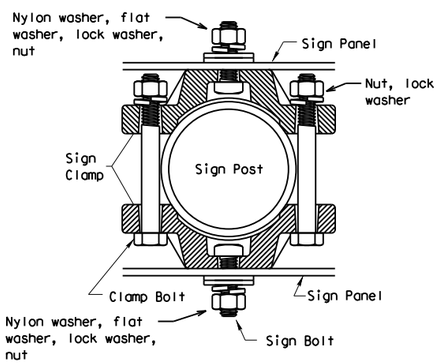


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

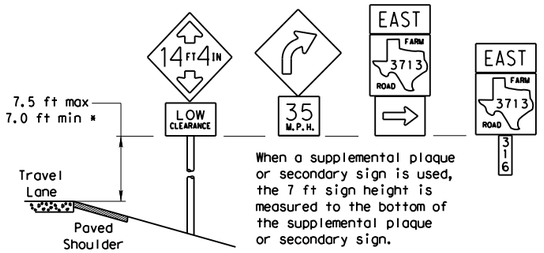
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



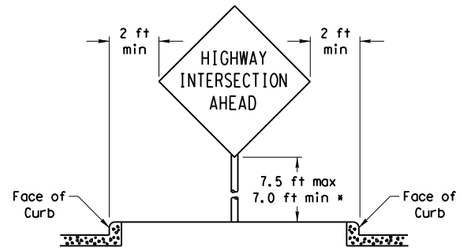
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



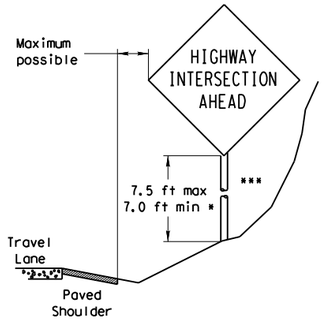
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

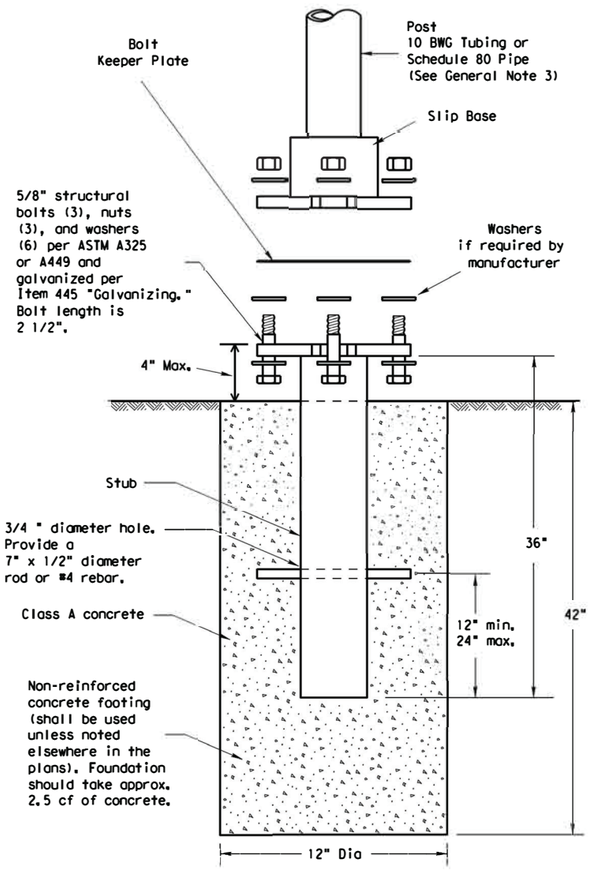
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2465	01	020	FM 2280

DIST	COUNTY	SHEET NO.
FTW	JOHNSON	122

DATE:
FILE:

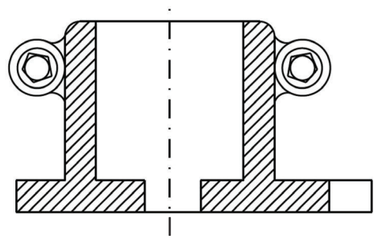
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.



SLIPBASE SECTION

BOLT CLAMP TYPE

(SEE APPLICABLE FABRICATION DRAWINGS FOR FURTHER DETAIL)

http://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/traffic/slipdetail.pdf

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm

3A. Slipbases ustilizing the "Set Screw type Section" will not be allowed. Use Slipbases matching the "Bolt Clamp type Section." The acceptable section has been added to this Standard for Contractor's information only.

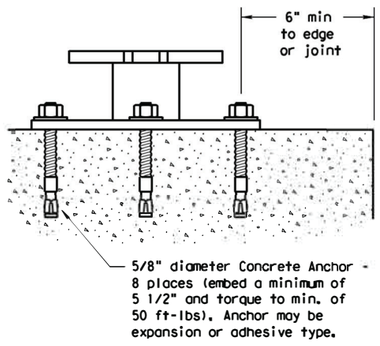
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Suchita Potta

01/20/24

Texas Department of Transportation
Traffic Operations Division

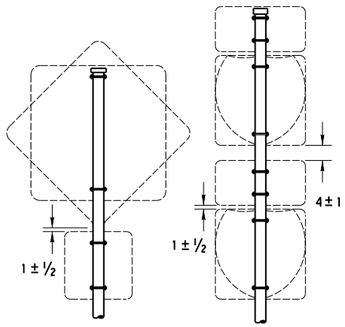
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

(MOD) SMD(SLIP-1)-08

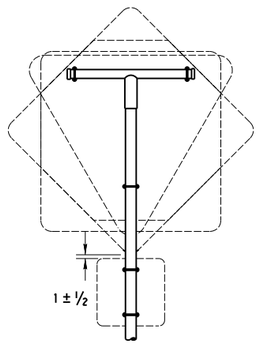
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		123

DATE:
FILE:



SM RD SGN ASSM TY XXXXX(1)XX(P)



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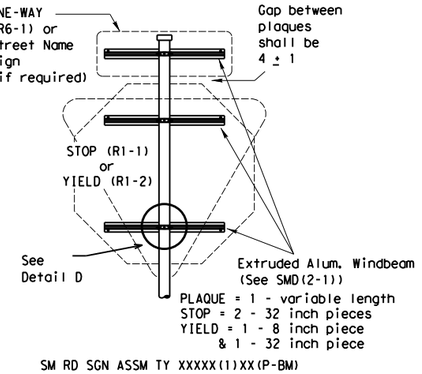
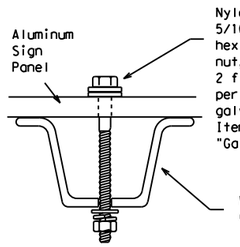
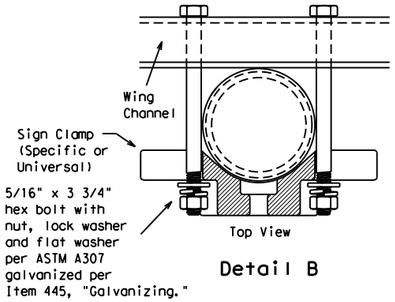


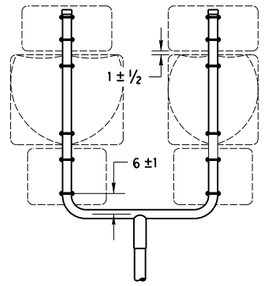
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



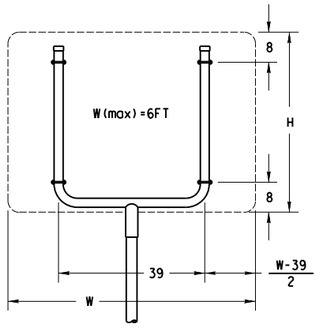
Detail A



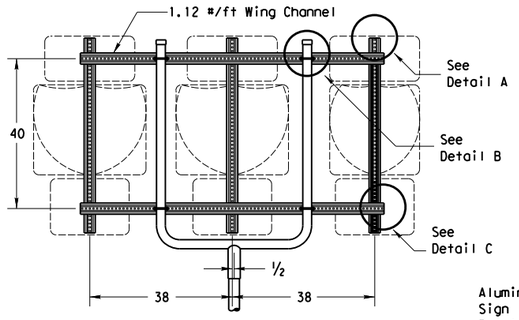
Detail B



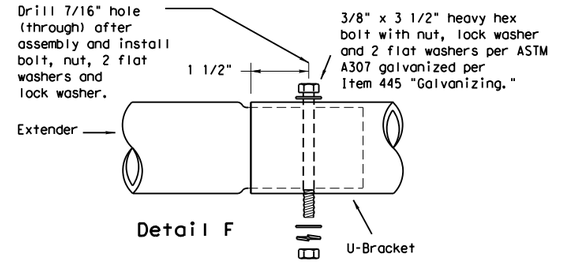
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

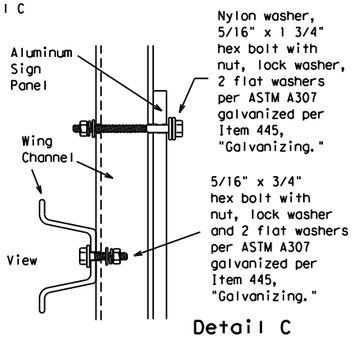


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

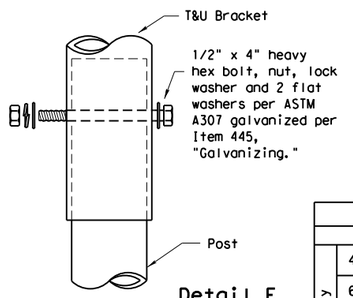


Detail F

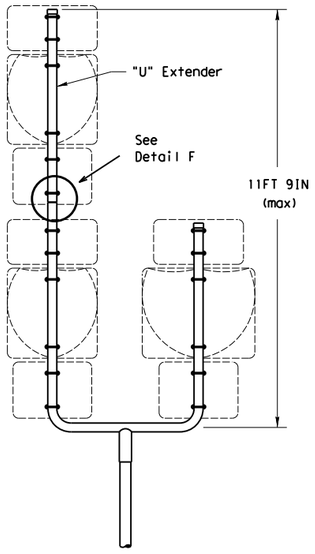
Splices shall only be allowed behind the sign substrate.



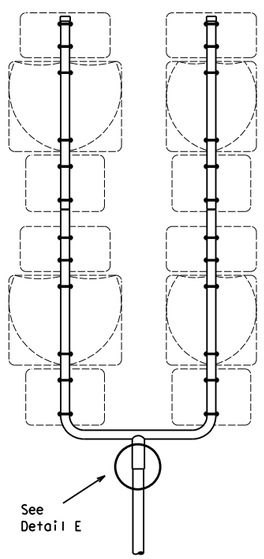
Detail C



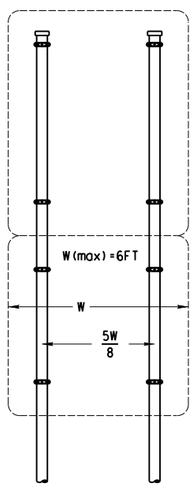
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

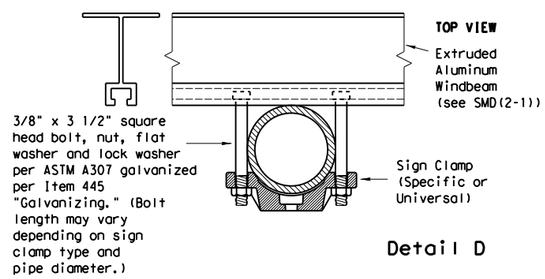


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

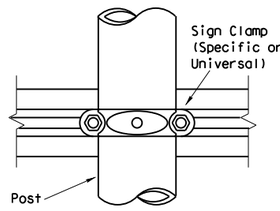


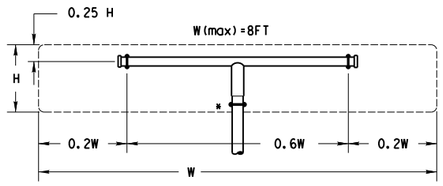
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

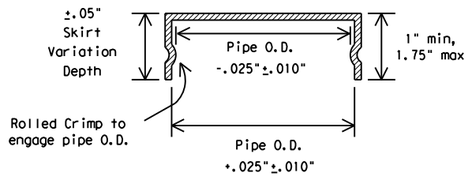




All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

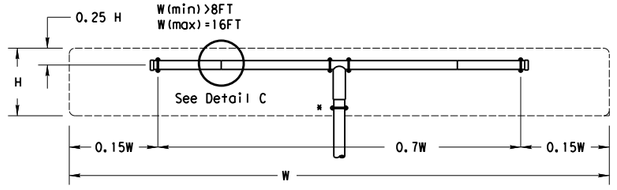
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

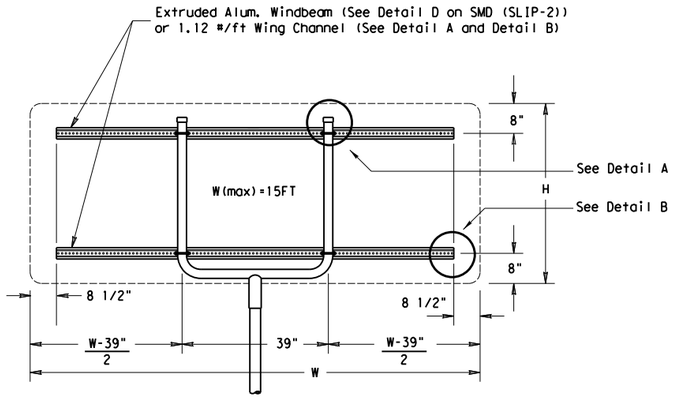
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		124

DATE:
FILE:

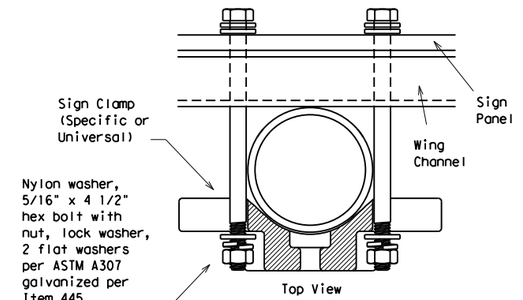


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

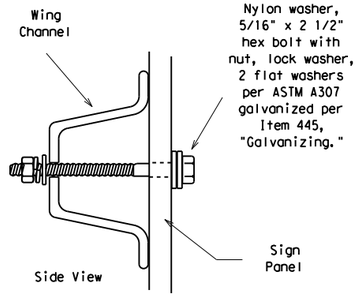
(* - See Note 12)



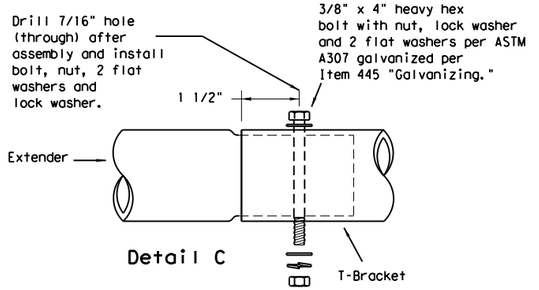
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail A

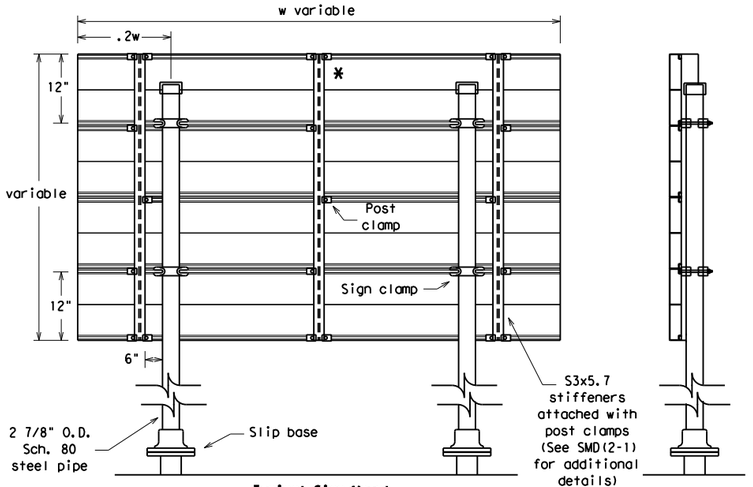


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

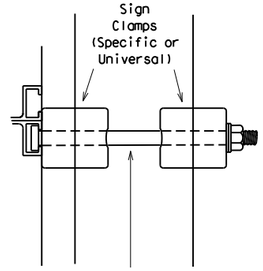


Typical Sign Mount

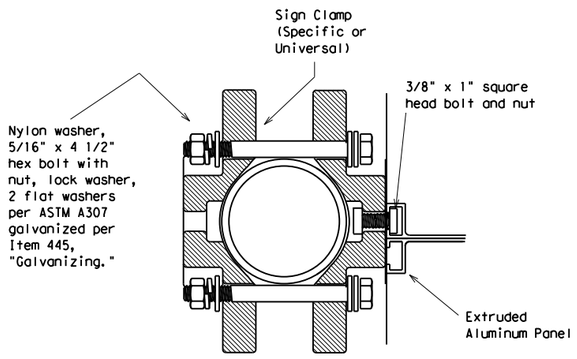
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

See Detail E
for clamp installation

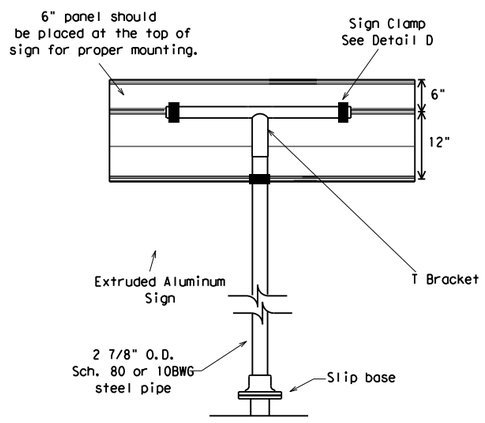


Detail E

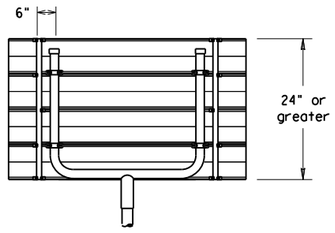


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

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

CONT	SECT	JOB	HIGHWAY
2465	01	020	FM 2280

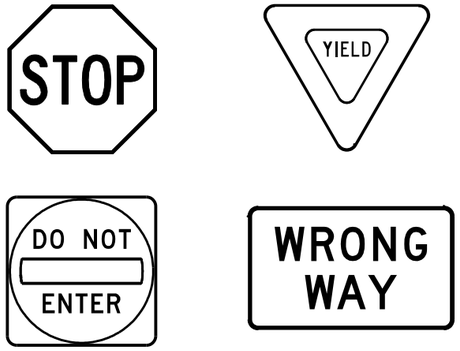
DIST	COUNTY	SHEET NO.
FTW	JOHNSON	125

DATE:
FILE:

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

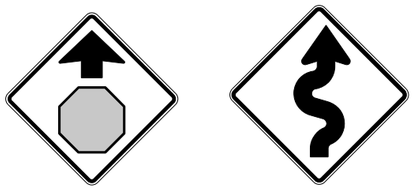
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

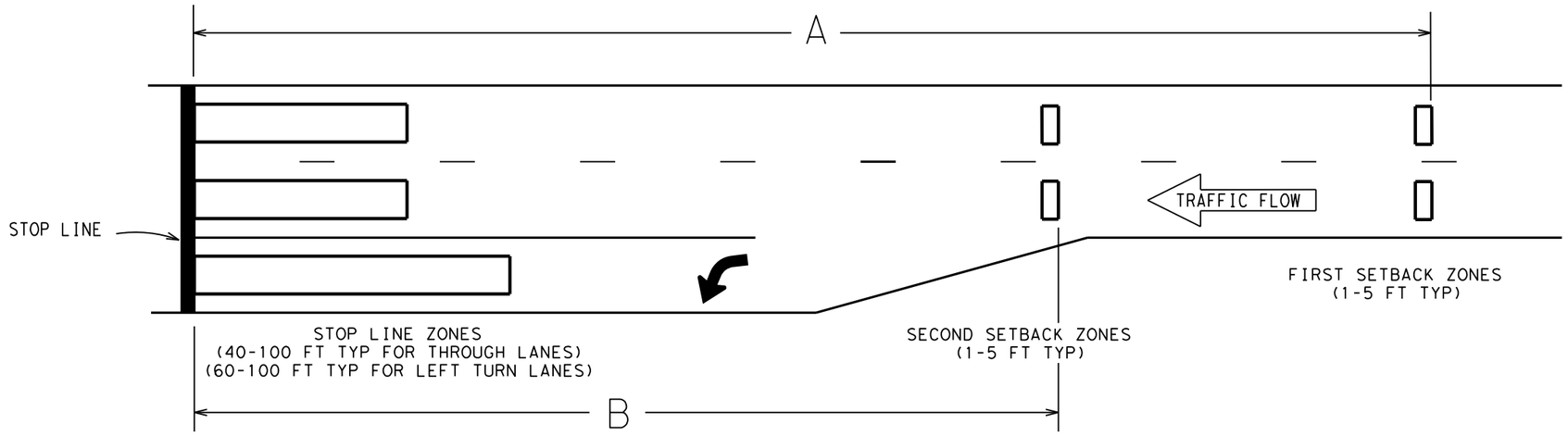
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		126

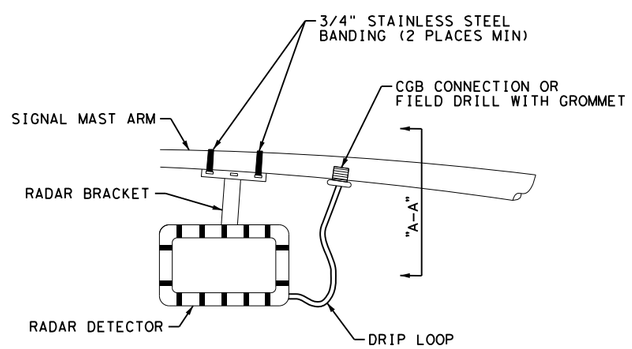
4

RADAR DETECTION ZONE LOCATIONS

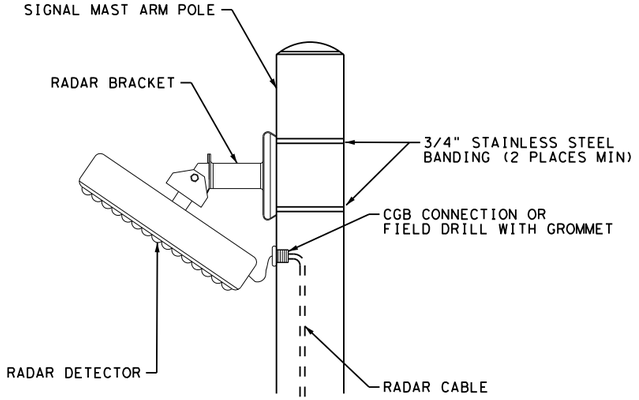


APPROACH SPEED LIMIT (MPH)	DISTANCE A (FT)	DISTANCE B (FT)	MINIMUM RANGE OF DETECTION (LF)
45	360	245	400
50	405	300	440
55	445	325	490
60	485	355	530
65	525	380	575
70	565	410	620

RADAR DETECTION INSTALLATION DETAILS

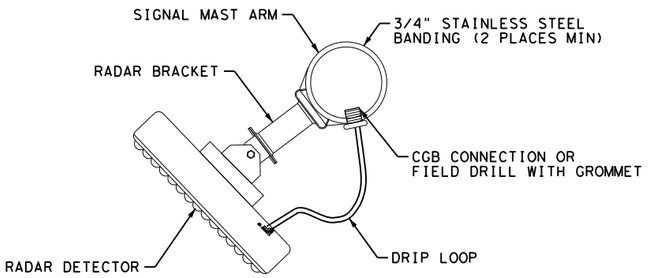


MAST ARM MOUNT



POLE MOUNT

SPAN WIRE MOUNT FOR ADVANCE RADAR



SECTION "A-A"

NOTES:

1. THE RADAR SENSOR MOUNTING BRACKET MUST BE ADJUSTABLE TO TILT UP, DOWN, LEFT, RIGHT, AND TO ROTATE.

2. THE RADAR DETECTOR UNITS SHOWN ARE NOT INTENDED TO REPRESENT ANY SPECIFIC BRAND OR PRODUCT, AND ALTERNATE MOUNTING METHODS MAY BE SUBMITTED FOR APPROVAL.

DALLAS DISTRICT STANDARD

Texas Department of Transportation

Dallas District

RADAR VEHICLE DETECTION SYSTEM
RVDS-18 (DAL)

©TxDOT May 2018	DN: EF	CK: ---	DW: EF	CK: TRF-Aus.
REVISIONS	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	(SEE TITLE SHEET)		FM 2280
	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	FTW	JOHNSON	127
	CONTROL	SECTION	JOB	
	2465	01	020	

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
2465-01-020

1.2 PROJECT LIMITS:
From: BU 67

To: FM 917

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 32.452888° ,(Long) -97.300269°

END: (Lat) 32.378681° ,(Long) -97.341142°

1.4 TOTAL PROJECT AREA (Acres): 70.40

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.3

1.6 NATURE OF CONSTRUCTION ACTIVITY:
The construction activity includes Overlay, Mill and Inlay, Repair Base Failures, Pavement Markings, and MBGF.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Crosstell Fine Sandy Loam 3 to 8 % slopes	85% sand, moderately well drained very high rate of runoff, and slight erosion potential.
Rader Fine Sandy Loam 0 to 3 % slopes	100% sand, moderately well drained low rate of runoff, and slight erosion potential.
Gasil Fine Sandy Loam 1 to 3 % slopes	85% sand, well drained low rate of runoff, and slight erosion potential.
Crosstell Fine Sandy Loam 1 to 3 % slopes	85% sand, moderately well drained very high rate of runoff, and slight erosion potential.
Stilstid Loamy Fine Sand 1 to 3 % slopes	100% sand, well drained very low rate of runoff, and slight erosion potential.

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

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

Type	Sheet #s

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

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

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

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

Tributaries	Classified Waterbody
Lockett Branch	
Unnamed Tributary to Lockett Branch	
Turkey Creek	
Unnamed Tributary to Turkey Creek	
NO TMDLs OR I-PLANS WERE IDENTIFIED	

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

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

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

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

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

MS4 Entity

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Christopher Boles

1/30/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		128
STATE	STATE DIST.	COUNTY	
TEXAS	FTW	JOHNSON	
CONT.	SECT.	JOB	HIGHWAY NO.
2465	01	020	FM 2280

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

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

T / P

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

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

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

2.9 INSPECTIONS:

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

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

2.10 MAINTENANCE:

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

STATE OF TEXAS
CHRISTOPHER A. BOLES
109725
REGISTERED PROFESSIONAL ENGINEER

Christopher Boles

1/30/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		129
STATE	STATE DIST.	COUNTY	
TEXAS	FTW	JOHNSON	
CONT.	SECT.	JOB	HIGHWAY NO.
2465	01	020	FM 2280

DATE: 1/5/2024
FILE: V:\RFA_Shared\Design\3600_TXDOT\368IDP5052_WA_02_FTW\4-Design\Plan Set\9. Environmental\05_FM 2280\05_FM2280_EPIC.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1.

2.

☒ No Action Required ☐ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

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

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

☒ No Permit Required

☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

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

1.

2.

3.

4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1.

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.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

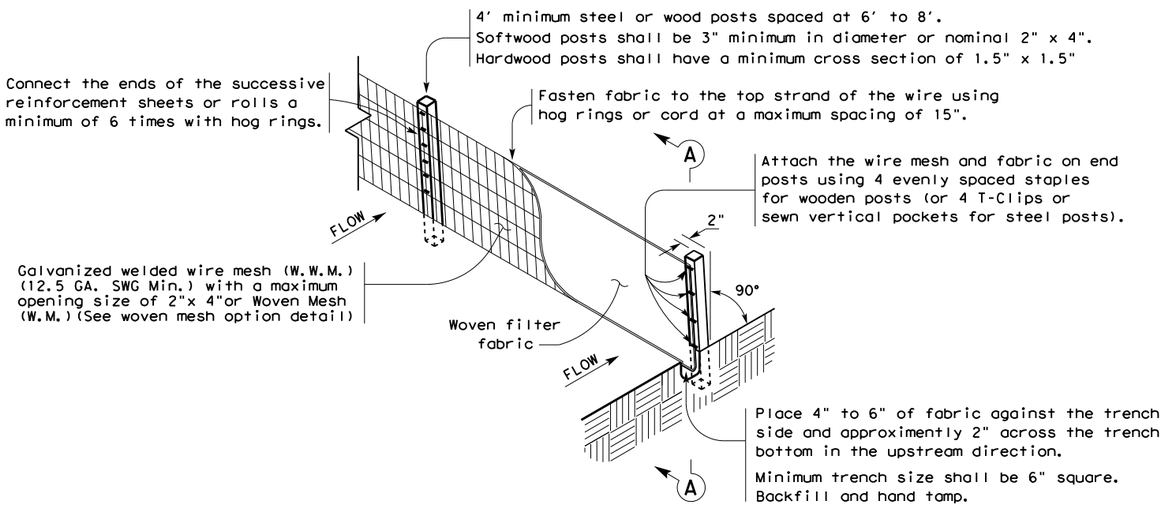
Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

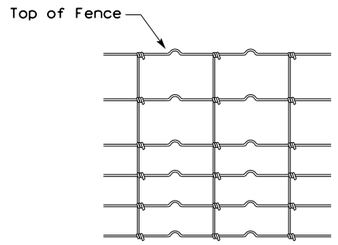
EPIC

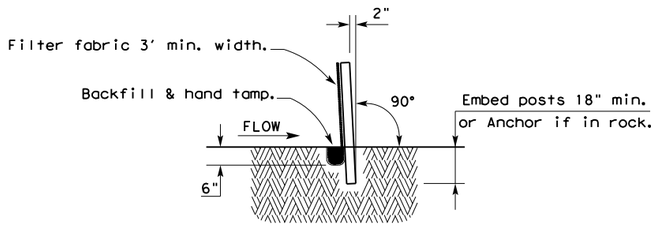
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	FTW	JOHNSON		130
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

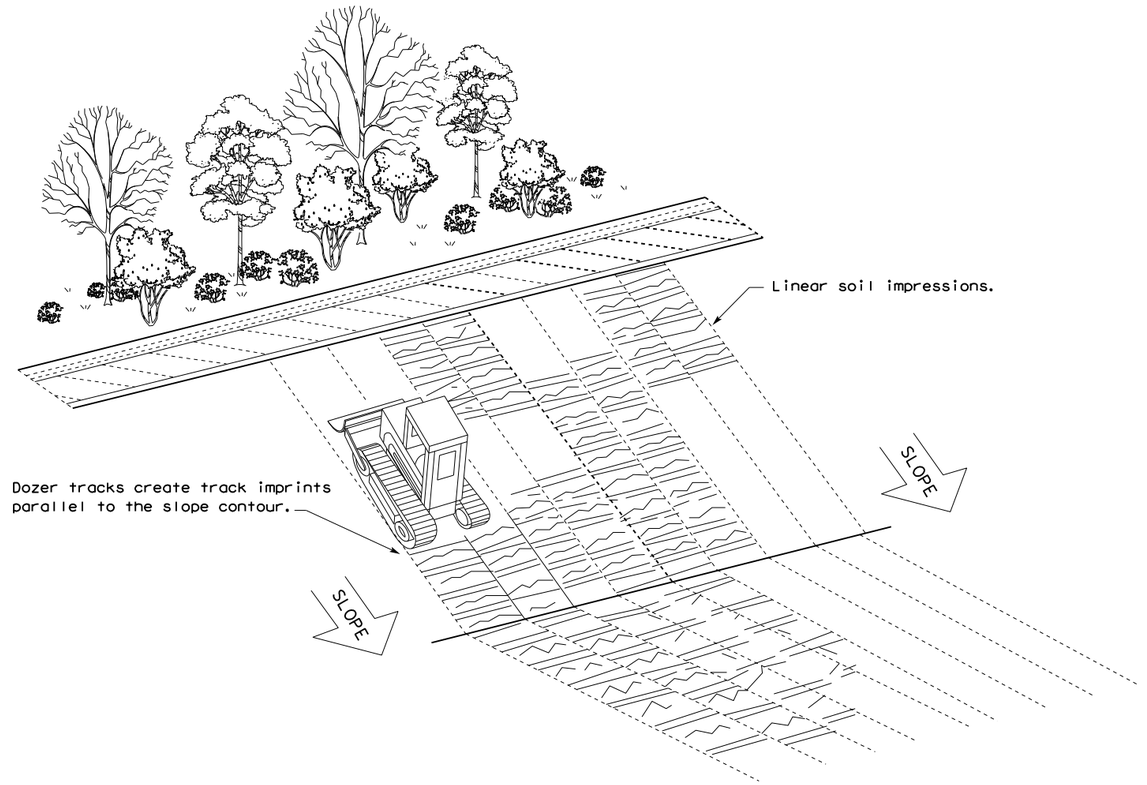
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2465	01	020		FM 2280	
	DIST	COUNTY			SHEET NO.	
	FTW	JOHNSON			131	

DATE
FILE

DATE:
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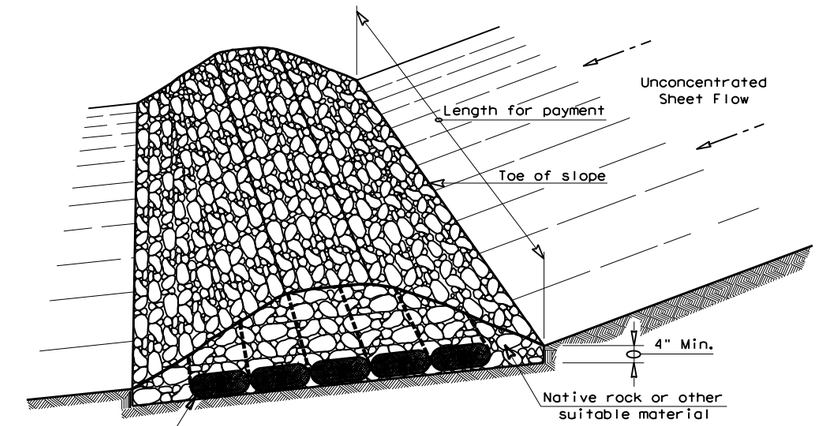
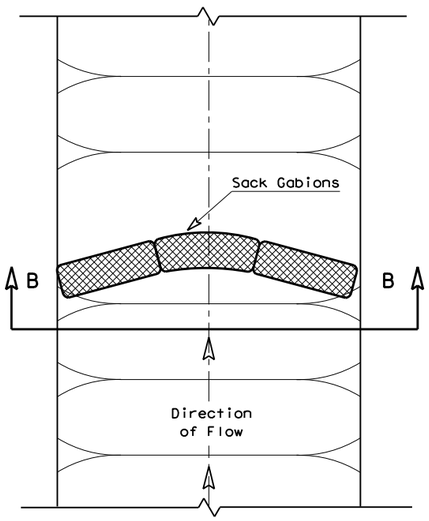
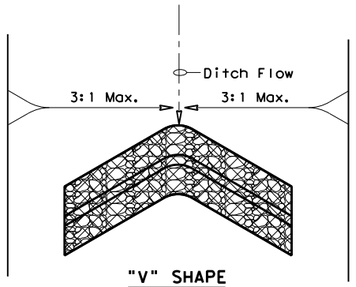


FILTER DAM AT TOE OF SLOPE

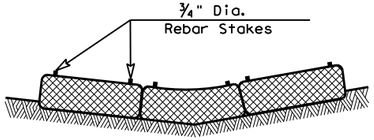
RFD1



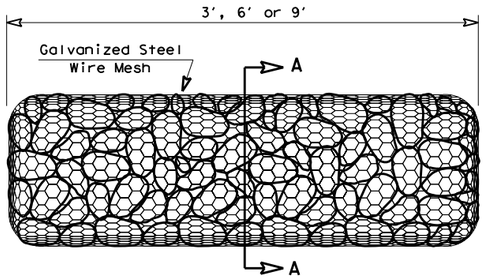
PLAN VIEW



"V" SHAPE PLAN VIEW

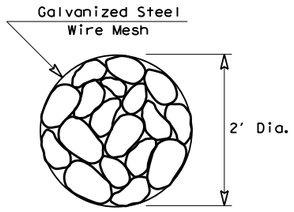


SECTION B-B

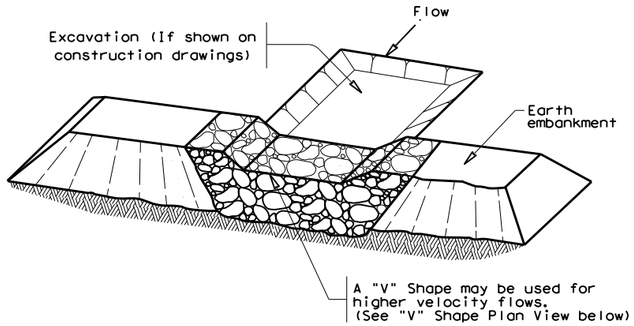


TYPE 4 (SACK GABIONS)

RFD4

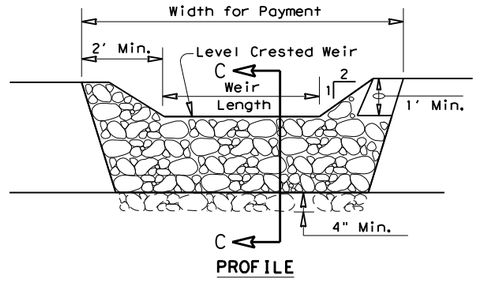


SECTION A-A

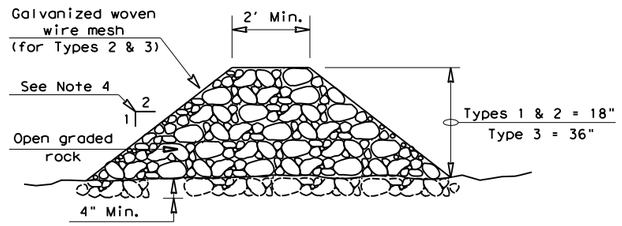


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

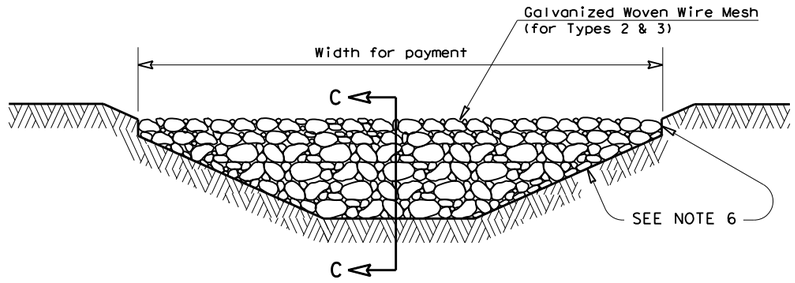
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		132

DATE:
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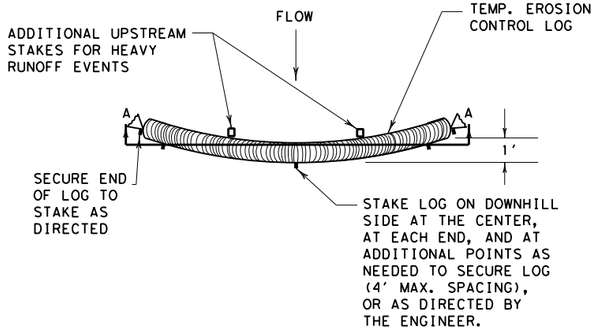
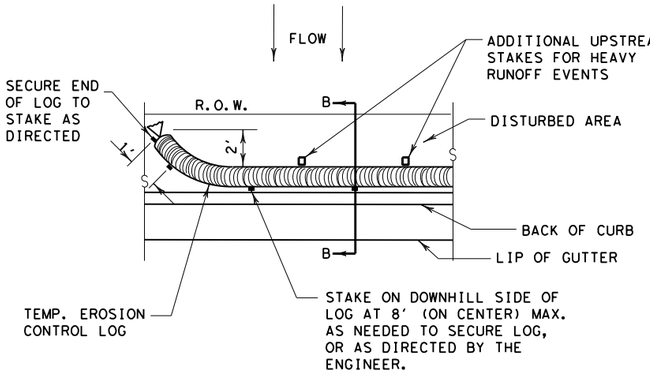


PLAN VIEW



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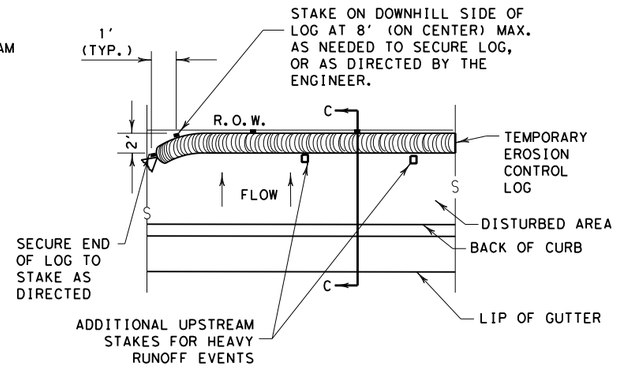

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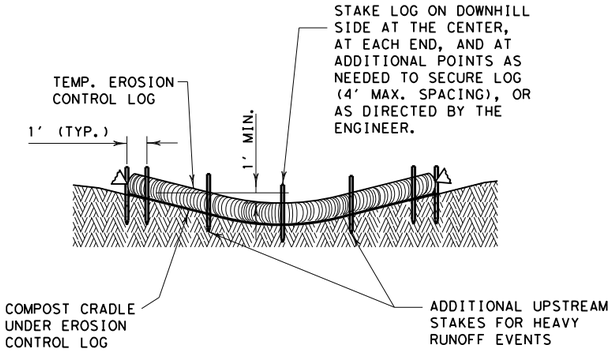
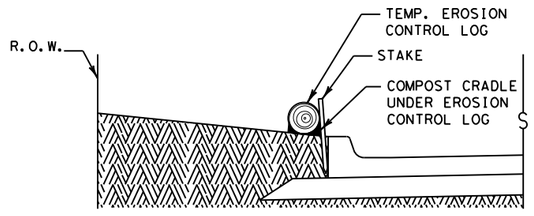


SECTION A-A

EROSION CONTROL LOG DAM

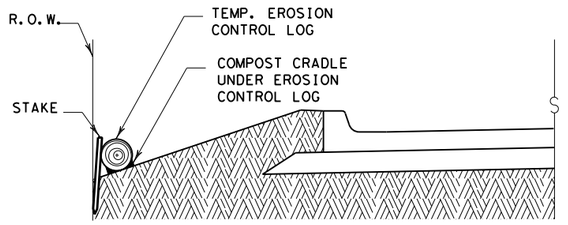
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

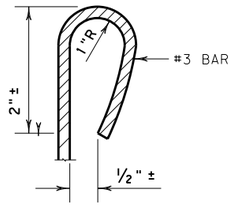
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

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

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

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.

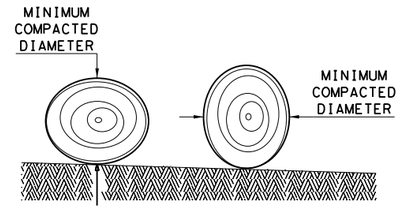
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2465	01	020		FM 2280	
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	FTW	JOHNSON			133	

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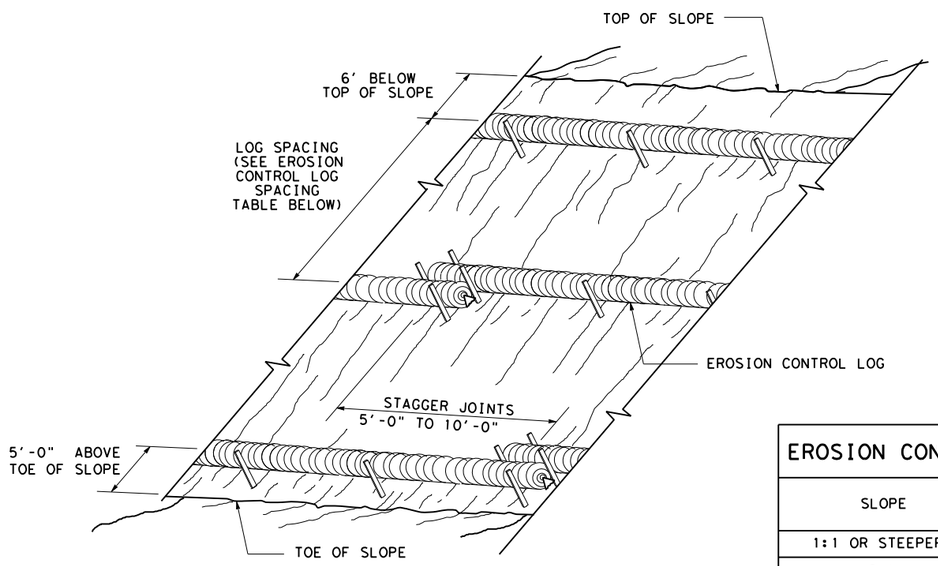
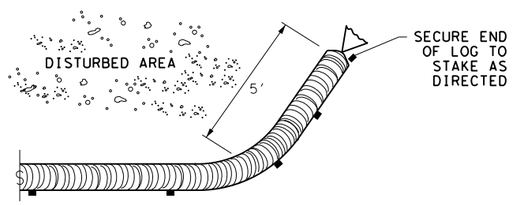


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

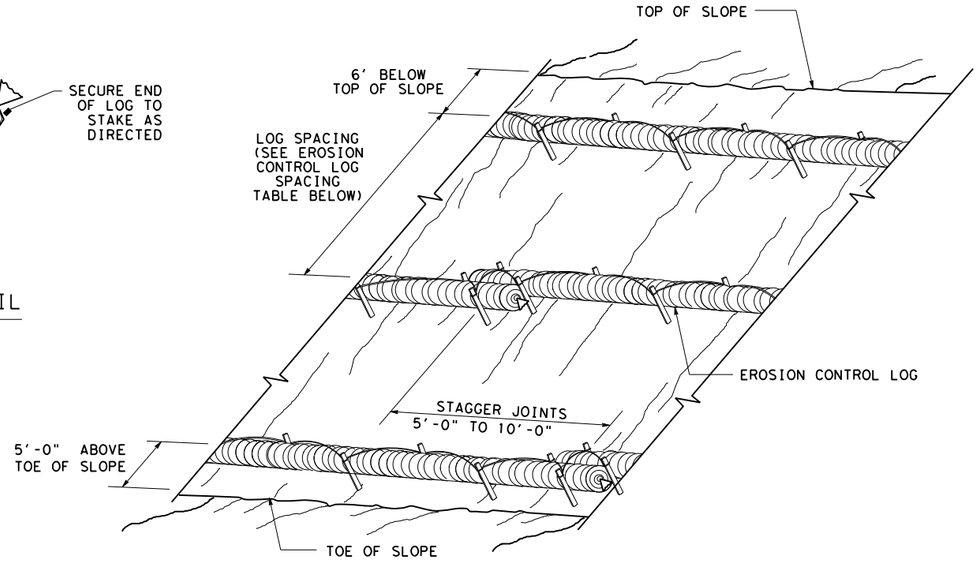
CL-SST



END SECTION RAP DETAIL

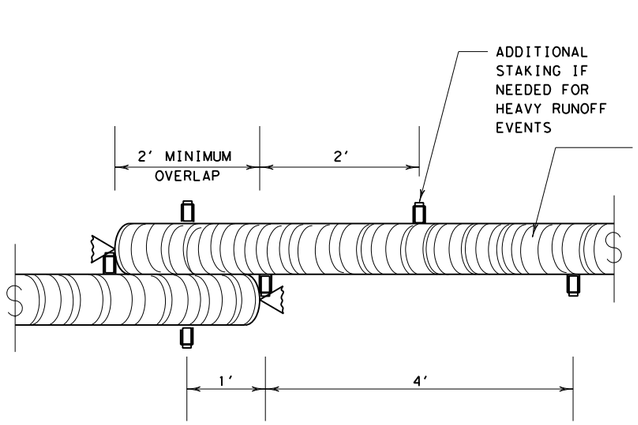
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

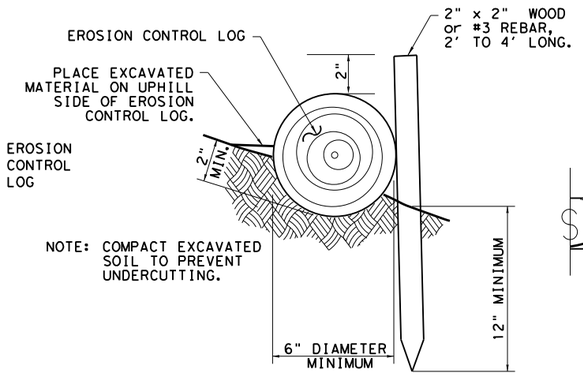
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

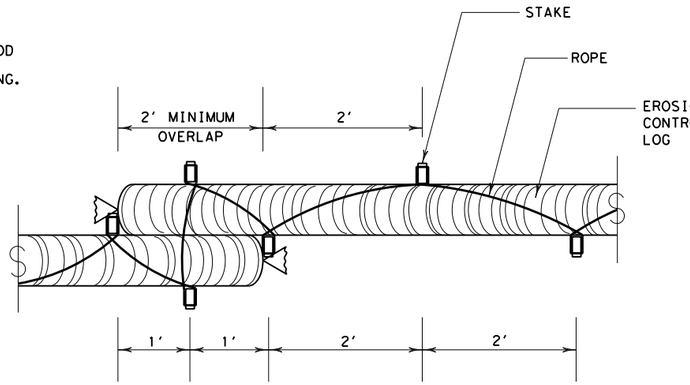


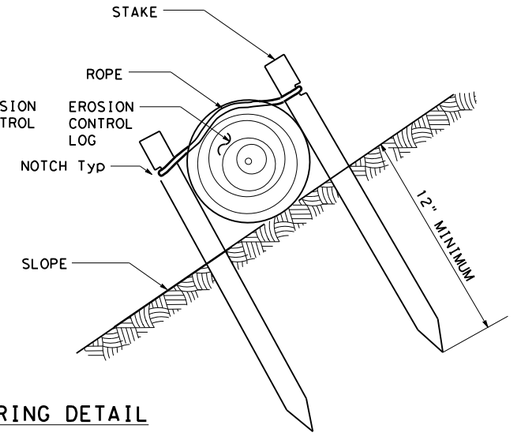


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

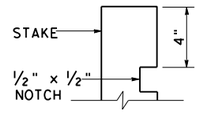
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		134

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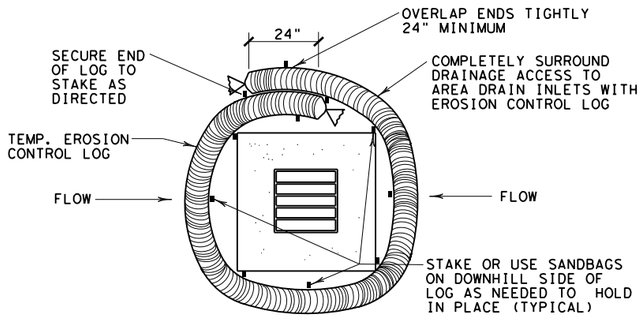
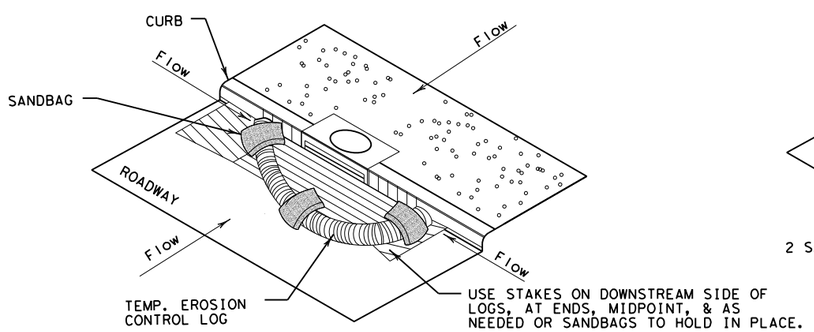


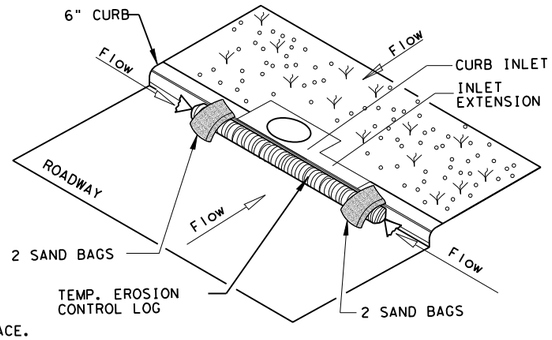
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

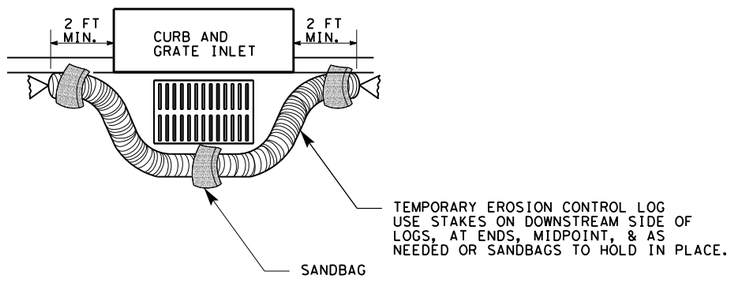
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

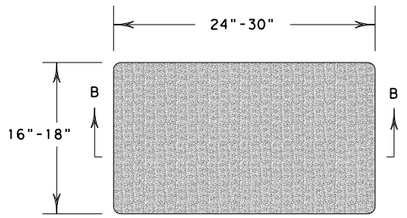
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		135

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

☑ This project is adjacent or parallel work, not within RR ROW:

DOT No.: 415981S
Crossing Type: At grade crossing
RR Company Operating Track at Crossing: UPRR
RR Company Owning Track at Crossing: UPRR
RR MP: 230.430
RR Subdivision: Fort Worth
City: Alvarado
County: Johnson
CSJ at this Crossing: 2465-01-020
Latitude: 32.4531137
Longitude: -97.2998734

Scope of Work, including any TCP, to be performed by State Contractor:

State's contractor to perform overlay work and inlay work.
pavement markings and MBGF.
Consisting of an HMAC overlay, mill and inlay, repair base failures.
All work in TxDOT ROW, and no work will be conducted on RR ROW.
Parallel work only.

Scope of Work to be performed by Railroad Company:

None

II. FLAGGING & INSPECTION

No. of Days of Railroad Flagging Expected: none

On this project, night or weekend flagging is:

☐ Expected
☑ Not Expected

Flagging services will be provided by:

☐ Railroad Company: 1) Txdot will pay flagging invoices. Flagging Agreement with railroad will be needed or, 2) Permitted crossing. Railroad company to provide flagging.
☐ Outside Party: Contractor will pay flagging invoices to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30-day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☐ **UPRR** UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
UP.request@nrssinc.net
Call Center 877-984-6777

☐ **BNSF** BNSFinfo@railprosfs.com
Call Center 877-315-0513, Select #1 for flagging

☐ **CPKCR** KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS:

Contractor must incorporate railroad construction inspection into anticipated construction schedule.

☑ Not Required
☐ Required. Contact Information for Construction Inspection:

III. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

☐ Required.
☑ Not Required

Railroad Point of Contact: _____

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

IV. RAILROAD INSURANCE REQUIREMENTS

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies and corresponding certificates of insurance must be issued by the contractor on behalf of the Railroad. Separate insurance policies and certificates are required when more than one Railroad Company is operating on the same right of way, or when several Railroad Companies are involved and operate on their own separate right of ways.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Escalated Limits

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000

Railroad Protective Liability Limits

☑ Not Required
☐ Non - Bridge/Typical Maintenance Projects. Includes repairs to overpass/underpass and culvert structures — $2,000,000 / $6,000,000
☐ Bridge Structure Projects. Includes new construction or replacement of overpass/ underpass structures — $5,000,000 / $10,000,000
☐ Other: _____

V. CONTRACTOR'S RIGHT OF ENTRY (CROE)

☑ Not Required
☐ Required: UPRR Maintenance Consent Letter. TxDOT to assist
☐ Required: TxDOT to assist in obtaining the UPRR CROE
☐ Required: Contractor to obtain
- ☐ BNSF: _____
  https://bnsf.railpermitting.com
- ☐ CPKCR
  https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12
- ☐ Other Railroads: _____

To view previously approved CROE templates agreed upon between the State and Railroad, see: https://www.txdot.gov/business/resources/railroad-highway-crossing/sample-right-of-entry-agreements.html

Approved CROE templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed CROE between the Contractor and the Railroad if required on project.

VI. RAILROAD COORDINATION MEETING

A Railroad Coordination Meeting is required. See item 5, Article 8.1, of the Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Manual for more details.

VII. RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety," and maintain registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

UPRR, BNSF, CPKCR will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information.

Know and follow the Contractor's Right of Entry Agreement EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are subject to the same insurance requirements as the Prime Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency

Call: UPRR RR
Railroad Emergency Line at: 888-877-7267
Location: DOT 415981S
RR Milepost: 230.430
Subdivision: Fort Worth

RRD Review Only
Initials: E M
Date: 10/03/2023

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK
PROJECT SPECIFIC DETAILS

FILE: rr-scope-of-work.pdf		DN: TxDOT	CK:	DW:		CK:
© TxDOT June 2014		CONT	SECT	JOB		HIGHWAY
REVISIONS		2465	01	020		FM 2280
6/2023		DIST	COUNTY			SHEET NO.
		02	Johnson			136

PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

DATE:
FILE:

SHEET 1 OF 2

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		137

3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of ¼ inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

DATE:
FILE:

Texas Department of Transportation

Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS March 2020	2465	01	020	FM 2280
	DIST	COUNTY		SHEET NO.
	FTW	JOHNSON		138