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CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696
DIST	COUNTY		SHEET NO.
AUS	LEE		1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

STATE PROJECT NUMBER

C: 334-3-21

CSJ: 0334-03-021

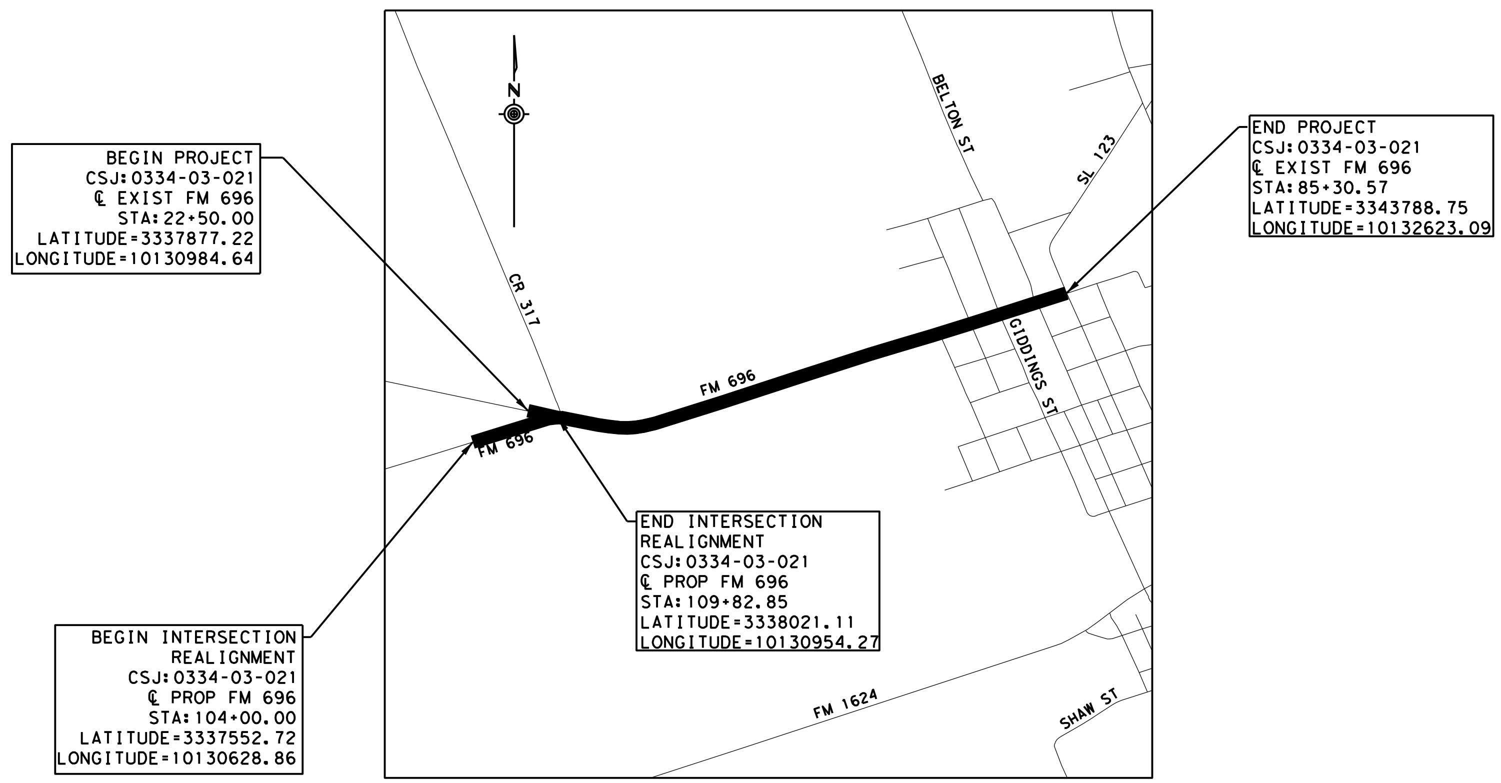
NET LENGTH OF PROJECT = 6,863 FEET = 1.299 MILES
- ROADWAY = 6,840 FEET = 1.295 MILES
- BRIDGE = 23.00 FEET = 0.004 MILES

LEE COUNTY
FM 696

FROM: FM 112
TO: SL 123

FOR THE CONSTRUCTION OF: INTERSECTION & OPERATIONAL IMPROVEMENT

CONSISTING OF: PROVIDE ADDITIONAL PAVED SURFACE WIDTH



LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

DESIGN SPEED

RURAL: 40 MPH

A.D.T.

2020: 2,899 VPD
2040: 4,589 VPD

FINAL PLANS

NAME OF CONTRACTOR: ______
DATE OF LETTING: ______
DATE WORK BEGAN: ______
DATE WORK COMPLETED: ______
DATE WORK ACCEPTED: ______
FINAL CONTRACT COST: ______

LIST OF APPROVED CHANGE ORDERS:

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

______ P.E. ______ DATE

TDLR INSPECTION NOT REQUIRED

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

KCI TECHNOLOGIES
ENGINEERS
PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
15021 Katy Freeway, Suite 200
Houston, TX 77094
Phone: 832.975.1565
www.kci.com
TBPE Registration No. F-10573

Texas Department of Transportation

CORRECT: 01/28/2021

Mark W. Lutzmann, P.E.
CONSULTING ENG. (TBPE FIRM REG. F - 1364)

SUBMITTED FOR LETTING: 2/24/2021

DocuSigned by: Diana K. Schulze, P.E.
6773445255A3482...
AREA ENGINEER

RECOMMENDED FOR LETTING: 2/25/2021

DocuSigned by: Dwayne M. Hollandi, P.E.
19801249?A804A0...
DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING: 2/25/2021

DocuSigned by: Heather Ashley-Nguyen
8912AF16F45B41E...
DIRECTOR OF TRANSPORTATION, PLANNING & DEVELOPMENT

FILE: $FILE$
DATE: $DATE$
$TIME$

GENERAL

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8, 8A-B	ESTIMATE & QUANTITY SHEETS
9-11	QUANTITY SUMMARY
12-14	PROJECT LAYOUT

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STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED
PROFESSIONAL ENGINEER

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

Mark W. Litzmann, P.E.

MARK W. LITZMANN, P.E. — 01.27.2021 DATE

STATE OF TEXAS
MANTHAN SHAH
134585
LICENSED
PROFESSIONAL ENGINEER

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

MANTHAN SHAH, P.E. — 01.29.2021 DATE

NO.	DATE	REVISION	APPROV.

KCI TECHNOLOGIES
Engineers
Planners
Surveyors
Construction Managers
15021 Katy Freeway, Suite 200
Houston, Tx 77094
Phone: 832.975.1565
www.kci.com
TBPE Registration No. F-10573

LEE COUNTY
FM 696

INDEX OF SHEETS

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FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
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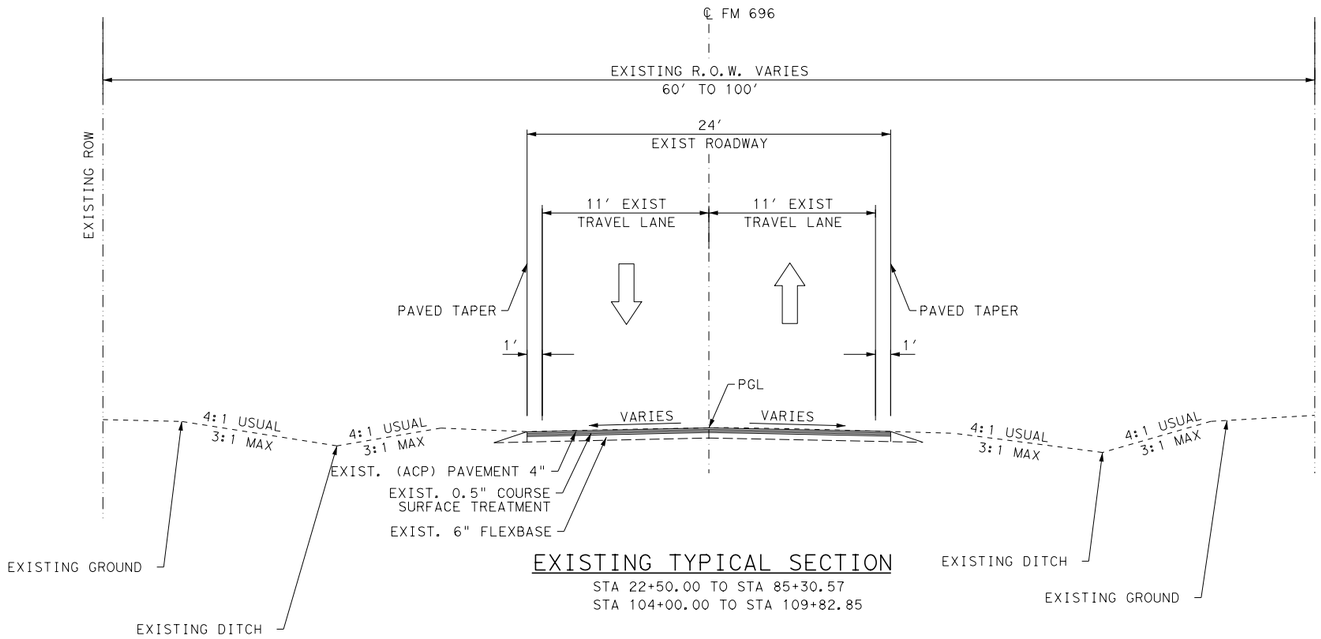
AUSTIN	LEE	0334	03	021	2



EXISTING TYPICAL SECTION

STA 22+50.00 TO STA 85+30.57
STA 104+00.00 TO STA 109+82.85

0′ 2.5′ 5′ 10′

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER

01/28/2021

Mark W. Litzmann, P.E.

Engineers
Planners
Scientists
Construction Managers
KCI TECHNOLOGIES
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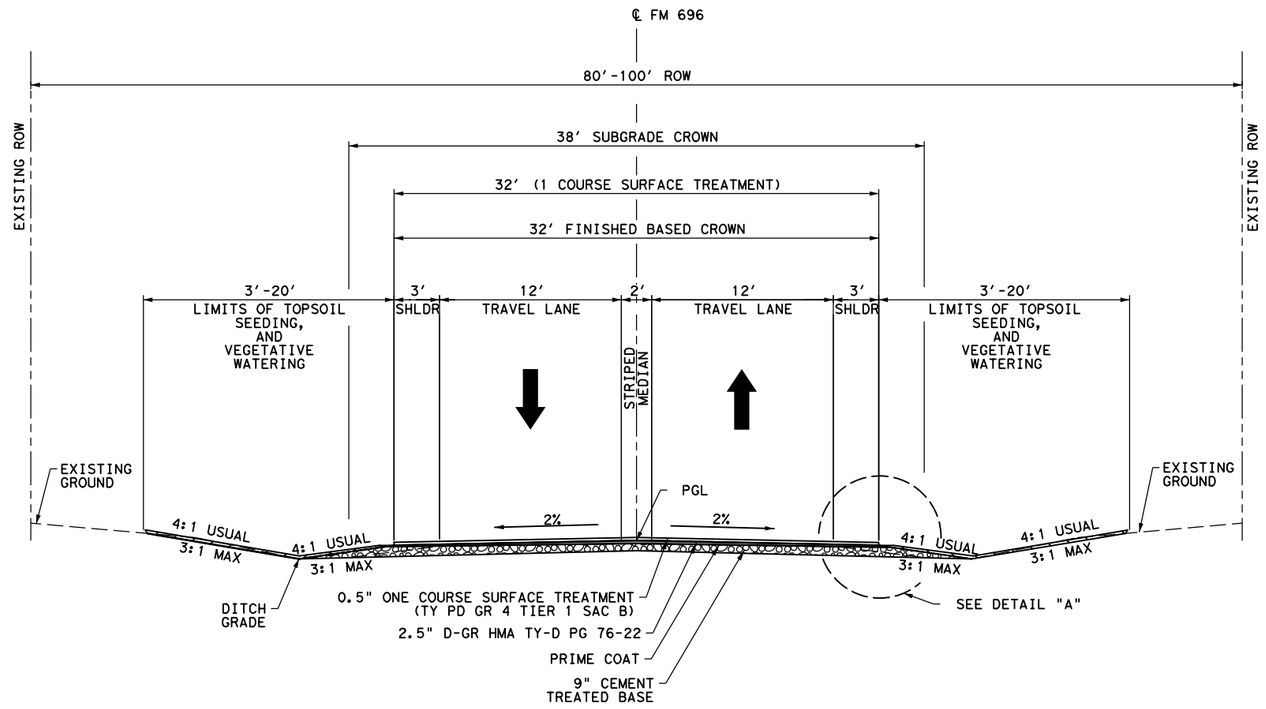
Texas Department of Transportation

LEE COUNTY
FM 696

EXISTING
TYPICAL SECTIONS

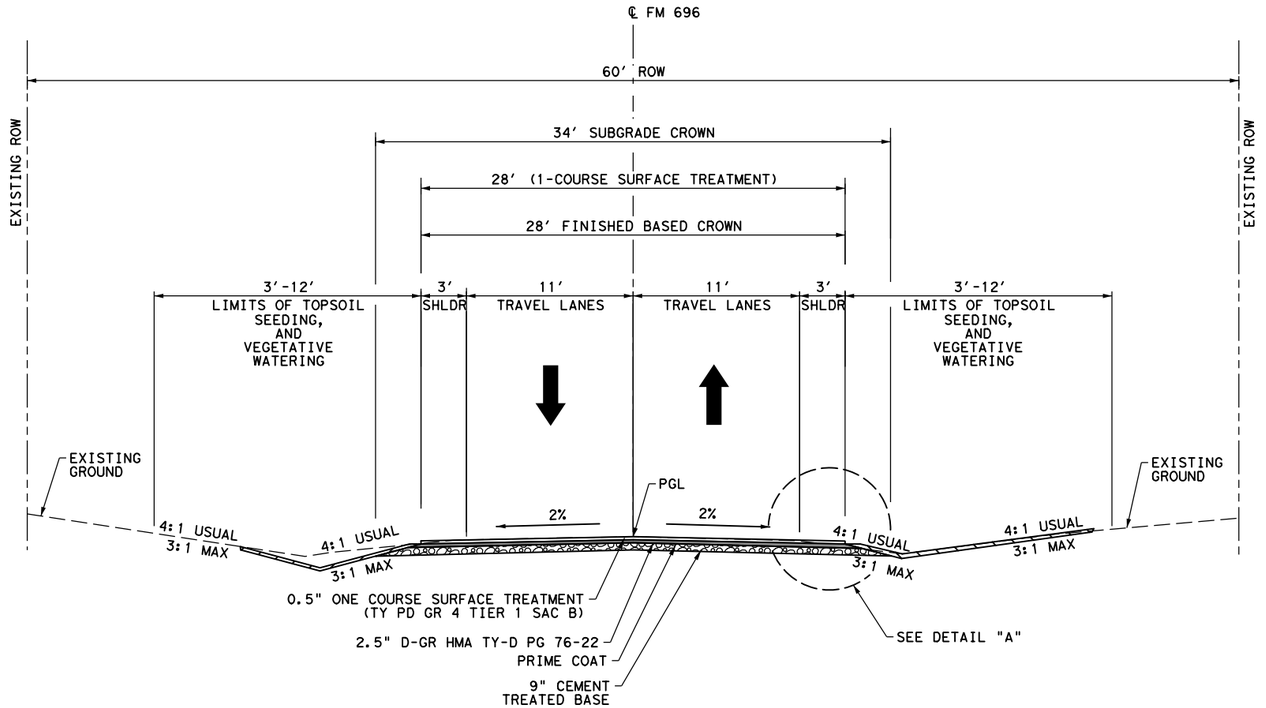
SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	3



PROPOSED TYPICAL SECTION

STA 24+50.00 TO STA 67+60.00

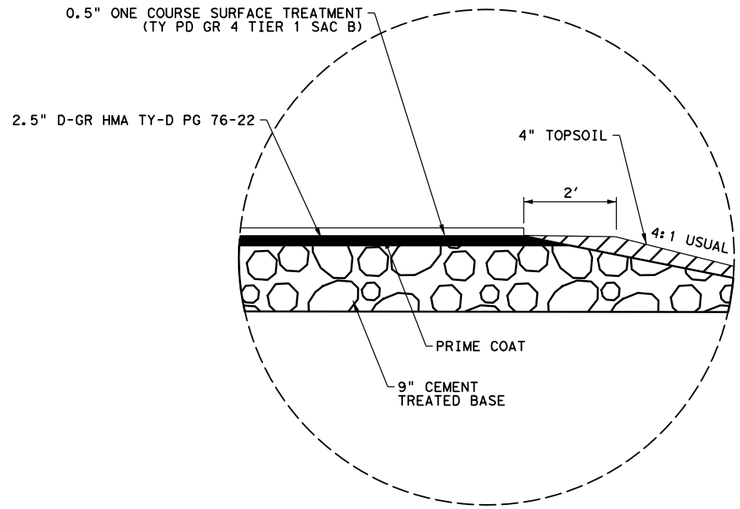


PROPOSED TYPICAL SECTION

STA 69+20.00 TO STA 85+30.57

NOTE TO CONTRACTOR:

1. ANY DAMAGES TO EXISTING CROSS CULVERTS OR IRRIGATION CROSSINGS CAUSED BY THE CONTRACTOR WILL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.
2. MAINTAIN MIN 4 INCHES TOPSOIL THICKNESS.



DETAIL "A"

0' 2.5' 5' 10'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER

01.20.2021

Mark W. Litzmann, P.E.

ENGINEERS PLANNERS SURVEYORS CONSTRUCTION MANAGERS
KCI TECHNOLOGIES
15021 Katy Freeway, Suite 200
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Phone: 832.975.1565
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 Texas Department of Transportation

LEE COUNTY
FM 696
PROPOSED
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SHEET 1 OF 3

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	4

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PLOTDRIVER: $PLTDRVS$
USER:
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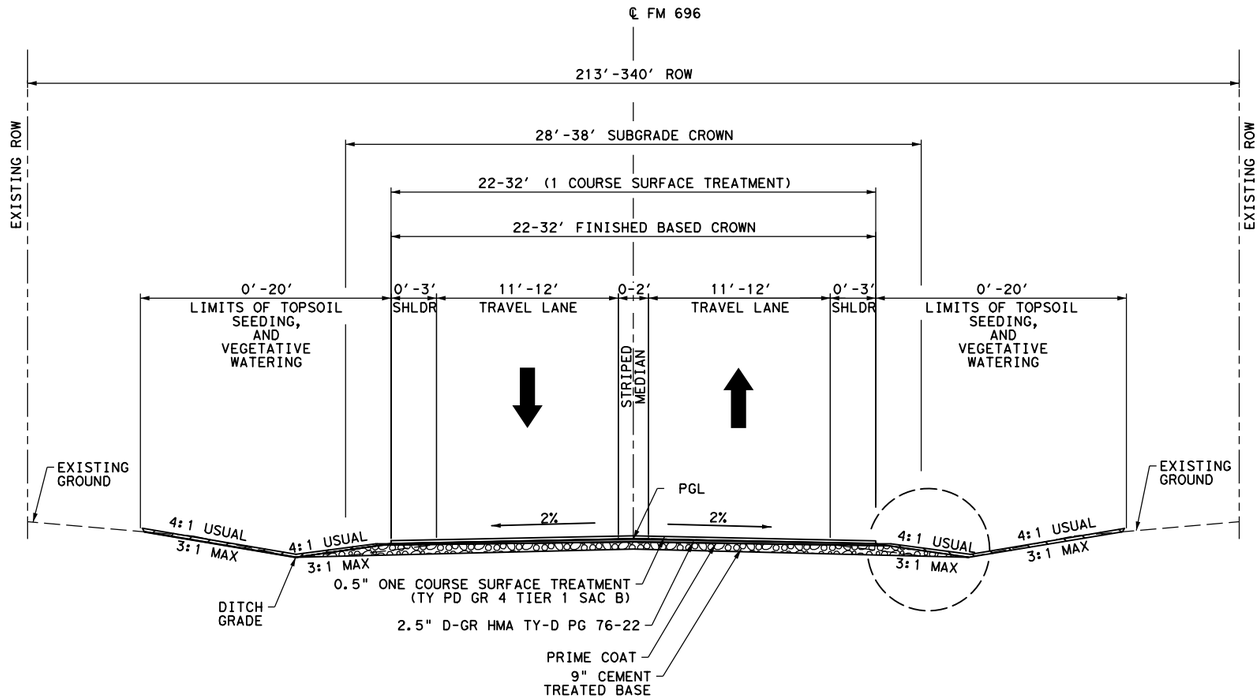
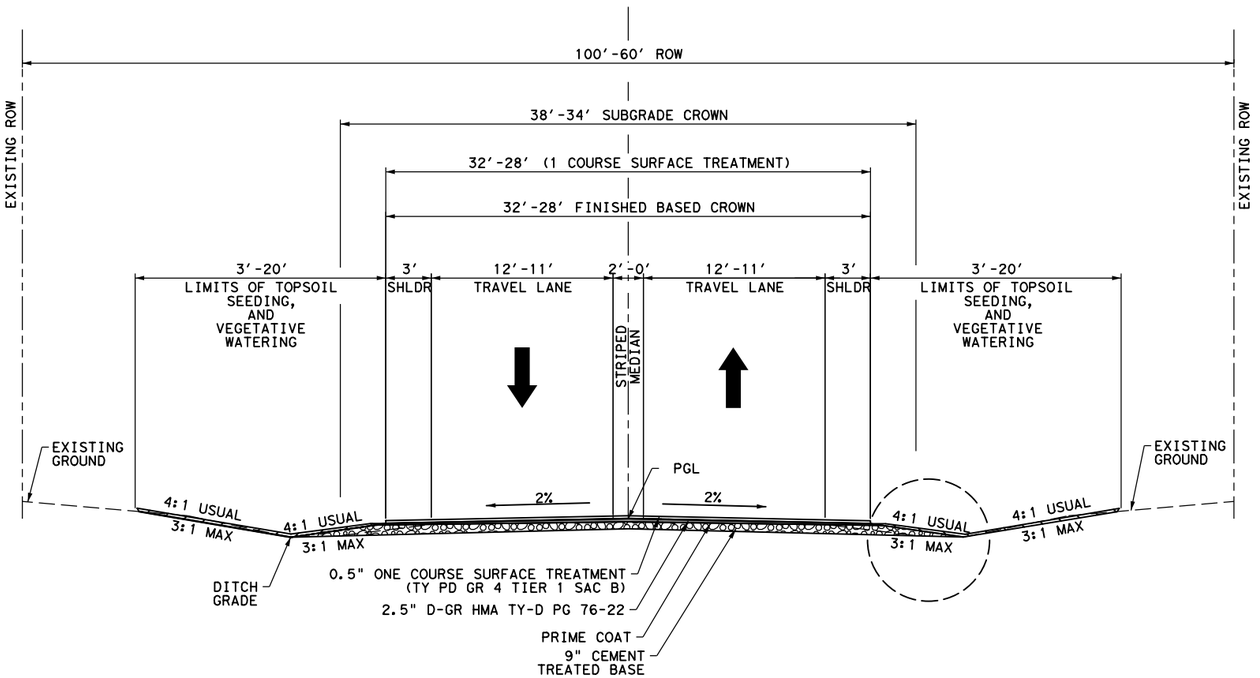


PROPOSED TRANSITION TYPICAL SECTION

STA 22+50.00 TO STA 24+50.00



PROPOSED TRANSITION TYPICAL SECTION

STA 67+60.00 TO STA 69+20.00

NOTE TO CONTRACTOR:

1. ANY DAMAGES TO EXISTING CROSS CULVERTS OR IRRIGATION CROSSINGS CAUSED BY THE CONTRACTOR WILL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.
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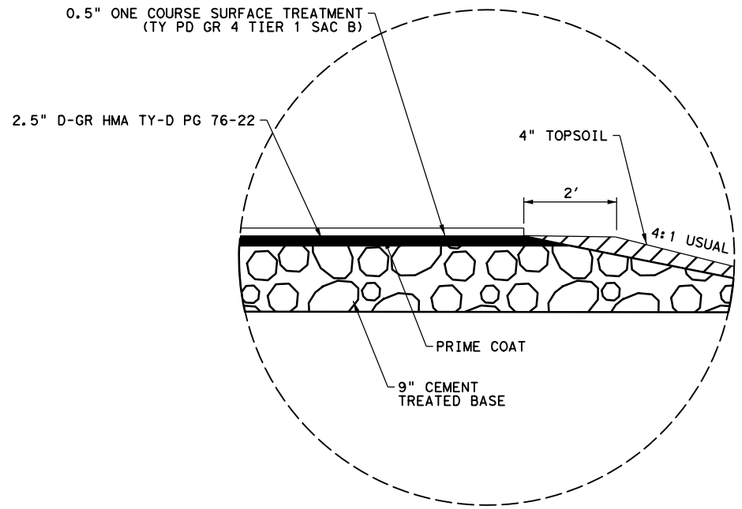

DETAIL "A"

0' 2.5' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER

01.20.2021

Mark W. Litzmann, P.E.

ENGINEERS
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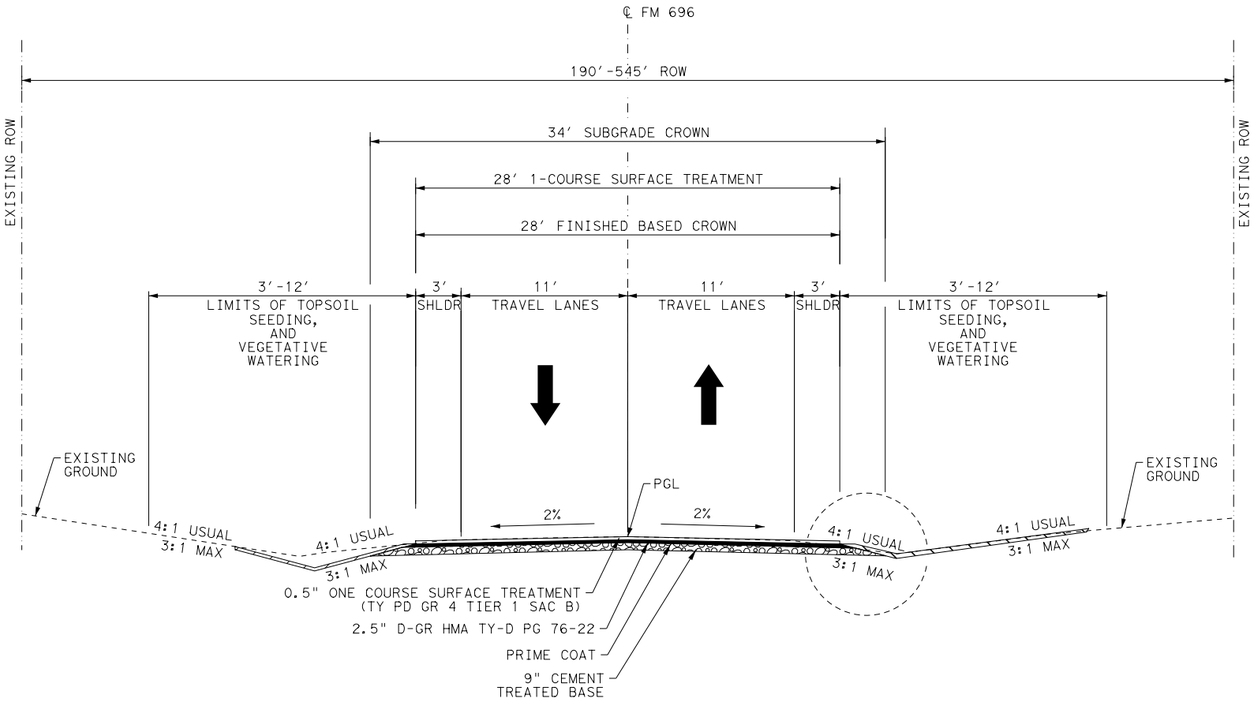
 Texas Department of Transportation

LEE COUNTY
FM 696

PROPOSED TYPICAL SECTIONS

SHEET 2 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	5

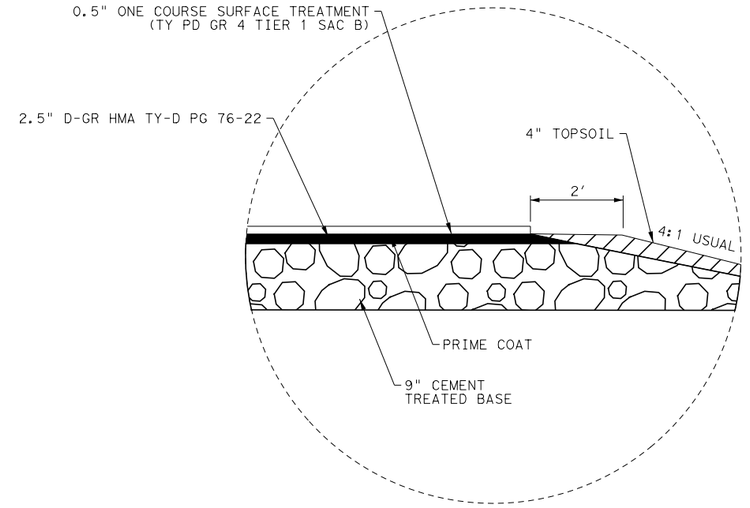


PROPOSED REALIGNMENT TYPICAL SECTION

STA 104+00.00 TO STA 109+82.85

NOTE TO CONTRACTOR:

1. ANY DAMAGES TO EXISTING CROSS CULVERTS OR IRRIGATION CROSSINGS CAUSED BY THE CONTRACTOR WILL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.
2. MAINTAIN MIN 4 INCHES TOPSOIL THICKNESS.



DETAIL "A"

0' 2.5' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
01/28/2021
Mark W. Litzmann, P.E.

ENGINEERS
PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
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LEE COUNTY
FM 696
PROPOSED
TYPICAL SECTIONS

SHEET 3 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	6

GENERAL NOTES: Version: January 11, 2021

Item	Description	**Rate
**204	**Sprinkling** (Dust) (Item 132) (Item 247)	 30 GAL/CY 30 GAL/CY 30 GAL/CY
**210	**Rolling (Flat Wheel)** (Item 247) (Item 316)	 1 HR/200 TON 1 HR/6000 SY
**210	**Rolling (Tamping and Heavy Tamping)**	1 HR/200 CY
**210	**Rolling (Lt Pneumatic Tire)** (Item 132) (Item 247) (Item 316 - Seal Coat) (Item 316 - Two Course)	 1 HR/500 CY 1 HR/200 TON 1 HR/6000 SY 1 HR/3000 SY
247	**Flexible Base (CMP IN PLC)**	132 LB/CF
310	**Prime Coat**	0.20 GAL/SY
316	**Underseals Asphalts (Multi Option)**	0.20 GAL/SY
	Surface Treatments	
	Seal Coat	
	Grade 4	
	Asphalt	0.38 GAL/SY
	Aggregate	1 CY/120 SY
3076	**Dense-Graded Hot-Mix Asphalt and Superpave**	110 LB/SY/IN

** For Informational Purposes Only

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

Bastrop Area Diana.Schulze@txdot.gov
Bastrop Area Mark.Baumann@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

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

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

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

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

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

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

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

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

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

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

Coordinate and obtain approval for all bridgework over existing roadways.

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

ITEM 5 – CONTROL OF THE WORK
Place construction stakes at intervals of no more than 100 ft. This work is subsidiary.

Electronic Shop Drawing Submittals.
Submit electronic shop drawing submittals according to the current Guide to Electronic Shop Drawing Submittal https://www.txdot.gov/business/resources/specifications/shop-drawings.html (TxDOT.gov Business > Resources - General > Shop Drawings). Pre-approved producers can be found online at TxDOT.gov > Business > Resources - Material Producer List. Use the following contact list for all submittals that are not required to be sent to Bridge Division and to copy the Engineer for all submittals to the Bridge Division.

Submittal Contact List
Bastrop Area Diana.Schulze@txdot.gov AUS_BA-ShopReview@txdot.gov

ITEM 6 - CONTROL OF MATERIALS
Give a minimum of 1 business day notice for materials, which require inspection at the Plant.

The area designated as the potential habitat for the Houston Toad will not be allowed as a source for embankment unless approved by the Engineer. The general area is Bastrop County north of the Colorado River and east of SH 95 unless provided in the plans.

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

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES
Roadway closures during key dates and/or special events are prohibited. See notes for Item 502 for the key dates and/or special events.

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

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

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

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

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

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

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

Work over or near Bodies of Water (Lakes, Rivers, Ponds, Creeks, etc.).
Keep on site a universal spill kit adequate for the body of water and the work being performed. Debris is not allowed to fall into the ordinary high-water level (OHWL). Debris that falls into the OHWL must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. Install and maintain traffic control devices to maintain a navigable corridor for water traffic, except during bridge demo and beam placement. This work is subsidiary.

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

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

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

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

Law Enforcement Personnel.
Submit charge summary and invoices using the Department forms.

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

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

A maximum combined rate of $70 per hour for the law enforcement personnel and the patrol vehicle will be allowed. Any scheduling fee is subsidiary per Standard Specification 502.4.2.

Cancel law enforcement personnel when the event is canceled. Cancellation, minimums or "show up" fees will not be paid when cancellation is made 12 hours prior to beginning of the event. Failure to cancel within 12 hours will not be cause for payment for cancellation, minimums, or "show up" time. Payment of actual "show up" time to the event site due to cancellation will be on a case by case basis at a maximum of 2 hours per officer.

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

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

ITEM 8 – PROSECUTION AND PROGRESS
Electronic versions of schedules will be saved in Primavera P6 format.

In accordance with SP 008-005, the latest work start date is August 1st immediately following the authorization to begin work.

ITEM 100 - PREPARING RIGHT OF WAY
Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas.

Backfill material will be Type B Embankment using ordinary compaction.

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

ITEM 110 – EXCAVATION
The Engineer will define unsuitable material.

ITEM 132 – ALL EMBANKMENT
The Engineer will define unsuitable material. Material which the Contractor might deem to be unsuitable due to moisture content will not be considered unsuitable material.

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

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

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

ITEM 160 - TOPSOIL
Off-site topsoil will have a minimum PI of 25.

No Sandy Loam allowed.

Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources. Construct topsoil stockpiles of no more than five (5) feet in height.

It is permissible to use topsoil dikes for erosion control berms within the right of way, as directed.

Seed or track slopes within 14 days of placement.

Salvage topsoil from sites of excavation and embankment. Maximum salvage depth is 6 inches.

Windrowing of topsoil obtained from the Right of Way (ROW) is not allowed.

ITEM 162 – SODDING FOR EROSION CONTROL
Provide common Bermuda. Provide St. Augustine if the adjacent grass is St. Augustine.

ITEM 168 – VEGETATIVE WATERING
Water all areas of project to be seeded or sodded.

Maintain the seedbed in a condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall on the site of ½ inch or greater, but will be resumed before the soil dries out. Continue watering until final acceptance.

Vegetative watering rates and quantities are based on ¼ inch of watering per week over a 3-month watering cycle. The actual rates used and paid for will be as directed and will be based on prevailing weather conditions to maintain the seedbed.

Obtain water at a source that is metered (furnish a current certification of the meter being used) or furnish the manufacturer's specifications showing the tank capacity for each truck used. Notify the Engineer, each day that watering takes place, before watering, so that meter readings or truck counts can be verified.

ITEM 169 – SOIL RETENTION BLANKETS
Type A blankets containing straw fibers are not allowed.

ITEM 204 – SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 247 - FLEXIBLE BASE
The lift thickness will be 4" to 6" unless shown in the plans. When compacted in multiple lifts, the density of the bottom and middle lifts will be 95% and 98% of the maximum dry density, respectively.

Correction of subgrade soft spots is subsidiary.

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.

Do not use a vibratory roller to compact the material directly over a box culvert.

ITEM 260 thru 276 – SUBGRADE TREATMENTS AND BASE
Use ordinary compaction for subgrade treatment.

Three weeks prior to treatment, provide a sample of soil or flexible base to be treated.

ITEM 276 – CEMENT TREATMENT (PLANT-MIXED)
Unless shown on the plans, flexible base will be as follows: Class N, Type A Grade 5, and microcracked.

Class N Requirements

Description	**Minimum**	**Maximum**
Cement Content (by dry weight of base)	2% (Flexible Pavement) 3% (Rigid Pavement)	5%
	Test Method	**Requirement**
7-Day Unconfined Compressive Strength (min.)[1]	Tex-120-E, Part I	300 psi (Flexible Pavement)
		500 psi. (Rigid Pavement)
Retained Strength after Moisture Conditioning (min.)	Tex-120-E, Part I (10-day capillary soak)	100% of 7-Day Unconfined Compressive Strength
Expansion[2]	ASTM C 1567	0.10% (maximum)

1. Meet the unconfined compressive strength after addition of stabilizer.

2. Required when using crushed concrete or other material that contains cement. Provide the certified test report signed and sealed by a licensed professional engineer. This may be waived by the Engineer when the material has a known performance history based on previous ASTM C 1567 or ASTM C 1260 tests.

ITEM 300s – SURFACE COURSES AND PAVEMENTS
Asphalt season is May 1 thru September 15. Emulsified Asphalt season is April 1 thru October 15. The latest work start date for asphalt season is August 1.

If an under seal is not provided, furnish a tack coat. Apply tack coat at 0.08 GAL/SY (residual). Apply non-tracking tack coat using manufacturer recommend rates.

ITEM 302 – AGGREGATES FOR SURFACE TREATMENTS
Previously tested aggregates delivered to the project, which are found to contain excessive quantities of dust (more than 0.5 percent passing the no. 40 sieve) during pre-coating, stockpiling or hauling operations, will be rejected. Use test method Tex-200-F, Part II, for testing.

Table 3 Los Angeles Abrasion, % Max, is lowered from 35 to 30 and is applicable to all aggregates.

When TY E is allowed, furnish coarse fractionated recycled asphalt pavement (CF-RAP). CF-RAP aggregate stockpiles must be approved on a stockpile-by-stockpile basis, unless approved by the Engineer. Do not exceed stockpiles greater than 2000 tons. CF-RAP will meet the below gradation requirement (after ignition burn off of asphalt) or finer than Grade 4. CF-RAP will meet deleterious material and decantation requirements in accordance with Table 3.

CF-RAP Requirements

Percent Retained				
5/8”	**1/2"**	**3/8"**	**#4**	**#8**
0	10-25	60-80	85-100	90-100

ITEM 310 – PRIME COAT
Apply blotter material to all driveways and intersections. This work is subsidiary.

When Multi Option is allowed, provide MC 30, EC 30 or AE-P. MC 30 is not allowed in Travis County.

Rolling to ensure penetration is required.

ITEM 316 – SEAL COAT
Ensure that all underseals are covered by HMACP before exposing to traffic for roadways listed in Table 1 of Item 502 or ADT greater than 5,000.

Aggregates (Multi Option) for seal coats not exposed to traffic and underseals shall be Type E, PA, PB, A or B. The Grade shall range between 4 and 5.

Use a medium pneumatic roller in accordance with Item 210.

Surface all transitions, tapers, climbing lanes and intersections to the limits as directed.

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

ITEM 3076 - DENSE-GRADED HOT-MIX ASPHALT
Use the SGC for design and production testing of all mixtures. Design all Dense-Graded Type D mixtures as a surface mix, maximum 15% RAP and no RAS.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

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

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES
Unless shown on the plans, the following backfill will apply to cutting and restoring flexible pavement. Backfill with cement-stabilized backfill. The cement-stabilized backfill is subsidiary. Cap the backfill with Type B hot-mix to a depth equal to the adjacent hot-mix. At locations where the backfill surface is final, place 1-1/2 in. Type D for the surface. The minimum hot-mix depth will be 4 in.

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

ITEM 432 - RIPRAP
Mow strip riprap will be 4 in. and all other riprap will be 5 in. unless otherwise shown on the plans or in the pay items. Mow strip for cable barrier may be placed monolithically with the barrier foundations if using concrete in accordance with Item 543. Fiber reinforcement is not allowed except in mow strip for cable barrier if foundation and mow strip are placed monolithically.

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

For cement-stabilized riprap, provide Type A Grade 5 flexible base. Compressive strengths for Item 247 are waived.

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

ITEM 466 - HEADWALLS AND WINGWALLS

Remove all loose formwork and materials from the waterway at the end of each work week or prior to a rain event. Debris that falls into the waterway must be removed at the end of each work day. Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

ITEM 467 - SAFETY END TREATMENT

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

ITEM 496 - REMOVING STRUCTURES

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

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

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

Table 1

Roadway	Limits	Allowable Closure Time
All	Within 200' of a signalized intersection	9 P to 5 A
All	All (Full Closure, see allowable work below)	11 P to 4 A

For roadways without defined allowable closure times, nighttime lane closures will be allowed from 7 P to 6 A. Unless stated, daytime or Friday night lane closures will not be allowed and one lane in each direction will remain open at all times for all roadways.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend. Closures the Sunday of the Super Bowl will not be allowed from 1 P to 11 P. No closures will be allowed on Friday and the weekends for projects within 20 miles of Formula 1 at COTA, ACL Fest, SXSW, ROT Rally, UT home football games (includes games not on a Friday or weekend), sales tax holiday, Dell Match Play (includes Thursday) or other special events that could be impacted by the construction. All lanes will be open by noon of the day before these special events.

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

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

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

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

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

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

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

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

Meet with the Engineer prior to lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Take immediate action to modify traffic control, if at any time the queue becomes greater than 20 minutes. Have a contingency plan of how modification will occur. Consider inclement weather prior to implementing the lane closures. Do not set up traffic control when the pavement is wet.

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

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

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

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

ITEM 504 - FIELD OFFICE AND LABORATORY
All labs and offices will include cleaning at least once a week. The cleaning will include sweeping and mopping of floors, cleaning the toilet and lavatory, and emptying wastebaskets. Space heaters are not considered adequate heating.

Projects with more than 500 CY of structural class concrete, 5000 SY of Class P concrete, and/or 2000 CY of non-structural concrete will include a concrete testing facility. Provide a structure with at least 200 sq. ft. of gross floor area in room 8 ft. high. The structure will include the laboratory equipment and all other related items to perform the contract-controlling test procedures.

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

ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENV CONTROLS
Install, maintain, remove erosion, sedimentation and environmental control measures in areas of the right of way utilized by the contractor that are outside the limits of disturbance required for construction. Permanently stabilize the area. This work is subsidiary.

ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hr. in advance of beginning work on their driveway. Provide a list of each notification and contact prior to each closure. Only close driveways for reconstruction if duration and alternate access are approved. Install and maintain material across a work zone as temporary access. Temporary access must not have grade breaks that exceed 8%. This work is subsidiary.

Grade breaks must not exceed 8%. Sidewalk crossing slope will be 1.5% and 5 ft. wide with width reduction in approved locations.

For ACP or SURF TREAT, the pavement structure will match the adjacent roadway unless detailed on the plans. HMA, including surface, may use a maximum allowable amount of 40% RAP and 5% RAS for private driveways, public driveways for 2-lane roadways or smaller, and turnouts. Blending of 2 or more sources is allowed. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Compressive strengths for flexible base are waived. Base must be placed using ordinary compaction.

For CONC, the pavement structure will be 6 in. thick and have 3 in. base bedding unless detailed on the plans. Furnish base meeting ACP or SURF TREAT requirements. Class A concrete is required and may use Coarse Aggregate Grades 1-8. Expansion joints will be placed every 20 ft.

Expansion joints will be constructed as detailed in the latest TxDOT Concrete Curb and Curb and Gutter Standard. Reinforcement will be in accordance with concrete riprap for Item 432.3.1., unless specified on the plans.

ITEM 540 & 544 - METAL BEAM GUARD FENCE AND GUARDRAIL END TREATMENTS
Furnish round timber posts for guard fence. Steel posts for low fill culverts are subsidiary. Stake the locations for approval prior to installation. Adjust the limits of the fence to meet field conditions. Install delineators before opening the road to traffic.

Retain all materials. Contractor may reuse all existing materials that are structurally sound and dent free. All reused material shall be from this project and in compliance with current standards. Structurally sound rust spots with the largest dimension of 4 in. may be cleaned and repaired in accordance with 540.3.5. Contractor may punch or field drill holes in the metal rail element to accommodate post spacing. Additional holes for splice or connections are not allowed. The holes shall be spaced in accordance with the latest standard and shall not be closer than the minimum spacing shown on the current standard.

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

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

ITEM 644 – SMALL ROADSIDE SIGN ASSEMBLIES
Triangular slip base that use set screws to secure the post will require 1 of the set screws to penetrate the post by drilling a hole in the post at the location of the screw. All set screws shall be treated with anti-seize compound.

ITEM 658 – DELINEATOR AND OBJECT MARKER ASSEMBLIES
Installation and maintenance of portable CTB reflectors will be subsidiary to the barrier.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS
Notify the Engineer at least 24 hours in advance of work for this item.

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

Item 668 is not allowed for use as Item 662.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS
Notify the Engineer at least 24 hr. before beginning work.

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

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

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

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

ITEM 752 – TREE AND BRUSH REMOVAL
Follow Item 752 general notes when removing or working on or near trees and brush even if Item 752 is not included as a pay item.

Flailing equipment is not allowed. Burning brush is not allowed in urban areas or on ROW. Use hand methods or other means of removal if doing work by mechanical methods is impractical.

Prior to begin tree pruning, send email confirmation to the Engineer that training and demonstration of work methods has been provided to the employees. This work is subsidiary.

Shredded vegetation may be blended, at a rate not to exceed 15 percent by volume, with Item 160 if the maximum dimension is not greater than 2 in.

ITEM 6185 – TRUCK MOUNTED ATTENUATOR AND TRAILER ATTENUATOR
The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

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

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

QUANTITY SHEET

CONTROLLING PROJECT ID 0334-03-021 **DISTRICT** Austin **COUNTY** Lee
HIGHWAY FM 696

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0334-03-021**			
		PROJECT ID		**A00060712**			
		COUNTY		**Lee**			
		HIGHWAY		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	68.300		68.300	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	645.000		645.000	
	106-6001	OBLITERATING ABANDONED ROAD	STA	7.000		7.000	
	110-6001	EXCAVATION (ROADWAY)	CY	3,724.000		3,724.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	3,407.000		3,407.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5,268.000		5,268.000	
	162-6002	BLOCK SODDING	SY	7,562.000		7,562.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	2,634.000		2,634.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	2,634.000		2,634.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	5,268.000		5,268.000	
	168-6001	VEGETATIVE WATERING	MG	45.000		45.000	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	5,268.000		5,268.000	
	275-6001	CEMENT	TON	627.000		627.000	
	276-6096	CM TRT(PT MX)(CL N)(TY A)(GR 4)(FN POS)	CY	6,981.210		6,981.210	
	305-6022	SALV, HAUL & STKPL RCL APH PV (4")	SY	19,343.000		19,343.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	5,585.000		5,585.000	
	316-6004	ASPH (TIER I)	GAL	8,895.000		8,895.000	
	316-6240	AGGR(TY-PD GR-4 SAC-B)	CY	196.000		196.000	
	400-6001	STRUCT EXCAV	CY	120.000		120.000	
	400-6005	CEM STABIL BKFL	CY	107.000		107.000	
	400-6006	CUT & RESTORING PAV	SY	200.000		200.000	
	401-6001	FLOWABLE BACKFILL	CY	86.000		86.000	
	403-6001	TEMPORARY SPL SHORING	SF	562.000		562.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	31.000		31.000	
	432-6026	RIPRAP (STONE COMMON)(DRY)(18 IN)	CY	215.000		215.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	63.000		63.000	
	462-6059	CONC BOX CULV (7 FT X 4 FT)(EXTEND)	LF	52.000		52.000	
	462-6060	CONC BOX CULV (7 FT X 5 FT)(EXTEND)	LF	81.000		81.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	724.000		724.000	
	464-6018	RC PIPE (CL IV)(24 IN)	LF	43.000		43.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA	2.000		2.000	
	466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA	2.000		2.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	48.000		48.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	2.000		2.000	
	480-6001	CLEAN EXIST CULVERTS	EA	5.000		5.000	
	496-6004	REMOV STR (SET)	EA	2.000		2.000	
	496-6005	REMOV STR (WINGWALL)	EA	4.000		4.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0334-03-021 **DISTRICT** Austin **COUNTY** Lee
HIGHWAY FM 696

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0334-03-021**			
		PROJECT ID		**A00060712**			
		COUNTY		**Lee**			
		HIGHWAY		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	496-6007	REMOV STR (PIPE)	LF	380.000		380.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	12.000		12.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	100.000		100.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	100.000		100.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	120.000		120.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	120.000		120.000	
	530-6002	INTERSECTIONS (ACP)	SY	855.000		855.000	
	530-6004	DRIVEWAYS (CONC)	SY	671.000		671.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,396.000		1,396.000	
	530-6009	TURNOUTS (SURF TREAT)	SY	302.000		302.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	1,450.000		1,450.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF	87.500		87.500	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	8.000		8.000	
	560-6003	MAILBOX INSTALL-M (TWG-POST) TY 1	EA	21.000		21.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	3.000		3.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	9.000		9.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6.000		6.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	4.000		4.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA	3.000		3.000	
	644-6038	IN SM RD SN SUP&AM TYS80(1)SA(U-EXAL)	EA	2.000		2.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	27.000		27.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	46.000		46.000	
	658-6016	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	EA	25.000		25.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	4.000		4.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	12,555.000		12,555.000	
	662-6093	WK ZN PAV MRK REMOV (Y)4"(BRK)	LF	3,223.000		3,223.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	9,169.000		9,169.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	663.000		663.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	133.000		133.000	
	666-6342	REF PROF PAV MRK TY I(W)4"(SLD)(100MIL)	LF	12,755.000		12,755.000	
	666-6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)	LF	3,223.000		3,223.000	
	666-6345	REF PROF PAV MRK TY I(Y)4"(SLD)(100MIL)	LF	9,369.000		9,369.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	161.000		161.000	
	3076-6048	D-GR HMA TY-D PG76-22	TON	3,218.000		3,218.000	
	6185-6002	TMA (STATIONARY)	DAY	5.000		5.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000		40.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0334-03-021 **DISTRICT** Austin **COUNTY** Lee
HIGHWAY FM 696

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0334-03-021**			
		PROJECT ID		**A00060712**			
		COUNTY		**Lee**			
		HIGHWAY		**FM 696**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6305-6003	LCS SYSTEM (INSTALL ONLY)	EA	2.000		2.000	
	6305-6004	LCS SIGNAL UNIT (INSTALL ONLY)	EA	2.000		2.000	
	6305-6005	LCS SYSTEM (RELOCATE)	EA	6.000		6.000	
	6305-6006	LCS SIGNAL UNIT (RELOCATE)	EA	6.000		6.000	
	6305-6007	LCS SYSTEM (REMOVE)	EA	2.000		2.000	
	6305-6008	LCS SIGNAL UNIT (REMOVE)	EA	2.000		2.000	
	08	SAFETY CONTINGENCY (NON-PART)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE (NON-PART)	LS	1.000		1.000	
		LAW ENFORCEMENT	LS	1.000		1.000	

SUMMARY OF ROADWAY ITEMS

LOCATION	100 6002	104 6017	106 6001	110 6001	132 6003	275 6001	276 6096	305 6022	310 6001	316 6004	316 6240	400 6006	432 6002	432 6045	464 6003	467 6363	496 6004	496 6007
	PREPARING ROW	REMOVING CONC (DRIVEWAYS)	OBLITERATING ABANDONED ROAD	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CEMENT	CM TRT (PT MX) (CL N) (TY A) (GR 4) (FN POS)	SALV, HAUL & STKPL RCL APH PV (4")	PRIME COAT (MULTI OPTION)	ASPH (TIER I)	AGGR (TY-PD GR-4 SAC-B)	CUT & RESTORING PAV	RIPRAP (CONC) (5 IN)	RIPRAP (MOW STRIP) (4 IN)	RC PIPE (CL III) (18 IN)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	REMOV STR (SET)	REMOV STR (PIPE)
	STA	SY	STA	CY	CY	TON	CY	SY	GAL	GAL	CY	SY	CY	CY	LF	EA	EA	LF
BEGIN INTERSECTION REALIGNMENT TO STA 109+83 (SHEET 1 OF 7)	6		7	908	384	55	572.17	4894	457	745	16				104	6	2	65
STA 22+50 TO STA 35+00 (SHEET 2 OF 7)	12.5			551	750	117	1309.83	2782	1048	1674	37				96	8		84
STA 35+00 TO STA 47+00 (SHEET 3 OF 7)	12			551	872	113	1273.83	2788	1019	1622	36			31	60	4		17
STA 47+00 TO STA 59+00 (SHEET 4 OF 7)	12			551	896	113	1266.67	2788	1013	1621	36			32	24	2		16
STA 59+00 TO STA 71+00 (SHEET 5 OF 7)	12	149.4		559	262	110	1237.71	2832	990	1578	35		31		236	18		98
STA 71+00 TO STA 83+00 (SHEET 6 OF 7)	12	496		552	196	101	1133.32	2810	907	1419	31	200			204	10		100
STA 83+00 TO STA 84+83 (SHEET 7 OF 7)	1.8			52	47	17	187.69	449	150	236	5							
PROJECT TOTALS	68.30	645	7	3724	3407	627	6981.21	19343	5585	8895	196	200	31	63	724	48	2	380

SUMMARY OF ROADWAY ITEMS

LOCATION	530 6002	530 6004	530 6005	530 6009	540 6001	540 6020	544 6001	560 6003	3076 6048
	INTERSECTIONS (ACP)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	TURNOUTS (SURF TREAT)	MTL W-BEAM GD FEN (TIM POST)	MTL W - BEAM GD FEN (LOW FILL CULVERT)	GUARDRAIL END TREATMENT (INSTALL)	MAILBOX INSTALL-M (TWG-POST) TY 1	D-GR HMA TYP-D PG76-22
	SY	SY	SY	SY	LF	LF	EA	EA	TON
BEGIN INTERSECTION REALIGNMENT TO STA 109+83 (SHEET 1 OF 7)			271						270
STA 22+50 TO STA 35+00 (SHEET 2 OF 7)	152		221	60				4	606
STA 35+00 TO STA 47+00 (SHEET 3 OF 7)			124	30	700	37.5	4	2	587
STA 47+00 TO STA 59+00 (SHEET 4 OF 7)			97	30	750	50	4	2	587
STA 59+00 TO STA 71+00 (SHEET 5 OF 7)	133	181	533	137				8	571
STA 71+00 TO STA 83+00 (SHEET 6 OF 7)	570	490	150	45				5	513
STA 83+00 TO STA 84+83 (SHEET 7 OF 7)									86
PROJECT TOTALS	855	671	1396	302	1450	87.5	8	21	3218

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	401 6001	662 6063	662 6093	662 6095	662 6111	6185 6002	6185 6003	6305 6003	6305 6004	6305 6005	6305 6006	6305 6007	6305 6008
	FLOWABLE BACKFILL	WK ZN PAV MRK REMOV (W) 4" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (BRK)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	TMA (STATIONARY)	TMA (MOBILE OPERATION)	LCS SYSTEM (INSTALL ONLY)	LCS SIGNAL UNIT (INSTALL ONLY)	LCS SYSTEM (RELOCATE)	LCS SIGNAL UNIT (RELOCATE)	LCS SYSTEM (REMOVE)	LCS SIGNAL UNIT (REMOVE)
	CY	LF	LF	LF	EA	DAY	HR	EA	EA	EA	EA	EA	EA
STA 44+48.07-BOX EXTENSION	30												
STA 49+36.82-BOX EXTENSION	40												
PROJECT TOTALS	70	12555	3223	9169	663	5	40	2	2	6	6	2	2

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SCALE: NONE

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

01.29.2021

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 Texas Department of Transportation

LEE COUNTY
FM 696

QUANTITY SUMMARY

SHEET 1 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	9

SUMMARY OF SIGNING ITEMS

LOCATION	644 6001	644 6002	644 6004	644 6007	644 6027	644 6038	644 6060	644 6076
	IN SM RD SN SUP&AM TY10BWG(1)SA (P)	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1)SA (T)	IN SM RD SN SUP&AM TY10BWG(1)SA (U)	IN SM RD SN SUP&AM TYS80(1)SA(P)	IN SM RD SN SUP&AM TYS80(1)SA(U-EXAL)	IN SM RD SN SUP&AM TYTWT(1)WS(P)	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA	EA	EA	EA
BEGIN INTERSECTION REALIGNMENT TO STA 26+00 (SHEET 1 OF 4)		1	1	2		1	8	10
STA 26+00 TO STA 49+00 (SHEET 2 OF 4)		1	3	1		1	5	10
STA 49+00 TO STA 73+00 (SHEET 3 OF 4)		1	1				9	10
STA 73+00 TO END (SHEET 4 OF 4)	3	6	1	1	3		5	16
PROJECT TOTALS	3	9	6	4	3	2	27	46

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	658 6016	658 6047	666 6048	666 6342	666 6344	666 6345	672 6009
	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	INSTL OM ASSM (OM-2Y)(WC)GND	REFL PAV MRK TY I (W)24"(SLD) (100MIL)	REF PROF PAV MRK TY I(W)4"(SLD) (100MIL)	REF PROF PAV MRK TY I(Y)4"(BRK) (100MIL)	REF PROF PAV MRK TY I(Y)4"(SLD) (100MIL)	REFL PAV MRKR TY II-A-A
	EA	EA	LF	LF	LF	LF	EA
BEGIN INTERSECTION REALIGNMENT TO STA 26+00 (SHEET I OF 4)			11	1570	50	1450	21
STA 26+00 TO STA 49+00 (SHEET 2 OF 4)	20	2	11	4510	1260	3200	56
STA 49+00 TO STA 73+00 (SHEET 3 OF 4)	5	2	20	4725	1913	2735	59
STA 73+00 TO END (SHEET 4 OF 4)			91	1950		1984	25
PROJECT TOTALS	25	4	133	12755	3223	9369	161

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	160 6003	162 6002	164 6009	164 6011	164 6035	168 6001	169 6002	506 6002	506 6011	506 6038	506 6039
	FURNISHING AND PLACING TOPSOIL (4")	BLOCK SODDING	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	DRILL SEEDING (PERM) (RURAL) (CLAY)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY B)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	SY	MG	SY	LF	LF	LF	LF
BEGIN INTERSECTION REALIGNMENT TO STA 26+00 (SHEET I OF 4)	36		18	18	36	0.30	36				
STA 26+00 TO STA 49+00 (SHEET 2 OF 4)	5232		2616	2616	5232	43.95	5232	50	50	40	40
STA 49+00 TO STA 73+00 (SHEET 3 OF 4)		3550						50	50	40	40
STA 73+00 TO END (SHEET 4 OF 4)		4012								40	40
PROJECT TOTALS	5268	7562	2634	2634	5268	45	5268	100	100	120	120

SCALE: NONE

NO.	DATE	REVISION	APPROV.

2.1.2021

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Texas Department of Transportation

LEE COUNTY
FM 696

QUANTITY SUMMARY

SHEET 2 OF 3

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	10

FM 696 SUMMARY OF DRAINAGE													
ITEM NO	400	400	401	403	432	462	462	464	466	466	467	480	496
DESC CODE	6001	6005	6001	6001	6026	6059	6060	6018	6180	6181	6388	6001	6005
LOCATION	STRUC EXCAV	CEM STABIL BKFL	FLOWABLE BACKFILL	TEMPORARY SPL SHORING	RIPRAP (STONE COMMON) (DRY) (18 IN)	CONC BOX CULV (7FT X4FT) (EXTEND)	CONC BOX CULV (7FT X5FT) (EXTEND)	RC PIPE (CL IV) (24 IN)	WINGWALL (PW-1) (HW= 5 FT)	WINGWALL (PW-1) (HW= 6 FT)	SET (TY II) (24 IN) (RCP) (3: 1) (C)	CLEAN EXIST CULVERTS	REMOVE STR (WINGWALL)
	CY	CY	CY	SF	CY	LF	LF	LF	EA	EA	EA	EA	EA
CULVERT A	34	35		212	95	52			2			2	2
CULVERT B	51	50	16	350	120		81			2		3	2
CULVERT C	35	22						43			2		
TOTAL:	120	107	16	562	215	52	81	43	2	2	2	5	4

NOTES:

PAINTING PSN ON BRIDGE CLASS CULVERT IS SUBSIDIARY TO ITEM 462, CONCRETE BOX CULVERTS AND DRAINS. SEE PSN, FOR DETAILS NOT SHOWN.

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FM 696

QUANTITY SUMMARY

SHEET 3 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	11

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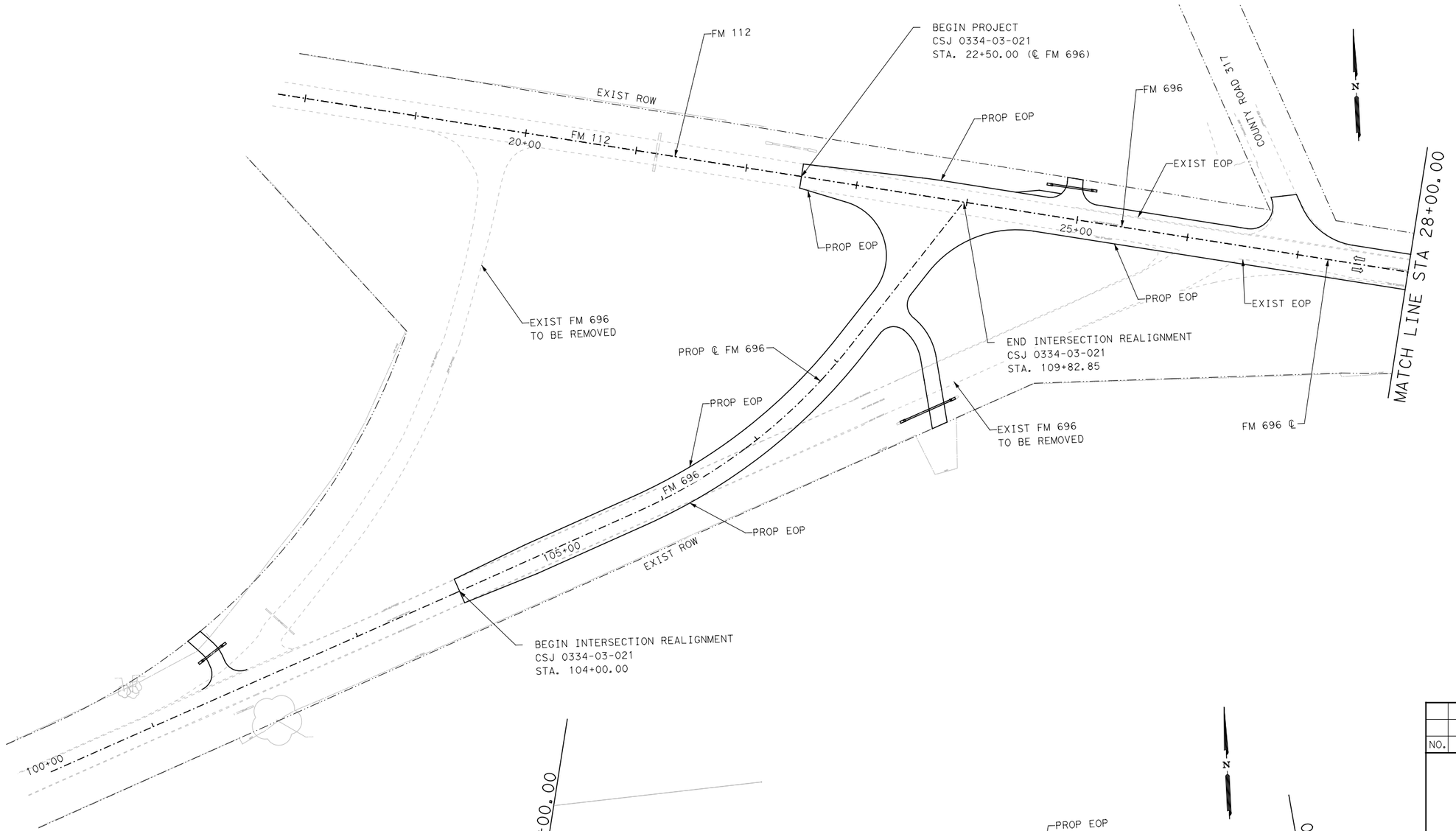

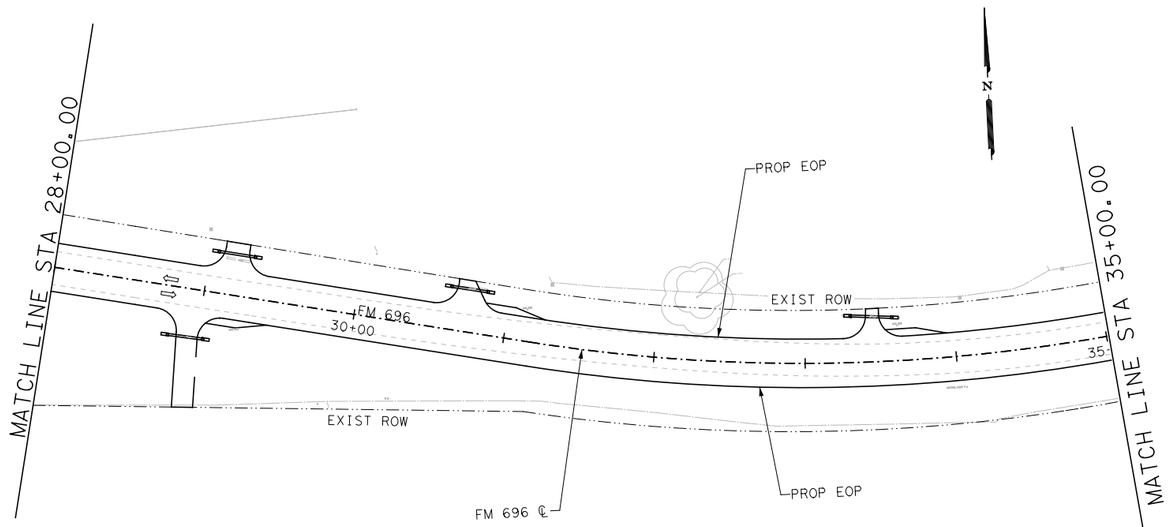

NO.	DATE	REVISION	APPROV.

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Texas Department of Transportation

LEE COUNTY
FM 696
PROJECT LAYOUT

SHEET 1 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	12

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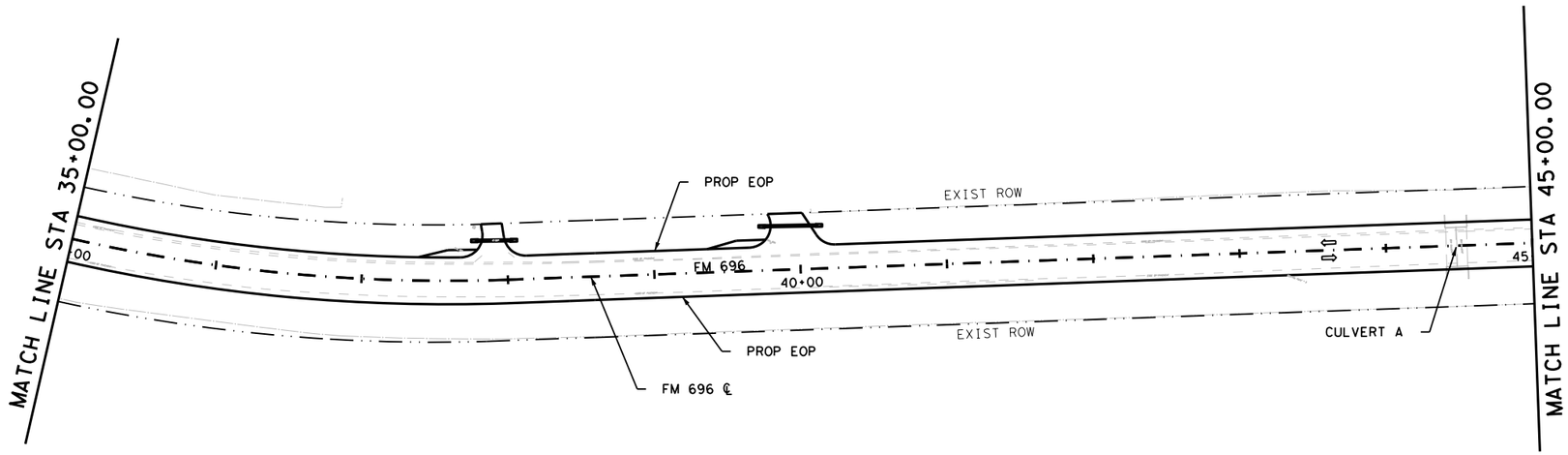

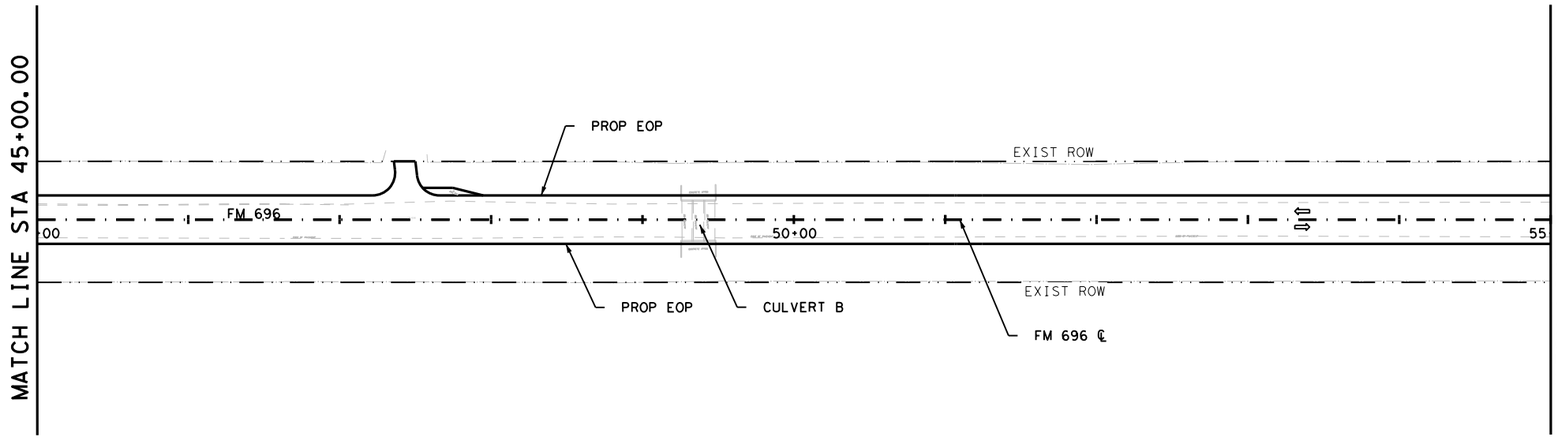

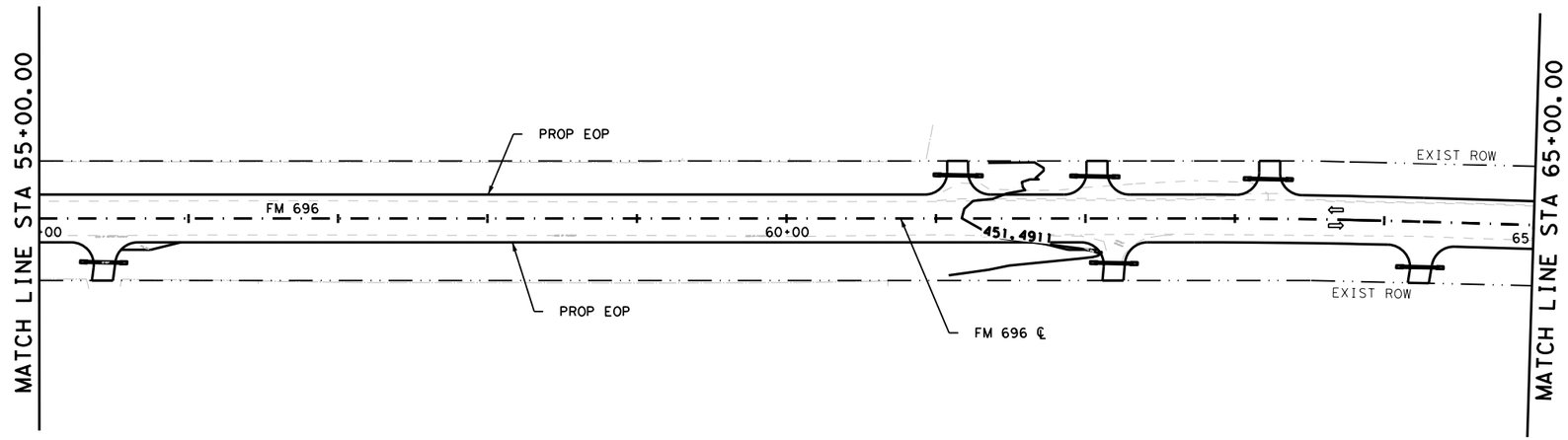

LEGEND:

- DIRECTION OF TRAVEL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE

N

0' 25' 50' 100'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
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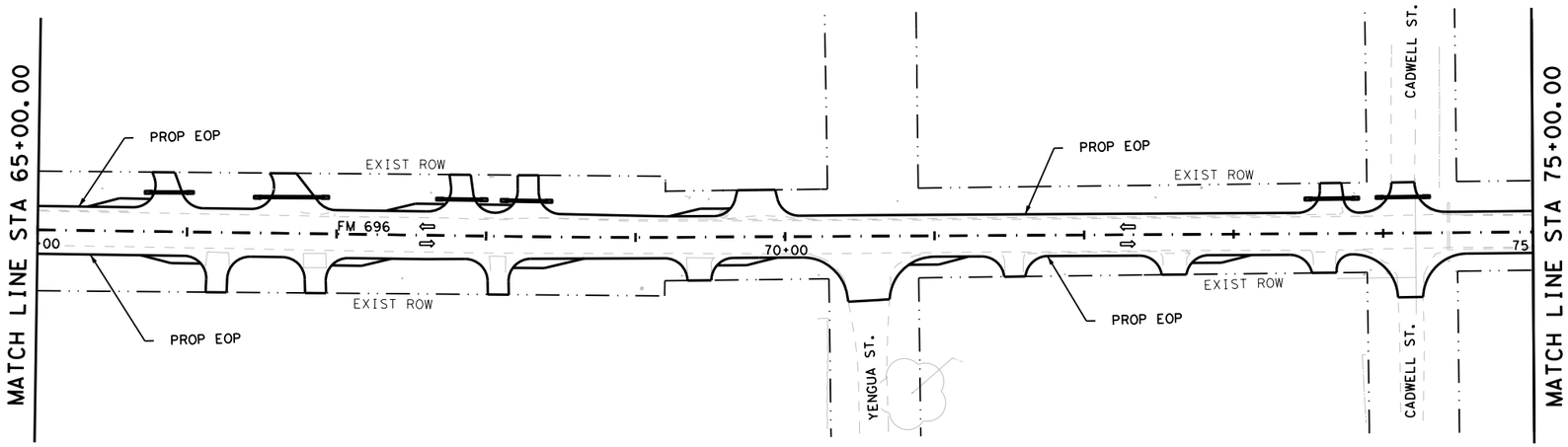
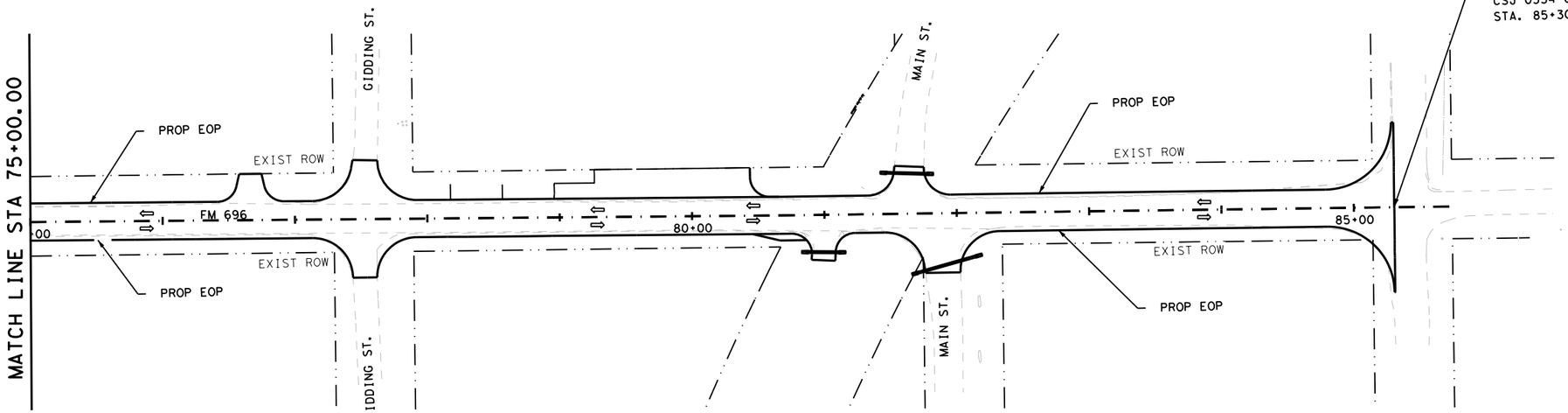
LEE COUNTY
FM 696

PROJECT LAYOUT

SHEET 2 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	13





LEGEND:

- DIRECTION OF TRAVEL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE

N

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0' 25' 50' 100'

NO.	DATE	REVISION	APPROV.

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LEE COUNTY
FM 696

PROJECT LAYOUT

SHEET 3 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	14

PENTABLE: $PENTBLS$
PLOTDRIVER: $PLTDRVS$
USER:
11:06:00 AM
DATE:10/23/2020
FILE:FM696_PL3.dgn

GENERAL NOTES

1. CONSTRUCT THE ROADWAY USING ONE-WAY TRAFFIC CONTROL AND USE TEMPORARY SIGNALS DURING THE CLOSURE OF ONE LANE.
2. CONSTRUCT 100:1 (OR AS APPROVED) VERTICAL TRANSITIONS BETWEEN WORK SECTIONS BEFORE OPENING TO TRAFFIC. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY.
3. SPRINKLE FOR DUST CONTROL AS DIRECTED. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY.
4. UTILIZE TCP(2-1)-18 FOR WORK IN THE RIGHT-OF-WAY THAT DOES NOT REQUIRE LANE CLOSURES. THIS WORK INCLUDES PREPARING ROW, GRADING, DRIVEWAY CONSTRUCTION, SEEDING, ETC.
5. INCORPORATE 3:1 SAFETY WEDGES FOR ALL DROP OFFS GREATER THAN TWO (2") INCHES LEFT OVERNIGHT. CONSIDER THIS SUBSIDIARY TO THE VARIOUS ITEMS.
6. MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT SITE TO REDUCE PONDING.

PHASE 1

PHASE 1 CONSISTS OF EXTENDING OR REPLACING CROSS DRAINAGE STRUCTURES. SEE (TCP TYPICAL SECTIONS PHASE 1) FOR MORE DETAILS.

1. EXTEND OR REPLACE THE DOWNSTREAM END OF THE CULVERT UTILIZING TCP(2-2b)-18 FOR BOX EXTENSION FOR FULL PIPE CULVERT REPLACEMENT.
2. EXTEND OR REPLACE THE UPSTREAM END OF THE CULVERT UTILIZING TCP(2-2b)-18 FOR BOX EXTENSION FOR FULL PIPE CULVERT REPLACEMENT.
3. RESTORE TRAFFIC TO ITS ORIGINAL LOCATION AND STABILIZE SOIL UTILIZING TCP(2-1)-18 OR TCP(2-2b)-18. REPEAT STEPS 1 AND 2 FOR EACH CULVERT UNTIL EVERY CULVERT HAS BEEN EXTENDED OR REPLACED AS SHOWN ELSEWHERE IN THE PLANS.

PHASE 2, STEP 1-3

THIS STEP CONSISTS OF CONSTRUCTING THE WESTBOUND LANE.

1. CLOSE WESTBOUND LANE FOR THE LIMITS OF THE WORK ZONE USING TCP(2-2b)-18. LIMIT THE LENGTH OF THE WORK ZONE TO 0.5 MILES. USE ONE-WAY TRAFFIC CONTROL AND TEMPORARY TRAFFIC SIGNALS WHILE THE LANE CLOSURE IS IN PLACE.
2. PLANE 4" OF HMAC AND STOCKPILE AT A LOCATION FOR FUTURE USE.THIS MATERIAL WILL BE USED FOR BACKFILLING EDGES.
3. EXCAVATE 6" OF EXIST FLEXBASE AND 2" OF SUBGRADE.
4. PLACE PLANT MIXED CEMENT TREATED BASE MATERIAL ON THE WESTBOUND LANE.
5. APPLY PRIME COAT ON CEMENT TREATED BASE WESTBOUND LANE.
6. PAVE THE SECTION IN STEP (5) WITH (2.5") OF TYP "D" PG (76-22)AND INSTALL SHORT TERM PAVEMENT MARKING PER WZ(STMP)-13.
7. REPEAT STEPS (1) THROUGH STEP (6) ON WESTBOUND LANE IN 1000 FT INTERVALS.
8. CONSTRUCT PAVEMENT TRANSITIONS AND OPEN SECTION TO TRAFFIC.

PHASE 2, STEP 4-6

THIS STEP CONSISTS OF CONSTRUCTING THE EASTBOUND LANE.

1. CLOSE EASTBOUND LANE FOR THE LIMITS OF THE WORK ZONE USING TCP(2-2b)-18. LIMIT THE LENGTH OF THE WORK ZONE TO 0.5 MILES. USE ONE-WAY TRAFFIC CONTROL AND TEMPORARY TRAFFIC SIGNALS WHILE THE LANE CLOSURE IS IN PLACE.
2. PLANE 4" OF HMAC AND STOCKPILE AT A LOCATION FOR FUTURE USE.THIS MATERIAL WILL BE USED FOR BACKFILLING EDGES.
3. EXCAVATE 6" OF EXIST FLEXBASE AND 2" OF SUBGRADE.
4. PLACE PLANT MIXED CEMENT TREATED BASE MATERIAL ON THE EASTBOUND LANE.
5. APPLY PRIME COAT ON SECTION IN STEP (4).
6. PAVE THE SECTION IN STEP (4) WITH (2.5") OF TYP "D" PG (76-22)AND INSTALL SHORT TERM PAVEMENT MARKING PER WZ(STMP)-13.
7. REPEAT STEPS (2) THROUGH STEP (6) ON EASTBOUND LANE ON 1000 FT INTERVALS.
8. CONSTRUCT PAVEMENT TRANSITIONS AND OPEN SECTION TO TRAFFIC.

PHASE 2, STEP 7-8

THIS STEP CONSISTS OF OVERLAYING THE TY "D" HMA WITH 0.5" OCST MATERIAL.

1. CLOSE ONE LANE FOR THE LIMITS OF THE WORK ZONE USING TCP(2-2b)-18. LIMIT THE LENGTH OF THE WORK ZONE TO WHAT CAN BE CONSTRUCTED IN A SINGLE DAY. USE ONE-WAY TRAFFIC CONTROL WHILE THE LANE CLOSURE IS IN PLACE.
2. OVERLAY 0.5" OCST FOR BOTH LANES ALONG THE FULL LENGTH OF THE PROJECT.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	401 6001	6185 6002	6185 6003	6305 6003	6305 6004	6305 6005	6305 6006	6305 6007	6305 6008	662 6063	662 6093	662 6095	662 6111
	FLOWABLE BACKFILL	TMA (STATIONARY)	TMA (MOBILE OPERATION)	LCS SYSTEM (INSTALL ONLY)	LCS SIGNAL UNIT (INSTALL ONLY)	LCS SYSTEM (RELOCATE)	LCS SIGNAL UNIT (RELOCATE)	LCS SYSTEM (REMOVE)	LCS SIGNAL UNIT (REMOVE)	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (Y)4"(BRK)	WK ZN PAV MRK REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2
	CY	DAY	HR	EA	EA	EA	EA	EA	EA	LF	LF	LF	EA
STA 44+48.07-BOX EXTENSION	30												
STA 49+36.82-BOX EXTENSION	40												
PROJECT TOTALS	70	5	40	2	2	6	6	2	2	12555	3223	9169	663

*INCIDENTAL ITEMS, FOR CONTRACTOR'S INFORMATION ONLY

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS — MARK W. LITZMANN — 62129 — LICENSED PROFESSIONAL ENGINEER

11.05.2020

Mark W. Litzmann, P.E.

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Houston, TX 77094
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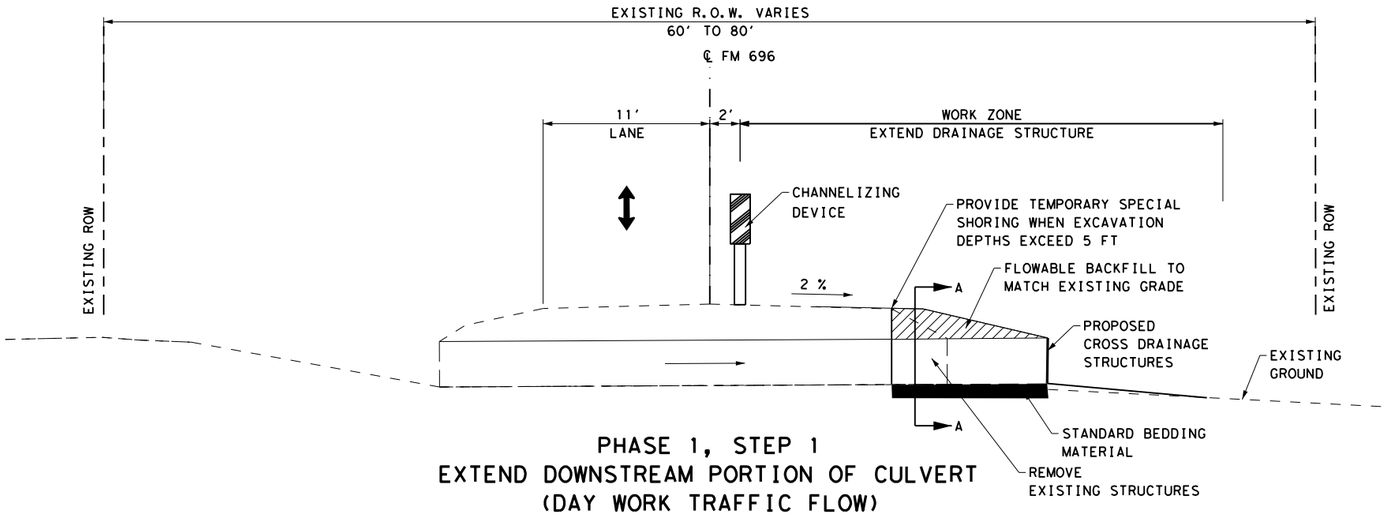
texas.kci.com
TBPE Registration No. F-10573

LEE COUNTY
FM 696

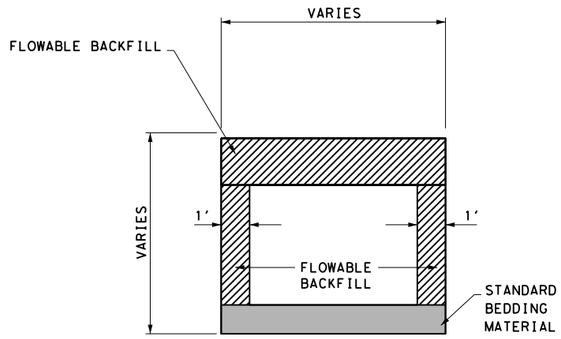
SEQUENCE OF WORK

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	15

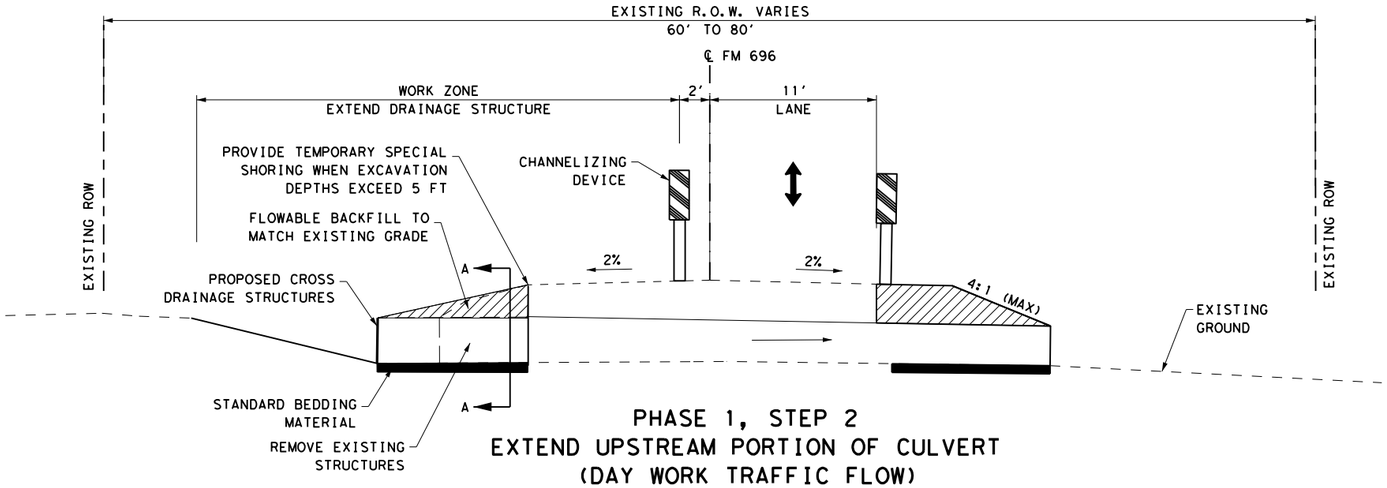


PHASE 1, STEP 1
EXTEND DOWNSTREAM PORTION OF CULVERT
(DAY WORK TRAFFIC FLOW)
UTILIZE BC-(10)-14 DURING NON-WORK HOURS



SECTION A-A

NOTE: 1) THE CONTRACTOR SHALL RESTORE TWO-WAY TRAFFIC TO ITS ORIGINAL LOCATION AT THE END THE WORK DAY.



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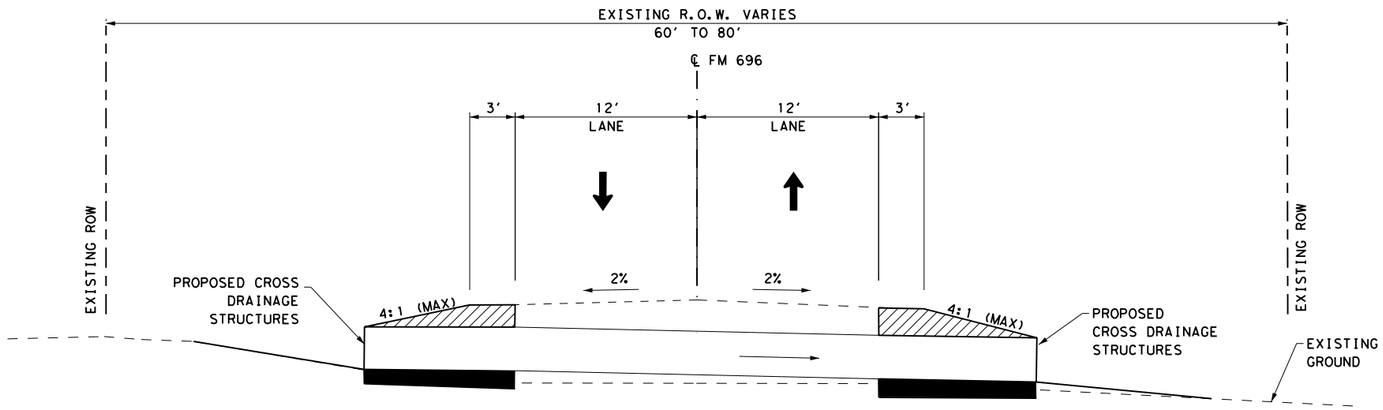
EXTEND UPSTREAM PORTION OF CULVERT
(DAY WORK TRAFFIC FLOW)
UTILIZE BC-(10)-14 DURING NON-WORK HOURS



PHASE 1, STEP 3
(NON-WORK TRAFFIC FLOW)

NOT TO SCALE

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
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10.23.2020
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FM 696

TCP TYPICAL SECTIONS

PHASE 1

MBC CULVERT EXTENSIONS

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	16

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PLOTDRIVER: $PLTDRVS$
USER:
DATE:10/23/2020 11:06:07 AM
FILE:FM696_TCP_TYP.dgn

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

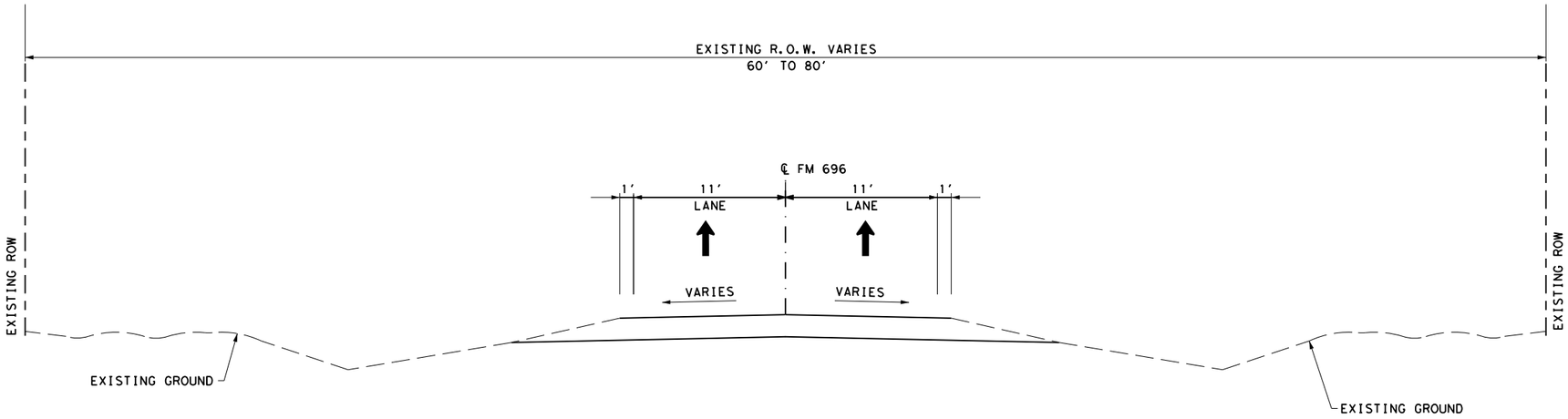
DATE:10/23/2020 11:06:08 AM

FILE:FM696_TCP_TYP.dgn

SEQUENCE OF WORK

TRAFFIC CONTROL:
FROM STA. 22+50.00 TO 85+30.57
PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION.

A. SETUP ADVANCED WARNING SIGNS ACCORDING TO BC STANDARDS.
B. INSTALL EROSION CONTROLS.
C. PREPARE RIGHT OF WAY.
D. SAW CUT, EXCAVATE, AND PREPARE SUBGRADE LEFT OF FM 696 CENTELINE.
E. INSTALL 3:1 SAFETY WEDGES.



EXISTING CONDITION

NOT TO SCALE

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020

Mark W. Litzmann, P.E.

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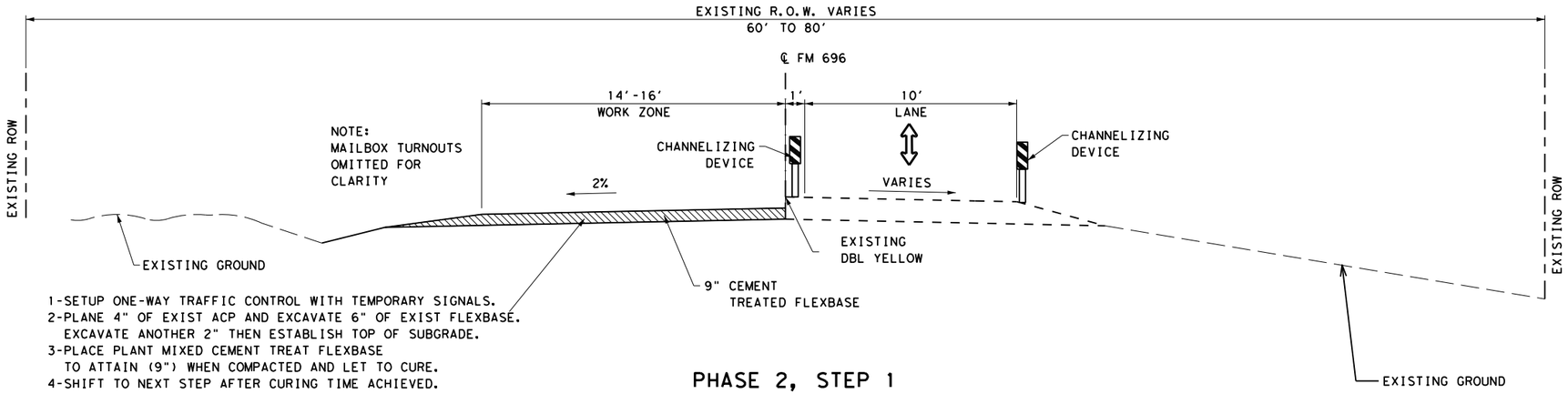
LEE COUNTY
FM 696

TCP TYPICAL SECTIONS

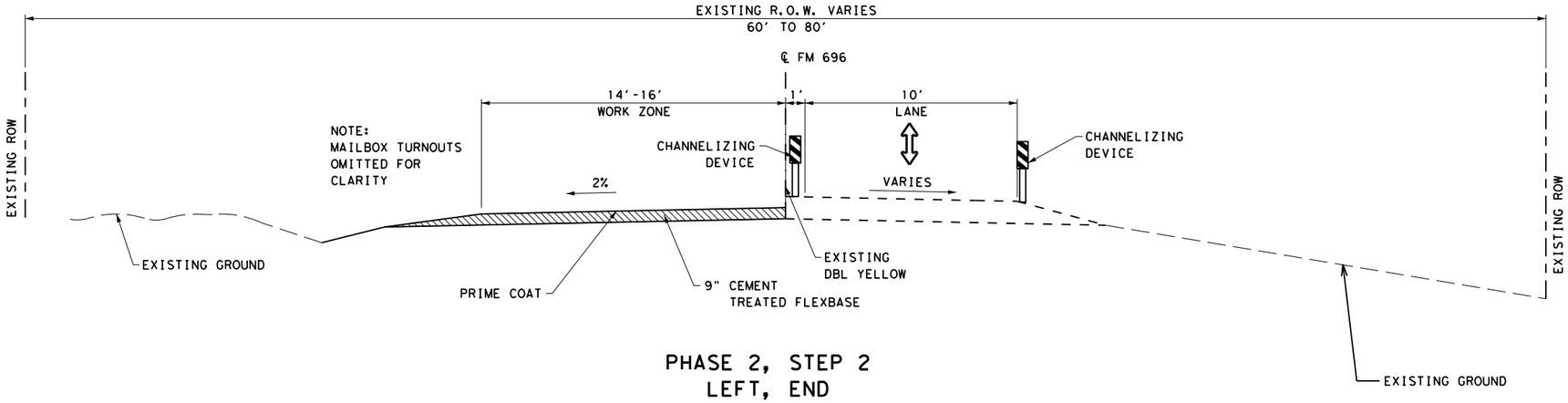
EXISTING CONDITION

SHEET 1 OF 1

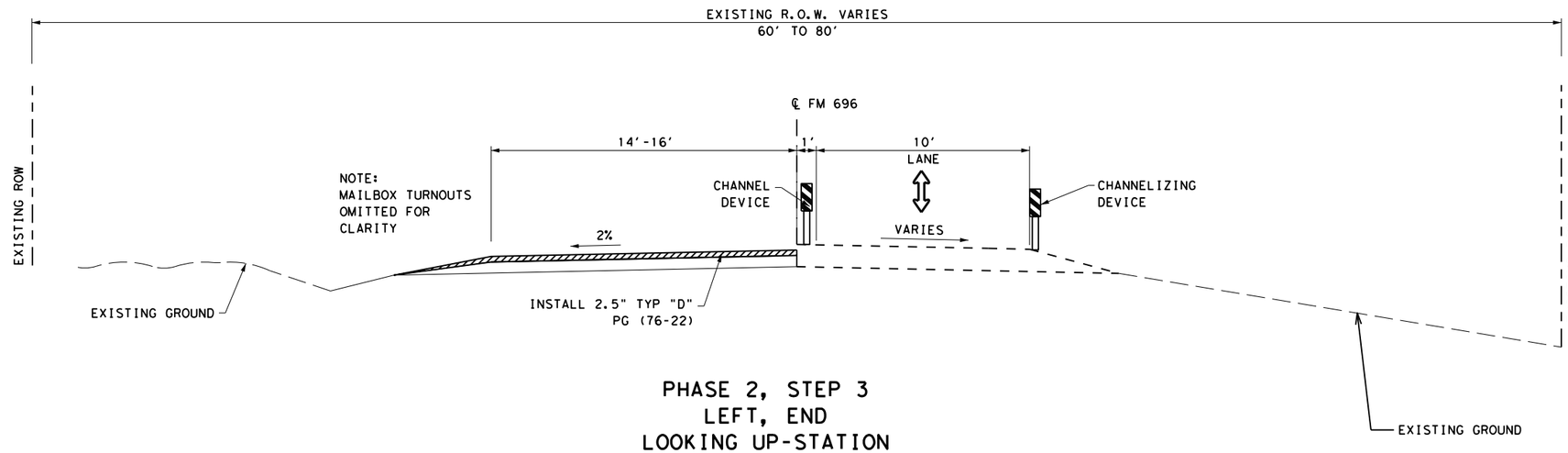
FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	17



PHASE 2, STEP 1
LEFT, BEGIN
LOOKING UP-STATION



PHASE 2, STEP 2
LEFT, END
LOOKING UP-STATION



PHASE 2, STEP 3
LEFT, END
LOOKING UP-STATION

SEQUENCE OF WORK

TRAFFIC CONTROL:
STA. 22+50.00 TO STA. 85+30.57
PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION.

A. INSTALL 3:1 SAFETY WEDGE FOR DROP-OFF GREATER THAN 2".
B. CONSTRUCT 100:1 TRANSITIONS.
C. LIMIT WORK ZONE TO 0.5 MILES.

NOT TO SCALE

NO.	DATE	REVISION	APPROV.

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FM 696

TCP TYPICAL SECTIONS
PHASE 2, STEP 1-3

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	18

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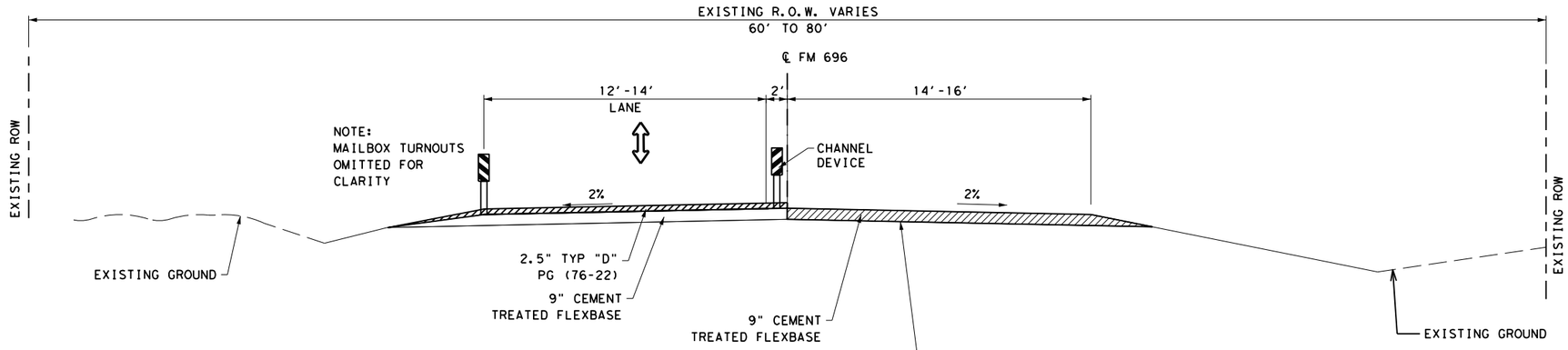
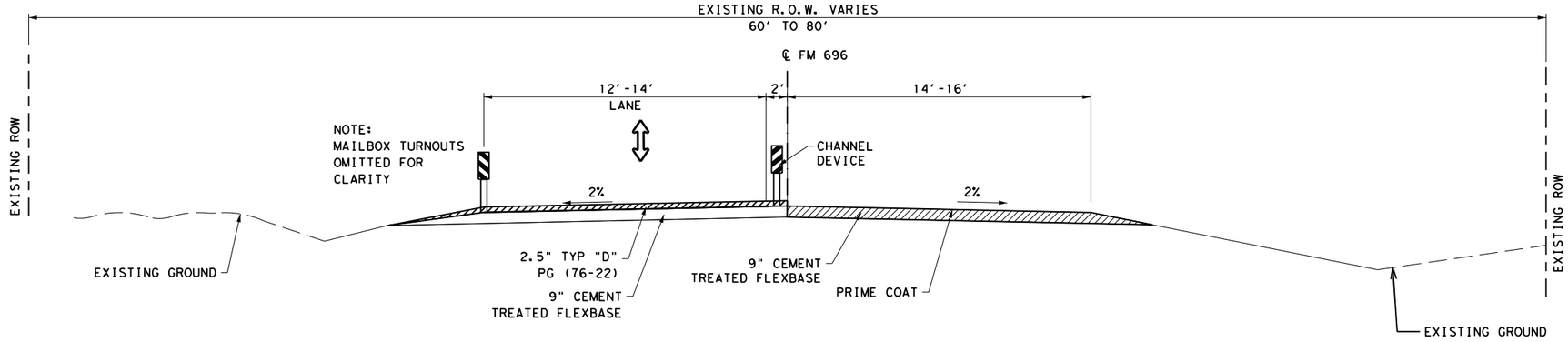
PLOTDRIVER: $PLTDRVS$
USER:
DATE:10/23/2020 11:06:08 AM
FILE:FM696_TCP_TYP.dgn

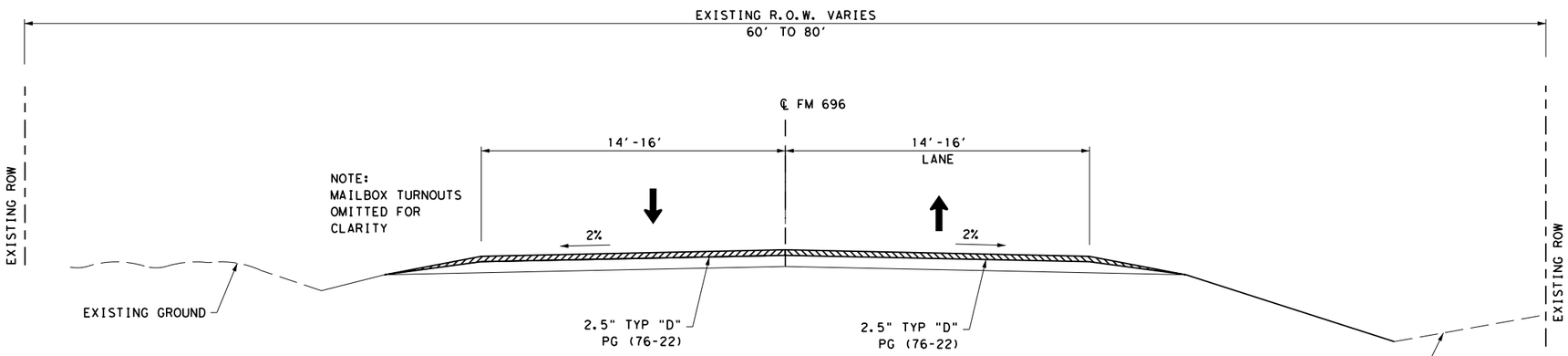


PHASE 2, STEP 4
RIGHT
BEGIN

1-SETUP ONE-WAY TRAFFIC CONTROL WITH TEMPORARY SIGNALS.
2-PLANE 4" OF EXIST ACP AND EXCAVATE 6" OF EXIST FELXBASE.
EXCAVATE ANOTHER 2" THEN ESTABLISH TOP OF SUBGRADE.
3-PLACE PLANT MIXED CEMENT TREAT FLEXBASE
TO ATTAIN (9") WHEN COMPACTED AND LET TO CURE.
4-SHIFT TO NEXT STEP AFTER CURING TIME ACHIEVED.



PHASE 2, STEP 5
RIGHT
END



PHASE 2, STEP 6
END

SEQUENCE OF WORK

TRAFFIC CONTROL:
STA. 22+50.00 TO 85+30.57
PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION.

A. INSTALL 3:1 SAFETY WEDGE FOR DROP-OFF GREATER THAN 2".
B. CONSTRUCT 100:1 TRANSITIONS.
C. RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF PHASE 2 STEP 6

NOT TO SCALE

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
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10.23.2020
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LEE COUNTY
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TCP TYPICAL SECTIONS
PHASE 2, STEP 4-6

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	19

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USER:
DATE: 10/23/2020 11:06:09 AM
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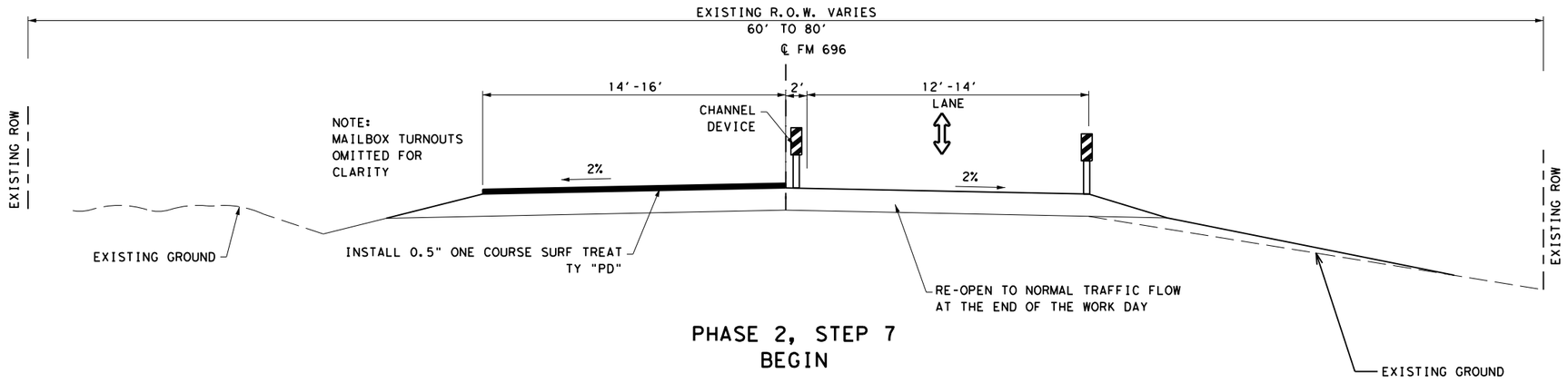
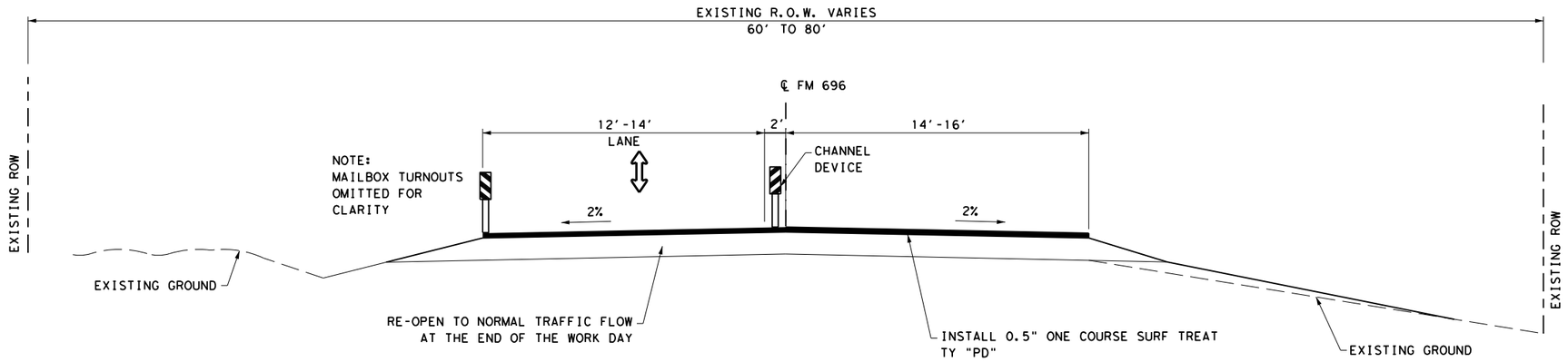


PHASE 2, STEP 7
BEGIN



PHASE 2, STEP 8
END

SEQUENCE OF WORK

TRAFFIC CONTROL:
STA. 22+50.00 TO 85+30.57
PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION.
A. INSTALL 3:1 SAFETY WEDGE FOR DROP-OFF GREATER THAN 2".
B. CONSTRUCT 100:1 TRANSITIONS.
C. RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF PHASE 2 STEP 8.

NO.	DATE	REVISION	APPROV.

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TCP TYPICAL SECTIONS
PHASE 2, STEP 7-8

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	20

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

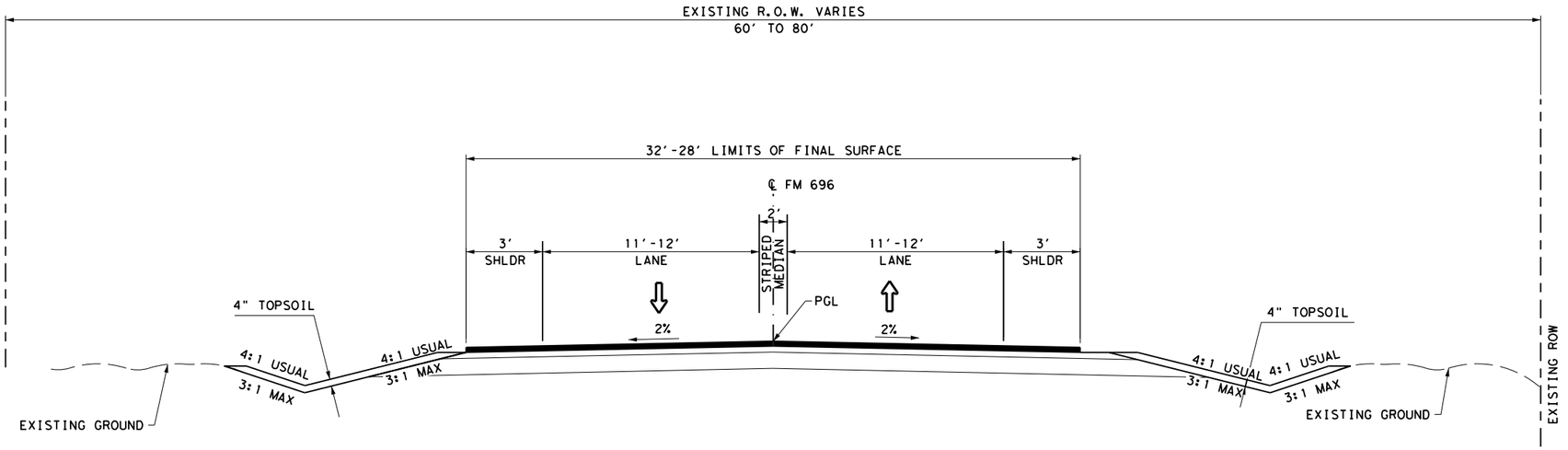
DATE:10/23/2020 11:06:10 AM

FILE:FM696_TCP_TYP.dgn

SEQUENCE OF WORK

TRAFFIC CONTROL:
STA. 22+50.00 TO 85+30.57
PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION.

A. PULL TOPSOIL UP TO NEW PAVEMENT EDGE.
B. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNAGE.
C. PERFORM FINAL CLEAN UP.



WIDENING/REHABILITATION COMPLETE

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
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TCP TYPICAL SECTIONS PHASE 2
REHABILITATION COMPLETE

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	21

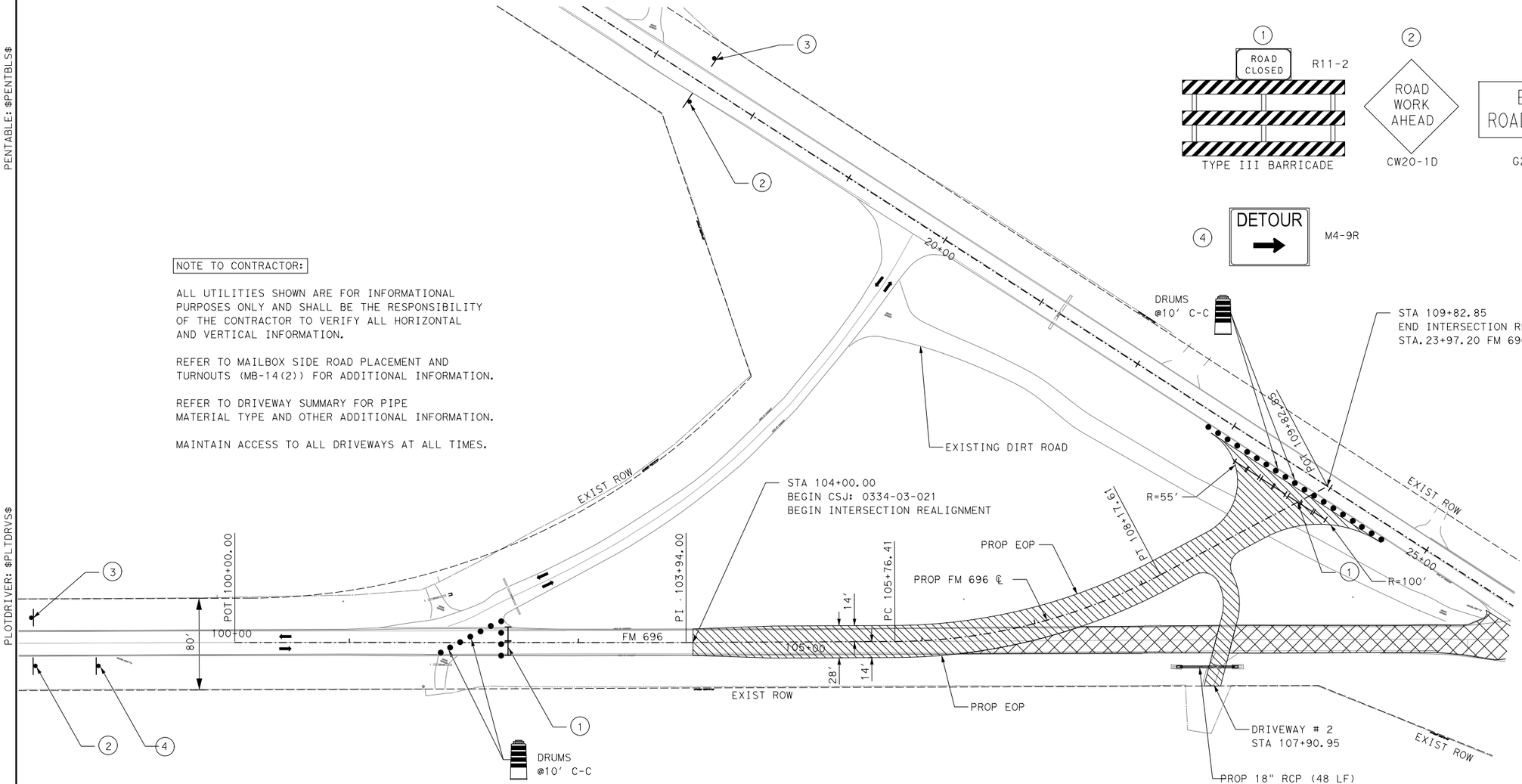
NOTE TO CONTRACTOR:

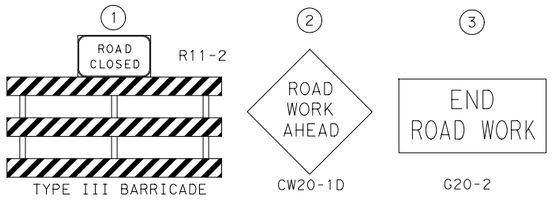
ALL UTILITIES SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL HORIZONTAL AND VERTICAL INFORMATION.

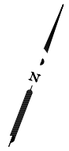
REFER TO MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS (MB-14(2)) FOR ADDITIONAL INFORMATION.

REFER TO DRIVEWAY SUMMARY FOR PIPE MATERIAL TYPE AND OTHER ADDITIONAL INFORMATION.

MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES.







LEGEND:

- DIRECTION OF TRAVEL
- PROPOSED REMOVAL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE
- PROPOSED CONSTRUCTION

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER

01/28/2021

Mark W. Litzmann, P.E.

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TCP INTERSECTION LAYOUT
PHASE 1

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	22

NOTE TO CONTRACTOR:

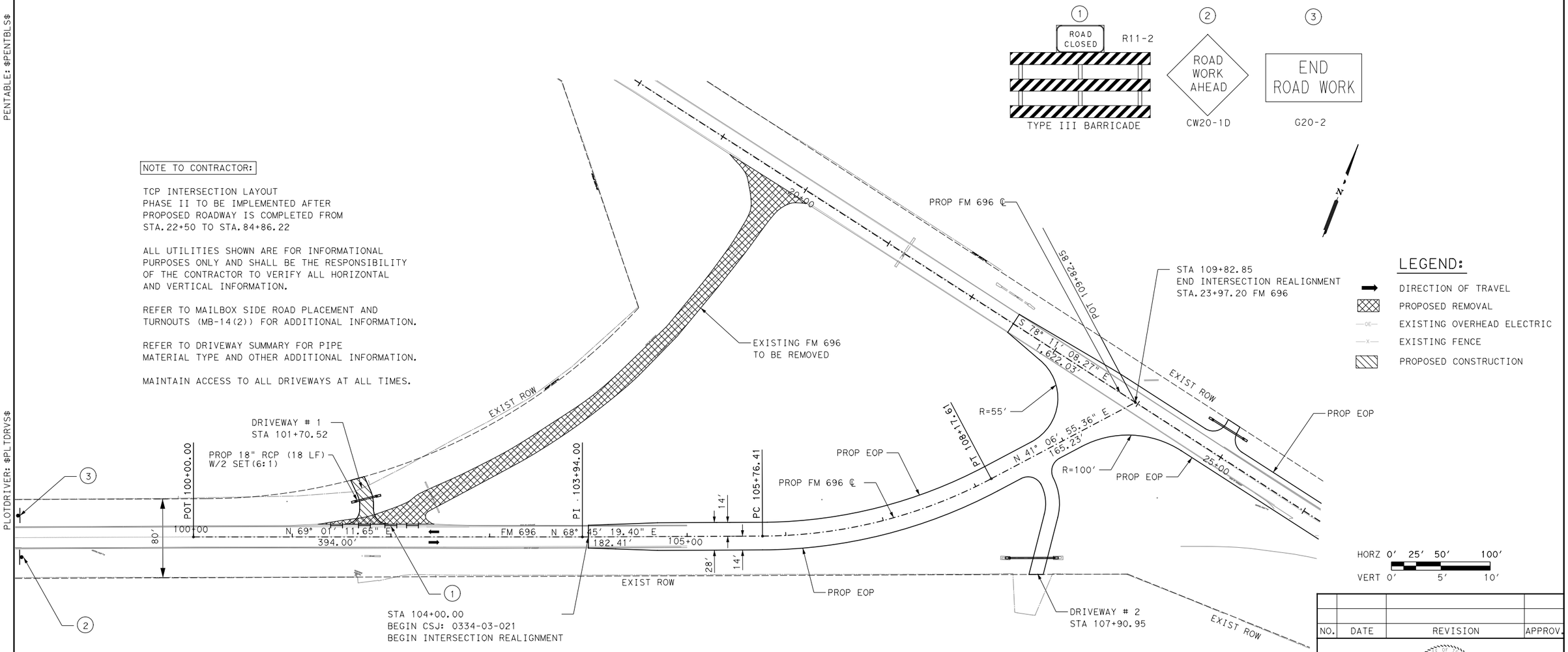
TCP INTERSECTION LAYOUT
PHASE II TO BE IMPLEMENTED AFTER
PROPOSED ROADWAY IS COMPLETED FROM
STA.22+50 TO STA.84+86.22

ALL UTILITIES SHOWN ARE FOR INFORMATIONAL
PURPOSES ONLY AND SHALL BE THE RESPONSIBILITY
OF THE CONTRACTOR TO VERIFY ALL HORIZONTAL
AND VERTICAL INFORMATION.

REFER TO MAILBOX SIDE ROAD PLACEMENT AND
TURNOUTS (MB-14(2)) FOR ADDITIONAL INFORMATION.

REFER TO DRIVEWAY SUMMARY FOR PIPE
MATERIAL TYPE AND OTHER ADDITIONAL INFORMATION.

MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES.



NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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01/28/2021
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LEE COUNTY
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TCP INTERSECTION LAYOUT
PHASE 2

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	23

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

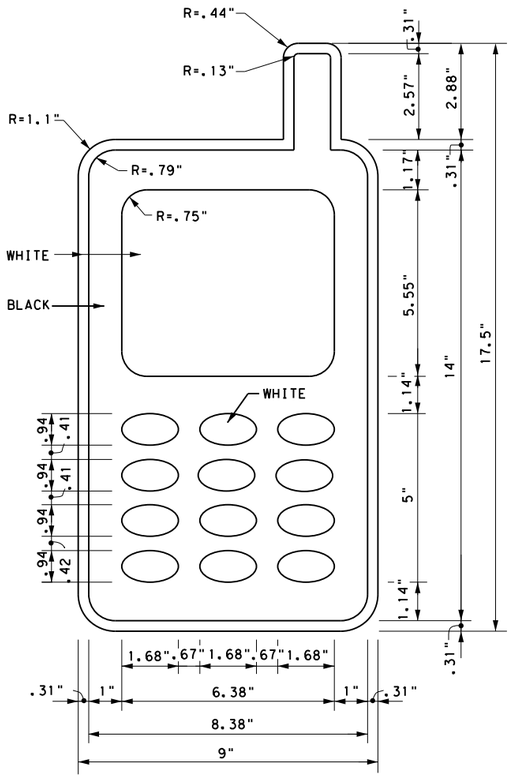
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY APPAREL NOTES:

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



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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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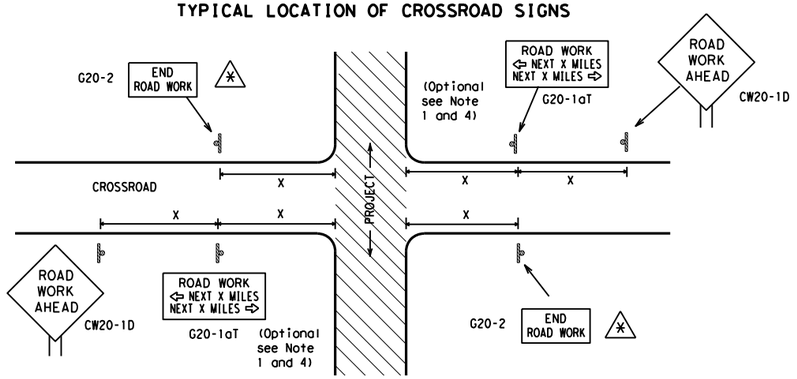
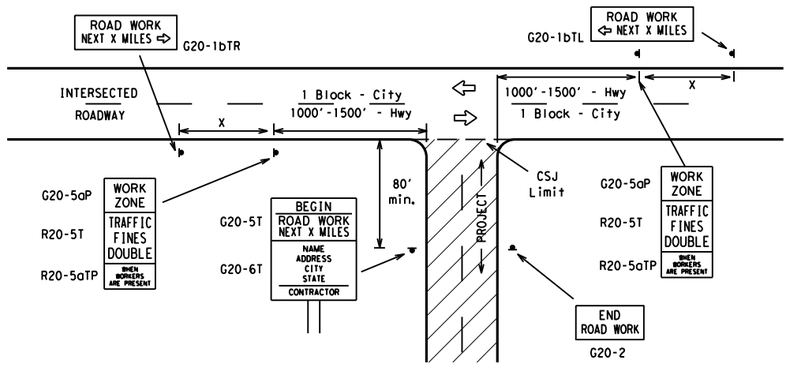
TYPICAL LOCATION OF CROSSROAD SIGNS



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

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. 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]

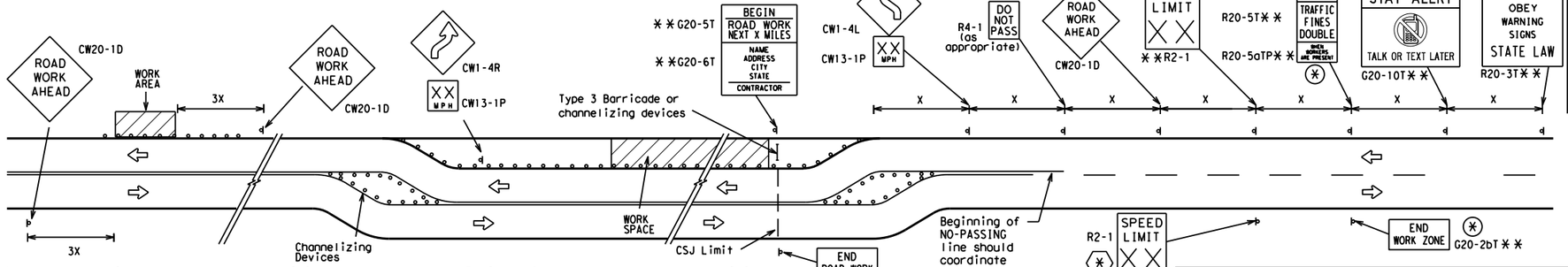
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

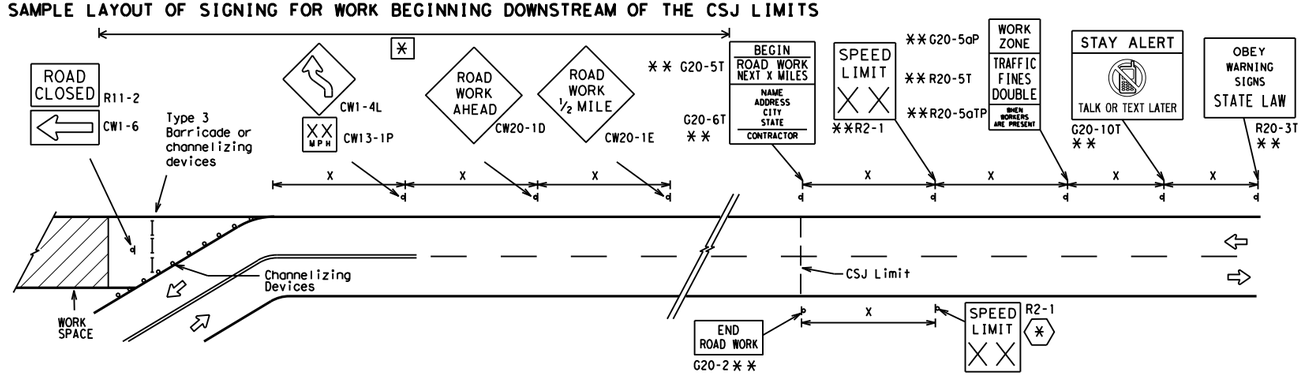
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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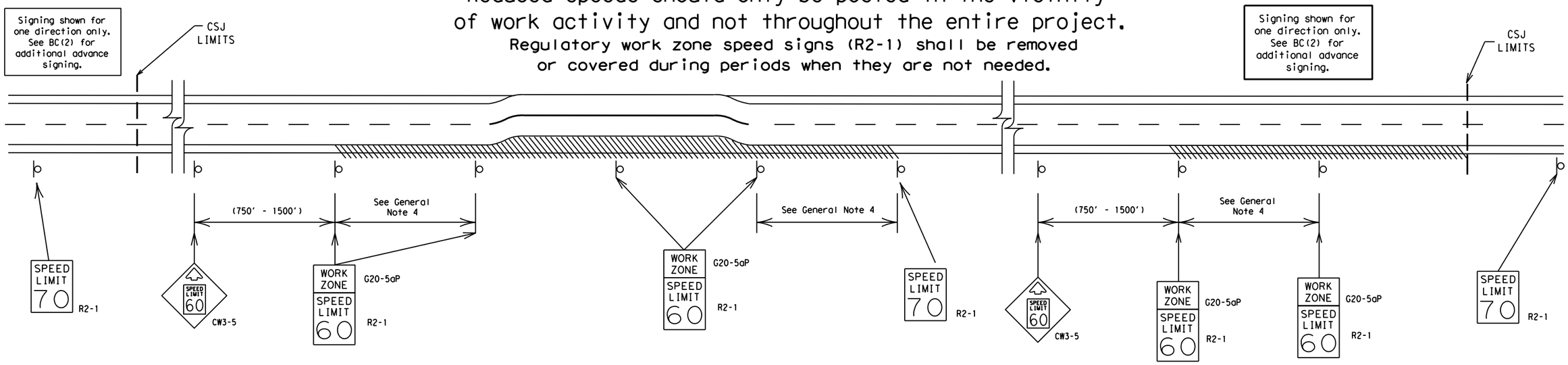
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

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BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

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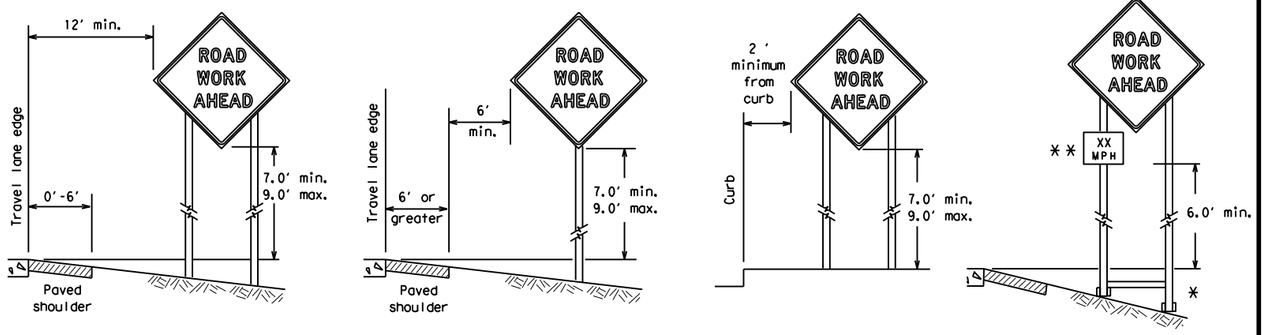
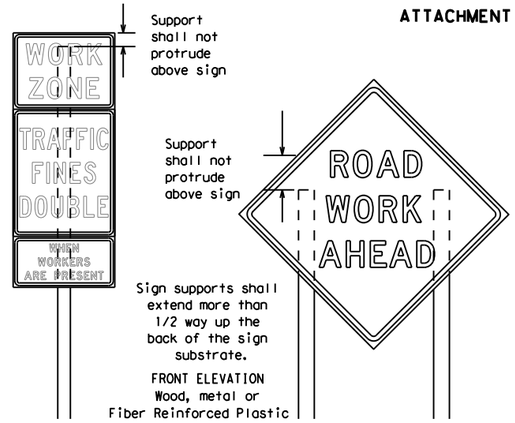
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

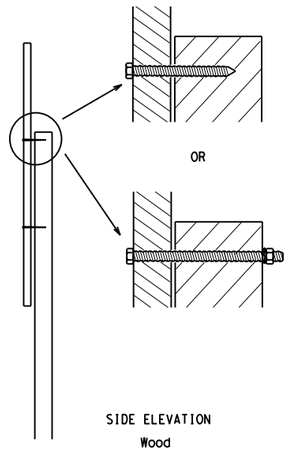


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





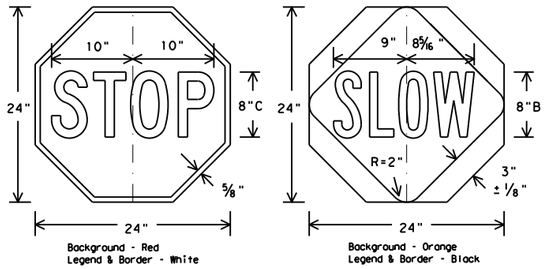
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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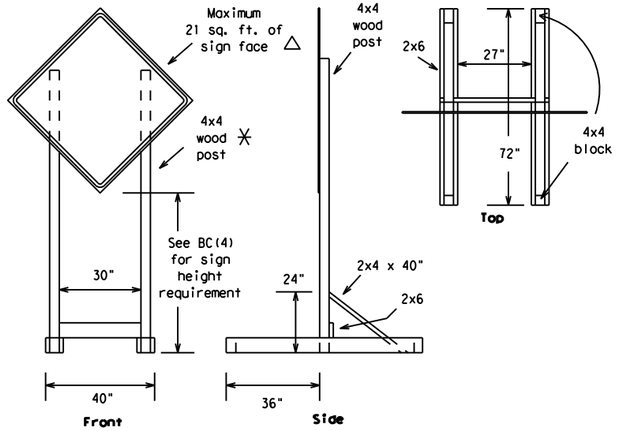
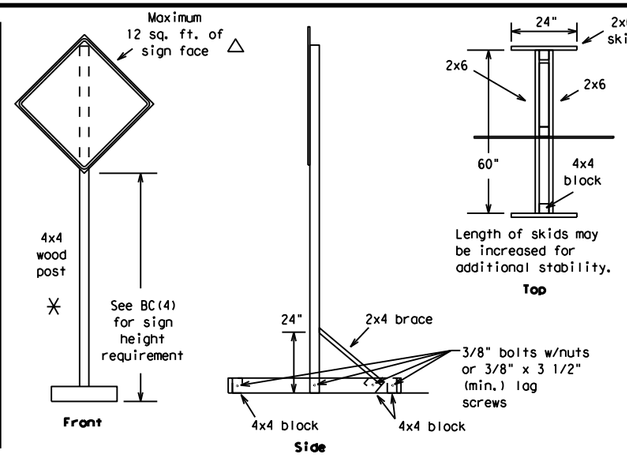
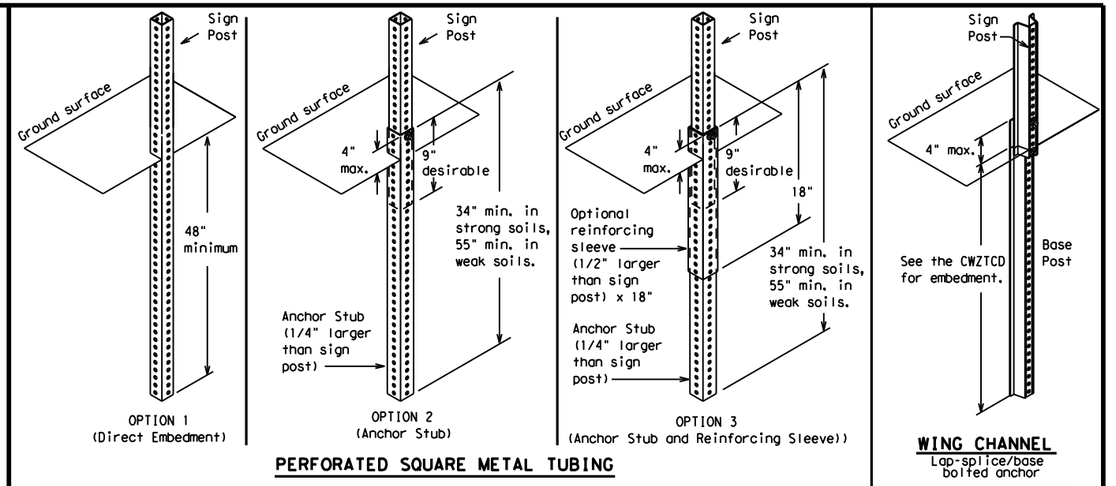




SKID MOUNTED WOOD SIGN SUPPORTS

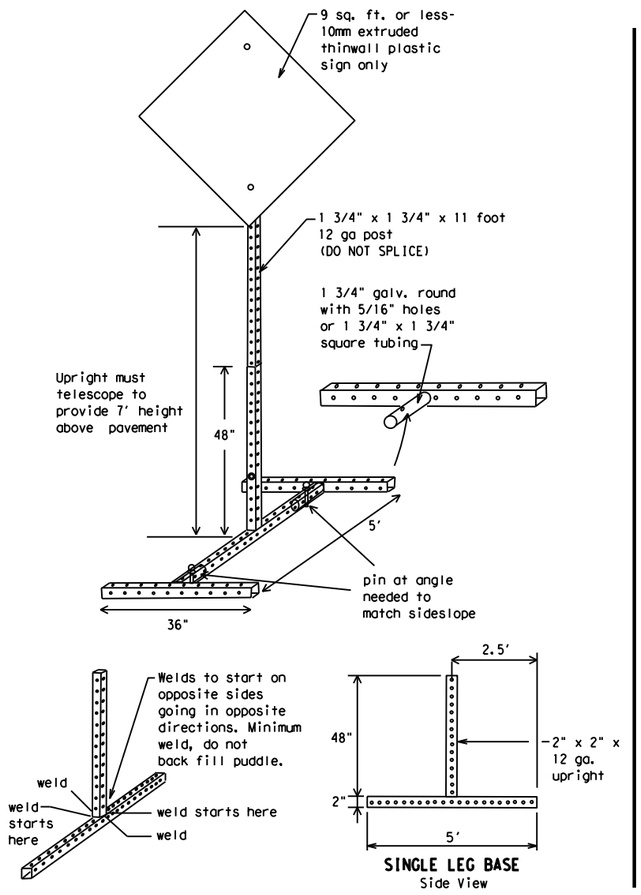
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

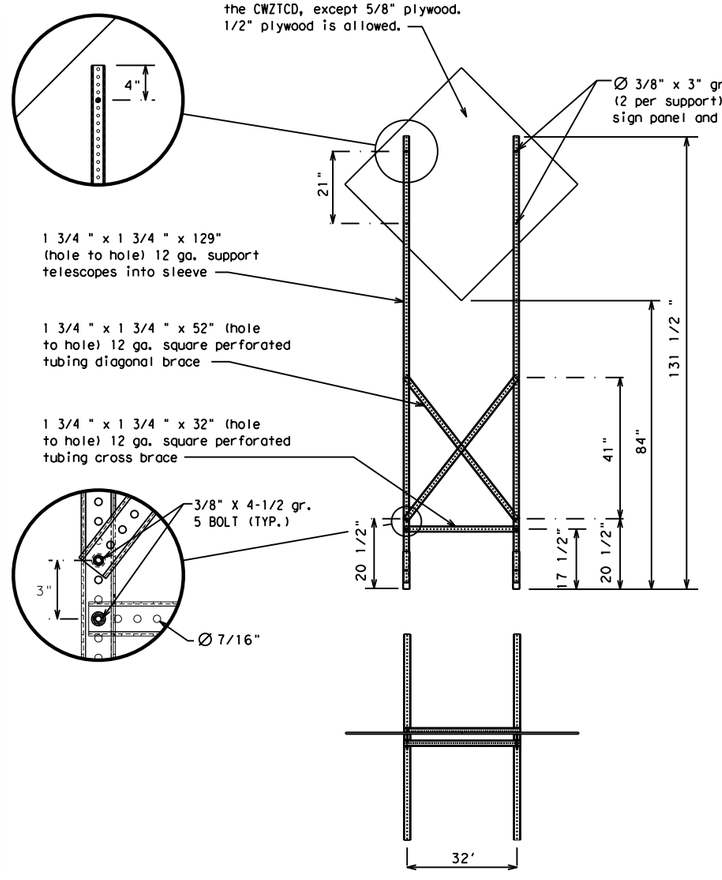


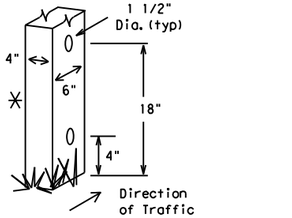
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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

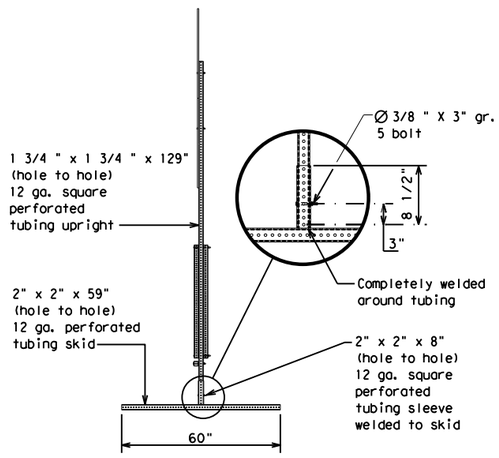






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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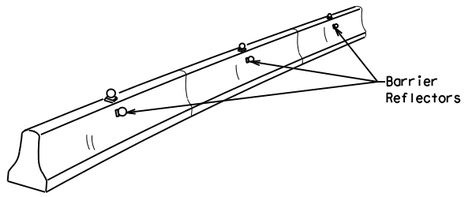
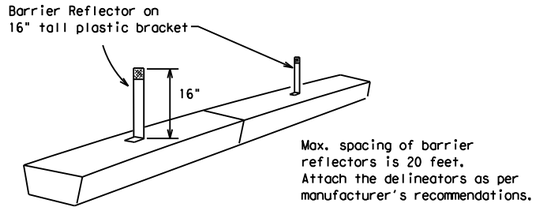
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

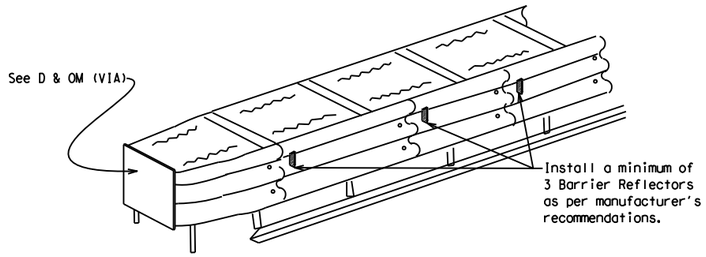


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

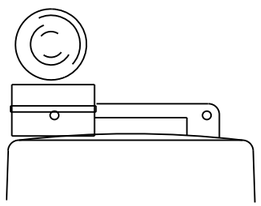


DELINEATION OF END TREATMENTS

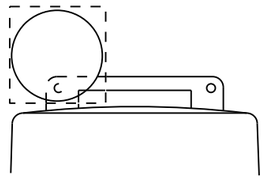
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

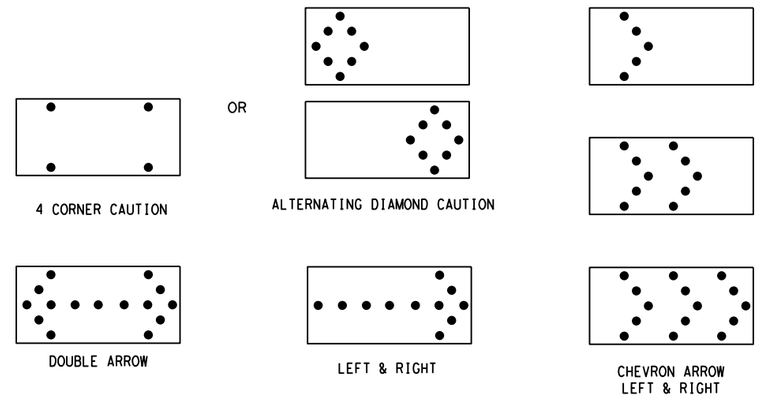
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

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	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		30

DATE:
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

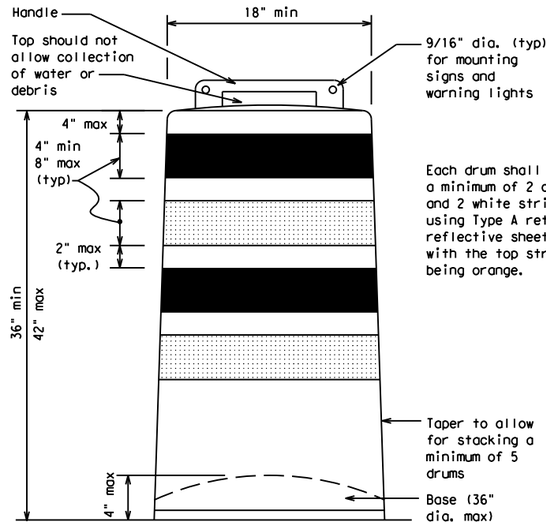
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

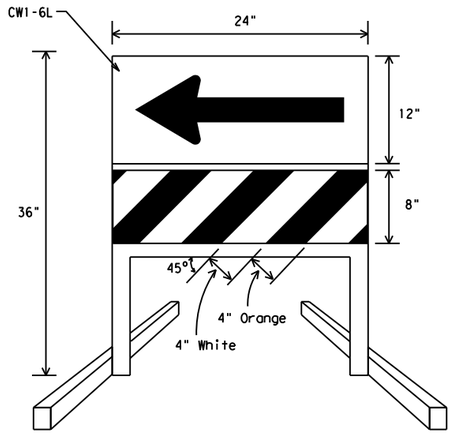
RETROREFLECTIVE SHEETING

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

BALLAST

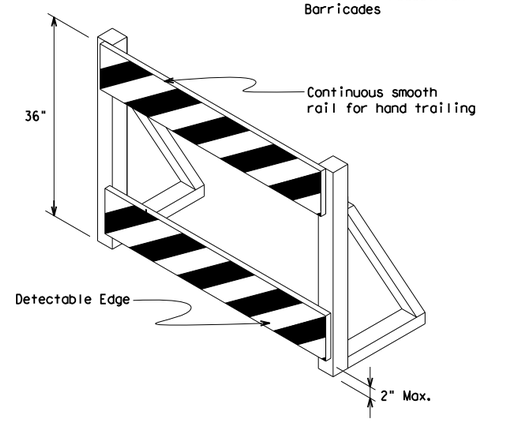
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





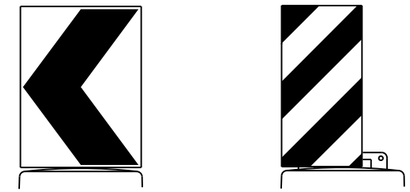
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.



DETECTABLE PEDESTRIAN BARRICADES

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



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

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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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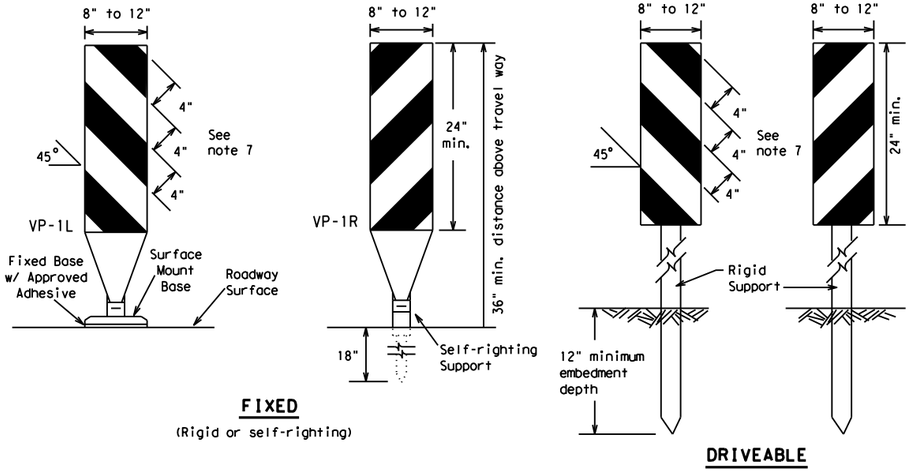
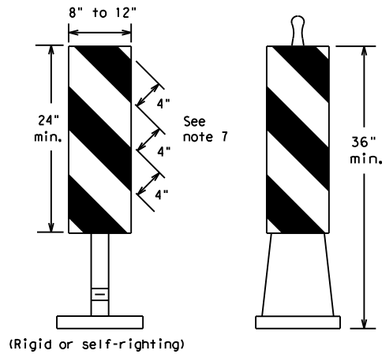


FIXED
(Rigid or self-righting)

DRIVEABLE

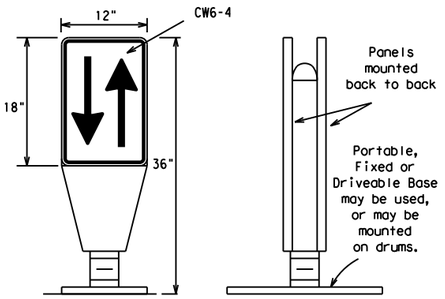


(Rigid or self-righting)

PORTABLE

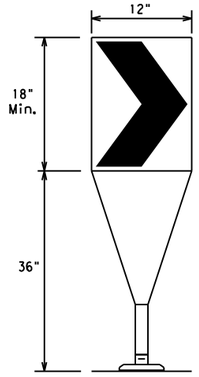
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



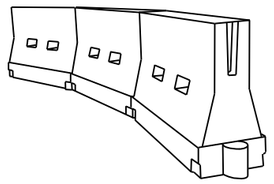
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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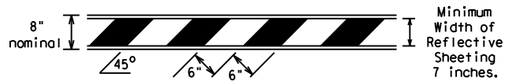
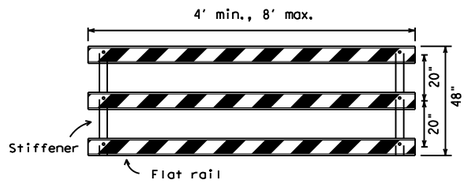
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



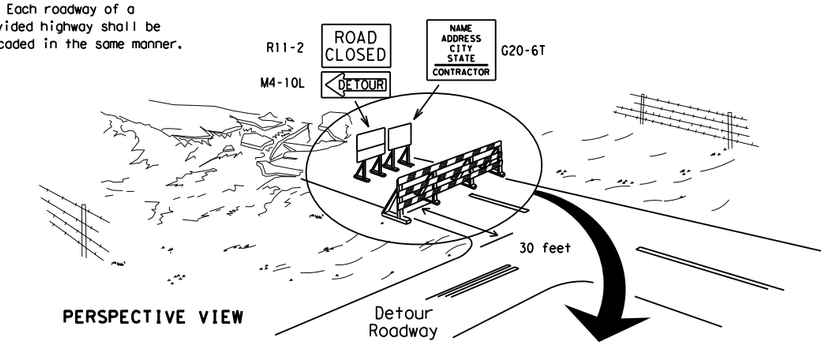
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

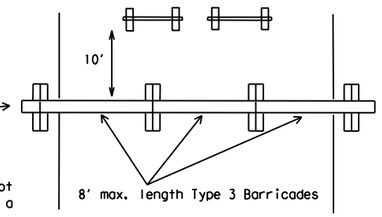
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

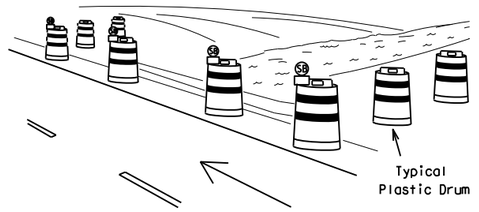
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

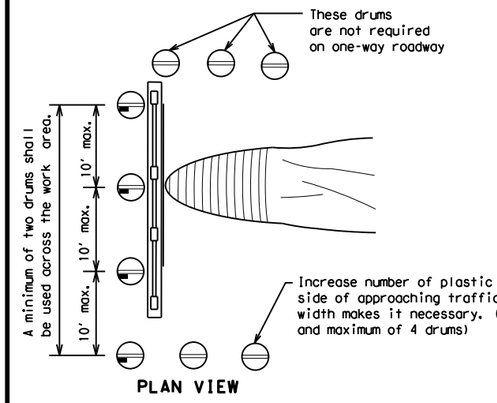
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

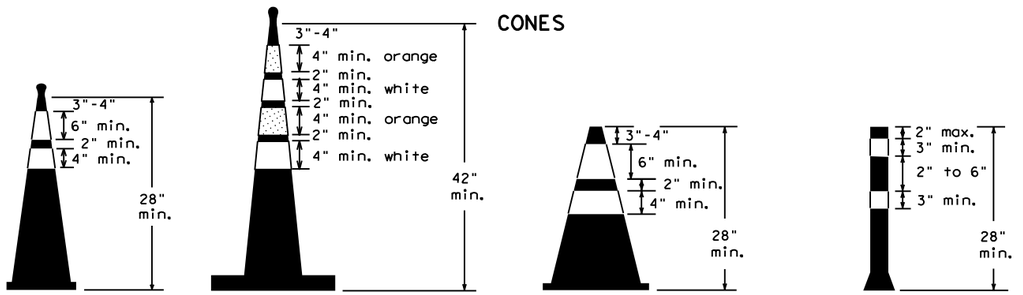
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

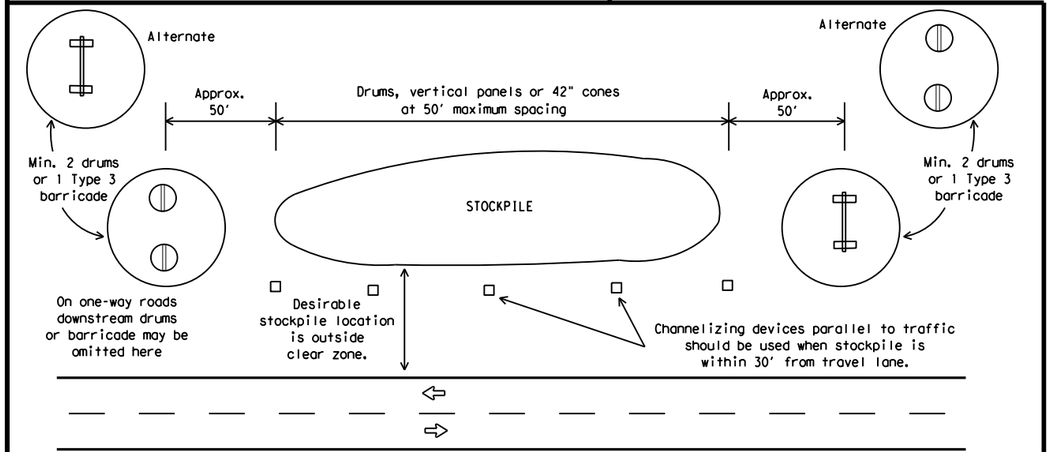
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

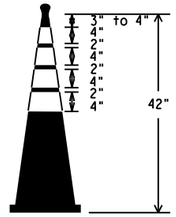
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

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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.

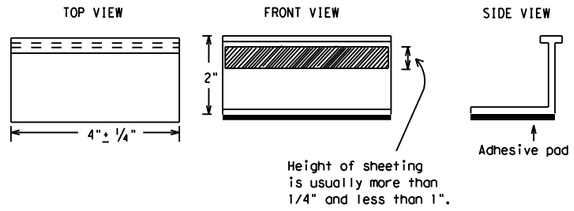
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

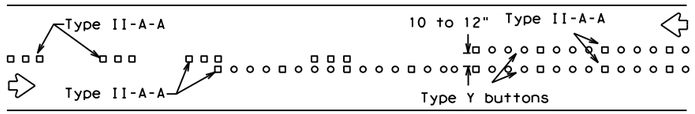
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	AUSTIN	LEE		34
11-02 8-14				

105

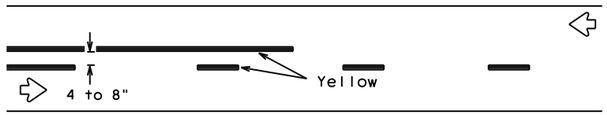
DATE:
FILE:

PAVEMENT MARKING PATTERNS

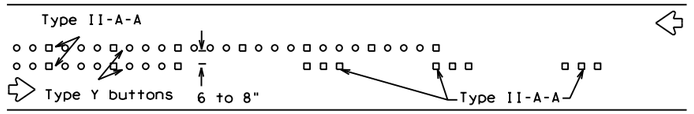
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



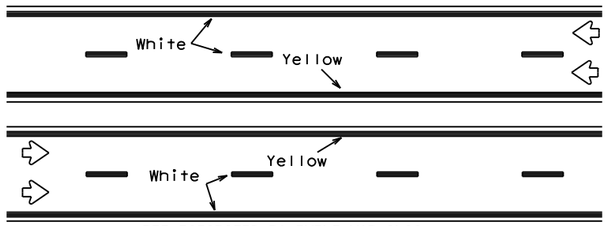
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



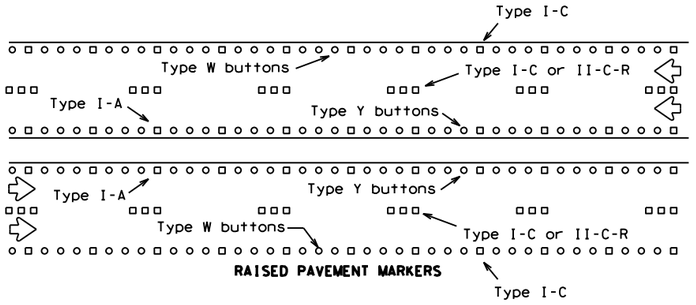
RAISED PAVEMENT MARKERS - PATTERN B

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



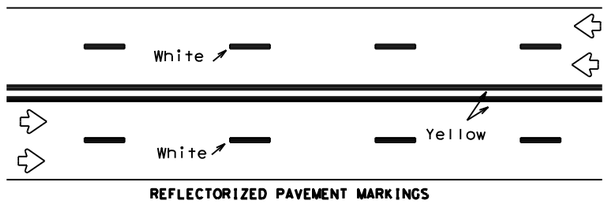
REFLECTORIZED PAVEMENT MARKINGS



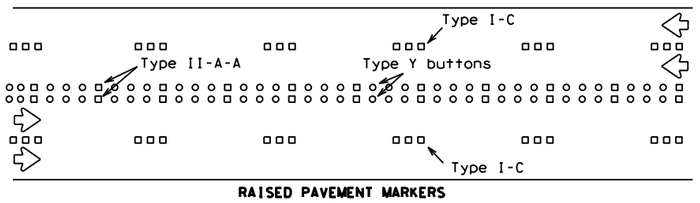
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



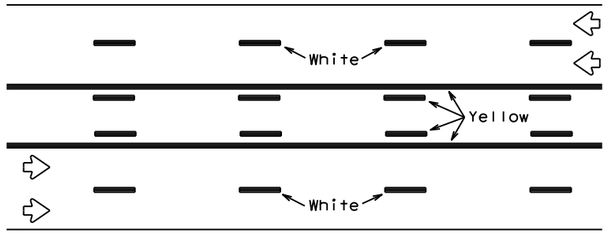
REFLECTORIZED PAVEMENT MARKINGS



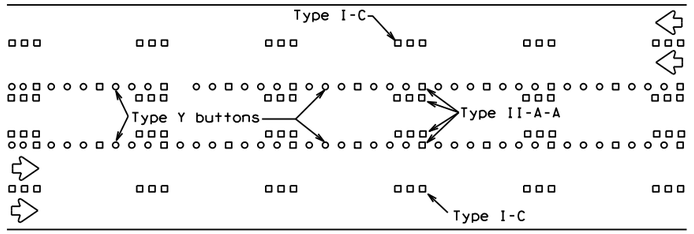
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

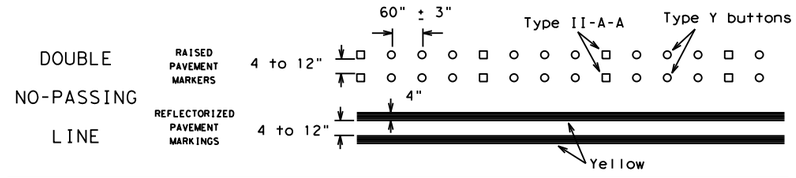
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

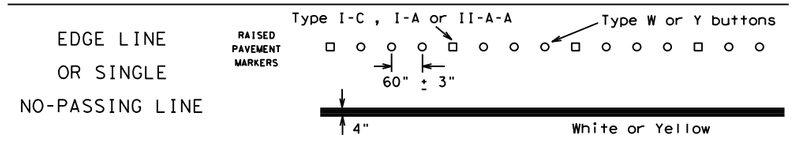
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

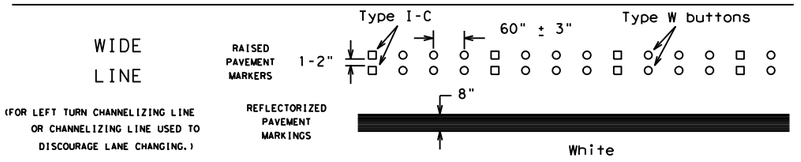


EDGE LINE OR SINGLE NO-PASSING LINE



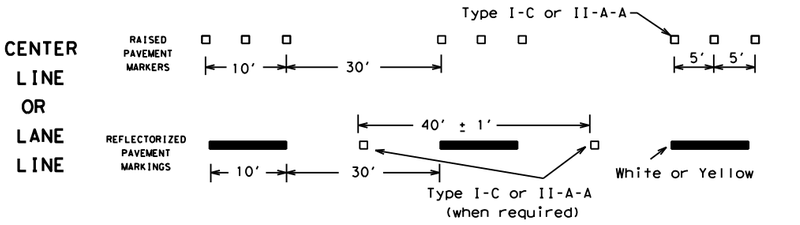
WIDE LINE

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

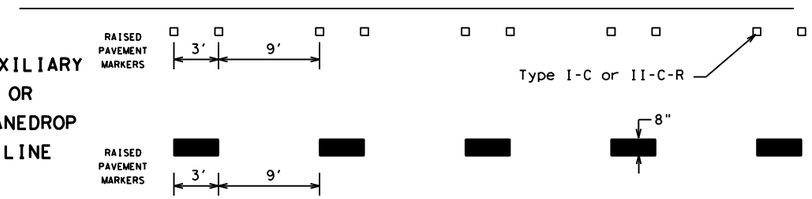


BROKEN LINES

CENTER LINE OR LANE LINE

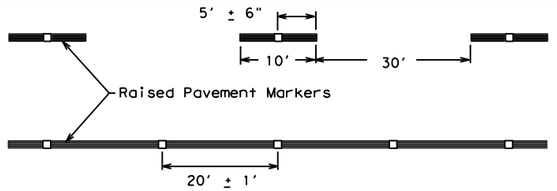


AUXILIARY OR LANEDROP LINE



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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
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2-98 7-13	AUSTIN	LEE		35
11-02 8-14				

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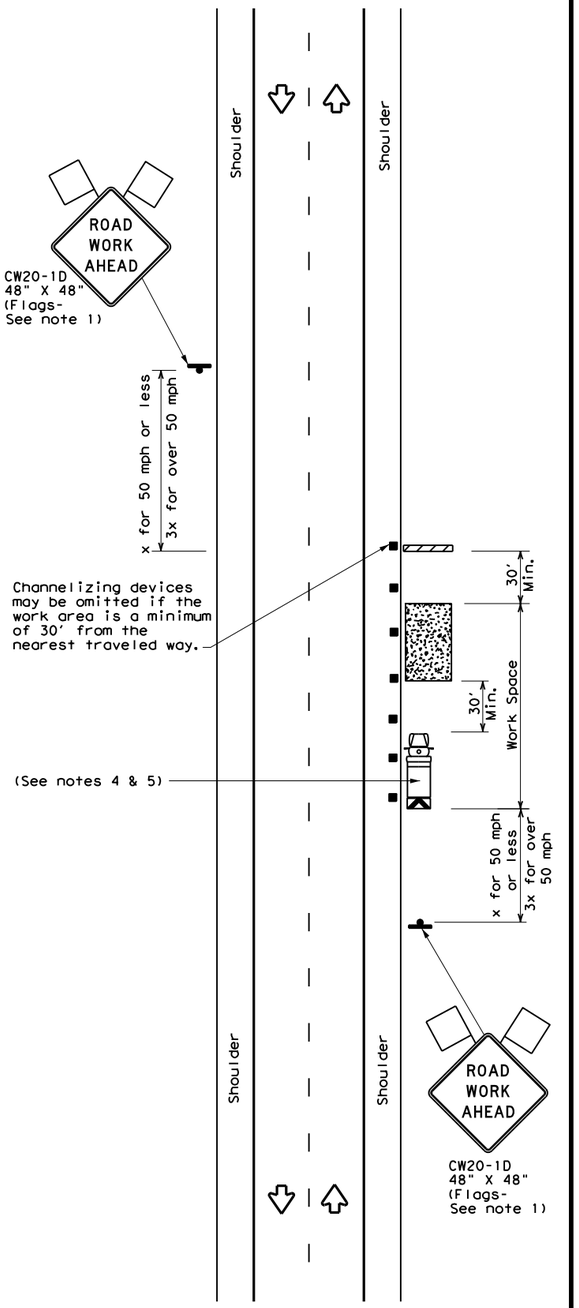
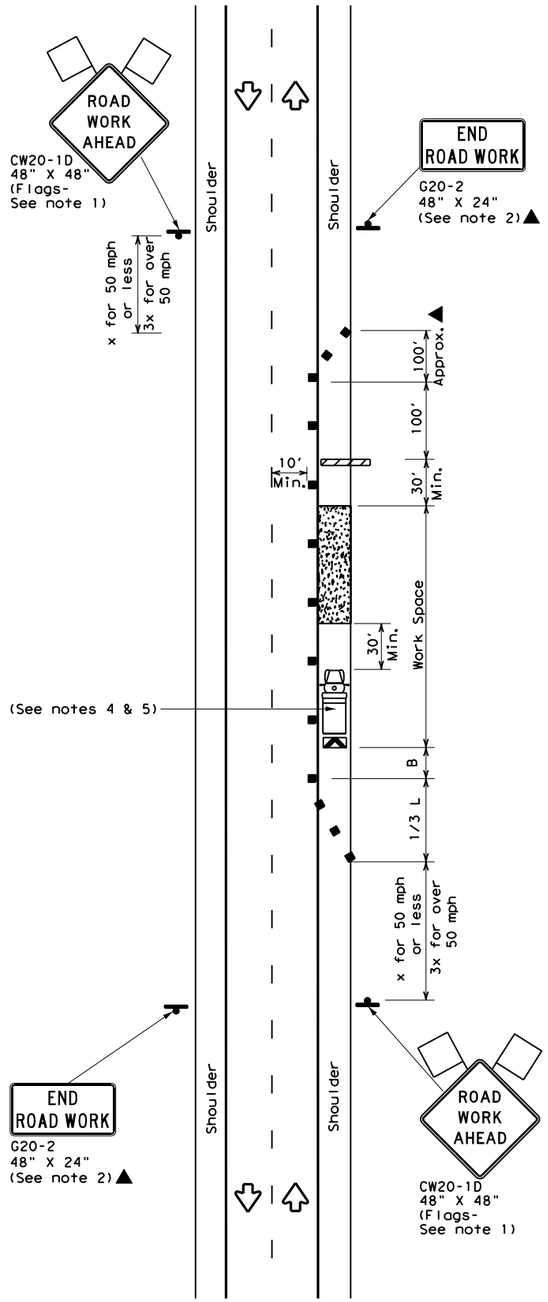


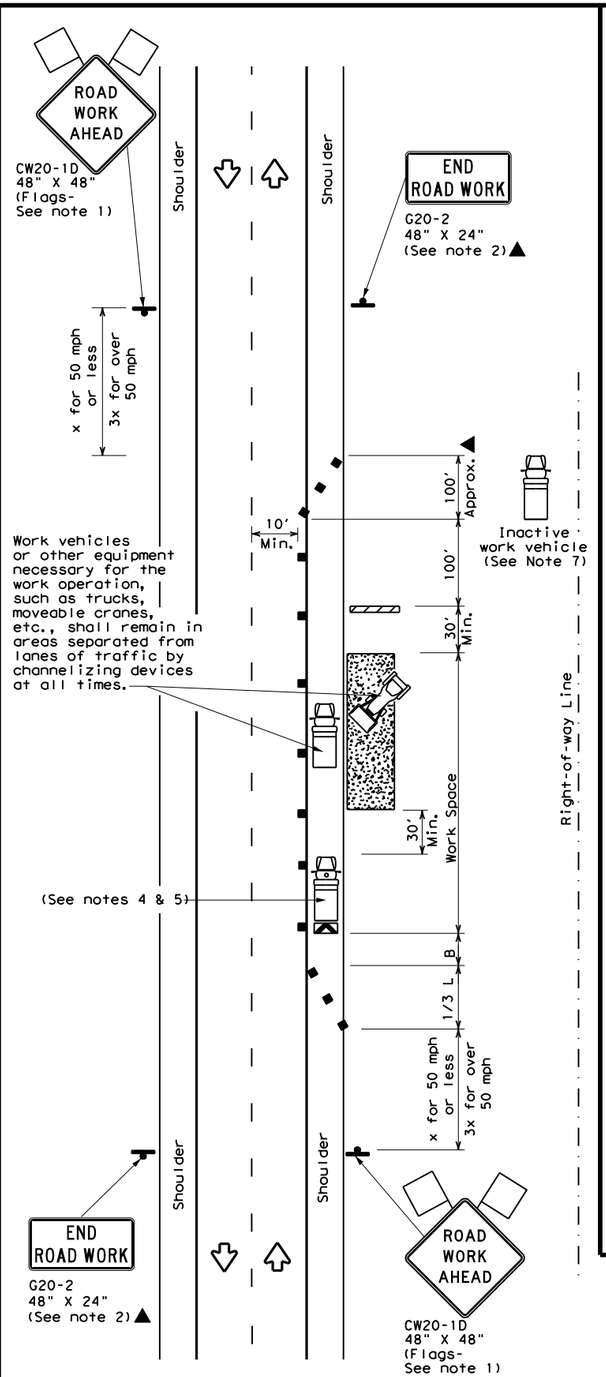
TCP (2-1a)

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

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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AUSTIN	LEE		36
1-97 2-18				

DATE:
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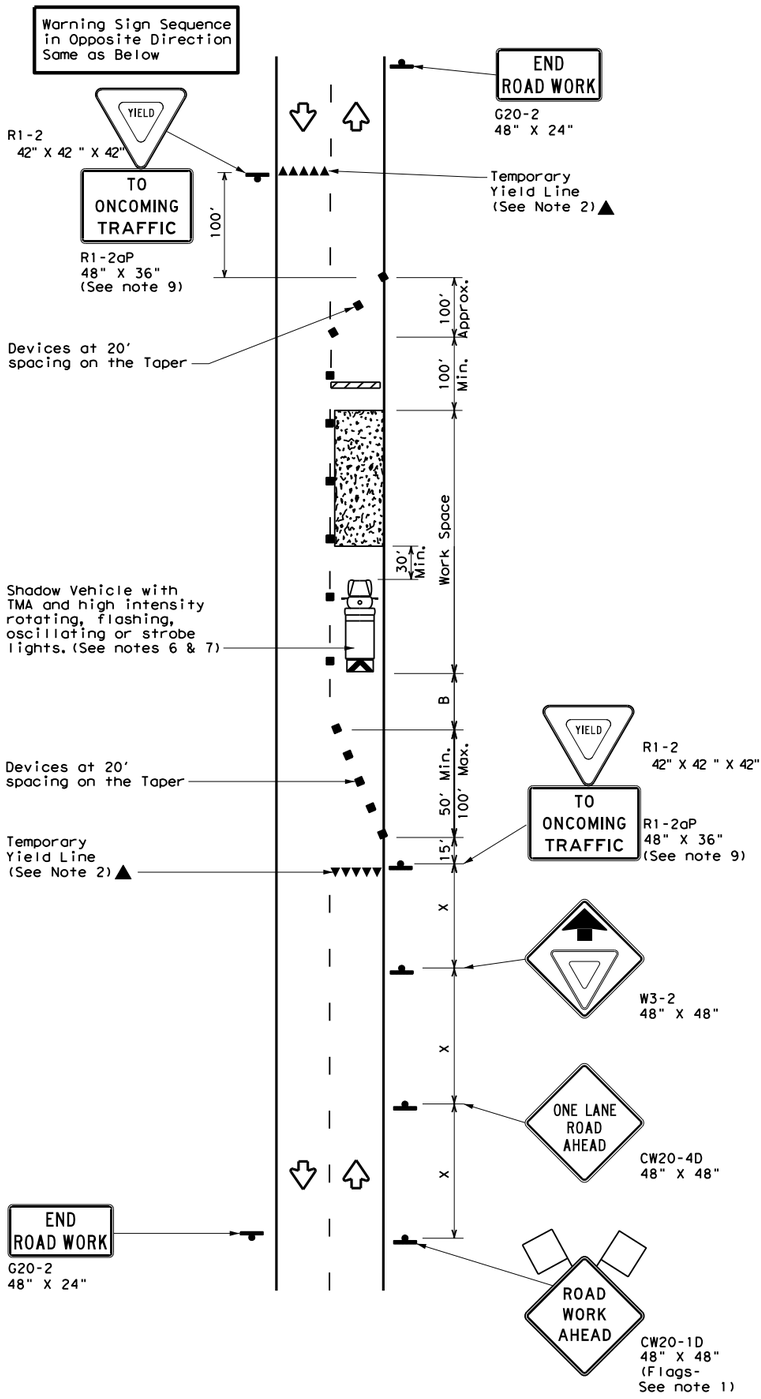
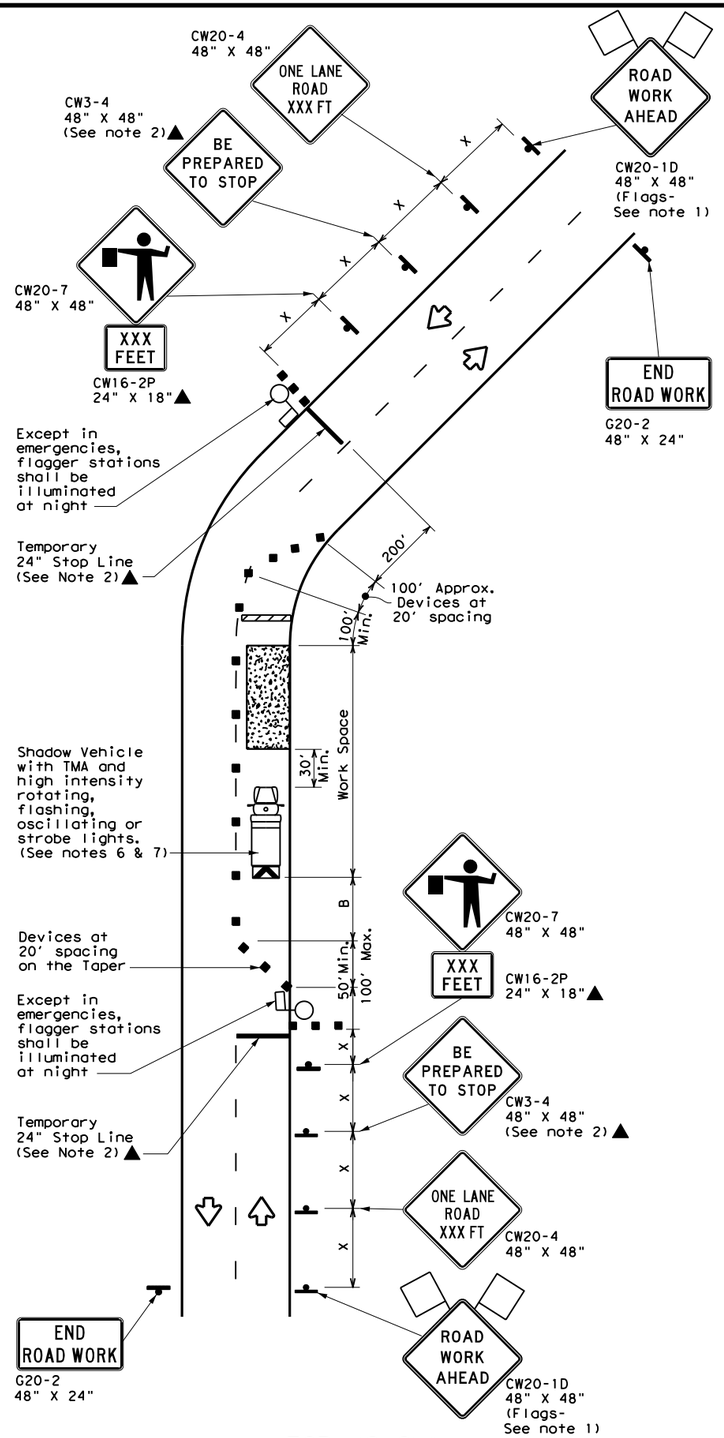


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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.

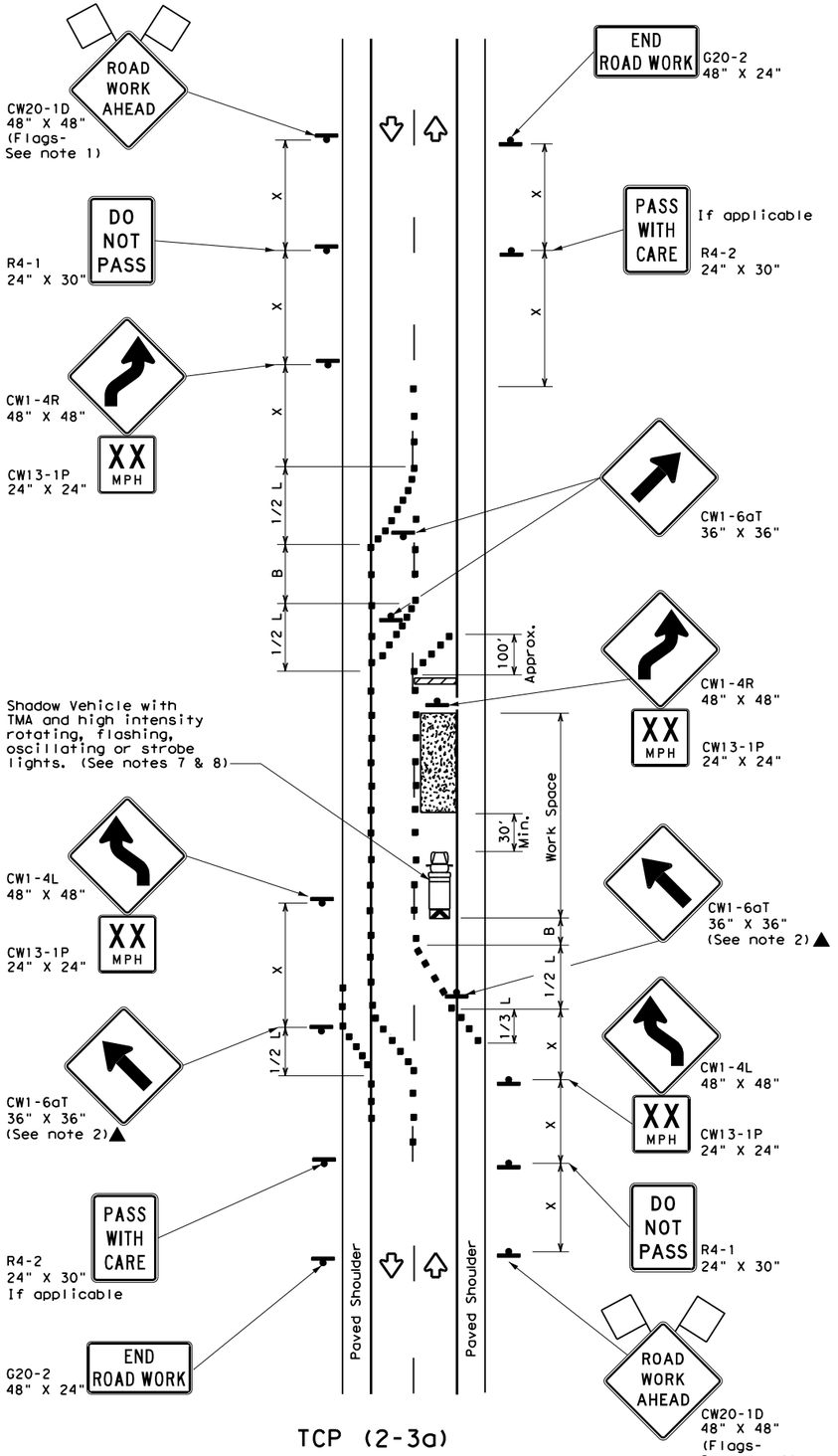
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

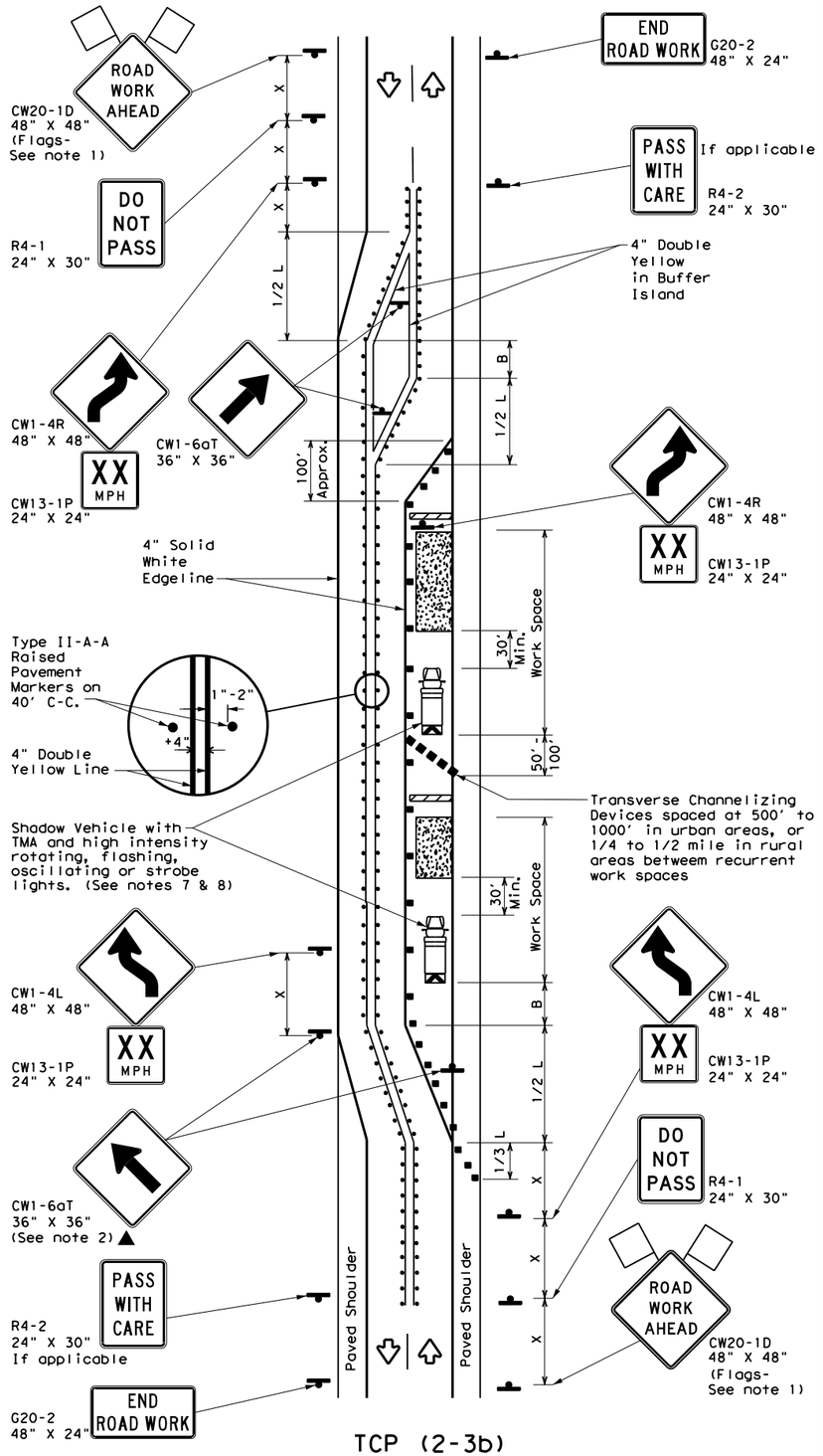
FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	AUSTIN	LEE		37
4-98 2-18				

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 Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
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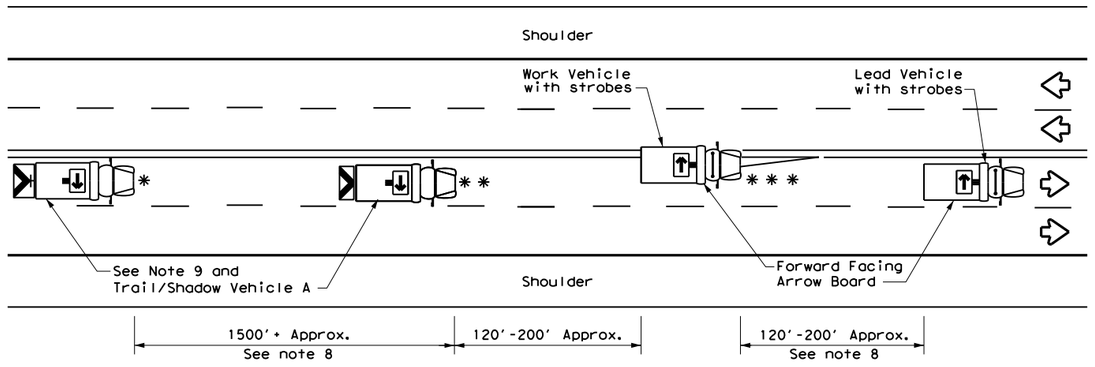
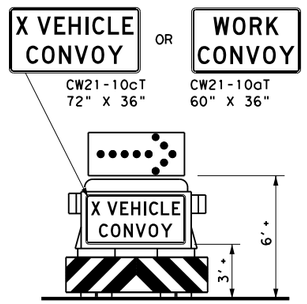
REVISIONS	0334	03	021	FM 696
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	AUSTIN	LEE		38
4-98 2-18				

DATE:
FILE:



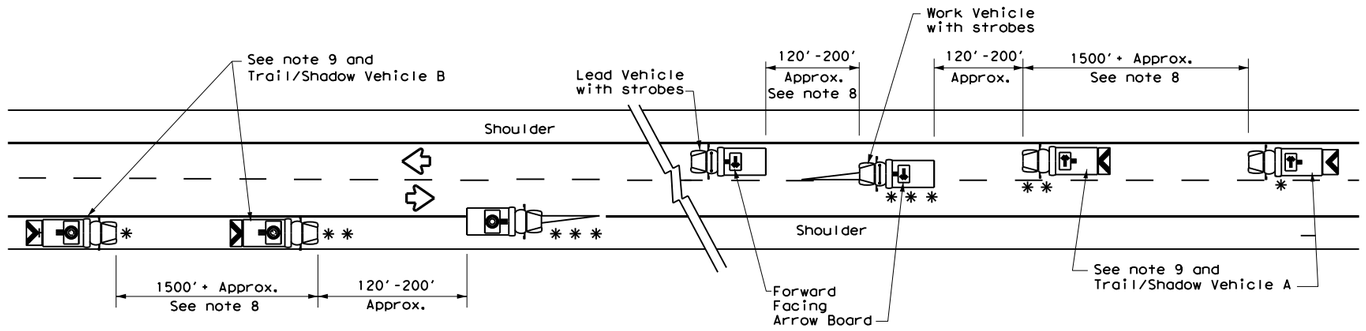
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

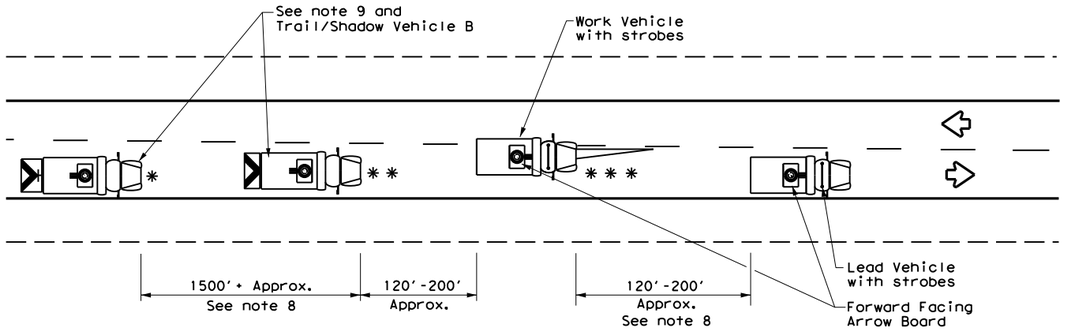


WORK ON SHOULDER

WORK ON TRAVEL LANE

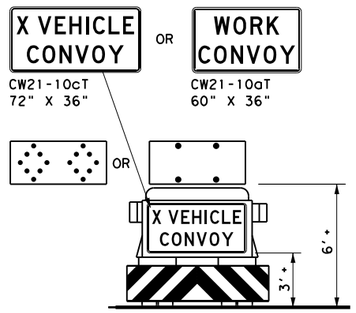
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

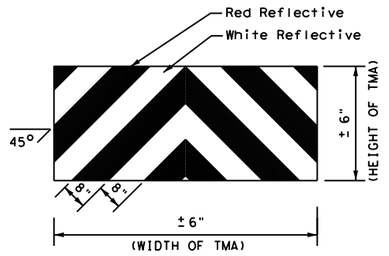
with Flashing Arrow Board in CAUTION display

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	0334	03	021	FM 696
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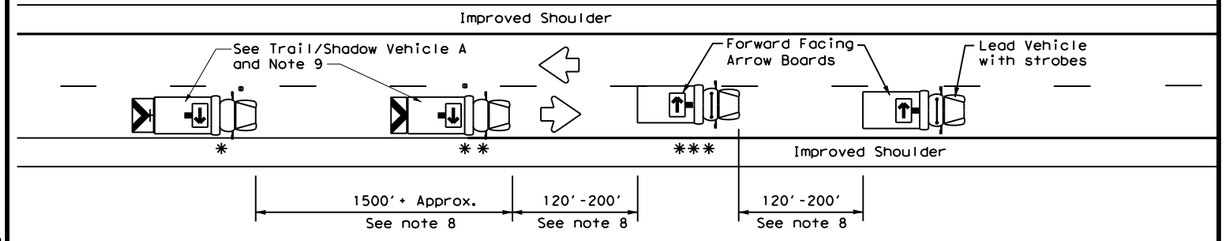
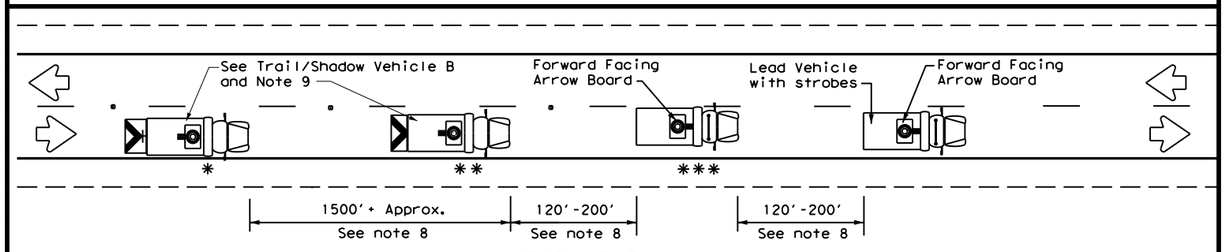
	AUSTIN	LEE		39



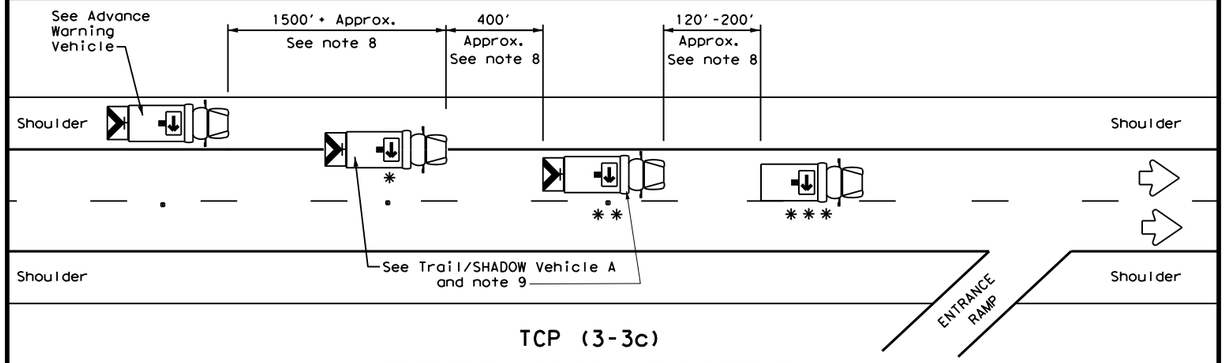
TCP (3-3a)

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



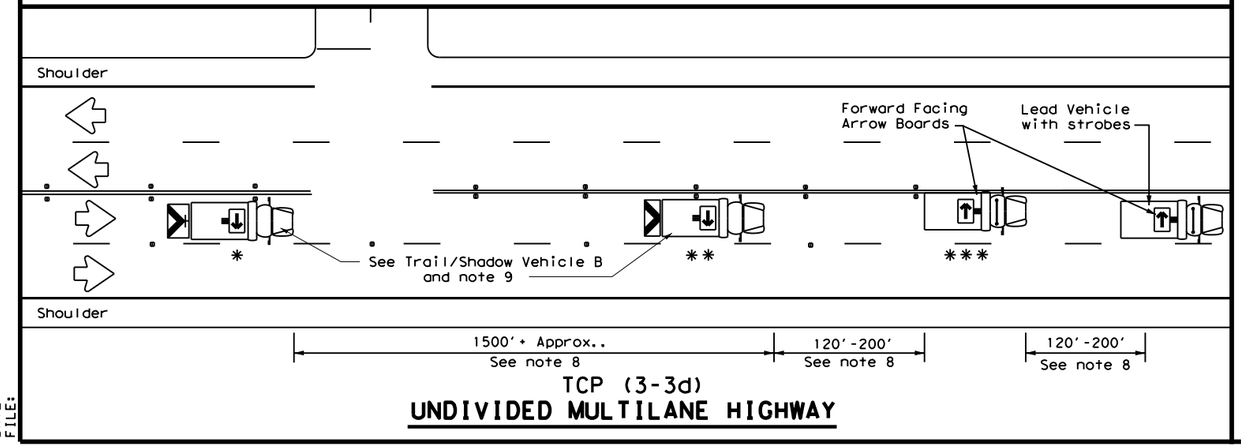
TCP (3-3b)

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



TCP (3-3c)

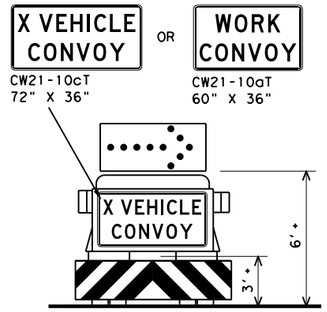
DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

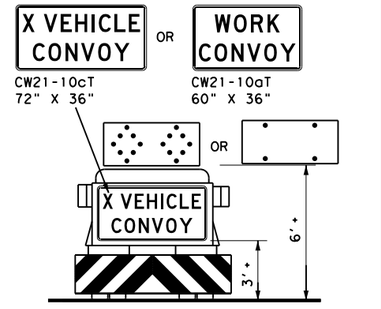
UNDIVIDED MULTILANE HIGHWAY

DATE:
FILE:



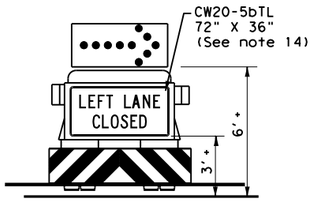
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

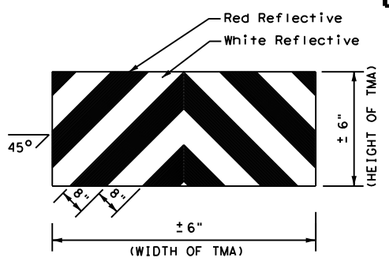


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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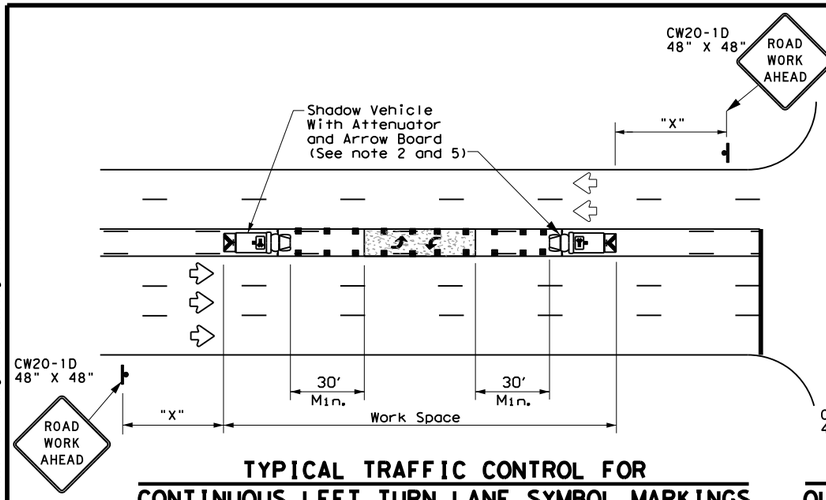
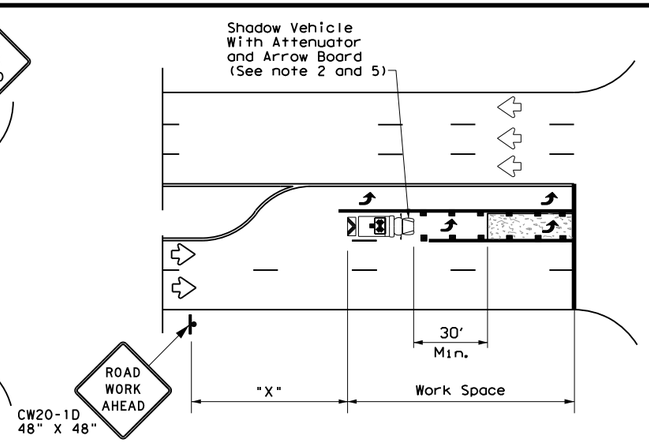
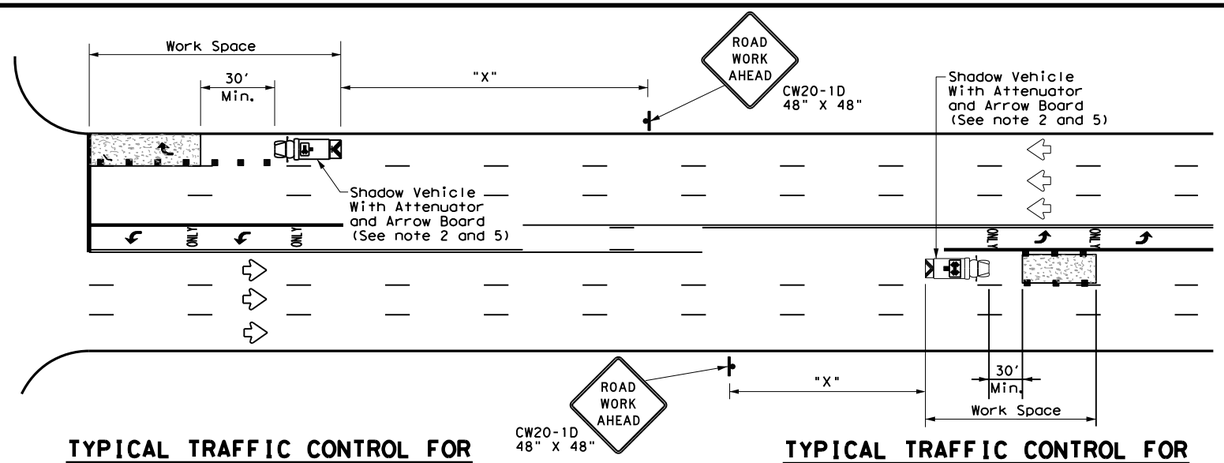
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	AUSTIN	LEE		40
1-97 7-14				



TYPICAL TRAFFIC CONTROL FOR CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

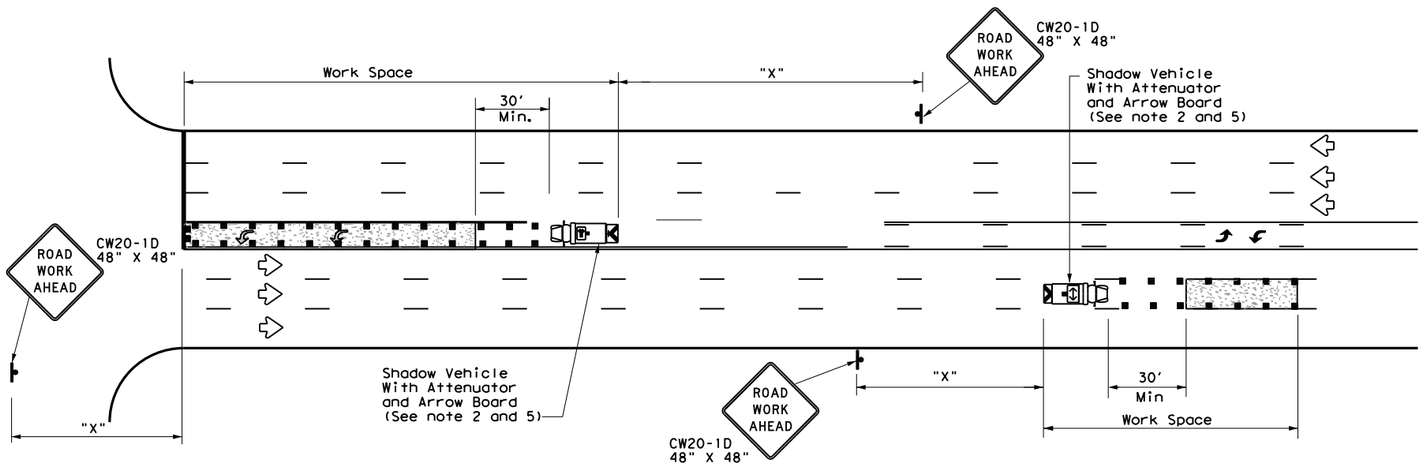


TYPICAL TRAFFIC CONTROL FOR OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



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

DATE:
FILE:

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		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'

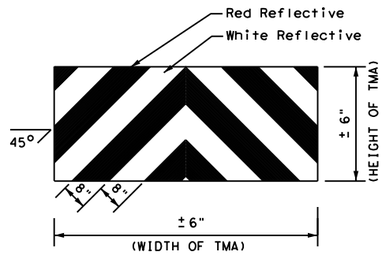
* Conventional Roads Only

** 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
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		41

DATE:
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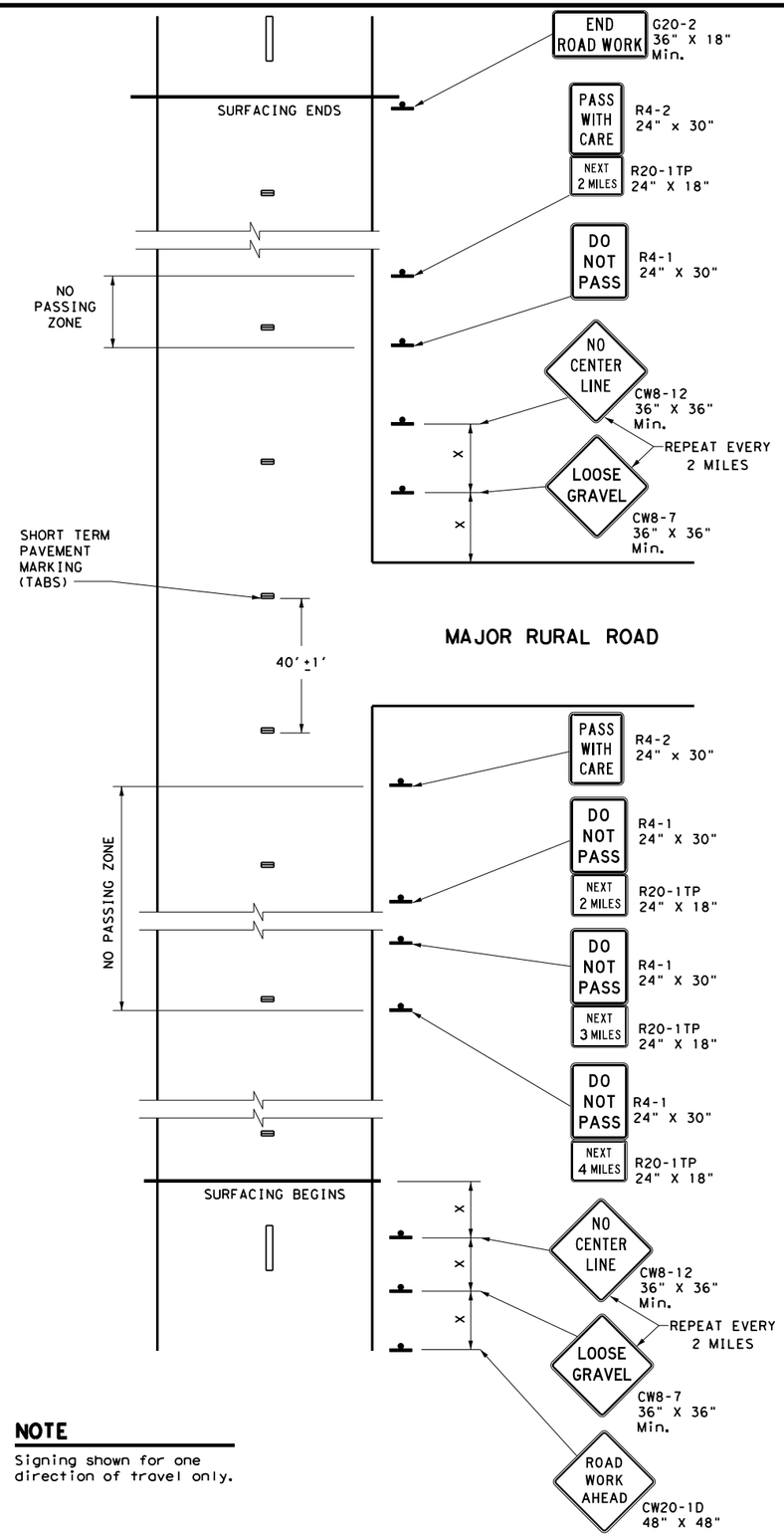
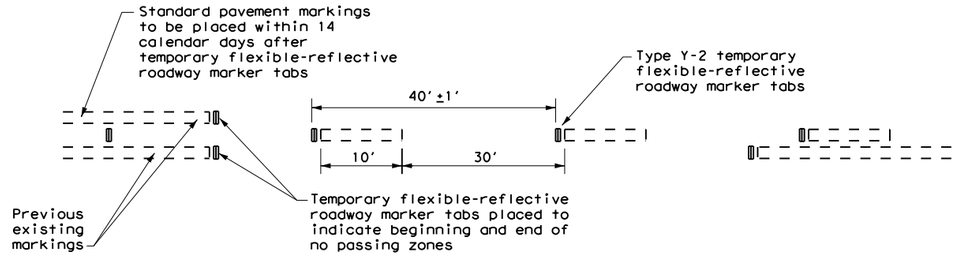


NOTE

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

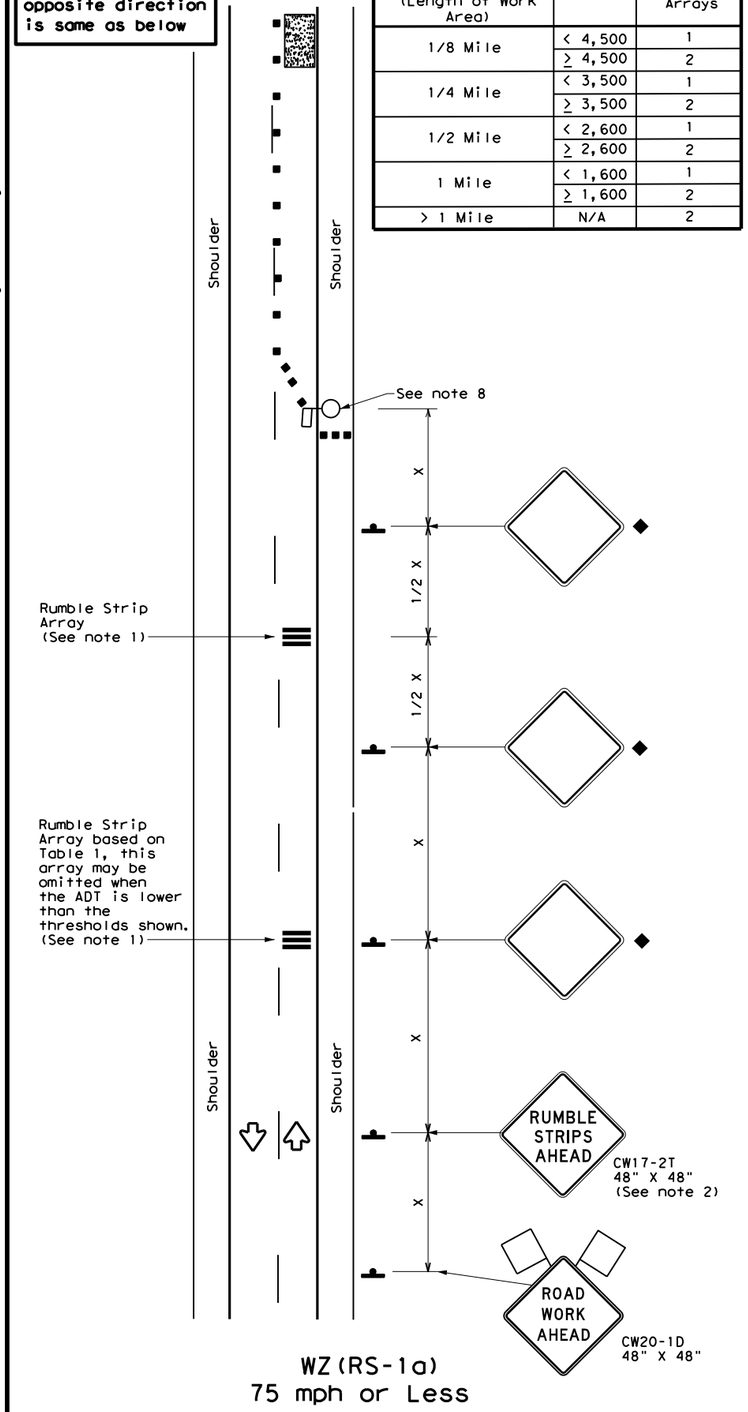
FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	AUSTIN	LEE		42

210

DATE:
FILE:

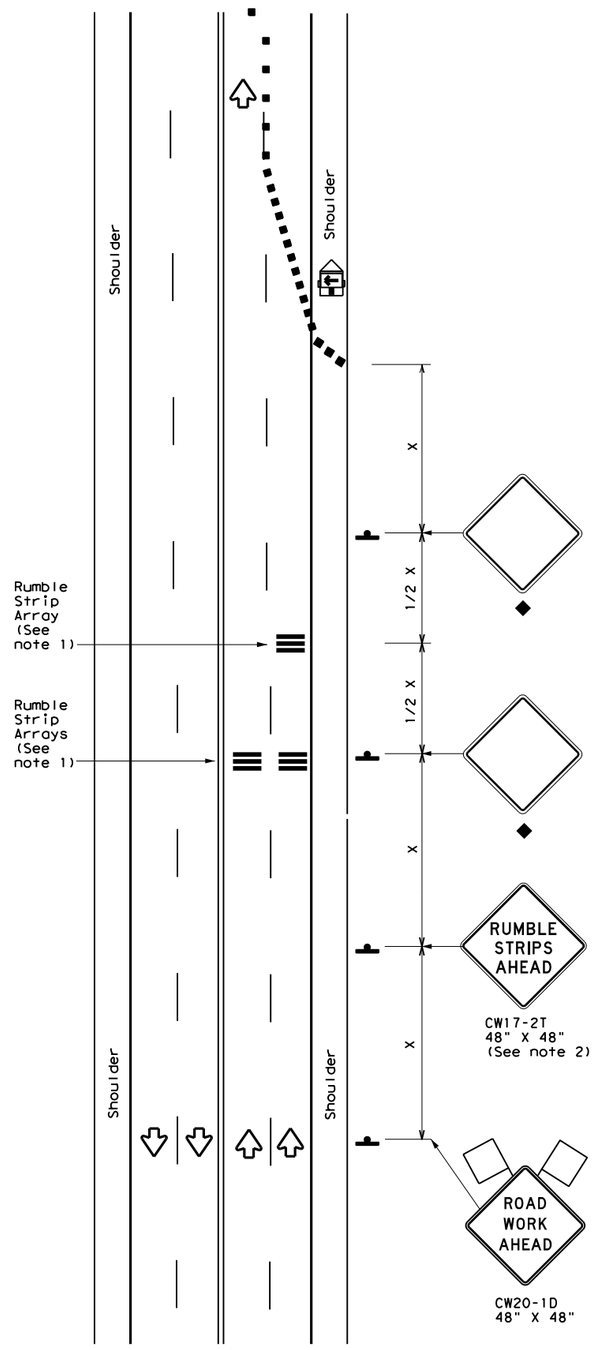
Warning sign and rumble strip sequence in opposite direction is same as below

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)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

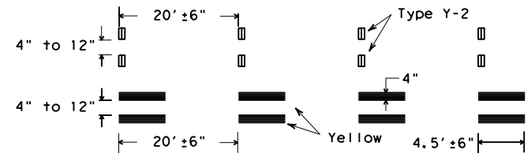
FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
2-14	DIST	COUNTY		SHEET NO.
4-16	AUSTIN	LEE		43

DATE:
FILE:

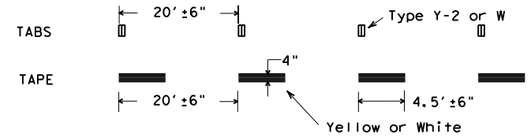
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

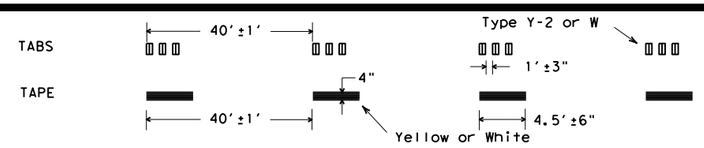


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



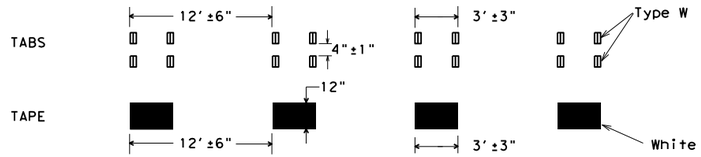
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

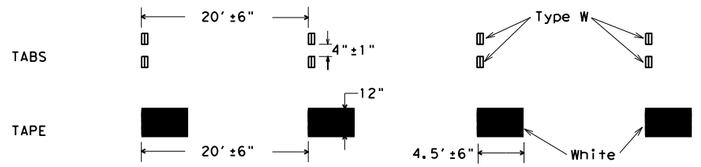


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



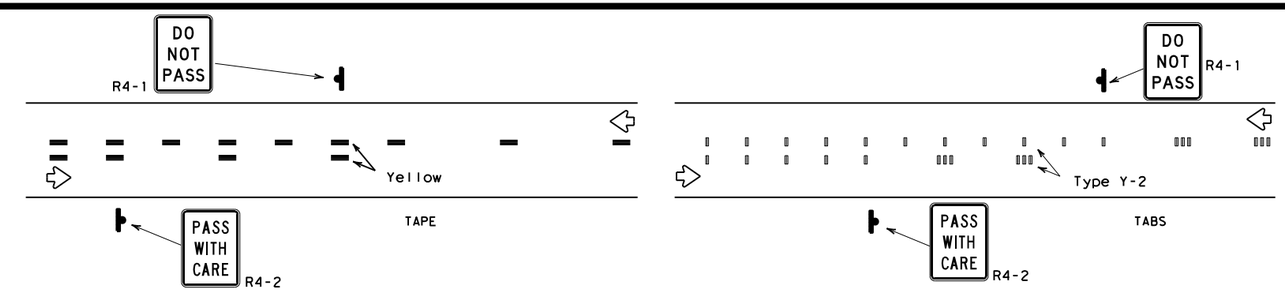
NOTES:

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

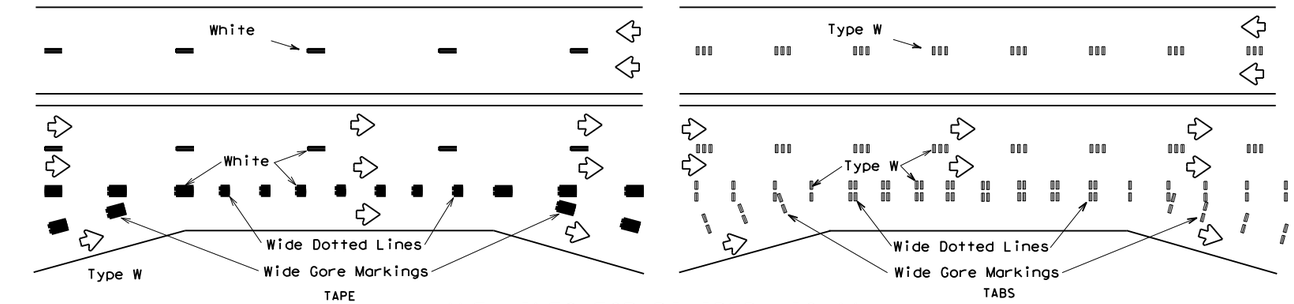
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

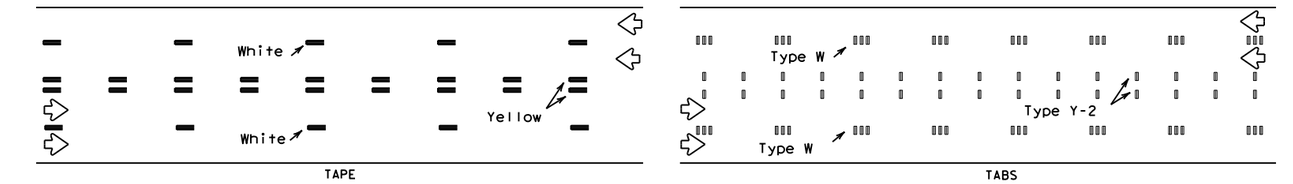
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



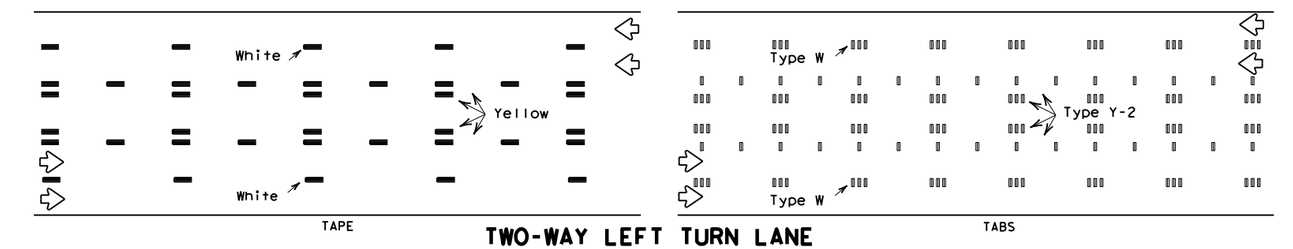
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



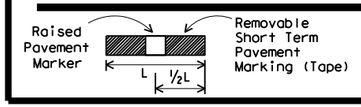
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

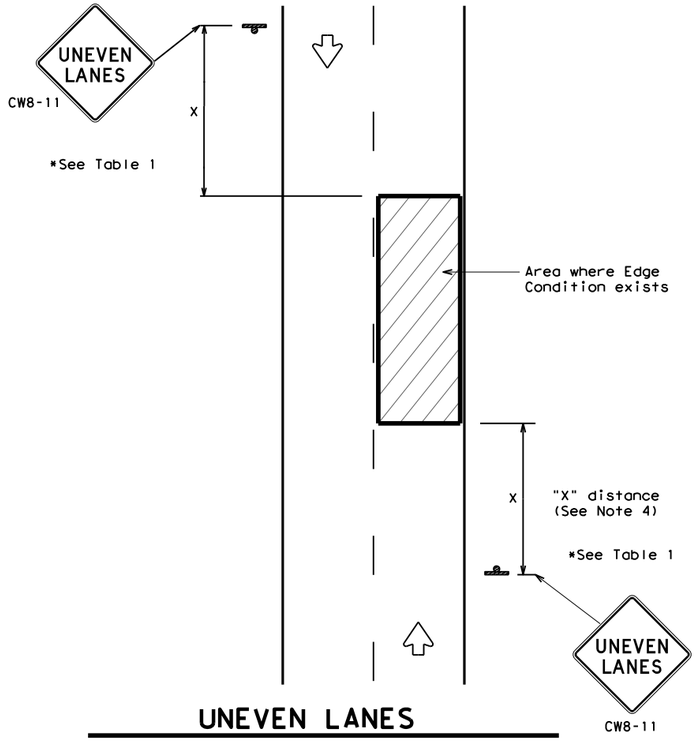
Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

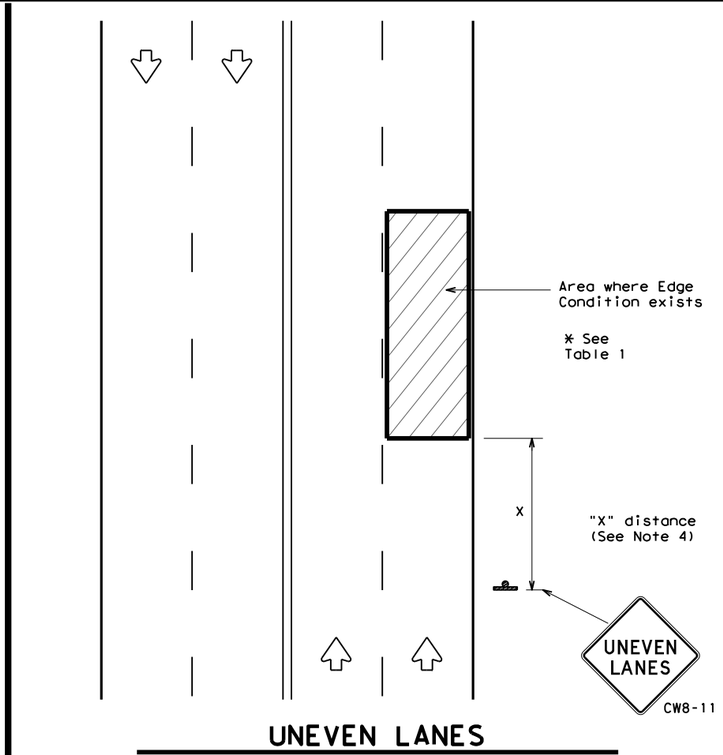
WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0334	03	021	FM 696
1-97		DIST	COUNTY		SHEET NO.
3-03		AUSTIN	LEE		44
7-13					

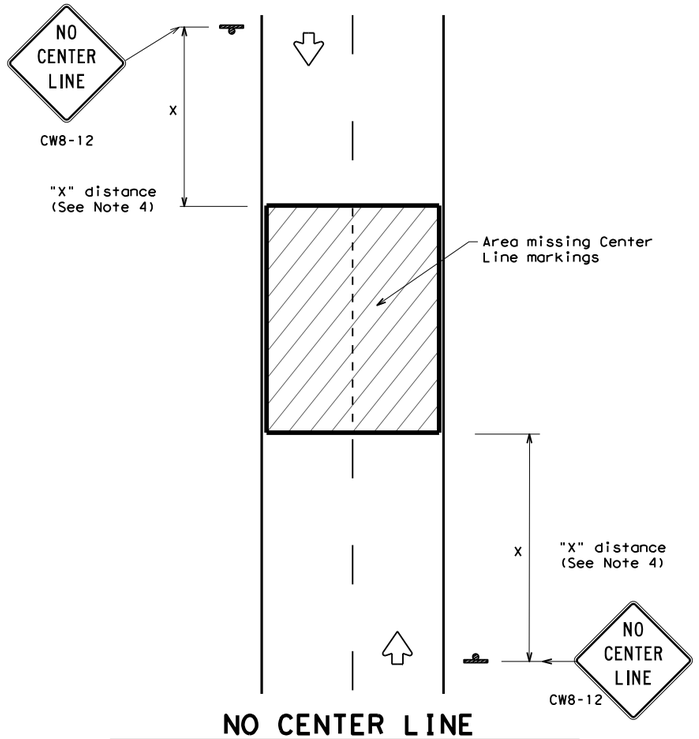
DATE:
FILE:



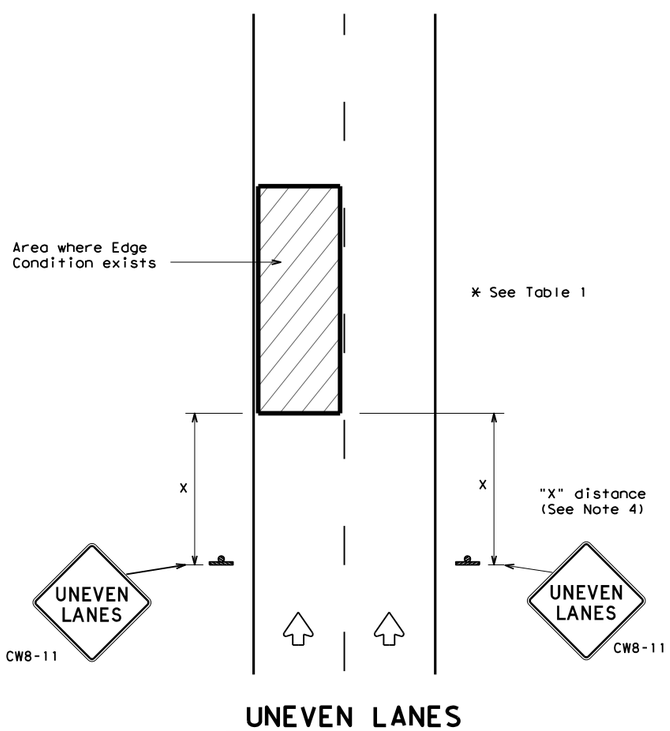
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

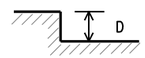
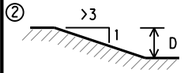
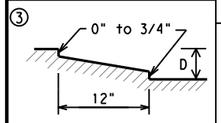
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

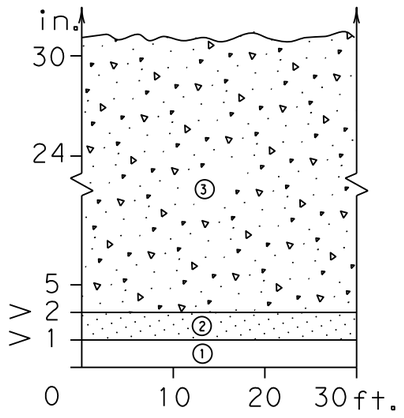
FILE:	wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS					
8-95 2-98 7-13		DIST	COUNTY		SHEET NO.
1-97 3-03					45

112

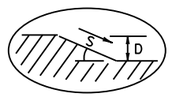
DATE:
FILE:

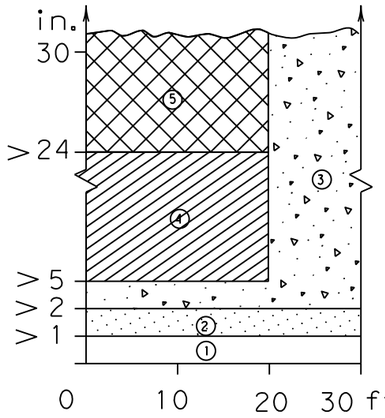
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

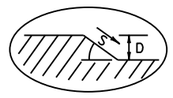


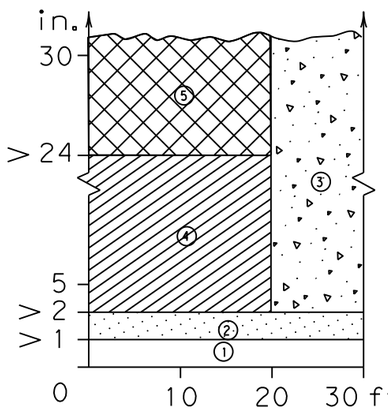
Edge Condition I
S = (3:1) (or flatter)



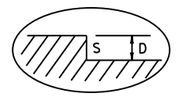


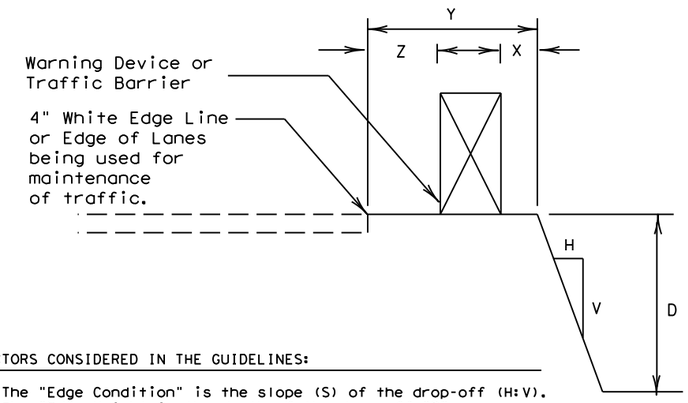
Edge Condition II
S = ((2.99):1) to (1:1)





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	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive 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:

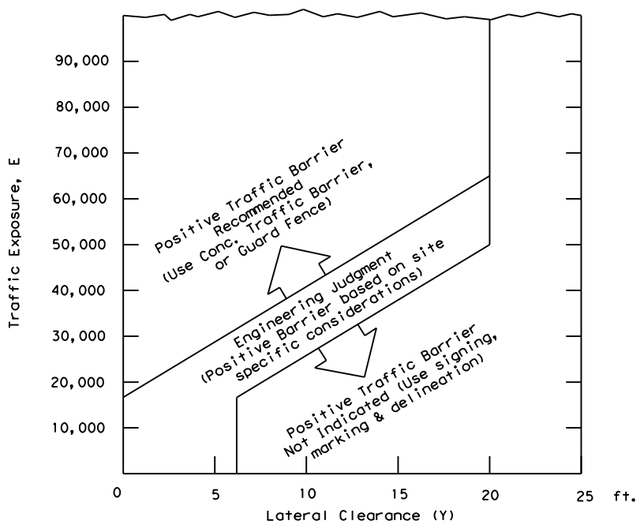
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 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 a lateral offset of 20 feet from the edge of the travel lane.

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

Engineer's Seal

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER

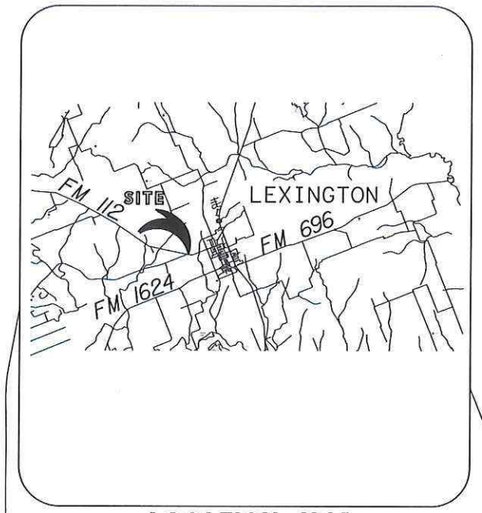
Mark W. Litzmann, P.E.

Date 1/26/2021

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
03-01	CONT	SECT	JOB	HIGHWAY
08-01 correct typos	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUST	LEE		46



LOCATION MAP
NOT TO SCALE

SCALE 1" = 1000' 22" x 34"
SCALE 1" = 2000' 11" x 17"

PRIMARY AND SECONDARY CONTROL

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP 144-1004	10132621.64	3343837.84	451.34	3/4" ALUMINUM ROD
CP 144-1006	10131334.71	3336032.54	480.22	3/4" ALUMINUM ROD
CP-1	10132055.75	3342323.16	461.71	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-1 ON A 24" x 5/8" IRON ROD
CP-2	10131646.50	3341268.73	441.23	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-2 ON A 24" x 5/8" IRON ROD
CP-3	10131051.93	3339901.77	429.16	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-3 ON A 24" x 5/8" IRON ROD
CP-4	10130761.58	3339005.76	447.09	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-4 ON A 24" x 5/8" IRON ROD
CP-5	10130899.71	3338177.81	461.43	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-5 ON A 24" x 5/8" IRON ROD
CP-6	10130435.15	3337094.95	447.91	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-6 ON A 24" x 5/8" IRON ROD
CP-7	10131174.36	3337046.08	461.91	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-7 ON A 24" x 5/8" IRON ROD
CP-8	10131563.30	3335186.21	488.22	3 1/2" ALUMINUM TxDOT DISK STAMPED CP-8 ON A 24" x 5/8" IRON ROD

NOTES:

1.) PRIMARY AND SECONDARY CONTROL (HORIZONTAL) WAS ESTABLISHED USING GPS-RTK METHODS CONFORMING TO TxDOT CATEGORY 2 CONTROL SURVEY.

2.) BEARINGS ARE BASED ON GRID NORTH, TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE 4203, NAD83 (2011).

3.) COORDINATES AND DISTANCES SHOWN ARE BASED ON A PROJECT COORDINATE SYSTEM ESTABLISHED BY APPLYING A SURFACE ADJUSTMENT FACTOR OF 1.00008 TO STATE PLANE GRID COORDINATES NAD 83-(2011),TEXAS STATE PLANE COORDINATE SYSTEM,CENTRAL ZONE 4203, U.S. SURVEY FEET.

PROJECT COORDINATES = GRID COORDINATES x 1.00008

4.) THE VERTICAL VALUES WERE ESTABLISHED BY DIGITAL LEVELING BETWEEN CP 144-1004 AND CP144-1006. THE VERTICAL DATUM IS NAVD1988.

LEGEND

- PRIMARY CONTROL POINT
- SECONDARY CONTROL POINT
- POWER POLE
- SIGN
- TELEPHONE PEDESTAL

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E

21 DEC 2018

DARRYL L. ZERCHER DATE
REGISTERED PROFESSIONAL LAND SURVEYOR NO. 5609

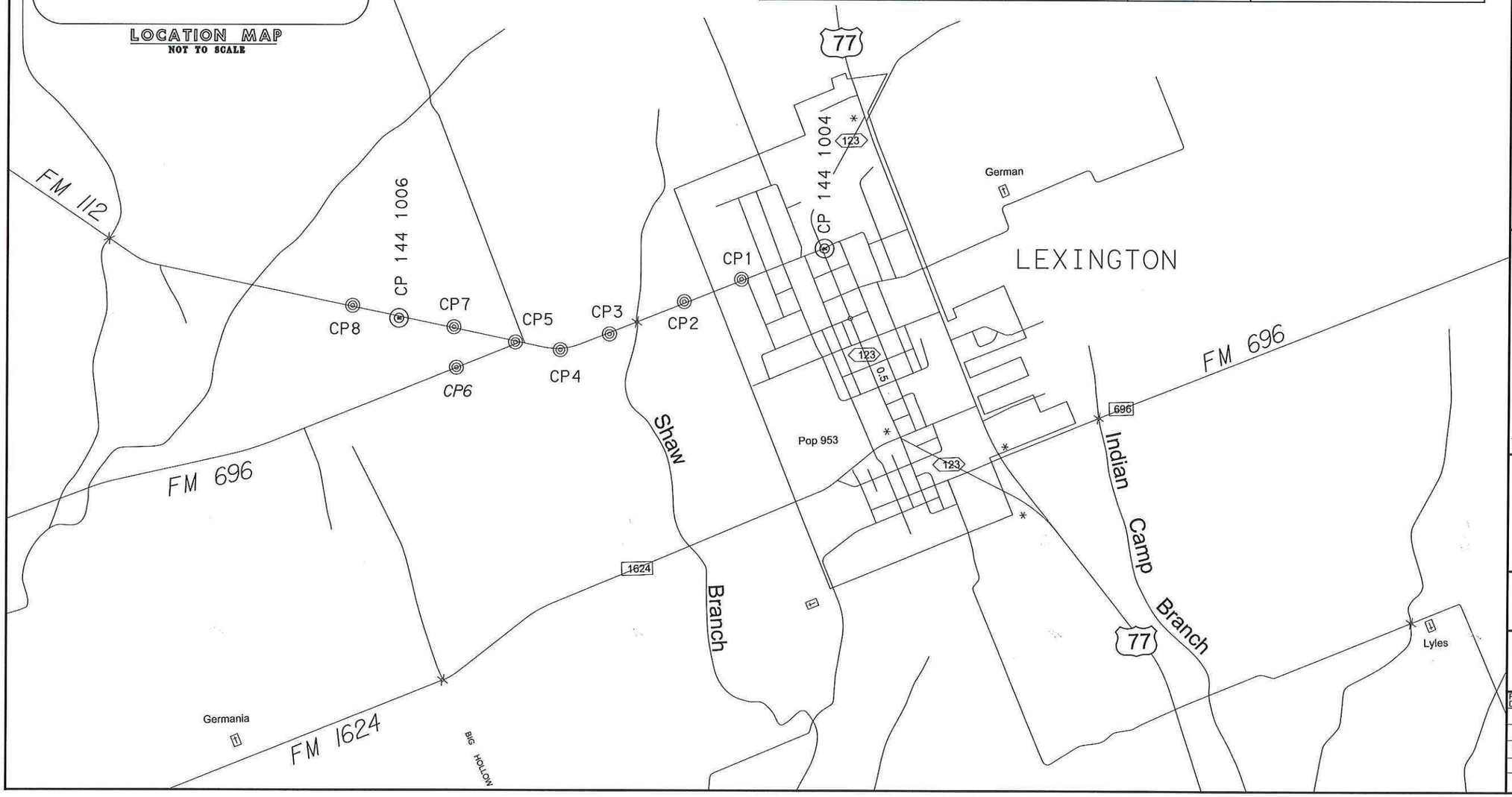
CDS muery
ENGINEERS • SURVEYORS
3111 MAGIC DRIVE • SAN ANTONIO • TEXAS • (210)581-1111
TBPE NO. F-1733 • TBPLS NO. 100193-00

2018 Texas Department of Transportation

PROJECT CONTROL INDEX SHEET

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
		47

STATE	DIST.	COUNTY	
TEXAS	14	LEE	
CONT.	SECT.	JOB	HIGHWAY NO.
0334	03	021	FM 696



Beginning chain FM696_CL description

Point 61 N 10,131,242.8282 E 3,336,654.1821 Sta 10+00.00

Course from 61 to 62 S 77° 55′ 06.66" E Dist 495.6897

Point 62 N 10,131,139.0791 E 3,337,138.8927 Sta 14+95.69

Course from 62 to PC FM696-C2 S 78° 11′ 08.27" E Dist 1,622.0349

Curve Data

Curve FM696-C2
P.I. Station = 34+68.46 N 10,130,735.1705 E 3,339,069.8747
Delta = 33° 55′ 20.40" (LT)
Degree = 4° 58′ 56.07"
Tangent = 350.7382
Length = 680.8649
Radius = 1,150.0000
External = 52.2967
Long Chord = 670.9640
Mid. Ord. = 50.0219
P.C. Station = 31+17.72 N 10,130,806.9812 E 3,338,726.5666
P.T. Station = 37+98.59 N 10,130,867.1719 E 3,339,394.8253
C.C. N 10,131,932.6197 E 3,338,962.0193
Back = S 78° 11′ 08.27" E
Ahead = N 67° 53′ 31.32" E
Chord Bear = N 84° 51′ 11.53" E

Course from PT FM696-C2 to PC FM696-C3 N 67° 53′ 31.32" E Dist 2,479.4650

Curve Data

Curve FM696-C3
P.I. Station = 63+52.01 N 10,131,828.1595 E 3,341,760.5089
Delta = 1° 41′ 41.32" (RT)
Degree = 1° 08′ 45.30"
Tangent = 73.9554
Length = 147.9001
Radius = 5,000.0000
External = 0.5469
Long Chord = 147.8947
Mid. Ord. = 0.5469
P.C. Station = 62+78.05 N 10,131,800.3262 E 3,341,691.9910
P.T. Station = 64+25.95 N 10,131,853.9542 E 3,341,829.8201
C.C. N 10,127,167.9446 E 3,343,573.7563
Back = N 67° 53′ 31.32" E
Ahead = N 69° 35′ 12.64" E
Chord Bear = N 68° 44′ 21.98" E

Course from PT FM696-C3 to PC FM696-C4 N 69° 35′ 12.64" E Dist 405.4558

Curve Data

Curve FM696-C4
P.I. Station = 68+79.57 N 10,132,012.1708 E 3,342,254.9530
Delta = 1° 06′ 13.65" (LT)
Degree = 1° 08′ 45.30"
Tangent = 48.1635
Length = 96.3239
Radius = 5,000.0000
External = 0.2320
Long Chord = 96.3224
Mid. Ord. = 0.2320
P.C. Station = 68+31.41 N 10,131,995.3720 E 3,342,209.8141
P.T. Station = 69+27.73 N 10,132,029.8361 E 3,342,299.7599
C.C. N 10,136,681.3817 E 3,340,465.8779
Back = N 69° 35′ 12.64" E
Ahead = N 68° 28′ 58.99" E
Chord Bear = N 69° 02′ 05.82" E

Course from PT FM696-C4 to 63 N 68° 28′ 58.99" E Dist 466.5424

Point 63 N 10,132,200.9528 E 3,342,733.7885 Sta 73+94.28

Course from 63 to 64 N 68° 17′ 18.75" E Dist 671.5081

Point 64 N 10,132,449.3655 E 3,343,357.6589 Sta 80+65.78

Course from 64 to 65 N 68° 03′ 01.31" E Dist 507.9952

Point 65 N 10,132,639.2498 E 3,343,828.8309 Sta 85+73.78

Ending chain FM696_CL description

Beginning chain FM696_INT description

Point 69 N 10,130,485.6187 E 3,337,179.2436 Sta 100+00.00

Course from 69 to 70 N 69° 01′ 11.65" E Dist 394.0000

Point 70 N 10,130,626.6879 E 3,337,547.1233 Sta 103+94.00

Course from 70 to PC FM696-C1 N 68° 45′ 19.40" E Dist 182.4099

Curve Data

Curve FM696-C1
P.I. Station = 106+99.41 N 10,130,737.3522 E 3,337,831.7753
Delta = 27° 38′ 24.05" (LT)
Degree = 11° 27′ 32.96"
Tangent = 122.9969
Length = 241.2046
Radius = 500.0000
External = 14.9061
Long Chord = 238.8725
Mid. Ord. = 14.4745
P.C. Station = 105+76.41 N 10,130,692.7842 E 3,337,717.1370
P.T. Station = 108+17.61 N 10,130,830.0165 E 3,337,912.6553
C.C. N 10,131,158.8052 E 3,337,535.9619
Back = N 68° 45′ 19.40" E
Ahead = N 41° 06′ 55.36" E
Chord Bear = N 54° 56′ 07.38" E

Course from PT FM696-C1 to 71 N 41° 06′ 55.36" E Dist 165.2340

Point 71 N 10,130,954.5016 E 3,338,021.3095 Sta 109+82.85

Ending chain FM696_INT description

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
Mark W. Litzmann, P.E.

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TBPE Registration No. F-10573

Texas Department of Transportation

LEE COUNTY
FM 696

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST.NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	48

FULL SUPERELEVATION SECTION

STA 106+06.41 TO STA 107+57.61

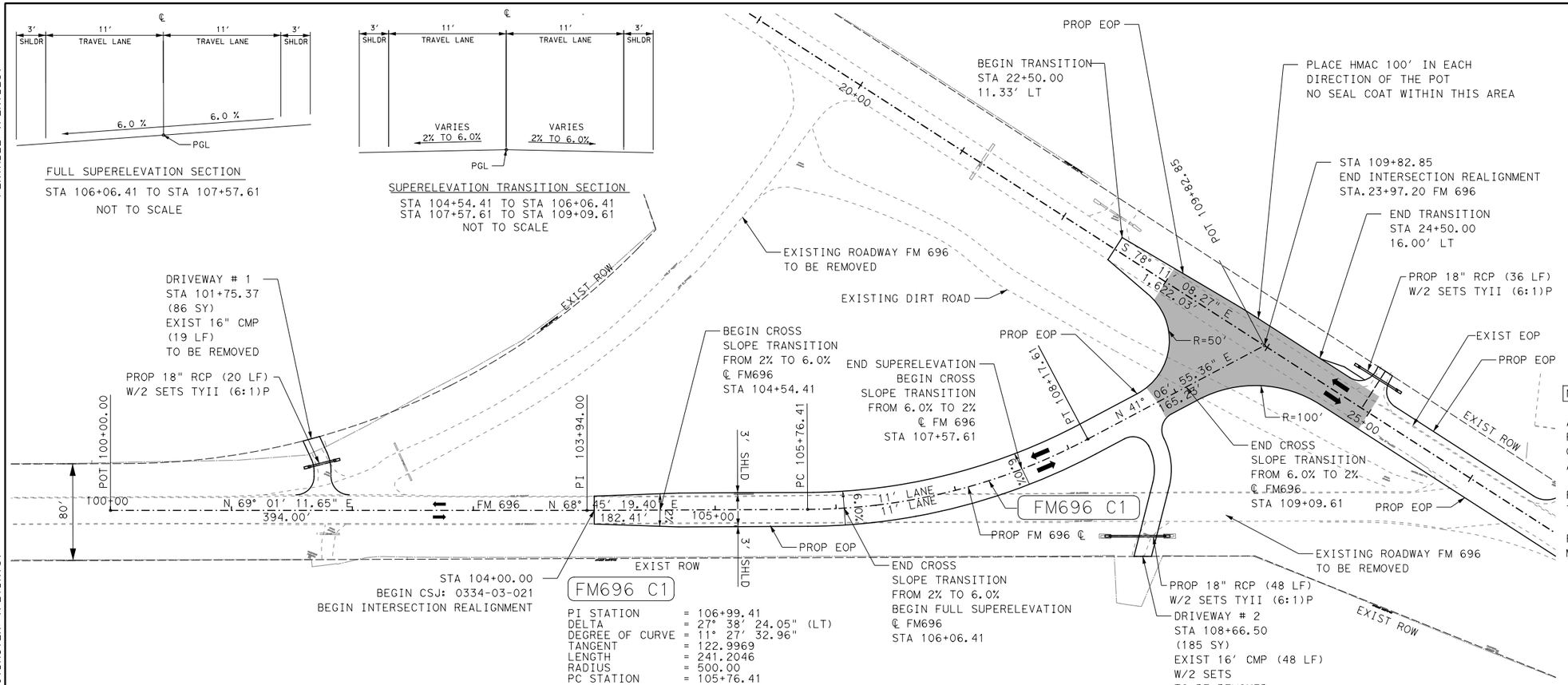
NOT TO SCALE

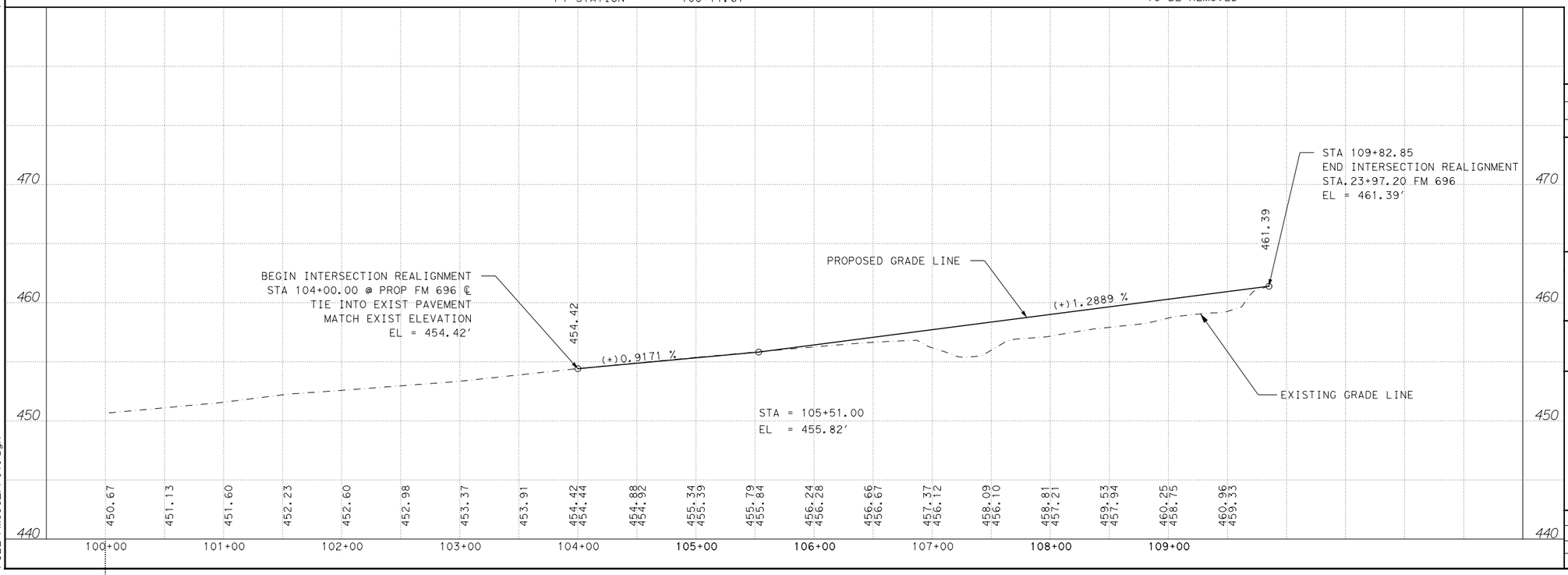
SUPERELEVATION TRANSITION SECTION

STA 104+54.41 TO STA 106+06.41

STA 107+57.61 TO STA 109+09.61

NOT TO SCALE





HORZ 0′ 25′ 50′ 100′

VERT 0′ 5′ 10′

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER

01/28/2021

Mark W. Litzmann, P.E.

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Texas Department of Transportation

LEE COUNTY

FM 696

PLAN & PROFILE

INTERSECTION REALIGNMENT

SHEET 1 OF 7

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	49

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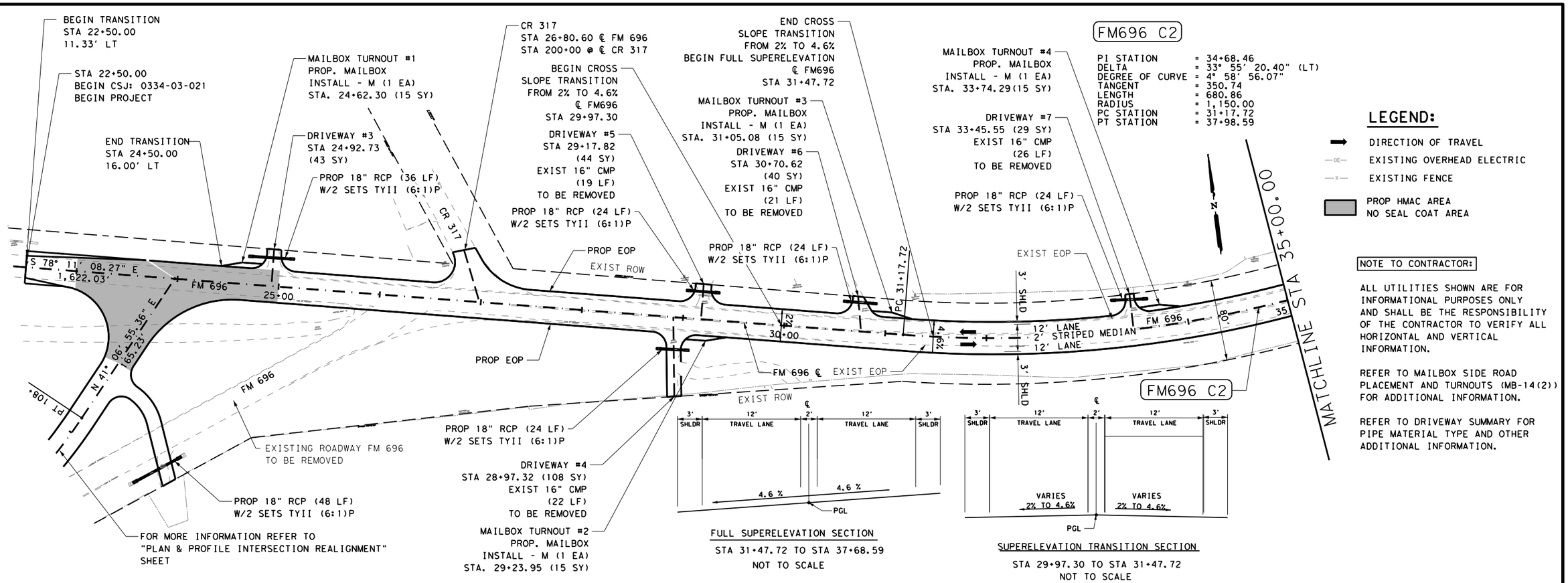

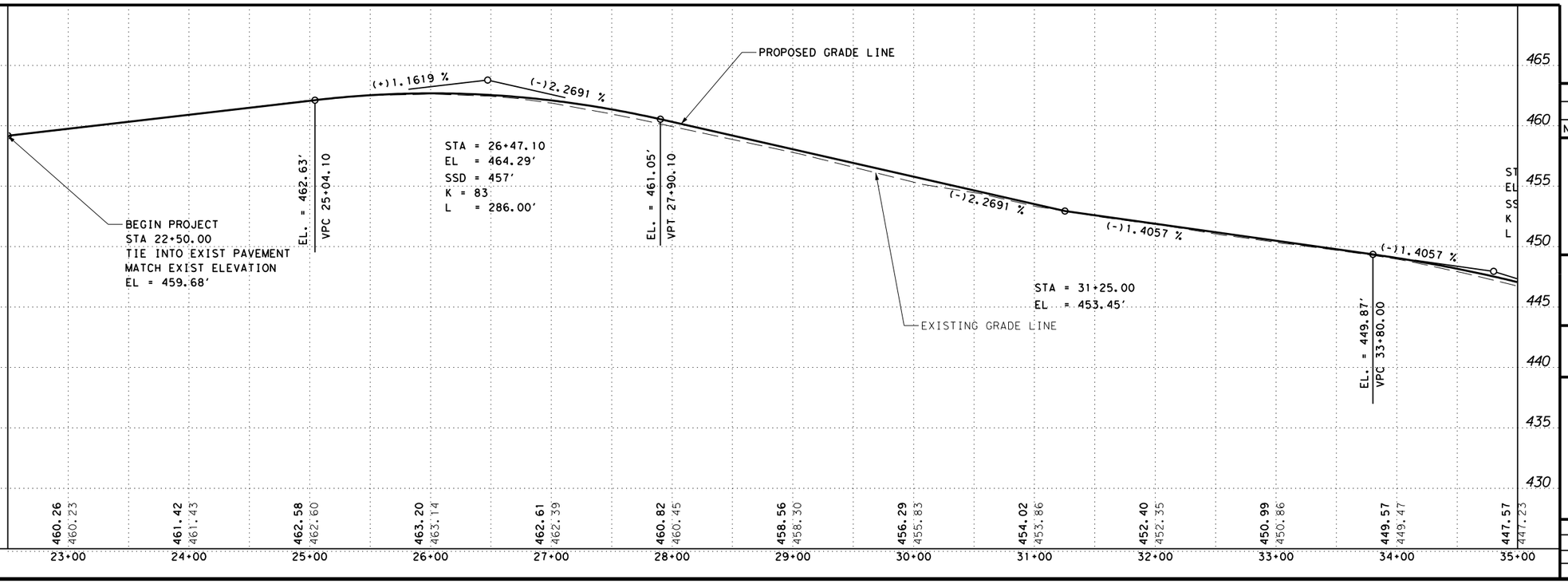

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
11.05.2020
Mark W. Litzmann, P.E.

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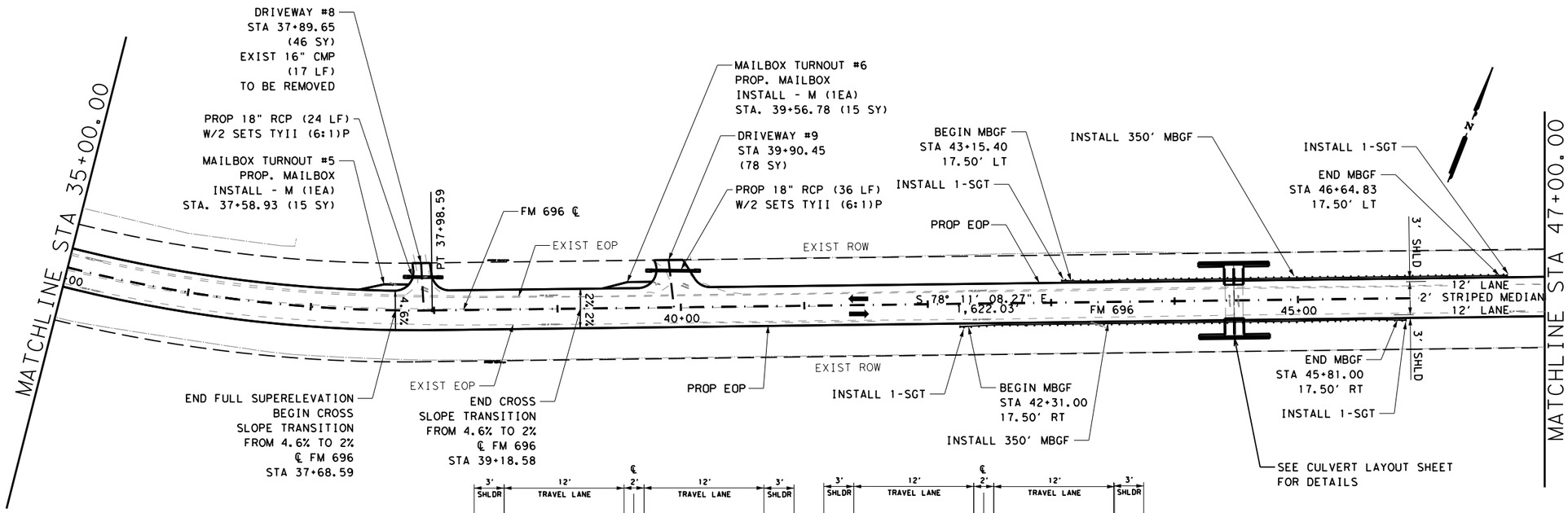
LEE COUNTY
FM 696

PLAN & PROFILE

SHEET 2 OF 7

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	50



LEGEND:

- DIRECTION OF TRAVEL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE

NOTE TO CONTRACTOR:

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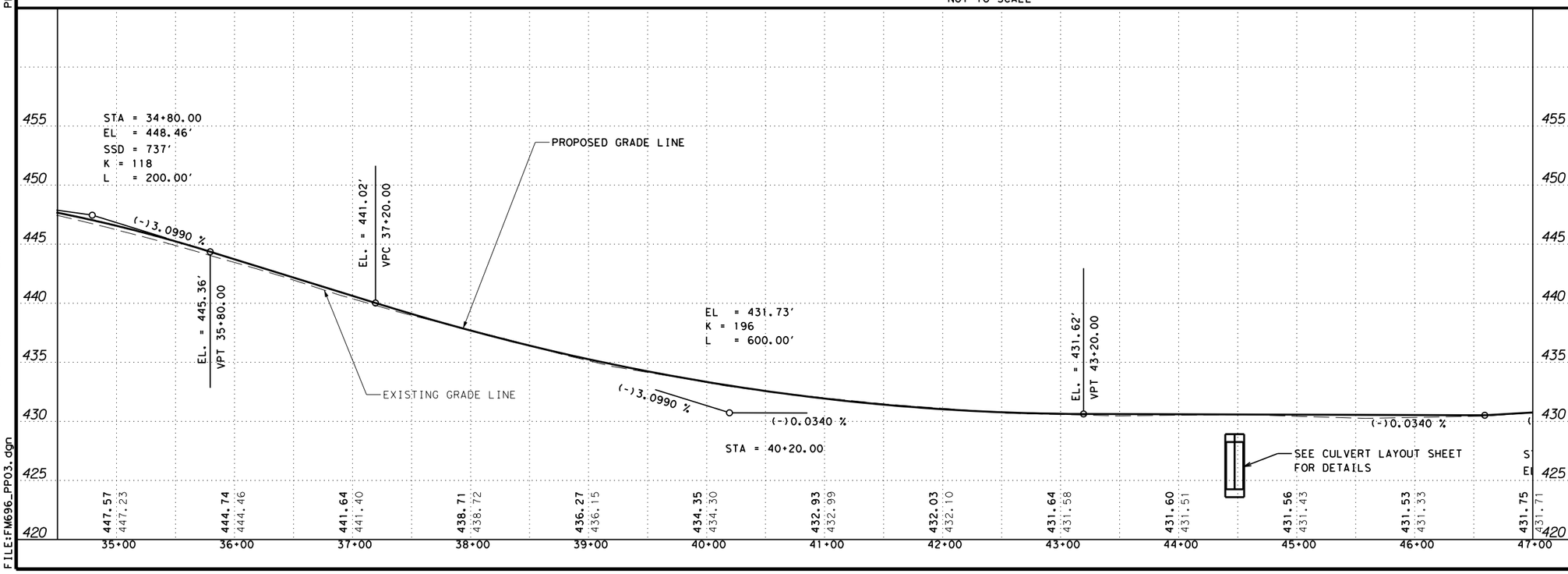
REFER TO MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS (MB-14(2)) FOR ADDITIONAL INFORMATION.

REFER TO DRIVEWAY SUMMARY FOR PIPE MATERIAL TYPE AND OTHER ADDITIONAL INFORMATION.



HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
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LICENSED PROFESSIONAL ENGINEER
11.05.2020
Mark W. Litzmann, P.E.

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Texas Department of Transportation

LEE COUNTY
FM 696

PLAN & PROFILE

SHEET 3 OF 7

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	51

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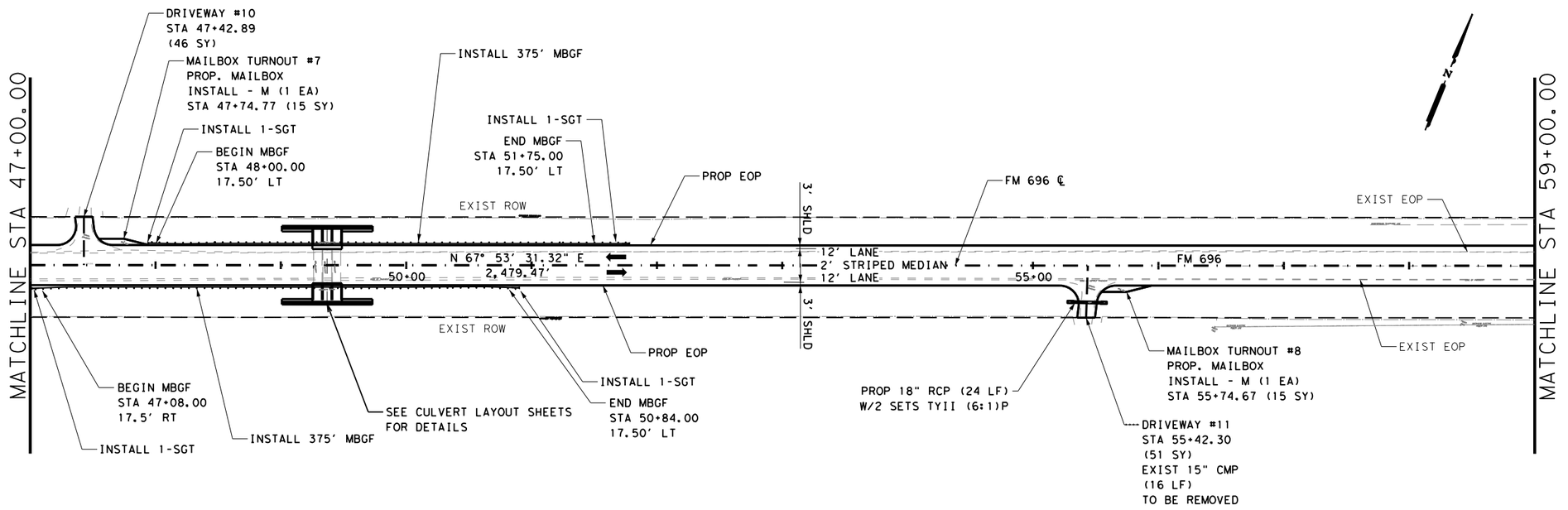

LEGEND:

- DIRECTION OF TRAVEL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE

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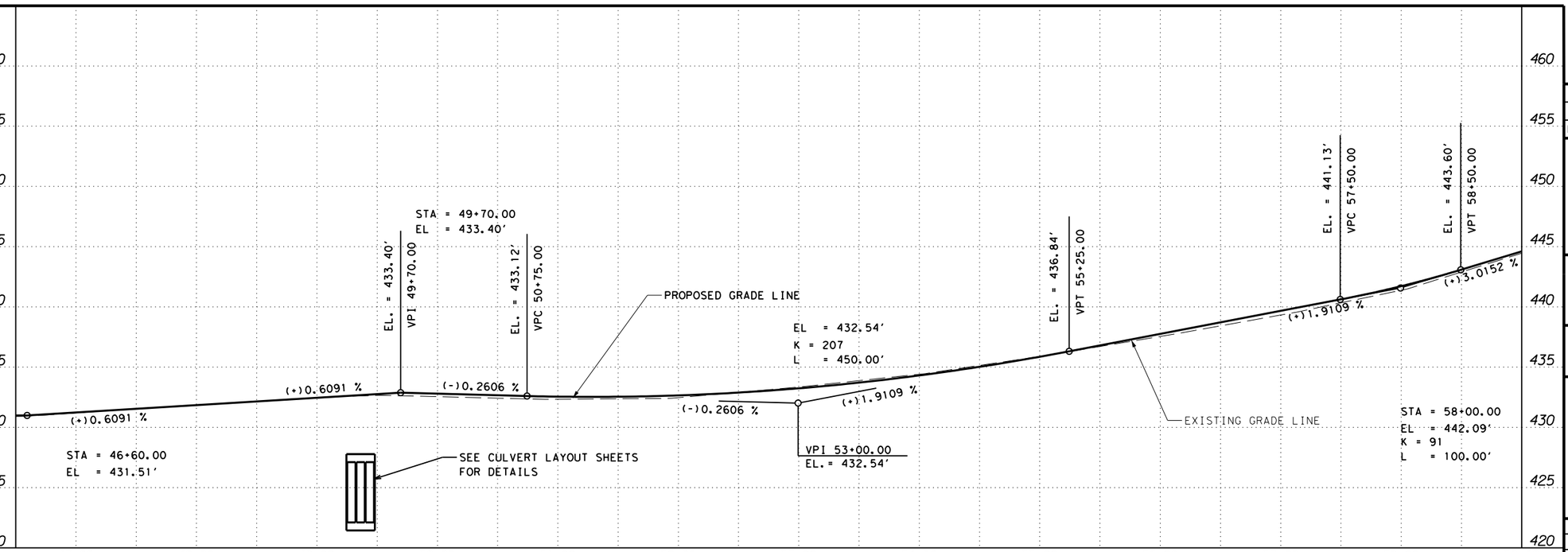

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
11.05.2020
Mark W. Litzmann, P.E.

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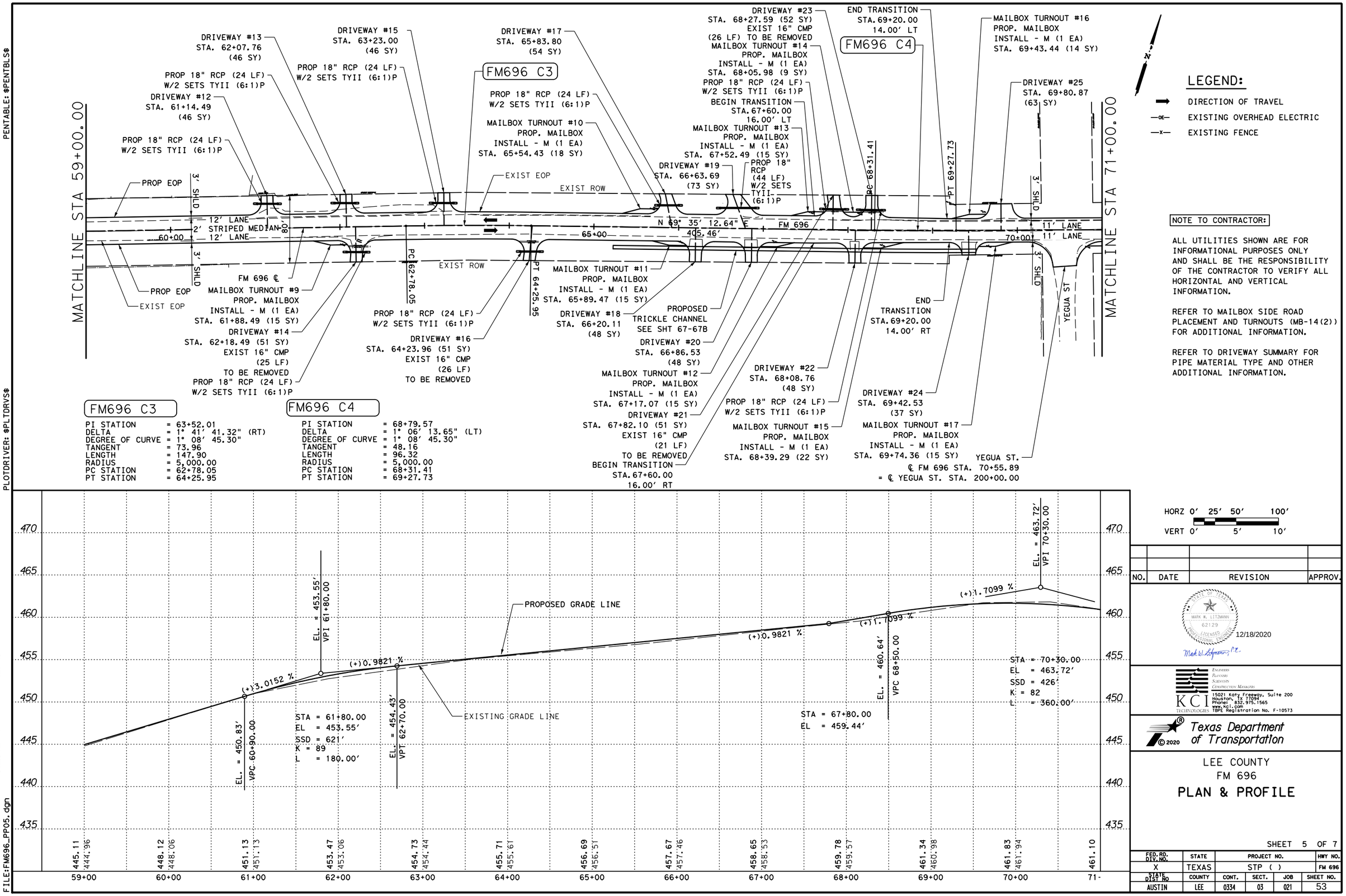
LEE COUNTY
FM 696

PLAN & PROFILE

SHEET 4 OF 7

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	52



FM696 C3

PI STATION	= 63+52.01
DELTA	= 1° 41' 41.32" (RT)
DEGREE OF CURVE	= 1° 08' 45.30"
TANGENT	= 73.96
LENGTH	= 147.90
RADIUS	= 5,000.00
PC STATION	= 62+78.05
PT STATION	= 64+25.95

FM696 C4

PI STATION	= 68+79.57
DELTA	= 1° 06' 13.65" (LT)
DEGREE OF CURVE	= 1° 08' 45.30"
TANGENT	= 48.16
LENGTH	= 96.32
RADIUS	= 5,000.00
PC STATION	= 68+31.41
PT STATION	= 69+27.73

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER
12/18/2020
Mark W. Litzmann, P.E.

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 Texas Department of Transportation

LEE COUNTY
FM 696
PLAN & PROFILE

SHEET 5 OF 7

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	53

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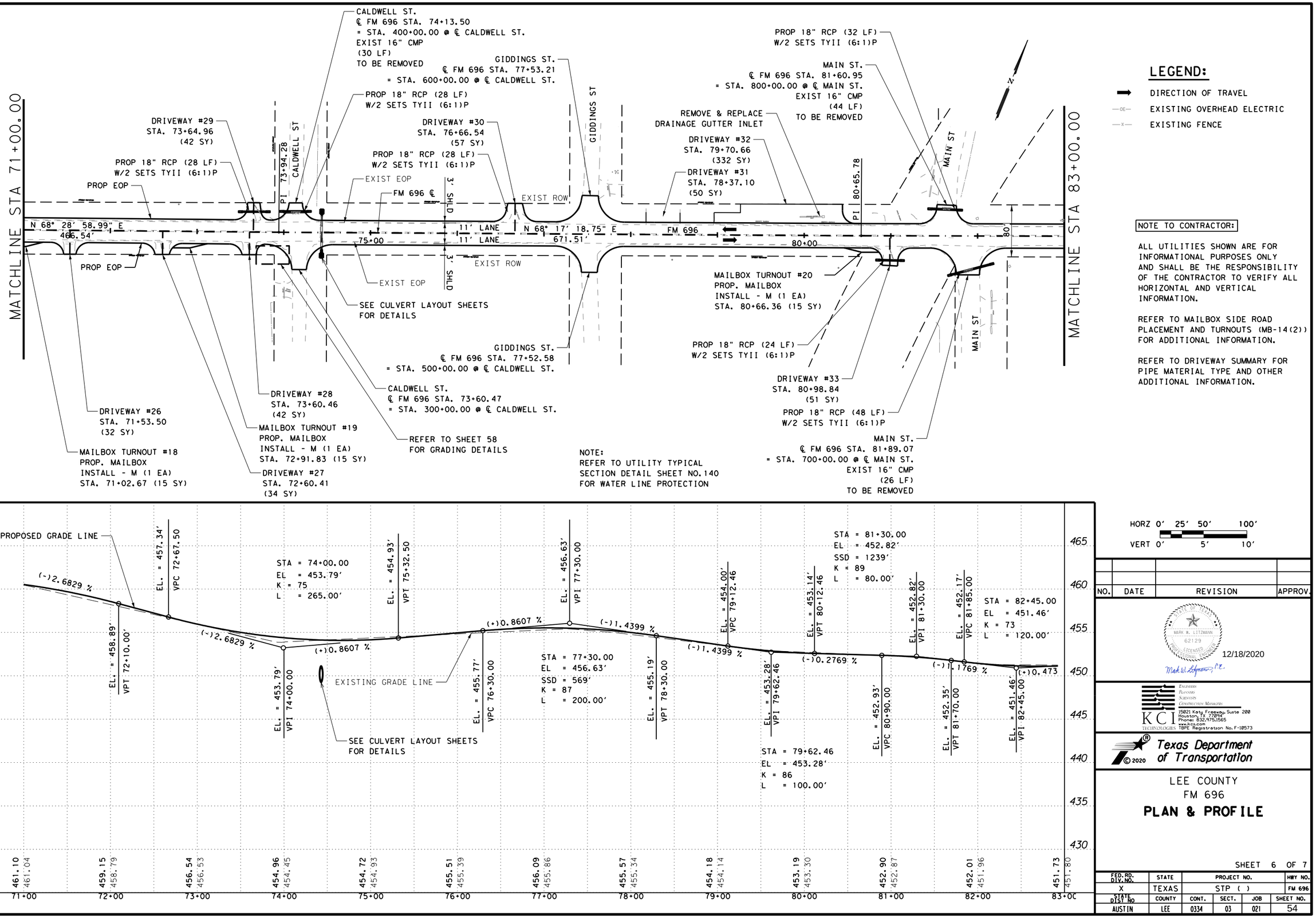

NOTE:
REFER TO UTILITY TYPICAL SECTION DETAIL SHEET NO. 140 FOR WATER LINE PROTECTION

LEGEND:

- DIRECTION OF TRAVEL
- —OE— EXISTING OVERHEAD ELECTRIC
- —X— EXISTING FENCE

NOTE TO CONTRACTOR:

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REFER TO MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS (MB-14(2)) FOR ADDITIONAL INFORMATION.

REFER TO DRIVEWAY SUMMARY FOR PIPE MATERIAL TYPE AND OTHER ADDITIONAL INFORMATION.

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER
12/18/2020
Mark W. Litzmann, P.E.

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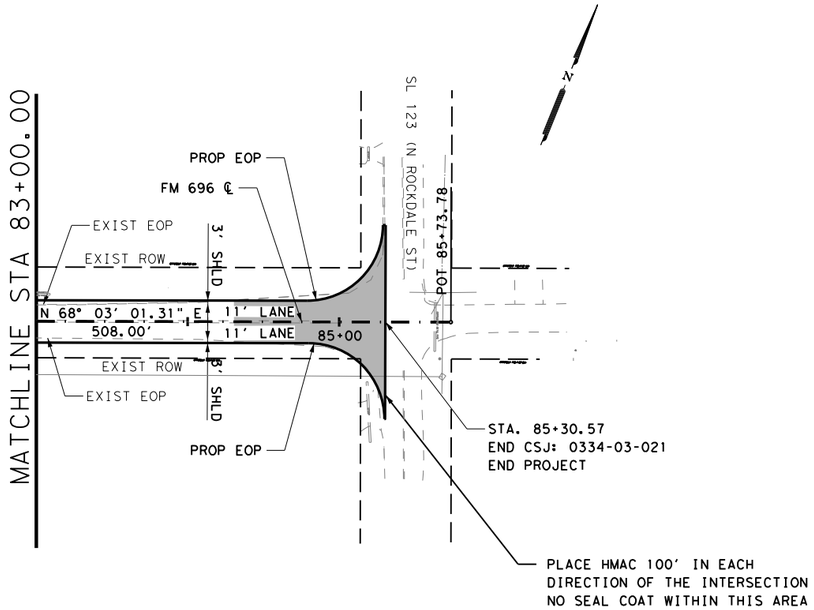
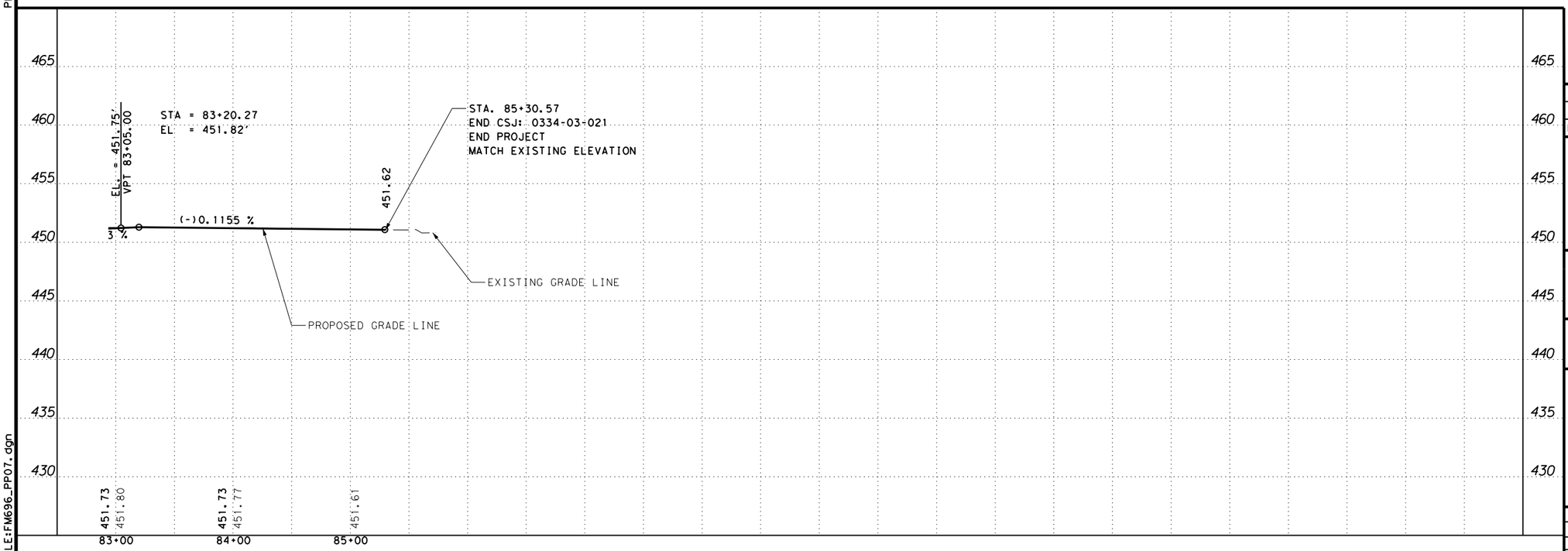
Texas Department of Transportation

LEE COUNTY
FM 696
PLAN & PROFILE

SHEET 6 OF 7

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	54





LEGEND:

- DIRECTION OF TRAVEL
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE
- PROP HMAC AREA
  NO SEAL COAT AREA

NOTE TO CONTRACTOR:

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REFER TO DRIVEWAY SUMMARY FOR PIPE MATERIAL TYPE AND OTHER ADDITIONAL INFORMATION.

HORZ 0' 25' 50' 100'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
Mark W. Litzmann P.E.

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 Texas Department of Transportation

LEE COUNTY
FM 696
PLAN & PROFILE

SHEET 7 OF 7

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	55

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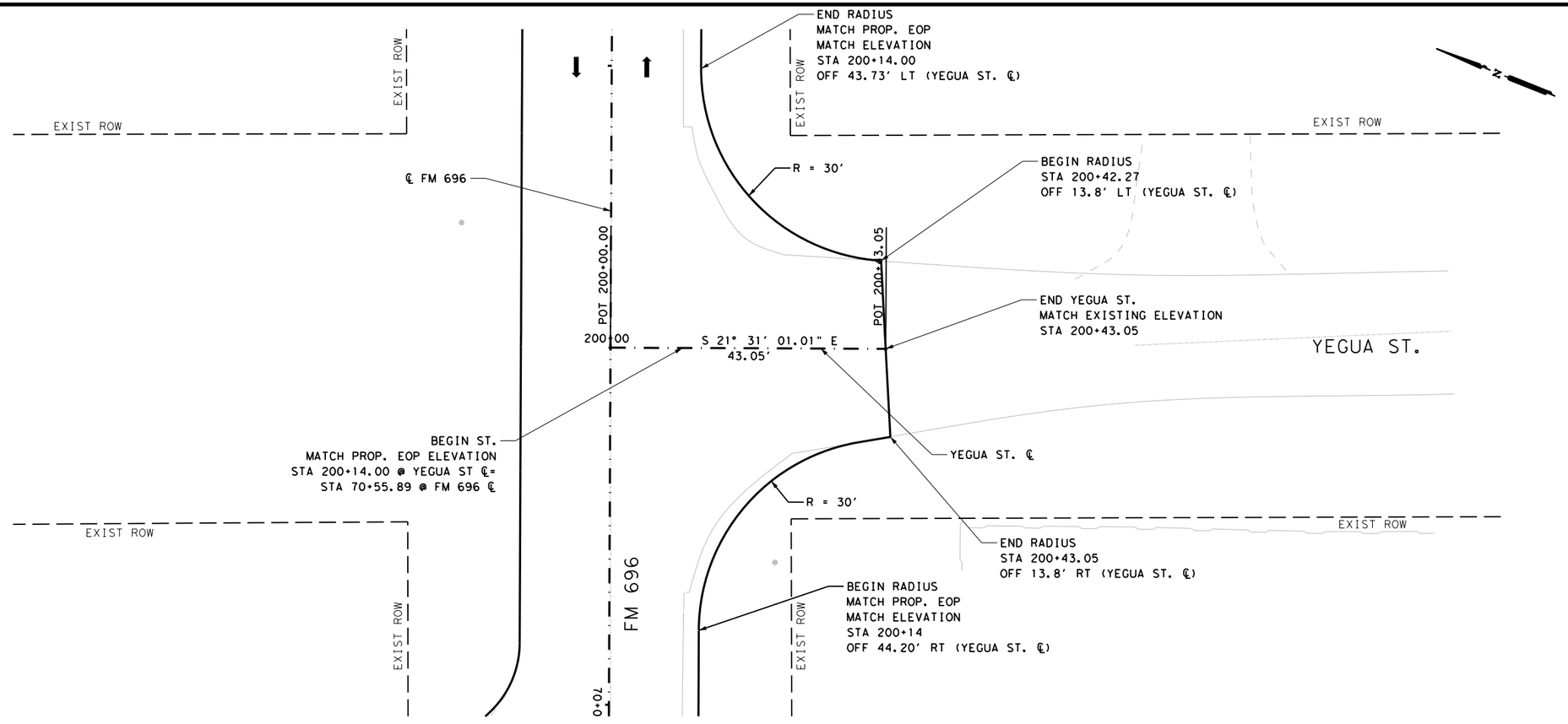
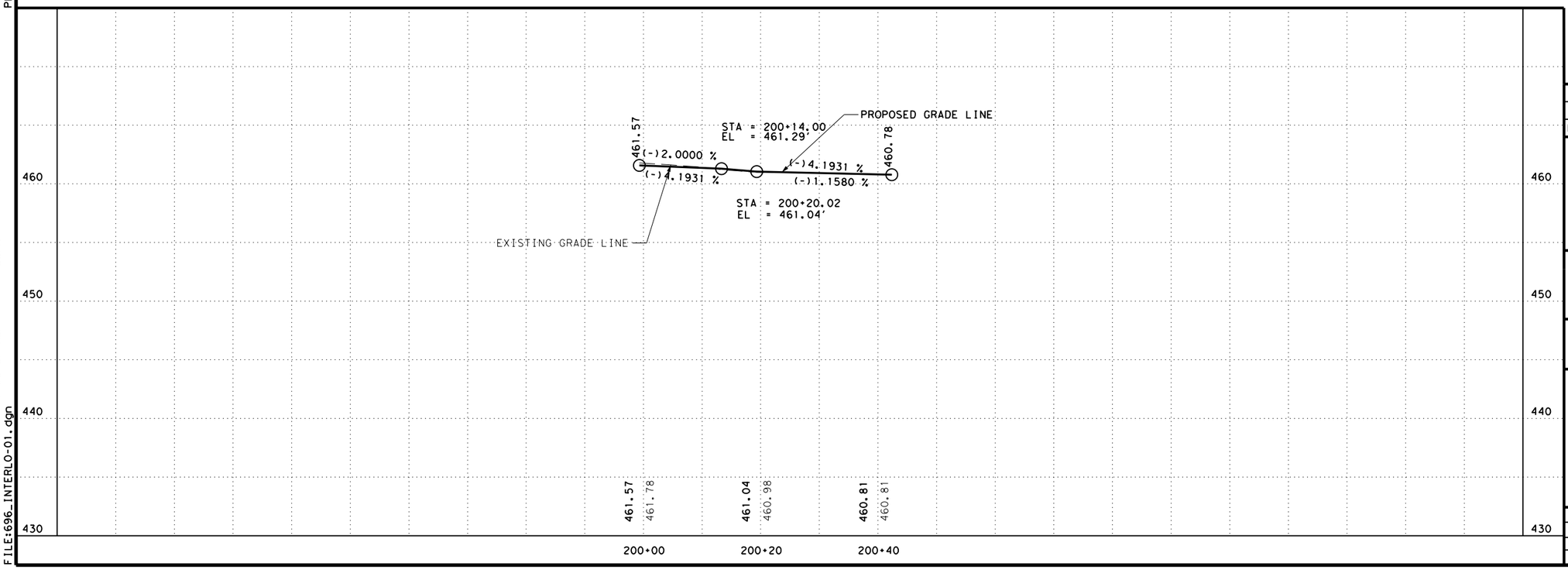


LEGEND:

➡ DIRECTION OF TRAVEL



HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
Mark W. Litzmann, P.E.

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Houston TX 77094
Phone: 832.975.1565
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LEE COUNTY
FM 696

YEGUA ST.
PLAN & PROFILE

SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	56

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

DATE:10/23/2020 11:08:59 AM
FILE:696_INTERLO-02_NORTH.dgn

EXIST ROW

℄ FM 696

SEE CULVERT LAYOUT SHEET FOR DETAILS

END RADIUS
STA 300+19.98
OFF 27.71' LT (CALDWELL ST. NW ℄)

PROP 18" RCP (28 LF)
W/2 SETS TYII (6:1)P

BEGIN RADIUS
STA 300+00.00
OFF 7.71' LT (CALDWELL ST. NW ℄)

CALDWELL ST.

BEGIN CALDWELL ST. NORTH
MATCH EXISTING ELEVATION
STA 300+00.00

END RADIUS
STA 300+00.02
OFF 7.71' RT (CALDWELL ST. NW ℄)

CALDWELL ST. NW ℄

R = 20'

END CALDWELL ST. NORTH
MATCH PROP. EOP ELEVATION
STA 300+19.98 @ CALDWELL ST NW ℄=
STA 74+13.50 @ FM 696 ℄

BEGIN RADIUS
STA 300+19.95
OFF 27.78' RT (CALDWELL ST. NW ℄)

POT 300+00.00

300+00

S 21° 42' 4

33.98'

34.28

POT 300+76.88

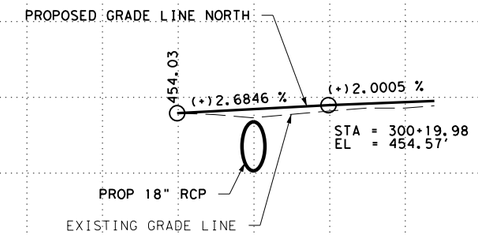
CALDWELL ST.

CALDWELL ST. SE ℄

N

LEGEND:

➡ DIRECTION OF TRAVEL



	460	450	440
454.03	454.03		
454.57	454.17		
454.68	454.12		
453.98	453.24		

300+00 300+20 300+40 300+60

HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

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CALDWELL ST. NORTH
PLAN & PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	57

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

DATE:12/18/2020 2:43:29 PM

FILE:696_INTERLO-02_SOUTH.dgn

EXIST ROW

℄ FM 696

END RADIUS
STA 300+47.98
OFF 38.38' LT (CALDWELL ST. SE ℄)

SEE CULVERT LAYOUT SHEET FOR DETAILS

BEGIN CALDWELL ST. SOUTH
MATCH PROP. EOP ELEVATION
STA 300+47.98 @ CALDWELL ST SE ℄=
STA 74+17.97 @ FM 696 ℄

R = 30'

BEGIN RADIUS
STA 300+76.85
OFF 8.41' LT (CALDWELL ST. SE ℄)

END CALDWELL ST. SOUTH
MATCH EXISTING ELEVATION
STA 300+76.88

POT 300+00.00

POT 300+33.98

POT 300+76.88

CALDWELL ST.

300+00

S 21° 42' 41.25" E
33.98'

S 21° 42' 41.25" E
42.90'

CALDWELL ST. SE ℄

CALDWELL ST. NW ℄

PI 73+94.28

R = 30'

END RADIUS
STA 300+76.88
OFF 8.41' RT (CALDWELL ST. SE ℄)

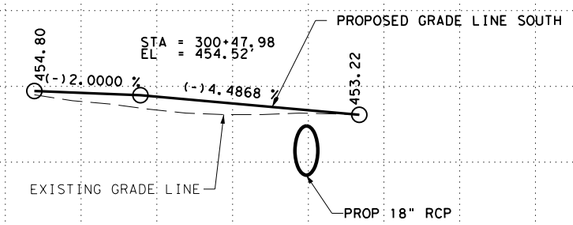
ELEVATION= 452.67

BEGIN RADIUS
STA 300+47.93
OFF 38.29' RT (CALDWELL ST. SE ℄)

ELEVATION= 453.32

LEGEND:

➡ DIRECTION OF TRAVEL



HORZ 0' 5' 10' 20'

VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER

12/18/2020

Mark W. Litzmann, P.E.

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CALDWELL ST. SOUTH
PLAN & PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	58

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

DATE:10/23/2020 11:09:14 AM
FILE:696_INTERLO-03_NORTH.dgn

END RADIUS
STA. 500+30.41
OFF 39.36' LT (GIDDINGS ST. NW ℄)

EXIST ROW

EXIST ROW

EXIST ROW

EXIST ROW

R = 30'

BEGIN RADIUS
STA. 500+00.19
OFF 9.36' LT (GIDDINGS ST. NW ℄)

10" PVC

BEGIN GIDDINGS ST. NORTH
MATCH EXISTING ELEVATION
STA. 500+00.00

POT 500+00.00

POT 500+44.41

POT 500+88.45

500+00

S 21° 42' 41.25" E
44.41'

S 21° 42' 41.25" E
44.04'

GIDDINGS ST.

GIDDINGS ST.

GIDDINGS ST. NW ℄

END RADIUS
STA. 500+00.00
OFF 9.36' RT (GIDDINGS ST. NW ℄)

GIDDINGS ST. SE ℄

EXIST ROW

EXIST ROW
END GIDDINGS ST. NORTH
MATCH PROP. EOP
MATCH ELEVATION
STA 500+30.41 @ GIDDINGS ST. NW ℄ @
STA 77+53.21 @ FM 696 ℄

R = 30'

N 68° 17' 18.75" E
671.51'

EXIST ROW

EXIST ROW

BEGIN RADIUS
STA. 500+30.41
OFF 39.98' RT (GIDDINGS ST. NW ℄)

℄ FM 696

N

LEGEND:

➡ DIRECTION OF TRAVEL

PROPOSED GRADE LINE NORTH

456.36

(-)2.2496 %

(+)2.0000 %

455.96

STA = 500+30.41
EL = 455.67

EXISTING GRADE LINE

460
450
440

456.36 456.36 | 455.91 456.16 | 455.87 455.68 | 455.64 455.15 | 455.16 454.97

500+00 500+20 500+40 500+60 500+80

HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

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FM 696

GIDDINGS ST NORTH
PLAN & PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	59

PENTABLE: $PENTBLS$
PLOTDRIVER: $PLTDRVS$
USER:
DATE:10/23/2020 11:09:22 AM
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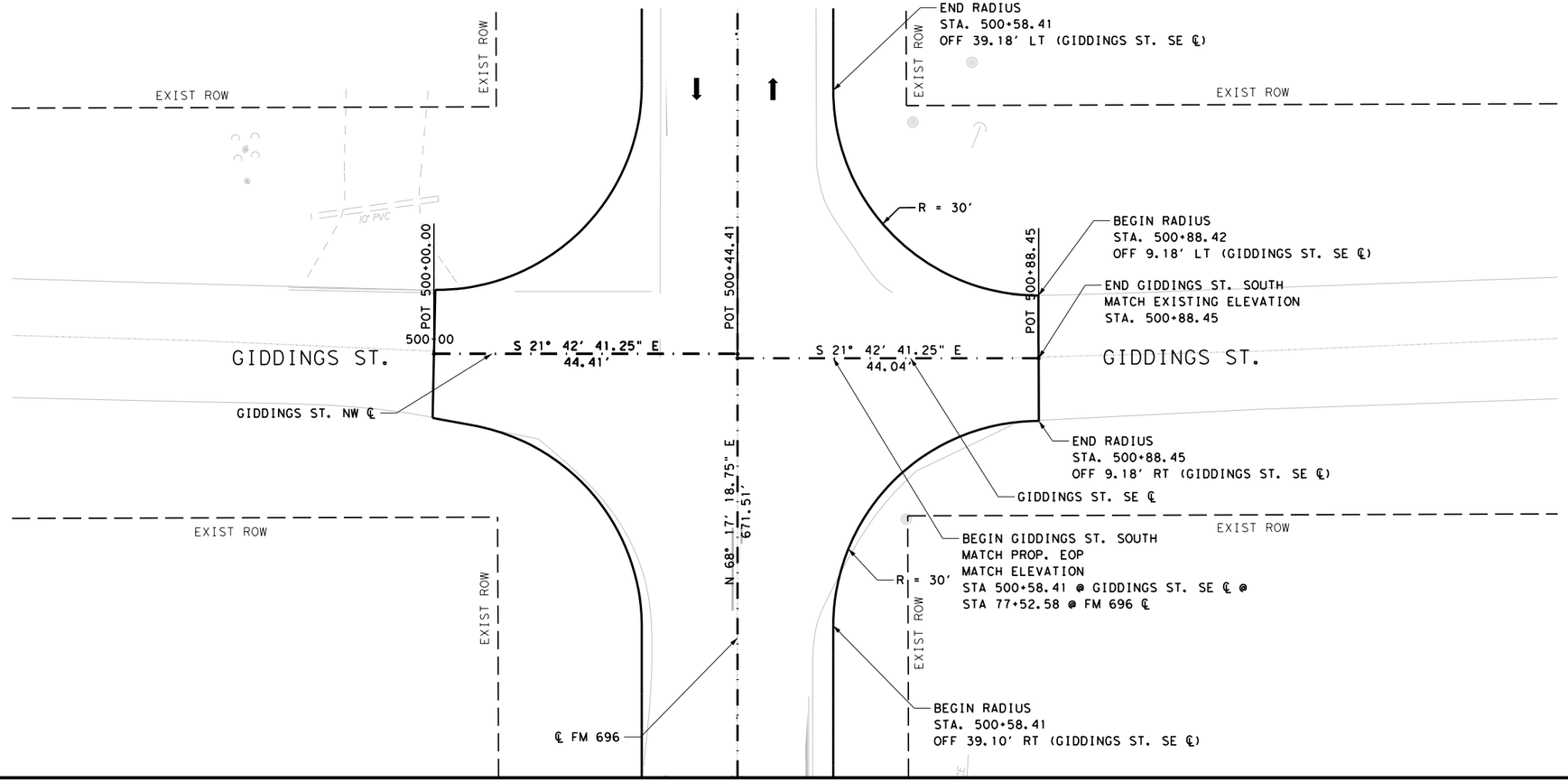

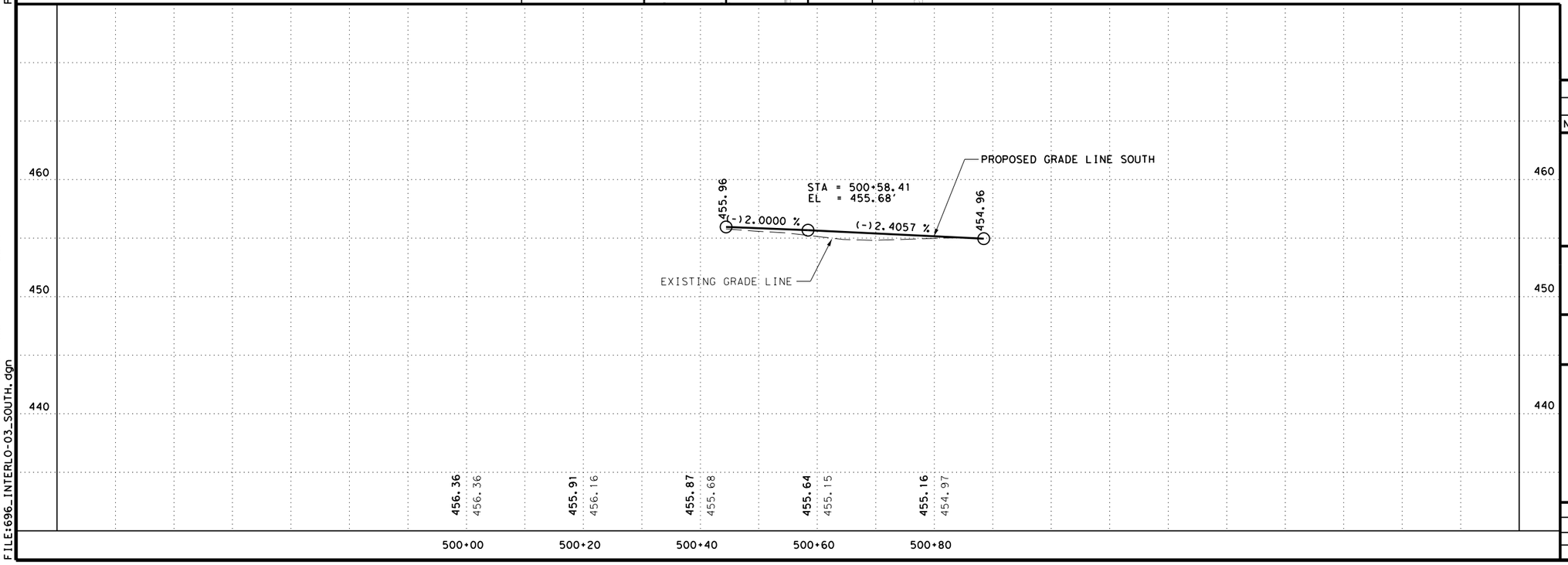

HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

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PLAN & PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	60

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

DATE:10/23/2020 11:09:31 AM
FILE:696_INTERLO-04_NORTH.dgn

EXIST ROW

EXIST ROW

℄ FM 696

END RADIUS
STA. 700+21.61
OFF 31.08' LT (MAIN ST. ℄)

BEGIN RADIUS
STA. 700+00.54
OFF 11.11' LT (MAIN ST. ℄)

MAIN ST. ℄

R = 20'

POT 700+00.00

700+00

MAIN ST.

S 21° 56' 58.69" E
35.61'

POT 700+35.61

POT 700+35.61

S 21° 56' 58.69" E
44.84'

POT 700+80.45

MAIN ST.

MAIN ST. ℄

EXIST ROW

BEGIN MAIN ST. NORTH
MATCH EXISTING ELEVATION
STA. 700+00.00

END RADIUS
STA. 700+00.00
OFF 11.11' RT (MAIN ST. ℄)
PROP 18" RCP (32 LF)
W/2 SETS TYII (6:1)P

END MAIN ST. NORTH
MATCH PROP. EOP
MATCH ELEVATION
STA 700+21.61 @ MAIN ST. ℄=
STA 81+64.40 @ FM 696 ℄

R = 20'

BEGIN RADIUS
STA. 700+21.61
OFF 31.41' RT (MAIN ST. ℄)

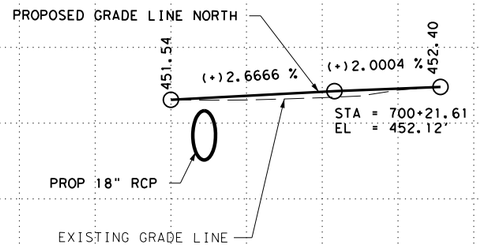
EXIST ROW

EXIST ROW

N

LEGEND:

➡ DIRECTION OF TRAVEL



460
450
440
430

451.54 451.54
452.07 451.68
452.04 451.97
451.56 451.26
451.00 451.00

700+00 700+20 700+40 700+60 700+80

HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

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10.23.2020

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FM 696

MAIN ST. NORTH
PLAN & PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	61

PENTABLE: $PENTBLS$

PLOTDRIVER: $PLTDRVS$

USER:

DATE:10/23/2020 11:09:36 AM
FILE:696_INTERLO-04_SOUTH.dgn

EXIST ROW

EXIST ROW

℄ FM 696

POT 700+35.61

R = 30'

END RADIUS
STA. 700+49.75
OFF 40.25' LT (MAIN ST. ℄)

PROP 18" RCP (48 LF)
W/2 SETS TYII (6:1)P

BEGIN RADIUS
STA. 700+80.46
OFF 13.20' LT (MAIN ST. ℄)

MAIN ST.

POT 700+80.45

END MAIN ST. SOUTH
MATCH EXISTING ELEVATION
STA. 700+80.45

MAIN ST. ℄

S 21° 56' 58.69" E
44.84'

MAIN ST. ℄

R = 20'

POT 700+00.00

POT 700+35.61

700+00

S 21° 56' 58.69" E
35.61'

MAIN ST.

EXIST ROW

END RADIUS
STA. 700+80.43
OFF 13.20' RT (MAIN ST. ℄)

BEGIN MAIN ST. SOUTH
MATCH PROP. EOP ELEVATION
STA 700+49.61 @ MAIN ST. ℄=
STA 81+89.07 @ FM 696 ℄

R = 30'

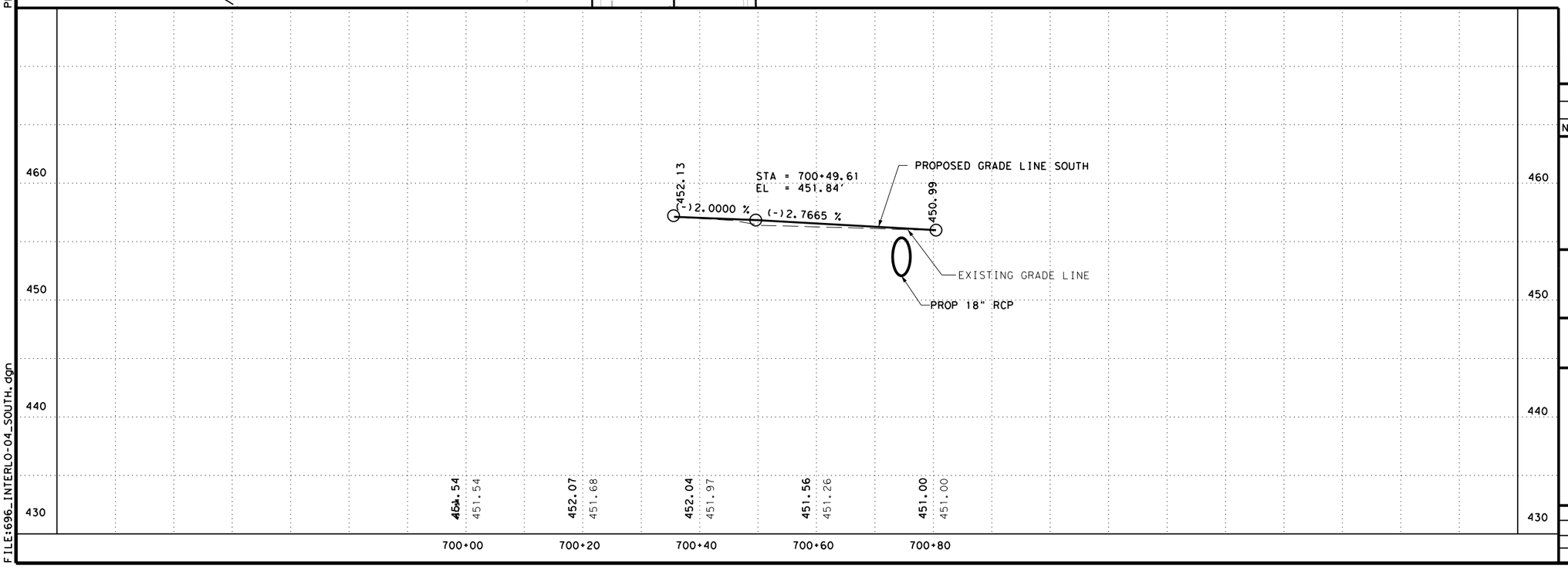
EXIST ROW

EXIST ROW

BEGIN RADIUS
STA. 700+49.61
OFF 43.60' RT (MAIN ST. ℄)

LEGEND:

➡ DIRECTION OF TRAVEL



HORZ 0' 5' 10' 20'
VERT 0' 5' 10'

NO.	DATE	REVISION	APPROV.

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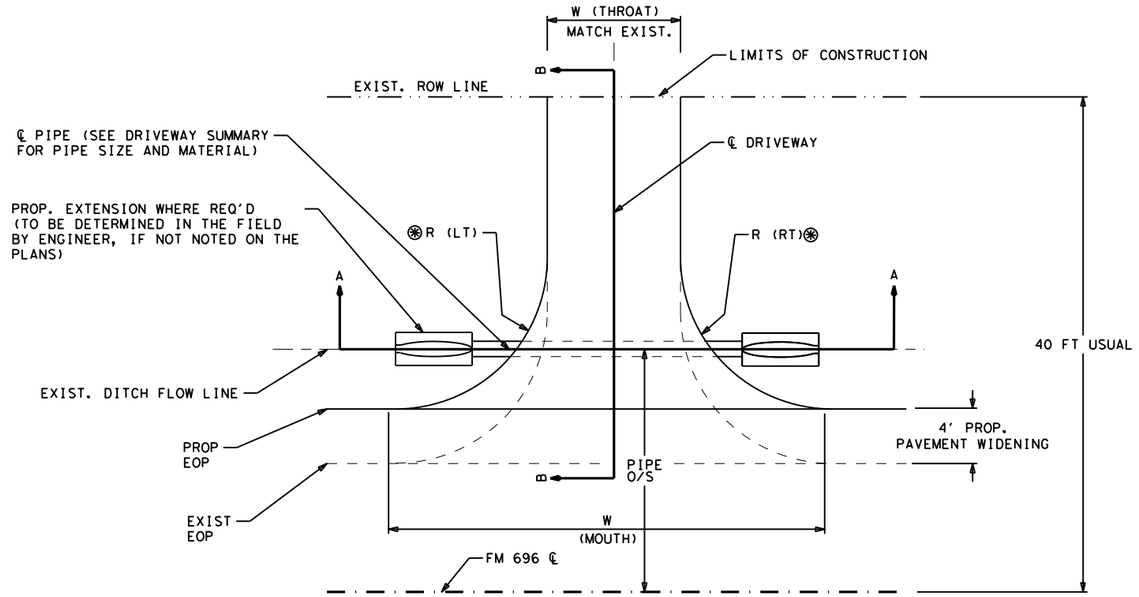
MAIN ST. SOUTH
PLAN & PROFILE

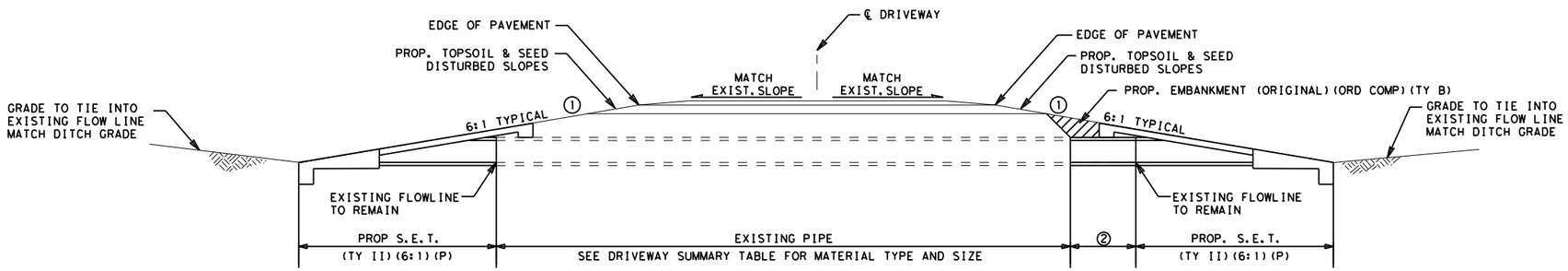
SHEET 1 OF 1

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	62



DRIVEWAY PLAN VIEW

APPLIES TO ALL DRIVEWAYS AND CROSS-STREET APPROACHES



SECTION A-A

APPLIES TO ALL DRIVEWAYS AND CROSS-STREET APPROACHES

(1) EXISTING SLOPES MAY BE STEEPER THAN 6:1. FILL TO A MINIMUM 6:1 SLOPE AND ADD S.E.T.

(2) TAPERED PIPE EXTENSION SHALL BE CONSIDERED SUBSIDUARY TO INSTALLATION OF S.E.T.

NOTE TO CONTRACTOR:

DRIVEWAY EARTHWORK QUANTITIES CALCULATED BEYOND TYPICAL SLOPE.

GRADE ALL DRIVEWAYS TO MAINTAIN POSITIVE DRAINAGE.

PROP. WIDTH OF DRIVEWAYS TO MATCH EXISTING WIDTH AT R.O.W. LINE

ACCESS TO THE ADJOINING PROPERTY SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCION OF PROPOSED DRIVEWAY IMPROVEMENTS.

AVERAGE DRIVEWAY DIMENSIONS SHOWN ON THE DRIVEWAY SUMMARY TABLE ARE FOR ESTIMATING PURPOSES ONLY. ACTUAL DRIVEWAY DIMENSIONS MAY BE CHANGED BY THE ENGINEER BASED ON EXISTING FIELD CONDITIONS.

SEE GENERAL NOTES FOR APPLICAPLE RATES OF MATERIALS UTILIZED FOR THE CONSTRUCTION OF DRIVEWAYS.

R SEE DRIVEWAY SUMMARY TABLE, TURNING RADIUS MAY BE REDUCED AS APPROVED BY THE ENGINEER.

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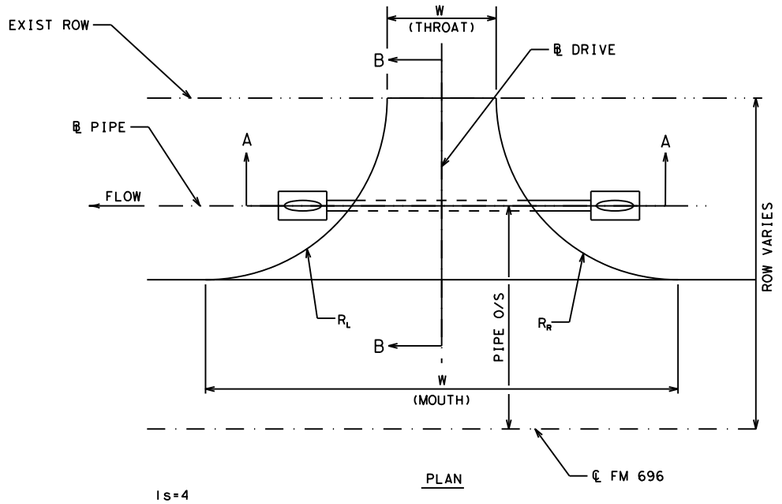
DRIVEWAY DETAILS

SHEET 1 OF 3

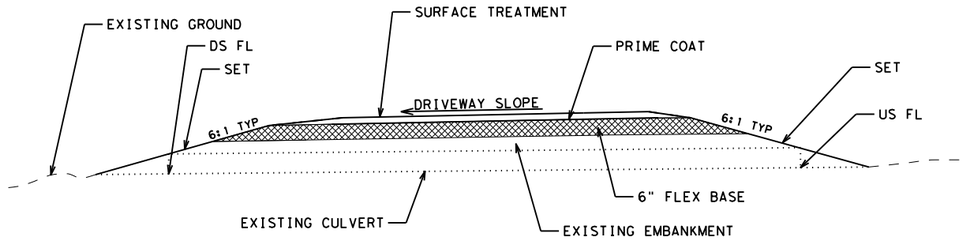
FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	63



PLAN

ls=4
wt=1

DRIVEWAY WITH CULVERT



SECTION A-A

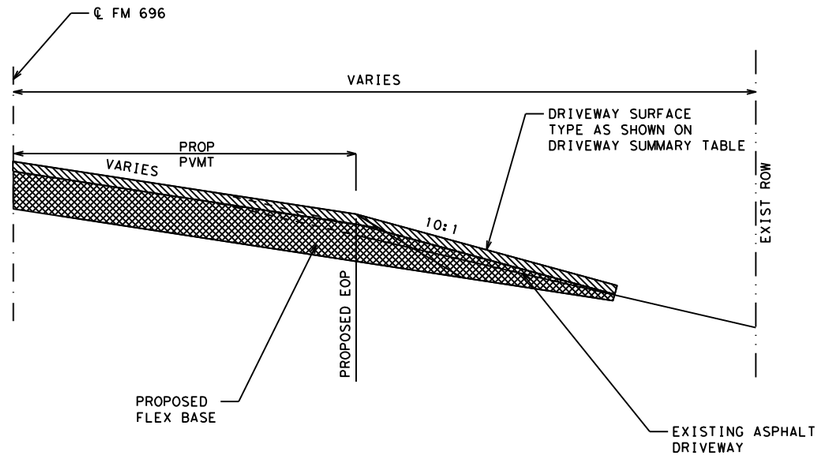
FOR SURFACE TREATED DRIVEWAYS

NOTE:

DRIVEWAY EARTHWORK QUANTITIES CALCULATED BEYOND TYPICAL ROADWAY SLOPE.

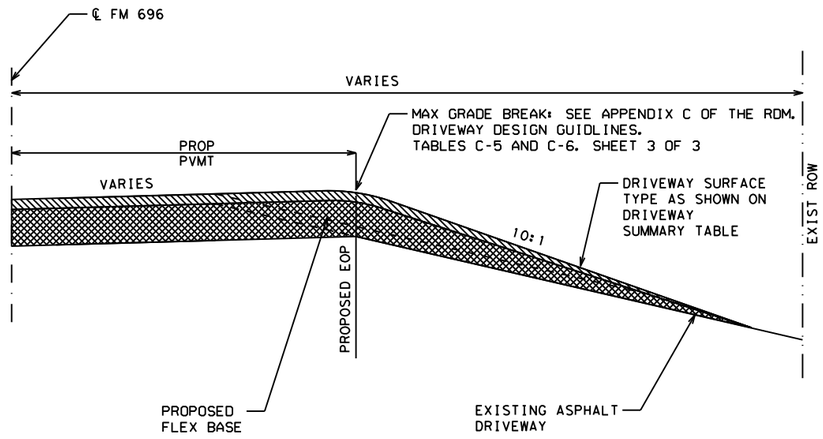
GRADE ALL DRIVEWAYS TO DRAIN.

ls=6
wt=1



SECTION B-B

FOR APSHALT DRIVEWAYS



SECTION B-B

FOR APSHALT DRIVEWAYS

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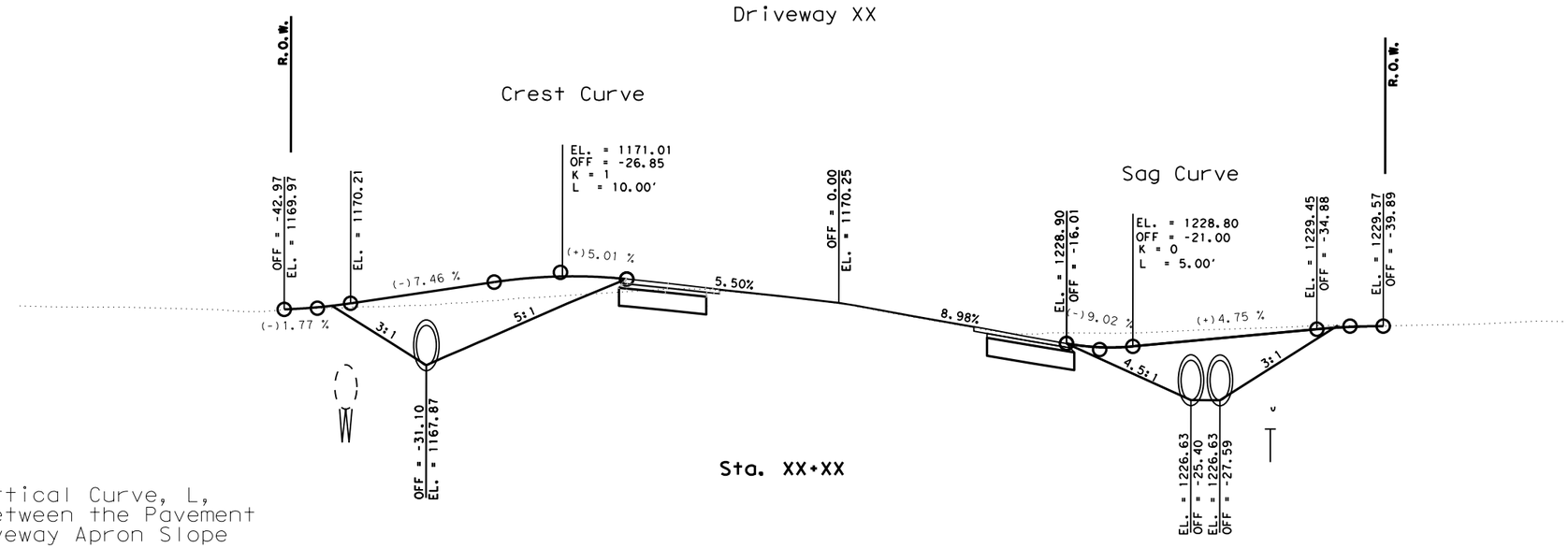
DRIVEWAY DETAILS

SHEET 2 OF 3

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	64

PENTABLE: $PENTBLS$
PLOTDRIVER: $PLTDRVS$
USER:
DATE:10/23/2020 11:12:03 AM
FILE:FM696_DRIVEWAYDETAILS.dgn



NOTE:
DRIVEWAY PROFILES ARE SHOWN IN THE ROADWAY CROSS SECTIIONS.

Table C-5. Length of Vertical Curve, L, For a Change in Grade Between the Pavement Cross-Slope and the Driveway Apron Slope

	Crest		Sag	
Change in Grade	Des. ft (m)	Min. ft (m)	Des. ft (m)	Min. ft (m)
4-5%	5 (1.5)	3 (0.9)	7 (2.1)	4 (1.2)
6-7%	6 (1.8)	4 (1.2)	8 (2.4)	5 (1.5)
8-10%	8 (2.4)	5 (1.5)	10 (3.0)	7 (2.1)

Rounded: Parabolic curvature. The plans specify a particular type of curvature.
Des: Desirable Minimum Length
Min: Minimum Length
Where practical, greater lengths should be provided to achieve a flatter and smoother profile.

Table C-6. Typical Length of Vertical Curve, L, For change in Grade in Driveway Profile

	Crest		Sag	
Change in Grade	Private Residential Driveways ft(m)	Other Driveways ft (m)	Private Residential Driveways ft(m)	Other Driveways ft (m)
4-5%	2 (0.6)	5 (1.5)	3 (0.9)	6 (1.8)
6-7%	3 (0.9)	5 (1.5)	5 (1.5)	7 (2.1)
8-10%	4 (1.2)	6 (1.8)	6 (1.8)	8 (2.4)

Section 4: Profiles

Public driveways and commercial driveways should be constructed with a vertical curve between the pavement cross-slope and the driveway approach and between changes in grade within the driveway throat length. A private residential driveway may be constructed without vertical curves provided that a change in grade does not adversely affect vehicle operations. Typically a change in grade of three percent (3%) or less and a distance between changes in grade of at least eleven feet [3.3 m] accommodates most vehicles. However, literature suggests that a six percent (6%) to eight percent (8%) change in grade may operate effectively. Individual site conditions should be evaluated to accommodate the vehicle fleet using the driveway.

Driveway Grades
To achieve satisfactory driveway profiles, some of the significant factors to be considered are:

1. Abrupt grade changes, which cause vehicles entering and exiting driveways to move at extremely slow speeds, can create:
   - The possibility of rear end collisions for vehicles entering the driveway.
   - The need for large traffic gaps that may be unavailable or infrequent, causing drivers to accept inadequate gaps.
2. Where sidewalks are present, or in developing areas where pedestrians may be expected now or in the future, slower turning speeds may be beneficial and special design requirements apply. See Section 6 for more information.
3. The comfort of vehicle occupants and potential vehicle damage, (i.e., prevent the dragging of center or overhanging portion of passenger vehicles).
4. Grades must be compatible with the site requirements for sight distance and drainage, to prevent excessive drainage runoff from entering the roadway or adjacent property.

Because a large combination of slopes, tangent lengths, and vertical curves will provide satisfactory driveway profiles, some generalizations should be considered relative.

On curb and gutter sections, placement of vertical curves should be at the extended gutter line and not closer to the travel lanes unless curb and gutter returns and proper drainage are provided. On curb and gutter sections, the entire curb and gutter for the length of the curb cut should be removed and the gutter pan recast as an integral part of the driveway apron.

The suggested changes in driveway grades with a vertical curve (between the pavement cross slope and the driveway apron slope) are approximately 10 percent for private residential driveways and approximately 8 percent for all other driveways.

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Austin District
Central Design

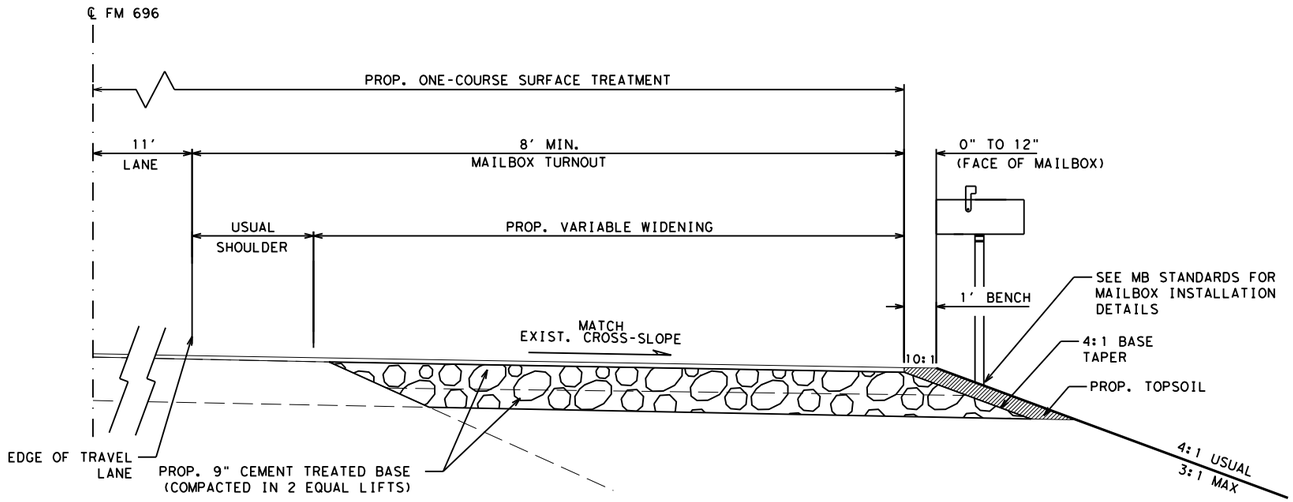
Texas Department of Transportation

FM 696

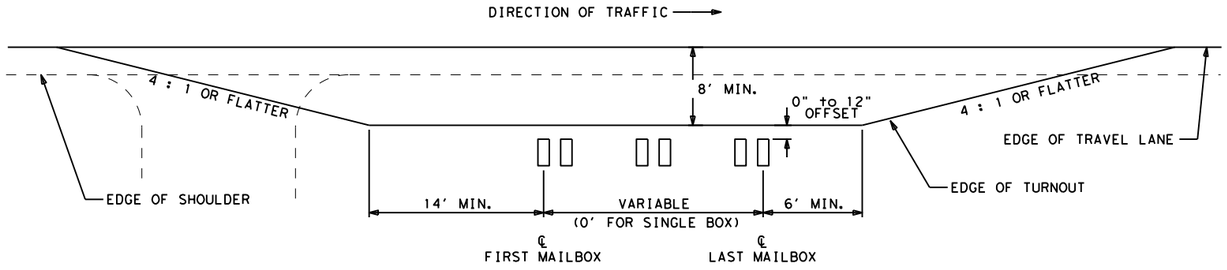
DRIVEWAY DETAILS

SHEET 3 OF 3

DSI:	CK:	CONT	SECT	JOB	HIGHWAY
		0334	03	021	FM 696
DW:	CK:	DIST	COUNTY		SHEET NO.
		AUS	LEE		65



TYPICAL SECTION
N.T.S.



PLAN
N.T.S.

NO.	DATE	REVISION	APPROV.

KCI TECHNOLOGIES
Engineers
Planners
Surveyors
Construction Managers
15021 Katy Freeway Suite 200
Houston, TX 77094
Phone: 832.475.1565
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TBPE Registration No. F-10573

Texas Department of Transportation

LEE COUNTY
FM 696

DESIGN DETAILS FOR TYPICAL MAILBOX TURNOUTS

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	66

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PLOTDRIVER: $PLTDRVS$
USER:
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FILE: FM696_DRIVEWAYDETAILS.dgn

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PLOTDRIVER: $PLTDRVS$

USER:

DATE:12/18/2020 2:46:33 PM
FILE:FM696_DRVWY_E&O_SHEETS_01.dgn

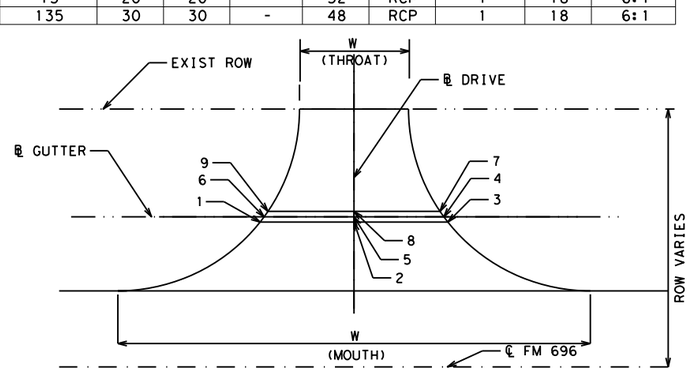
SUMMARY OF DRIVEWAYS, MAILBOX TURNOUTS, AND SIDE DRAINS

P&P SHEET NO.	DRIVE WAY NO.	DRIVEWAY TYPE	EXISTING DRIVEWAY PAVEMENT SURFACE	PROPOSED DRIVEWAY PAVEMENT SURFACE	STATION	SIDE (LT/RT)	DWY LENGTH (FT)	DWY WIDTH @ MOUTH (FT)	DWY WIDTH @ THROAT (FT)	SURFACE AREA (SY)	RADIUS		MAILBOX TURNOUT (SY)	DRIVEWAY CULVERTS				
											LT (FT)	RT (FT)		PIPE LENGTH (FT)	PIPE TYPE	NO. OF BARRELS	PIPE SIZE (IN)	EXISTING S.E.T. SIDE
1	1	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	101+75.37	LT	48.2	44	14	86	15	15	-	20	RCP	1	18	6:1
1	2	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	108+66.50	RT	112	44	14	185	15	15	-	52	RCP	1	18	6:1
2	4	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	28+90.23	RT	61.41	44	14	108	15	15	15	24	RCP	1	18	6:1
2	5	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	29+17.86	LT	18.74	46	16	44	15	15	-	24	RCP	1	18	6:1
2	6	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	30+92.59	LT	18.4	41	11	40	15	15	15	24	RCP	1	18	6:1
2	7	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	33+45.00	LT	19	38	8	29	15	15	15	24	RCP	1	18	6:1
3	8	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	37+95.08	LT	22.5	44	14	46	15	15	15	24	RCP	1	18	6:1
3	9	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	39+99.48	LT	23	54	24	78	15	15	15	36	RCP	1	18	6:1
4	10	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	47+47.52	LT	22.5	44	14	46	15	15	15	24	RCP	1	18	6:1
4	11	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	55+47.71	RT	25.7	44	14	51	15	15	15	24	RCP	1	18	6:1
5	12	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	61+14.89	LT	22.57	44	14	46	15	15	-	24	RCP	1	18	6:1
5	13	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	62+07.80	LT	22.5	44	14	46	15	15	-	24	RCP	1	18	6:1
5	14	RESIDENTIAL DRIVEWAY	ASPHALT	ASPHALT	62+22.02	RT	25.59	44	14	51	15	15	15	24	RCP	1	18	6:1
5	15	COMMERCIAL DRIVEWAY	SURF TREAT	ASPHALT	63+23.00	LT	22.75	44	14	46	15	15	-	24	RCP	1	18	6:1
5	16	SERVICE DRIVEWAY	SURF TREAT	ASPHALT	64+29.78	RT	25.34	44	14	51	15	15	-	24	RCP	1	18	6:1
5	17	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	65+99.34	LT	25.4	45	15	54	15	15	18	24	RCP	1	18	6:1
5	18	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	66+21.35	RT	24.35	44	14	48	15	15	15	-	-	-	-	-
5	19	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	66+91.49	RT	28.8	48	18	73	15	15	-	44	RCP	1	18	6:1
5	20	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	66+85.16	LT		44	14	48	15	15	15	-	-	-	-	-
5	21	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	67+88.18	LT	25.1	44	14	51	15	15	15	24	RCP	1	18	6:1
5	22	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	68+07.50	RT	23.1	44	14	48	15	15	22	-	-	-	-	-
5	23	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	68+28.40	LT	25.1	44	14	52	15	15	9	24	RCP	1	18	6:1
5	24	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	69+42.12	RT	15	46	16	37	15	15	15	-	-	-	-	-
5	25	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	69+80.87	RT	17.3	55	25	63	15	15	14	40	RCP	1	18	6:1
6	26	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	71+54.22	RT	13.56	44	14	32	15	15	15	-	-	-	-	-
6	27	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	72+59.98	RT	12.86	47	17	34	15	15	15	-	-	-	-	-
6	28	RESIDENTIAL DRIVEWAY	CONCRETE	CONCRETE	73+60.47	RT	12.2	42	17	42	10	15		-	-	-	-	-
6	29	RESIDENTIAL DRIVEWAY	SURF TREAT	ASPHALT	73+64.96	LT	20	20	14	42	15	10	-	28	RCP	1	18	6:1
6	30	RESIDENTIAL DRIVEWAY	SURF TREAT	CONCRETE	76+66.54	LT	20.9	36	17	57	15	15	-	-	-	-	-	-
6	31	SERVICE DRIVEWAY	CONCRETE	CONCRETE	78+37.10	LT	26	39	39	50	-	-	-	-	-	-	-	-
6	32	SERVICE DRIVEWAY	CONCRETE	CONCRETE	79+70.66	LT	21.8	36	100	332	-	15	-	-	-	-	-	-
6	33	RESIDENTIAL DRIVEWAY	ASPHALT	ASPHALT	81+00.11	RT	20.38	48	18	51	15	15	15	24	RCP	1	18	6:1
6	35	CALDWELL STREET	ASPHALT	ASPHALT	73+60.47	LT	19.96	55	15	53	30	30	-	28	RCP	1	18	6:1
6	36	CALDWELL STREET	ASPHALT	ASPHALT	74+13.50	RT	28.92	77	17	97	20	20	-	-	-	-	-	-
6	37	MAIN STREET	ASPHALT	ASPHALT	81+60.95	LT	21.61	62	22	73	20	20	-	32	RCP	1	18	6:1
6	38	MAIN STREET	ASPHALT	ASPHALT	81+89.07	RT	30.84	87	26	135	30	30	-	48	RCP	1	18	6:1

DRIVEWAY NO.	WESTBOUND GUTTER		1	2	3	4	5	6	7	8	9
30	STA 76+66.54	STATION	76+54.38	76+66.54	76+78.77	76+77.80	76+66.54	76+55.35	76+77.16	76+66.54	76+55.98
		ELEVATION	455.33	455.43	455.53	455.33	455.22	455.12	455.53	455.43	455.33
		OFFSET(LT)	21.47	21.47	21.47	23.47	23.47	23.47	23.47	25.47	25.47
31	STA 78+38.53	STATION	78+71.59	78+37.22	78+56.72	78+71.59	78+37.22	78+56.72	78+71.59	78+37.22	78+56.72
		ELEVATION	454.62	454.34	454.06	453.85	454.13	454.41	454.06	454.34	454.62
		OFFSET(LT)	21.47	21.47	21.47	23.47	23.47	23.47	25.47	25.47	25.47

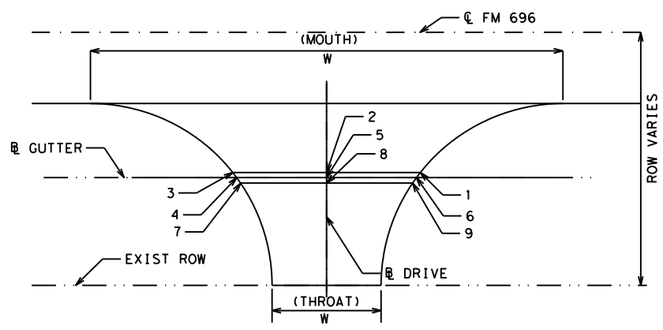
DRIVEWAY NO.	EASTBOUND GUTTER		1	2	3	4	5	6	7	8	9
18	STA 66+20.11	STATION	66+29.82	66+20.11	66+10.64	66+11.82	66+20.11	66+28.72	66+12.62	66+20.11	66+27.97
		ELEVATION	457.29	457.20	457.11	456.90	456.99	457.08	457.11	457.20	457.29
		OFFSET(RT)	22.46	22.46	22.46	24.47	24.46	24.44	26.48	26.46	26.45
20	STA 66+86.53	STATION	66+95.15	66+86.53	66+77.14	66+78.13	66+86.53	66+94.22	66+78.78	66+86.53	66+93.61
		ELEVATION	457.77	457.69	457.60	457.39	457.48	457.57	457.60	457.69	457.77
		OFFSET(RT)	23.66	23.54	23.41	25.42	25.54	25.65	27.43	27.54	27.64
22	STA 68+08.76	STATION	68+16.12	68+08.76	68+00.48	68+01.09	68+08.76	68+15.66	68+01.41	68+08.76	68+15.48
		ELEVATION	458.68	458.55	458.42	458.22	458.34	458.47	458.42	458.55	458.68
		OFFSET(RT)	25.40	25.29	25.17	27.18	27.29	27.39	29.19	29.29	29.39
24	STA 69+42.53	STATION	69+51.60	69+42.53	69+33.36	69+34.04	69+42.53	69+50.96	69+34.42	69+42.53	69+50.61
		ELEVATION	460.98	460.81	460.64	460.44	460.60	460.77	460.64	460.81	460.98
		OFFSET(RT)	23.44	23.31	23.18	25.19	25.31	25.43	27.20	27.31	27.43
26	STA 71+53.50	STATION	71+62.29	71+53.50	71+44.10	71+45.17	71+53.50	71+61.88	71+45.90	71+53.50	71+61.13
		ELEVATION	459.05	459.30	459.55	459.35	459.09	458.84	459.55	459.30	459.05
		OFFSET(RT)	22.30	20.82	20.89	22.88	22.82	22.76	24.88	24.82	24.77
27	STA 72+60.41	STATION	72+71.12	72+60.41	72+48.95	72+50.18	72+60.41	72+69.84	72+51.03	72+60.41	72+68.96
		ELEVATION	456.21	456.50	456.79	456.58	456.10	456.00	456.79	456.28	456.21
		OFFSET(RT)	19.98	20.06	20.14	22.13	22.06	21.99	24.13	24.51	24.00
28	STA 73+60.46	STATION	73+69.99	73+60.46	73+48.96	73+50.28	73+60.46	73+69.25	73+51.33	73+60.46	73+68.83
		ELEVATION	454.13	454.40	454.67	454.46	454.19	453.92	454.67	454.40	454.13
		OFFSET(RT)	19.28	19.34	19.42	21.29	21.17	21.07	23.41	23.34	23.28

DRWY	STA	FLOW (CFS)		C	I	A (AC)	SLOPE	DEPTH (FT)	AVG V (FPS)	FLOW AREA (SF)
18	66+20.11	0.790	↑	0.95	6.07	0.137	0.0098	0.182	1.98	0.399
20	66+86.53	0.634		0.95	6.07	0.110	0.0098	0.167	1.87	0.336
22	68+08.76	0.409		0.95	6.07	0.071	0.0098	0.142	1.68	0.243
24	69+42.53	0.161		0.95	6.07	0.028	0.0098	0.100	1.33	0.121
26	71+53.5	0.252		0.95	6.07	0.044	0.0260	0.099	2.147	0.117
27	72+60.41	0.469	↓	0.95	6.07	0.081	0.0260	0.125	2.5	0.187
28	73+60.46	0.612		0.95	6.07	0.106	0.0260	0.138	2.68	0.228
30	76+66.54	0.104		0.95	6.07	0.018	0.0055	0.095	0.96	0.108
31	78+38.53	0.231	↓	0.95	6.07	0.040	0.0167	0.127	1.78	0.129



PLAN

DRIVEWAY WITH GUTTER (WESTBOUND)



PLAN

DRIVEWAY WITH GUTTER (EASTBOUND)

NOTE TO CONTRACTOR:

1. DRIVEWAY EARTHWORK QUANTITES CALCULATED BEYOND TYPICAL SLOPE
2. GRADE ALL DRIVEWAYS TO MAINTAIN POSITIVE DRAINAGE.
3. INSTALL 6:1 S.E.T. ON EACH END OF ALL DRIVEWAY PIPES THAT DONT HAVE AN EXISTING S.E.T. SIDE SLOPE SEE P&P SHEETS FOR ADDITIONAL INFORMATION.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED
PROFESSIONAL ENGINEER

12/18/2020

Mark W. Litzmann, P.E.

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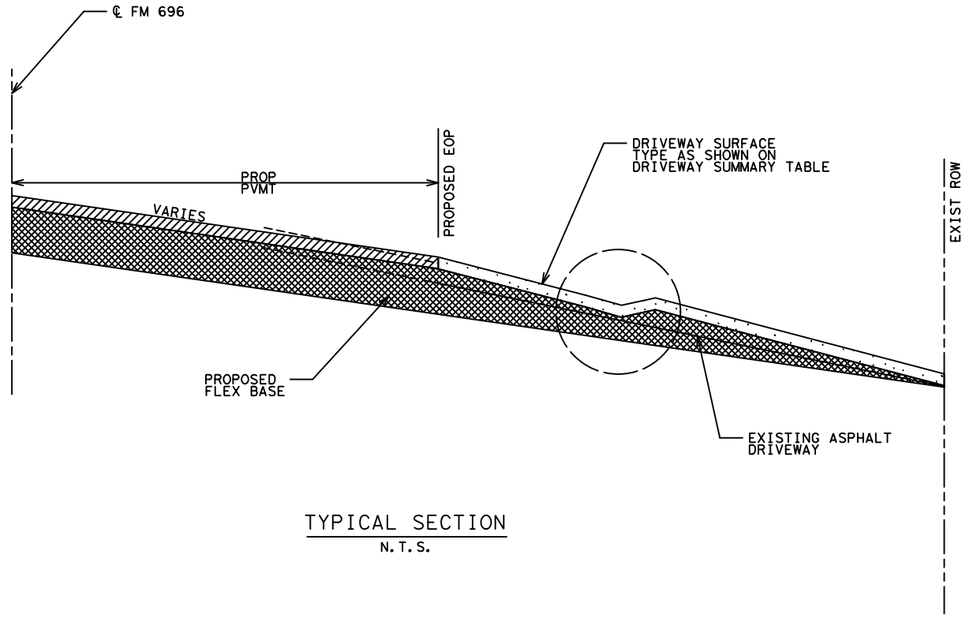
Texas Department of Transportation

LEE COUNTY
FM 696

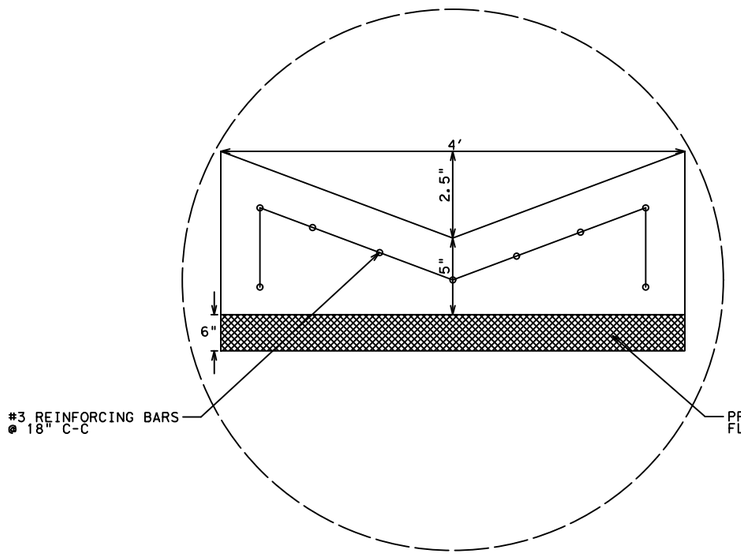
DRIVEWAY SUMMARY

SCALE: NONE SHEET 1 OF 2

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	67



TYPICAL SECTION
N.T.S.



DETAIL A

NOTE TO CONTRACTOR:

1. DRIVEWAY EARTHWORK QUANTITES CALCULATED BEYOND TYPICAL SLOPE
2. GRADE ALL DRIVEWAYS TO MAINTAIN POSITIVE DRAINAGE.
3. INSTALL 6:1 S.E.T. ON EACH END OF ALL DRIVEWAY PIPES THAT DONT HAVE AN EXISTING S.E.T. SIDE SLOPE SEE P&P SHEETS FOR ADDITIONAL INFORMATION.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED
PROFESSIONAL ENGINEER
12/18/2020
Mark W. Litzmann, P.E.

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Texas Department of Transportation

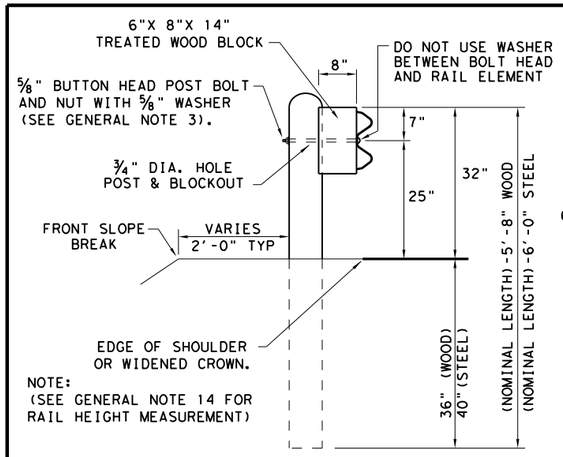
LEE COUNTY
FM 696

DRIVEWAY SUMMARY

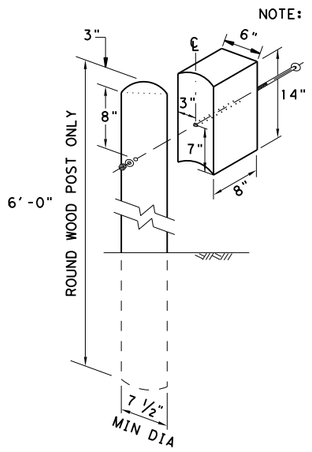
SCALE: NONE SHEET 2 OF 2

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST.NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	67A

DATE:
FILE:

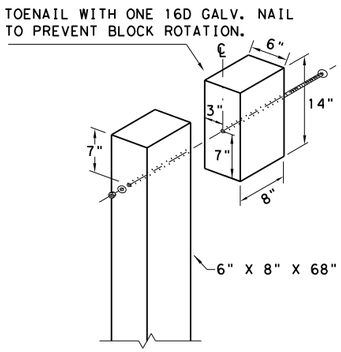


TYPICAL POST PLACEMENT

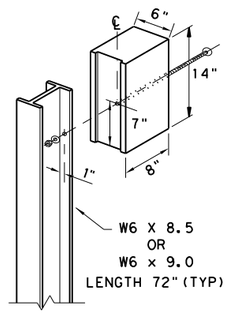


WOOD BLOCK TO ROUND WOOD POST

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

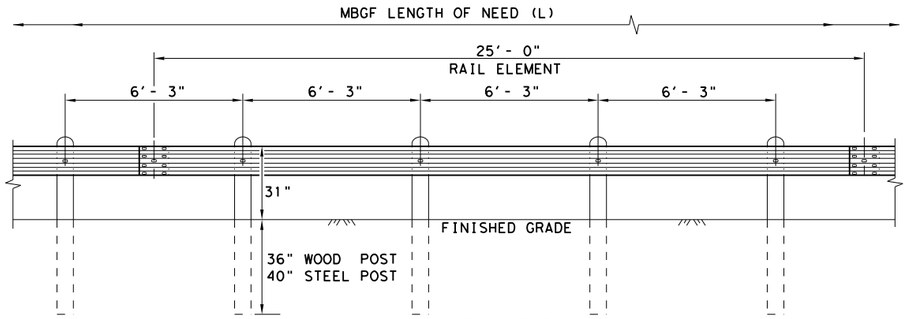


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

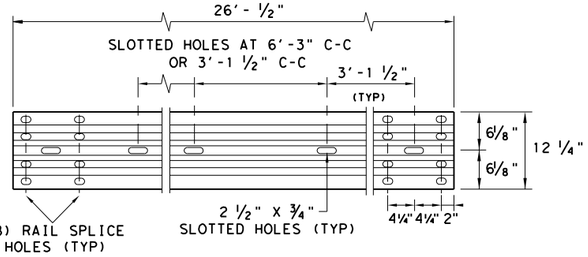
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

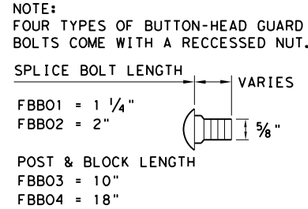
ELEVATION
MID-SPAN RAIL SPLICE

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



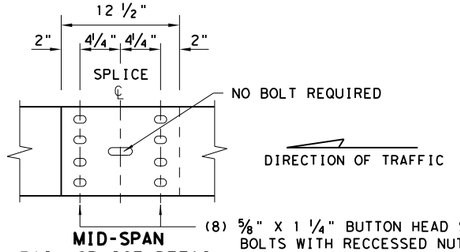
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

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



BUTTON HEAD BOLT

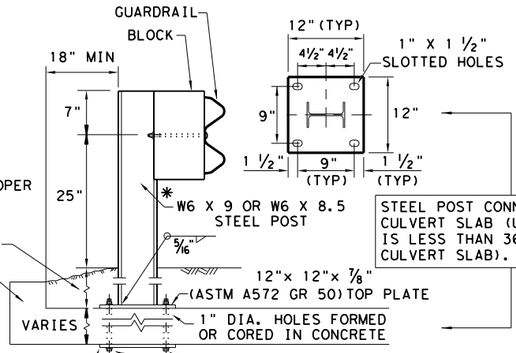
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

MID-SPAN RAIL SPLICE DETAIL

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



12" X 12" X ¼" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

LOW FILL CULVERT POST

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.

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.

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.

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
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REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		68

DATE:
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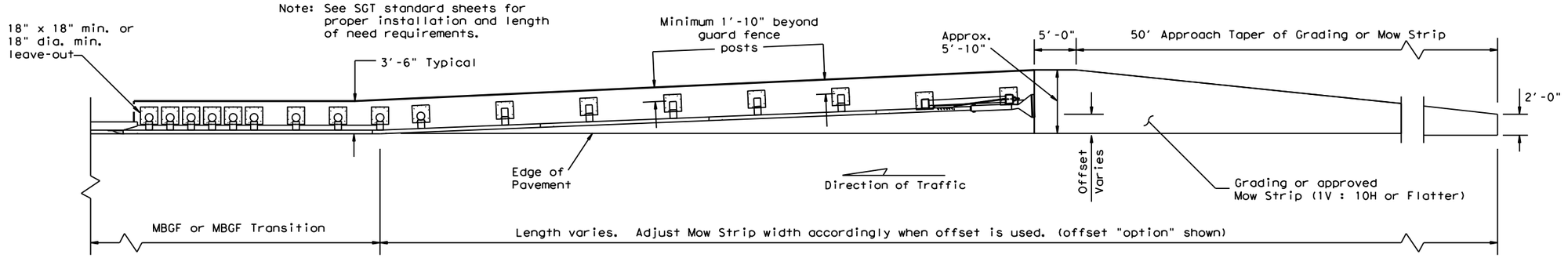
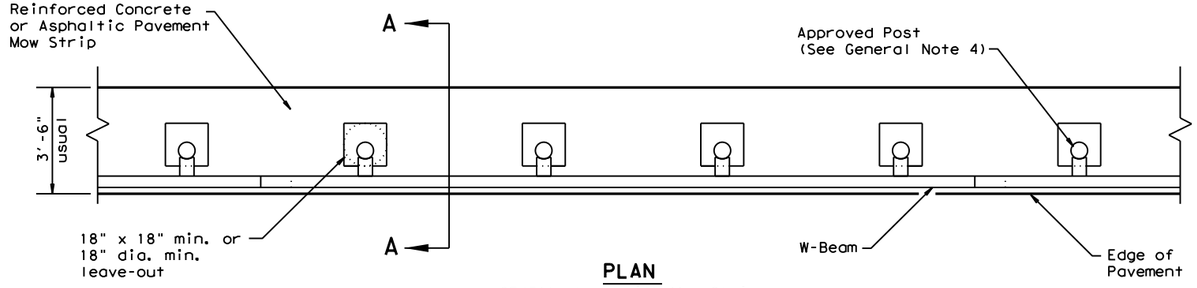
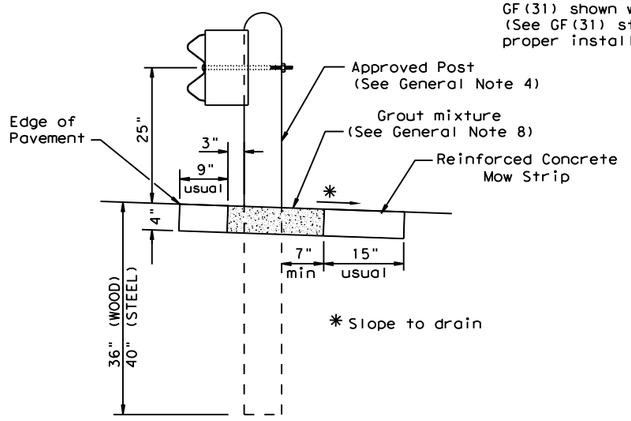


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



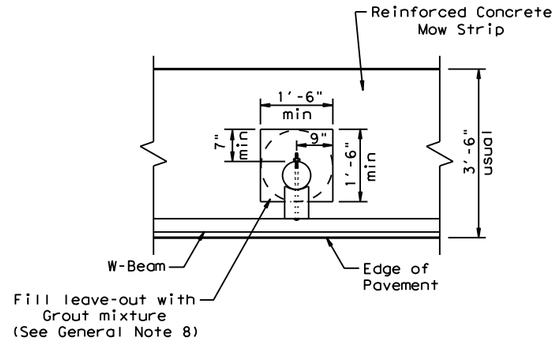
PLAN

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



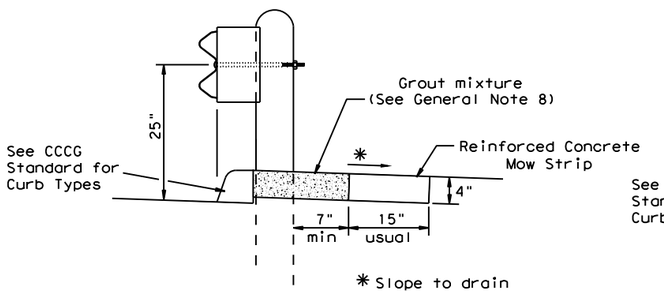
SECTION A-A

Typical



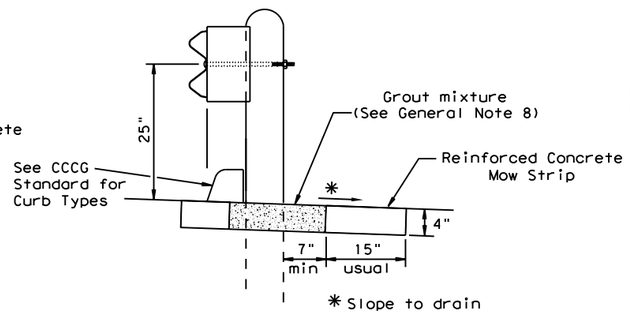
MOW STRIP DETAIL

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



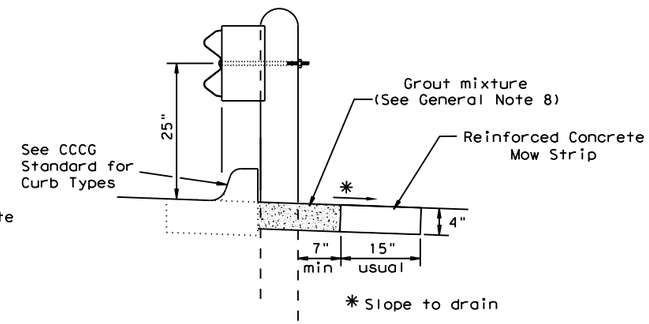
CURB OPTION (1)

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	
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REVISIONS	0334	03	021	FM 696	
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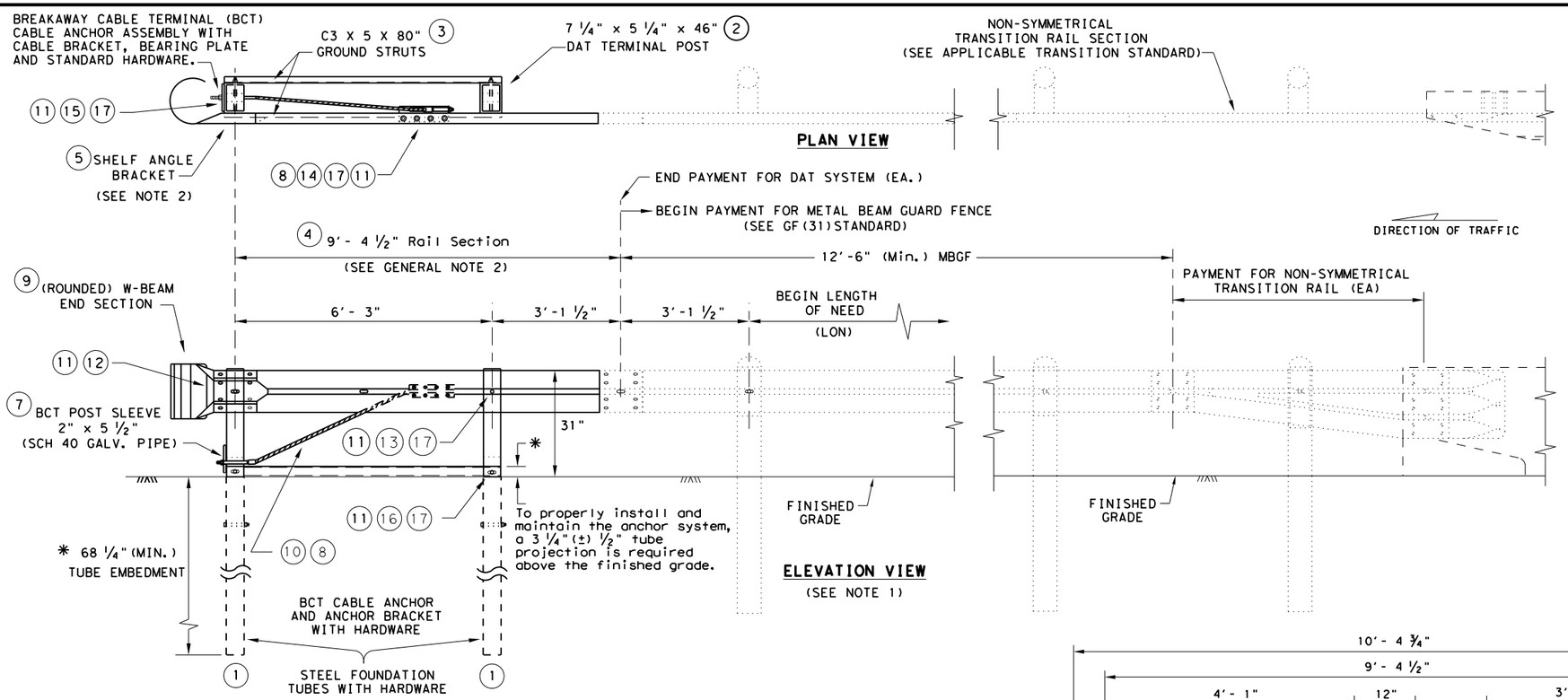


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

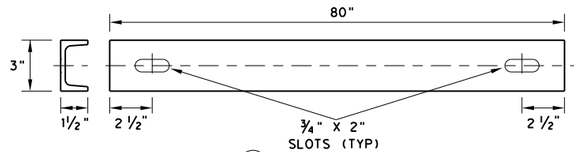
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

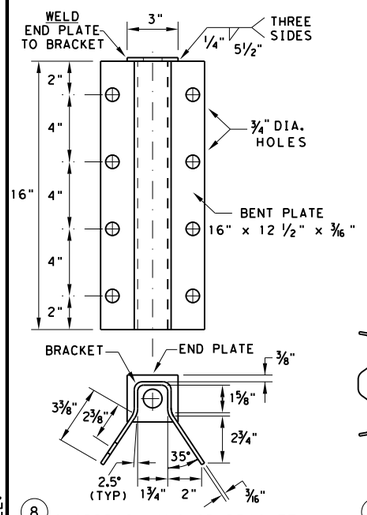
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

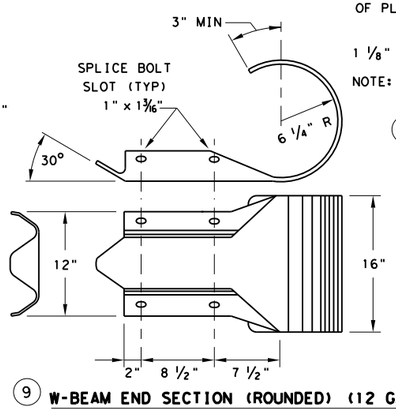
(4) **TERMINAL RAIL ELEMENT FOR DAT**



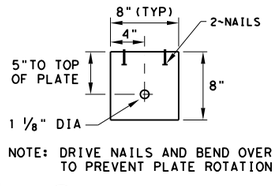
(3) **CHANNEL STRUT**
C3 X 5 X 80", GRADE A36



(8) **GUARDRAIL ANCHOR BRACKET**

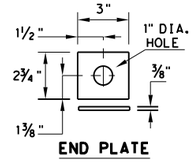


(9) **W-BEAM END SECTION (ROUNDED) (12 GA.)**



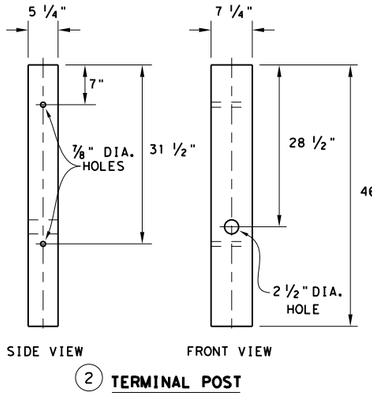
NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

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

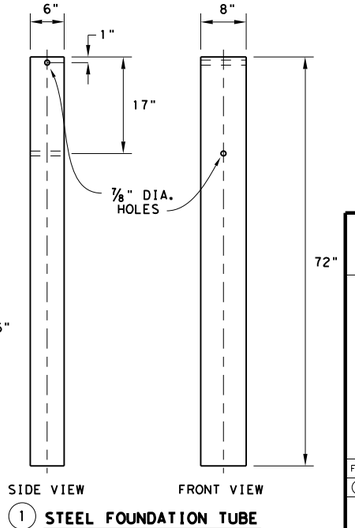


END PLATE

(5) **SHELF ANGLE BRACKET**



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



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

Texas Department of Transportation — Design Division Standard

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

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
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	AUSTIN	LEE		70

DATE:
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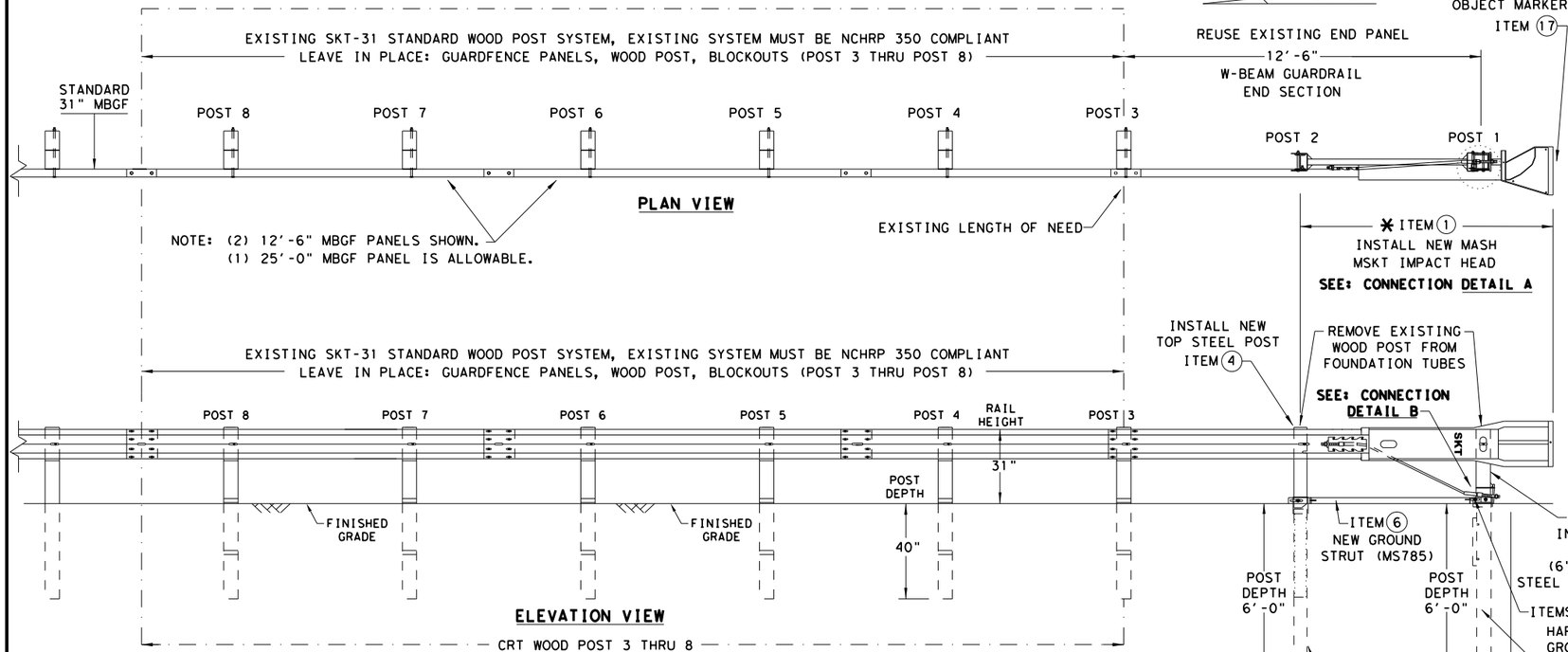
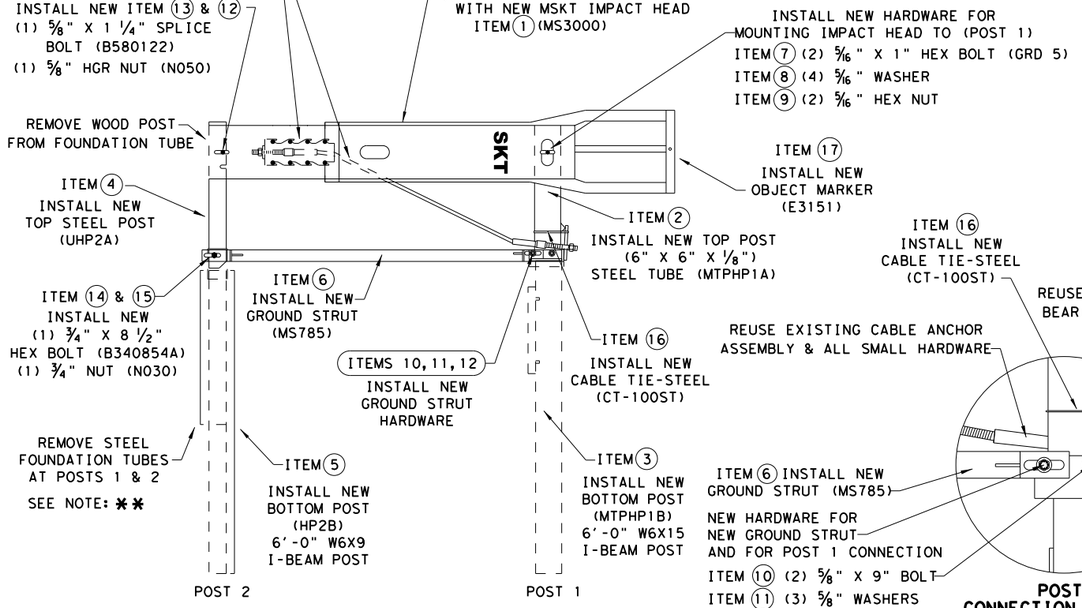


** NOTE: EXTRA SOIL COMPACTION WILL BE NEEDED AROUND NEW (POSTS 1 & 2) DUE TO THE REMOVAL OF THE STEEL FOUNDATION TUBES.

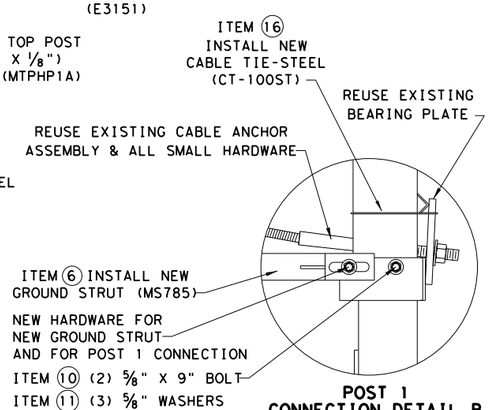
GENERAL NOTES

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; 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. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. THE EXISTING SKT 31" STANDARD WOOD POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" WOOD POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
9. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
10. 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.
11. SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.

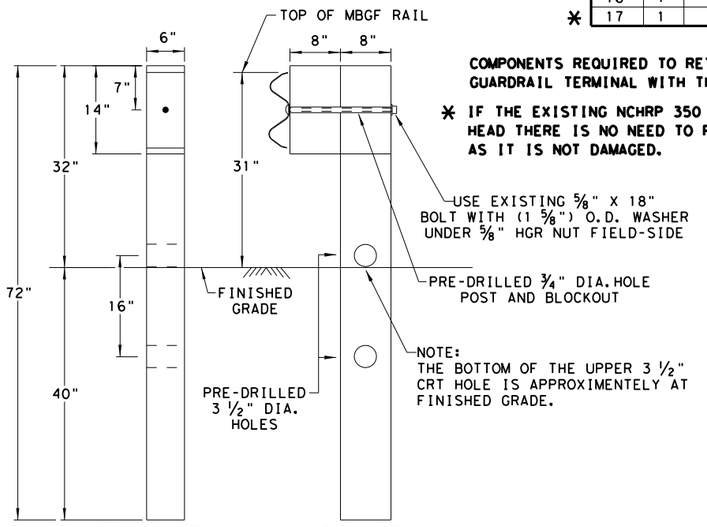
ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
1	1	MSKT IMPACT HEAD	MS3000
2	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
3	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
4	1	POST 2 - ASSEMBLY TOP	UHP2A
5	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
6	1	GROUND STRUT	MS785
7	2	5/16" X 1" HEX BOLT (GRD 5)	B516014A
8	4	5/16" WASHERS	W0516
9	2	5/16" HEX NUT	N0516
10	2	5/8" X 9" HEX BOLT (GRD A449)	B580904A
11	3	5/8" WASHERS	W050
12	3	5/8" H.G.R NUT	N050
13	1	5/8" X 1 1/4" SPLICE BOLT	B580122
14	1	3/4" X 8 1/2" HEX BOLT (GRD 5)	B340854A
15	1	3/4" HEX NUT	N030
16	1	CABLE TIE-STEEL	CT-100ST
* 17	1	OBJECT MARKER 18" X 18"	E3151



CONNECTION DETAIL A
IMPACT HEAD (POST 1 & POST 2)



POST 1
CONNECTION DETAIL B



FRONT VIEW **SIDE VIEW**
EXISTING WOOD POSTS 3-8
CONTROLLED RELEASE TERMINAL (CRT)

COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" WOOD POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).

*** IF THE EXISTING NCHRP 350 (31" WOOD POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.**

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

Texas Department of Transportation

Design Division Standard

RETROFIT STANDARD SKT 31" WOOD POST SYSTEM TO MASH MSKT

SGT(14W)31-18

FILE: sgt14w3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
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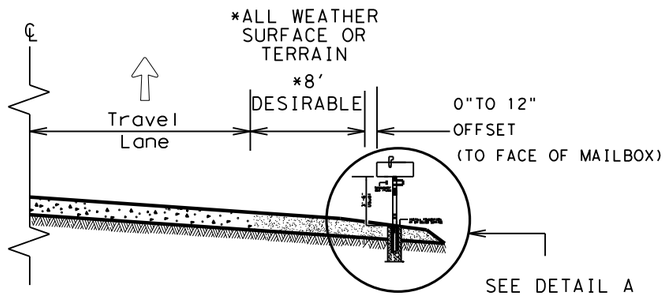
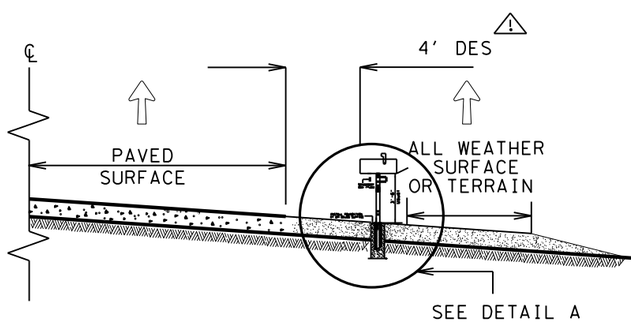
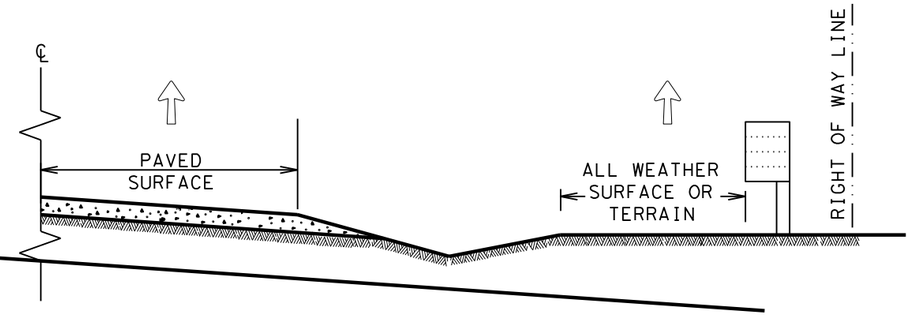


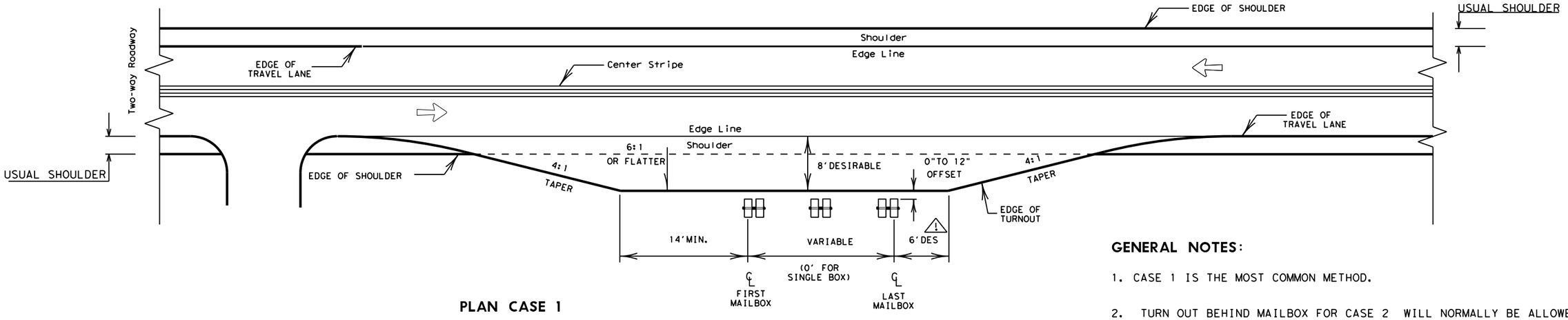
CASE 1. OFF TRAVEL WAY DELIVERY



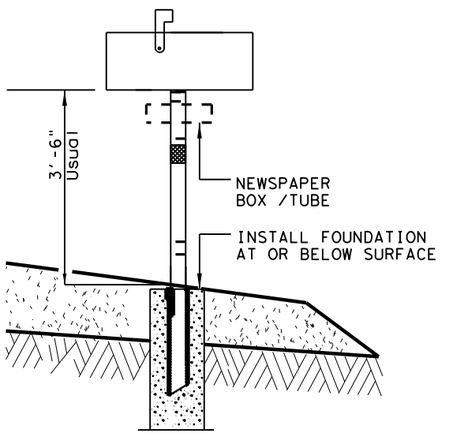
CASE 2. BACK SIDE DELIVERY



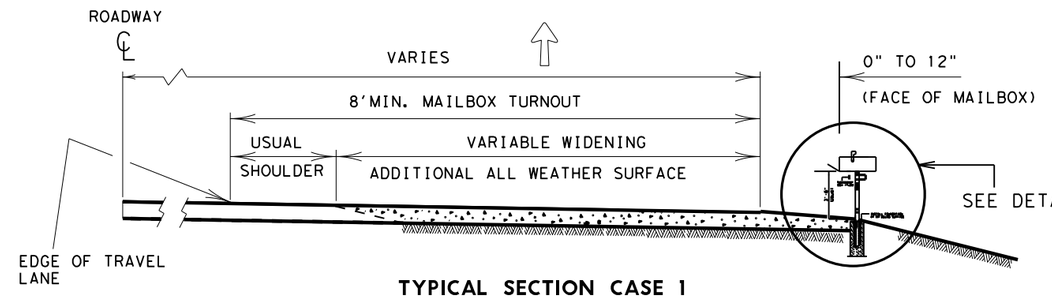
CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



PLAN CASE 1



DETAIL A



TYPICAL SECTION CASE 1

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. IF THE NUMBER OF MAILBOXES EXCEEDS FOUR, A COMMUNITY MAIL BOX SHOULD BE ENCOURAGED AT THESE LOCATIONS.

Texas Department of Transportation

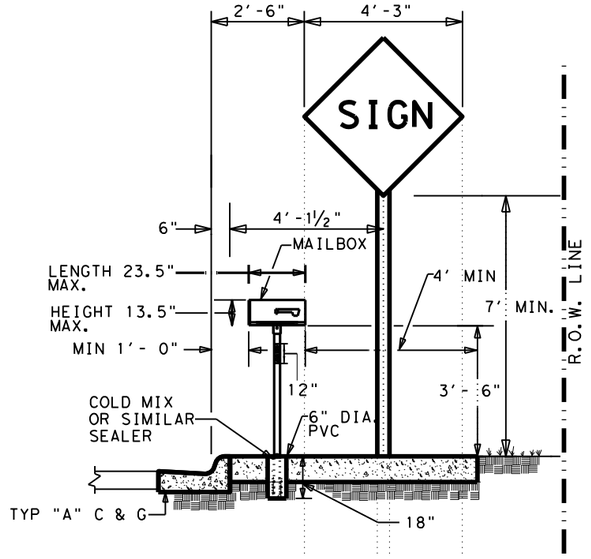
Maintenance Division Standard

Guideline

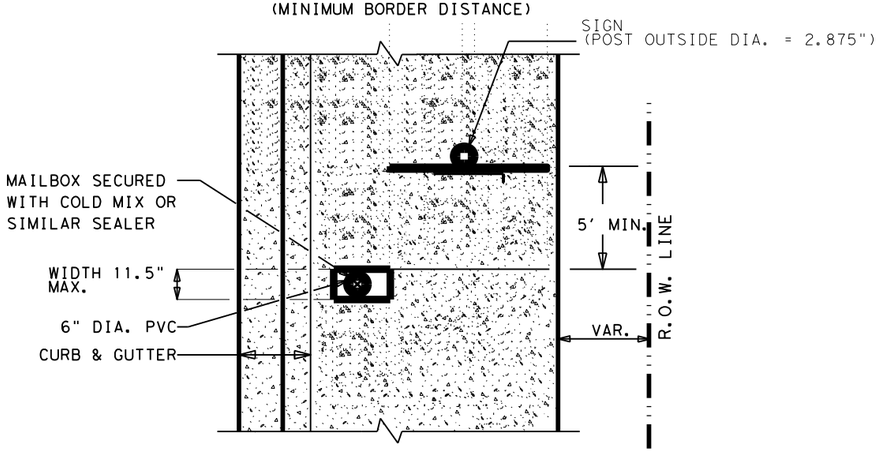
MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS
MB-14(2)

FILE: MB14(2).DGN	DN: JEO	CK:	DW: JEO	CK:	
© TxDOT MAY 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS DECEMBER 2012-NEW TXDOT TITLE BLOCK	0334	03	021	FM 696	
	DIST	COUNTY		SHEET NO.	
	AUSTIN	LEE		72	

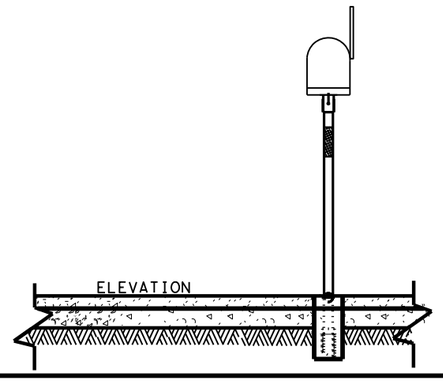
DATE:
FILE:

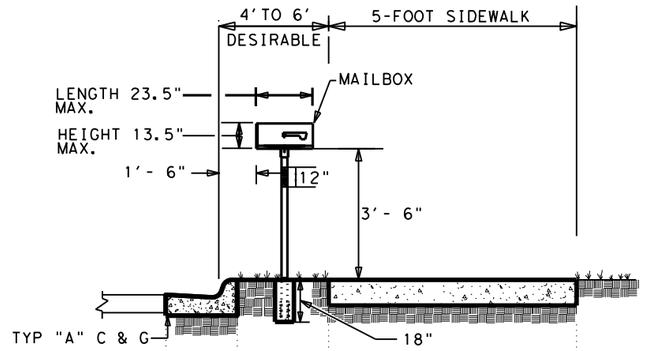


MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)

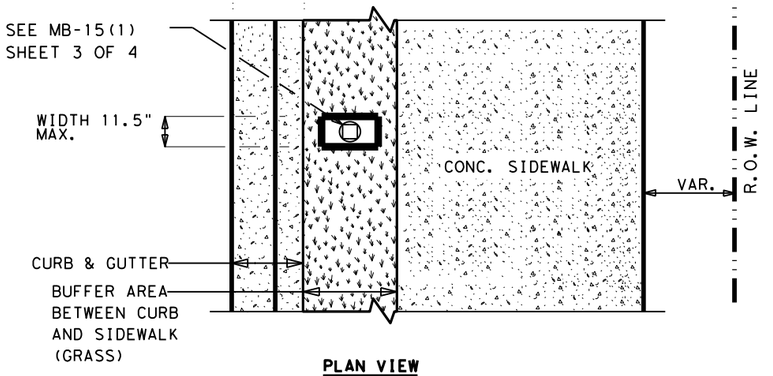


PLAN VIEW





MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW

DATE:
FILE:

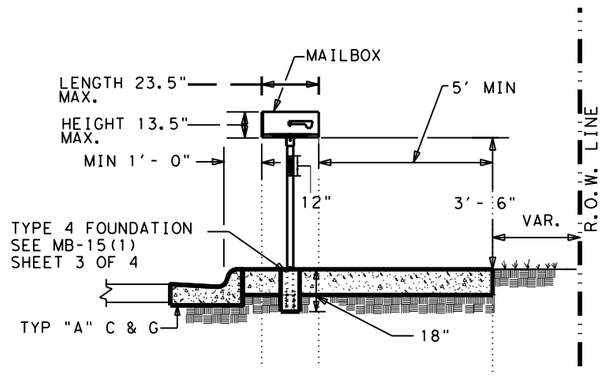
Texas Department of Transportation

Maintenance Division Standard

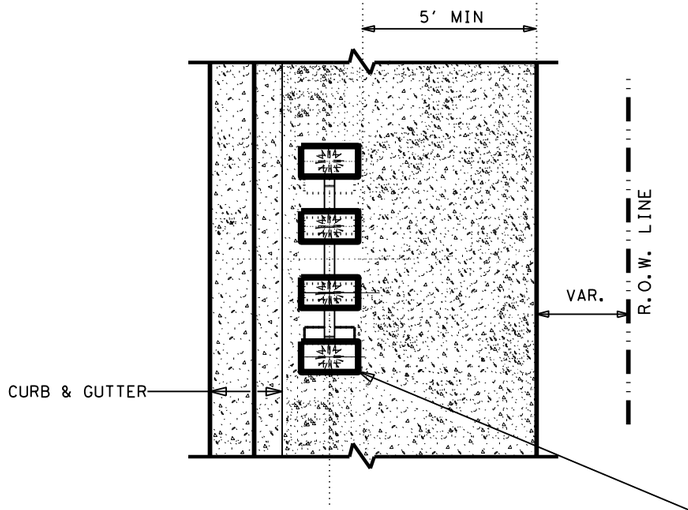
SINGLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

MB-14(2A)

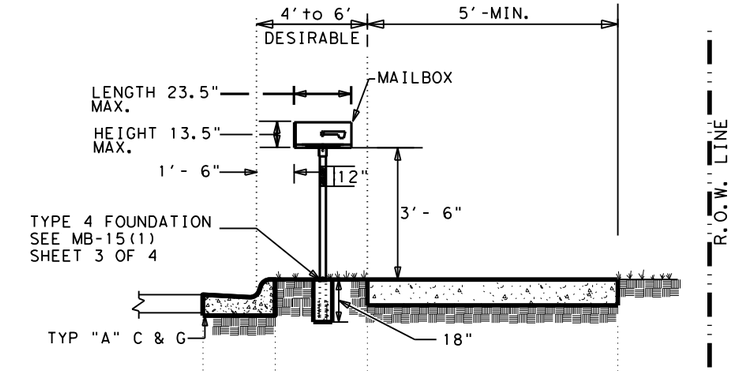
FILE: MB-14(2A)	DN:	CK:	DW:	CK:
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		73



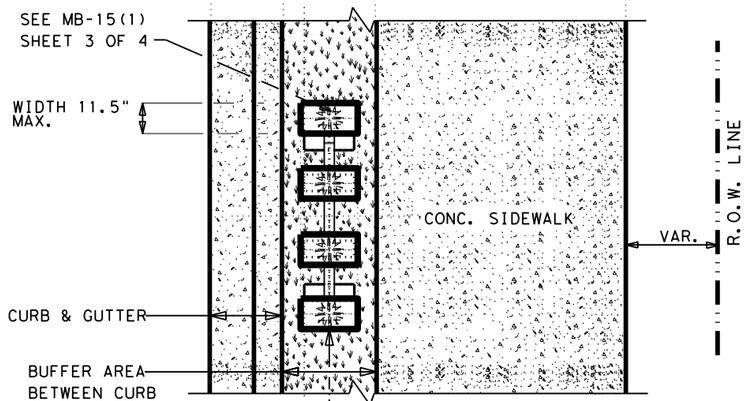
MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)



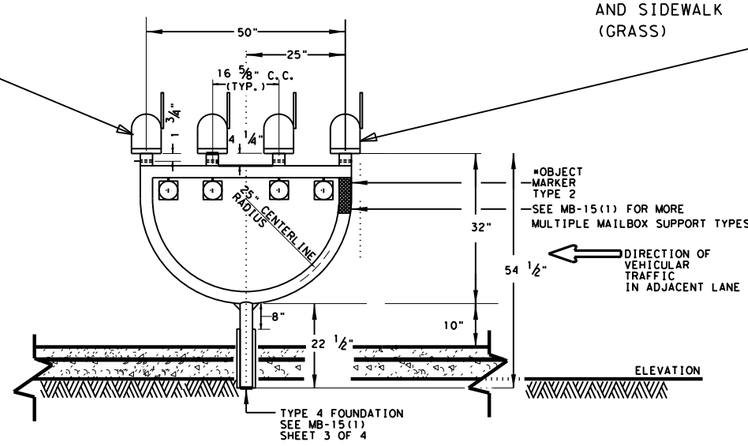
PLAN VIEW



MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW



SHEET 3 OF 3

Texas Department of Transportation

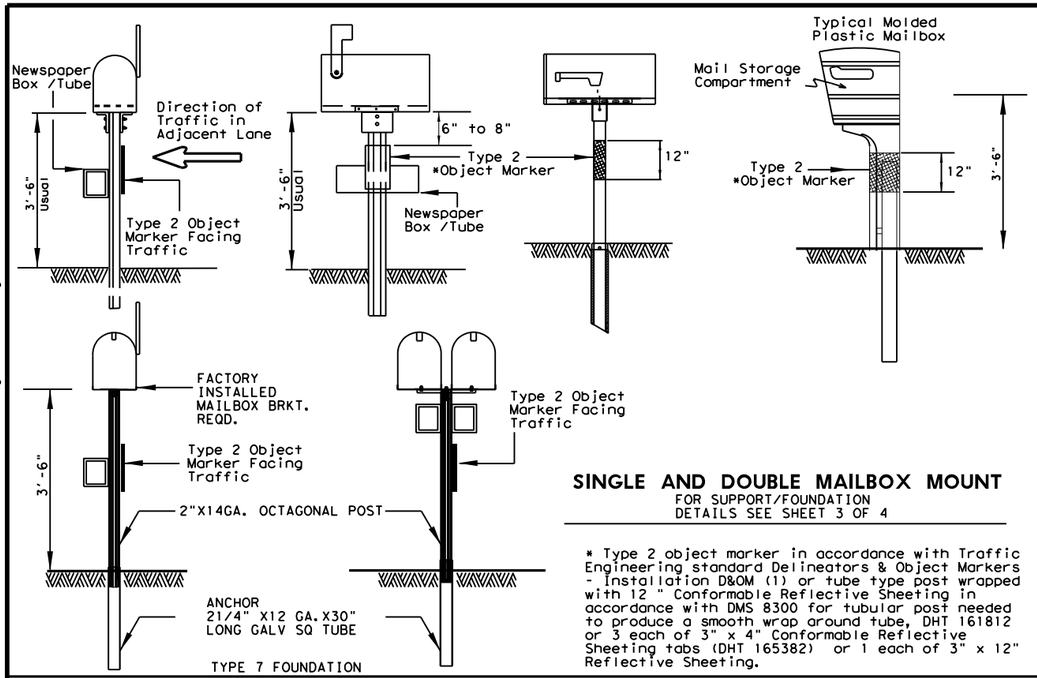
Maintenance Division Standard

MULTIPLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

MB-14(2B)

FILE: MB-14(2A)	DN:	CK:	DW:	CK:
© TxDOT MAY 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		74

DATE:
FILE:



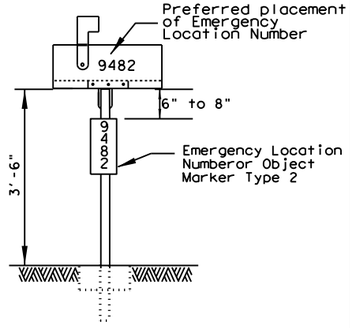
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

* Type 2 object marker in accordance with Traffic Engineering standard Delineators & Object Markers - Installation D&OM (1) or tube type post wrapped with 12 " Conformable Reflective Sheeting in accordance with DMS 8300 for tubular post needed to produce a smooth wrap around tube, DHT 161812 or 3 each of 3" x 4" Conformable Reflective Sheeting tabs (DHT 165382) or 1 each of 3" x 12" Reflective Sheeting.

Note: Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Pedestrian Facilities Curb ramps standard *PED-XX for pedestrian facilities.

*PED-XX: XX is the standard year for example PED- 12 , PED-13,etc.



PLACEMENT OF EMERGENCY LOCATION NUMBER

Location Number shall be placed on: 1. A yellow, type A plate with class 1 flat surface reflective sheeting in accordance with DMS 8600. The color of numbers shall be black. or 2: A green or blue plate with white numbers attached to post beside the object marker. Other contrasting color configuration, as approved , may be used. (Use Same type plate as used for the type 2 Object Marker. Recommended sign size is 6" by 15")

MAILBOX SIZES

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
	LENGTH	WIDTH	HEIGHT	MAXIMUM WEIGHT	
SIZE	INCHES			POUNDS	
SMALL	19 ½	6	7	5	5
MEDIUM	22 ½	8	11 ½	7	7
LARGE	23 ½*	11 ½*	13 ½*	10	10

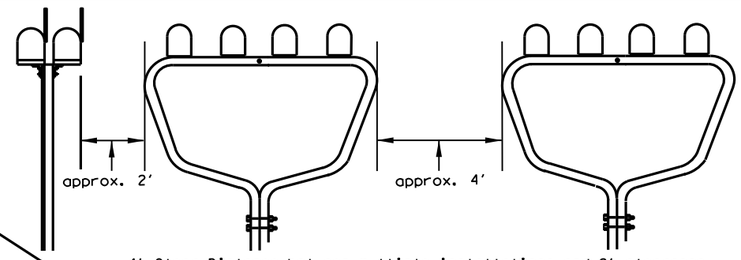
* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT
SIDE	18	15	18.3	15	(POUNDS)
BACK	11 ½	11 ½		15	22.4

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

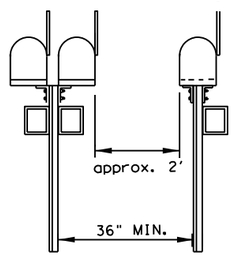
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



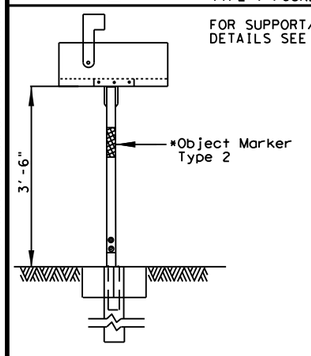
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

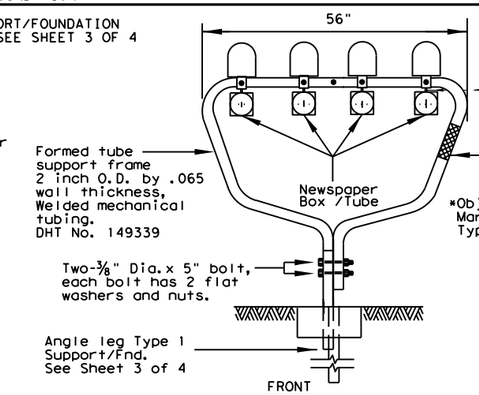
MULTIPLE MAILBOX PLACEMENT

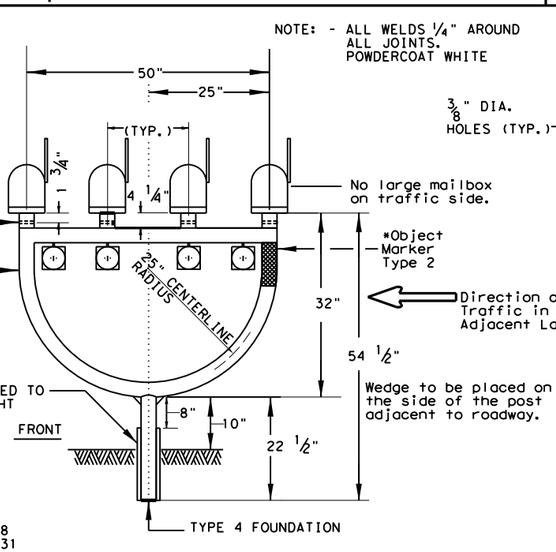


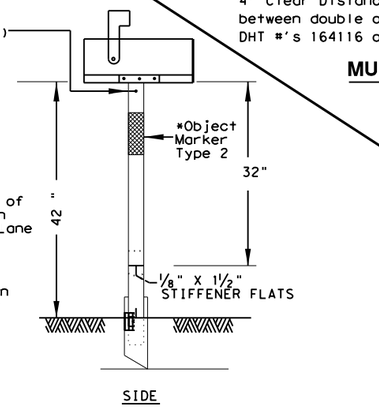
Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

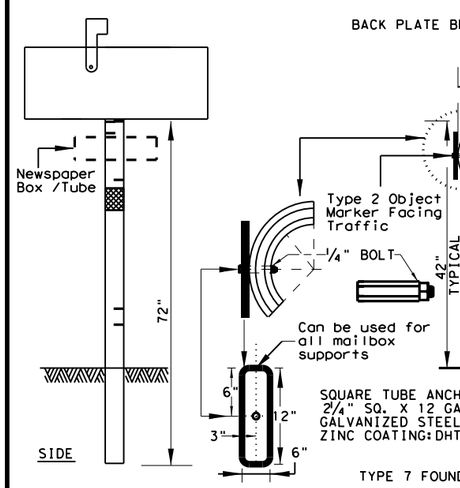
SINGLE & DOUBLE MAILBOX PLACEMENT

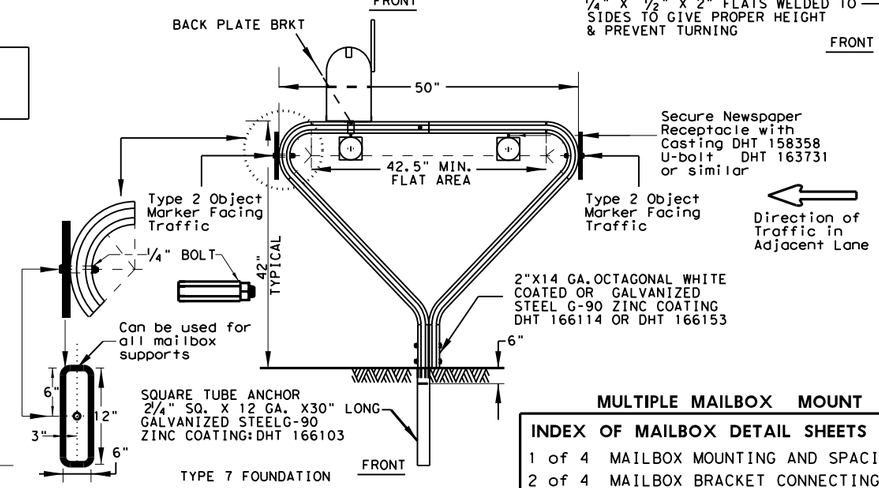












DOUBLE AND MULTIPLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4
FOR DHT NUMBERS SEE SHEET 4 OF 4

NEWSPAPER RECEPTACLE

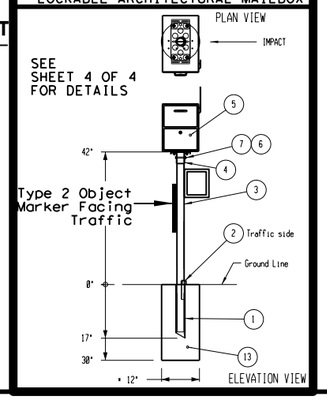
A light weight receptacle for newspaper delivery can be attached to mailbox posts as shown on this page if the receptacle:

- Does not touch the mailbox.
- Does not present a hazard to traffic or delivery of the mail.
- Does not extend beyond the front of the mailbox.
- Does not display advertising, except the publication title.
- Newspaper receptacles on separate supports are prohibited.

MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

LOCKABLE ARCHITECTURAL MAILBOX



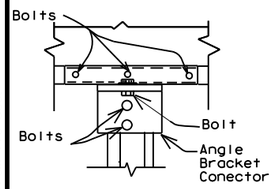
Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

MB-15(1)

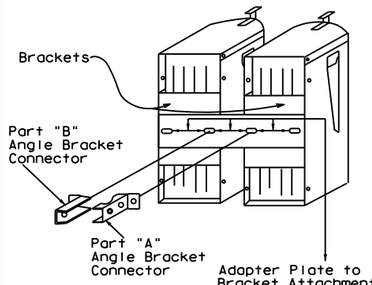
FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		75

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



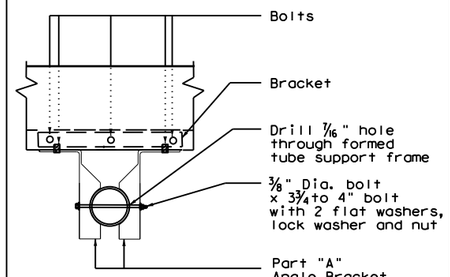
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

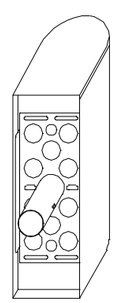


(Not permitted for Large Mailboxes)

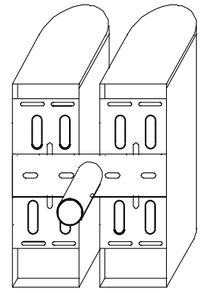
DOUBLE MAILBOX



MULTIPLE MAILBOX



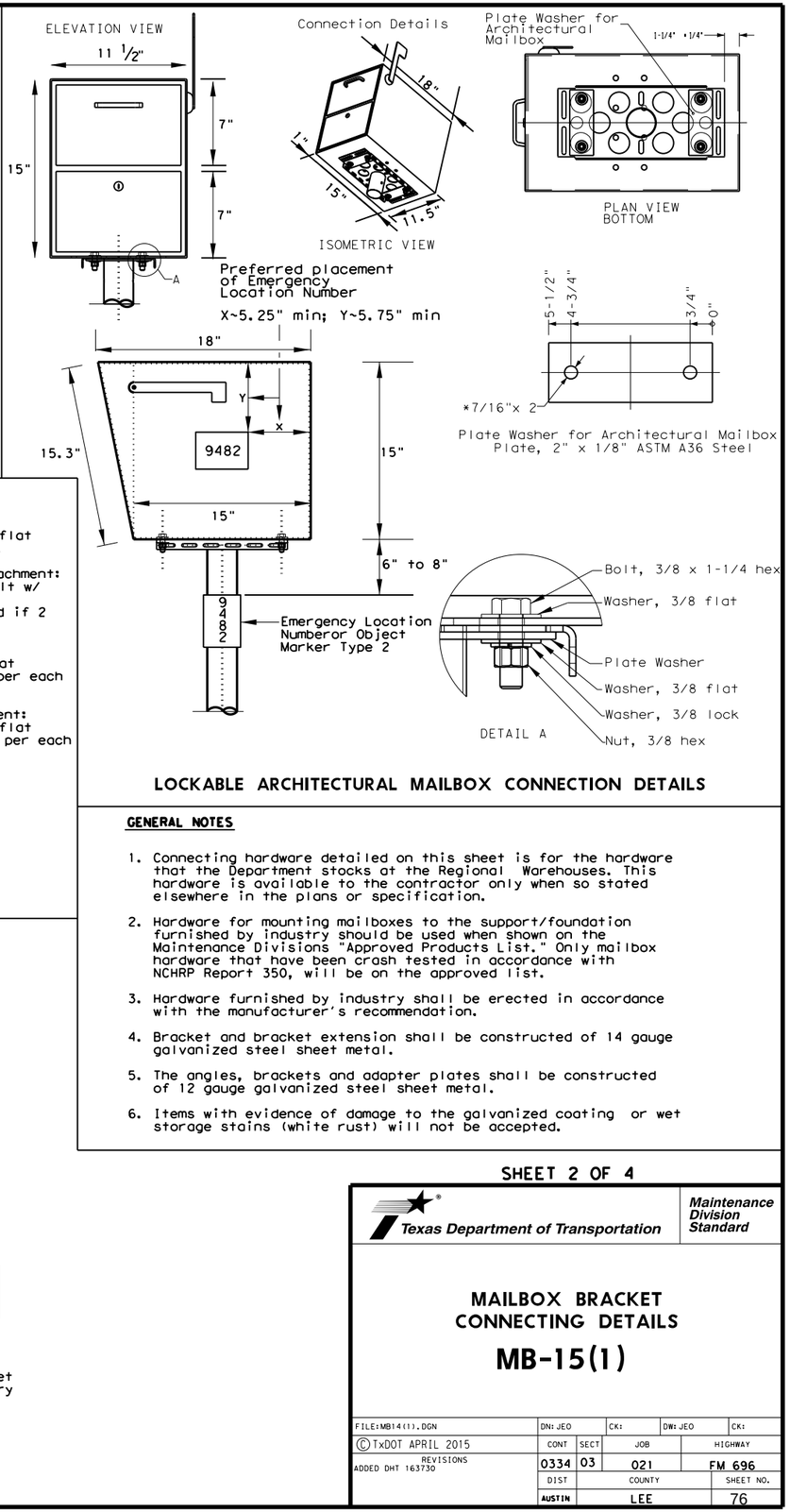
To be used with 2⅜" OD RR or thinwall Steel posts.



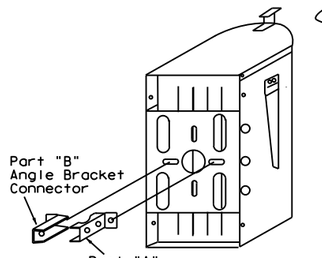
To be used with thinwall Steel posts. Not to be used with RR posts.

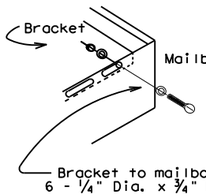
WELDED SINGLE MAILBOXBRACKET

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS



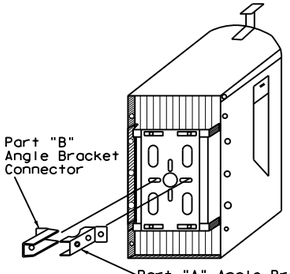


Bracket to mailbox attachment: 6 - ¼" Dia. x ¾" bolt w/ 2 flat washers and nut per each bolt.

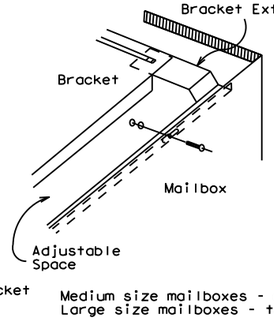
Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to 2 - ⅜" Dia. x 2½" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



Use both Parts "A" and "B" Angle Bracket Connectors for Winged Channel Posts



Bracket to mailbox attachment: 6 - ¼" Dia. x ¾" bolt w/2 flat washers and nut per each bolt.

Bracket to bracket extension attachment: 2 - ¼" Dia. x ¾" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt w/2 flat washers, lock washer and nut per each bolt.

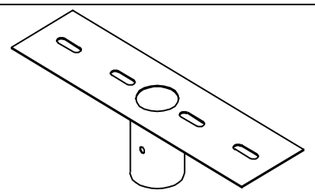
Angle to mailbox support attachment: 2 - ⅜" Dia. x 2½" bolt w/2 flat washers, lock washer, and nut per each bolt.

Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES

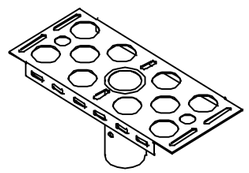
GENERAL NOTES

1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by industry should be used when shown on the Maintenance Divisions "Approved Products List." Only mailbox hardware that have been crash tested in accordance with NCHRP Report 350, will be on the approved list.
3. Hardware furnished by industry shall be erected in accordance with the manufacturer's recommendation.
4. Bracket and bracket extension shall be constructed of 14 gauge galvanized steel sheet metal.
5. The angles, brackets and adapter plates shall be constructed of 12 gauge galvanized steel sheet metal.
6. Items with evidence of damage to the galvanized coating or wet storage stains (white rust) will not be accepted.



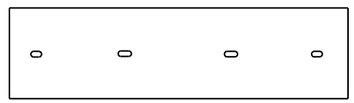
DHT 162323

For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.



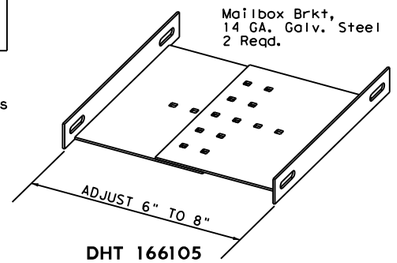
DHT 161443

For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.

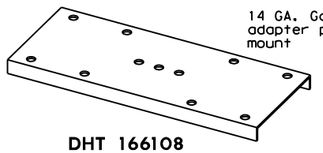


DHT #3789

Used for mounting two Mailboxes on the same post.

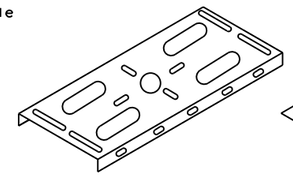


DHT 166105



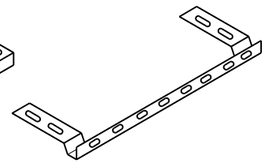
14 GA. Galv. Steel adapter plate for double mount

DHT 166108



DHT 148939

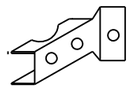
Mailbox Bracket



DHT 148938

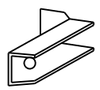
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



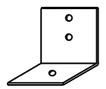
DHT 159489

Part "A" Angle Bracket Connector



DHT 159490

Part "B" Angle Bracket Connector



DHT 2917

Angle Bracket For Temporary Mailbox

HARDWARE AT TXDOT REGIONAL WAREHOUSES

Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

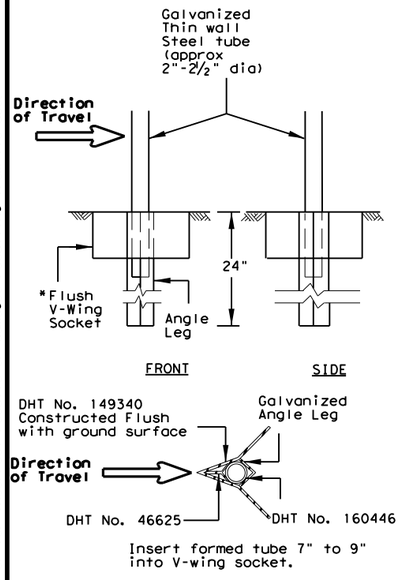
SHEET 2 OF 4

Texas Department of Transportation | Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

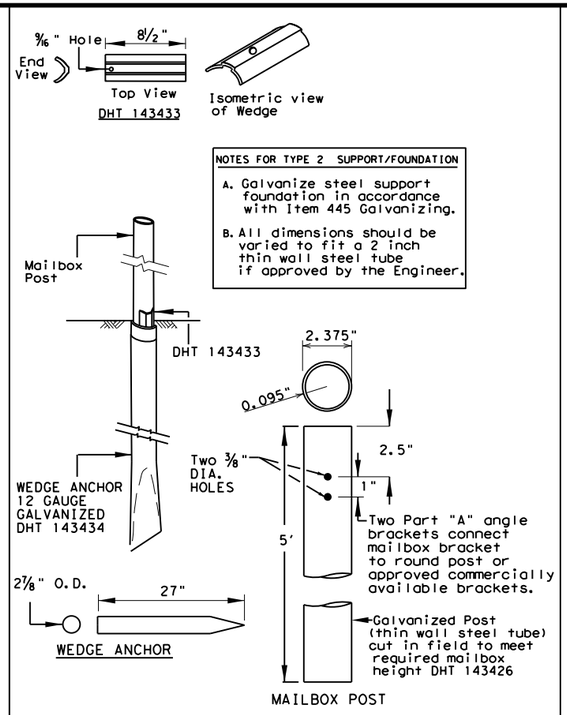
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:	
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS ADDED DHT 163730	0334	03	021	FM 696	
	DIST	COUNTY		SHEET NO.	
	AUSTIN	LEE		76	



TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



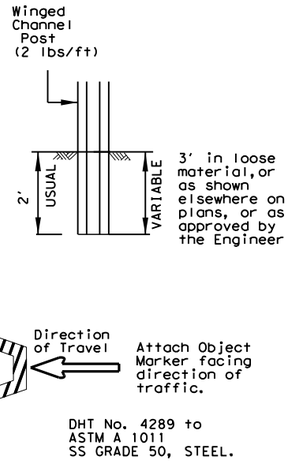
NOTES FOR TYPE 2 SUPPORT/FOUNDATION

A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.

TYPE 2 SUPPORT/FOUNDATION

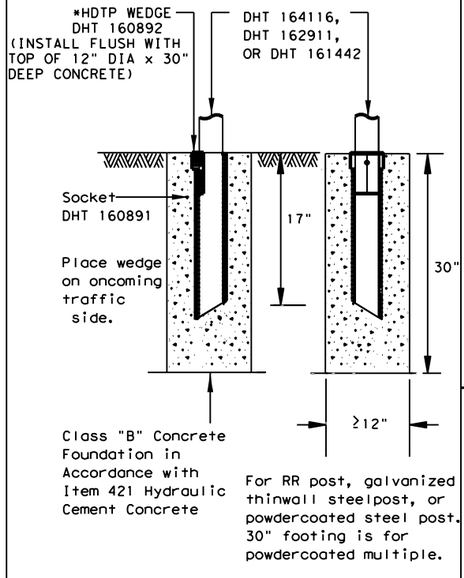
THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



TYPE 3 SUPPORT/FOUNDATION

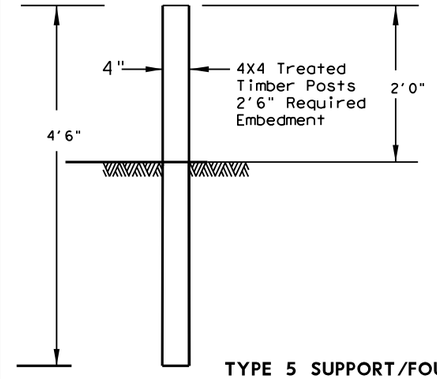
WINGED CHANNEL POST

Note on DHT Number
See Table of Applicable DHT
Numbers on this sheet 4 for
DHT description.



TYPE 4 SUPPORT/FOUNDATION

FOR WHITECOATED STEEL POST, MULTIPLE POST, AND RECYCLED RUBBER.

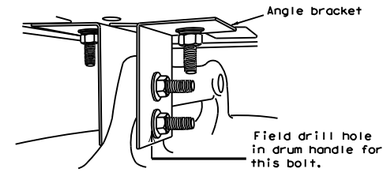


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

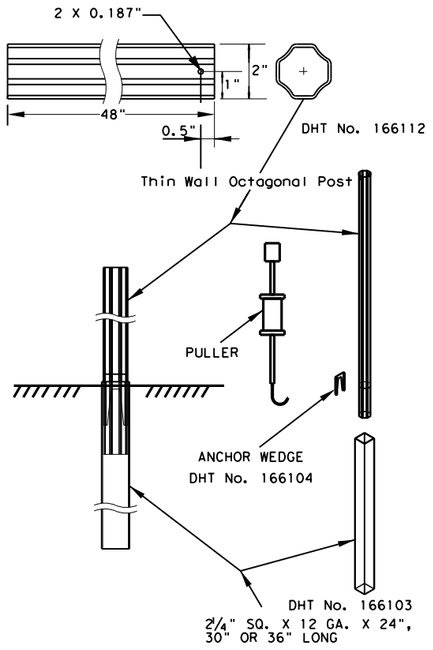
Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

MB-(X) ASSM TY (XXX) (X) (XX) (OPTIONAL)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- SP = Single Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post
- Ty 7 = Wedge Anchor

Type of Bracket
- AB = Angle Bracket.
- TB = 2.375" Tube Bracket

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition.

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
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REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		77

LOCKABLE ARCHITECTURAL MAILBOX

SINGLE-MOUNT INSTALLATION PARTS			
#	PART NAME	PART/DHT #	QTY
1	SOCKET, TYPE 4 FOUNDATION	160891	1
2	WEDGE FOR TYPE 4 FOUNDATION	160892	1
3	THIN-WALL WHITE STEEL TUBE 2.375 OD	162911	1
4	BRACKET FOR ATTACHING MAILBOX	161443	1
5	ARCHITECTURAL MAILBOX	SEE NOTE	1
6	NUT, 5/16" HEX	NUT, 5/16" HEX	1
7	BOLT, 5/16 X 3 HEX	GRADE 5	1
8	PLATE WASHER FOR ARCHITECTURAL MAILBOX	SEE SEE SHEET 2	2
9	WASHER, 3/8 FLAT		8
10	WASHER, 3/8 LOCK		4
11	NUT, 3/8 HEX		4
12	BOLT, 3/8 X 1-1/4 HEX	GRADE 5	4
13	CONCRETE, CLASS B (2000 PSI)		1

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

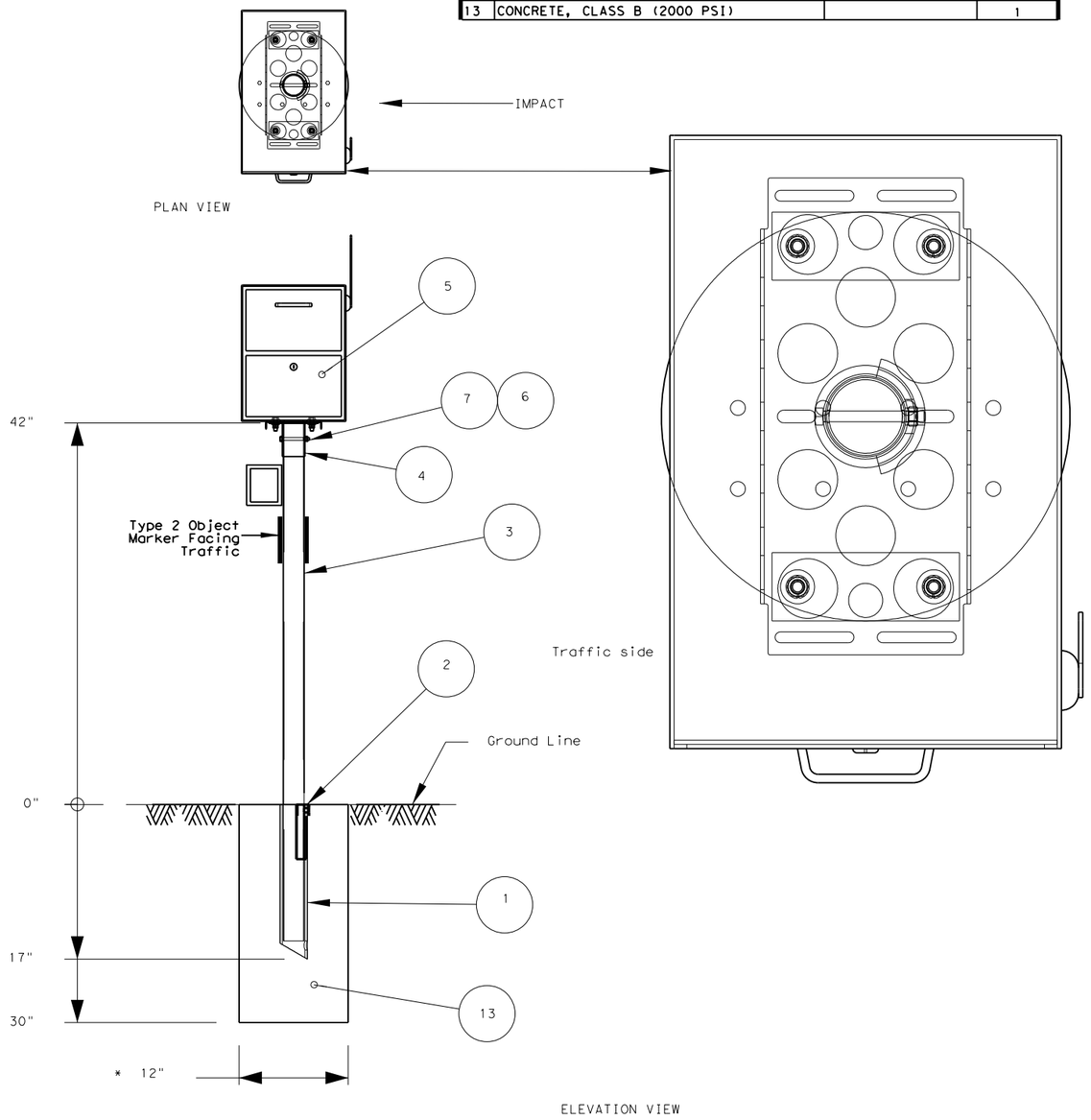

TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
160892	WEDGE FOR TYPE 4 FOUNDATION
166104	WEDGE FOR TYPE 7 FOUNDATION
	POSTS
4289	WINGED CHANNEL MAILBOX POST
149339	MULTIPLE MAILBOX POST (GALVANIZED TUBING)
164116	MULTIPLE MAILBOX POST (WHITE COATED)
166114	MULTIPLE MAILBOX POST (WHITE COATED OCTAGONAL)
166153	MULTIPLE MAILBOX POST (GALVANIZED OCTAGONAL)
161442	RECYCLED RUBBER POST. FOR SMALL MAILBOX ONLY
143426	THIN-WALL GALVANIZED STEEL TUBE 2.375" OUTER DIAMETER
162911	THINWALL WHITE STEEL TUBE 2.375" OUTER DIAMETER
166152	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED 2" OCTAGONAL
166112	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED 2" OCTAGONAL
	REFLECTIVE SHEETING
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
	CONNECTING HARDWARE
2917	ANGLE BRACKET USED FOR TEMPORARY MAILBOX SUPPORT
166105	BRACKET FOR SINGLE MOUNTING OF MAILBOXES (MOUNTING KIT)
3789	PLATE FOR DOUBLE MOUNTING OF MAILBOXES
166108	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES (MOUNTING KIT)
166111	BRACKET FOR MULTIPLE MOUNTING OF MAILBOXES (MOUNTING KIT)
148939	BRACKET FOR ATTACHING SMALL OR MEDIUM SIZE MAIL BOX
148938	EXTENDER TO BRACKET FOR ATTACHING LARGE MAILBOX
159489	ANGLE BRACKET PART A
159490	ANGLE BRACKET PART B
162323	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL STEEL POST, GALVANIZED OR POWDERCOATED.
161443	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST AND TO MULTIPLE WHITE MAILBOX POST
158358	CASTING (NEWSPAPER RECEPTACLE BRACKET)
163731	U-BOLT (NEWSPAPER RECEPTACLE BRACKET)
160698	BOLT;HEX HEAD, GALV;3/8"DIA X 3/4"L HD, W/2-FLAT WASHERS
163750	BOLT;HEX HEAD, GALV;3/8" X 1-1/2, 16 NC, W/WASHERS
160701	BOLT;HEX HEAD, GALV;3/8"DIA X 2-1/2"L, HD, W/2-FLAT WASHERS
163730	BOLT;HEX HEAD, GALV;3/8" X 3-1/2", NC, W/NUT, 2 FLAT WASHERS
160699	BOLT;HEX HEAD, GALV;3/8"DIA X 3-3/4"L HD, W/2-FLAT WASHERS
160700	BOLT;HEX HEAD, GALV;3/8"DIA X 4"L HD, W/2-FLAT WASHERS

Texas Department of Transportation — Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
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REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		78

DATE:
FILE:

SEAL COAT MATERIAL SELECTION TABLE

TIER I: HEAVY USE - USE ONLY THE SELECTED MATERIALS.

TYPE	ASPHALT RUBBER (A-R)	ASPHALT CEMENT (AC)
	☐ A-R ONLY	☒ AC ONLY
ASPHALT	☐ A-R TY II ☐ A-R TY III ☐ SP 300-	☒ AC-20-5TR ☒ AC-20XP ☐ AC-15P ☐ SP 300-

TIER II: MODERATE USE - USE THESE MATERIALS OR ANY SELECTED TIER I MATERIAL COMBINATIONS OF THE ALLOWED TYPES.

TYPE	ASPHALT CEMENT (AC)	ASPHALT EMULSION
	☒ AC ONLY	☐ EMULSION ONLY
ASPHALT	☒ AC-10-2TR ☐ AC-15P ☒ AC-20XP ☐ AC-10 W/2%SBR ☐ AC-5 W/2%SBR ☐ SP 300-	☐ CHFRS-2P ☐ HFRS-2P ☐ CRS-2P ☐ SP 300-

TIER III: LIGHT USE - USE THESE MATERIALS OR ANY SELECTED TIER I OR TIER II MATERIAL COMBINATIONS OF THE ALLOWED TYPES.

TYPE	ASPHALT CEMENT (AC)	ASPHALT EMULSION
	☐ AC ONLY	☐ EMULSION ONLY
ASPHALT	☐ AC-10 ☐ AC-5 ☐ SP 300-	☐ CRS-2 ☐ CRS-2H ☐ HFRS-2 ☐ SP 300-

DISTRICTWIDE SEAL COAT PROJECT SEASONS: REFER TO ITEM 316 FOR TEMPERATURE AND WEATHER RESTRICTIONS.

SEASON 1:	AMA, CHS, LBB	MAY 15 TO AUG 31
SEASON 2:	ABL, ATL, BWD, DAL, FTW, LFK, ODA, PAR, SJT, TYL, WAC, WFS	MAY 1 TO AUG 31
SEASON 3:	AUS, BMT, BRY, ELP, HOU, SAT, YKM	MAY 1 TO SEP 15
SEASON 4:	CRP, LRD, PHR	APR 1 TO SEPT 30

NOTE: SEAL COATS ON ROUTINE MAINTENANCE CONTRACTS MUST BE COMPLETED BY AUGUST 31 UNLESS OTHERWISE SHOWN ON THE PLANS.

INSTRUCTIONS TO THE CONTRACTOR:

1. PROVIDE MATERIALS ACCORDING TO THE ALTERNATES SELECTED FOR THE ROADWAY TIER DESIGNATIONS SPECIFIED AT VARIOUS ROADWAY LOCATIONS SHOWN ON THE PLANS;
2. ALTERNATELY, SUPPLY SELECTED BINDERS FROM A HIGHER TIER, BUT ONLY IF THE TYPE OF MATERIAL IS ALLOWED FOR THE DESIGNATED TIER; PAYMENT WILL ONLY BE MADE FOR THE TIER DESIGNATED FOR THE PAVEMENT;
3. SUPPLY THE AGGREGATE TYPE, GRADE AND SURFACE AGGREGATE CLASS SHOWN ON THE PLANS; AND
4. ADHERE TO THE APPLICATION SEASON SELECTED.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED
PROFESSIONAL ENGINEER

11.18.2020

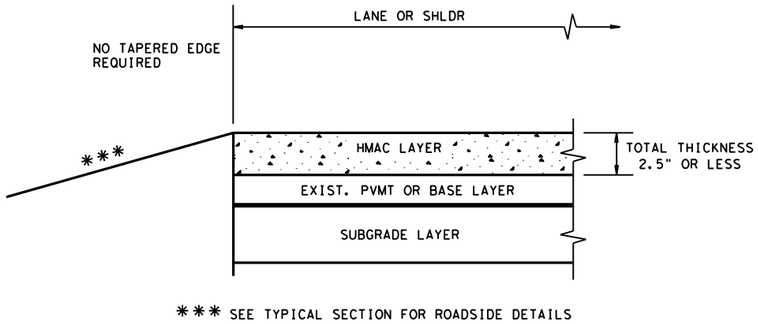
Mark W. Litzmann, P.E.

SEAL COAT MATERIAL SELECTION TABLE

SCTABLE

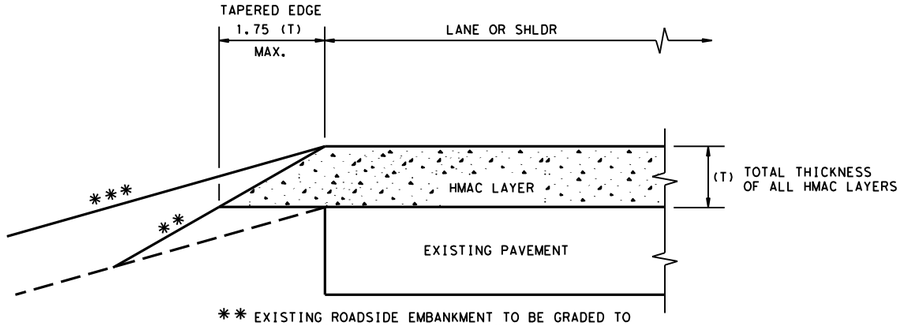
FILE: sctable.dgn	DN: TxDOT	CK:	DW:	CK:	
© TxDOT: March 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0334	03	021	FM 696	
	DIST	COUNTY		SHEET NO.	
	AUSTIN	LEE		79	

DATE:
FILE:



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

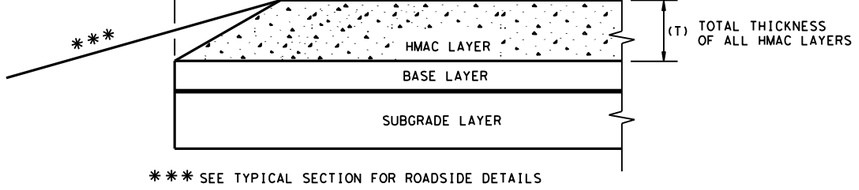
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

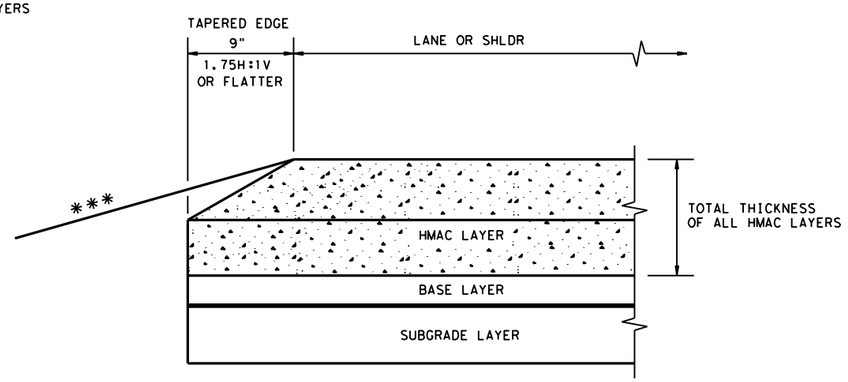
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

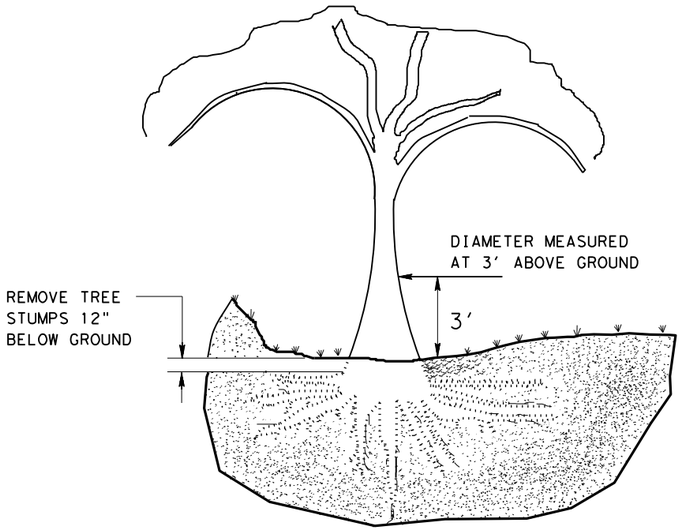
Texas Department of Transportation

Design Division Standard

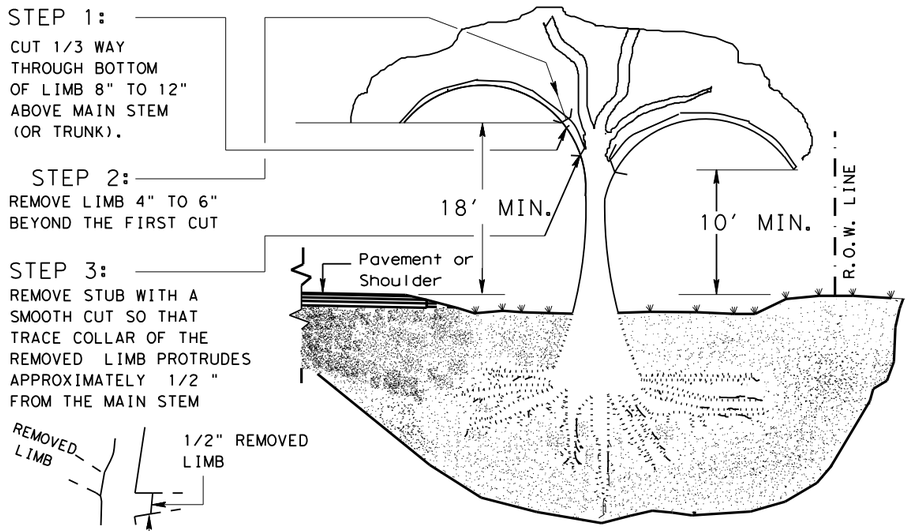
TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

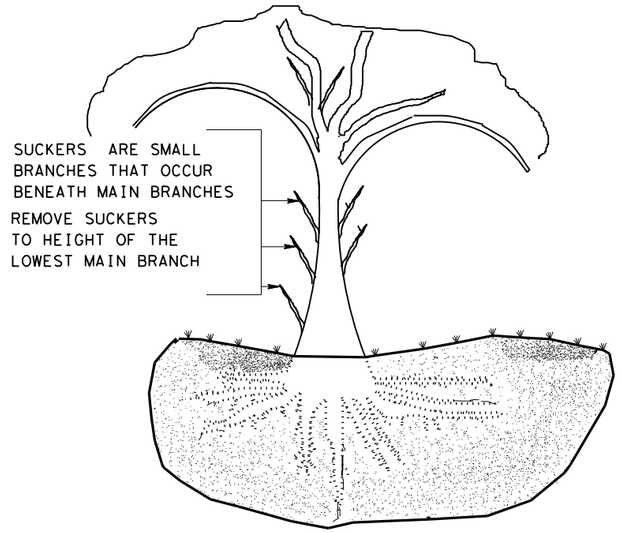
FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:		
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0334	03	021	FM 696		
	DIST	COUNTY		SHEET NO.		
	AUSTIN	LEE		80		



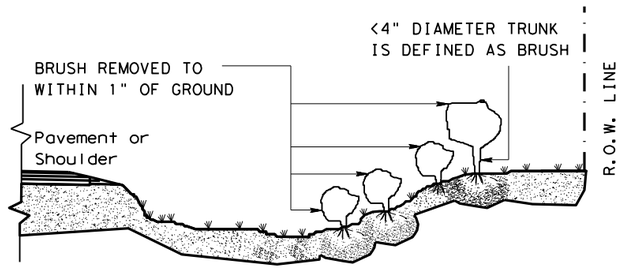
TREE REMOVAL



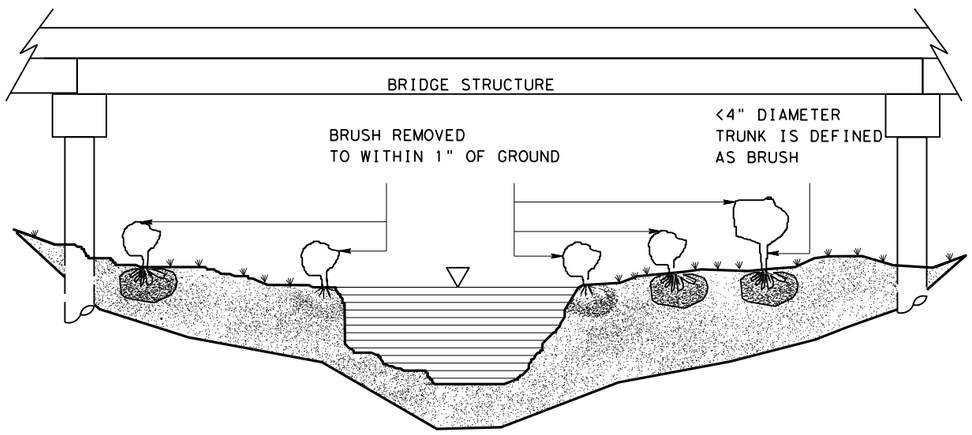
TREE TRIMMING



STEPS 1, 2 AND 3 APPLY WHEN REMOVING LIMBS 2" IN DIAMETER OR LARGER.



BRUSH REMOVAL



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL

GENERAL NOTES:

TREE TRIMMING

1. TRIM AND REMOVE ALL TREE LIMBS ON THE PAVEMENT SIDE OF THE TRUNK 18' ABOVE THE PAVEMENT OR BRIDGE DECK ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.

2. TRIM AND REMOVE ALL TREE LIMBS BETWEEN THE TRUNK AND R.O.W. LINE 10' ABOVE NATURAL GROUND, TERRAIN OR OTHER STRUCTURE ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.

TREE REMOVAL

3. FOR TREES MARKED FOR REMOVAL, THE DIAMETER OF TREES ARE DETERMINED BY MEASUREMENT OF THE TRUNK CIRCUMFERENCE 3' ABOVE THE GROUND. TREES WITH TRUNKS OF LESS THAN 4" DIAMETER ARE CONSIDERED TO BE BRUSH. TREES WITH MULTIPLE TRUNKS AT THE POINT OF MEASUREMENT ARE MEASURED AND PAID FOR SEPARATELY.

4. MEASUREMENTS FOR PAYMENT OF TREE DIAMETERS ARE DIVIDED INTO THE RANGES SHOWN IN TABLE 1.

TABLE 1
TREE TRUNK SIZE FOR TREE REMOVAL PAYMENT

PAY ITEM	RANGE FOR PAY ITEMS			
	TRUNK DIAMETER *		TRUNK CIRCUMFERENCE	
	LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO	LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO
752 6005	4	12	12 1/2	37 1/2
752 6006	12	18	37 1/2	56 1/2
752 6007	18	24	56 1/2	75 1/2
752 6008	24	30	75 1/2	94
752 6009	30	36	94	113
752 6010	36	42	113	132
752 6011	42	48	132	151
752 6012	48	60	151	188 1/2
752 6013	60	72	188 1/2	226
752 6019	72	84	226	264
	84	GREATER THAN 84	264	NOT APPLICABLE

*SEE GENERAL NOTE *3.

Texas Department of Transportation

Maintenance Division Standard

TREE AND BRUSH REMOVAL

TRB-15(1)

FILE:	DN: JEO	CK: LJB	DW: JEO	CK:
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REVISIONS	0334	03	021	FM 696
Revised table 1 to 2014 Specification	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		81

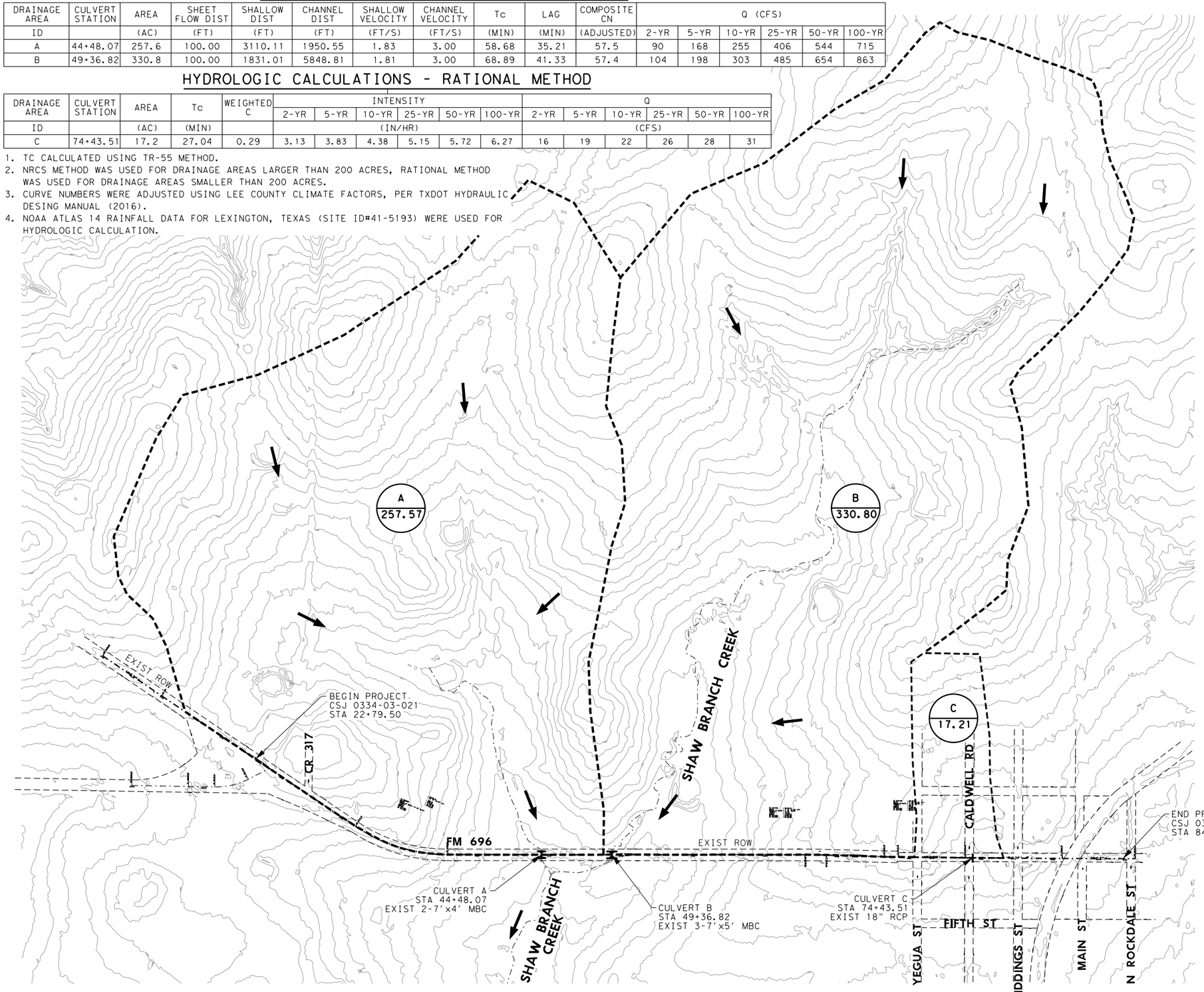
HYDROLOGIC CALCULATIONS - NRCS METHOD

DRAINAGE AREA	CULVERT STATION	AREA	SHEET FLOW DIST	SHALLOW DIST	CHANNEL DIST	SHALLOW VELOCITY	CHANNEL VELOCITY	Tc	LAG	COMPOSITE CN	Q (CFS)					
ID		(AC)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)	(MIN)	(MIN)	(ADJUSTED)	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
A	44+48.07	257.6	100.00	3110.11	1950.55	1.83	3.00	58.68	35.21	57.5	90	168	255	406	544	715
B	49+36.82	330.8	100.00	1831.01	5848.81	1.81	3.00	68.89	41.33	57.4	104	198	303	485	654	863

HYDROLOGIC CALCULATIONS - RATIONAL METHOD

DRAINAGE AREA	CULVERT STATION	AREA	Tc	WEIGHTED C	INTENSITY						Q					
					2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
ID		(AC)	(MIN)		(IN/HR)						(CFS)					
C	74+43.51	17.2	27.04	0.29	3.13	3.83	4.38	5.15	5.72	6.27	16	19	22	26	28	31

1. TC CALCULATED USING TR-55 METHOD.
2. NRCS METHOD WAS USED FOR DRAINAGE AREAS LARGER THAN 200 ACRES, RATIONAL METHOD WAS USED FOR DRAINAGE AREAS SMALLER THAN 200 ACRES.
3. CURVE NUMBERS WERE ADJUSTED USING LEE COUNTY CLIMATE FACTORS, PER TXDOT HYDRAULIC DESING MANUAL (2016).
4. NOAA ATLAS 14 RAINFALL DATA FOR LEXINGTON, TEXAS (SITE ID#41-5193) WERE USED FOR HYDROLOGIC CALCULATION.



LEGEND:

- X-XX / X.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- EXISTING CONTOURS
- STREAM

NOTES:

1. DRAINAGE AREAS DELINEATED BASED ON TNRIS STRATMAP LiDAR FOR LEE, LEON, MADISON & MILAM COUNTIES, 2010.

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

0′ 175 350′ 700′
SCALE: 1" = 700′

ENTECH CIVIL ENGINEERS INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 696

DRAINAGE AREA MAP

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	82

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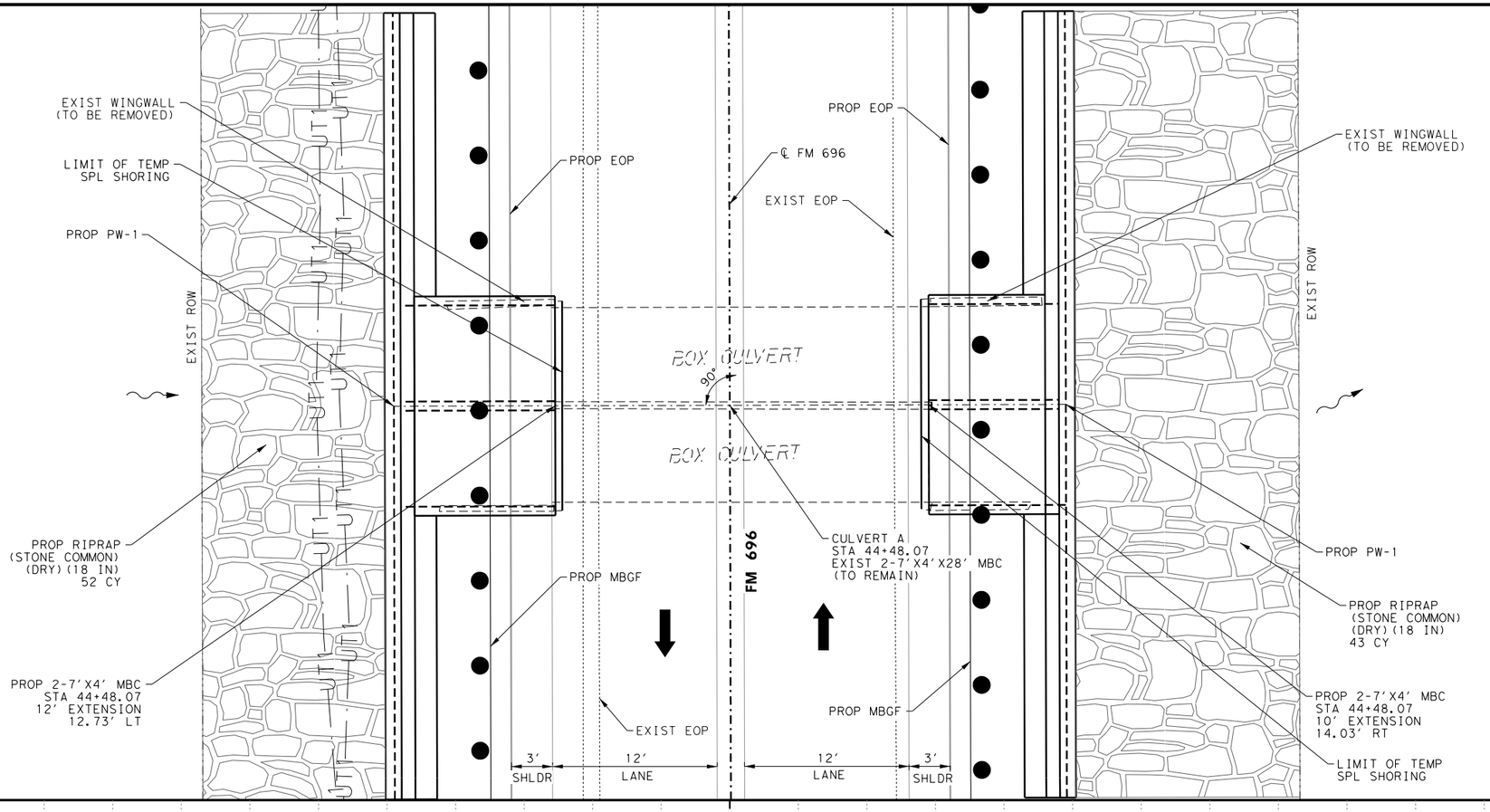

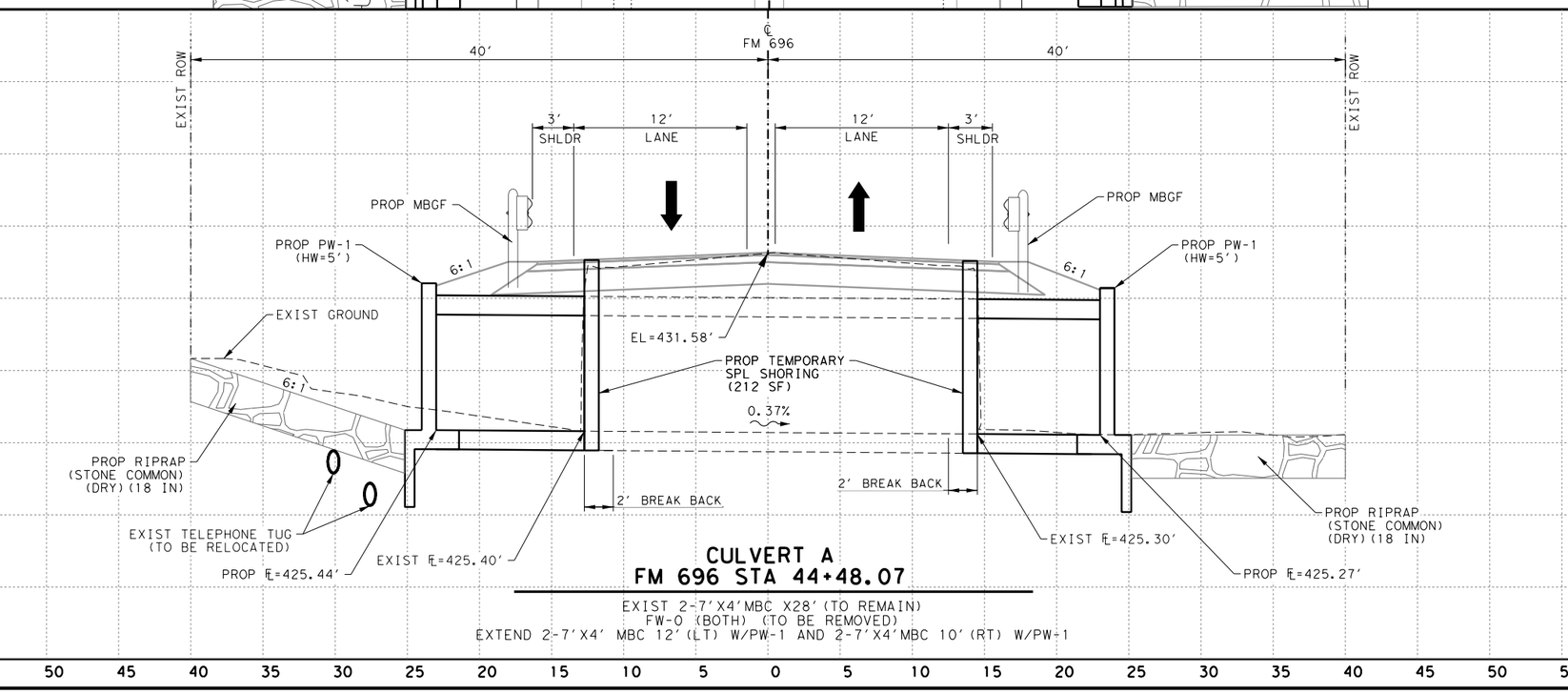

CULVERT A
FM 696 STA 44+48.07

EXIST 2-7'X4'MBC X28' (TO REMAIN)
FW-0 (BOTH) (TO BE REMOVED)
EXTEND 2-7'X4' MBC 12'(LT) W/PW-1 AND 2-7'X4'MBC 10'(RT) W/PW-1

LEGEND

- DIRECTION OF TRAFFIC
- FLOW DIRECTION
- EXIST ROW
- EXIST FENCE
- EXIST DRAINAGE
- PROP DRAINAGE
- PROP STONE RIPRAP
- PROP FLOWABLE BACKFILL
- PROP MBGF

NOTES:

1. CONTRACTOR WILL FIELD VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILTIES WHERE NEW FACILITIES CROSS.
2. CONTRACTOR WILL FIELD VERIFY THE SIZE OF ALL STRUCTURES TO BE EXTENDED BEFORE FABRICATING AND/OR ACQUIRING MATERIALS.
3. ALL STATION AND OFFSETS ARE BASED ON FM 696 ℄ UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL REMOVE ANY DEBRIS LOCATED WITHIN CULVERTS, PRIOR TO CONSTRUCTION.

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

0' 2.5' 5' 10'
SCALES: 1" = 10' H
1" = 5' V

ENTECH CIVIL ENGINEERS INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 696

CULVERT LAYOUT
CULVERT A
STA 44+48.07

SHEET 1 OF 3

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	83

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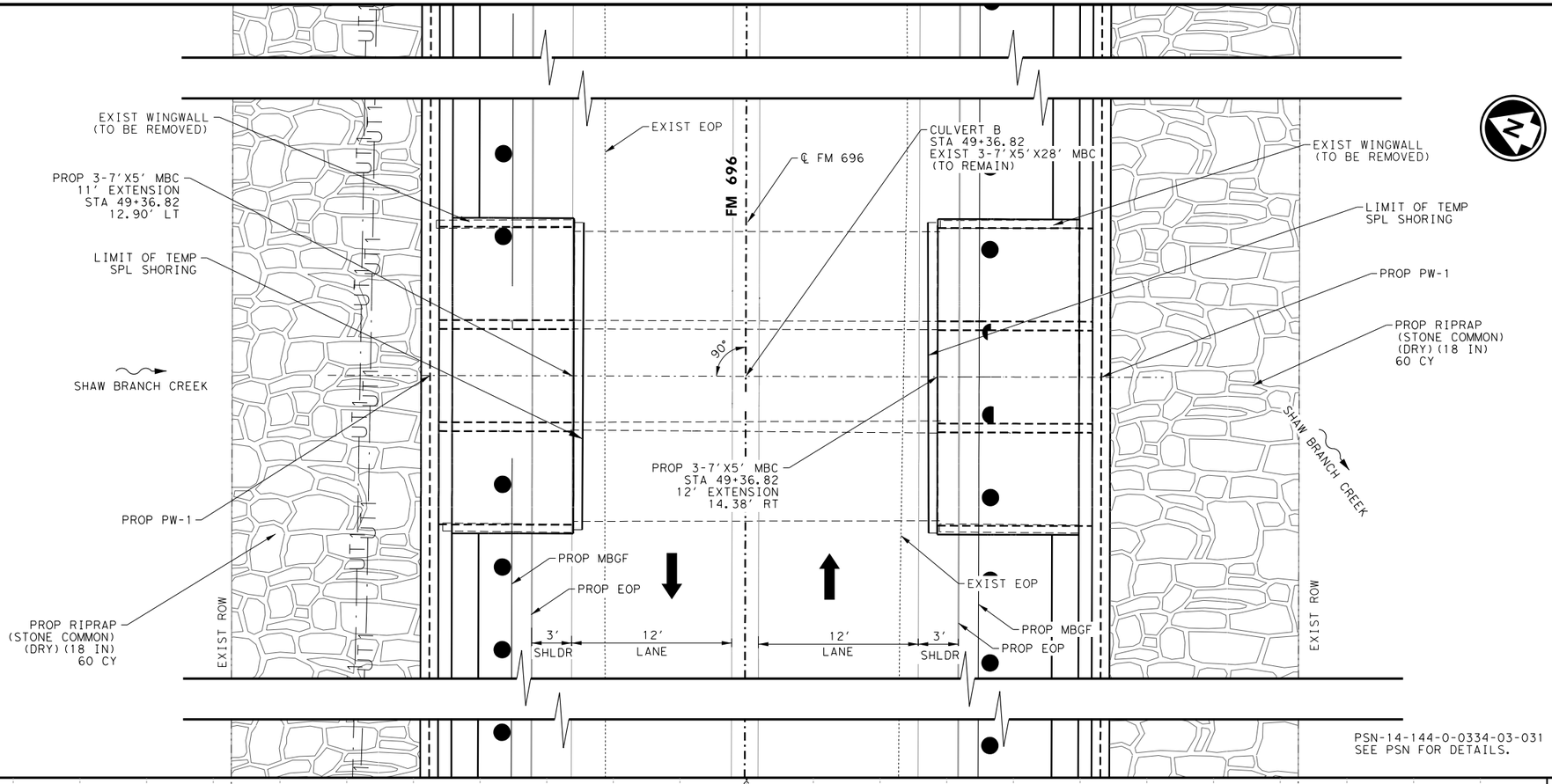

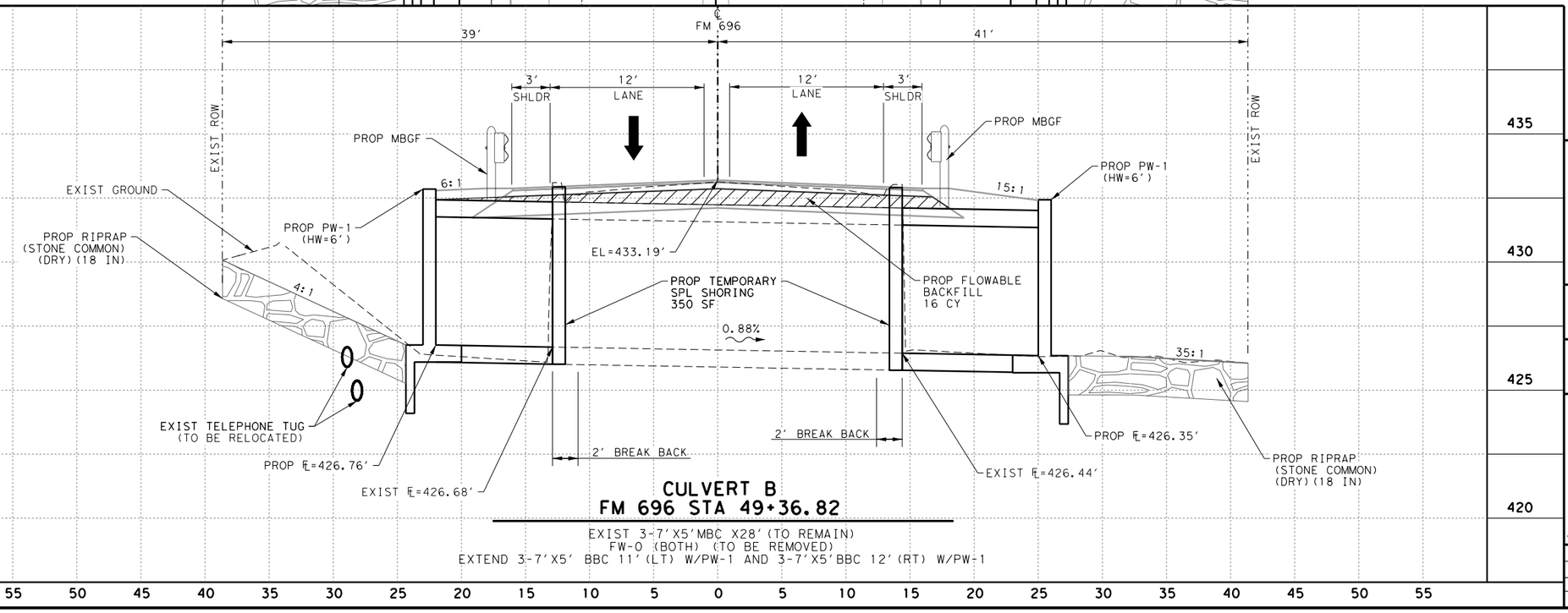

CULVERT B
FM 696 STA 49+36.82

EXIST 3-7'X5'MBC X28'(TO REMAIN)
FW-0 (BOTH) (TO BE REMOVED)
EXTEND 3-7'X5' BBC 11'(LT) W/PW-1 AND 3-7'X5'BBC 12'(RT) W/PW-1

LEGEND

- DIRECTION OF TRAFFIC
- FLOW DIRECTION
- EXIST ROW
- EXIST FENCE
- EXIST DRAINAGE
- PROP DRAINAGE
- PROP STONE RIPRAP
- PROP FLOWABLE BACKFILL
- PROP MBGF

NOTES:

1. CONTRACTOR WILL FIELD VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILTIES WHERE NEW FACILITIES CROSS.
2. CONTRACTOR WILL FIELD VERIFY THE SIZE OF ALL STRUCTURES TO BE EXTENDED BEFORE FABRICATING AND/OR ACQUIRING MATERIALS.
3. ALL STATION AND OFFSETS ARE BASED ON FM 696 ℄ UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL REMOVE ANY DEBRIS LOCATED WITHIN CULVERTS, PRIOR TO CONSTRUCTION.

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

0' 2.5' 5' 10'
SCALES: 1" = 10' H
1" = 5' V

ENTECH CIVIL ENGINEERS INC
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FM 696

CULVERT LAYOUT
CULVERT B
STA 49+36.82

SHEET 2 OF 3

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	84

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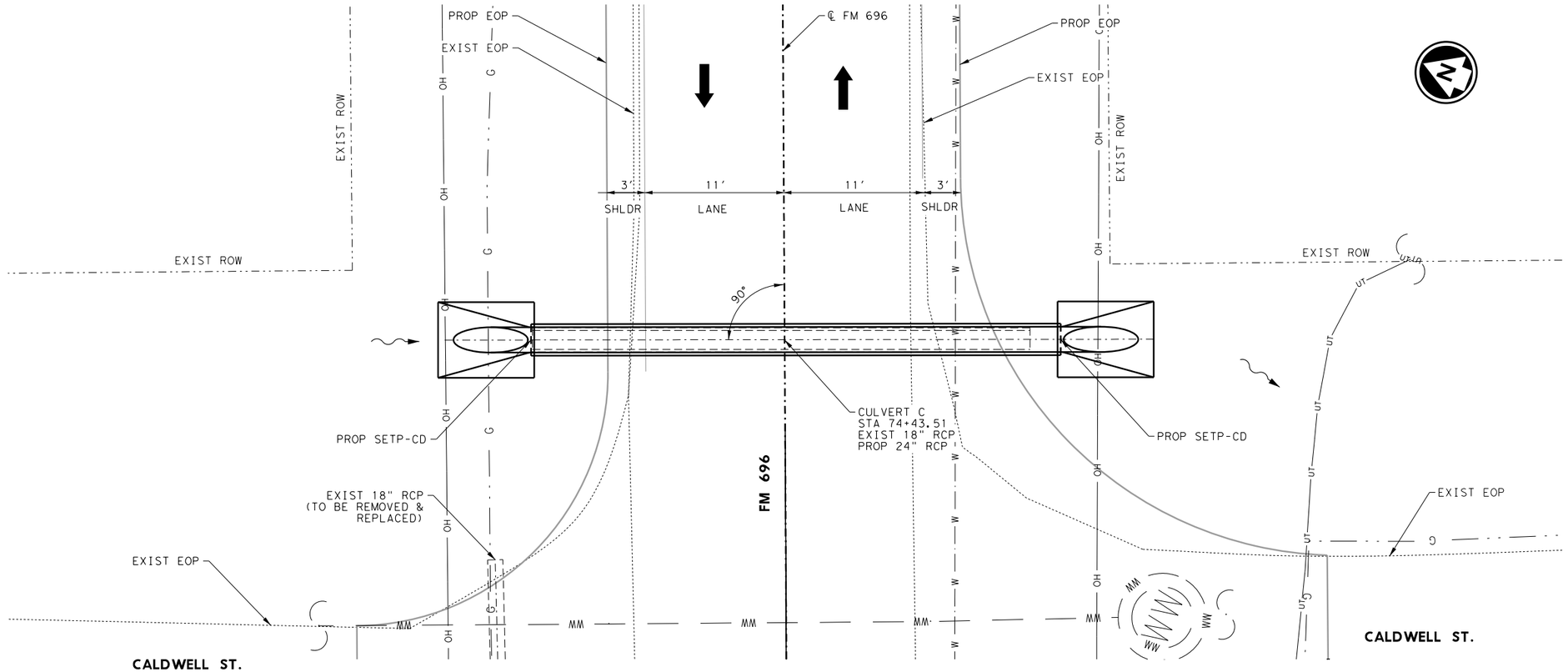
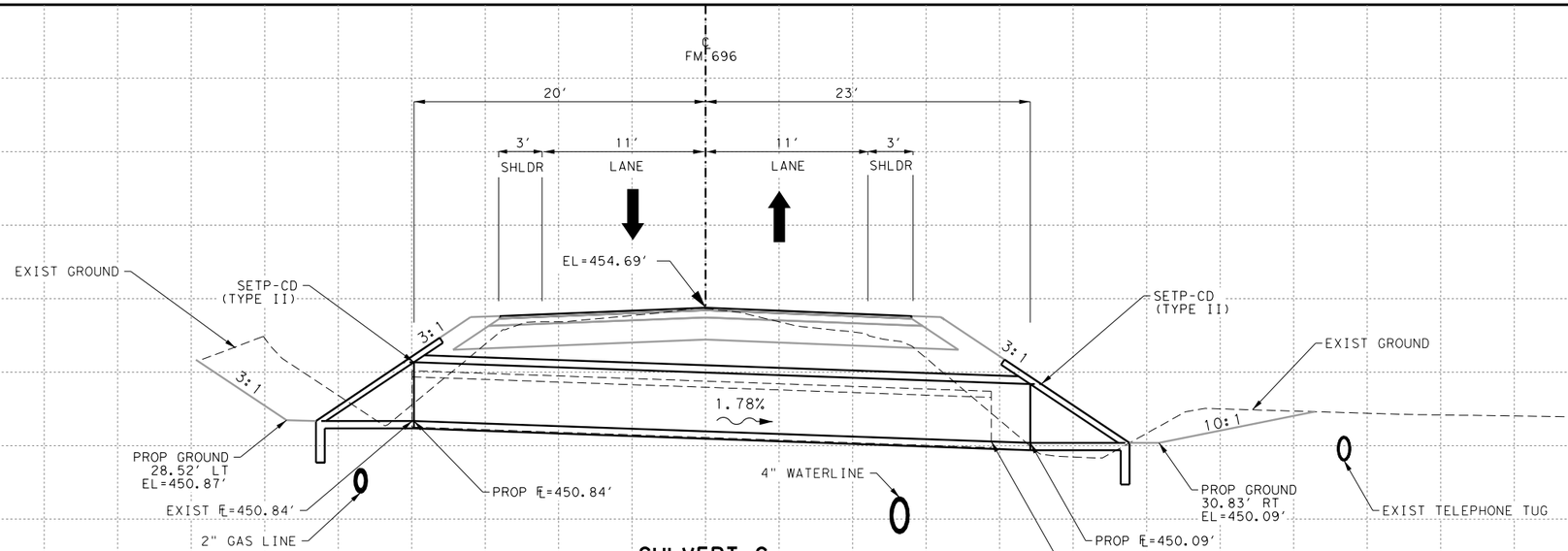


LEGEND

- DIRECTION OF TRAFFIC
- FLOW DIRECTION
- EXIST ROW
- EXIST FENCE
- EXIST DRAINAGE
- PROP DRAINAGE
- PROP STONE RIPRAP
- PROP FLOWABLE BACKFILL
- PROP MBGF

NOTES:

1. CONTRACTOR WILL FIELD VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILTIES WHERE NEW FACILITIES CROSS.
2. ALL STATION AND OFFSETS ARE BASED ON FM 696 ℄ UNLESS OTHERWISE NOTED.



CULVERT C
FM 696 STA 74+43.51

EXIST 18" RCP 39.4 LF (TO BE REMOVED)
PROPOSED 24"X 43" RCP (CLASS IV) WITH SETP-CD (TYPE II) (BOTH)

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

0' 2.5' 5' 10'
SCALES: 1" = 10' H
1" = 5' V

ENTECH CIVIL ENGINEERS INC
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FM 696

CULVERT LAYOUT
CULVERT C
STA 74+43.51

SHEET 3 OF 3

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	85

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DRIVER: TxDOT-BW-HALF_PDF.pltcfg

CULVERT A - EXISTING

ROADWAY DATA	
ROADWAY PROFILE SHAPE	CONSTANT ROADWAY ELEVATION
FIRST ROADWAY STATION (FT)	0.00
CREST LENGTH (FT)	900.00
CREST ELEVATION (FT)	431.36
ROADWAY SURFACE	PAVED
TOP WIDTH (FT)	22.00

TAILWATER DATA	
CHANNEL TYPE	TRAPEZOIDAL
CHANNEL SLOPE (FT/FT)	0.0025
MANNING'S "n" (CHANNEL)	0.035
CHANNEL INVERT EEVATION (FT)	425.40

SITE DATA	
SITE DATA INPUT OPTION	CULVERT INVERT
INLET STATION (FT)	0.00
INLET ELEVATION (FT)	425.40
OUTLET STATION (FT)	26.00
OUTLET ELEVATION (FT)	425.30
NUMBER OF BARRELS	2

CULVERT DATA	
NAME	A-EXISTING
SHAPE	CONCRETE BOX
MATERIAL	CONCRETE
SPAN X RISE (FT)	7 X 4
EMBANKMENT DEPTH (IN)	0
MANNING'S "n"	0.015
CULVERT TYPE	STRAIGHT
INLET CONFIGURATION	SQUARE EDGE (0° FLARE) WINGWALL
INLET DEPRESSION	NO

SUMMARY OF FLOWS AT CROSSING: EXISTING

HEADWATER ELEVATION (FT)	DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	ROADWAY DISCHARGE (CFS)	ITERATIONS
427.45	2-YEAR	89.00	89.00	0.00	1
428.38	5-YEAR	167.00	167.00	0.00	1
429.3	10-YEAR	255.00	255.00	0.00	1
430.76	25-YEAR	405.00	405.00	0.00	1
431.46	50-YEAR	543.00	457.93	83.02	11
431.56	100-YEAR	714.00	465.45	246.93	4

CULVERT SUMMARY TABLE: EXISTING

DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	OUTLET DEPTH (FT)	TAILWATER DEPTH (FT)	OUTLET VELOCITY (FT/S)	TAILWATER VELOCITY (FT/S)
2-YEAR	89.00	89.00	427.45	1.83	2.05	1.77	1.67	3.60	2.12
5-YEAR	167.00	167.00	428.38	2.74	2.98	2.30	2.20	5.19	2.49
10-YEAR	255.00	255.00	429.30	3.67	3.90	2.74	2.64	6.66	2.77
25-YEAR	405.00	405.00	430.76	5.36~	5.35	3.30	3.20	8.76	3.12
50-YEAR	543.00	457.93	431.46	6.06~	5.76	3.72	3.62	8.80	3.36
100-YEAR	714.00	465.45	431.56	6.16~	6.01	4.00	4.05	8.31	3.6

NOTES:

*HY-8 VERSION 7.50 USED FOR CULVERT HYDRAULIC CALCULATIONS.

STATE OF TEXAS
MANTHAN SHAH
134585
REGISTERED
PROFESSIONAL ENGINEER

10/19/2020

CULVERT A - PROPOSED

ROADWAY DATA	
ROADWAY PROFILE SHAPE	CONSTANT ROADWAY ELEVATION
FIRST ROADWAY STATION (FT)	0.00
CREST LENGTH (FT)	50.00
CREST ELEVATION (FT)	431.58
ROADWAY SURFACE	PAVED
TOP WIDTH (FT)	32.00

TAILWATER DATA	
CHANNEL TYPE	TRAPEZOIDAL
CHANNEL SLOPE (FT/FT)	0.0025
MANNING'S N (CHANNEL)	0.035
CHANNEL INVERT EEVATION (FT)	425.25

SITE DATA	
SITE DATA INPUT OPTION	CULVERT INVERT
INLET STATION (FT)	0.00
INLET ELEVATION (FT)	425.44
OUTLET STATION (FT)	48.00
OUTLET ELEVATION (FT)	425.27
NUMBER OF BARRELS	2

CULVERT DATA	
NAME	A-PROPOSED
SHAPE	CONCRETE BOX
MATERIAL	CONCRETE
SPAN X RISE (FT)	7 X 4
EMBANKMENT DEPTH (IN)	0
MANNING'S "n"	0.013
CULVERT TYPE	STRAIGHT
INLET CONFIGURATION	SQUARE EDGE WITH (90°) HEADWALL
INLET DEPRESSION	NO

SUMMARY OF FLOWS AT CROSSING: PROPOSED

HEADWATER ELEVATION (FT)	DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	ROADWAY DISCHARGE (CFS)	ITERATIONS
427.37	2-YEAR	90.00	90.00	0.00	1
428.3	5-YEAR	168.00	168.00	0.00	1
429.2	10-YEAR	255.00	255.00	0.00	1
430.67	25-YEAR	406.00	406.00	0.00	1
431.94	50-YEAR	544.00	511.95	31.94	6
432.6	100-YEAR	715.00	559.83	155.13	4

CULVERT SUMMARY TABLE: PROPOSED

DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	OUTLET DEPTH (FT)	TAILWATER DEPTH (FT)	OUTLET VELOCITY (FT/S)	TAILWATER VELOCITY (FT/S)
2-YEAR	90.00	90.00	427.37	1.86	1.91	1.68	1.68	3.84	2.13
5-YEAR	168.00	168.00	428.30	2.79	2.84	2.20	2.20	5.44	2.5
10-YEAR	255.00	255.00	429.20	3.68	3.74	2.64	2.64	6.91	2.77
25-YEAR	406.00	406.00	430.67	5.21~	5.13	3.21	3.21	9.04	3.12
50-YEAR	544.00	511.95	431.94	6.48~	6.02	3.62	3.62	10.10	3.36
100-YEAR	715.00	559.83	432.60	7.14~	6.50	4.00	4.05	10.00	3.6

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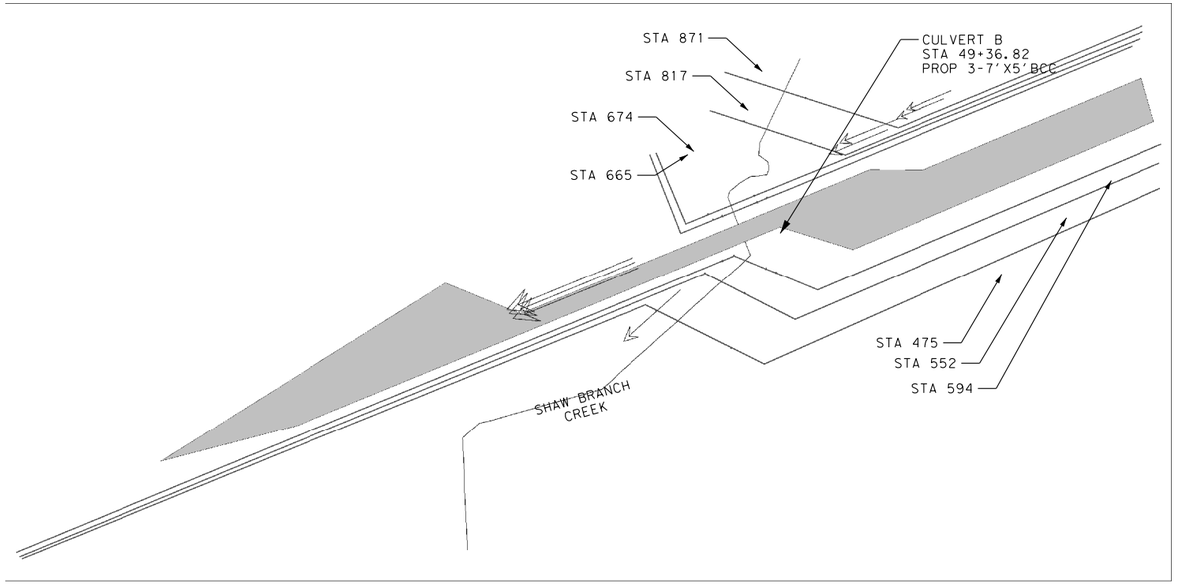
FM 696

HYDRAULIC CALCULATIONS
CULVERT A

SHEET 1 OF 6

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	86

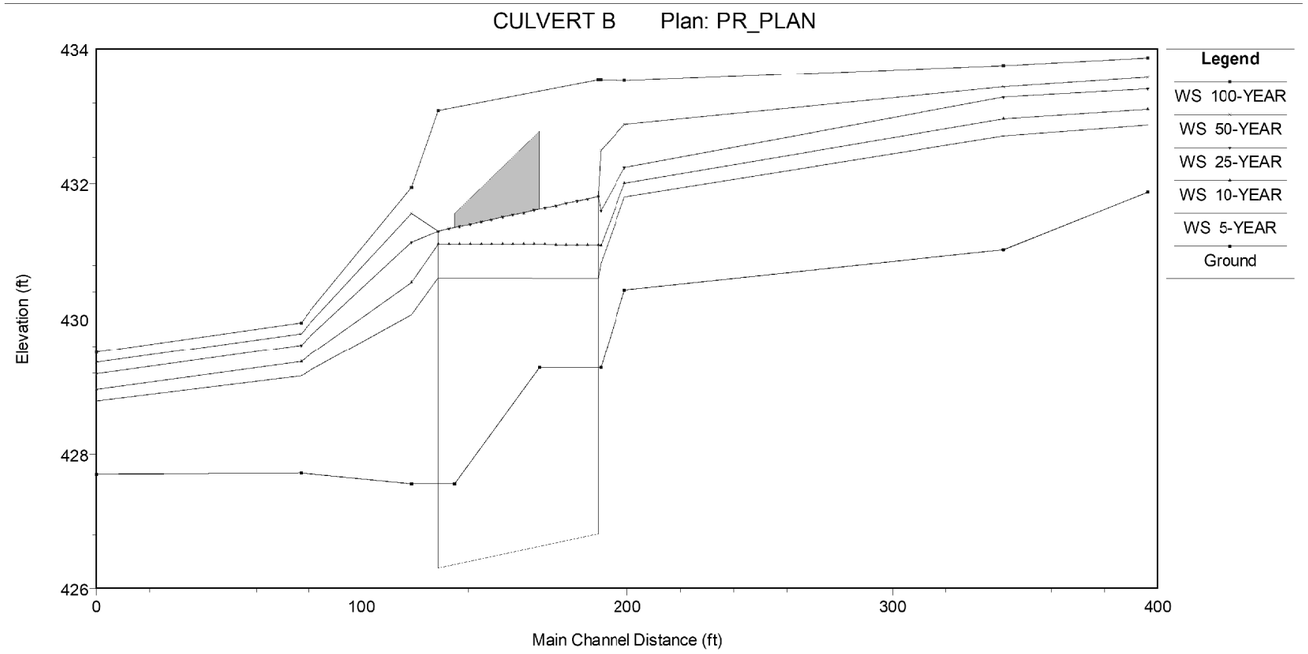
HEC-RAS STATION	SOTRM FREQUENCY	FLOW (CFS)	COMPUTED WATER SURFACE ELEVATIONS (FT)		
			EXIST	PROP	DIFFERENCE
871	5-YEAR	198	432.87	432.87	0
	10-YEAR	303	433.11	433.11	0
	25-YEAR	485	433.41	433.41	0
	50-YEAR	654	433.57	433.58	0.01
	100-YEAR	863	433.85	433.87	0.02
817	5-YEAR	198	432.72	432.72	0
	10-YEAR	303	432.97	432.97	0
	25-YEAR	485	433.29	433.29	0
	50-YEAR	654	433.43	433.44	0.01
	100-YEAR	863	433.73	433.76	0.03
674	5-YEAR	198	431.81	431.81	0
	10-YEAR	303	432.01	432.01	0
	25-YEAR	485	432.25	432.25	0
	50-YEAR	654	432.79	432.89	0.1
	100-YEAR	863	433.48	433.54	0.06
665	5-YEAR	198	430.83	430.83	0
	10-YEAR	303	431.09	431.09	0
	25-YEAR	485	431.49	431.61	0.12
	50-YEAR	654	432.36	432.5	0.14
	100-YEAR	863	433.49	433.54	0.05
636	Culvert				
594	5-YEAR	198	430.07	430.07	0
	10-YEAR	303	430.55	430.55	0
	25-YEAR	485	431.15	431.15	0
	50-YEAR	654	431.57	431.57	0
	100-YEAR	863	431.95	431.95	0
552	5-YEAR	198	429.16	429.16	0
	10-YEAR	303	429.37	429.37	0
	25-YEAR	485	429.61	429.61	0
	50-YEAR	654	429.79	429.79	0
	100-YEAR	863	429.95	429.95	0
475	5-YEAR	198	428.78	428.78	0
	10-YEAR	303	428.95	428.95	0
	25-YEAR	485	429.18	429.18	0
	50-YEAR	654	429.36	429.36	0
	100-YEAR	863	429.51	429.51	0



NOTE:

HEC-RAS(VERSION 5.0.5) WAS USED TO ESTIMATE THE WATER SURFACE ELEVATION FOR THIS BRIDGE CROSSING.

Plan: PR Shaw Branch		B OFF RS: 636	Culv Group: Culvert B	Profile: 10-YEAR
Q CULV GROUP (CFS)	303	CULV FULL LEN (FT)		
# BARRELS	3	CULV VEL US (FT/S)	3.37	
Q BARREL (CFS)	101	CULV VEL DS (FT/S)	3	
E.G. US. (FT)	431.37	CULV INV EL UP (FT)	426.82	
W.S. US. (FT)	431.09	CULV INV EL DN (FT)	426.31	
E.G. DS (FT)	431.26	CULV FRCTN LS (FT)	0.02	
W.S. DS (FT)	430.55	CULV EXIT LOSS (FT)	0	
DELTA EG (FT)	0.11	CULV ENTR LOSS (FT)	0.09	
DELTA WS (FT)	0.54	Q WEIR (CFS)		
E.G. IC (FT)	429.96	WEIR STA LFT (FT)		
E.G. OC (FT)	431.37	WEIR STA RGT (FT)		
CULVERT CONTROL	OUTLET	WEIR SUBMERG		
CULV WS INLET (FT)	431.11	WEIR MAX DEPTH (FT)		
CULV WS OUTLET (FT)	431.12	WEIR AVG DEPTH (FT)		
CULV NML DEPTH (FT)	1.52	WEIR FLOW AREA (SQ FT)		
CULV CRT DEPTH (FT)	1.86	MIN EL WEIR FLOW (FT)	433.02	



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10/19/2020

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FM 696

HYDRAULIC CALCULATIONS

CULVERT B

SHEET 2 OF 6

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	87

CULVERT C - EXISTING

ROADWAY DATA	
ROADWAY PROFILE SHAPE	CONSTANT ROADWAY ELEVATION
FIRST ROADWAY STATION (FT)	0.00
CREST LENGTH (FT)	350.00
CREST ELEVATION (FT)	454.47
ROADWAY SURFACE	PAVED
TOP WIDTH (FT)	22.00

TAILWATER DATA	
CHANNEL TYPE	TRAPEZOIDAL
CHANNEL SLOPE (FT/FT)	0.0025
MANNING'S "n" (CHANNEL)	0.035
CHANNEL INVERT EEVATION (FT)	450.14

SITE DATA INPUT OPTION	CULVERT INVERT
INLET STATION (FT)	0.00
INLET ELEVATION (FT)	450.84
OUTLET STATION (FT)	39.89
OUTLET ELEVATION (FT)	450.14
NUMBER OF BARRELS	1

CULVERT DATA	
NAME	C-EXISTING
SHAPE	CIRCULAR
MATERIAL	CONCRETE
DIAMETER (FT)	1.5
EMBANKMENT DEPTH (IN)	0
MANNING'S "n"	0.013
CULVERT TYPE	STRAIGHT
INLET CONFIGURATION	GROOVED END PROJECTING
INLET DEPRESSION	NO

SUMMARY OF FLOWS AT CROSSING: EXISTING

HEADWATER ELEVATION (FT)	DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	ROADWAY DISCHARGE (CFS)	ITERATIONS
454.42	2-YEAR	16.00	15.84	0.00	71
454.49	5-YEAR	19.00	16.05	2.87	10
454.5	10-YEAR	22.00	16.09	5.81	4
454.51	25-YEAR	25.00	16.12	8.69	3
454.52	50-YEAR	28.00	16.15	11.73	3
454.53	100-YEAR	31.00	16.17	14.76	3

CULVERT SUMMARY TABLE: EXISTING

DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	OUTLET DEPTH (FT)	TAILWATER DEPTH (FT)	OUTLET VELOCITY (FT/S)	TAILWATER VELOCITY (FT/S)
2-YEAR	16.00	15.84	454.42	3.58~	3.16	1.42	1.15	9.16	1.57
5-YEAR	19.00	16.05	454.49	3.65~	3.23	1.43	1.23	9.24	1.64
10-YEAR	22.00	16.09	454.50	3.66~	3.24	1.43	1.31	9.26	1.7
25-YEAR	25.00	16.12	454.51	3.67~	3.25	1.42	1.38	9.30	1.76
50-YEAR	28.00	16.15	454.52	3.68~	3.26	1.45	1.45	9.24	1.81
100-YEAR	31.00	16.17	454.53	3.69~	3.31	1.50	1.51	9.15	1.86

NOTES:

*HY-8 VERSION 7.50 USED FOR CULVERT HYDRAULIC CALCULATIONS.

STATE OF TEXAS
MANTHAN SHAH
134585
REGISTERED PROFESSIONAL ENGINEER
10/19/2020

CULVERT C - PROPOSED

ROADWAY DATA	
ROADWAY PROFILE SHAPE	CONSTANT ROADWAY ELEVATION
FIRST ROADWAY STATION (FT)	0.00
CREST LENGTH (FT)	350.00
CREST ELEVATION (FT)	454.69
ROADWAY SURFACE	PAVED
TOP WIDTH (FT)	30.85

TAILWATER DATA	
CHANNEL TYPE	TRAPEZOIDAL
CHANNEL SLOPE (FT/FT)	0.0025
MANNING'S N (CHANNEL)	0.035
CHANNEL INVERT EEVATION (FT)	450.06

SITE DATA	
SITE DATA INPUT OPTION	CULVERT INVERT
INLET STATION (FT)	0.00
INLET ELEVATION (FT)	450.84
OUTLET STATION (FT)	43.00
OUTLET ELEVATION (FT)	450.09
NUMBER OF BARRELS	1

CULVERT DATA	
NAME	C-PROPOSED
SHAPE	CIRCULAR
MATERIAL	CONCRETE
DIAMETER (FT)	2
EMBANKMENT DEPTH (IN)	0
MANNING'S "n"	0.013
CULVERT TYPE	STRAIGHT
INLET CONFIGURATION	GROOVED END PROJECTING
INLET DEPRESSION	NO

SUMMARY OF FLOWS AT CROSSING: PROPOSED

HEADWATER ELEVATION (FT)	DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	ROADWAY DISCHARGE (CFS)	ITERATIONS
453.03	2-YEAR	16.00	16.00	0.00	1
453.36	5-YEAR	19.00	19.00	0.00	1
453.75	10-YEAR	22.00	22.00	0.00	1
454.37	25-YEAR	26.00	26.00	0.00	1
454.67	50-YEAR	28.00	27.74	0.00	59
454.71	100-YEAR	31.00	27.95	2.91	7

CULVERT SUMMARY TABLE: PROPOSED

DISCHARGE NAMES	TOTAL DISCHARGE (CFS)	CULVERT DISCHARGE (CFS)	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	OUTLET DEPTH (FT)	TAILWATER DEPTH (FT)	OUTLET VELOCITY (FT/S)	TAILWATER VELOCITY (FT/S)
2-YEAR	16.00	16.00	453.03	2.19	1.39	1.11	1.15	8.98	1.57
5-YEAR	19.00	19.00	453.36	2.52	2.02	1.23	1.23	9.36	1.64
10-YEAR	22.00	22.00	453.75	2.91	2.41	1.35	1.31	9.72	1.7
25-YEAR	26.00	26.00	454.37	3.53	2.98	1.52	1.40	10.17	1.78
50-YEAR	28.00	27.74	454.67	3.83	3.26	1.59	1.45	10.35	1.81
100-YEAR	31.00	27.95	454.71	3.87	3.29	1.60	1.51	10.37	1.86

ENTECH CIVIL ENGINEERS INC
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Houston, Texas, 77094
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FM 696

HYDRAULIC CALCULATIONS

CULVERT C

SHEET 3 OF 6

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	88

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EASTBOUND DITCH CALCULATIONS

FROM STA		TO STA		FROM FL	TO FL	SLOPE	ROAD-SIDE SLOPE	ROW-SIDE SLOPE	BOTTOM WIDTH	DEPTH	n	MATERIAL	VELOCITY	5-YR DESIGN	DITCH CAPACITY
STA	OFFSET (RT, FT)	STA	OFFSET (RT, FT)			%	H:1	H:1	(FT)	(FT)			(FT/S)	(CFS)	(CFS)
27+50	27.68	28+00	26.68	459.08	457.79	2.58%	4.00	15.00	3.00	0.28	0.035	GRASS	2.27	1.42	3.65
28+00	26.68	29+50	31.65	457.79	453.65	2.76%	4.00	9.00	0.00	0.62	0.035	GRASS	3.78	2.03	16.52
29+50	31.65	30+00	33.00	453.65	452.18	2.94%	4.00	7.00	0.00	0.91	0.035	GRASS	4.25	2.23	19.18
30+00	33.00	31+00	36.47	452.18	449.26	2.92%	4.00	4.00	0.00	0.91	0.035	GRASS	4.20	2.63	13.77
31+00	36.47	32+00	34.38	449.26	447.54	1.72%	3.00	4.00	0.00	1.12	0.035	GRASS	3.69	2.63	16.19
32+00	34.38	33+00	38.45	447.54	446.25	1.29%	3.00	4.00	0.00	0.81	0.035	GRASS	2.58	3.44	5.98
33+00	38.45	34+00	37.43	446.25	445.43	0.82%	3.00	4.00	0.00	0.81	0.035	GRASS	2.06	3.85	4.77
34+00	37.43	35+00	33.68	445.43	443.98	1.45%	3.00	4.00	0.00	1.08	0.035	GRASS	4.19	4.25	40.03
35+00	33.68	36+00	29.74	443.98	442.40	1.58%	3.00	4.00	0.00	2.03	0.035	GRASS	5.27	4.66	76.14
36+00	29.74	37+00	29.51	442.40	438.96	3.44%	3.00	4.00	0.00	2.03	0.035	GRASS	7.77	5.06	112.34
37+00	29.51	38+00	29.34	438.96	436.53	2.43%	3.00	4.00	0.00	2.13	0.035	GRASS	6.73	5.47	106.51
38+00	29.34	39+00	26.03	436.53	433.94	2.59%	4.00	4.00	0.00	2.13	0.035	GRASS	6.99	5.87	126.49
39+00	26.03	40+00	25.80	433.94	432.15	1.79%	4.00	4.00	4.00	1.79	0.035	GRASS	5.95	6.28	119.18
40+00	25.80	41+00	26.80	432.15	430.37	1.78%	4.00	4.00	4.00	1.79	0.035	GRASS	6.06	6.68	132.36
41+00	26.80	42+00	27.10	430.37	429.40	0.97%	4.00	4.00	4.00	1.22	0.035	GRASS	3.62	7.09	43.69
42+00	27.10	43+00	28.52	429.40	428.65	0.75%	4.00	4.00	5.00	1.11	0.035	GRASS	3.03	7.49	31.90
43+00	28.52	44+00	31.00	428.65	427.98	0.67%	4.00	4.00	3.00	1.02	0.035	GRASS	2.57	7.90	18.63
46+00	32.03	47+00	28.98	427.66	427.10	0.56%	4.00	6.00	0.00	0.66	0.035	GRASS	1.50	0.70	3.30
47+00	28.98	47+50	31.16	427.10	427.91	1.62%	4.00	2.00	0.00	2.12	0.035	GRASS	5.42	0.70	73.07
47+50	31.16	48+00	31.86	427.91	428.00	0.18%	4.00	2.00	0.00	1.72	0.035	GRASS	1.57	0.54	13.97
48+00	31.86	49+00	37.58	428.00	427.34	0.66%	4.00	4.00	0.00	1.19	0.035	GRASS	2.39	0.54	13.44
50+00	29.97	51+00	29.48	428.97	429.84	0.87%	3.00	4.00	0.00	2.50	0.035	GRASS	4.48	5.99	97.67
51+00	29.48	52+00	28.80	429.84	430.13	0.29%	4.00	4.00	0.00	2.15	0.035	GRASS	2.36	5.70	43.73
52+00	28.80	53+00	30.04	430.13	430.97	0.84%	4.00	6.00	0.00	1.67	0.035	GRASS	3.42	5.42	47.72
53+00	30.04	54+00	28.74	430.97	431.78	0.81%	4.00	6.00	0.00	1.67	0.035	GRASS	3.35	5.13	46.86
54+00	28.74	55+00	28.56	431.78	432.51	0.73%	4.00	4.00	0.00	2.05	0.035	GRASS	3.62	4.85	60.85
55+00	28.56	56+00	25.97	432.51	435.25	2.74%	4.00	4.00	0.00	1.43	0.035	GRASS	6.29	4.56	78.57
56+00	25.97	57+00	26.97	435.25	436.83	1.58%	3.00	4.00	0.00	1.43	0.035	GRASS	4.81	4.28	55.19
57+00	26.97	58+00	26.28	436.83	439.11	2.28%	3.00	4.00	0.00	2.66	0.035	GRASS	7.57	3.99	187.62
58+00	26.28	59+00	26.62	439.11	441.87	2.76%	3.00	4.00	0.00	2.76	0.035	GRASS	8.54	3.71	227.57
59+00	26.62	60+00	26.04	441.87	445.08	3.21%	3.00	4.00	0.00	2.68	0.035	GRASS	9.03	3.42	226.96
60+00	26.04	61+00	24.39	445.08	448.64	3.56%	3.00	4.00	0.00	2.13	0.035	GRASS	8.16	3.14	129.51
61+00	24.39	62+00	24.35	448.64	450.99	2.35%	4.00	3.00	0.00	1.65	0.035	GRASS	5.59	2.85	53.40
62+00	24.35	63+00	23.20	450.99	452.63	1.64%	3.00	5.00	0.00	1.45	0.035	GRASS	4.31	2.57	36.26
63+00	23.20	64+50	21.13	452.63	455.06	1.62%	4.00	4.00	0.00	0.78	0.035	GRASS	2.84	2.28	6.90
64+50	21.13	65+00	17.04	455.06	456.07	2.02%	4.00	10.00	0.00	0.26	0.035	GRASS	2.33	1.85	13.24
70+50	23.50	71+00	23.39	459.25	458.93	0.63%	4.00	3.00	0.00	1.29	0.035	GRASS	2.45	0.14	14.21
71+50	18.62	73+50	20.43	458.91	453.79	2.56%	4.00	4.00	0.00	0.69	0.035	GRASS	3.29	0.86	6.32
75+00	21.71	76+00	20.88	450.58	453.56	2.98%	3.00	10.00	0.00	0.84	0.035	GRASS	4.08	1.09	18.74
76+00	20.88	77+00	18.75	453.56	455.08	1.52%	3.00	4.00	0.00	0.69	0.035	GRASS	2.50	1.09	4.13
78+00	17.21	79+00	18.30	454.95	453.09	1.86%	3.00	4.00	0.00	0.30	0.035	GRASS	1.59	0.40	0.50
79+00	18.30	80+00	23.12	453.09	450.49	2.60%	3.00	10.00	0.00	0.77	0.035	GRASS	3.59	0.79	13.85

EASTBOUND DRIVEWAY CULVERT CALCULATIONS

FROM			TO			SIZE	n	LENGTH	SLOPE	WP	AREA	VELOCITY	CAPACITY	5-YEAR DESIGN FLOW
STA	OFFSET	FL	STA	OFFSET	FL									
	(FT)	(FT)		(FT)	(FT)	(INCH)		(FT)	%	(FT)	(SQFT)	(FPS)	(CFS)	(CFS)
28+81.00	32.18' RT	455.26	29+03.00	31.65' RT	455.21	18	0.012	23	0.23%	4.71	1.77	3.08	5.44	2.03
55+32.28	29.09' RT	433.79	55+54.28	29.57' RT	434.01	18	0.012	23	1.00%	4.71	1.77	6.46	11.41	4.56
62+08.10	29.64' RT	450.83	62+30.10	30.12' RT	451.05	18	0.012	23	1.00%	4.71	1.77	6.46	11.41	2.57
64+13.68	30.55' RT	453.38	64+35.68	30.40' RT	453.49	18	0.012	23	0.50%	4.71	1.77	4.57	8.07	2.28
80+87.61	28.04' RT	448.80	81+10.61	28.43' RT	448.75	18	0.012	24	0.22%	4.71	1.77	3.01	5.32	0.79
81+70.56	44.55' RT	448.00	82+15.56	32.89' RT	448.15	18	0.012	47	0.33%	4.71	1.77	3.73	6.59	5.56

NOTES:

1. ATLAS 14 WAS USED TO DETERMINE 5-YEAR DESIGN FLOWS.
2. DITCH AND DRIVEWAY CULVERT CALCULATIONS WERE PERFORMED USING MANNNING'S EQUATION.

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER

10/19/2020

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FM 696

HYDRAULIC CALCULATIONS

DITCH CALCULATIONS

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	89

WESTBOUND DITCH CALCULATIONS

FROM STA		TO STA		FROM FL	TO FL	SLOPE	ROAD-SIDE SLOPE	ROW-SIDE SLOPE	BOTTOM WIDTH	DEPTH	n	MATERIAL	VELOCITY	5-YR DESIGN	DITCH CAPACITY
STA	OFFSET (RT, FT)	STA	OFFSET (RT, FT)			%	H:1	H:1	(FT)	(FT)			(FT/S)	(CFS)	(CFS)
23+00	25.05	24+00	23.07	458.14	459.80	1.66%	4.00	10.00	0.00	1.16	0.035	GRASS	3.79	3.42	35.99
24+00	23.07	24+50	21.90	459.80	460.67	1.74%	4.00	6.00	2.00	1.01	0.035	GRASS	4.04	3.42	32.87
25+50	20.23	26+00	19.56	462.12	462.44	0.64%	4.00	10.00	3.00	0.44	0.035	GRASS	1.49	3.42	3.99
27+50	25.29	28+00	25.88	459.68	458.49	2.38%	4.00	4.00	0.00	1.81	0.035	GRASS	6.03	0.25	79.18
28+00	25.88	29+00	24.71	458.49	456.52	1.97%	4.00	5.00	0.00	1.13	0.035	GRASS	4.46	1.05	35.80
29+00	24.71	30+00	26.58	456.52	453.78	2.74%	4.00	6.00	2.00	1.13	0.035	GRASS	5.23	1.74	45.33
30+00	26.58	31+00	27.93	453.78	451.54	2.24%	4.00	4.00	3.00	1.74	0.035	GRASS	6.37	2.44	110.62
31+00	27.93	32+00	28.22	451.54	449.95	1.59%	4.00	4.00	7.00	0.99	0.035	GRASS	4.29	3.14	46.40
32+00	28.22	33+00	30.66	449.95	448.96	0.99%	4.00	10.00	7.00	0.61	0.035	GRASS	2.44	3.83	16.62
33+00	30.66	34+00	27.32	448.96	446.88	2.08%	4.00	4.00	4.00	0.61	0.035	GRASS	3.74	4.53	21.37
34+00	27.32	35+00	26.91	446.88	444.08	2.80%	4.00	4.00	0.00	1.95	0.035	GRASS	7.80	5.23	179.49
35+00	26.91	36+00	26.26	444.08	441.85	2.23%	4.00	4.00	0.00	2.15	0.035	GRASS	6.54	5.92	120.88
36+00	26.26	37+00	24.98	441.85	438.70	3.15%	4.00	3.00	0.00	2.15	0.035	GRASS	7.72	6.62	124.93
37+00	24.98	37+50	25.49	438.70	437.34	2.72%	4.00	4.00	0.00	2.21	0.035	GRASS	7.36	6.97	143.70
37+50	25.49	38+50	25.47	437.34	435.21	2.13%	4.00	3.00	2.00	1.72	0.035	GRASS	6.00	7.67	82.79
38+50	25.47	39+00	25.51	435.21	434.40	1.62%	4.00	4.00	2.00	1.54	0.035	GRASS	5.05	8.02	71.17
39+00	25.51	39+50	23.96	434.40	433.80	1.20%	4.00	4.00	3.00	0.84	0.035	GRASS	3.34	8.36	26.02
39+50	23.96	40+50	24.96	433.80	431.00	2.80%	4.00	6.00	6.00	0.84	0.035	GRASS	4.98	9.06	42.35
40+50	24.96	41+00	25.56	431.00	431.41	0.82%	4.00	4.00	6.00	1.13	0.035	GRASS	3.25	9.41	38.36
41+00	25.56	42+00	25.37	431.41	429.83	1.58%	4.00	4.00	0.00	1.13	0.035	GRASS	4.51	10.11	53.25
42+00	25.37	43+00	27.45	429.83	428.92	0.91%	4.00	5.00	0.00	1.51	0.035	GRASS	3.32	10.80	34.12
45+00	30.10	46+00	27.68	427.38	427.58	0.20%	2.00	6.00	2.00	1.46	0.035	GRASS	1.65	0.70	18.93
46+00	27.68	47+00	26.83	427.58	429.02	1.44%	2.00	6.00	2.00	1.07	0.035	GRASS	4.07	0.70	40.24
48+00	24.84	49+00	28.75	430.22	429.46	0.76%	4.00	4.00	0.00	1.82	0.035	GRASS	4.00	0.50	89.29
50+50	26.53	51+00	25.20	428.64	429.19	1.10%	2.00	3.00	0.00	2.80	0.035	GRASS	5.30	6.03	103.73
51+00	25.20	52+00	26.05	429.19	430.13	0.94%	3.00	6.00	0.00	0.99	0.035	GRASS	2.53	5.86	11.04
52+00	26.05	53+00	26.84	430.13	431.19	1.06%	3.00	6.00	0.00	0.99	0.035	GRASS	2.68	5.53	11.72
53+00	26.84	54+00	26.63	431.19	432.31	1.12%	4.00	6.00	0.00	1.39	0.035	GRASS	3.48	5.19	33.57
54+00	26.63	55+00	26.10	432.31	433.31	1.00%	4.00	4.00	2.00	1.75	0.035	GRASS	4.14	4.86	65.50
55+00	26.10	56+00	27.00	433.31	434.91	1.60%	3.00	6.00	0.00	1.76	0.035	GRASS	4.86	4.52	67.99
56+00	27.00	57+00	26.48	434.91	436.99	2.08%	3.00	6.00	0.00	1.76	0.035	GRASS	5.54	4.19	77.52
57+00	26.48	58+00	25.87	436.99	439.25	2.26%	3.00	4.00	0.00	1.96	0.035	GRASS	6.15	3.85	82.76
58+00	25.87	59+00	25.92	439.25	442.11	2.86%	3.00	4.00	0.00	1.96	0.035	GRASS	6.92	3.52	93.10
59+00	25.92	60+00	24.72	442.11	445.72	3.61%	3.00	4.00	0.00	2.22	0.035	GRASS	8.45	3.18	146.29
60+00	24.72	60+50	24.89	445.72	448.12	4.80%	4.00	6.00	0.00	1.19	0.035	GRASS	6.51	2.85	46.10
60+50	24.89	61+50	21.64	448.12	449.00	0.88%	4.00	15.00	0.00	1.19	0.035	GRASS	2.81	2.68	37.79
61+50	21.64	64+00	24.87	449.00	453.51	1.80%	3.00	3.00	0.00	1.51	0.035	GRASS	4.57	2.35	31.15
64+00	24.87	65+00	22.59	453.51	454.50	0.99%	4.00	4.00	0.00	1.51	0.035	GRASS	3.44	1.51	31.26
65+00	22.59	66+50	22.34	454.50	455.60	0.73%	4.00	3.00	0.00	1.67	0.035	GRASS	3.14	1.17	30.57
66+50	22.34	67+50	22.98	455.60	457.00	1.40%	3.00	3.00	0.00	1.32	0.035	GRASS	3.68	0.67	19.13
67+50	22.98	68+50	22.50	457.00	458.78	1.78%	4.00	6.00	0.00	1.32	0.035	GRASS	4.24	0.34	36.73
71+50	20.02	72+00	20.52	458.62	457.32	2.60%	3.00	3.00	0.00	1.38	0.035	GRASS	5.17	2.10	29.56
72+00	20.52	73+00	19.72	457.32	454.98	2.34%	3.00	4.00	0.00	0.94	0.035	GRASS	3.82	2.10	11.72
73+00	19.72	74+50	23.86	454.98	451.73	2.17%	3.00	5.00	0.00	0.94	0.035	GRASS	3.70	2.10	12.97
74+50	23.86	75+00	22.51	451.73	452.77	2.08%	3.00	4.00	0.00	0.84	0.035	GRASS	3.36	1.48	8.39
75+00	22.51	75+50	14.00	452.77	453.29	1.04%	3.00	6.00	0.00	0.84	0.035	GRASS	2.40	1.48	7.70

NOTES:

1. ATLAS 14 WAS USED TO DETERMINE 5-YEAR DESIGN FLOWS.
2. DITCH AND DRIVEWAY CULVERT CALCULATIONS WERE PERFORMED USING MANNNING'S EQUATION.

STATE OF TEXAS
MANTHAN SHAH
134585
REGISTERED PROFESSIONAL ENGINEER

10/19/2020

ENTECH CIVIL ENGINEERS INC
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Texas Department of Transportation

FM 696

HYDRAULIC CALCULATIONS

DITCH CALCULATIONS

SHEET 5 OF 6

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	90

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WESTBOUND DRIVEWAY CULVERT CALCULATIONS

FROM			TO			SIZE	n	LENGTH	SLOPE	WP	AREA	VELOCITY	CAPACITY	5-YEAR DESIGN FLOW
STA	OFFSET	FL	STA	OFFSET	FL									
	(FT)	(FT)		(FT)	(FT)	(INCH)		(FT)	%	(FT)	(SQFT)	(FPS)	(CFS)	(CFS)
24+73.29	27.72' LT	460.41	25+08.29	28.16' LT	460.76	18	0.012	36	1.00%	4.71	1.77	6.5	11.4	3.42
29+06.32	27.24' LT	455.69	29+29.32	27.24' LT	455.46	18	0.012	23	1.00%	4.71	1.77	6.5	11.4	2.44
30+61.61	28.43' LT	451.69	30+89.61	28.43' LT	451.41	18	0.012	28	1.00%	4.71	1.77	6.5	11.4	2.44
33+31.25	30.87' LT	447.45	33+57.25	28.82' LT	447.19	18	0.012	27	1.00%	4.71	1.77	6.5	11.4	4.53
37+80.18	27.16' LT	437.21	38+02.18	26.82' LT	436.99	18	0.012	23	1.00%	4.71	1.77	6.5	11.4	7.67
39+77.07	30.04' LT	431.96	40+11.07	29.46' LT	431.79	18	0.012	35	0.50%	4.71	1.77	4.6	8.1	8.02
61+03.34	29.14' LT	448.46	61+26.34	28.68' LT	448.92	18	0.012	24	2.00%	4.71	1.77	9.1	16.1	2.68
61+94.79	28.44' LT	449.99	62+17.79	27.98' LT	450.11	18	0.012	24	0.52%	4.71	1.77	4.7	8.2	2.35
63+10.71	26.69' LT	451.50	63+33.71	26.44' LT	451.73	18	0.012	24	1.00%	4.71	1.77	6.5	11.4	2.35
65+76.29	26.18' LT	454.56	65+99.29	26.40' LT	455.02	18	0.012	24	2.00%	4.71	1.77	9.1	16.1	1.51
66+49.31	23.85' LT	455.37	66+89.31	24.39' LT	456.17	18	0.012	41	2.00%	4.71	1.77	9.1	16.1	1.17
67+71.17	24.22' LT	456.95	67+96.17	24.21' LT	457.45	18	0.012	26	2.00%	4.71	1.77	9.1	16.1	0.34
68+14.49	23.92' LT	457.76	68+39.49	23.80' LT	457.89	18	0.012	26	0.52%	4.71	1.77	4.7	8.2	0.34
73+52.45	23.26' LT	452.23	73+79.45	23.53' LT	451.96	18	0.012	28	1.00%	4.71	1.77	6.5	11.4	2.10
74+00.00	24.04' LT	450.14	74+27.00	24.22' LT	450.08	18	0.012	28	0.22%	4.71	1.77	3.0	5.4	2.10
81+47.53	31.01' LT	447.61	81+77.53	29.90' LT	447.54	18	0.012	31	0.23%	4.71	1.77	3.1	5.5	3.10

NOTES:

1. ATLAS 14 WAS USED TO DETERMINE 5-YEAR DESIGN FLOWS.
2. DITCH AND DRIVEWAY CULVERT CALCULATIONS WERE PERFORMED USING MANNNING'S EQUATION.

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

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Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 696

HYDRAULIC CALCULATIONS
DITCH CALCULATIONS

SHEET 6 OF 6

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
6	TEXAS	0334-03-021			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUS	LEE	0334	03	021	91

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT A, STA 44+48.07 (Both)	2 ~ 7'x 4'	2'	CIP	PW-1	0°	2:1	8"	8"	0.500'	5.083'	N/A	N/A	10.333'	15.750'	N/A	0.0	0.6	16.0	206
CULVERT B, STA 49+36.82 (Both)	3 ~ 7'x 5'	2'	CIP	PW-1	0°	2:1	8"	8"	0.500'	6.083'	N/A	N/A	12.333'	23.333'	N/A	0.0	0.8	22.4	296

DATE:
FILE:

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

SPECIAL NOTE:

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

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

STATE OF TEXAS
MANTHAN SHAH
134585
PROFESSIONAL ENGINEER
REGISTERED

10/19/2020

Texas Department of Transportation

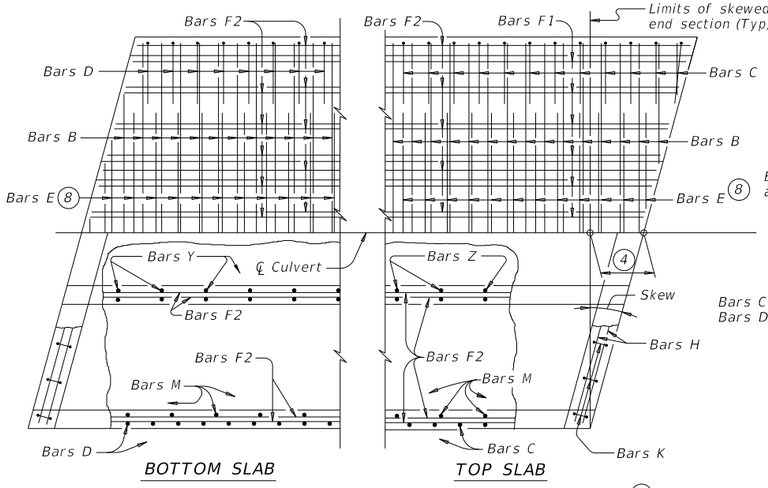
Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

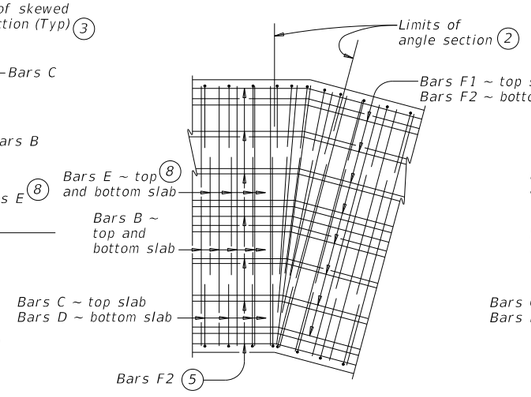
BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUS	LEE		92

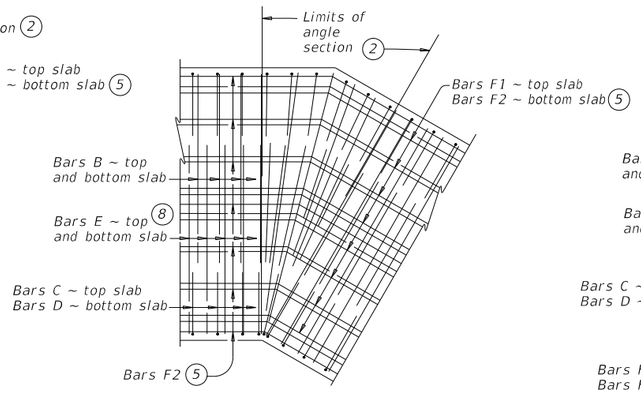
DATE:
FILE:



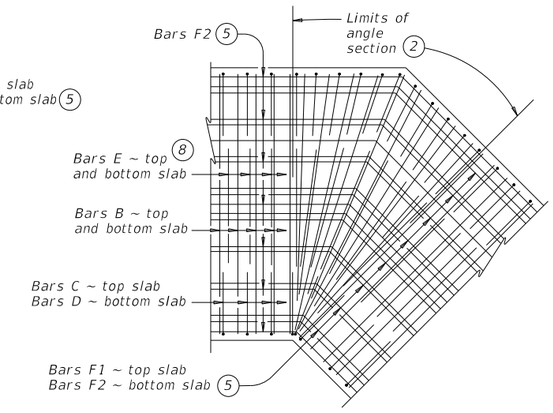
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



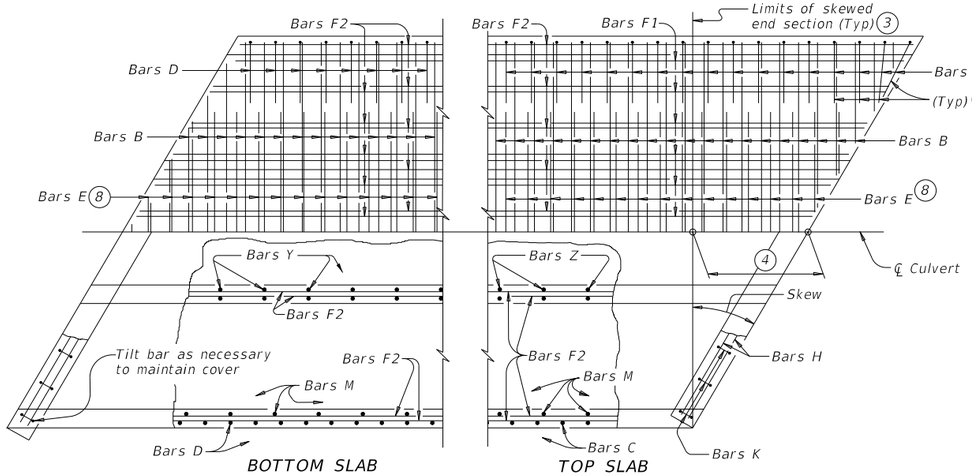
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



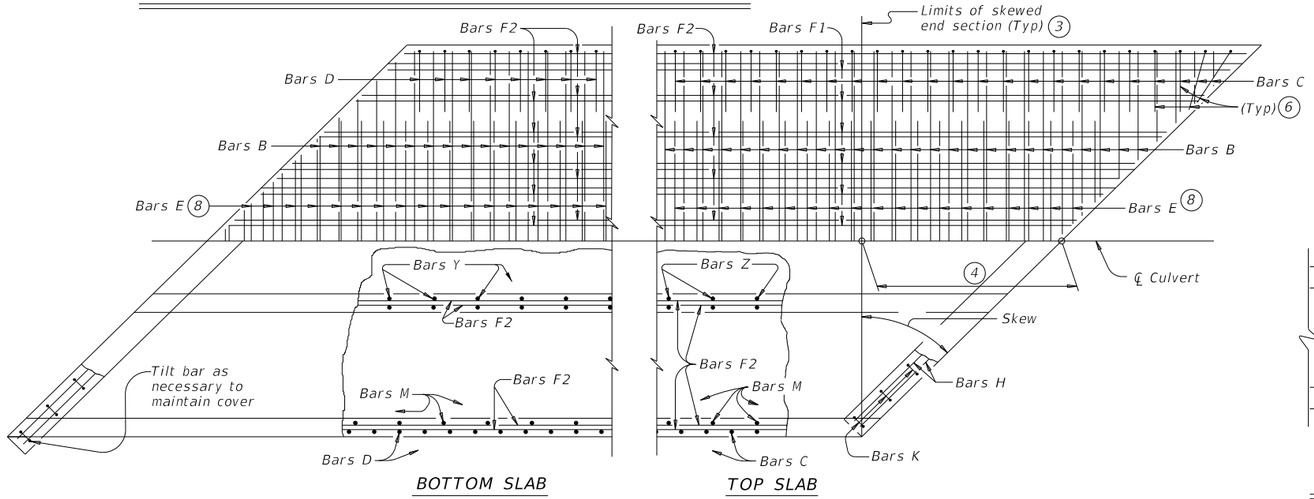
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

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

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

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

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

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

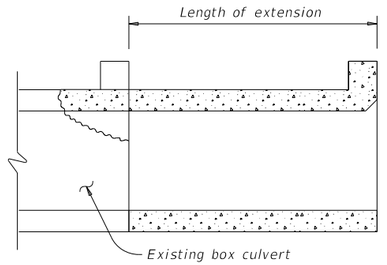
4 [One half of overall width] x [tangent of the skew angle]

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

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

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

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



LENGTHENING DETAIL 1

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

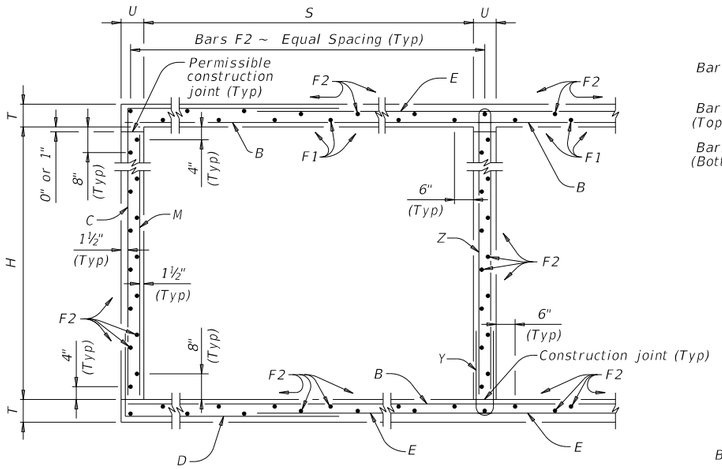
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

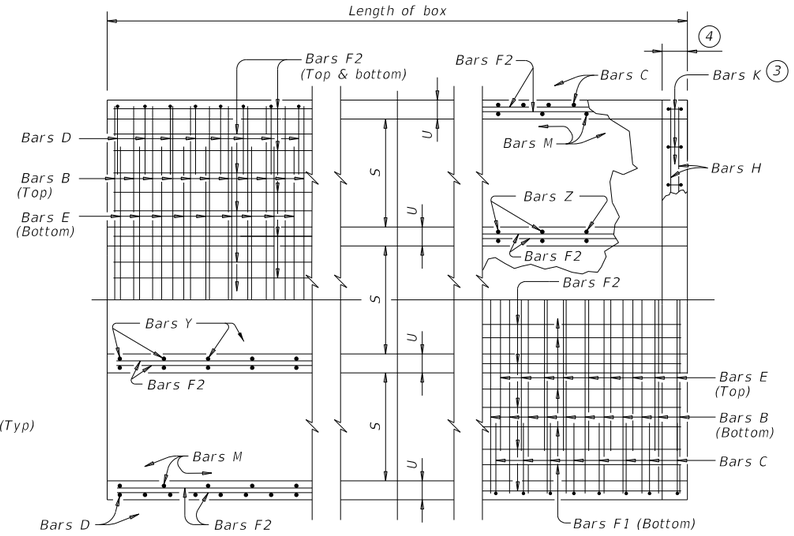
MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUS	LEE		93

DATE:
FILE:



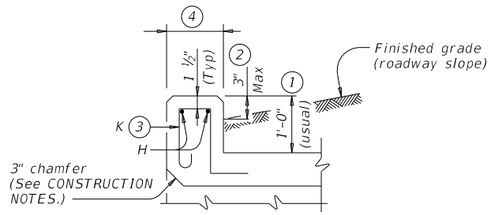
TYPICAL SECTION



BOTTOM SLAB

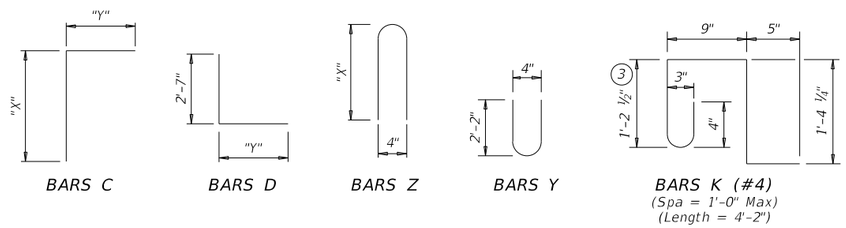
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	4'-5"
4'-0"	4'-6 ½"	4'-5"
5'-0"	5'-6 ½"	4'-5"
6'-0"	6'-6 ½"	4'-5"
7'-0"	7'-6 ½"	4'-5"



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

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

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

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.

Chamfer the bottom edge of the top slab 3" at the entrance.

Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:

- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:

- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

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

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUS	LEE		94

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DATE:
FILE:

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	7' – 0"	3' – 0"	8"	7"	108	#6	9"	15' – 6"	2,514	162	#5	6"	7' – 11"	1,338	7' – 0"	1,183	108	#6	9"	11' – 5"	1,852	10	18"	39' – 9"	266	54	18"	39' – 9"	1,434	108	9"	3' – 0"	216	54	9"	4' – 7"	165	7' – 3"	262	15' – 6"	41	34	95	0.972	230.8	1.2	136	40.0	9,366
3	7' – 0"	3' – 0"	8"	7"	108	#6	9"	23' – 1"	3,744	162	#5	6"	7' – 11"	1,338	7' – 0"	1,183	108	#6	9"	19' – 0"	3,082	15	18"	39' – 9"	398	77	18"	39' – 9"	2,045	108	9"	3' – 0"	216	108	9"	4' – 7"	331	7' – 3"	523	23' – 1"	62	50	139	1.412	321.5	1.7	201	58.2	13,061
4	7' – 0"	3' – 0"	8"	7"	108	#6	9"	30' – 8"	4,975	162	#5	6"	7' – 11"	1,338	7' – 0"	1,183	108	#6	9"	26' – 7"	4,312	20	18"	39' – 9"	531	100	18"	39' – 9"	2,655	108	9"	3' – 0"	216	162	9"	4' – 7"	496	7' – 3"	785	30' – 8"	82	64	178	1.851	412.3	2.3	260	76.3	16,751
5	7' – 0"	3' – 0"	8"	7"	108	#6	9"	38' – 3"	6,205	162	#5	6"	7' – 11"	1,338	7' – 0"	1,183	108	#6	9"	34' – 2"	5,542	25	18"	39' – 9"	664	123	18"	39' – 9"	3,266	108	9"	3' – 0"	216	216	9"	4' – 7"	661	7' – 3"	1,046	38' – 3"	102	80	223	2.290	503.0	2.8	325	94.4	20,446
6	7' – 0"	3' – 0"	8"	7"	108	#6	9"	45' – 10"	7,435	162	#5	6"	7' – 11"	1,338	7' – 0"	1,183	108	#6	9"	41' – 9"	6,773	30	18"	39' – 9"	797	146	18"	39' – 9"	3,877	108	9"	3' – 0"	216	270	9"	4' – 7"	827	7' – 3"	1,308	45' – 10"	122	94	262	2.729	593.9	3.4	384	112.6	24,138
2	7' – 0"	4' – 0"	8"	7"	108	#6	9"	15' – 6"	2,514	162	#5	6"	8' – 11"	1,507	7' – 0"	1,183	108	#6	9"	11' – 5"	1,852	10	18"	39' – 9"	266	54	18"	39' – 9"	1,434	108	9"	4' – 0"	289	54	9"	4' – 7"	165	9' – 3"	334	15' – 6"	41	34	95	1.037	238.6	1.2	136	42.6	9,680
3	7' – 0"	4' – 0"	8"	7"	108	#6	9"	23' – 1"	3,744	162	#5	6"	8' – 11"	1,507	7' – 0"	1,183	108	#6	9"	19' – 0"	3,082	15	18"	39' – 9"	398	77	18"	39' – 9"	2,045	108	9"	4' – 0"	289	108	9"	4' – 7"	331	9' – 3"	667	23' – 1"	62	50	139	1.498	331.2	1.7	201	61.6	13,447
4	7' – 0"	4' – 0"	8"	7"	108	#6	9"	30' – 8"	4,975	162	#5	6"	8' – 11"	1,507	7' – 0"	1,183	108	#6	9"	26' – 7"	4,312	20	18"	39' – 9"	531	100	18"	39' – 9"	2,655	108	9"	4' – 0"	289	162	9"	4' – 7"	496	9' – 3"	1,001	30' – 8"	82	64	178	1.959	423.7	2.3	260	80.6	17,209
5	7' – 0"	4' – 0"	8"	7"	108	#6	9"	38' – 3"	6,205	162	#5	6"	8' – 11"	1,507	7' – 0"	1,183	108	#6	9"	34' – 2"	5,542	25	18"	39' – 9"	664	123	18"	39' – 9"	3,266	108	9"	4' – 0"	289	216	9"	4' – 7"	661	9' – 3"	1,335	38' – 3"	102	80	223	2.420	516.3	2.8	325	99.6	20,977
6	7' – 0"	4' – 0"	8"	7"	108	#6	9"	45' – 10"	7,435	162	#5	6"	8' – 11"	1,507	7' – 0"	1,183	108	#6	9"	41' – 9"	6,773	30	18"	39' – 9"	797	146	18"	39' – 9"	3,877	108	9"	4' – 0"	289	270	9"	4' – 7"	827	9' – 3"	1,668	45' – 10"	122	94	262	2.881	608.9	3.4	384	118.6	24,740
2	7' – 0"	5' – 0"	8"	7"	108	#6	9"	15' – 6"	2,514	162	#5	6"	9' – 11"	1,676	7' – 0"	1,183	108	#6	9"	11' – 5"	1,852	10	18"	39' – 9"	266	60	18"	39' – 9"	1,593	108	9"	5' – 0"	361	54	9"	4' – 7"	165	11' – 3"	406	15' – 6"	41	34	95	1.102	250.4	1.2	136	45.2	10,152
3	7' – 0"	5' – 0"	8"	7"	108	#6	9"	23' – 1"	3,744	162	#5	6"	9' – 11"	1,676	7' – 0"	1,183	108	#6	9"	19' – 0"	3,082	15	18"	39' – 9"	398	85	18"	39' – 9"	2,257	108	9"	5' – 0"	361	108	9"	4' – 7"	331	11' – 3"	812	23' – 1"	62	50	139	1.584	346.1	1.7	201	65.1	14,045
4	7' – 0"	5' – 0"	8"	7"	108	#6	9"	30' – 8"	4,975	162	#5	6"	9' – 11"	1,676	7' – 0"	1,183	108	#6	9"	26' – 7"	4,312	20	18"	39' – 9"	531	110	18"	39' – 9"	2,921	108	9"	5' – 0"	361	162	9"	4' – 7"	496	11' – 3"	1,217	30' – 8"	82	64	178	2.067	441.8	2.3	260	85.0	17,932
5	7' – 0"	5' – 0"	8"	7"	108	#6	9"	38' – 3"	6,205	162	#5	6"	9' – 11"	1,676	7' – 0"	1,183	108	#6	9"	34' – 2"	5,542	25	18"	39' – 9"	664	135	18"	39' – 9"	3,585	108	9"	5' – 0"	361	216	9"	4' – 7"	661	11' – 3"	1,623	38' – 3"	102	80	223	2.549	537.5	2.8	325	104.8	21,825
6	7' – 0"	5' – 0"	8"	7"	108	#6	9"	45' – 10"	7,435	162	#5	6"	9' – 11"	1,676	7' – 0"	1,183	108	#6	9"	41' – 9"	6,773	30	18"	39' – 9"	797	160	18"	39' – 9"	4,248	108	9"	5' – 0"	361	270	9"	4' – 7"	827	11' – 3"	2,029	45' – 10"	122	94	262	3.032	633.2	3.4	384	124.7	25,713
2	7' – 0"	6' – 0"	8"	7"	108	#6	9"	15' – 6"	2,514	162	#5	6"	10' – 11"	1,845	7' – 0"	1,183	108	#6	9"	11' – 5"	1,852	10	18"	39' – 9"	266	66	18"	39' – 9"	1,752	108	9"	6' – 0"	433	54	9"	4' – 7"	165	13' – 3"	478	15' – 6"	41	34	95	1.167	262.2	1.2	136	47.8	10,624
3	7' – 0"	6' – 0"	8"	7"	108	#6	9"	23' – 1"	3,744	162	#5	6"	10' – 11"	1,845	7' – 0"	1,183	108	#6	9"	19' – 0"	3,082	15	18"	39' – 9"	398	93	18"	39' – 9"	2,469	108	9"	6' – 0"	433	108	9"	4' – 7"	331	13' – 3"	956	23' – 1"	62	50	139	1.671	361.0	1.7	201	68.6	14,642
4	7' – 0"	6' – 0"	8"	7"	108	#6	9"	30' – 8"	4,975	162	#5	6"	10' – 11"	1,845	7' – 0"	1,183	108	#6	9"	26' – 7"	4,312	20	18"	39' – 9"	531	120	18"	39' – 9"	3,186	108	9"	6' – 0"	433	162	9"	4' – 7"	496	13' – 3"	1,434	30' – 8"	82	64	178	2.175	459.9	2.3	260	89.3	18,655
5	7' – 0"	6' – 0"	8"	7"	108	#6	9"	38' – 3"	6,205	162	#5	6"	10' – 11"	1,845	7' – 0"	1,183	108	#6	9"	34' – 2"	5,542	25	18"	39' – 9"	664	147	18"	39' – 9"	3,903	108	9"	6' – 0"	433	216	9"	4' – 7"	661	13' – 3"	1,912	38' – 3"	102	80	223	2.679	558.7	2.8	325	110.0	22,673
6	7' – 0"	6' – 0"	8"	7"	108	#6	9"	45' – 10"	7,435	162	#5	6"	10' – 11"	1,845	7' – 0"	1,183	108	#6	9"	41' – 9"	6,773	30	18"	39' – 9"	797	174	18"	39' – 9"	4,620	108	9"	6' – 0"	433	270	9"	4' – 7"	827	13' – 3"	2,390	45' – 10"	122	94	262	3.183	657.6	3.4	384	130.7	26,687
2	7' – 0"	7' – 0"	8"	7"	108	#6	9"	15' – 6"	2,514	162	#5	6"	11' – 11"	2,014	7' – 0"	1,183	108	#6	9"	11' – 5"	1,852	10	18"	39' – 9"	266	66	18"	39' – 9"	1,752	108	9"	7' – 0"	505	54	9"	4' – 7"	165	15' – 3"	550	15' – 6"	41	34	95	1.231	270.0	1.2	136	50.4	10,937
3	7' – 0"	7' – 0"	8"	7"	108	#6	9"	23' – 1"	3,744	162	#5	6"	11' – 11"	2,014	7' – 0"	1,183	108	#6	9"	19' – 0"	3,082	15	18"	39' – 9"	398	93	18"	39' – 9"	2,469	108	9"	7' – 0"	505	108	9"	4' – 7"	331	15' – 3"	1,100	23' – 1"	62	50	139	1.757	370.7	1.7	201	72.0	15,027
4	7' – 0"	7' – 0"	8"	7"	108	#6	9"	30' – 8"	4,975	162	#5	6"	11' – 11"	2,014	7' – 0"	1,183	108	#6	9"	26' – 7"	4,312	20	18"	39' – 9"	531	120	18"	39' – 9"	3,186	108	9"	7' – 0"	505	162	9"	4' – 7"	496	15' – 3"	1,650	30' – 8"	82	64	178	2.283	471.3	2.3	260	93.6	19,112
5	7' – 0"	7' – 0"	8"	7"	108	#6	9"	38' – 3"	6,205	162	#5	6"	11' – 11"	2,014	7' – 0"	1,183	108	#6	9"	34' – 2"	5,542	25	18"	39' – 9"	664	147	18"	39' – 9"	3,903	108	9"	7' – 0"	505	216	9"	4' – 7"	661	15' – 3"	2,200	38' – 3"	102	80	223	2.809	571.9	2.8	325	115.2	23,202
6	7' – 0"	7' – 0"	8"	7"	108	#6	9"	45' – 10"	7,435	162	#5	6"	11' – 11"	2,014	7' – 0"	1,183	108	#6	9"	41' – 9"	6,773	30	18"	39' – 9"	797	174	18"	39' – 9"	4,620	108	9"	7' – 0"	505	270	9"	4' – 7"	827	15' – 3"	2,750	45' – 10"	122	94	262	3.334	672.6	3.4	384	136.8	27,288

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

7'-0" SPAN

0' TO 10' FILL

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0334	03	021	FM 696	
	DIST	COUNTY		SHEET NO.	
	AUS	LEE		95	

DATE:
FILE:

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

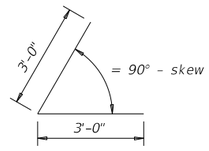
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

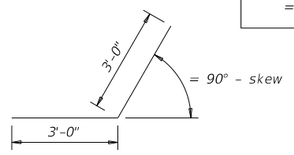
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

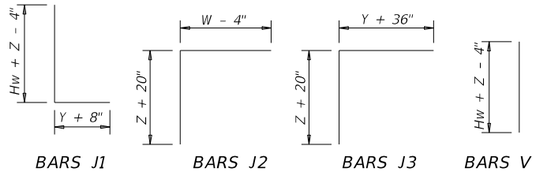
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

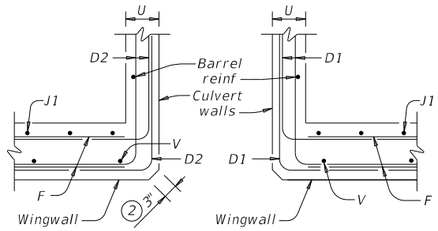
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

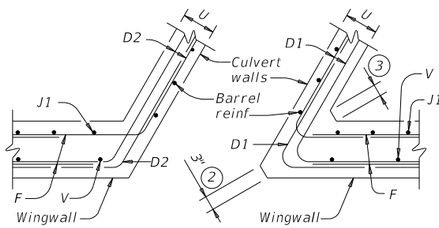
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

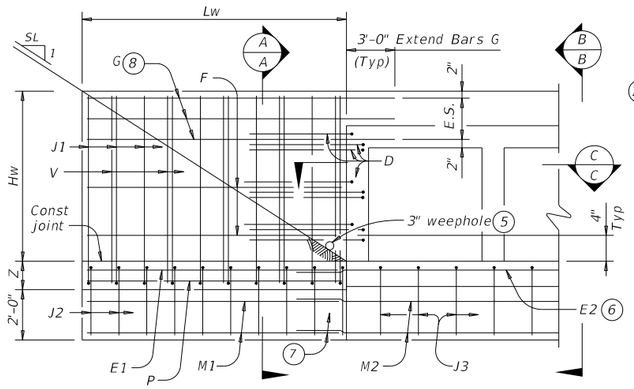
See applicable box culvert standard sheet for S, H, T, and U values.



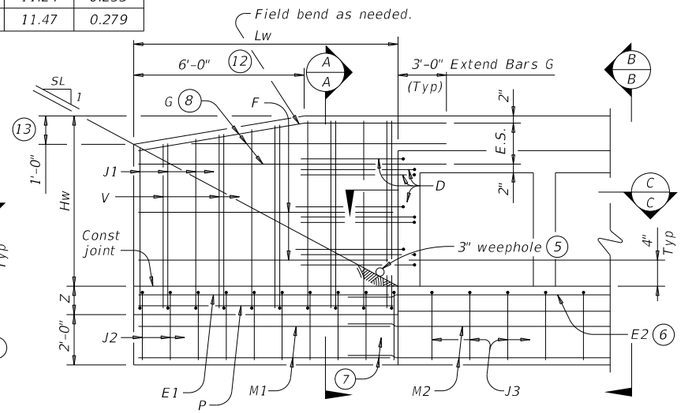
SECTION C-C - PW-1



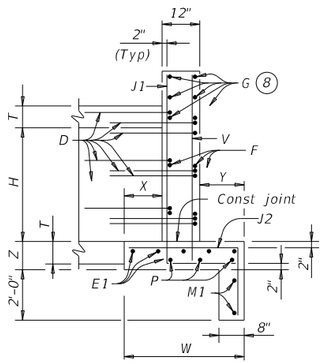
SECTION C-C - PW-2



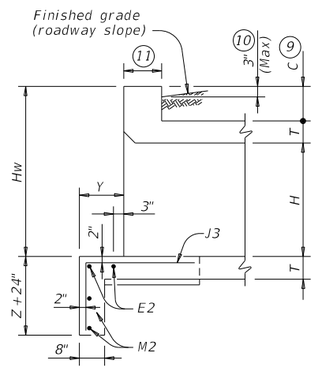
PARTIAL ELEVATION - PW-1



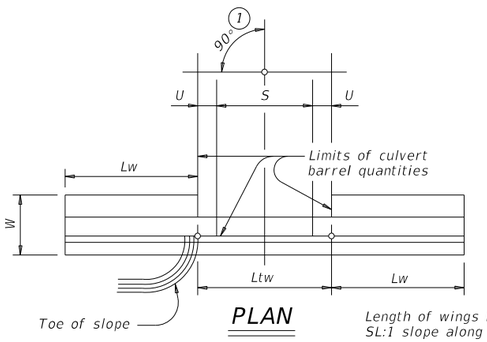
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

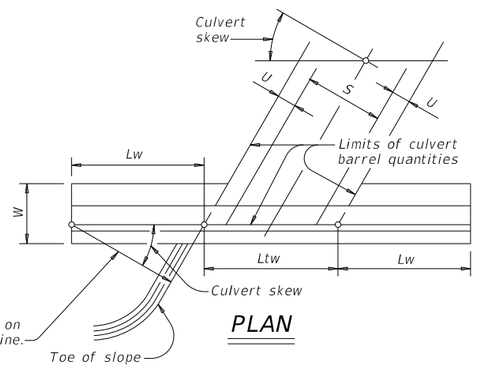


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

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

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.

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

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

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

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUS	LEE		96

DATE:
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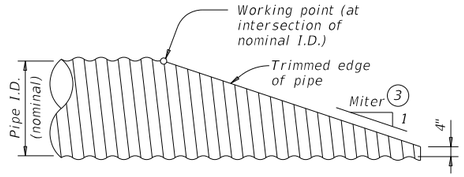
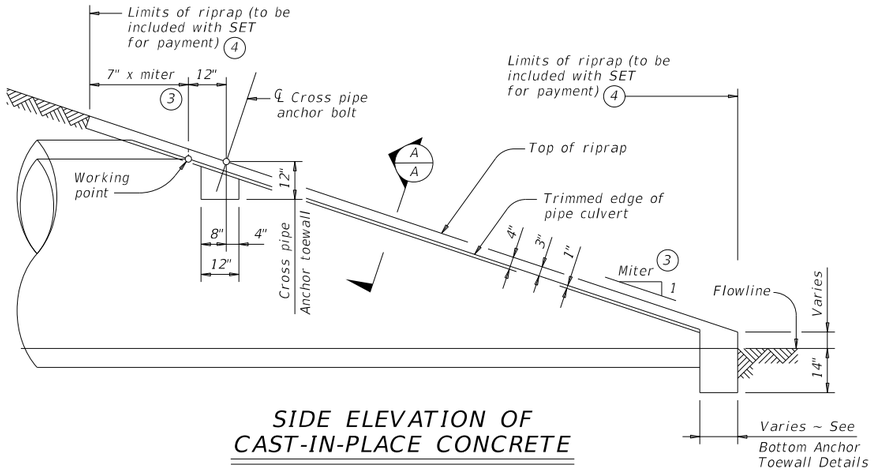


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

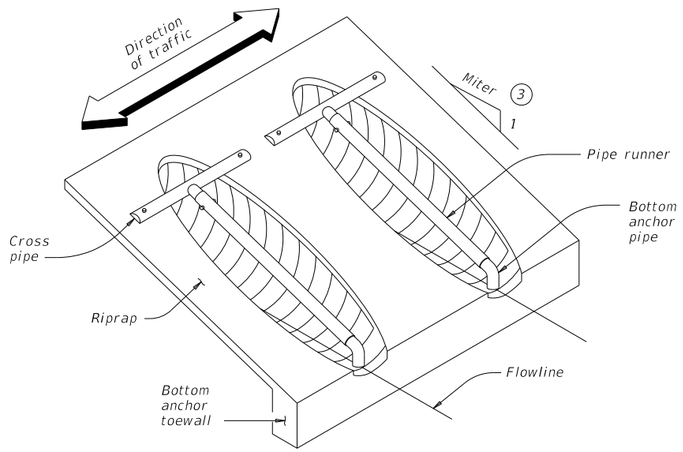
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

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

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

TYPICAL PIPE CULVERT MITERS (3)

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

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

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

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

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

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

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

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

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

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE:	setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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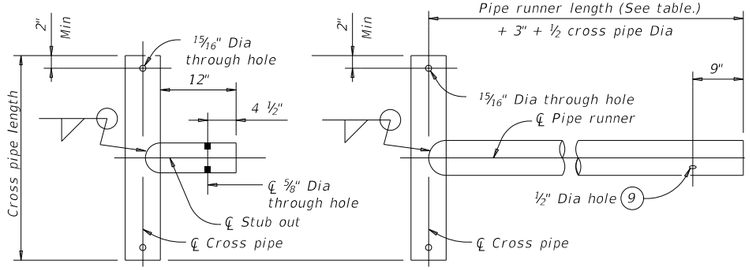
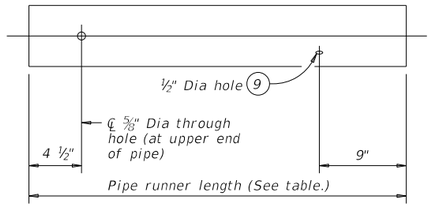


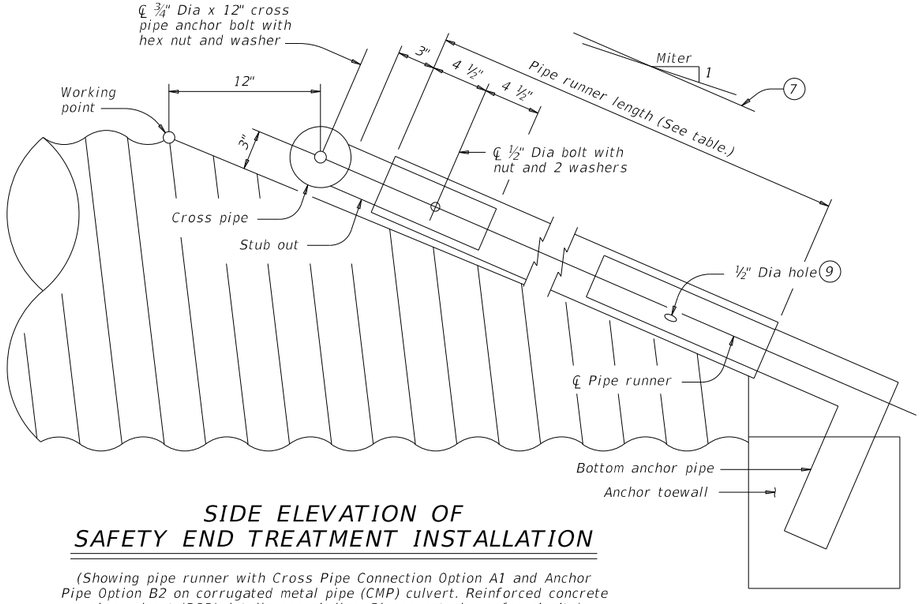
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



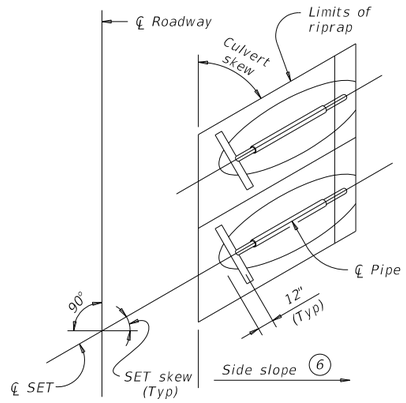
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

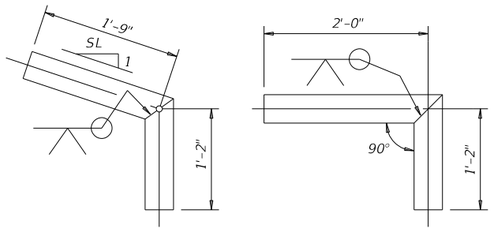


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

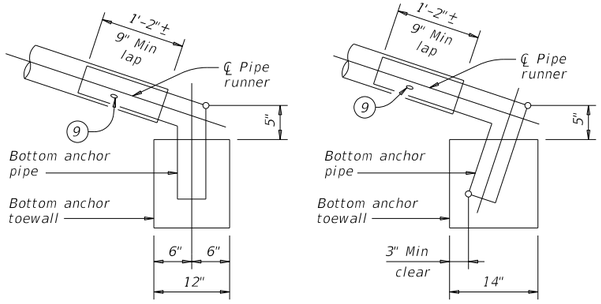


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

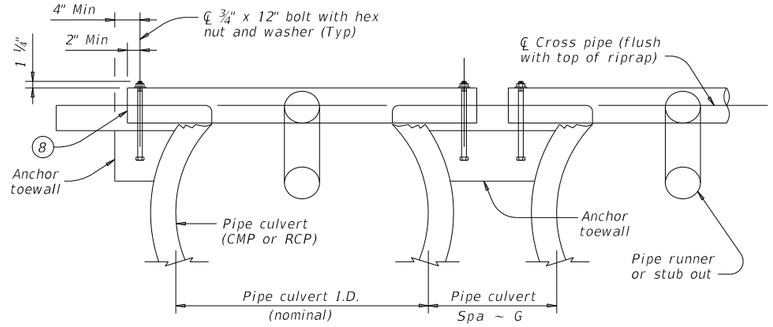
BOTTOM ANCHOR PIPE DETAILS (10)



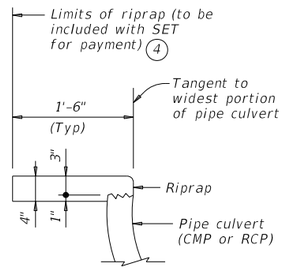
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

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

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

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

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

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

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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REVISIONS	0334	03	021	FM 696	
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	AUS	LEE		98	

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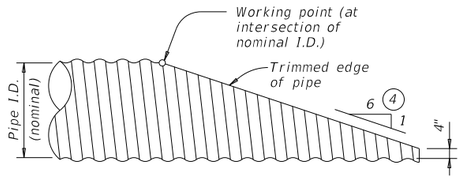
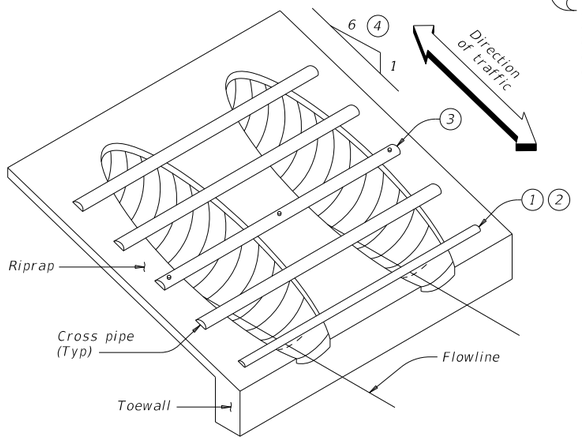


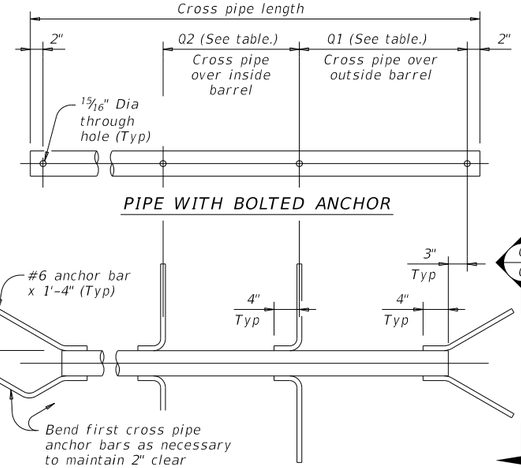
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

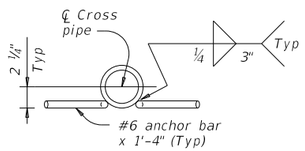
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



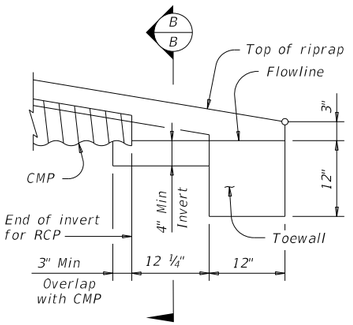
ISOMETRIC VIEW OF TYPICAL INSTALLATION





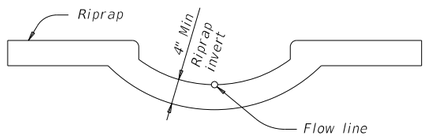
SECTION C-C

CROSS PIPE DETAILS



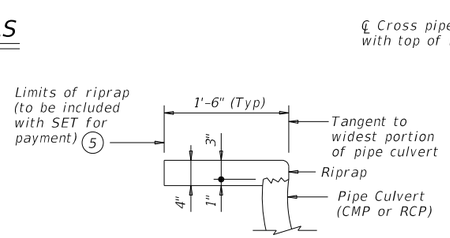
DETAIL "A"

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

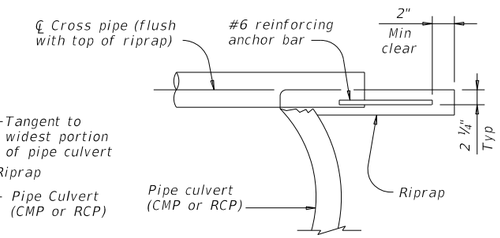


SECTION B-B

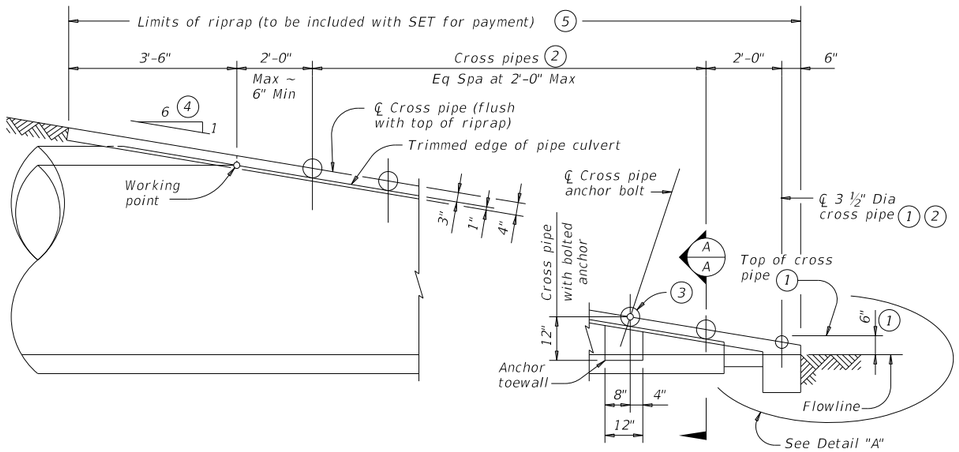
(Cross pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

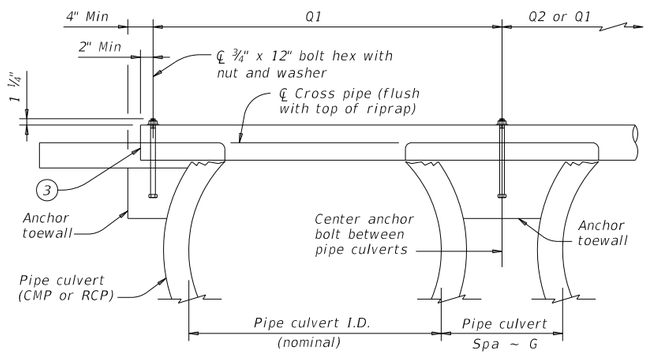


SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

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

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

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

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

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

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

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

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

MATERIAL NOTES:

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

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

Provide ASTM A307 bolts and nuts.

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

GENERAL NOTES:

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE:	setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0334	03	021	FM 696
		DIST	COUNTY		SHEET NO.
		AUS	LEE		99

14-XXX-0-XXXX-XX-XXX

4" minimum

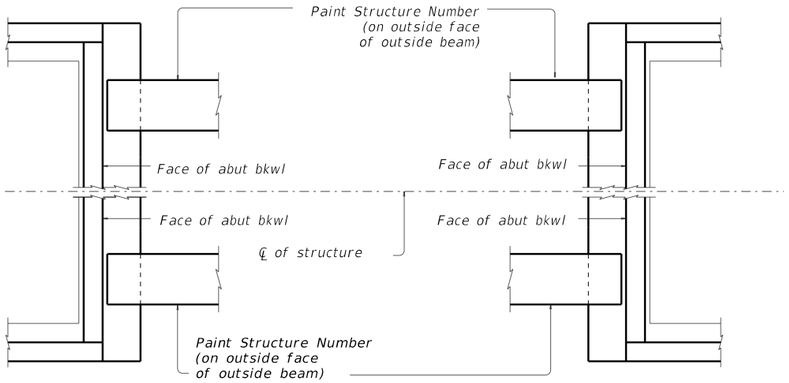
District designation | County designation | Placeholder | Control | Section | Structure number

PAINTED STRUCTURE NUMBER LEGEND

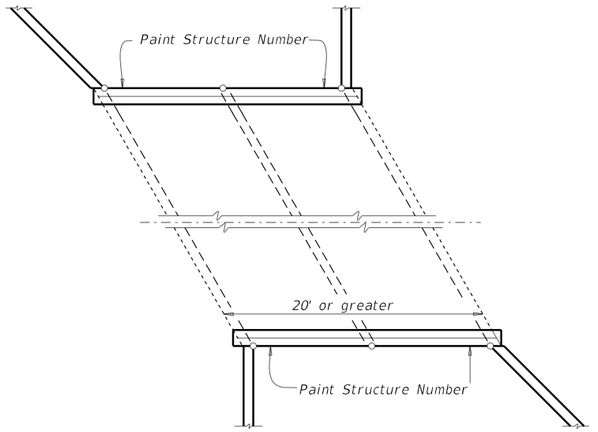
14-XXX-0-XXXX-XX-XXX

- District designation: 14 = Austin District
- County designation
- Placeholder required for national inventory purposes
- Control
- Section
- Structure number

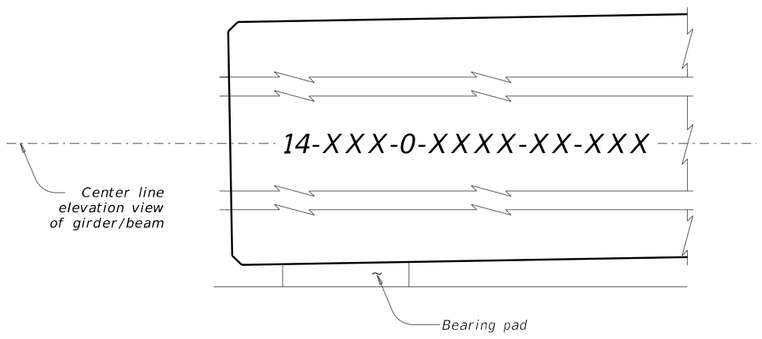
011 = Bastrop
016 = Blanco
027 = Burnet
028 = Caldwell
087 = Gillespie
106 = Hays
144 = Lee
150 = Llano
157 = Mason
227 = Travis
246 = Williamson



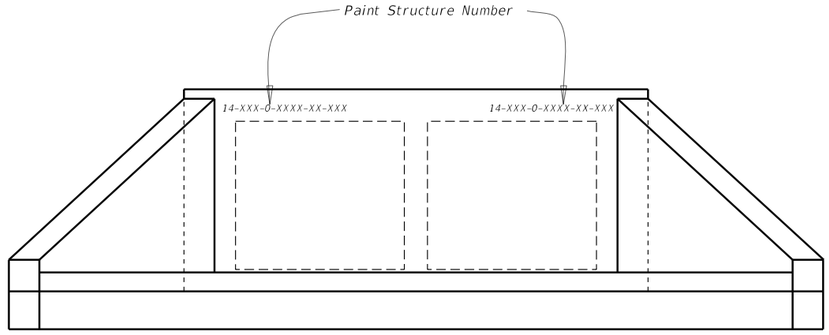
AT BRIDGE LOCATIONS



AT CULVERT LOCATIONS



ELEVATION VIEW DETAIL



ELEVATION VIEW DETAIL

GENERAL NOTES:

Permanently mark each structure with the painted structure number in accordance with the plans.

Each Structure shall have 4 (four) Structure numbers painted per structure.

Painting structure number work will not be measured or paid for directly but will be considered subsidiary to other pertinent items.

MATERIAL:

Provide black, lead free, CFC free, and CFHC free paint that is water proof, weather resistant, and dries instantly on all surfaces without smearing, smudging, or rippling

Texas Department of Transportation

Austin District Standard

PAINTING STRUCTURE NUMBERS

PSN-19 (AUS)

CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696
DIST	COUNTY		SHEET NO.
AUS	LEE		100

DATE: 10/13/2020 9:24:47 AM
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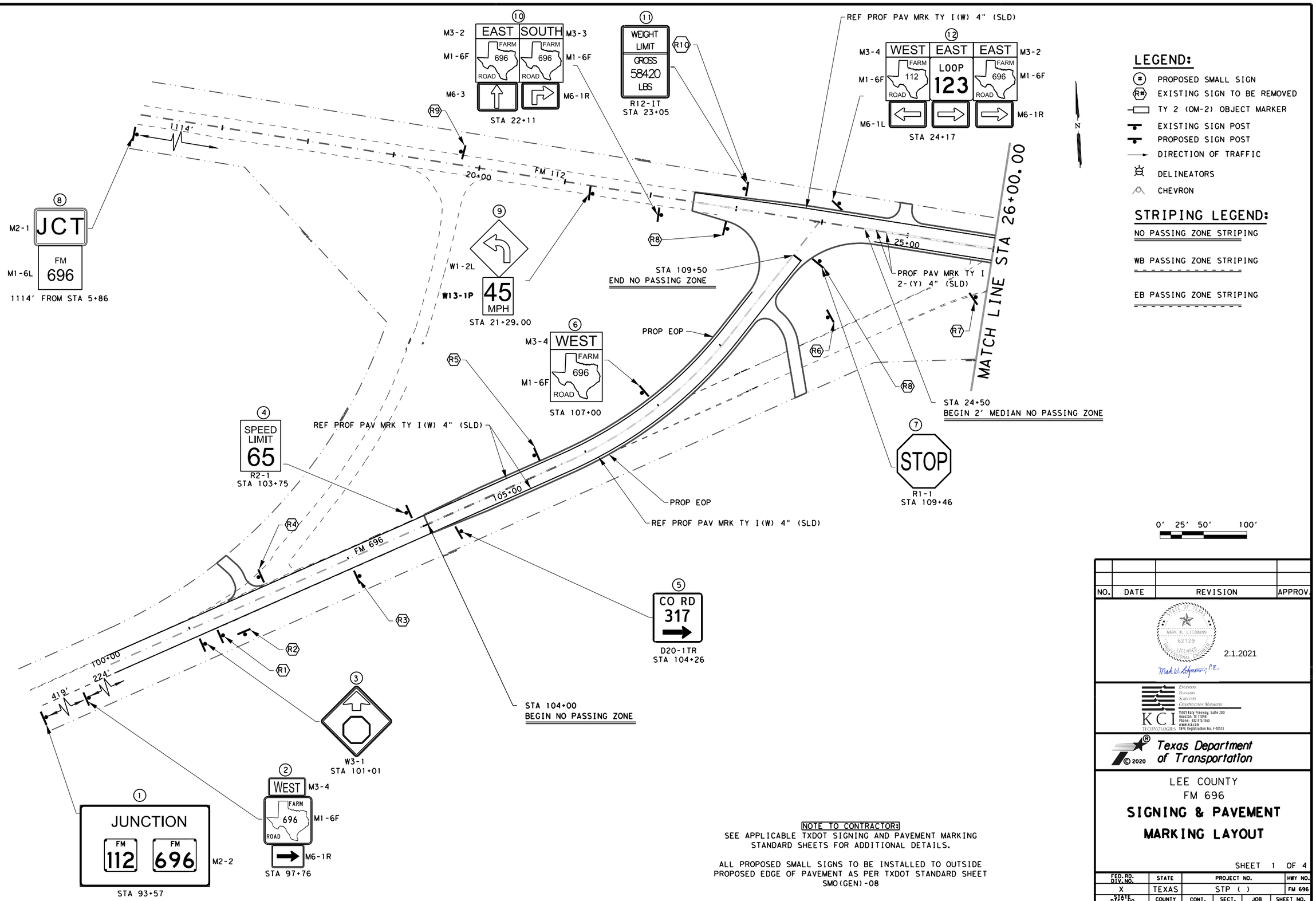

NOTE TO CONTRACTOR:
SEE APPLICABLE TXDOT SIGNING AND PAVEMENT MARKING STANDARD SHEETS FOR ADDITIONAL DETAILS.

ALL PROPOSED SMALL SIGNS TO BE INSTALLED TO OUTSIDE PROPOSED EDGE OF PAVEMENT AS PER TXDOT STANDARD SHEET SMO(GEN)-08

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS — MARK W. LITZMANN — 62129 — LICENSED PROFESSIONAL ENGINEER — 2.1.2021

Mark W. Litzmann P.E.

KCI TECHNOLOGIES
Engineers
Planners
Surveyors
Construction Managers
15021 Katy Freeway, Suite 200
Houston, TX 77094
Phone: 832.971.1565
www.kci.com
TBPE Registration No. F-10573

 Texas Department of Transportation

LEE COUNTY
FM 696
SIGNING & PAVEMENT MARKING LAYOUT

SHEET 1 OF 4

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	101

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USER:
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DATE:2/1/2021
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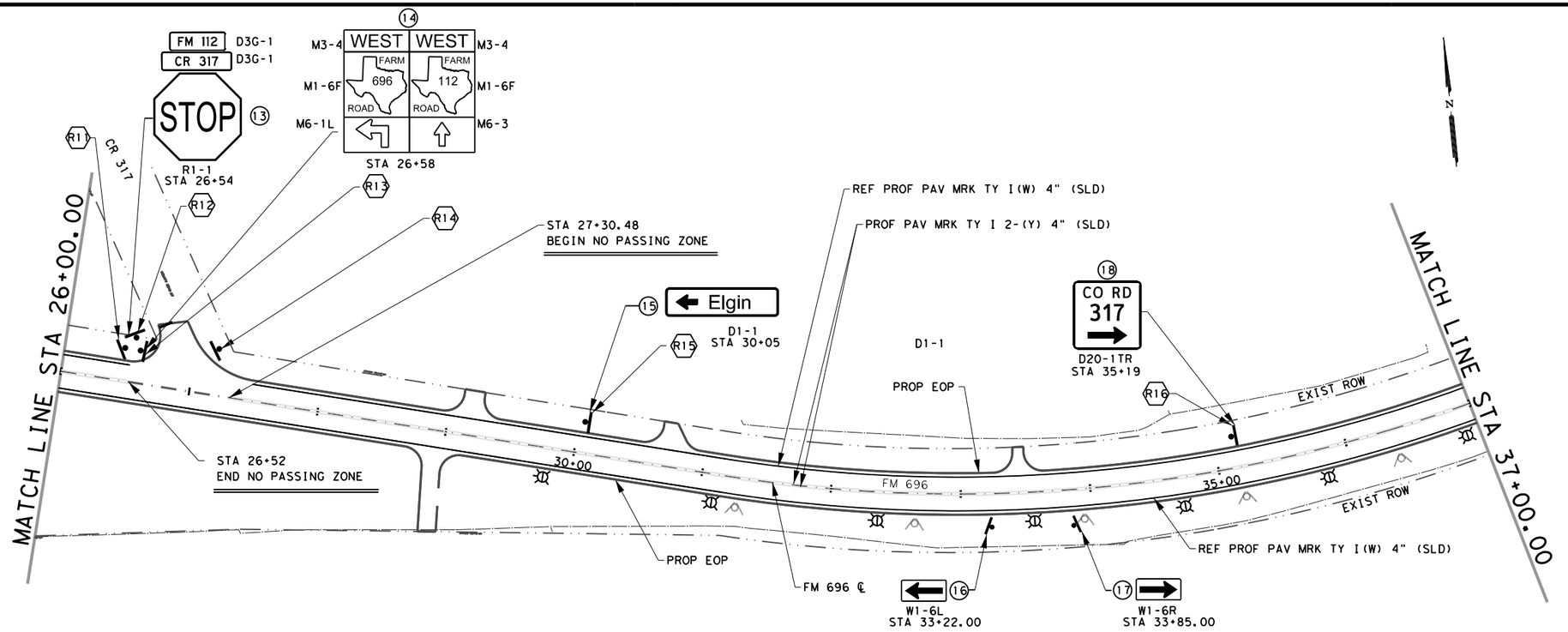

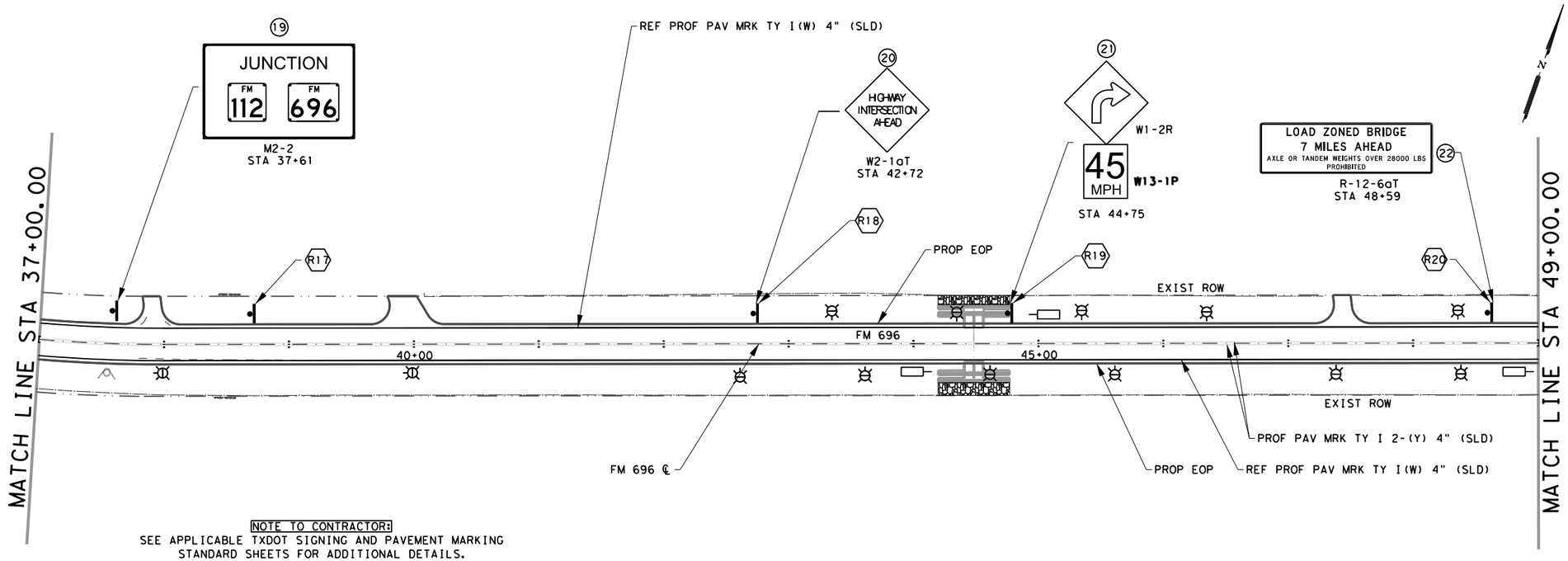

0' 25' 50' 100'

LEGEND:

- PROPOSED SMALL SIGN
- EXISTING SIGN TO BE REMOVED
- TY 2 (OM-2) OBJECT MARKER
- EXISTING SIGN POST
- PROPOSED SIGN POST
- DIRECTION OF TRAFFIC
- DELINEATORS
- CHEVRON

STRIPING LEGEND:

NO PASSING ZONE STRIPING

WB PASSING ZONE STRIPING

EB PASSING ZONE STRIPING

NOTE TO CONTRACTOR:
SEE APPLICABLE TXDOT SIGNING AND PAVEMENT MARKING STANDARD SHEETS FOR ADDITIONAL DETAILS.

ALL PROPOSED SMALL SIGNS TO BE INSTALLED TO OUTSIDE PROPOSED EDGE OF PAVEMENT AS PER TXDOT STANDARD SHEET SMO(GEN)-08

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
2.1.2021
Mark W. Litzmann, P.E.

KCI TECHNOLOGIES
Engineers
Planners
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TBPE Registration No. F-10573

Texas Department of Transportation

LEE COUNTY
FM 696

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 2 OF 4

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST.NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	102

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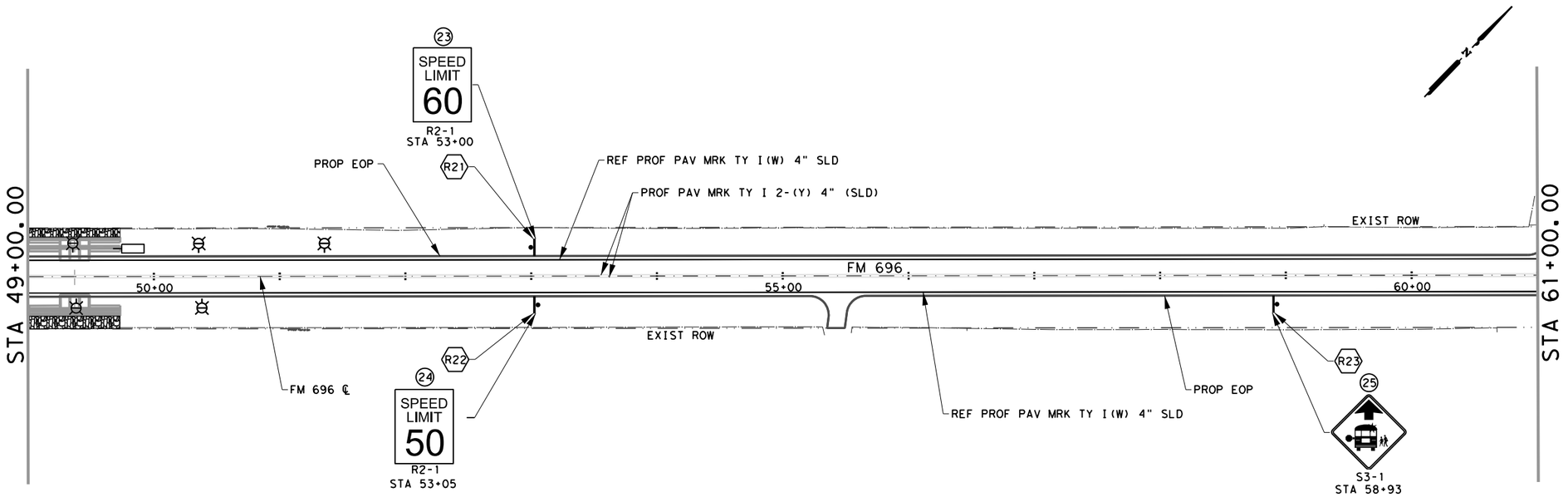

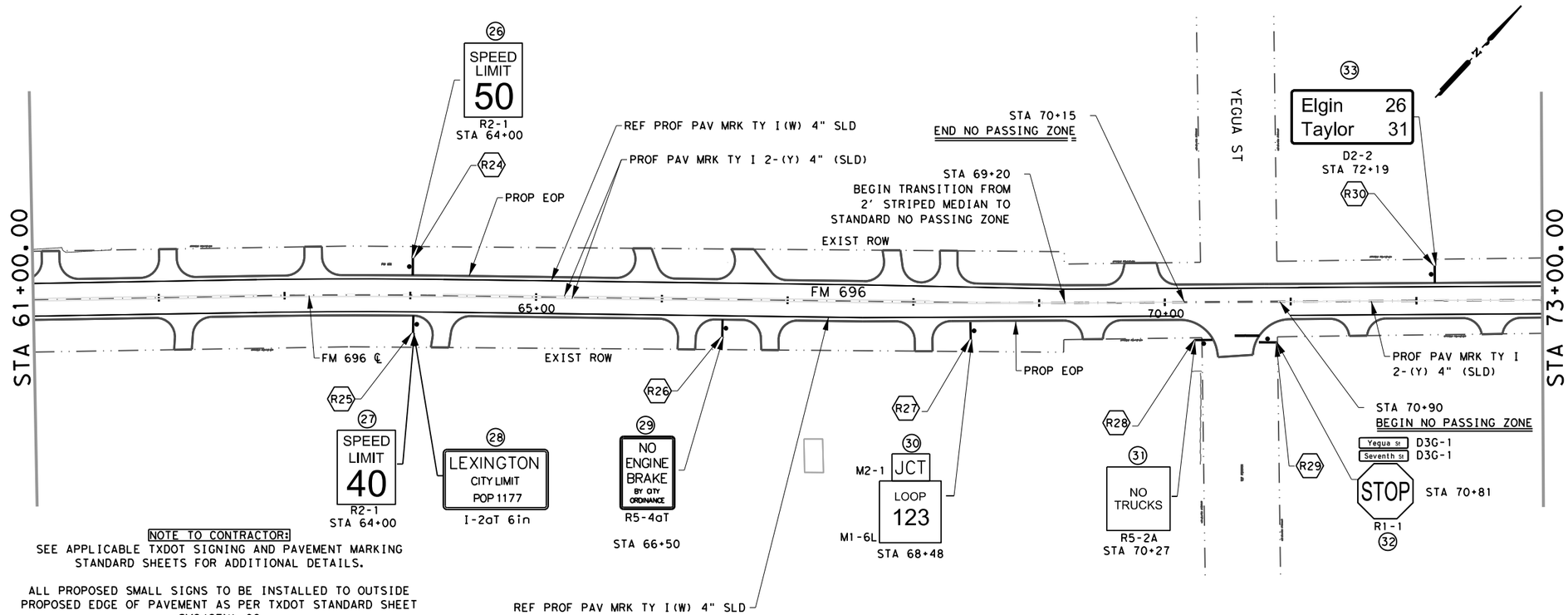

NOTE TO CONTRACTOR:
SEE APPLICABLE TXDOT SIGNING AND PAVEMENT MARKING STANDARD SHEETS FOR ADDITIONAL DETAILS.

ALL PROPOSED SMALL SIGNS TO BE INSTALLED TO OUTSIDE PROPOSED EDGE OF PAVEMENT AS PER TXDOT STANDARD SHEET SMO(GEN)-08

LEGEND:

- (#) PROPOSED SMALL SIGN
- (R#) EXISTING SIGN TO BE REMOVED
- TY 2 (OM-2) OBJECT MARKER
- EXISTING SIGN POST
- PROPOSED SIGN POST
- DIRECTION OF TRAFFIC
- DELINEATORS
- CHEVRON

STRIPING LEGEND:

- NO PASSING ZONE STRIPING
- WB PASSING ZONE STRIPING
- EB PASSING ZONE STRIPING

0' 25' 50' 100'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER
2.1.2021
Mark W. Litzmann, P.E.

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LEE COUNTY
FM 696
SIGNING & PAVEMENT MARKING LAYOUT

SHEET 3 OF 4

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	103

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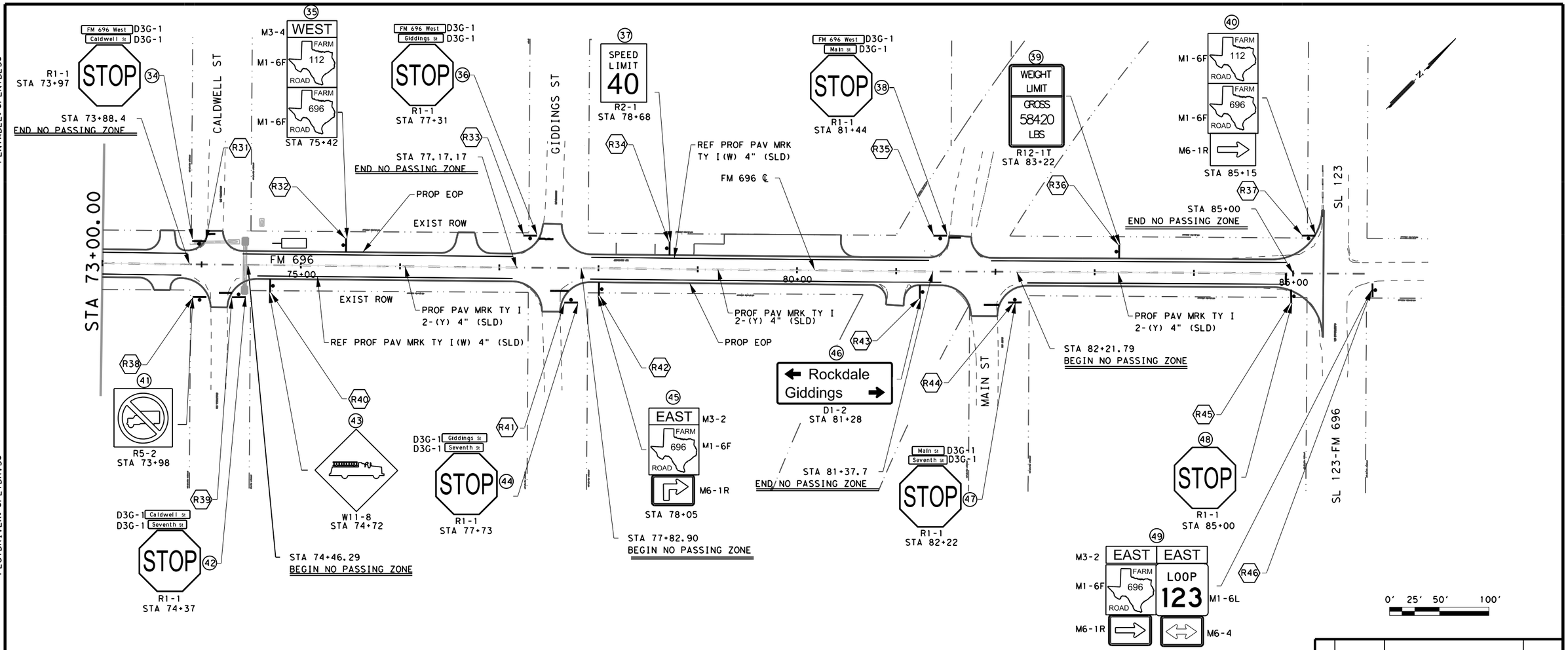

LEGEND:

- PROPOSED SMALL SIGN
- EXISTING SIGN TO BE REMOVED
- TY 2 (OM-2) OBJECT MARKER
- EXISTING SIGN POST
- PROPOSED SIGN POST
- DIRECTION OF TRAFFIC
- DELINEATORS
- CHEVRON

STRIPING LEGEND:

NO PASSING ZONE STRIPING

WB PASSING ZONE STRIPING

EB PASSING ZONE STRIPING

NOTE TO CONTRACTOR:
SEE APPLICABLE TXDOT SIGNING AND PAVEMENT MARKING STANDARD SHEETS FOR ADDITIONAL DETAILS.

ALL PROPOSED SMALL SIGNS TO BE INSTALLED TO OUTSIDE PROPOSED EDGE OF PAVEMENT AS PER TXDOT STANDARD SHEET SMO(GEN)-08

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER
2.1.2021
Mark W. Litzmann, P.E.

KCI TECHNOLOGIES
Engineers Planners Surveyors Construction Managers
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Houston, TX 77094
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TBPE Registration No. F-10573

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LEE COUNTY
FM 696

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 4 OF 4

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	104

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USER:
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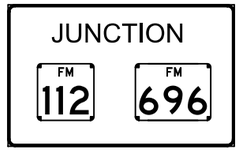
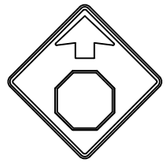
DATE:2/1/2021
FILE:FM696_SPM4.dgn

DATE:
FILE:

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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
1	1	M2-2		96x60	X		S80	1	SA	U	EXAL	
1	2	M3-4 M1-6F M6-1R		24X12 24X24 21X15	X		10 BWG	1	SA	P		
1	3	W3-1		48X48	X		10 BWG	1	WS	P		
1	4	R2-1		24x30	X		TWT	1	WS	P		
1	5	D20-1TR		24x24	X		TWT	1	WS	P		
1	6	M3-4 M1-6F		24X12 24X24	X		TWT	1	WS	P		

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

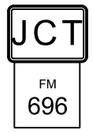
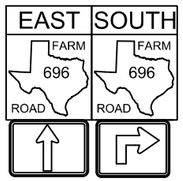
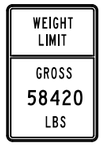
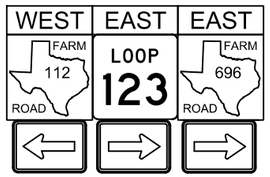
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		105

TB

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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"	MOUNTING DESIGNATION: 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
1	7	R1-1		48X48	X		TWT	1	WS	P		
1	8	M2-1 M1-6L		21X15 24X24	X		TWT	1	WS	P		
1	9	W1-2L W13-1P		30x30 18x18	X		TWT	1	WS	P		
1	10	M3-3 M1-6F M6-1R		24X12 24X24 21X15 24X12 24X24 21X15	X		10 BWG	1	SA	U		
1	11	R12-1T		24X36	X		TWT	1	WS	P		
1	12	M3-4 M1-6F M6-1L M3-2 M1-6L M6-1R M3-2 M1-6F M6-1R		24X12 24X24 21X15 24X12 24X24 21X15 24X12 24X24 21X15	X		10 BWG	1	SA	U	WC	

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"

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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.
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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

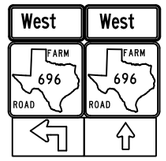
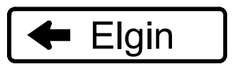
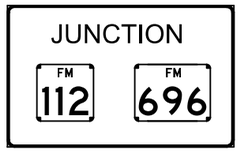
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		106

18

DATE:
FILE:

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) 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"	MOUNTING DESIGNATION: 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
2	13	D3G-1		36x12	X		10 BWG	1	SA	P		
		D3G-1		42x12								
		R1-1		30X30								
2	14	M3-4		24X12	X		10 BWG	1	SA	U		
		M1-6F		24X24								
		M6-1L		21X15								
		M3-4		24X12								
		M1-6F		24X24								
		M6-3		21X15								
2	15	D1-1		42x12	X		10 BWG	1	SA	T		
2	16	W1-6L		24x12	X		TWT	1	WS	P		
2	17	W1-6R		24x12	X		TWT	1	WS	P		
2	18	D20-1TR		24X24	X		TWT	1	WS	P		
2	19	M2-2		96x60	X		S80	1	SA	U	EXAL	
2	20	W2-1aT		48X48	X		TWT	1	WS	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

DATE:
FILE:

Texas Department of Transportation — Traffic Operations Division Standard

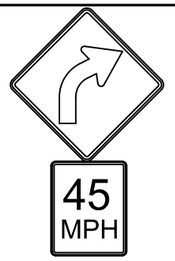
SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		107

TB

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) 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"	MOUNTING DESIGNATION: 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
2	21	W1-2R(R) W13-1P		30x30 18x18	X		TWT	1	WS	P		
2	22	R12-6bT	LOAD ZONED BRIDGE 7 MILES AHEAD AXLE OR TANDEM WEIGHTS OVER 28000 LBS PROHIBITED	102 x 30	X		S80	1	SA	T		
3	23	R2-1		24x30	X		TWT	1	WS	P		
3	24	R2-1		24X30	X		TWT	1	WS	P		
3	25	S3-1		36X36	X		TWT	1	WS	P		
3	26	R2-1		24X30	X		TWT	1	WS	P		
3	27	R2-1		24X30	X		TWT	1	WS	P		
3	28	I-2AT	LEXINGTON CITY LIMIT POP 1177	48X24	X		TWT	1	WS	P		

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).

DATE:
FILE:

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

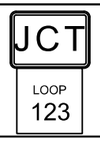
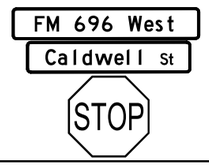
SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		108

TB

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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
3	29	R5-4at		36X18	X		TWT	1	WS	P		
3	30	M2-1 M1-6L		21X15 24X24	X		TWT	1	WS	P		
3	31	D2-2		24X24	X		TWT	1	WS	P		
3	32	D3G-1 D3G-1 R1-1		48X12 54X12 30X30	X		10 BWG	1	SA	P		
3	33	D2-2		66X30	X		10 BWG	1	SA	T		
4	34	D3G-1 D3G-1 R1-1		66x12 60X12 30X30	X		S80	1	SA	P		
4	35	M3-4 M1-6F M1-6F		24X12 24X24 24X24	X		10 BWG	1	SA	P		
4	36	D3G-1 D3G-1 R1-1		66x12 60x12 30X30	X		S80	1	SA	P		

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"

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

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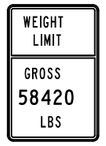
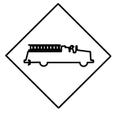
FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		109

18

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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"	MOUNTING DESIGNATION: 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
4	37	R2-1		24X30	X		TWT	1	WS	P		
4	38	D3G-1 D3G-1 R1-1		66x12 42x12 48X48	X		S80	1	SA	P		
4	39	R12-1T		24X36	X		TWT	1	WS	P		
4	40	M1-6F M1-6F M6-1R		24X24 24X24 21X15	X		10 BWG	1	SA	P		
4	41	R5-2		24X24	X		TWT	1	WS	P		
4	42	D3G-1 D3G-1 R1-1		60x12 54x12 30X30	X		10 BWG	1	SA	P		
4	43	W11X8		30X30	X		TWT	1	WS	P		

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"

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SUMMARY OF SMALL SIGNS

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FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
4-16	DIST	COUNTY		SHEET NO.
8-16	AUS	LEE		110

TB

DATE:
FILE:

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) 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
4	44	D3G-1 D3G-1 R1-1		60x12 54x12 30X30	X		10 BWG	1	SA	P		
4	45	M3-2 M1-6F M6-1R		24X12 24X24 21X15	X		10 BWG	1	SA	P		
4	46	D1-2		66x30	X		10 BWG	1	SA	T		
4	47	D3G-1 D3G-1 R1-1		42x12 54x12 30X30	X		10 BWG	1	SA	P		
4	48	R1-1		48X48	X		TWT	1	WS	P		
4	49	M3-2 M3-2 M1-6F M6-1R M1-6L M6-1R		24X12 24X24 24X24 21X15		X	10 BWG	1	SA	U		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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7.5 to 15	0.100"
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Texas Department of Transportation

Traffic Operations Division Standard

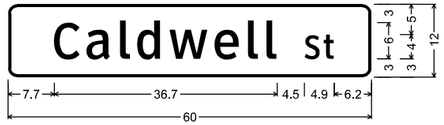
SUMMARY OF SMALL SIGNS

SOSS

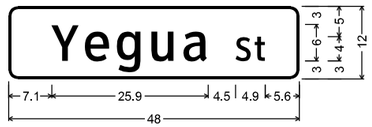
FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0334	03	021	FM 696
4-16		DIST	COUNTY		SHEET NO.
8-16		AUS	LEE		111

DATE:
FILE:

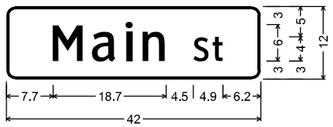
TB



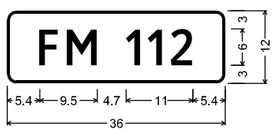
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Caldwell", ClearviewHwy-3-W; "St", ClearviewHwy-3-W;



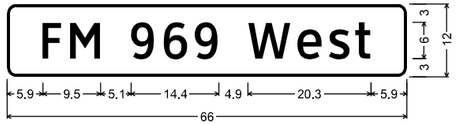
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Yegua", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;



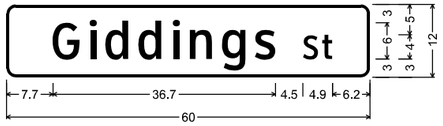
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Main", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;



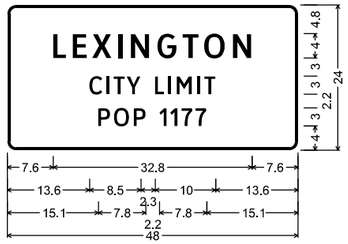
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"FM 112", ClearviewHwy-3-W;



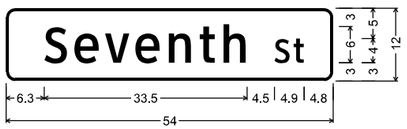
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"FM 969 West", ClearviewHwy-3-W;



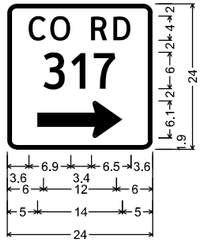
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Giddings", ClearviewHwy-3-W; "St", ClearviewHwy-3-W;



I-2_48x24;
1.5" Radius, 0.5" Border, White on, Green;
"LEXINGTON", ClearviewHwy-4-W;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 1177", ClearviewHwy-3-W;



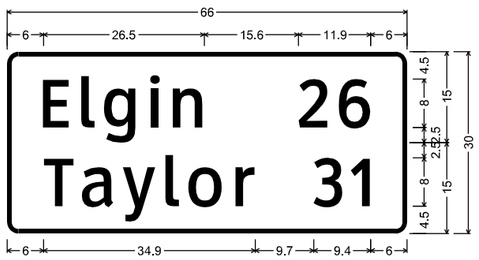
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"Seventh", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;



D20-1TR_24x24;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"317", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';

D1-1 8in LT;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180';
"Elgin", ClearviewHwy-3-W;

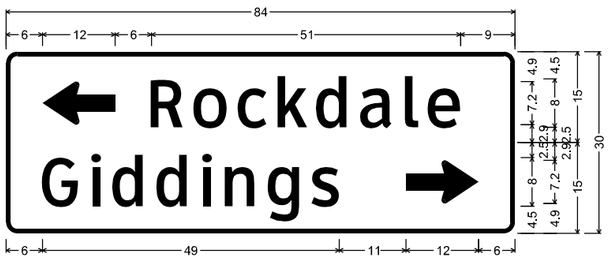
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on, Green;
"CR 317", ClearviewHwy-3-W;



D2-2 8in;

1.9" Radius, 0.8" Border, White on, Green;
"Elgin", ClearviewHwy-3-W; "26", ClearviewHwy-3-W;

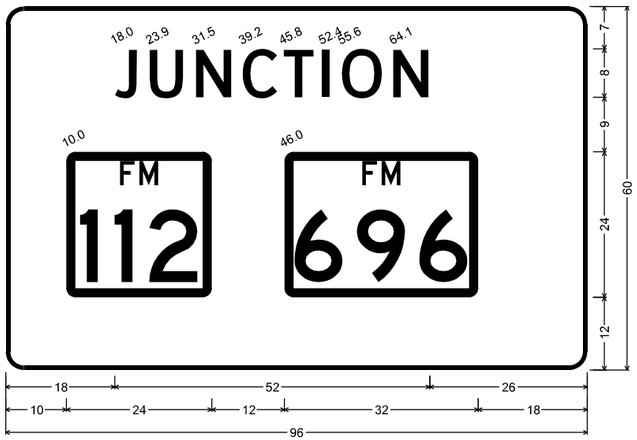
1.9" Radius, 0.8" Border, White on, Green;
"Taylor", ClearviewHwy-3-W; "31", ClearviewHwy-3-W;



D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Rockdale", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Giddings", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';



M2-2_96x60;
3.0" Radius, 0.8" Border, White on, Green;
"JUNCTION", ClearviewHwy-3-W specified length; State Highway 112 M1-6F3;
State Highway 696 M1-6F3;

0' 25' 50' 100'

NO.	DATE	REVISION	APPROV.

MARK W. LITZMANN 62129 LICENSED PROFESSIONAL ENGINEER
2.1.2021
Mark W. Litzmann, P.E.

KCI TECHNOLOGIES
Engineers
Planners
Surveyors
Construction Managers
15021 Katy Freeway, Suite 200
Houston, TX 77094
Phone: 832.975.1565
www.kci.com
TBPE Registration No. F-10529

Texas Department of Transportation

LEE COUNTY
FM 696

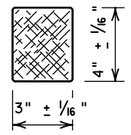
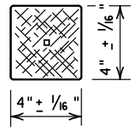
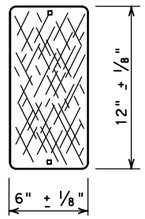
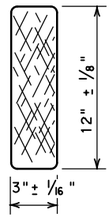
SMALL SIGN DETAILS

NTS 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST. NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	112

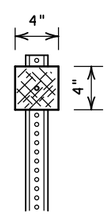
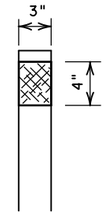
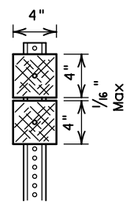
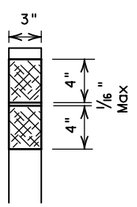
PENTABLE: $PENTBLS$
PLOTDRIVER: $PLTDRVS$
USER:
DATE:2/1/2021 10:31:19 AM
FILE:FM696_TRF_SIGN_DETAILS.dgn

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

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

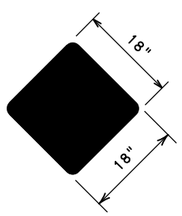
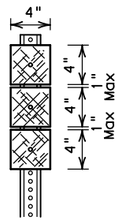
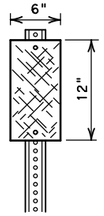
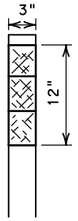
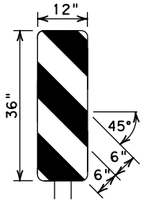
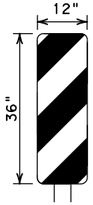
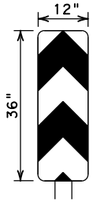
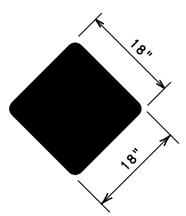
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

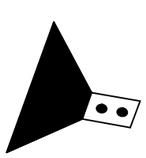
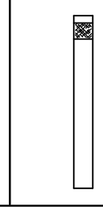
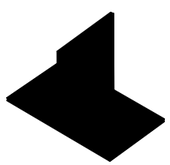
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

BARRIER REFLECTORS (BRF)

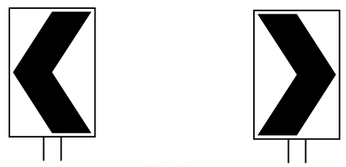
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING: Yellow, White, Red

NOTE
1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

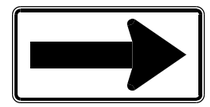
CHEVRONS

DEVICE:  W1-8

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

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

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

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

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

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DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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DATE:
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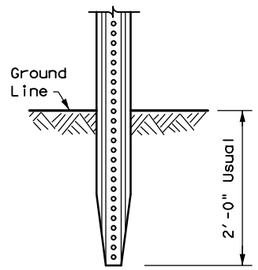
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

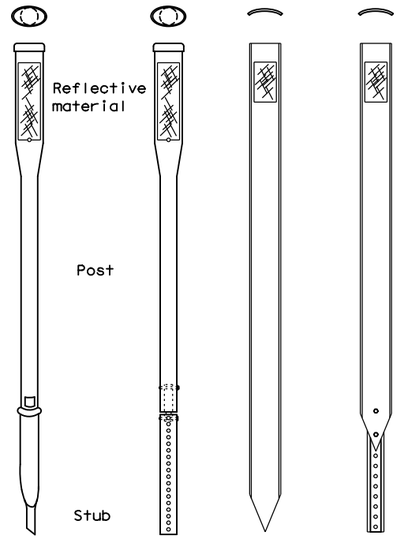


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

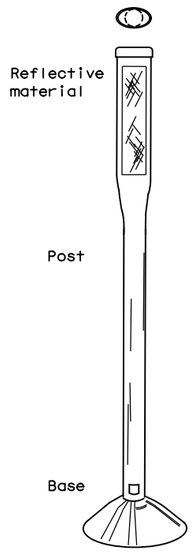
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



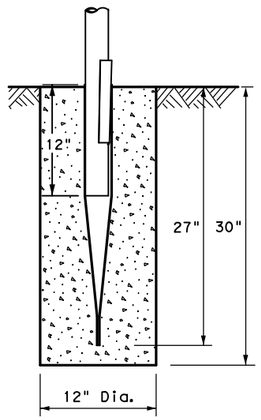
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

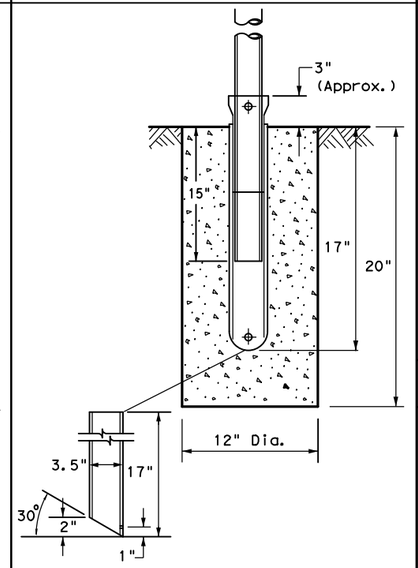
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

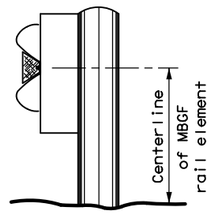
NOTE

1. Install per manufacturer's recommendations.

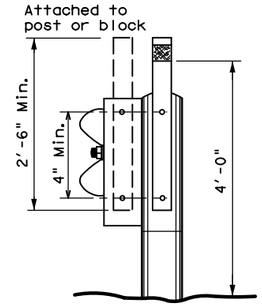
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

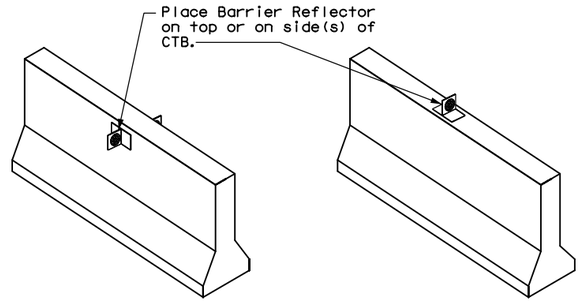
GF1



GF2



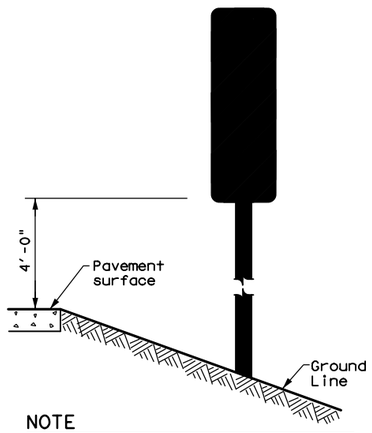
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

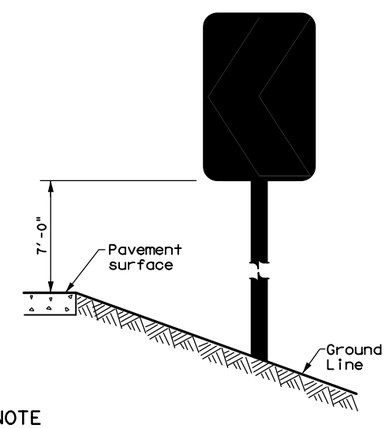
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

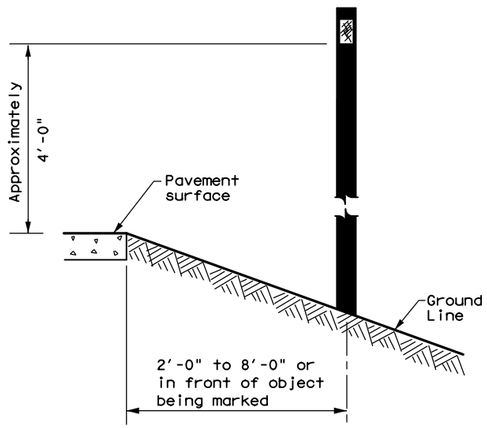
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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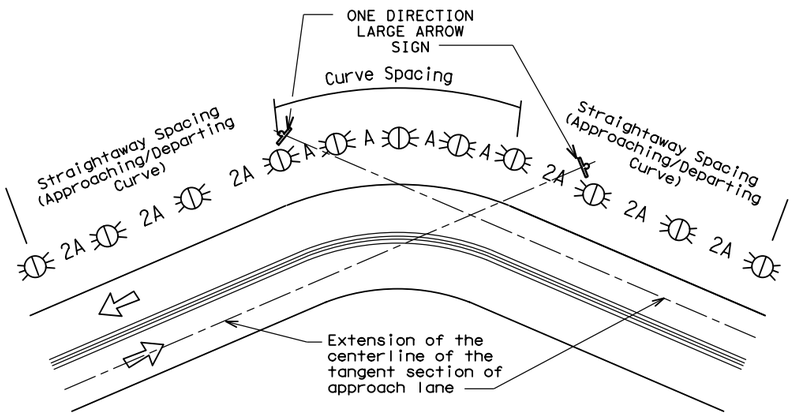
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

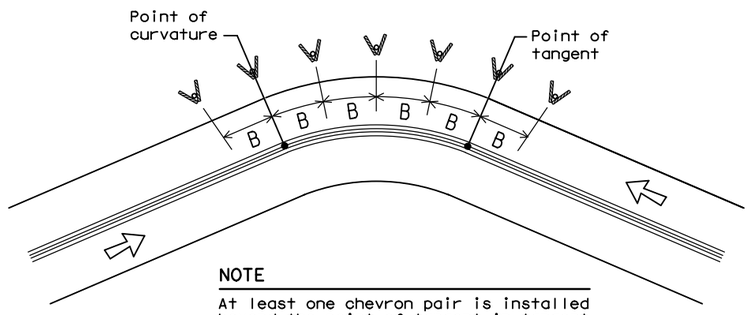
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

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3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	AUS	LEE		115

DATE:
FILE:

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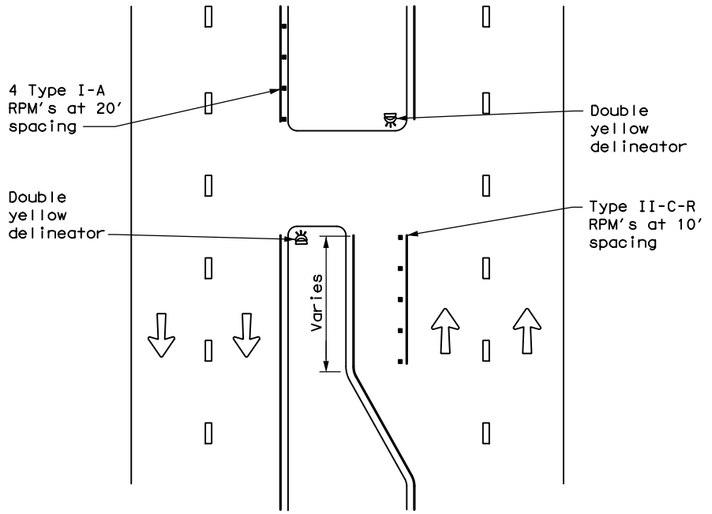
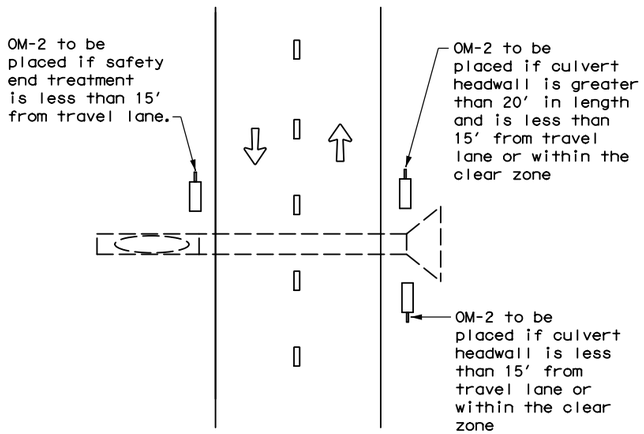
CROSSOVERS



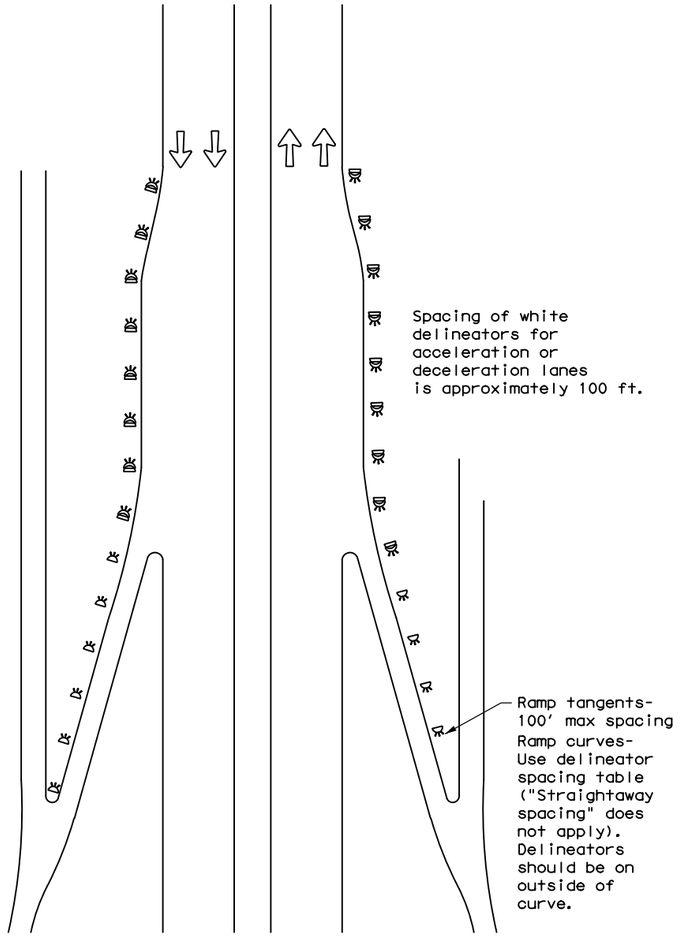
DETAIL 1

FOR CULVERTS WITHOUT MBGF



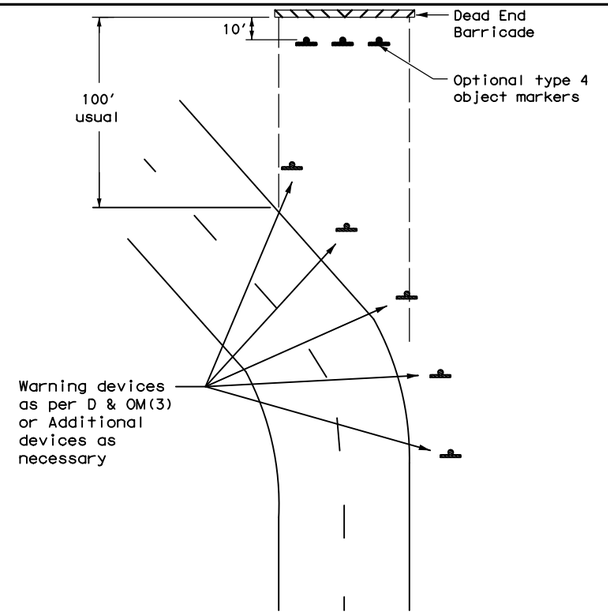
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



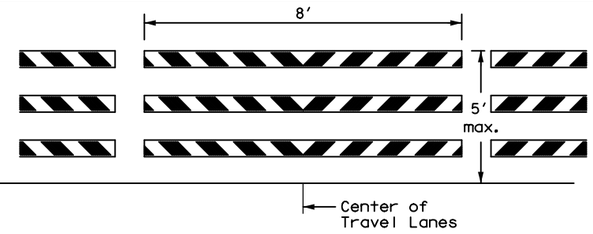
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

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7-20	AUS	LEE		116

DATE:
FILE:

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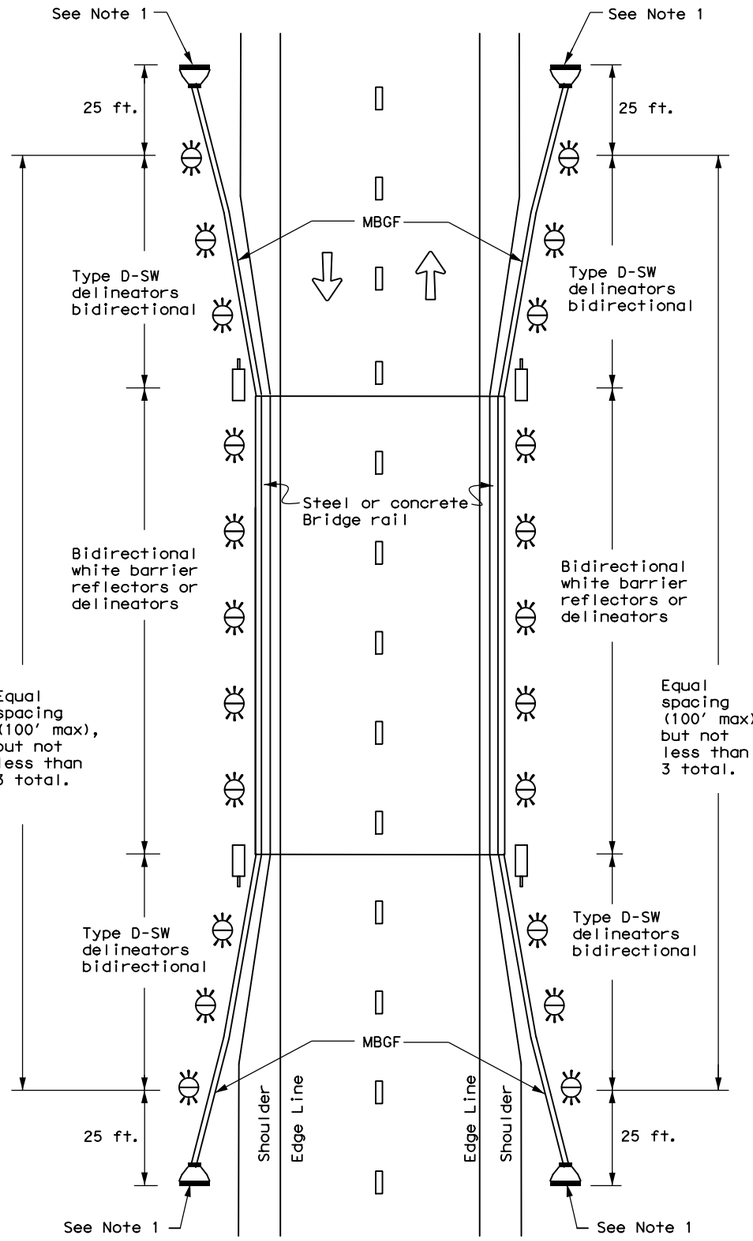
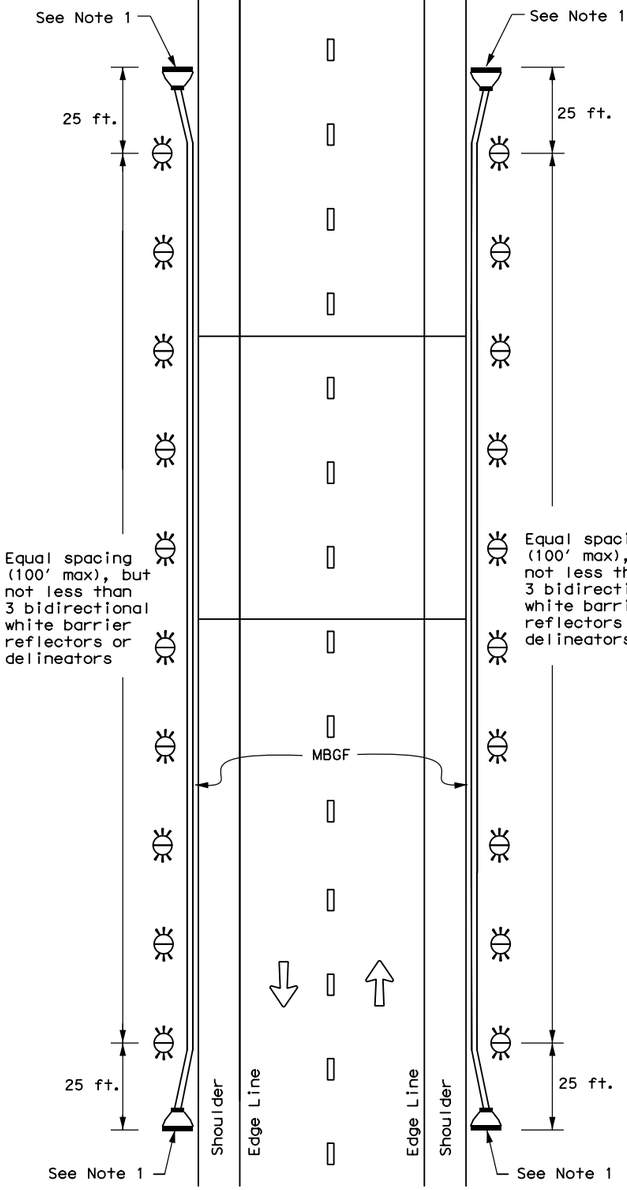
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

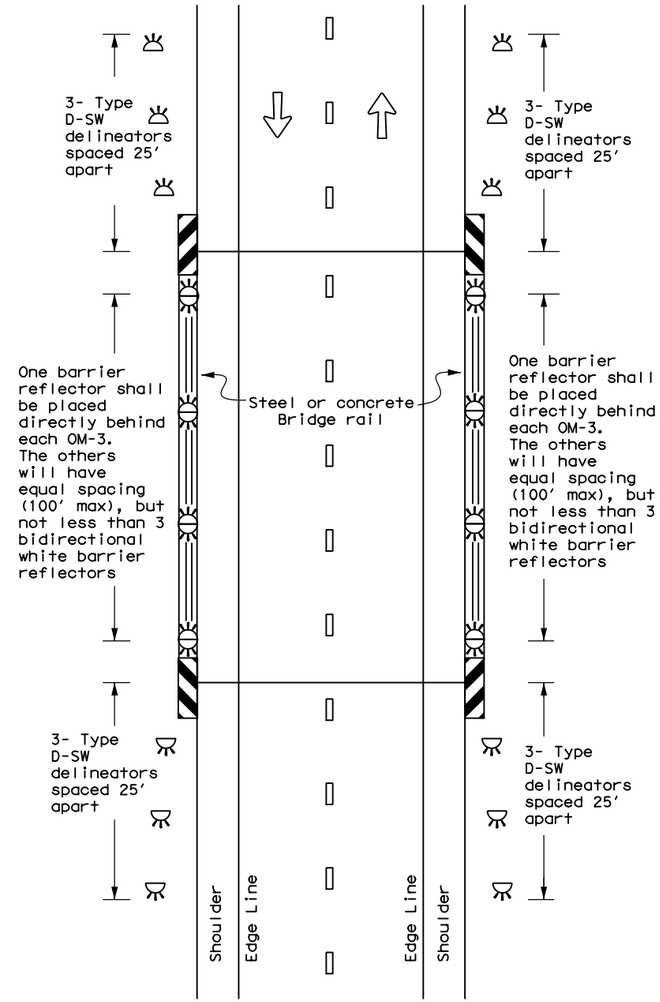
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

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

Texas Department of Transportation

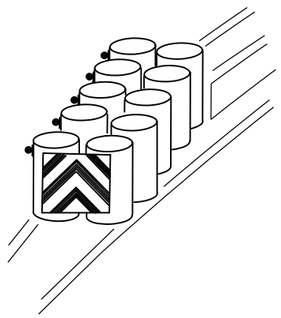
Traffic Safety Division Standard

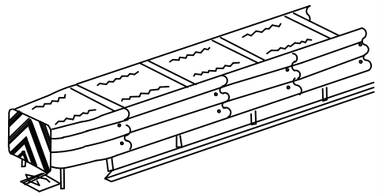
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

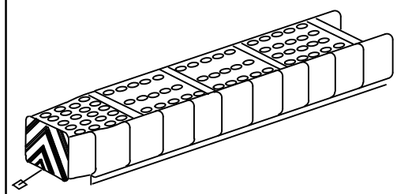
D & OM(5)-20

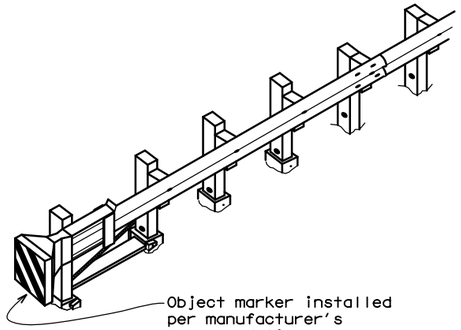
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
7-20	DIST	COUNTY		SHEET NO.
	AUS	LEE		117

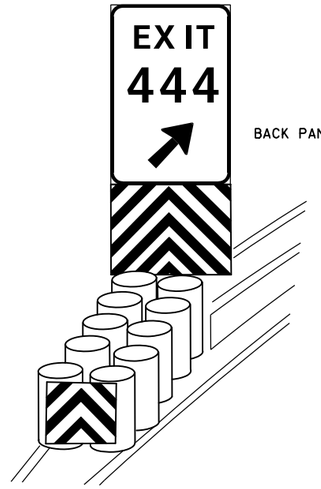
20E

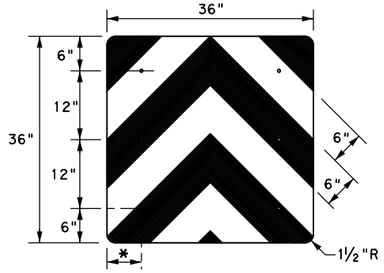


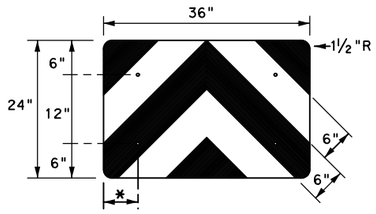




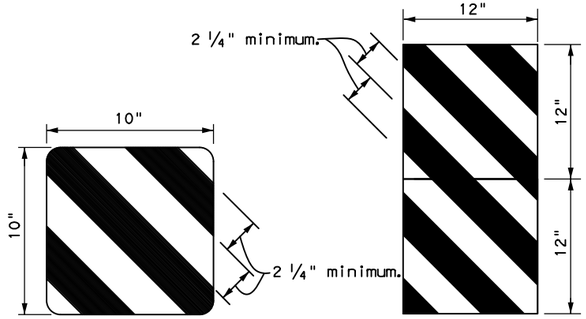




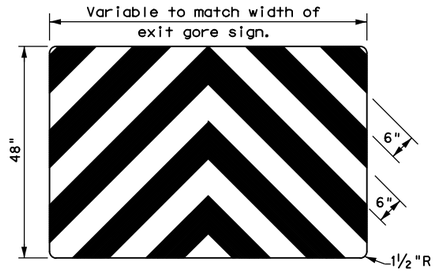


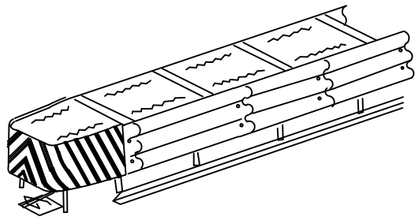


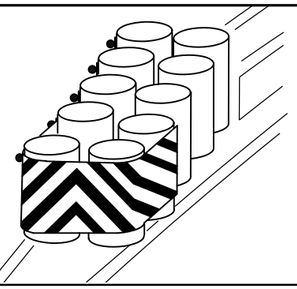
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

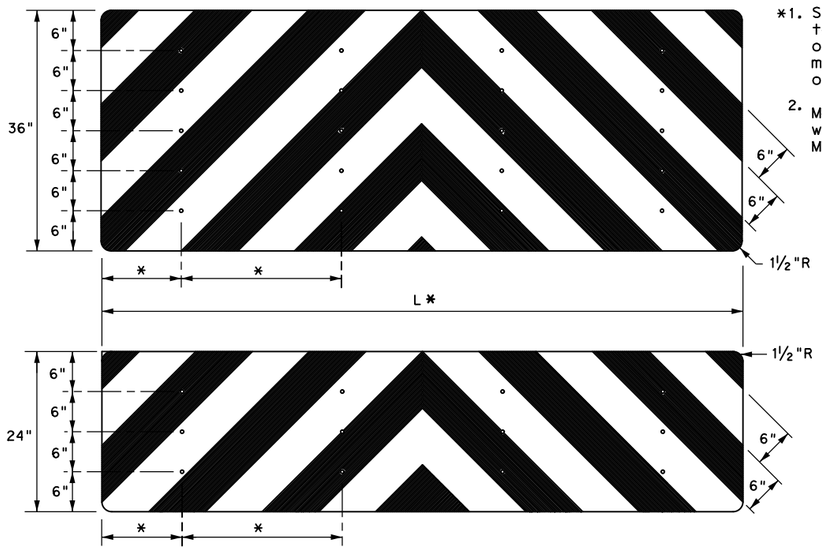


OBJECT MARKERS SMALLER THAN 3 FT^2









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	0334	03	021	FM 696
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	AUS	LEE		118
4-98 7-20				

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DATE:
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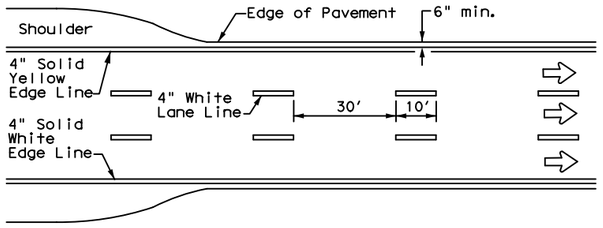
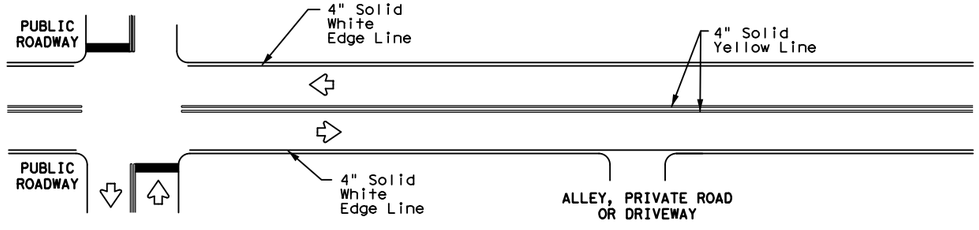
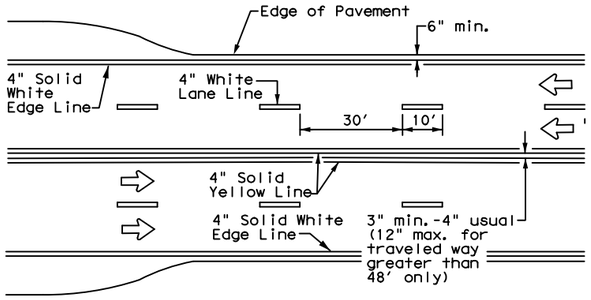


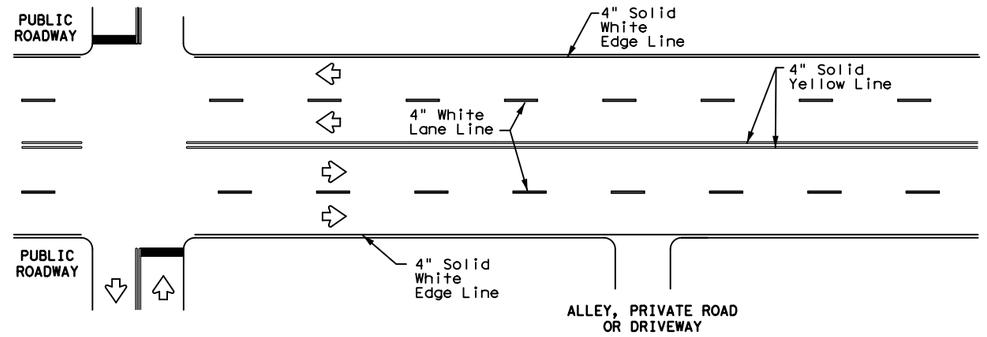
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



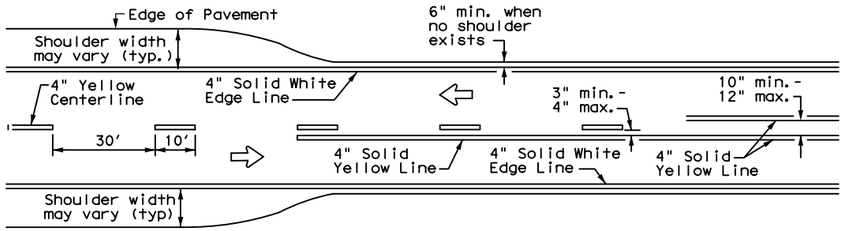
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



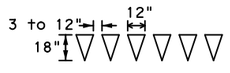
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



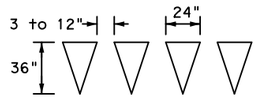
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

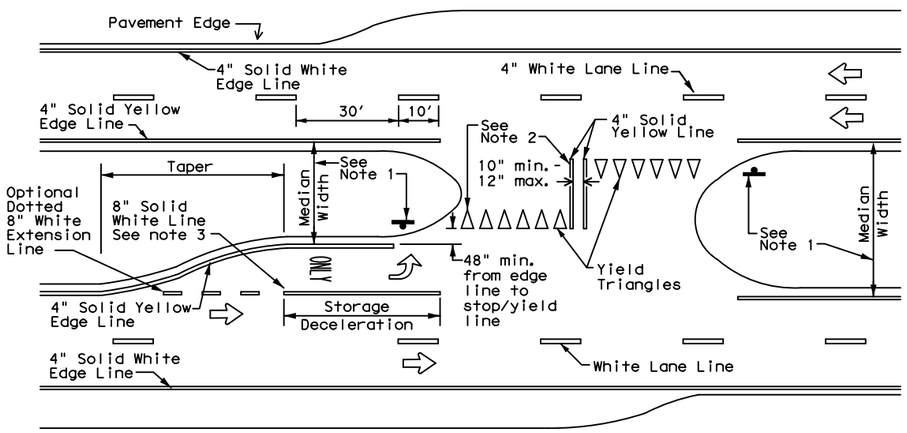


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

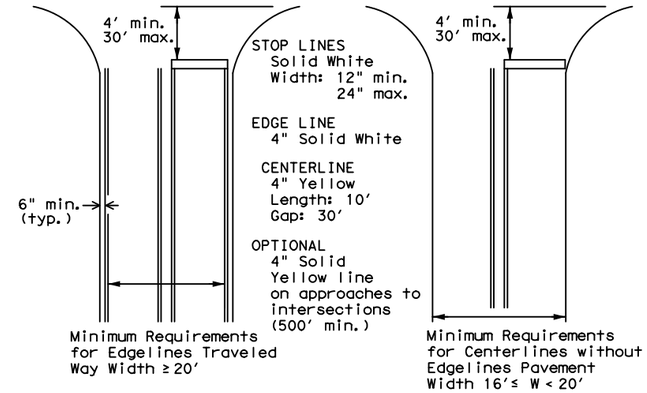
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



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

Texas Department of Transportation | Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

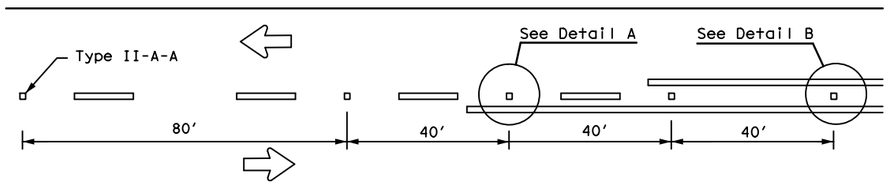
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0334	03	021	FM 696
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AUS	LEE		119

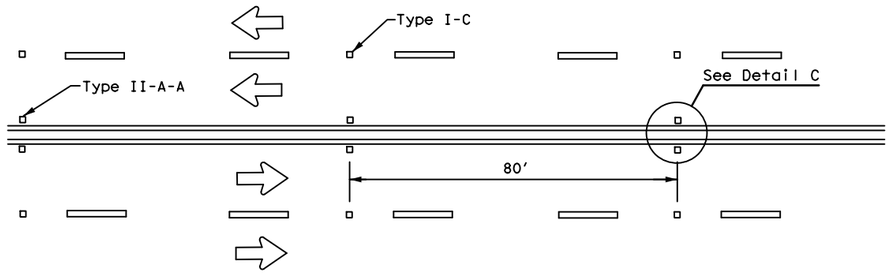
22A

DATE:
FILE:

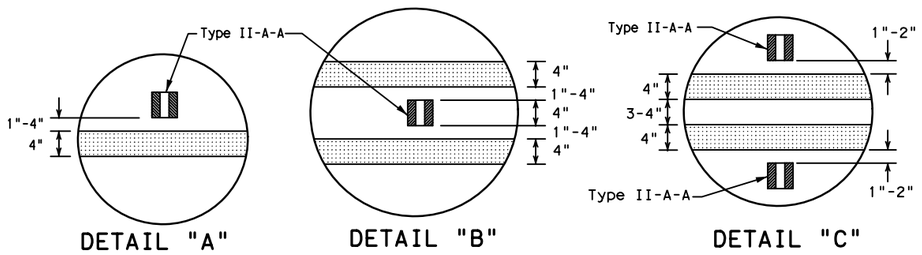
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



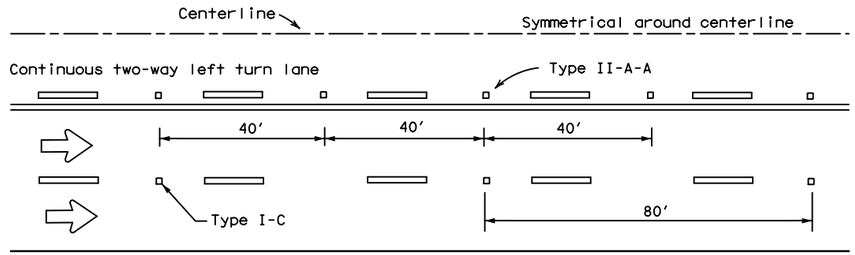
CENTERLINE FOR ALL TWO LANE ROADWAYS



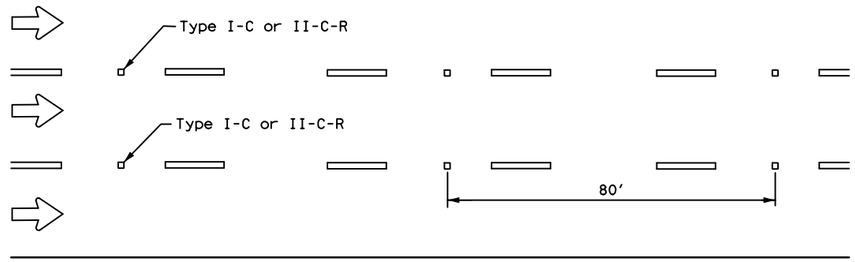
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"

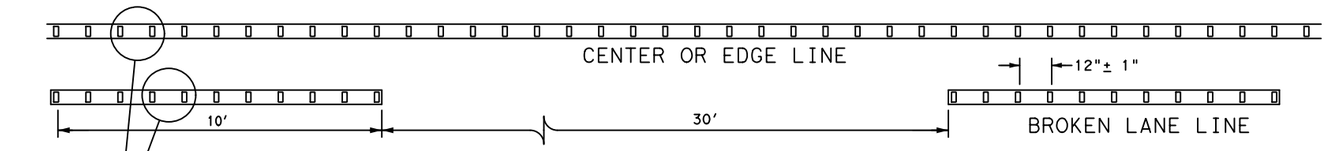


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



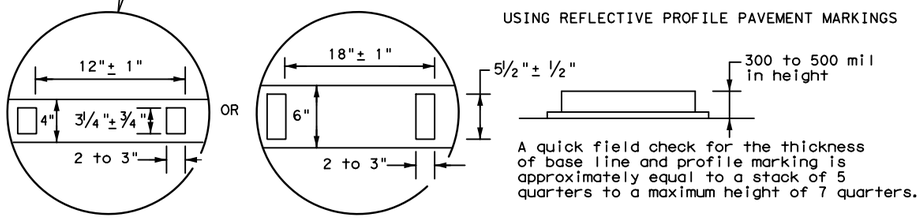
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

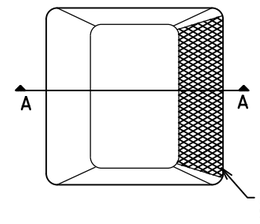
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

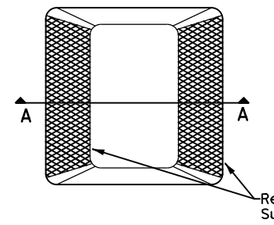
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

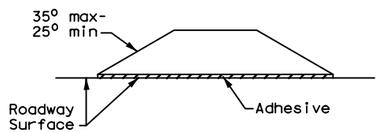
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUS	LEE		120

22B

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DATE:
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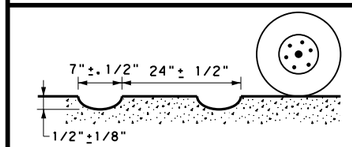
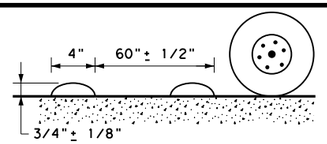
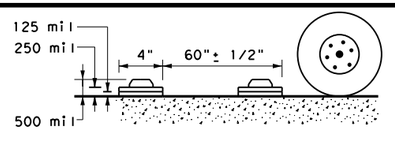
CENTERLINE RUMBLE STRIPS



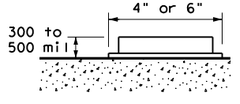
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

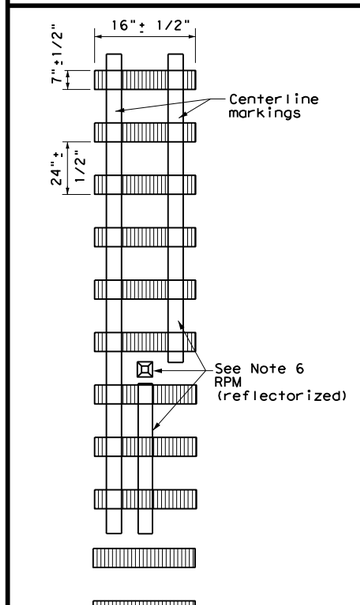


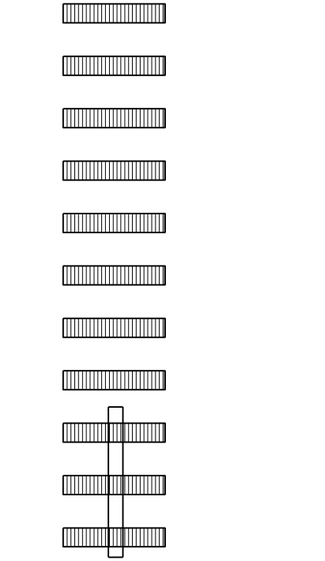
PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

PROFILE VIEW

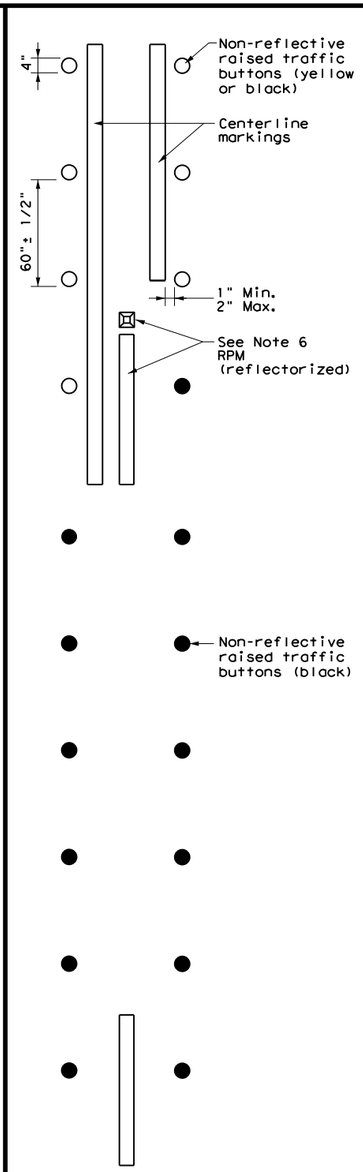




PLAN VIEW
OPTION 1

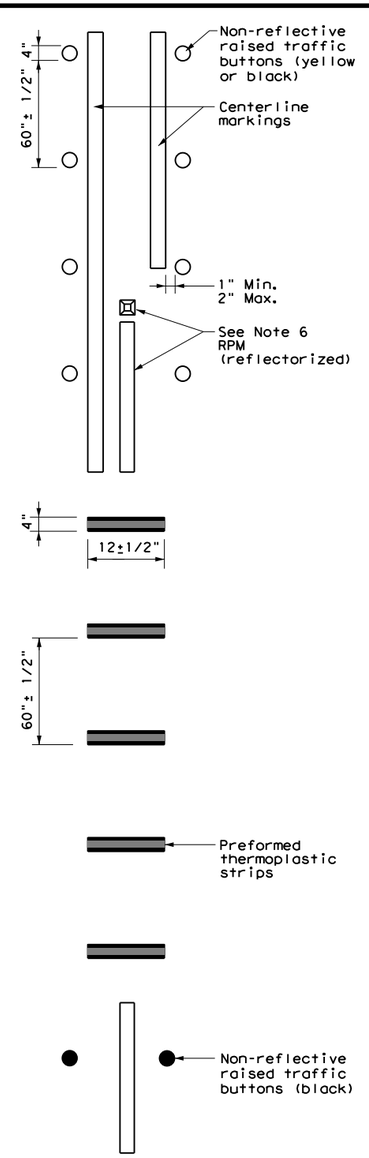
TWO LANE TWO-WAY ROADWAYS

MILLED CENTERLINE RUMBLE STRIPS



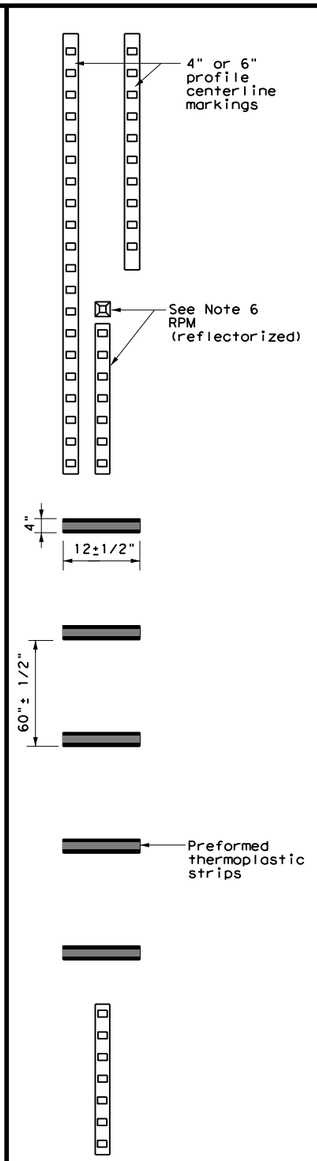
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

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

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

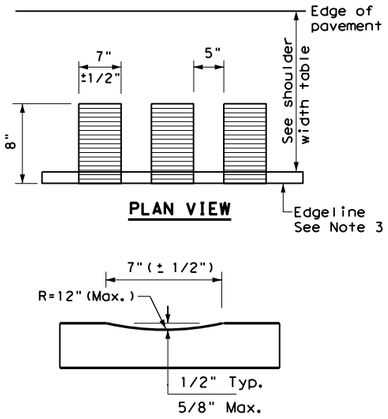
12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

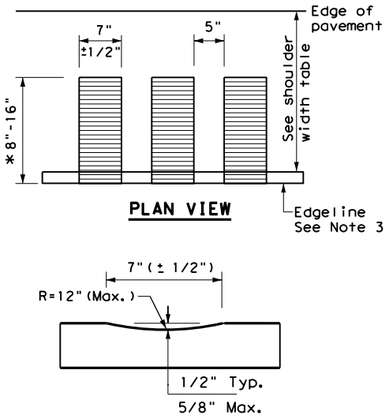
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		121



OPTION 1

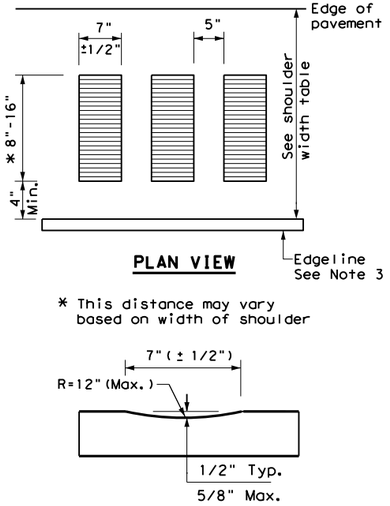
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

OPTION 2

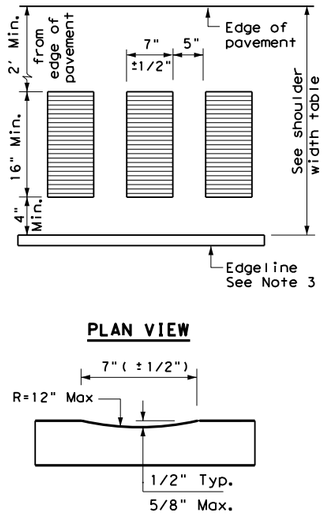
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

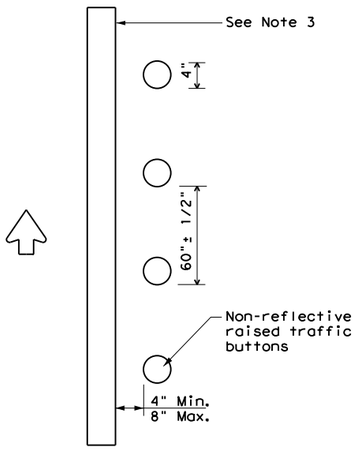
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



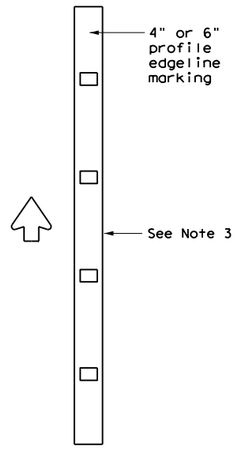
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



OPTION 5

RAISED EDGELINE RUMBLE STRIPS



OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		122

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)

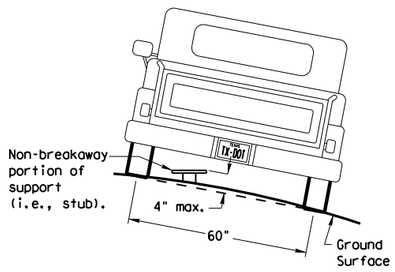
Anchor Type

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) to (SLIP-3))

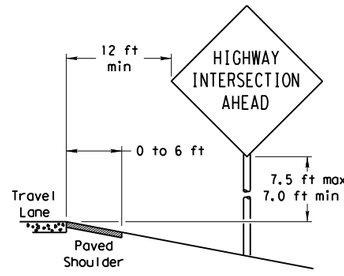
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

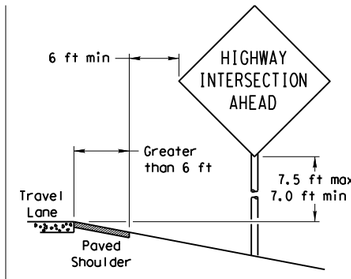
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

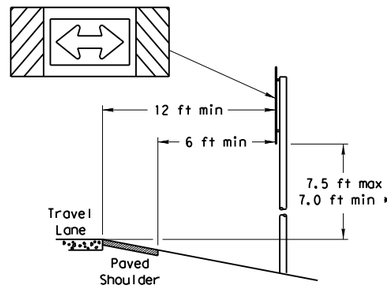
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



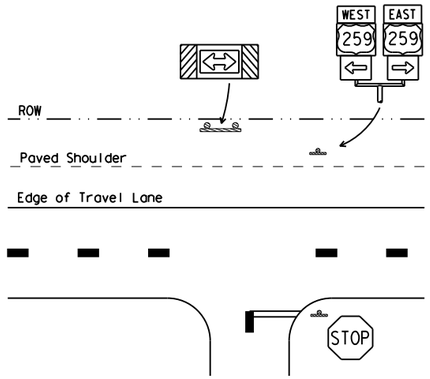
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

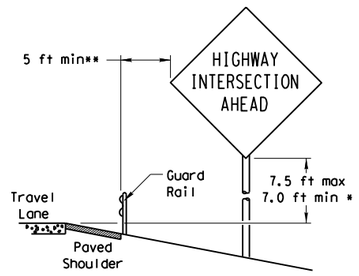
T-INTERSECTION



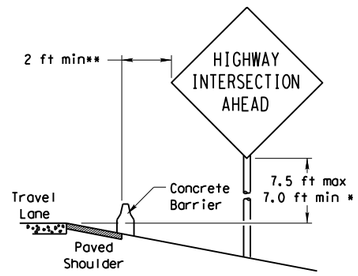
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



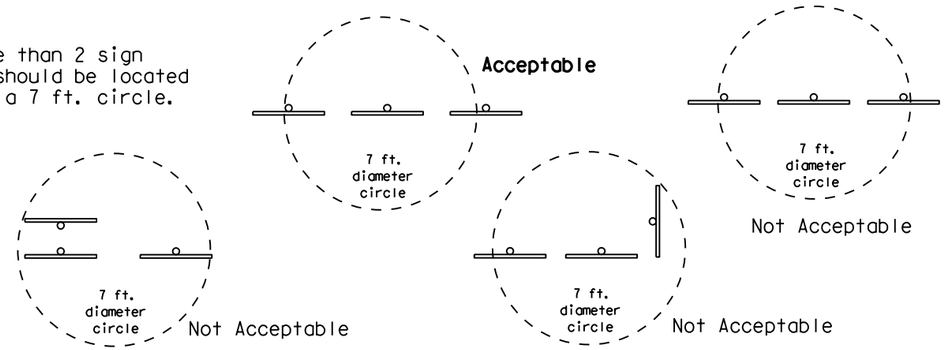
BEHIND GUARDRAIL



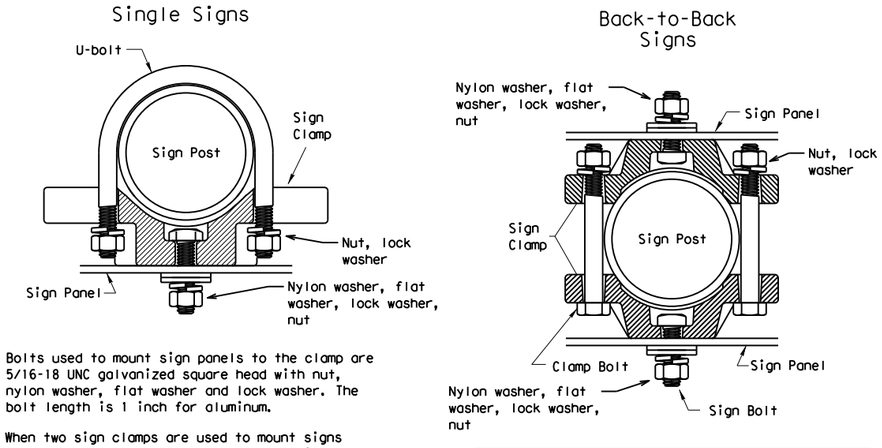
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL



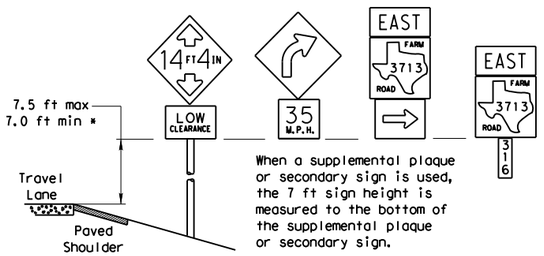
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

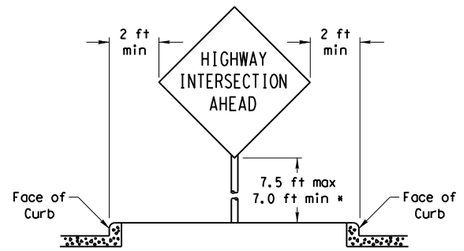
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



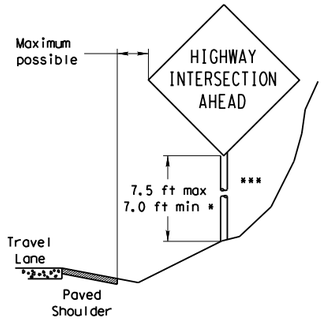
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

* 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

Texas Department of Transportation
Traffic Operations Division

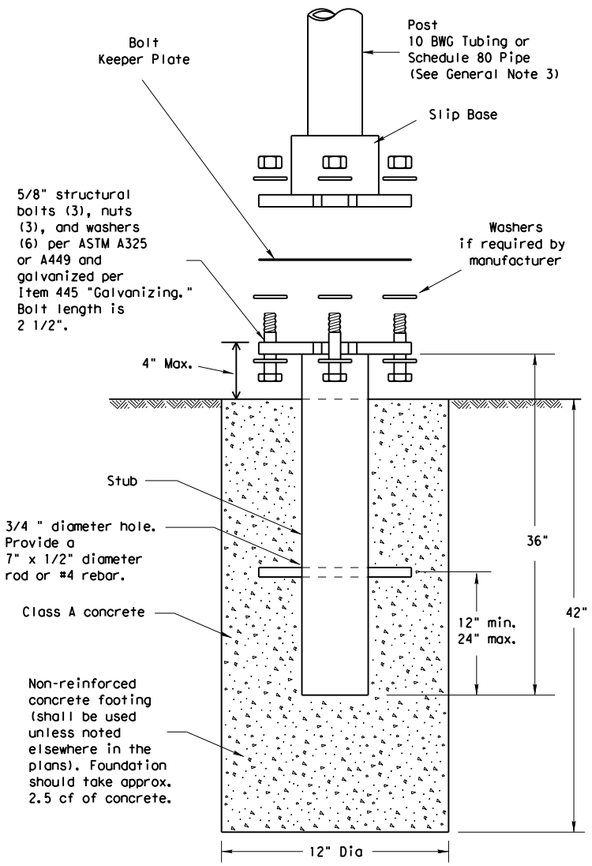
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		123

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.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

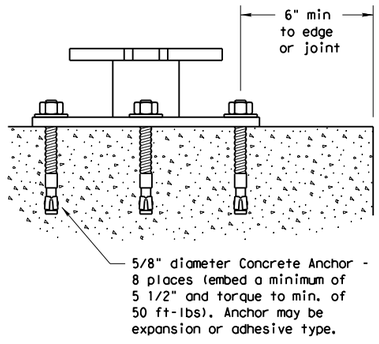
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

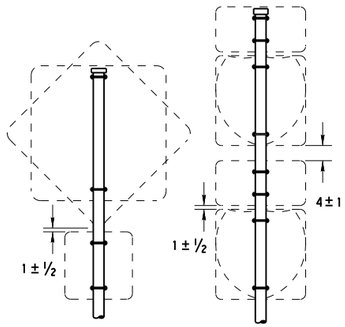
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

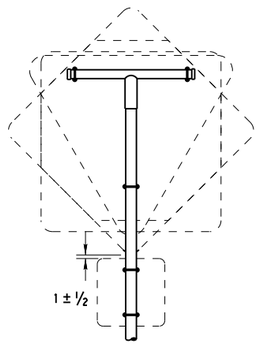
CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696

DIST	COUNTY	SHEET NO.
AUSTIN	LEE	124

DATE:
FILE:



SM RD SGN ASSM TY XXXXX(1)XX(P)



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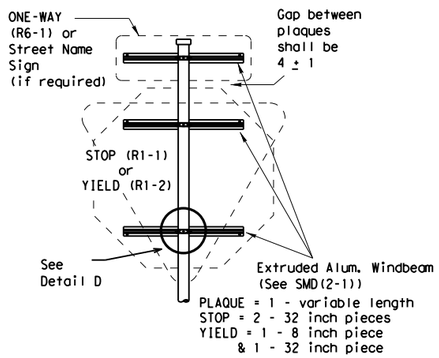

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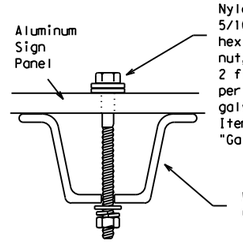
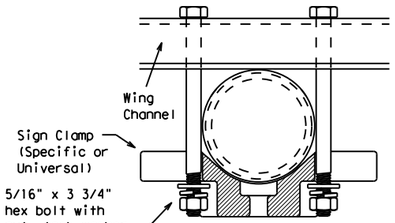
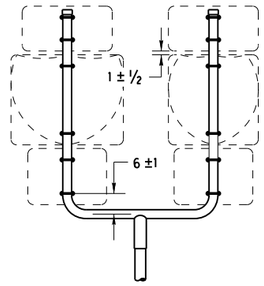


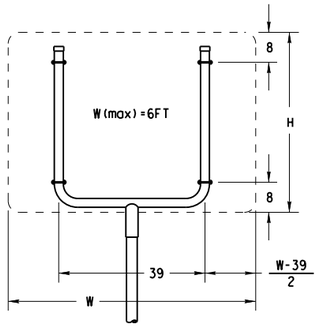
Detail A



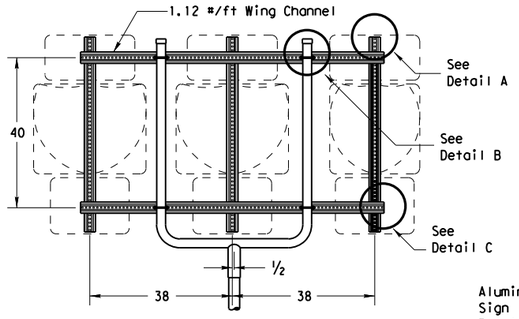
Detail B



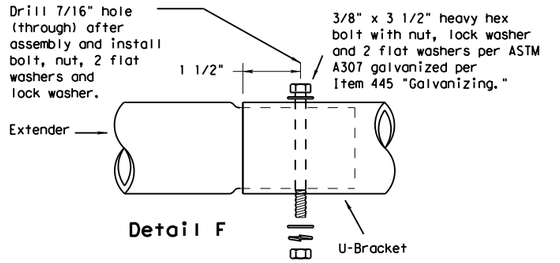
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

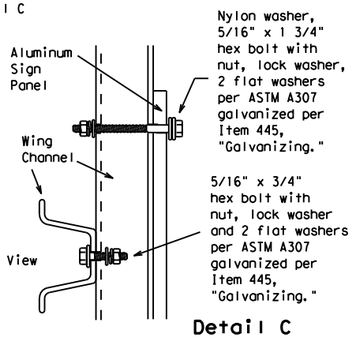


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

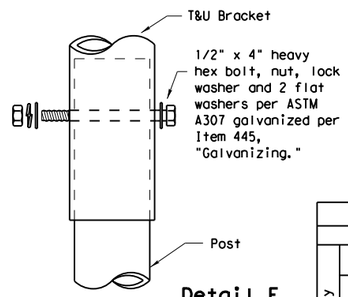


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



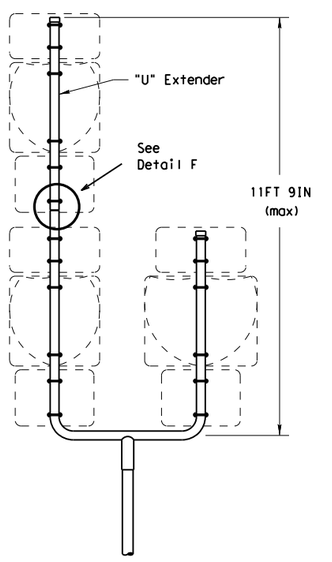
Detail E

GENERAL NOTES:

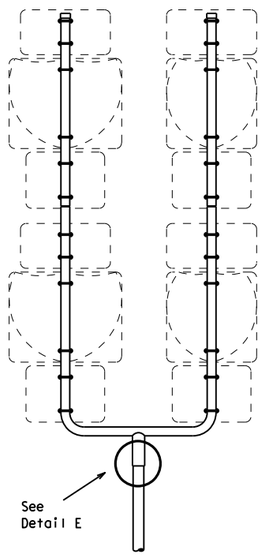
1.

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

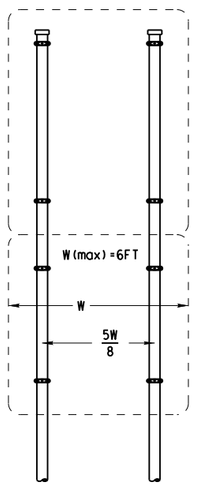
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

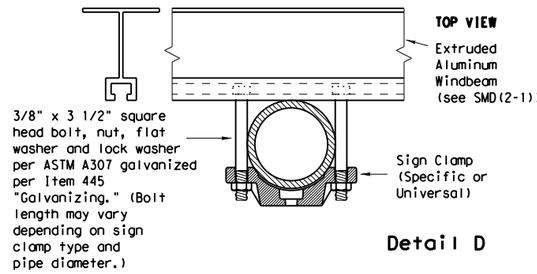


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

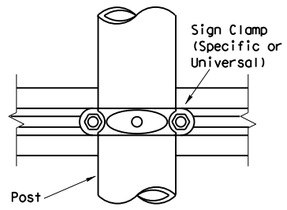


SM RD SGN ASSYM TY XXXXX(2)XX(P)

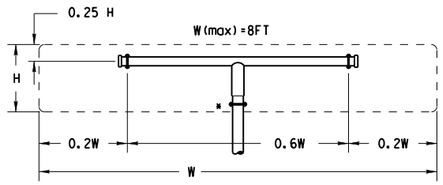
SIDE VIEW



Detail D



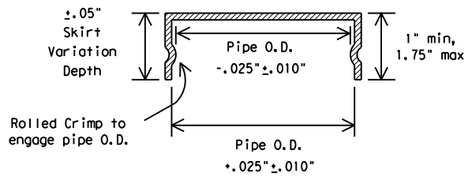
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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)



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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

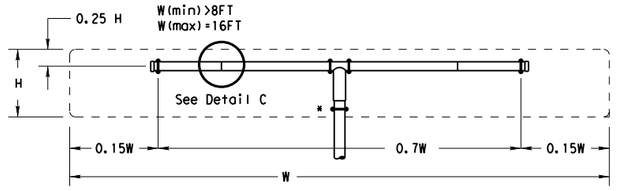
SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696
DIST	COUNTY		SHEET NO.
AUSTIN	LEE		125

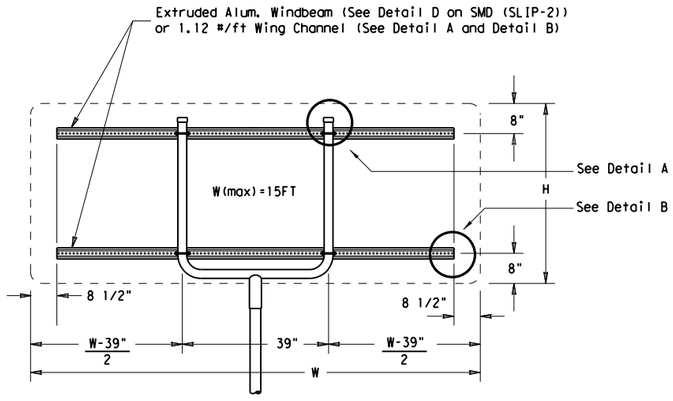
9-08 REVISIONS

DATE:
FILE:

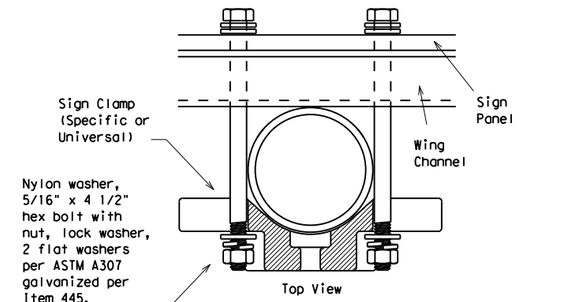
DATE:
FILE:



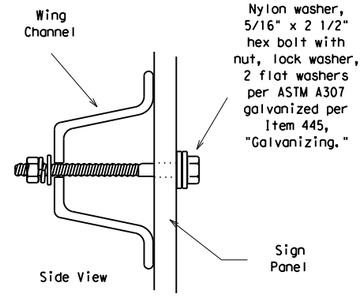
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



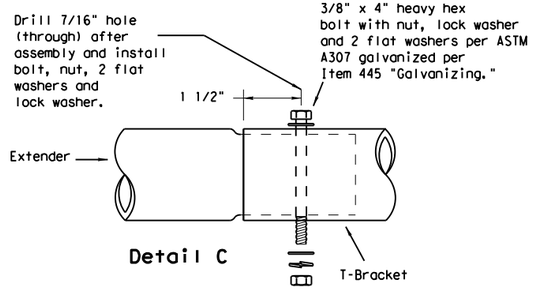
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail A

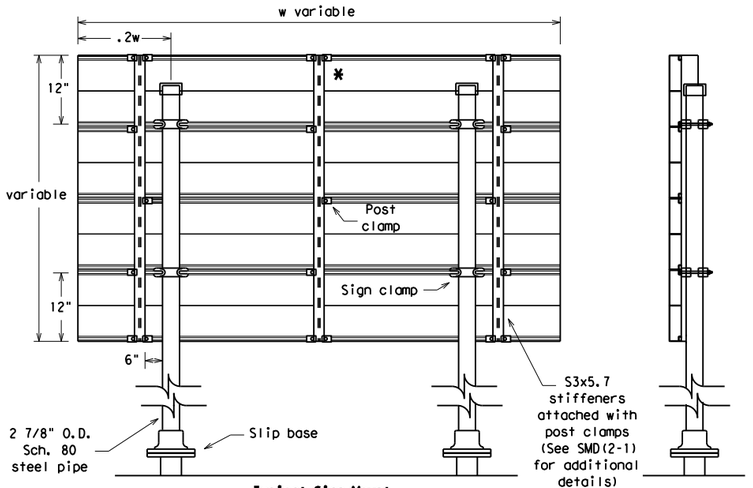


Detail B



Detail C

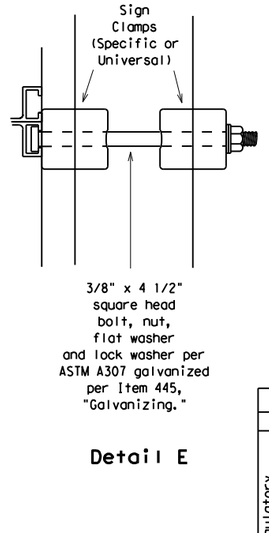
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

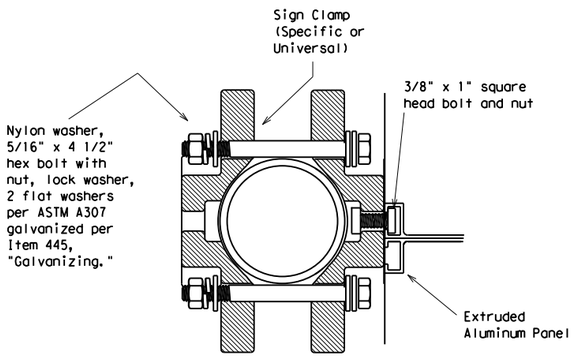
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

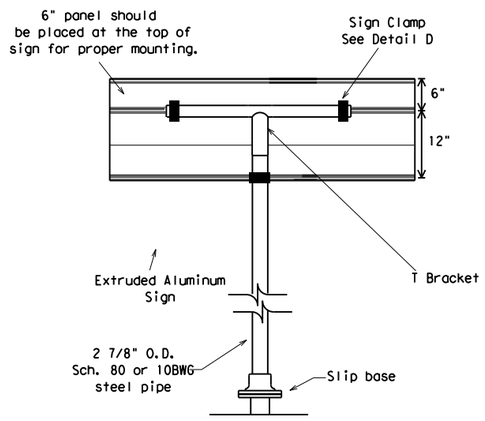


Detail E

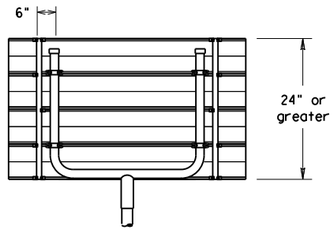
See Detail E
for clamp installation



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:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

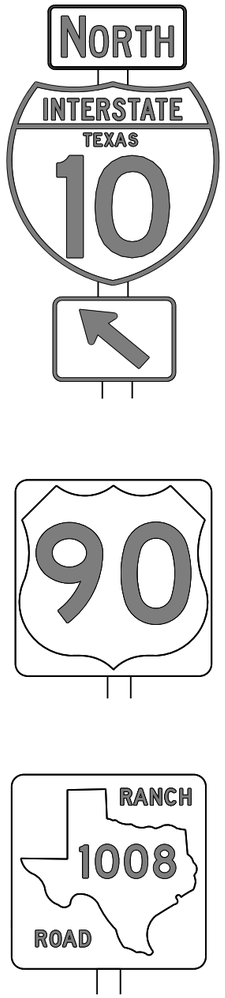
CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696

DIST	COUNTY	SHEET NO.
AUSTIN	LEE	126

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

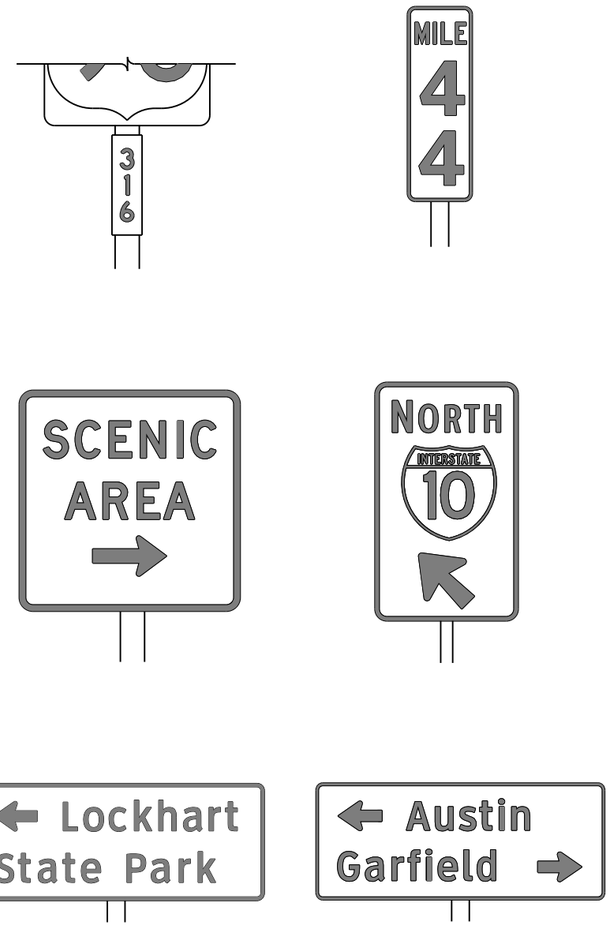
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

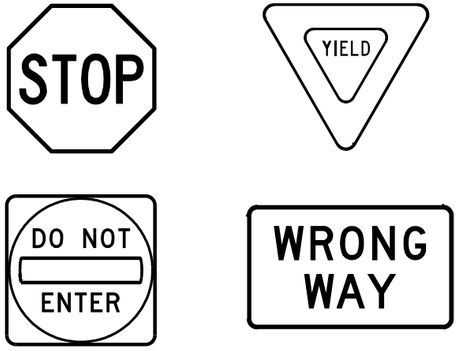
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUSTIN	LEE		127

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

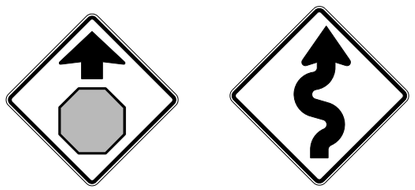
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

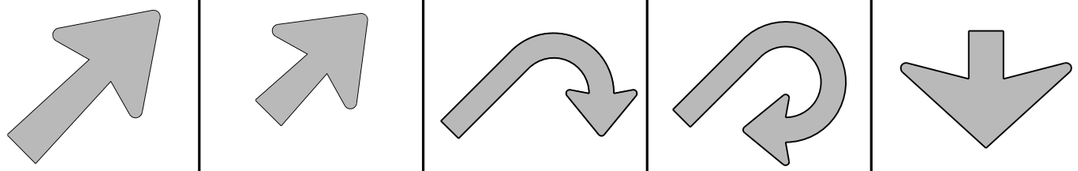
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUSTIN	LEE		128

DATE:
FILE:

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

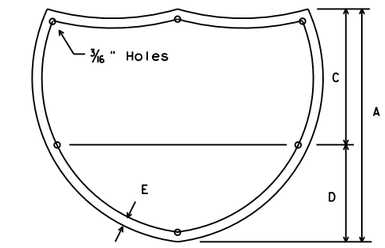
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

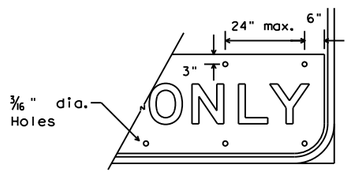
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

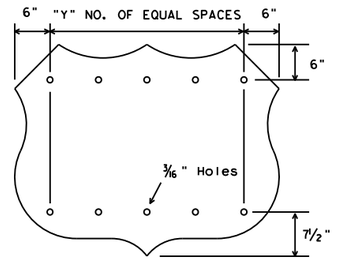


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

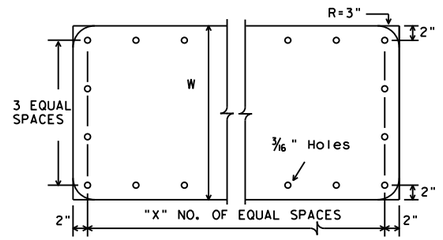


EXIT ONLY PANEL



U.S. ROUTE MARKERS

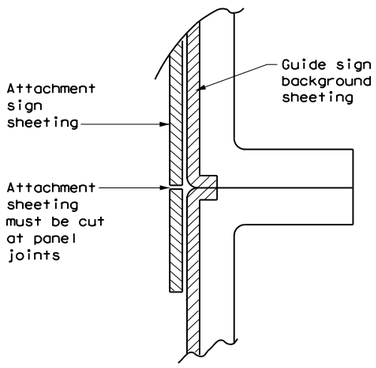
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

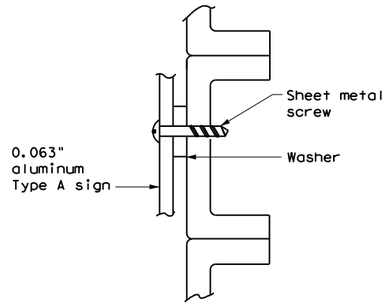
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



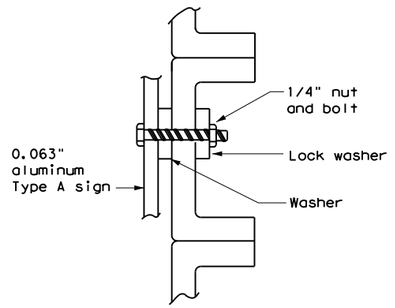
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



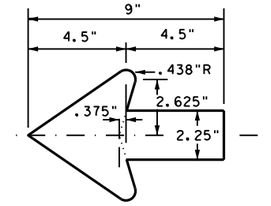
NUT/BOLT ATTACHMENT

NOTE:

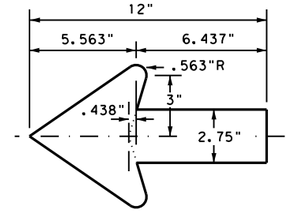
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

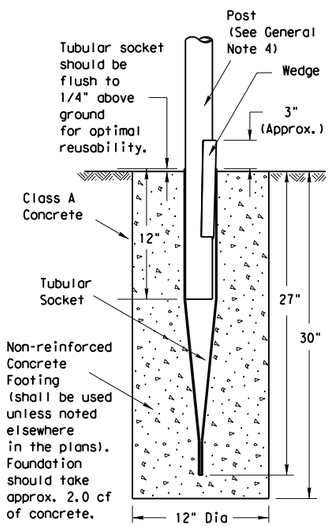
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

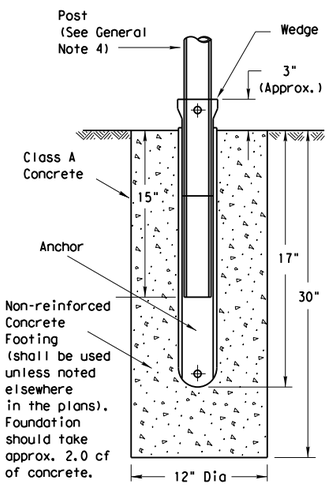
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUSTIN	LEE		129

Wedge Anchor Steel System



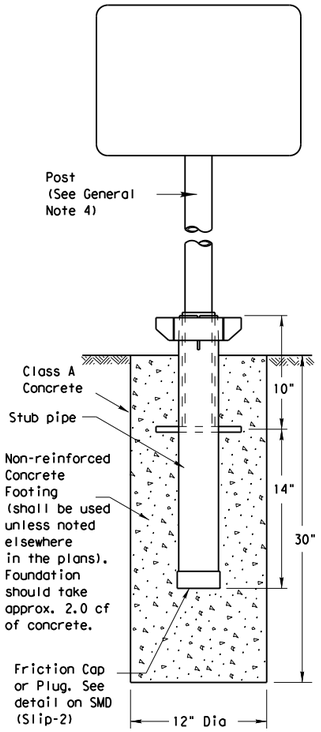
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

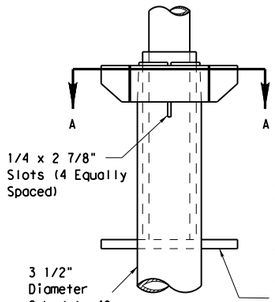


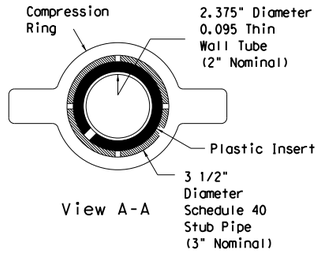
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



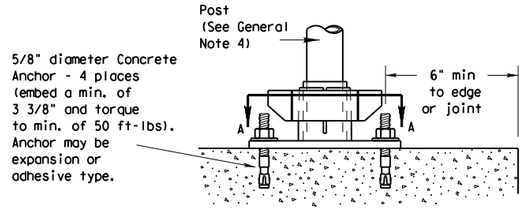
SM RD SGN ASSM TY TWT(X)UA(P)



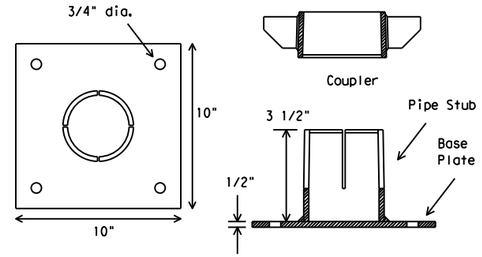


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

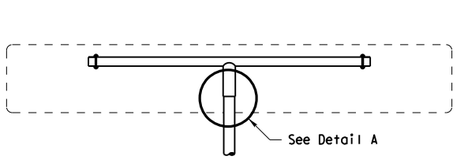


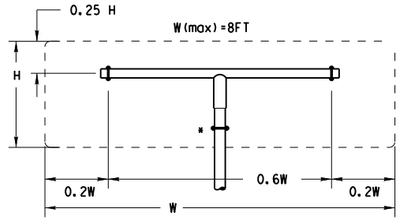
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



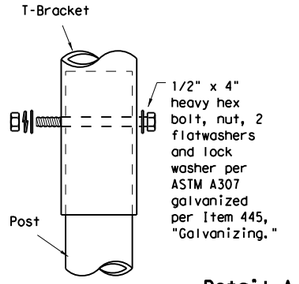
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
0334	03	021	FM 696
DIST	COUNTY		SHEET NO.
AUSTIN	LEE		130

26E

DATE:
FILE:

A. GENERAL SITE DATA

1. PROJECT LIMITS: *FROM FM 112 TO SL 123*
Project Length = 6.243 FEET = 1.182 MILES

2. PROJECT SITE MAPS:

- *Project Coordinates: Latitude: N 30° 24' 54.17" Longitude: W 97° 01' 47.37"*
- *Project Location Map: Shown on the Title Sheet.*
- *Drainage Patterns: Shown on Drainage Area Maps.*
- *Approx. Slopes Anticipated After Major Gradings or Areas of Soil Disturbance: Shown on Typical Sections.*
- *Major Controls and Locations of Erosion and Sediment Controls: Shown on "SW3P EROSION CONTROL" Sheets.*
- *Surface Waters and Discharge Locations: Shown on Drainage and Culvert Layout Sheets.*
- *Project Specific Locations (PSL): Off-site waste, borrow, or storage areas are not part of this SW3P.*

3. PROJECT DESCRIPTION:

CONSTRUCTION OF ADDITIONAL PAVEMENT WIDTH CONSISTING OF ADDING SHOULDERS, GUARDRAIL IMPROVEMENTS, AND SAFETY TREATMENT OF FIXED OBJECTS.

4. MAJOR SOIL DISTURBING ACTIVITIES:

PREPARING OF RIGHT-OF-WAY, GRADING, EXCAVATION AND EMBANKMENT OF ROADWAY, CONSTRUCTION OF CULVERT EXTENSIONS, AND TOPSOIL WORK FOR FINAL PLANTING AND SEEDING.

5. EXISTING AND PROPOSED CONDITIONS

Description of existing vegetative cover: Short to moderate native grasses, forage, and native brush of varying species.

Percentage of exisitng vegetative cover: 70.00%

Description of Soils: Site consists of moderately permeable soils consisting predominantly of fine sandy loams.

Site Acerage: 12.658 acres *Acerage Disturbed: 2.42 acres*

Pre-construciton Runoff Coefficient: 0.71 *Post-construction Runoff Coefficient: 0.78*

6. NAME OF RECEIVING WATERS:

____ *A classified stream does not pass through project.*
____ *A classified stream passes through project. Name:_____ Segment No._____*

Name of recieving waters that will recieve discharges from disturbed areas of project:

SHAW BRANCH CREEK

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

____ TEMPORARY SEEDING
____ MULCHING (Hay or Straw)
____ BUFFER ZONES
____ PLANTING
T SEEDING
T SODDING
____ PRESERVATION OF NATURAL RESOURCES
____ FLEXIBLE CHANNEL LINER
____ RIGID CHANNEL LINER
____ SOIL RETENTION BLANKET
____ COMPOST MANUFACTURED TOPSOIL
____ VERTICAL TRACKING
____ OTHER: *(Specify Practice)*

2. STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T SILT FENCES
____ EROSION CONTROL LOGS
____ EROSION CONTROL COMPOST BERMS (Low Velocity)
T ROCK FILTER DAMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
____ ROCK BEDDING AT CONSTRUCTION EXIT
____ TIMBER MATTING AT CONSTRUCTION EXIT
____ CHANNEL LINERS
____ SEDIMENT TRAPS
____ SEDIMENT BASINS
____ STORM INLET SEDIMENT TRAP
____ STONE OUTLET STRUCTURES
____ CURBS AND GUTTERS
____ STORM SEWERS
____ VELOCITY CONTROL DEVICES
____ OTHER: *(Specify Practice)*

NOTE: TOP OF BMP'S SHOULD NOT BE HIGHER THAN ROADWAY ELEVATION AS NOT TO FLOOD ROADWAY UNLESS PRIOR APPROVAL FROM ENGINEER IS OBTAINED.

3. STORM WATER MANAGEMENT:

Storm water drainage will be provided by existing roadside ditches, driveway culverts, and cross culverts. This system will carry drainage runoff within the ROW to low points in the ditch vertical profile where runoff will permeate through existing soils and vegetation.

5. NON-STORM WATER DISCHARGES:

Off-site discharges are prohibited except as follows:

1. *Discharges from fire-fighting activities and/or fire hydrant flushings.*
2. *Vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred. (unless all spilled material has been removed).*
3. *Plain water used in dust control activities.*
4. *Plain water originating from potable water sources.*
5. *Uncontaminated groundwater, spring water or accumulated stormwater.*
6. *Foundation or footing drains where flows are not contaminated with process materials such as solvents.*

Filter non-storm water discharges, or hold in retention basins, before being allowed to mix with storm water. These discharges consist of, but not limited to, non-polluted ground water, spring water, foundation or footing drain water, water used for dust control or pavement washing and vehicle washwater containing no detergents.

Any discharge of excess concrete or washout from concrete trucks should be prohibited or minimized on site. If allowed by the Engineer, they must be managed in a manner so as not to contaminate surface water. They must not be located in areas of concentrated flow. Concrete truck wash-out locations shall be field located as needed or as directed by the Engineer, added in the SW3P Layout and included in the inspections.

Hazardous material spills/leaks shall be prevented or minimized. At a minimum, this includes paints, acids, solvents, fuels, asphalt products, chemical additives for soil stabilization, and concrete curing compounds and additives. When storing hazardous material on the project site, or at a project specific location, BMPs shall be implemented to the storage areas of these products. All spills must be thoroughly cleaned and disposed of properly, and reported to the Engineer. Report any release at or above the reportable quantity during a 24 hour period to the National Response Center at 1-800-424-8802.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed before the next anticipated storm event but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by protecting storm sewer inlets.

2. INSPECTION:

For areas of the construction site that have not been finally stabilized, areas used for storage of materials, structural control measures, and locations where vehicles enter or exit the site, personnel provided by the permittee and familiar with the SW3P must inspect disturbed areas at least once every seven (7) days. The inspection must occor on a specifically defined day, regardless of whether or not there has been rainfall since the previous inspection. An Inspection and Maintenance Report shall be prepared for each inspection and the controls shall be revised on the SW3P within seven (7) calendar days following the inspection. In addition, the project site must be inspected after every 1/2-inch rainfall event. This inspection will be documented in the daily work reports.

3. WASTE MATERIALS:

All non-hazardous municipal waste materials such as litter, rubbish, trash, and garbage located on or originating from the project shall be collected and stored in a securely lidded metal dumpster, which shall be provided by the Contractor. The dumpster shall be emptied as necessary or as required by local regulation and the trash shall be hauled to a permitted disposal facility. The burying of non-hazardous municipal waste on project shall not be permitted. Construction material waste sites, stockpiles, and haul roads shall be constructed to minimize and control the amount of sediment that may enter recieving waters. Construction material waste sites shall not be located in any wetland, water body, or stream bed. Construction staging areas and vehicle maintenance areas shall be constructed in a manner to minimize the runoff of pollutants.

4. OFFSITE VEHICLE TRACKING:

Off-site vehicle tracking of sediments and the generation of dust shall be minimized by use of dust control practices such as dampening of haul roads, and the utilization of contruction exits/entrances. Excess sediments on the paved roadways abutting and traversing the project site shall be removed daily with a power broom or vacuum type sweeper, as directed/approved by the Engineer.

5. HAZARDOUS WASTE & SPILL REPORTING:

The contractor may not store fuels and hazardous substances on-site during construction operations.

HOTLINE: 1-800-832-8224

Reportable Quantities:
(RQ) For petroleum/hydrocarbon liquids: 25 GAL - on land.
(RQ) For petroleum/hydrocarbon liquids: "creating a sheen" - on water

6. SANITARY WASTE:

All sanitary waste will be collected from the portable units as necessary or as requried by a licensed sanitary waste management contractor.

7. OTHER

1. *See the EPIC sheet for additional environmental information.*
2. *Update the SW3P sheets as necessary.*

KCI TECHNOLOGIES
Engineers
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15021 Katy Freeway, Suite 200
Houston, TX 77094
Phone: 832.975.1565
www.kci.com
TBPE Registration No. F-10573

Texas Department of Transportation

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
			FM 696
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	AUS	LEE	
CONTROL	SECTION	JOB	
0334	03	021	131

DATE:
FILE:

DATE:
FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1.

☐ 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.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

IV. VEGETATION RESOURCES

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

☐ No Action Required ☒ Required Action

Action No.

1. COMPLY WITH EXECUTIVE ORDER 13112 ON INVASIVE SPECIES IF AND WHEN APPLICABLE.

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. SEE THE SPECIAL PROVISION FOR MIGRATORY BIRDS IN ITEM 7 OF THE GENERAL NOTES
2. EMPLOY BMPS FOR THE FOLLOWING SPECIES OF GREATEST CONSERVATION NEED:
   * BMP FOR THE PLAINS SPOTTED SKUNK, AMERICAN BADGER, ARANSAS SHORT-TAILED SHREW, EASTERN SPOTTED SKUNK, SOUTHERN SHORT-TAILED SHREW, AND WOODLAND VOLE
     . CONTRACTORS WILL BE ADVISED OF POTENTIAL OCCURRENCE WITHIN THE PROJECT AREA, AND TO AVOID HARMING THE SPECIES IF ENCOUNTERED, AND TO AVOID UNNECESSARY IMPACT TO DENS.
   * BAT BMP FOR THE EASTERN RED BAT AND MEXICAN FREE -TAILED BAT
     . all bat surveys and other activities that include direct contact with bats shall comply with tpwd recommended white-nose syndrome protocols located on the tpwd wildlife habitat assessment program website under "project design and construction".
     . THE FOLLOWING SURVEY AND EXCLUSION PROTOCOLS SHOULD BE FOLLOWED PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES. FOR THE PURPOSE OF THIS DOCUMENT, STRUCTURES ARE DEFINED AS BRIDGES, CULVERTS(CONCRETE OR METAL), WELLS, AND BUILDINGS.
     . For activities that have the potential to impact structures, cliffs or caves, or trees; a qualified biologist will perform a habitat assessment and occupancy survey of the feature(s) with roost potential as early in the planning process as possible or within one year before project letting.
     . For roosts where occupancy is strongly suspected but unconfirmed during the initial survey, revisit feature(s) at most four weeks prior to scheduled disturbance to confirm absence of bats.
     . If bats are present or recent signs of occupation (i.e., piles of guano, distinct musky odor, or staining and rub marks at potential entry points) are observed, take appropriate measures to ensure that bats are not harmed, such as implementing non-lethal exclusion activities or timing or phasing of construction.
     . Retain mature, large diameter hardwood forest species and native/ornamental palm trees where feasible.
     . In all instances, avoid harm or death to bats. Bats should only be handled as a last resort and after communication with TPWD.
   * Terrestrial Reptile BMPs for timber rattlesnake, eastern box turtle, slender glass lizard, western box turtle
     . Inform contractors that if reptiles are found on project site allow species to safely leave the project area.
     . Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible. However, they will remove large vegetation from the clear zone for safety reasons.
     . Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered.

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

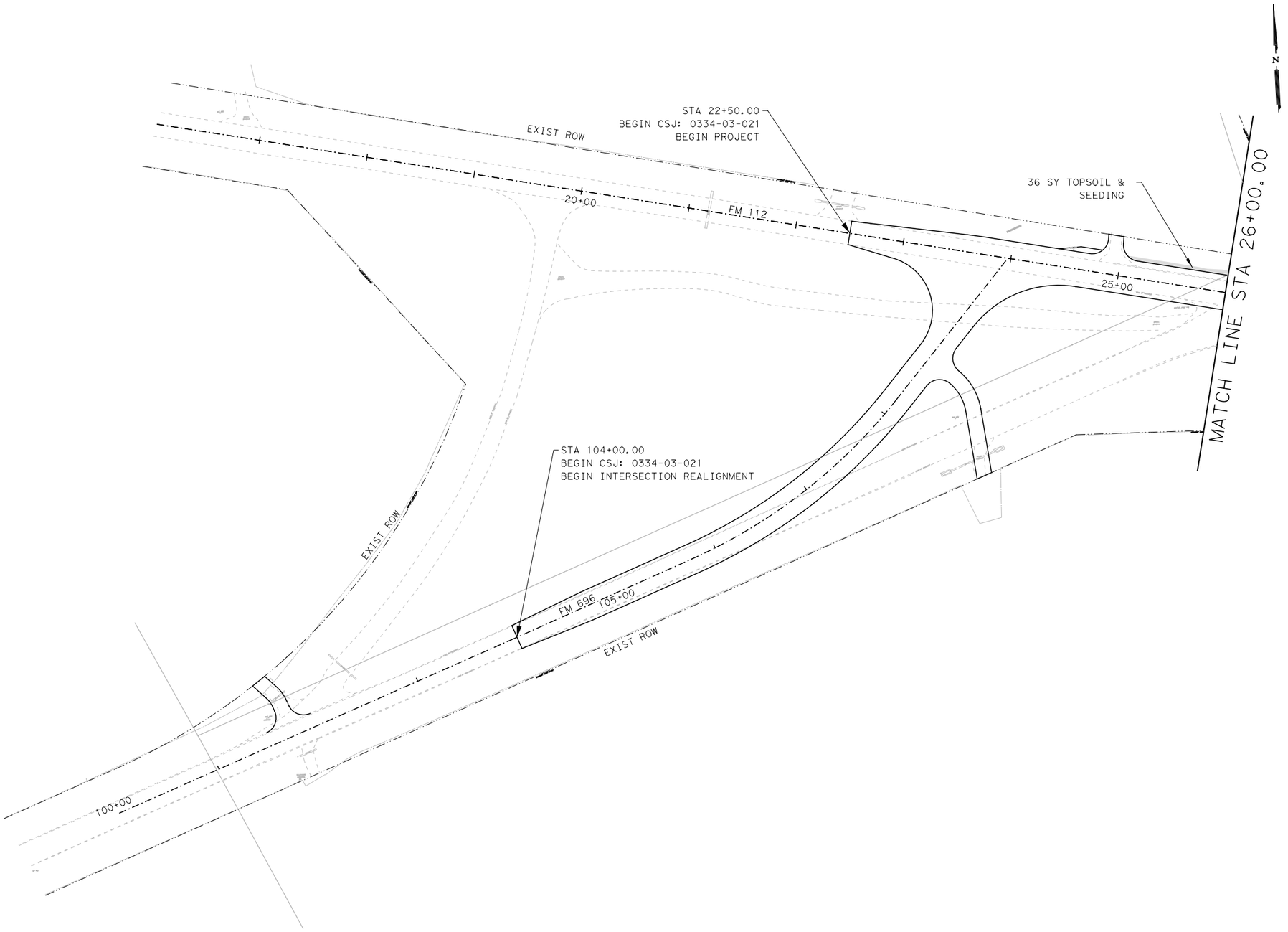
Action No.

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	0334	03	021	FM 696	
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	AUS	LEE		132	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					



LEGEND

- TEMPORARY SEDIMENT CONTROL FENCE (SCF)
- TEMPORARY ROCK FILTER DAM (TY 2) (RFD)
- PROPOSED SOIL RETENTION BLANKETS, TOPSOIL & SEEDING
- FLOW DIRECTION

NOTE TO CONTRACTOR:

CONTRACTOR WILL MAINTAIN POSITIVE DRAINAGE.

(XXX) REPRESENTS DEVICE DESIGNATION.

INSTALL EROSION CONTROL DEVICES PRIOR TO THE START OF ANY CONSTRUCTION AND KEEP IN PLACE UNTIL CONSTRUCTION IS COMPLETE.

PROTECT ALL INLETS AND JUNCTION BOXES WITHIN PROJECT LIMITS OR AFFECTED BY CONSTRUCTION DEBRIS AT ALL TIMES.

INSTALLATION, MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES WILL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.

0′ 25′ 50′ 100′

DISTURBED DATES:_____

STABILIZED DATES:_____

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK R. LITZMANN
92129
LICENSED
PROFESSIONAL ENGINEER

01/28/2021

Mark R. Litzmann, P.E.

KCI TECHNOLOGIES
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TBPE Registration No. F-10573

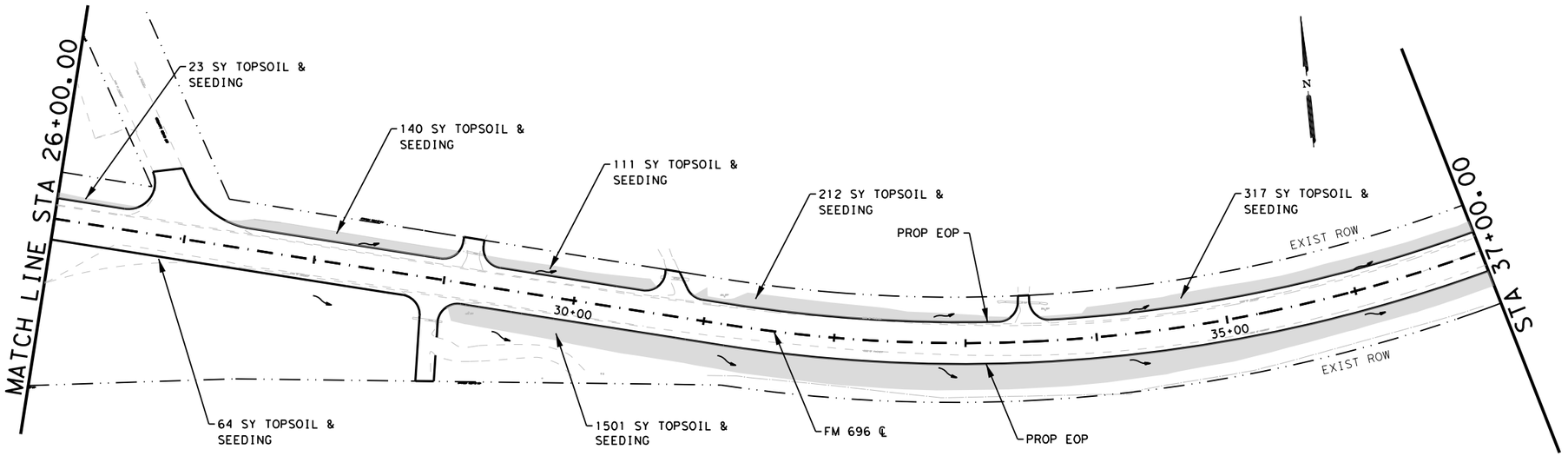
Texas Department of Transportation

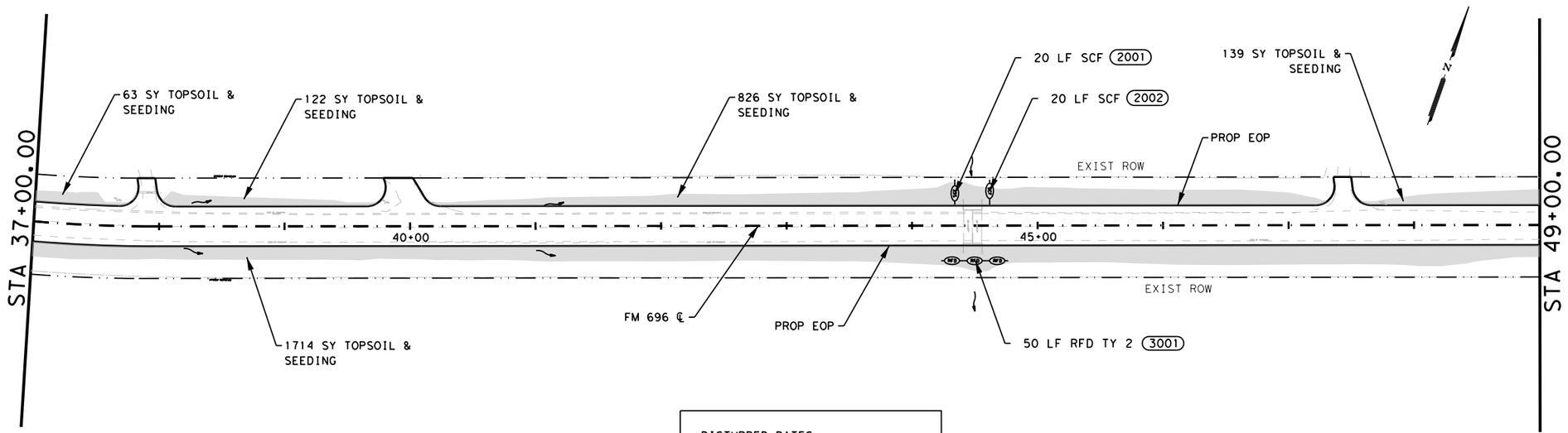
LEE COUNTY
FM 696

EROSION CONTROL LAYOUT

SHEET 1 OF 4

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	133





DISTURBED DATES:_____

STABILIZED DATES:_____

LEGEND

- TEMPORARY SEDIMENT CONTROL FENCE
- TEMPORARY ROCK FILTER DAM (TY 2)
- PROPOSED SOIL RETENTION BLANKETS, TOPSOIL & SEEDING
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0' 25' 50' 100'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
Mark W. Litzmann, P.E.

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Texas Department of Transportation

LEE COUNTY
FM 696

EROSION CONTROL LAYOUT

SHEET 2 OF 4

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
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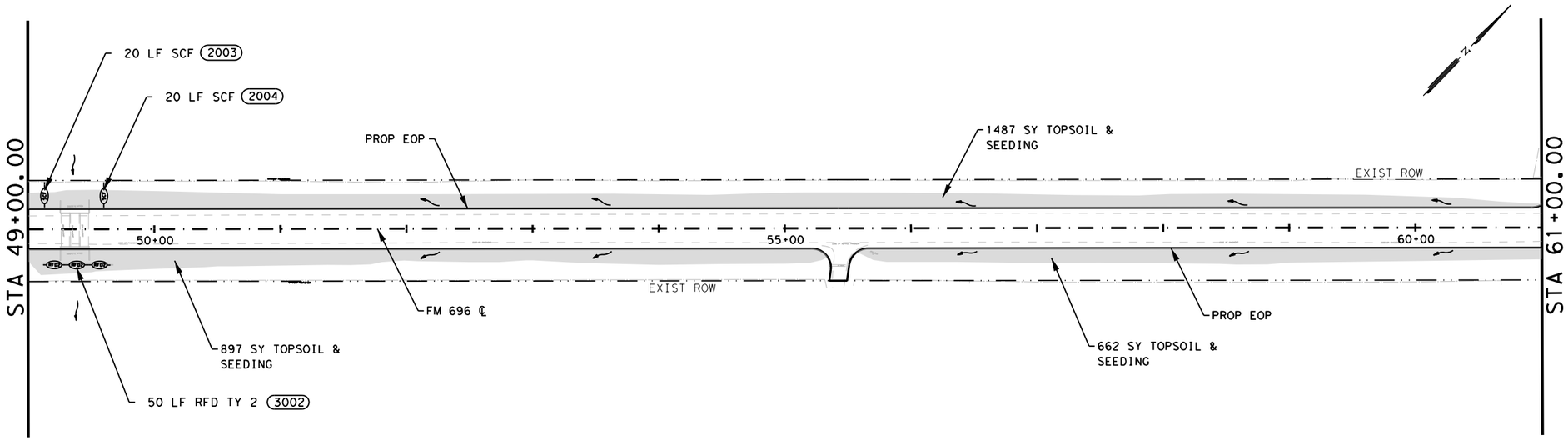

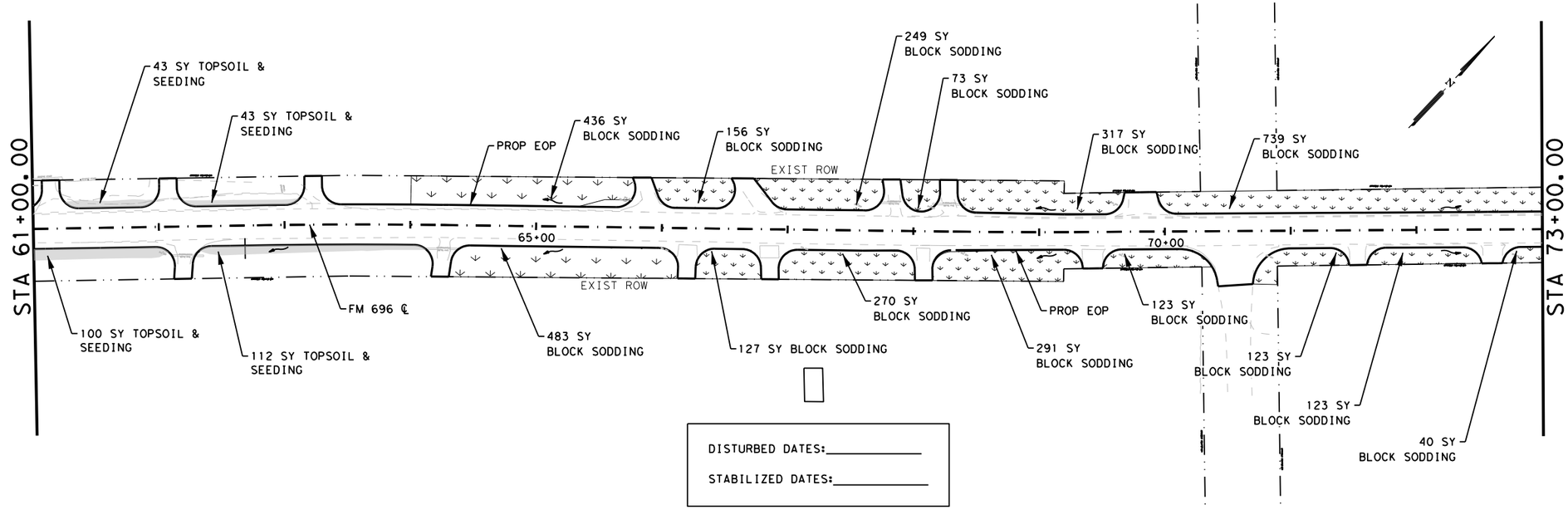

LEGEND

- TEMPORARY SEDIMENT CONTROL FENCE
- TEMPORARY ROCK FILTER DAM (TY 2)
- PROPOSED SOIL RETENTION BLANKETS, TOPSOIL & SEEDING
- FLOW DIRECTION
- BLOCK SODDING

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DISTURBED DATES:_____

STABILIZED DATES:_____

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020
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Texas Department of Transportation

LEE COUNTY
FM 696

EROSION CONTROL LAYOUT

SHEET 3 OF 4

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
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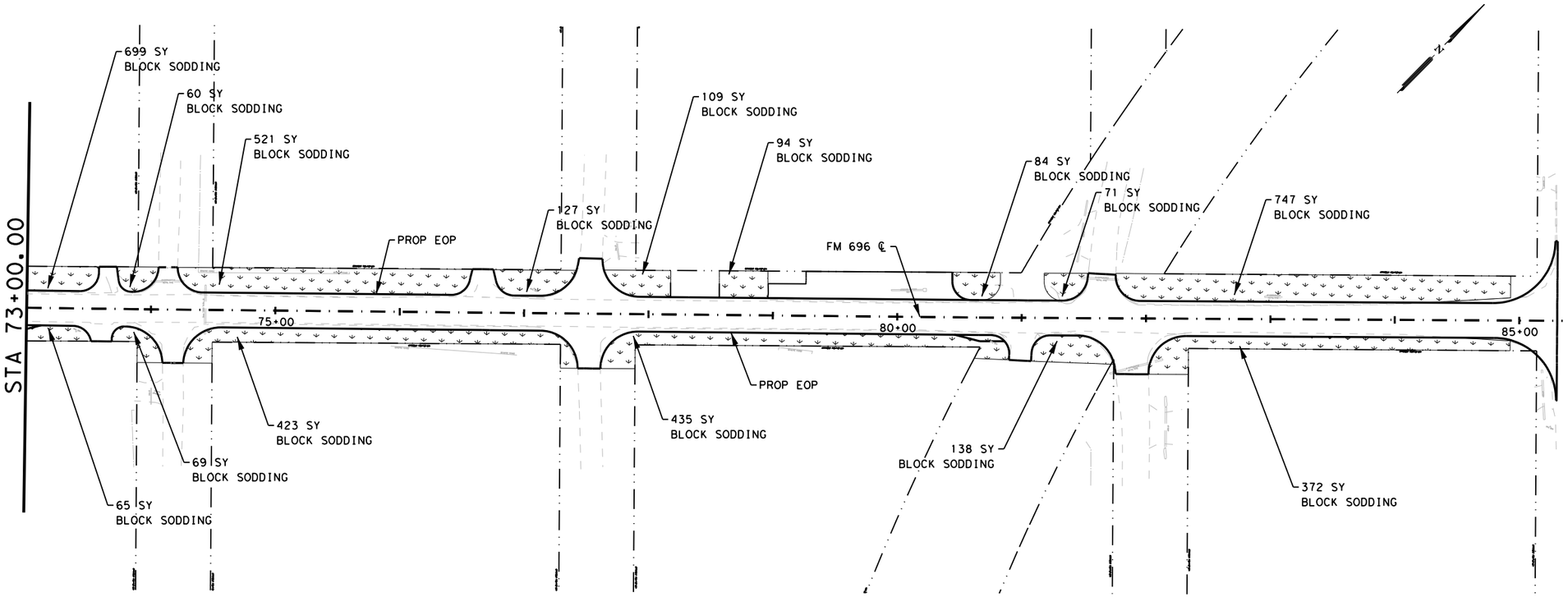

LEGEND

- TEMPORARY SEDIMENT CONTROL FENCE
- TEMPORARY ROCK FILTER DAM (TY 2)
- PROPOSED SOIL RETENTION BLANKETS, TOPSOIL & SEEDING
- FLOW DIRECTION
- BLOCK SODDING

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NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
MARK W. LITZMANN
62129
LICENSED PROFESSIONAL ENGINEER
10.23.2020

Mark W. Litzmann, P.E.

ENGINEERS
PLANNERS
SURVEYORS
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Texas Department of Transportation

LEE COUNTY
FM 696

EROSION CONTROL LAYOUT

SHEET 4 OF 4

FED.RD. DIV.NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	STP ( )			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
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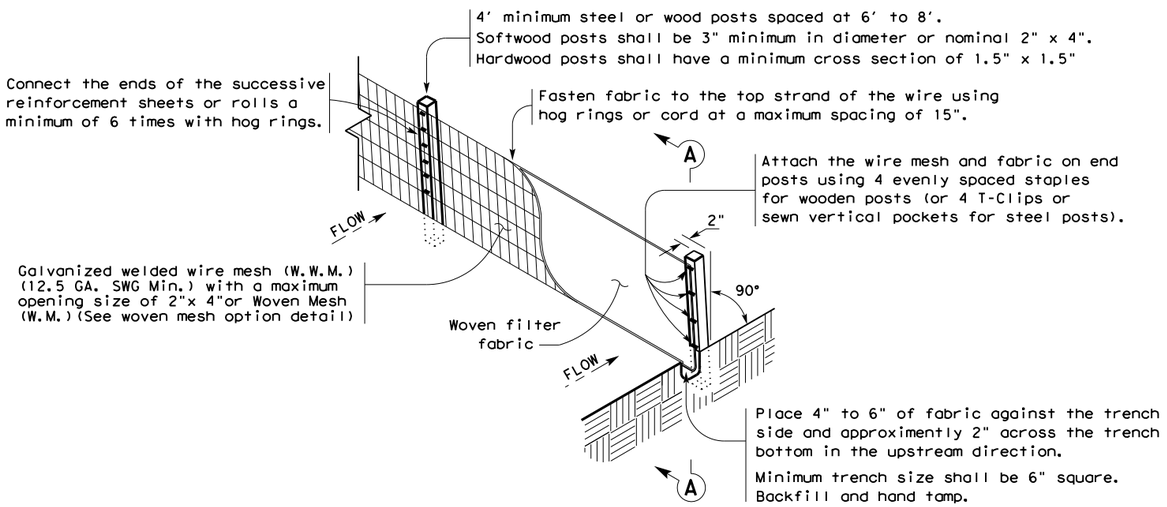
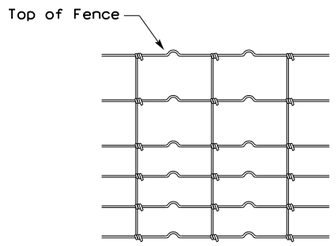
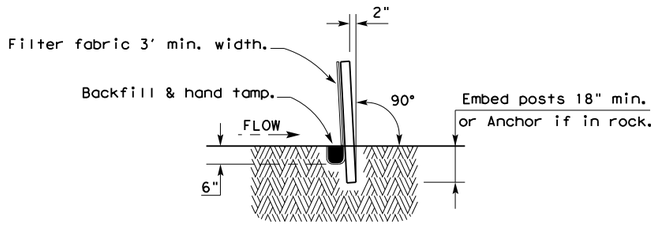


TEMPORARY SEDIMENT CONTROL FENCE

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.

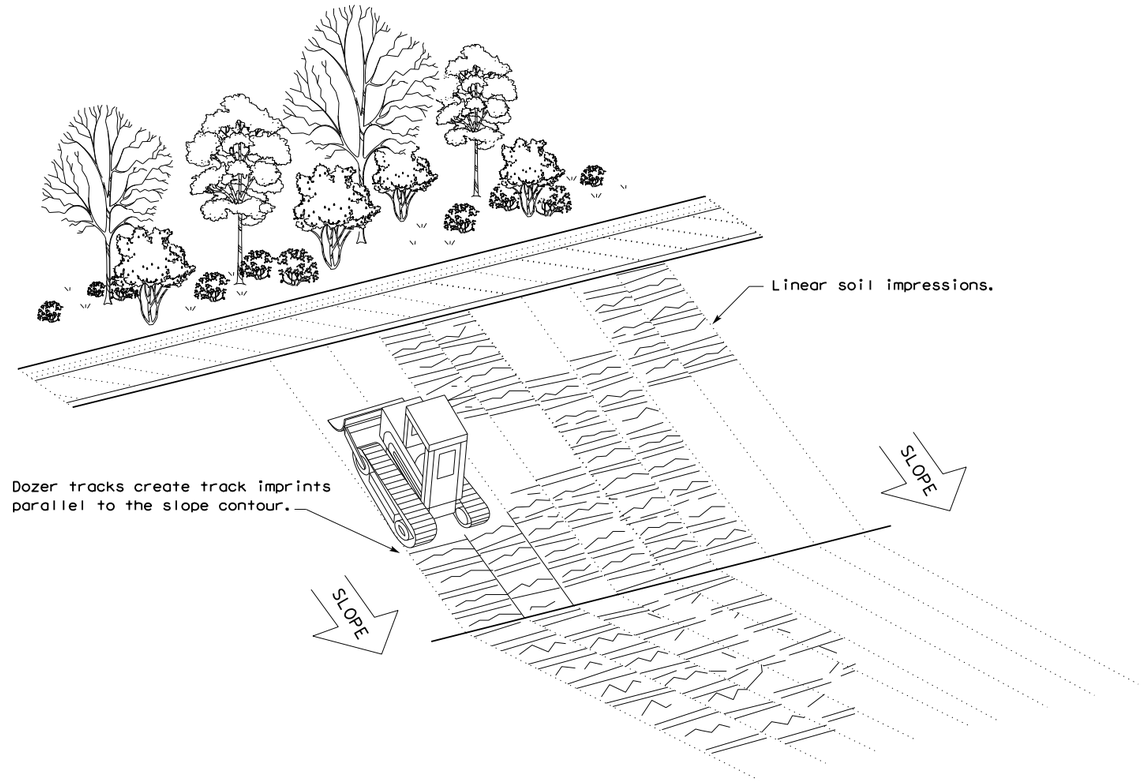
LEGEND

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	0334	03	021		FM 696	
	DIST		COUNTY			SHEET NO.
	AUSTIN		LEE			137

DATE
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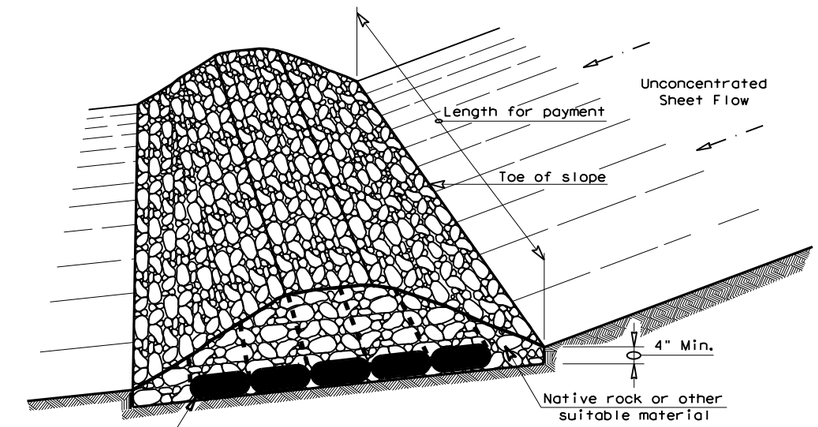
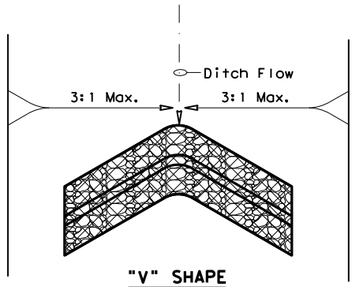
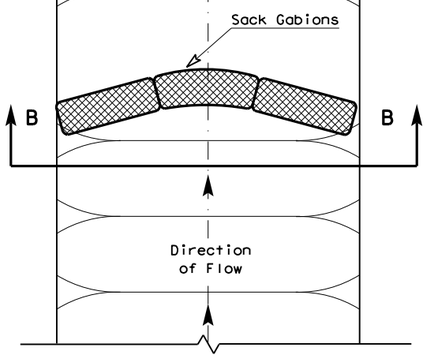


FILTER DAM AT TOE OF SLOPE

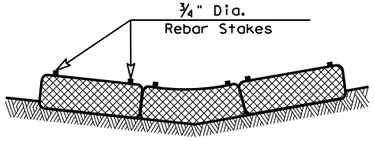
RFD1



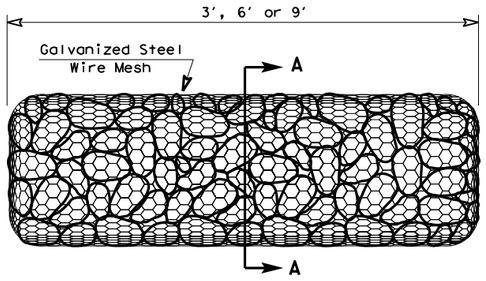
"V" SHAPE PLAN VIEW



PLAN VIEW

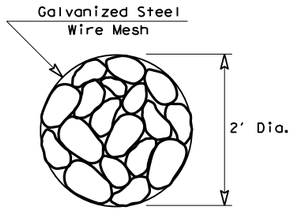


SECTION B-B

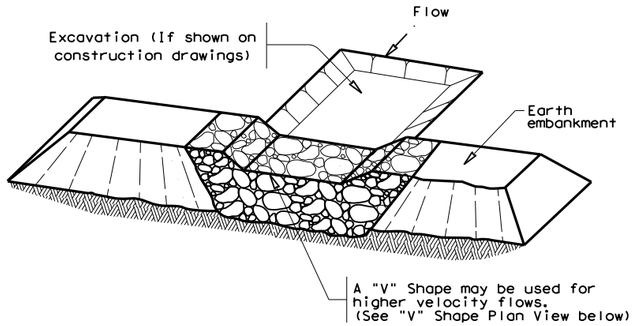


TYPE 4 (SACK GABIONS)

RFD4

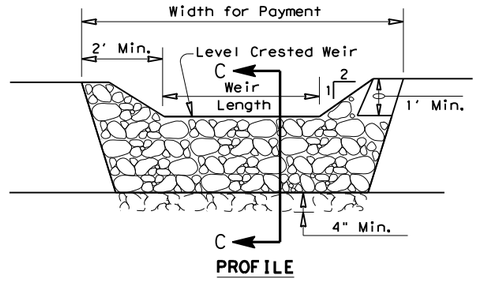


SECTION A-A

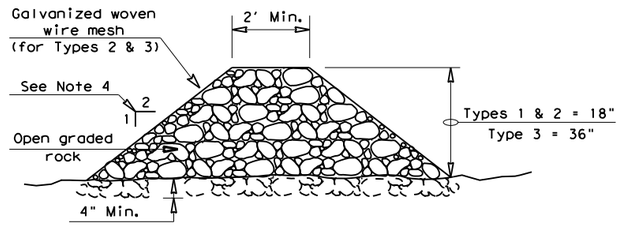


FILTER DAM AT SEDIMENT TRAP

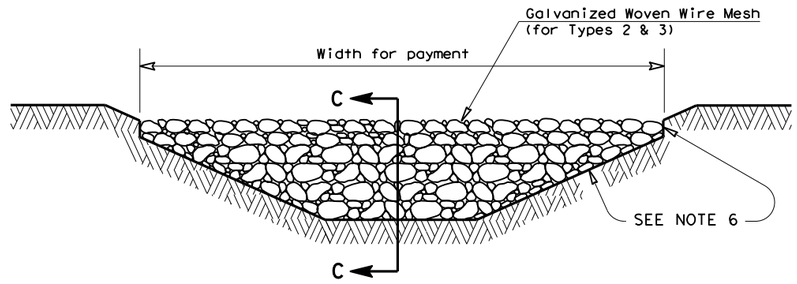
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

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.

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

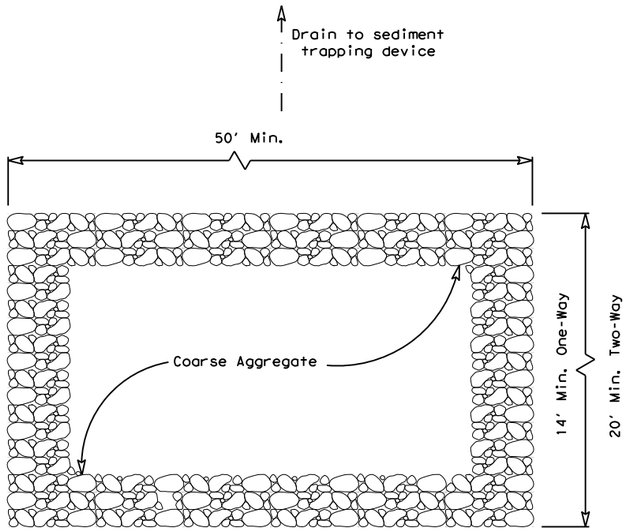
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

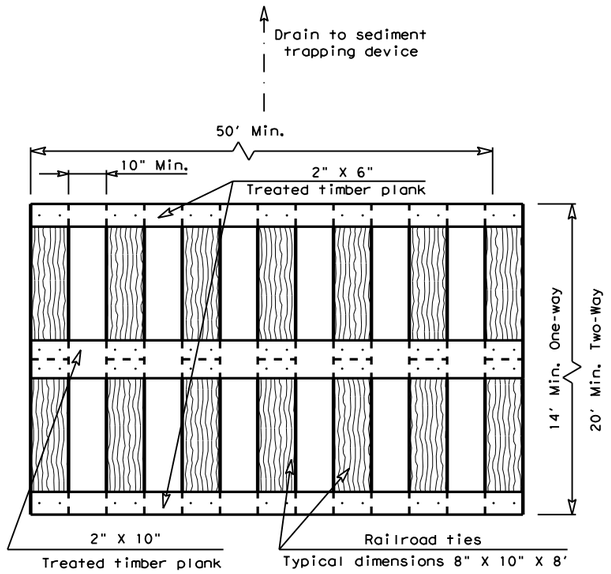
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0334	03	021	FM 696	
	DIST	COUNTY		SHEET NO.	
	AUSTIN	LEE		138	

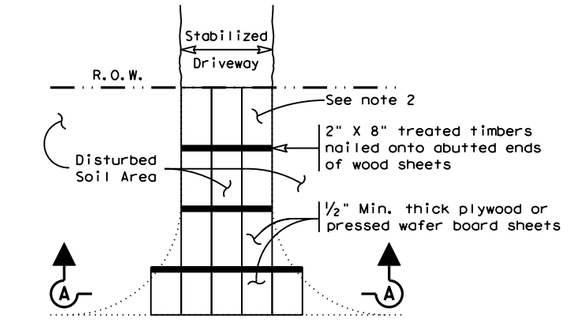
DATE: $DATE$
FILE: $FILE$



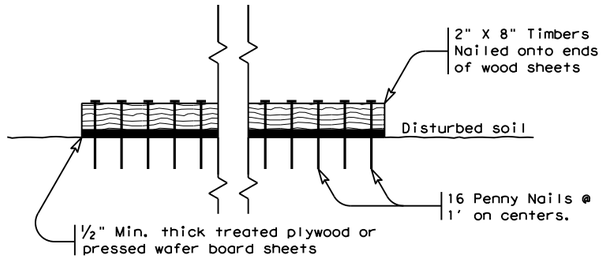
PLAN VIEW



PLAN VIEW



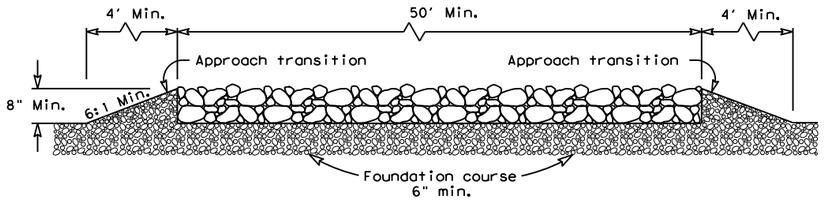
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

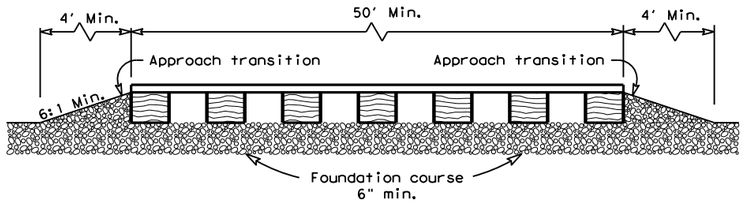
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

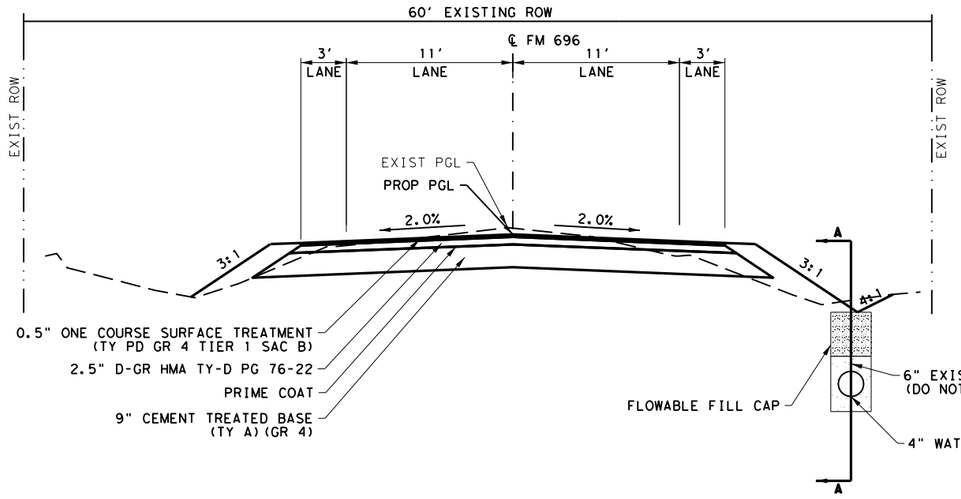
Design Division Standard

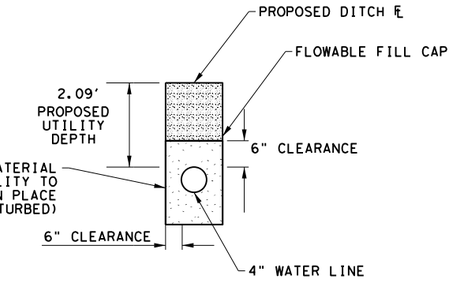
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0334	03	021	FM 696
	DIST	COUNTY		SHEET NO.
	AUSTIN	LEE		139





SECTION A-A

NOTE:
EXISTING UTILITY DEPTHS WERE OBTAINED THROUGH CITY OF LEXINGTON PUBLIC WORKS POT-HOLING WATER LINE

UTILITY TYPICAL SECTION (4" WATER LINE)

STA 75+00.00

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
11.05.2020
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UTILITY TYPICAL SECTION

CITY OF LEXINGTON 4" WATER LINE

SCALE: NTS

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HWY NO.
X	TEXAS	XX			FM 696
STATE DIST NO	COUNTY	CONT.	SECT.	JOB	SHEET NO.
AUSTIN	LEE	0334	03	021	140