

CONT	SECT	JOB	HIGHWAY
2690	01	038	FM 971
DIST		COUNTY	SHEET NO.
AUS		WILLIAMSON	1

STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

STATE PROJECT NUMBER
C 2690 -1 -38
CSJ: 2690-01-038

NET LENGTH OF PROJECT = 11,056.80 FEET = 2.09 MILES
 ROADWAY = 11,026.42 FEET = 2.08 MILES
 BRIDGE = 30.38 FEET = 0.01 MILES

WILLIAMSON COUNTY FM 971

FROM: 6.704 MILES EAST OF SH 130
TO: CR 333

CONSISTING OF: REHABILITATE PAVEMENT, ADD SHOULDERS & SAFETY TREAT

DESIGN SPEED

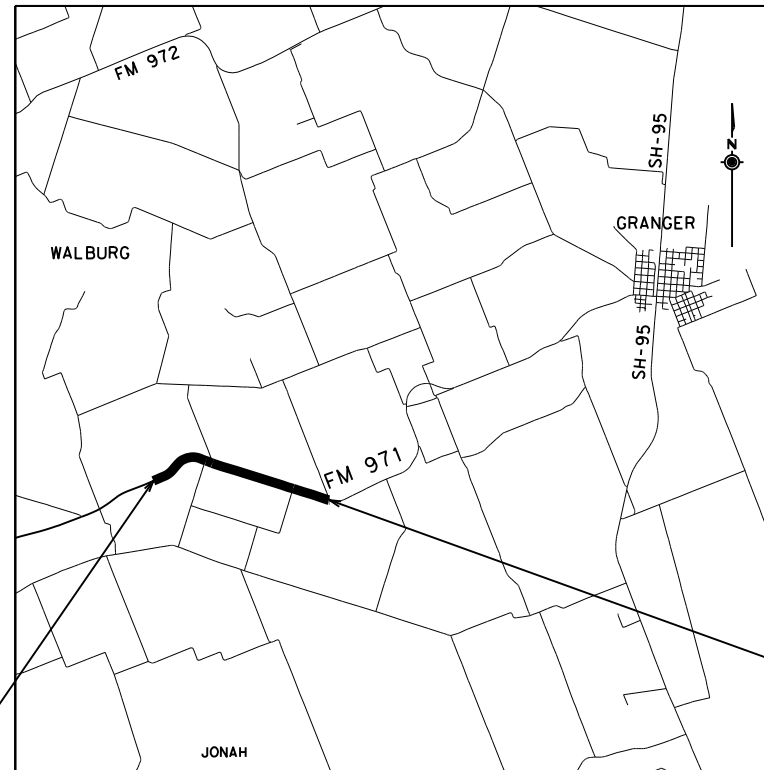
MAIN LANES: 40 MPH
FRONTAGE ROADS: NA
RAMPS: NA
A. D. T.
2020: 1,682 VPD
2040: 2,355 VPD

FINAL PLANS

DATE OF LETTING: _____
DATE WORK BEGAN: _____
DATE WORK COMPLETED AND ACCEPTED: _____
FINAL CONTRACT COST: \$ _____
CONTRACTOR: _____
LIST OF APPROVED CHANGE ORDERS:

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

AREA ENGINEER P. E. DATE



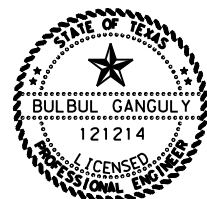
BEGIN PROJECT
CSJ: 2690-01-038
STA 458+00.00
REF MRKR: 548-0.619
MILE PT: 8.579
DFO: 8.579

END PROJECT
CSJ: 2690-01-038
STA 568+56.80
REF MRKR: 550-0.841
MILE PT: 10.65
DFO: 10.65

LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: STA 493+26.00

11/9/2022



DocuSigned by:
Bulbul Ganguly
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END PROJECT
CSJ: 2690-01-038
STA 568+56.80
REF MRKR: 550-0.841
MILE PT: 10.65
DFO: 10.65

SUBMITTED FOR LETTING: 11/29/2022

DocuSigned by:
J.P.C. P.E.
089654558998492
AREA ENGINEER

RECOMMENDED FOR LETTING: 11/30/2022

DocuSigned by:
Angelio L. Garcia, P.E.
BA9745A0D6C4400
for DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING: 11/30/2022

DocuSigned by:
Heather Ashby-Nguyen
8912AF18F45A416
DIRECTOR OF TRANSPORTATION
PLANNING & DEVELOPMENT

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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).

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DRAINAGE DETAILS STANDARDS

MC - MD
MC-8-13-1
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SCC-3 & 4-1/2
SCC-3 & 4-2/2
SCC-7-1/2
SCC-7-2/2
SCC-9-1/2
SCC-9-2/2
SCP-3
SCP-7
SCP-9
SCP-MD
PW
CH - PW - 0
CH - PW - S
FW-S
SETP-CD-1/2
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SETP-PD
ECD

SIGNING AND PAVEMENT MARKING

SIGNING AND PAVEMENT MARKING LAYOUT
SUMMARY OF SMALL SIGNS
SMALL SIGN DETAILS

SIGNING AND PAVEMENT MARKING STANDARDS

PM (1) - 20
PM (2) - 20
PM (3) - 20
D & OM (1) - 20
D & OM (2) - 20
D & OM (3) - 20
D & OM (4) - 20
D & OM (5) - 20
D & OM (6) - 20
D & OM (VIA) - 20
SMD (GEN) - 08
SMD (SLIP - 1) - 08
SMD (SLIP - 2) - 08
SMD (SLIP - 3) - 08
SMD (TWT) - 08
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FGA-15

ENVIRONMENTAL ISSUES

STORMWATER POLLUTION PREVENTION PLAN (SW3P)
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)
EROSION CONTROL LAYOUT

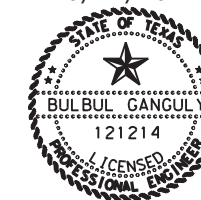
ENVIRONMENTAL ISSUES STANDARDS

EC (1) - 16
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RAILROAD EXHIBIT A

RAILROAD SCOPE OF WORK
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10/17/2022



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Bulbul Ganguly

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>> THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THIS PROJECT.

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Bulbul Ganguly

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BULBUL GANGULY, P.E.

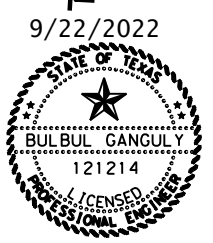
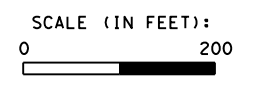
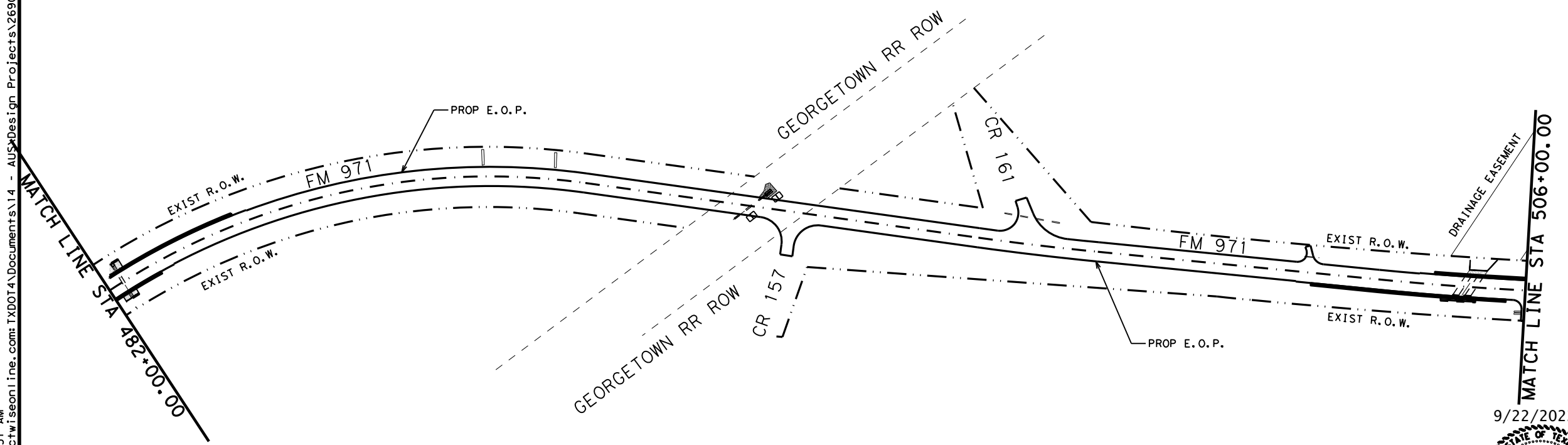
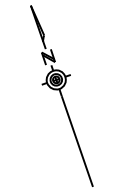
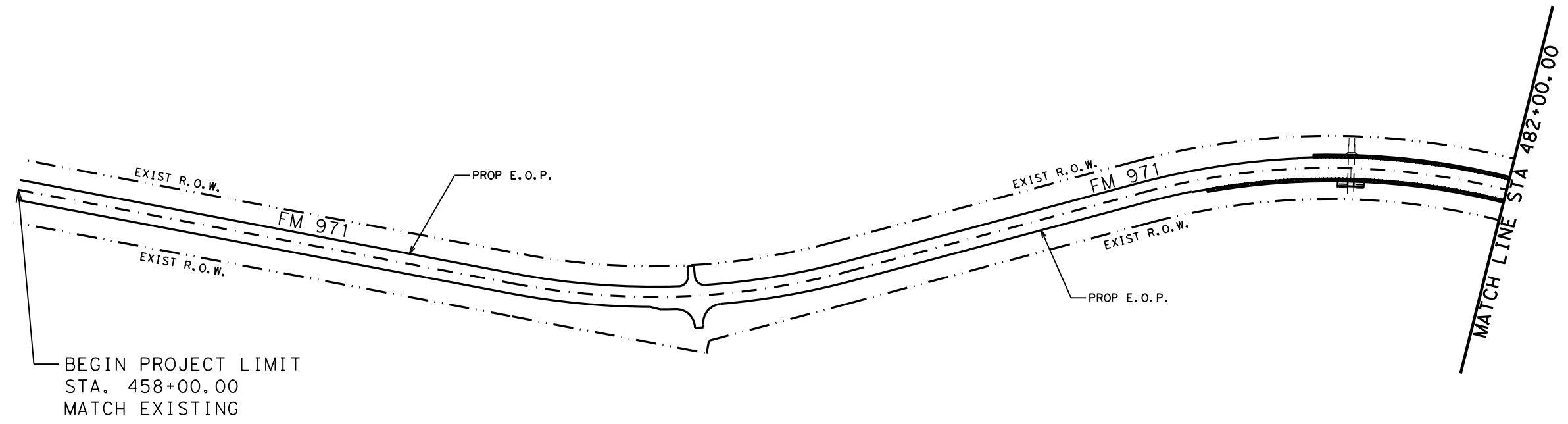
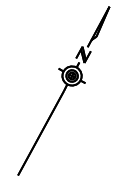
P. E.

10/17/2022

DATE

Austin District Central Design				
FM 971 INDEX OF SHEETS				
© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		2

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**Austin District
Central Design**

Texas Department of Transportation

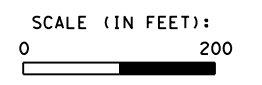
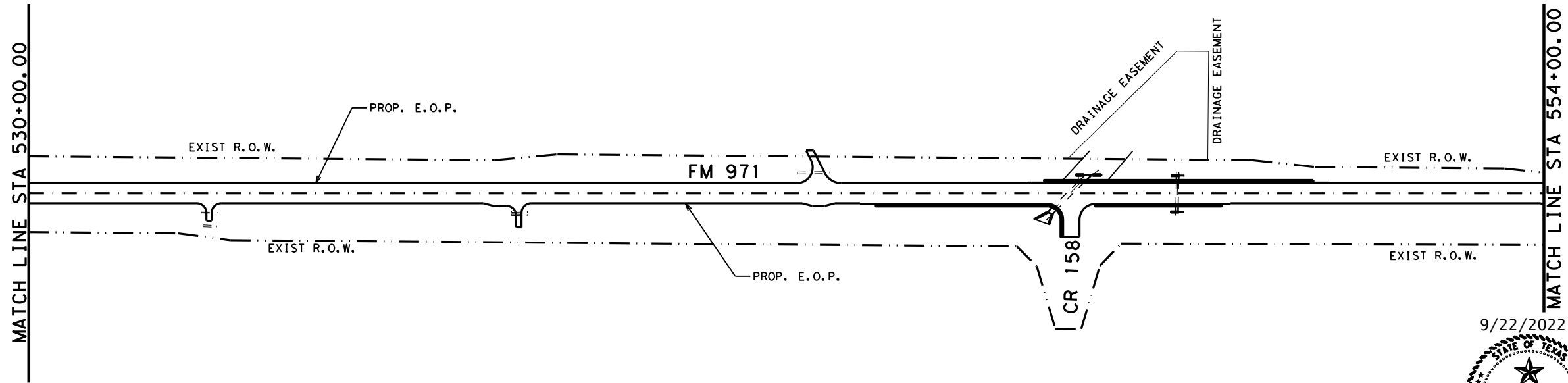
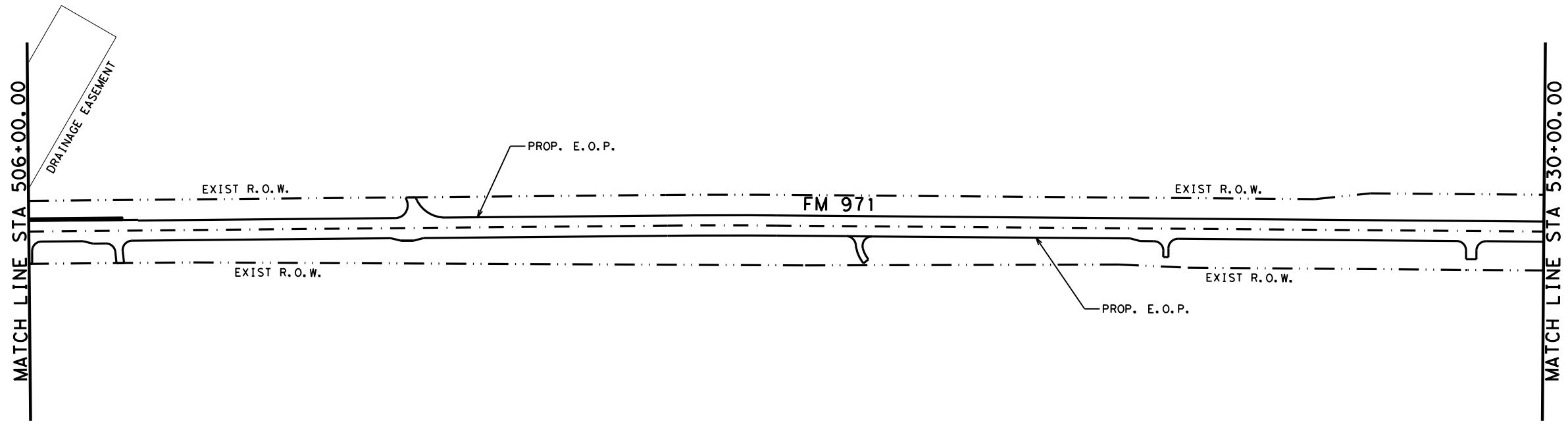
**FM 971
PROJECT LAYOUT
STA. 458+00.00-
STA. 506+00.00**

SHEET 1 OF 3

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	AUS		WILLIAMSON	3

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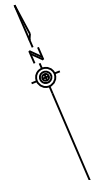
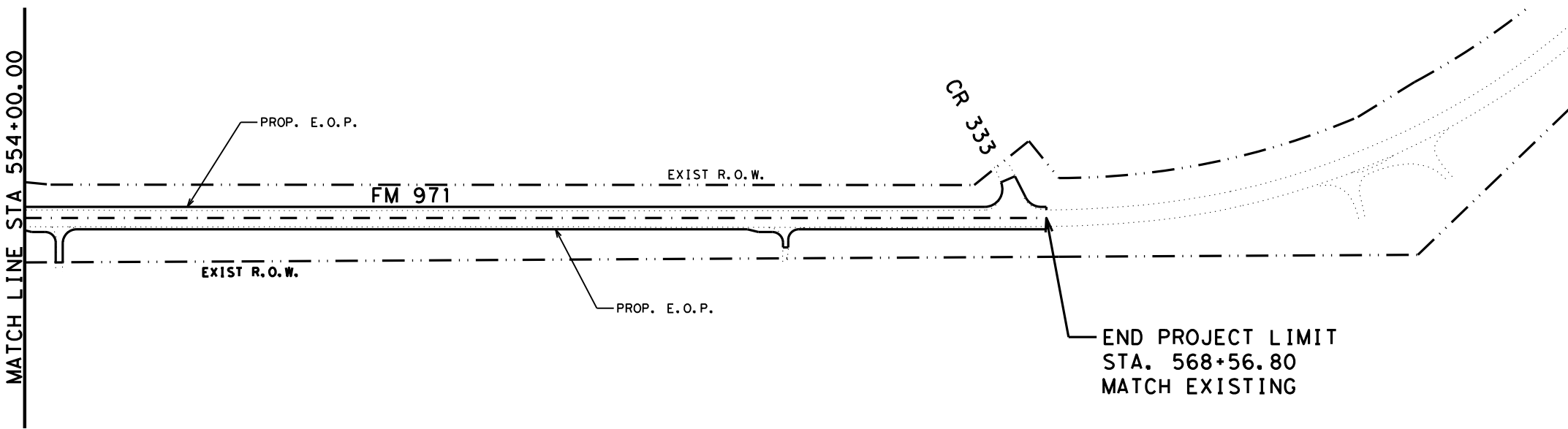
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Texas Department of Transportation

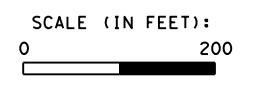
**FM 971
 PROJECT LAYOUT
 STA. 506+00.00-
 STA. 554+00.00**

SHEET 2 OF 3

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DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	4



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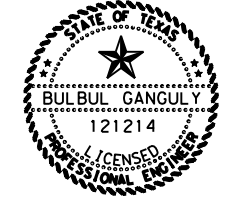
**Austin District
Central Design**



**FM 971
PROJECT LAYOUT
STA. 554+00.00-
STA. 568+56.80**

SHEET 3 OF 3

9/22/2022

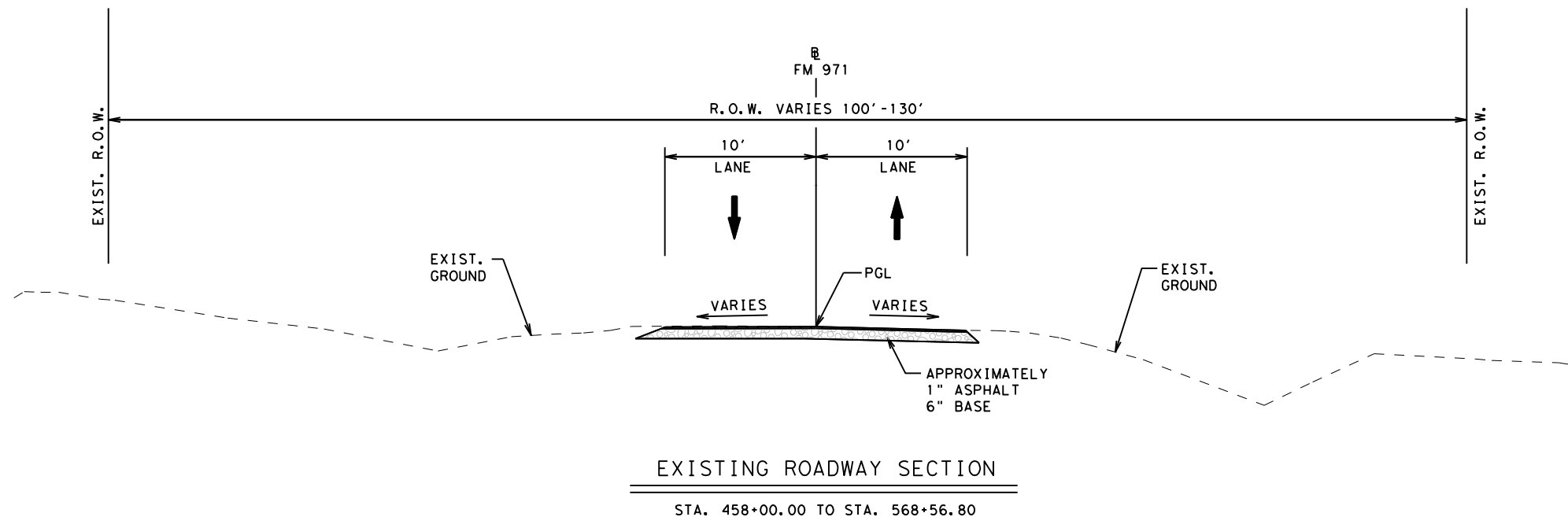


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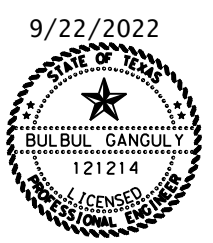
© 2023	CONT	SECT	JOB	HIGHWAY
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	AUS	WILLIAMSON		5

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EXISTING ROADWAY SECTION
 STA. 458+00.00 TO STA. 568+56.80



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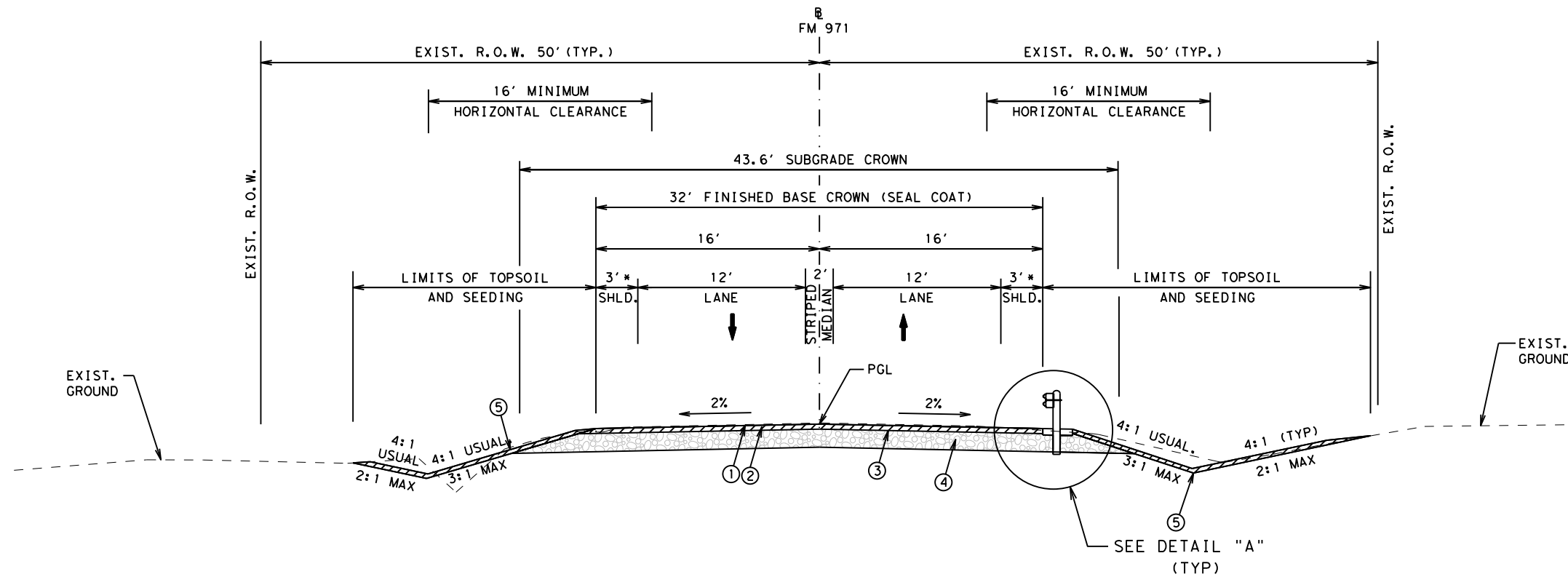
FM 971
EXISTING
TYPICAL SECTIONS

NOT TO SCALE SHEET 1 OF 1

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK1	2690	01	038	FM 971
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	AUS		WILLIAMSON	6

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- KEY**
- ① SEAL COAT
 - ② 2.0" D-GR HMA TY-D PG76-22
 - ③ INVERTED PRIME
 - ④ 12.0" CEMENT TREATED BASE
 - ⑤ 4" TOPSOIL

PROPOSED TYPICAL SECTION

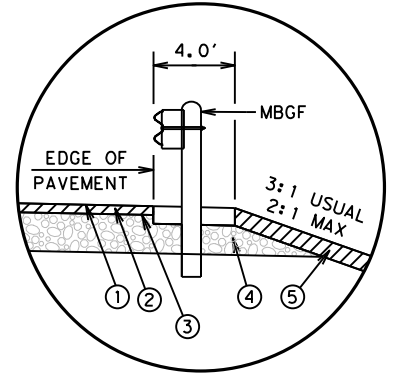
* PROP 4' SHOULDER IN THE FOLLOWING STATION RANGES:
 STA. 476+93.00 TO STA. 483+05.50 (RT)
 STA. 478+67.00 TO STA. 484+73.00 (LT)
 STA. 502+19.00 TO STA. 505+80.51 (RT)
 STA. 504+23.00 TO STA. 507+73.00 (LT)
 STA. 543+16.00 TO STA. 546+13.33 (RT)
 STA. 545+83.00 TO STA. 550+58.00 (LT)

STA. 458+00.00 (BL) TO STA. 568+56.80 (BL)

NOTES:
 TYPICAL SECTIONS SHOWN DEPICT MOST COMMON CASES.
 SEE CROSS-SECTIONS FOR ALL OTHER CASES.

SLOPES 2:1 OR STEEPER GREATER THAN 5' HIGH WILL REQUIRE CONCRETE RIPRAP.

THE CENTER LINE MARKING, INCLUDING SOLID AND BROKEN LINES, SHALL BE SEPARATED Laterally BY 24 IN. THE PASSING ZONES WITH A SINGLE BROKEN LINE PER THE PAVEMENT MARKING STANDARD WILL REQUIRE A DOUBLE BROKEN LINE SPACED Laterally THE SAME AS THE OTHER CENTER LINE MARKINGS.



DETAIL "A"
(TYP)



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**Austin District
Central Design**

Texas Department of Transportation

**FM 971
PROPOSED
TYPICAL SECTIONS**

NOT TO SCALE SHEET 2 OF 2

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	7

GENERAL NOTES: Version: August 23, 2022

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
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
	Grade 5	
	Asphalt	0.32 GAL/SY
	Aggregate	1 CY/150 SY
	Two Course Surface Treatment	
	Asphalt 1st Application	0.28 GAL/SY
	Asphalt 2nd Application	0.24 GAL/SY
	Aggregate 1st Application Grade 4	1 CY/110 SY
	Aggregate 2nd Application Grade 4	1 CY/130 SY
341/3076, 344/3077	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):

Georgetown Jason.Hudson@txdot.gov
Georgetown John.Peters@txdot.gov

Contractor questions and request for documents will be accepted through email, phone, and in person by the above individuals. Response and documents will be posted to TxDOT's Public FTP at the following Address:

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

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.

Bridge Vertical Clearance and Traffic Handling.

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

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

County: Williamson
Highway: FM 971

Sheet:
Control: 2690-01-038

ITEM 5 – CONTROL OF THE WORK

Place construction or silt fence 2 ft. inside TxDOT ROW along the Railroad ROW. If work is to be performed inside the Railroad ROW, then the Contractor will coordinate with the Railroad for a Railroad Flagger. This work is subsidiary.

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

Precast Alternate Proposals.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with “Standard Operating Procedure for Alternate Precast Proposal Submission” found online at <https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design>. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

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

Georgetown Jason.Hudson@txdot.gov AUS_GE-ShopReview@txdot.gov

Alignment and Profile.

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

ITEM 6 - CONTROL OF MATERIALS

Give a minimum of 1 business day notice for materials, which require inspection at the Plant. For structures with paint containing hazardous materials, provide locations of material removal 60 days prior to begin removal. For metal elements to be removed, mechanical shear or unbolting for removal and disposal does not require paint abatement but requires 60 day advance notice.

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

General Notes

Sheet C

County: Williamson
Highway: FM 971

Sheet: 8A
Control: 2690-01-038

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES

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

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

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

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

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

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

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

Work over or near Bodies of Water (lakes, rivers, ponds, creeks, dry waterways, 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.

Obtain written approval from the Engineer for temporary fill or crossings not specifically addressed in the plans. Provide a signed sketch of the location 60 business days prior to begin work at the location. Complete and return any forms provided by TxDOT. Approval of the work is not guaranteed. Unapproved work is not a compensable impact.

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.

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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.

ITEM 100 - PREPARING RIGHT OF WAY

Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas.

Backfill material will be Type B Embankment using ordinary compaction.

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

Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas within 30 ft. of edge of pavement under construction. Trim or remove to provide

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minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 14 ft. vertical clearance under all trees. This work is subsidiary.

ITEM 105 – REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT

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

ITEM 110 – EXCAVATION

The Engineer will define unsuitable material.

ITEM 132 – ALL EMBANKMENT

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

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

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

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

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

ITEM 132 – EMBANKMENT TYPE C

The Department must approve all Type C embankment material before use on the project. Do not furnish shale clays. Furnish embankment with sulfate content less than 3000 ppm if treated with calcium-based chemicals or within 5 ft. of the finished subgrade elevation. Existing material from within the project limits that meets the Type C Substitute requirements may substituted for Type C but is not allowed to substitute for C1, C2, or density-controlled material. Offsite material may be used to blend with onsite material to achieve the Type C requirements. The Type C substitute may also be existing material in accordance with 132 for rock embankment. The Type C substitute material may

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only be placed vertically beyond 5 ft. below the finished subgrade elevation or 5 ft. beyond the edge of the subgrade.

Type C				
Percent Retained		LL	PI	PI
3"	#4	Max	Max	Min
0	MIN45	55	20	6
Type C Substitute				
Percent Retained			PI	
3"	#4		Max	
Max 10	10-90		25	

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 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. Type B and D blankets shall be a spray type blanket.

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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 216 - PROOF ROLLING

Correct and perform "Proof Rolling" retest at the Contractor's expense, to the satisfaction of the Engineer, when initial "Proof Rolling" yields a failing result.

ITEM 247 - FLEXIBLE BASE

The layer thickness will be 4 in. to 6 in. unless shown on the plans. Placing in a single layer is allowed when total thickness of base is 8 in. or less. When placed in multiple layers, compact the bottom and middle layers to at least 95% and 98% of the maximum dry density, respectively. When placed in a single layer or the final layer, compact to at least 100%.

Correction of subgrade soft spots is subsidiary.

Complete per plans the subgrade, ditches, slopes, and drainage structures prior to the placement of base.

Do not use a vibratory roller to compact base placed directly on top of a drainage structure.

Grade 4 will have the same material requirements as Grade 5 except minimum compressive strength at lateral pressure 3 psi will be 70 psi and at lateral pressure 15 psi will be 150 psi. Grade 4 does not have a minimum compressive strength at lateral pressure 0 psi.

ITEMS 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 275 – CEMENT TREATMENT (ROAD-MIXED)

Apply 48 pounds per square yard.

Unless shown on the plans flexible base will be as follows: Type A Grade 4 or 5, microcracked, and 7-day unconfined compressive strength of 150 psi.

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 316 – SEAL COAT

Ensure that all underseals are covered by HMA CP before exposing to traffic for roadways listed in Table 1 of Item 502 or ADT greater than 5,000.

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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.

ITEMS 341, 344, & 3076 THRU 348/3082 - HOT-MIX ASPHALT PAVEMENT

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

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

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

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

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

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

Tack every layer. Do not dilute tack coat. Apply it evenly through a distributor spray bar.

Provide a minimum transition of 10' for intersections, 10' for commercial driveways, and 6' for residential driveways unless otherwise shown on the plans.

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

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

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

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

No RAS is allowed in surface courses.

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

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

ITEMS 341/3076 - DENSE-GRADED HOT-MIX ASPHALT

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

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

ITEMS 420, 425, 441, & 462 - STRUCTURES

Bridge Vertical Clearance and Traffic Handling.

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

ITEM 432 - RIPRAP

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

Saw-cut existing riprap then epoxy 12 in. long No. 3 or No. 4 bars 6 in. deep at a maximum spacing of 18 in. in each direction to tie new riprap to existing riprap. This work is subsidiary. Provide Type A Grade 3 or 5 flexible base for cement stabilized riprap. Compressive strengths for flexible base are waived.

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

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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
IH 35	All (1 lane closed)	9 P to 5 A
IH 35	All (2 lanes closed, see allowable work below)	9 P to 5 A
IH 35	All (2 lanes closed, all work)	11 P to 5 A
SH 45	US 183 to SH130	8 P to 5 A
LP 1	William Cannon to Parmer Lane	8 P to 5 A
US 183	SH 29 to FM 1327	8 P to 5 A
SH 71	SH 130 to IH 35	8 P to 5 A
SH 71	SH 304 to Tahitian Drive	8 P to 5 A
SH 71	US 290 W to RM 3238	8 P to 5 A
US 290 W	IH 35 to Nutty Brown Rd	8 P to 5 A
US 290 E	IH 35 to SH 95	8 P to 5 A
FM 734	FM 1431 to US 290 E	8 P to 5 A
US 79	IH 35 to Bus 79 in Taylor	8 P to 5 A
RM 1431	Lohmans Ford Rd to IH 35	8 P to 5 A
SH 29	LP 332 western terminus to SH 130	8 P to 5 A
SH 80	Charles Austin to River Road	8 P to 5 A
RM 2222	All	8 P to 5 A
RM 620	All	8 P to 5 A
RM 2244	All	8 P to 5 A
SPUR 69	All	8 P to 5 A

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LP 360	All	8 P to 5 A
LP 343	All	8 P to 5 A
LP 275	All	8 P to 5 A
FM 1325	All	8 P to 5 A
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 8 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.

Full closures only allowed Friday night thru Monday morning for bridge beam installation, bridge demolition, or OSB truss removal/installation. Full closures only allowed for roadways with frontage roads or if a designated detour route is provided in the plans.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend. 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), Rodeo Austin, 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 roadways not listed in Table 1: Submit the request a minimum of 48 hours prior to the closure and by the following deadline immediately prior to the closure: 11 A on Tuesday or 11 A on Friday. 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

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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 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

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

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

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

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

ITEMS 528, 529, 530, 531, & 536 – MISCELLANEOUS CONSTRUCTION

Reinforcement will be in accordance with Section 432.3.1 unless shown on the plans. Fiber reinforcement is not allowed. GFRP is allowed reinforcement for all applications. Class A and B Concrete are allowed to use Coarse Aggregate Grades 1-8.

Unless shown on the plans, all concrete will be 5 in. thick and have 2 in. sand, base, or RAP bedding. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Compressive strengths for flexible base are waived. RAP must be 100% passing a 1 in. sieve. Bedding and flexible base must be placed using ordinary compaction.

Expansion joints will be placed every 40 ft. Expansion joints must be 1 in. wide asphalt board and flush with the surface. The bottom of the asphalt board will be at half the depth of the concrete. The reinforcement will be continuous thru the expansion joint.

Sidewalk cross slope must not exceed 1.5%.

If roots are encountered verify with the Engineer before accommodating or removing 2 in. diameter or larger roots. Root removal must be in accordance with Section 752.4.2. Roots may remain in the bedding or base. For improvements within 6 in. of a root, the concrete thickness may be reduced by 1 in. and the bedding increased by 1 in. to minimize impacts to the roots. Adjust bedding and surface profile to provide a 1 in. bedding cushion around the roots. The surface profile may be adjusted to the extent allowed by ADA. This work is subsidiary.

ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS

Notify property owners at least 48 hr. before beginning work on their driveway. Provide a list of each notification and contact before 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. This work is subsidiary.

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 quantity 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.

For CONC, the pavement structure will be 6 in. thick and have 3 in. flexible base bedding unless detailed on the plans.

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

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

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

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

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

ITEMS 600s & 6000s – ITS, LIGHTING, SIGNING, MARKINGS, AND SIGNALS

Meet the requirements of the NEC, Texas MUTCD, TxDOT standards, and TxDOT Standard Specifications. Notify the Engineer if existing elements to remain do not meet code or specification.

Contractor shall provide all service, equipment and material required to provide a functional item and interface with existing equipment and software.

For signal shop contact Charles Vaughn Jr (Charles.Vaughn@txdot.gov) and Douglas Turner (Douglas.L.Turner@txdot.gov).

Use the TxDOT provided form to submit an electrical, illumination, and signal checklist prior to request for signal activation or a punch list.

Provide a 7 day advance email notice to the Engineer to request illumination or traffic signal punch list inspection.

Provide a 14 day advance email notice to the Engineer with signal technician contact information and signal locations prior to working or assuming operations of illumination or traffic signal. Provide a 60 day advance email notice to the Engineer to request signal timing if timing is not provided in the plans.

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Provide a 180 day advance email notice to the Engineer for equipment to be provided by TxDOT. Provide equipment that requires TxDOT programming, etc. to TxDOT 180 day in advance.

Prior to relief of maintenance, a Test Period is required for signals and ITS equipment in accordance with Item 680.3.1.8. Response time to reported trouble calls shall be less than 2 hours. Complete repairs within 24 hours. Notify the Engineer and maintain a logbook in the controller cabinet of each trouble call. Do not clear the error log in the conflict monitor without approval. Maintain the existing ITS equipment and HUB buildings operational during construction. ITS downtime is allowed from 12A to 4A. Downtime is restricted to one time per HUB or equipment.

Definitions of abbreviations used to designate ITS equipment, material, etc. can be provided by the Engineer.

Stakes or other physical method shall be installed to hold down conduit prior to placement of concrete/flow fill encasement.

Minimum distance between HDPE joints will be 200 ft.

For conduit mounted to bridges in hangers, fiberglass can be substituted for RMC. Furnish and install per Special Specification 6390.

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.

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

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.

Roadways with existing profile pavement markings or rumble strips must supplement work zone solid lines with traffic buttons spaced at 12 in. Traffic buttons used to supplement the work zone markings will be paid by the each in addition to the work zone item.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS

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

County: Williamson
Highway: FM 971

Sheet:
Control: 2690-01-038

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 752.4 Work Methods and 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 6001 – PORTABLE CHANGEABLE MESSAGE SIGN

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

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

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

ITEM 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.

County: Williamson
Highway: FM 971

Sheet: 8H
Control: 2690-01-038

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

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



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2690-01-038

DISTRICT Austin
HIGHWAY FM 971

COUNTY Williamson

CONTROL SECTION JOB				2690-01-038		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00064097			
COUNTY				Williamson			
HIGHWAY				FM 971			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	110.000		110.000	
	104-6028	REMOVING CONC (MISC)	SY	154.000		154.000	
	105-6058	REMOVING STAB BASE & ASPH PAV (10"-12")	SY	26,812.000		26,812.000	
	110-6001	EXCAVATION (ROADWAY)	CY	15,341.000		15,341.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY	5,602.000		5,602.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	28,339.000		28,339.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	14,170.000		14,170.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	14,170.000		14,170.000	
	164-6071	BROADCAST SEED (TEMP)(WARM OR COOL)	SY	14,170.000		14,170.000	
	168-6001	VEGETATIVE WATERING	MG	479.000		479.000	
	169-6001	SOIL RETENTION BLANKETS (CL 1) (TY A)	SY	28,339.000		28,339.000	
	247-6391	FL BS (RDWY DEL)(TY A GR 5)	TON	18,700.000		18,700.000	
	275-6001	CEMENT	TON	935.000		935.000	
	275-6003	CEMENT TREAT (NEW BASE) (6")	SY	39,774.000		39,774.000	
	275-6004	CEMENT TREAT (MX EXST MTL & NW BS) (6")	SY	44,689.000		44,689.000	
	316-6005	ASPH (TIER II)	GAL	15,114.000		15,114.000	
	316-6029	ASPH (RC-250)	GAL	12,728.000		12,728.000	
	316-6240	AGGR(TY-PD GR-4 SAC-B)	CY	331.000		331.000	
	316-6467	AGGR (TY-D GR-5)	CY	265.000		265.000	
	400-6005	CEM STABIL BKFL	CY	131.000		131.000	
	403-6001	TEMPORARY SPL SHORING	SF	1,882.000		1,882.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	53.000		53.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY	256.000		256.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	134.000		134.000	
	462-6046	CONC BOX CULV (3 FT X 3 FT)(EXTEND)	LF	16.000		16.000	
	462-6059	CONC BOX CULV (7 FT X 4 FT)(EXTEND)	LF	24.000		24.000	
	462-6064	CONC BOX CULV (8 FT X 5 FT)(EXTEND)	LF	36.000		36.000	
	462-6070	CONC BOX CULV (9 FT X 7 FT)(EXTEND)	LF	8.000		8.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	556.000		556.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	338.000		338.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	148.000		148.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	70.000		70.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	6.000		6.000	
	466-6103	HEADWALL (CH - PW - 0) (DIA= 48 IN)	EA	2.000		2.000	
	466-6166	WINGWALL (FW - S) (HW=5 FT)	EA	1.000		1.000	
	466-6179	WINGWALL (PW - 1) (HW=4 FT)	EA	2.000		2.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA	1.000		1.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Austin	Williamson	2690-01-038	9



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2690-01-038

DISTRICT Austin
HIGHWAY FM 971

COUNTY Williamson

CONTROL SECTION JOB				2690-01-038		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00064097			
COUNTY				Williamson			
HIGHWAY				FM 971			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	1.000		1.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	1.000		1.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	16.000		16.000	
	467-6391	SET (TY II) (24 IN) (RCP) (4: 1) (P)	EA	1.000		1.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	12.000		12.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	480-6001	CLEAN EXIST CULVERTS	EA	3.000		3.000	
	496-6005	REMOV STR (WINGWALL)	EA	4.000		4.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	7.000		7.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	125.000		125.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	50.000		50.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	175.000		175.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	444.000		444.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	444.000		444.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	6,617.000		6,617.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	6,617.000		6,617.000	
	530-6006	DRIVEWAYS (SURF TREAT)	SY	1,675.000		1,675.000	
	530-6009	TURNOUTS (SURF TREAT)	SY	110.000		110.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	1,894.000		1,894.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	150.000		150.000	
	540-6014	SHORT RADIUS	LF	38.000		38.000	
	540-6015	DRIVEWAY TERMINAL ANCHOR SECTION	EA	1.000		1.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	312.000		312.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	13.000		13.000	
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA	7.000		7.000	
	560-6005	MAILBOX INSTALL-D (TWG-POST) TY 2	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	20.000		20.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	22.000		22.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	17.000		17.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	31.000		31.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	21,936.000		21,936.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	21,936.000		21,936.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	123.000		123.000	
	666-6093	REFL PAV MRK TY I (W)(RR XING)(100MIL)	EA	2.000		2.000	



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DISTRICT	COUNTY	CCSJ	SHEET
Austin	Williamson	2690-01-038	9A



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2690-01-038

DISTRICT Austin
HIGHWAY FM 971

COUNTY Williamson

CONTROL SECTION JOB				2690-01-038		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00064097			
COUNTY				Williamson			
HIGHWAY				FM 971			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	978.000		978.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	16,706.000		16,706.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	286.000		286.000	
	3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	4,375.000		4,375.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	90.000		90.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	80.000		80.000	
	02	RAILROAD FORCE ACCOUNT WORK (NON PARTICIPATING)	LS	1.000		1.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

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SUMMARY OF ROADWAY ITEMS												
LOCATION	100 6002	110 6001	132 6005	247 6391	275 6001	275 6003	275 6004	316 6005	316 6029	316 6240	316 6467	432 6002
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C)	FL BS (RDWY DEL) (TY A GR 5)	CEMENT	CEMENT TREAT (NEW BASE) (6")	CEMENT TREAT (MX EXST MTL & NW BS) (6")	ASPH (TIER II)	ASPH (RC-250)	AGGR (TY-PD GR-4 SAC-B)	AGGR (TY-D GR-5)	RIPRAP (CONC) (5 IN)
	STA	CY	CY	TON	TON	SY	SY	GAL	GAL	CY	CY	CY
Sheet 1 of 10	12	1605	580	2000	100	4267	4800	1621	1365	36	28	
Sheet 2 of 10	12	1565	1121	2067	103	4379	4913	1664	1401	36	29	6
Sheet 3 of 10	12	1461	625	2036	102	4327	4861	1644	1385	36	29	16
Sheet 4 of 10	12	1403	1060	2050	103	4351	4885	1654	1392	36	29	5
Sheet 5 of 10	12	1798	337	2023	101	4305	4838	1636	1378	36	29	
Sheet 6 of 10	12	1907	280	2000	100	4267	4800	1621	1365	36	28	
Sheet 7 of 10	12	1498	442	2000	100	4267	4800	1621	1365	36	28	
Sheet 8 of 10	12	1903	707	2098	105	4432	4965	1684	1418	37	30	26
Sheet 9 of 10	12	1607	397	2000	100	4267	4800	1621	1365	36	28	
Sheet 10 of 10	2	595	53	428	21	913	1027	347	292	8	6	
PROJECT TOTALS	110	15341	5602	18700	935	39774	44689	15114	12728	331	265	53

SUMMARY OF ROADWAY ITEMS											
LOCATION	432 6045	530 6006	530 6009	540 6001	540 6002	540 6014	540 6015	544 6001	560 6004	560 6005	3076 6072
	RIPRAP (MOW STRIP) (4 IN)	DRIVEWAYS (SURF TREAT)	TURNOUTS (SURF TREAT)	MTL W-BEAM GD FEN (TIM POST)	MTL W-BEAM GD FEN (STEEL POST)	SHORT RADIUS	DRIVEWAY TERMINAL ANCHOR SECTION	GUARDRAIL END TREATMENT (INSTALL)	MAILBOX INSTALL-S (TWG-POST) TY 2	MAILBOX INSTALL-D (TWG-POST) TY 2	D-GR HMA TY-D PG 76-22 (EXEMPT)
	CY	SY	SY	LF	LF	LF	EA	EA	EA	EA	TON
Sheet 1 of 10		157	15						1		469
Sheet 2 of 10	55			881	38			4			482
Sheet 3 of 10		206									476
Sheet 4 of 10	31	330		350	75			4			479
Sheet 5 of 10		166	28						2		474
Sheet 6 of 10		166	13						1		469
Sheet 7 of 10		89	13						1		469
Sheet 8 of 10	48	294	16	663	38	38	1	5		1	487
Sheet 9 of 10		114	25						2		469
Sheet 10 of 10		153									100
PROJECT TOTALS	134	1675	110	1894	150	38	1	13	7	1	4375

SUMMARY OF MOBILIZATION ITEMS		
LOCATION	500 6001	502 6001
	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING
	LS	MO
	1	7
PROJECT TOTALS	1	7

**Austin District
Central Design**

**FM 971
SUMMARY OF
QUANTITIES**

SHEET 1 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		10


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SUMMARY OF REMOVAL ITEMS						
LOCATION	104	105	496	496	496	542
	6028	6058	6004	6005	6007	6001
	REMOVING CONC (MISC)	REMOVING STAB BASE & ASPH PAV (10"-12")	REMOV STR (SET)*	REMOV STR (WINGWALL)	REMOV STR (PIPE)*	REMOVE METAL BEAM GUARD FENCE
	SY	SY	EA	EA	LF	LF
SHEET 1 OF 10		2933				
SHEET 2 OF 10		2933		1		
SHEET 3 OF 10	22	2933	3			
SHEET 4 OF 10		2933	6	1	166	312
SHEET 5 OF 10		2933	2		66	
SHEET 6 OF 10	32	2933	4		125	
SHEET 7 OF 10	64	2933	2		97	
SHEET 8 OF 10	23	2933	2	2	51	
SHEET 9 OF 10	13	2933			72	
SHEET 10 OF 10		412				
PROJECT TOTALS	154	26812	19	4	577	312

* FOR CONTRACTOR'S INFORMATION ONLY

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS					
LOCATION	662	662	6001	6185	6185
	6004	6034	6002	6002	6003
	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	EA	DAY	HR
Sheet 1 of 10	2400	2400			
Sheet 2 of 10	2400	2400			
Sheet 3 of 10	2400	2400			
Sheet 4 of 10	2400	2400			
Sheet 5 of 10	2400	2400			
Sheet 6 of 10	2400	2400			
Sheet 7 of 10	2400	2400			
Sheet 8 of 10	2400	2400			
Sheet 9 of 10	2400	2400			
Sheet 10 of 10	336	336			
PROJECT TOTALS	21936	21936	2	90	80

**Austin District
Central Design**



**FM 971
SUMMARY OF
QUANTITIES**

SHEET 2 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		11


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SUMMARY OF DRAINAGE ITEMS											
LOCATION	400 6005	403 6001	432 6031	462 6046	462 6059	462 6070	464 6003	464 6005	464 6007	464 6008	464 6010
	CEM STABIL BKFL	TEMPORARY SPL SHORING	RIPRAP (STONE PROTECTION) (12 IN)	CONC BOX CULV (3 FT X 3 FT) (EXTEND)	CONC BOX CULV (7 FT X 4 FT) (EXTEND)	CONC BOX CULV (9 FT X 7 FT) (EXTEND)	RC PIPE (CL 111) (18 IN)	RC PIPE (CL 111) (24 IN)	RC PIPE (CL 111) (30 IN)	RC PIPE (CL 111) (36 IN)	RC PIPE (CL 111) (48 IN)
	CY	SF	CY	LF	LF	LF	LF	LF	LF	LF	LF
P&P Sheet 1											
P&P Sheet 2 (STA. 479+50.70)	18	648	51			8					
P&P Sheet 3 (STA. 482+26.55)	14	214	38								6
P&P Sheet 3 (STA. 493+05.71)	5								4		
P&P Sheet 4							196	96			
P&P Sheet 5							122				
P&P Sheet 6							112	112			
P&P Sheet 7								44	148		
P&P Sheet 8 (STA. 546+49.22)	19	516	104		24					70	
P&P Sheet 8 (STA. 548+19.25)	13		63	16							
P&P Sheet 9							126				
P&P Sheet 10								82			
PROJECT TOTALS	69	1378	256	16	24	8	556	338	148	70	6

SUMMARY OF DRAINAGE ITEMS											
LOCATION	466 6103	466 6166	466 6179	466 6180	466 6182	466 6183	467 6363	467 6391	467 6395	467 6423	467 6454
	HEADWALL (CH - PW - 0) (DIA= 48 IN)	WINGWALL (FW - S) (HW=5 FT)	WINGWALL (PW - 1) (HW=4 FT)	WINGWALL (PW - 1) (HW=5 FT)	WINGWALL (PW - 1) (HW=7 FT)	WINGWALL (PW - 1) (HW=8 FT)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (4: 1) (P)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (30 IN) (RCP) (6: 1) (P)	SET (TY II) (36 IN) (RCP) (6: 1) (P)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
P&P Sheet 1											
P&P Sheet 2 (STA. 479+50.70)						1					
P&P Sheet 3 (STA. 482+26.55)	2										
P&P Sheet 3 (STA. 493+05.71)								1			
P&P Sheet 4 (STA. 505+03.43)					1		4		2		
P&P Sheet 5							4		2		
P&P Sheet 6							4		4		
P&P Sheet 7									2	4	
P&P Sheet 8 (STA. 546+49.22)		1		1							2
P&P Sheet 8 (STA. 548+19.25)			2								
P&P Sheet 9							4				
P&P Sheet 10									2		
PROJECT TOTALS	2	1	2	1	1	1	16	1	12	4	2

SUMMARY OF BRIDGE # 1 ITEMS					
LOCATION	NBI: 14-246-2690-01-011				
	400 6005	403 6001	462 6064	466 6182	480 6001
	CEM STABIL BKFL	TEMPORARY SPL SHORING	CONC BOX CULV (8 FT X 5 FT) (EXTEND)	WINGWALL (PW - 1) (HW=7 FT)	CLEAN EXIST CULVERTS
	CY	SF	LF	EA	EA
MBC at STA. 505+03.43	62	504	36	1	3
PROJECT TOTALS	62	504	36	1	3

**Austin District
Central Design**



FM 971

**SUMMARY OF
QUANTITIES**

SHEET 3 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		12

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SUMMARY OF EROSION CONTROL ITEMS

LOCATION	160 6003	164 6035	164 6071	164 6023	168 6001	169 6001	506 6002	506 6003	506 6011	506 6038	506 6039	506 6020	506 6024
	FURNISHING AND PLACING TOPSOIL (4")	DRILL SEEDING (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP) (WARM OR COOL)	CELL FBR MLCH SEED (PERM) (RURAL) (CLAY)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY A)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)
	SY	SY	SY	SY	MG	SY	LF	LF	LF	LF	LF	SY	SY
SHEET 1 OF 5	5845	2923	2923	2923	99	5845	25	50	25	1555	1555	222	222
SHEET 2 OF 5	6060	3030	3030	3030	102	6060	25	50	75	2432	2432		
SHEET 3 OF 5	5955	2978	2978	2978	101	5955				1060	1060		
SHEET 4 OF 5	6885	3443	3443	3443	116	6885	75		75	590	590		
SHEET 5 OF 5	3594	1797	1797	1797	61	3594				980	980	222	222
PROJECT TOTALS	28339	14170	14170	14170	479	28339	125	50	175	6617	6617	444	444


SUMMARY OF SIGNING ITEMS

LOCATION	644 6001	644 6004	644 6076	658 6047	658 6062
	IN SM RD SN SUP&AM TY10BWG (1) SA (P)	IN SM RD SN SUP&AM TY10BWG (1) SA (T)	REMOVE SM RD SN SUP&AM	INSTL OM ASSM (OM-2Y) (WC) GND	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF 2 (BI)
	EA	EA	EA	EA	EA
SHEET 1 OF 5	3	1	3	17	12
SHEET 2 OF 5	9		10		8
SHEET 3 OF 5	1		2		
SHEET 4 OF 5	3		2		11
SHEET 5 OF 5	4		5		
PROJECT TOTALS	20	1	22	17	31

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	666 6048	666 6093	666 6300	666 6315	672 6009
	REFL PAV MRK TY I (W) 24" (SLD) (100MIL)	REFL PAV MRK TY I (W) (RR XING) (100MIL)	RE PM W/RET REQ TY I (W) 4" (BRK) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)	REFL PAV MRKR TY II-A-A
	LF	EA	LF	LF	EA
SHEET 1 OF 5			199	4005	63
SHEET 2 OF 5	96	2	0	4348	59
SHEET 3 OF 5			163	4147	63
SHEET 4 OF 5	14		578	1622	64
SHEET 5 OF 5	13		39	2584	37
PROJECT TOTALS	123	2	978	16706	286

**Austin District
Central Design**



**FM 971
SUMMARY OF
QUANTITIES**

SHEET 4 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		13

GENERAL NOTES

1. THE PROVISIONS FOR ROUTING TRAFFIC DURING CONSTRUCTION AND THE SEQUENCE OF CONSTRUCTION OPERATIONS SHALL BE IN GENERAL CONFORMITY WITH THE DETAILS SHOWN ON THE PLANS. ALL TRAFFIC HANDLING WILL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE TMUTCD AND APPLICABLE COUNTY TCP AND WORK ZONE STANDARDS THROUGHOUT THE DURATION OF THE PROJECT CONSTRUCTION.
2. THE SPACING OF SIGNS MAY BE VARIED TO MEET TRAFFIC CONTROL CONDITIONS AS DIRECTED.
3. ALL LANE CLOSURES WILL BE SCHEDULED IN ADVANCE AND APPROVED BY THE ENGINEER.
4. CONSTRUCT THE ROADWAY USING ONE-WAY TRAFFIC CONTROL DURING DAYTIME WORKING HOURS. THIS WORK WILL BE CONSIDERED SUBSIDIARY TO ITEM 502. RESTORE TWO-WAY TRAFFIC FOR NIGHTTIME OPERATIONS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
5. LIMIT THE LENGTH OF THE WORK ZONE TO WHAT CAN BE CONSTRUCTED FOR ONE DIRECTION OF TRAFFIC IN A SINGLE DAY. THERE SHOULD BE NO EDGE DROP-OFF BETWEEN THE TRAFFIC LANES BEFORE OPENING TO TWO-WAY TRAFFIC. IN THE EVENT THAT CONSTRUCTION IS NOT ABLE TO BE COMPLETED BEFORE NIGHTTIME OPERATIONS, PROVIDE A TRANSITION BETWEEN THE TRAFFIC LANES AS APPROVED BY THE ENGINEER BEFORE OPENING TO TWO-WAY TRAFFIC.
6. PROVIDE ACCESS TO ADJACENT PROPERTIES AT ALL TIMES THROUGHOUT CONSTRUCTION. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.
7. 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.
8. CONSTRUCT PHASE 4 FOR EACH SECTION WITHIN 5 CALENDAR DAYS OF CONSTRUCTING PHASE 2 OR 3 FOR THAT SECTION.
9. THE CONTRACTOR MAY WORK ON ADJACENT WORK SECTIONS SO LONG AS EACH INDIVIDUAL SECTION IS COMPLETED WITHIN THE TIME PERIODS SPECIFIED ABOVE.
10. SPRINKLE FOR DUST CONTROL AS DIRECTED. THIS WORK WILL NOT BE PAID FOR DIRECTLY BUT WILL BE CONSIDERED SUBSIDIARY.
11. IF A SECTION IS NOT COMPLETED WITHIN THE TIME PERIODS SPECIFIED ABOVE, APPLY AN ASPHALT EMULSION TO THE SECTION AS SPECIFIED BY THE ENGINEER AND RESTORE IT TO A CONDITION APPROVED BY THE ENGINEER BEFORE PROCEEDING TO THE NEXT PHASE OF CONSTRUCTION. THIS WORK WILL BE AT THE CONTRACTOR'S EXPENSE. THESE REQUIREMENTS DO NOT APPLY TO FULL-DEPTH HMA SECTIONS.
12. UTILIZE TCP(2-1)-18 FOR WORK IN THE RIGHT-OF-WAY THAT DOES NOT REQUIRE LANE CLOSURES. THIS WORK INCLUDES PREPARING R.O.W., GRADING, DRIVEWAY CONSTRUCTION, SEEDING, ETC.
13. INCORPORATE 3:1 SAFETY WEDGES FOR ALL DROP OFFS GREATER THAN TWO (2") INCHES LEFT OVERNIGHT. CONSIDER THIS SUBSIDIARY TO THE VARIOUS ITEMS.
14. MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT SITE TO REDUCE PONDING.
15. NO EQUIPMENT, STOCKPILED MATERIAL, ETC. WILL BE PERMITTED TO REMAIN IN A POSITION AFTER WORKING HOURS THAT WILL ENDANGER THE TRAVELING PUBLIC.

SEQUENCE OF WORK

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 OR (2-8b)-18 FOR FULL PIPE CULVERT REPLACEMENT.
2. EXTEND OR REPLACE THE UPSTREAM END OF THE CULVERT UTILIZING TCP(2-2b)-18 FOR BOX EXTENSION OR (2-8b)-18 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 ON THE PLANS.

PHASE 2

THIS PHASE CONSISTS OF CONSTRUCTING THE SUBGRADE, FLEX BASE AND CEMENT TREATING THE FLEXBASE. IT IS ANTICIPATED THAT ADJACENT WORK AREAS WILL BE CONSTRUCTED BEFORE MOVING TO A NEW SECTION OF ROADWAY.

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. SAWCUT AND REMOVE PAVEMENT IN THE AREAS NOTED ON THE TCP TYPICAL SECTIONS.
3. CONSTRUCT THE SUBGRADE MATERIAL AND RE GRADE PROPOSED DITCHES.
4. PLANE OR MILL 6" OF EXISTING ROADWAY AND BASE MATERIAL AS SHOWN ON THE TCP TYPICAL SECTIONS. RECLAIM THIS EXISTING MATERIAL AND WINDROW ASIDE IN THE PREPARED SUBGRADE AREA.
5. REDISTRIBUTE THE RECLAIMED ROADWAY MATERIAL OVER THE SUBGRADE AREA. MIX WITH NEW BASE MATERIAL AND CEMENT TREAT.
6. HAUL IN NEW BASE MATERIAL AND CEMENT TREAT.
7. CONSTRUCT PAVEMENT TRANSITIONS AND OPEN SECTION TO TRAFFIC.
8. REPEAT STEPS 1-7 FOR THE OPPOSITE SIDE OF THE ROADWAY.

PHASE 3

THIS PHASE INCLUDES INSTALLING 2.0" HMA TY-D ON EACH SIDE OF THE ROADWAY AND GRADING TO PROPOSED PGL.

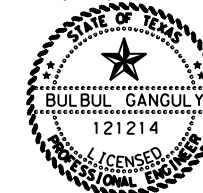
PHASE 4

PHASE 4 INCLUDES COMPLETING THE SEAL COAT, INSTALLATION OF TOPSOIL, SIGNS AND PERMANENT PAVEMENT MARKINGS.

1. UTILIZING TCP(2-2B) AND TCP(7-1)-13, APPLY SEAL COAT TO HMA PAVEMENT SECTIONS AND INSTALL SHORT TERM PAVEMENT MARKING PER WZ(STPM)-13.
2. UTILIZING TCP(2-1)-18, INSTALL SIGNS, TOPSOIL AND SEEDING.
3. AFTER THE SURFACE TREATMENT HAS CURED, UTILIZE TCP(3-1)-13 & TCP(3-3)-14 TO INSTALL WORK ZONE PAVEMENT MARKINGS.
4. AFTER THE ROADWAY FOR THE ENTIRE PROJECT LIMITS HAS BEEN WIDENED, BEGIN FINAL APPLICATION OF THE SECOND COURSE OF SURFACE TREATMENT.
5. INSTALL ANY REMAINING SIGNS AND COMPLETE ALL MISCELLANEOUS WORK TO FINISH THE PROJECT AS DIRECTED BY THE ENGINEER.
6. REMOVE EROSION CONTROL DEVICES ONCE VEGETATION IS ESTABLISHED TO THE SATISFACTION OF THE ENGINEER.
7. REMOVE PROJECT BARRICADES WHEN DIRECTED BY THE ENGINEER.

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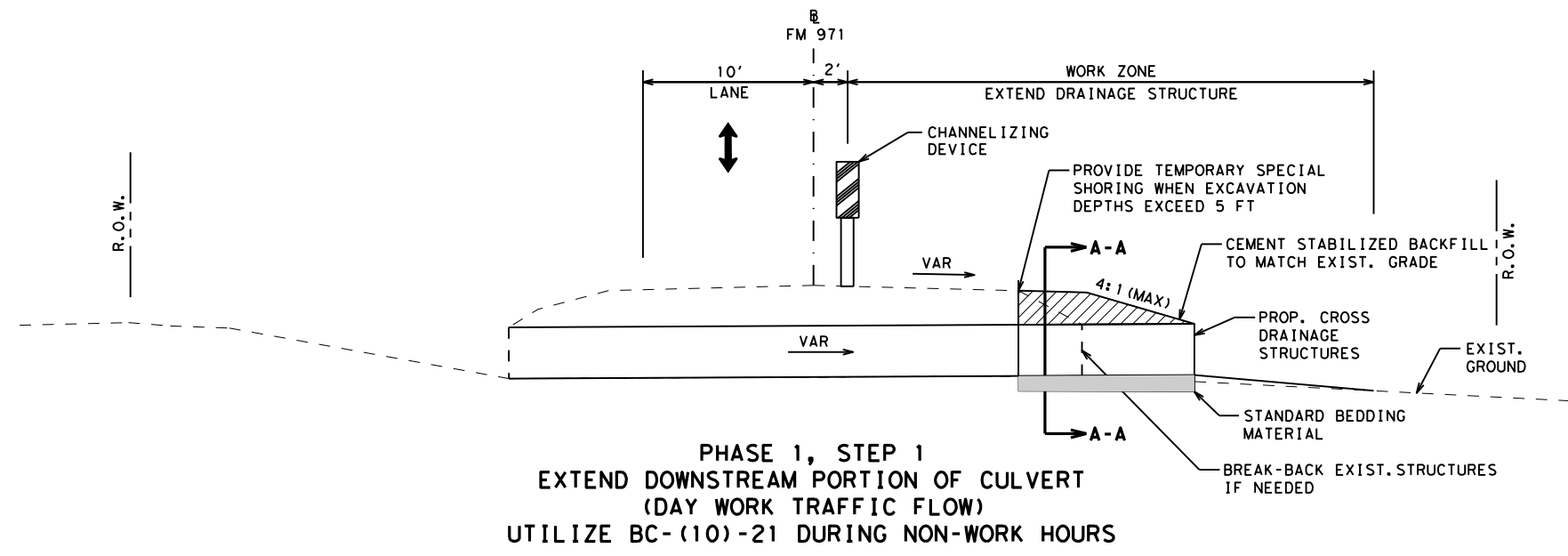
**FM 971
SEQUENCE OF WORK**

SHEET 1 OF 1

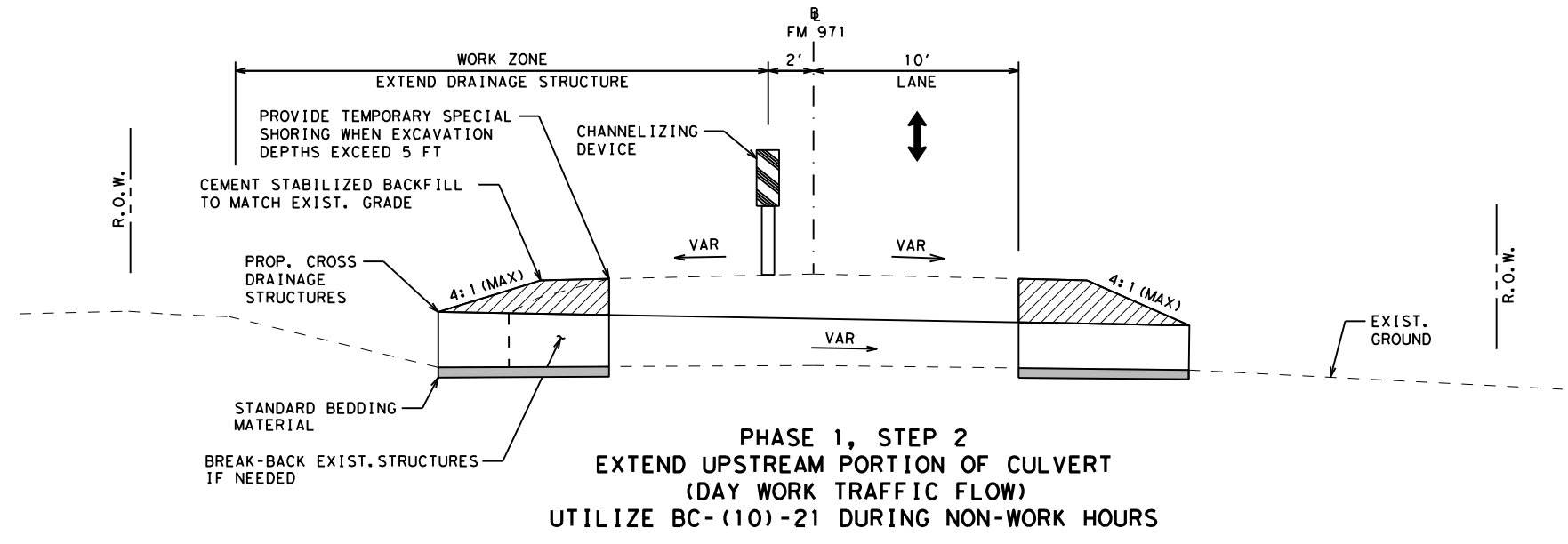
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	DIST		COUNTY	SHEET NO.
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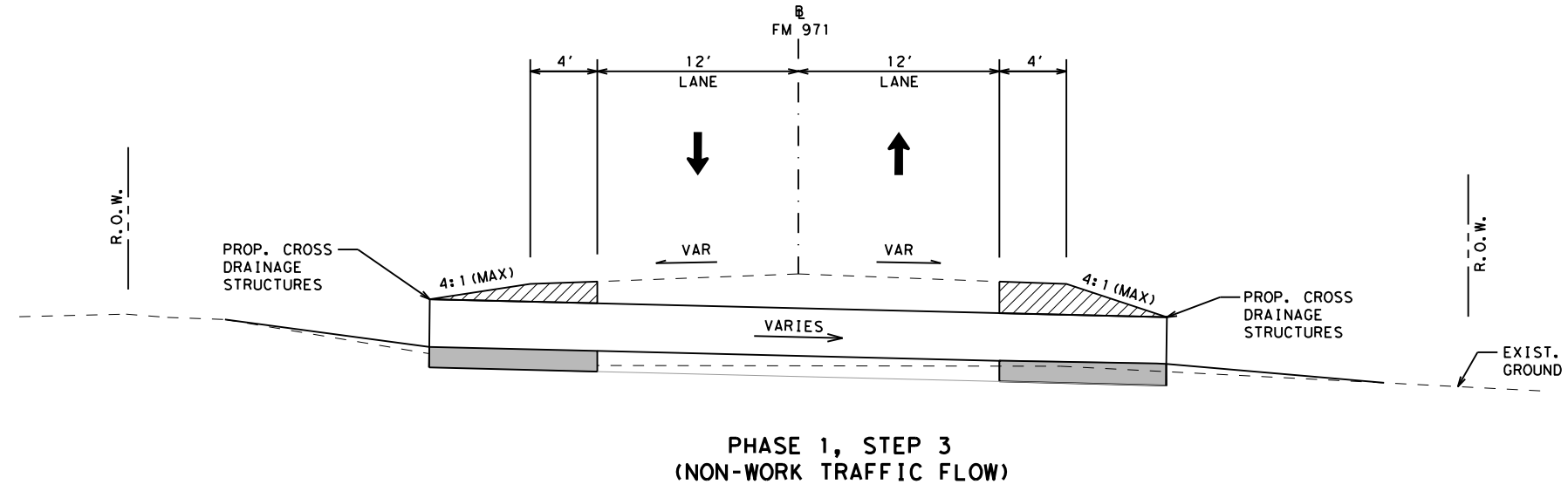
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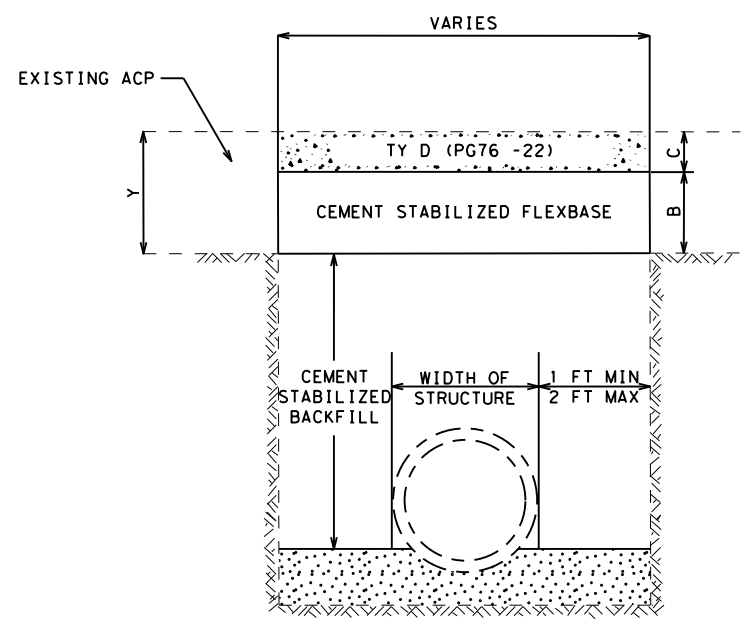
PHASE 1, STEP 1
EXTEND DOWNSTREAM PORTION OF CULVERT
(DAY WORK TRAFFIC FLOW)
UTILIZE BC-(10)-21 DURING NON-WORK HOURS



PHASE 1, STEP 2
EXTEND UPSTREAM PORTION OF CULVERT
(DAY WORK TRAFFIC FLOW)
UTILIZE BC-(10)-21 DURING NON-WORK HOURS



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



SECTION A-A
Y = DEPTH OF EXISTING ACP (IN)
Y = C + B
C = MIN 2 IN AND MAX 4 IN THICKNESS

NOTE: 1) RESTORE TWO-WAY TRAFFIC TO ITS ORIGINAL LOCATION AT THE END THE WORK DAY.
2) UTILIZE TCP (2-2b)-18 FOR WORK HOURS TRAFFIC FLOW.



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**FM 971
TCP TYPICAL SECTIONS
PHASE 1
CULVERT EXTENSION**

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SEQUENCE OF WORK

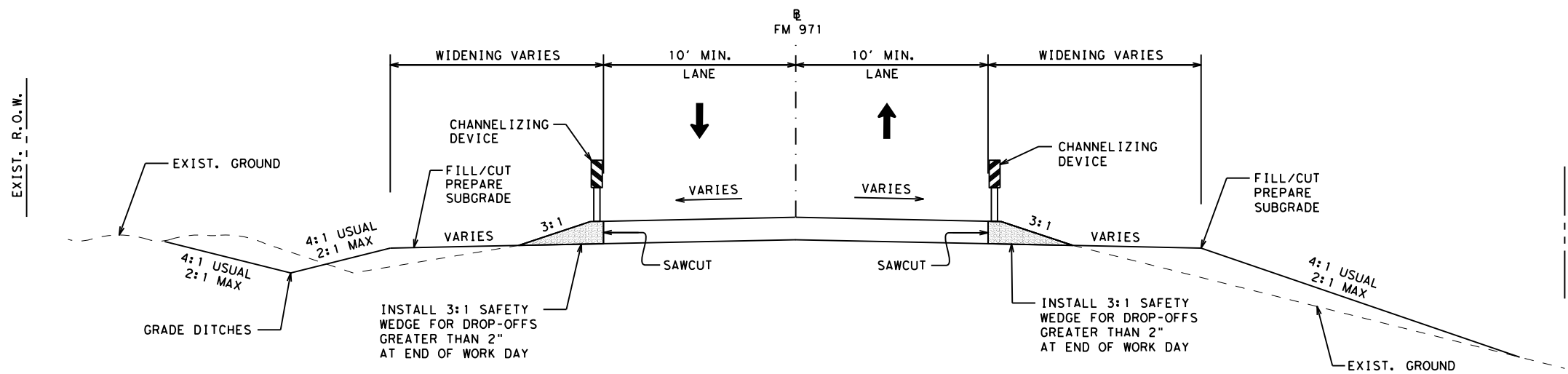
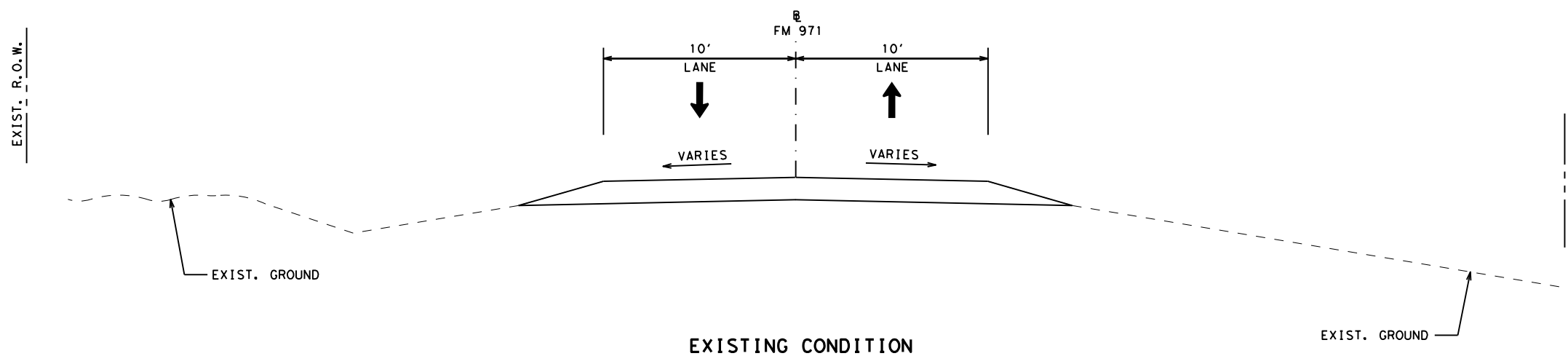
TRAFFIC CONTROL: FROM STA. 458+00.00 TO STA. 567+68.53
 PLACE NEW PAVEMENT FOR PROPOSED WIDENED SECTION
 (WITH THE EXCEPTION OF GEORGETOWN RAILROAD CROSSING AT
 STA. 493+26.00 RR MP 913.50 DOT NO. 414 902A)

- 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/RIGHT OF FM-971 CENTERLINE.
- E. CONSTRUCT 12" CEMENT TREATED FLEXIBLE BASE LEFT/RIGHT OF FM-971 CENTERLINE.
- F. CONSTRUCT 2" D-GR HMA TYD LEFT/RIGHT OF FM-971 CENTERLINE.
- G. INSTALL SEAL COAT LEFT/RIGHT OF FM-971 CENTERLINE.
- H. INSTALL 3:1 SAFETY WEDGE FOR DROP-OFF GREATER THAN 2".
- I. CONSTRUCT 100:1 TRANSITIONS.
- J. RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF THE DAY.

NOTE:

NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

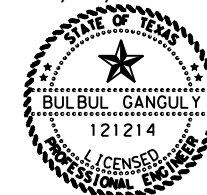
MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



**PHASE 2,
PREP WORK SETUP**

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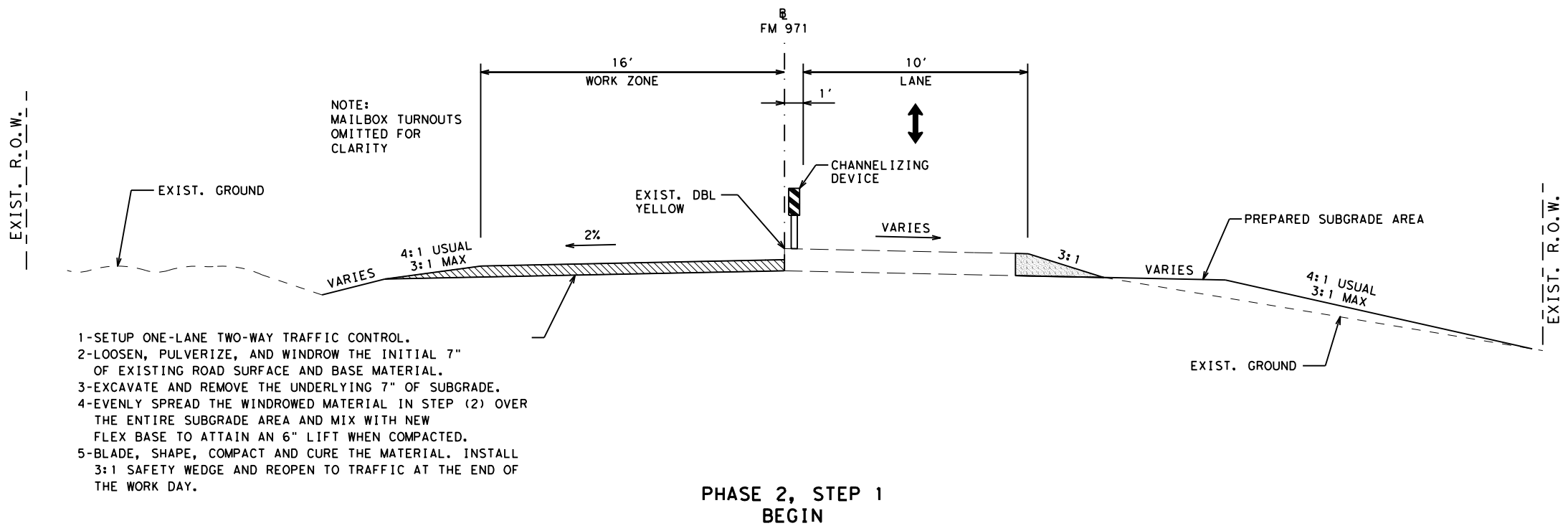
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**FM 971
TCP TYPICAL SECTIONS
PHASE 2
PAVEMENT WIDENING**

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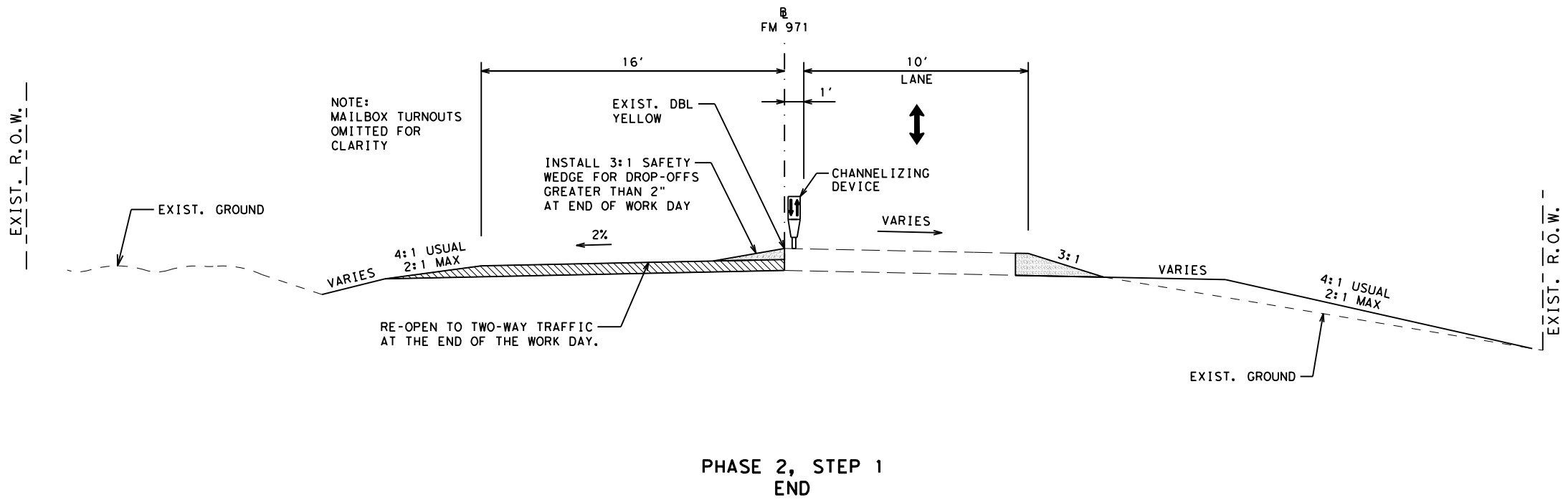
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- 1-SETUP ONE-LANE TWO-WAY TRAFFIC CONTROL.
- 2-LOOSEN, PULVERIZE, AND WINDROW THE INITIAL 7" OF EXISTING ROAD SURFACE AND BASE MATERIAL.
- 3-EXCAVATE AND REMOVE THE UNDERLYING 7" OF SUBGRADE.
- 4-EVENLY SPREAD THE WINDROWED MATERIAL IN STEP (2) OVER THE ENTIRE SUBGRADE AREA AND MIX WITH NEW FLEX BASE TO ATTAIN AN 6" LIFT WHEN COMPACTED.
- 5-BLADE, SHAPE, COMPACT AND CURE THE MATERIAL. INSTALL 3:1 SAFETY WEDGE AND REOPEN TO TRAFFIC AT THE END OF THE WORK DAY.

NOTE:
NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



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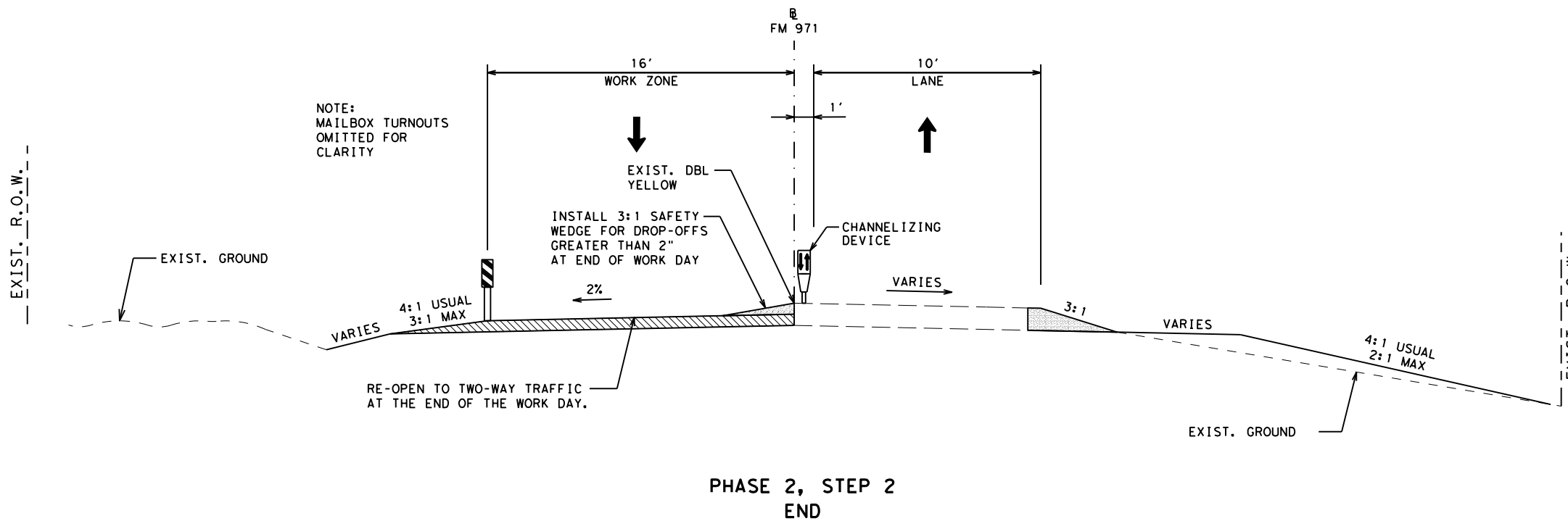
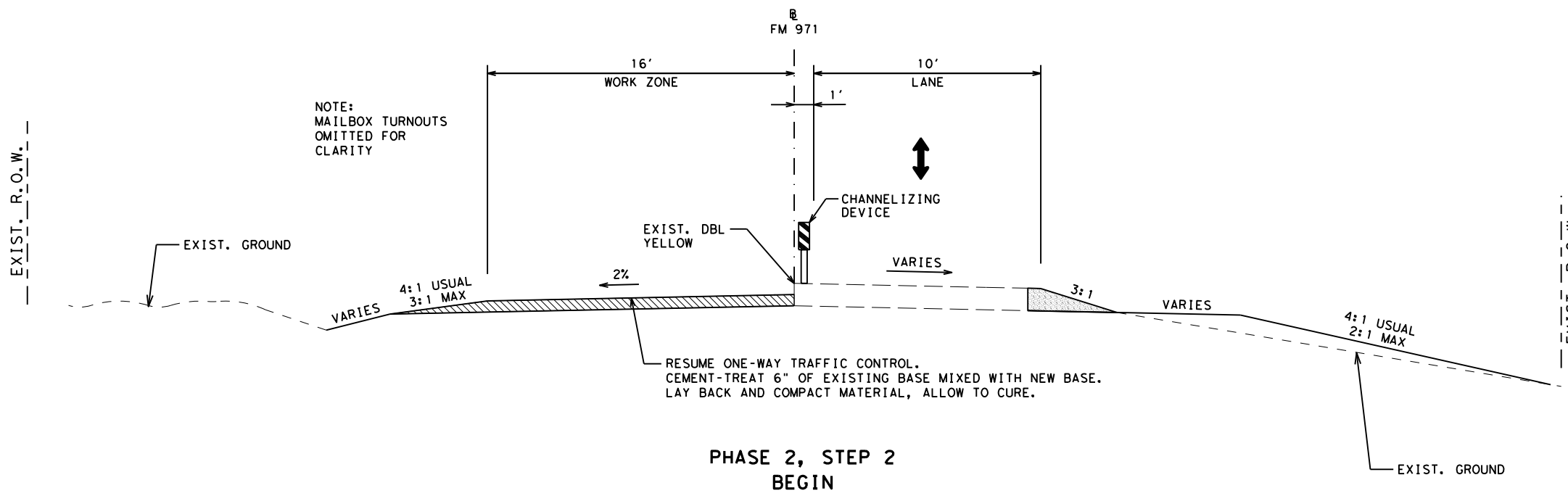
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**FM 971
TCP TYPICAL SECTIONS
PHASE 2
PAVEMENT WIDENING**

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NOTE:
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MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



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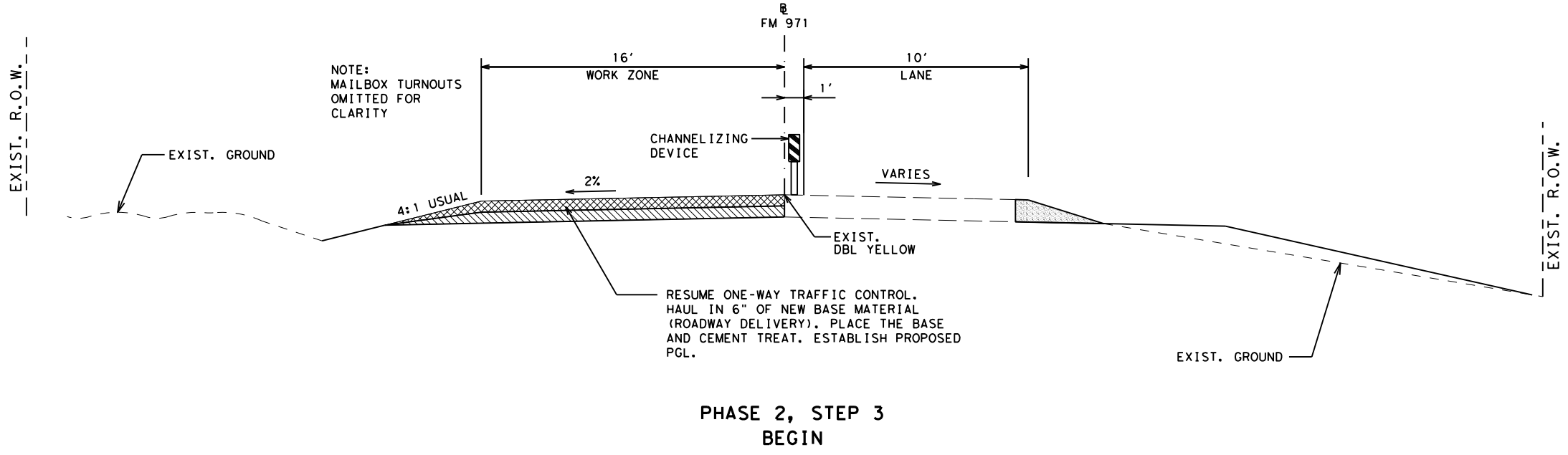
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FM 971
 TCP TYPICAL SECTIONS
 PHASE 2
 PAVEMENT WIDENING

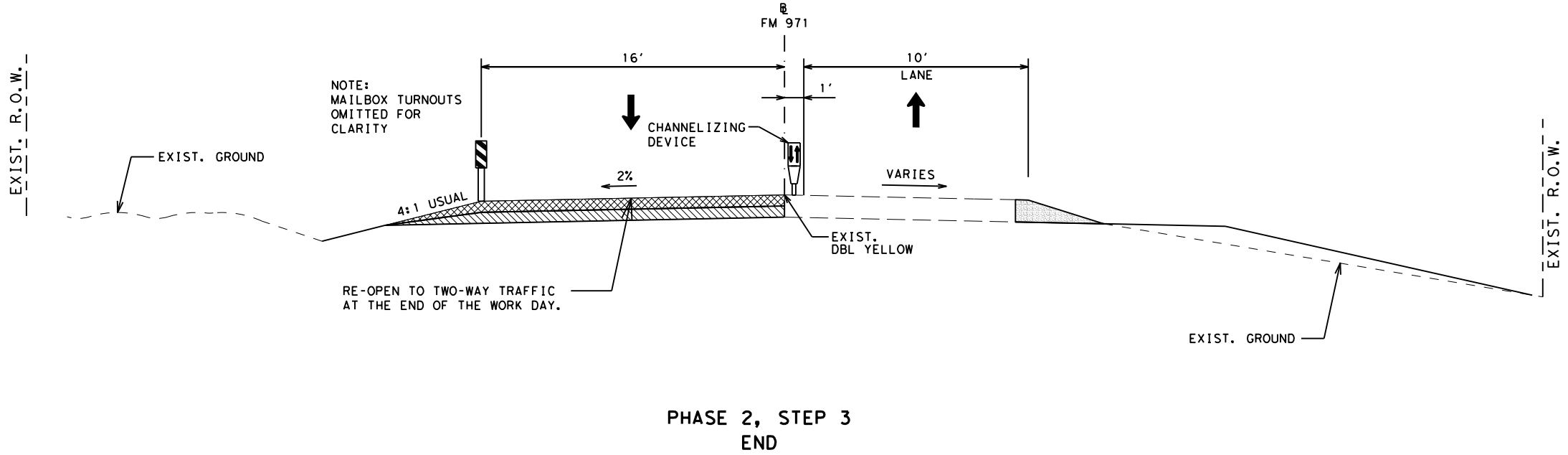
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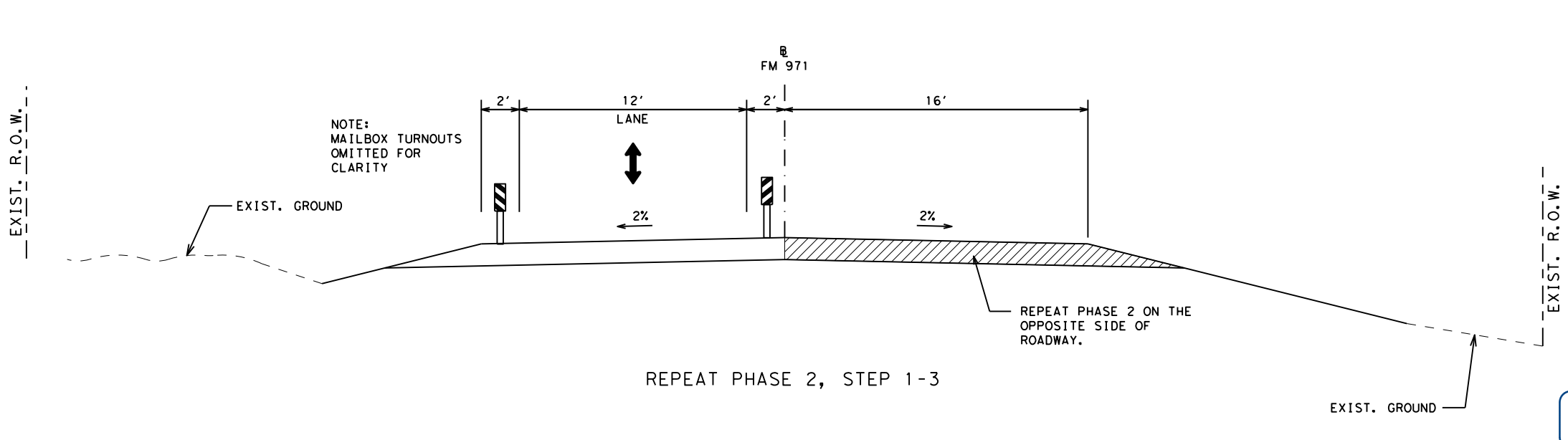
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**PHASE 2, STEP 3
BEGIN**



**PHASE 2, STEP 3
END**



REPEAT PHASE 2, STEP 1-3

NOTE:
NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



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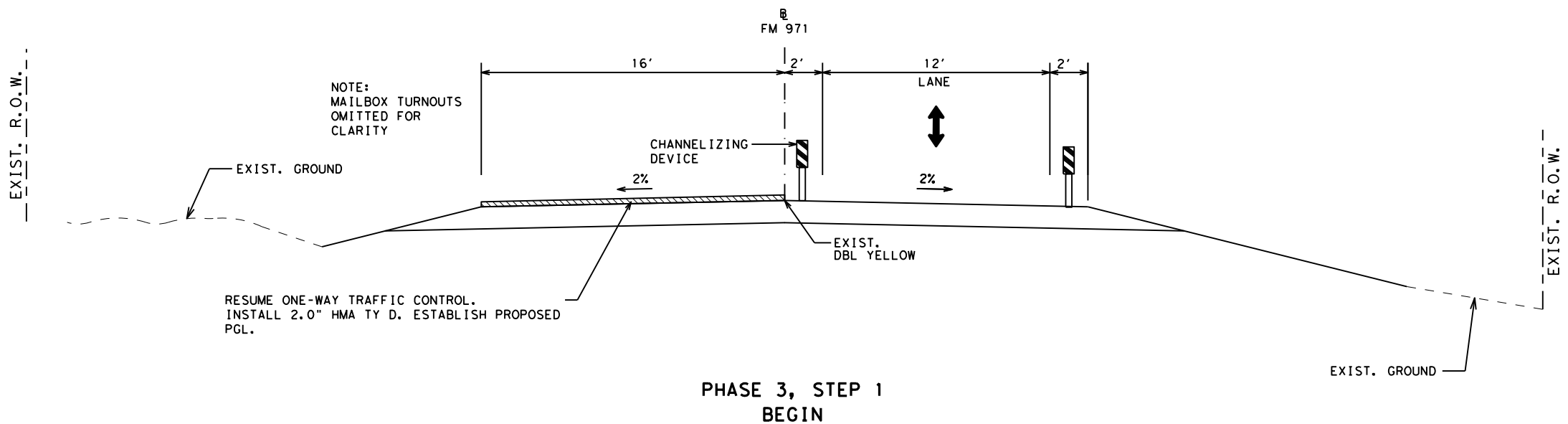
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**FM 971
TCP TYPICAL SECTIONS
PHASE 2
PAVEMENT WIDENING**

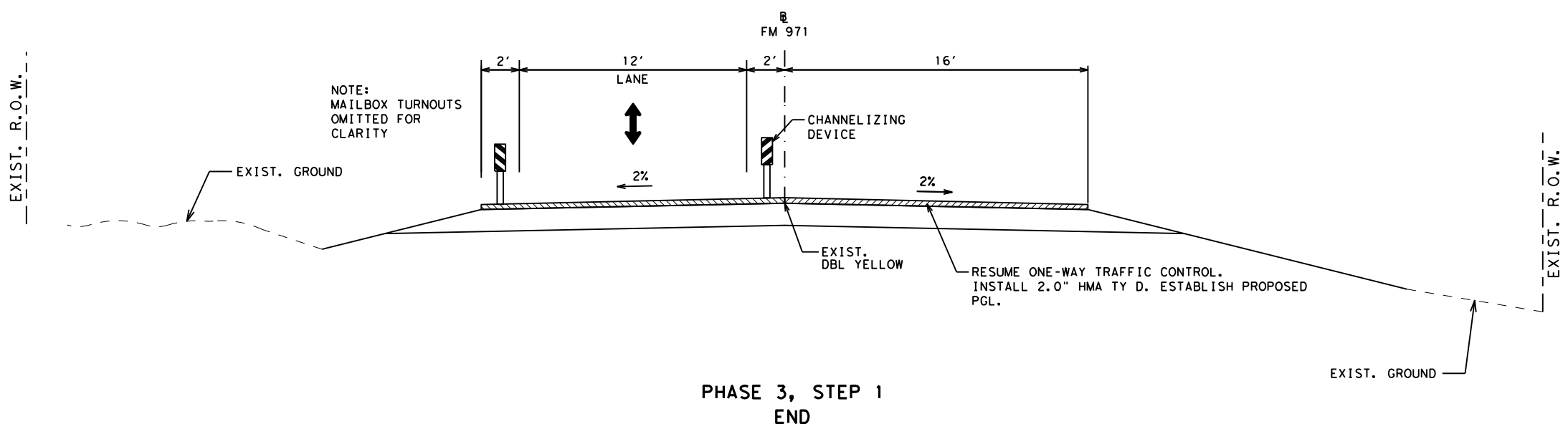
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**PHASE 3, STEP 1
BEGIN**



**PHASE 3, STEP 1
END**

NOTE:
NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



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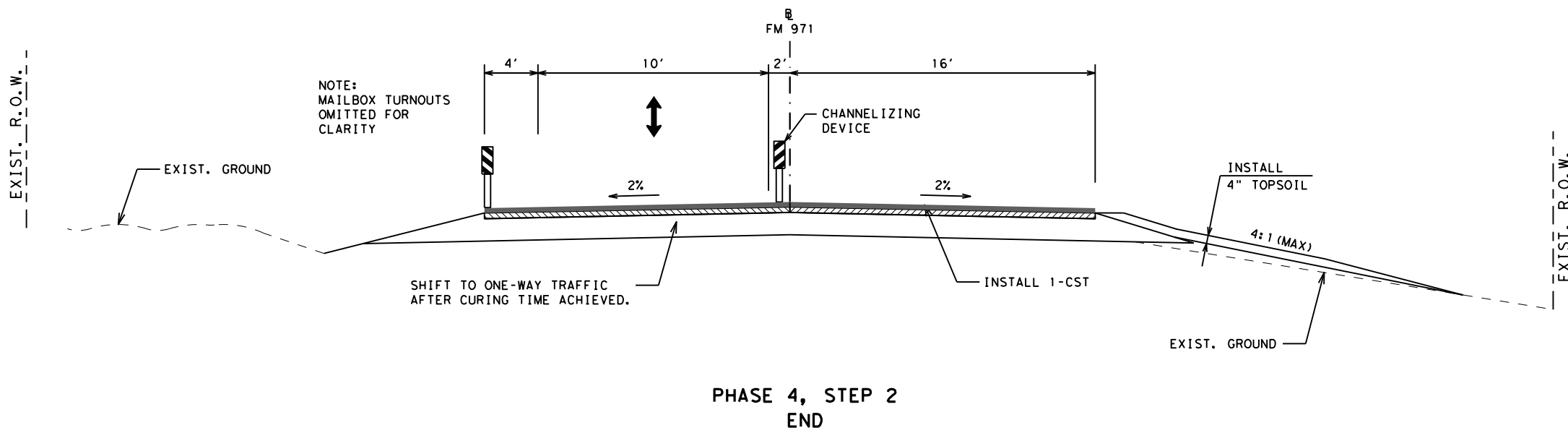
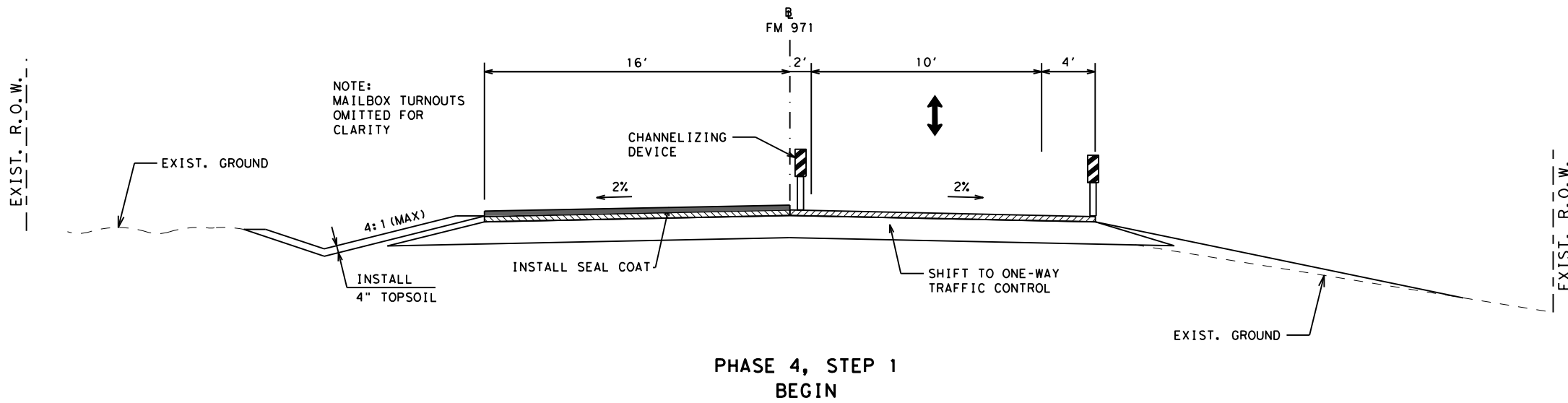
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**FM 971
TCP TYPICAL SECTIONS
PHASE 3
PAVEMENT WIDENING**

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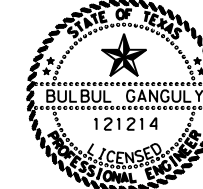
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NOTE:
NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.

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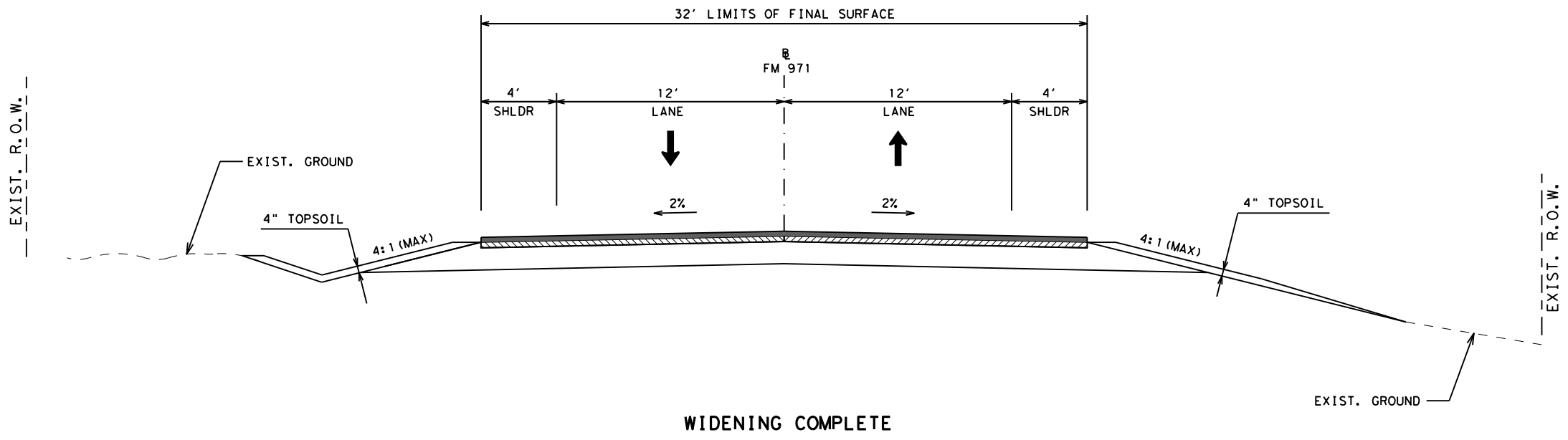
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**FM 971
TCP TYPICAL SECTIONS
PHASE 4
PAVEMENT WIDENING**

NOT TO SCALE SHEET 7 OF 8

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	DIST AUS	COUNTY WILLIAMSON	SHEET NO. 21	

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NOTE:
NO PLAN VIEW TCP PROVIDED. USE TCP(2-2)-18 FOR ONE-WAY TRAFFIC CONTROL SETUP/LANE CLOSURE DETAILS. WORKZONES WILL BE LIMITED TO WHAT THE CONTRACTOR CAN REMOVE, RESTORE AND RE-OPEN TO TWO-WAY TRAFFIC AT THE END OF EACH WORKDAY. MULTIPLE WORKZONE PHASES MAY BE OPERATED CONCURRENTLY. VERTICAL PANELS OR BARRELS MAY BE USED. CONTRACTOR MAY CHANGE SEQUENCE OF CONSTRUCTION WITH PRIOR APPROVAL FROM THE ENGINEER. MAINTAIN POSITIVE DRAINAGE.

MAINTAIN MILLINGS ON SITE TO TREAT EXISTING SUBGRADE THAT TRAFFIC DRIVES ON DURING RAIN EVENTS OR AS DIRECTED BY THE ENGINEER.



DocuSigned by:
Bulbul Ganguly

**Austin District
Central Design**

Texas Department of Transportation

**FM 971
TCP TYPICAL SECTIONS
PHASE 4
PAVEMENT WIDENING**

NOT TO SCALE SHEET 8 OF 8

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST		COUNTY	
	AUS		WILLIAMSON	
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:



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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

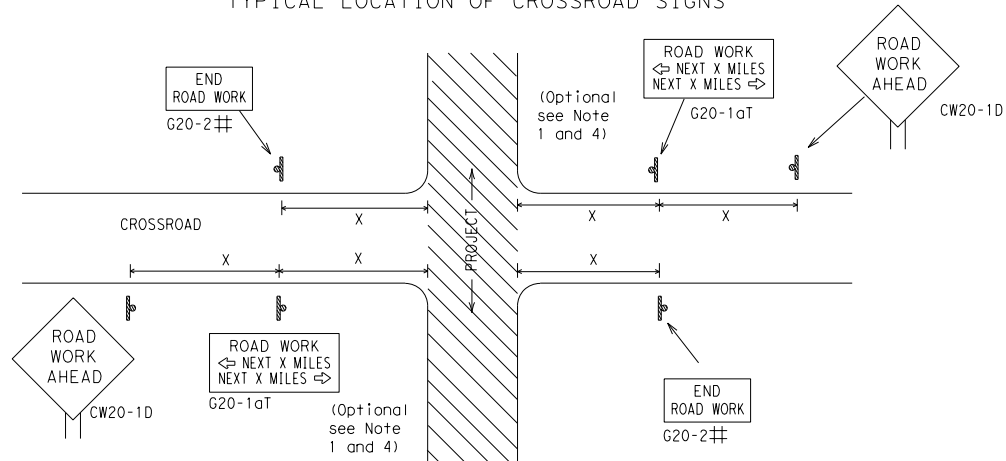
1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

SHEET 1 OF 12

			
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS			
BC (1) -21			
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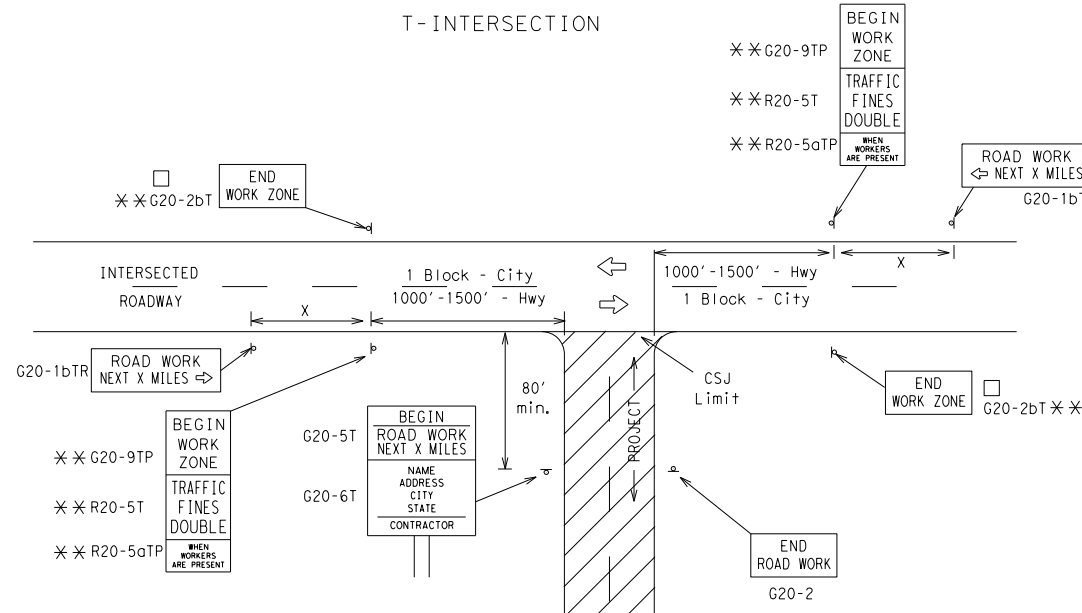
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

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

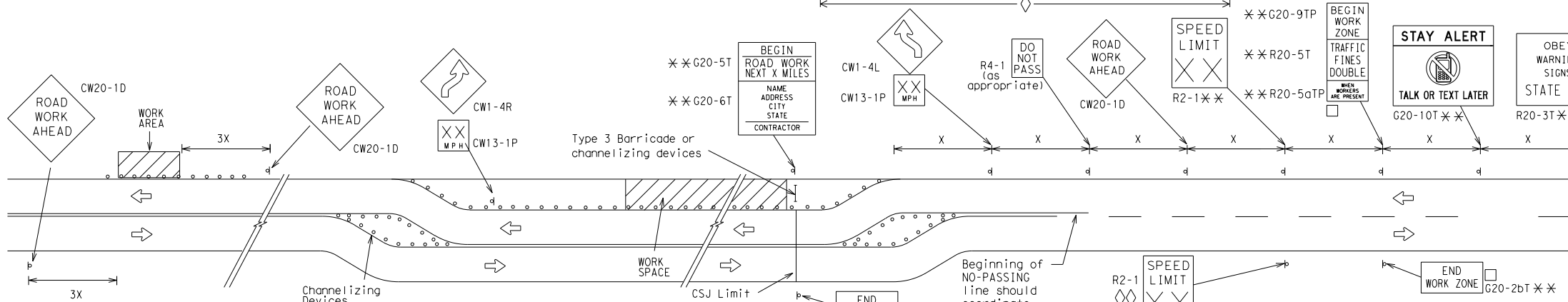
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

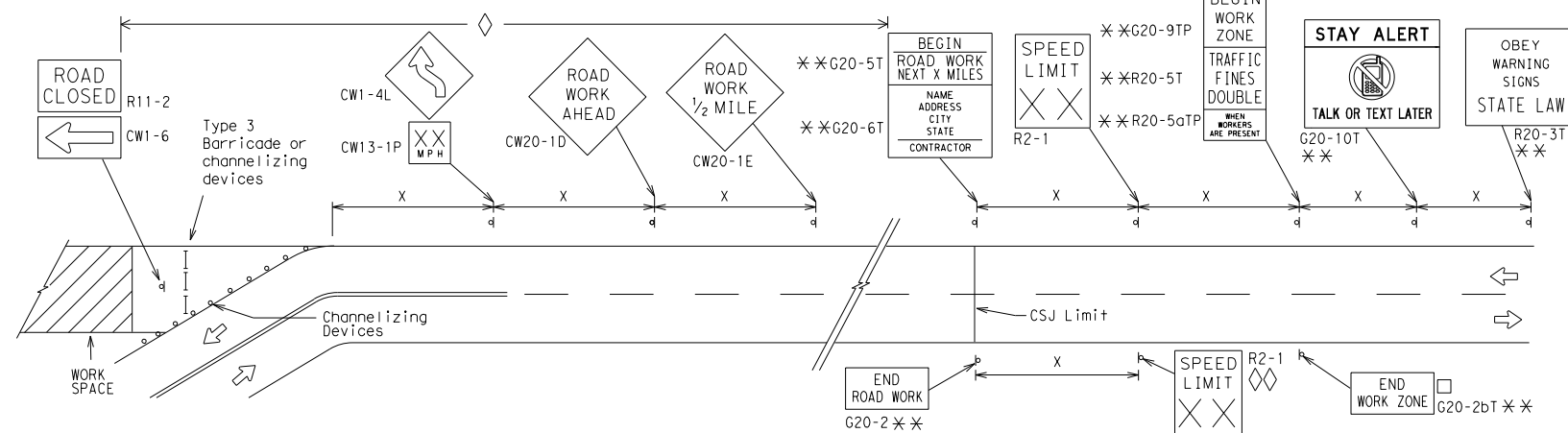
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

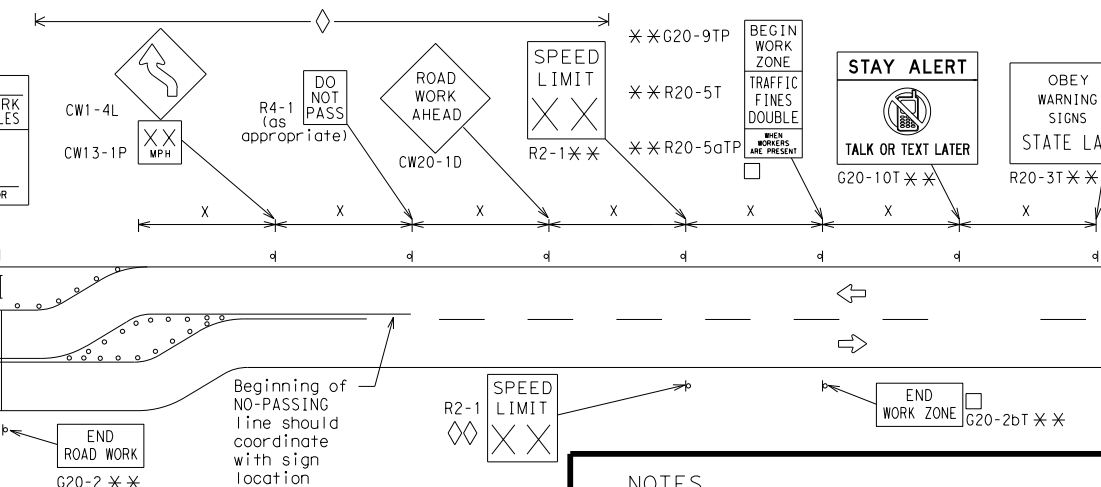


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

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

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

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

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

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

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

SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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7-13 5-21	AUS	WILLIAMSON		24

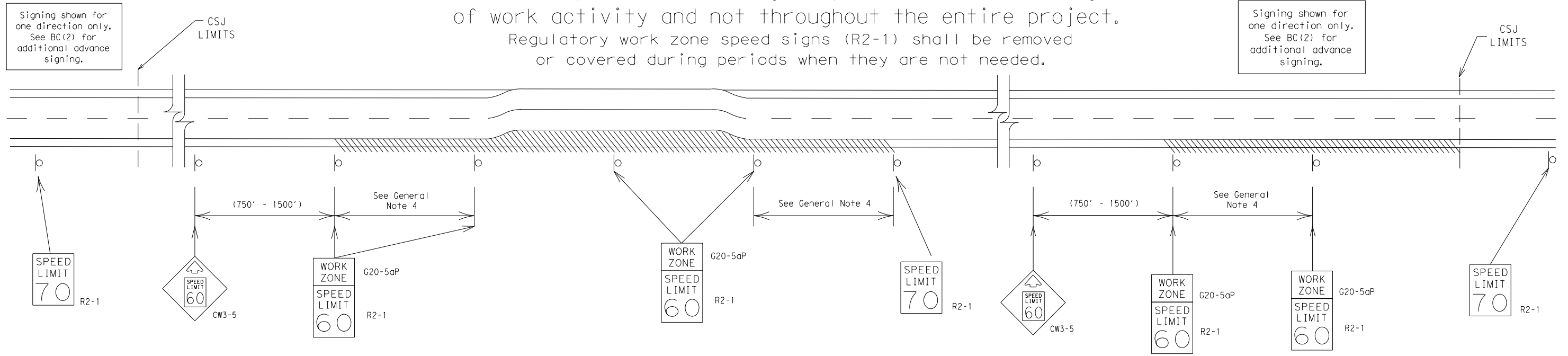
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:

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

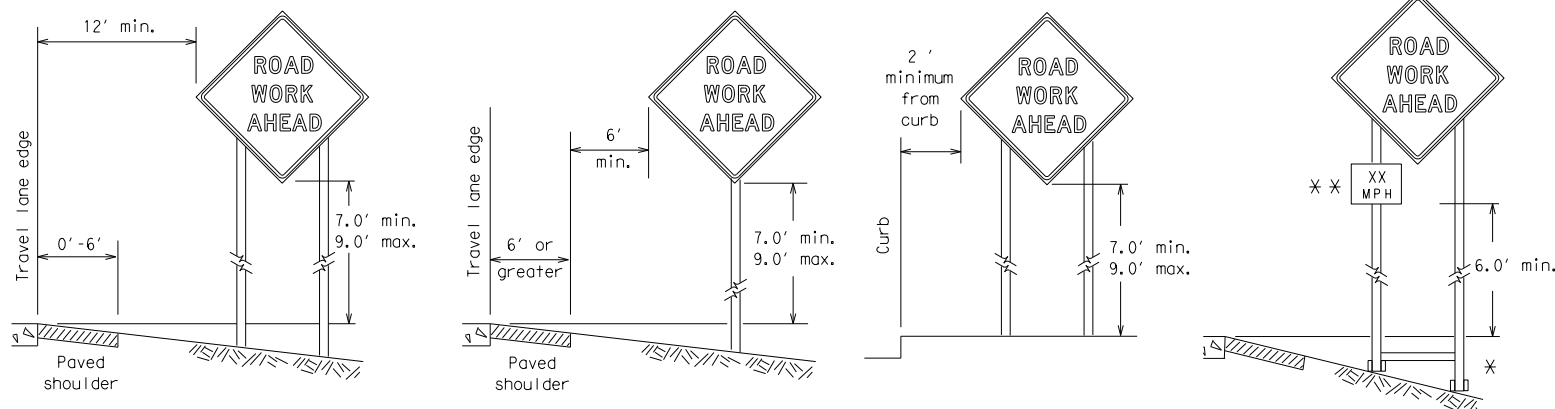
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SHEET 3 OF 12

		Traffic Safety Division Standard	
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT			
BC (3) - 21			
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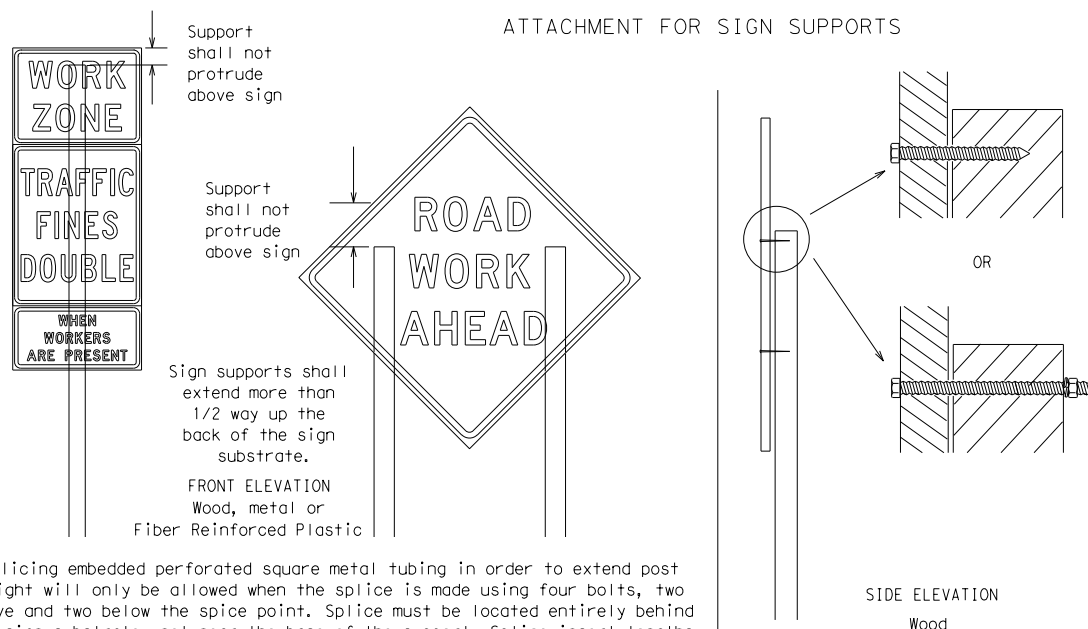
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

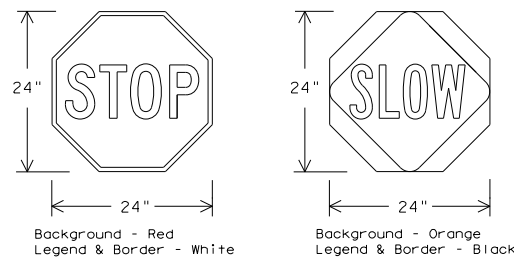
ATTACHMENT FOR SIGN SUPPORTS



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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

SHEET 4 OF 12



BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) -21

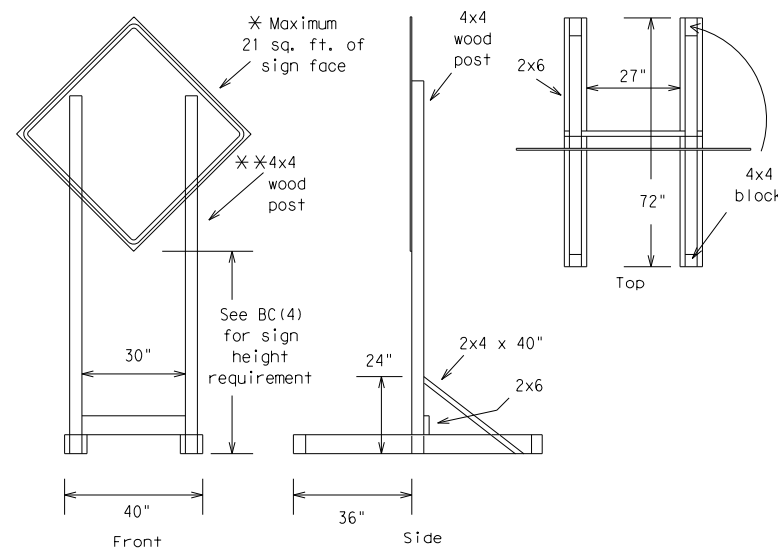
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		2690	01	038	FM 971				
9-07	8-14	DIST	COUNTY		SHEET NO.				
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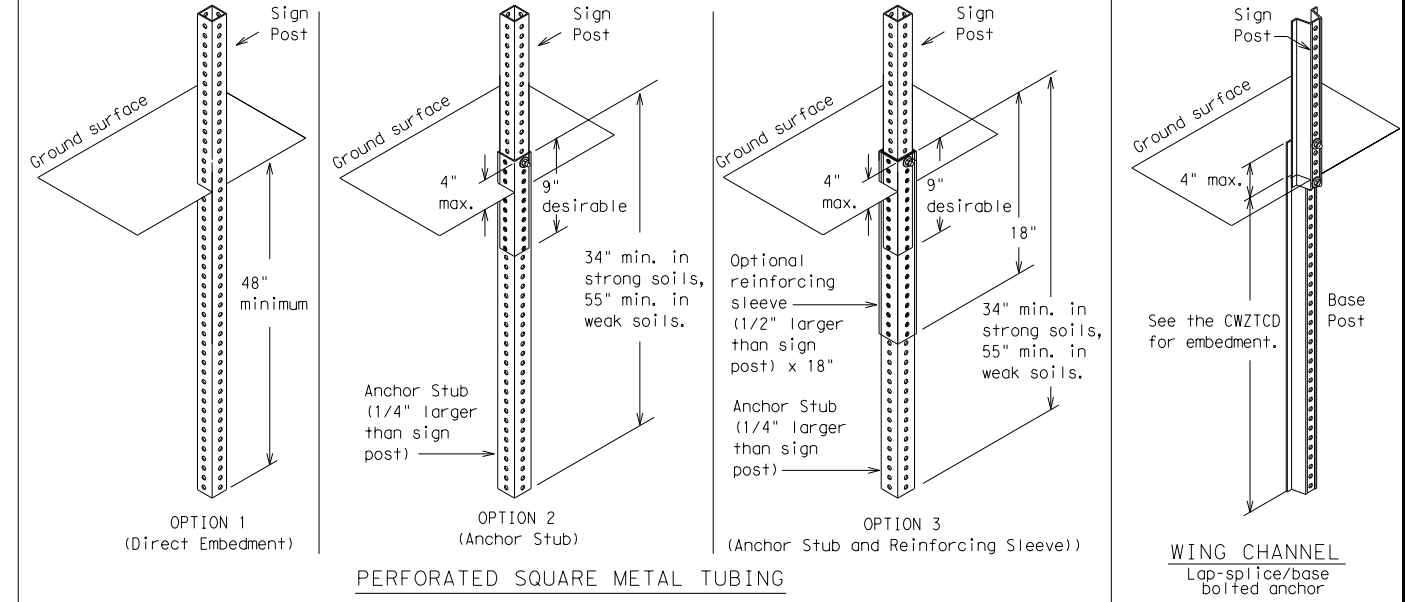
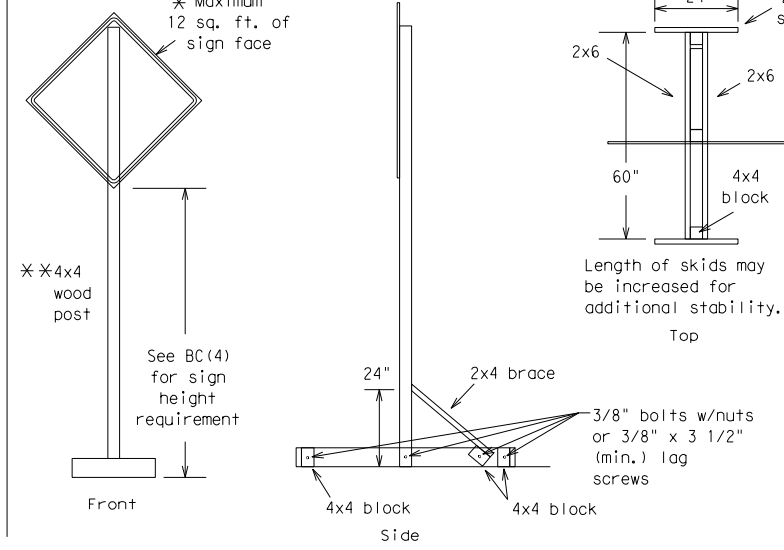
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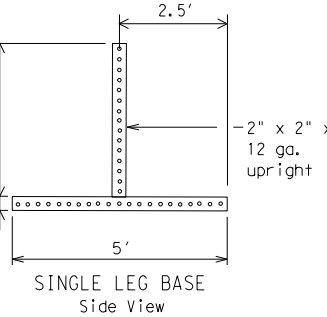
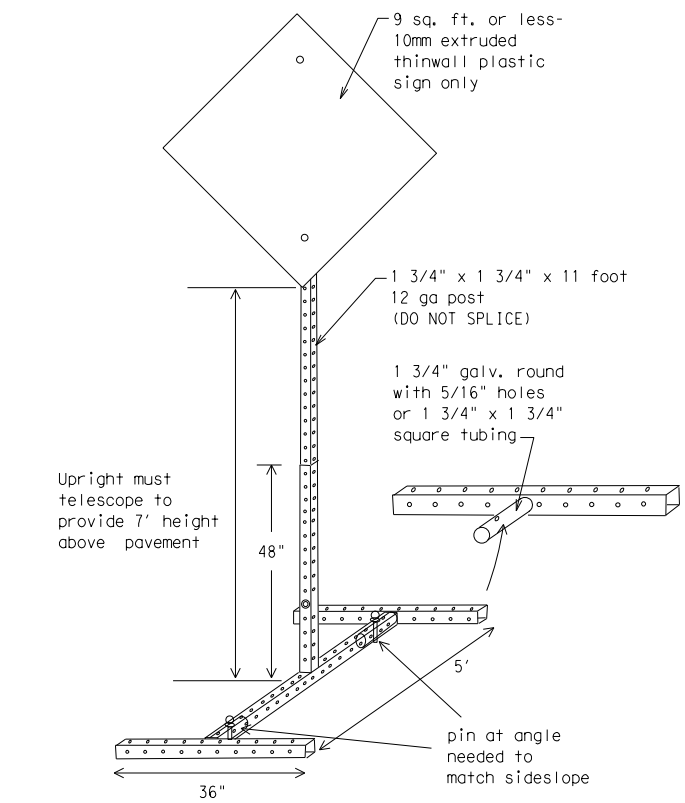
SKID MOUNTED WOOD SIGN SUPPORTS

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



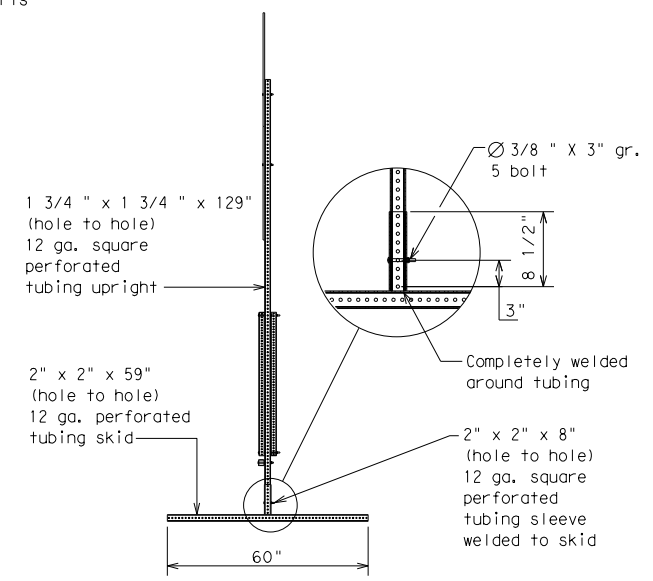
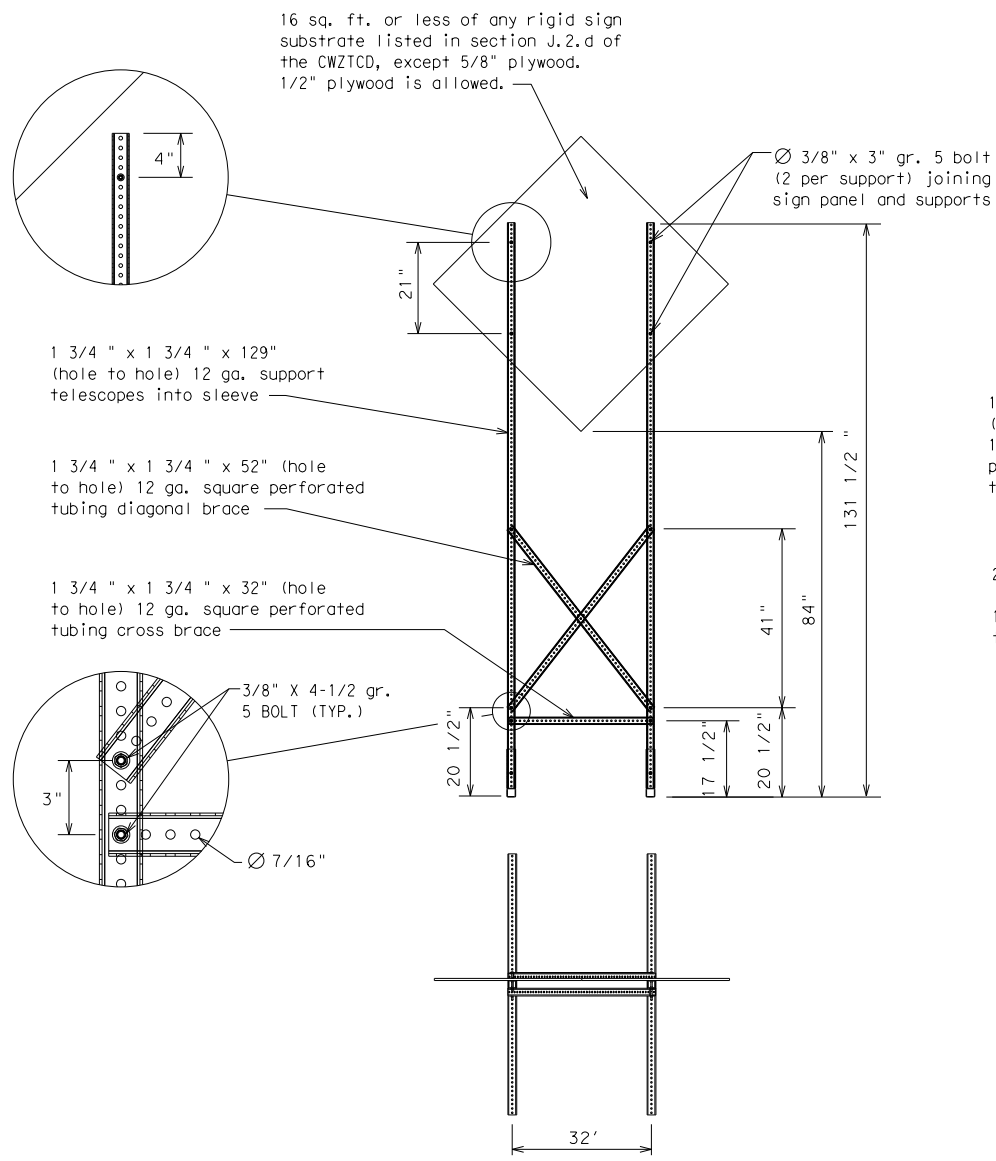
GROUND MOUNTED SIGN SUPPORTS

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



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
 - No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
 - When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.
- * See BC(4) for definition of "Work Duration."
 - ** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
 - See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	AUS	WILLIAMSON	27	

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

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

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

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

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
XXXXXXXX TO XXXXXXX
US XXX TO FM XXXX

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 21

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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	AUS	WILLIAMSON	28	

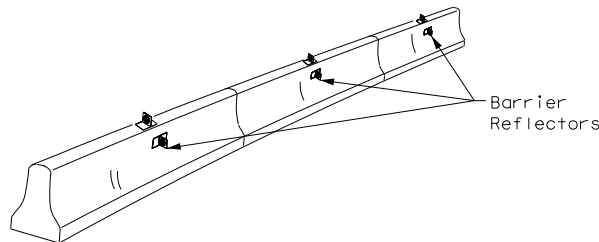
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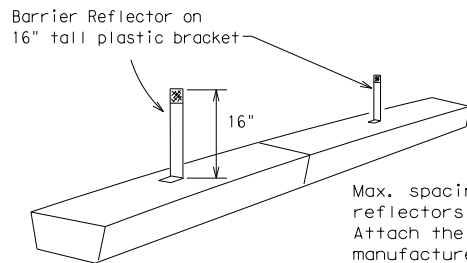
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



CONCRETE TRAFFIC BARRIER (CTB)



LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

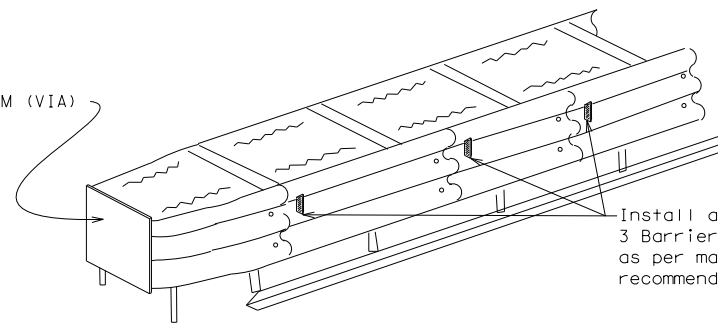
LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

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

LOW PROFILE CONCRETE BARRIER (LPCB)

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

See D & OM (VIA)



DELINEATION OF END TREATMENTS

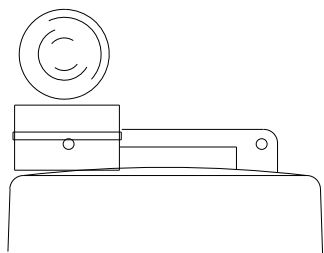
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

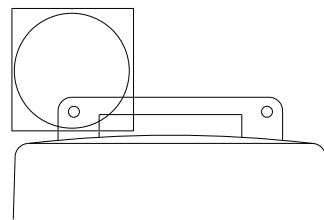
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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



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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

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



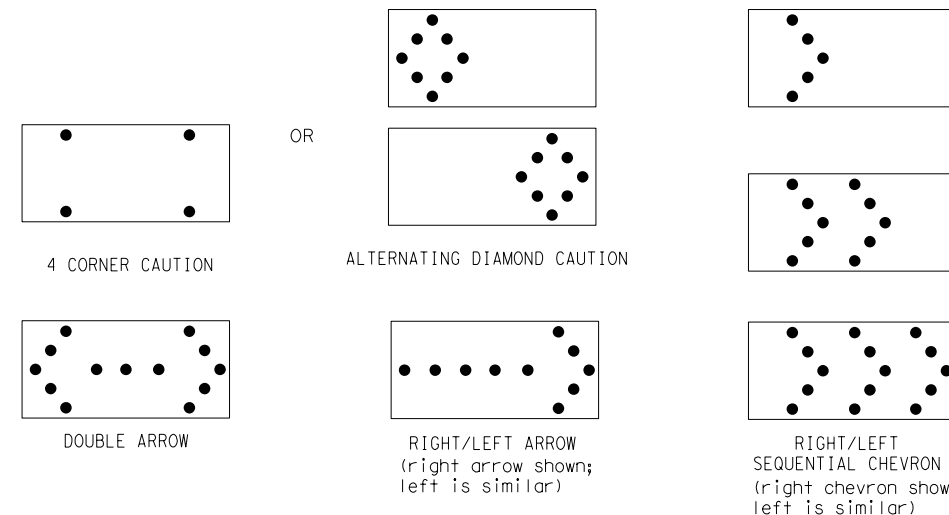
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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

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

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



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

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

ATTENTION
 Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

SHEET 7 OF 12



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

BC (7) - 21

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

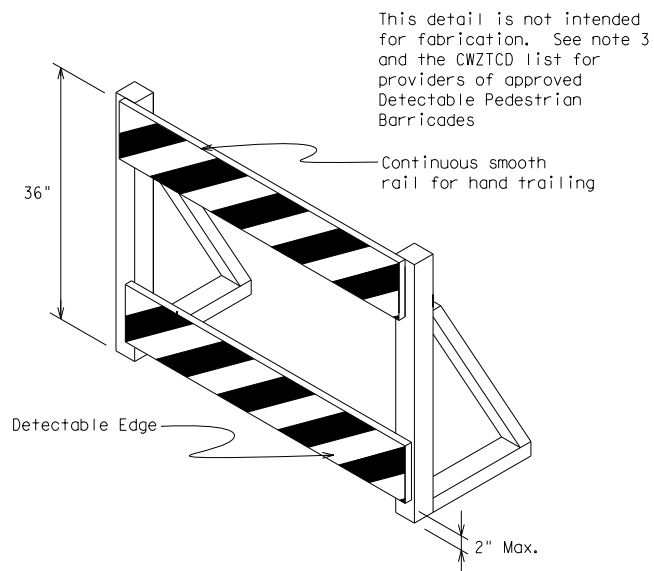
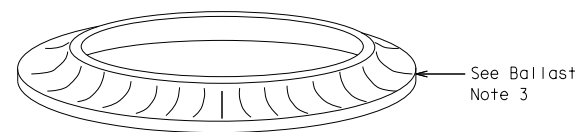
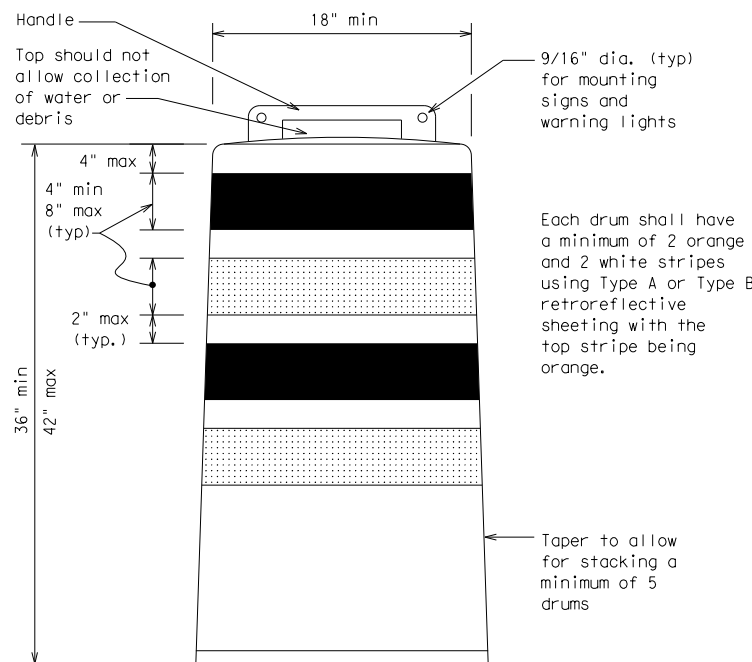
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

RETROREFLECTIVE SHEETING

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

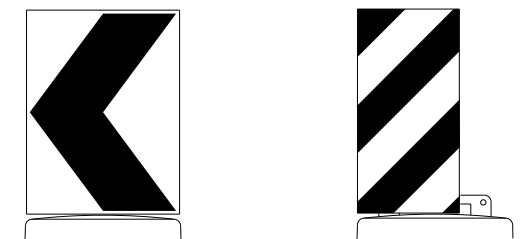
BALLAST

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



DETECTABLE PEDESTRIAN BARRICADES

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



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

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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

SHEET 8 OF 12



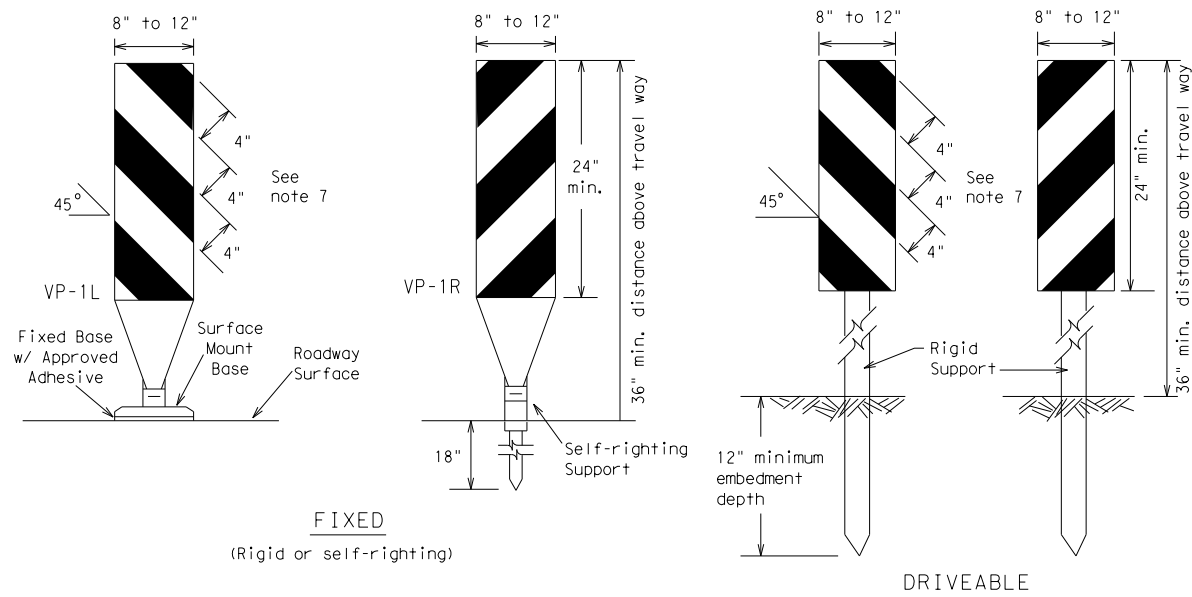
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

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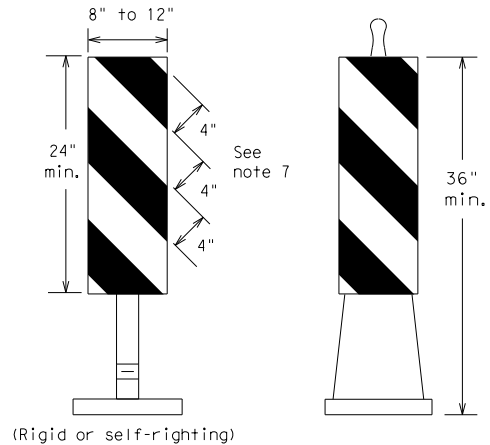
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FIXED
(Rigid or self-righting)

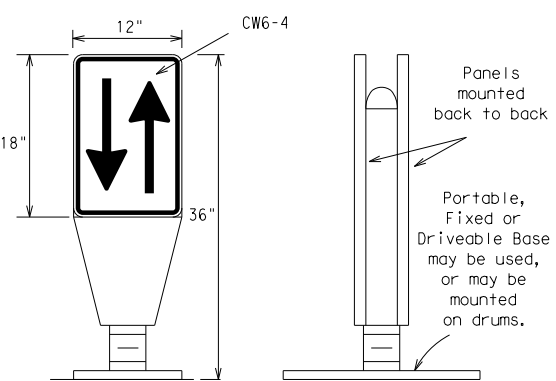
DRIVEABLE

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



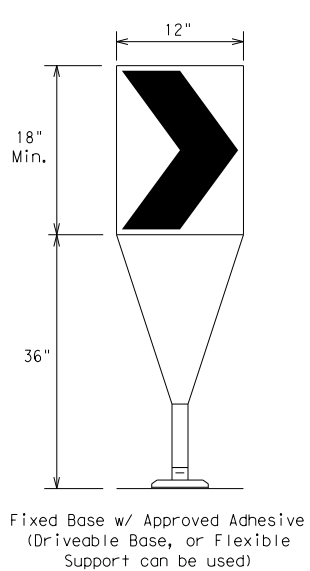
PORTABLE

VERTICAL PANELS (VPs)



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

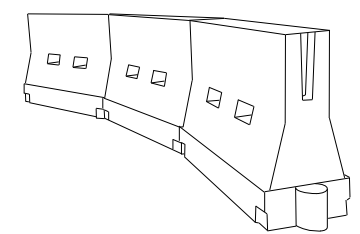
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base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



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

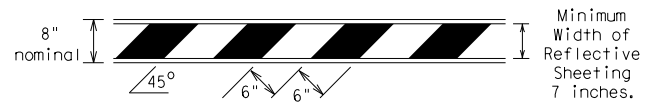
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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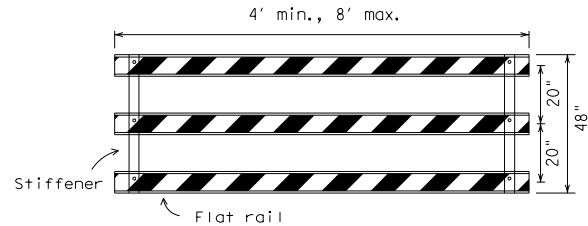
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



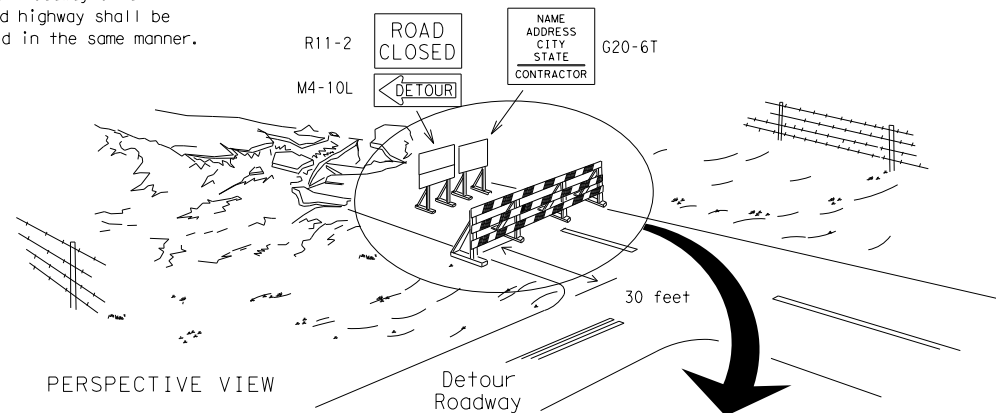
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

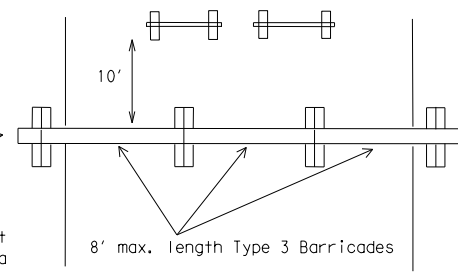
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

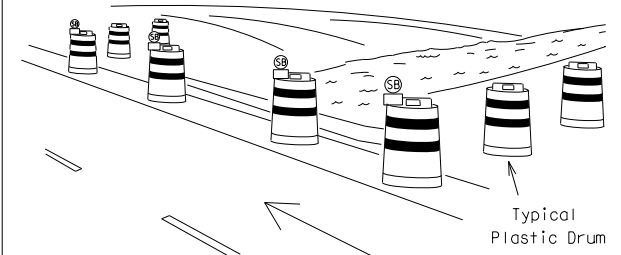
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



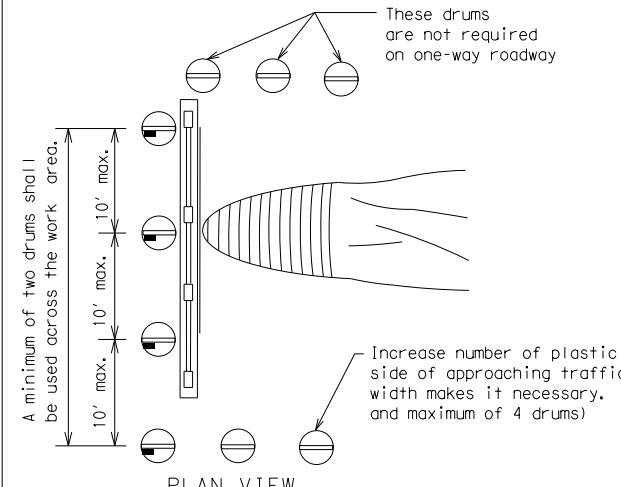
PLAN VIEW

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

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

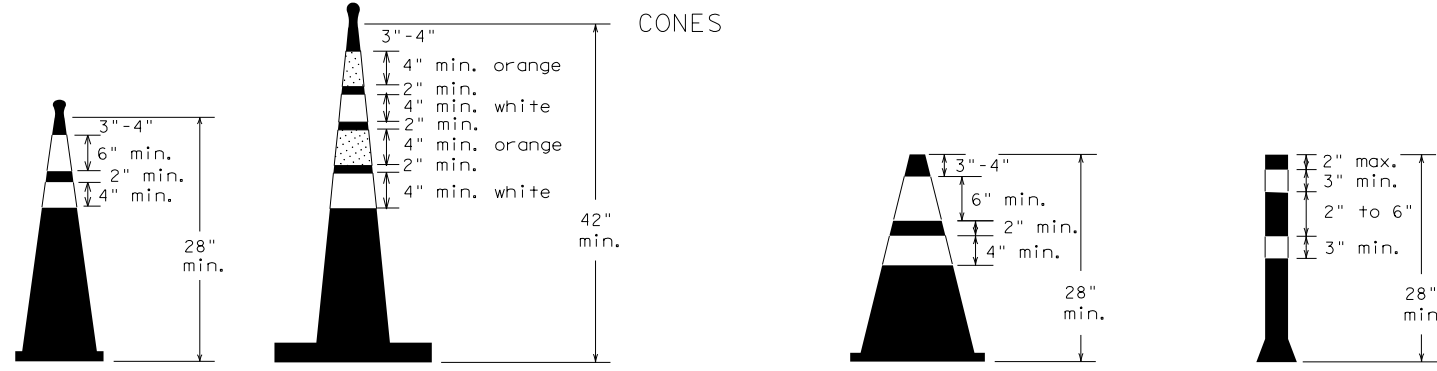


PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

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

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



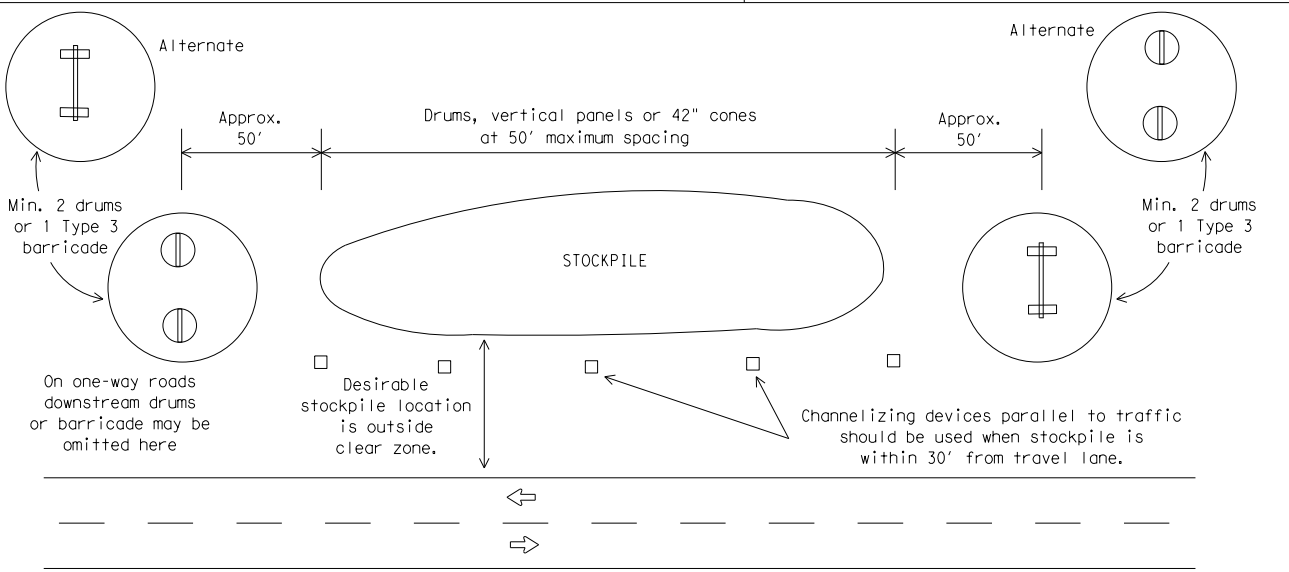
Two-Piece cones

One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) -21

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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.

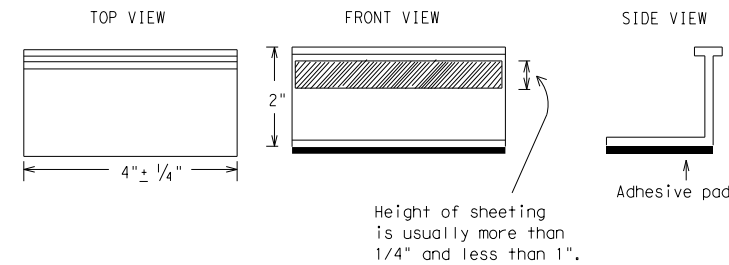
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

SHEET 11 OF 12



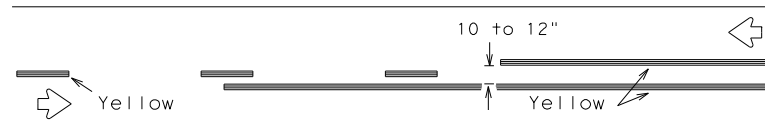
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

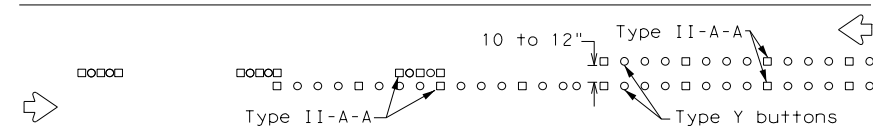
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	AUS	WILLIAMSON	33	
11-02 8-14				

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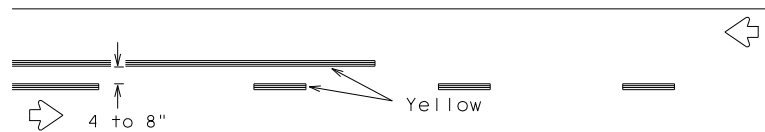
PAVEMENT MARKING PATTERNS



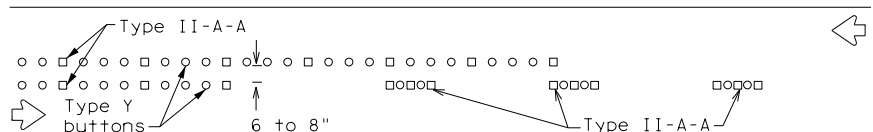
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



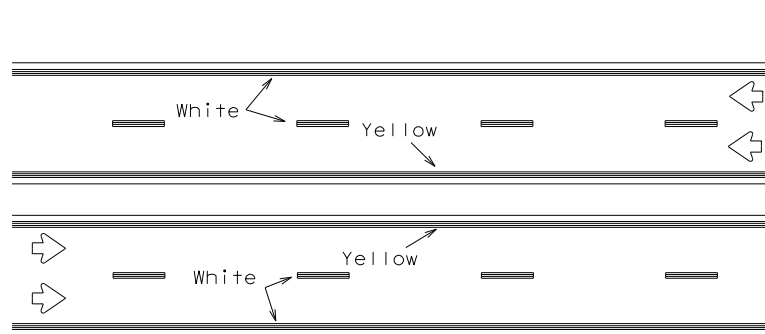
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



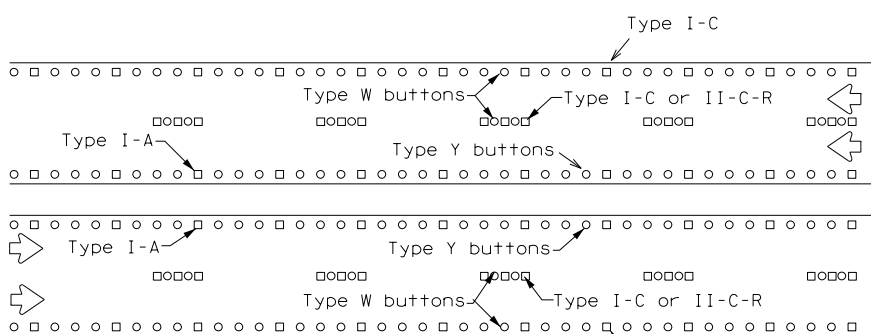
RAISED PAVEMENT MARKERS - PATTERN B

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

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



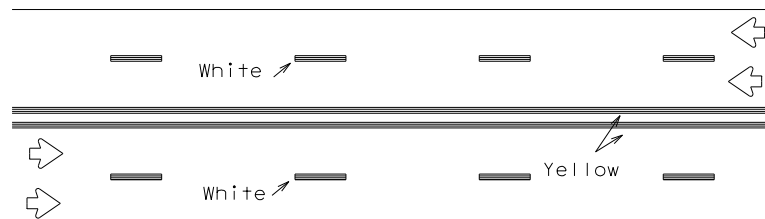
REFLECTORIZED PAVEMENT MARKINGS



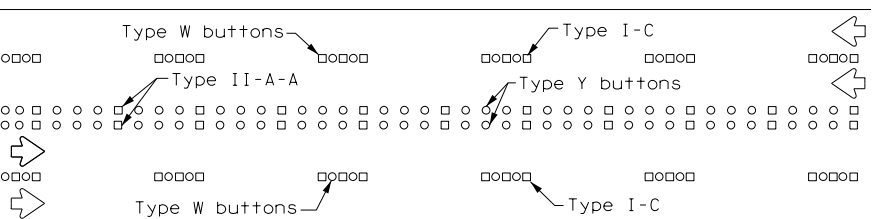
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



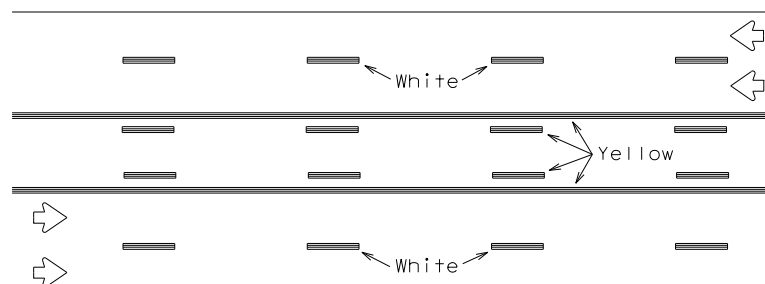
REFLECTORIZED PAVEMENT MARKINGS



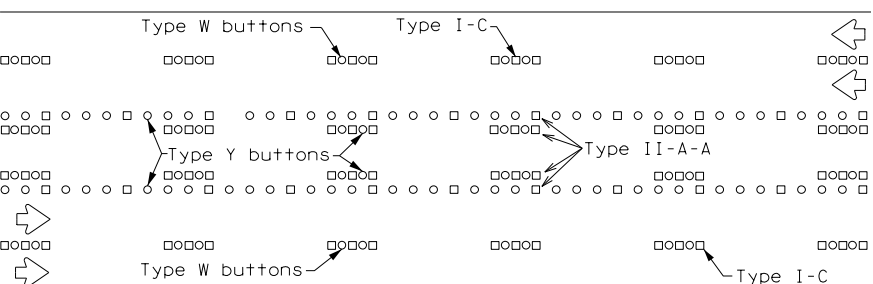
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

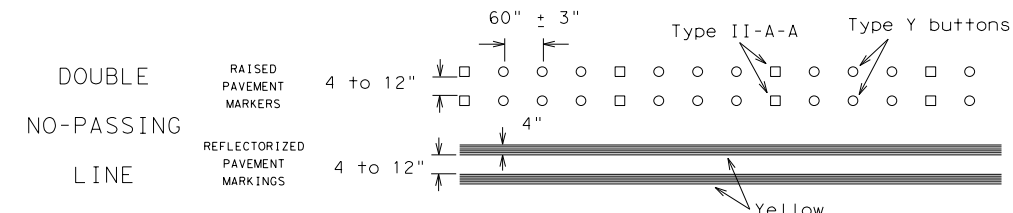


RAISED PAVEMENT MARKERS

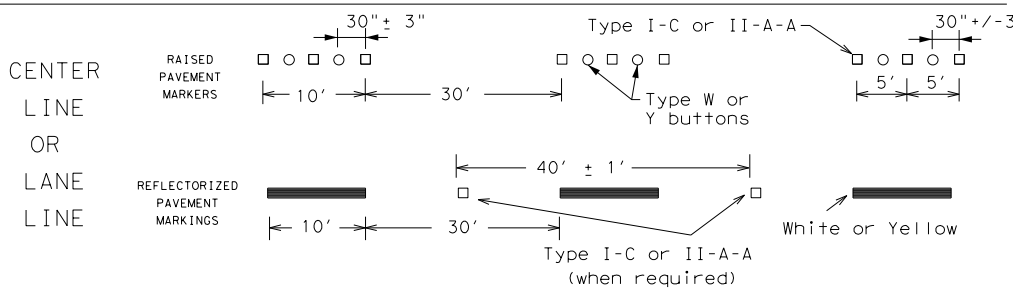
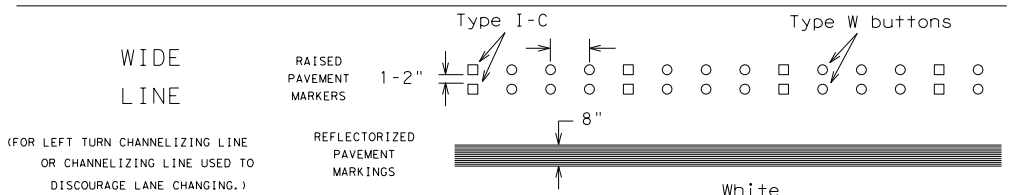
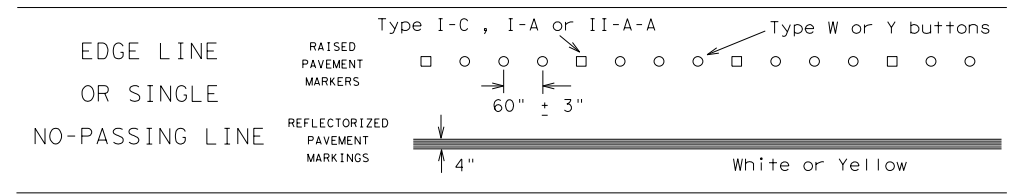
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

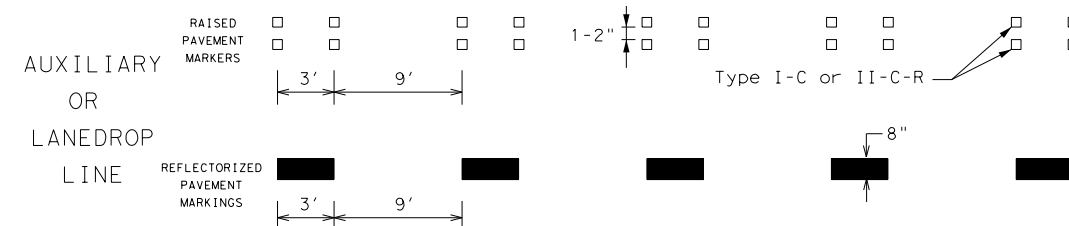
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SOLID LINES

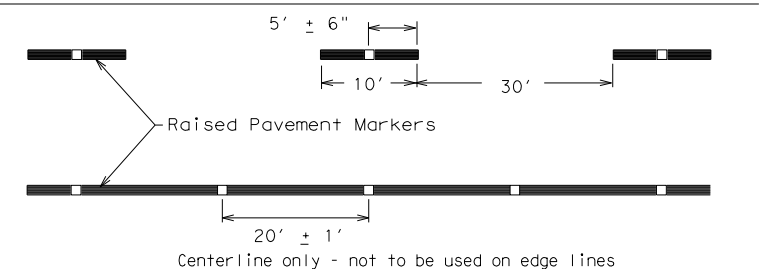


BROKEN LINES



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

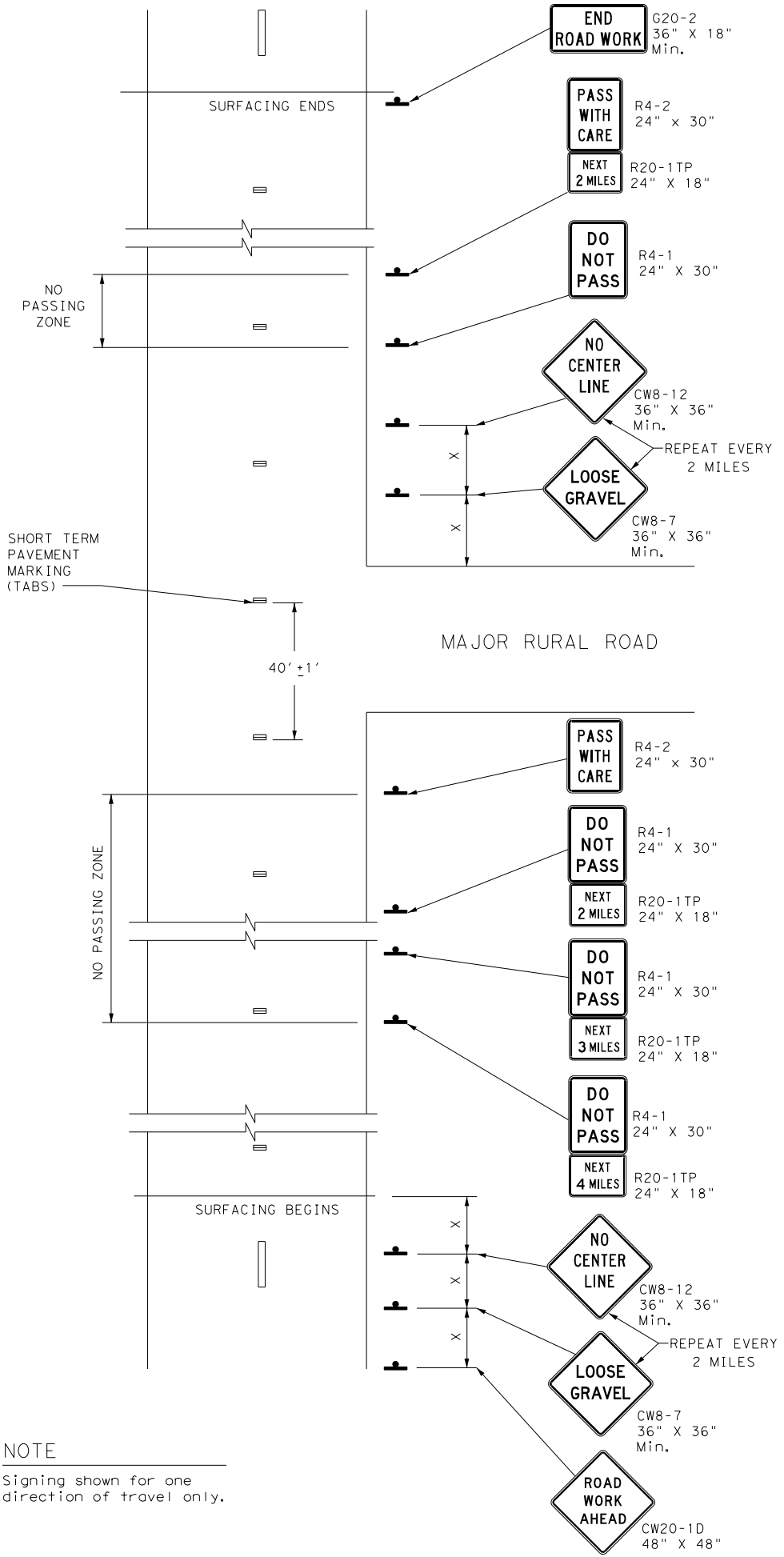
BC (12) - 21

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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690 01	038	FM 971	
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	AUS	WILLIAMSON	34	
11-02 8-14				

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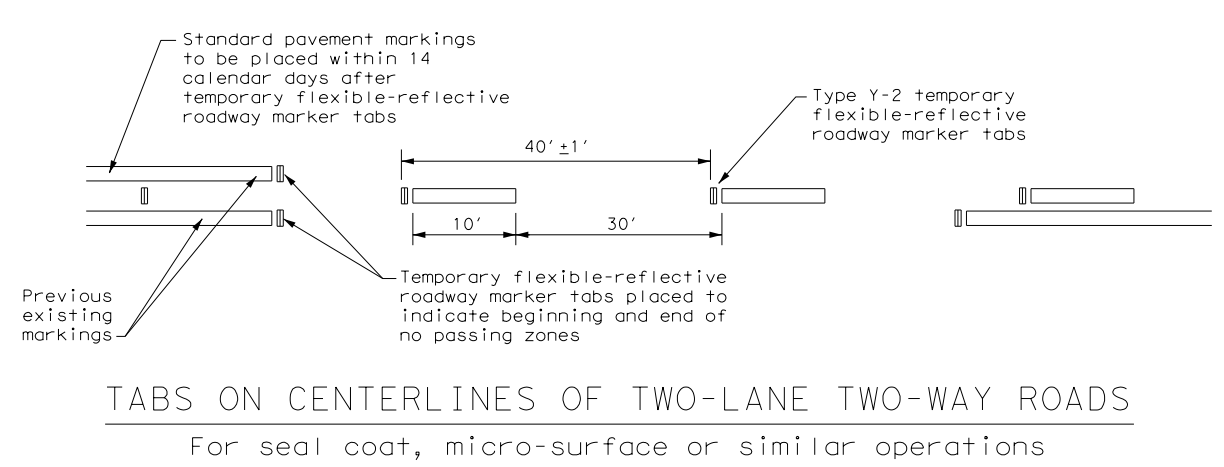
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NOTE
 Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



"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 day's 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.

Traffic Operations Division Standard

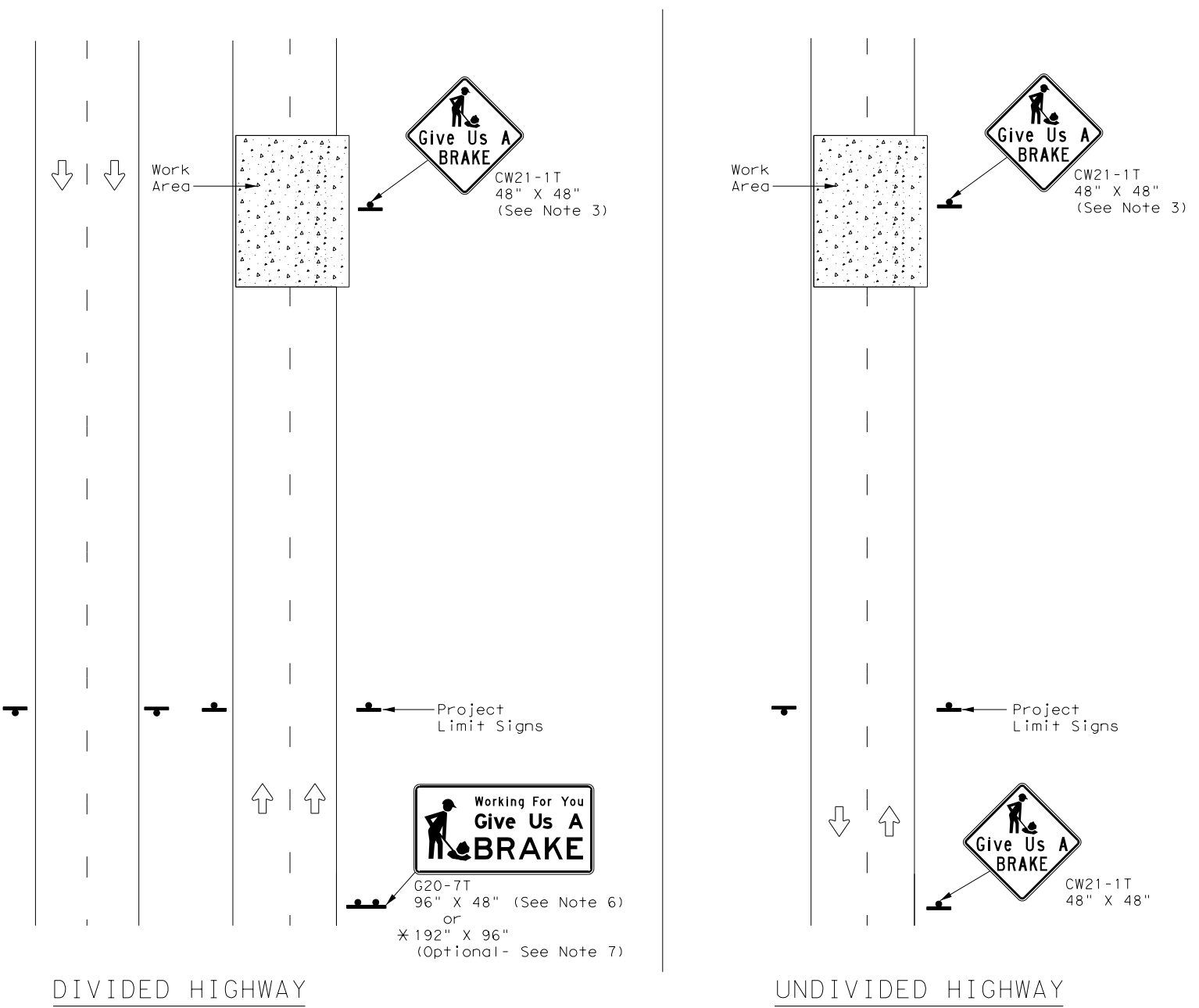
TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690 01		038	FM 971
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	AUS	WILLIAMSON		41

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SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

SUMMARY OF LARGE SIGNS									
BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL		DRILLED SHAFT	
						Size	(LF)		24" DIA. (LF)
Orange	G20-7T		96" X 48"	Type B _{FL} or C _{FL}	32	▲	▲	▲	▲
Orange	G20-7T		192" X 96"	Type B _{FL} or C _{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

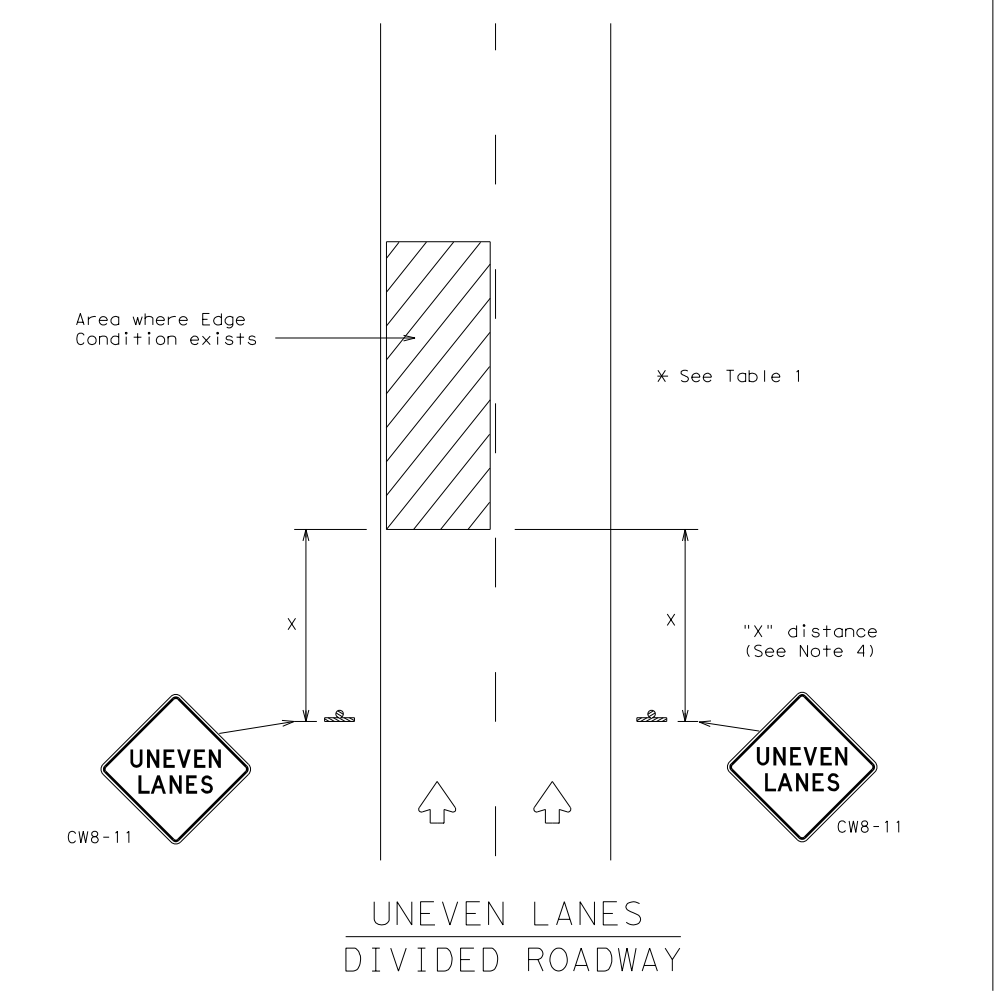
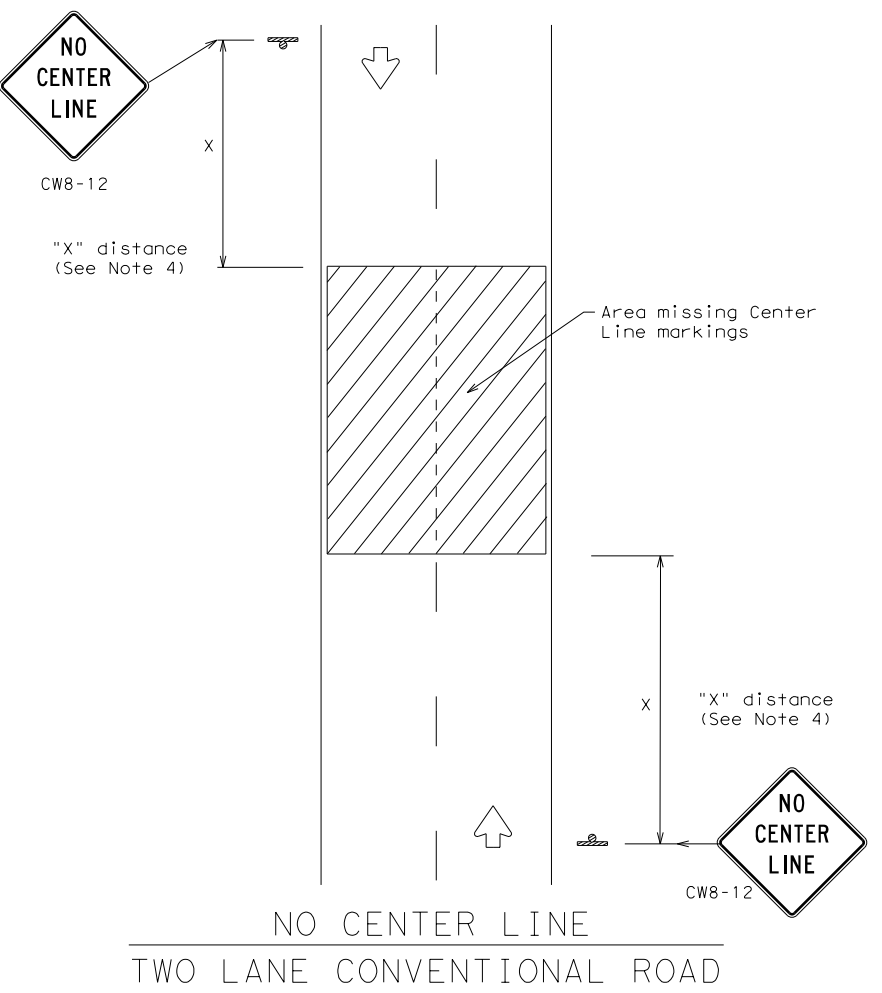
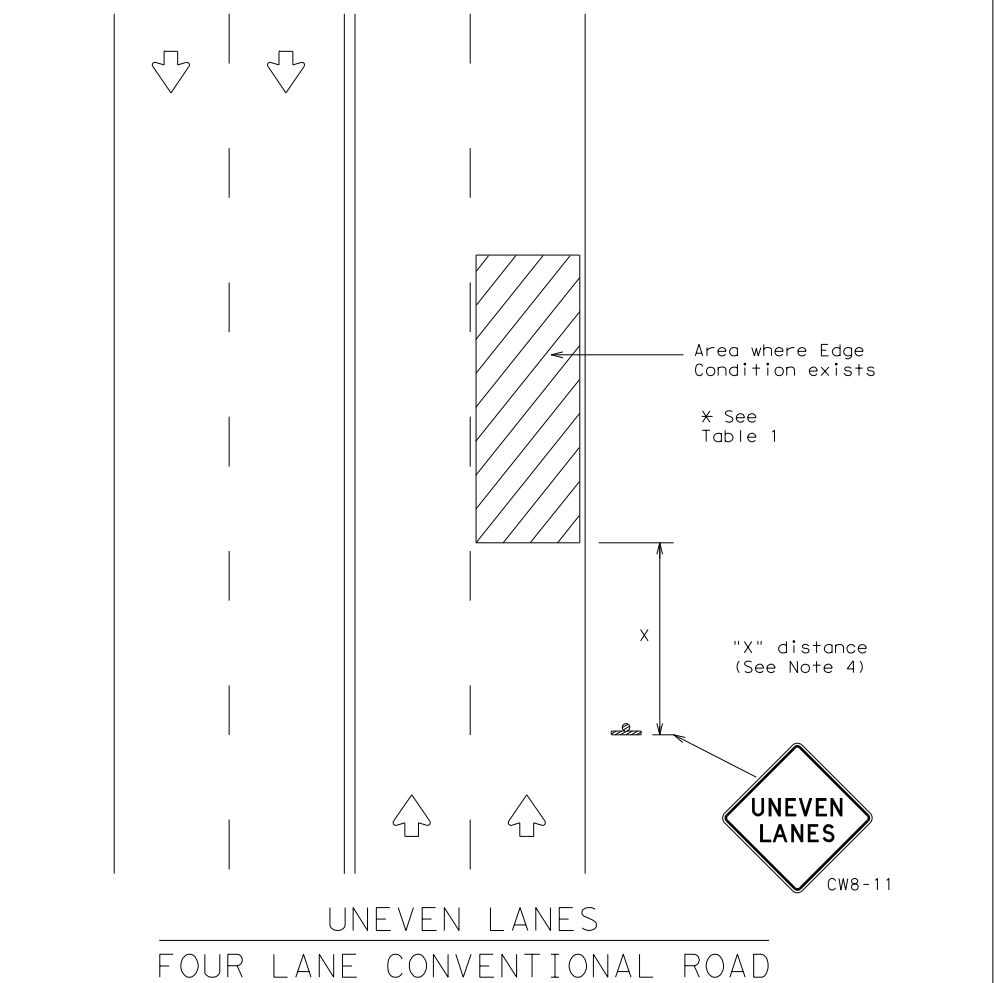
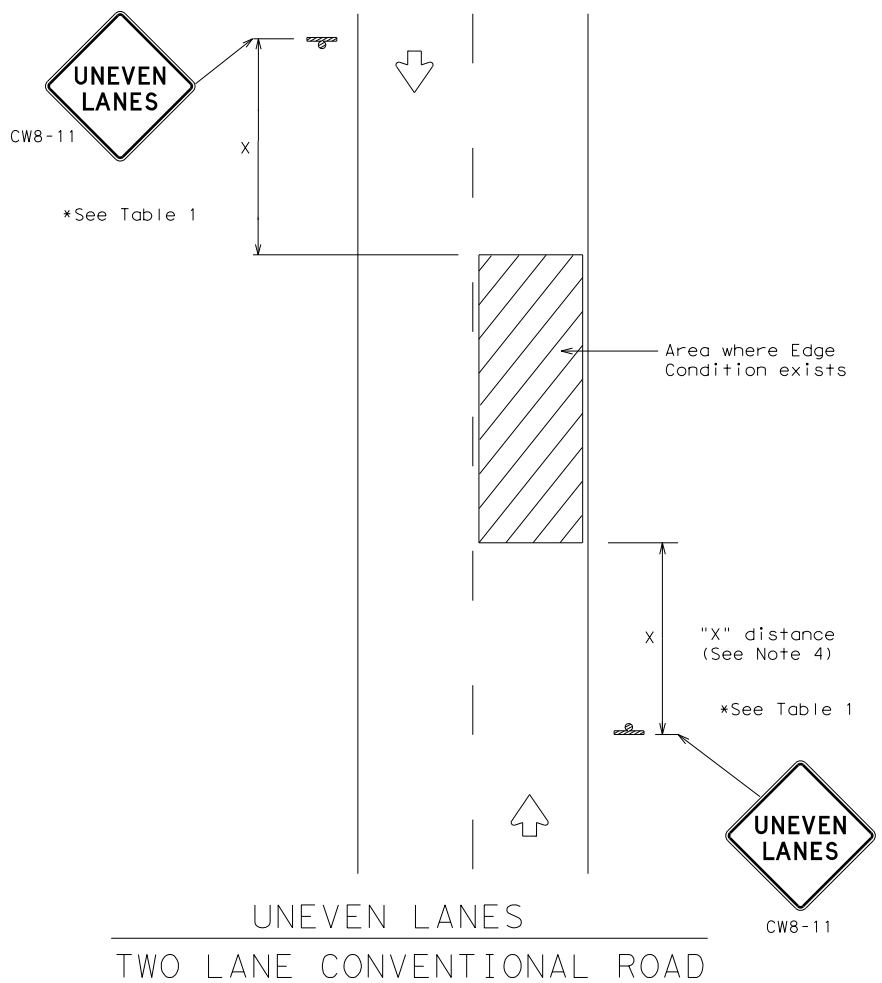
COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B _{FL} OR TYPE C _{FL}
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

GENERAL NOTES

- See BC and SMD sheets for additional sign support details.
- Sign locations shall be approved by the Engineer.
- For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
- Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
- Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
- The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
- The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
 Item 636 - Aluminum Signs
 Item 647 - Large Roadside Sign Supports and Assemblies.
 Item 416 - Drilled Shaft Foundations
- 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.

				Traffic Operations Division Standard	
WORK ZONE "GIVE US A BRAKE" SIGNS WZ (BRK) - 13					
FILE:	wzbrk-13.dgn	DN:	TxDOT	CK:	TxDOT
©TxDOT	August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS		2690	01	038	FM 971
6-96	5-98 7-13	DIST	COUNTY		SHEET NO.
8-96	3-03	AUS	WILLIAMSON		42

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

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B _{FL} OR TYPE C _{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING


GENERAL NOTES

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

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

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

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



Texas Department of Transportation

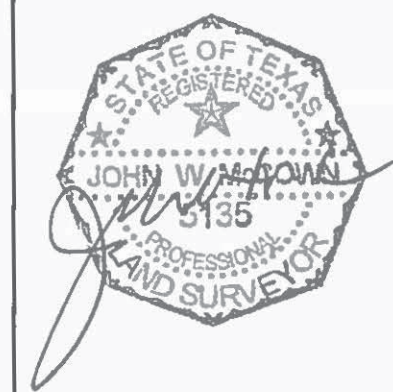
SIGNING FOR UNEVEN LANES

WZ (UL) - 13

FILE: WZUL-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
8-95 2-98 7-13	DIST	COUNTY	SHEET NO.	
1-97 3-03	AUS	WILLIAMSON	44	

NOTES:

1. THE COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 (2011, EPOCH 2010.00). THE PROJECT'S VERTICAL DATUM IS NAVD 88. THE COORDINATES AND DISTANCES PROVIDED HEREON HAVE BEEN SCALED (SCALING ORIGIN N 0.00 E 0.00) FROM GRID COORDINATES USING A SURFACE ADJUSTMENT FACTOR OF 1.00013. THE UNITS ARE U.S. SURVEY FEET.
2. THE HORIZONTAL CONTROL FOR THIS PROJECT WAS ESTABLISHED USING VARIOUS GPS METHODS (STATIC AND RTK) AND HOLDING THE PUBLISHED VALUES FOR NGS CORS STATIONS, PRIOR TO THE FINAL ADJUSTMENT, A MINIMAL CONSTRAINT WAS PERFORMED AND YIELDED ACCEPTABLE RESULTS.
3. THE VERTICAL CONTROL FOR THIS PROJECT WAS ESTABLISHED BY STATIC GPS OBSERVATIONS (HOLDING PUBLISHED NGS CORS STATIONS) ON THE PROJECT'S PRIMARY CONTROL AND DIFFERENTIAL LEVELING (DIGITAL LEVELS) TO SECONDARY CONTROL. GPS WAS PROCESSED USING THE NGS'S GEOID 12A.



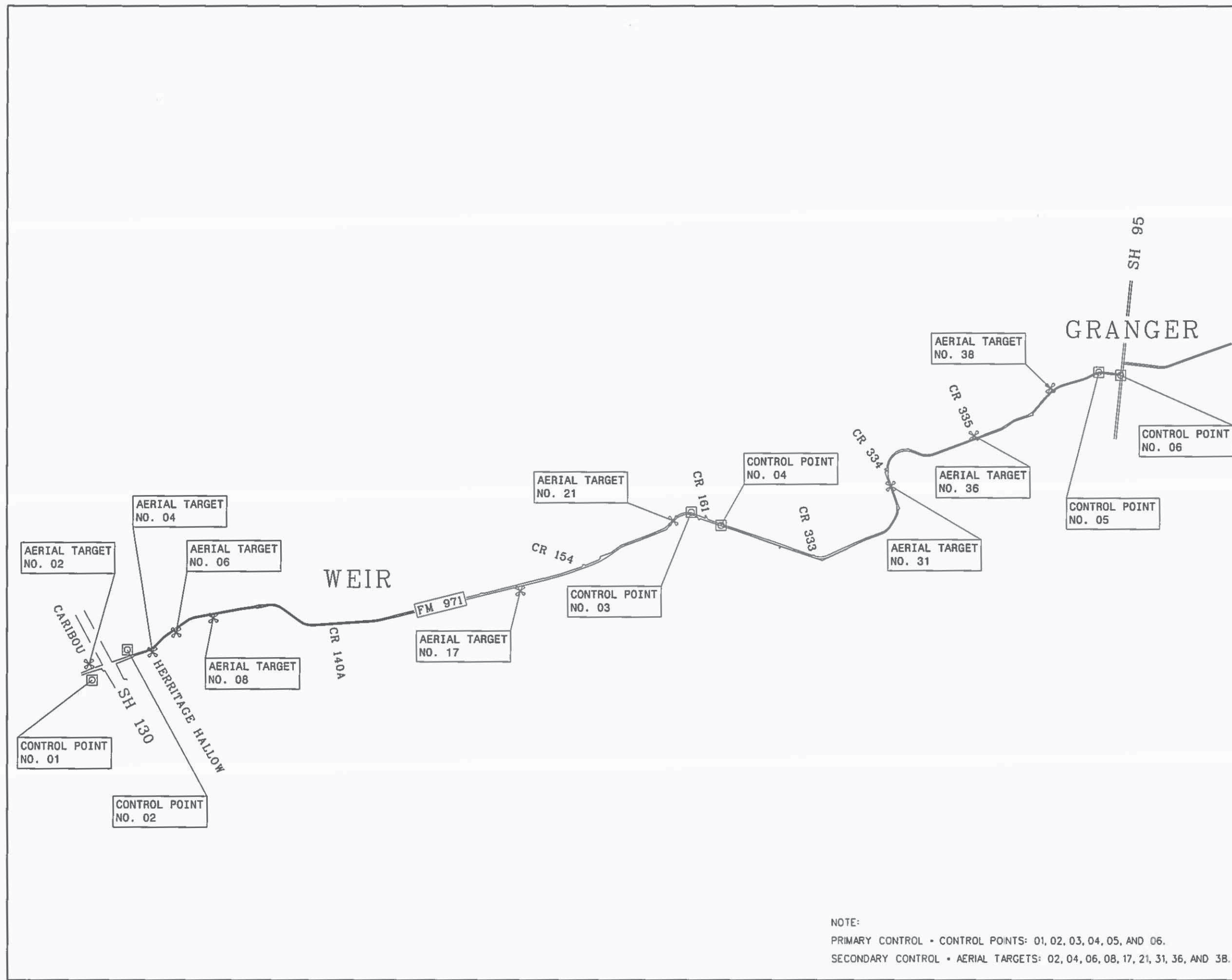
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 Fax (512) 249-5040
 TBPLS FIRM NO. 100B4600

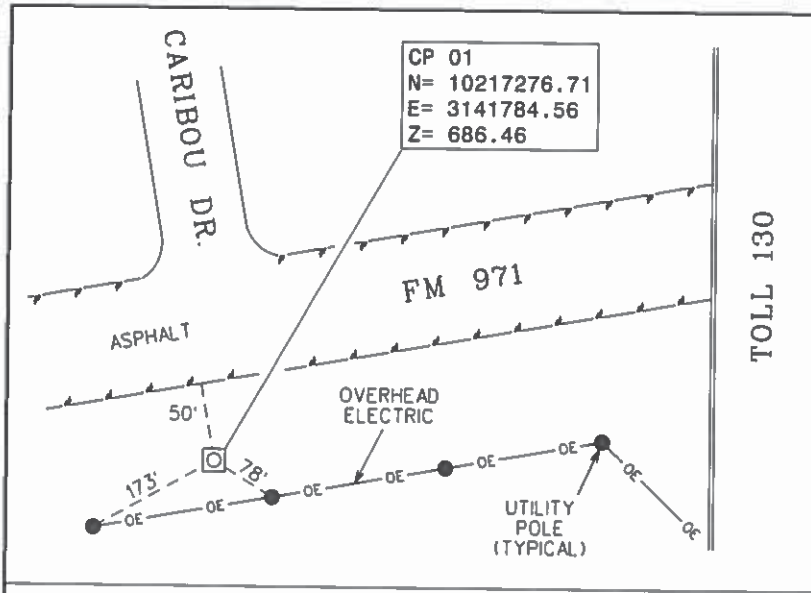


INDEX SHEET FOR
 FM 971
 PRIMARY CONTROL &
 SECONDARY CONTROL 1-3

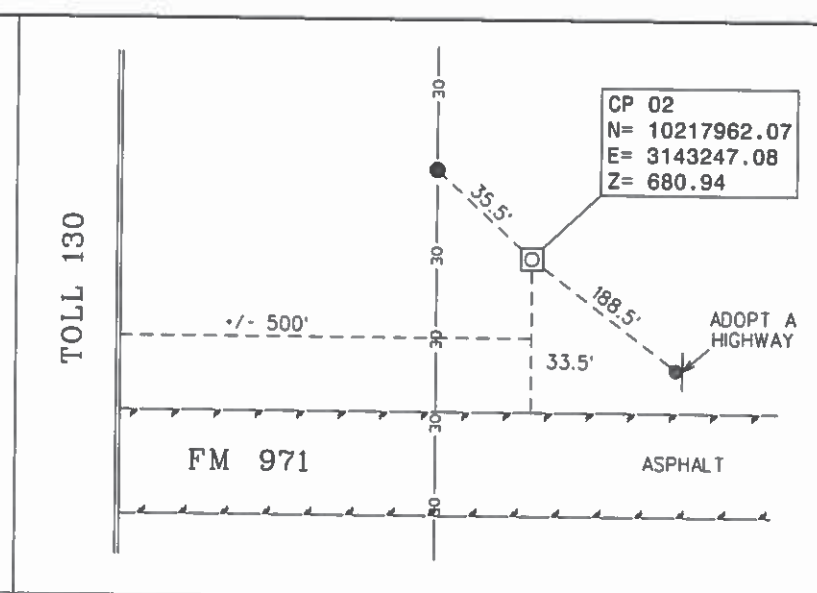
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.	SHEET NO.
STATE	DISTRICT	COUNTY
TEXAS	AUSTIN	WILLIAMSON
CONTROL	SECTION	JOB
2690	01	036
		HIGHWAY NO.
		FM 971



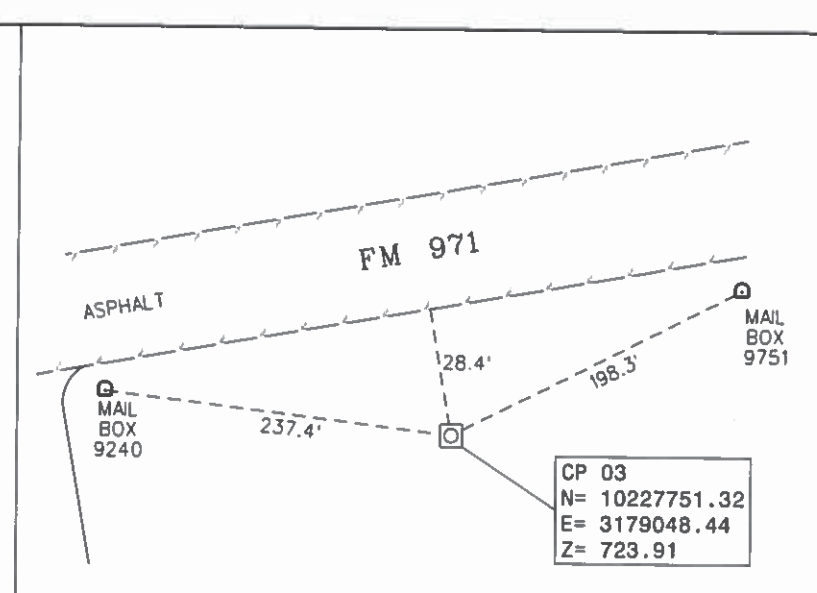
NOTE:
 PRIMARY CONTROL • CONTROL POINTS: 01, 02, 03, 04, 05, AND 06.
 SECONDARY CONTROL • AERIAL TARGETS: 02, 04, 06, 08, 17, 21, 31, 36, AND 38.



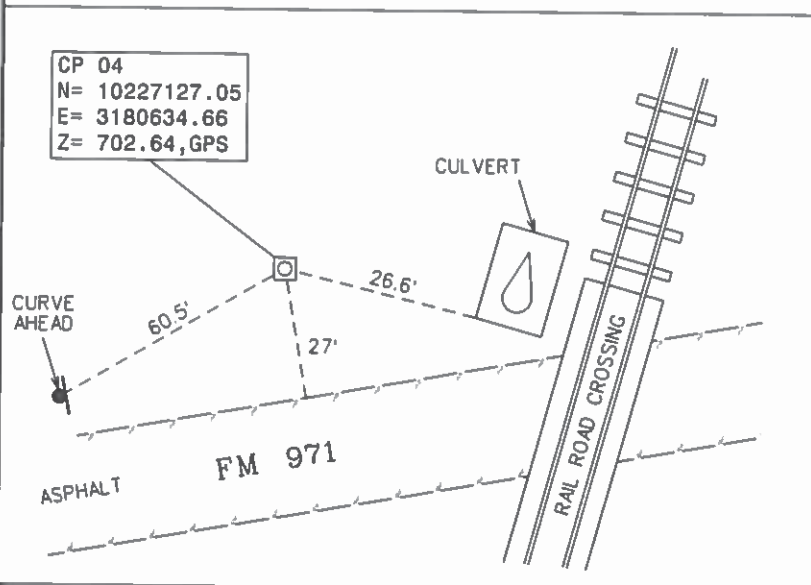
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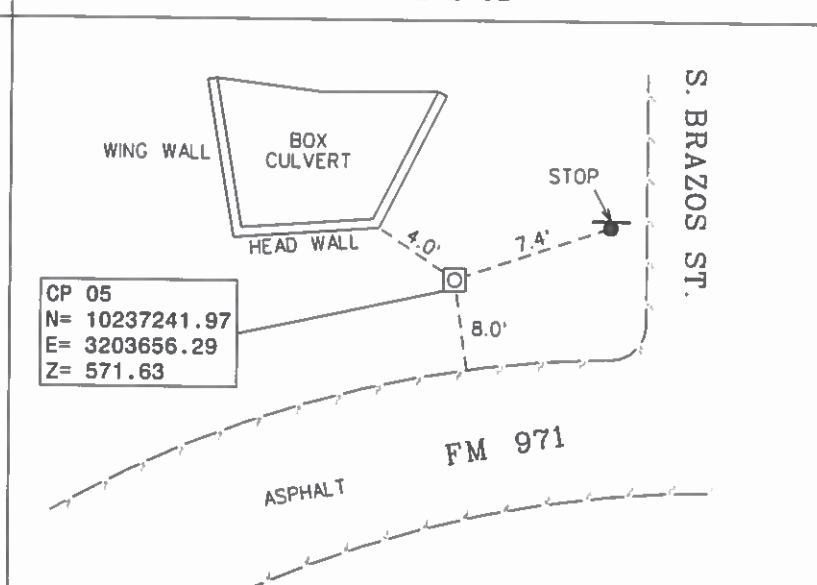
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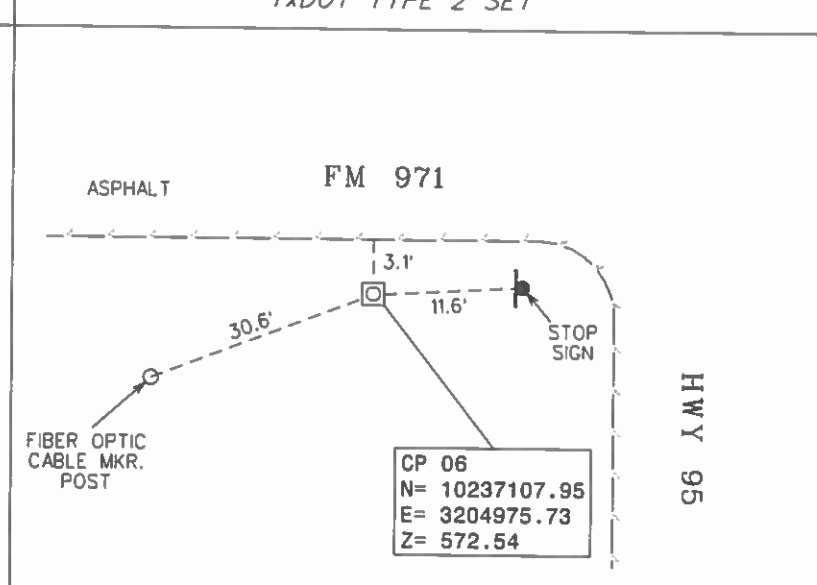
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TxDOT TYPE 2 SET



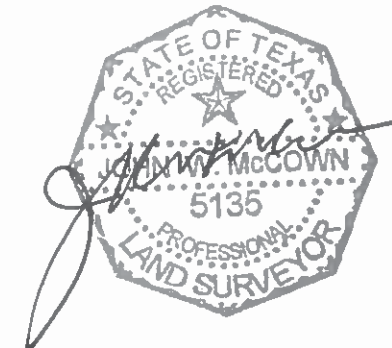
TxDOT TYPE 2 SET



TxDOT TYPE 2 SET

NOTES:

1. THE COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 (2011, EPOCH 2010.00). THE PROJECT'S VERTICAL DATUM IS NAVD 88. THE COORDINATES AND DISTANCES PROVIDED HEREON HAVE BEEN SCALED (SCALING ORIGIN N 0.00 E 0.00) FROM GRID COORDINATES USING A SURFACE ADJUSTMENT FACTOR OF 1.00013. THE UNITS ARE U.S. SURVEY FEET.
2. THE HORIZONTAL CONTROL FOR THIS PROJECT WAS ESTABLISHED USING UTILIZING VARIOUS GPS METHODS (STATIC AND RTK) AND HOLDING THE PUBLISHED VALUES FOR NGS CORS STATIONS. PRIOR TO THE FINAL ADJUSTMENT, A MINIMAL CONSTRAINT WAS PERFORMED AND YIELDED ACCEPTABLE RESULTS.
3. THE VERTICAL CONTROL FOR THIS PROJECT WAS ESTABLISHED BY STATIC GPS OBSERVATIONS (HOLDING PUBLISHED NGS CORS STATIONS) ON THE PROJECT'S PRIMARY CONTROL AND DIFFERENTIAL LEVELING (DIGITAL LEVELS) TO SECONDARY CONTROL. GPS WAS PROCESSED USING THE NGS'S GEOID 12A.



SURVTEX • 2014-002B

SURVTEX LLC
 PROFESSIONAL SURVEYING AND MAPPING SERVICES
 600 W. Whitestone Blvd.
 Cedar Park, Texas 78613
 (512) 249-8875
 Fax (512) 249-5040
 TBPLS FIRM NO. 10084600



FM 971
 PRIMARY CONTROL

FIRMA TEXAS DIVISION	FEDERAL AID PROJECT NO.	SHEET NO.
TEXAS	AUSTIN	WILLIAMSON
CONTROL	SECTION	JOB
2690	01	036
		FM 971

NOTES:

1. THE COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83 (2011, EPOCH 2010.00). THE PROJECT'S VERTICAL DATUM IS NAVD 88. THE COORDINATES AND DISTANCES PROVIDED HEREON HAVE BEEN SCALED (SCALING ORIGIN N 0.00 E 0.00) FROM GRID COORDINATES USING A SURFACE ADJUSTMENT FACTOR OF 1.00013. THE UNITS ARE U.S. SURVEY FEET.
2. THE HORIZONTAL CONTROL FOR THIS PROJECT WAS ESTABLISHED USING VARIOUS GPS METHODS (STATIC AND RTK) AND HOLDING THE PUBLISHED VALUES FOR NGS CORS STATIONS. PRIOR TO THE FINAL ADJUSTMENT, A MINIMAL CONSTRAINT WAS PERFORMED AND YIELDED ACCEPTABLE RESULTS.
3. THE VERTICAL CONTROL FOR THIS PROJECT WAS ESTABLISHED BY STATIC GPS OBSERVATIONS (HOLDING PUBLISHED NGS CORS STATIONS) ON THE PROJECT'S PRIMARY CONTROL AND DIFFERENTIAL LEVELING (DIGITAL LEVELS) TO SECONDARY CONTROL. GPS WAS PROCESSED USING THE NGS'S GEOID 12A.



SURVTX • 2014-0028

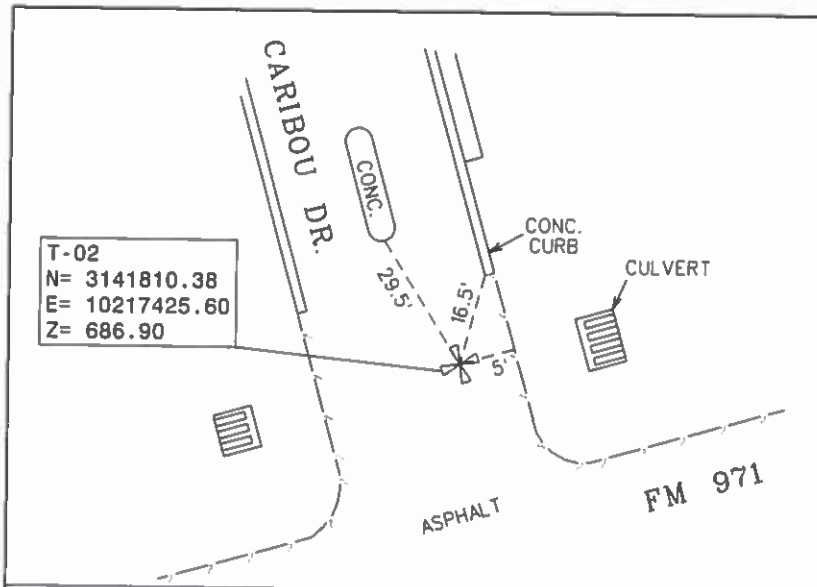
SURVTX LLC
PROFESSIONAL SURVEYING AND MAPPING SERVICES

600 W. Whitestone Blvd.
Cedar Park, Texas 78613
(512) 249-8875
Fax (512) 249-5040
TBPLS FIRM NO. 10084600

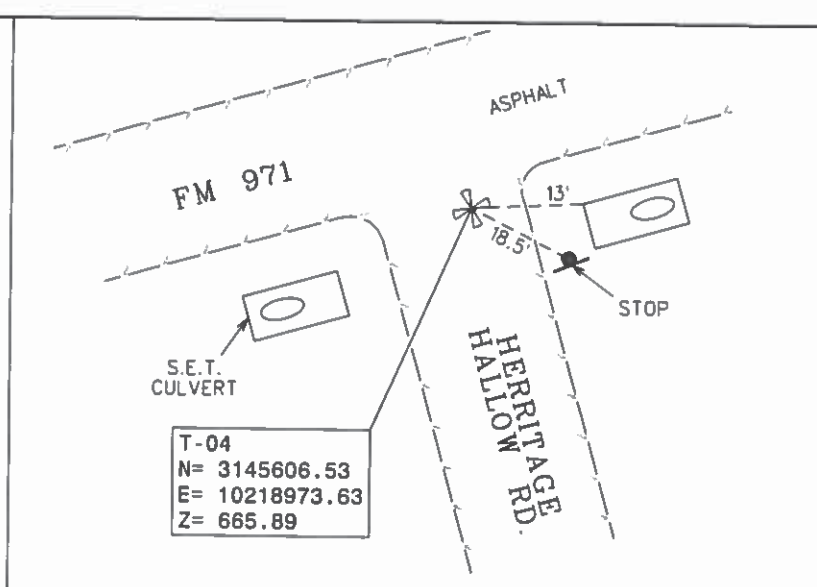


FM 971
SECONDARY CONTROL

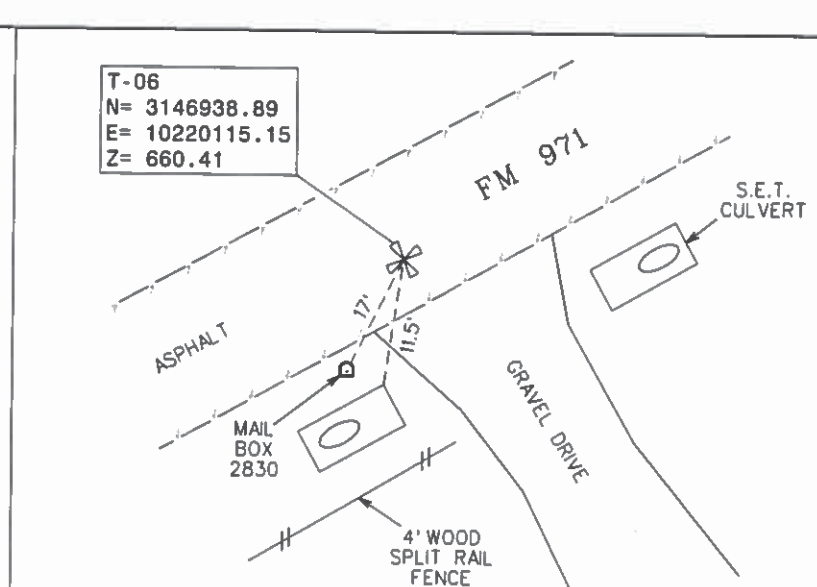
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.	SHEET NO.
TEXAS	DISTRICT	3 OF 3
CONTROL	COUNTY	
2690	AUSTIN WILLIAMSON	
	SECTION	JOB
	01	036
		HIGHWAY NO.
		FM 971



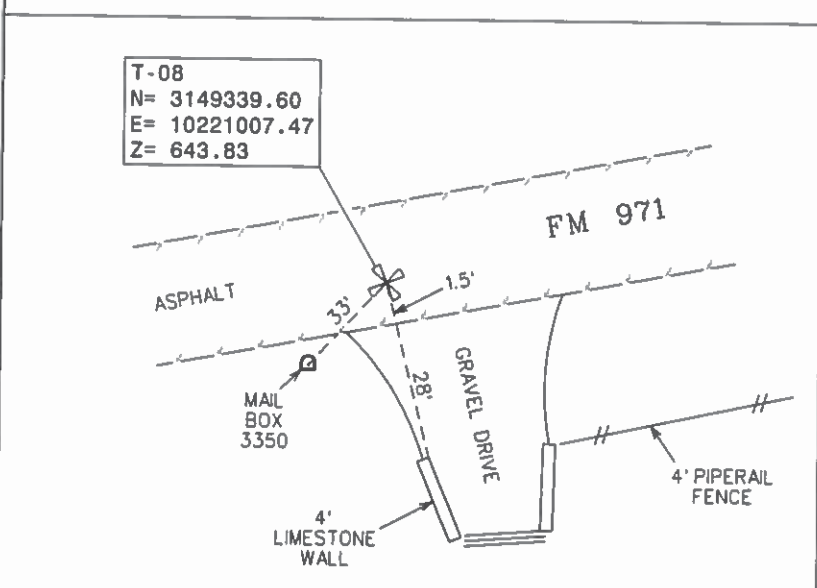
COTTON SPINDLE



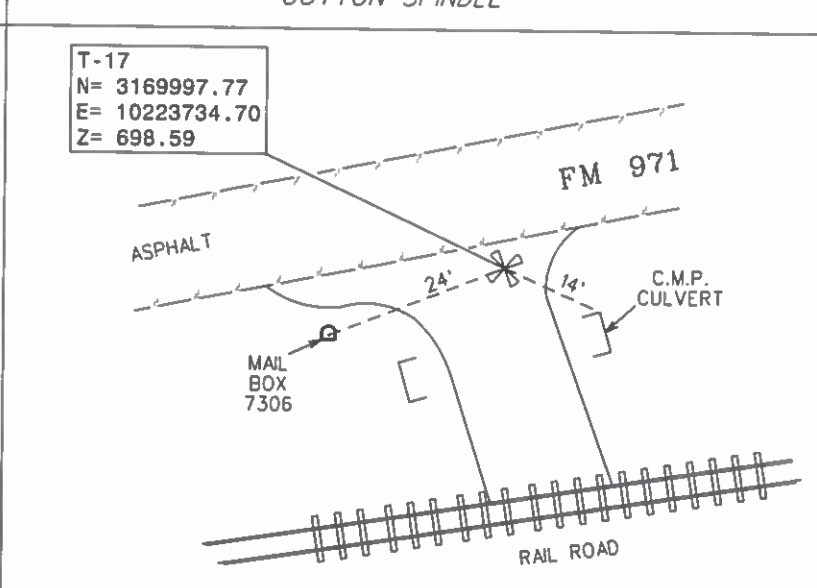
COTTON SPINDLE



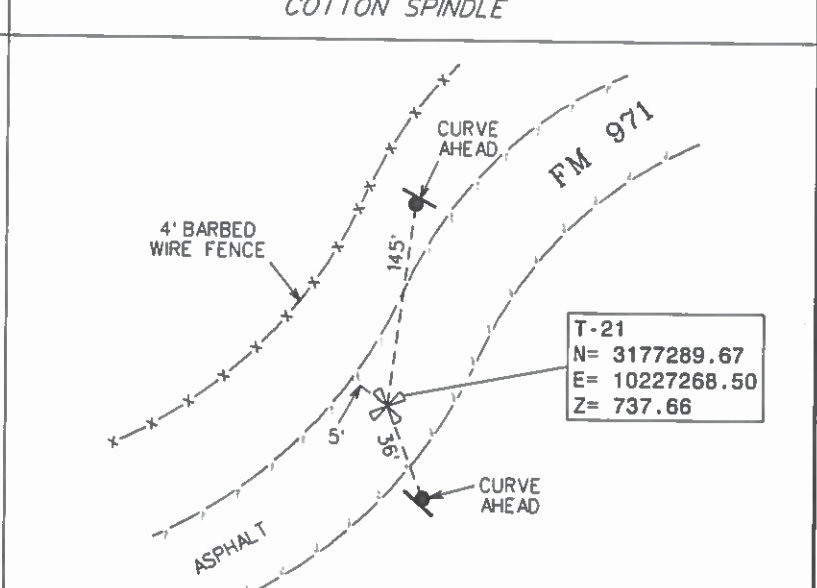
COTTON SPINDLE



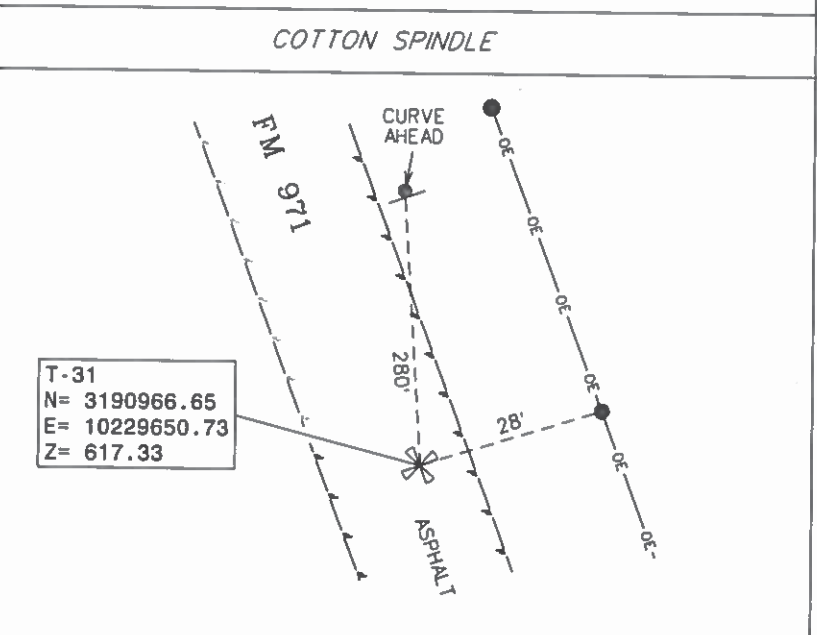
COTTON SPINDLE



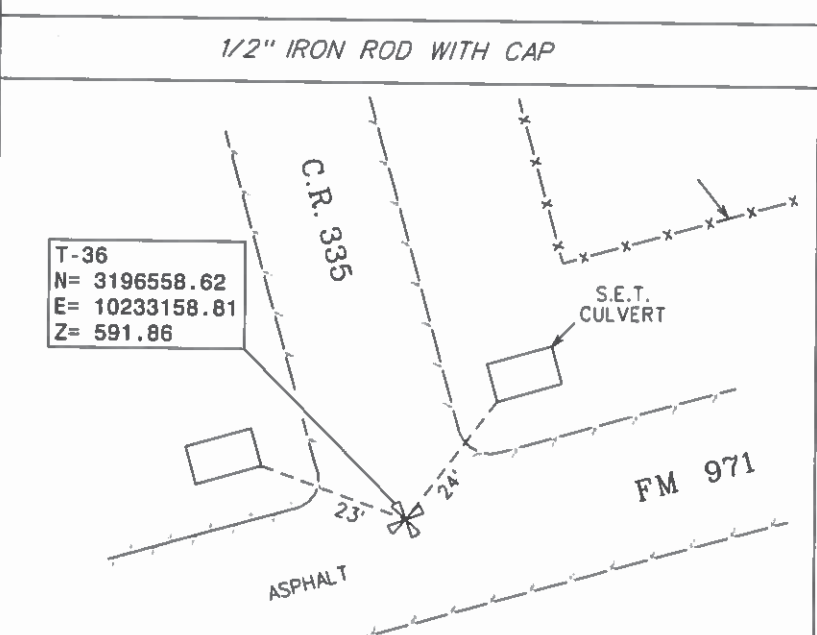
1/2" IRON ROD WITH CAP



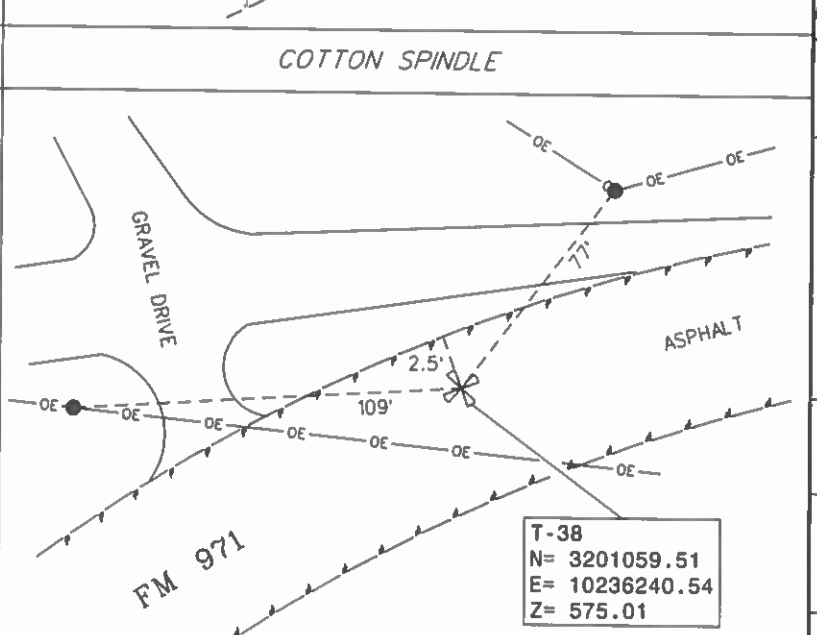
COTTON SPINDLE



COTTON SPINDLE



COTTON SPINDLE



COTTON SPINDLE

DATE: 9/22/2022 8:09:24 AM
FILE: \\txdot\projectwiseonline.com\TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\3. Roadway\038_FM971_RDW_HAD.dgn

Beginning chain FM971BL description
Feature: Road_Centerline

Point 5 X 3,176,016.72 Y 10,226,495.05 Sta 458+00.00

Course from 5 to PC FM971BL_3 N 66° 31' 31.70" E Dist 797.76

Curve Data

Curve FM971BL_3

P.I. Station 468+71.42 X 3,176,999.47 Y 10,226,921.84
Delta = 25° 41' 37.35" (LT)
Degree = 4° 46' 28.73"
Tangent = 273.67
Length = 538.13
Radius = 1,200.00
External = 30.81
Long Chord = 533.63
Mid. Ord. = 30.04
P.C. Station 465+97.76 X 3,176,748.45 Y 10,226,812.83
P.T. Station 471+35.89 X 3,177,178.40 Y 10,227,128.91
C.C. = N 66° 31' 31.70" E
Back = N 40° 49' 54.35" E
Ahead = N 53° 40' 43.03" E
Chord Bear = N 53° 40' 43.03" E

Course from PT FM971BL_3 to PC FM971BL_6 N 40° 49' 54.35" E Dist 480.77

Curve Data

Curve FM971BL_6

P.I. Station 484+26.58 X 3,178,022.31 Y 10,228,105.49
Delta = 70° 18' 45.11" (RT)
Degree = 4° 58' 56.07"
Tangent = 809.92
Length = 1,411.26
Radius = 1,150.00
External = 256.58
Long Chord = 1,324.36
Mid. Ord. = 209.78
P.C. Station 476+16.65 X 3,177,492.75 Y 10,227,492.67
P.T. Station 490+27.92 X 3,178,777.70 Y 10,227,813.33
C.C. = N 40° 49' 54.35" E
Back = S 68° 51' 20.54" E
Ahead = N 75° 59' 16.91" E
Chord Bear = N 75° 59' 16.91" E

Course from PT FM971BL_6 to PC FM971BL_9 S 68° 51' 20.54" E Dist 659.05

Curve Data

Curve FM971BL_9

P.I. Station 497+86.96 X 3,179,485.64 Y 10,227,539.53
Delta = 2° 17' 28.66" (LT)
Degree = 1° 08' 45.30"
Tangent = 99.99
Length = 199.95
Radius = 5,000.00
External = 1.00
Long Chord = 199.94
Mid. Ord. = 1.00
P.C. Station 496+86.97 X 3,179,392.38 Y 10,227,575.60
P.T. Station 498+86.92 X 3,179,580.26 Y 10,227,507.22
C.C. = S 68° 51' 20.54" E
Back = S 71° 08' 49.20" E
Ahead = S 70° 00' 04.87" E
Chord Bear = S 70° 00' 04.87" E

Course from PT FM971BL_9 to PC FM971BL_12 S 71° 08' 49.20" E Dist 468.30

Curve Data

Curve FM971BL_12

P.I. Station 504+56.06 X 3,180,118.87 Y 10,227,323.31
Delta = 2° 18' 38.14" (LT)
Degree = 1° 08' 45.30"
Tangent = 100.83
Length = 201.64
Radius = 5,000.00
External = 1.02
Long Chord = 201.62
Mid. Ord. = 1.02
P.C. Station 503+55.22 X 3,180,023.44 Y 10,227,355.89
P.T. Station 505+56.86 X 3,180,215.53 Y 10,227,294.60
C.C. = S 71° 08' 49.20" E
Back = S 73° 27' 27.34" E
Ahead = S 72° 18' 08.27" E
Chord Bear = S 72° 18' 08.27" E

Course from PT FM971BL_12 to PC FM971BL_15 S 73° 27' 27.34" E Dist 1,054.85

Curve Data

Curve FM971BL_15

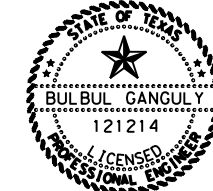
P.I. Station 516+97.86 X 3,181,309.29 Y 10,226,969.73
Delta = 0° 59' 13.63" (RT)
Degree = 0° 34' 22.65"
Tangent = 86.14
Length = 172.28
Radius = 10,000.00
External = 0.37
Long Chord = 172.28
Mid. Ord. = 0.37
P.C. Station 516+11.71 X 3,181,226.71 Y 10,226,994.26
P.T. Station 517+84.00 X 3,181,391.44 Y 10,226,943.78
C.C. = S 73° 27' 27.34" E
Back = S 72° 28' 13.71" E
Ahead = S 72° 57' 50.52" E
Chord Bear = S 72° 57' 50.52" E

Course from PT FM971BL_15 to 9 S 72° 28' 13.71" E Dist 5,072.80

Point 9 X 3,186,228.66 Y 10,225,415.87 Sta 568+56.80

Ending chain FM971BL description

9/22/2022



DocuSigned by:
Bulbul Ganguly

**Austin District
Central Design**

Texas Department of Transportation

**FM 971
HORIZONTAL
ALIGNMENT DATA**

SHEET 1 OF 2

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	48

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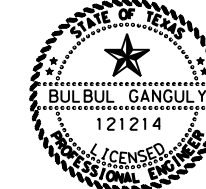
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Beginning profile FM971PROF1 description:
 Feature: Road_Centerline

	STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	458+00.00	727.71			
VPC	458+08.00	727.71	-0.05	K = 115.5		
Low Point	458+14.19	727.70				
VPI	2	459+30.50	727.64	245.00	122.50	122.50
VPT	460+53.00	730.17	2.07			
VPC	463+58.00	736.48	2.07	K = 247.0	SSD = 730.1	
VPI	3	468+39.00	746.43	962.00	481.00	481.00
High Point	468+68.88	741.76				
VPT	473+20.00	737.65	-1.83			
VPC	474+84.00	734.65	-1.83	K = 115.1		
VPI	4	476+50.50	731.61	333.00	166.50	166.50
Low Point	476+94.16	732.73				
VPT	478+17.00	733.39	1.07			
VPC	481+93.00	737.40	1.07	K = 151.1	SSD = 571.1	
High Point	483+54.34	738.26				
VPI	5	485+03.00	740.71	620.00	310.00	310.00
VPT	488+13.00	731.30	-3.03			
VPC	489+42.00	727.39	-3.03	K = 82.7		
VPI	6	491+08.00	722.35	332.00	166.00	166.00
Low Point	491+92.96	723.58				
VPT	492+74.00	723.98	0.98			
VPC	493+40.00	724.62	0.98	K = 106.4	SSD = 481.1	
High Point	494+44.26	725.13				
VPI	7	495+59.00	726.77	438.00	219.00	219.00
VPT	497+78.00	719.90	-3.14			
VPC	502+12.00	706.28	-3.14	K = 135.1		
VPI	8	505+57.00	695.46	690.00	345.00	345.00
Low Point	506+35.69	699.64				
VPT	509+02.00	702.26	1.97			
VPC	512+26.00	708.65	1.97	K = 312.1	SSD = 820.7	
VPI	9	516+60.00	717.21	868.00	434.00	434.00
High Point	518+41.43	714.72				
VPT	520+94.00	713.70	-0.81			
VPC	523+09.00	711.96	-0.81	K = 312.3	SSD = 1002.7	
VPI	10	525+22.50	710.23	427.00	213.50	213.50
VPT	527+36.00	705.58	-2.18			
VPC	540+65.50	676.65	-2.18	K = 206.4		
VPI	11	541+38.00	675.07	145.00	72.50	72.50
VPT	542+10.50	674.00	-1.47			
VPC	545+70.00	668.70	-1.47	K = 136.1		
Low Point	547+70.65	667.22				
VPI	12	548+26.00	664.93	512.00	256.00	256.00
VPT	550+82.00	670.78	2.29			
VPC	552+65.00	674.97	2.29	K = 193.1	SSD = 663.9	
VPI	13	555+19.50	680.79	509.00	254.50	254.50
High Point	557+06.63	680.02				
VPT	557+74.00	679.90	-0.35			
VPC	561+59.00	678.56	-0.35	K = 247.2	SSD = 811.3	
VPI	14	563+88.00	677.76	458.00	229.00	229.00
VPT	566+17.00	672.72	-2.20			
VPI	15	567+03.00	670.82			
VPI	16	568+56.80	665.97			

Ending profile FM971PROF1 description

9/22/2022



DocuSigned by:
Bulbul Ganguly

**Austin District
 Central Design**

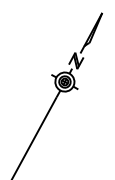
Texas Department of Transportation

**FM 971
 VERTICAL
 ALIGNMENT DATA**

SHEET 2 OF 2

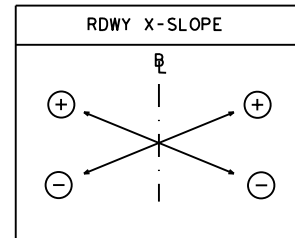
© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	49

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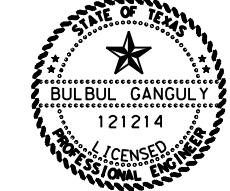


CURVE 1:
 PI STATION = 468+71.42
 DELTA = 25° 41' 37.35" (LT)
 DEGREE OF CURVE = 4° 46' 28.73"
 TANGENT = 273.67
 LENGTH = 538.13
 RADIUS = 1,200.00
 PC STATION = 465+97.76
 PT STATION = 471+35.89

PROP RDWY X-SLOPE		
STATION	LEFT	RIGHT
464+36.00	-2.0%	-2.0%
466+25.00	-5.3%	5.3%

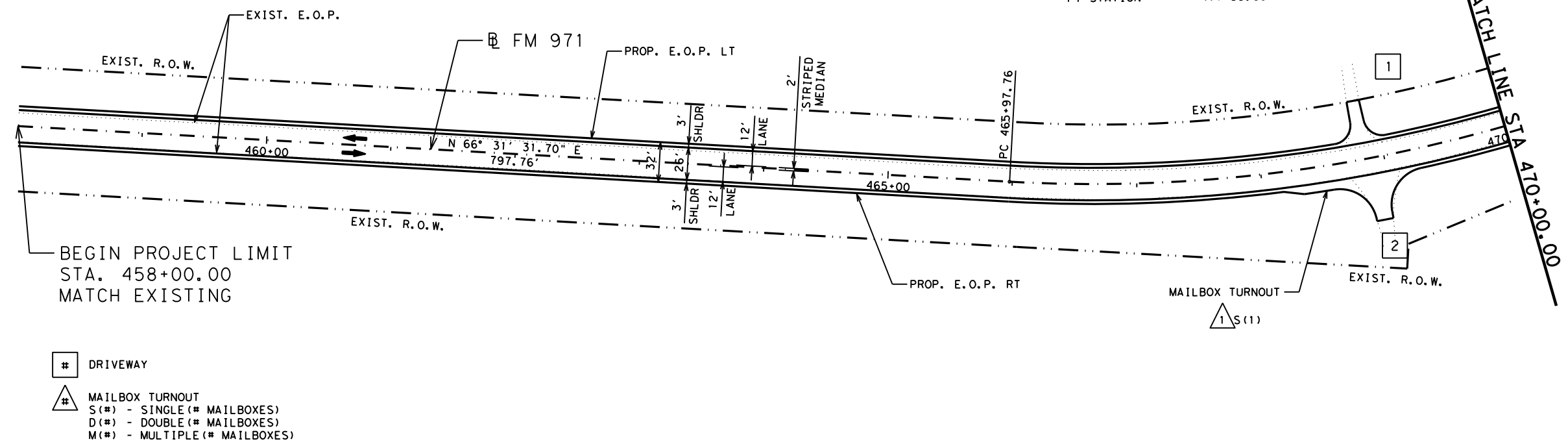


11/30/2022



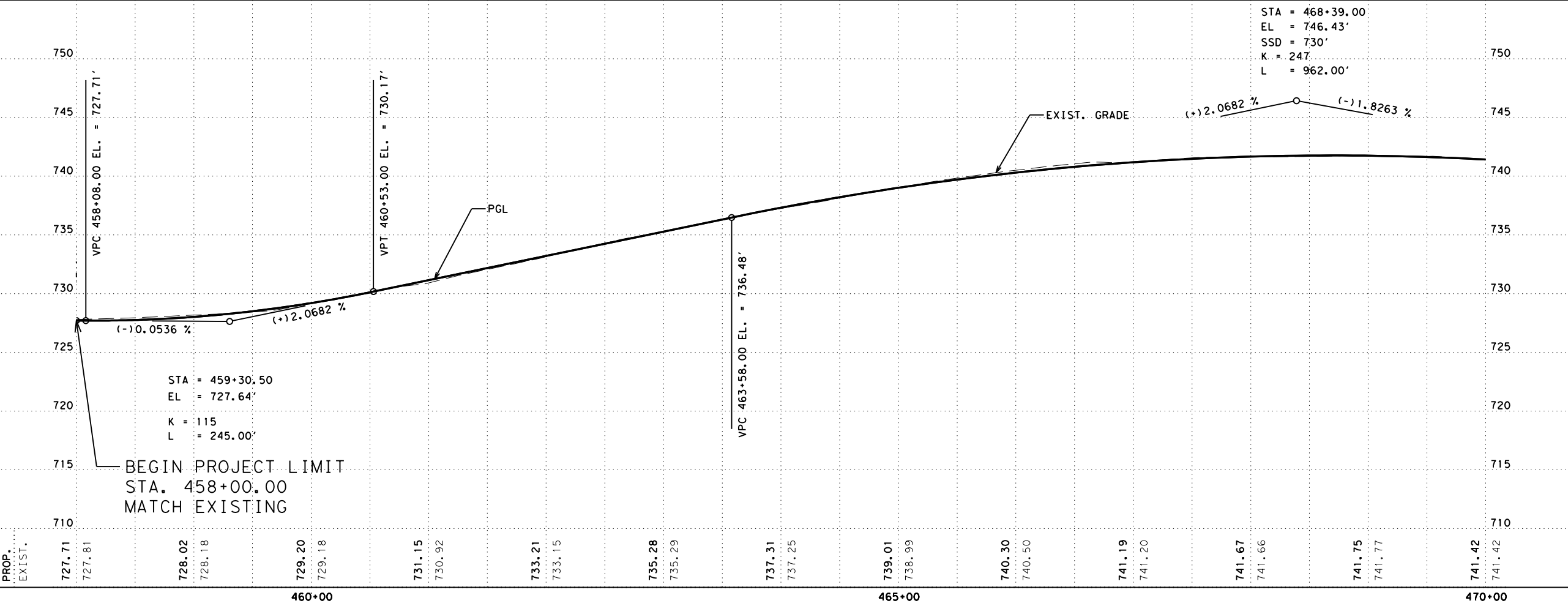
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BEGIN PROJECT LIMIT
 STA. 458+00.00
 MATCH EXISTING

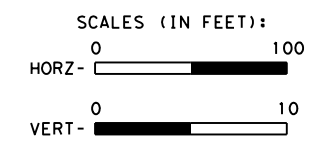
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- # MAILBOX TURNOUT
- S(#) - SINGLE (# MAILBOXES)
- D(#) - DOUBLE (# MAILBOXES)
- M(#) - MULTIPLE (# MAILBOXES)



STA = 468+39.00
 EL = 746.43'
 SSD = 730'
 K = 247
 L = 962.00'

STA = 459+30.50
 EL = 727.64'
 K = 115
 L = 245.00'

BEGIN PROJECT LIMIT
 STA. 458+00.00
 MATCH EXISTING



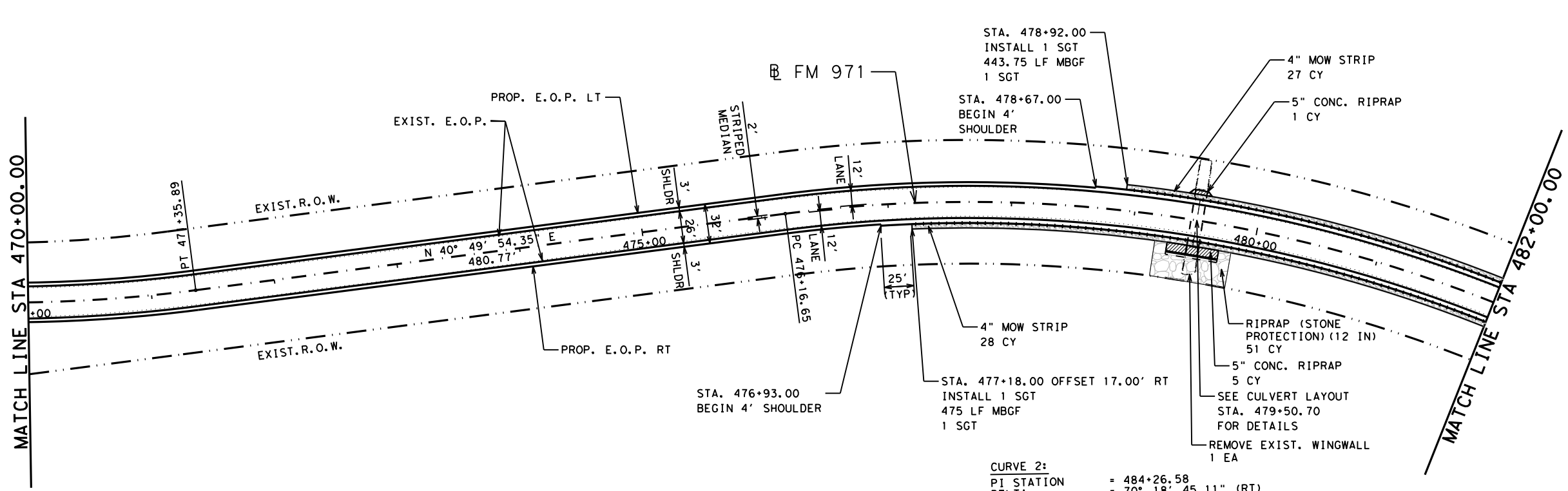
Austin District
 Central Design



FM 971
PLAN & PROFILE
 STA. 458+00.00-
 STA. 470+00.00

SHEET 1 OF 10			
CONT	SECT	JOB	HIGHWAY
2690	01	038	FM 971
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	50	

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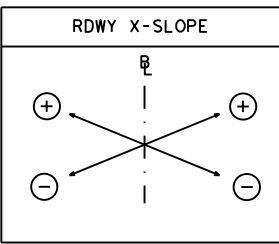


5" CONC. RIPRAP

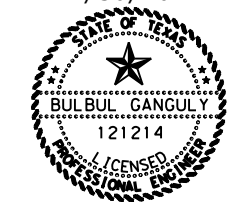
CURVE 2:
 PI STATION = 484+26.58
 DELTA = 70° 18' 45.11" (RT)
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 TANGENT = 809.92
 LENGTH = 1411.26
 RADIUS = 1,150.00
 PC STATION = 476+16.65
 PT STATION = 490+27.92

- # DRIVEWAY
- # MAILBOX TURNOUT
- S(#) - SINGLE (# MAILBOXES)
- D(#) - DOUBLE (# MAILBOXES)
- M(#) - MULTIPLE (# MAILBOXES)

PROP. RDWY X-SLOPE		
STATION	LEFT	RIGHT
471+10.00	-5.3%	5.3%
472+99.00	-2.0%	-2.0%
474+54.00	-2.0%	-2.0%
476+45.00	5.4%	-5.4%

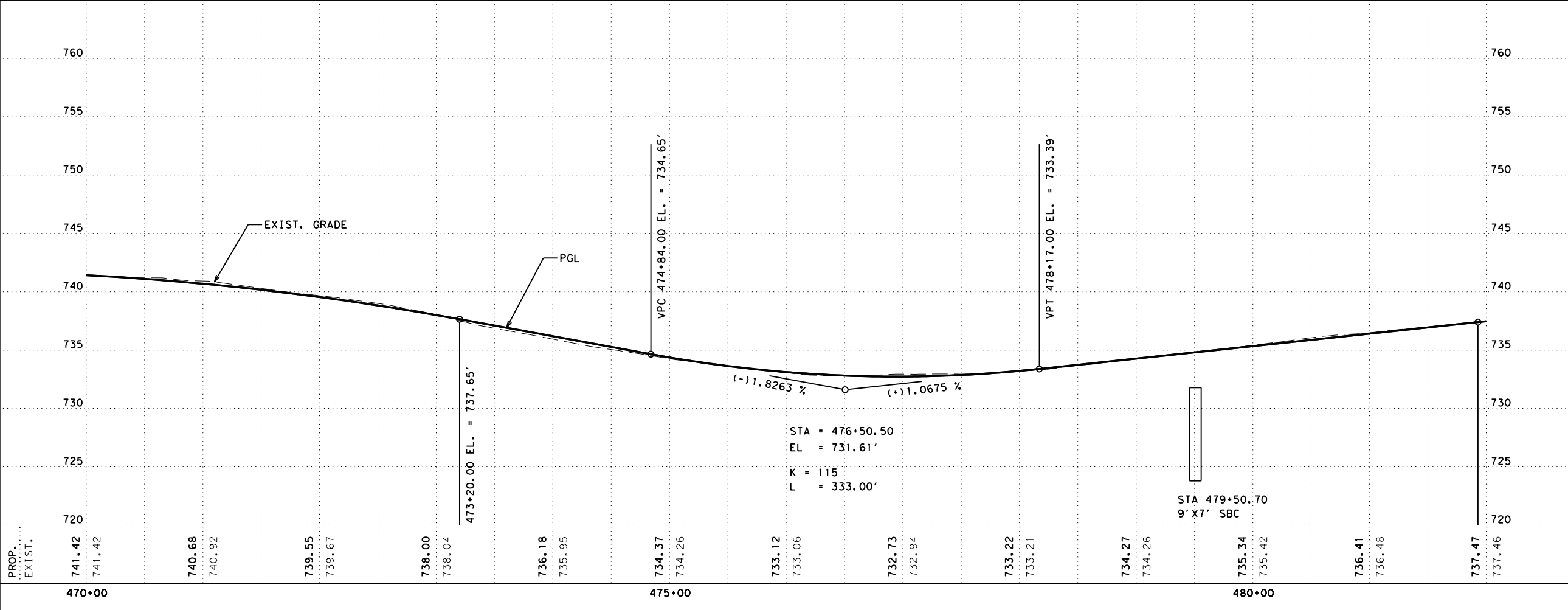


11/30/2022



DocuSigned by:
Bulbul Ganguly

B36C53A335184E4...



SCALES (IN FEET):
 HORZ - 0 to 100
 VERT - 0 to 10

**Austin District
 Central Design**

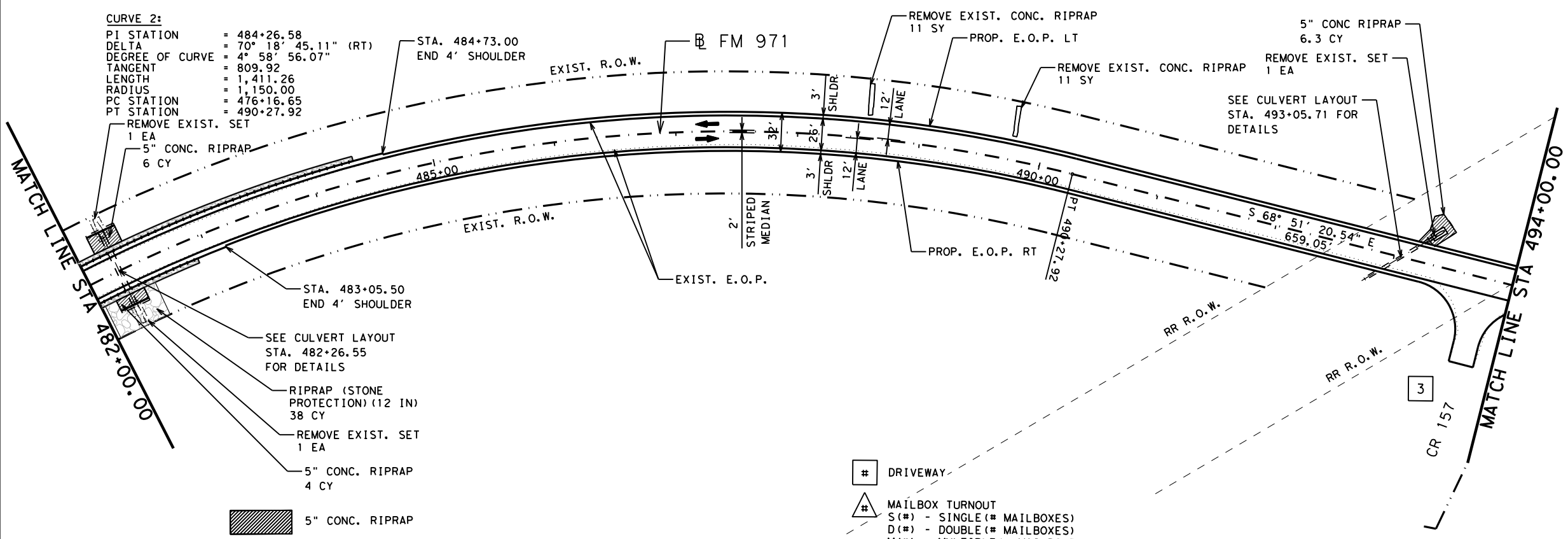


FM 971
 PLAN & PROFILE
 STA. 470+00.00-
 STA. 482+00.00

SHEET 2 OF 10

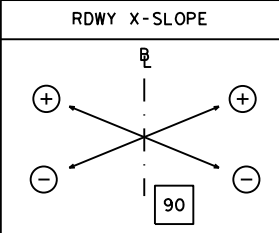
© 2023	CONT	SECT	JOB	HIGHWAY
DSI	CK1	2690	01	038
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	51		

DATE: 11/30/2022 2:59:19 PM FILE: pw:\txdot\projectwiseonline.com\TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\3. Roadway\038_FM971_PP3.dgn

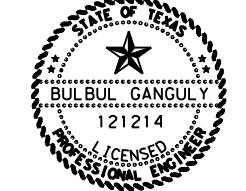


CURVE 2:
 PI STATION = 484+26.58
 DELTA = 70° 18' 45.11" (RT)
 DEGREE OF CURVE = 4° 58' 56.07"
 TANGENT = 809.92
 LENGTH = 1,411.26
 RADIUS = 1,150.00
 PC STATION = 476+16.65
 PT STATION = 490+27.92

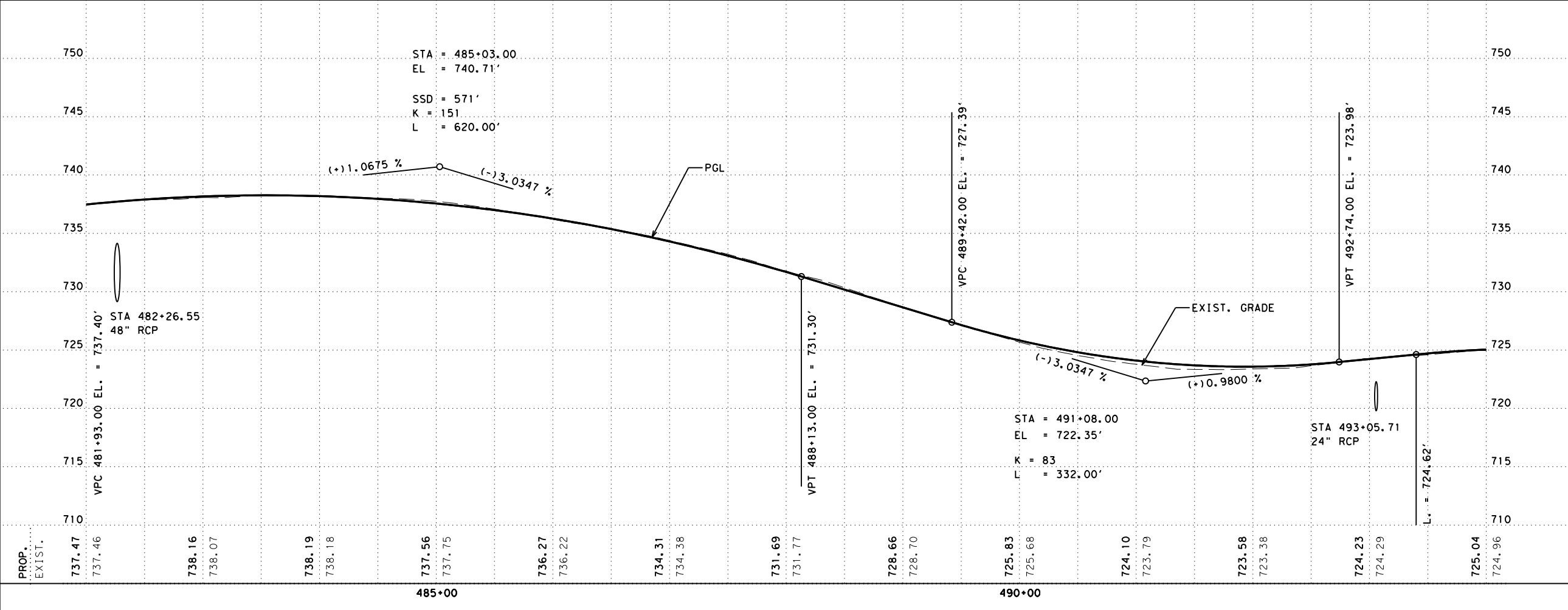
STATION	LEFT	RIGHT
490+00.00	5.4%	-5.4%
491+91.00	-2.0%	-2.0%



11/30/2022



DocuSigned by:
Bulbul Ganguly
 B36C53A335184E4...



**Austin District
 Central Design**

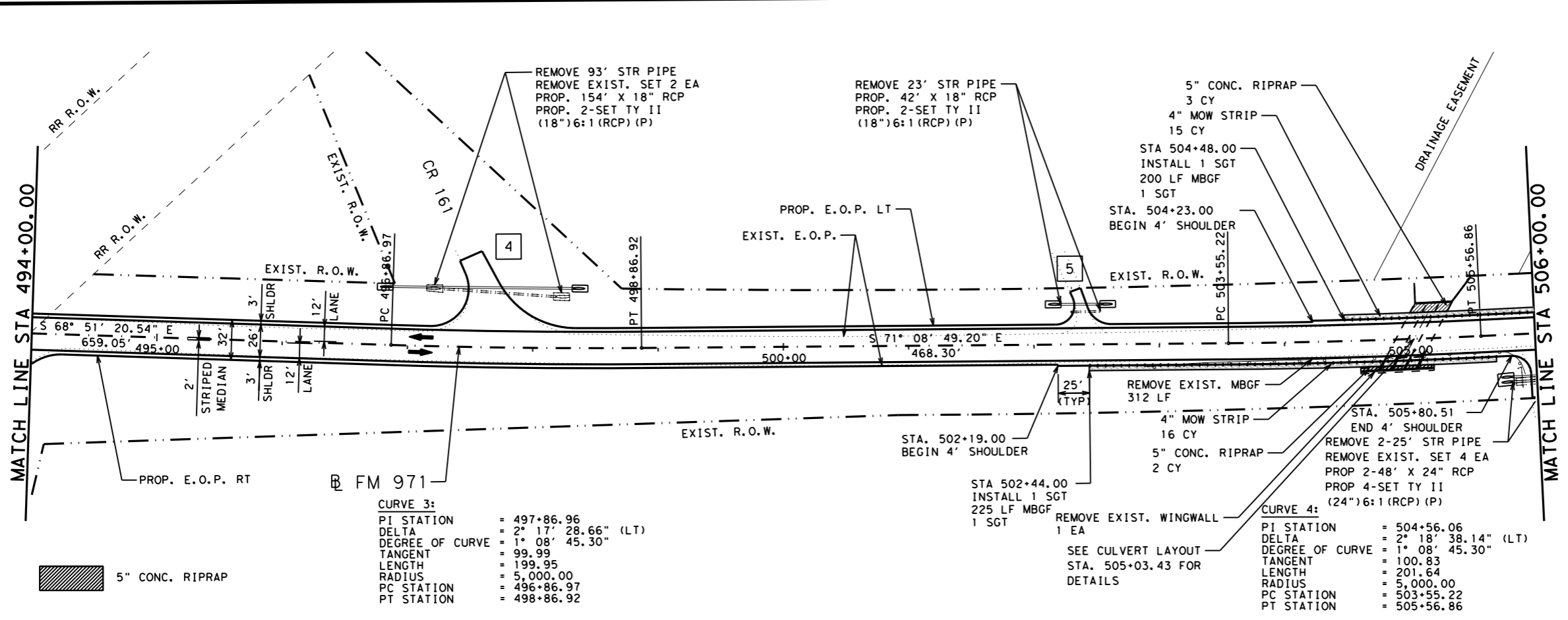
Texas Department of Transportation

**FM 971
 PLAN & PROFILE
 STA. 482+00.00-
 STA. 494+00.00**

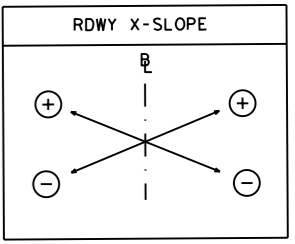
SHEET 3 OF 10

DS#	CK#	CONT	SECT	JOB	HIGHWAY
		2690	01	038	FM 971
DW#	CK#	DIST	COUNTY	SHEET NO.	
		AUS	WILLIAMSON	52	

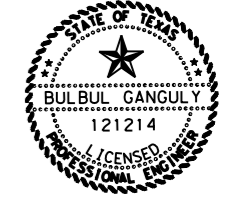
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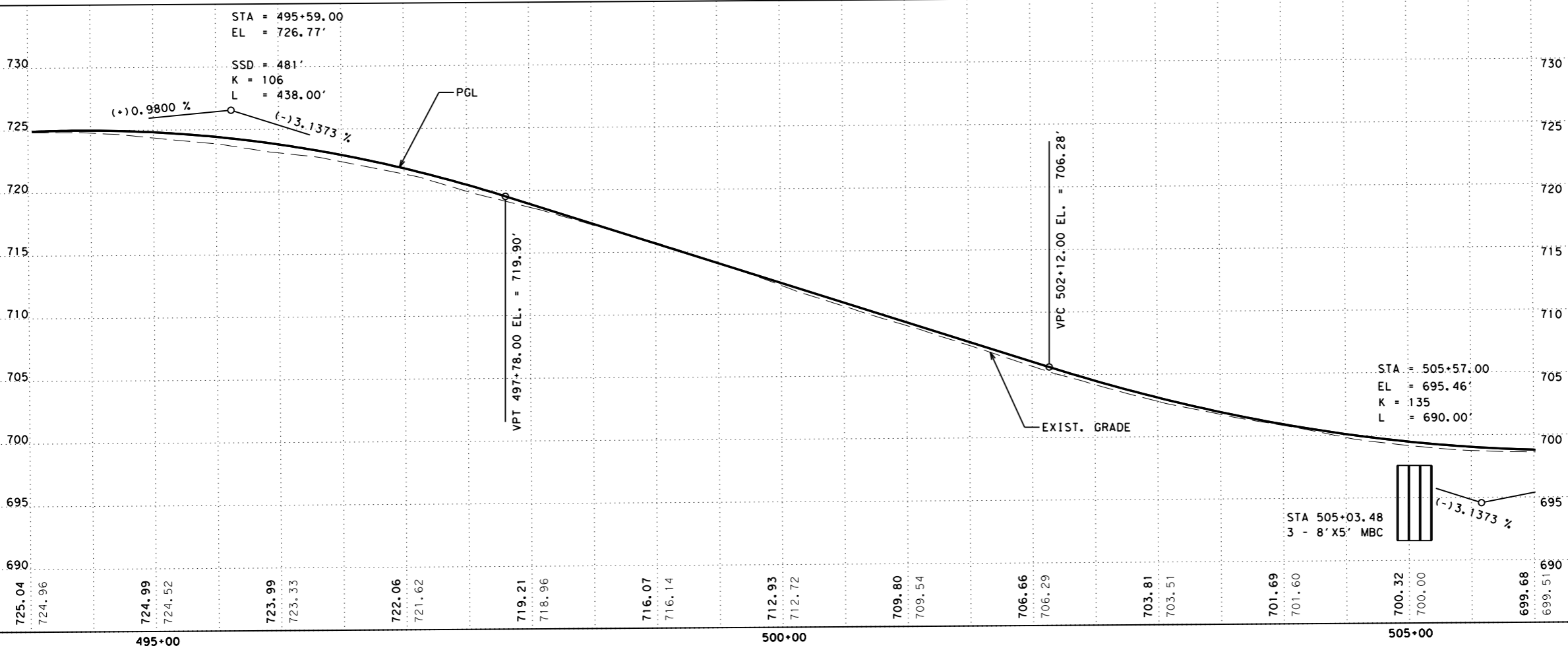
PROP. RDWY X-SLOPE		
STATION	LEFT	RIGHT
495+97.00	-2.0%	-2.0%
497+00.00	-2.0%	2.0%
498+70.00	-2.0%	2.0%
499+73.00	-2.0%	-2.0%



11/30/2022



DocuSigned by:
Bulbul Ganguly
 B36C53A335184E4...



**Austin District
 Central Design**

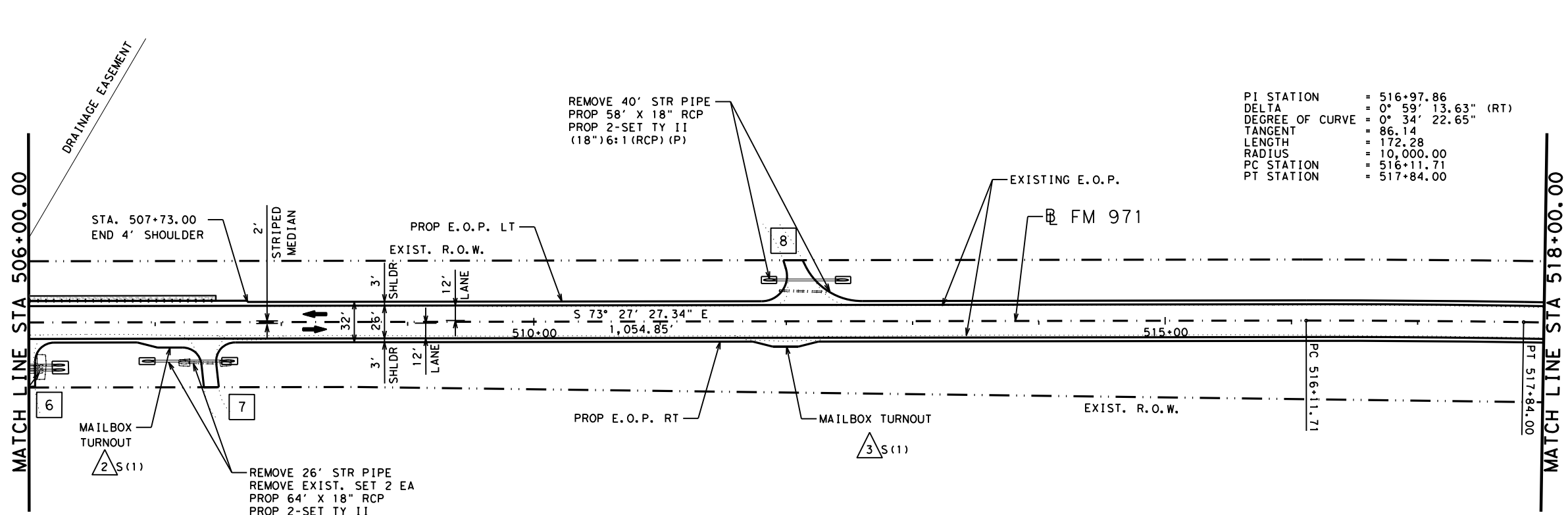
Texas Department of Transportation

FM 971
 PLAN & PROFILE
 STA. 494+00.00-
 STA. 506+00.00

SHEET 4 OF 10

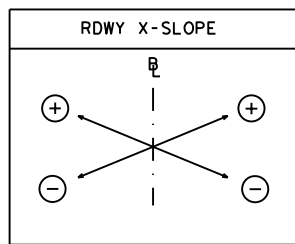
© 2023	CONT	SECT	JOB	HIGHWAY
DS#	2690	01	038	FM 971
DIST	COUNTY		SHEET NO.	
DW#	AUS	WILLIAMSON	53	

DATE: 11/30/2022 3:02:08 PM
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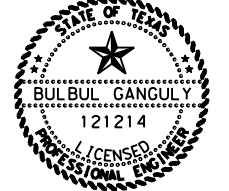


PI STATION = 516+97.86
 DELTA = 0° 59' 13.63" (RT)
 DEGREE OF CURVE = 0° 34' 22.65"
 TANGENT = 86.14
 LENGTH = 172.28
 RADIUS = 10,000.00
 PC STATION = 516+11.71
 PT STATION = 517+84.00

PROP. RDWY X-SLOPE		
STATION	LEFT	RIGHT
502+67.00	-2.0%	-2.0%
503+70.00	-2.0%	2.0%
505+40.00	-2.0%	2.0%
506+43.00	-2.0%	-2.0%

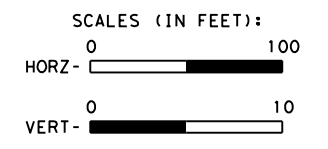
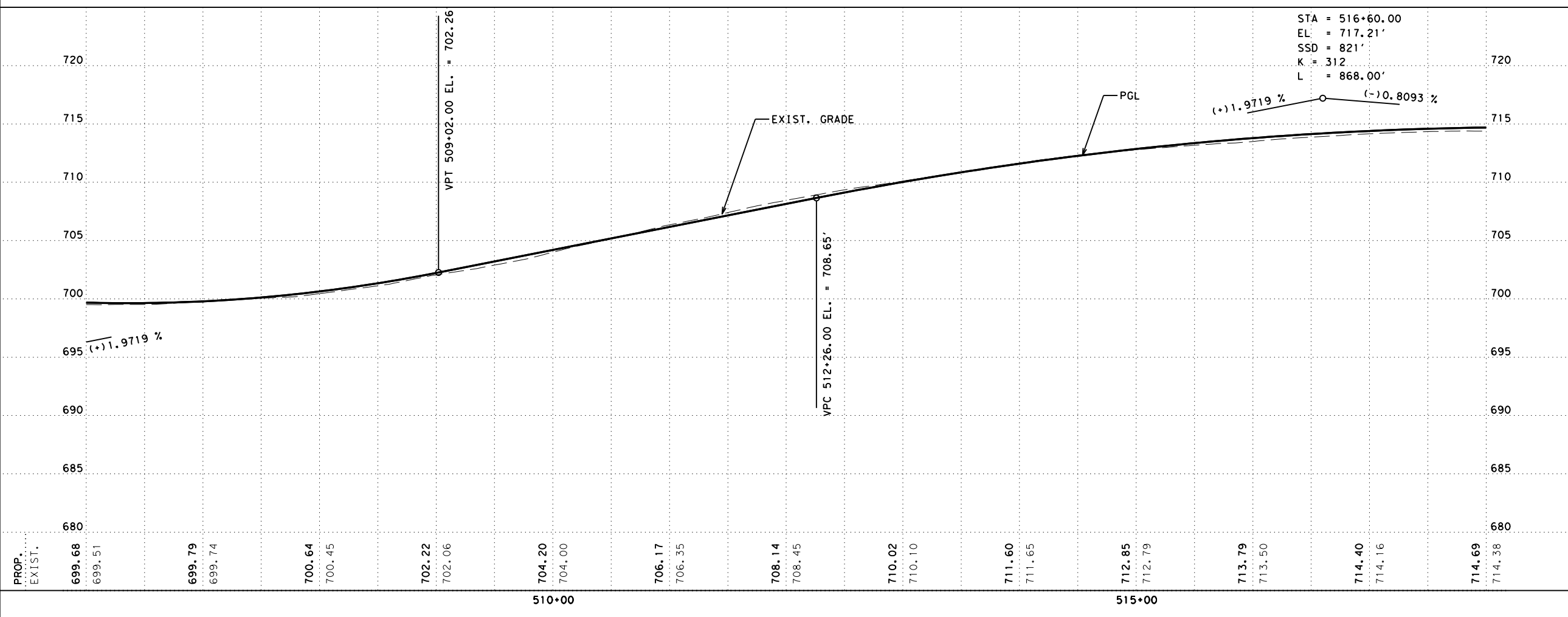


11/30/2022



DocuSigned by:
Bulbul Ganguly
 B36C53A335184E4...

- # DRIVEWAY
- △ MAILBOX TURNOUT
- S(#) - SINGLE (# MAILBOXES)
- D(#) - DOUBLE (# MAILBOXES)
- M(#) - MULTIPLE (# MAILBOXES)



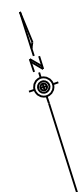
Austin District
 Central Design



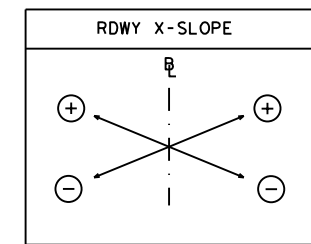
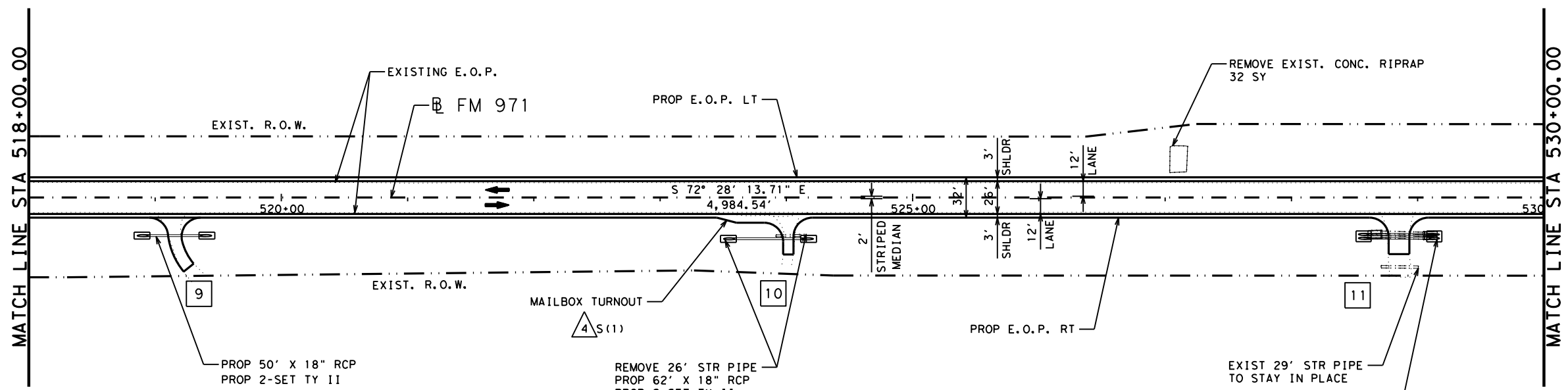
FM 971
 PLAN & PROFILE
 STA. 506+00.00-
 STA. 518+00.00

SHEET 5 OF 10

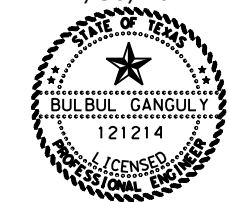
© 2023	CONT	SECT	JOB	HIGHWAY
DSI	CK1	2690	01 038	FM 971
DW:	CK1	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	54



DATE: 11/30/2022 3:03:15 PM
FILE: pw:\txdot\projectwiseonline.com\TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\3. Roadway\038_FM971_PP6.dgn

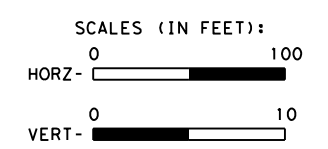
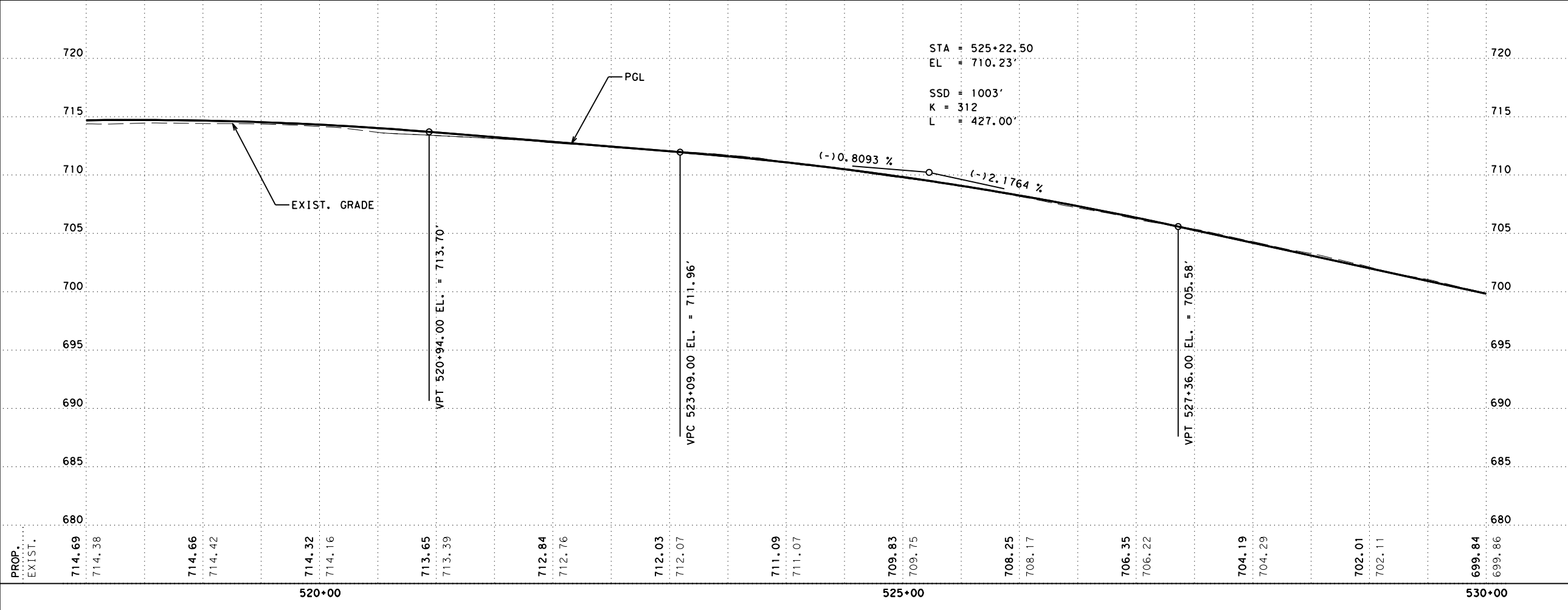


11/30/2022



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...

- # DRIVEWAY
- △ MAILBOX TURNOUT
 - S(#) - SINGLE (# MAILBOXES)
 - D(#) - DOUBLE (# MAILBOXES)
 - M(#) - MULTIPLE (# MAILBOXES)



**Austin District
Central Design**



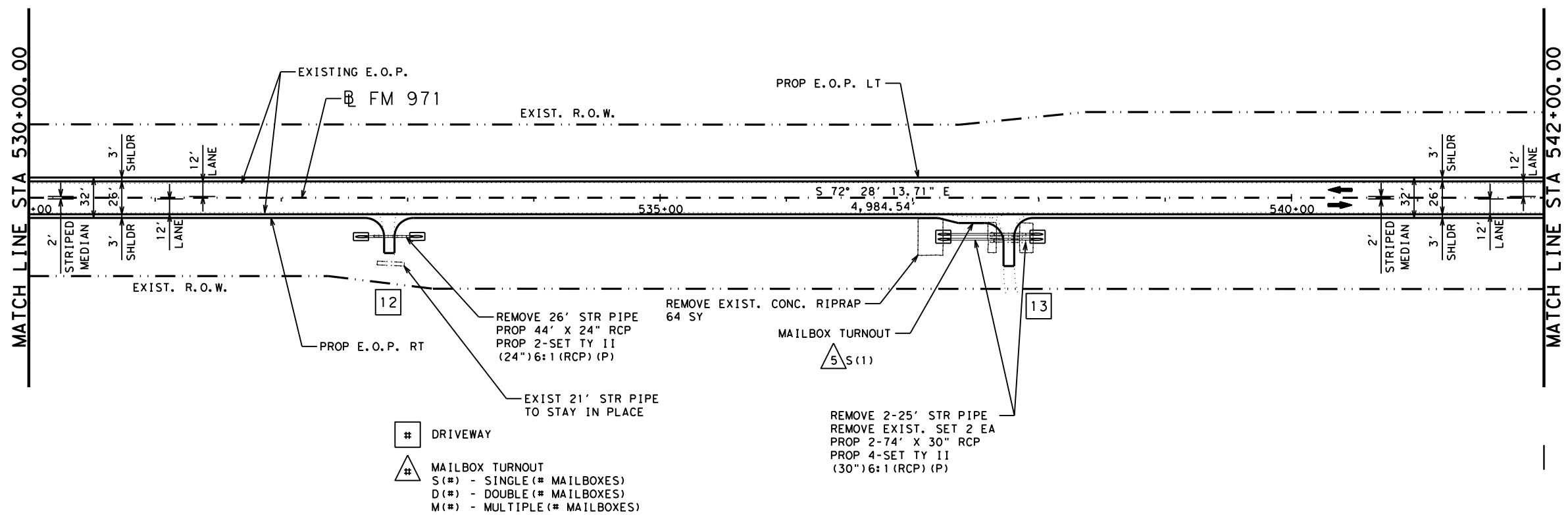
FM 971
PLAN & PROFILE
STA. 518+00.00-
STA. 530+00.00

SHEET 6 OF 10

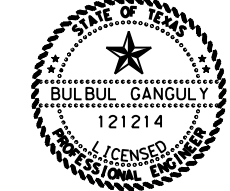
© 2023	CONT	SECT	JOB	HIGHWAY
DSI	CK1	2690	01	038
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	55		



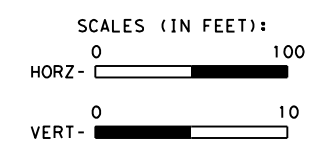
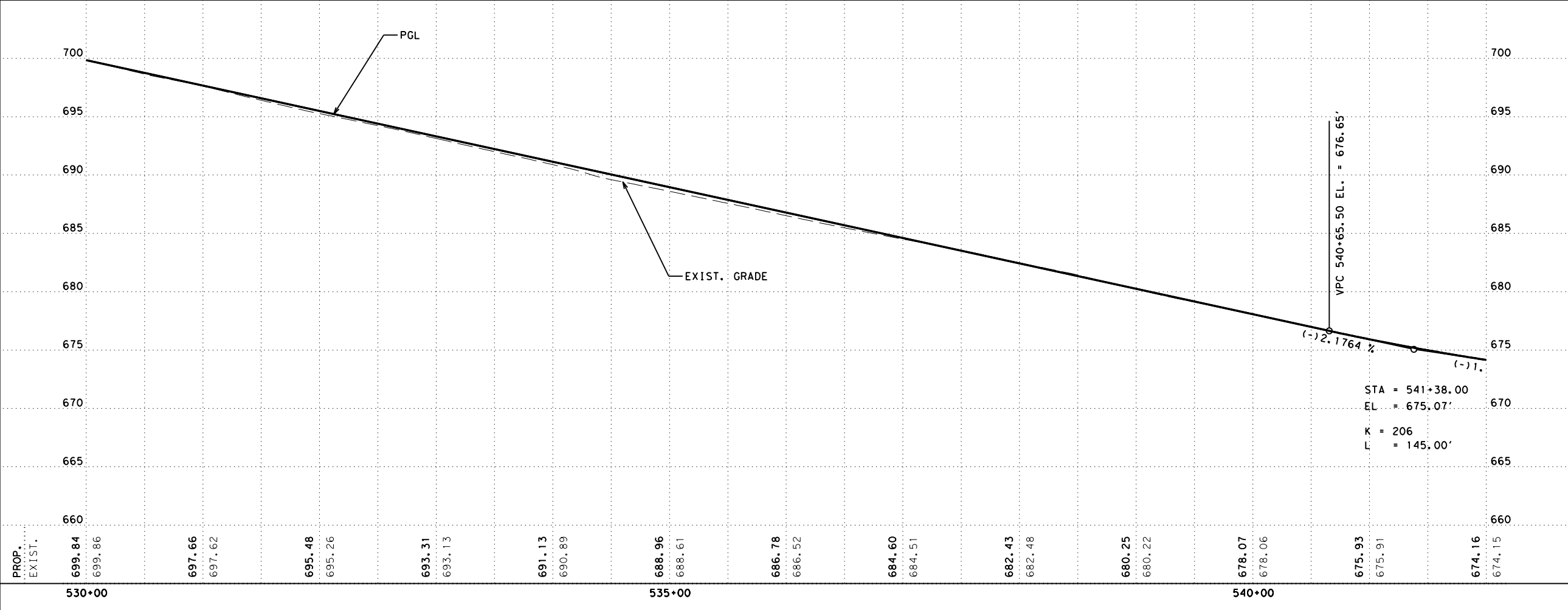
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11/30/2022



DocuSigned by:
Bulbul Ganguly
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**Austin District
Central Design**

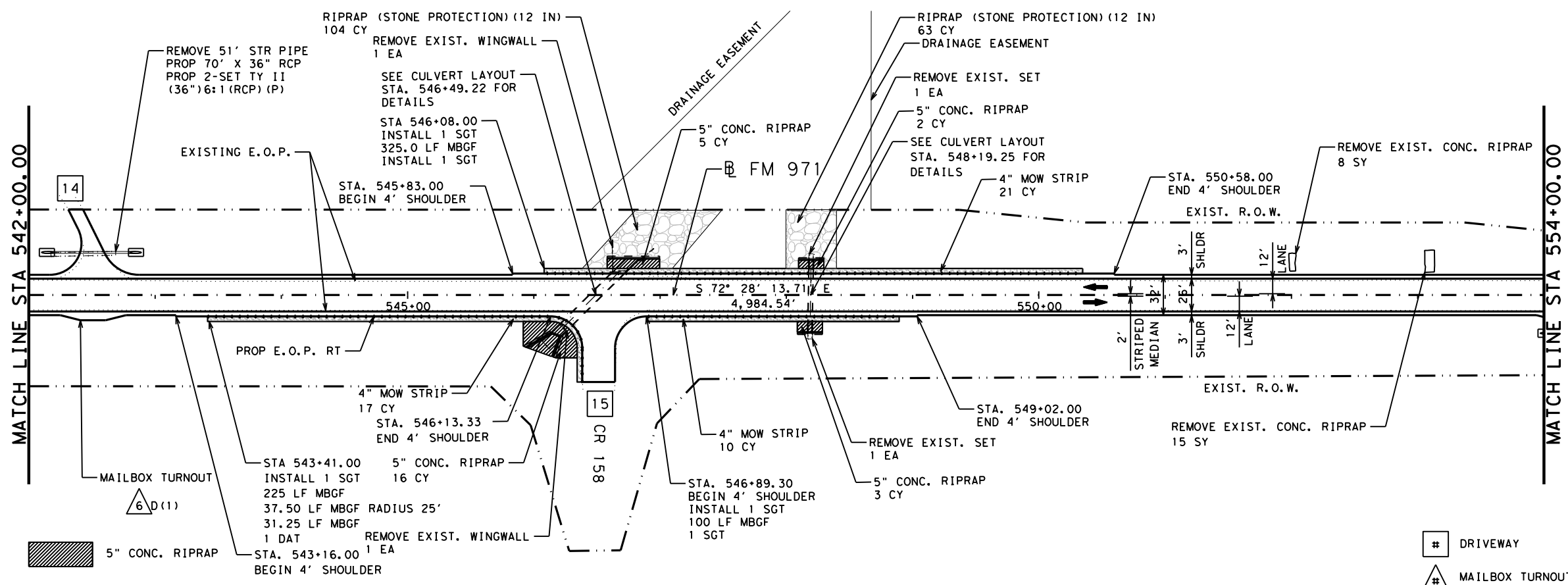
Texas Department of Transportation

FM 971
PLAN & PROFILE
STA. 530+00.00-
STA. 542+00.00

SHEET 7 OF 10

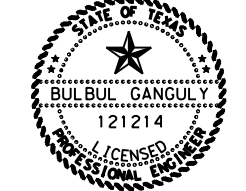
© 2023	CONT	SECT	JOB	HIGHWAY
DS1	CK1	2690	01	038
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	56		

DATE: 11/30/2022 3:10:19 PM
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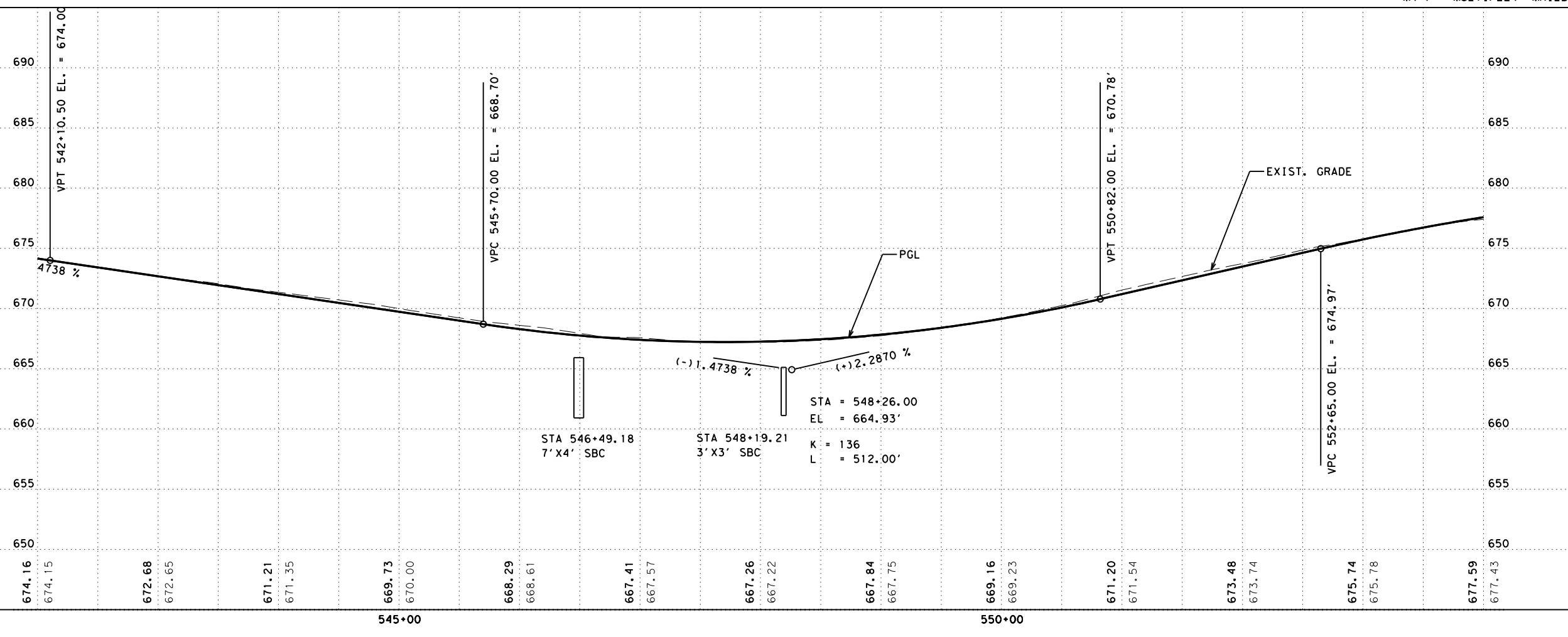


- # DRIVEWAY
- # MAILBOX TURNOUT
- S(#) - SINGLE (# MAILBOXES)
- D(#) - DOUBLE (# MAILBOXES)
- M(#) - MULTIPLE (# MAILBOXES)

11/30/2022



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...



**Austin District
Central Design**

Texas Department of Transportation

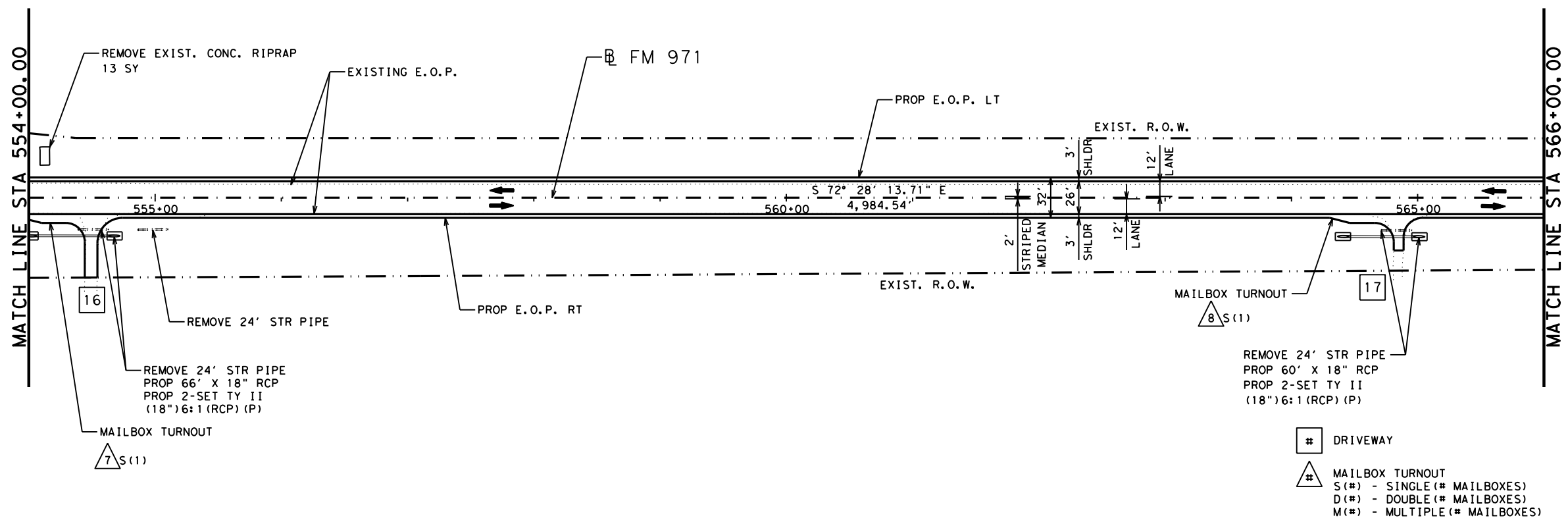
FM 971
PLAN & PROFILE
STA. 542+00.00-
STA. 554+00.00

SHEET 8 OF 10

© 2023	CONT	SECT	JOB	HIGHWAY
DS	CK1	2690	01	038
DM	CK1	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	57



DATE: 11/30/2022 3:06:23 PM
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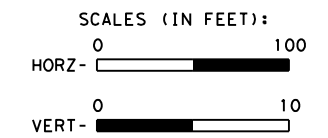
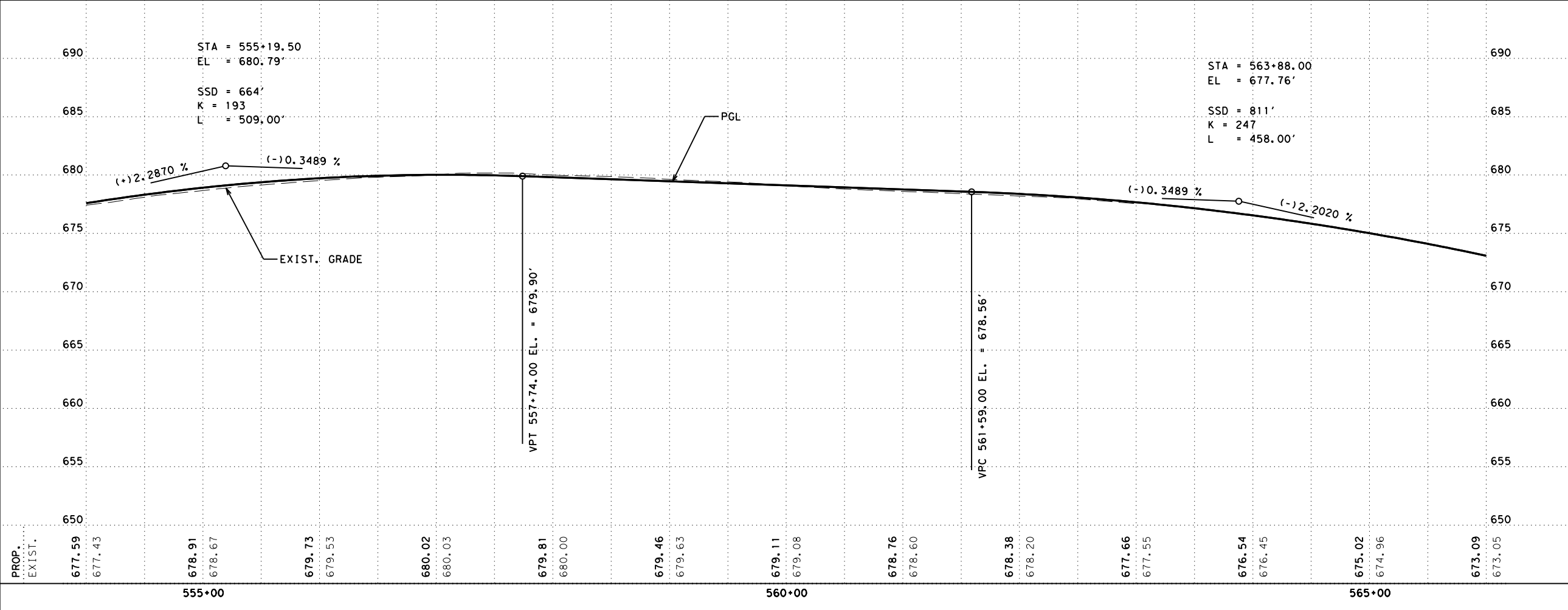
- # DRIVEWAY
- △ MAILBOX TURNOUT
 - S (#) - SINGLE (# MAILBOXES)
 - D (#) - DOUBLE (# MAILBOXES)
 - M (#) - MULTIPLE (# MAILBOXES)

11/30/2022



DocuSigned by:
Bulbul Ganguly

B36C53A335184E4...



Austin District
Central Design

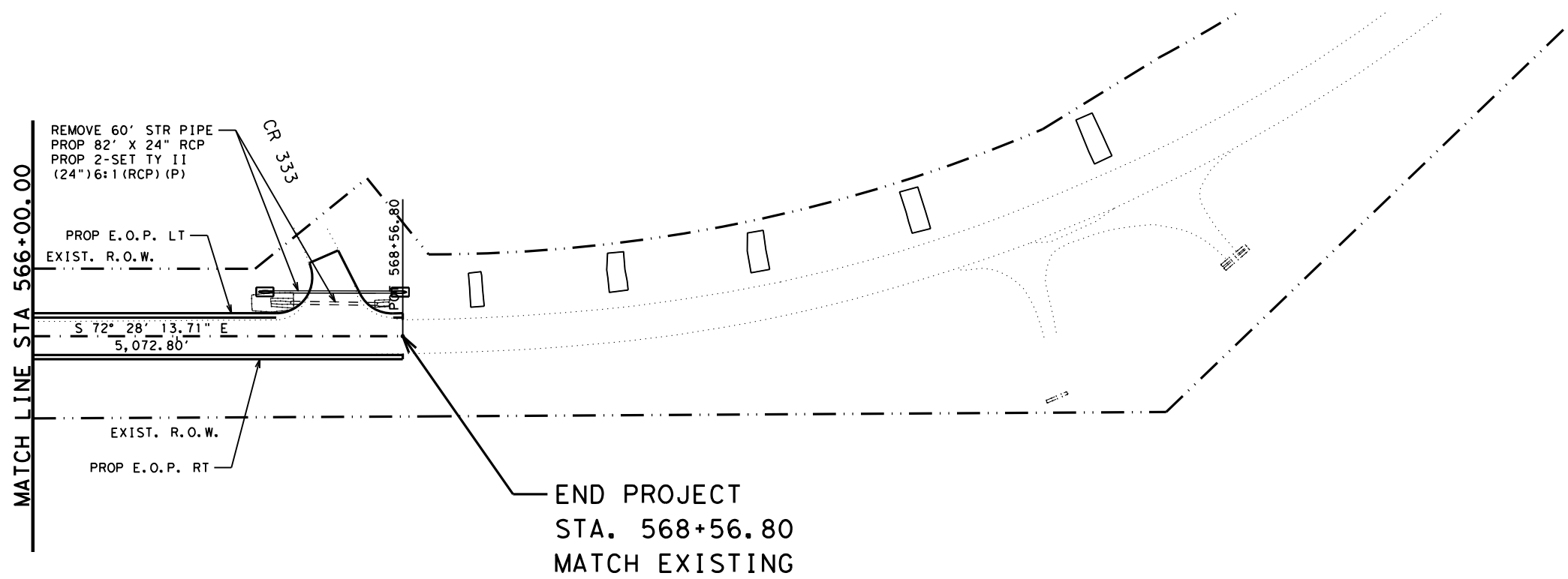


FM 971
PLAN & PROFILE
STA. 554+00.00-
STA. 566+00.00

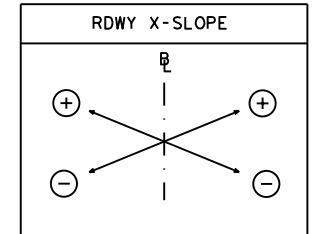
SHEET 9 OF 10

© 2023	CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	58		

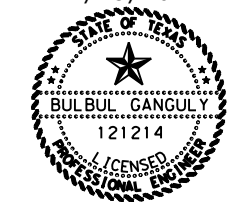
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PROP. RDWY X-SLOPE		
STATION	LEFT	RIGHT
567+50.00	-2.0%	-2.0%
568+00.00	-3.01%	0.63%
568+50.00	-3.76%	2.57%
568+56.80	MATCH EXTG	MATCH EXTG

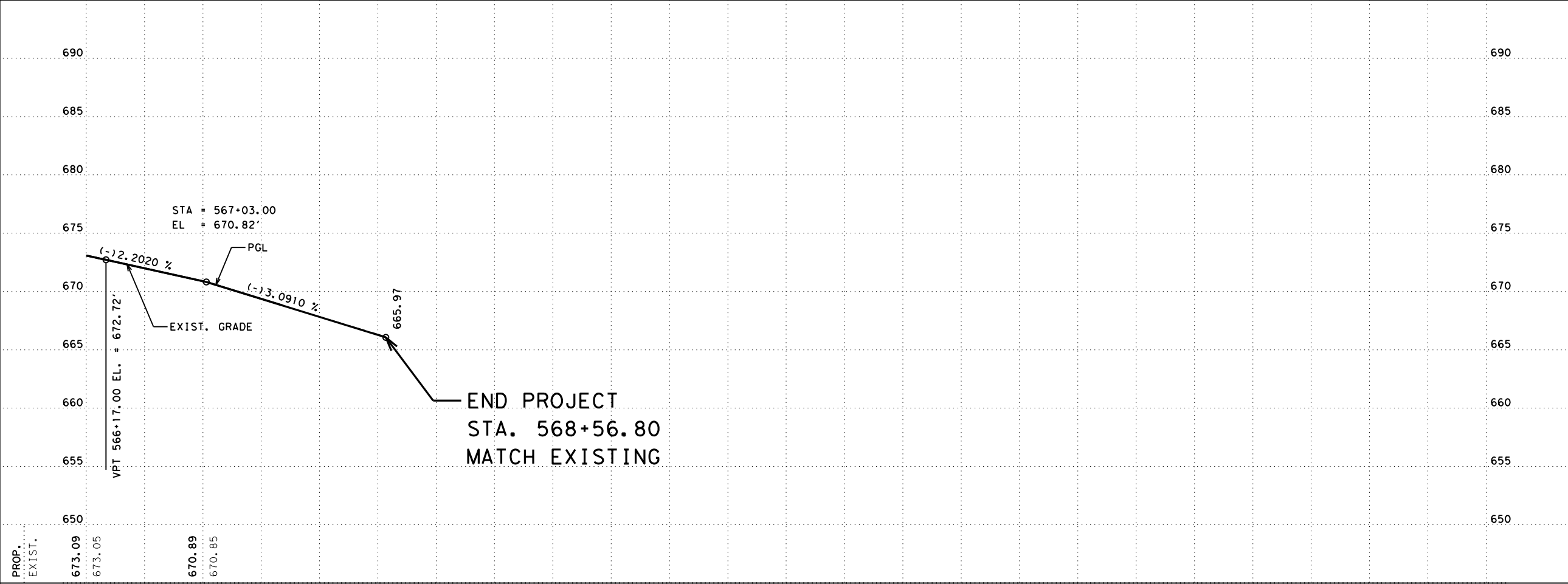


11/29/2022



- # DRIVEWAY
- # MAILBOX TURNOUT
 - S(#) - SINGLE (# MAILBOXES)
 - D(#) - DOUBLE (# MAILBOXES)
 - M(#) - MULTIPLE (# MAILBOXES)

DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...



**Austin District
Central Design**

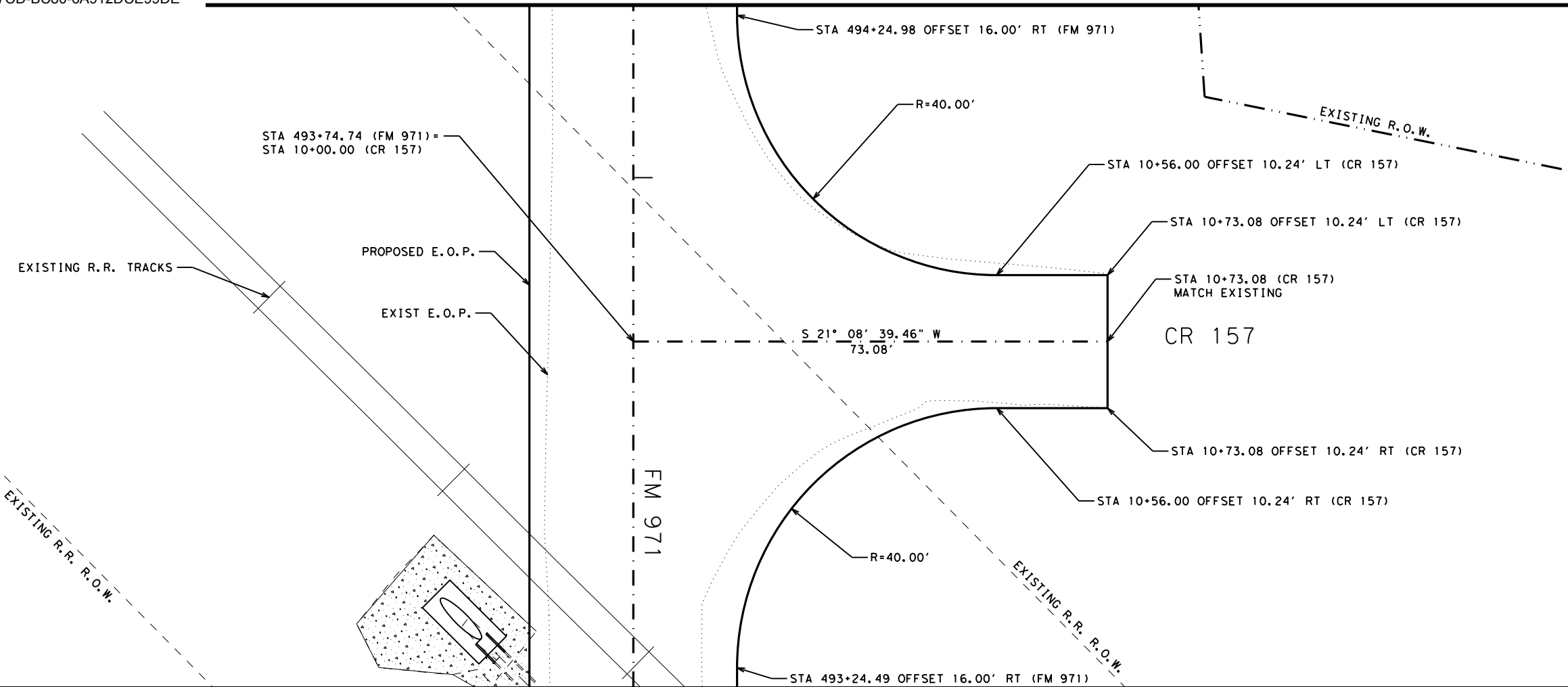


FM 971
PLAN & PROFILE
STA. 566+00.00-
STA. 568+56.80

SHEET 10 OF 10

© 2023	CONT	SECT	JOB	HIGHWAY
DS1	CK1	2690	01 038	FM 971
DW1	CK1	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	59

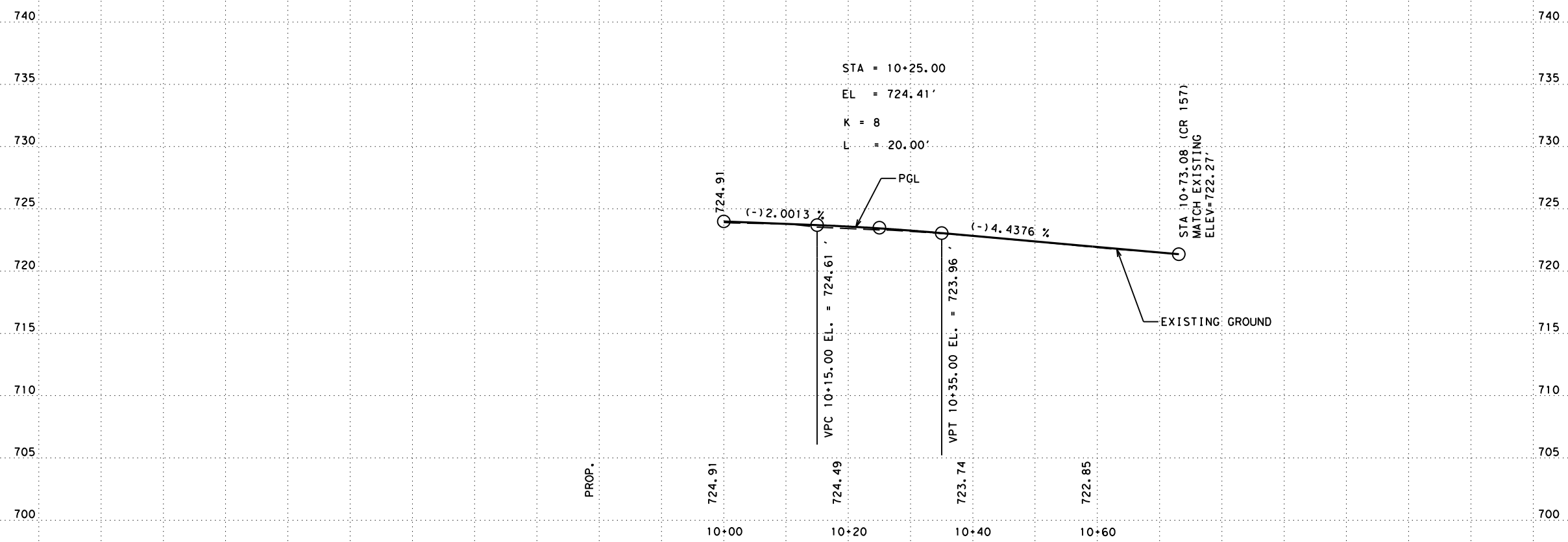
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9/22/2022



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...



**Austin District
Central Design**

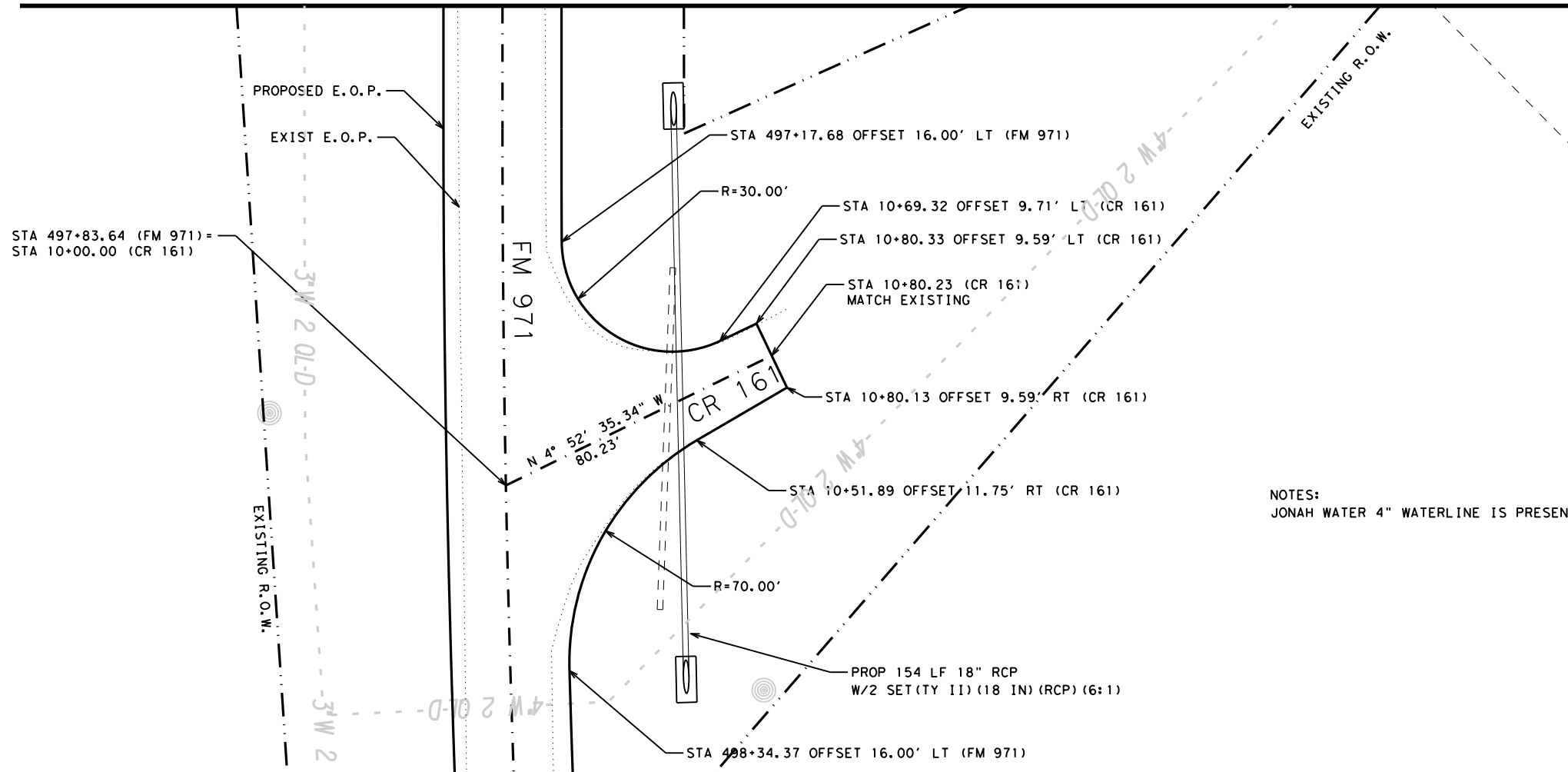


**FM 971
PLAN & PROFILE
CR 157**

SHEET 1 OF 4

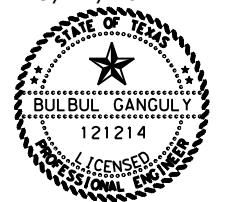
© 2023	CONT	SECT	JOB	HIGHWAY
DS:	CK:	2690	01 038	FM 971
DW:	CK:	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	60

DATE: 9/22/2022 8:11:42 AM
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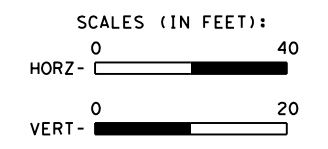
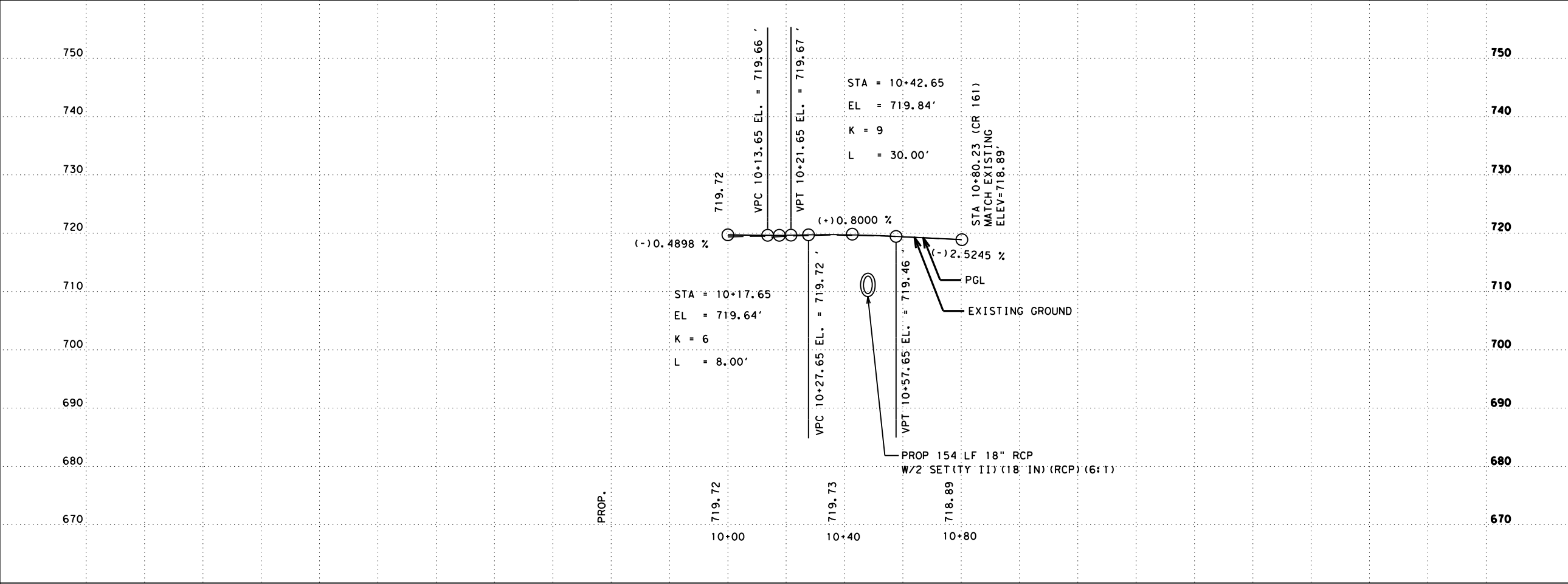


NOTES:
JONAH WATER 4" WATERLINE IS PRESENT AT THE APPROXIMATE LOCATION SHOWN.

9/22/2022



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...



**Austin District
Central Design**

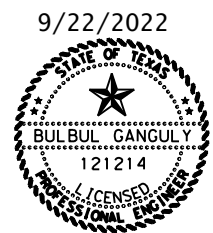
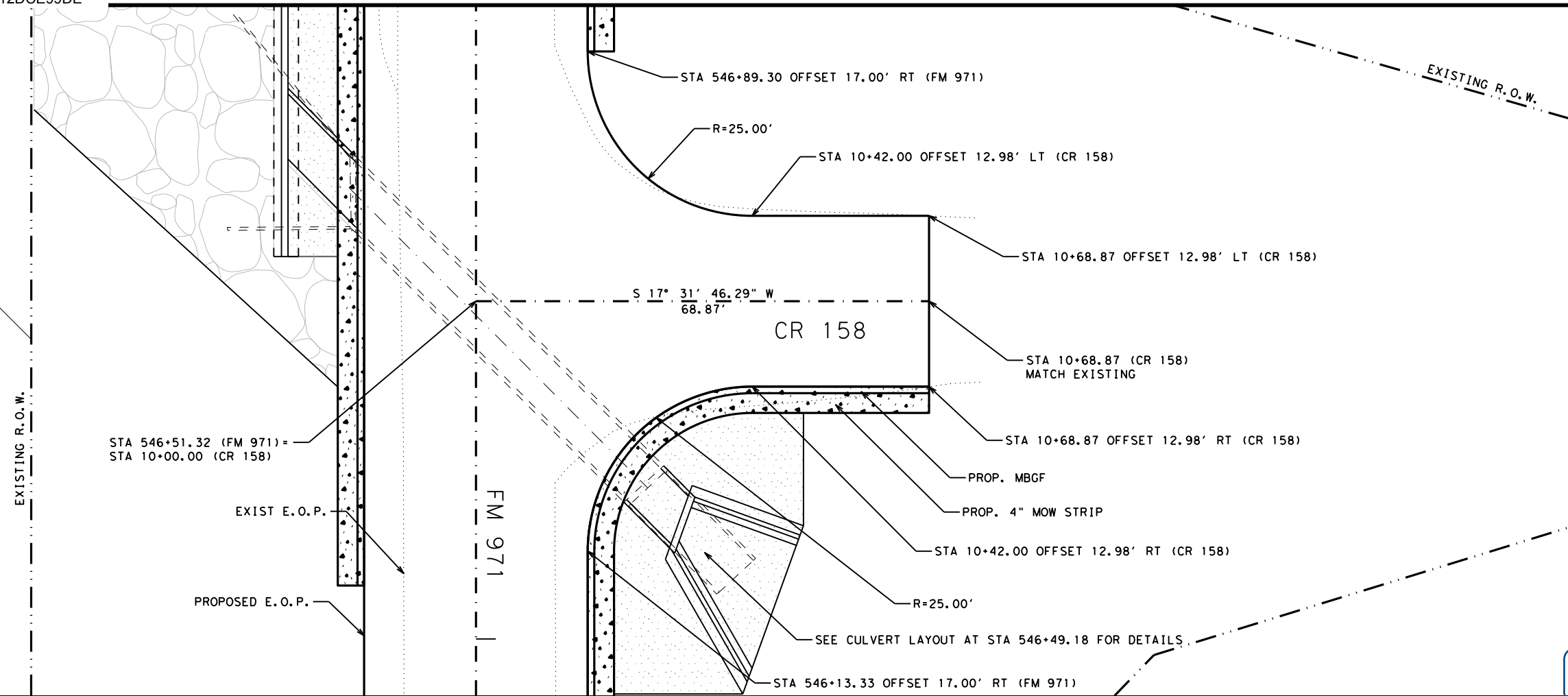
Texas Department of Transportation

**FM 971
PLAN & PROFILE
CR 161**

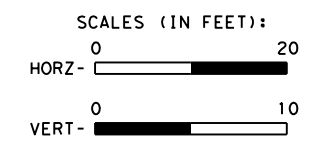
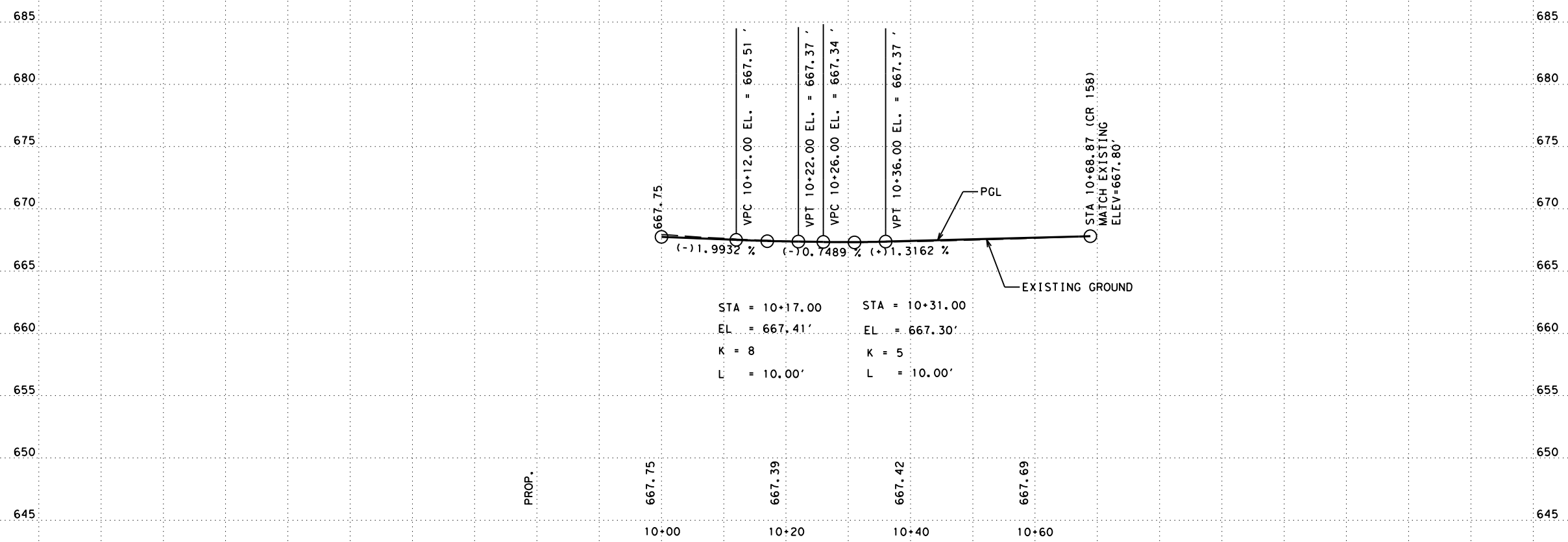
SHEET 2 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	61

DATE: 9/22/2022 8:11:53 AM
FILE: \\txdot.projectwiseonline.com:TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\3 - Roadway\038_FM971_PP\INT3.dgn



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...



**Austin District
Central Design**

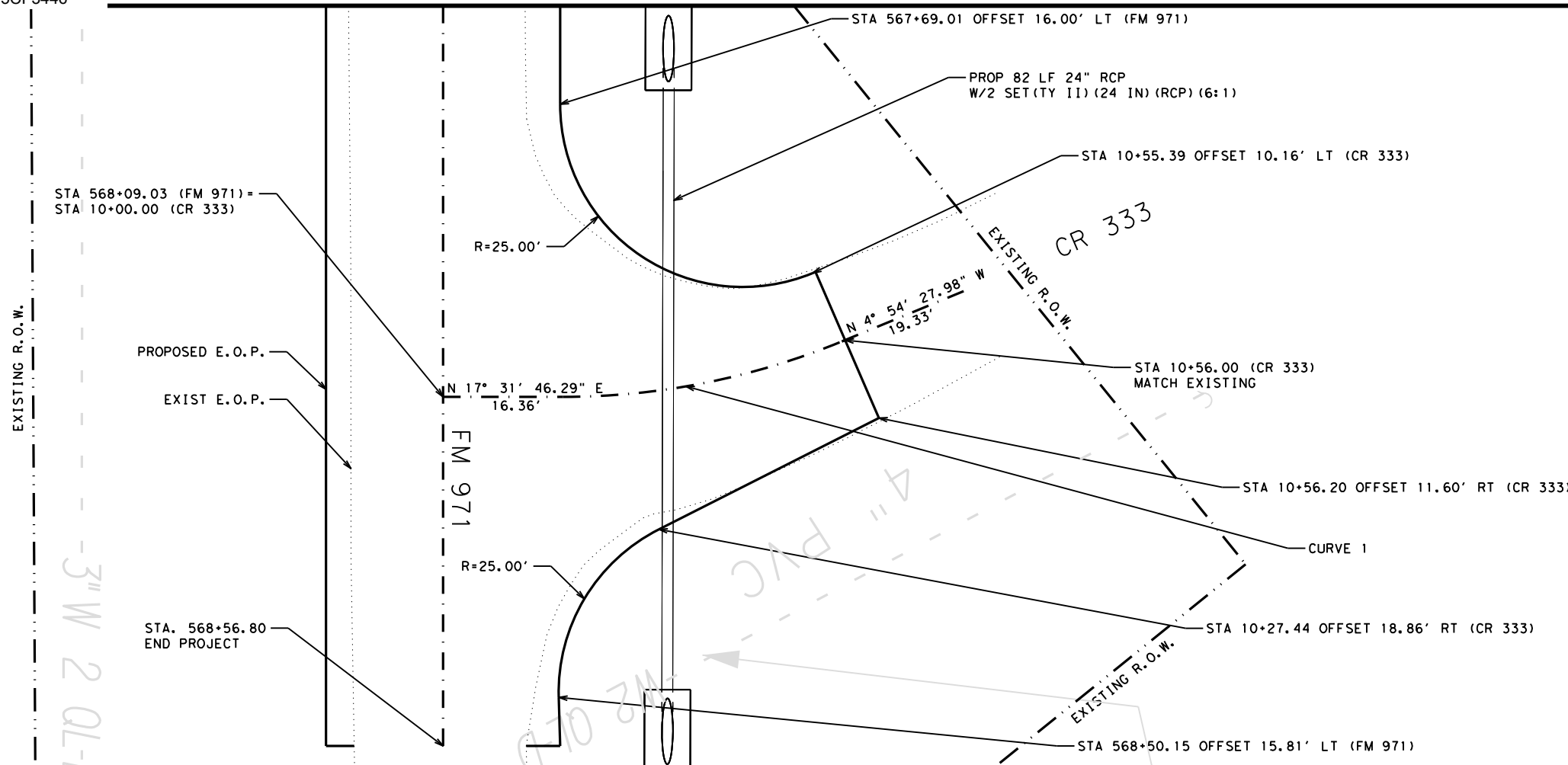
Texas Department of Transportation

**FM 971
PLAN & PROFILE
CR 158**

SHEET 3 OF 4

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	62

DATE: 11/29/2022 1:25:31 PM
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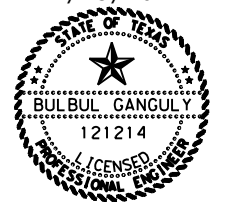


CURVE 1

PI STATION	= 10+36.20
DELTA	= 22° 26' 14.27" (LT)
DEGREE OF CURVE	= 57° 17' 44.81"
TANGENT	= 19.83
LENGTH	= 39.16
RADIUS	= 100.00
PC STATION	= 10+16.36
PT STATION	= 10+55.52

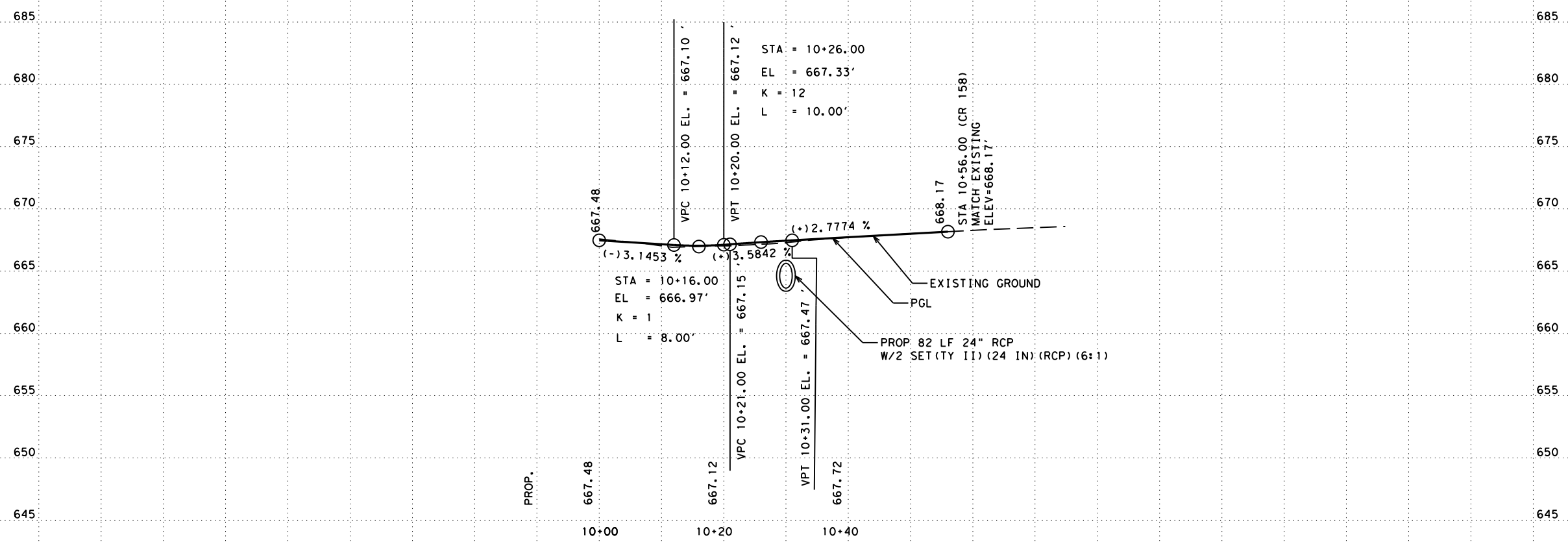
NOTES:
JONAH WATER 4" WATERLINE IS PRESENT AT THE APPROXIMATE LOCATION SHOWN.

11/29/2022



DocuSigned by:
Bulbul Ganguly

B36C53A335184E4...



**Austin District
Central Design**

Texas Department of Transportation

**FM 971
PLAN & PROFILE
CR 333**

SHEET 4 OF 4

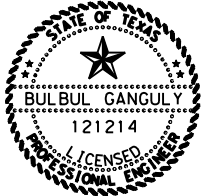
© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	63

DATE: 10/14/2022 9:01:44 AM
FILE: pw:\txdot.projectwiseonline.com:TXD014\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\3. Roadway\038_FM971-DRWY-DETAILS.dgn

DRIVEWAY NO.	P&P SHEET NO.	DRIVEWAY TYPE	STATION	SIDE (LT/RT)	DWY LENGTH L (FT)	DWY WIDTH @ MOUTH (FT)	DWY WIDTH @ THROAT (FT)	SURFACE AREA (SY)	RADIUS LT (FT)	RADIUS RT (FT)	MAILBOX TURNOUT (SY)	PIPE LENGTH (FT)	NO. OF BARRELS	PIPE SIZE (IN)	S.E.T. SIDE SLOPE	DRIVEWAY CL OFFSET (FT)	CONSTRUCTION LICENSE AREA (SF)
1	1	SURF TREAT	468+83.20	LT	37.4	41.6	10.0	48.5	15	15	-	-	-	-	-	-	-
2	1	SURF TREAT	468+91.48	RT	38.5	71.5	13.4	108.1	30	30	14.7	-	-	-	-	-	-
3	3	SURF TREAT	493+74.74	RT	61.1	100.5	20.5	206.2	40	40	-	-	-	-	-	-	-
4	4	SURF TREAT	497+83.64	LT	67.0	116.3	19.2	239.7	30	70	-	154.00	1	18	6:1	48.00	-
5	4	SURF TREAT	502+48.86	LT	36.5	44.5	9.0	43.7	15	20	-	42.00	1	18	6:1	32.00	-
6	4	SURF TREAT	506+00.21	RT	41.0	39.4	9.4	46.7	15	15	-	96.00	2	24	6:1	33.00	-
7	5	SURF TREAT	507+39.18	RT	41.1	41.5	11.8	63.5	15	15	12.4	64.00	1	18	6:1	30.00	-
8	5	SURF TREAT	512+20.59	LT	38.2	79.5	15.3	102.7	20	50	16.0	58.00	1	18	6:1	32.00	-
9	6	SURF TREAT	519+15.35	RT	17.6	36.1	10.1	59.1	15	15	-	50.00	1	18	6:1	29.50	-
10	6	SURF TREAT	524+01.56	RT	33.3	38.1	8.1	43.7	15	15	13.2	62.00	1	18	6:1	32.00	-
11	6	SURF TREAT	528+86.18	RT	33.0	48.3	18.3	63.3	15	15	-	112.00	2	24	6:1	28.50	-
12	7	SURF TREAT	532+85.50	RT	31.7	38.2	8.2	35.9	15	15	-	44.00	1	24	6:1	30.00	-
13	7	SURF TREAT	537+76.18	RT	42.0	38.5	8.5	53.1	15	15	12.8	148.00	2	30	6:1	28.00	-
14	8	SURF TREAT	542+70.77	LT	62.6	70.3	11.6	114.7	25	30	16.0	70.00	1	36	6:1	33.00	-
15	8	SURF TREAT	546+51.32	RT	56.9	76.0	26.0	179.5	25	25	-	-	-	-	-	-	-
16	9	SURF TREAT	554+49.27	RT	51.3	45.0	10.0	74.1	20	15	12.1	66.00	1	18	6:1	29.51	-
17	9	SURF TREAT	564+84.97	RT	29.8	37.8	7.8	39.7	15	15	12.4	60.00	1	18	6:1	30.00	-
18	10	SURF TREAT	568+09.03	LT	44.3	81.1	21.8	153.1	25	25	-	82.00	1	24	6:1	30.00	-

NOTE TO CONTRACTOR:
 MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
 DRIVEWAY EARTHWORK QUANTITIES CALCULATED BEYOND TYPICAL ROADWAY SLOPE.
 GRADE ALL DRIVEWAYS TO DRAIN.
 PROPOSED PIPE SIZES AND NO. OF BARRELS MATCH EXISTING.
 *OFFSET DISTANCE FROM EDGE OF R.O.W. FOR CONSTRUCTION EASEMENT PURPOSES. VALUES ONLY GIVEN IF BEYOND R.O.W.

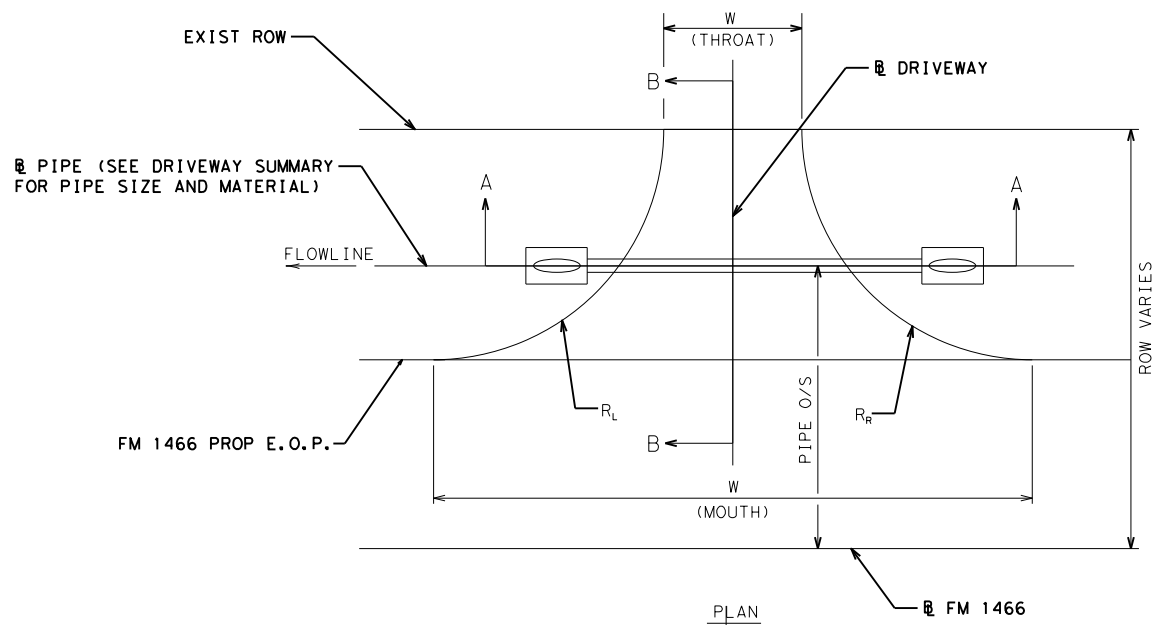
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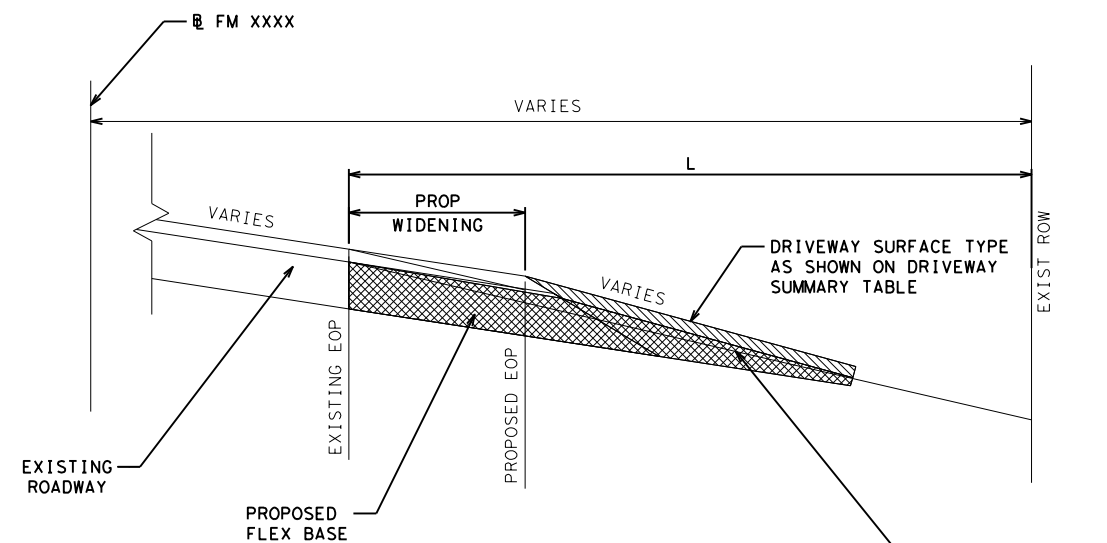
Austin District Central Design				
Texas Department of Transportation				
FM 971				
DRIVEWAY SUMMARY				
SHEET 1 OF 1				
© 2023	CONT	SECT	JOB	HIGHWAY
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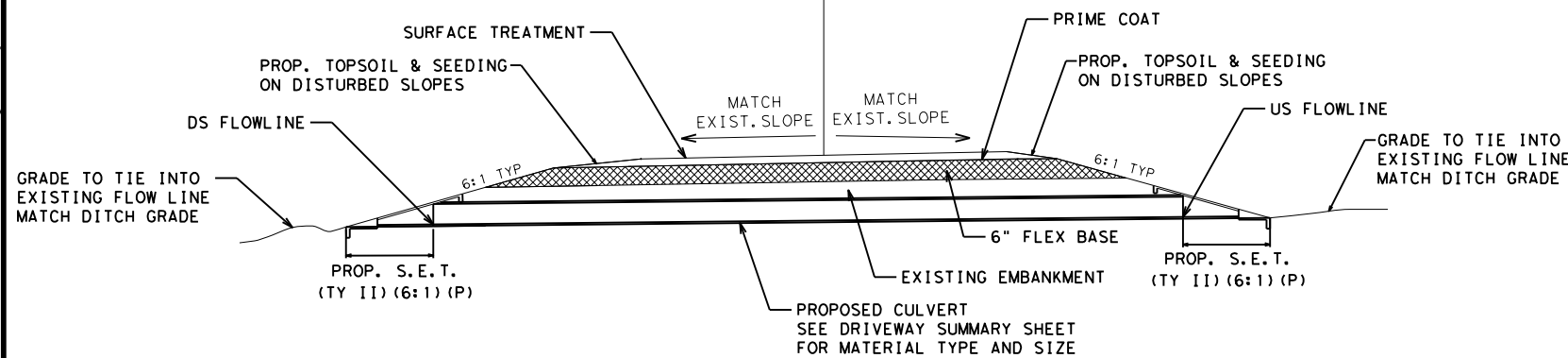
DRIVEWAY PLAN VIEW

APPLIES TO ALL DRIVEWAYS AND CROSS-STREET APPROACHES



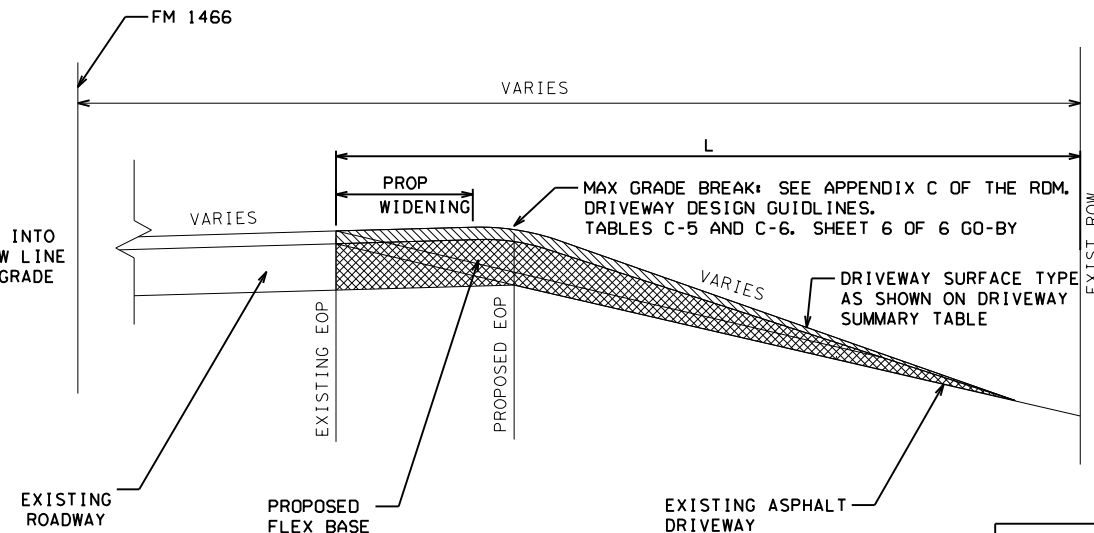
SECTION B-B

FOR ASPHALT DRIVEWAYS



SECTION A-A

APPLIES TO ALL DRIVEWAYS AND CROSS-STREET APPROACHES



SECTION B-B

FOR ASPHALT DRIVEWAYS

NOTE:

1. DRIVEWAY EARTHWORK QUANTITIES CALCULATED BEYOND TYPICAL ROADWAY SLOPE.
2. GRADE ALL DRIVEWAYS TO DRAIN.
3. EXISTING SLOPES MAY BE STEEPER THAN 6:1. FILL TO A MINIMUM 6:1 SLOPE AND ADD S.E.T.
4. TAPERED PIPE LENGTH SHALL BE CONSIDERED SUBSIDIARY TO INSTALLATION OF S.E.T.

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DRIVEWAY DETAILS

SHEET 1 OF 2

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DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	65

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NOTE:
DRIVEWAY PROFILES ARE SHOWN IN
DRIVEWAY PLAN & PROFILE SHEETS
& IN ROADWAY CROSS SECTIONS.

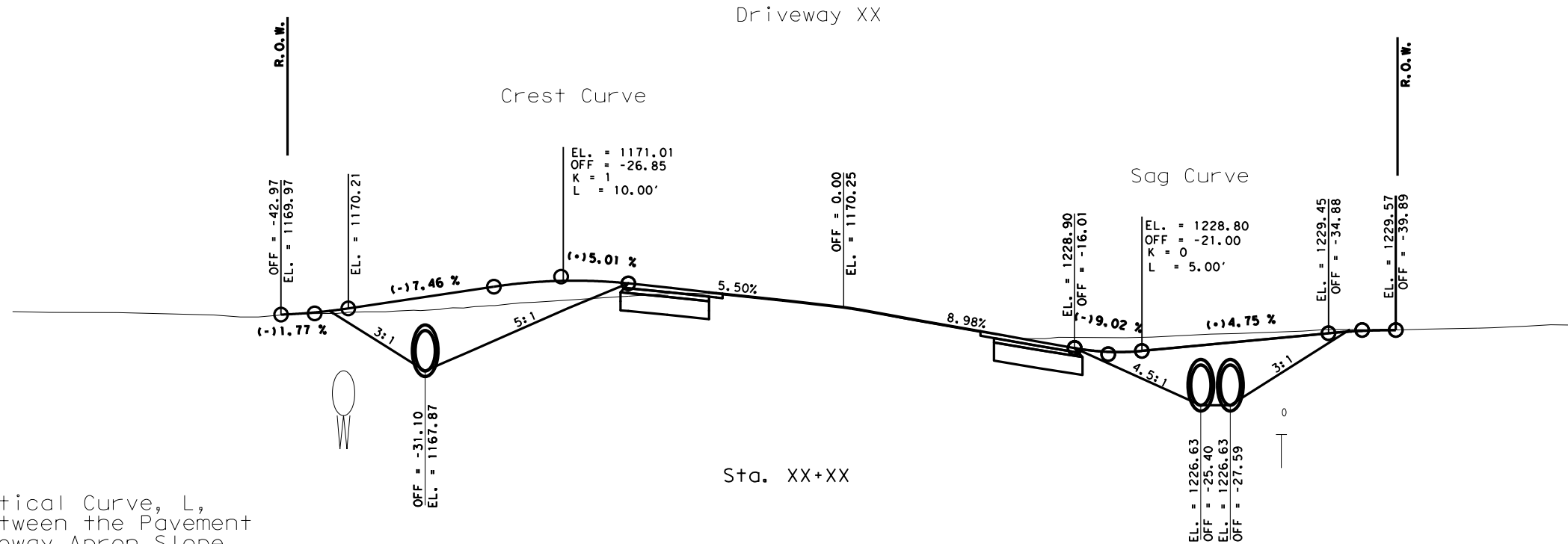


Table C-5. Length of Vertical Curve, L, For a Change in Grade Between the Pavement Cross-Slope and the Driveway Apron Slope

Change in Grade	Crest		Sag	
	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

Change in Grade	Crest		Sag	
	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:

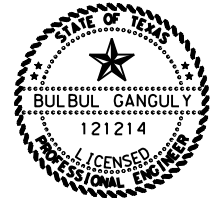
1. Abrupt grade changes, which cause vehicles entering and exiting driveways to move at extremely slow speeds, can create:
 - The possibility of rear end collisions for vehicles entering the driveway.
 - The need for large traffic gaps that may be unavailable or infrequent, causing drivers to accept 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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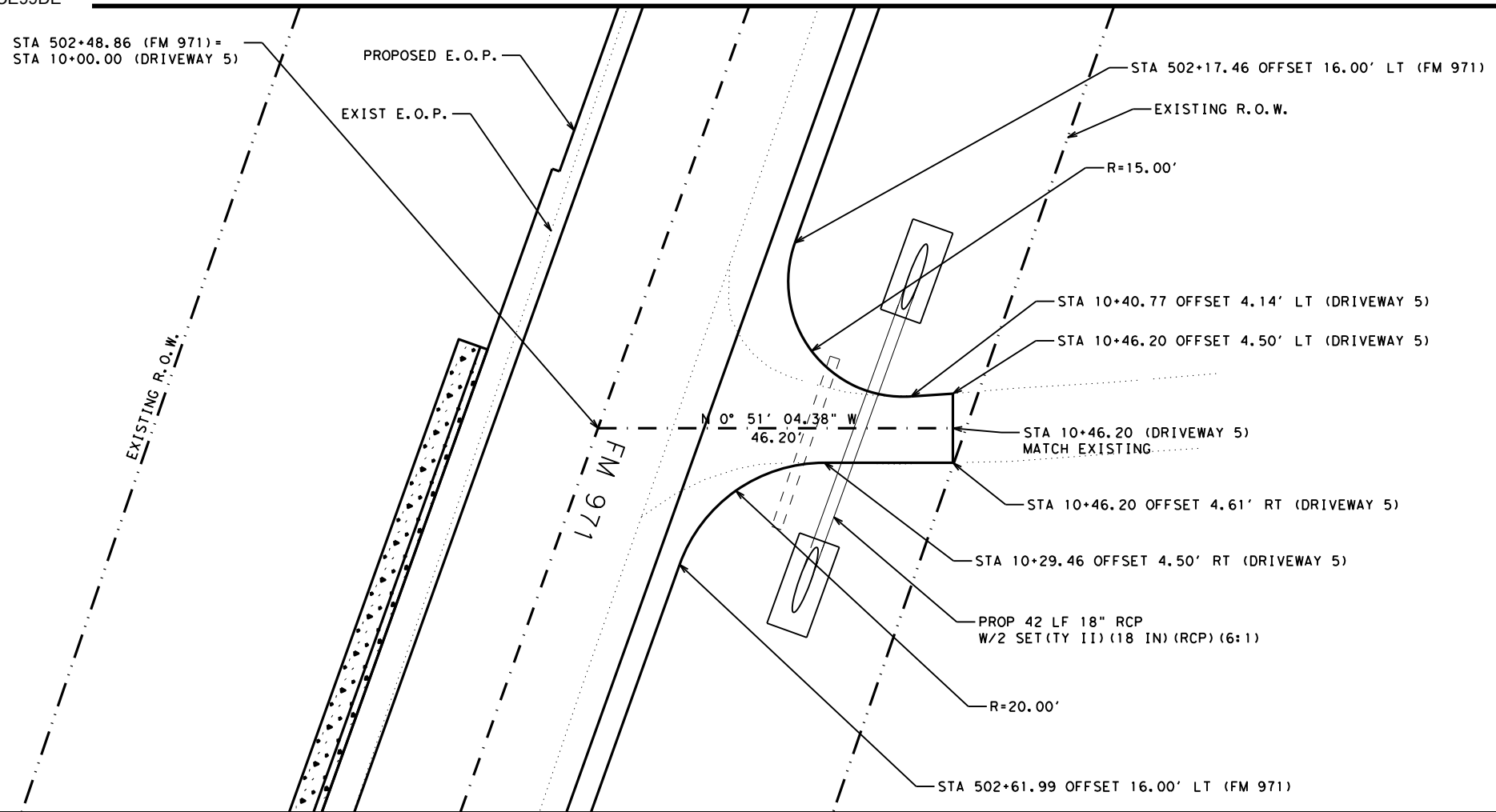
FM 971

DRIVEWAY DETAILS

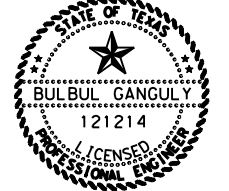
SHEET 2 OF 2

© 2023	CONT	SECT	JOB	HIGHWAY
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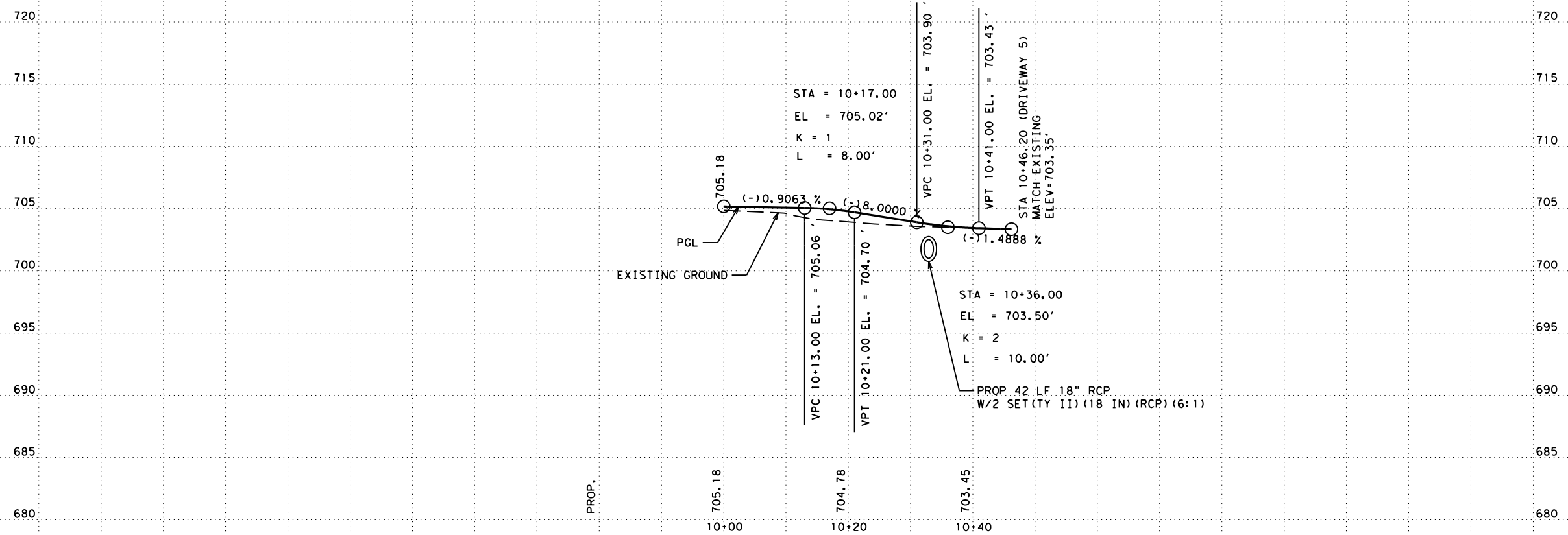
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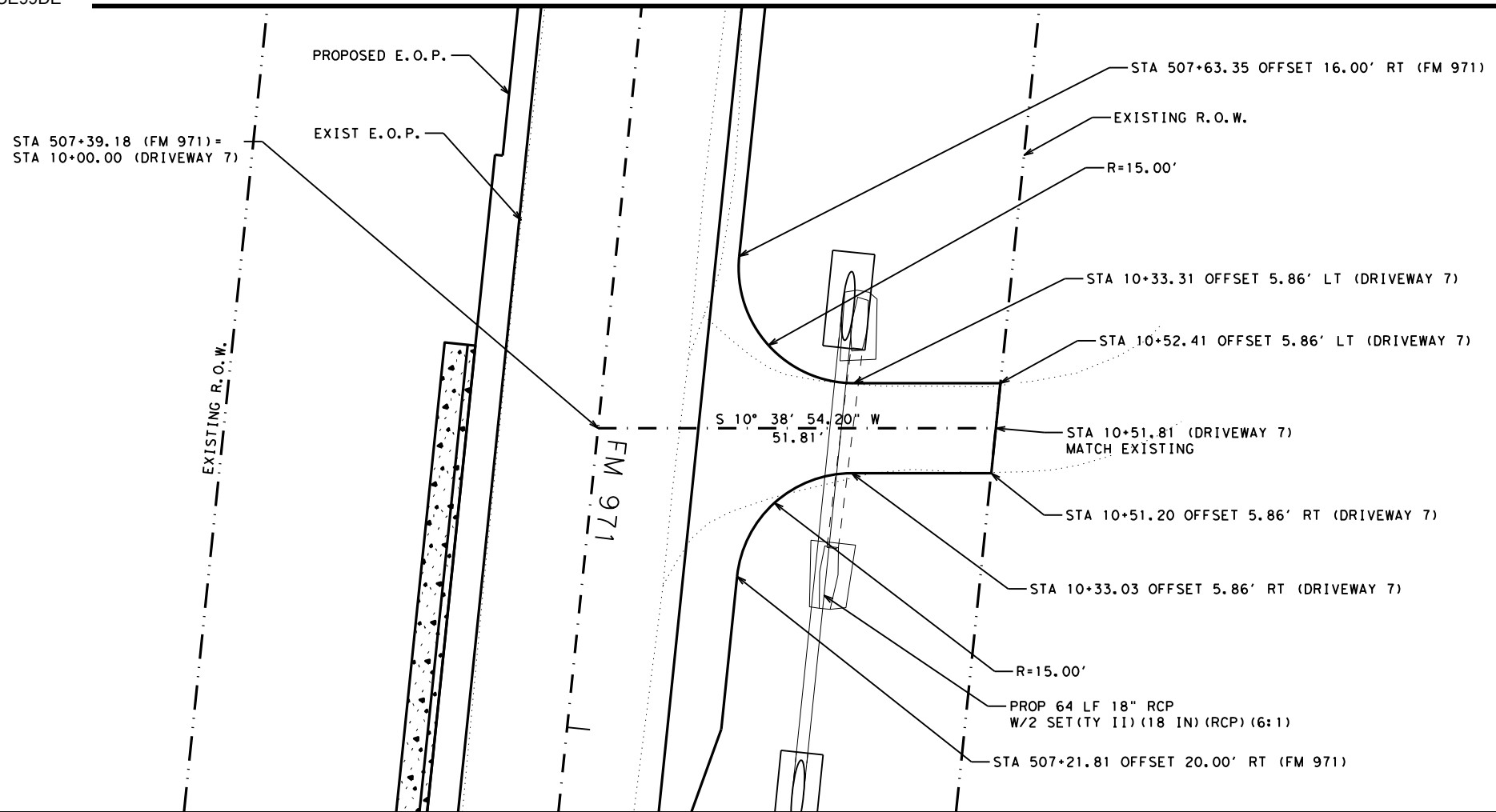
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**FM 971
PLAN & PROFILE
DRIVEWAY 5**

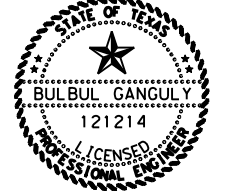
SHEET 1 OF 5

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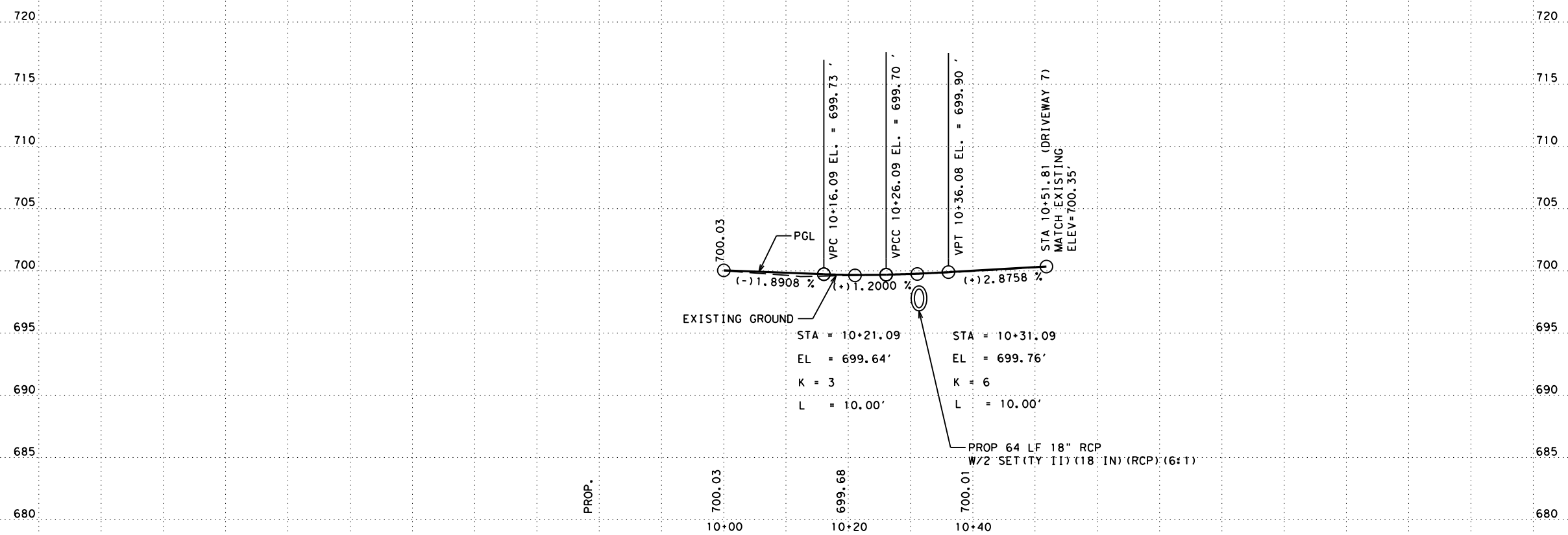
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Central Design**

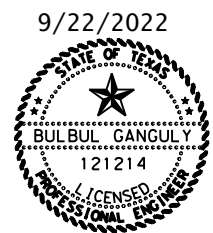
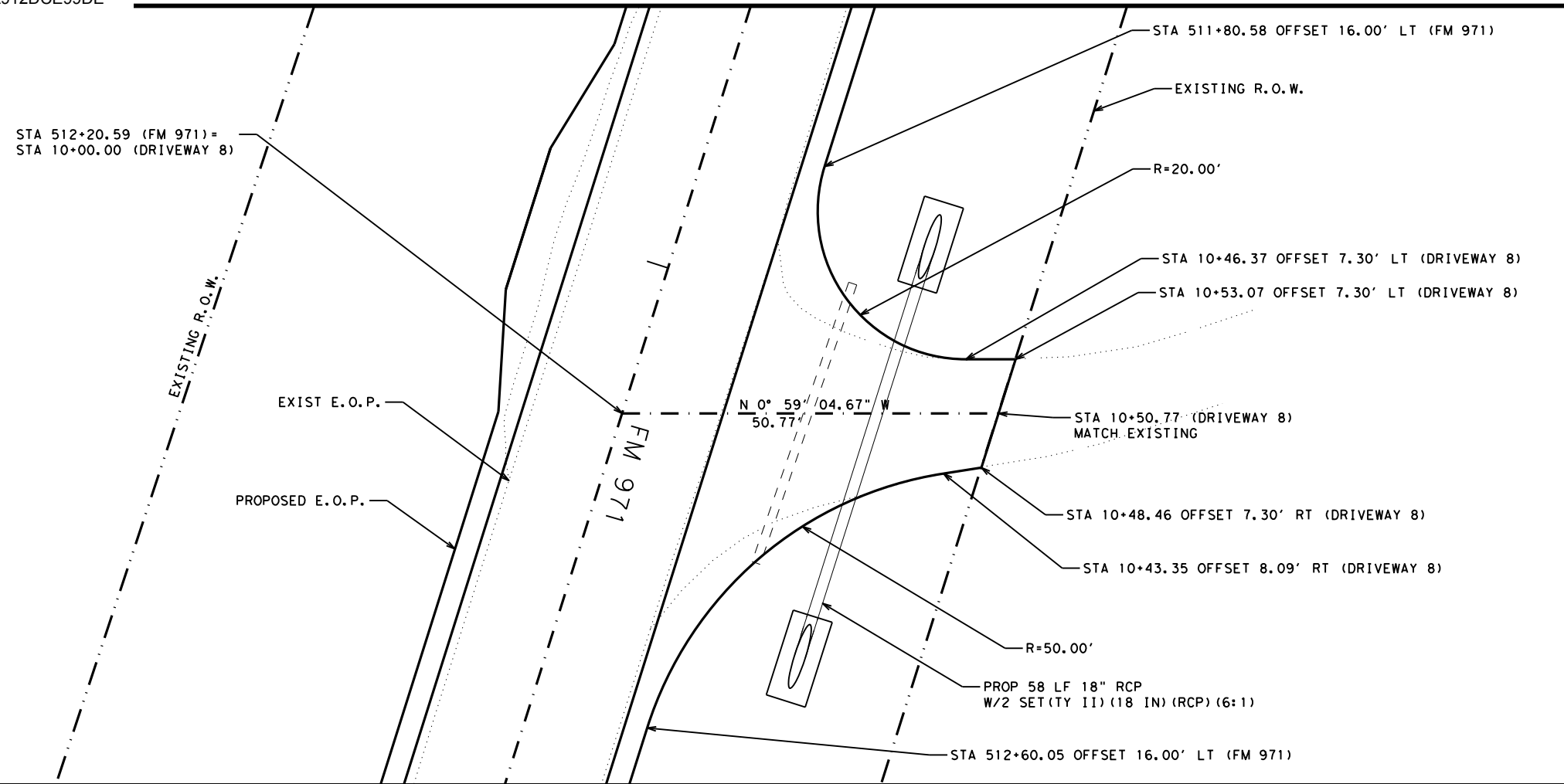
Texas Department of Transportation

**FM 971
PLAN & PROFILE
DRIVEWAY 7**

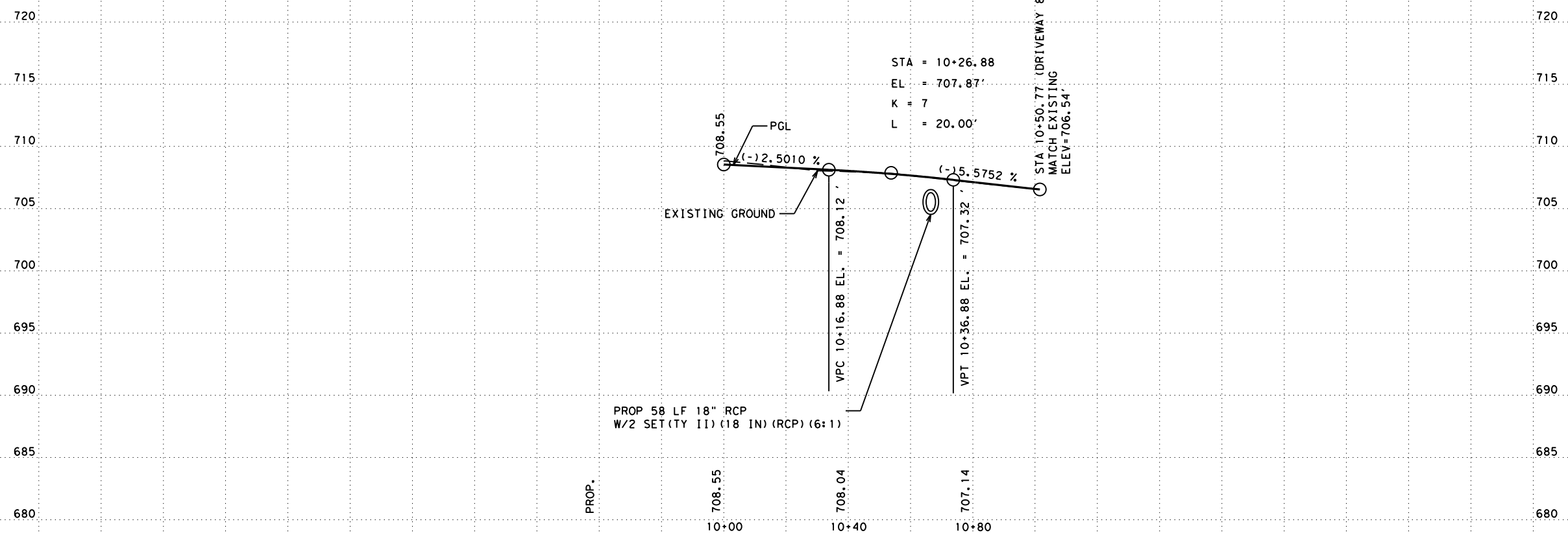
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© 2023	CONT	SECT	JOB	HIGHWAY
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PLAN & PROFILE
DRIVEWAY 8

SHEET 3 OF 5

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STA 519+15.35 (FM 971) =
 STA 10+00.00 (DRIVEWAY 8)

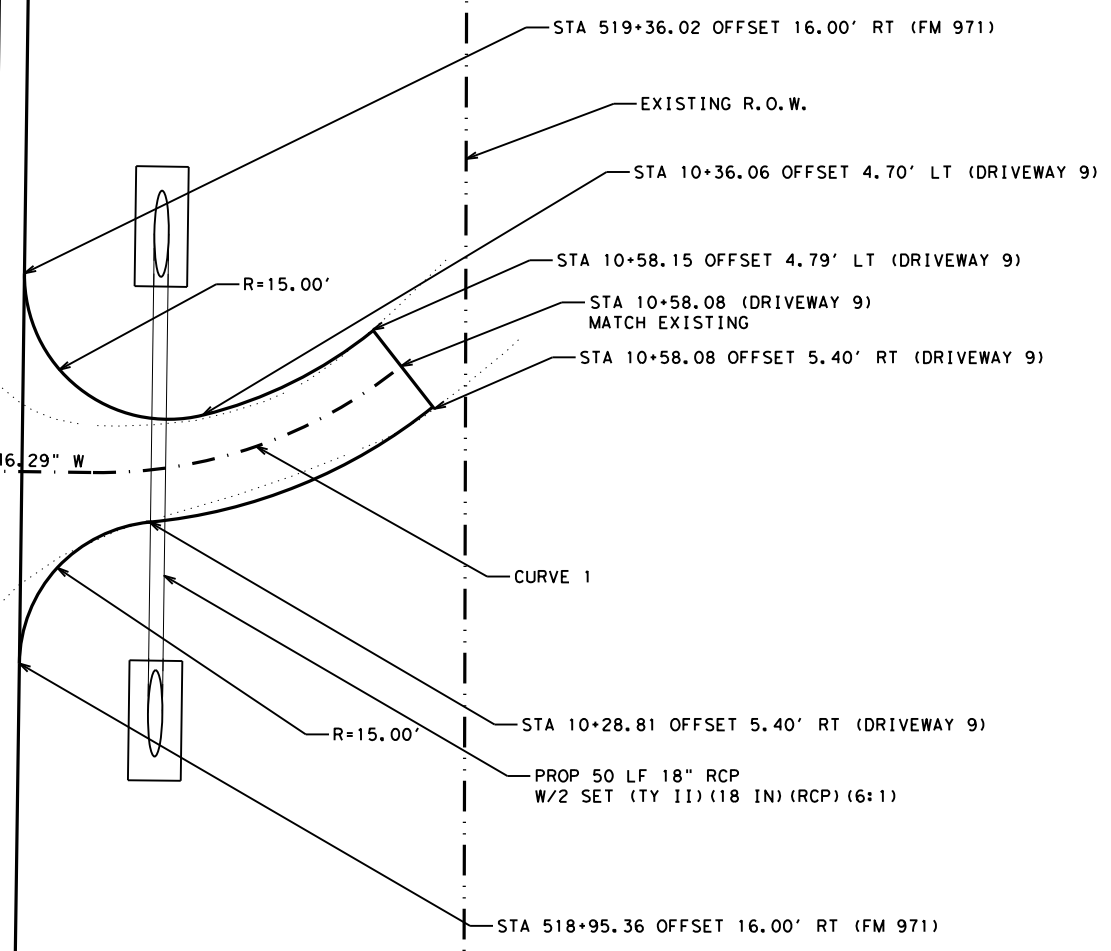
EXISTING R.O.W.

EXIST E.O.P.

PROPOSED E.O.P.

FM 971

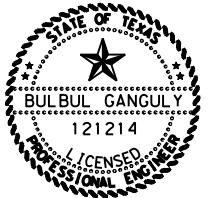
S 17° 31' 23.42" W
 46.29' W



CURVE 1

PI STATION	= 10+41.48
DELTA	= 39° 43' 17.66" (LT)
DEGREE OF CURVE	= 114° 35' 29.61"
TANGENT	= 18.06
LENGTH	= 34.66
RADIUS	= 50.00
PC STATION	= 10+23.42
PT STATION	= 10+58.08

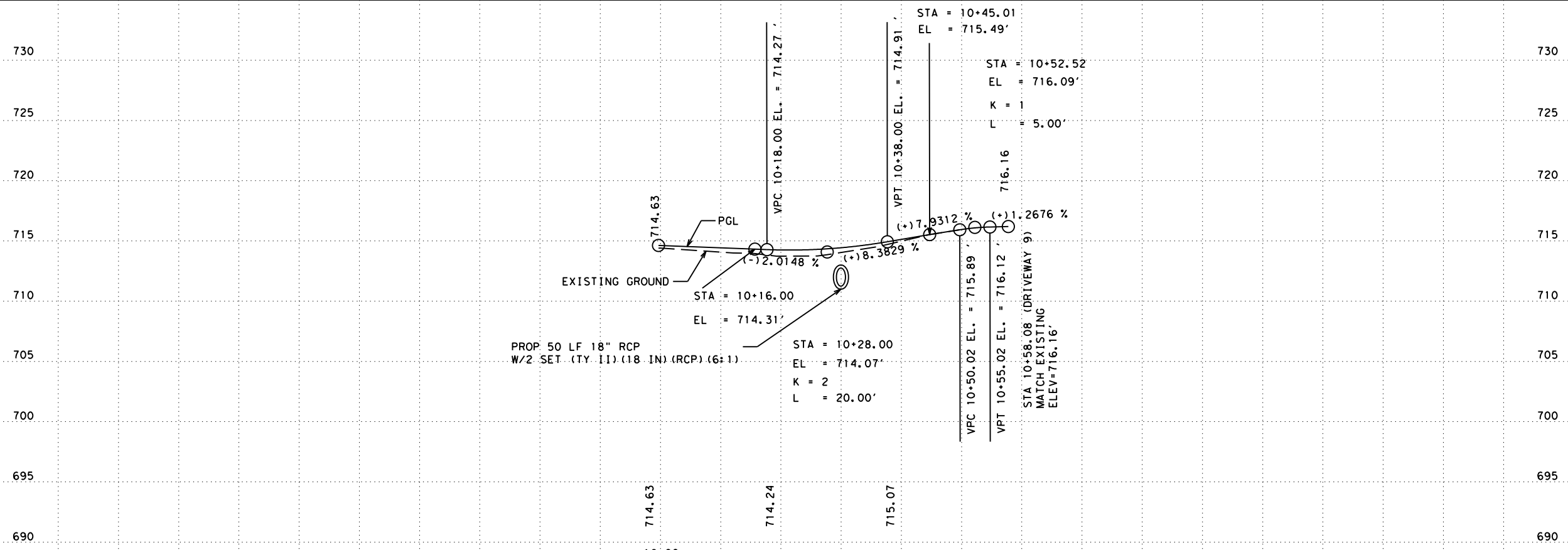
9/22/2022



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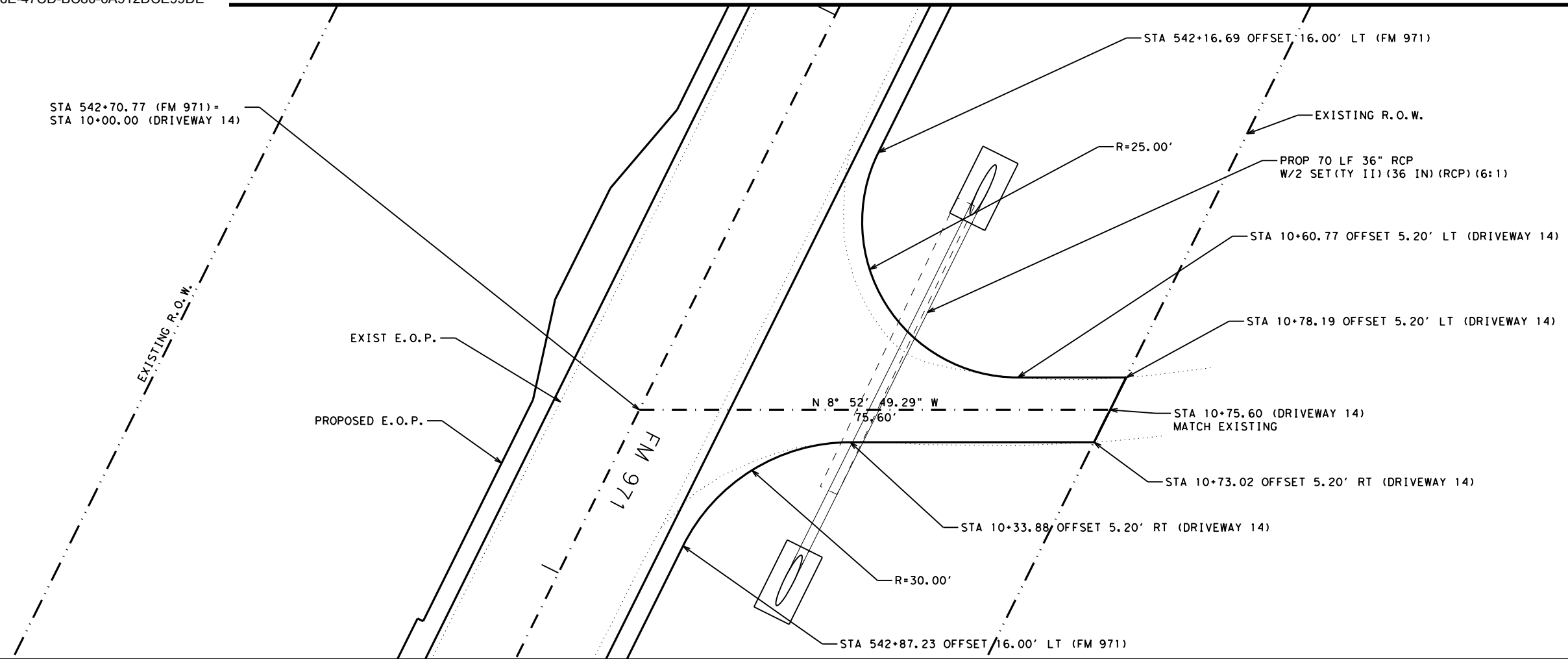


FM 971
 PLAN & PROFILE
 DRIVEWAY 9

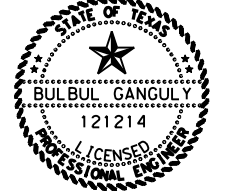
SHEET 4 OF 5

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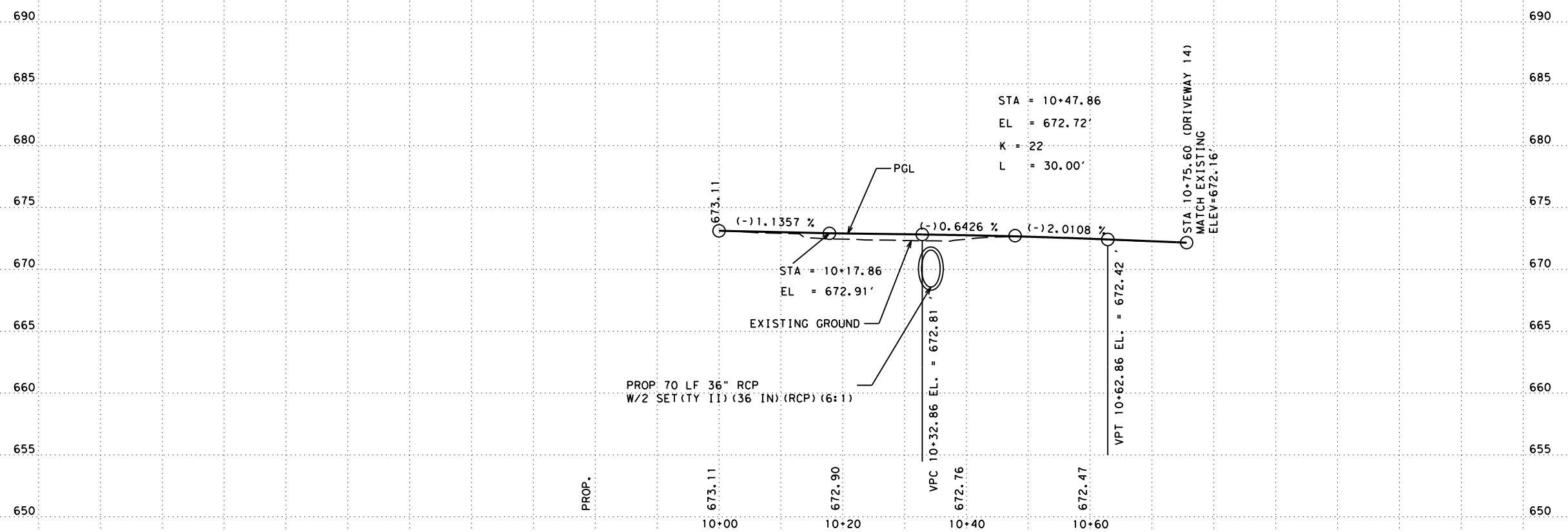
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 PLAN & PROFILE
 DRIVEWAY 14**

SHEET 5 OF 5

© 2023	CONT	SECT	JOB	HIGHWAY
DS:	CK:	2690	01 038	FM 971
DW:	CK:	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	71

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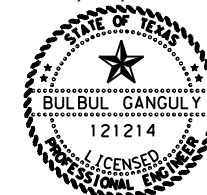
SEAL COAT MATERIAL SELECTION TABLE		
TIER I: HEAVY USE - USE ONLY THE SELECTED MATERIALS.		
TYPE	ASPHALT RUBBER (A-R) <input type="checkbox"/> A-R ONLY	ASPHALT CEMENT (AC) <input type="checkbox"/> AC ONLY
ASPHALT	<input type="checkbox"/> A-R TY II <input type="checkbox"/> A-R TY III <input type="checkbox"/> SP 300-	<input type="checkbox"/> AC-20-5TR <input type="checkbox"/> AC-20XP <input type="checkbox"/> AC-15P <input type="checkbox"/> SP 300-
TIER II: MODERATE USE - USE THESE MATERIALS OR ANY SELECTED TIER I MATERIAL COMBINATIONS OF THE ALLOWED TYPES.		
TYPE	ASPHALT CEMENT (AC) <input checked="" type="checkbox"/> AC ONLY	ASPHALT EMULSION <input type="checkbox"/> EMULSION ONLY
ASPHALT	<input type="checkbox"/> AC-10-2TR <input type="checkbox"/> AC-15P <input type="checkbox"/> AC-20XP <input type="checkbox"/> AC-10 W/2%SBR <input type="checkbox"/> AC-5 W/2%SBR <input type="checkbox"/> SP 300-	<input type="checkbox"/> CHFRS-2P <input type="checkbox"/> HFRS-2P <input type="checkbox"/> CRS-2P <input type="checkbox"/> 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) <input type="checkbox"/> AC ONLY	ASPHALT EMULSION <input type="checkbox"/> EMULSION ONLY
ASPHALT	<input type="checkbox"/> AC-10 <input type="checkbox"/> AC-5 <input type="checkbox"/> SP 300-	<input type="checkbox"/> CRS-2 <input type="checkbox"/> CRS-2H <input type="checkbox"/> HFRS-2 <input type="checkbox"/> 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, SGT, 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.

THERE ARE 107 WORKING DAYS ALLOWED FOR THIS PROJECT.
 THE LATEST ROADWAY START WORK DATE IS 5-2-2023 .

10/17/2022



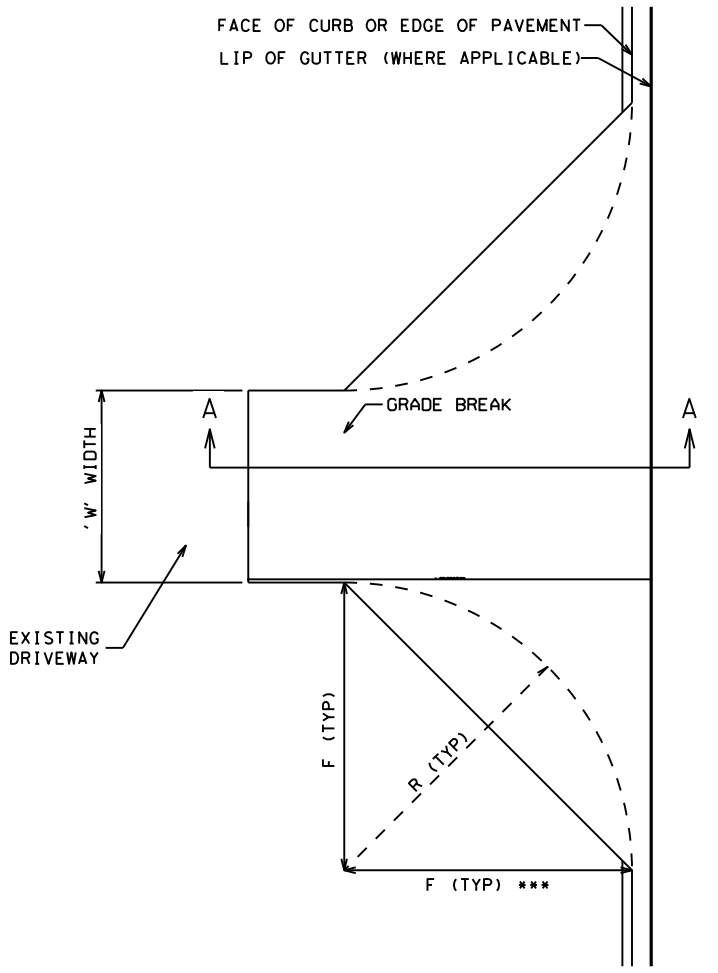
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SEAL COAT MATERIAL SELECTION TABLE

SCTABLE

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DIST	COUNTY		SHEET NO.	
AUS	WILLIAMSON		71A	

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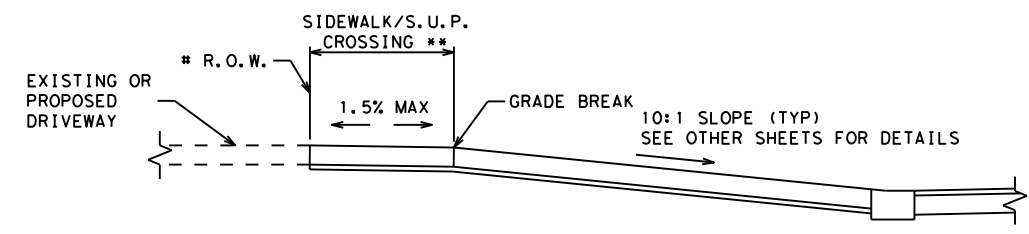
DRIVEWAY PLAN

FLARE OR RADIUS	FARM/RANCH	RESIDENTIAL	COMMERCIAL
"F" OR "R" (FT)	25	25	25

THESE ARE STANDARD DIMENSIONS UNLESS OTHERWISE SHOWN ELSEWHERE ON THE PLANS.

FLARES ARE TYPICALLY USED FOR SUBURBAN/URBAN (CURBED) ROADWAYS. RADII ARE TYPICALLY USED FOR RURAL OR UNCURBED ROADWAYS.

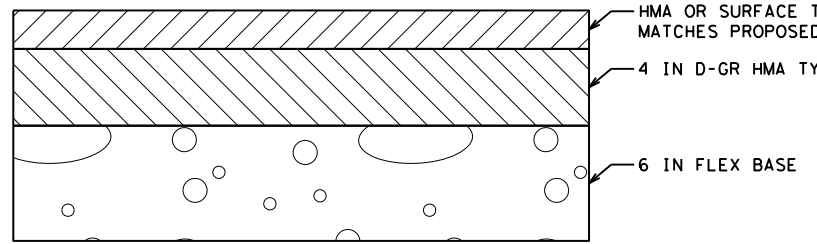
*** THIS 'F' DIMENSION MAY BE REDUCED TO KEEP WORK WITHIN THE ROW.



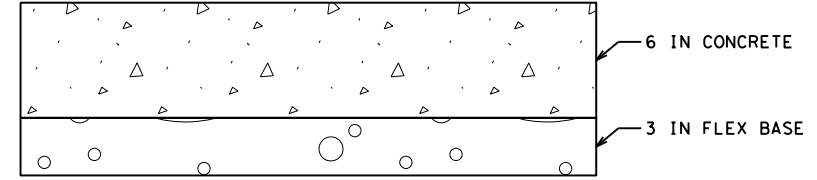
DRIVEWAY WITH GUTTER SECTION A-A

ENSURE GRADE BREAK DOES NOT EXCEED 8% UNLESS OTHERWISE DIRECTED. PROVIDE ABSOLUTE MINIMUM SIDEWALK CROSSING WIDTH OF 4' FOR DRIVEWAYS WIDTH OF 20' OR LESS

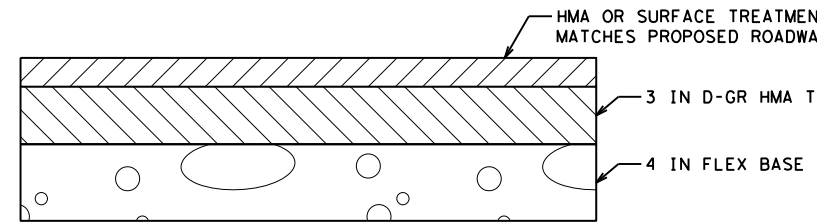
** LOCATE SIDEWALK CROSSING TO ALIGN WITH ADJACENT SIDEWALK; SIDEWALK/S.U.P. WIDTH AND LOCATION SHOWN ELSEWHERE ON THE PLANS.



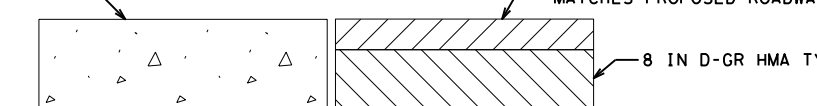
HMA OR SURFACE TREATMENT - COMMERCIAL



CONCRETE - ALL DRIVEWAY TYPES

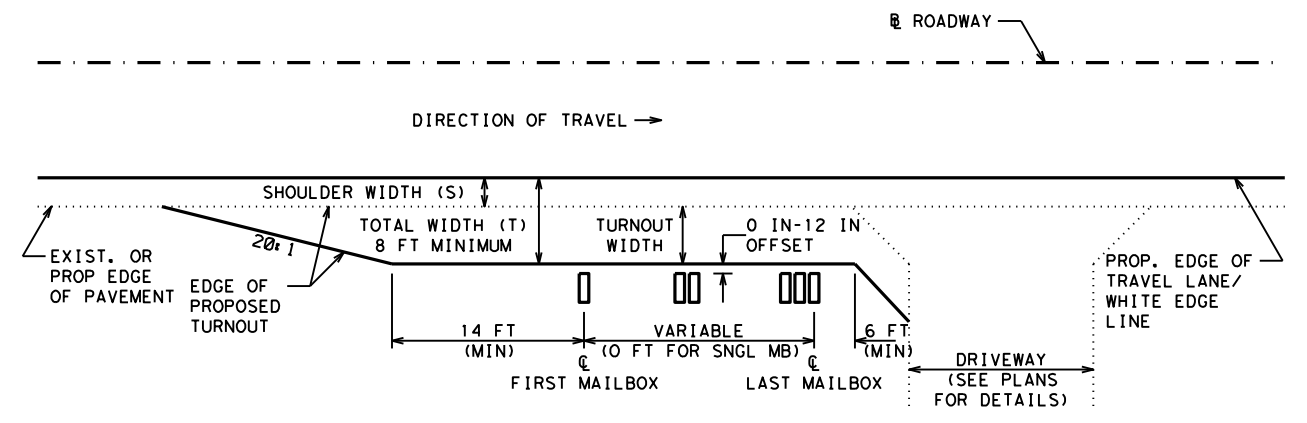


HMA OR SURFACE TREATMENT - FARM/RANCH/RESIDENTIAL

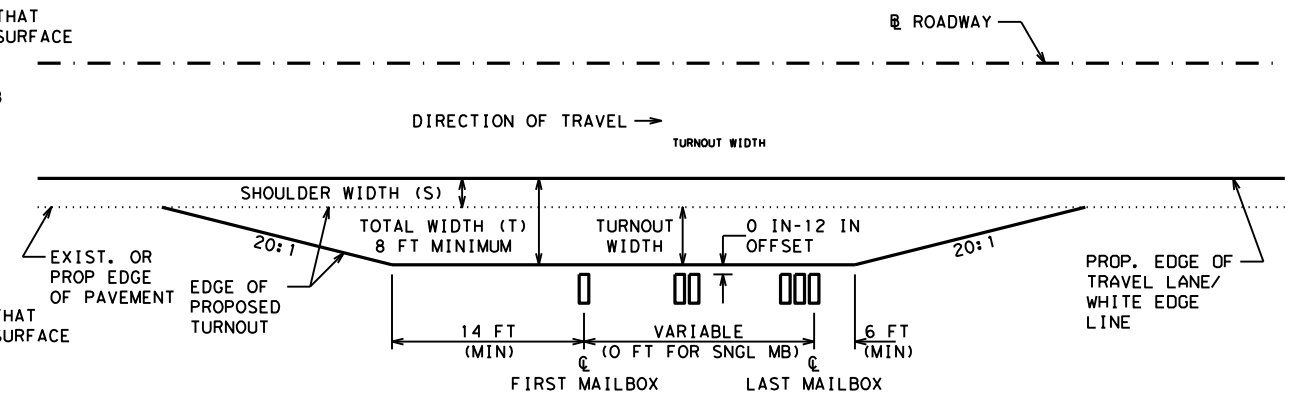


FAST TRACK ACP (TYPE 3) OR CONCRETE

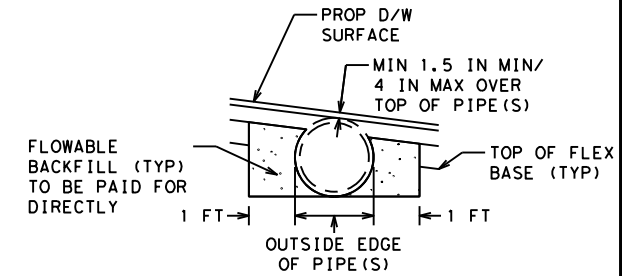
DRIVEWAY AND TURNOUT TYPICAL SECTIONS



MAILBOX TURNOUT PLAN WITH DRIVEWAY



MAILBOX TURNOUT PLAN WITHOUT DRIVEWAY



LOW FILL DRIVEWAY

ONLY ONE PIPE SHOWN SEE ELSEWHERE ON THE PLANS FOR SPECIFIC DRIVEWAY DETAILS

GENERAL NOTES

PROVIDE EXPANSION 20 FT C-C FOR WIDTH OR LENGTH OVER 25 FT. EXPANSION JOINT PER AUS STANDARD FOR SIDEWALK (MCPSWMD).

REINFORCEMENT WILL BE IN ACCORDANCE WITH ITEM 432.3.1 USING NO. 3 OR NO. 4 BARS.

FIBER REINFORCEMENT IS NOT ALLOWED. CLASS A CONCRETE IS ALLOWED TO USE COARSE AGGREGATE GRADES 1-8.

IN LIEU OF PFC OR TOM, SURFACE MUST BE 1.5" D-GR HMA TY D. IF SURFACE IS A MULTIPLE COURSE SURFACE TREATMENT, ALL COURSES MUST BE PLACED ON DRIVEWAY. SURFACE HMA IS PG 76-22. NON SURFACE HMA IS PG 64-22 AND MAY BE BLADE LAID.

FURNISH BASE MEETING THE REQUIREMENTS FOR ANY TYPE OR GRADE IN ACCORDANCE WITH ITEM 247. BASE COMPRESSIVE STRENGTHS ARE WAIVED.

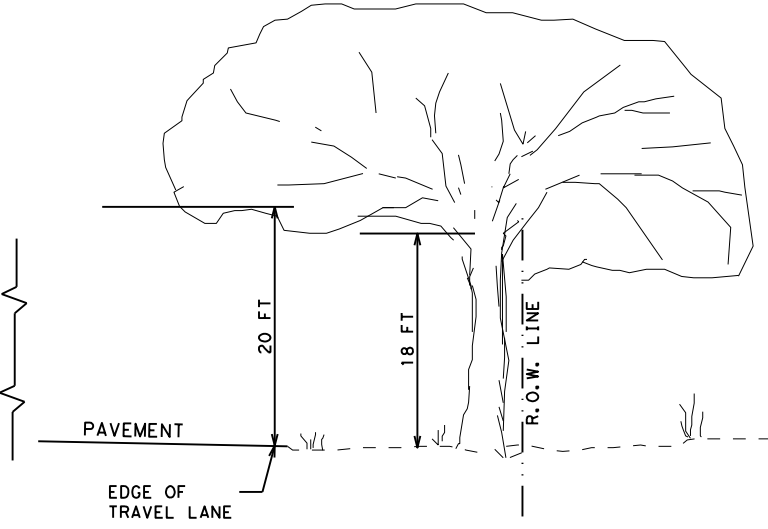
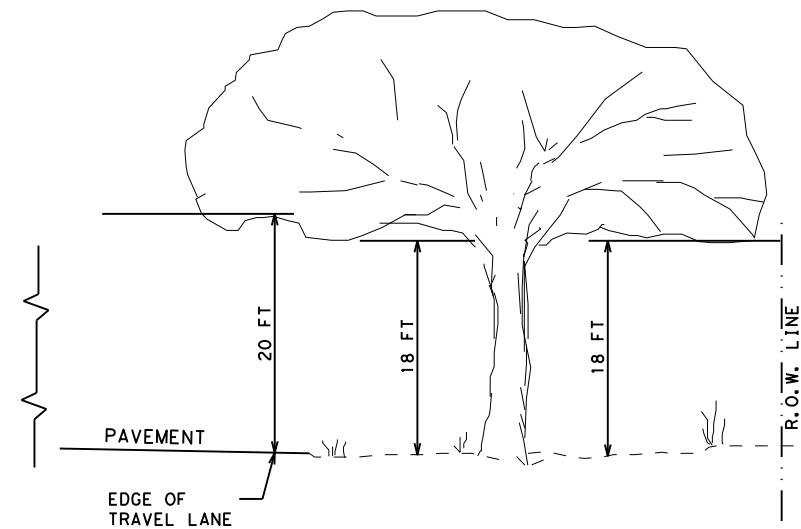
THE BASE UNDER THE CONCRETE MAY BE REPLACED WITH CONCRETE AT A RATIO OF 3 INCHES OF BASE EQUALS 2 INCHES OF CONCRETE.

FAST TRACK DRIVEWAYS MUST BE CLOSED, CONSTRUCTED, AND REOPENED WITHIN 24 HOURS.

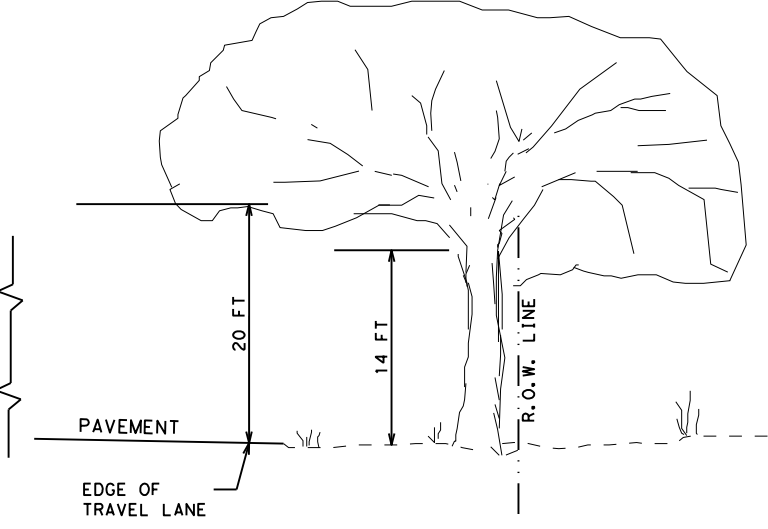
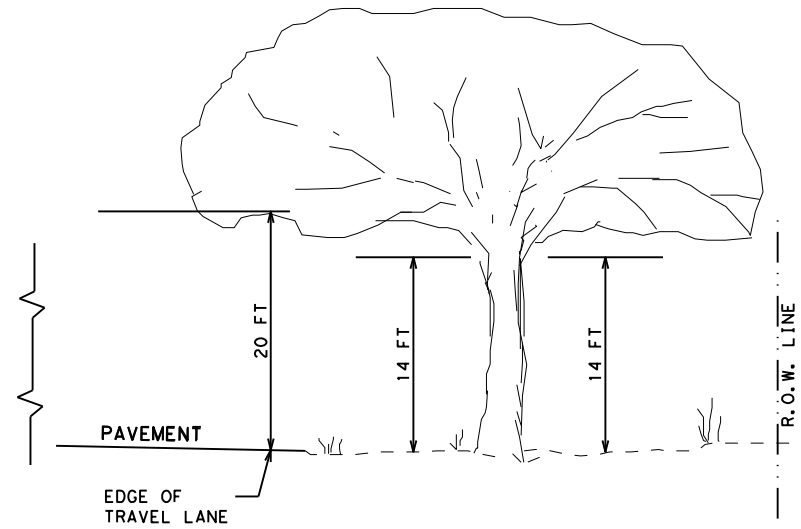
IF ROOTS ARE ENCOUNTERED VERIFY WITH THE ENGINEER PRIOR TO ACCOMMODATING OR REMOVING 2 IN. DIAMETER OR LARGER ROOTS. ROOT REMOVAL MUST BE IN ACCORDANCE WITH ITEM 752.4.2. ROOTS MAY REMAIN IN THE BASE. FOR IMPROVEMENTS WITHIN 6 IN. OF A ROOT, THE CONCRETE THICKNESS MAY BE REDUCED BY 1 IN. AND THE BASE INCREASED BY 1 IN. TO MINIMIZE IMPACTS TO THE ROOTS. ADJUST BASE AND SURFACE PROFILE TO PROVIDE A 1 IN. BASE CUSHION AROUND THE ROOTS. THE SURFACE PROFILE MAY BE ADJUSTED TO THE EXTENT ALLOWED BY ADA. THIS WORK IS SUBSIDIARY.

		Austin District Standard	
DRIVEWAYS AND MAILBOX TURNOUTS DWMB-22 (AUS)			
©TXDOT 2023 REVISIONS 01/16: SHEET CREATED 04/19: APPROVED 11/20: TABLE REVISED, GN ADDED, PLAN & PROFILE MODIFIED 01/22: ADDED TURNOUT INFO	CONT 2690	SECT 01	JOB 038
DIST AUS	COUNTY WILLIAMSON	HIGHWAY FM 971	SHEET NO. 72

DATE: 9/22/2022 8:13:12 AM FILE: \\txdot\projectwiseon\ine.com\TXDOT4\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\13. Standard\ROADWAY\PRWD-20 (AUS).dgn



**NON-OAK SPECIES
TREE PRUNING LIMITS**

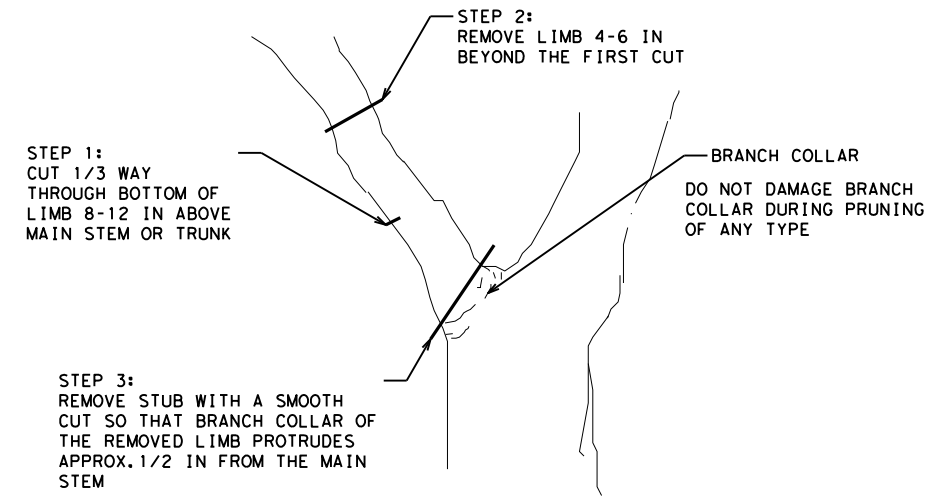


**OAK SPECIES
TREE PRUNING LIMITS**

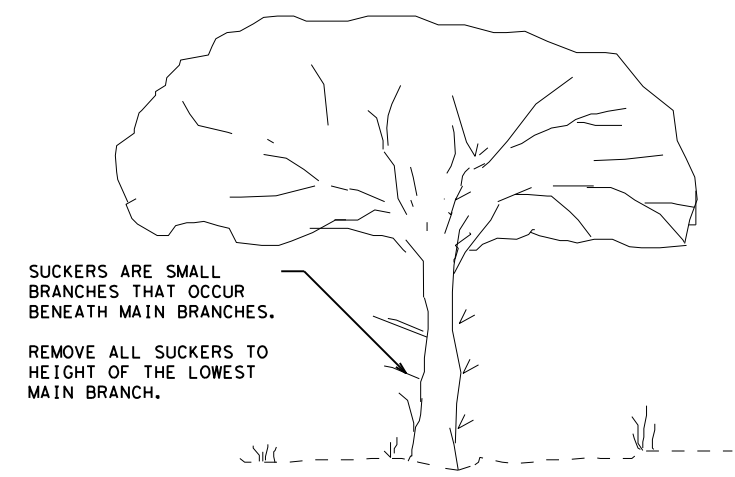
GENERAL NOTES

PAYMENT FOR THIS WORK IS SUBSIDIARY TO PREP R.O.W.

1. REMOVE ALL DEAD TREES, DEAD BRUSH, AND DEAD MULTI-TRUNKED TREES WITHIN THE R.O.W.. TREES, SHRUBS, OR MULTI-TRUNKED TREES THAT DIE DURING CONSTRUCTION SHALL BE REMOVED PRIOR TO COMPLETION OF THE PROJECT.
2. USE WORK METHODS IN ACCORDANCE WITH ANSI A300 STANDARDS AND ITEM 752.
3. FLAILING EQUIPMENT IS NOT ALLOWED ON OAK TREES.
4. REPAIR DAMAGE TO PRIVATE FENCES AND/OR PRIVATE PROPERTY.
5. PERFORM TREE PRUNING ONLY WITHIN THE R.O.W.. NO CUTS SHALL BE MADE OUTSIDE THE R.O.W..
6. PERFORM TREE PRUNING PER DETAIL FOR ENTIRE R.O.W. AREA WITHIN PROJECT LIMITS. THE ENGINEER MAY DEFINE AREAS TO RESTRICT TREE PRUNING.
7. REVIEW EPIC SHEETS FOR AREAS TO BE AVOIDED DUE TO ENVIRONMENTAL REASONS OR ADDITIONAL NOTES THAT PERTAIN TO TREE PRUNING.
8. MIGRATORY BIRDS AND BATS MAY BE NESTING WITHIN THE PROJECT LIMITS. PERFORM TREE TRIMMING OUTSIDE THE NESTING SEASON DATES LISTED IN THE GENERAL NOTES.
9. NO TRIMMING OF THE VEGETATION THAT CONTAINS AN ACTIVE NEST FOR MIGRATORY BIRDS IS ALLOWED.
10. THE TRIMMING OR CUTTING OF RED OAK AND LIVE OAK SPECIES FOR PURPOSES OTHER THAN PROTECTING PUBLIC SAFETY IS ONLY PERMITTED BETWEEN JULY 1ST AND JANUARY 31ST AND PROHIBITED BETWEEN FEBRUARY 1ST AND JUNE 30TH
11. ALL PRUNING CUTS MUST BE TREATED IMMEDIATELY WITH COMMERCIAL PRUNING PAINT TO SEAL THE EXPOSED SURFACE FROM CONTAMINATION. USE OF AEROSOL CAN IS THE PREFERRED METHOD OF APPLICATION FOR SEALING CUTS. ANY WOUNDS, WHETHER MADE BY TRIMMING, CONSTRUCTION OR ACCIDENT, SHALL BE TREATED IMMEDIATELY WITH COMMERCIAL PRUNING PAINT TO SEAL THE SURFACE FROM CONTAMINATION. THE TXDOT INSPECTOR MAY CONDUCT UNANNOUNCED INSPECTIONS TO ENSURE COMPLIANCE.
12. IF MORE THAN 25% OF THE TREE CANOPY WILL BE REMOVED CONTACT THE TXDOT ARBORIST OR INSPECTOR FOR APPROVAL PRIOR TO PROCEEDING.



**PROPER TREE PRUNING
FOR LIMBS 2" IN DIA. AND GREATER**



SUCKER REMOVAL DETAIL



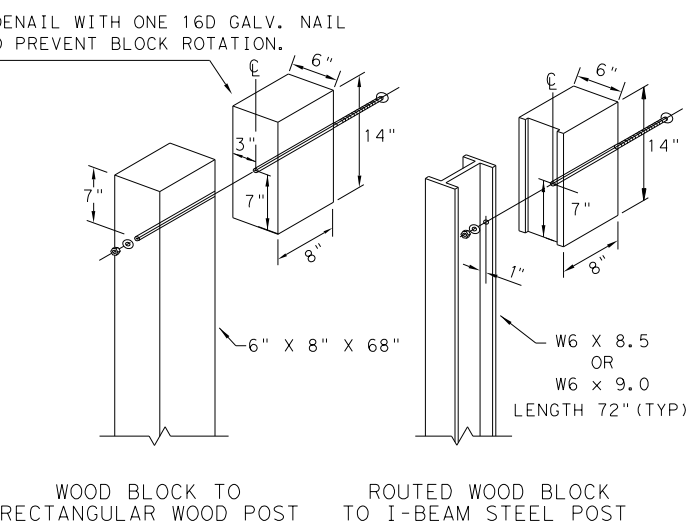
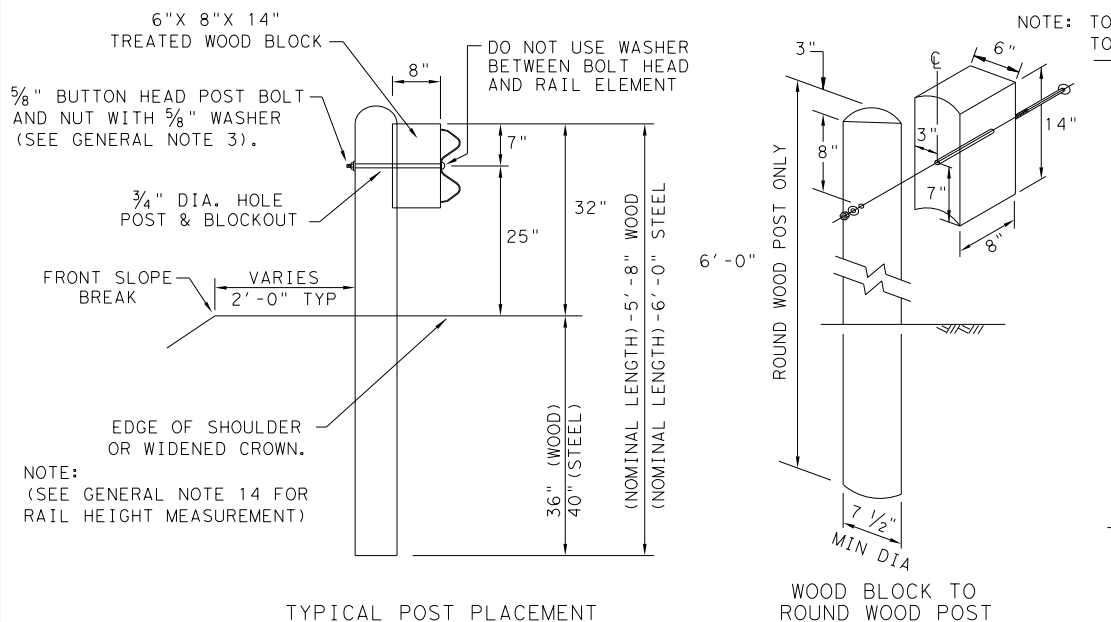
**PREP R.O.W.
PRUNING
DETAIL**

PRWD-20 (AUS)

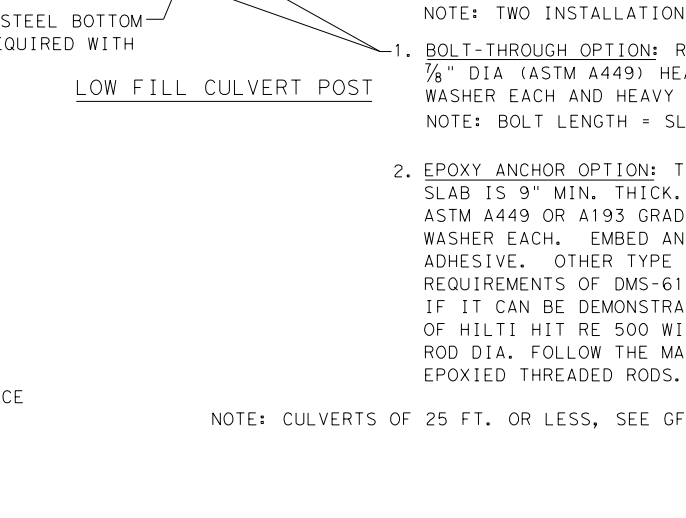
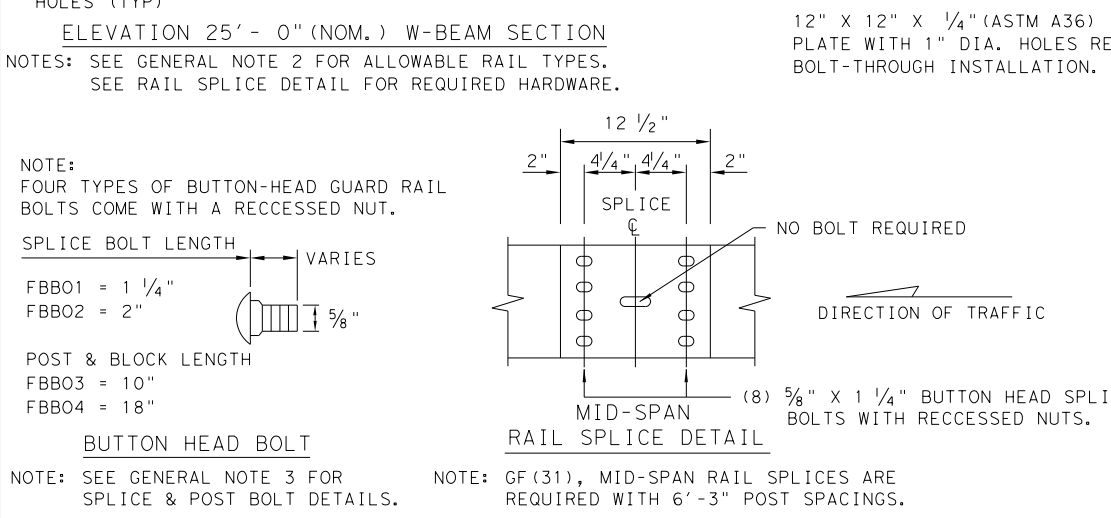
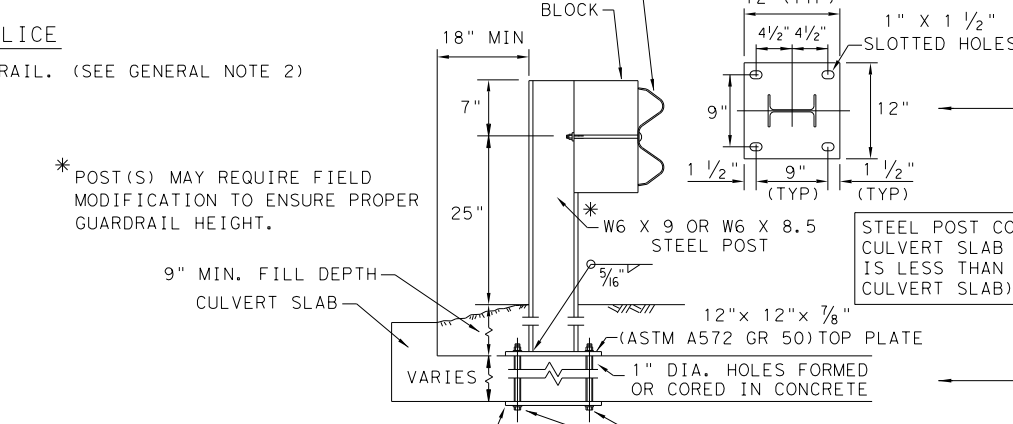
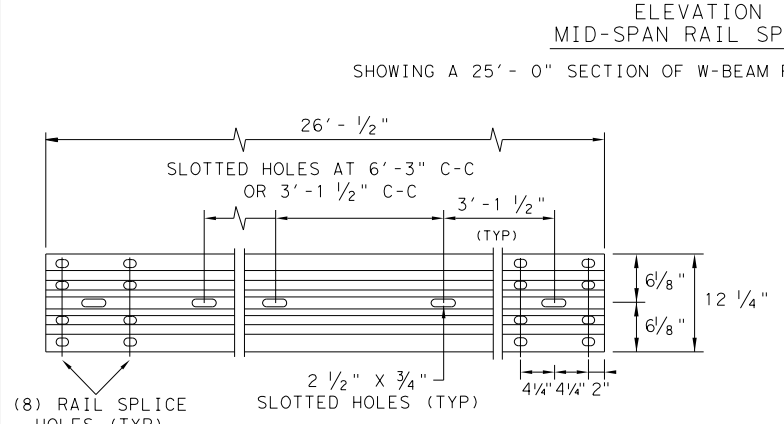
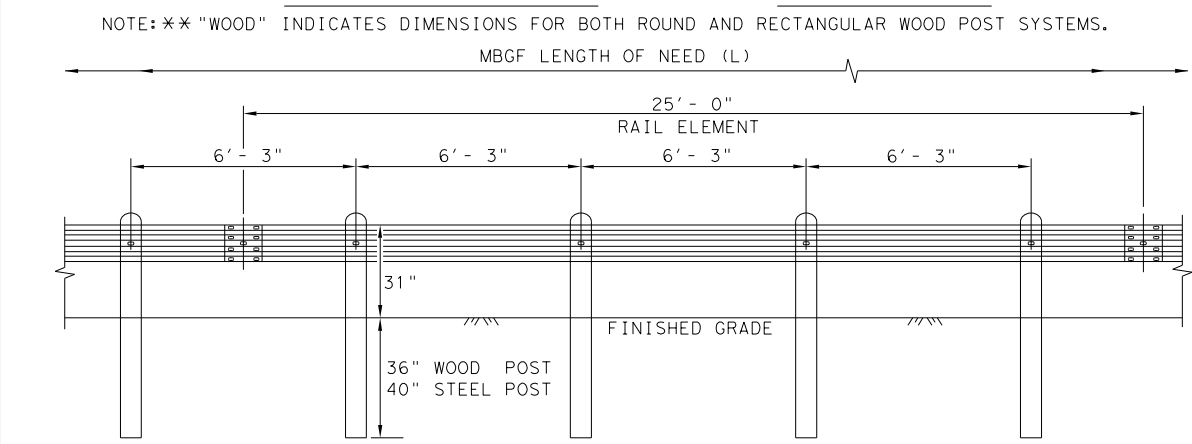
©TXDOT 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		73

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DATE: 9/22/2022
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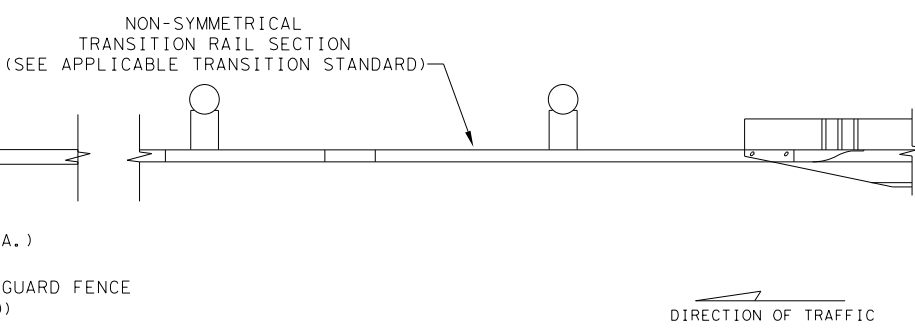
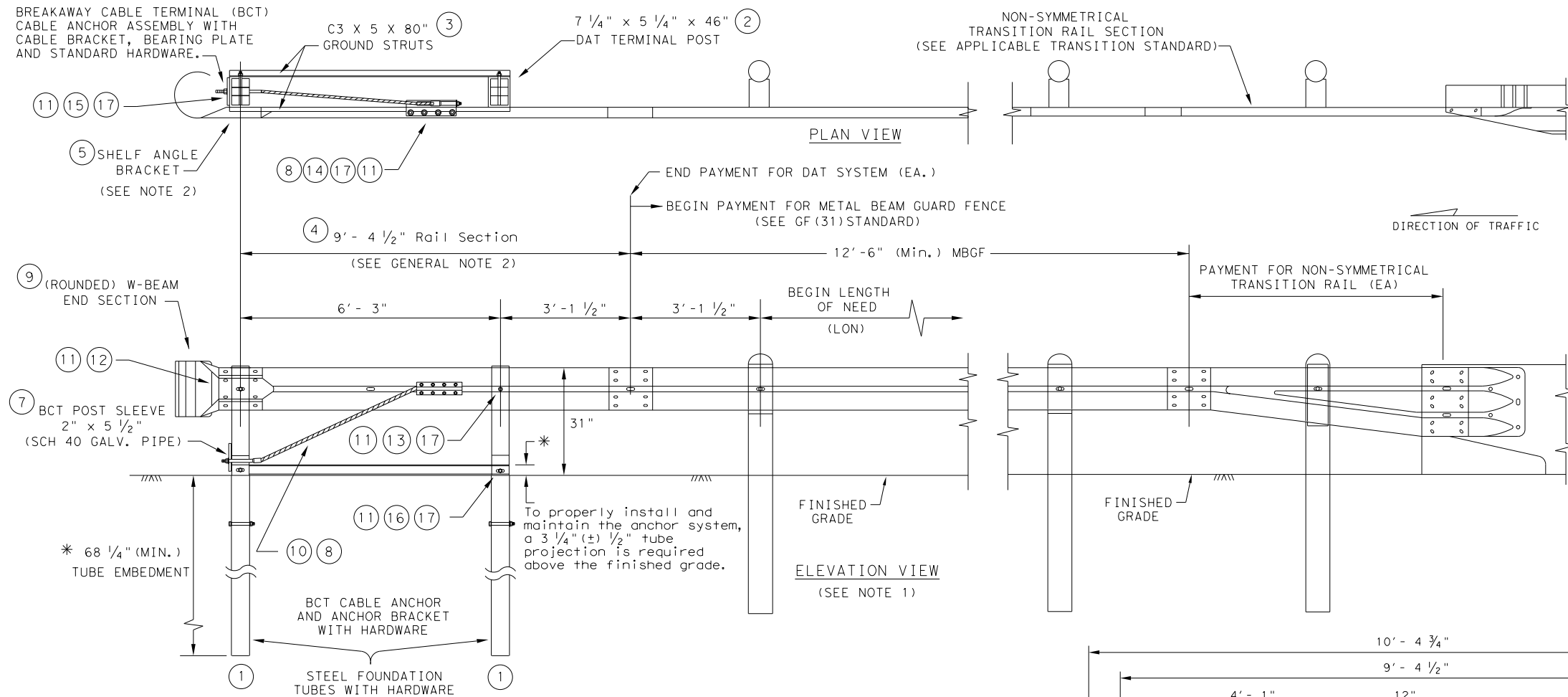
- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
 2. RAIL ELEMENTS 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 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
 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 5/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
 4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
 6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
 7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
 8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
 9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
 10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
 11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
 12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
 13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
 14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.



- NOTE: TRANSITIONS 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.
1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
 2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.
- NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

				Design Division Standard
METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT GF(31)-19				
FILE: qf3119.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690 01	038	FM 971	
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	74	

DATE: 9/22/2022
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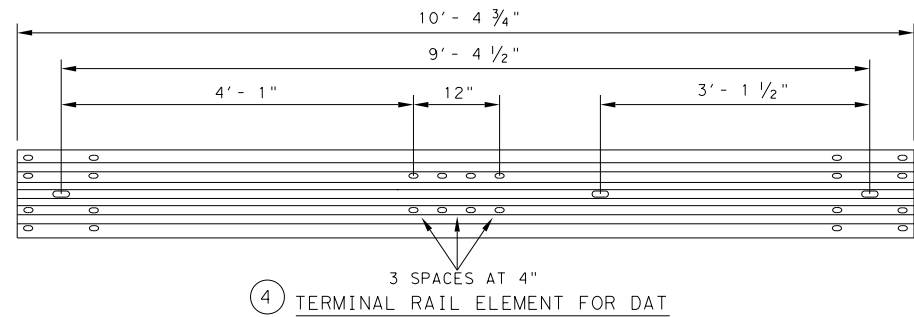
GENERAL NOTES

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.

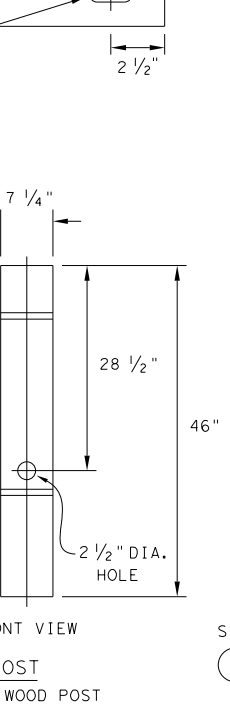
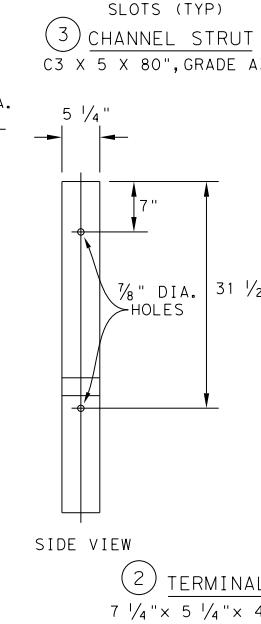
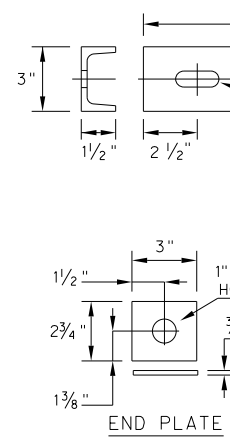
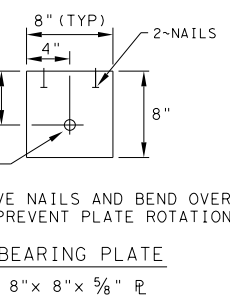
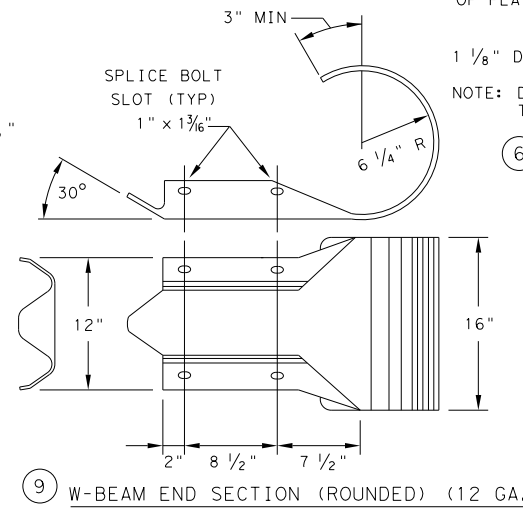
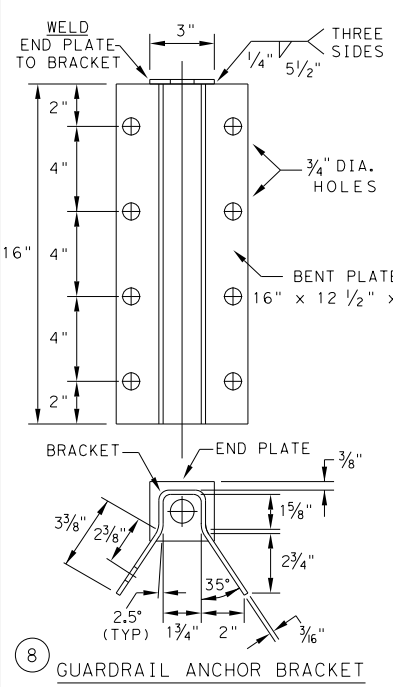
MOW STRIP INSTALLATION
 IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

DOWNSTREAM ANCHOR TERMINAL (DAT)

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

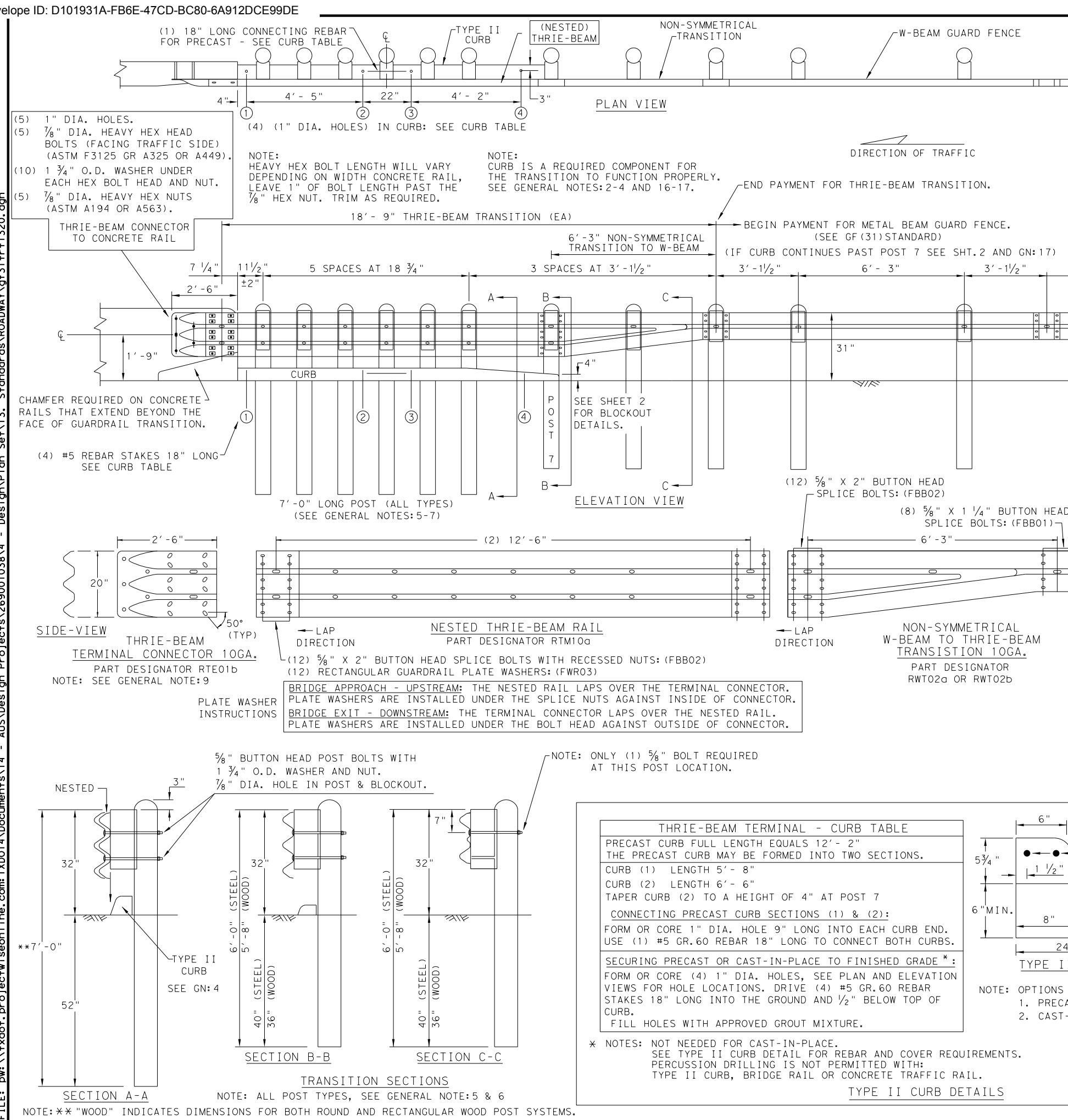


#	(DAT) PARTS LIST	QTY
1	STEEL FOUNDATION TUBE	2
2	DAT TERMINAL POST	2
3	CHANNEL STRUT	2
4	TERMINAL RAIL ELEMENT	1
5	SHELF ANGLE BRACKET	1
6	BCT BEARING PLATE	1
7	BCT POST SLEEVE	1
8	GUARDRAIL ANCHOR BRACKET	1
9	(ROUNDED) W-BEAM END SECTION	1
10	BCT CABLE ANCHOR	1
11	RECESSED NUT, GUARDRAIL	20
12	1 1/4"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



		Design Division Standard	
METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT GF(31)DAT-19			
FILE: gf31dat19.dgn	DN: TXDOT	CK: KM	DW: VP
©TXDOT: NOVEMBER 2019	CONT: 2690	SECT: 01	JOB: 038
REVISIONS	DIST: AUS	COUNTY: WILLIAMSON	HIGHWAY: FM 971
			SHEET NO.: 75

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GENERAL NOTES

- CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
- CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5-3/4" HEIGHT); SEE CURRENT CCGG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE:17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
- CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
- UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
- FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
- THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
- THE POST LENGTH SHALL BE MARKED ON ALL 7'-0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
- POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
- BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
- WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
- UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
- REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
- THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
- IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

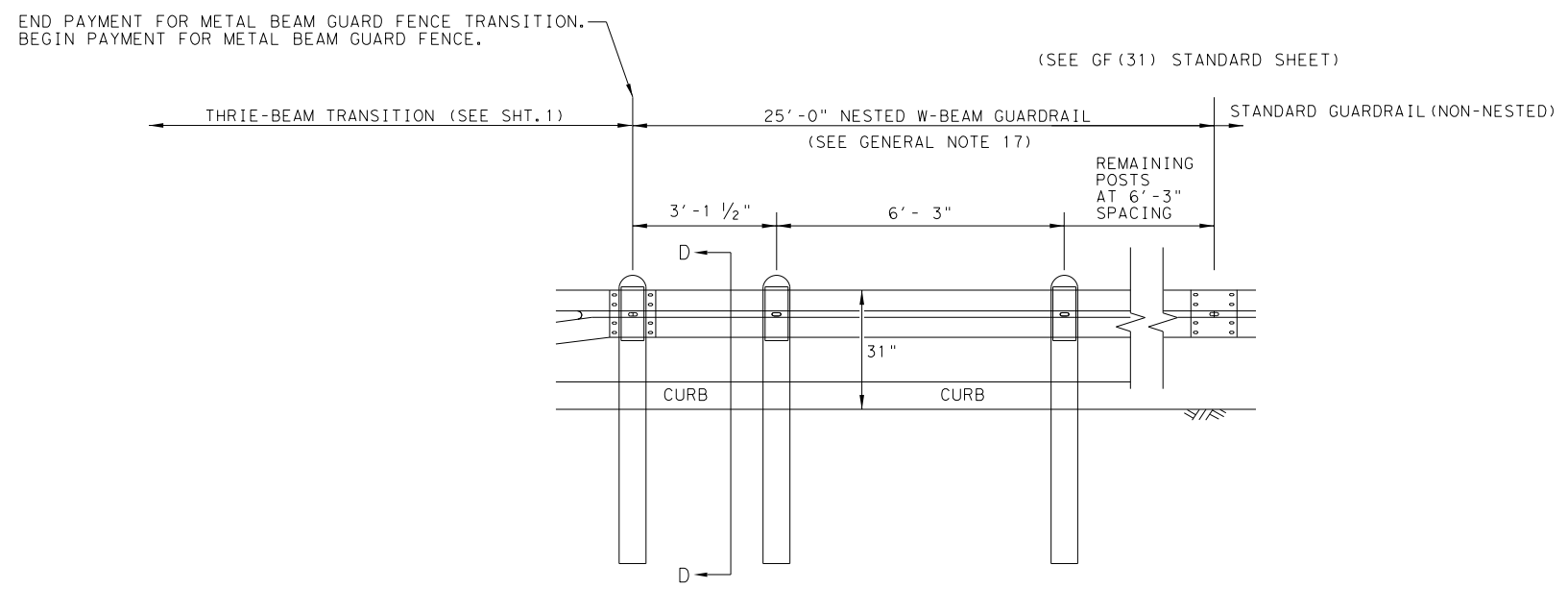
HIGH-SPEED TRANSITION
SHEET 1 OF 2

		Design Division Standard	
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT GF(31) TR TL3-20			
FILE: gf31tr+1320.dgn	DN: TxDOT	CK: KM	DW: VP
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REVISIONS	2690 01	038	FM 971
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	76	

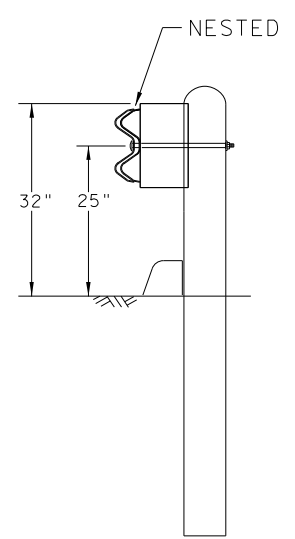
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

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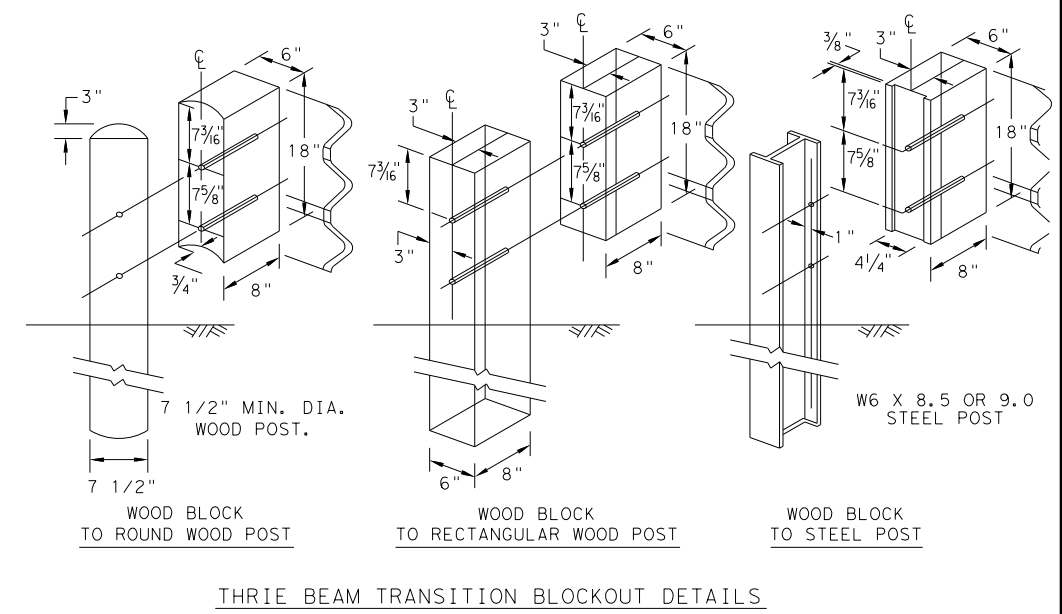
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D

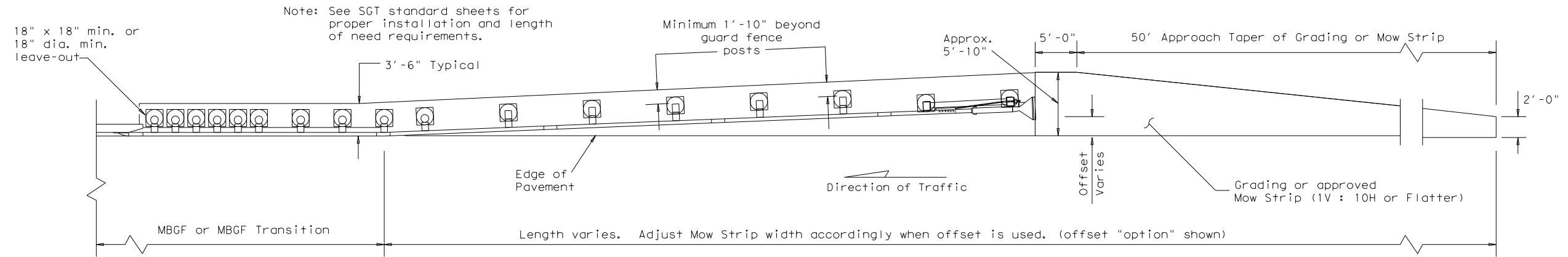


HIGH-SPEED TRANSITION

SHEET 2 OF 2

				Design Division Standard	
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT GF (31) TR TL3-20					
FILE: gf31tr+1320.dgn	DN: TXDOT	CK: KM	DW: KM	CK: CGL/AG	
©TXDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS		2690 01	038	FM 971	
DIST	COUNTY		SHEET NO.		
AUS	WILLIAMSON		77		

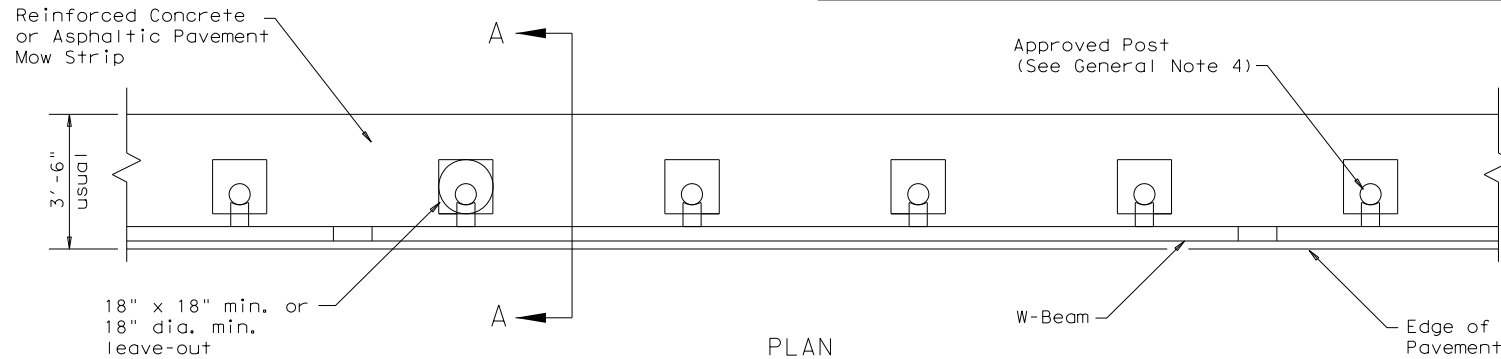
DISCLAIMER: THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.
 DATE: 9/22/2022
 FILE: \\txdot.projectwiseonline.com:TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\13_ Standards\ROADWAY\gf31ms19.dgn



Note: See SGT standard sheets for proper installation and length of need requirements.

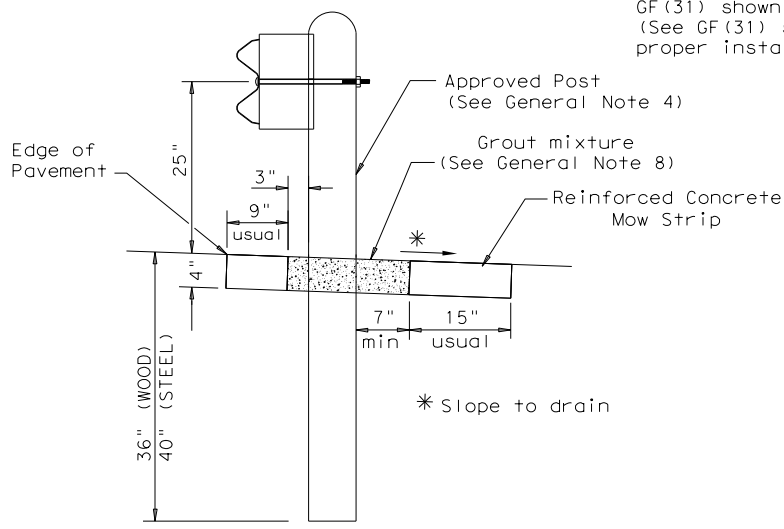
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

Note: Site Condition(s)
 Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.
 Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

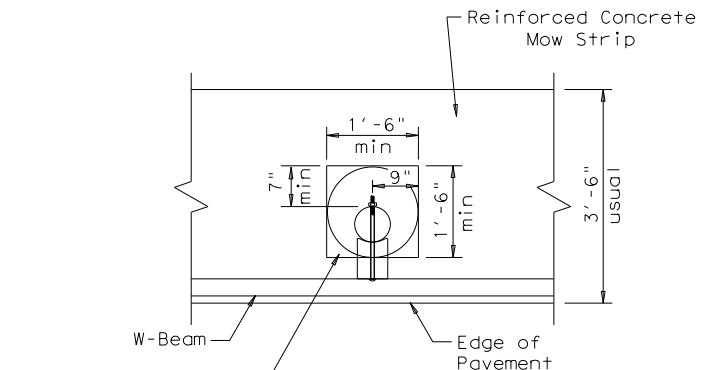


PLAN

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



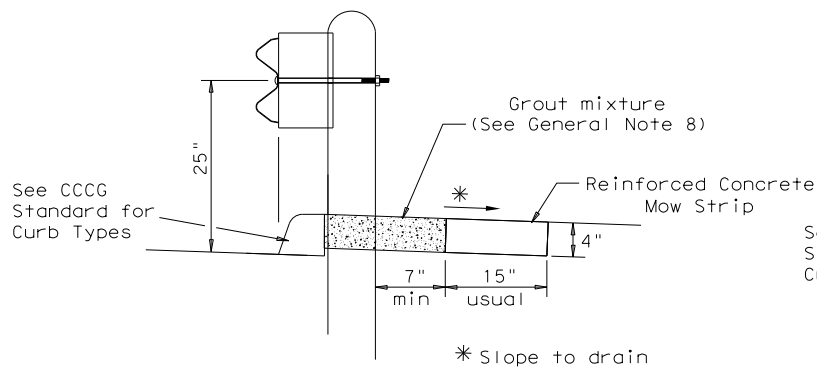
SECTION A-A
Typical



MOW STRIP DETAIL

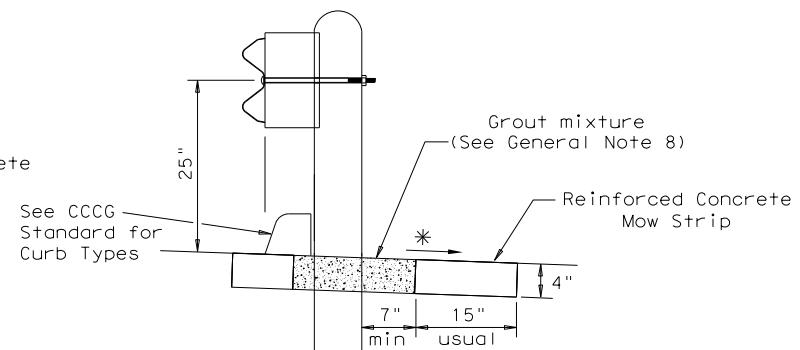
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

- GENERAL NOTES**
- 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.
 - 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.
 - The leave-out behind the post shall be a minimum of 7".
 - Only steel (W6 x 8.5 or W6 x 9.0), or 7 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
 - 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.
 - Thickness of the mow strip will be 4".
 - The limits of payment for reinforced concrete will include leave-outs for the posts.
 - The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



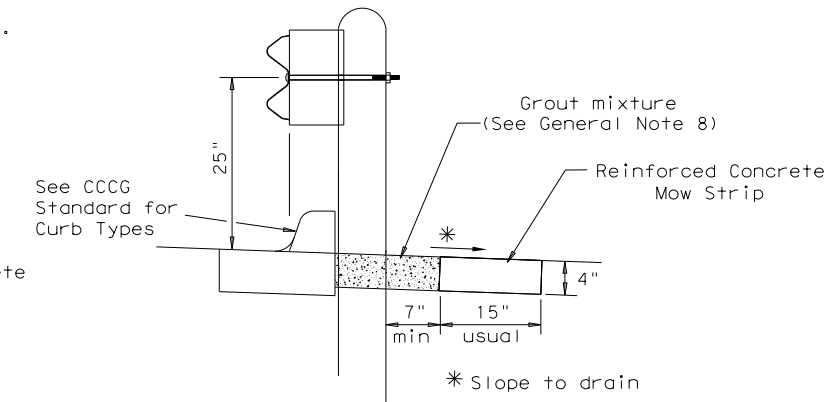
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip

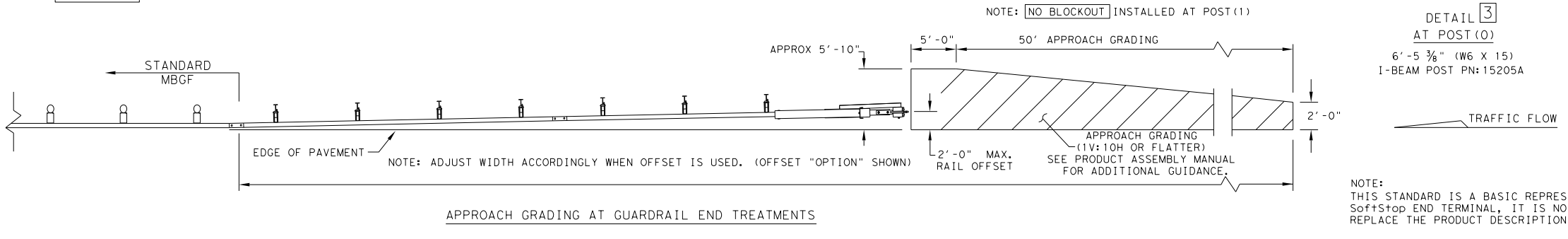
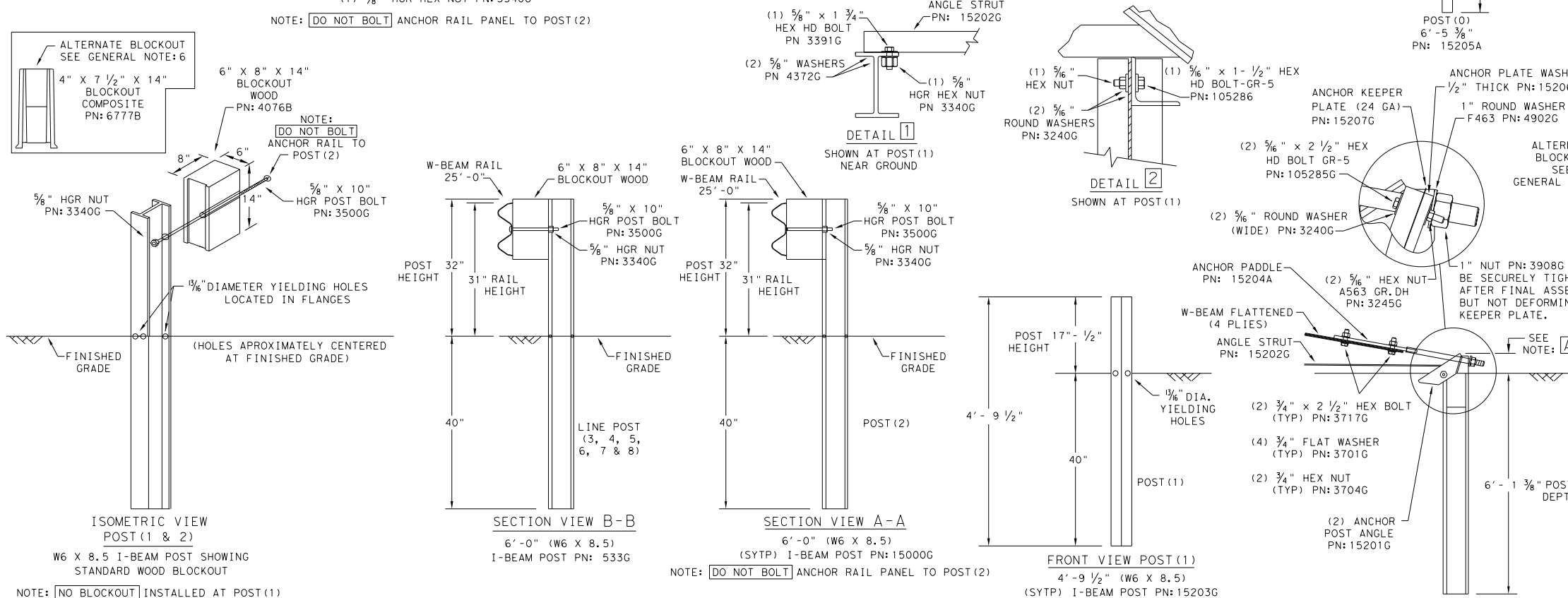
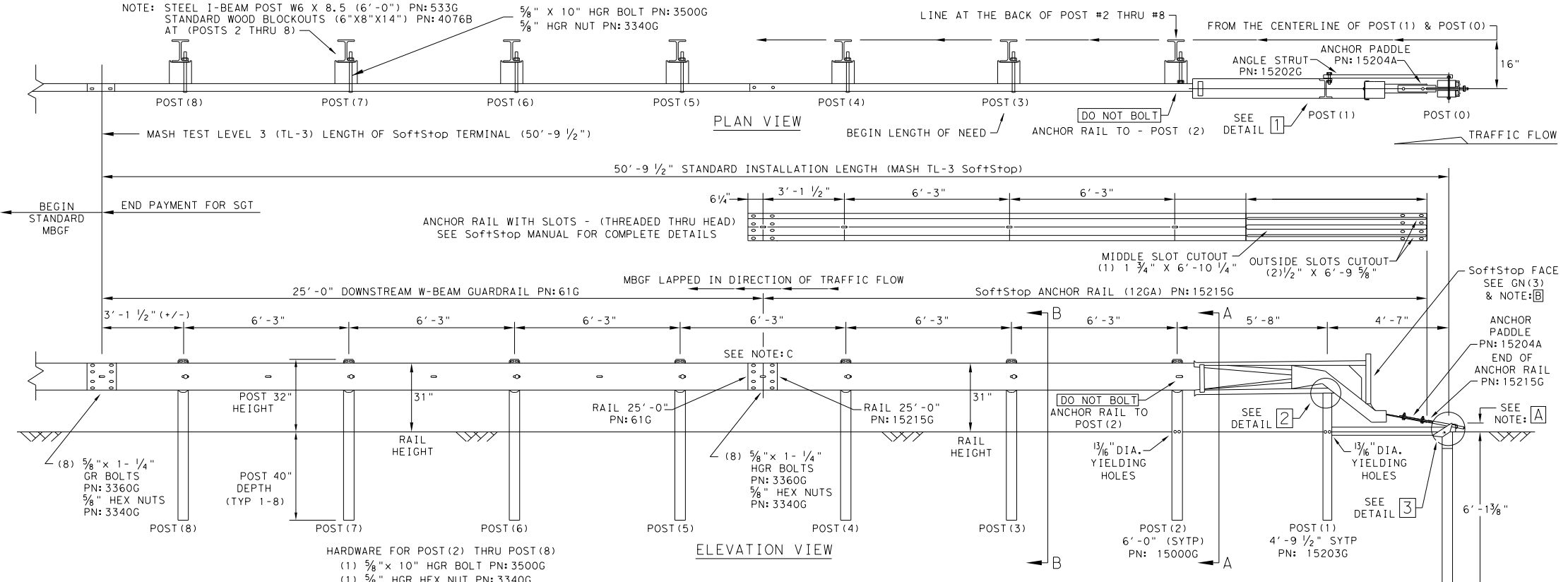


CURB OPTION (3)

		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
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	2690 01	038	FM 971
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	78

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 FILE: \\txdot.projects\wiseonline.com\TXDOT4\Documents\14 - AUS\Design Projects\269001038.4 - Design\Plan Set\13. Standards\ROADWAY\sgt10s3116.dgn



- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN:620237B
 - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
 - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
 - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
 - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
 - POSTS SHALL NOT BE SET IN CONCRETE.
 - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
 - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
 - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
 - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoaching ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3'-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

NOTE: B PART PN:5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN:5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

NOTE: C W-BEAM SPLICE LOCATED BETWEEN LINE POST (4) AND LINE POST (5) GUARDRAIL PANEL 25'-0" PN:61G ANCHOR RAIL 25'-0" PN:15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

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

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



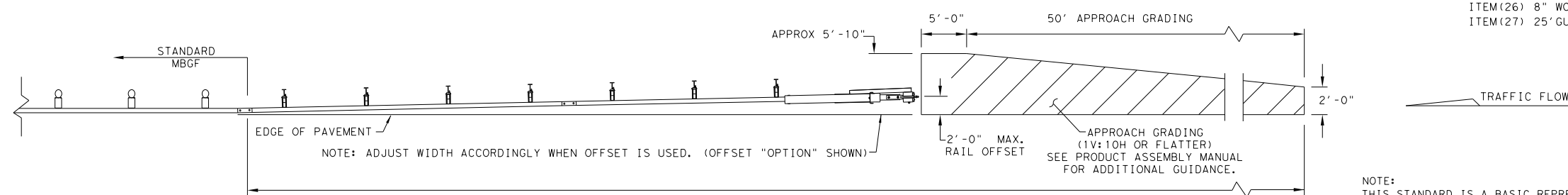
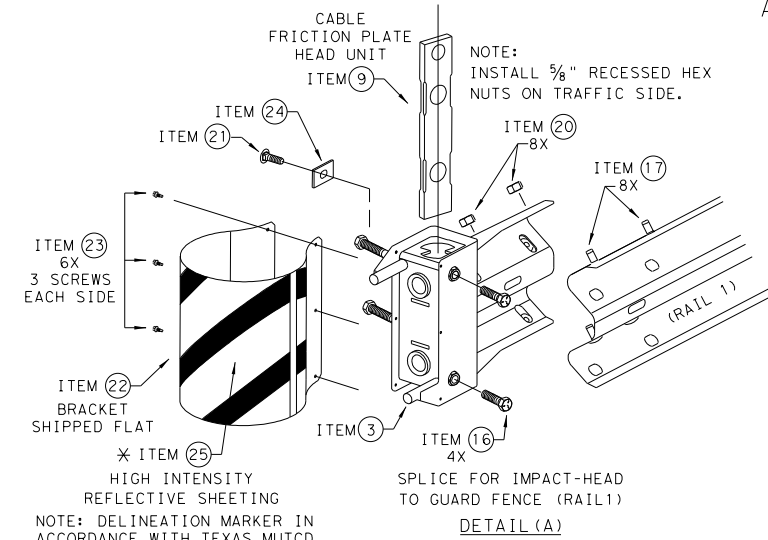
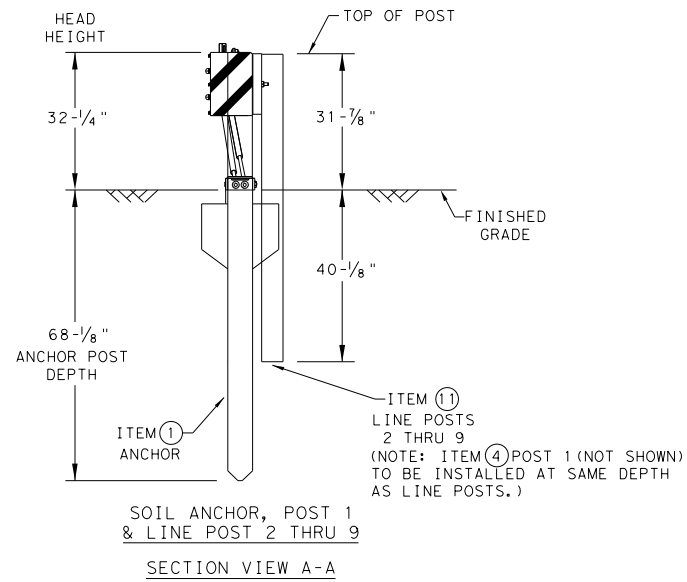
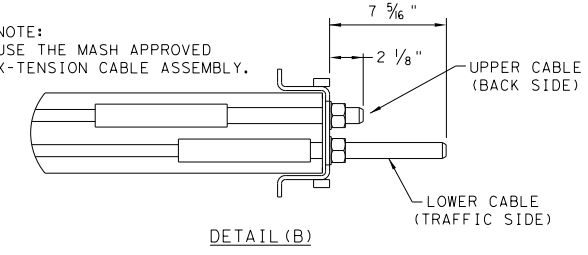
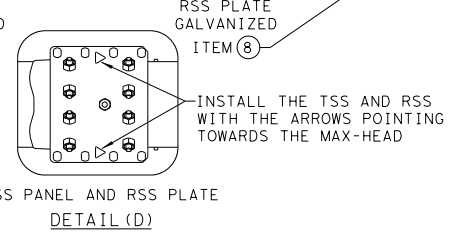
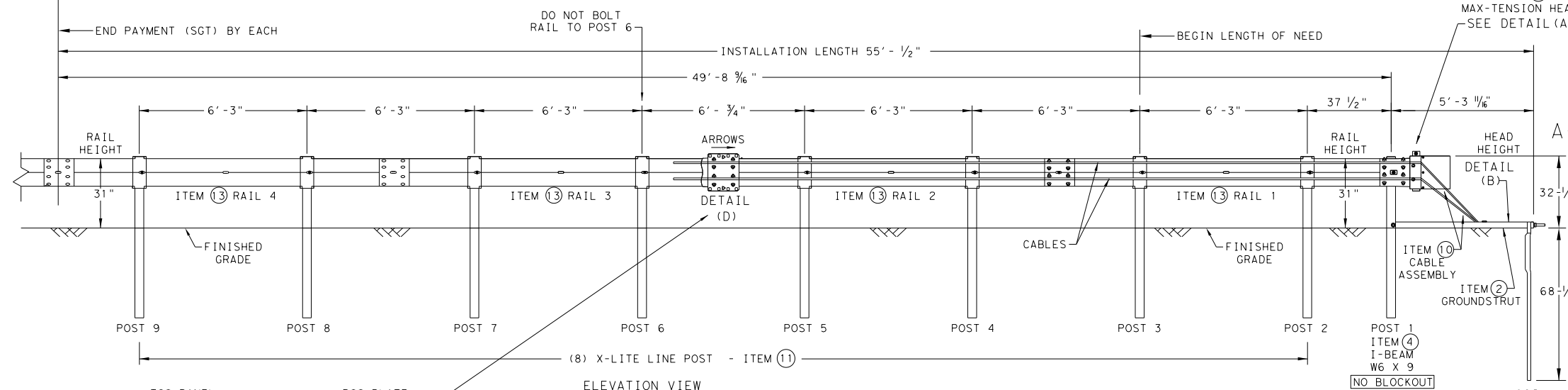
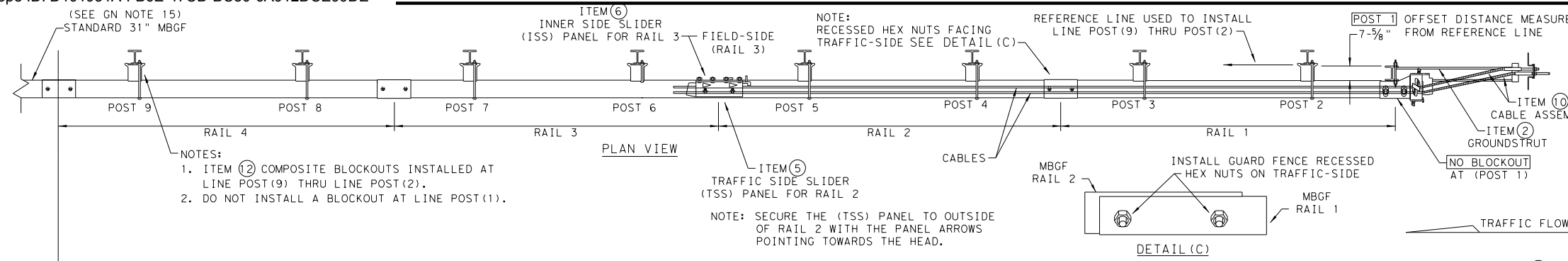
**TRINITY HIGHWAY
 SOFTSTOP END TERMINAL
 MASH - TL-3
 SGT (10S) 31-16**

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON	79		

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

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

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.
 ** ALTERNATIVE ITEMS NOT SHOWN.
 ITEM (26) 8" WOOD-BLOCKOUTS
 ITEM (27) 25' GUARD FENCE PANELS

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3

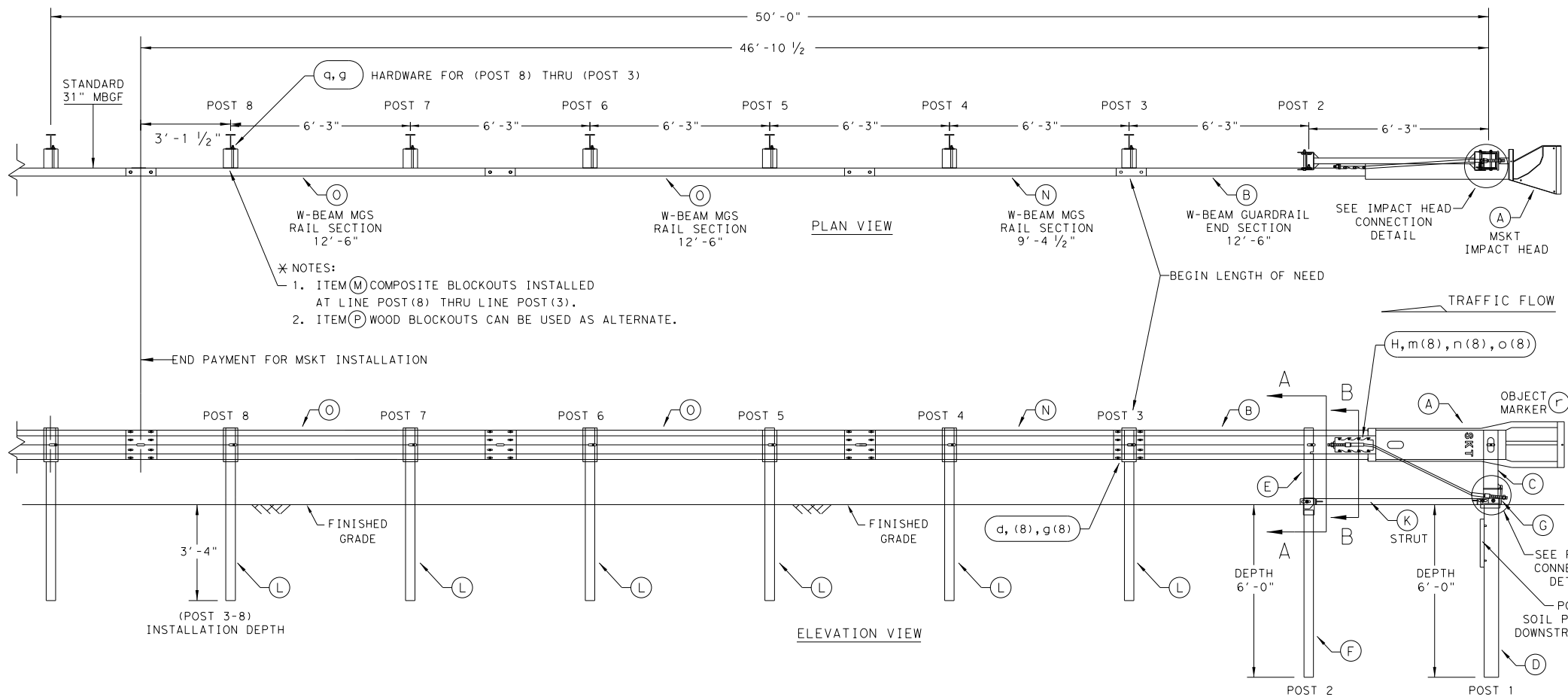
SGT (11S) 31-18

FILE: sg+11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690 01	038	FM 971	
DIST	COUNTY		SHEET NO.	
AUS	WILLIAMSON		80	

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

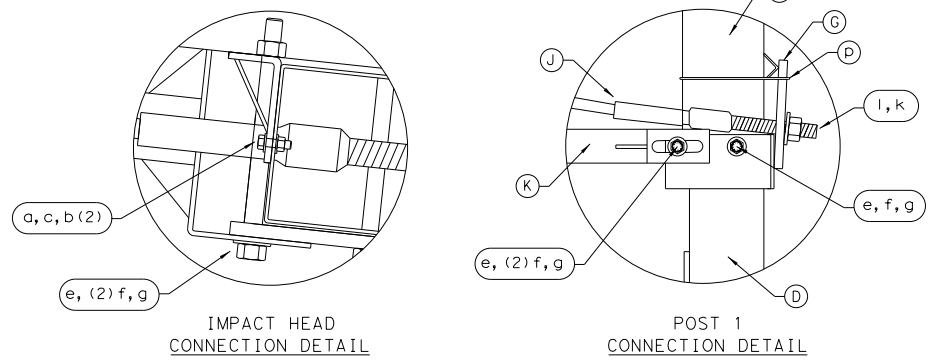
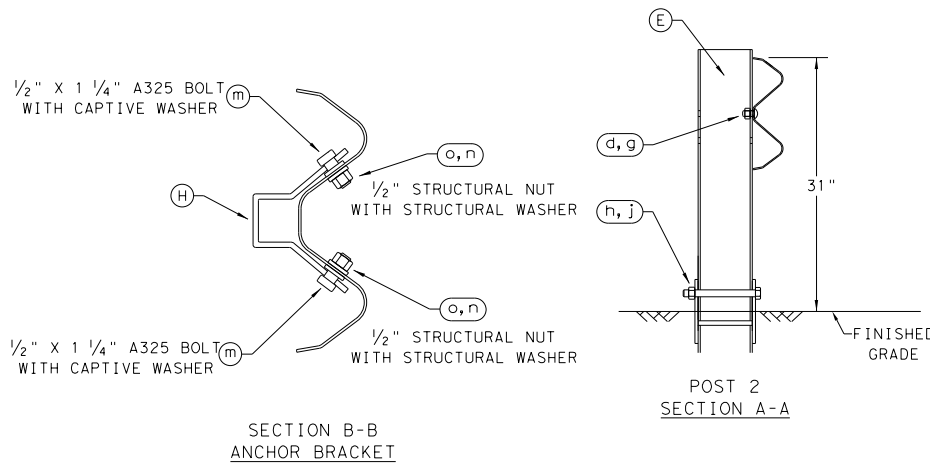
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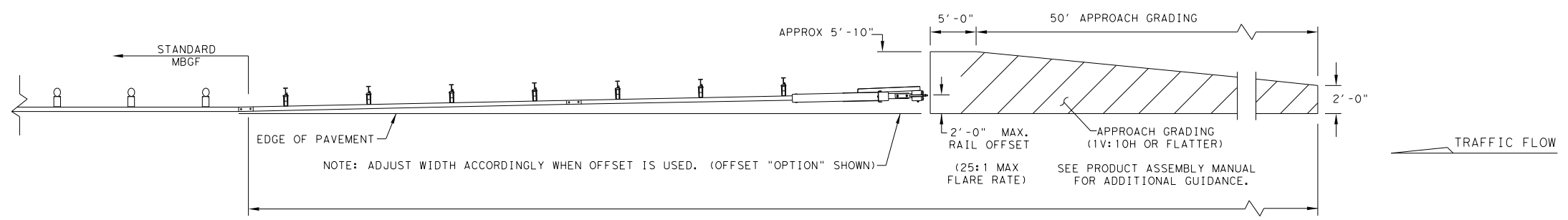


- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
 - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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



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



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

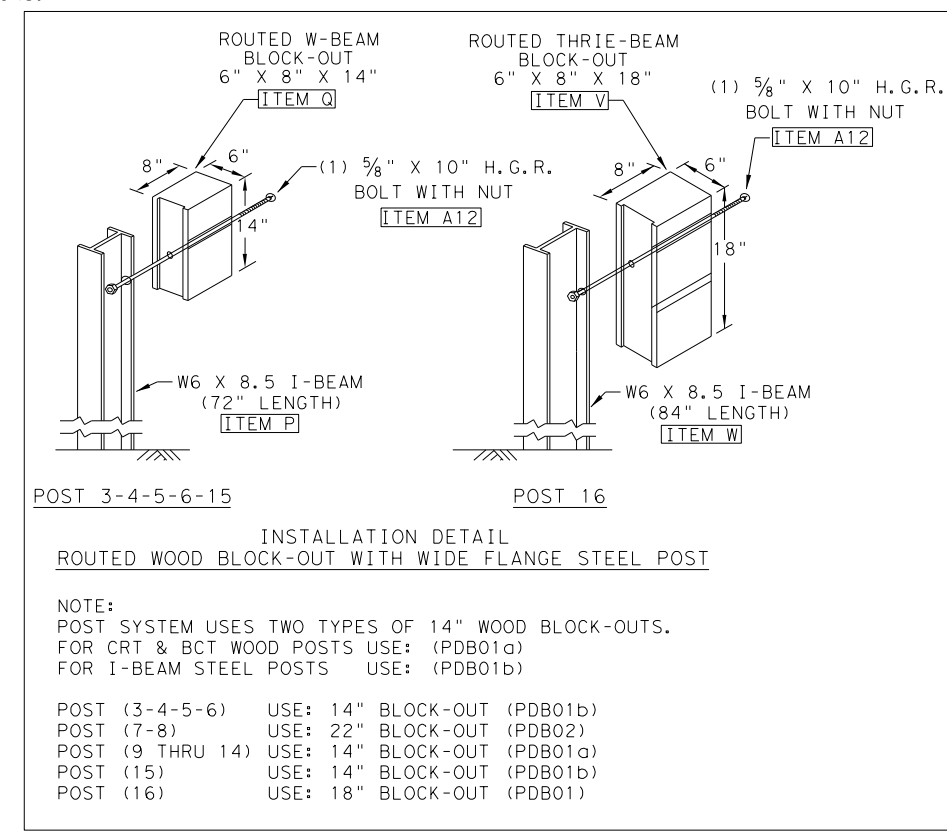
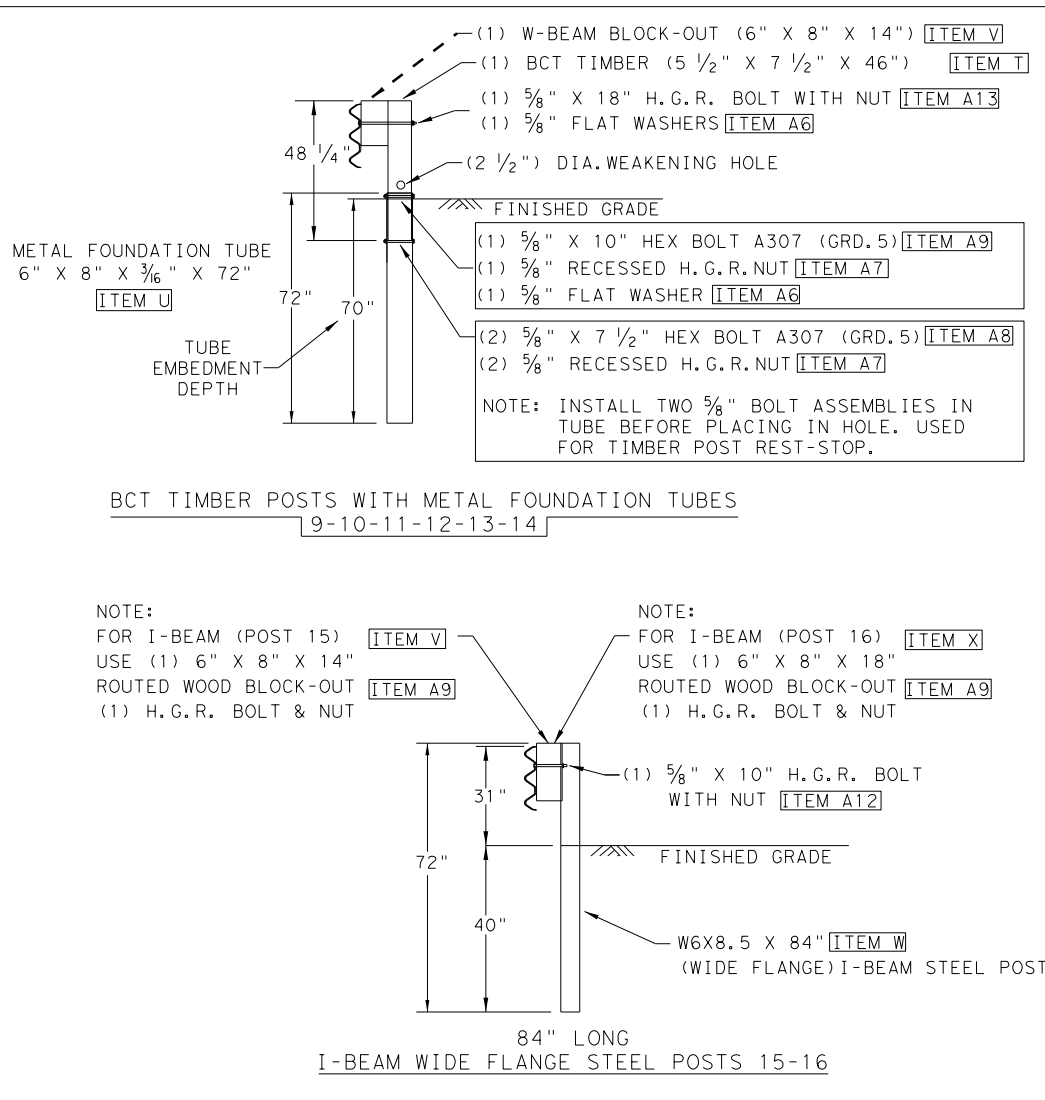
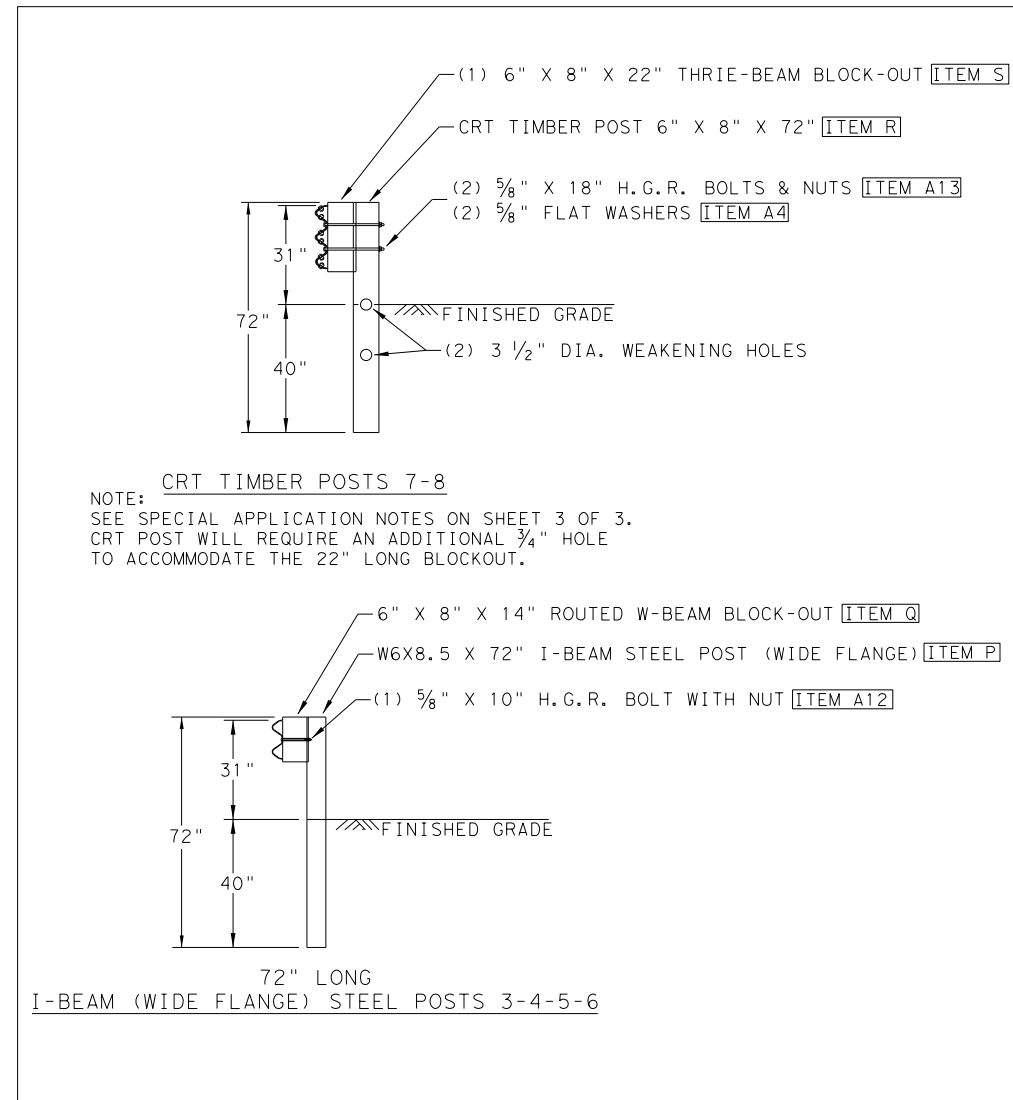
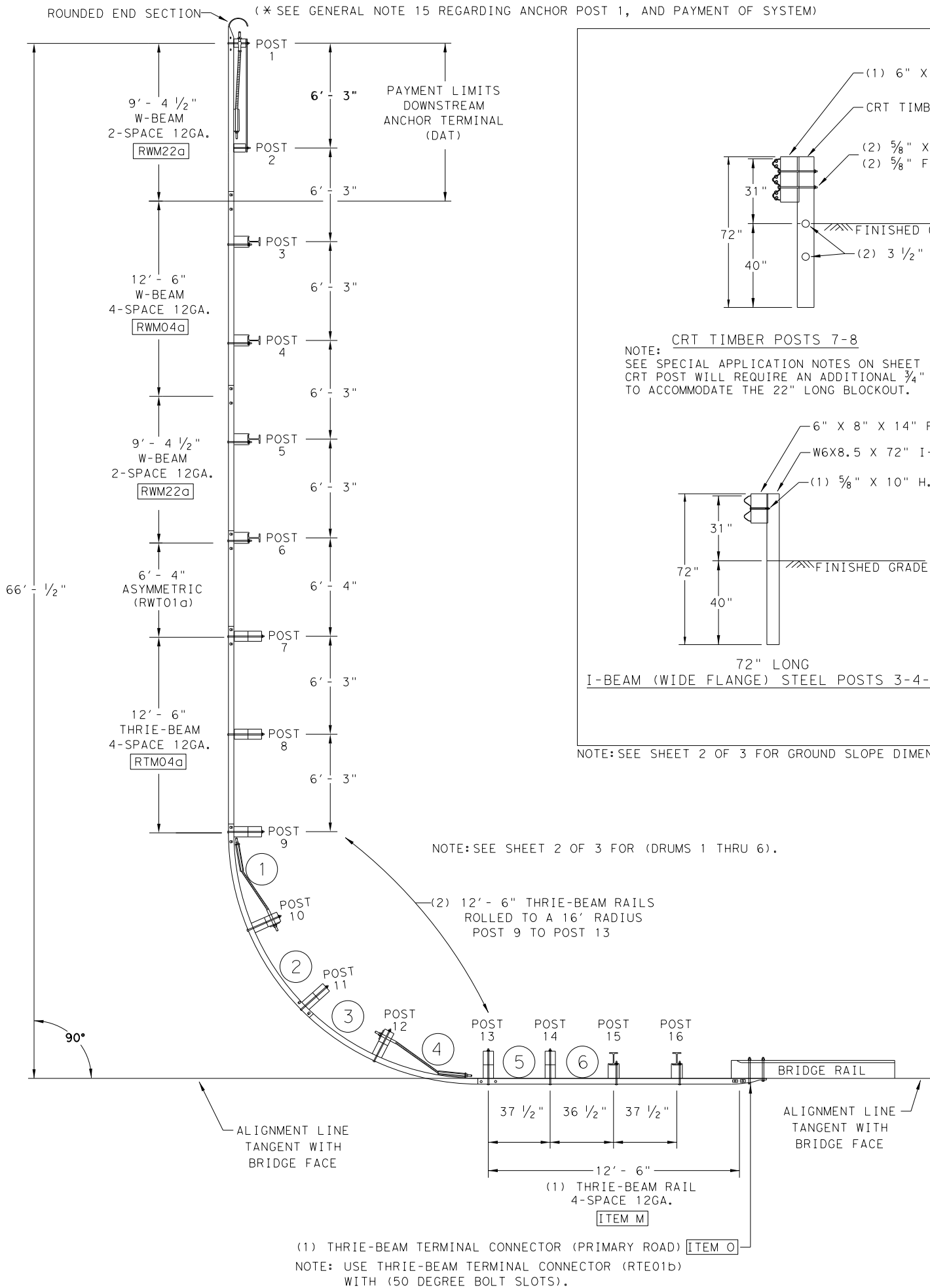
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT SECT	JOB	HIGHWAY	
REVISIONS		2690 01	038	FM 971
DIST	COUNTY	SHEET NO.		
AUS	WILLIAMSON			81

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(MASH TL-2 COMPLIANT)
 TESTED TO MASH TL-2 WITH A 3:1 SLOPE

SHEET 1 OF 3

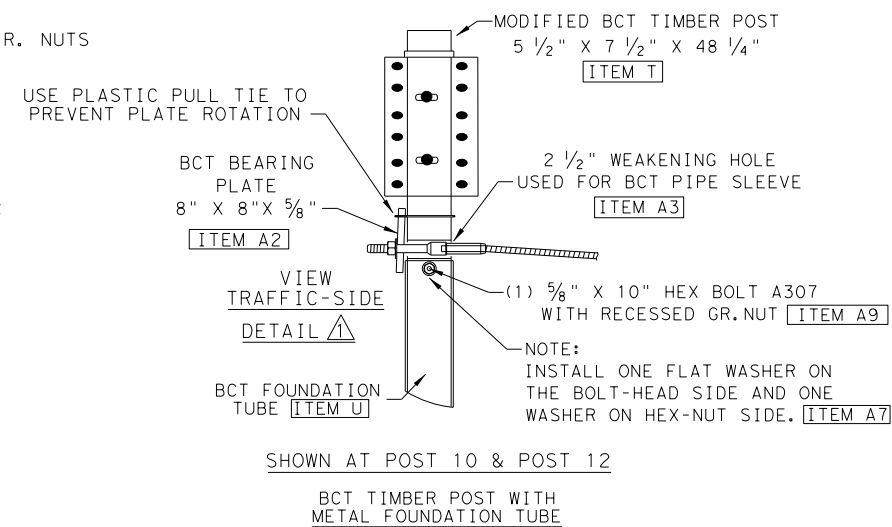
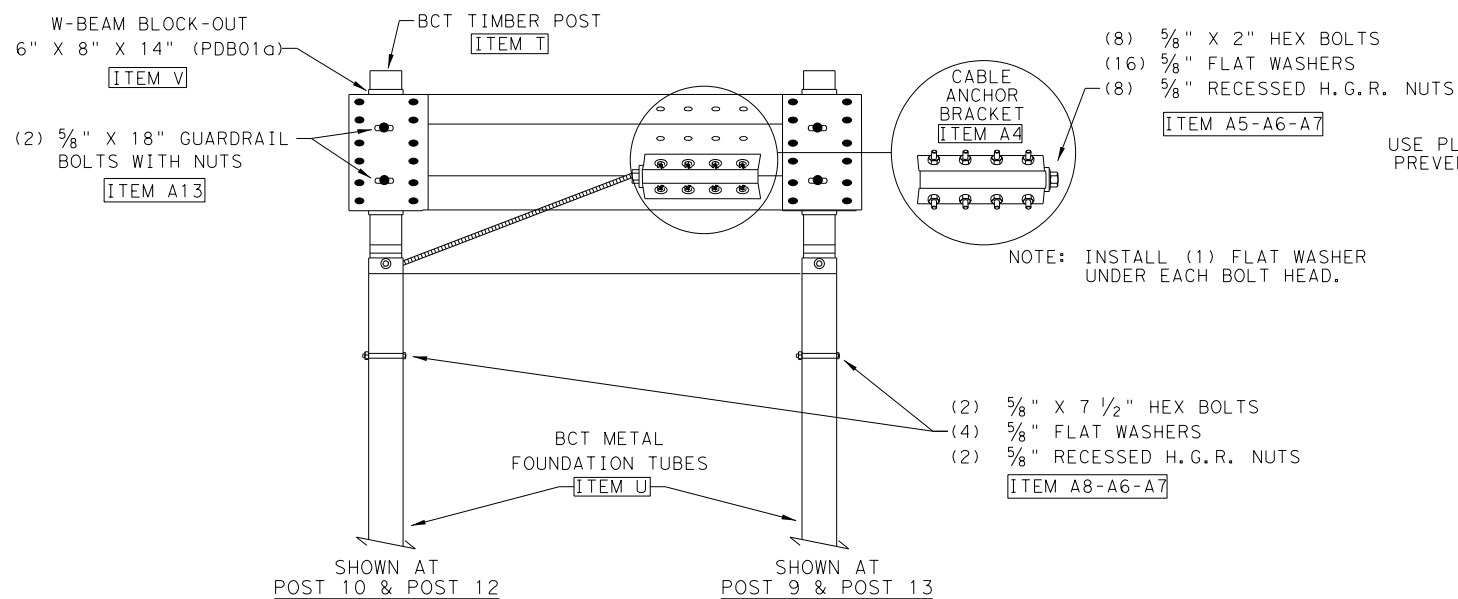
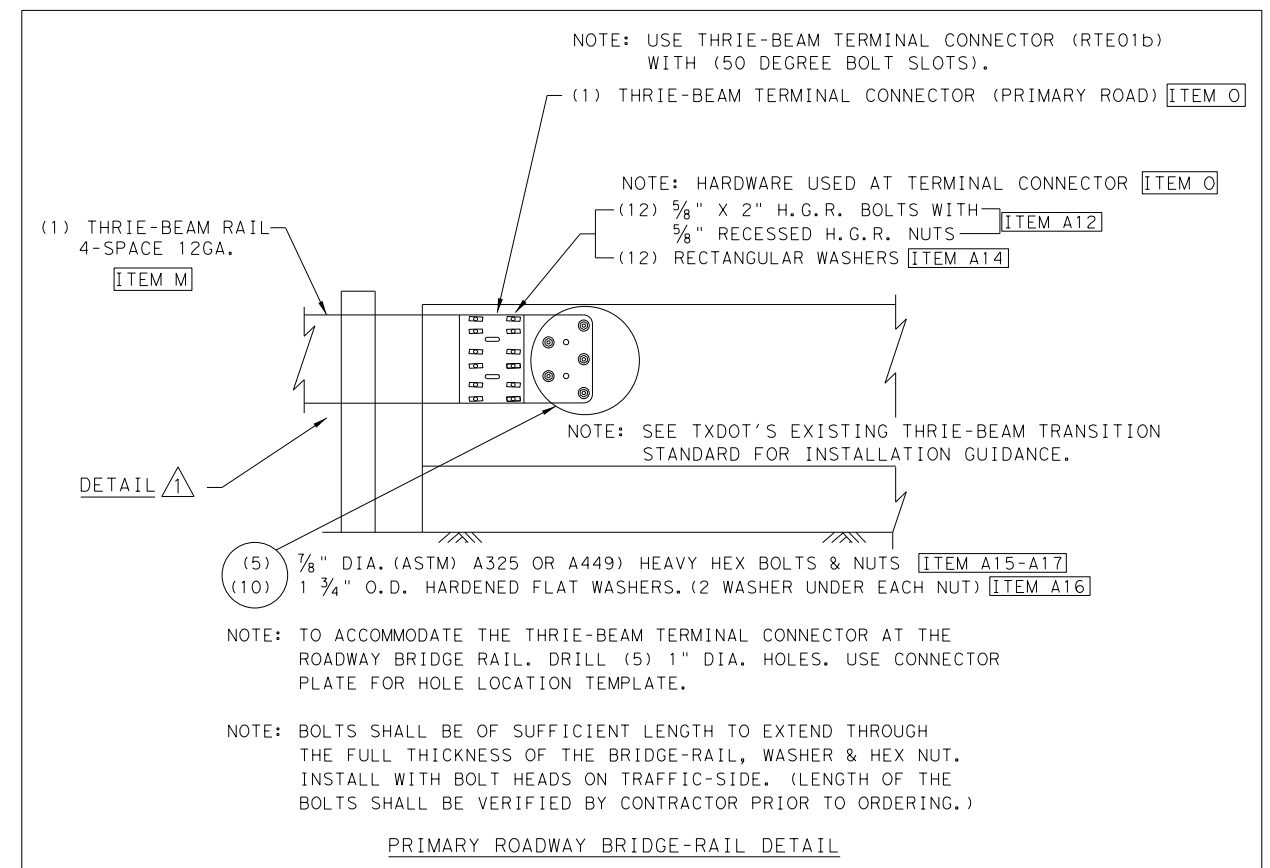
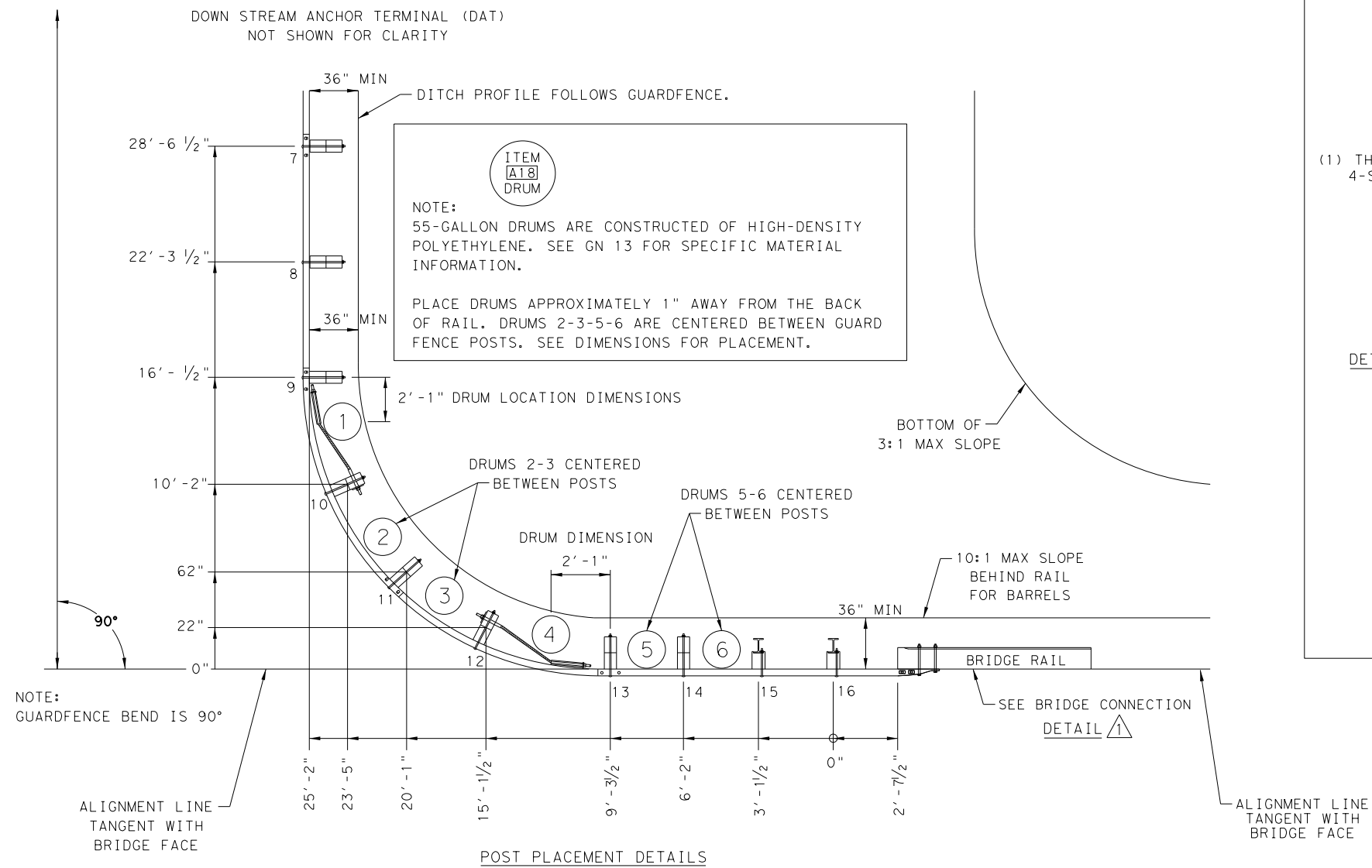
Texas Department of Transportation

Design Division Standard

TL-2
 SHORT RADIUS GUARDRAIL
 MASH COMPLIANT
 SRG (TL-2) -21

FILE: srgt1221	TxDOT	CK:KM	DN:VP	CK:CGL
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REVISIONS	2690	01	038	FM 971
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AUS	WILLIAMSON		82	

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(MASH TL-2 COMPLIANT)
TESTED TO MASH TL-2 WITH A 3:1 SLOPE

SHEET 2 OF 3

		Design Division Standard	
TL-2 SHORT RADIUS GUARDRAIL MASH COMPLIANT SRG (TL-2) -21			
FILE: srqt1221	TxDOT	CK:KM	DN:VP
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REVISIONS	2690	01	038
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	83

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ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS	TL-2 DOWNSTREAM ANCHOR TERMINAL (DAT) ☐ (PAYABLE BY EA.)		TL-2 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM (INCL DAT) △ (ALL PAY ITEMS)	
		ITEM	QTY	ITEM	TOTAL QTY
A	POST 1 & 2 BCT TIMBER (5 1/2" X 7 1/2" X 48 1/4") (PDF01)	A	2	A	2
B	POST 1 & 2 BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)	B	2	B	2
C	POST 1 & 2 CHANNEL STRUTS (C3 X 5 X 80") A36	C	2	C	2
D	POST 1 SHELF ANGLE BRACKET (6" X 7 1/2" X 1/4") SEE DAT DETAIL	D	1	D	1
E	POST 1 BCT POST SLEEVE (FMM02a)	E	1	E	1
F	POST 1 BCT CABLE BEARING PLATE (5/8" X 8" X 8") (FPB01)	F	1	F	1
G	BCT CABLE ANCHOR ASSEMBLIES (3/4" X 6'-6 3/4" LENGTH) (FCA01)	G	1	G	1
H	W-BEAM RAIL (ROUNDED END ANCHOR-TYPE) 12GA. (RWE03a)	H	1	H	1
I	W-BEAM RAIL (LENGTH 9'-4 1/2") 12GA. (RWM22a)	I	2	I	2
J	W-BEAM RAIL (LENGTH 12'-6") 12GA. (4 SPACE) (RWM04a)			J	1
K	W-BEAM RAIL (LENGTH 9'-4 1/2") 12GA. (RWM22a)			K	1
L	W-BEAM TO THRIE-BEAM ASYMMETRIC RAIL (RWT01a). (LENGTH 6'-4")			L	1
M	THRIE-BEAM RAIL (LENGTH 12'-6") 12GA. (4 SPACE) (RTM04a)			M	1
N	THRIE-BEAM RAIL (LENGTH 12'-6") 12GA. (16' RADIUS) (RTM02a)			N	2
O	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)			O	1
P	POSTS 3,4,5,6 I-BEAM POSTS (LENGTH W6X8.5 X 72") (PWE01)			P	4
Q	POSTS 3,4,5,6,15 ROUTED W-BEAM BLOCK-OUTS (6" X 8" X 14") (PDB01b)			Q	5
R	POSTS 7,8 CRT TIMBER POSTS (LENGTH 6" X 8" X 72") (PDE09)			R	2
S	POSTS 7,8 THRIE-BEAM BLOCK-OUTS (6" X 8" X 22") (PDB02a)			S	2
T	POSTS 9,10,11,12,13,14 BCT TIMBER (5 1/2" X 7 1/2" X 46") (PDF04)			T	6
U	POSTS 9,10,11,12,13,14 BCT TUBE (6" X 8" X 3/16" X 72") (PTE05)			U	6
V	POSTS 9,10,11,12,13,14, W-BEAM BLOCK-OUTS (6" X 8" X 14") (PDB01a)			V	6
W	POSTS 15,16 I-BEAM POSTS (LENGTH W6X8.5 X 84") (PWE07)			W	2
X	POSTS 16 ROUTED THRIE-BEAM BLOCK-OUT (6" X 8" X 18") (PDB01)			X	1
A1	MODIFIED BCT CABLE ANCHOR ASSEMBLIES (3/4" X LENGTH 5'-5")			A1	2
A2	BCT CABLE BEARING PLATE (5/8" X 8" X 8") (POST 10 & POST 12) (FPB01)			A2	2
A3	BCT CABLE POST SLEEVE (POST 10 & POST 12) (FMM02)			A3	2
A4	BCT CABLE ANCHOR BRACKET (AT POST 9 & POST 13) (FPA01)			A4	2
A5	5/8" X 2" HEX BOLTS A307 GRD.5 (FOR CABLE ANCHOR BRACKETS)	A5	8	A5	24
A6	5/8" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT & 1 WASHER UNDER NUT)	A6	18	A6	48
A7	5/8" RECESSED H.G.R. NUTS (FOR ALL 5/8" BOLTS)	A7	20	A7	152
A8	5/8" X 7 1/2" HEX BOLTS A307 GRD.5 BCT POSTS (9-10-11-12-13-14)	A8	4	A8	12
A9	5/8" X 10" HEX BOLTS A307 GRD.5 BCT POSTS (9-10-11-12-13-14)	A9	2	A9	6
A10	5/8" X 1 1/4" H.G.R. BOLTS SPLICES AT POST (2-3-4-5-6-7-9-11-13) (FBB01)	A10	4	A10	72
A11	5/8" X 2" H.G.R. BOLTS (ROUND TERM-POST 10-END SPLICE) (FBB02)			A11	18
A12	5/8" X 10" H.G.R. BOLTS (I-BEAM POSTS RAIL & BLOCKOUT) (FBB03)	A12	2	A12	10
A13	5/8" X 18" H.G.R. BOLTS (POSTS 9,10,11,12,13,14) (FBB04)			A13	10
A14	RECTANGULAR WASHERS (FWRO3) (FOR TERMINAL CONNECTOR RTE01b)			A14	12
A15	7/8" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5			A15	5
A16	1 3/4" O.D. HARDENED FLAT WASHER A325			A16	10
A17	7/8" HEX NUT GR.5 A325			A17	5
A18	55 GALLON DRUM - FILLED WITH SAND 700-715lbs.			A18	6

GENERAL NOTES

- FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION, (TXDOT'S DESIGN DIVISION). (512) 416-2678. THE EXACT POSITION OF MGBF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.
- STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.
- RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 1/2" OR 25 FOOT NOMINAL LENGTHS.
- BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND TYPE A (1 3/4" O.D.) WASHER AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1 1/4" OR 2" LONG AT TRIPLE RAIL SPLICES WITH A DOUBLE RECESSED NUT (ASTM A563).
- FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
- THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.
- IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.
- GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
- SPECIAL RAIL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).
- ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND DRUMS, AND OTHER PARTS.
- ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.
- THE DRUMS ARE EAGLE MODEL 1656 FILLED WITH 715 LB (+/-15) SAND WITH THE PLASTIC LEVER-LOCK; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE DRUM IS 37" (+/-).
- WHEN THE SHORT RADIUS SYSTEM IS TERMINATED BY A DAT, REFER TO THE LATEST DAT STANDARD FOR INSTALLATION OF THE DAT SYSTEM. IF THE SYSTEM IS TERMINATED BY ANOTHER END TERMINAL SYSTEM, REFER TO THE CORRESPONDING END TERMINAL STANDARD.
- WHEN THE PLANNED LOCATION OF POST (1) IS WITHIN THE RIGHT-OF-WAY AND WITHIN THE CLEAR ZONE OF THE DIRECTION OF THE OPPOSING TRAFFIC, AN APPROPRIATE CRASHWORTHY END TERMINAL SHALL BE INSTALLED IN PLACE OF THE DOWNSTREAM ANCHOR TERMINAL (DAT). THE PAYMENT OF THE COMPLETE SHORT RADIUS SYSTEM WITH A DAT AT THE TERMINUS WILL BE WITH BID ITEMS: 540 6016 DOWNSTREAM ANCHOR TERMINAL SECTION, AND 540 6046 TL-2 31" SHORT RADIUS (W/O DAT). THE PAYMENT OF THE SYSTEM TERMINATED BY A CRASHWORTHY END TERMINAL (IN LIEU OF THE DAT) WILL BE WITH BID ITEMS: 540 6046 TL-2 31" SHORT RADIUS (W/O DAT), AND 544 6001 GUARDRAIL END TREATMENT (INSTALL).
- TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE, THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.


* NOTE: SEE SHEET 1 OF 3.

(MASH TL-2 COMPLIANT)
TESTED TO MASH TL-2 WITH A 3:1 SLOPE

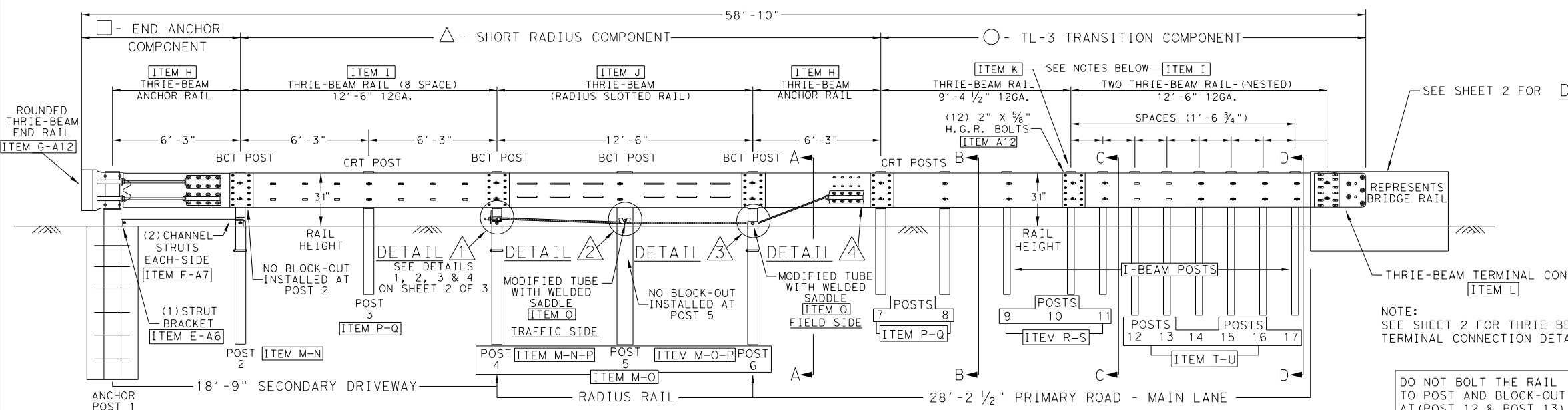
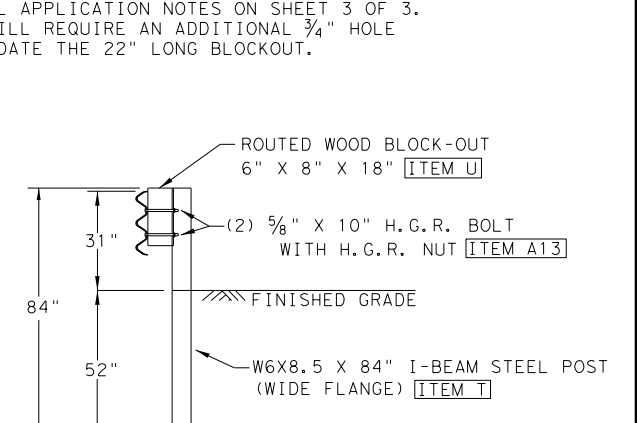
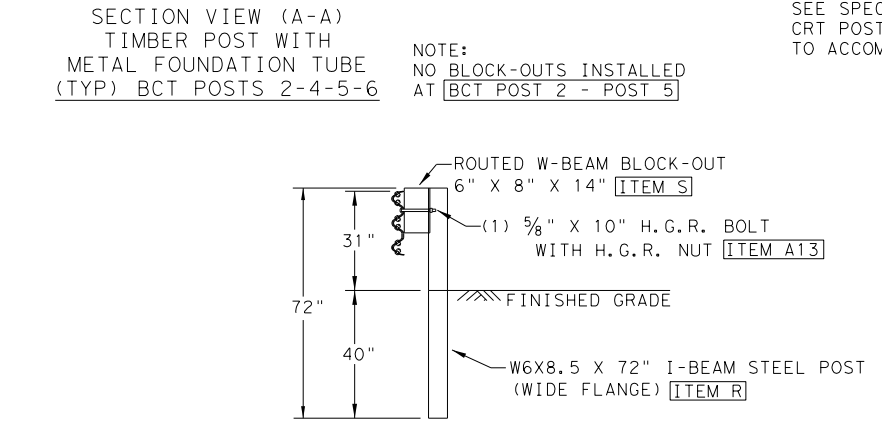
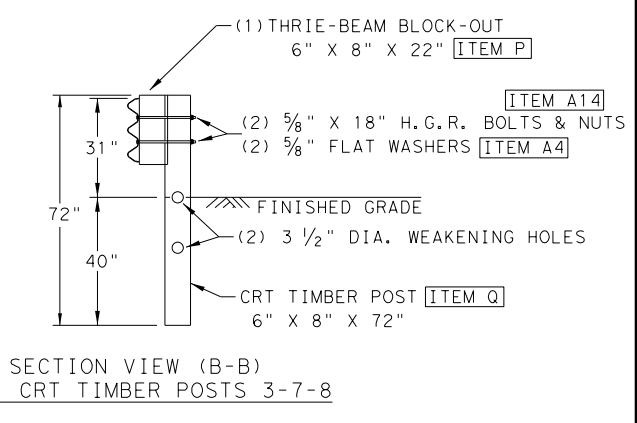
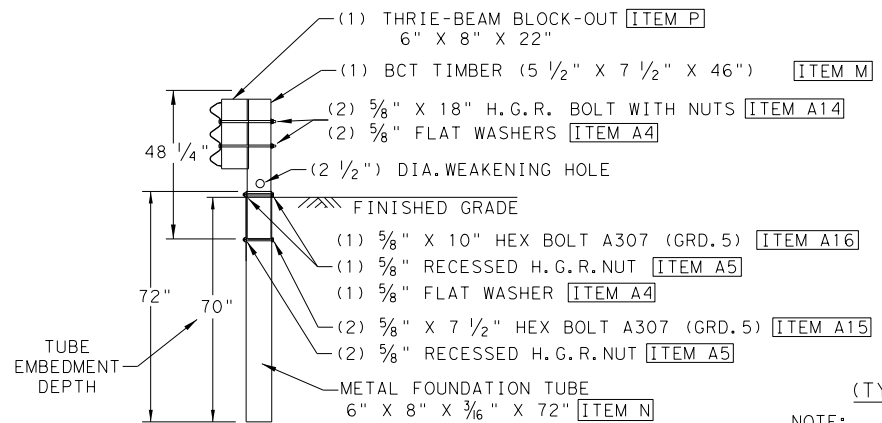
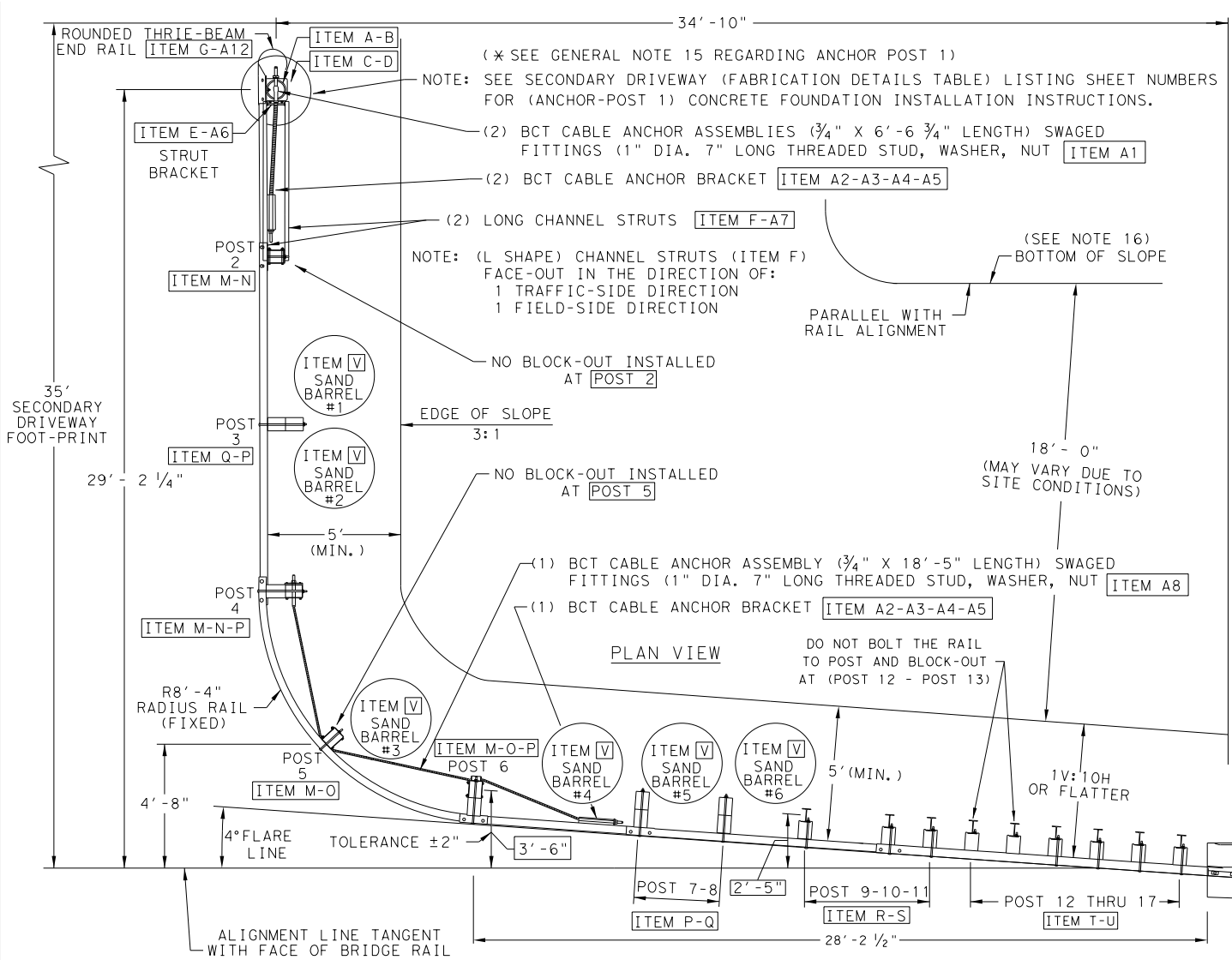
SHEET 3 OF 3

SPECIAL APPLICATION NOTES.

- THIS IS A MASH COMPLIANT TL-2 SHORT RADIUS GUARDRAIL SYSTEM 31 INCHES TALL. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 35' ALONG THE PRIMARY ROAD AND 30' ALONG THE SECONDARY DRIVEWAY.
- THE SYSTEM ALSO REQUIRES A MINIMUM 3' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM, WITH A SLOPE AT 1V:10H, FROM THERE A 3:1 SLOPE IS RECOMMENDED. SEE SHEET 2 OF 3 FOR SLOPE DETAILS.
- NOTE FOR INSTALLER: THE TWO (2) CRT POSTS ITEM (R), AT POST LOCATIONS 7 & 8., WILL REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A 3/4" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-7/8" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT. OPTION FOR ADDITIONAL 3/4" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO 3/4" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM 3/4" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM 3/4" HOLE.

		Design Division Standard	
TL-2 SHORT RADIUS GUARDRAIL MASH COMPLIANT SRG (TL-2) -21			
FILE: srqt1221	TxDOT	CK:KM	DN:VP
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REVISIONS	2690	01	038
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	84

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ANCHOR POST 1 FABRICATION DETAILS	
SHEET DESCRIPTION	SHEET NUMBER
ANCHOR POST	SHEET 1 OF 8
ANCHOR SLEEVE	SHEET 2 OF 8
RADIUS RAIL	SHEET 3 OF 8
THRIE-BEAM RAILS	SHEET 4 OF 8
BCT TIMBER POST	SHEET 5 OF 8
STRUT RADIUS ANCHOR	SHEET 6 OF 8
FOUNDATION TUBE	SHEET 7 OF 8
ANCHOR CABLE	SHEET 8 OF 8

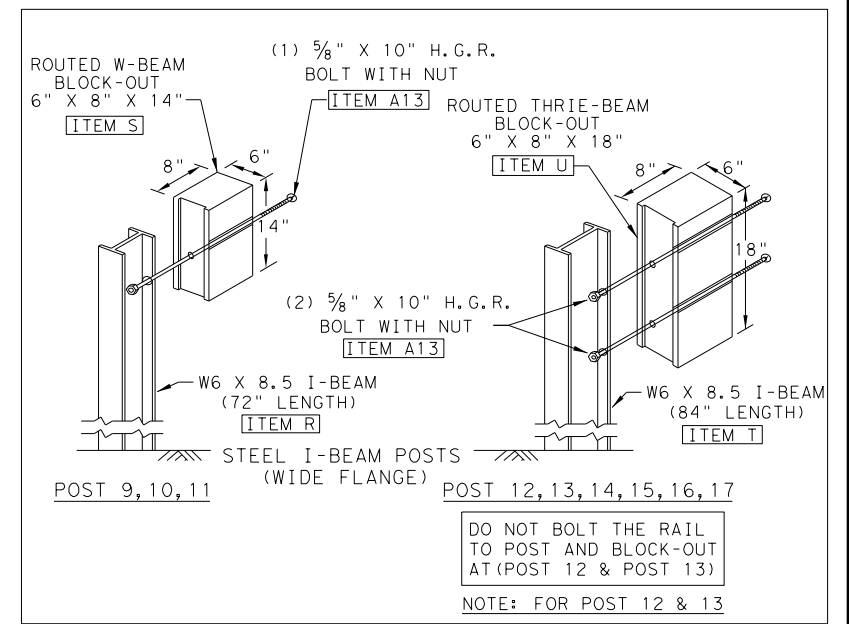
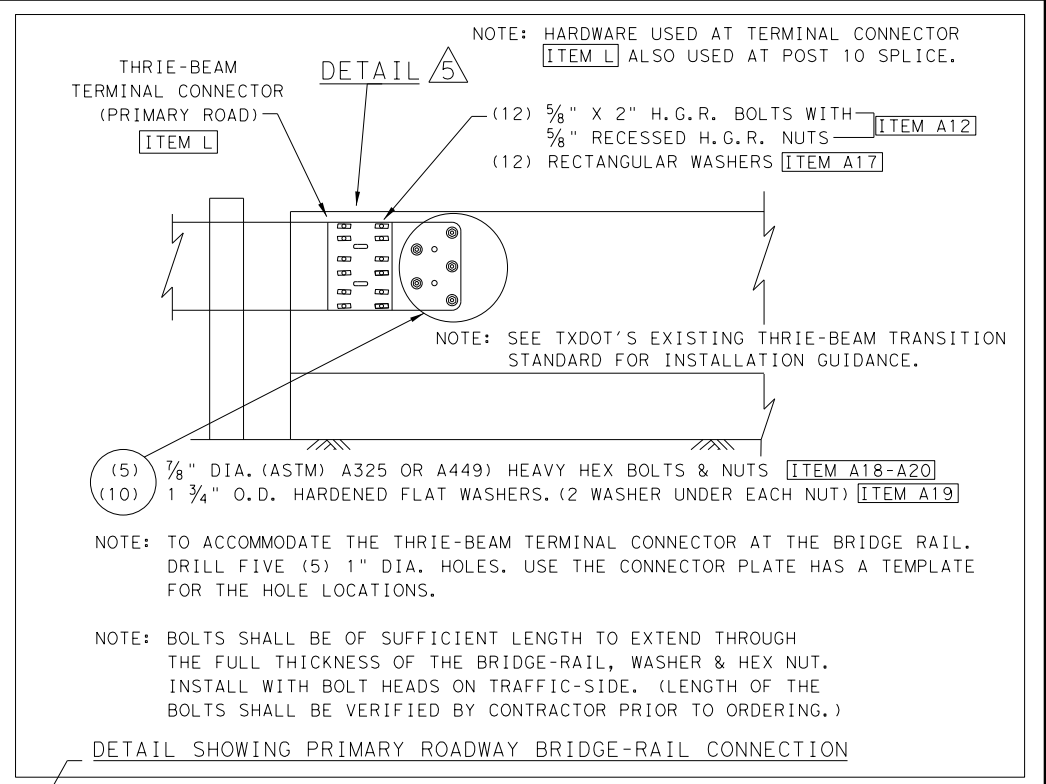
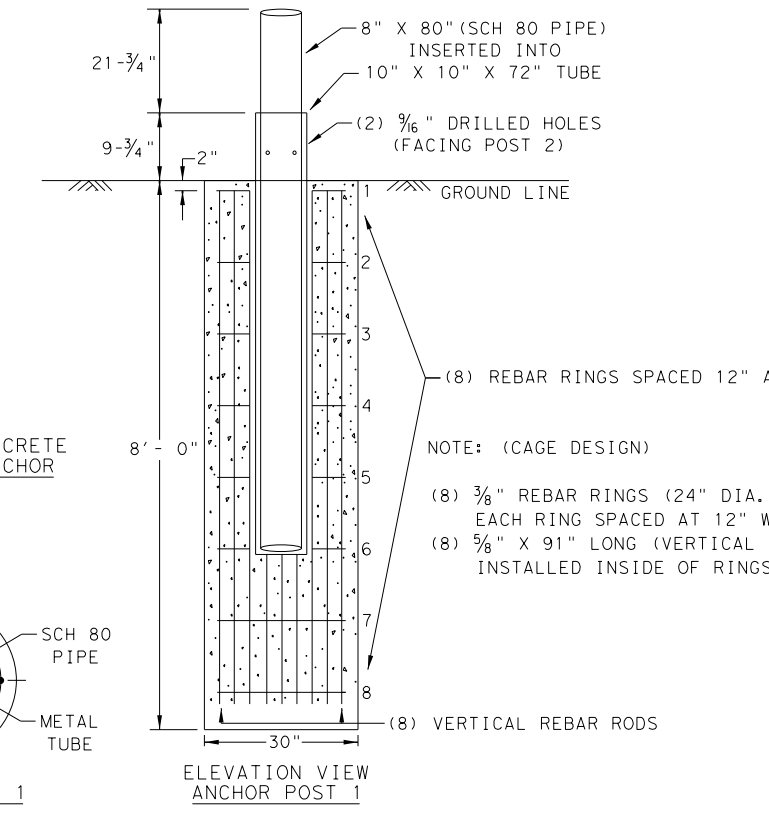
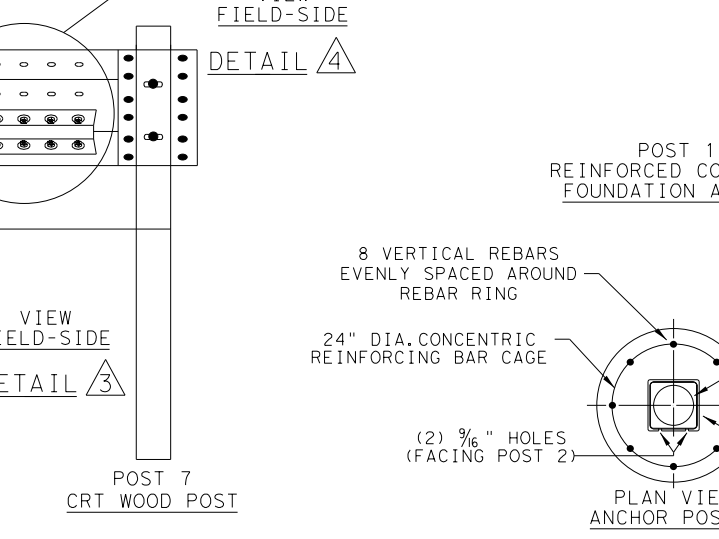
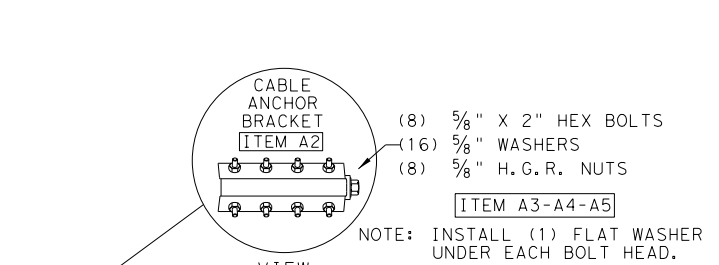
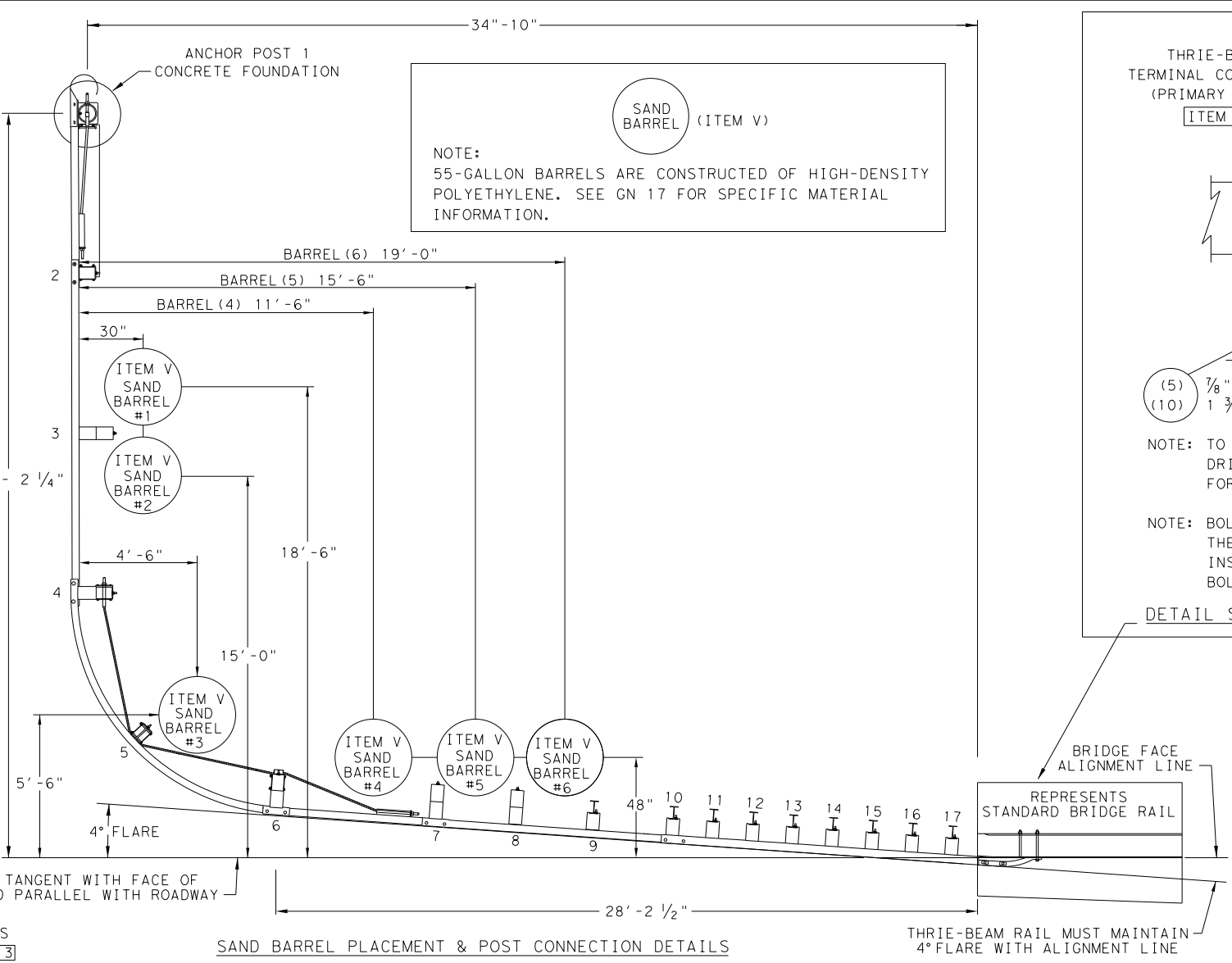
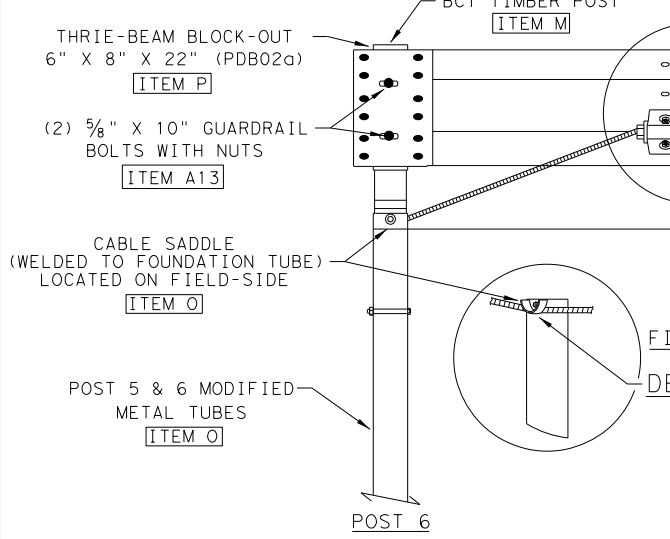
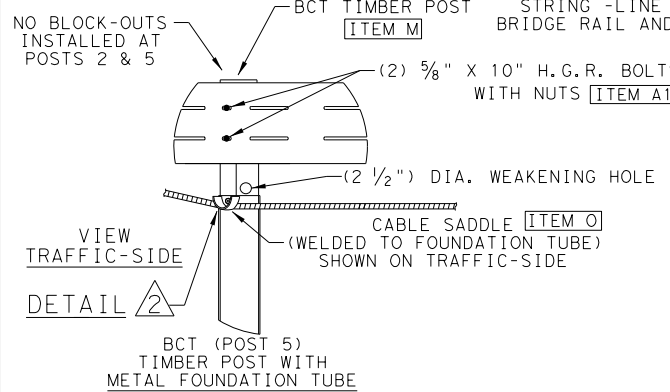
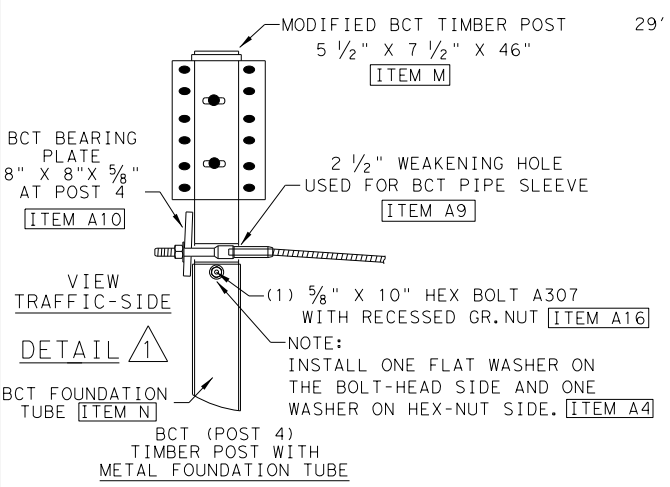
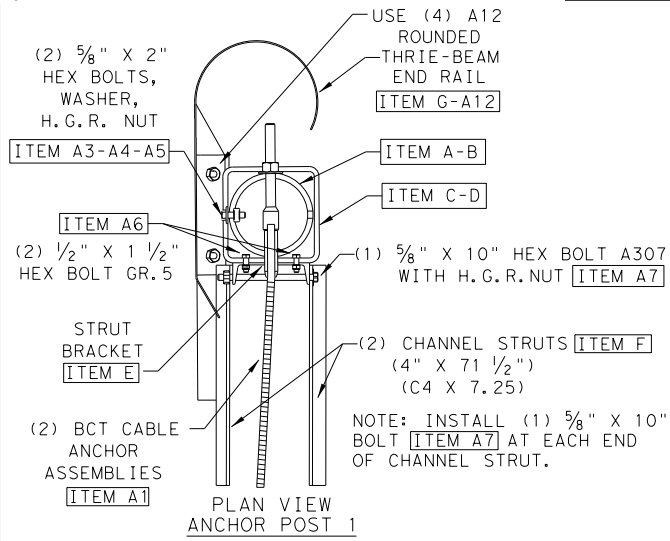
(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SHEET 1 OF 3

Design Division Standard

TL-3 SHORT RADIUS GUARDRAIL MASH COMPLIANT SRG (TL-3) - 21	
FILE: srg1321	TxDOT CK:KM DN:VP CK:CGL
© TxDOT: FEBRUARY 2021 REVISIONS	CONT SECT JOB HIGHWAY
	2690 01 038 FM 971
DIST COUNTY SHEET NO.	AUS WILLIAMSON 85

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(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SHEET 2 OF 3

		Design Division Standard	
TL-3 SHORT RADIUS GUARDRAIL MASH COMPLIANT SRG (TL-3) - 21			
FILE: srg1321	TxDOT	CK:KM	DN:VP
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REVISIONS	2690 01	038	FM 971
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	86	

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ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS
A	POST 1 TOP (SCH.80 PIPE) (8" X 80" LENGTH)
B	POST 1 TOP (WELDED SUPPORT COLLAR 10" X 10" X 1/2" ASTM A36)
C	POST 1 TUBE (HSS 10" X 10" X 1/2" X 72" LENGTH) A500 GR.B
D	POST 1 (WELDED PLATE 9 1/4" X 9 1/4" X 1/8") A36
E	POST 1 STRUT BRACKET (C8 X 11.50 A36)
F	(POST 1 & 2) CHANNEL STRUTS (4" X 71 1/2") (C4 X 7.25)A36
G	THRIE-BEAM RAIL (END ANCHOR - ROUNDED TYPE) 12GA. (RTE02a)
H	THRIE-BEAM RAIL (ANCHOR) (6'-3" LENGTH) 12GA. (RWM14a)
I	THRIE-BEAM RAIL (8 SPACE) (12'-6" LENGTH) 12GA. (RTM08)
J	THRIE-BEAM RAIL (RADIUS 8'-4 1/2") (SLOTTED) 12GA.
K	THRIE-BEAM RAIL (3 SPACE) (9'-4 1/2" LENGTH) 12GA.
L	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)
M	POST 2,4,5,6 BCT TIMBER (5 1/2" X 7 1/2" X 46") (PDF04)
N	POST 2,4, BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)
O	POST 5,6 MODIFIED BCT TUBES (FOR WELDED CABLE SADDLES)
P	POST 3,4,6,7,8 THRIE-BEAM BLOCK-OUT (6" X 8" X 22") (PDB02a)
Q	POST 3,7,8 CRT TIMBER POSTS (6" X 8" X 72" LENGTH) (PDE09)
R	POST 9,10,11 I-BEAM POSTS (W6X8.5 X 72" LENGTH) (PWE01)
S	POST 9,10,11 ROUTED W-BEAM BLOCK-OUT (6" X 8" X 14") (PDB01b)
T	POST 12 THRU 17 I-BEAM POSTS (W6X8.5 X 84" LENGTH) (PWE07)
U	POST 12 THRU 17 ROUTED BLOCK-OUT (6" X 8" X 18") (PDB??)
V	SAND BARRELS 700-715 LBS
A1	BCT CABLE ANCHOR ASSEMBLIES (3/4" X 6'-6 3/4" LENGTH) (FCA01)
A2	BCT CABLE ANCHOR BRACKET (FPA01)
A3	5/8" X 2" HEX BOLT A307 GRD.5 (FOR CABLE BRACKETS)
A4	5/8" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT HEAD & 1 NUT)
A5	5/8" RECESSED H.G.R NUT (NUTS FOR HEX BOLTS)
A6	STRUT BRACKET HARDWARE (1/2" X 1 1/2") HEX BOLT A307 GRD.5
A7	CHANNEL STRUT HARDWARE (5/8" X 10") HEX BOLT A307 GRD.5
A8	BCT CABLE ANCHOR ASSEMBLY (FCA02) (3/4" X 18'-5" LENGTH)
A9	BCT POST SLEEVE (FMM02a) (POST 4 ONLY)
A10	BCT CABLE BEARING PLATE (5/8" X 8" X 8" (FPB01) (POST 4 ONLY)
A11	5/8" X 1 1/4" H.G.R. BOLTS (FBB01) (SPLICES AT POST 2,4,6,7)
A12	5/8" X 2" H.G.R. BOLTS (FBB02) (ROUND TERM-POST 10-END SPLICE)
A13	5/8" X 10" H.G.R. BOLTS (FBB03) (I-BEAM POSTS RAIL & BLOCKOUT)
A14	5/8" X 18" H.G.R. BOLTS (FBB04) (POSTS 3,4,6,7,8)
A15	5/8" X 7 1/2" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)
A16	5/8" X 10" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)
A17	RECTANGULAR WASHERS (FWR03) (FOR TERMINAL CONNECTOR RTE01b)
A18	7/8" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5
A19	1 3/4" O.D. HARDENED FLAT WASHER A325
A20	7/8" HEX NUT GR.5 A325

END ANCHOR (POST 1 & POST 2) □	
ITEM	QTY
A	1
B	1
C	1
D	1
E	1
F	2
G	1
H	1
I	
J	
K	
L	
M	
N	
O	
P	
Q	
R	
S	
T	
U	
V	
A1	2
A2	2
A3	18
A4	36
A5	22
A6	2
A7	2
A8	
A9	
A10	
A11	
A12	4
A13	
A14	
A15	
A16	
A17	
A18	
A19	
A20	

TL-3 SHORT RADIUS (POST 2 TO POST 7) △	
ITEM	QTY
H	1
I	1
J	1
M	4
N	2
O	2
P	4
Q	2
A8	1
A9	1
A10	1
A11	48
A12	
A13	
A14	8
A15	8
A16	4
A17	
A18	
A19	
A20	

TL-3 TRANSITION (POST 7 TO POST 17) ○	
ITEM	QTY
I	2
K	1
L	1
M	
N	
O	
P	1
Q	1
R	3
S	3
T	6
U	6
A12	24
A13	18
A14	2
A15	
A16	
A17	12
A18	5
A19	10
A20	5

TL-3 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM	
ITEM	TOTAL QTY
A	1
B	1
C	1
D	1
E	1
F	2
G	1
H	2
I	3
J	1
K	1
L	1
M	4
N	2
O	2
P	5
Q	3
R	3
S	3
T	6
U	6
V	6
A1	2
A2	3
A3	26
A4	76
A5	42
A6	2
A7	2
A8	1
A9	1
A10	1
A11	48
A12	28
A13	18
A14	10
A15	8
A16	4
A17	12
A18	5
A19	10
A20	5

- GENERAL NOTES
- FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION, (TXDOT'S DESIGN DIVISION). (512) 416-2678. THE EXACT POSITION OF MBGF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.
 - STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.
 - RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 1/2" OR 25 FOOT NOMINAL LENGTHS.
 - BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
 - FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
 - CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
 - THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.
 - IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.
 - GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
 - SPECIAL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).
 - ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND BARRELS, AND OTHER PARTS.
 - ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.
 - THE BCT BEARING PLATE INSTALLED AT POST 4 SHOULD BE ORIENTED SUCH THAT THE 3" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE BOTTOM AND 5" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE TOP.
 - FOUNDATION AT POST 1 SHALL BE CLASS C CONCRETE.
 - POST (1) IS NOT A CRASHWORTHY TERMINAL. THE DESIGN AND PLACEMENT OF POST (1) MUST BE OUTSIDE OF THE CLEAR ZONE OF THE SECONDARY ROADWAY USING THE RESPECTIVE CLEAR ZONE CRITERIA. PLEASE CONTACT THE DESIGN DIVISION (512) 416-2678 FOR ASSISTANCE IN DETERMINING THE APPROPRIATE USE AND/OR PLACEMENT OF THE SYSTEM IN CONSTRAINED LOCATIONS. THE PAYMENT OF THE COMPLETE SYSTEM WILL BE WITH BID ITEMS: 540 XXXX TL-3 31" SHORT RADIUS (COMPLETE).
 - TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE, THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.
 - THE BARRELS ARE ENERGY ABSORPTION ENERGITE III, MODEL 640 FILLED WITH 715 LB (+/-15) SAND; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE BARREL IS 41" (+/-).
 - ALTERNATE METHODS TO TERMINATE THE SRG ALONG THE PRIMARY ROADWAY ARE AVAILABLE WHEN SITE CONDITIONS DICTATE. CONTACT DESIGN DIVISION FOR DETAILS: 512 416-2678
- NOTE: SEE SHEET 1 OF 3.

SPECIAL APPLICATION NOTES.

- THIS IS A MASH COMPLIANT TL-3 SHORT RADIUS GUARDRAIL SYSTEM WITH A TOP RAIL HEIGHT OF 31". AVAILABLE FOR USE ON ANY SPEED ROADWAY. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 34'-10" ALONG THE PRIMARY ROAD AND A 35'-0" ALONG SECONDARY DRIVEWAY.
- IT IS CRITICAL THAT THE PRIMARY GUARDRAIL MAINTAIN A (4 DEGREE FLARE) WITH THE SECONDARY DRIVEWAY.
- THE SYSTEM REQUIRES A MINIMUM 5' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM WITH A SLOPE AT 1V:10H OR FLATTER FROM THERE A MAXIMUM 3:1 SLOPE IS RECOMMENDED. SEE SHEET 1 OF 3 FOR FLARE AND SLOPE DETAILS.
- NOTE FOR INSTALLER: THE THREE (3) CRT POSTS ITEM (Q), AT POST LOCATIONS, 3, 7, & 8.), REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A 3/4" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-7/8" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT.

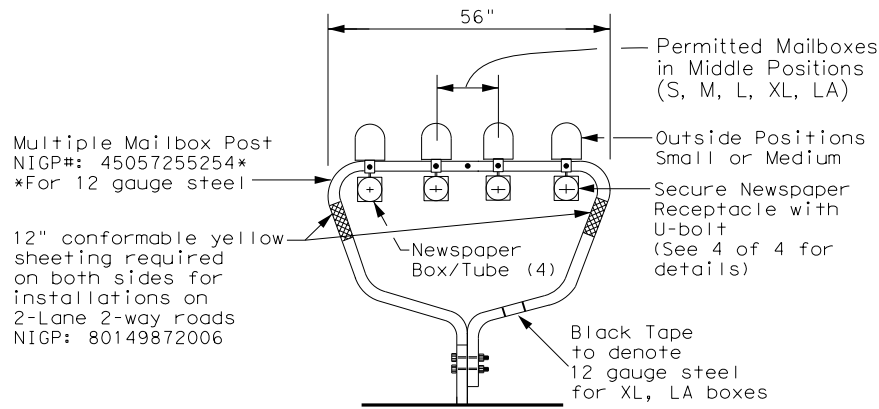
OPTION FOR ADDITIONAL 3/4" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO 3/4" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM 3/4" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM 3/4" HOLE.

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

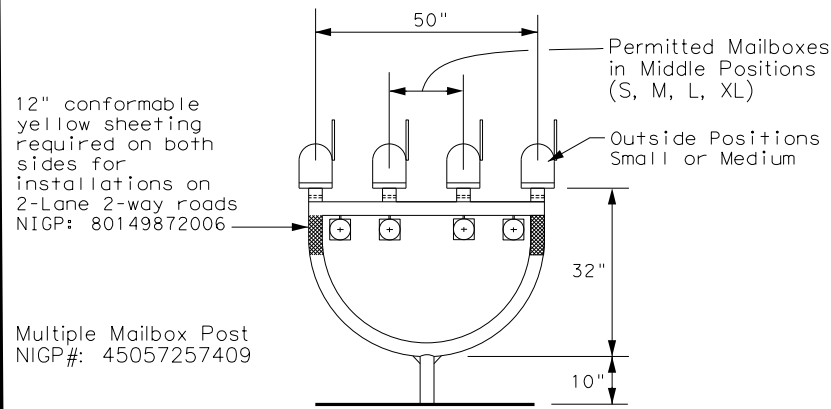
SHEET 3 OF 3

		Design Division Standard
TL-3 SHORT RADIUS GUARDRAIL MASH COMPLIANT SRG (TL-3) -21		
FILE: srg+1321	TXDOT	CK:KM DN:VP CK:CGL
© TXDOT: FEBRUARY 2021	CONT SECT	JOB HIGHWAY
REVISIONS	2690 01	038 FM 971
DIST	COUNTY SHEET NO.	
AUS	WILLIAMSON 87	

TYPE 1 - MULTIPLE



TYPE 4 - MULTIPLE



MAILBOX SIZES

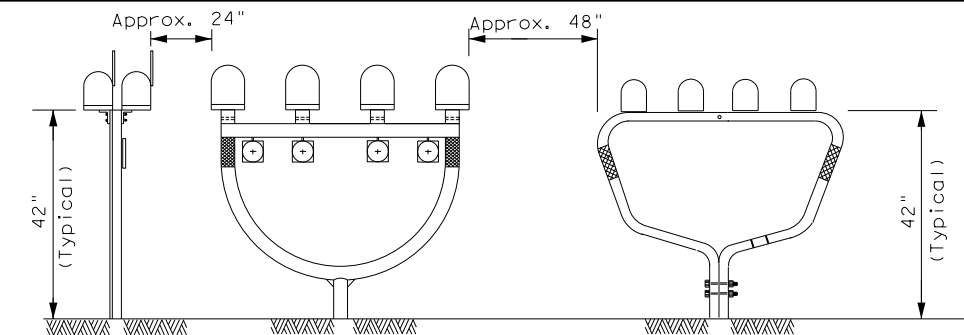
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX ** WEIGHT
	LENGTH	WIDTH	HEIGHT	
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

GENERAL NOTES:

- Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
- Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

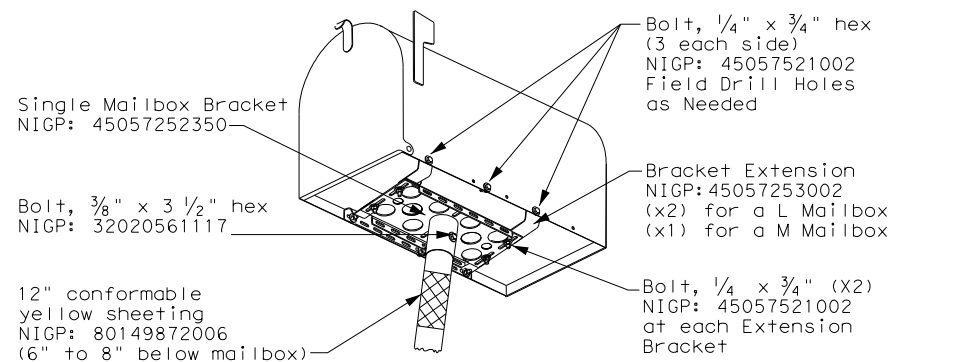
TYPICAL INSTALLATION MEASUREMENTS



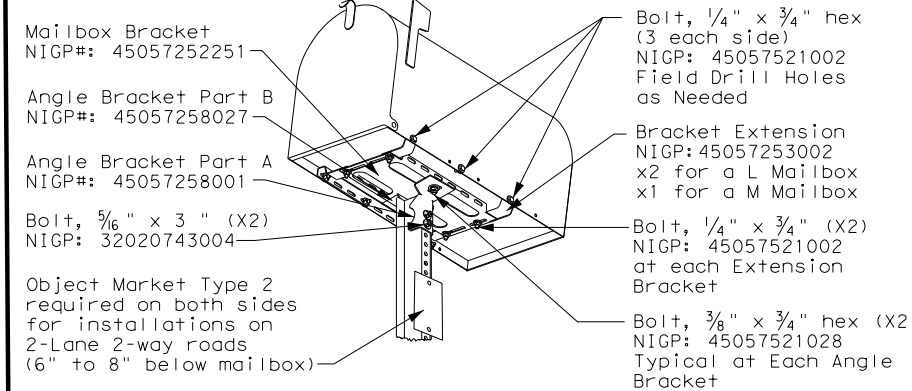
NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

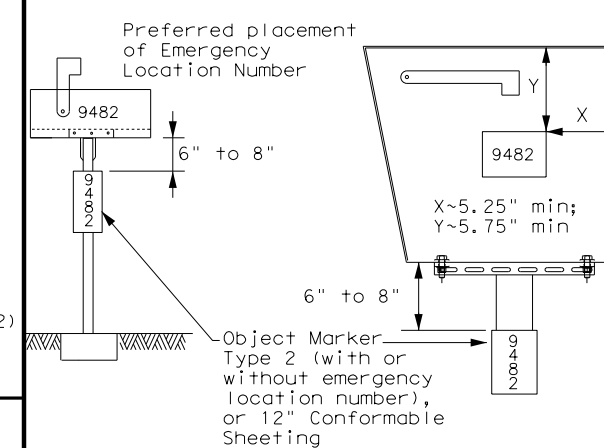
TYPE 2 and 4 - SINGLE/DOUBLE



TYPE 3 - SINGLE/DOUBLE



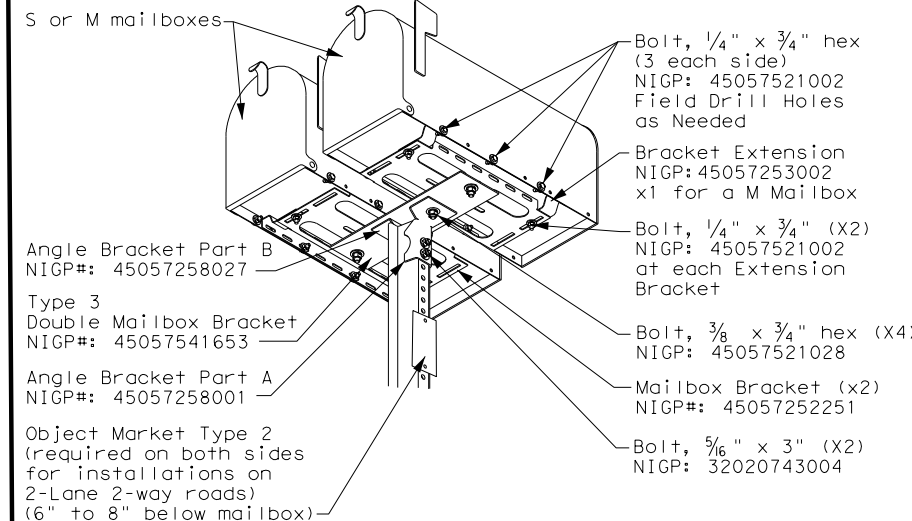
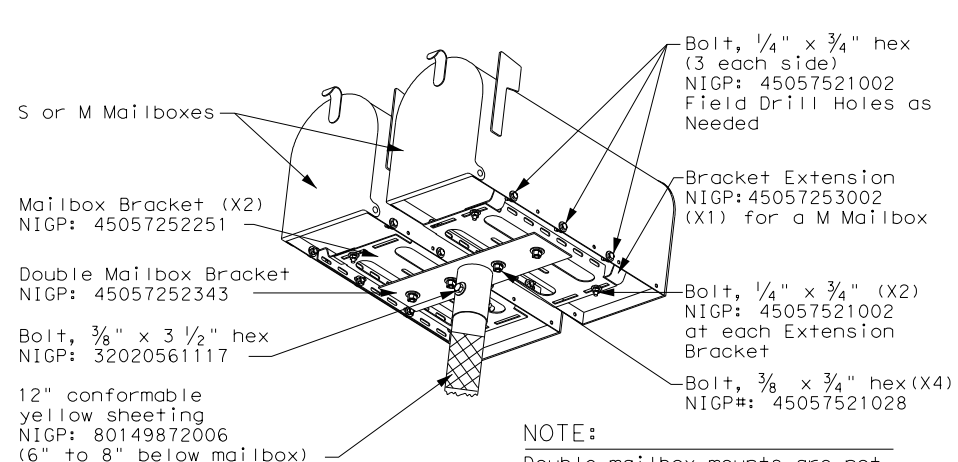
PLACEMENT OF EMERGENCY LOCATION NUMBER



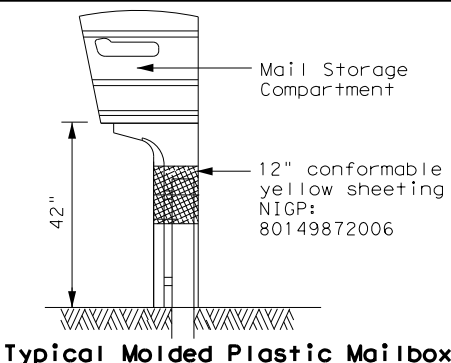
NOTES:

- Location numbers are provided by homeowner. Minimum size 1" height.
- Location number is typically placed on the mailbox in a contrasting color.
- Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
- Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
- See 3 of 4 for Foundation details.
- See 4 of 4 for Hardware details.

SHEET 1 OF 4



TYPE 5



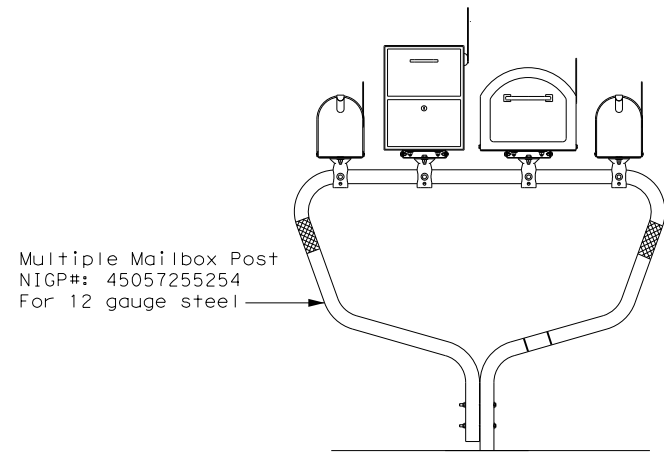
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

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© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
2/2005	11/2009	4/2015		
6/2005	1/2011			
11/2006	7/2014			
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		88

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TYPE 1 - MULTI LOCKABLE AND XL MAILBOX



Multiple Mailbox Post
NIGP#: 45057255254
For 12 gauge steel

TYPE 2/4 - SINGLE LOCKABLE MAILBOX

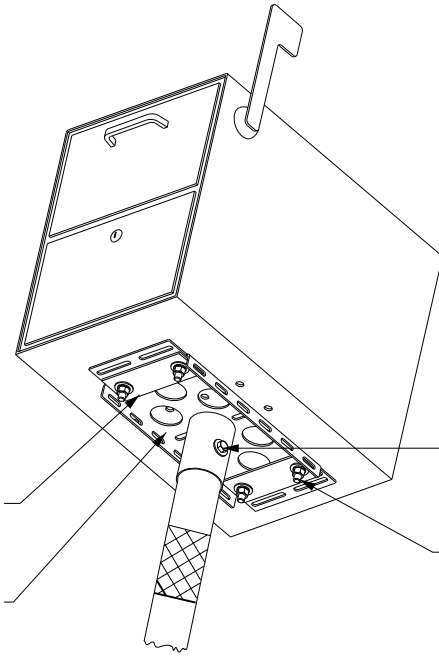


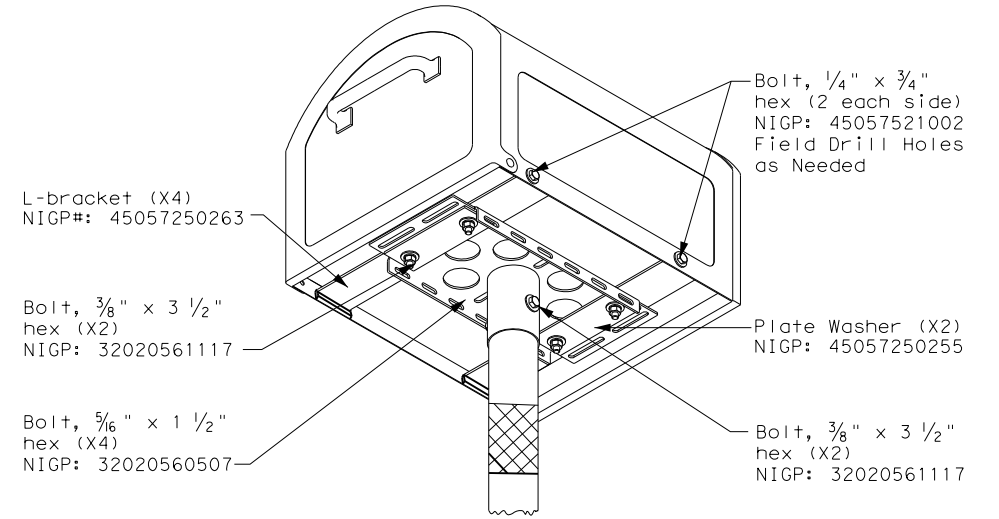
Plate Washer (X2)
NIGP: 45057250255

Single Mailbox
Bracket
NIGP: 45057252350

Bolt, 3/8" x 3 1/2"
hex (X2)
NIGP: 32020561117

Bolt, 5/16" x 1 1/4"
hex (X4)
NIGP: 32020681246

TYPE 2/4 - SINGLE XL MAILBOX



L-bracket (X4)
NIGP#: 45057250263

Bolt, 3/8" x 3 1/2"
hex (X2)
NIGP: 32020561117

Bolt, 5/16" x 1 1/2"
hex (X4)
NIGP: 32020560507

Single Mailbox
Bracket
NIGP: 45057252350

Bolt, 1/4" x 3/4"
hex (2 each side)
NIGP: 45057521002
Field Drill Holes
as Needed

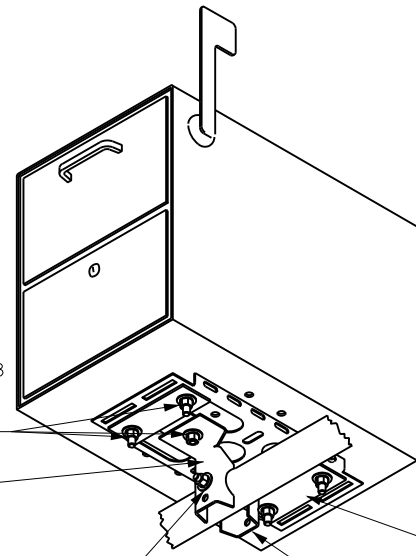
Plate Washer (X2)
NIGP: 45057250255

Bolt, 3/8" x 3 1/2"
hex (X2)
NIGP: 32020561117

NOTE:

Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

TYPE 1 MULTI - LOCKABLE ARCHITECTURAL (LA)



Bolt, 3/8" x 3/4"
hex (X6)
NIGP: 45057521028
Typical at Each
Angle Bracket
and plate washer

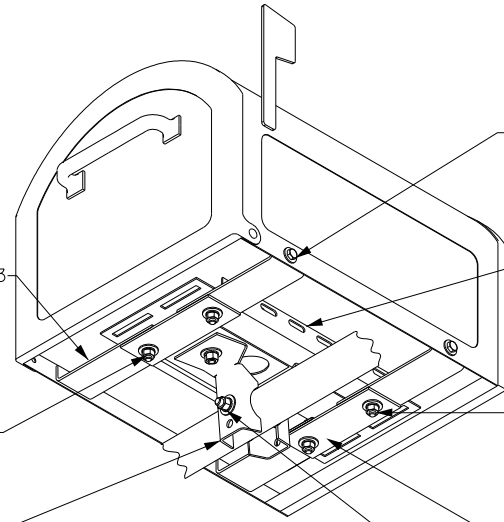
Mailbox Bracket
NIGP: 45057252251
(Inverted)

Bolt, 3/8" x 4 1/2" hex
NIGP: 32020561133
Drill 7/16" hole in Post

Plate Washer (X2)
NIGP: 45057250255

Angle Bracket
Part A (X2)
NIGP: 45057258001

TYPE 1 MULTI - XL MAILBOX



L-bracket (X4)
NIGP# 45057250263

Bolt, 3/8" x 3/4"
hex (X6)
NIGP: 45057521028
Typical at Each
Angle Bracket
and plate washer

Angle Bracket
Part A (X2)
NIGP: 45057258001

Bolt, 1/4" x 3/4" hex
(2 each side)
NIGP: 45057521002
Field Drill Holes
as Needed

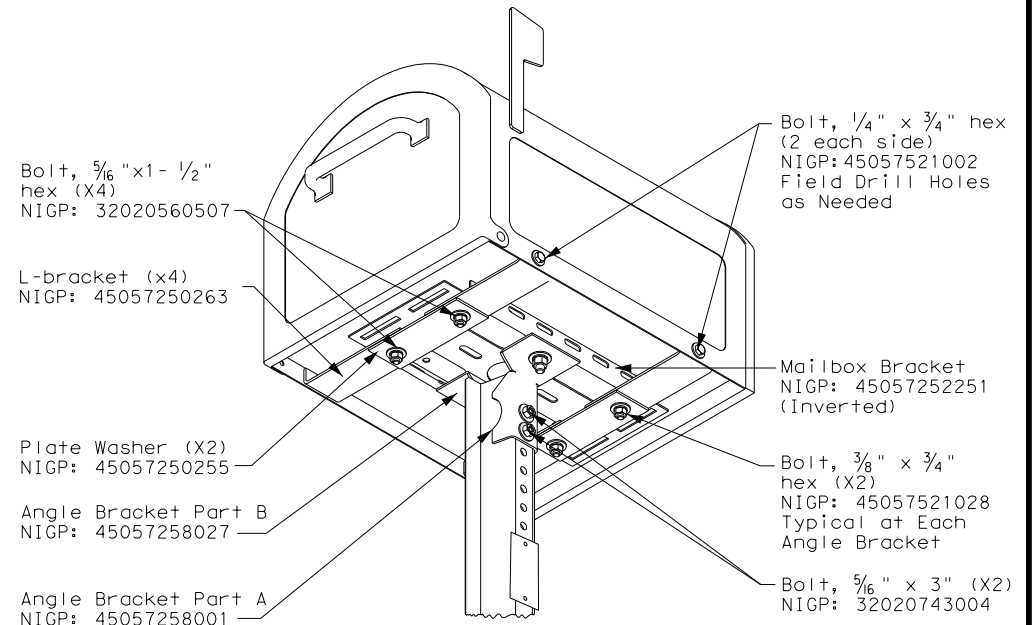
Mailbox Bracket
NIGP#: 45057252251
(Inverted)

Bolt, 5/16" x 2 1/2"
hex (X4)
NIGP: 32020220938
Use existing
hole in mailbox

Plate Washer (x2)
NIGP#: 45057250255

Bolt, 3/8" x 4 1/2" hex
NIGP: 32020561133
Drill 7/16" hole
in Post

TYPE 3 - XL MAILBOX MOUNTING



Bolt, 5/16" x 1 1/2"
hex (X4)
NIGP: 32020560507

L-bracket (x4)
NIGP: 45057250263

Plate Washer (X2)
NIGP: 45057250255

Angle Bracket Part B
NIGP: 45057258027

Angle Bracket Part A
NIGP: 45057258001

Bolt, 1/4" x 3/4" hex
(2 each side)
NIGP: 45057521002
Field Drill Holes
as Needed

Mailbox Bracket
NIGP: 45057252251
(Inverted)

Bolt, 3/8" x 3/4"
hex (X2)
NIGP: 45057521028
Typical at Each
Angle Bracket

Bolt, 5/16" x 3" (X2)
NIGP: 32020743004

SHEET 2 OF 4



XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY MB (2) - 21

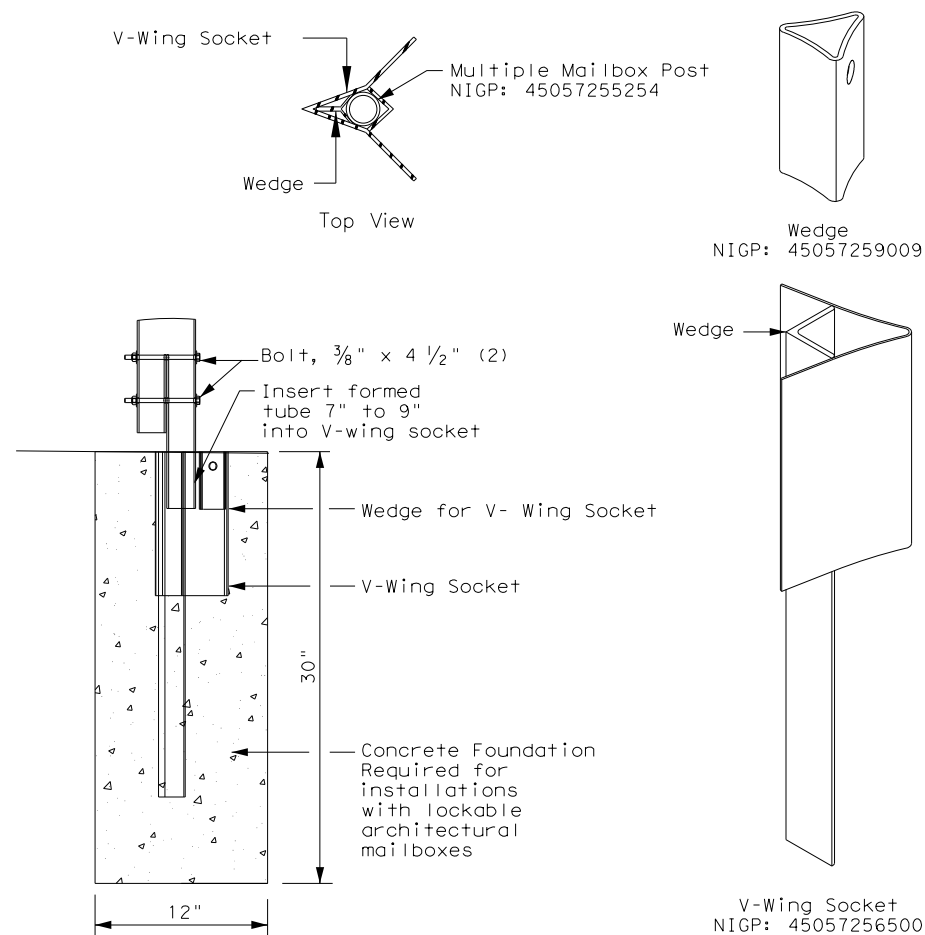
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© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
2/2005 11/2009 4/2015	DIST	COUNTY	SHEET NO.	
6/2005 1/2011	AUS	WILLIAMSON	89	
11/2006 7/2014				

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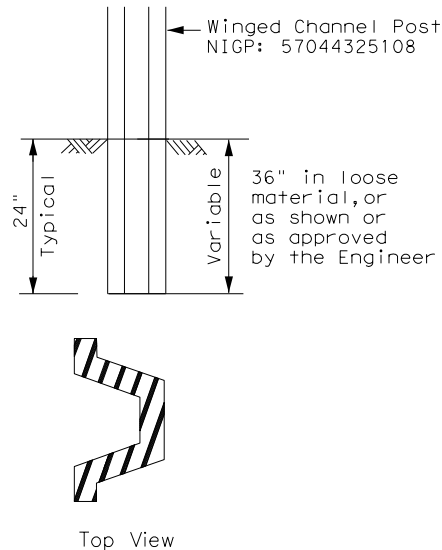
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TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



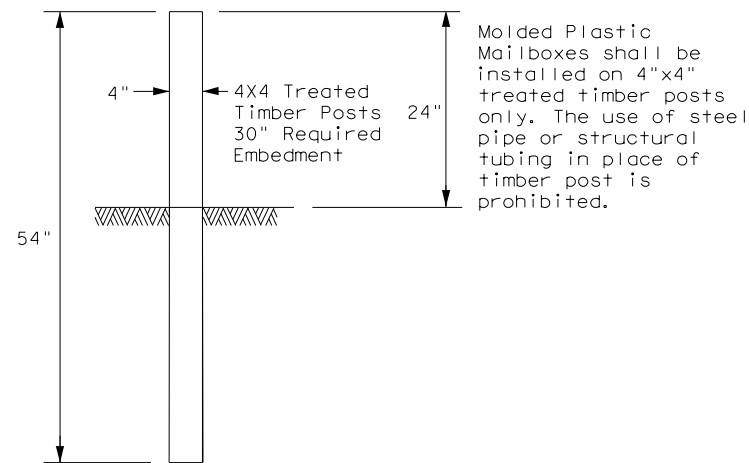
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

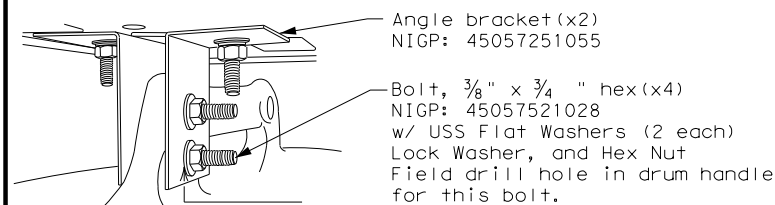
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



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.

TYPE 6 - TEMPORARY MAILBOX SUPPORT



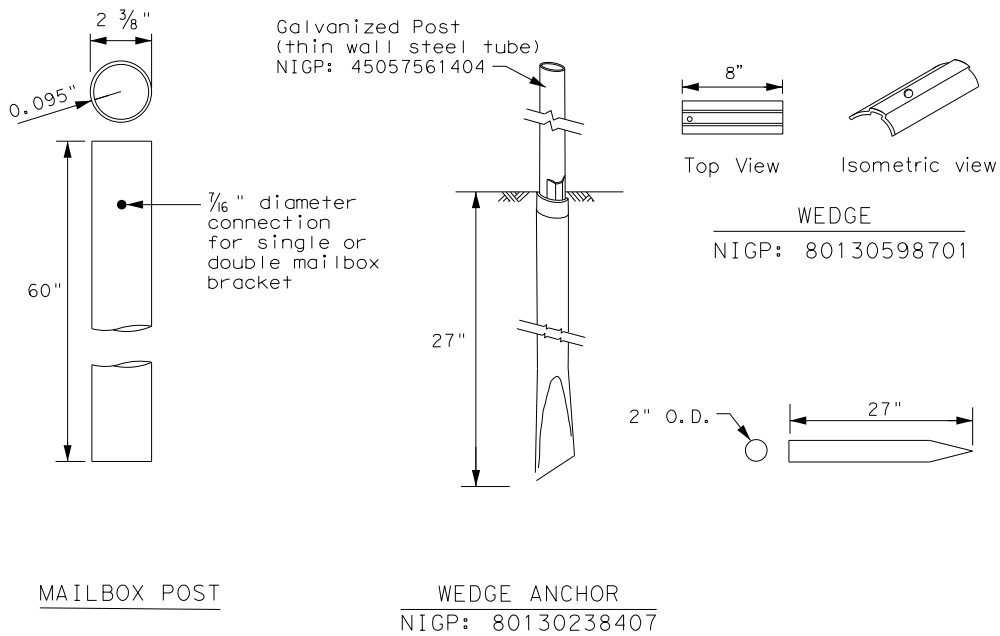
Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

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

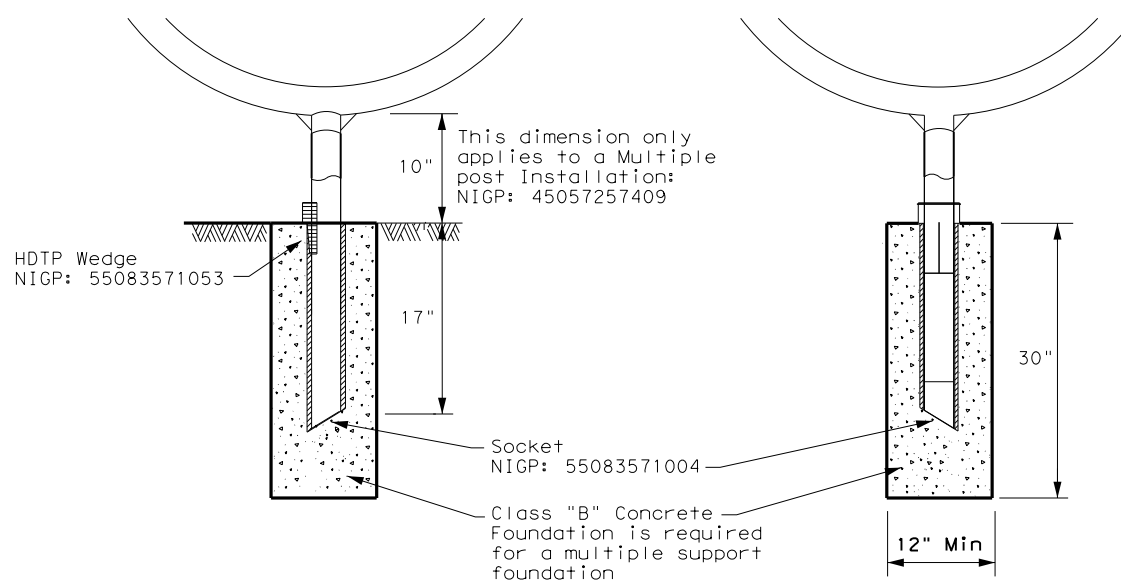
TYPE 2 - SUPPORT/FOUNDATION

Thin Wall Steel Tube w/Wedge Anchor System



TYPE 4 - SUPPORT/FOUNDATION

Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. 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, only on Type 1, Type 2, and Type 4

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SHEET 3 OF 4



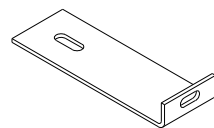
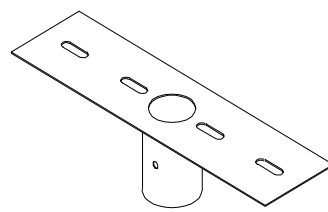
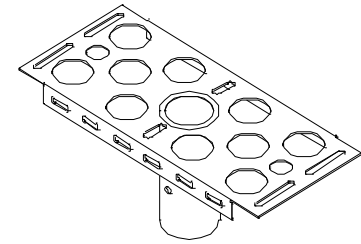
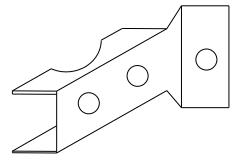
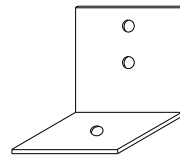
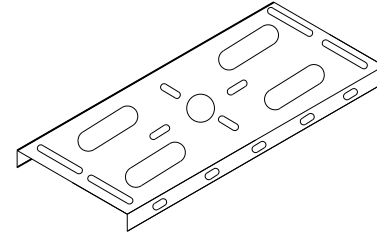
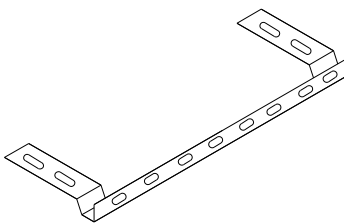
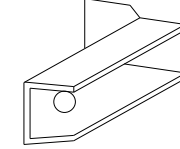
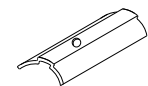

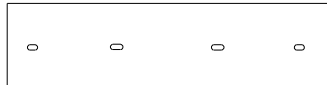
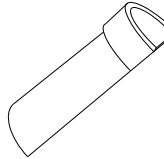
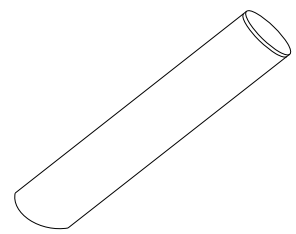

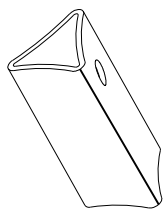
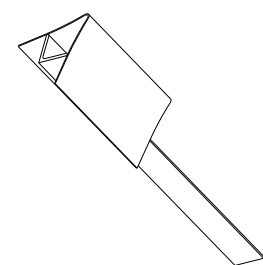
MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
2/2005	DIST	COUNTY	SHEET NO.	
6/2005	AUS	WILLIAMSON	90	
11/2009				
4/2015				
1/2011				
7/2014				

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 units or the accuracy of the information presented herein.
 DATE: 9/22/2022 8:14:49 AM
 FILE: \\txdot\projectwiseonline.com:TXDOT4\Documents\14 - AUS\Design Projects\14-0320\14-0320.dwg

TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Govanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete None

 NIGP: 45057250263 L-Bracket x4 for XL sized mailboxes	 NIGP: 45057252343 Double Mailbox Bracket For Type 2 and Type 4 double mount	 NIGP: 45057252350 Single Mailbox Bracket For Type 2 single and for Type 4 single and multi mount	 NIGP: 45057258001 Part "A" Angle Bracket For Type 1 multi (2 per mailbox) and Type 3 single and double
 NIGP: 45057251055 Type 6 Angle Bracket (2 per mailbox)	 NIGP: 45057252251 Mailbox Bracket For Type 1 multi and any double mount (use 2)	 NIGP: 45057253002 Bracket Extension Use 1 for a medium Mailbox Use 2 for a Large Mailbox	 NIGP: 45057258027 Part "B" Angle Bracket For Type 3 single and double
 NIGP: 80130598701 Wedge for Type 2	 NIGP: 45057250255 Plate Washer for Architecural and XL Mailboxes	 NIGP: 45057541653 Type 3 double mailbox bracket	 NIGP: 55083571053 Type 4 Mailbox Wedge
 NIGP: 55083571004 Type 4 Mailbox Socket	 NIGP: 80130238407 Type 2 Wedge Anchor	 NIGP: 45057259009 Wedge for Type 1 V-wing Socket	 NIGP: 45057256500 V-wing Socket for Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

- Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
- A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

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

Type of Mailbox _____

S = Single
 D = Double
 M = Multiple
 MP = Molded 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 _____

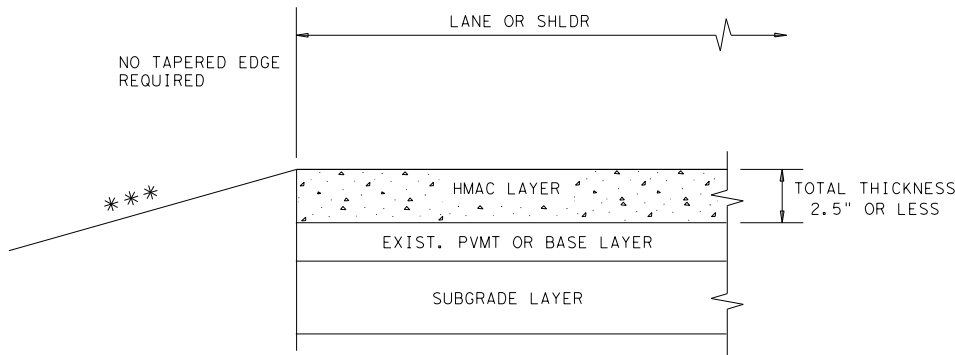
Ty 1 = V-Loc
 Ty 2 = Wedge Anchor Steel System
 Ty 3 = Winged Channel post
 Ty 4 = Wedge Anchor Plastic System
 Ty 5 = 4 X 4 Post

SHEET 4 OF 4

				Maintenance Division Standard	
<h2>NIGP PARTS LIST AND COMPATIBILITY</h2> <h3>MB(4)-21</h3>					
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY	
	2690	01	038	FM 971	
2/2005 11/2009 4/2015	DIST	COUNTY	SHEET NO.		
6/2005 1/2011	AUS	WILLIAMSON		91	
11/2006 7/2014					

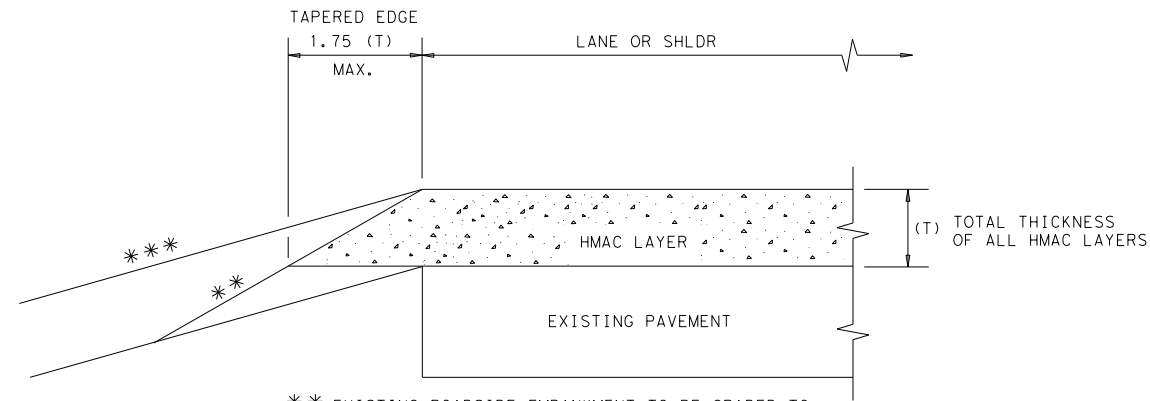
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DATE: 9/22/2022
 FILE: pw:\txdot\projectwiseonline.com:TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\13. Standards\ROADWAY\tehmoc11.dgn



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

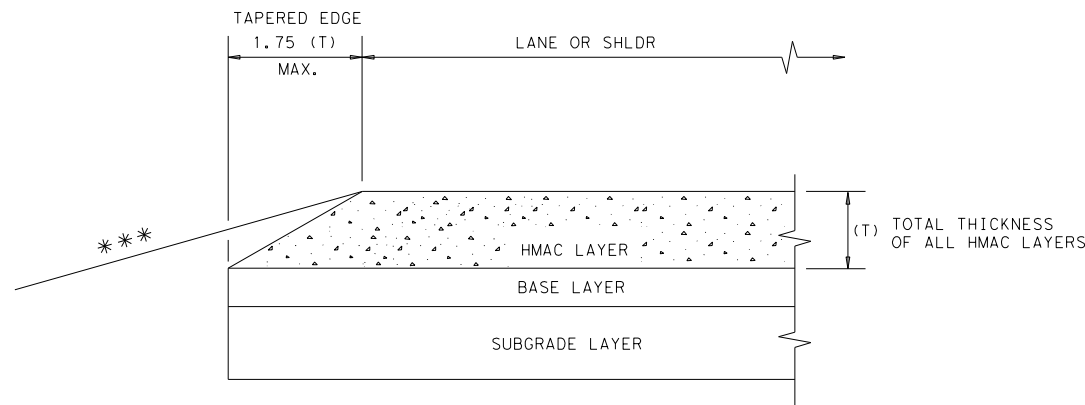
CONDITION - 1
 THIN HMAC SURFACES OR HMAC OVERLAY
 WITH THICKNESS OF 2.5" OR LESS



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

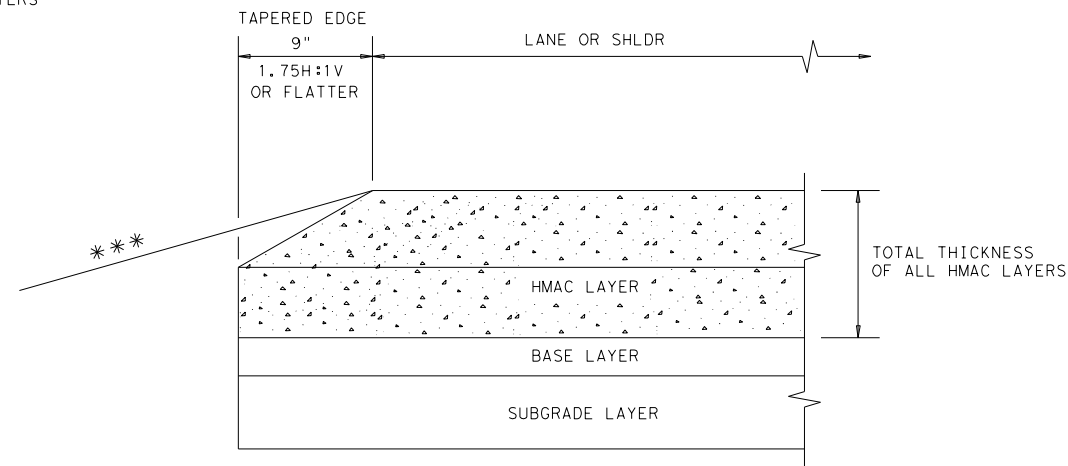
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

GENERAL NOTES

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

(NOT TO SCALE)

				Design Division Standard	
TAPERED EDGE DETAILS HMAC PAVEMENT TE (HMAC) - 11					
FILE: tehmoc11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:	
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY	
REVISIONS			2690 01	038	FM 971
DIST	COUNTY		SHEET NO.		
AUS	WILLIAMSON		92		

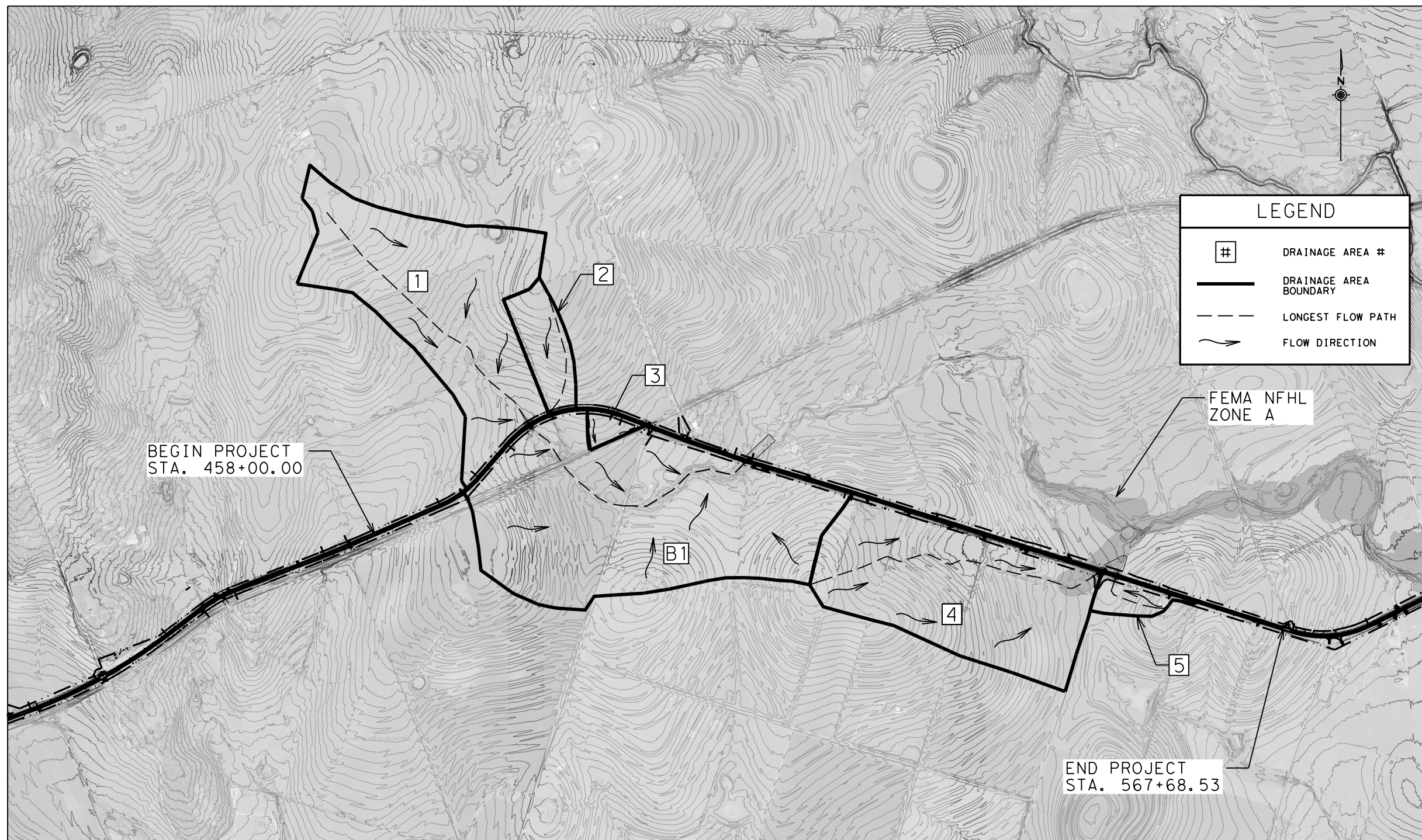
DATE: 9/27/2022 2:10:48 PM
 FILE: \\txdot\projectwiseonline.com\TxDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\5. Drainage\FM0971 Drainage Area Map.dgn

TIME OF CONCENTRATION (NRCS METHOD)															
DRAINAGE AREA	CULVERT STA	P ₂ (IN)	N _u	L _{SH} (FT)	S _{SH} (FT/FT)	t _{SH} (MIN)	K	L _{SC,1} (FT)	S _{SC,1} (FT/FT)	L _{SC,2} (FT)	S _{SC,2} (FT/FT)	L _{SC,3} (FT)	S _{SC,3} (FT/FT)	t _{SC} (MIN)	t _c (MIN)
2	482+26.54	3.5	0.17	100	0.0083	14.7	16.13	700	0.0130	692	0.029	-	-	10.5	25.3
3	493+05.71	3.5	0.17	100	0.030	8.80	16.13	266	0.022	572	0.005	39	0.054	10.7	19.5
4	546+49.22	3.5	0.17	100	0.005	18.0	16.13	3292	0.022	-	-	-	-	22.7	40.7
5	548+19.25	3.5	0.17	97.3	0.027	9.00	16.13	403	0.026	216	0.009	31	0.093	5.0	14.0


RATIONAL METHOD																
DRAINAGE AREA	C	RAINFALL INTENSITY (in/hr)						AREA (AC)	Q (cfs)							
		2 YR	5 YR	10 YR	25 YR	50 YR	100 YR		2 YR	5 YR	10 YR	25 YR	50 YR	100 YR		
1	0.43	2.17	2.95	3.57	4.46	5.17	5.95	99.2	92.4	125.8	152.5	190.0	220.4	253.6		
2	0.43	2.91	3.93	4.74	5.87	6.78	7.74	15.2	19.0	25.7	30.9	38.3	44.2	50.5		
3	0.44	3.35	4.51	5.42	6.68	7.68	8.74	3.93	5.8	7.8	9.4	11.6	13.3	15.1		
4	0.42	2.19	2.98	3.61	4.50	5.22	6.00	93.4	85.9	116.9	141.7	176.6	204.8	235.6		
5	0.42	3.92	5.26	6.30	7.72	8.84	10.01	7.31	12.05	16.14	19.33	23.70	27.14	30.74		


TIME OF CONCENTRATION (KERBY-KIRPICH METHOD)									
DRAINAGE AREA	CULVERT STA	N	L ₀ (FT)	S ₀ (FT/FT)	L _{0,1} (FT)	S _{0,1} (FT/FT)	L _{0,2} (FT)	S _{0,2} (FT/FT)	t _c (MIN)
B1	505+03.50	0.4	1000	0.0180	2230	0.0190	3070	0.0100	71

SCS CURVE NUMBER METHOD										
DRAINAGE AREA	CN	LAG TIME (MIN)	AREA (m ²)	Q (cfs)						
				2 YR	5 YR	10 YR	25 YR	50 YR	100 YR	
B1	88.0	42.6	0.405	308.4	464.4	587.5	755.8	886.5	1025.4	



9/27/2022



 MATTHEW SANNER
 135459
 LICENSED PROFESSIONAL ENGINEER

DocuSigned by:


- NOTES: 102EF1917E2C49D...
- DRAINAGE AREAS DELINEATED BASED ON TNRS 2016 CENTRAL TEXAS LIDAR 2 FT CONTOURS
 - DRAINAGE AREA B1 INCLUDES DRAINAGE AREAS 1 & 2
 - DESIGN STORM IS 10-YR FOR CULVERTS AND 25-YR FOR BRIDGE CLASS CULVERT
 - NOAA ATLAS-14 AMS-BASED PRECIPITATION FREQUENCIES WERE USED FOR FLOW CALCS
 - CULVERT STA. 546+49.22 IS IN ZONE A OF THE FEMA FLOODPLAIN, PANEL 48491C0320F EFF. 12/20/2019
 - PLANS WERE SENT TO CITY OF WEIR FPA, THE HONORABLE MERVIN WALKER, ON 09/27/2022.

SCALE (IN FEET):
 0 2,125

**Austin District
Central Design**


 Texas Department of Transportation

**FM 971
DRAINAGE AREA
MAP**

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
AUS		WILLIAMSON		93

DATE: 9/27/2022 1:26:30 PM
 FILE: \\txdot\projectwiseonline.com\FXD014\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\5. Drainage\CUL HYD DATA\FM0971 CULVERT HYDRAULIC DATA STA. 479+50.70

HY-8 EXISTING CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	92.4	92.4	727.74	2.45	0.23	1-S2n	0.68	1.49	0.86	1.17	11.93	4.43
5 YR	125.8	125.8	728.30	3.01	0.62	1-S2n	0.82	1.82	1.09	1.33	12.79	4.79
* 10 YR	152.5	152.5	728.71	3.42	0.93	1-S2n	0.93	2.07	1.27	1.44	13.35	5.02
25 YR	190.0	190.0	729.24	3.95	1.34	1-S2n	1.08	2.40	1.51	1.57	14.00	5.31
50 YR	220.4	220.4	729.64	4.35	1.68	1-S2n	1.19	2.65	1.69	1.67	14.45	5.51
100 YR	253.6	253.6	730.07	4.78	2.05	1-S2n	1.30	2.91	1.89	1.76	14.90	5.71

* DESIGN STORM

 Straight Culvert
 Inlet Elevation (invert): 725.29 ft, Outlet Elevation (invert): 723.98 ft
 Culvert Length: 47.27 ft, Culvert Slope: 0.0277

 Site Data - EXISTING
 Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 725.29 ft
 Outlet Station: 47.25 ft
 Outlet Elevation: 723.98 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 479+50.70-EXIST
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 3.31 ft
 Side Slope (H:V): 12.40 (:1)
 Channel Slope: 0.0400
 Channel Manning's n: 0.0500
 Channel Invert Elevation: 723.98 ft

Culvert Data Summary - EXISTING
 Barrel Shape: Concrete Box
 Barrel Span: 9.00 ft
 Barrel Rise: 7.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Square Edge (0° flare) Wingwall
 Inlet Depression: None

HY-8 PROPOSED CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	92.4	92.4	727.74	2.453	0.045	1-S2n	0.681	1.485	0.841	1.17	12.21	4.43
5 YR	125.8	125.8	728.30	3.013	0.435	1-S2n	0.829	1.824	1.069	1.328	13.08	4.79
* 10 YR	152.5	152.5	728.72	3.425	0.737	1-S2n	0.939	2.074	1.243	1.437	13.64	5.02
25 YR	190.0	190.0	729.24	3.949	1.154	1-S2n	1.085	2.401	1.476	1.571	14.30	5.31
50 YR	220.4	220.4	729.64	4.352	1.492	1-S2n	1.194	2.651	1.657	1.667	14.78	5.51
100 YR	253.6	253.6	730.07	4.778	1.862	1-S2n	1.31	2.911	1.851	1.764	15.23	5.71

* DESIGN STORM

 Straight Culvert
 Inlet Elevation (invert): 725.29 ft, Outlet Elevation (invert): 723.79 ft
 Culvert Length: 55.27 ft, Culvert Slope: 0.0271

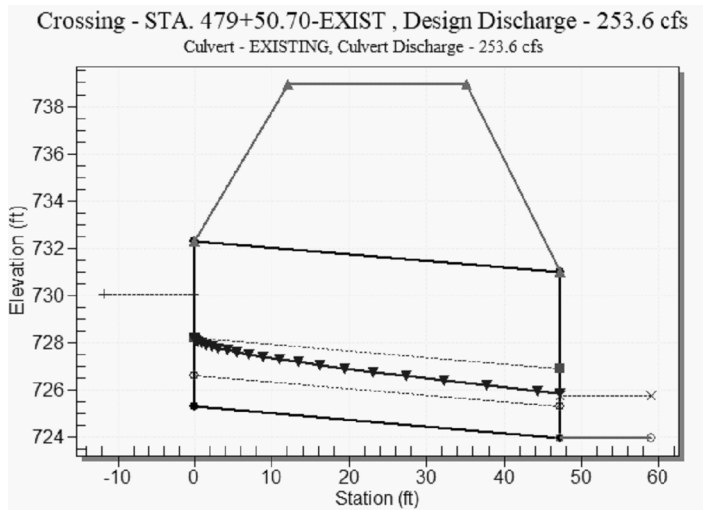
 Site Data - PROPOSED
 Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 725.29 ft
 Outlet Station: 55.25 ft
 Outlet Elevation: 723.79 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 479+50.70-PROP
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 3.31 ft
 Side Slope (H:V): 12.40 (:1)
 Channel Slope: 0.0400
 Channel Manning's n: 0.0500
 Channel Invert Elevation: 723.80 ft

Culvert Data Summary - PROPOSED
 Barrel Shape: Concrete Box
 Barrel Span: 9.00 ft
 Barrel Rise: 7.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Square Edge (0° flare) Wingwall
 Inlet Depression: None

EXISTING CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	727.74	92.4	92.4	0	1
5 YR	728.30	125.8	125.8	0	1
10 YR	728.71	152.5	152.5	0	1
25 YR	729.24	190.0	190.0	0	1
50 YR	729.64	220.4	220.4	0	1
100 YR	730.07	253.6	253.6	0	1
Overtopping	733.31	511.8	511.8	0	Overtopping

Roadway Data for Crossing: STA 479+50.70-EXIST
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No. STA Elev (ft) Coord No. STA Elev (ft)
 0 0 738.95 7 555.67 733.75
 1 80.81 737.77 8 634.22 734.45
 2 161.57 736.32 9 711.45 735.14
 3 238.88 734.94 10 785.83 735.98
 4 319.37 733.85 11 860.70 736.72
 5 397.84 733.31 12 936.18 737.63
 6 477.39 733.4

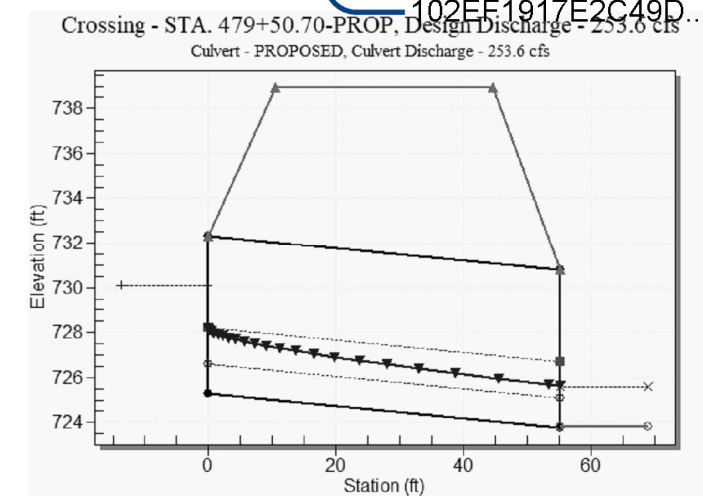
Roadway Surface: Paved
 Roadway Top Width: 23.2 ft



PROPOSED CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	727.74	92.4	92.4	0	1
5 YR	728.30	125.8	125.8	0	1
10 YR	728.72	152.5	152.5	0	1
25 YR	729.24	190.0	190.0	0	1
50 YR	729.64	220.4	220.4	0	1
100 YR	730.07	253.6	253.6	0	1
Overtopping	733.31	511.7	511.7	0	Overtopping

Roadway Data for Crossing: STA 479+50.70-PROP
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No. STA Elev (ft) Coord No. STA Elev (ft)
 0 0 738.95 7 555.67 733.75
 1 80.81 737.77 8 634.22 734.45
 2 161.57 736.32 9 711.45 735.14
 3 238.88 734.94 10 785.83 735.98
 4 319.37 733.85 11 860.70 736.72
 5 397.84 733.31 12 936.18 737.63
 6 477.39 733.4

Roadway Surface: Paved
 Roadway Top Width: 34.00 ft



9/27/2022
 Documented by
 Matthew Sanner
 135459
 102EF1917E2C49D...

**Austin District
 Central Design**

Texas Department of Transportation

**FM 971
 CULVERT
 HYDRAULIC DATA
 STA. 479+50.70**

SHEET 1 OF 5

© 2023	CONT	SECT	JOB	HIGHWAY
DS:	CK:	2690	01 038	FM 971
DW:	CK:	DIST	COUNTY	SHEET NO.
		AUS	WILLIAMSON	94

DATE: 9/27/2022 1:29:39 PM
 FILE: \\txdot\projectwiseonline.com\FXD014\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\5. Drainage\CUL - HYD DATA\FM0971_CULVERT_HYDRAULIC DATA STA. 482+26.54

HY-8 EXISTING CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	19.0	19.0	732.01	1.868	0.356	1-S2n	0.81	1.277	0.891	0.825	8.76	4.82
5 YR	25.7	25.7	732.35	2.207	0.63	1-S2n	0.942	1.493	1.056	0.924	9.35	5.20
* 10 YR	30.9	30.9	732.58	2.445	0.837	1-S2n	1.034	1.644	1.172	0.99	9.72	5.45
25 YR	38.3	38.3	732.89	2.753	1.137	1-S2n	1.154	1.845	1.324	1.073	10.18	5.75
50 YR	44.2	44.2	733.13	2.985	1.373	1-S2n	1.244	1.989	1.436	1.132	10.52	5.96
100 YR	50.5	50.5	733.37	3.229	1.628	1-S2n	1.334	2.129	1.553	1.190	10.81	6.16

* DESIGN STORM

 Straight Culvert
 Inlet Elevation (invert): 730.14 ft, Outlet Elevation (invert): 729.15 ft
 Culvert Length: 60.01 ft, Culvert Slope: 0.0165

 Site Data - EXISTING
 Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 730.14 ft
 Outlet Station: 60.00 ft
 Outlet Elevation: 729.15 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 482+26.54-EXIST
 Tailwater Channel Option: Triangular Channel
 Side Slope (H:V): 5.79 (L:1)
 Channel Slope: 0.1260
 Channel Manning's n: 0.0600
 Channel Invert Elevation: 729.15 ft

Culvert Data Summary - EXISTING
 Barrel Shape: Circular
 Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Mitered to Conform to Slope
 Inlet Depression: None

HY-8 PROPOSED CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	19.0	19.0	731.95	1.706	0.239	1-S2n	0.81	1.277	0.885	0.597	8.86	5.50
5 YR	25.7	25.7	732.25	2.006	0.499	1-S2n	0.942	1.493	1.044	0.726	9.50	6.12
* 10 YR	30.9	30.9	732.50	2.256	0.693	1-S2n	1.034	1.644	1.161	0.819	9.85	6.52
25 YR	38.3	38.3	732.81	2.574	0.968	1-S2n	1.154	1.845	1.311	0.944	10.31	7.01
50 YR	44.2	44.2	733.04	2.804	1.182	1-S2n	1.243	1.989	1.424	1.039	10.64	7.35
100 YR	50.5	50.5	733.27	3.033	1.409	1-S2n	1.334	2.129	1.537	1.136	10.96	7.68

* DESIGN STORM

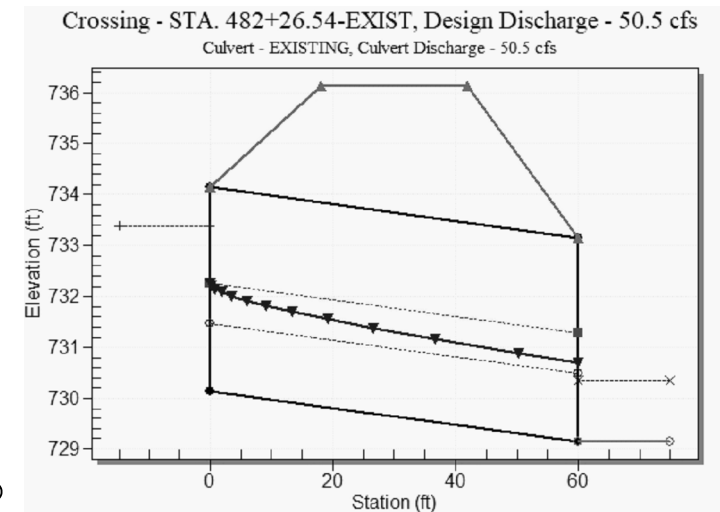
 Straight Culvert
 Inlet Elevation (invert): 730.24 ft, Outlet Elevation (invert): 729.15 ft
 Culvert Length: 66.01 ft, Culvert Slope: 0.0165

 Site Data - PROPOSED
 Site Data Option: Culvert Invert Data
 Inlet Station: -6.00 ft
 Inlet Elevation: 730.24 ft
 Outlet Station: 60.00 ft
 Outlet Elevation: 729.15 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 482+26.54-PROP
 Tailwater Channel Option: Rectangular Channel
 Bottom Width: 5.79 ft
 Channel Slope: 0.1260
 Channel Manning's n: 0.0600
 Channel Invert Elevation: 729.15 ft

Culvert Data Summary - PROPOSED
 Barrel Shape: Circular
 Barrel Diameter: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Beveled Edge (1.5:1)
 Inlet Depression: None

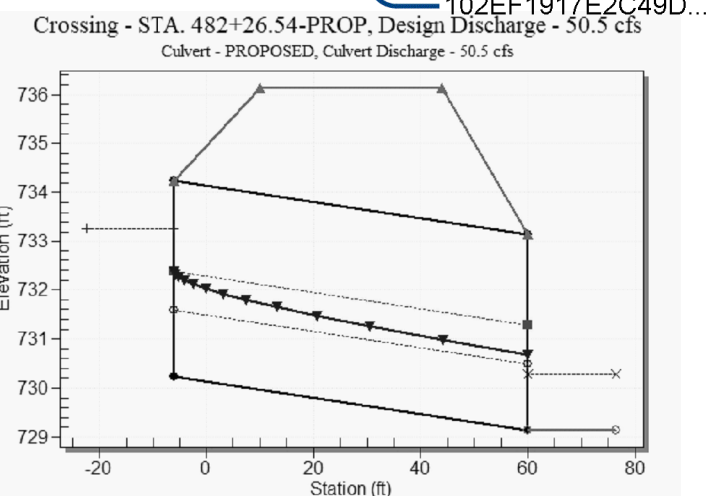
EXISTING CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	732.01	19.0	19.0	0	1
5 YR	732.35	25.7	25.7	0	1
10 YR	732.58	30.9	30.9	0	1
25 YR	732.89	38.3	38.3	0	1
50 YR	733.13	44.2	44.2	0	1
100 YR	733.37	50.5	50.5	0	1
Overtopping	734.04	67.0	67.0	0	Overtopping

Roadway Data for Crossing: STA 482+26.54-EXIST
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No. STA Elev (ft) Coord No. STA Elev (ft)
 0 0 736.14 7 426.9 738.9
 1 60.17 736.82 8 492.46 738.64
 2 121.07 737.55 9 555.1 737.9
 3 182.3 738.08 10 624.66 736.82
 4 244.26 738.64 11 690.15 735.68
 5 302.71 738.93 12 755.68 734.04
 6 363.2 739.05
 Roadway Surface: Paved
 Roadway Top Width: 23.85 ft



PROPOSED CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	731.95	19.0	19.0	0	1
5 YR	732.25	25.7	25.7	0	1
10 YR	732.50	30.9	30.9	0	1
25 YR	732.81	38.3	38.3	0	1
50 YR	733.04	44.2	44.2	0	1
100 YR	733.27	50.5	50.5	0	1
Overtopping	734.04	73.8	73.8	0	Overtopping

Roadway Data for Crossing: STA 482+26.54-PROP
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No. STA Elev (ft) Coord No. STA Elev (ft)
 0 0 736.14 7 426.9 738.9
 1 60.17 736.82 8 492.46 738.64
 2 121.07 737.55 9 555.1 737.9
 3 182.3 738.08 10 624.66 736.82
 4 244.26 738.64 11 690.15 735.68
 5 302.71 738.93 12 755.68 734.04
 6 363.2 739.05
 Roadway Surface: Paved
 Roadway Top Width: 34.00 ft



9/27/2022
 Matthew Sanner
 135459
 LICENSED PROFESSIONAL ENGINEER
 STATE OF TEXAS
 102EF1917E2C49D...

**Austin District
 Central Design**

Texas Department of Transportation

**FM 971
 CULVERT
 HYDRAULIC DATA
 STA. 482+26.54**

SHEET 2 OF 5

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
AUS		WILLIAMSON		95

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HY-8 EXISTING CULVERT ANALYSIS SUMMARY TABLE

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	5.8	5.8	722.56	1.271	0.0*	1-S2n	0.526	0.849	0.555	0.899	7.889	1.39
5 YR	7.8	7.8	722.79	1.499	0.0*	1-S2n	0.613	0.994	0.652	1.005	8.470	1.497
* 10 YR	9.4	9.4	722.96	1.674	0.022	1-S2n	0.676	1.092	0.723	1.078	8.859	1.569
25 YR	11.6	11.6	723.22	1.928	0.321	1-S2n	0.757	1.218	0.817	1.166	9.290	1.653
50 YR	13.3	13.3	723.44	2.148	0.57	5-S2n	0.816	1.310	0.891	1.227	9.499	1.711
100 YR	15.1	13.8	723.51	2.219	0.647	5-S2n	0.833	1.335	0.911	1.287	9.593	1.766

* DESIGN STORM

Straight Culvert

Inlet Elevation (invert): 721.29 ft, Outlet Elevation (invert): 719.89 ft
Culvert Length: 64.02 ft, Culvert Slope: 0.0219

Site Data - EXISTING

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 721.29 ft

Outlet Station: 64.00 ft

Outlet Elevation: 719.89 ft

Number of Barrels: 1

Tailwater Channel Data - STA. 493+05.71-EXIST

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 5.16 (=:1)

Channel Slope: 0.0262

Channel Manning's n: 0.0900

Channel Invert Elevation: 719.92 ft

Culvert Data Summary - EXISTING

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

EXISTING CULVERT FLOW TABLE

Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	722.56	5.8	5.8	0	1
5 YR	722.79	7.8	7.8	0	1
10 YR	722.96	9.4	9.4	0	1
25 YR	723.22	11.6	11.6	0	1
50 YR	723.44	13.3	13.3	0	1
100 YR	723.51	15.1	13.8	1.23	7
Overtopping	723.48	13.6	13.6	0	Overtopping

Roadway Data for Crossing: STA. 493+05.71-EXIST

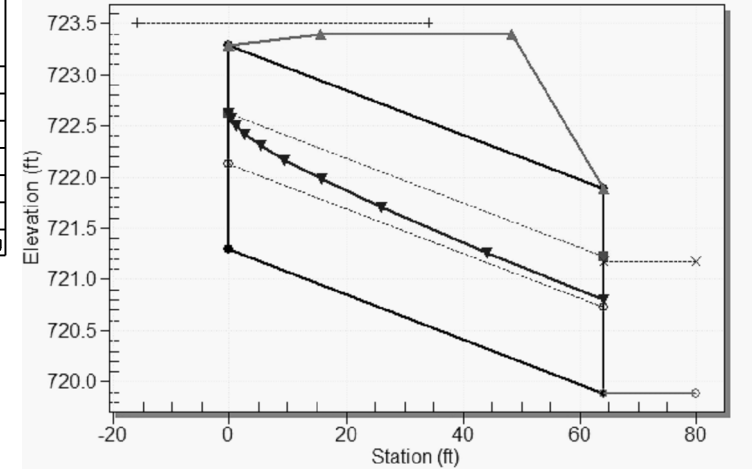
Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

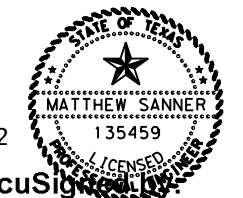
Coord No.	STA	Elev (ft)	Coord No.	STA	Elev (ft)
0	0	723.39	8	165.28	724.81
1	20.46	723.48	9	185.46	724.93
2	41.67	723.59	10	207.44	725.00
3	61.85	723.83	11	226.28	725.07
4	83.16	724.16	12	246.85	725.07
5	103.17	724.36	13	268.08	724.98
6	123.05	724.49	14	288.88	724.84
7	144.27	724.68			

Roadway Surface: Paved
Roadway Top Width: 32.79 ft

Crossing - STA. 493+05.71-EXIST, Design Discharge - 15.1 cfs
Culvert - EXISTING, Culvert Discharge - 13.8 cfs



9/27/2022



DocuSign

HY-8 PROPOSED CULVERT ANALYSIS SUMMARY TABLE

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	5.8	5.8	722.56	1.271	0.0*	1-S2n	0.526	0.849	0.552	0.422	7.95	6.30
5 YR	7.8	7.8	722.79	1.499	0.0*	1-S2n	0.613	0.994	0.650	0.472	8.51	6.79
* 10 YR	9.4	9.4	722.96	1.674	0.0*	1-S2n	0.676	1.092	0.720	0.506	8.91	7.11
25 YR	11.6	11.6	723.22	1.928	0.240	1-S2n	0.756	1.218	0.816	0.548	9.31	7.49
50 YR	13.3	13.3	723.44	2.148	0.492	5-S2n	0.815	1.310	0.887	0.577	9.56	7.75
100 YR	15.1	13.8	723.51	2.219	0.57	5-S2n	0.833	1.335	0.905	0.605	9.67	8.00

* DESIGN STORM

Straight Culvert

Inlet Elevation (invert): 721.29 ft, Outlet Elevation (invert): 719.80 ft
Culvert Length: 68.02 ft, Culvert Slope: 0.0219

Site Data - PROPOSED

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 721.29 ft

Outlet Station: 68.00 ft

Outlet Elevation: 719.80 ft

Number of Barrels: 1

Tailwater Channel Data - STA. 493+05.71-PROP

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 5.16 (=:1)

Channel Slope: 0.0211

Channel Manning's n: 0.0120

Channel Invert Elevation: 719.66 ft

Culvert Data Summary - PROPOSED

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

PROPOSED CULVERT FLOW TABLE

Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	722.56	5.8	5.8	0	1
5 YR	722.79	7.8	7.8	0	1
10 YR	722.96	9.4	9.4	0	1
25 YR	723.22	11.6	11.6	0	1
50 YR	723.44	13.3	13.3	0	1
100 YR	723.51	15.1	13.8	1.23	7
Overtopping	723.48	13.6	13.6	0	Overtopping

Roadway Data for Crossing: STA. 493+05.71-PROP

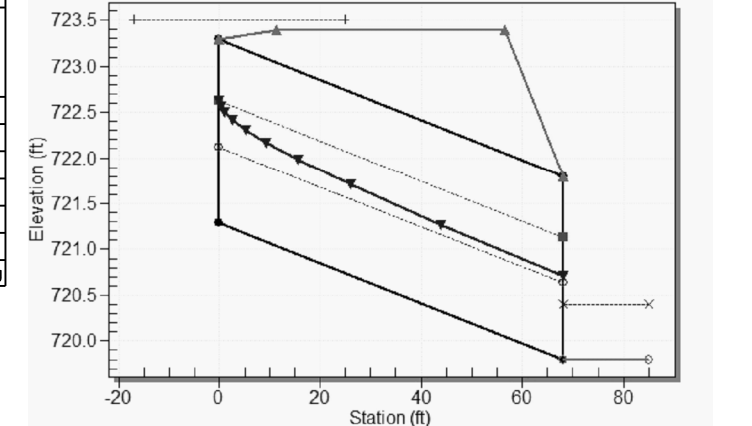
Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	STA	Elev (ft)	Coord No.	STA	Elev (ft)
0	0	723.39	8	165.28	724.81
1	20.46	723.48	9	185.46	724.93
2	41.67	723.59	10	207.44	725
3	61.85	723.83	11	226.28	725.07
4	83.16	724.16	12	246.85	725.07
5	103.17	724.36	13	268.08	724.98
6	123.05	724.49	14	288.88	724.84
7	144.27	724.68			

Roadway Surface: Paved
Roadway Top Width: 45.12 ft

Crossing - STA. 493+05.71-PROP, Design Discharge - 15.1 cfs
Culvert - PROPOSED, Culvert Discharge - 13.8 cfs



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CONT: 2690
SECT: 01
JOB: 038
HIGHWAY: FM 971

DIST: AUS
COUNTY: WILLIAMSON
SHEET NO.: 96

SHEET 3 OF 5

DATE: 9/27/2022 1:33:35 PM
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HY-8 EXISTING CULVERT ANALYSIS SUMMARY TABLE

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	85.9	85.9	664.12	2.79	1.629	1-S2n	1.363	1.672	1.446	0.369	8.49	10.59
5 YR	116.9	116.9	664.77	3.443	2.246	1-S2n	1.683	2.054	1.796	0.442	9.30	11.87
* 10 YR	141.7	141.7	665.29	3.964	2.768	1-S2n	1.924	2.335	2.058	0.495	9.84	12.73
25 YR	176.6	176.6	666.06	4.735	3.554	5-S2n	2.249	2.704	2.408	0.564	10.48	13.79
50 YR	204.8	204.8	666.75	5.417	4.238	5-S2n	2.501	2.984	2.677	0.615	10.93	14.55
100 YR	235.6	227.4	667.34	6.013	5.219	5-S2n	2.698	3.200	2.886	0.667	11.25	15.29

* DESIGN STORM

 Straight Culvert
 Inlet Elevation (invert): 661.33 ft, Outlet Elevation (invert): 661.01 ft
 Culvert Length: 64.00 ft, Culvert Slope: 0.0050

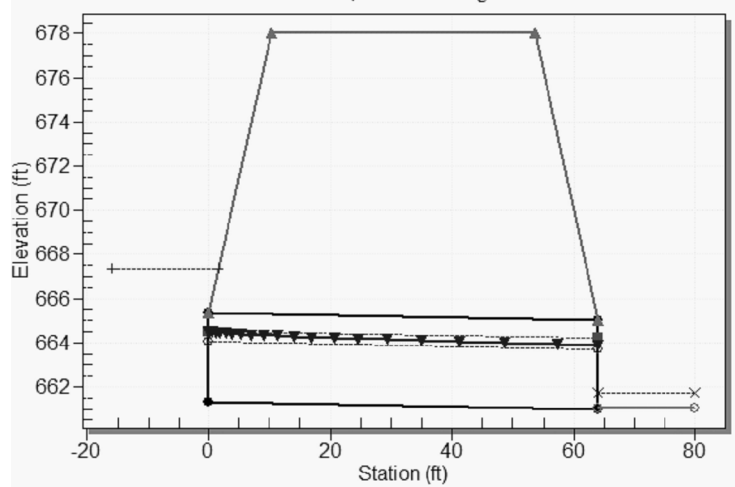
 Site Data - EXISTING
 Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 661.33 ft
 Outlet Station: 64.00 ft
 Outlet Elevation: 661.01 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 546+49.22-EXIST
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 20.70 ft
 Side Slope (H:V): 3.57 (:1)
 Channel Slope: 0.1880
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 661.04 ft
 Culvert Data Summary - EXISTING
 Barrel Shape: Concrete Box
 Barrel Span: 7.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Square Edge (0° flare) Wingwall
 Inlet Depression: None

EXISTING CULVERT FLOW TABLE

Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	664.12	85.9	85.9	0	1
5 YR	664.77	116.9	116.9	0	1
10 YR	665.29	141.7	141.7	0	1
25 YR	666.06	176.6	176.6	0	1
50 YR	666.75	204.8	204.8	0	1
100 YR	667.34	235.6	227.4	7.98	15
Overtopping	667.16	220.6	220.6	0	Overtopping

Roadway Data for Crossing: STA. 546+49.22-EXIST
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No STA Elev (ft) Coord No STA Elev (ft)
 0 0 678.05 8 805.2 667.16
 1 100.26 676.03 9 907.91 667.77
 2 200.47 674.38 10 1007.38 669.27
 3 300.69 672.78 11 1108.73 671.58
 4 404.12 671.34 12 1209.5 673.84
 5 503.22 670 13 1309.71 675.95
 6 604.57 668.5 14 1411 677.57
 7 704.99 667.43
 Roadway Surface: Paved
 Roadway Top Width: 43.21 ft

Crossing - STA. 546+49.22-EXIST, Design Discharge - 235.6 cfs
 Culvert - EXISTING, Culvert Discharge - 227.4 cfs



HY-8 PROPOSED CULVERT ANALYSIS SUMMARY TABLE

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	85.9	85.9	663.98	2.606	1.447	1-S2n	1.363	1.672	1.431	0.435	8.58	8.87
5 YR	116.9	116.9	664.56	3.194	2.011	1-S2n	1.683	2.054	1.776	0.522	9.41	9.92
* 10 YR	141.7	141.7	664.99	3.625	2.478	1-S2n	1.924	2.335	2.036	0.585	9.94	10.64
25 YR	176.6	176.6	665.57	4.200	3.170	5-S2n	2.249	2.704	2.382	0.665	10.59	11.51
50 YR	204.8	204.8	666.03	4.658	3.763	5-S2n	2.501	2.984	2.65	0.725	11.04	12.13
100 YR	235.6	235.6	666.54	5.171	4.811	5-S2n	2.769	3.277	2.933	0.787	11.48	12.74

* DESIGN STORM

 Straight Culvert
 Inlet Elevation (invert): 661.37 ft, Outlet Elevation (invert): 660.93 ft
 Culvert Length: 88.00 ft, Culvert Slope: 0.0050

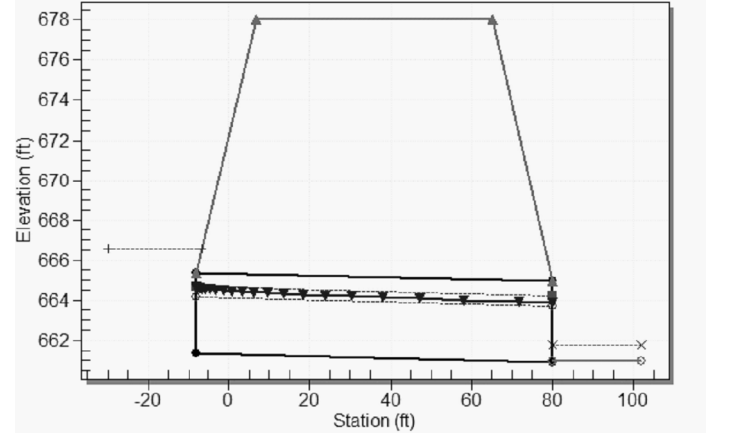
 Site Data - PROPOSED
 Site Data Option: Culvert Invert Data
 Inlet Station: -8.00 ft
 Inlet Elevation: 661.37 ft
 Outlet Station: 80.00 ft
 Outlet Elevation: 660.93 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 546+49.22-PROP
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 20.70 ft
 Side Slope (H:V): 3.57 (:1)
 Channel Slope: 0.1070
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 660.97 ft
 Culvert Data Summary - EXISTING
 Barrel Shape: Concrete Box
 Barrel Span: 7.00 ft
 Barrel Rise: 4.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: 1.5:1 Bevel (18-34° flare) Wingwall
 Inlet Depression: None


PROPOSED CULVERT FLOW TABLE

Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	663.98	85.9	85.9	0	1
5 YR	664.56	116.9	116.9	0	1
10 YR	664.99	141.7	141.7	0	1
25 YR	665.57	176.6	176.6	0	1
50 YR	666.03	204.8	204.8	0	1
100 YR	666.54	235.6	235.6	0	1
Overtopping	667.16	270.8	270.8	0	Overtopping


Roadway Data for Crossing: STA. 546+49.22-PROP
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No STA Elev (ft) Coord No STA Elev (ft)
 0 0 678.05 8 805.2 667.16
 1 100.26 676.03 9 907.91 667.77
 2 200.47 674.38 10 1007.38 669.27
 3 300.69 672.78 11 1108.73 671.58
 4 404.12 671.34 12 1209.5 673.84
 5 503.22 670 13 1309.71 675.95
 6 604.57 668.5 14 1411 677.57
 7 704.99 667.43
 Roadway Surface: Paved
 Roadway Top Width: 58.53 ft

Crossing - STA. 546+49.22-PROP, Design Discharge - 235.6 cfs
 Culvert - PROPOSED, Culvert Discharge - 235.6 cfs



9/27/2022
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 STATE OF TEXAS
 MATTHEW SANNER
 135459
 LICENSED PROFESSIONAL ENGINEER

**Austin District
 Central Design**


Texas Department of Transportation

**FM 971
 CULVERT
 HYDRAULIC DATA
 STA. 546+49.22**

SHEET 4 OF 5

© 2023	CONT	SECT	JOB	HIGHWAY
DS:	CK:	2690	01 038	FM 971
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		AUS	WILLIAMSON	97

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HY-8 EXISTING CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	12.0	12.0	662.89	1.332	0.406	1-S2n	0.562	0.792	0.599	0.500	6.68	4.26
5 YR	16.1	16.1	663.17	1.614	0.621	1-S2n	0.687	0.963	0.739	0.577	7.26	4.61
* 10 YR	19.3	19.3	663.37	1.812	0.788	1-S2n	0.779	1.087	0.843	0.629	7.63	4.83
25 YR	23.7	23.7	663.63	2.073	1.019	1-S2n	0.900	1.247	0.979	0.693	8.07	5.10
50 YR	27.1	27.1	663.83	2.268	1.201	1-S2n	0.990	1.363	1.081	0.738	8.36	5.29
100 YR	30.7	30.7	664.03	2.471	1.397	1-S2n	1.084	1.482	1.186	0.782	8.63	5.46

* DESIGN STORM

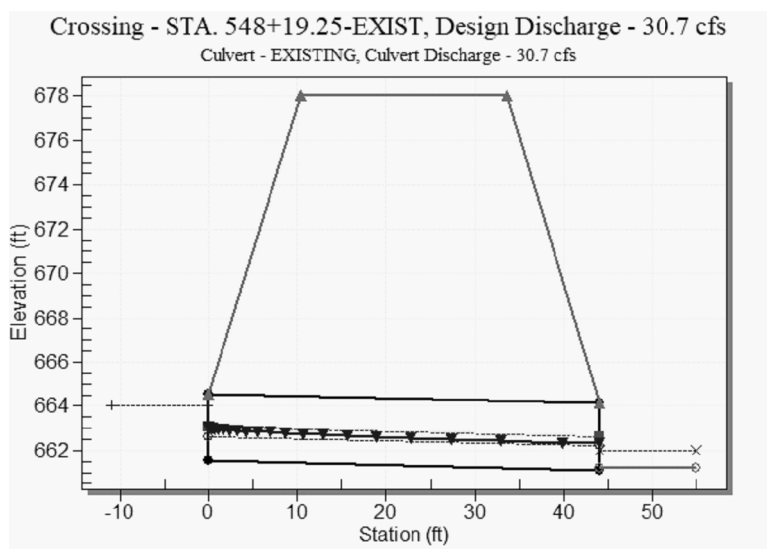
 Straight Culvert
 Inlet Elevation (invert): 661.56 ft, Outlet Elevation (invert): 661.12 ft
 Culvert Length: 44.00 ft, Culvert Slope: 0.0100

 Site Data - EXISTING
 Site Data Option: Culvert Invert Data
 Inlet Station: 0.00 ft
 Inlet Elevation: 661.56 ft
 Outlet Station: 44.00 ft
 Outlet Elevation: 661.12 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 548+19.25-EXIST
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 2.90 ft
 Side Slope (H:V): 5.48 (:1)
 Channel Slope: 0.0320
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 661.21 ft

Culvert Data Summary - EXISTING
 Barrel Shape: Concrete Box
 Barrel Span: 3.00 ft
 Barrel Rise: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: Square Edge (0° flare) Wingwall
 Inlet Depression: None

EXISTING CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	662.89	12.0	12.0	0	1
5 YR	663.17	16.1	16.1	0	1
10 YR	663.37	19.3	19.3	0	1
25 YR	663.63	23.7	23.7	0	1
50 YR	663.83	27.1	27.1	0	1
100 YR	664.03	30.7	30.7	0	1
Overtopping	667.16	76.8	76.8	0	Overtopping

Roadway Data for Crossing: STA. 548+19.25-EXIST
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No STA Elev (ft) Coord No. STA Elev (ft)
 0 0 678.05 8 805.20 667.16
 1 100.26 676.03 9 907.91 667.77
 2 200.47 674.38 10 1007.38 669.27
 3 300.69 672.78 11 1108.73 671.58
 4 404.12 671.34 12 1209.5 673.84
 5 503.22 670.00 13 1309.71 675.95
 6 604.57 668.50 14 1411.00 677.57
 7 704.99 667.43
 Roadway Surface: Paved
 Roadway Top Width: 23.14 ft



HY-8 PROPOSED CULVERT ANALYSIS SUMMARY TABLE												
Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 YR	12.0	12.0	662.87	1.227	0.235	1-S2n	0.562	0.792	0.59	0.345	6.78	7.26
5 YR	16.1	16.1	663.13	1.493	0.441	1-S2n	0.687	0.963	0.726	0.401	7.39	7.88
* 10 YR	19.3	19.3	663.33	1.687	0.599	1-S2n	0.779	1.087	0.828	0.439	7.77	8.29
25 YR	23.7	23.7	663.58	1.935	0.816	1-S2n	0.900	1.247	0.962	0.486	8.21	8.76
50 YR	27.1	27.1	663.76	2.116	0.984	1-S2n	0.99	1.363	1.062	0.519	8.51	9.09
100 YR	30.7	30.7	663.94	2.298	1.165	1-S2n	1.084	1.482	1.164	0.552	8.79	9.40

* DESIGN STORM

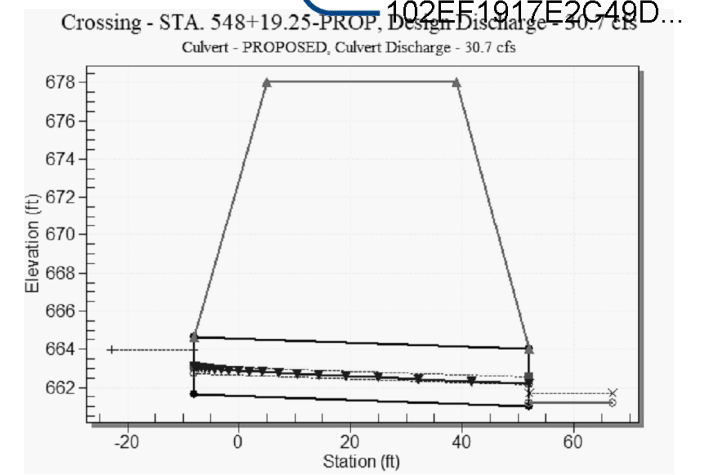
 Straight Culvert
 Inlet Elevation (invert): 661.64 ft, Outlet Elevation (invert): 661.04 ft
 Culvert Length: 60.00 ft, Culvert Slope: 0.0100

 Site Data - PROPOSED
 Site Data Option: Culvert Invert Data
 Inlet Station: -8.00 ft
 Inlet Elevation: 661.64 ft
 Outlet Station: 52.00 ft
 Outlet Elevation: 661.04 ft
 Number of Barrels: 1
 Tailwater Channel Data - STA. 548+19.25-PROP
 Tailwater Channel Option: Trapezoidal Channel
 Bottom Width: 2.90 ft
 Side Slope (H:V): 5.48 (:1)
 Channel Slope: 0.1400
 Channel Manning's n: 0.0300
 Channel Invert Elevation: 661.16 ft

Culvert Data Summary - PROPOSED
 Barrel Shape: Concrete Box
 Barrel Span: 3.00 ft
 Barrel Rise: 3.00 ft
 Barrel Material: Concrete
 Embedment: 0.00 in
 Barrel Manning's n: 0.0120
 Culvert Type: Straight
 Inlet Configuration: 1.5:1 Bevel (90°) Headwall
 Inlet Depression: None

PROPOSED CULVERT FLOW TABLE					
Discharge Names	Headwater Elevation (ft)	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2 YR	662.87	12.0	12.0	0	1
5 YR	663.13	16.1	16.1	0	1
10 YR	663.33	19.3	19.3	0	1
25 YR	663.58	23.7	23.7	0	1
50 YR	663.76	27.1	27.1	0	1
100 YR	663.94	30.7	30.7	0	1
Overtopping	667.16	97.2	97.2	0	Overtopping

Roadway Data for Crossing: STA. 548+19.25-PROP
 Roadway Profile Shape: Irregular Roadway Shape (coordinates)
 Irregular Roadway Cross-Section:
 Coord No STA Elev (ft) Coord No. STA Elev (ft)
 0 0 678.05 8 805.20 667.16
 1 100.26 676.03 9 907.91 667.77
 2 200.47 674.38 10 1007.38 669.27
 3 300.69 672.78 11 1108.73 671.58
 4 404.12 671.34 12 1209.5 673.84
 5 503.22 670 13 1309.71 675.95
 6 604.57 668.5 14 1411.00 677.57
 7 704.99 667.43
 Roadway Surface: Paved
 Roadway Top Width: 34.00 ft



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Texas Department of Transportation

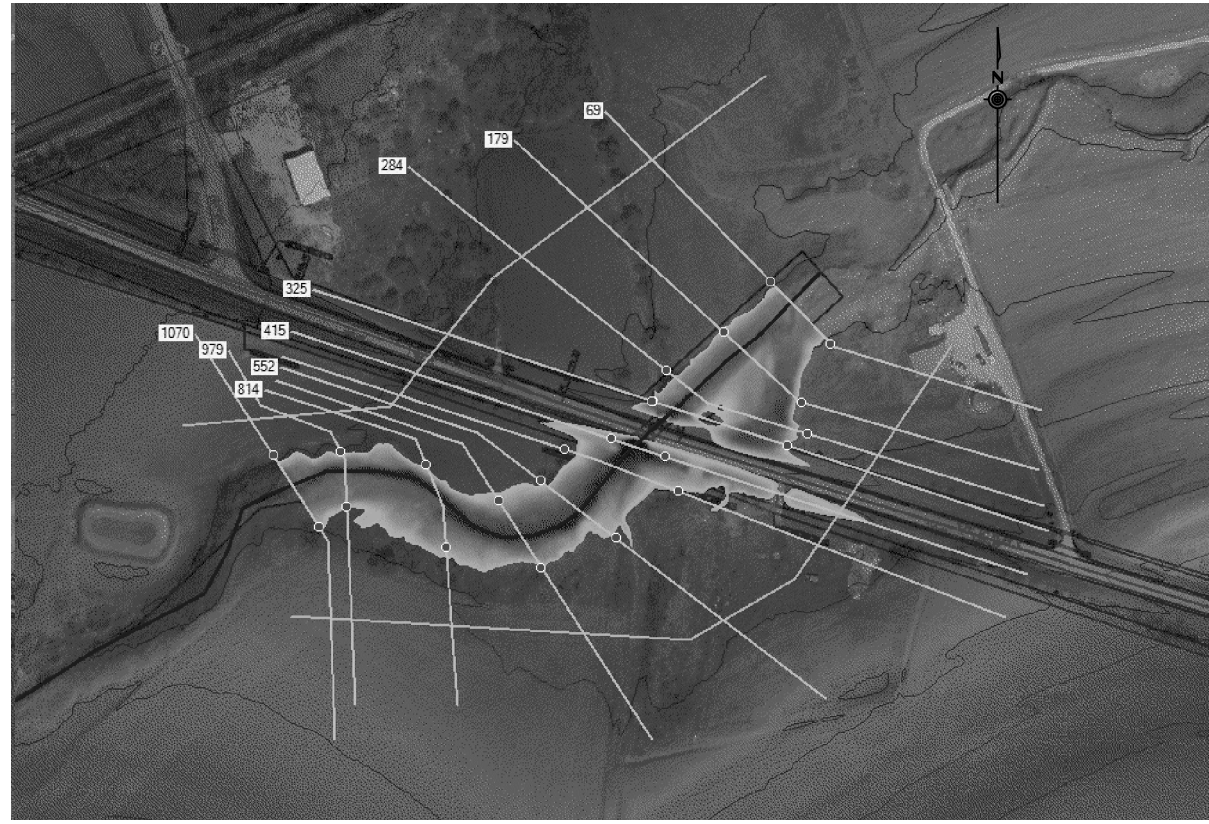
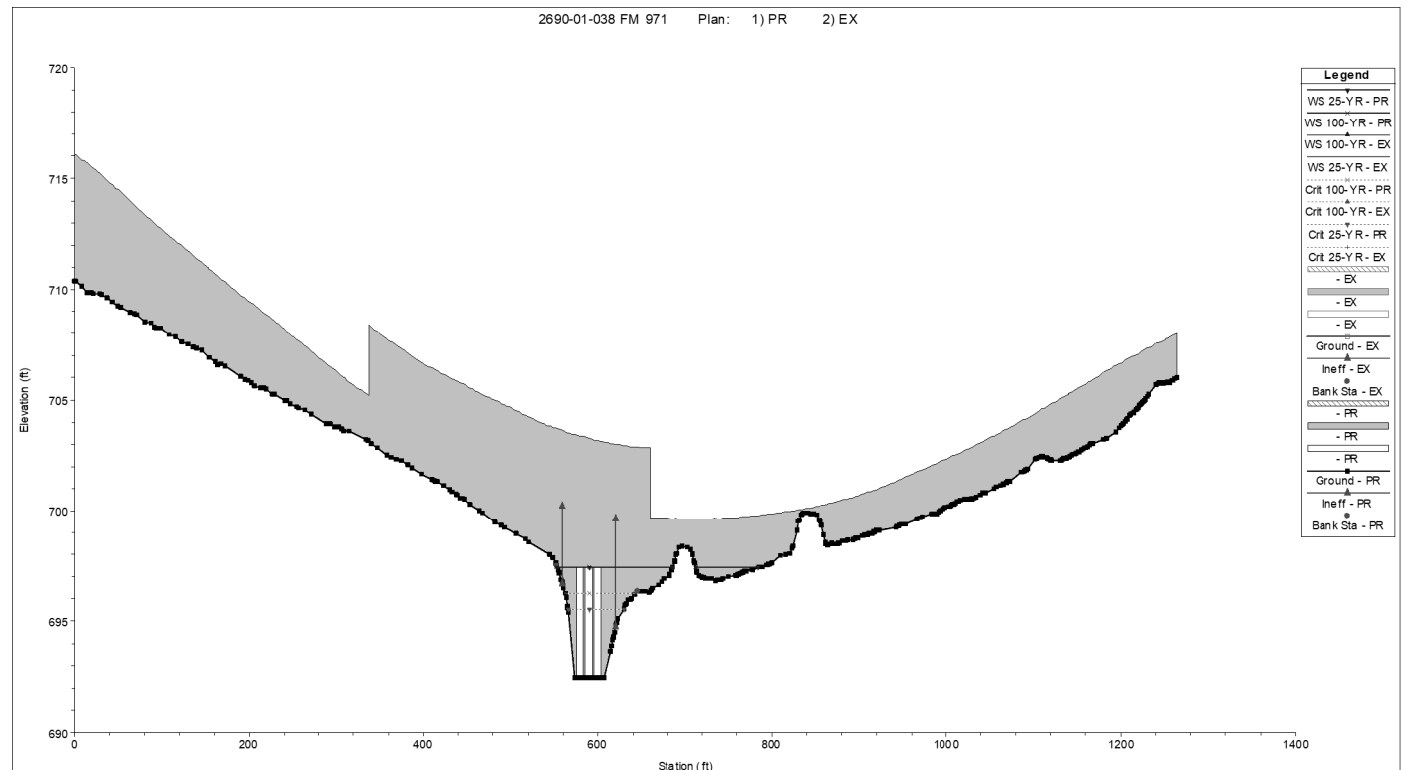
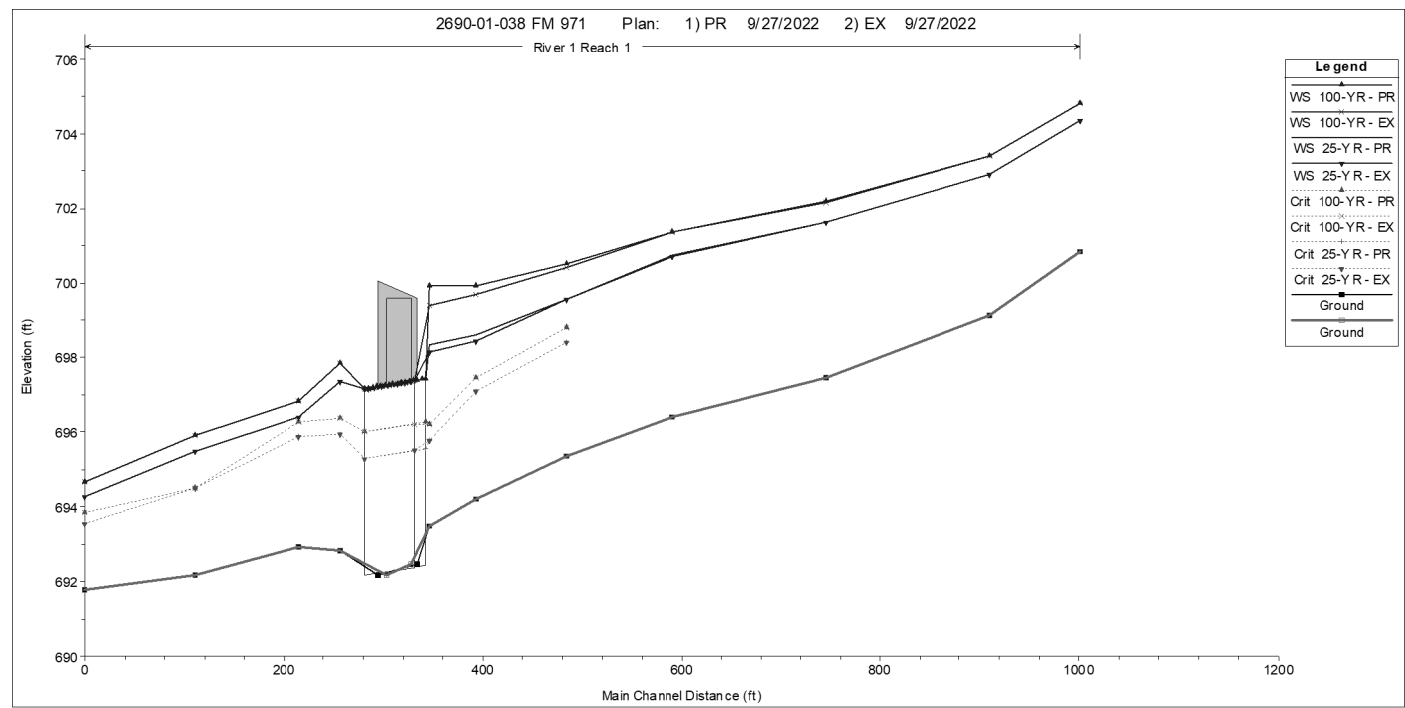
**FM 971
 CULVERT
 HYDRAULIC DATA
 STA. 548+19.25**

SHEET 5 OF 5

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HEC-RAS ANALYSIS OUTPUT (HEC-RAS 5.0.6)												
River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Fr #
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
659	25-YR	PR	755.8	696.40	700.73		700.84	0.006636	2.71	279.32	120.31	0.31
659	25-YR	EX	755.8	696.40	700.73		700.84	0.00667	2.71	278.85	120.21	0.31
659	100-YR	PR	1025.4	696.40	701.38		701.51	0.005574	2.85	363.84	140.21	0.29
659	100-YR	EX	1025.4	696.40	701.36		701.49	0.00572	2.87	360.55	139.31	0.3
552	25-YR	PR	755.8	695.36	699.57	698.4	699.8	0.015336	3.83	197.34	91.29	0.46
552	25-YR	EX	755.8	695.36	699.55	698.4	699.78	0.015686	3.86	195.61	90.81	0.46
552	100-YR	PR	1025.4	695.36	700.53	698.82	700.7	0.010764	3.33	307.83	135.35	0.39
552	100-YR	EX	1025.4	695.36	700.43	698.8	700.62	0.012203	3.48	294.76	132.86	0.41
462	25-YR	PR	755.8	694.22	698.61	697.1	698.75	0.008667	3.04	248.70	106.25	0.35
462	25-YR	EX	755.8	694.22	698.44	697.1	698.61	0.010537	3.27	231.36	102.69	0.38
462	100-YR	PR	1025.4	694.22	699.92	697.46	700.01	0.005289	2.44	419.83	181.55	0.28
462	100-YR	EX	1025.4	694.22	699.68	697.46	699.79	0.006706	2.70	379.43	165.4	0.31
415	25-YR	PR	755.8	693.49	698.35	695.79	698.49	0.003912	2.99	252.73	284.76	0.26
415	25-YR	EX	755.8	693.49	698.14	695.79	698.29	0.004672	3.15	239.63	266.08	0.28
415	100-YR	PR	1025.4	693.49	699.92	696.21	699.93	0.000328	1.02	1041.92	523.14	0.08
415	100-YR	EX	1025.4	693.49	699.40	696.21	699.56	0.003409	3.24	316.29	440.74	0.25
382												
			Culvert									
325	25-YR	PR	755.8	692.84	697.37	695.95	697.66	0.011328	4.29	176.15	178.05	0.42
325	25-YR	EX	755.8	692.84	697.37	695.95	697.66	0.011328	4.29	176.15	178.05	0.42
325	100-YR	PR	1025.4	692.84	697.86	696.37	698.26	0.012975	5.05	203.09	191.41	0.46
325	100-YR	EX	1025.4	692.84	697.86	696.37	698.26	0.012975	5.05	203.09	191.41	0.46
284	25-YR	PR	755.8	692.93	696.4	695.89	696.84	0.035815	5.35	141.24	184.33	0.69
284	25-YR	EX	755.8	692.93	696.4	695.89	696.84	0.035815	5.35	141.24	184.33	0.69
284	100-YR	PR	1025.4	692.93	696.82	696.29	697.35	0.039411	5.86	175.11	209.79	0.73
284	100-YR	EX	1025.4	692.93	696.82	696.29	697.35	0.039416	5.86	175.1	209.78	0.73
179	25-YR	PR	755.8	692.18	695.48	694.5	695.56	0.005393	2.25	336.51	160.73	0.27
179	25-YR	EX	755.8	692.18	695.48	694.5	695.56	0.005393	2.25	336.51	160.73	0.27
179	100-YR	PR	1025.4	692.18	695.91	694.51	696.01	0.005429	2.52	407.23	167.57	0.28
179	100-YR	EX	1025.4	692.18	695.91	694.51	696.01	0.005428	2.52	407.25	167.57	0.28
69	25-YR	PR	755.8	691.78	694.26	693.55	694.5	0.020908	3.92	192.71	108.93	0.52
69	25-YR	EX	755.8	691.78	694.26	693.55	694.5	0.020908	3.92	192.71	108.93	0.52
69	100-YR	PR	1025.4	691.78	694.65	693.84	694.94	0.020933	4.33	236.93	115.6	0.53
69	100-YR	EX	1025.4	691.78	694.65	693.84	694.94	0.020933	4.33	236.93	115.6	0.53



Austin District
Central Design

Texas Department of Transportation

**FM 971
BRIDGE
HYDRAULIC DATA
STA. 505+03.50**

SHEET 1 OF 1

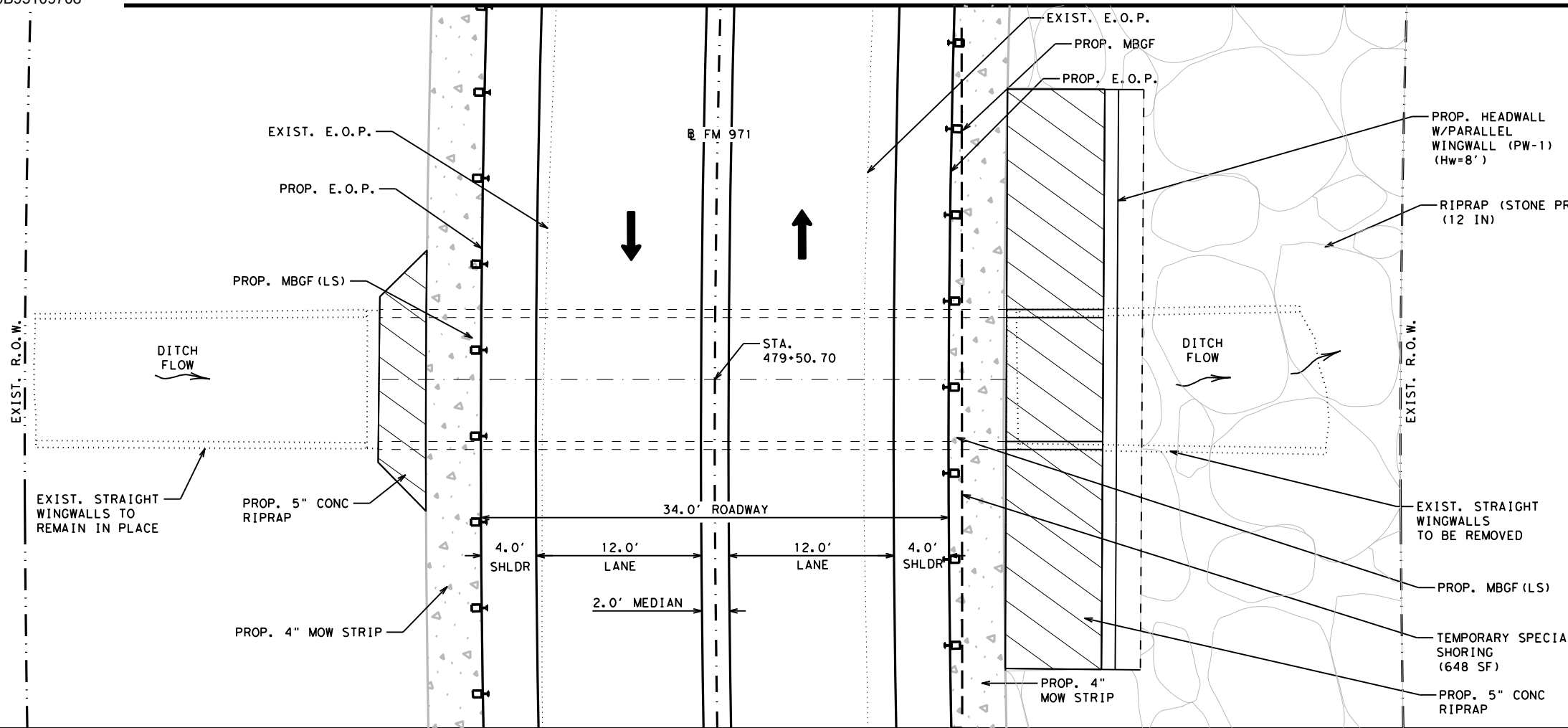
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9/27/2022

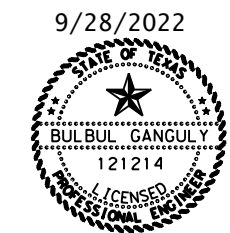
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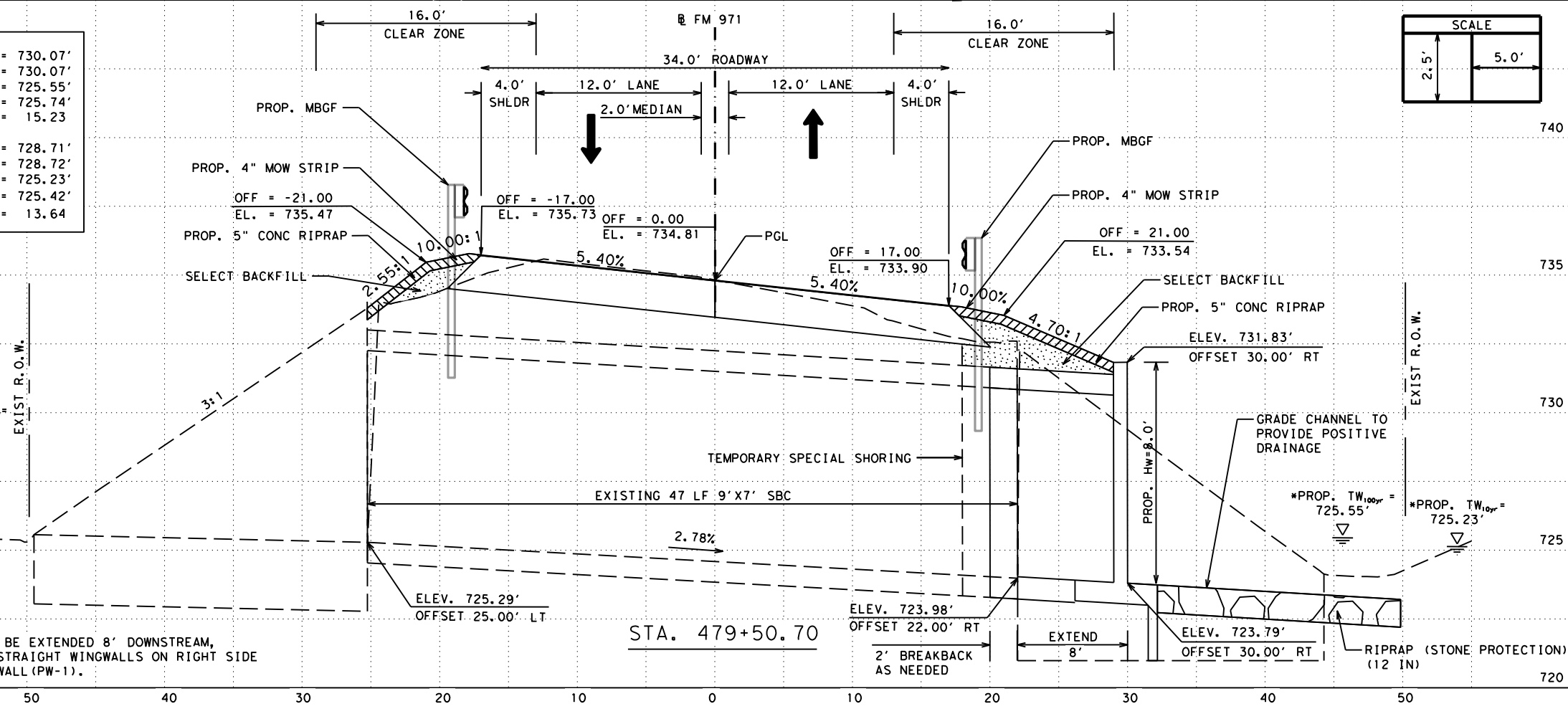
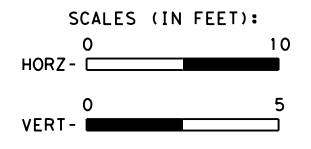
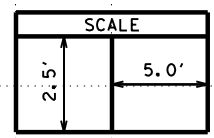


NOTE:
HY-8 CALCULATED ON CULV
HYDRAULIC DATA SHEET
STA. 479+50.70



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PROP. Hw100	=	730.07'
EXIST. Hw100	=	730.07'
PROP. Tw100	=	725.55'
EXIST. Tw100	=	725.74'
V100 fps	=	15.23
PROP. Hw10	=	728.71'
EXIST. Hw10	=	728.72'
PROP. Tw10	=	725.23'
EXIST. Tw10	=	725.42'
V10 fps	=	13.64



DESCRIPTION OF WORK
EXISTING 9'x7' SBC TO BE EXTENDED 8' DOWNSTREAM,
REMOVE 1 EA EXISTING STRAIGHT WINGWALLS ON RIGHT SIDE
AND INSTALL 1 EA WINGWALL (PW-1).

**Austin District
Central Design**

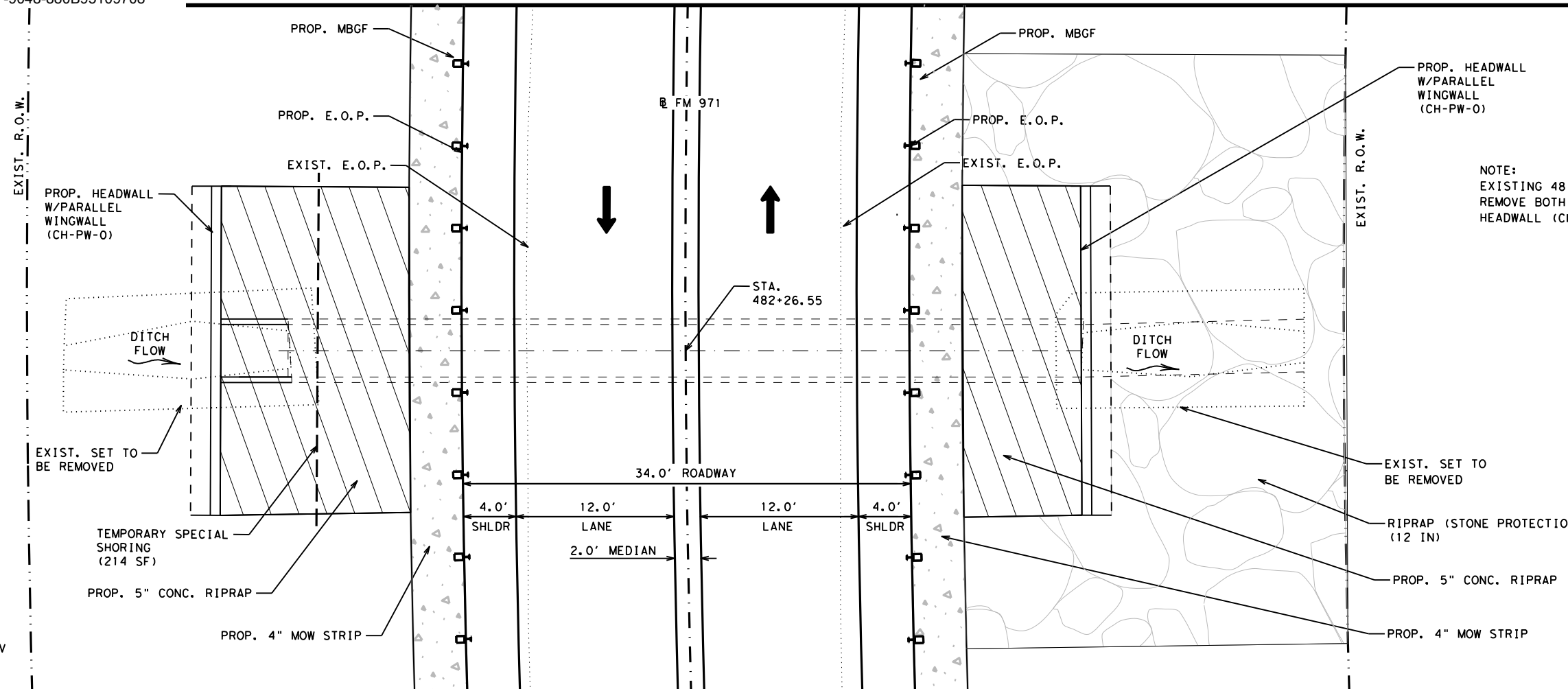
Texas Department of Transportation

**FM-971
CULVERT LAYOUT
STA 479+50.70**

SHEET 1 OF 7

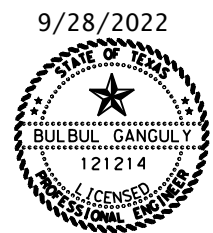
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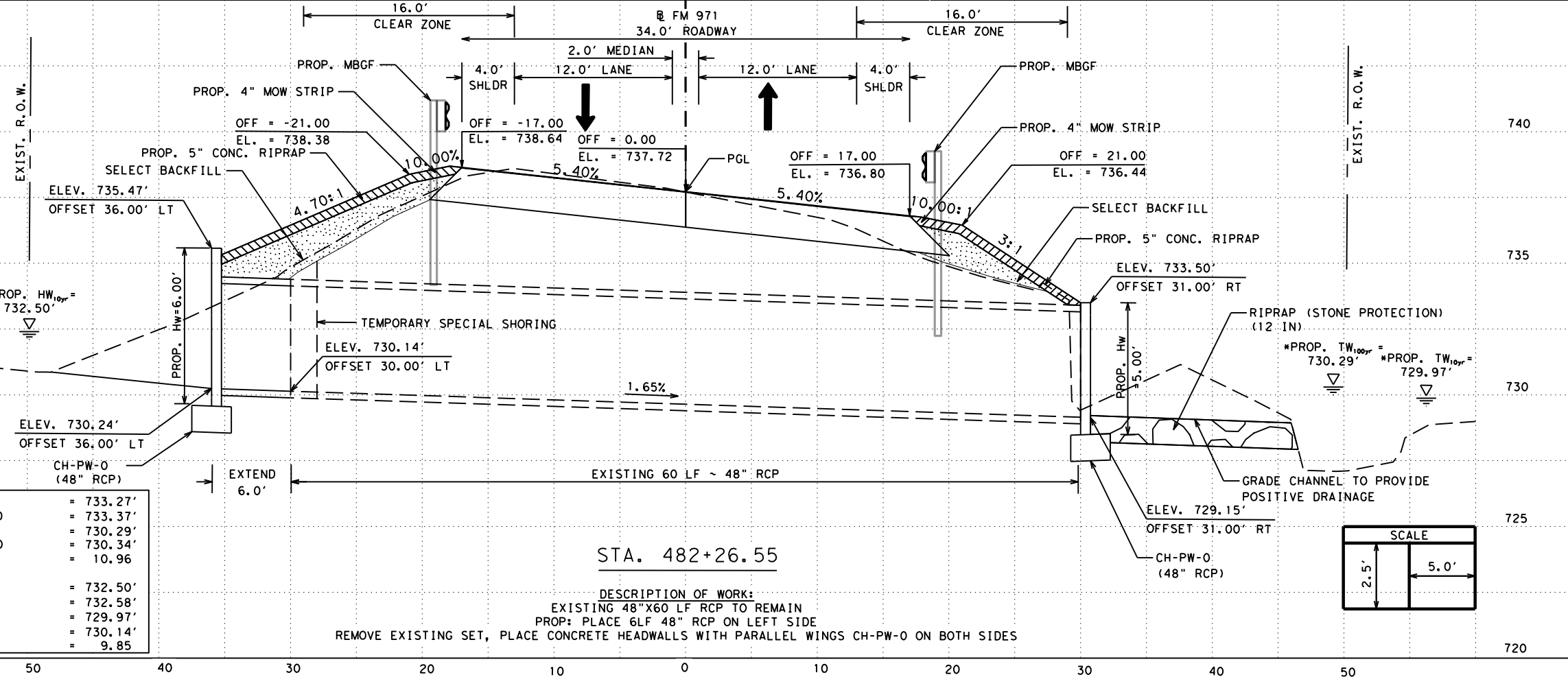


NOTE:
EXISTING 48" RCP TO BE EXTENDED 6' UPSTREAM,
REMOVE BOTH EXISTING SET AND INSTALL 2 EA
HEADWALL (CH-PW-0).

NOTE:
HY-8 CALCULATED ON CULV
HYDRAULIC DATA SHEET
STA. 482+26.55



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Bulbul Ganguly
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PROP. Hw100	=	733.27'
EXIST. Hw100	=	733.37'
PROP. Tw100	=	730.29'
EXIST. Tw100	=	730.34'
V100 fps	=	10.96
PROP. Hw10	=	732.50'
EXIST. Hw10	=	732.58'
PROP. Tw10	=	729.97'
EXIST. Tw10	=	730.14'
V10 fps	=	9.85

DESCRIPTION OF WORK:
EXISTING 48"x60 LF RCP TO REMAIN
PROP: PLACE 6LF 48" RCP ON LEFT SIDE
REMOVE EXISTING SET, PLACE CONCRETE HEADWALLS WITH PARALLEL WINGS CH-PW-0 ON BOTH SIDES



Austin District
Central Design

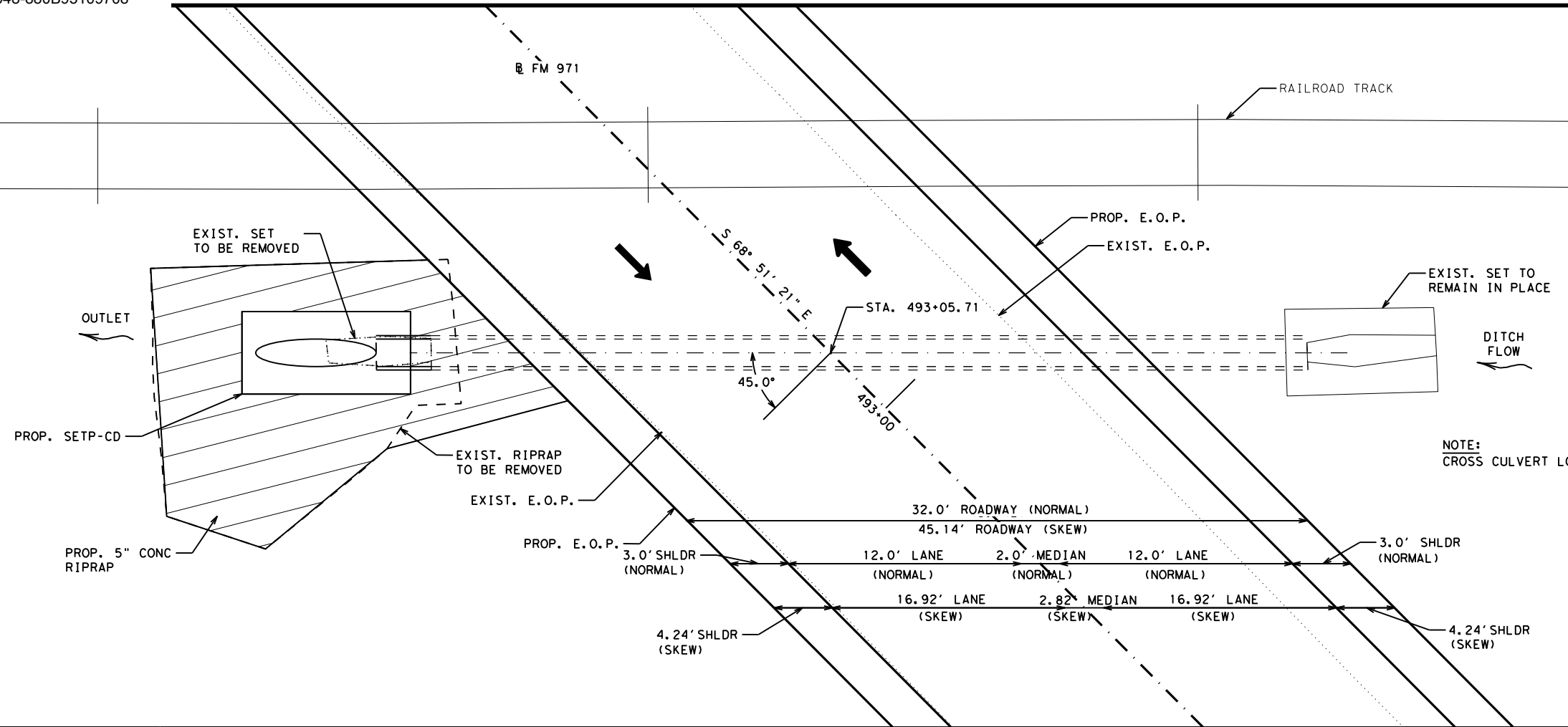
Texas Department of Transportation

FM-971
CULVERT LAYOUT
STA. 482+26.55

SHEET 2 OF 7

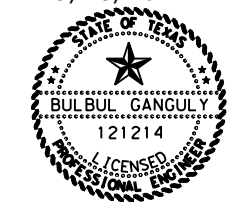
© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
AUS		WILLIAMSON		101

DATE: 9/27/2022 3:44:03 PM FILE: \\txdot\project\wiseonline.com\TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\5. Drainage\CUL LO\038_FM971\CUL03.dgn



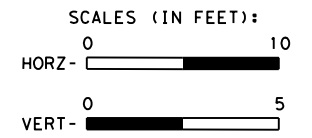
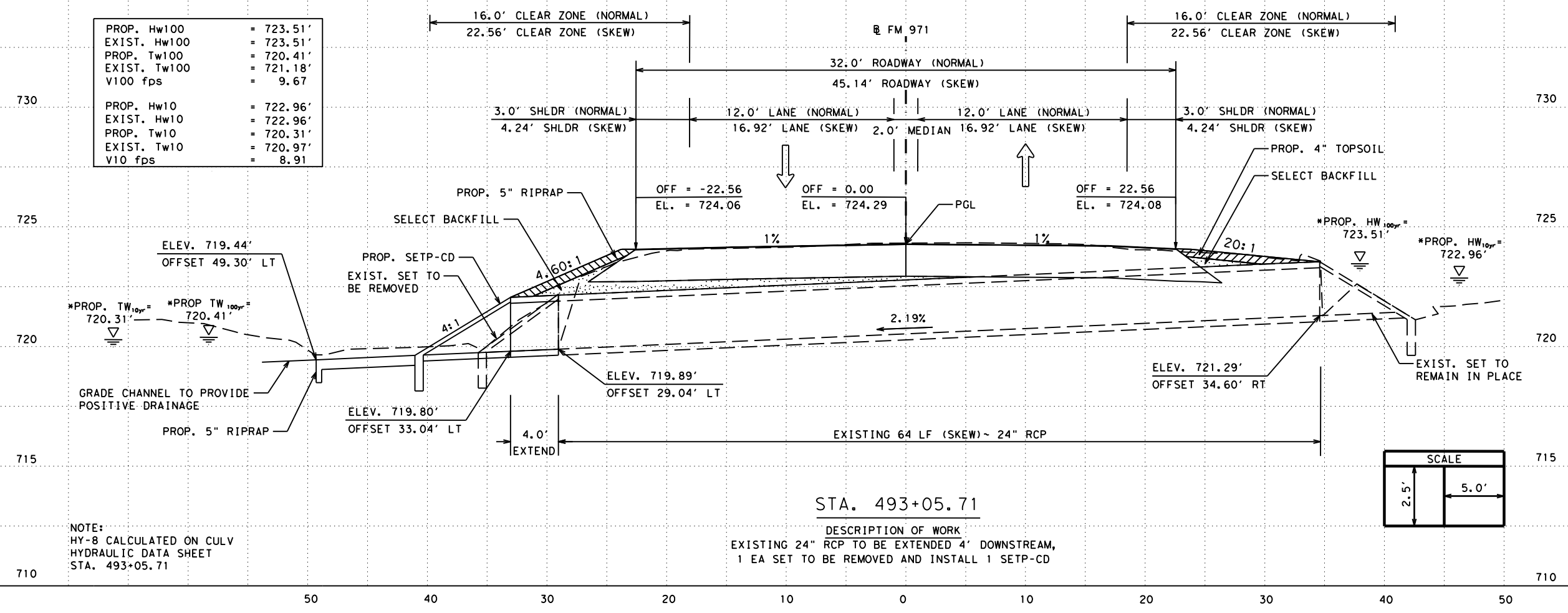
NOTE: CROSS CULVERT LOCATED WITHIN GEORGETOWN RAILROAD R.O.W.

9/28/2022



DocuSigned by:
Bulbul Ganguly
B36C53A335184E4...

PROP. Hw100	=	723.51'
EXIST. Hw100	=	723.51'
PROP. Tw100	=	720.41'
EXIST. Tw100	=	721.18'
V100 fps	=	9.67
PROP. Hw10	=	722.96'
EXIST. Hw10	=	722.96'
PROP. Tw10	=	720.31'
EXIST. Tw10	=	720.97'
V10 fps	=	8.91



Austin District
Central Design



FM-971
CULVERT LAYOUT
STA 493+05.71

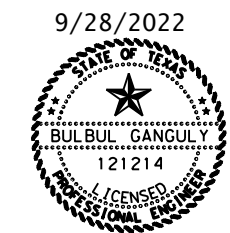
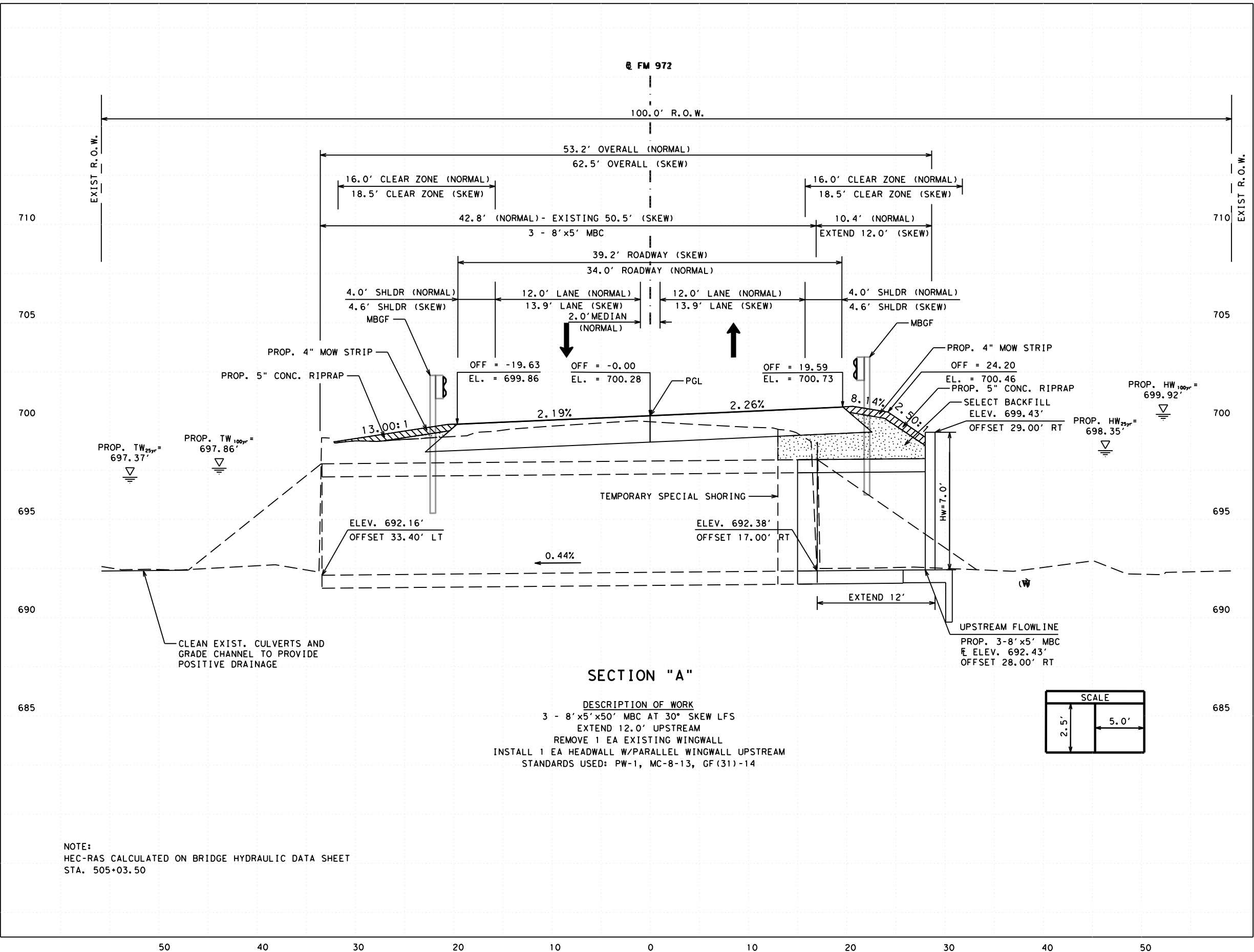
SHEET 3 OF 7

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	102		

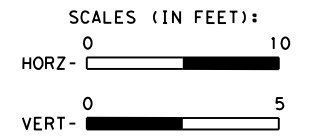
NOTE:
HY-8 CALCULATED ON CULV
HYDRAULIC DATA SHEET
STA. 493+05.71

DESCRIPTION OF WORK
EXISTING 24" RCP TO BE EXTENDED 4' DOWNSTREAM,
1 EA SET TO BE REMOVED AND INSTALL 1 SETP-CD

DATE: 9/27/2022 3:44:19 PM
FILE: \\txdot\project\wiseonline.com\TXDOT14\Documents\14 - AUS\Design Projects\269001038\4 - Design\Plan Set\5. Drainage\CUL LO\038_FM971CL05.dgn



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Bulbul Ganguly
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**Austin District
 Central Design**

Texas Department of Transportation

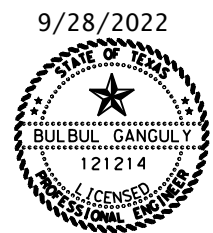
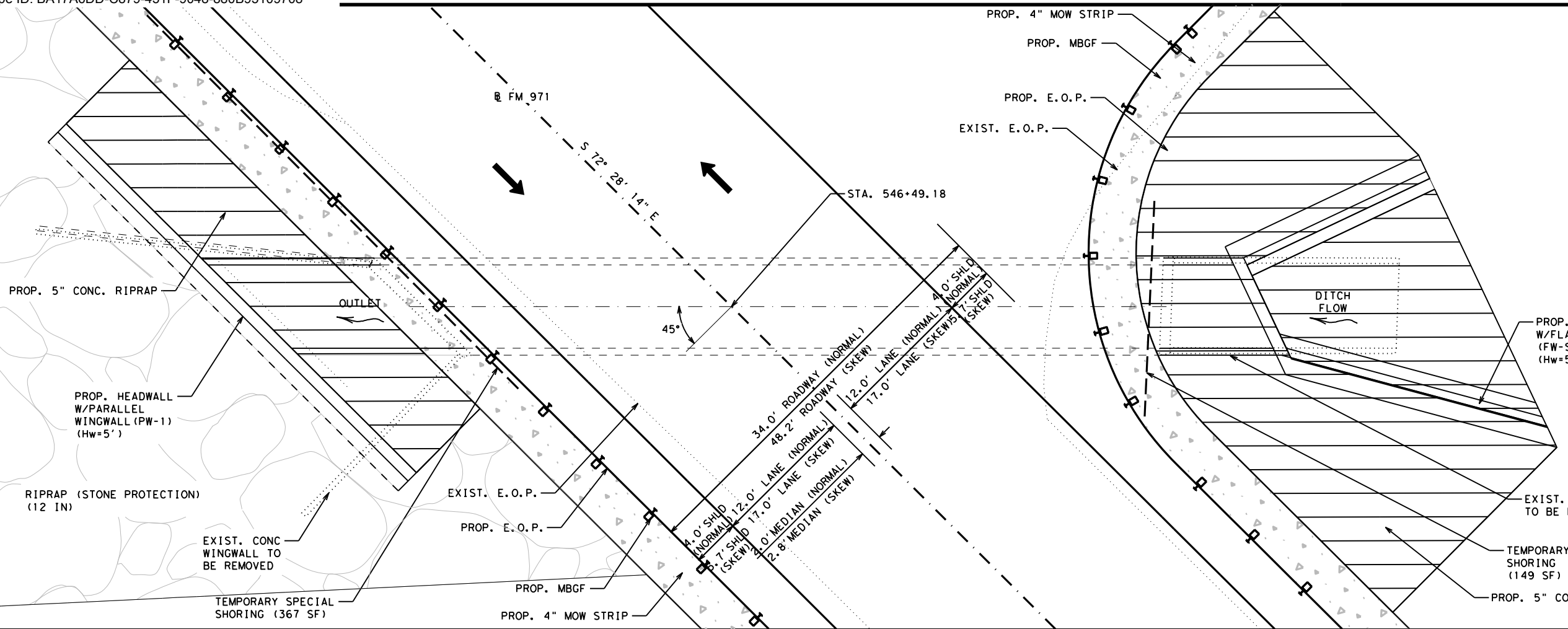
**FM-971
 BRIDGE CLASS LAYOUT
 SECTION A-A**

STA. 504+88.29
 TO STA. 505+18.67

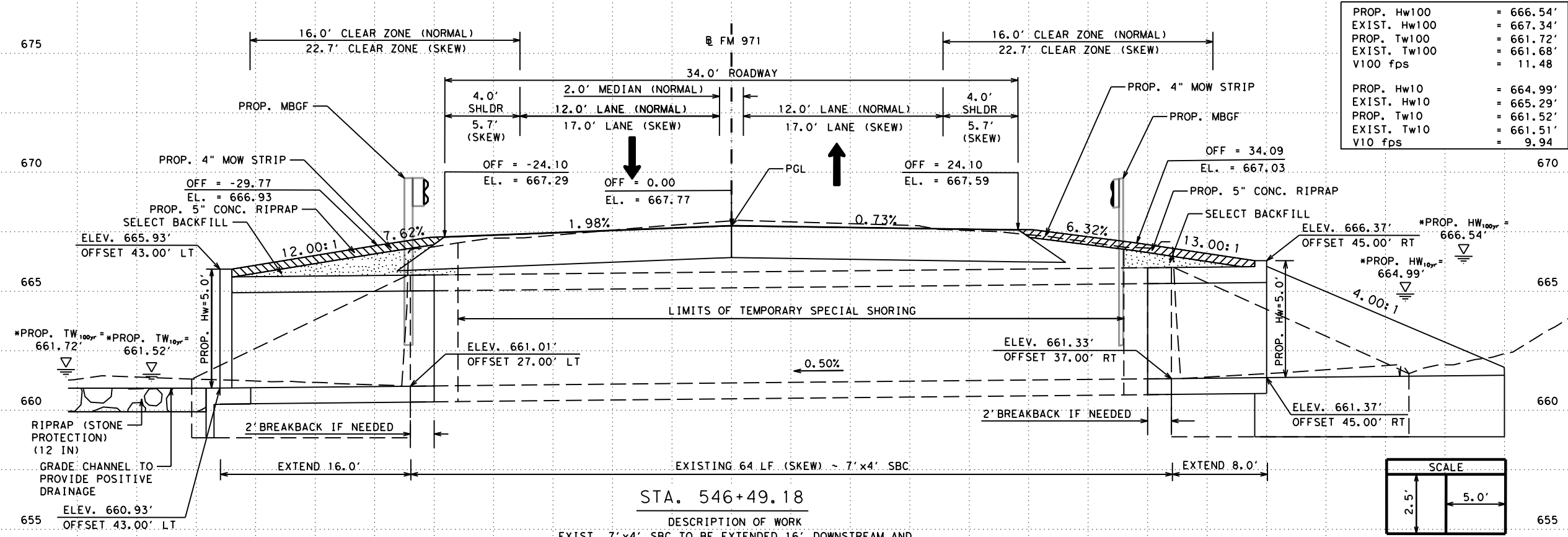
SHEET 5 OF 7

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
	AUS		WILLIAMSON	104

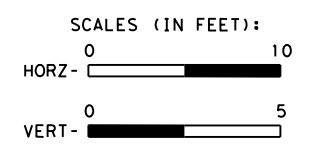
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DocuSigned by:
Bulbul Ganguly
 B36C53A335184E...

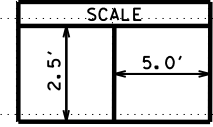


PROP. Hw100	= 666.54'
EXIST. Hw100	= 667.34'
PROP. Tw100	= 661.72'
EXIST. Tw100	= 661.68'
V100 fps	= 11.48
PROP. Hw10	= 664.99'
EXIST. Hw10	= 665.29'
PROP. Tw10	= 661.52'
EXIST. Tw10	= 661.51'
V10 fps	= 9.94



**Austin District
 Central Design**
 Texas Department of Transportation

**FM-971
 CULVERT LAYOUT
 STA. 546+49.18**

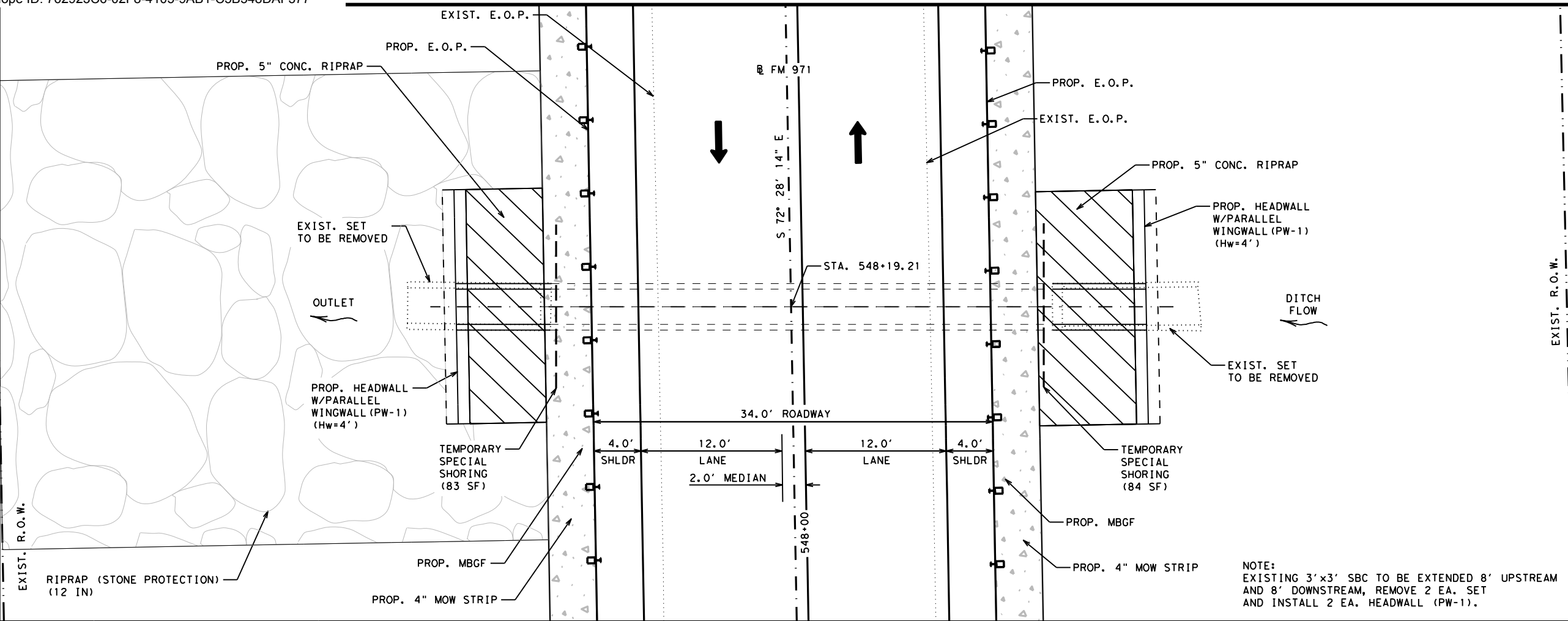


DESCRIPTION OF WORK
 EXIST. 7'x4' SBC TO BE EXTENDED 16' DOWNSTREAM AND 8' UPSTREAM, REMOVE 1 EA FLARED WINGWALL AND STRAIGHT WINGWALL AND INSTALL WINGWALL (PW-1) DOWNSTREAM AND FLARED WINGWALL (FW-S) UPSTREAM.

SHEET 6 OF 7

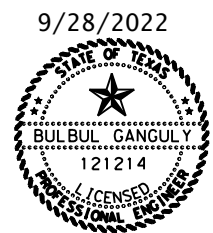
© 2023	CONT	SECT	JOB	HIGHWAY
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AUS	WILLIAMSON	105		

DATE: 9/27/2022 3:54:06 PM
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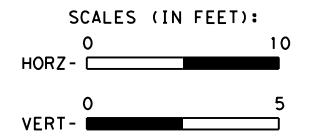
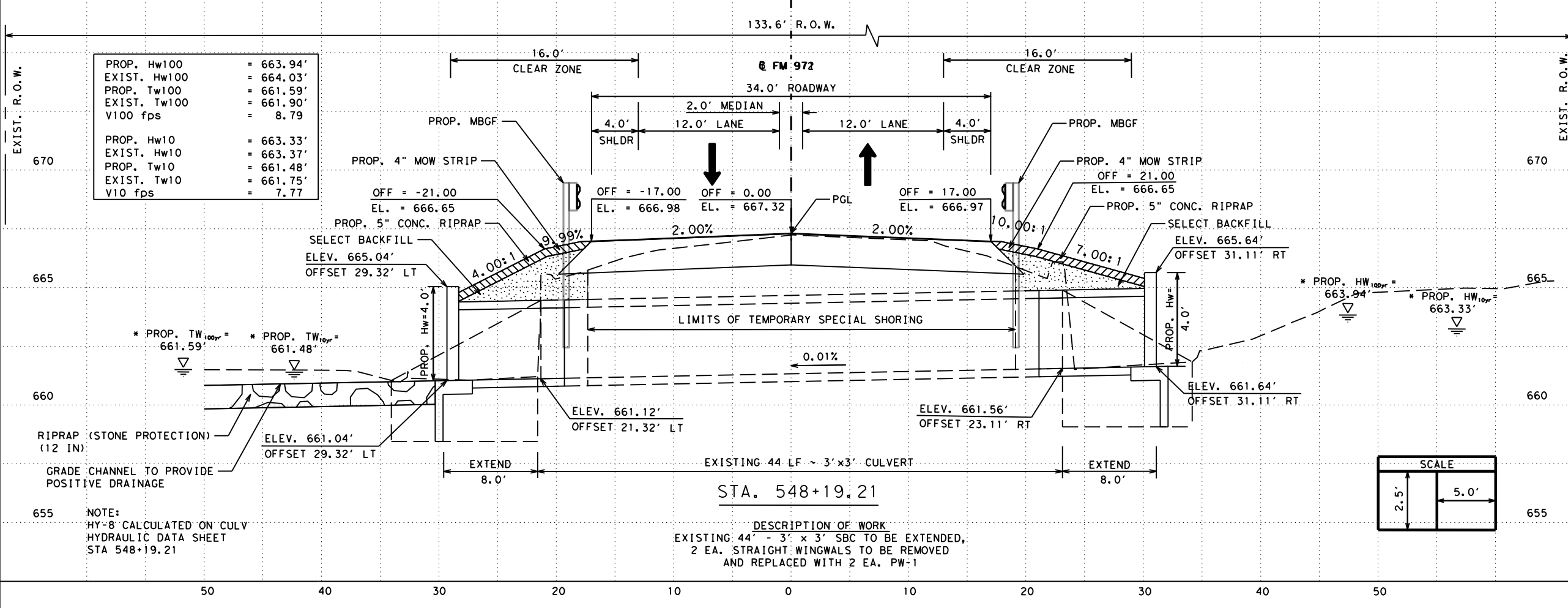


EXIST. R.O.W.

EXIST. R.O.W.



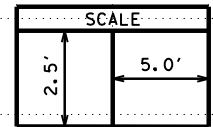
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Austin District
Central Design

Texas Department of Transportation

FM-971
CULVERT LAYOUT
STA. 548+19.21

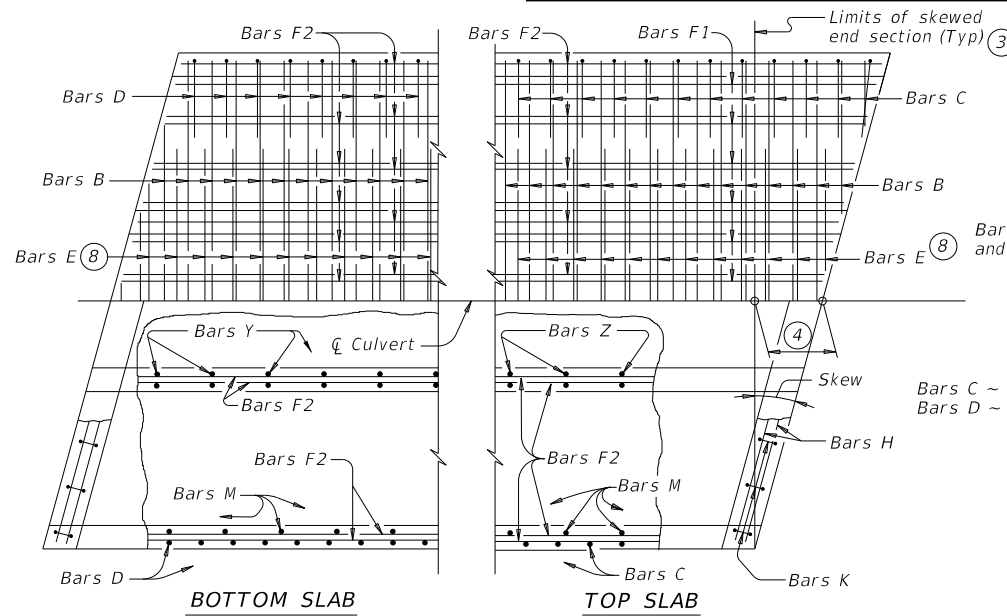


SHEET 7 OF 7

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK:	2690	01	038	FM 971
DW: CK:	DIST		COUNTY	SHEET NO.
AUS		WILLIAMSON		106

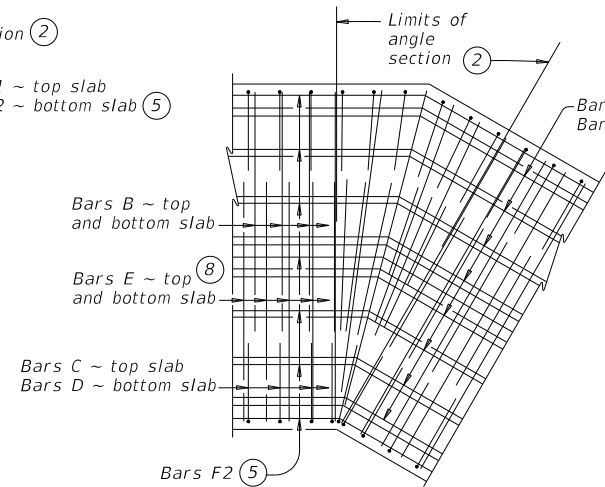
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DATE: 9/22/2022 8:20:54 AM
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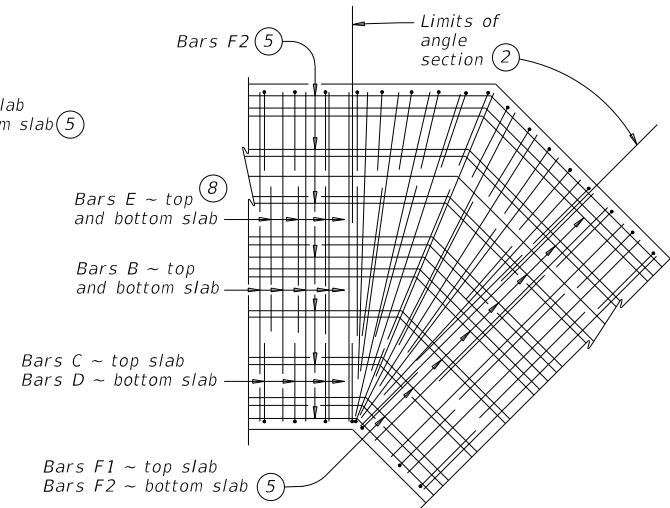


PLAN OF SKEWED ENDS ~ FROM 0° TO 15°

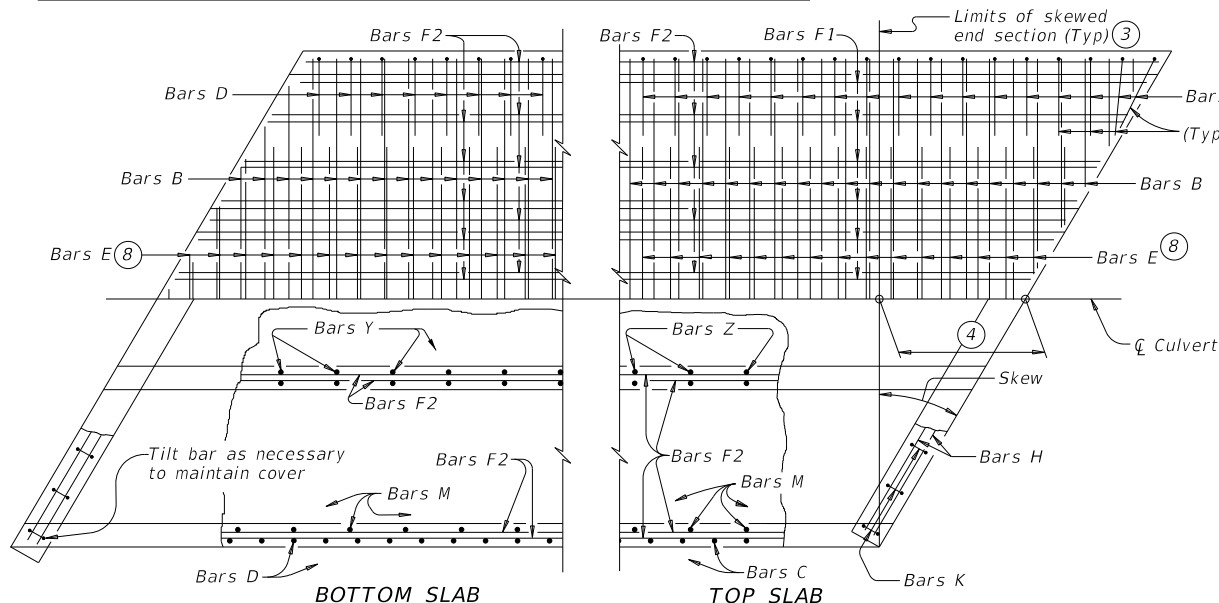
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°

- 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, N_{ba}, 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 $[0.5 \times \text{overall width}] \times [\text{tangent of the skew angle}]$
- 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.

CONSTRUCTION NOTES:

Do not use permanent forms.
 When required, lap Bars H 1'-8" for uncoated or galvanized bars.
 Provide a minimum of 1 1/2" clear cover.

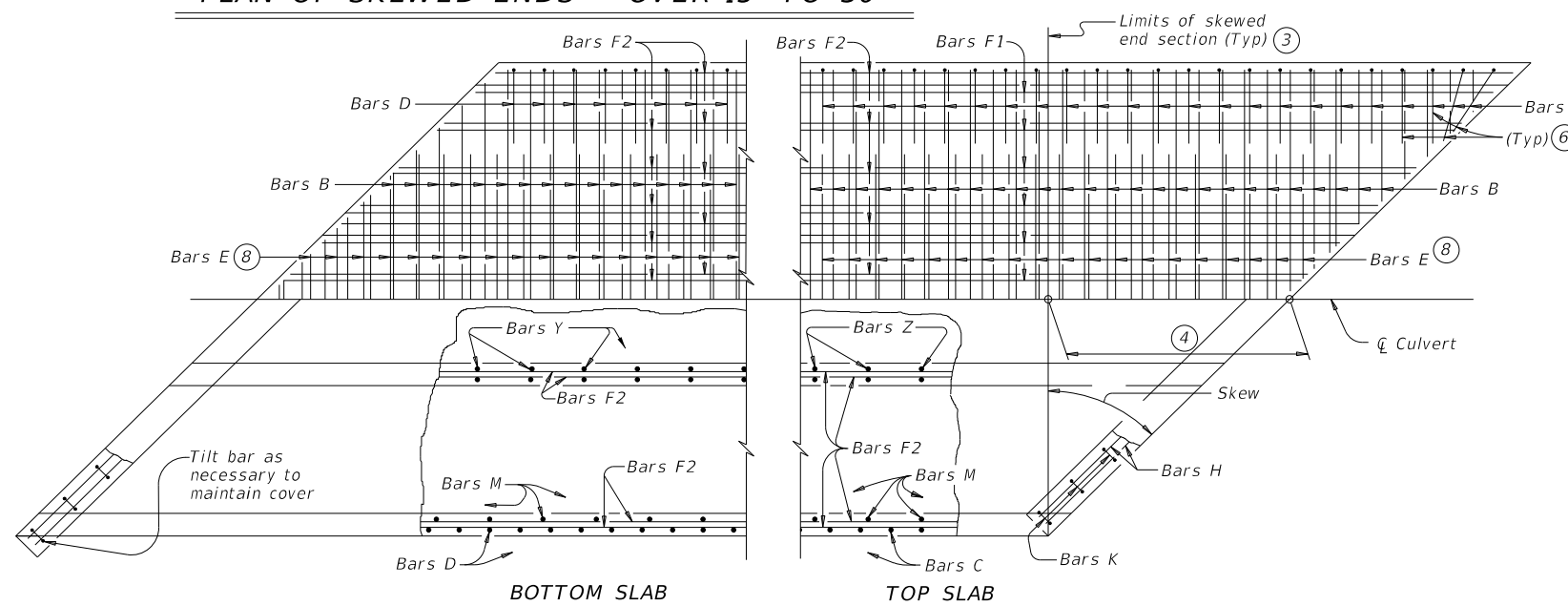
MATERIAL NOTES:

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.

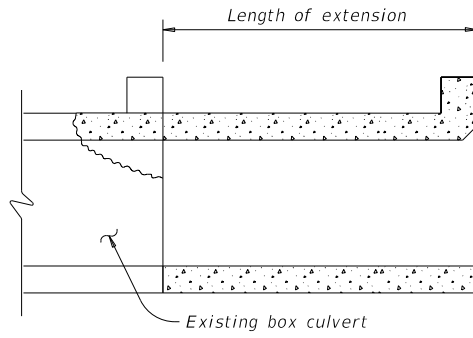
GENERAL NOTES:

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.



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



LENGTHENING DETAIL

HL93 LOADING



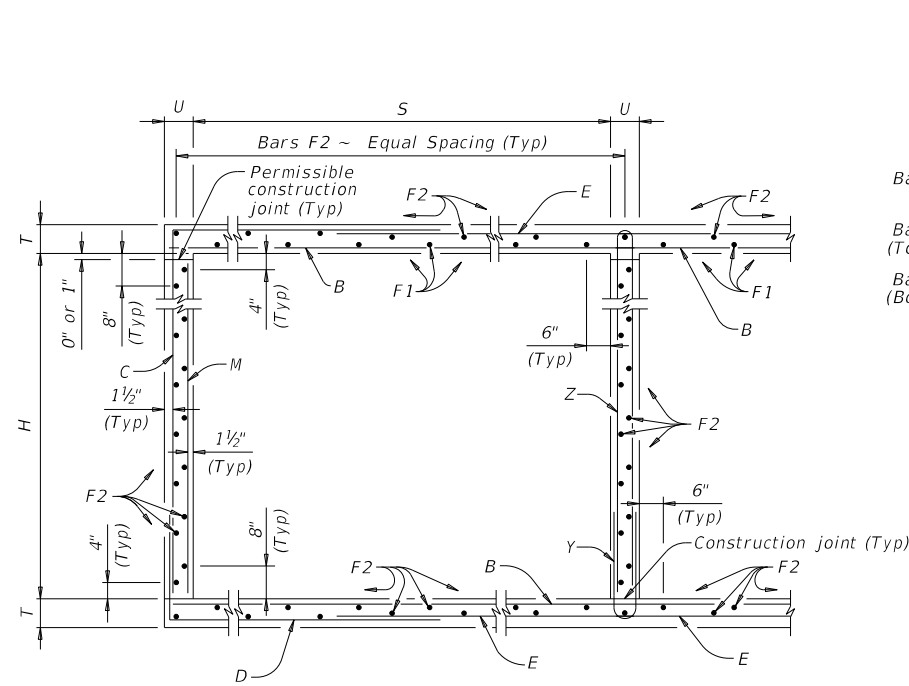
**MULTIPLE BOX CULVERTS
 CAST-IN-PLACE
 MISCELLANEOUS DETAILS**

MC-MD

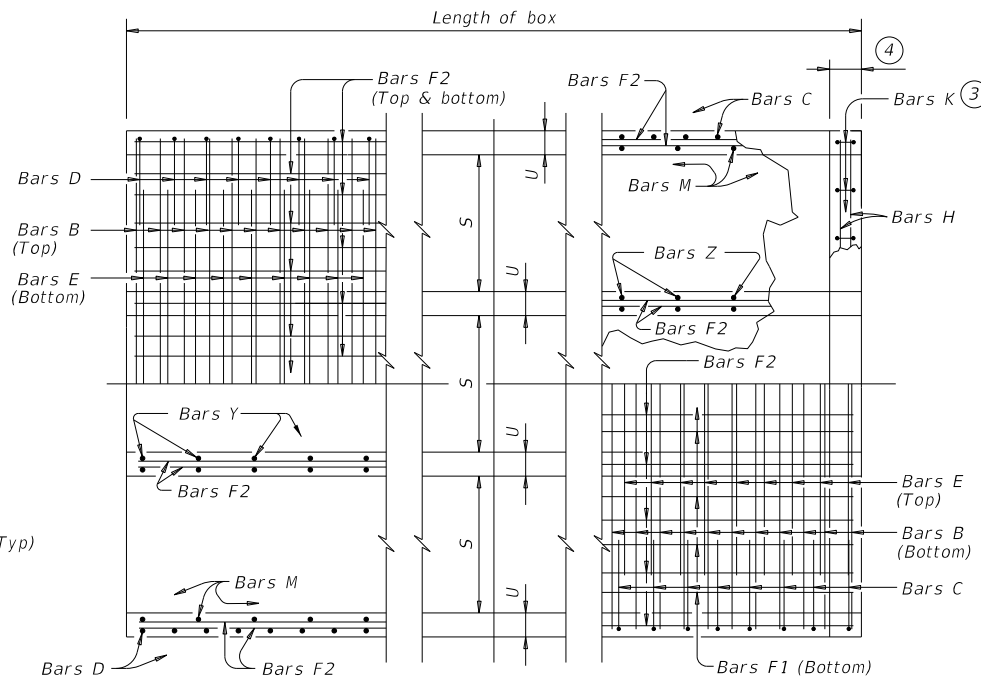
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REVISIONS	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	108	

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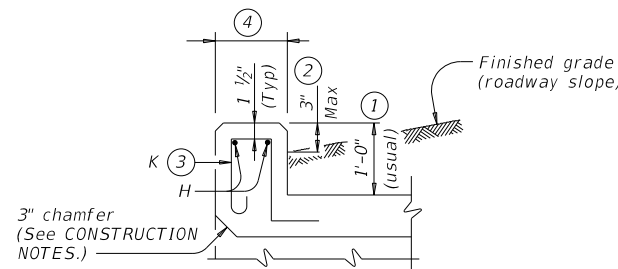
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TYPICAL SECTION

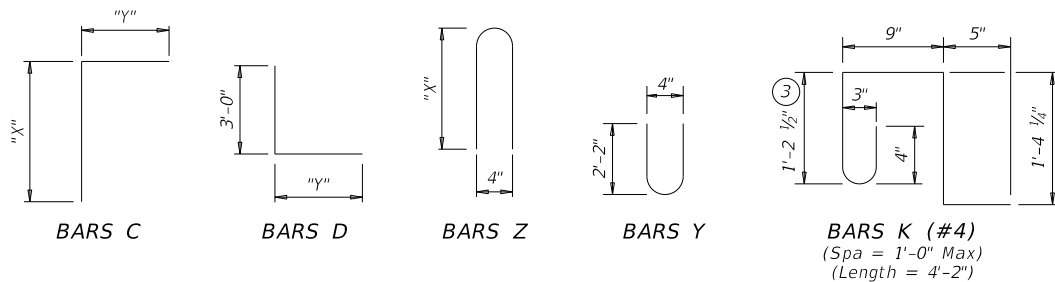


BOTTOM SLAB
PART PLANS
TOP SLAB



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 1/2"	5'-1"
4'-0"	4'-6 1/2"	5'-1"
5'-0"	5'-6 1/2"	5'-1"
6'-0"	6'-6 1/2"	5'-1"
7'-0"	7'-6 1/2"	5'-1"
8'-0"	8'-6 1/2"	5'-1"



- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

CONSTRUCTION NOTES:
 Do not use permanent forms.
 Chamfer the bottom edge of the top slab 3" at the entrance.
 Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide galvanized reinforcing steel if required elsewhere in the plans.
 Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
 • culverts with overlay,
 • culverts with 1-to-2 course surface treatment, or
 • culverts with the top slab as the final riding surface.
 Provide bar laps, where required, as follows:
 • Uncoated or galvanized ~ #4 = 1'-8" Min
 • Uncoated or galvanized ~ #5 = 2'-1" Min
 • Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
 See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

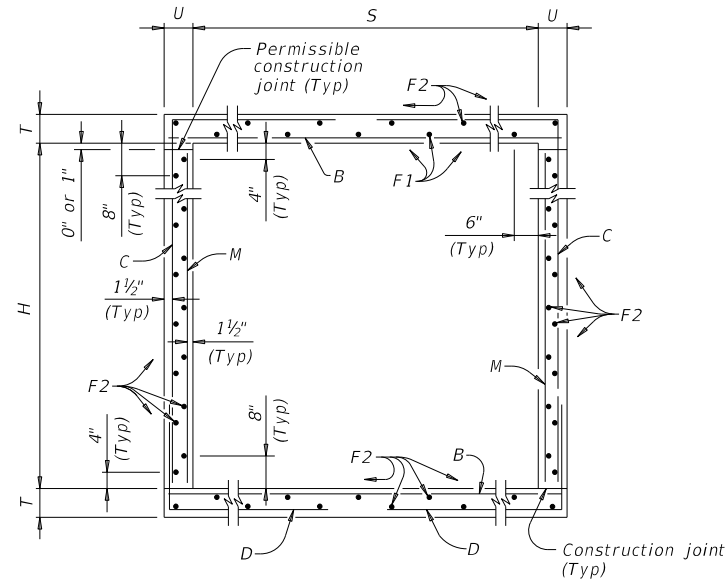
Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING		SHEET 1 OF 2	
		Bridge Division Standard	
MULTIPLE BOX CULVERTS CAST-IN-PLACE 8'-0" SPAN 0' TO 13' FILL			
MC-8-13			
FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT
©TxDOT February 2020	CONT	SECT	HIGHWAY
REVISIONS	2690 01	038	FM 971
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	109	

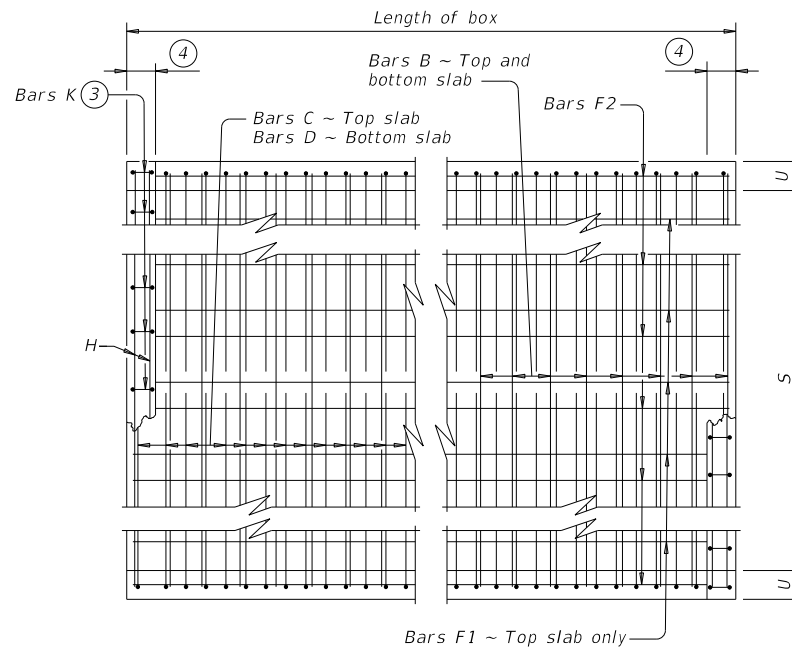
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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES																		
					Bars B					Bars C & D					Bars E					Bars F1 ~ #4			Bars F2 ~ #4			Bars M ~ #4			Bars Y & Z ~ #4				Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total												
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Ref (Lb)	Conc (CY)	Ref (Lb)	Conc (CY)	Ref (Lb)
													Length	Wt	Length	Wt																								Length	Wt	Length	Wt										
2	8'-0"	3'-0"	8"	7"	162	#6	6"	17'-6"	4,258	108	#6	9"	8'-8"	1,406	8'-2"	1,325	162	#6	6"	12'-9"	3,102	12	18"	39'-9"	319	56	18"	39'-9"	1,487	108	9"	3'-0"	216	54	9"	4'-7"	165	7'-3"	262	17'-6"	47	38	106	1.071	313.5	1.3	153	44.2	12,693				
3	8'-0"	3'-0"	8"	7"	162	#6	6"	26'-1"	6,347	108	#6	9"	8'-8"	1,406	8'-2"	1,325	162	#6	6"	21'-4"	5,191	18	18"	39'-9"	478	80	18"	39'-9"	2,124	108	9"	3'-0"	216	108	9"	4'-7"	331	7'-3"	523	26'-1"	70	56	156	1.560	448.5	1.9	226	64.3	18,167				
4	8'-0"	3'-0"	8"	7"	162	#6	6"	34'-8"	8,435	108	#6	9"	8'-8"	1,406	8'-2"	1,325	162	#6	6"	29'-11"	7,279	24	18"	39'-9"	637	104	18"	39'-9"	2,762	108	9"	3'-0"	216	162	9"	4'-7"	496	7'-3"	785	34'-8"	93	72	200	2.048	583.5	2.6	293	84.5	23,634				
5	8'-0"	3'-0"	8"	7"	162	#6	6"	43'-3"	10,524	108	#6	9"	8'-8"	1,406	8'-2"	1,325	162	#6	6"	38'-6"	9,368	30	18"	39'-9"	797	128	18"	39'-9"	3,399	108	9"	3'-0"	216	216	9"	4'-7"	661	7'-3"	1,046	43'-3"	116	90	251	2.537	718.6	3.2	367	104.7	29,109				
6	8'-0"	3'-0"	8"	7"	162	#6	6"	51'-10"	12,612	108	#6	9"	8'-8"	1,406	8'-2"	1,325	162	#6	6"	47'-1"	11,457	36	18"	39'-9"	956	152	18"	39'-9"	4,036	108	9"	3'-0"	216	270	9"	4'-7"	827	7'-3"	1,308	51'-10"	138	106	295	3.026	853.6	3.8	433	124.9	34,576				
2	8'-0"	4'-0"	8"	7"	162	#6	6"	17'-6"	4,258	108	#6	9"	9'-8"	1,568	8'-2"	1,325	162	#6	6"	12'-9"	3,102	12	18"	39'-9"	319	56	18"	39'-9"	1,487	108	9"	4'-0"	289	54	9"	4'-7"	165	9'-3"	334	17'-6"	47	38	106	1.136	321.2	1.3	153	46.8	13,000				
3	8'-0"	4'-0"	8"	7"	162	#6	6"	26'-1"	6,347	108	#6	9"	9'-8"	1,568	8'-2"	1,325	162	#6	6"	21'-4"	5,191	18	18"	39'-9"	478	80	18"	39'-9"	2,124	108	9"	4'-0"	289	108	9"	4'-7"	331	9'-3"	667	26'-1"	70	56	156	1.646	458.0	1.9	226	67.8	18,546				
4	8'-0"	4'-0"	8"	7"	162	#6	6"	34'-8"	8,435	108	#6	9"	9'-8"	1,568	8'-2"	1,325	162	#6	6"	29'-11"	7,279	24	18"	39'-9"	637	104	18"	39'-9"	2,762	108	9"	4'-0"	289	162	9"	4'-7"	496	9'-3"	1,001	34'-8"	93	72	200	2.156	594.8	2.6	293	88.8	24,085				
5	8'-0"	4'-0"	8"	7"	162	#6	6"	43'-3"	10,524	108	#6	9"	9'-8"	1,568	8'-2"	1,325	162	#6	6"	38'-6"	9,368	30	18"	39'-9"	797	128	18"	39'-9"	3,399	108	9"	4'-0"	289	216	9"	4'-7"	661	9'-3"	1,335	43'-3"	116	90	251	2.667	731.7	3.2	367	109.9	29,633				
6	8'-0"	4'-0"	8"	7"	162	#6	6"	51'-10"	12,612	108	#6	9"	9'-8"	1,568	8'-2"	1,325	162	#6	6"	47'-1"	11,457	36	18"	39'-9"	956	152	18"	39'-9"	4,036	108	9"	4'-0"	289	270	9"	4'-7"	827	9'-3"	1,668	51'-10"	138	106	295	3.177	868.5	3.8	433	130.9	35,171				
2	8'-0"	5'-0"	8"	7"	162	#6	6"	17'-6"	4,258	108	#6	9"	10'-8"	1,730	8'-2"	1,325	162	#6	6"	12'-9"	3,102	12	18"	39'-9"	319	62	18"	39'-9"	1,646	108	9"	5'-0"	361	54	9"	4'-7"	165	11'-3"	406	17'-6"	47	38	106	1.201	332.8	1.3	153	49.4	13,465				
3	8'-0"	5'-0"	8"	7"	162	#6	6"	26'-1"	6,347	108	#6	9"	10'-8"	1,730	8'-2"	1,325	162	#6	6"	21'-4"	5,191	18	18"	39'-9"	478	88	18"	39'-9"	2,337	108	9"	5'-0"	361	108	9"	4'-7"	331	11'-3"	812	26'-1"	70	56	156	1.733	472.8	1.9	226	71.3	19,138				
4	8'-0"	5'-0"	8"	7"	162	#6	6"	34'-8"	8,435	108	#6	9"	10'-8"	1,730	8'-2"	1,325	162	#6	6"	29'-11"	7,279	24	18"	39'-9"	637	114	18"	39'-9"	3,027	108	9"	5'-0"	361	162	9"	4'-7"	496	11'-3"	1,217	34'-8"	93	72	200	2.264	612.7	2.6	293	93.1	24,800				
5	8'-0"	5'-0"	8"	7"	162	#6	6"	43'-3"	10,524	108	#6	9"	10'-8"	1,730	8'-2"	1,325	162	#6	6"	38'-6"	9,368	30	18"	39'-9"	797	140	18"	39'-9"	3,717	108	9"	5'-0"	361	216	9"	4'-7"	661	11'-3"	1,623	43'-3"	116	90	251	2.796	752.7	3.2	367	115.1	30,473				
6	8'-0"	5'-0"	8"	7"	162	#6	6"	51'-10"	12,612	108	#6	9"	10'-8"	1,730	8'-2"	1,325	162	#6	6"	47'-1"	11,457	36	18"	39'-9"	956	166	18"	39'-9"	4,408	108	9"	5'-0"	361	270	9"	4'-7"	827	11'-3"	2,029	51'-10"	138	106	295	3.328	892.6	3.8	433	137.0	36,138				
2	8'-0"	6'-0"	8"	7"	162	#6	6"	17'-6"	4,258	108	#6	9"	11'-8"	1,893	8'-2"	1,325	162	#6	6"	12'-9"	3,102	12	18"	39'-9"	319	68	18"	39'-9"	1,806	108	9"	6'-0"	433	54	9"	4'-7"	165	13'-3"	478	17'-6"	47	38	106	1.265	344.5	1.3	153	51.9	13,932				
3	8'-0"	6'-0"	8"	7"	162	#6	6"	26'-1"	6,347	108	#6	9"	11'-8"	1,893	8'-2"	1,325	162	#6	6"	21'-4"	5,191	18	18"	39'-9"	478	96	18"	39'-9"	2,549	108	9"	6'-0"	433	108	9"	4'-7"	331	13'-3"	956	26'-1"	70	56	156	1.819	487.6	1.9	226	74.7	19,729				
4	8'-0"	6'-0"	8"	7"	162	#6	6"	34'-8"	8,435	108	#6	9"	11'-8"	1,893	8'-2"	1,325	162	#6	6"	29'-11"	7,279	24	18"	39'-9"	637	124	18"	39'-9"	3,293	108	9"	6'-0"	433	162	9"	4'-7"	496	13'-3"	1,434	34'-8"	93	72	200	2.372	630.6	2.6	293	97.5	25,518				
5	8'-0"	6'-0"	8"	7"	162	#6	6"	43'-3"	10,524	108	#6	9"	11'-8"	1,893	8'-2"	1,325	162	#6	6"	38'-6"	9,368	30	18"	39'-9"	797	152	18"	39'-9"	4,036	108	9"	6'-0"	433	216	9"	4'-7"	661	13'-3"	1,912	43'-3"	116	90	251	2.926	773.7	3.2	367	120.3	31,316				
6	8'-0"	6'-0"	8"	7"	162	#6	6"	51'-10"	12,612	108	#6	9"	11'-8"	1,893	8'-2"	1,325	162	#6	6"	47'-1"	11,457	36	18"	39'-9"	956	180	18"	39'-9"	4,780	108	9"	6'-0"	433	270	9"	4'-7"	827	13'-3"	2,390	51'-10"	138	106	295	3.479	916.8	3.8	433	143.0	37,106				
2	8'-0"	7'-0"	8"	7"	162	#6	6"	17'-6"	4,258	108	#6	9"	12'-8"	2,055	8'-2"	1,325	162	#6	6"	12'-9"	3,102	12	18"	39'-9"	319	68	18"	39'-9"	1,806	108	9"	7'-0"	505	54	9"	4'-7"	165	15'-3"	550	17'-6"	47	38	106	1.330	352.1	1.3	153	54.5	14,238				
3	8'-0"	7'-0"	8"	7"	162	#6	6"	26'-1"	6,347	108	#6	9"	12'-8"	2,055	8'-2"	1,325	162	#6	6"	21'-4"	5,191	18	18"	39'-9"	478	96	18"	39'-9"	2,549	108	9"	7'-0"	505	108	9"	4'-7"	331	15'-3"	1,100	26'-1"	70	56	156	1.905	497.0	1.9	226	78.1	20,107				
4	8'-0"	7'-0"	8"	7"	162	#6	6"	34'-8"	8,435	108	#6	9"	12'-8"	2,055	8'-2"	1,325	162	#6	6"	29'-11"	7,279	24	18"	39'-9"	637	124	18"	39'-9"	3,293	108	9"	7'-0"	505	162	9"	4'-7"	496	15'-3"	1,650	34'-8"	93	72	200	2.480	641.9	2.6	293	101.8	25,968				
5	8'-0"	7'-0"	8"	7"	162	#6	6"	43'-3"	10,524	108	#6	9"	12'-8"	2,055	8'-2"	1,325	162	#6	6"	38'-6"	9,368	30	18"	39'-9"	797	152	18"	39'-9"	4,036	108	9"	7'-0"	505	216	9"	4'-7"	661	15'-3"	2,200	43'-3"	116	90	251	3.056	786.8	3.2	367	125.5	31,838				
6	8'-0"	7'-0"	8"	7"	162	#6	6"	51'-10"	12,612	108	#6	9"	12'-8"	2,055	8'-2"	1,325	162	#6	6"	47'-1"	11,457	36	18"	39'-9"	9																												

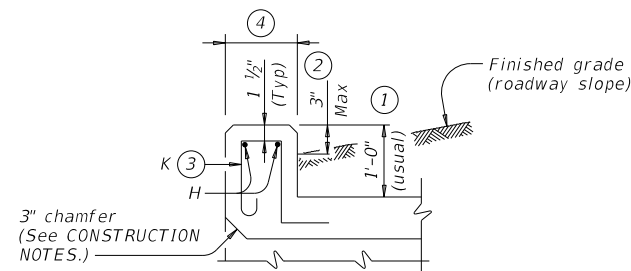
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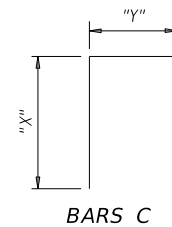
TYPICAL SECTION



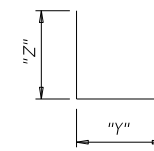
PLAN OF REINF STEEL



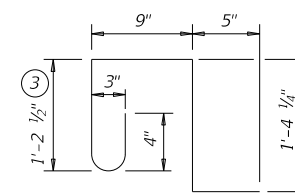
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
 - culverts with overlay,
 - culverts with 1-to-2 course surface treatment, or
 - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
 - Uncoated or galvanized ~ #4 = 1'-8" Min
 - Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

- Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
- See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING SHEET 1 OF 2

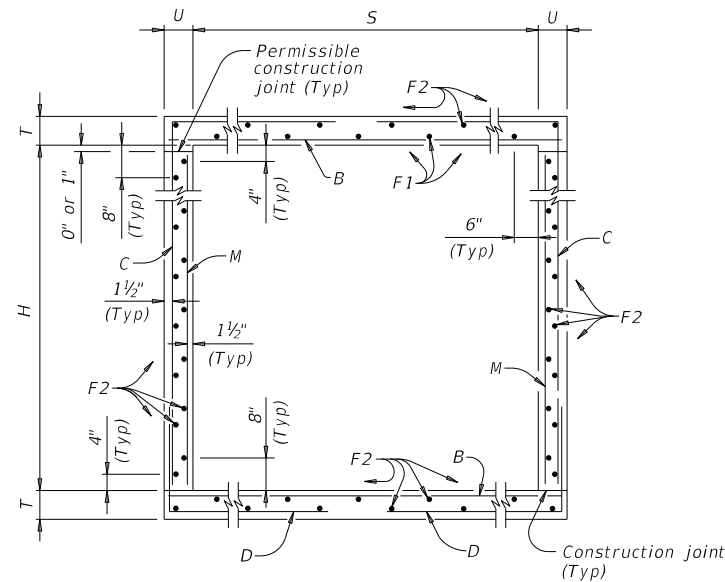


**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

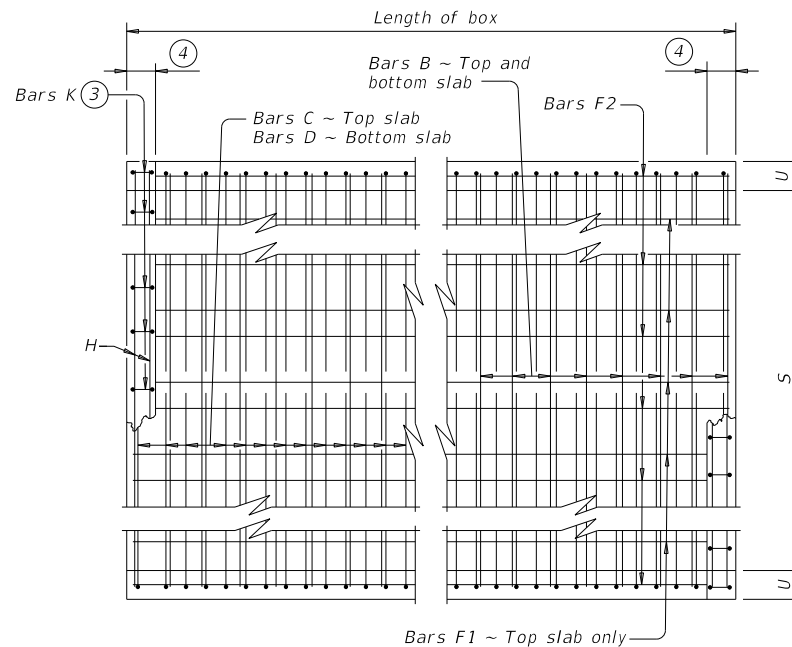
SCC-3 & 4

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04/2021 Updated X values.	DIST	COUNTY	SHEET NO.	
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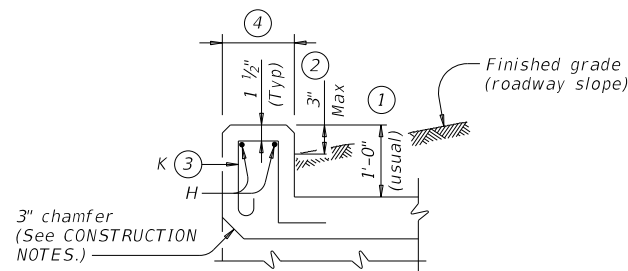
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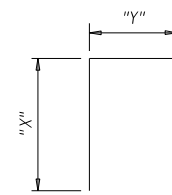
TYPICAL SECTION



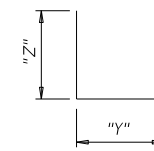
PLAN OF REINF STEEL



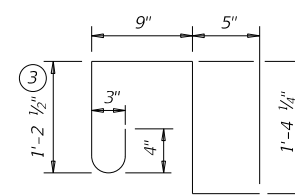
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

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 Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING

SHEET 1 OF 2

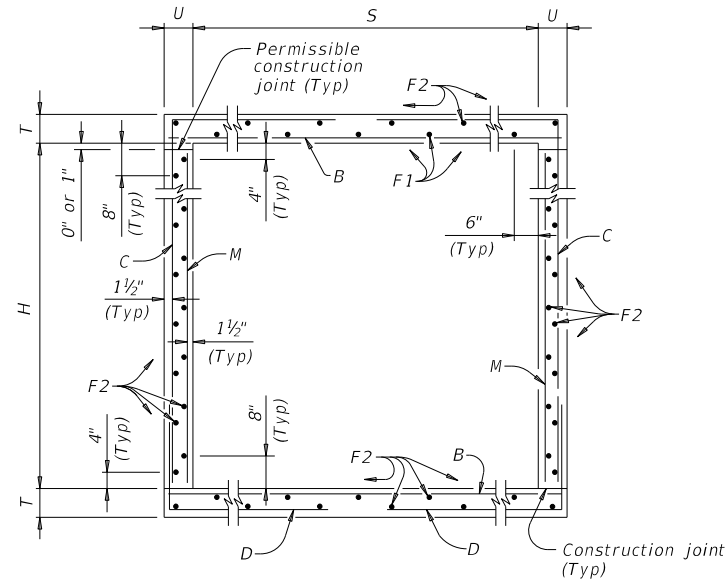


**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

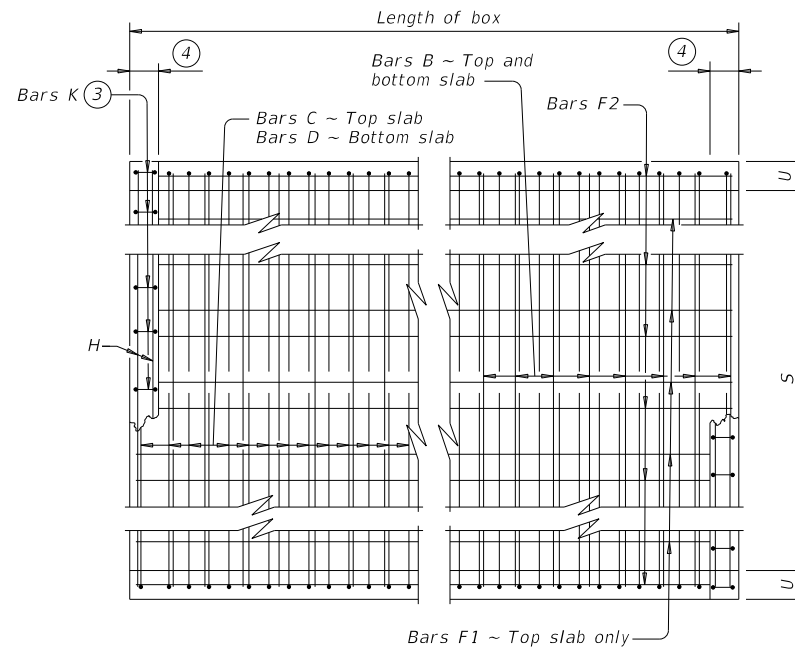
SCC-7

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04/2021 Updated X values.	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	113	

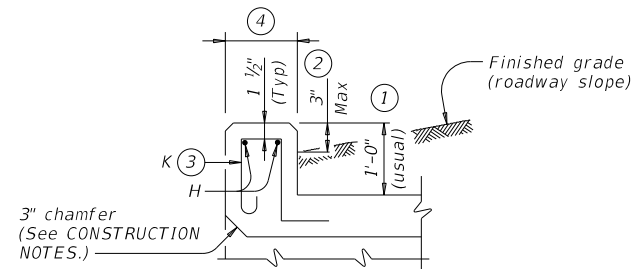
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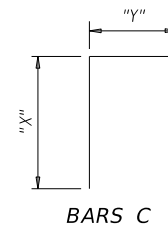
TYPICAL SECTION



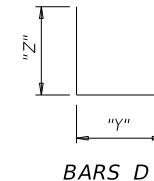
PLAN OF REINF STEEL



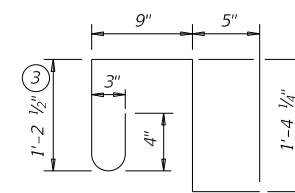
SECTION THRU CURB



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

CONSTRUCTION NOTES:

- Do not use permanent forms.
- Chamfer the bottom edge of the top slab 3" at the entrance.
- Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

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 Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING SHEET 1 OF 2



**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

SCC-9

FILE: scc09ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
04/2021 Updated X values.	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	115	

SECTION DIMENSIONS

FILL HEIGHT

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

QUANTITIES

Table with columns: SECTION DIMENSIONS (S, H, T, U), FILL HEIGHT, Bars B, Bars C, Bars D, Bars M ~ #4, Bars F1 ~ #4 at 18" Spa, Bars F2 ~ #4 at 18" Spa, Bars H 4 ~ #4, Bars K, Per Foot of Barrel (Conc (CY), Reinf (Lb)), Curb (Conc (CY), Reinf (Lb)), Total (Conc (CY), Reinf (Lb)).

5 For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

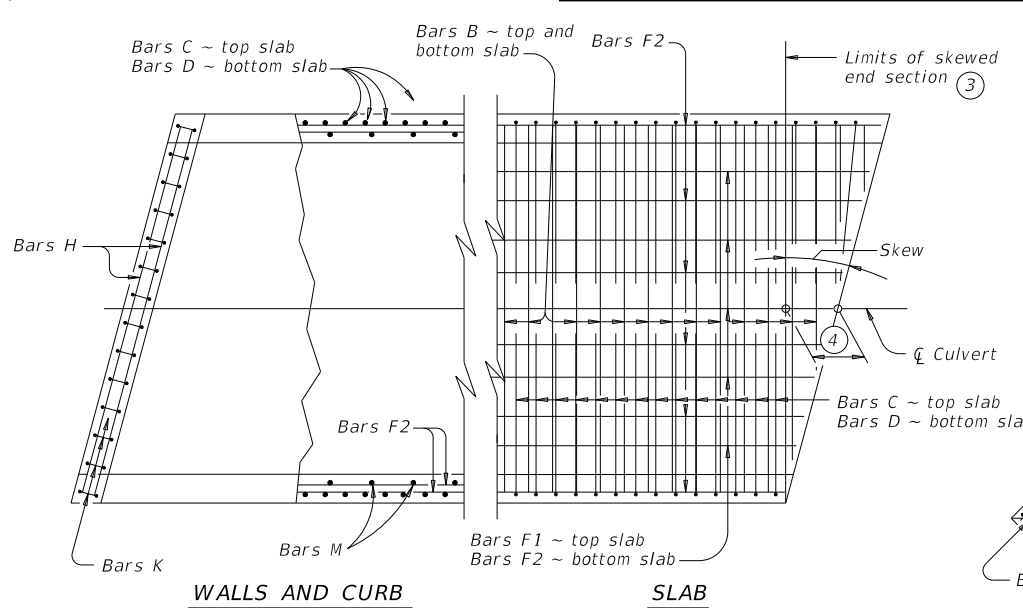
HL93 LOADING SHEET 2 OF 2

	Bridge Division Standard			
SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL				
SCC-9				
FILE: scc09ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
© TxDOT February 2020		CONT	SECT	HIGHWAY
REVISIONS		2690	01	038 FM 971
04/2021 Updated X values.		DIST	COUNTY	SHEET NO.
AUS		WILLIAMSON		116

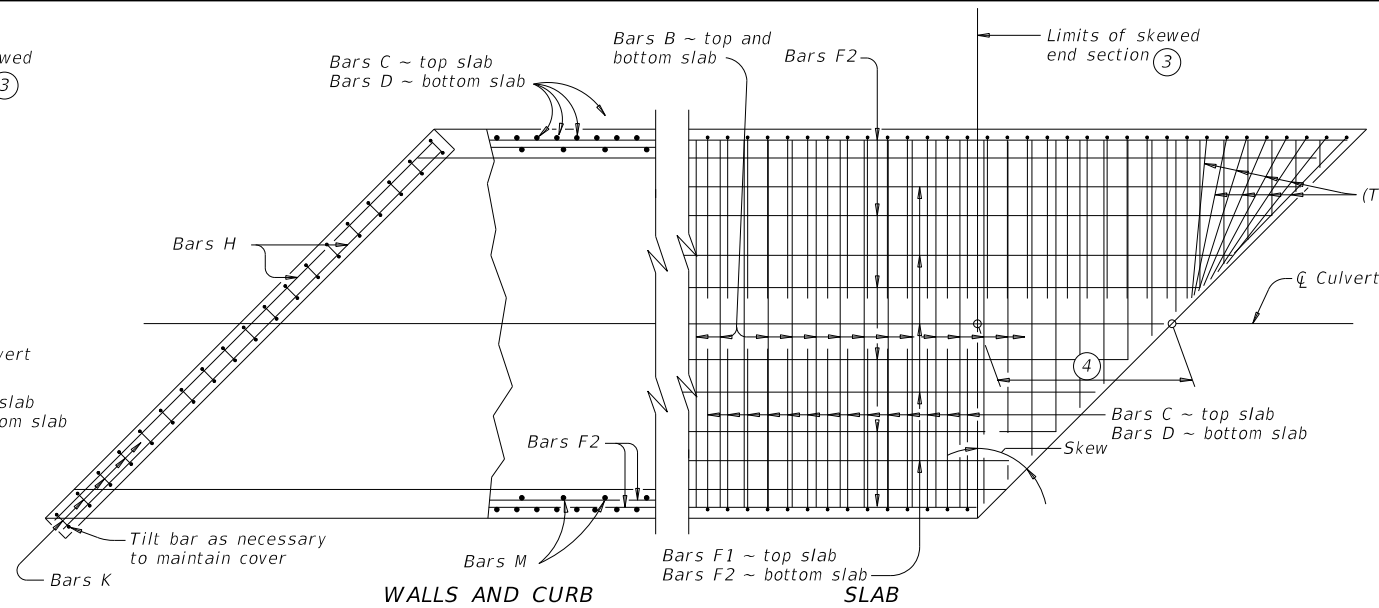
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units.
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DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units.

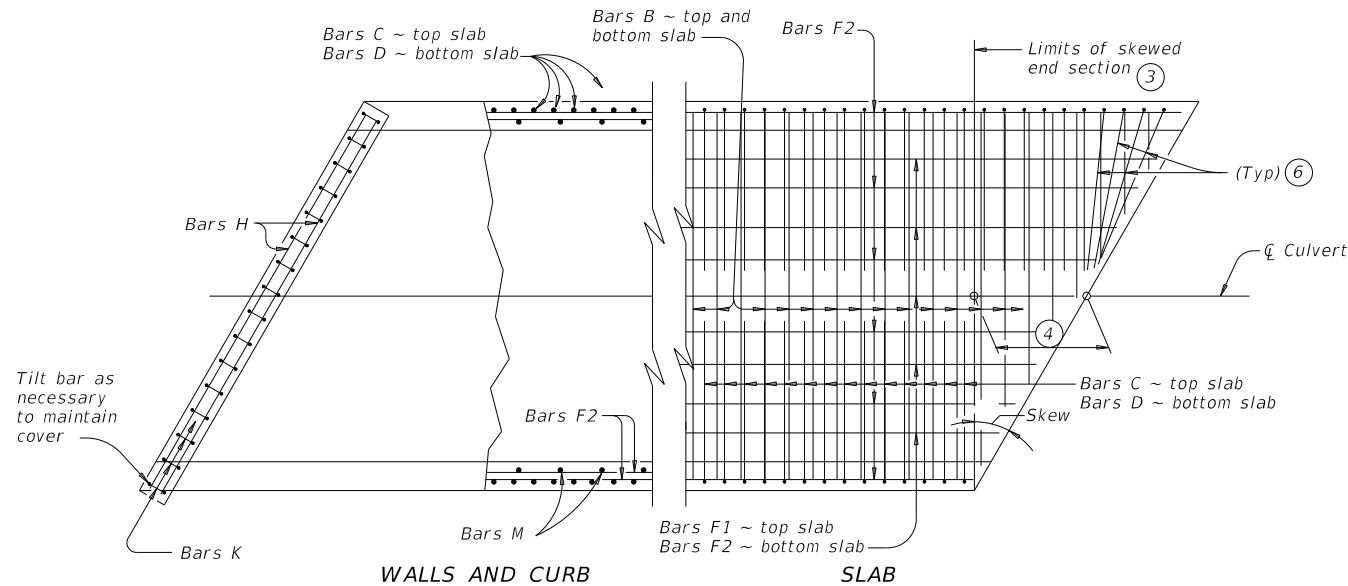
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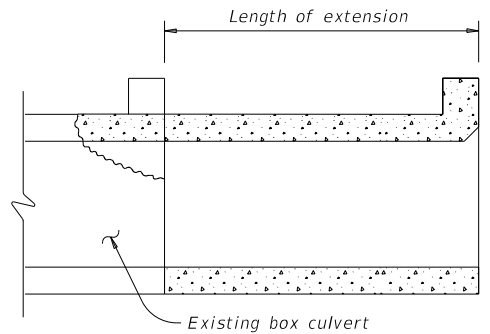
PLAN OF SKEWED ENDS ~ FROM 0° TO 15°



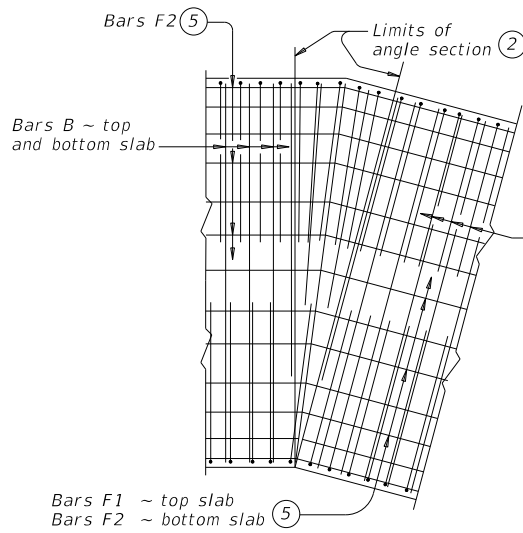
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



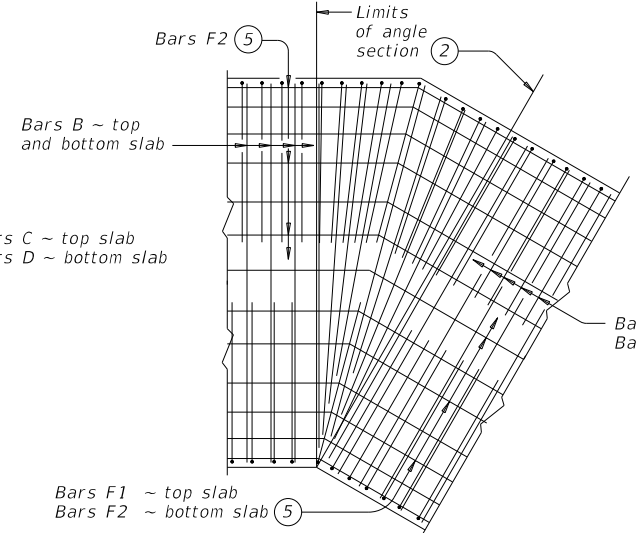
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



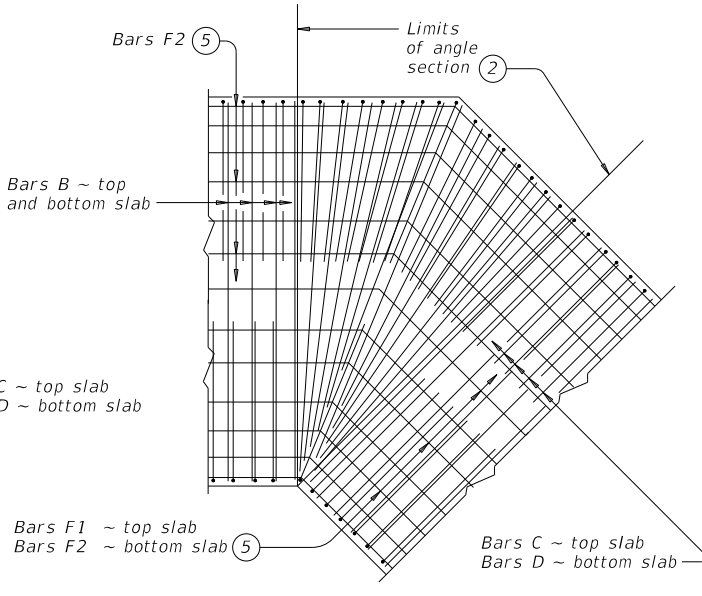
LENGTHENING DETAIL



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

- 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, 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.

- When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.
- The length of Bars B vary in the skewed end sections.
- [One half of overall width] x [tangent of the skew angle]
- 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.
- 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°.
- At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:
 Do not use permanent forms.
 When required, lap Bars H 1'-8" for uncoated or galvanized bars.
 Provide a minimum of 1 1/2" 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 Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.
 For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) 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 culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

		Bridge Division Standard	
<h2>SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS</h2>			
<h3>SCC-MD</h3>			
FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT	SECT	JOB
REVISIONS	2690	01	038
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	117	

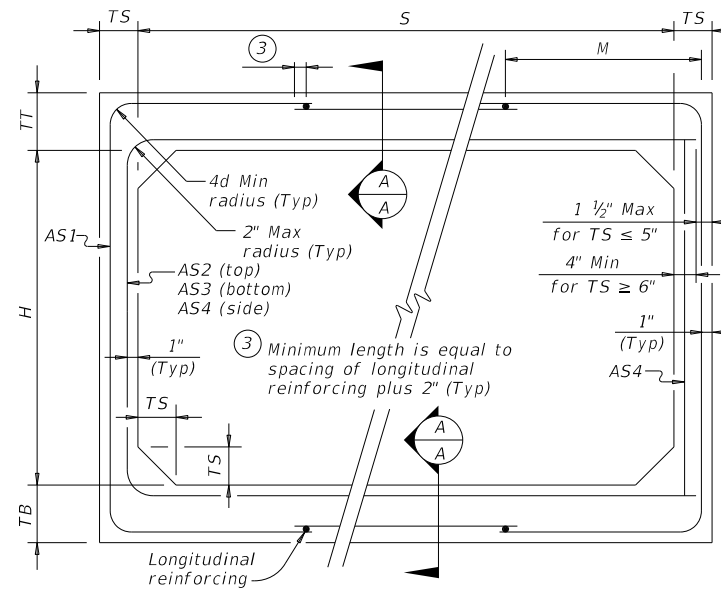
BOX DATA

SECTION DIMENSIONS					Fill Height (ft.)	M (Min) (in.)	REINFORCING (sq. in. / ft.) ^②						① Lift Weight (tons)	
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)			AS1	AS2	AS3	AS4	AS5	AS7		AS8
3	2	7	6	4	< 2	-	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	-	-	-	2.4
3	2	4	4	4	3 - 5	31	0.10	0.11	0.12	0.10	-	-	-	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	-	-	-	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	-	-	-	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	-	-	-	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	-	-	-	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	-	-	-	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	-	-	-	2.4
3	3	7	6	4	< 2	-	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	-	-	-	2.8
3	3	4	4	4	3 - 5	31	0.10	0.14	0.14	0.10	-	-	-	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	-	-	-	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	-	-	-	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	-	-	-	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	-	-	-	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	-	-	-	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	-	-	-	2.8

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 units.

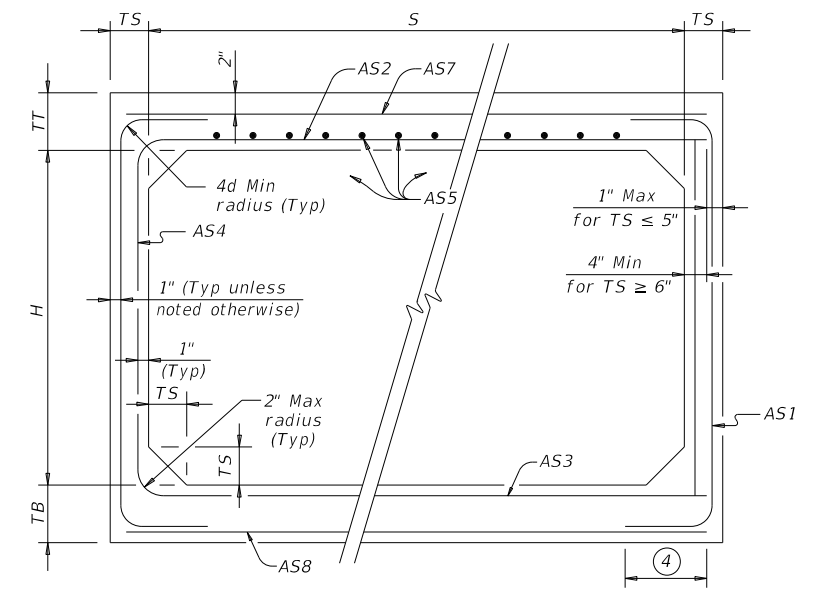
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① For box length = 8'-0"
 ② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

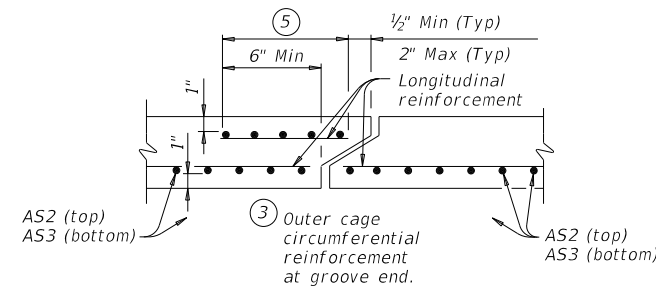
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.
 Provide Class H concrete ($f'c = 5,000$ psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
 See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
 In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

		Bridge Division Standard	
<h2>SINGLE BOX CULVERTS PRECAST 3'-0" SPAN</h2>			
<h3>SCP-3</h3>			
FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT	SECT	JOB
REVISIONS	2690	01	038
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	118	

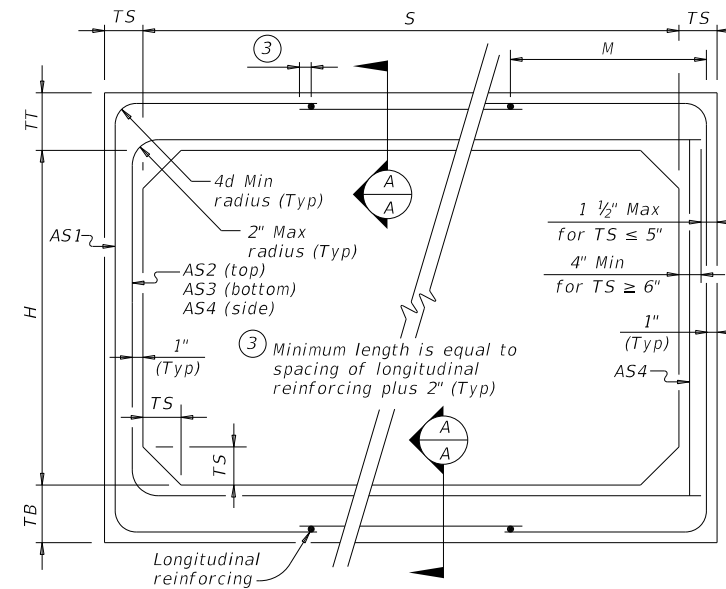
BOX DATA

SECTION DIMENSIONS					Fill Height (ft.)	M (Min) (in.)	REINFORCING (sq. in. / ft.) ⁽²⁾						Lift Weight (tons) ⁽¹⁾
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)			AS1	AS2	AS3	AS4	AS5	AS7	
7	3	8	8	8	< 2	-	0.23	0.31	0.22	0.19	0.19	0.19	9.6
7	3	8	8	8	2 < 3	47	0.27	0.25	0.24	0.19	-	-	9.6
7	3	8	8	8	3 - 5	43	0.19	0.19	0.19	0.19	-	-	9.6
7	3	8	8	8	10	43	0.21	0.20	0.21	0.19	-	-	9.6
7	3	8	8	8	15	43	0.28	0.26	0.27	0.19	-	-	9.6
7	3	8	8	8	20	43	0.36	0.34	0.35	0.19	-	-	9.6
7	3	8	8	8	25	43	0.45	0.42	0.43	0.19	-	-	9.6
7	3	8	8	8	30	43	0.54	0.50	0.51	0.19	-	-	9.6
7	4	8	8	8	< 2	-	0.21	0.34	0.25	0.19	0.19	0.19	10.4
7	4	8	8	8	2 < 3	43	0.23	0.28	0.28	0.19	-	-	10.4
7	4	8	8	8	3 - 5	43	0.19	0.22	0.19	0.19	-	-	10.4
7	4	8	8	8	10	43	0.19	0.23	0.23	0.19	-	-	10.4
7	4	8	8	8	15	41	0.24	0.30	0.30	0.19	-	-	10.4
7	4	8	8	8	20	41	0.31	0.38	0.39	0.19	-	-	10.4
7	4	8	8	8	25	41	0.38	0.47	0.48	0.19	-	-	10.4
7	4	8	8	8	30	41	0.46	0.57	0.57	0.19	-	-	10.4
7	5	8	8	8	< 2	-	0.19	0.36	0.27	0.19	0.19	0.19	11.2
7	5	8	8	8	2 < 3	47	0.21	0.31	0.31	0.19	-	-	11.2
7	5	8	8	8	3 - 5	43	0.19	0.24	0.21	0.19	-	-	11.2
7	5	8	8	8	10	43	0.19	0.25	0.26	0.19	-	-	11.2
7	5	8	8	8	15	41	0.21	0.32	0.33	0.19	-	-	11.2
7	5	8	8	8	20	41	0.27	0.41	0.42	0.19	-	-	11.2
7	5	8	8	8	25	41	0.33	0.51	0.52	0.19	-	-	11.2
7	5	8	8	8	30	41	0.40	0.61	0.62	0.19	-	-	11.2
7	6	8	8	8	< 2	-	0.19	0.38	0.30	0.19	0.19	0.19	12.0
7	6	8	8	8	2 < 3	59	0.19	0.33	0.34	0.19	-	-	12.0
7	6	8	8	8	3 - 5	47	0.19	0.25	0.23	0.19	-	-	12.0
7	6	8	8	8	10	43	0.19	0.26	0.27	0.19	-	-	12.0
7	6	8	8	8	15	41	0.19	0.34	0.35	0.19	-	-	12.0
7	6	8	8	8	20	41	0.24	0.43	0.45	0.19	-	-	12.0
7	6	8	8	8	25	41	0.29	0.53	0.55	0.19	-	-	12.0
7	6	8	8	8	30	41	0.35	0.64	0.65	0.19	-	-	12.0
7	7	8	8	8	< 2	-	0.19	0.40	0.33	0.19	0.19	0.19	12.8
7	7	8	8	8	2 < 3	59	0.19	0.36	0.37	0.19	-	-	12.8
7	7	8	8	8	3 - 5	59	0.19	0.27	0.25	0.19	-	-	12.8
7	7	8	8	8	10	47	0.19	0.27	0.29	0.19	-	-	12.8
7	7	8	8	8	15	43	0.19	0.35	0.37	0.19	-	-	12.8
7	7	8	8	8	20	43	0.22	0.44	0.46	0.19	-	-	12.8
7	7	8	8	8	25	43	0.27	0.54	0.57	0.19	-	-	12.8
7	7	8	8	8	30	41	0.32	0.65	0.67	0.19	-	-	12.8

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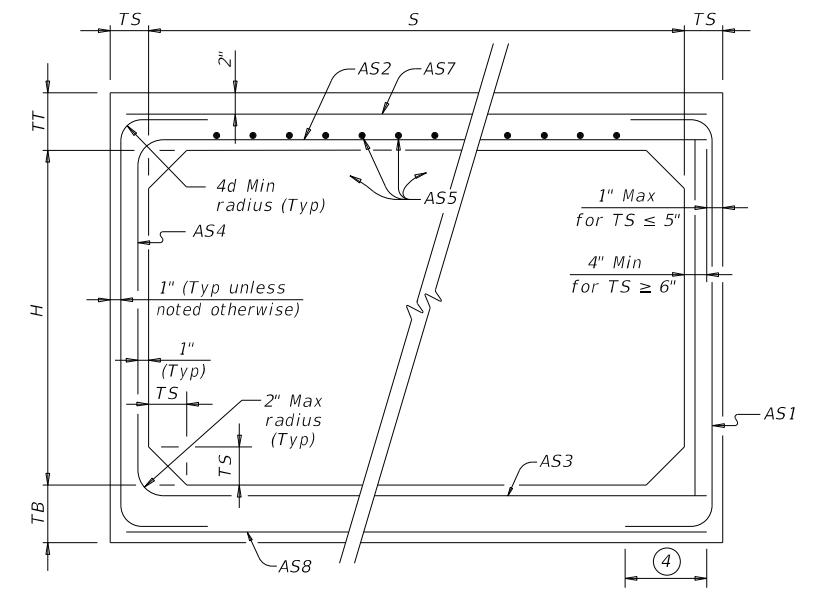
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⁽¹⁾ For box length = 8'-0"
⁽²⁾ AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

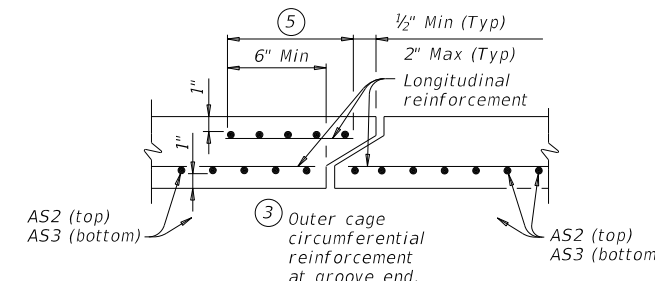
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimal requirement may be met by the transverse wires when wire mesh reinforcement is used.
 Provide Class H concrete ($f'c = 5,000$ psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
 See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
 In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

		Bridge Division Standard	
<h2>SINGLE BOX CULVERTS PRECAST 7'-0" SPAN</h2>			
<h3>SCP-7</h3>			
FILE: scp07sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT	SECT	JOB
REVISIONS	2690	01	038
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	119	

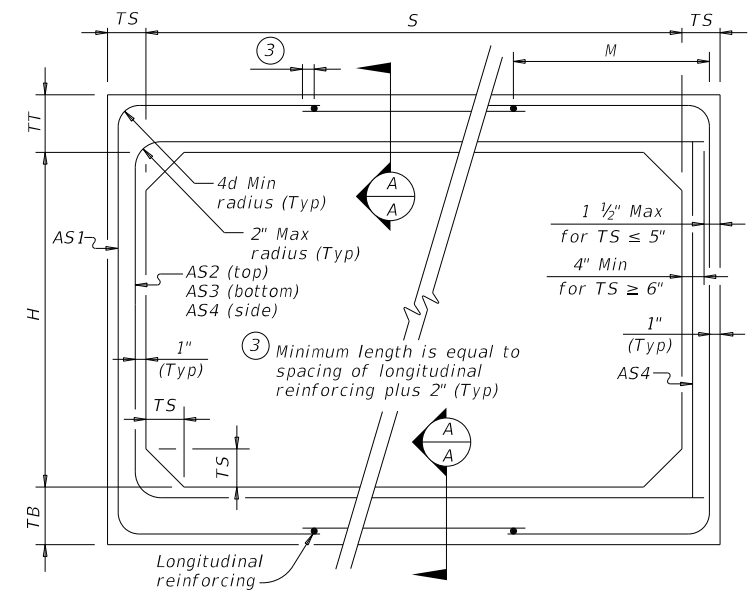
BOX DATA

SECTION DIMENSIONS					Fill Height (ft.)	M (Min) (in.)	REINFORCING (sq. in. / ft.) ⁽²⁾						⁽¹⁾ Lift Weight (tons)	
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)			AS1	AS2	AS3	AS4	AS5	AS7		AS8
9	4	9	9	9	< 2	-	0.30	0.36	0.28	0.22	0.22	0.22	0.22	13.7
9	4	9	9	9	2 < 3	54	0.35	0.34	0.31	0.22	-	-	-	13.7
9	4	9	9	9	3 - 5	50	0.28	0.27	0.27	0.22	-	-	-	13.7
9	4	9	9	9	10	49	0.31	0.30	0.31	0.22	-	-	-	13.7
9	4	9	9	9	15	49	0.40	0.40	0.41	0.22	-	-	-	13.7
9	4	9	9	9	20	44	0.52	0.51	0.52	0.22	-	-	-	13.7
9	4	9	9	9	25	44	0.65	0.64	0.65	0.22	-	-	-	13.7
9	5	9	9	9	< 2	-	0.28	0.38	0.31	0.22	0.22	0.22	0.22	14.6
9	5	9	9	9	2 < 3	54	0.32	0.38	0.34	0.22	-	-	-	14.6
9	5	9	9	9	3 - 5	49	0.25	0.30	0.30	0.22	-	-	-	14.6
9	5	9	9	9	10	49	0.28	0.33	0.34	0.22	-	-	-	14.6
9	5	9	9	9	15	44	0.36	0.43	0.45	0.22	-	-	-	14.6
9	5	9	9	9	20	44	0.47	0.56	0.57	0.22	-	-	-	14.6
9	5	9	9	9	25	44	0.58	0.69	0.71	0.22	-	-	-	14.6
9	6	9	9	9	< 2	-	0.25	0.40	0.34	0.22	0.22	0.22	0.22	15.5
9	6	9	9	9	2 < 3	54	0.29	0.41	0.38	0.22	-	-	-	15.5
9	6	9	9	9	3 - 5	49	0.23	0.33	0.33	0.22	-	-	-	15.5
9	6	9	9	9	10	49	0.26	0.35	0.37	0.22	-	-	-	15.5
9	6	9	9	9	15	44	0.33	0.46	0.48	0.22	-	-	-	15.5
9	6	9	9	9	20	44	0.42	0.60	0.61	0.22	-	-	-	15.5
9	6	9	9	9	25	44	0.52	0.74	0.75	0.22	-	-	-	15.5
9	7	9	9	9	< 2	-	0.23	0.42	0.36	0.22	0.22	0.22	0.22	16.4
9	7	9	9	9	2 < 3	59	0.26	0.44	0.41	0.22	-	-	-	16.4
9	7	9	9	9	3 - 5	54	0.22	0.35	0.35	0.22	-	-	-	16.4
9	7	9	9	9	10	49	0.24	0.37	0.39	0.22	-	-	-	16.4
9	7	9	9	9	15	44	0.31	0.48	0.51	0.22	-	-	-	16.4
9	7	9	9	9	20	44	0.39	0.62	0.65	0.22	-	-	-	16.4
9	8	9	9	9	< 2	-	0.22	0.43	0.39	0.22	0.22	0.22	0.22	17.3
9	8	9	9	9	2 < 3	59	0.24	0.46	0.43	0.22	-	-	-	17.3
9	8	9	9	9	3 - 5	59	0.22	0.37	0.38	0.22	-	-	-	17.3
9	8	9	9	9	10	54	0.22	0.39	0.41	0.22	-	-	-	17.3
9	8	9	9	9	15	44	0.29	0.50	0.53	0.22	-	-	-	17.3
9	8	9	9	9	20	44	0.36	0.64	0.67	0.22	-	-	-	17.3
9	9	9	9	9	< 2	-	0.22	0.44	0.42	0.22	0.22	0.22	0.22	18.2
9	9	9	9	9	2 < 3	72	0.23	0.49	0.46	0.22	-	-	-	18.2
9	9	9	9	9	3 - 5	72	0.22	0.39	0.40	0.22	-	-	-	18.2
9	9	9	9	9	10	59	0.22	0.40	0.43	0.22	-	-	-	18.2
9	9	9	9	9	15	49	0.27	0.51	0.55	0.22	-	-	-	18.2
9	9	9	9	9	20	49	0.34	0.66	0.69	0.22	-	-	-	18.2

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 units.

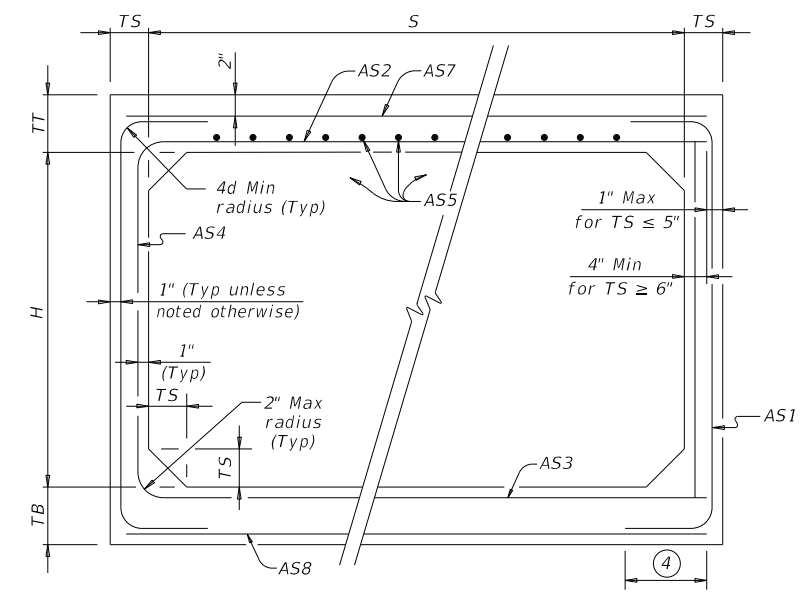
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⁽¹⁾ For box length = 8'-0"
⁽²⁾ AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

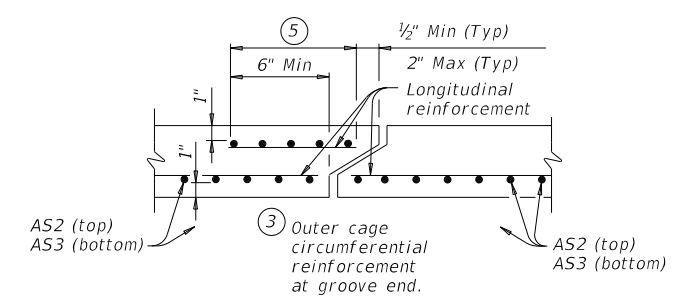
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

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



SECTION A-A

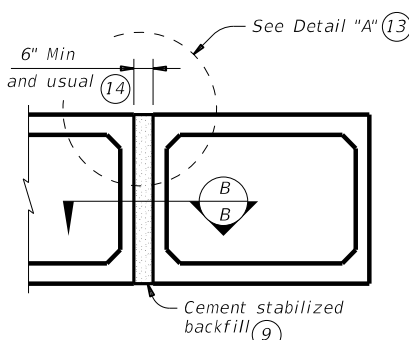
(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:
 Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.
 Provide Class H concrete ($f'c = 5,000$ psi).

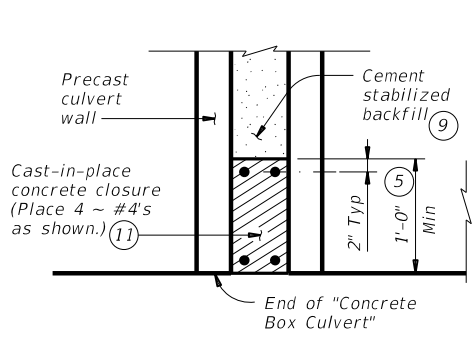
GENERAL NOTES:
 Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
 See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
 In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING			
			Bridge Division Standard
SINGLE BOX CULVERTS PRECAST 9'-0" SPAN			
SCP-9			
FILE:	scp09sts-20.dgn	DN: TxDOT	CK: TxDOT
CONT:	February 2020	SECT:	JOB
REVISIONS:		2690 01	038 FM 971
DIST:	AUS	COUNTY:	WILLIAMSON
		SHEET NO.:	120

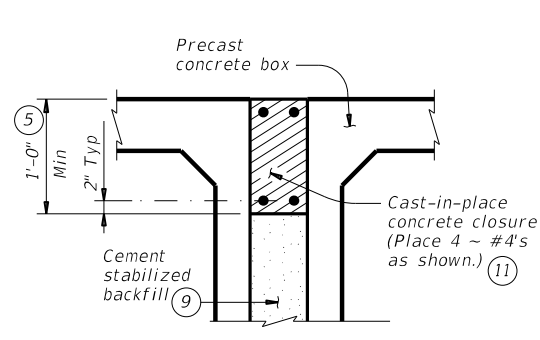
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 The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of drawings to PDF format.



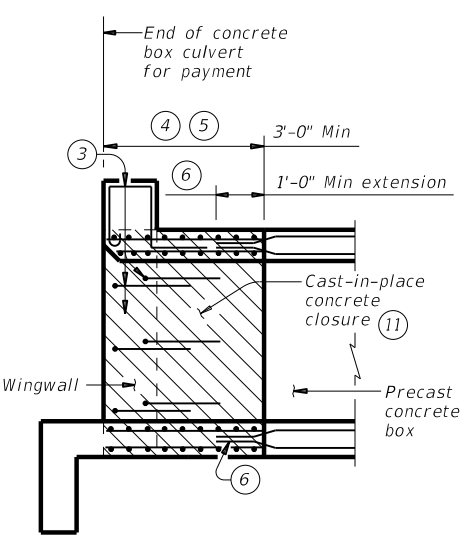
MULTIPLE UNIT PLACEMENT



SECTION B-B

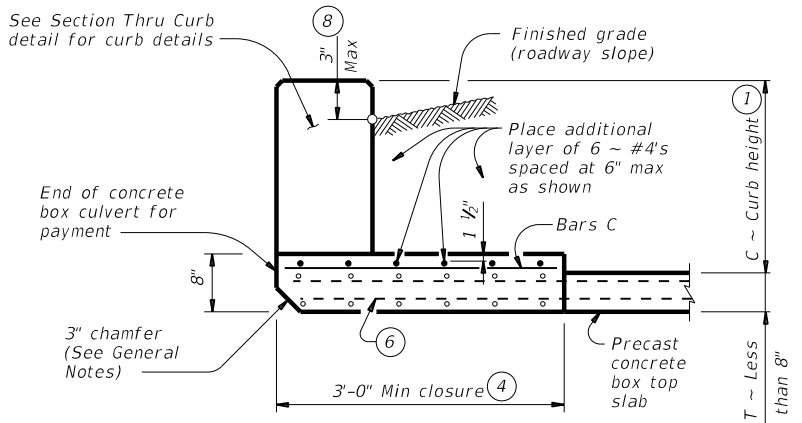


DETAIL "A" (13)

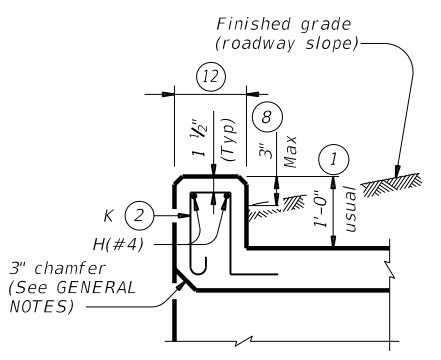


WINGWALL CONNECTION
(Also applies to safety end treatment.)

- 1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- 2 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- 3 Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
- 4 Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
- 5 For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
- 6 Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
- 7 Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
- 8 For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above 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.
- 9 Cement stabilized backfill between boxes is considered part of the box culvert for payment.
- 10 All curb concrete and reinforcing is considered part of the box culvert for payment.
- 11 Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
- 12 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
- 13 For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
- 14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

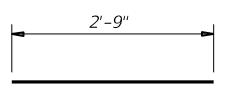


SECTION THRU TOP SLABS LESS THAN 8"

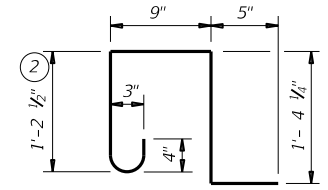


SECTION THRU CURB

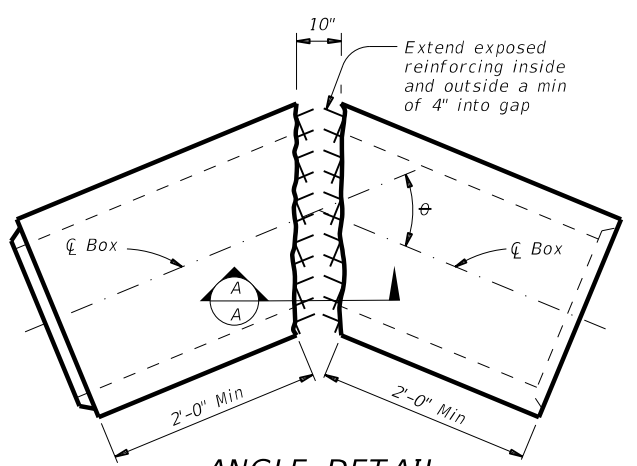
QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



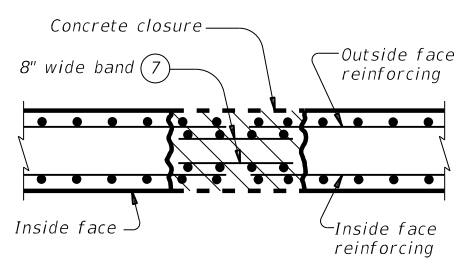
BARS C (#4)
(Spa = 1'-0" Max)



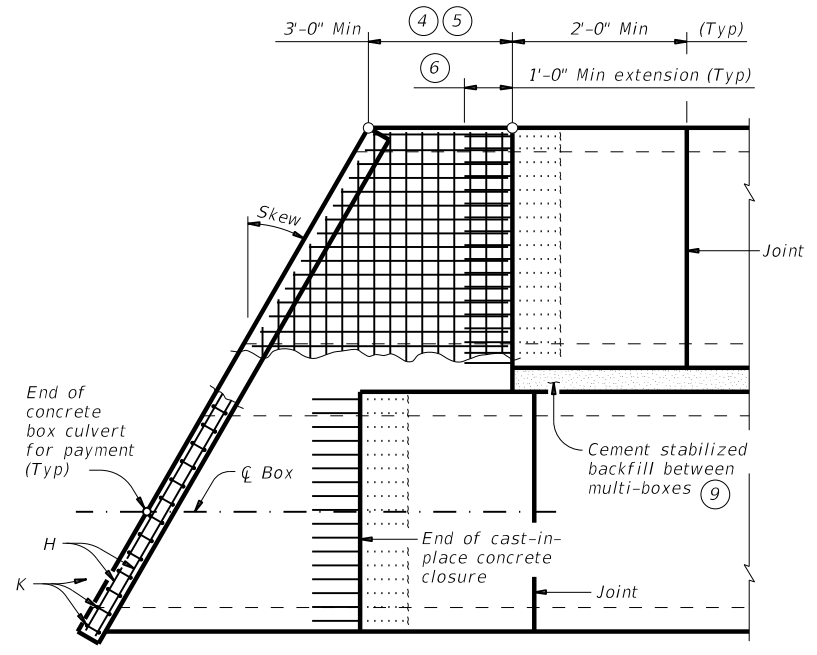
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS
(Showing multi-box placement.)

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

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

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

HL93 LOADING

		Bridge Division Standard	
BOX CULVERTS PRECAST MISCELLANEOUS DETAILS			
SCP-MD			
FILE: scpmstds-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT
©TxDOT February 2020	CONT	SECT	JOB
REVISIONS	2690	01	038
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	121

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

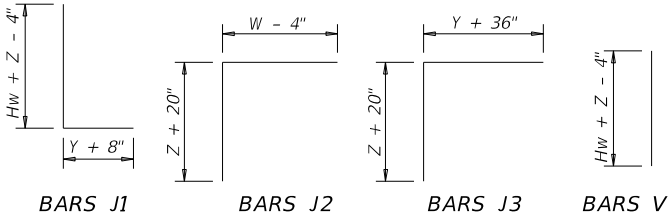
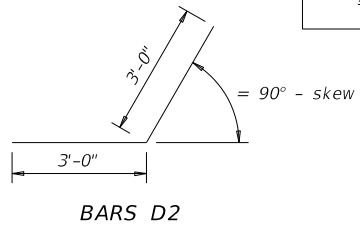
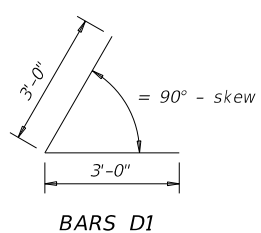
Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing (2-wings) (4)		Estimated Quantities per ft of Toewall (1-toewall)	
	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
					Size	Spa	Size	Spa				
2'-6"	2'-10"	10"	1'-0"	7"	#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"



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

$Hw = H + T + C$
 $Lw = (Hw) (SL) \div \cosine (\theta)$ for Type PW-1
 $= (Hw - 1') (SL) \div \cosine (\theta)$ for Type PW-2 and $Hw \geq 4'$
 $= (Hw - 0.5') (SL) \div \cosine (\theta)$ for Type PW-2 and $Hw < 4'$

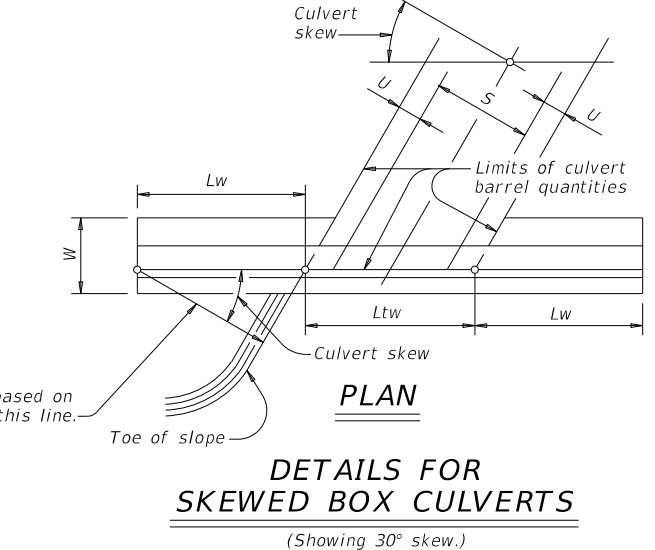
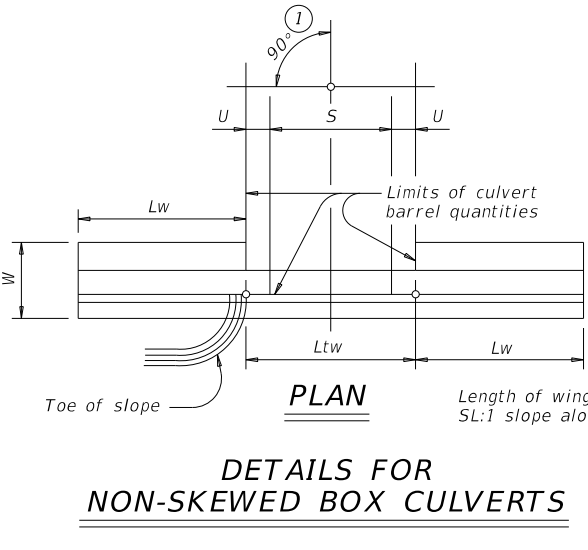
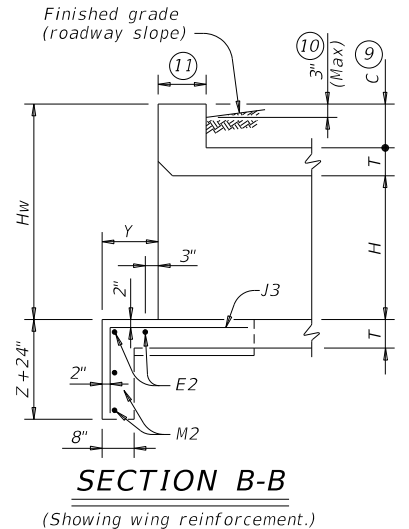
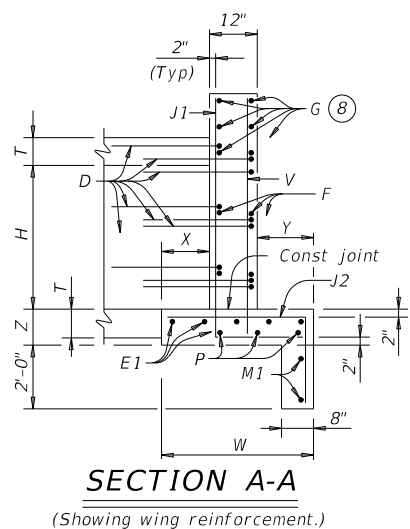
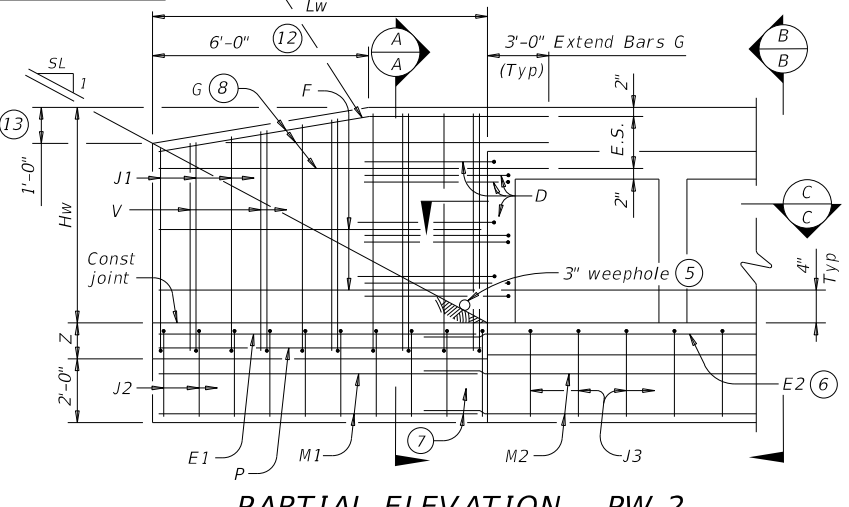
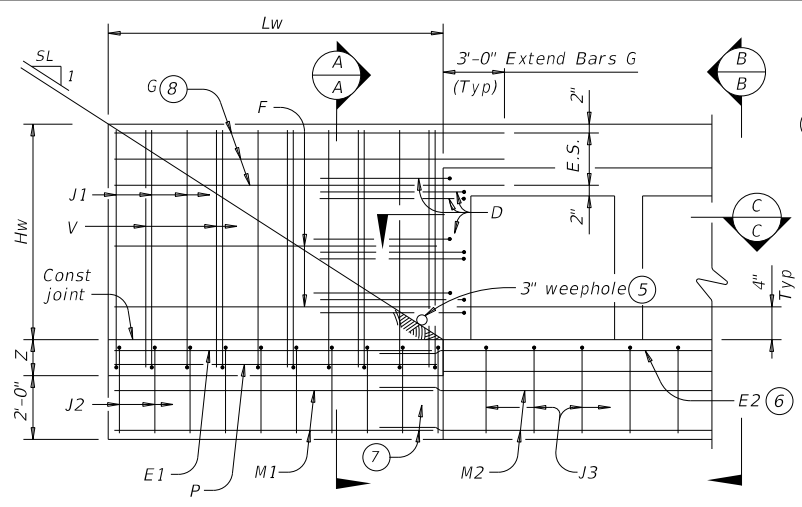
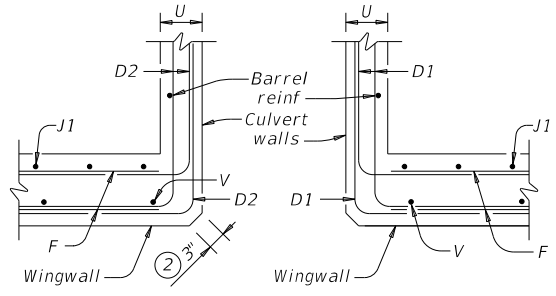
For cast-in-place culverts:
 $Ltw = [(N) (S) + (N + 1) (U)] \div \cosine (\theta)$

For precast culverts:
 $Ltw = [(N) (2 U + S) + (N - 1) (0.5')] \div \cosine (\theta)$
 Total Wingwall Area (two wings ~ SF)
 $= (2)(Hw)(Lw)$ for Type PW-1
 $= (2)(Hw)(Lw) - 6 SF$ for Type PW-2 and $Hw \geq 4'$
 $= (2)(Hw)(Lw) - 1.5 SF$ 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.

- Skew = 0°
- At discharge end, chamfer may be 3/4" minimum.
- For 15° skew ~ 1"
For 30° skew ~ 2"
For 45° skew ~ 3"
- 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.
- Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
- Extend Bars E2 1'-6" minimum into the wingwall footing.
- Lap Bars M1 1'-6" minimum with Bars M2.
- Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
- 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.
- 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.
- 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
- 3'-0" for Hw < 4'.
- 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 reinforcing 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.

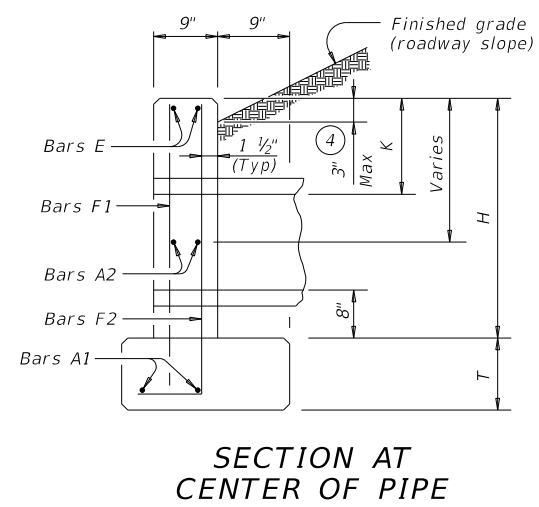
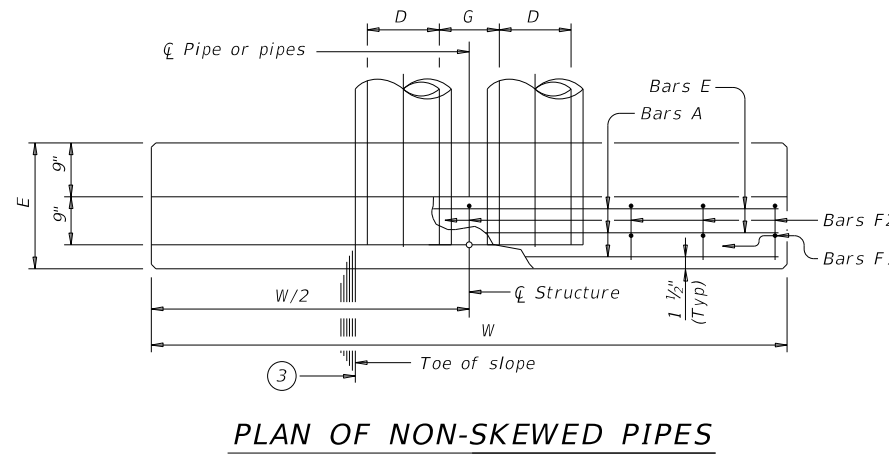
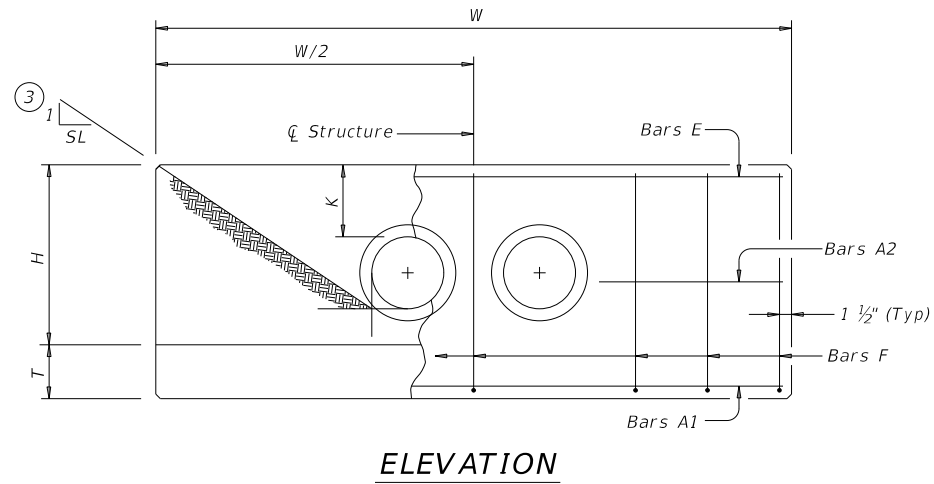
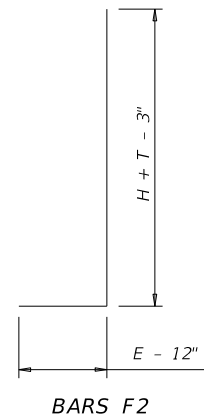
Texas Department of Transportation
CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2
 PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	122	

DATE: 9/22/2022 8:22:22 AM
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TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL

Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Add'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	0.2
2:1	15"	10' - 3"	136	1.3	2' - 2"	16	0.2
2:1	18"	11' - 6"	163	1.5	2' - 8"	19	0.3
2:1	21"	12' - 9"	200	1.8	3' - 1"	31	0.4
2:1	24"	14' - 0"	217	2.1	3' - 7"	34	0.4
2:1	27"	15' - 3"	254	2.4	3' - 11"	37	0.5
2:1	30"	16' - 6"	272	2.7	4' - 4"	40	0.6
2:1	33"	17' - 9"	314	3.1	4' - 8"	43	0.6
2:1	36"	19' - 0"	371	3.9	5' - 1"	46	0.8
2:1	42"	21' - 6"	442	4.9	5' - 10"	52	1.0
2:1	48"	25' - 0"	569	6.4	6' - 7"	59	1.3
2:1	54"	27' - 6"	701	7.5	7' - 6"	82	1.6
2:1	60"	30' - 0"	794	8.8	8' - 3"	90	1.8
2:1	66"	32' - 6"	894	10.2	8' - 9"	96	2.0
2:1	72"	35' - 0"	1,055	11.7	9' - 4"	103	2.3
3:1	12"	13' - 0"	175	1.6	1' - 9"	14	0.2
3:1	15"	14' - 9"	193	1.9	2' - 2"	17	0.2
3:1	18"	16' - 6"	228	2.2	2' - 8"	19	0.3
3:1	21"	18' - 3"	299	2.6	3' - 1"	31	0.4
3:1	24"	20' - 0"	323	3.0	3' - 7"	33	0.4
3:1	27"	21' - 9"	371	3.5	3' - 11"	37	0.5
3:1	30"	23' - 6"	415	4.0	4' - 4"	40	0.5
3:1	33"	25' - 3"	469	4.6	4' - 8"	43	0.6
3:1	36"	27' - 0"	556	5.7	5' - 1"	46	0.8
3:1	42"	30' - 6"	675	7.1	5' - 10"	52	1.0
3:1	48"	35' - 6"	837	9.2	6' - 7"	59	1.3
3:1	54"	39' - 0"	1,015	11.0	7' - 6"	84	1.6
3:1	60"	42' - 6"	1,171	12.9	8' - 3"	91	1.8
3:1	66"	46' - 0"	1,298	14.9	8' - 9"	98	2.0
3:1	72"	49' - 6"	1,561	17.1	9' - 4"	103	2.3
4:1	12"	17' - 0"	229	2.0	1' - 9"	15	0.2
4:1	15"	19' - 3"	266	2.4	2' - 2"	17	0.2
4:1	18"	21' - 6"	308	2.9	2' - 8"	19	0.3
4:1	21"	23' - 9"	382	3.5	3' - 1"	31	0.3
4:1	24"	26' - 0"	430	3.9	3' - 7"	34	0.4
4:1	27"	28' - 3"	486	4.7	3' - 11"	37	0.5
4:1	30"	30' - 6"	539	5.2	4' - 4"	40	0.6
4:1	33"	32' - 9"	603	6.0	4' - 8"	42	0.6
4:1	36"	35' - 0"	738	7.5	5' - 1"	47	0.8
4:1	42"	39' - 6"	881	9.3	5' - 10"	52	1.0
4:1	48"	46' - 0"	1,102	12.1	6' - 7"	61	1.3
4:1	54"	50' - 6"	1,364	14.4	7' - 6"	84	1.6
4:1	60"	55' - 0"	1,547	16.9	8' - 3"	91	1.8
4:1	66"	59' - 6"	1,741	19.5	8' - 9"	98	2.0
4:1	72"	64' - 0"	2,077	22.4	9' - 4"	102	2.3
6:1	12"	25' - 0"	336	3.0	1' - 9"	14	0.2
6:1	15"	28' - 3"	384	3.6	2' - 2"	17	0.2
6:1	18"	31' - 6"	452	4.2	2' - 8"	19	0.3
6:1	21"	34' - 9"	581	5.1	3' - 1"	31	0.4
6:1	24"	38' - 0"	644	5.8	3' - 7"	34	0.4
6:1	27"	41' - 3"	737	6.9	3' - 11"	37	0.5
6:1	30"	44' - 6"	807	7.7	4' - 4"	39	0.6
6:1	33"	47' - 9"	912	8.9	4' - 8"	44	0.6
6:1	36"	51' - 0"	1,108	11.0	5' - 1"	48	0.8
6:1	42"	57' - 6"	1,318	13.7	5' - 10"	54	1.0
6:1	48"	67' - 0"	1,682	17.9	6' - 7"	59	1.3
6:1	54"	73' - 6"	2,072	21.3	7' - 6"	83	1.6
6:1	60"	80' - 0"	2,351	24.9	8' - 3"	89	1.8
6:1	66"	86' - 6"	2,643	28.9	8' - 9"	96	2.0
6:1	72"	93' - 0"	3,121	33.1	9' - 4"	101	2.3



- ① Total quantities include one 3'-1" lap for bars over 60' in length.
- ② Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- ③ Indicated slope is perpendicular to centerline pipe or pipes.
- ④ For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ⑤ Dimensions shown are usual and maximum.
- ⑥ Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel.
 Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 Do not mount bridge rails of any type directly to these culvert headwalls.
 This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

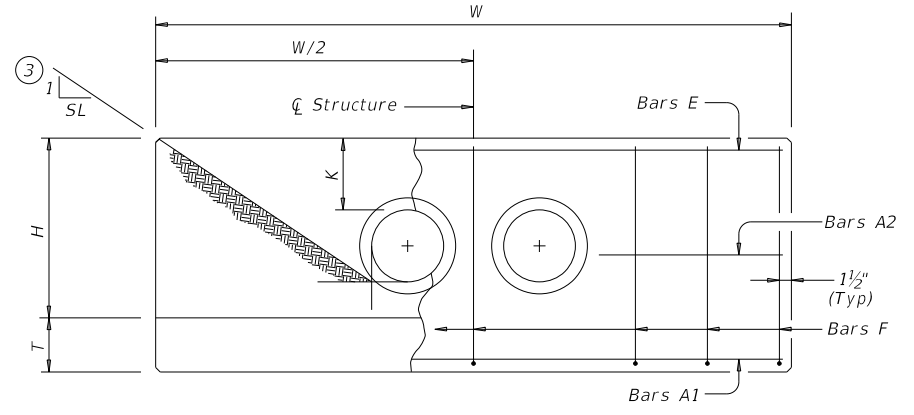
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AUS	WILLIAMSON		123	

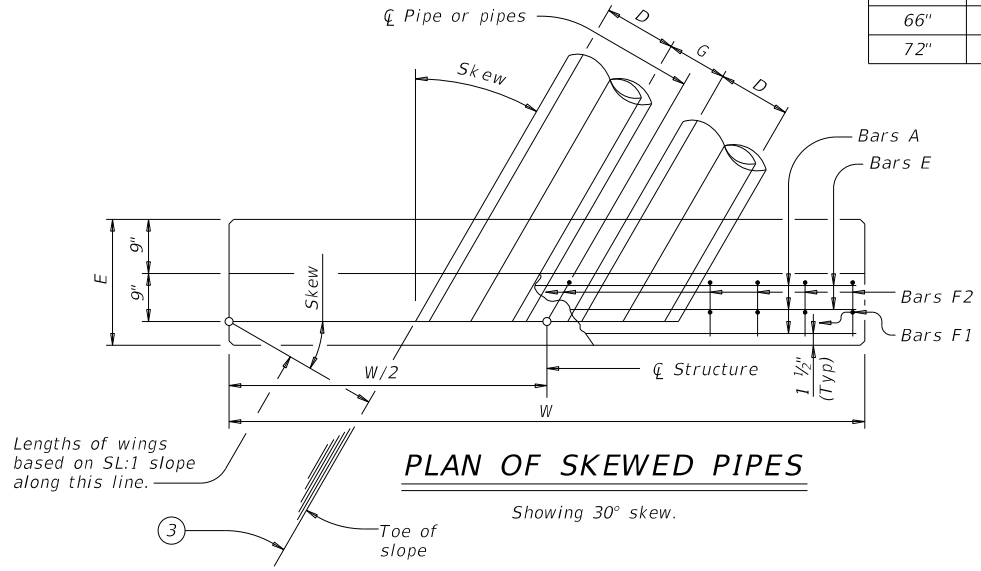
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TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

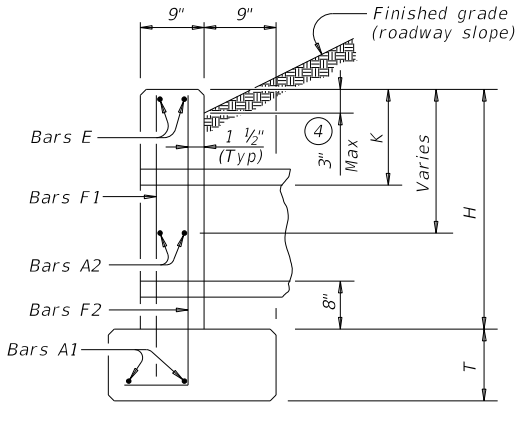
Table with columns for Skew (15°, 30°, 45°), Dia of Pipe (D), W, Reinf (Lbs) (1), Conc (CY) (2), and values for one pipe and values to be added for each add'l pipe.



ELEVATION



PLAN OF SKEWED PIPES



SECTION AT CENTER OF PIPE

TABLE OF CONSTANT DIMENSIONS

Table with columns: Dia of Pipe (D), G, K (5), H, T, E. Lists dimensions for pipe diameters from 12" to 72".

TABLE OF (6) REINFORCING STEEL

Table with columns: Bar, Size, Spa, No. Lists reinforcement bars A1, A2, E, and F with their respective sizes and spacings.

- MATERIAL NOTES: Provide Grade 60 reinforcing steel. Provide Class C concrete (f'c = 3,600 psi). GENERAL NOTES: Designed according to AASHTO LRFD Bridge Design Specifications.

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

- (1) Total quantities include one 3'-1" lap for bars over 60' in length. (2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

Bridge Division Standard logo, project title CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS, and project details including file name, date, and county (WILLIAMSON).

Vertical text on the left margin containing project information and a disclaimer: 'No warranty of any kind is made by TxDOT for any purpose whatsoever.'

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 PROJECT: 2690010384
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

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

TABLE OF WINGWALL REINFORCING
(2-wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

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

WING DIMENSION FORMULAS:

(All values are in feet.)

$Hw = H + T + C - 0.250'$
 $A = (Hw - 0.333)(SL)$
 $B = (A) [\tan(\theta + 15^\circ)]$
 $Lw = (A) \div [\cos(\theta + 15^\circ)]$

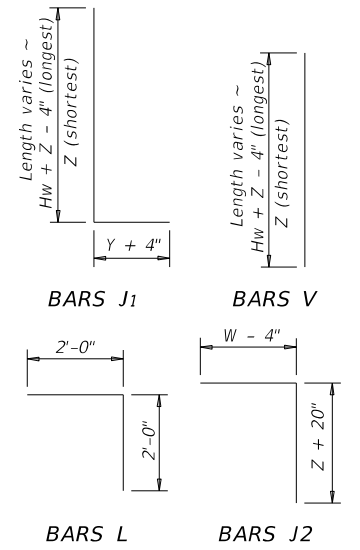
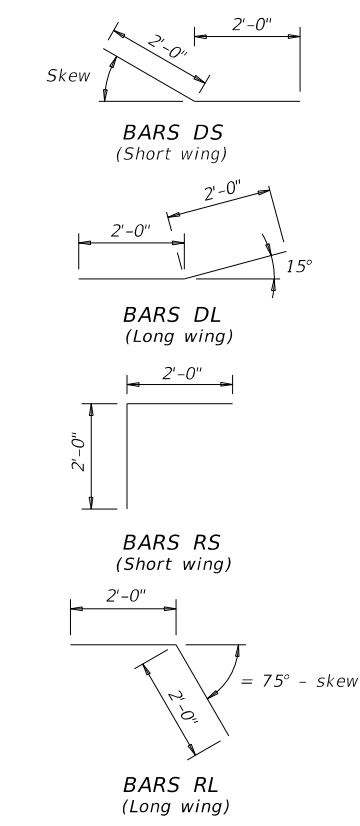
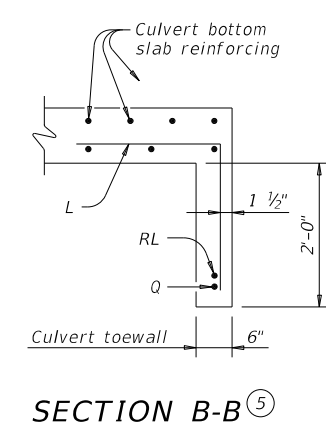
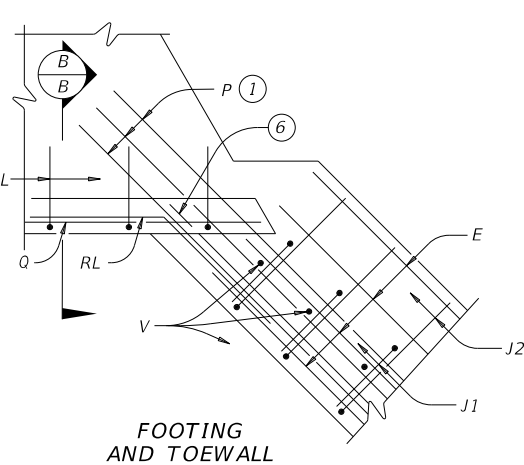
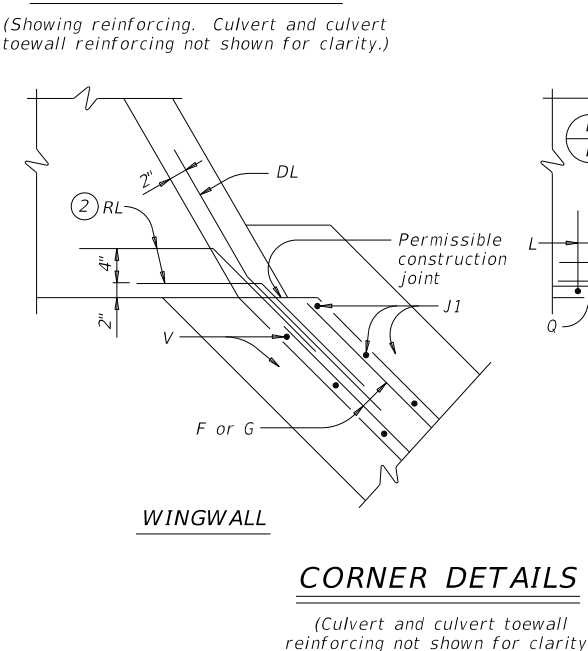
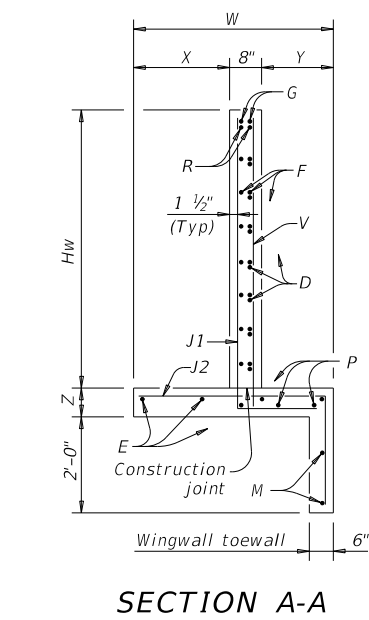
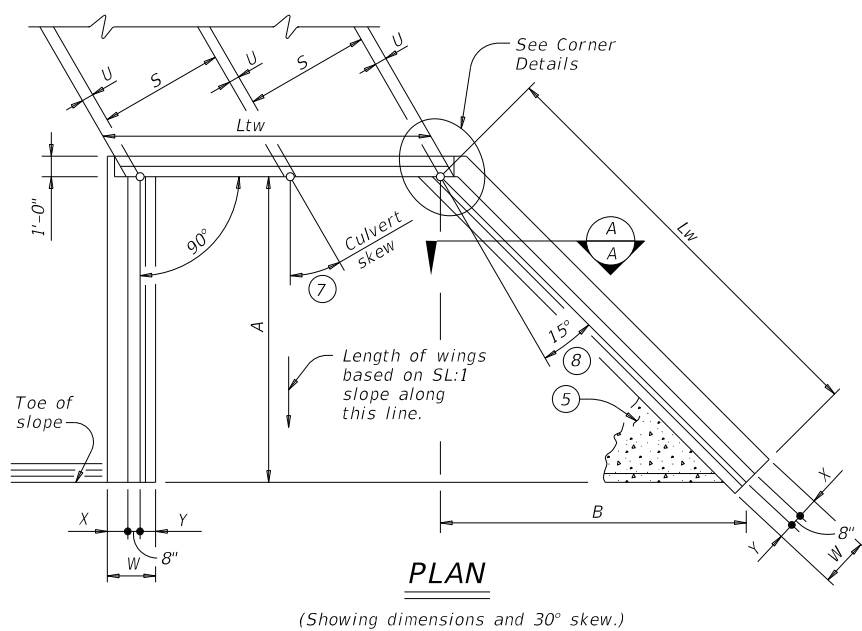
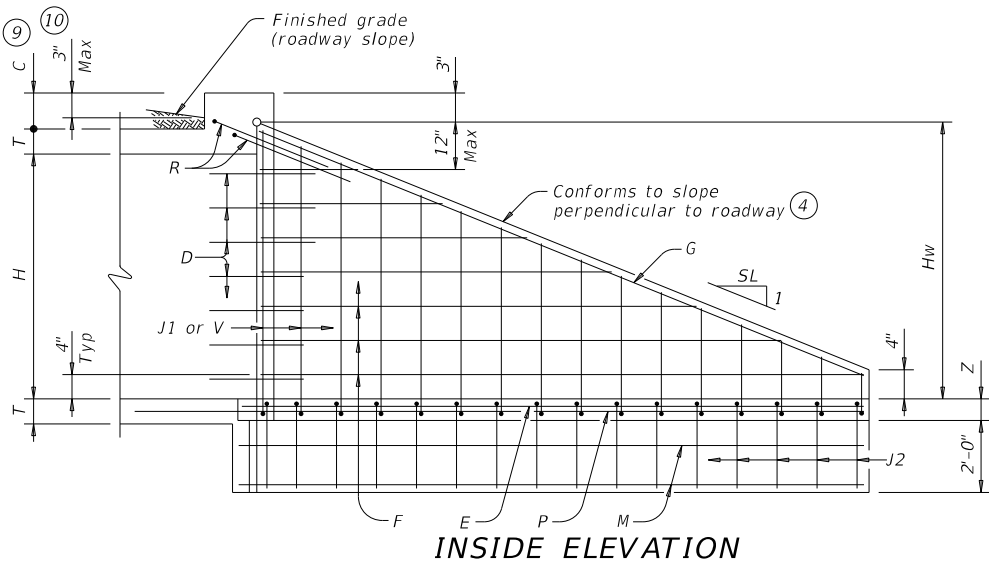
For cast-in-place culverts:
 $Ltw = [(N)(S) + (N + 1)(U)] \div \cos(\theta)$

For precast culverts:
 $Ltw = [(N)(2U + S) + (N - 1)(0.5')] \div \cos(\theta)$

Total wingwall area (two wings ~ SF) = $0.5 (Hw + 0.333) (Lw + A)$

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

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



- Extend Bars P 3'-0" minimum into bottom slab of box culvert.
- Adjust as necessary to maintain 1 1/2" clear cover and 4" minimum between bars.
- Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).
- Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
- When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
- At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
- Applicable values of skew are: 15°, 30°, and 45°.
- Typical wingwall angle for all skews.
- 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 or 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.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, construct curbs no more than 3" above finished grade.
 - For structures with bridge rail, construct curbs flush with finished grade.
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

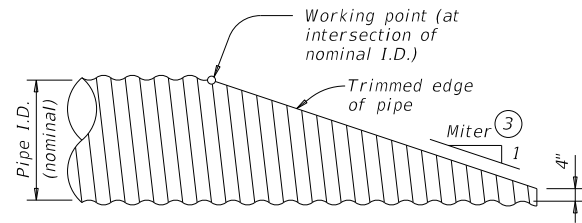
GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
 See Box Culvert Supplement (BCS) standard sheet for additional dimensions and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

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

				Bridge Division Standard	
CONCRETE WINGWALLS WITH FLARED WINGS FOR SKEWED BOX CULVERTS					
FW-S					
FILE:	fw-sstde-20.dgn	DN:	GAF	CK:	CAT
©TxDOT	February 2020	CONTRACT:	2690	SECTION:	01
REVISIONS:		JOB:	038	HIGHWAY:	FM 971
		DIST:	AUS	COUNTY:	WILLIAMSON
		SHEET NO.:			125

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS ①②

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	N/A	7' - 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	N/A	8' - 9"	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



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.)

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

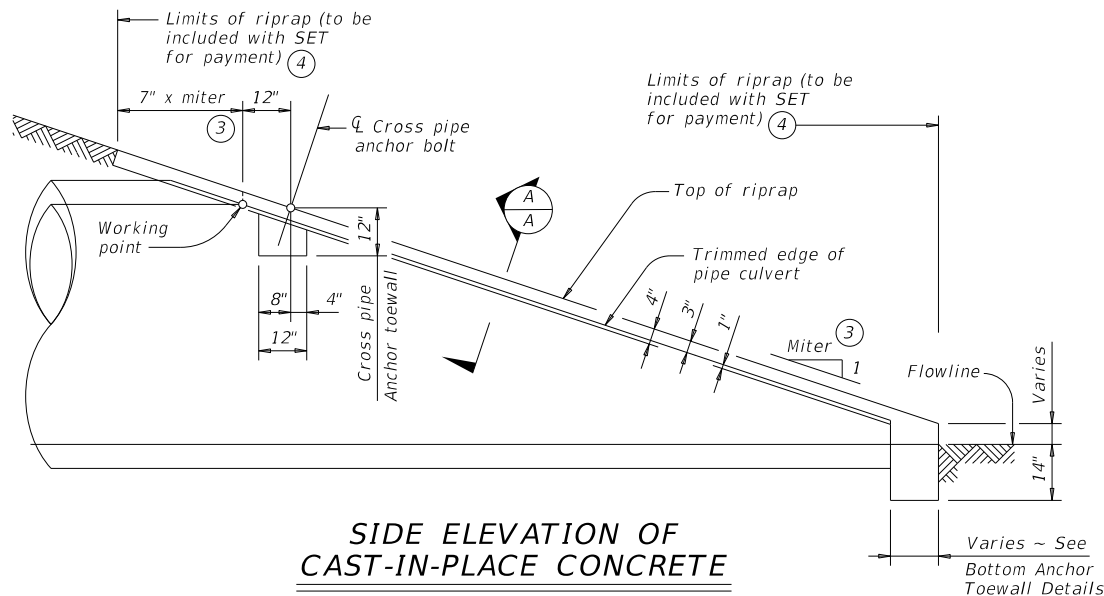
Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always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

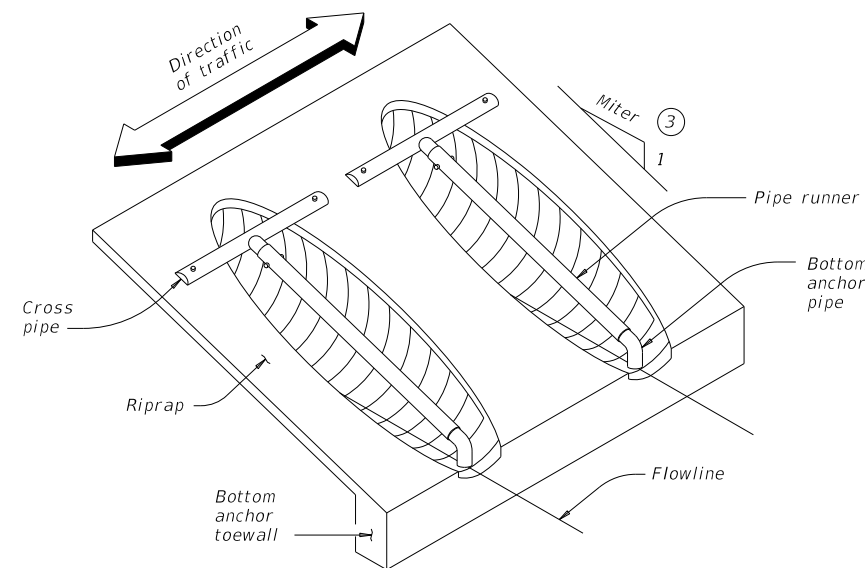
ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤

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



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.)

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.

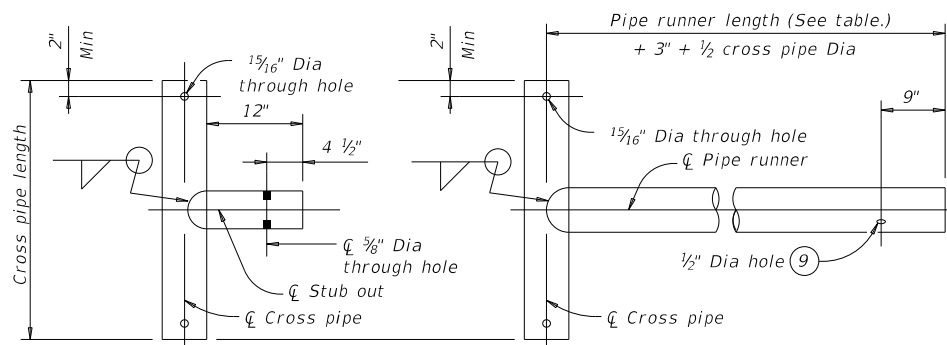
③ Miter = slope of mitered end of pipe culvert.

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

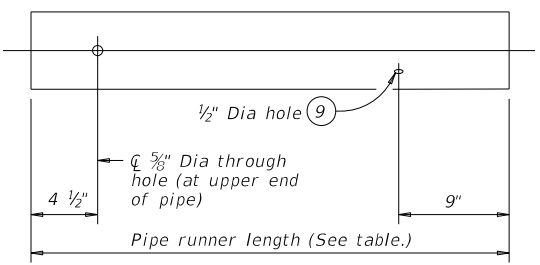
⑤ Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

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 DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this drawing to any other format.

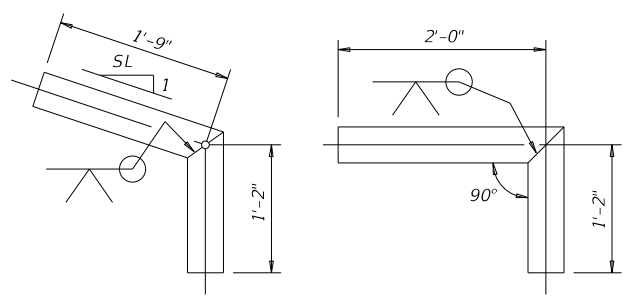


OPTION A1 **OPTION A2**
CROSS PIPE AND CONNECTIONS DETAILS

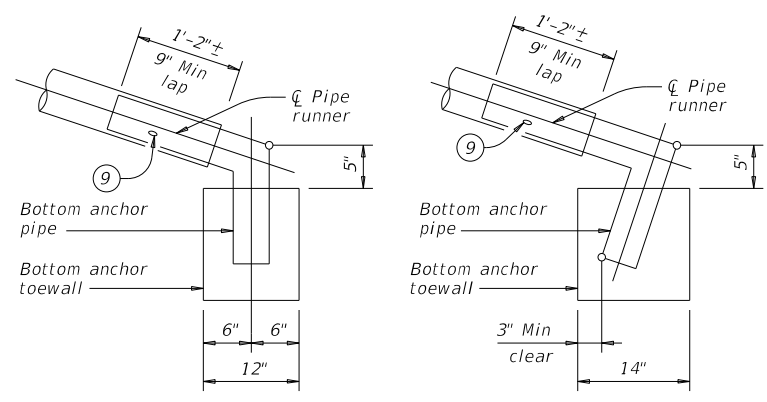


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



OPTION B1 **OPTION B2**
BOTTOM ANCHOR PIPE DETAILS ⑩



OPTION B1 **OPTION B2**
BOTTOM ANCHOR TOEWALL DETAILS

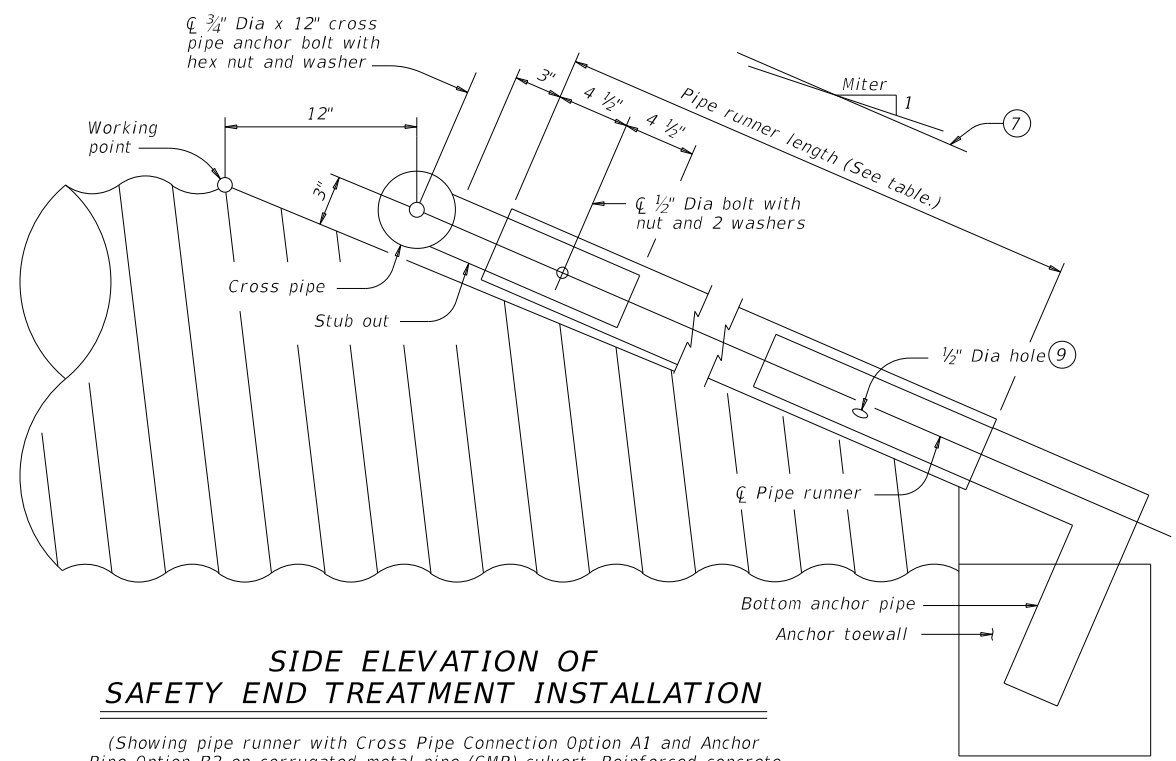
(Culvert and riprap not shown for clarity.)

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.

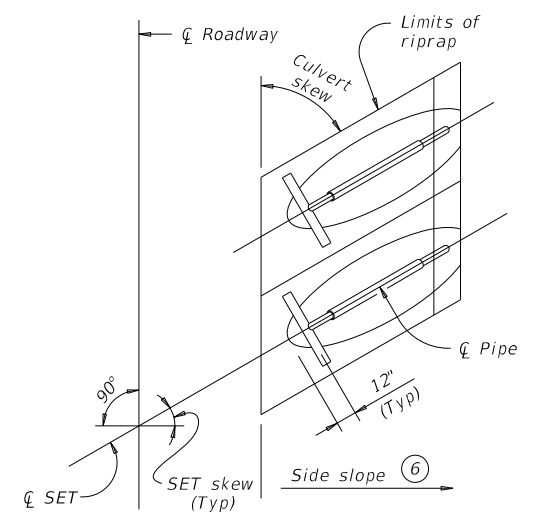
GENERAL NOTES:

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".

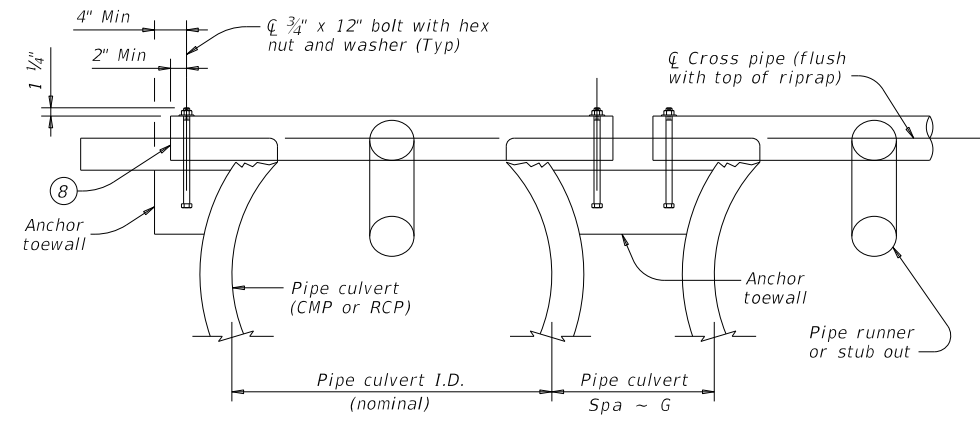


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

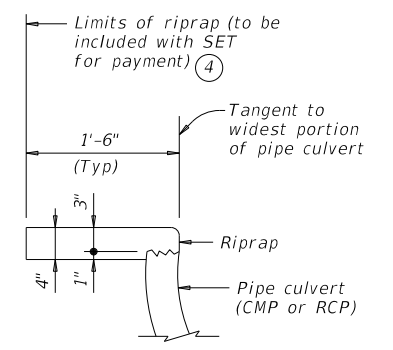
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)



PLAN OF SKEWED INSTALLATION



SECTION A-A
 SHOWING CROSS PIPE AND ANCHOR TOEWALL

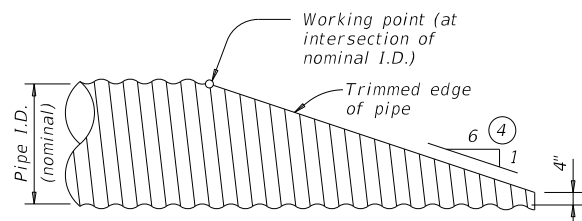


SHOWING TYPICAL PIPE CULVERT AND RIPRAP

- 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 inch 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.

		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
©TxDOT February 2020	CONT	SECT	JOB
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AUS	WILLIAMSON		127

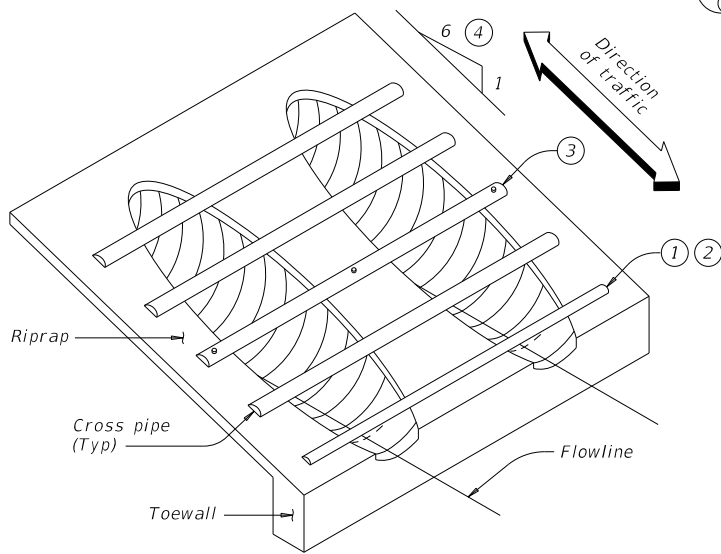
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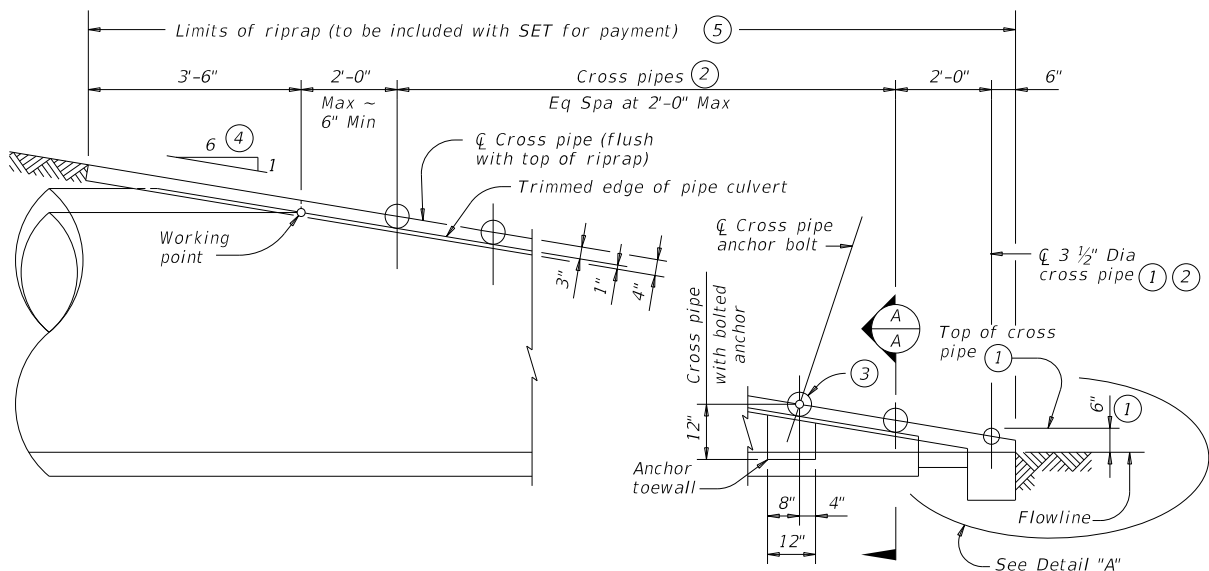
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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

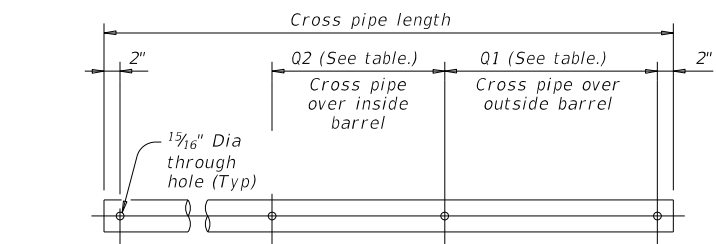


ISOMETRIC VIEW OF TYPICAL INSTALLATION

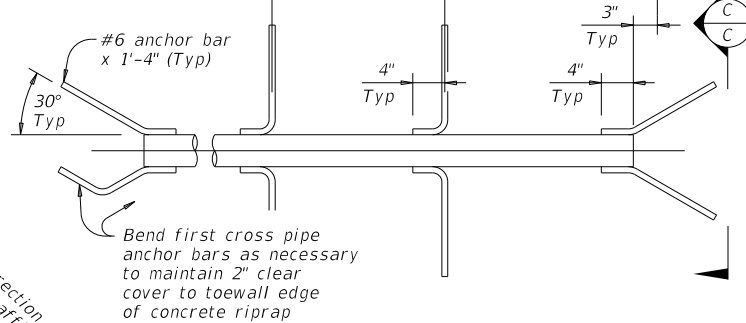


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

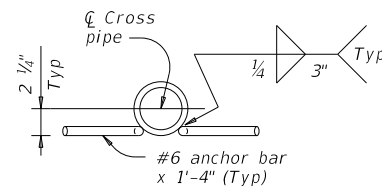
(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



PIPE WITH BOLTED ANCHOR



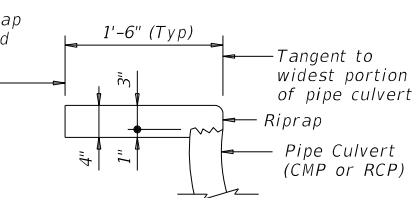
PIPE WITH ANCHOR BARS



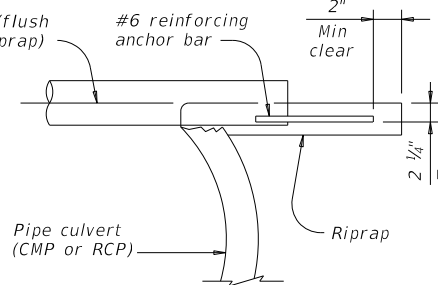
SECTION C-C

CROSS PIPE DETAILS

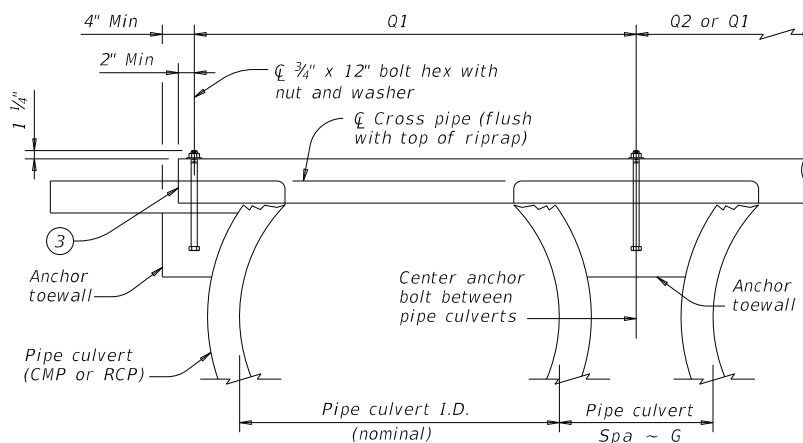
Limits of riprap (to be included with SET for payment) ⑤



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

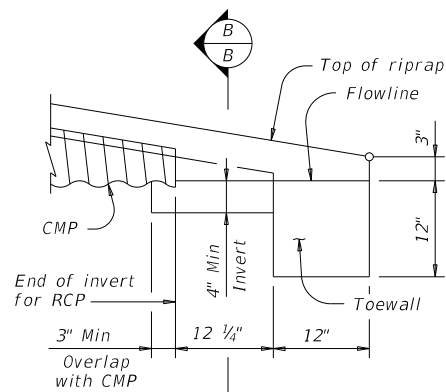


SHOWING CROSS PIPE WITH ANCHOR BAR



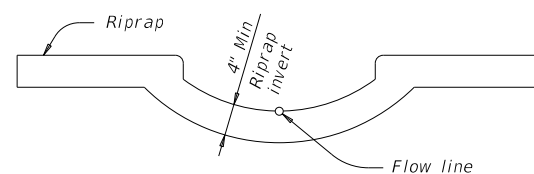
SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A



DETAIL "A"

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



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES

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"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"		
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	4" Std (4.500" O.D.)
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"		

- 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.
- 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.
- 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.
- Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".
- 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.

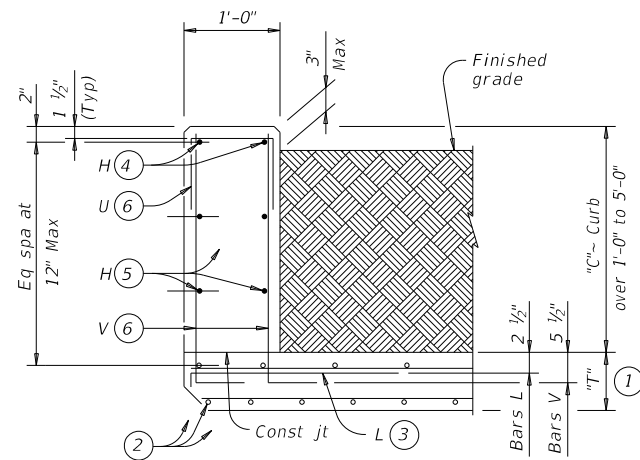
Bridge Division Standard

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

SETP-PD

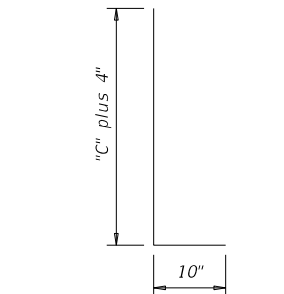
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AUS	WILLIAMSON		128	

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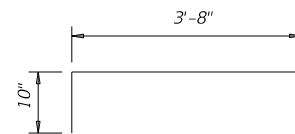
TYPICAL SECTION

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



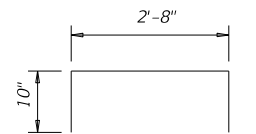
BARS V (#5)

Spaced at 12" Max



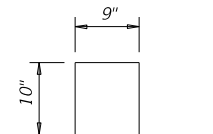
BARS L (#5)

Spaced at 12" Max



OPTIONAL BARS L (#5)

Spaced at 12" Max



BARS U (#4)

Spaced at 12" Max

- ① "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
- ② Adjust normal culvert slab bars as necessary to clear obstructions.
- ③ Place bars L as shown. Tilt hook as necessary to maintain cover.
- ④ Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
- ⑤ Additional bars H(#4) as required to maintain 12" Max spacing.
- ⑥ Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
- ⑦ Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
- ⑧ Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 1/4" cover. For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel. Provide galvanized reinforcing steel if required elsewhere in the plans. Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs. Provide bar laps, where required, as follows:
 • Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard. This Curb is considered as part of the Box Culvert for payment.

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

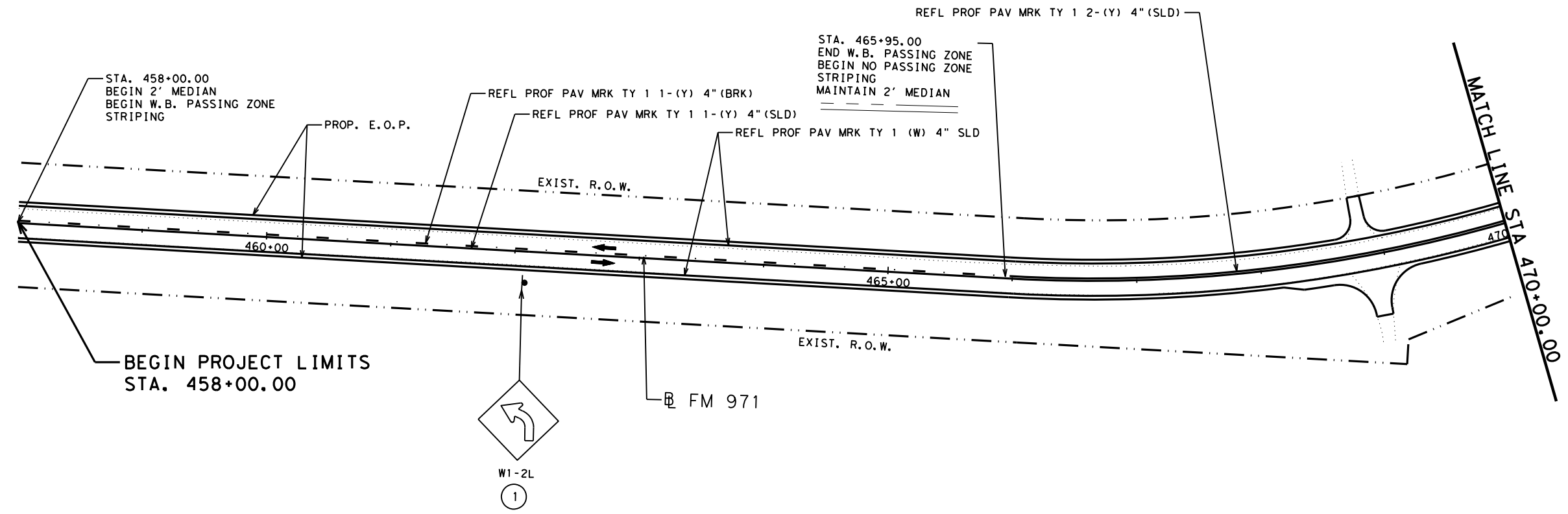


EXTENDED CURB DETAILS
FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

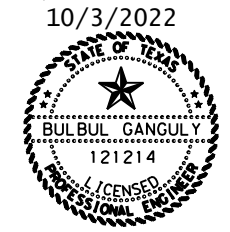
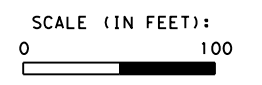
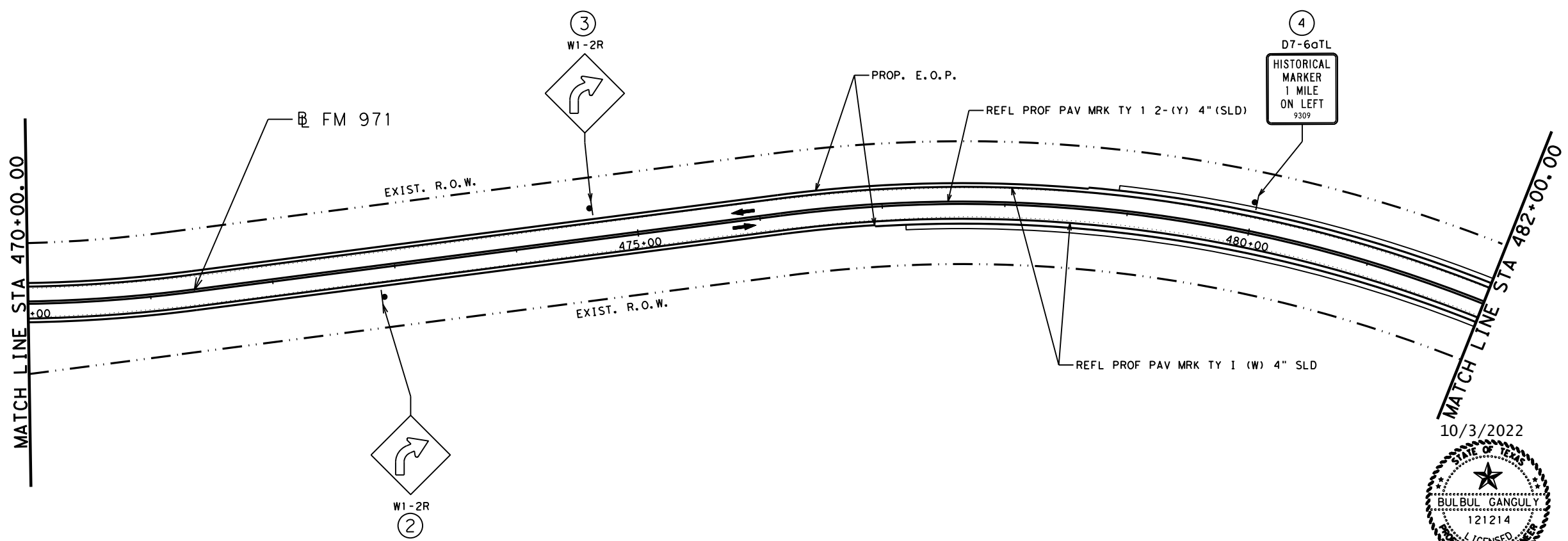
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©TxDOT February 2020	CONT SECT	JOB	HIGHWAY	
REVISIONS	2690 01	038	FM 971	
DIST	COUNTY		SHEET NO.	
AUS	WILLIAMSON		129	

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LEGEND

	NO PASSING ZONE STRIPING
	EAST BOUND (E.B.) PASSING ZONE
	WEST BOUND (W.B.) PASSING ZONE
	TWO-WAY PASSING ZONE
	TWO-WAY LEFT TURN LANE



DocuSigned by:
Bulbul Ganguly

**Austin District
 Central Design**

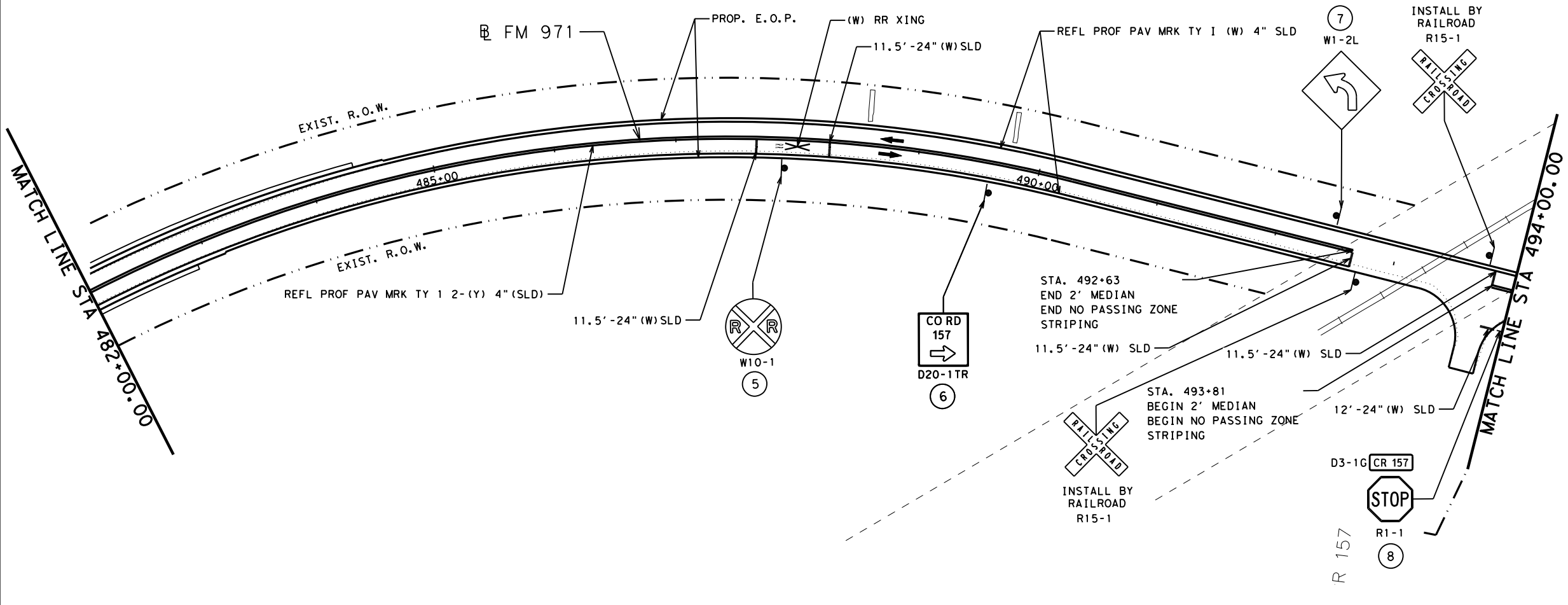
Texas Department of Transportation

**FM 971
 SIGNING AND
 PAVEMENT MARKING
 LAYOUT**

SHEET 1 OF 5

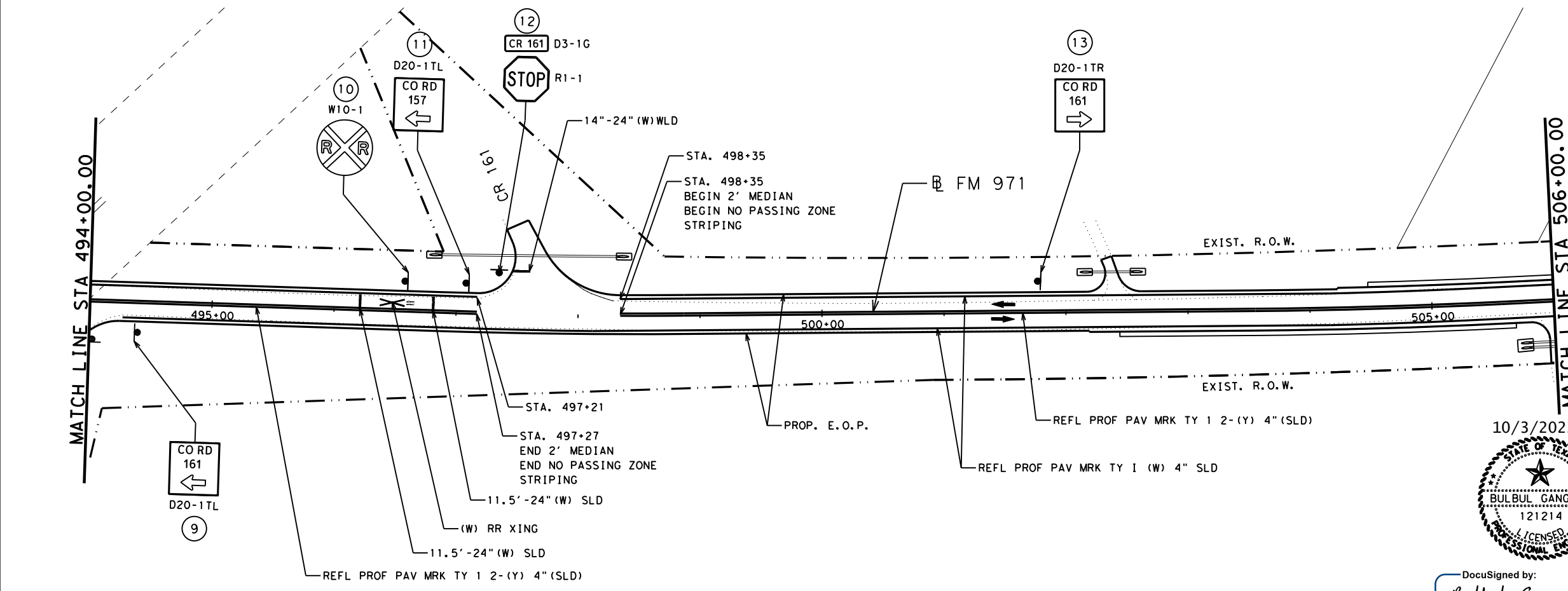
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LEGEND

	NO PASSING ZONE STRIPING
	EAST BOUND (E.B.) PASSING ZONE
	WEST BOUND (W.B.) PASSING ZONE
	TWO-WAY PASSING ZONE
	TWO-WAY LEFT TURN LANE



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Bulbul Ganguly

**Austin District
 Central Design**

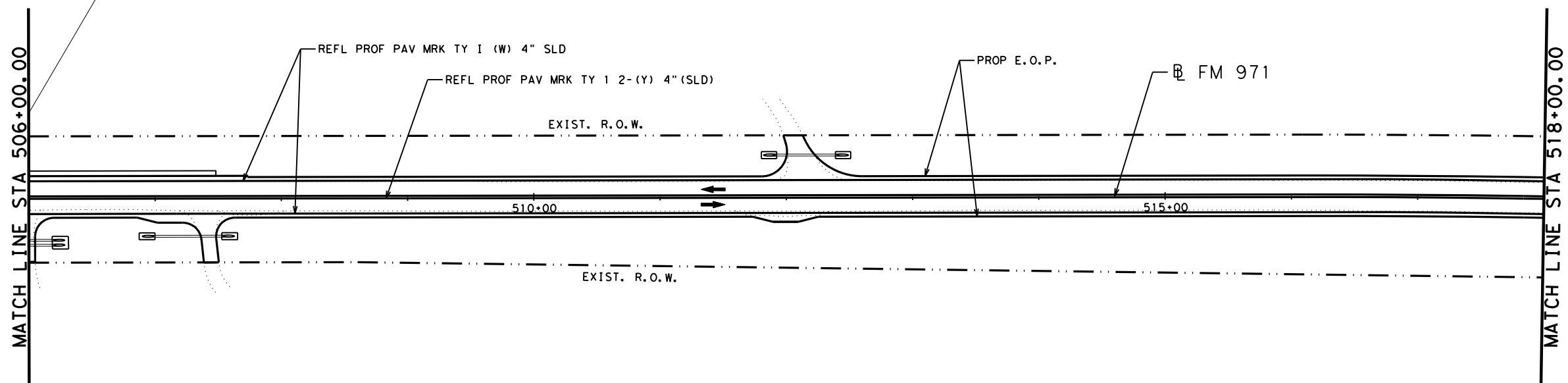
Texas Department of Transportation

**FM 971
 SIGNING AND
 PAVEMENT MARKING
 LAYOUT**

SHEET 2 OF 5

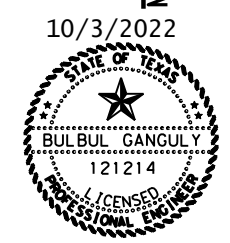
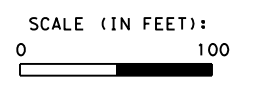
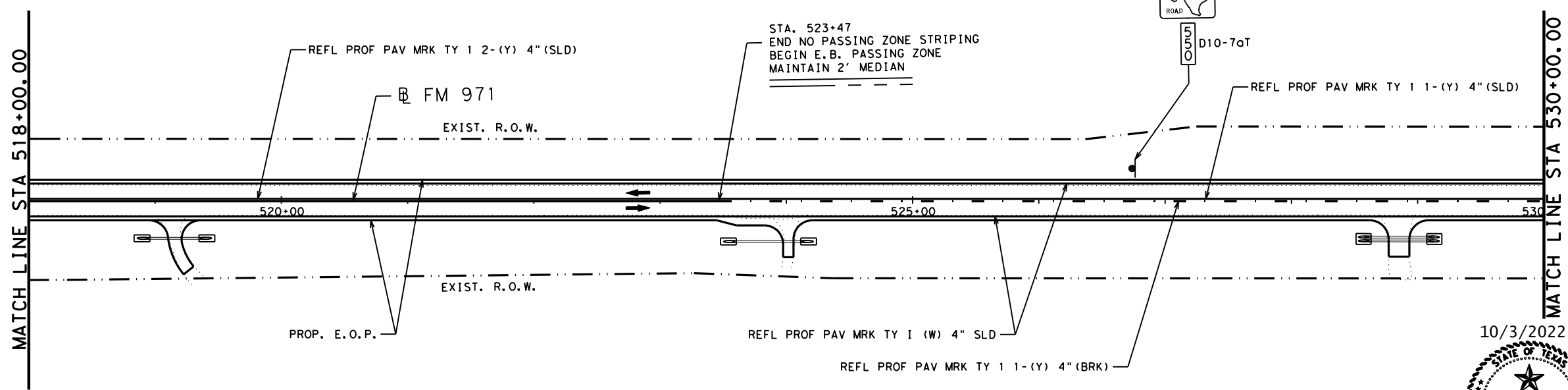
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	NO PASSING ZONE STRIPING
	EAST BOUND (E.B.) PASSING ZONE
	WEST BOUND (W.B.) PASSING ZONE
	TWO-WAY PASSING ZONE
	TWO-WAY LEFT TURN LANE



DocuSigned by:
Bulbul Ganguly

**Austin District
Central Design**

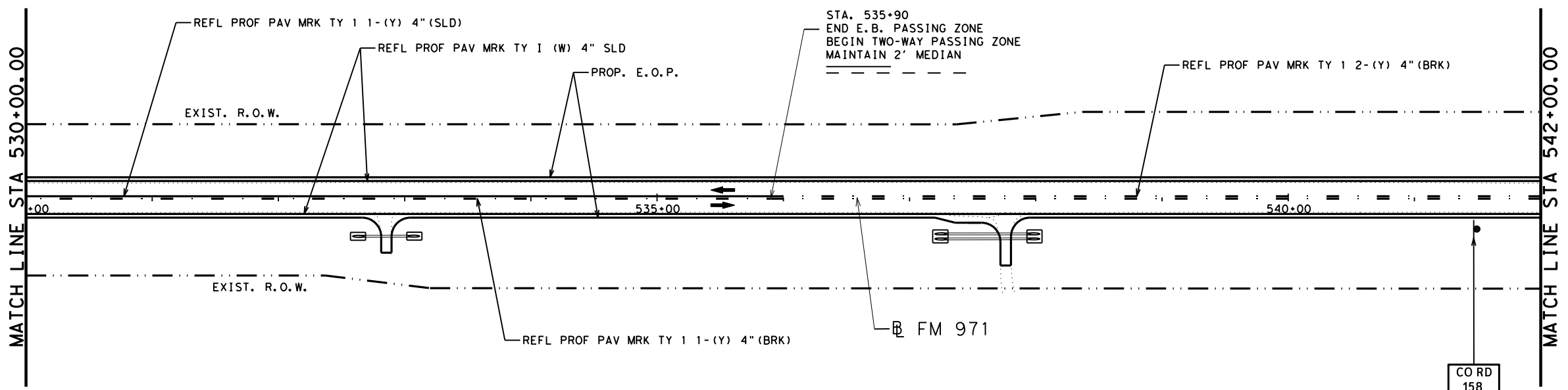
Texas Department of Transportation

FM 971
SIGNING AND
PAVEMENT MARKING
LAYOUT

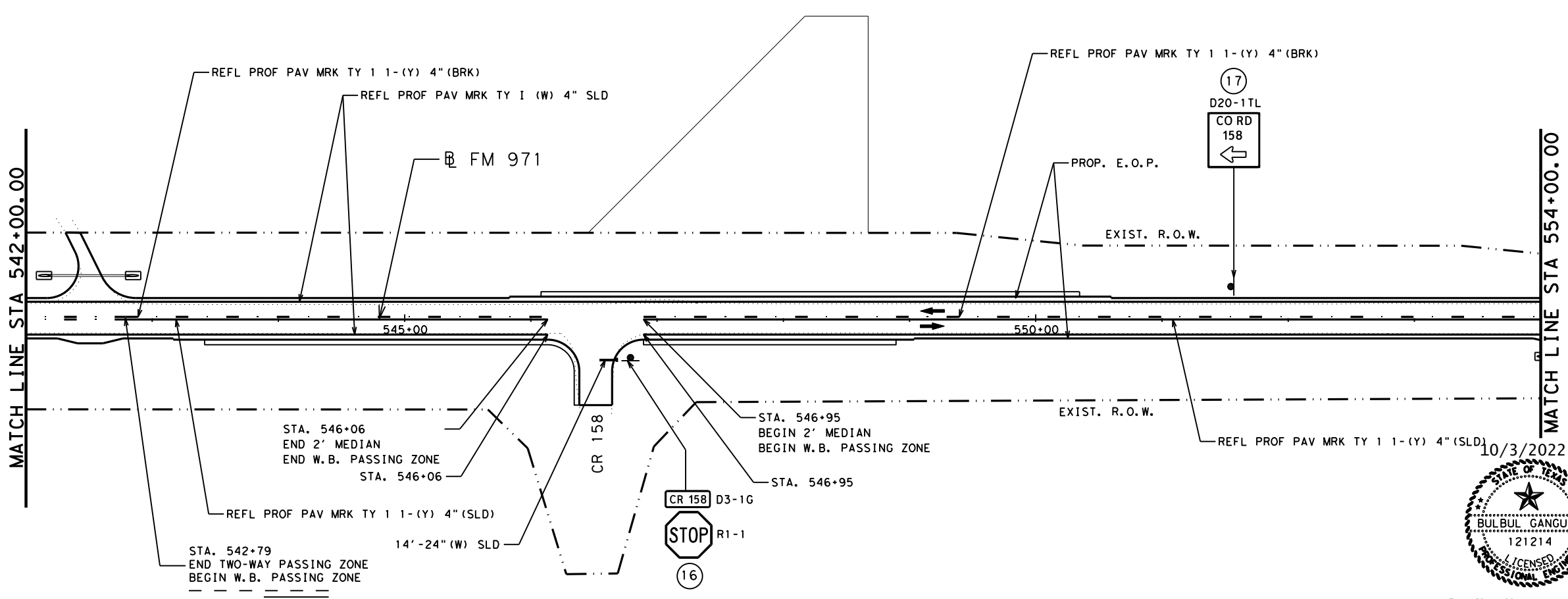
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LEGEND	
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	EAST BOUND (E.B.) PASSING ZONE
	WEST BOUND (W.B.) PASSING ZONE
	TWO-WAY PASSING ZONE
	TWO-WAY LEFT TURN LANE



10/3/2022

DocuSigned by:
Bulbul Ganguly

**Austin District
Central Design**

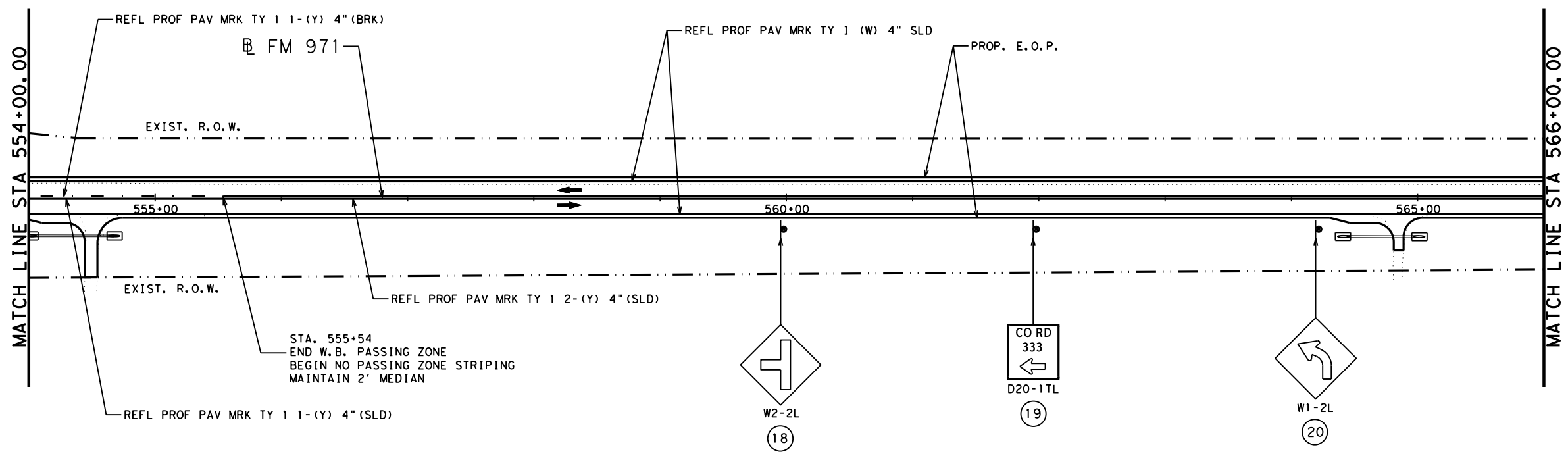
Texas Department of Transportation

FM 971
SIGNING AND
PAVEMENT MARKING
LAYOUT

SHEET 4 OF 5

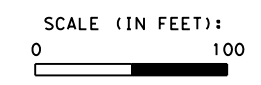
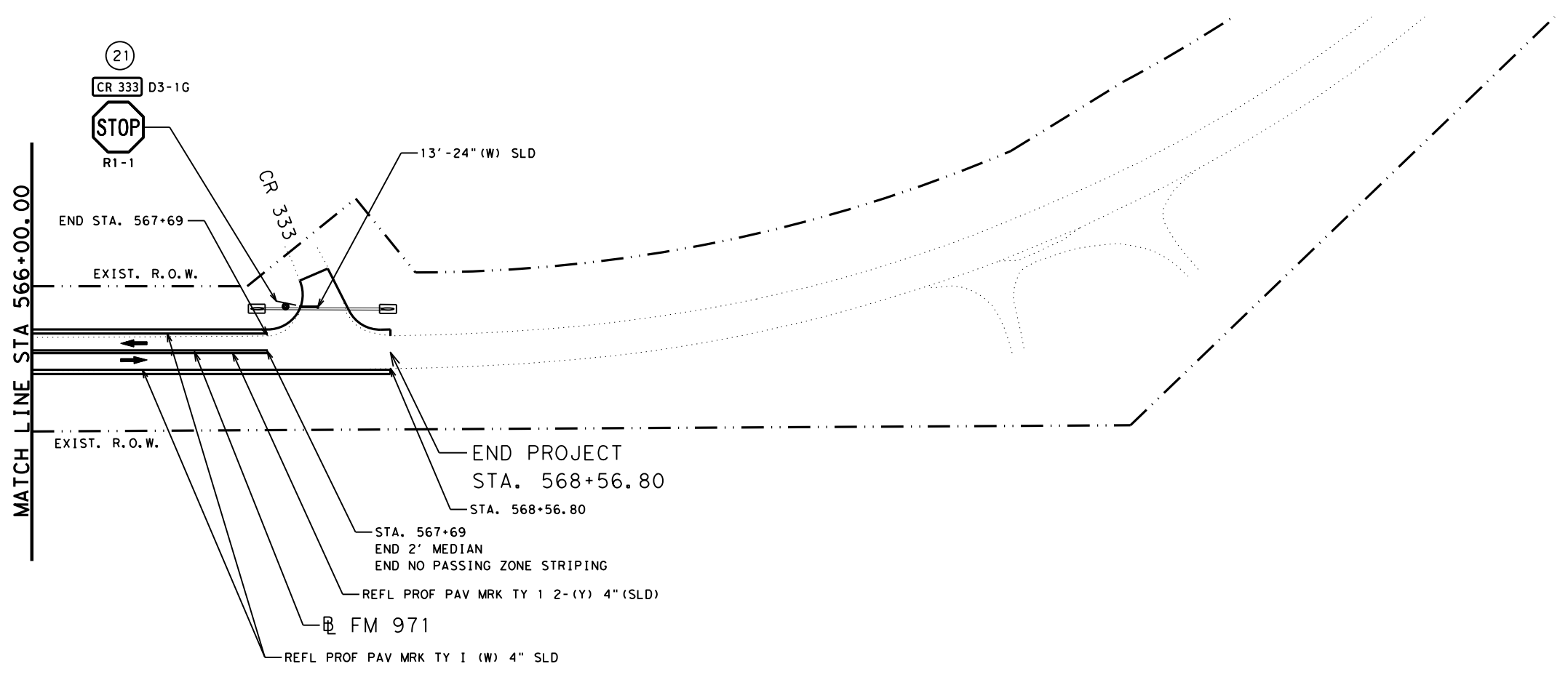
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DW1	CK1	DIST	COUNTY	SHEET NO.
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LEGEND

- NO PASSING ZONE STRIPING
- EAST BOUND (E.B.) PASSING ZONE
- WEST BOUND (W.B.) PASSING ZONE
- TWO-WAY PASSING ZONE
- TWO-WAY LEFT TURN LANE



10/3/2022

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Central Design**

Texas Department of Transportation

FM 971
SIGNING AND
PAVEMENT MARKING
LAYOUT

SHEET 5 OF 5

© 2023	CONT	SECT	JOB	HIGHWAY
DS: CK1	2690	01	038	FM 971
DW: CK1	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	134	

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)				BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)		
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION			
										PREFABRICATED		1EXT or 2EXT = # of Ext	
1 OF 5	1	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P			
	2	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P			
	3	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P			
	4	D7-6aTL	HISTORICAL MARKER 1 MILE ON LEFT	48 x 48	X		10BWG	1	SA	T			
2 OF 5	5	W10-1	SYMBOL - GRADE XING ADVANCED WARNING	36 diameter	X		10BWG	1	SA	P			
	6	D20-1TR	CO RD 157 <RIGHT ARROW>	24 x 24	X		10BWG	1	SA	P			
	7	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P			
	8	R1-1 D3-1G	STOP CR 157	36 x 36 12 x 30	X		10BWG	1	SA	P			
	9	D20-1TL	CO RD 161 <LEFT ARROW>	24 x 24	X		10BWG	1	SA	P			
	10	W10-1	SYMBOL - GRADE XING ADVANCED WARNING	36 diameter	X		10BWG	1	SA	P			
	11	D20-1TL	CO RD 157 <LEFT ARROW>	24 x 24	X		10BWG	1	SA	P			
	12	R1-1 D3-1G	STOP CR 161	36 x 36 12 x 30	X		10BWG	1	SA	P			
	13	D20-1TR	CO RD 161 <RIGHT ARROW>	24 x 24	X		10BWG	1	SA	P			
3 OF 5	14	M1-6F D10-7aT	FM 971 REF MRKR 550 (2 EA)	24 x 24 3 x 10	X X		10BWG	1	SA	P			
4 OF 5	15	D20-1TR	CO RD 158 <RIGHT ARROW>	24 x 24	X		10BWG	1	SA	P			
	16	R1-1 D3-1G	STOP CR 158	36 x 36 12 x 30	X		10BWG	1	SA	P			
	17	D20-1TL	CO RD 158 <LEFT ARROW>	24 x 24	X		10BWG	1	SA	P			
5 OF 5	18	W2-2L	SYMBOL - SIDE ROAD AHEAD LEFT	30 x 30	X		10BWG	1	SA	P			
	19	D20-1TL	CO RD 333 <LEFT ARROW>	24 x 24	X		10BWG	1	SA	P			
	20	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P			
	21	R1-1 D3-1G	STOP CR 333	36 x 36 12 x 30	X		10BWG	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"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
<http://www.txdot.gov/>

- NOTE:**
- 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.
 - For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
 - For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD (GEN).

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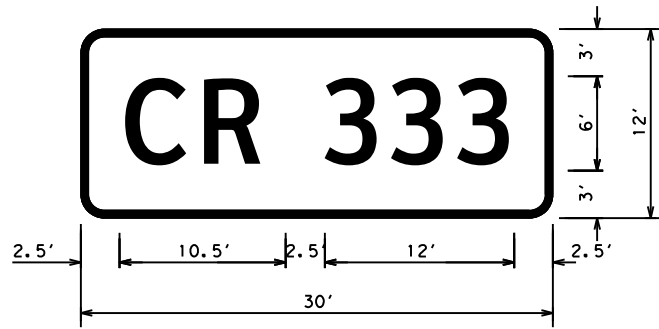
Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

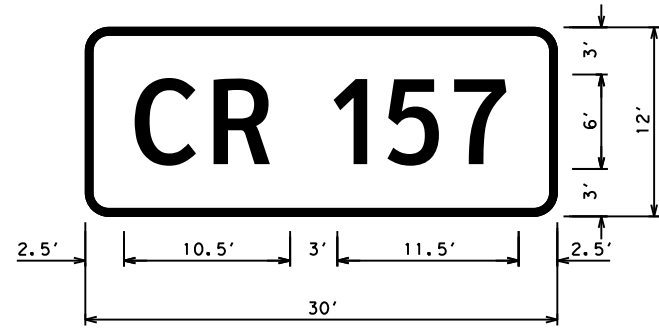
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© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
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4-16	DIST	COUNTY	SHEET NO.	
8-16	AUS	WILLIAMSON	135	

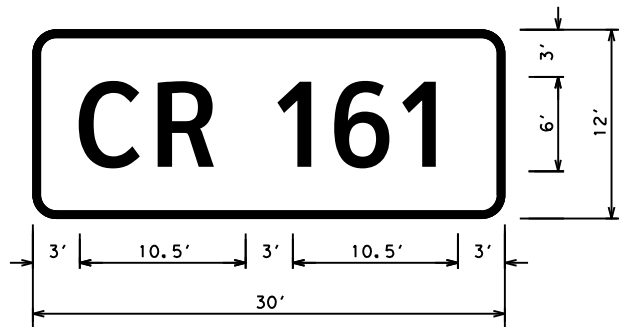
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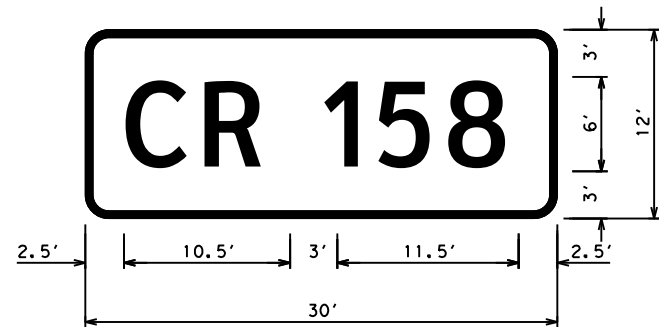
D3-1G(1) 6in;
 1.5" Radius, 0.5" Border, White on, Green;
 "CR 333", ClearviewHwy-3-W;



D3-1G(1) 6in;
 1.5" Radius, 0.5" Border, White on, Green;
 "CR 157", ClearviewHwy-3-W;

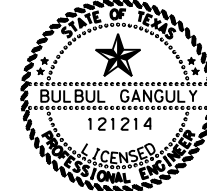


D3-1G(1) 6in;
 1.5" Radius, 0.5" Border, White on, Green;
 "CR 161", ClearviewHwy-3-W;



D3-1G(1) 6in;
 1.5" Radius, 0.5" Border, White on, Green;
 "CR 158", ClearviewHwy-3-W;

10/3/2022



DocuSigned by:
Bulbul Ganguly

**Austin District
Central Design**

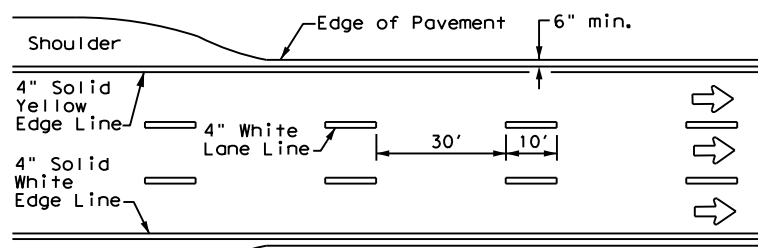
Texas Department of Transportation

**FM 971
SMALL SIGN
DETAILS**

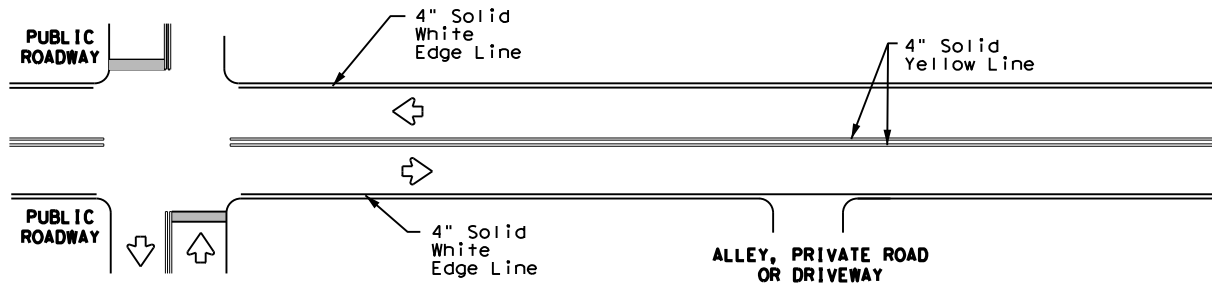
SHEET 1 OF 1

© 2023	CONT	SECT	JOB	HIGHWAY
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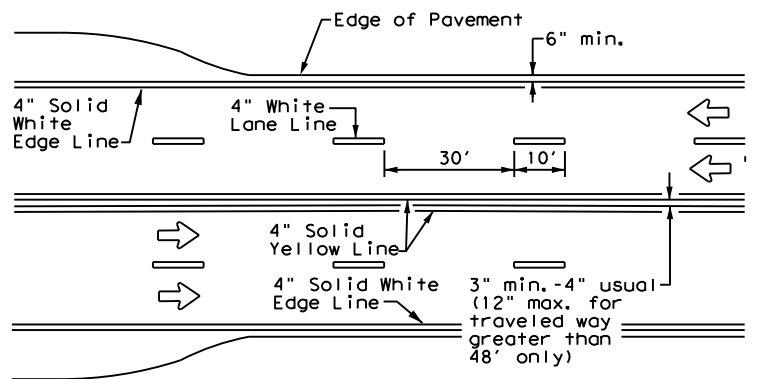
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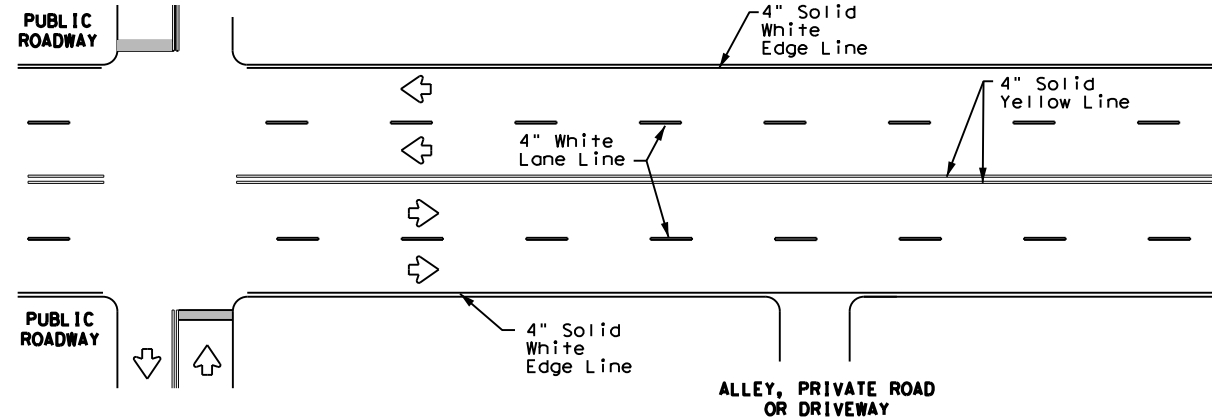
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



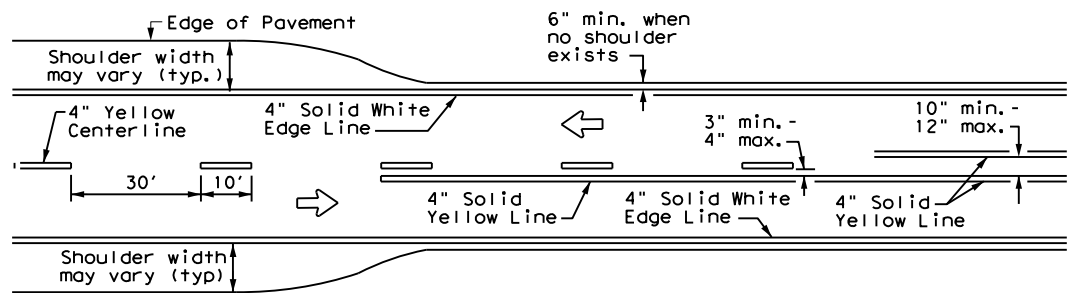
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



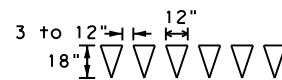
**CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



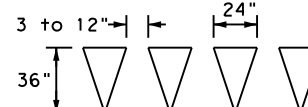
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MARKINGS THROUGH INTERSECTIONS**



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

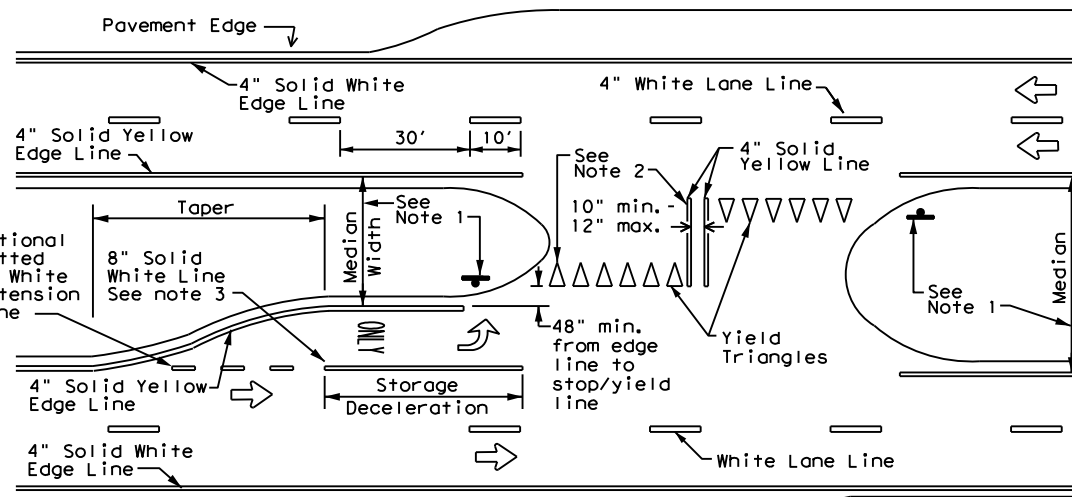


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

- 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.
- 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 triangles shall only be used with yield signs.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown in the plans or as directed by the Engineer.

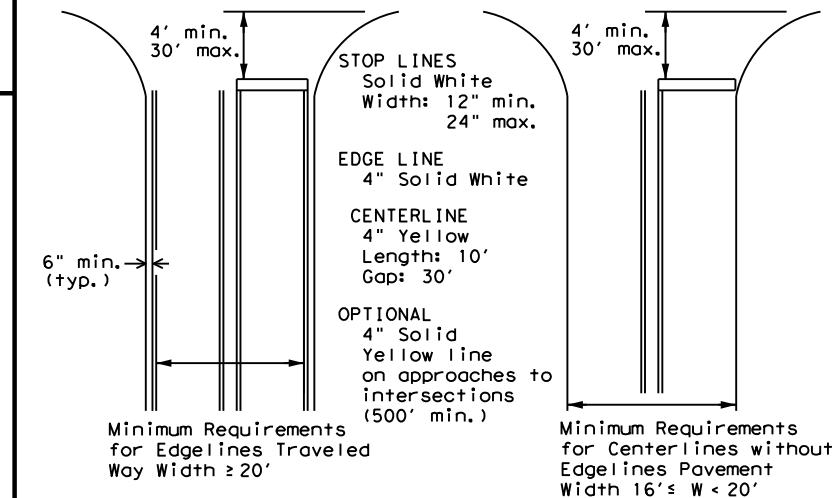
GENERAL NOTES

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed 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.
- 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



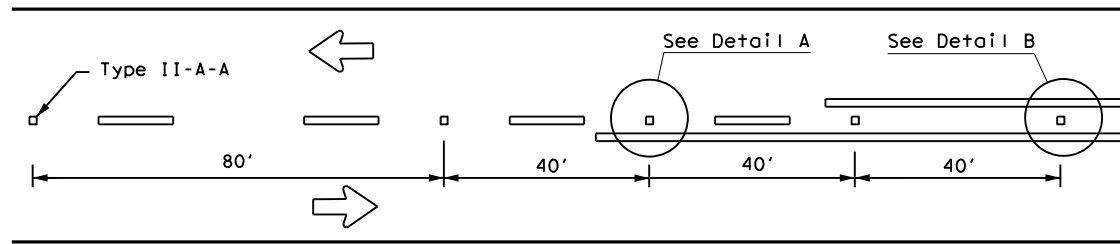
**TYPICAL STANDARD
PAVEMENT MARKINGS**

PM(1) - 20

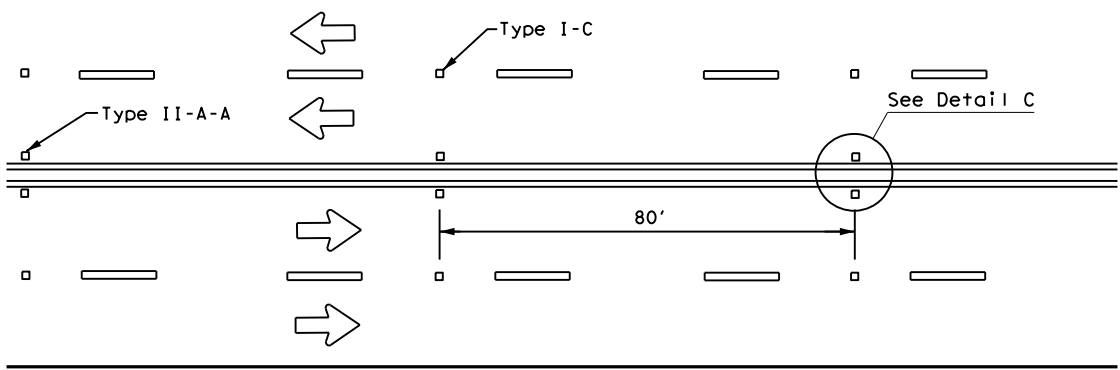
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8-95 3-03 REVISIONS	2690	01	038	FM 971
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	AUS	WILLIAMSON	137	

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

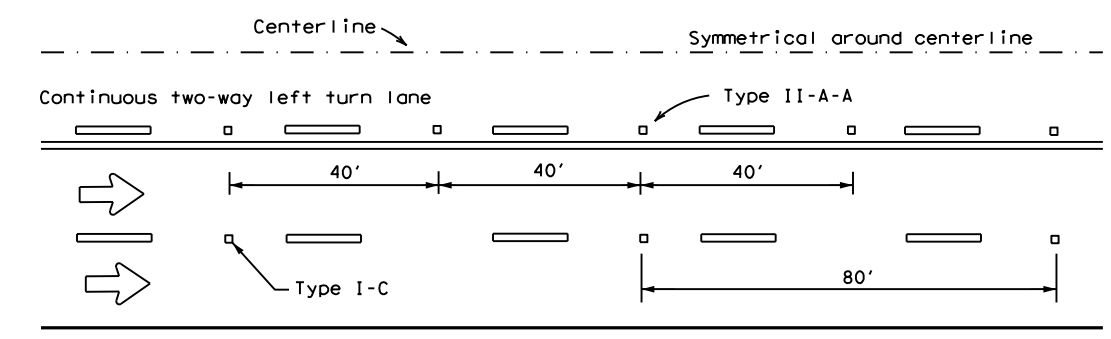
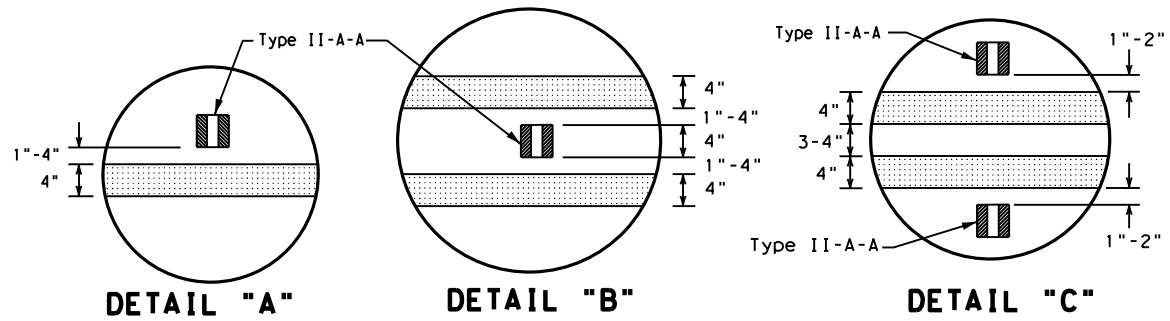
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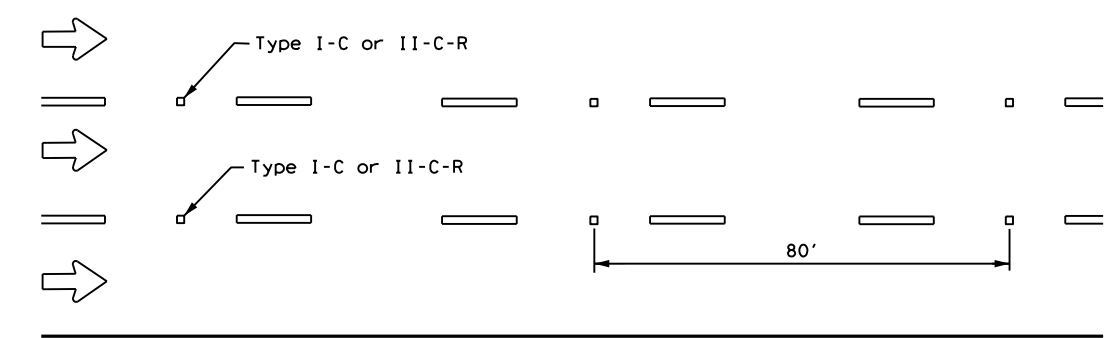
CENTERLINE FOR ALL TWO LANE ROADWAYS



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



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

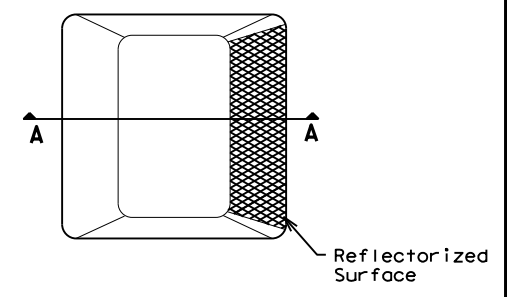


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

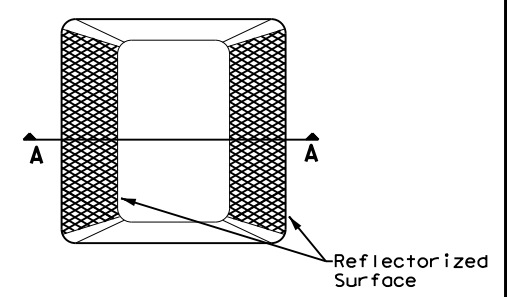
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

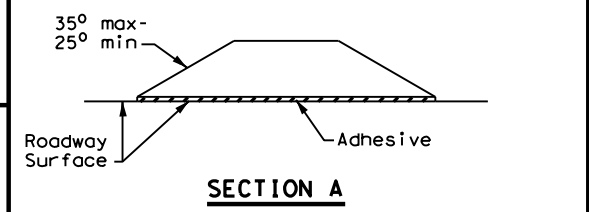
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



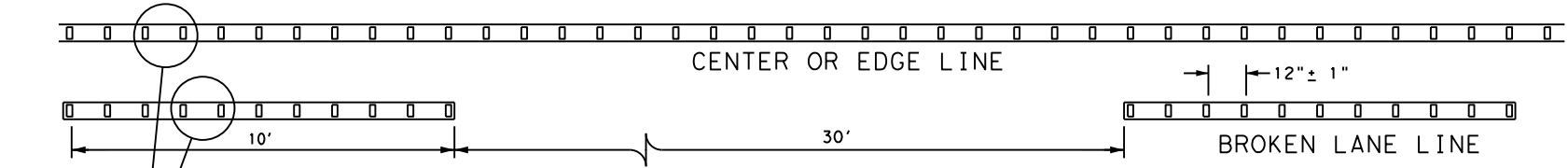
Type II (Top View)



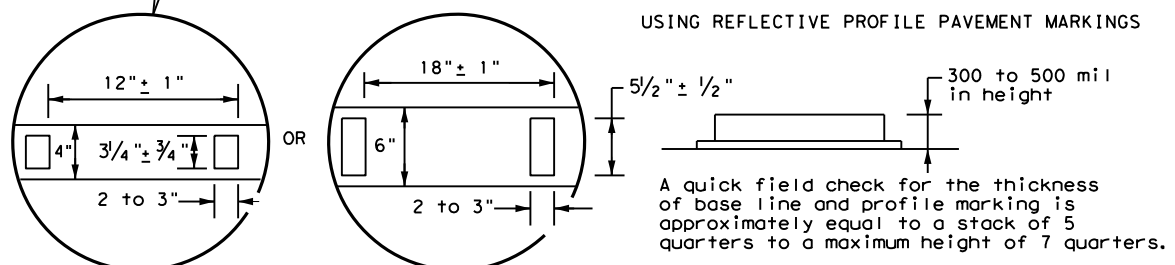
RAISED PAVEMENT MARKERS

GENERAL NOTES

- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.



**REFLECTORIZED PROFILE
PATTERN DETAIL
USING REFLECTIVE PROFILE PAVEMENT MARKINGS**



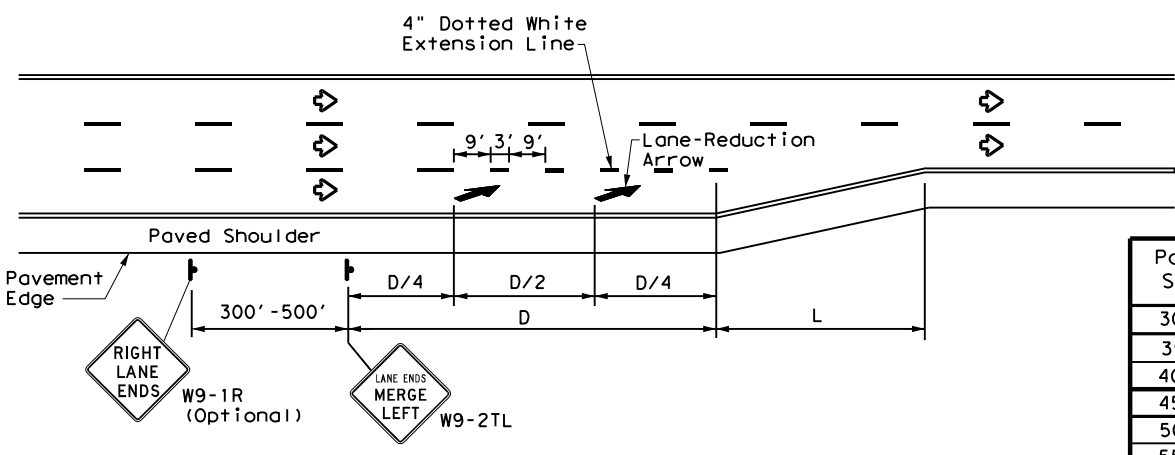
NOTE
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.



POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

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© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
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5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AUS	WILLIAMSON		138

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

LANE REDUCTION

NOTES

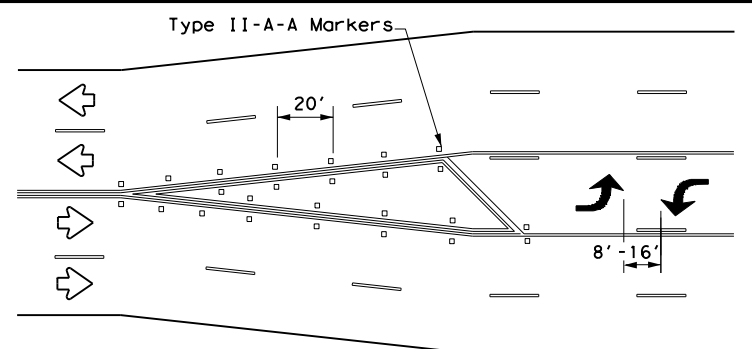
- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an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

GENERAL NOTES

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

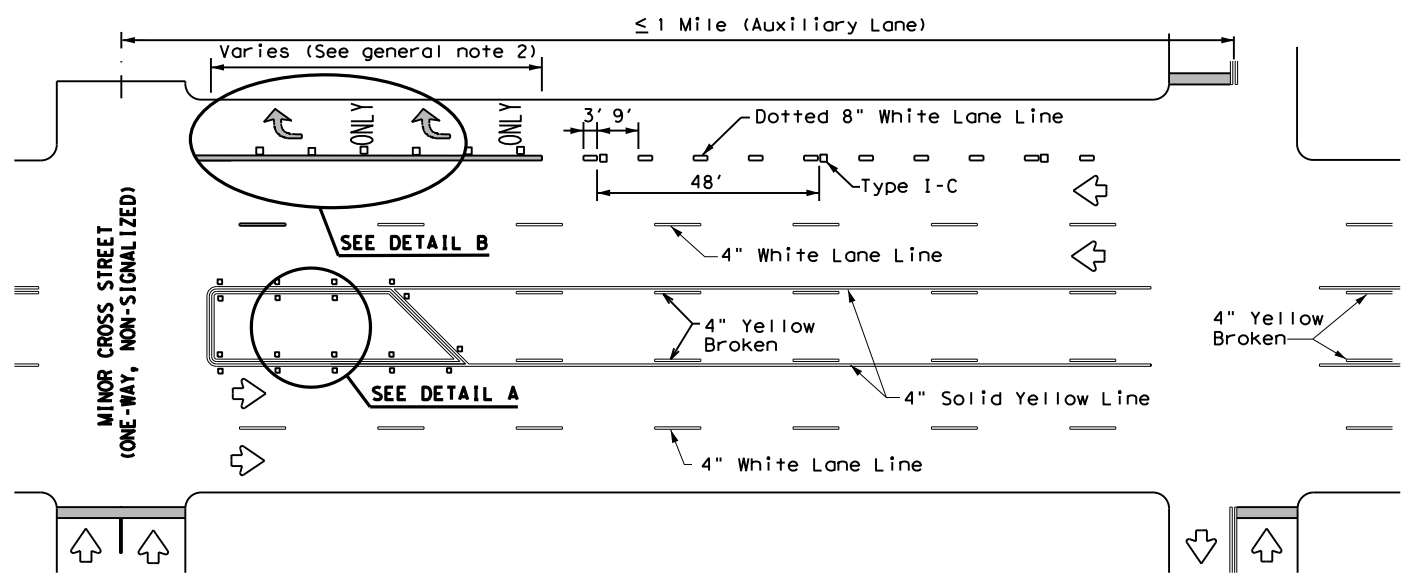
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

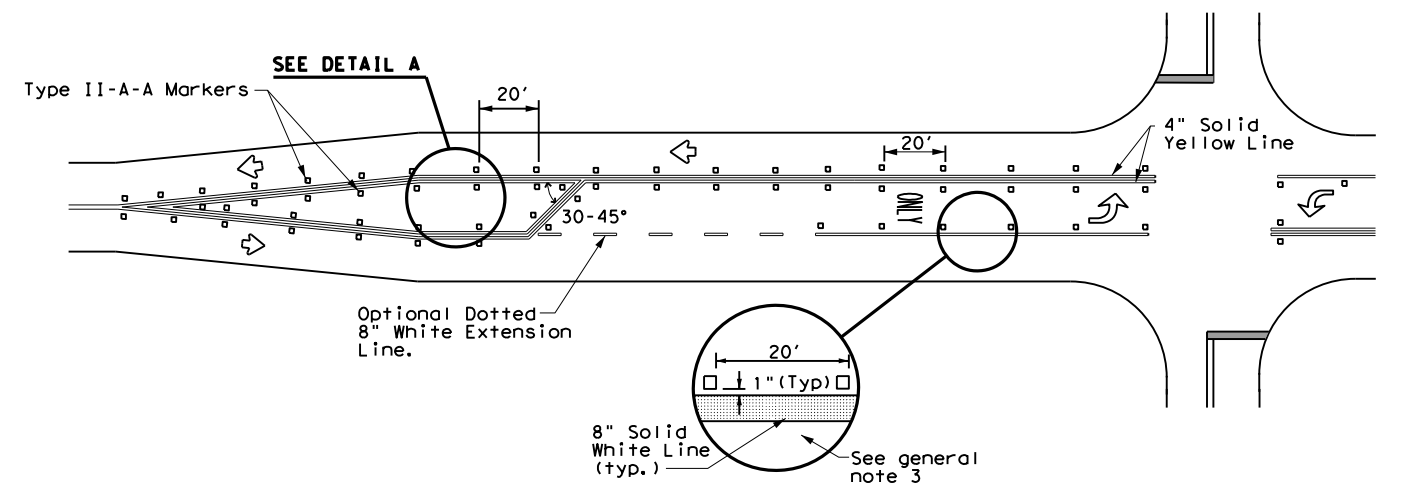


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

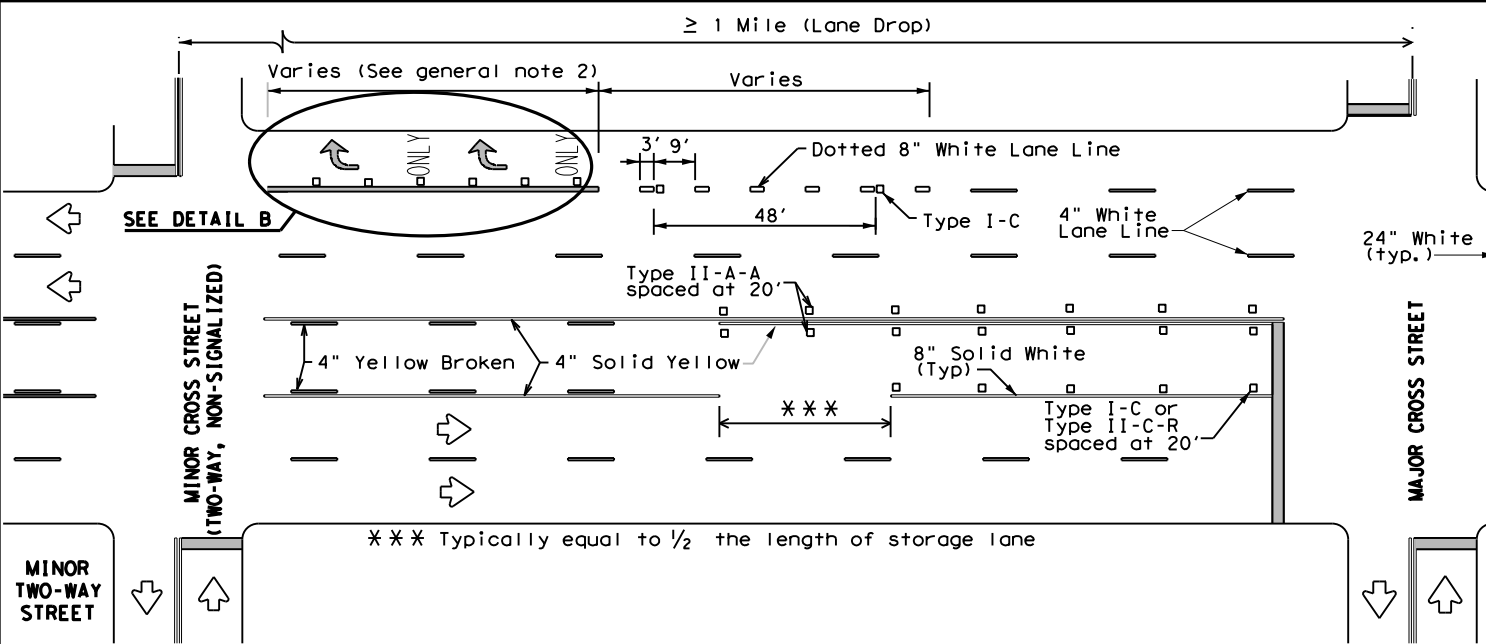
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



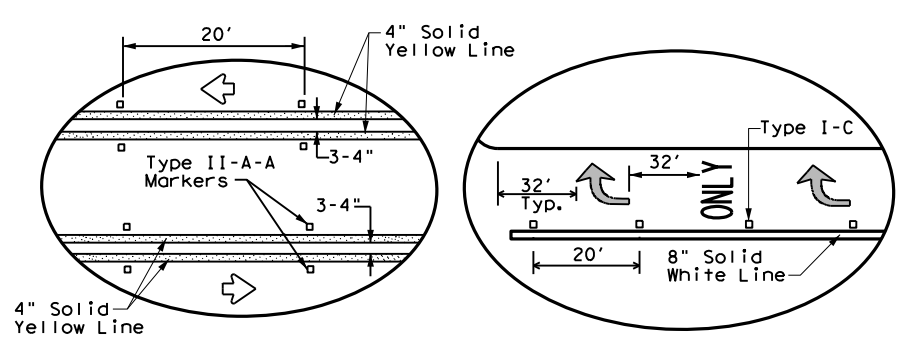
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



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



DETAIL A

DETAIL B

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES,
 RURAL LEFT TURN BAYS,
 AND LANE REDUCTION
 PAVEMENT MARKINGS
PM(3) - 20

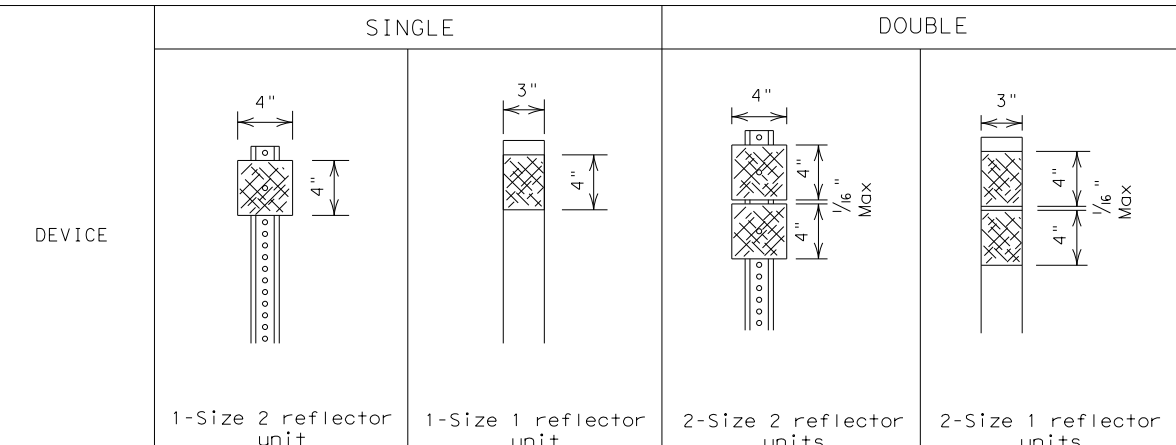
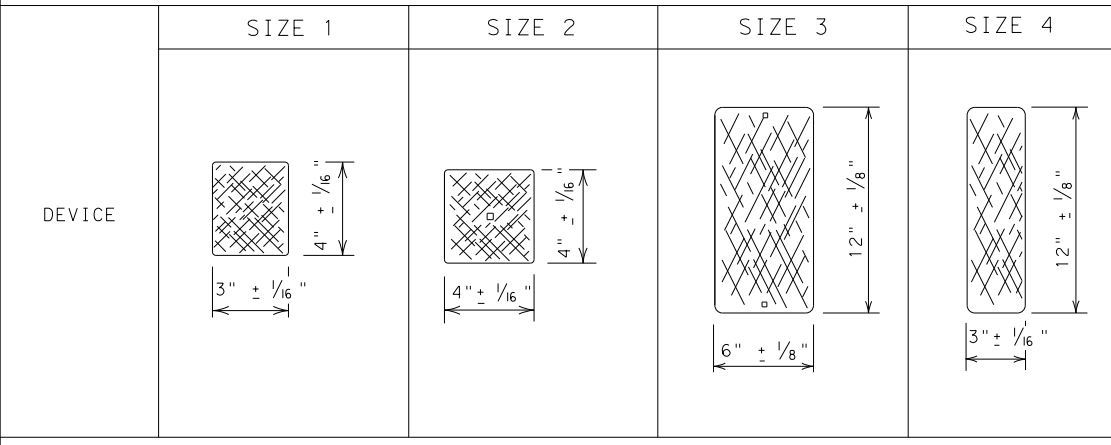
FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
5-00 2-10	DIST	COUNTY	SHEET NO.	
8-00 2-12	AUS	WILLIAMSON	139	
3-03 6-20				

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

DELINEATORS

D & OM DESCRIPTIVE CODES



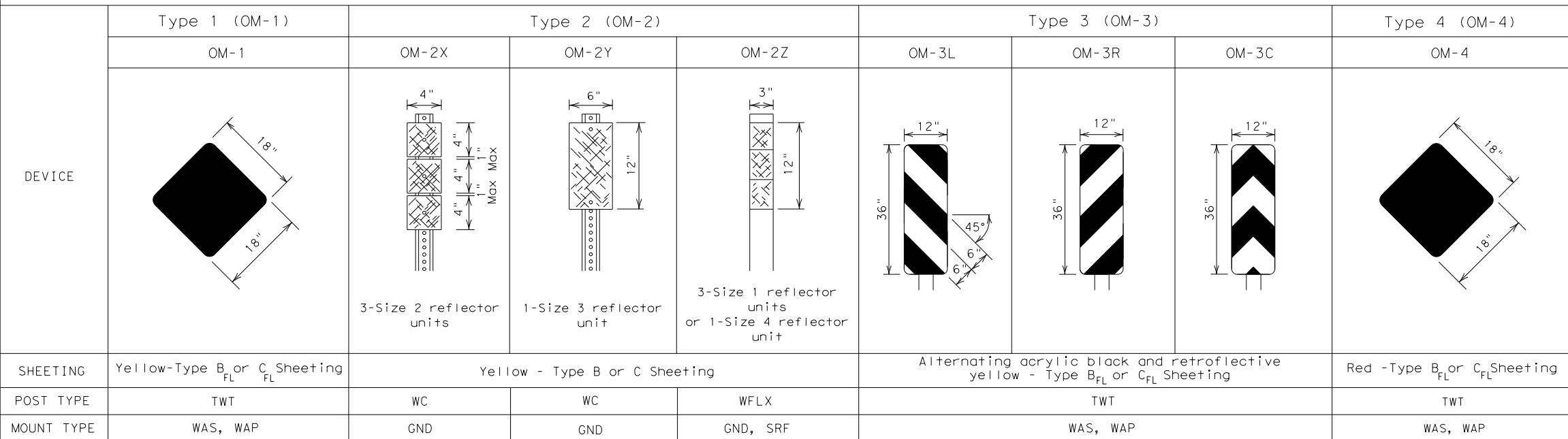
INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX (XX)
 NUMBER OF REFLECTORS
 S = Single
 D = Double
 COLOR OF REFLECTORS
 W = White
 Y = Yellow
 R = Red
 REFLECTOR UNIT SIZE
 1 or 2
 TYPE OF POST OR DELINEATOR
 WC = Wing Channel Post
 YFLX = Yellow Flexible Post
 WFLX = White Flexible Post
 BRF = Barrier Reflector
 TYPE OF MOUNT
 GND = Embedded (drivable or set in concrete)
 CTB = Concrete Barrier Mount
 GF1 or GF2 = Guard Fence Attachment
 SRF = Surface Mount

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 (fix).
 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.

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

INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)
 TYPE OF OBJECT MARKER
 1, 2, 3, or 4
 NUMBER OF REFLECTORS OR DIRECTION
 X = 3-Size 2 reflector unit (Type 2 only)
 Y = 1-Size 3 reflector unit (Type 2 only)
 Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
 L = Left Side (Type 3 Object Marker only)
 R = Right Side (Type 3 Object Marker only)
 C = Center (Type 3 Object Marker only)
 TYPE OF POST
 WC = Wing Channel Post
 WFLX = White Flexible Post
 TWT = Thin Walled Tubing
 TYPE OF MOUNT
 GND = Embedded (drivable)
 SRF = Surface Mount
 WAS = Wedge Anchor Steel
 WAP = Wedge Anchor Plastic
 DIRECTION
 If Required
 BI = Bi-Directional

OBJECT MARKERS



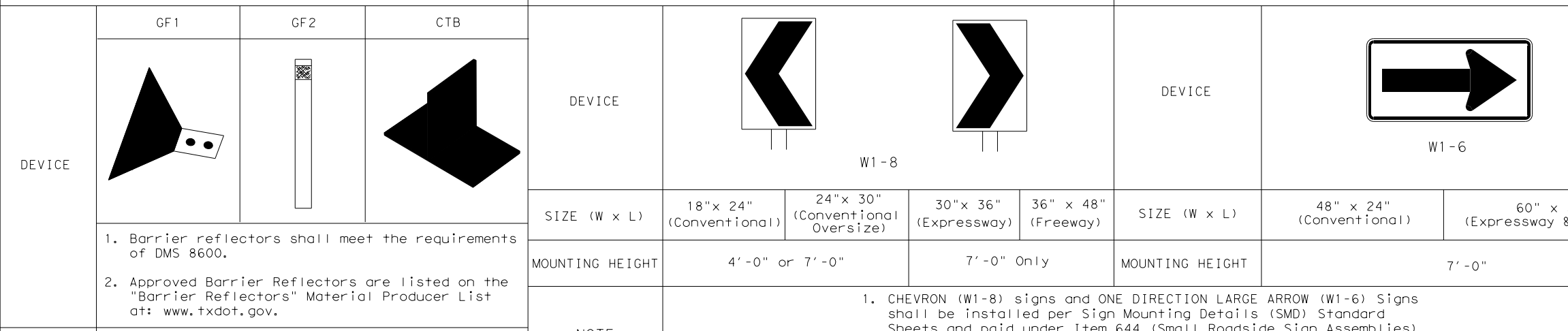
SHEETING Yellow-Type B or C Sheeting FL FL Yellow - Type B or C Sheeting Alternating acrylic black and retroreflective yellow - Type B_{FL} or C_{FL} Sheeting Red -Type B_{FL} or C_{FL} Sheeting
 POST TYPE TWT WC WC WFLX TWT TWT
 MOUNT TYPE WAS, WAP GND GND GND, SRF WAS, WAP WAS, WAP

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)

CHEVRONS

ONE DIRECTION LARGE ARROW



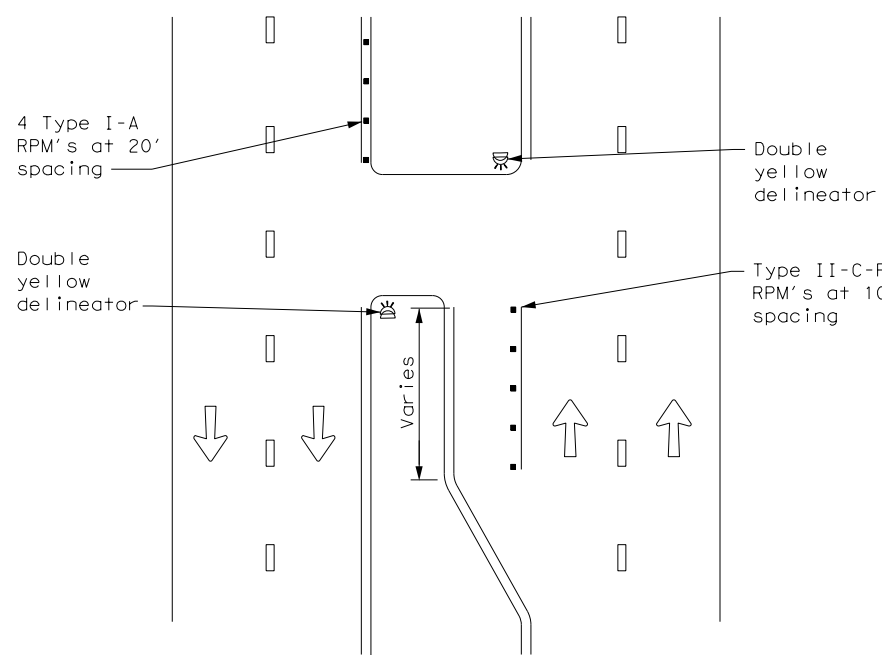
SHEETING Yellow, White, Red
 NOTE 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.
 1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

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

Texas Department of Transportation
DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION
D & OM(1)-20
 FILE: dom1-20.dgn D#: TxDOT C#: TxDOT DW: TxDOT CK: TxDOT
 © TxDOT August 2004 CONT SECT JOB HIGHWAY
 REVISIONS 2690 01 038 FM 971
 10-09 3-15 DIST COUNTY SHEET NO.
 4-10 7-20 AUS WILLIAMSON 140

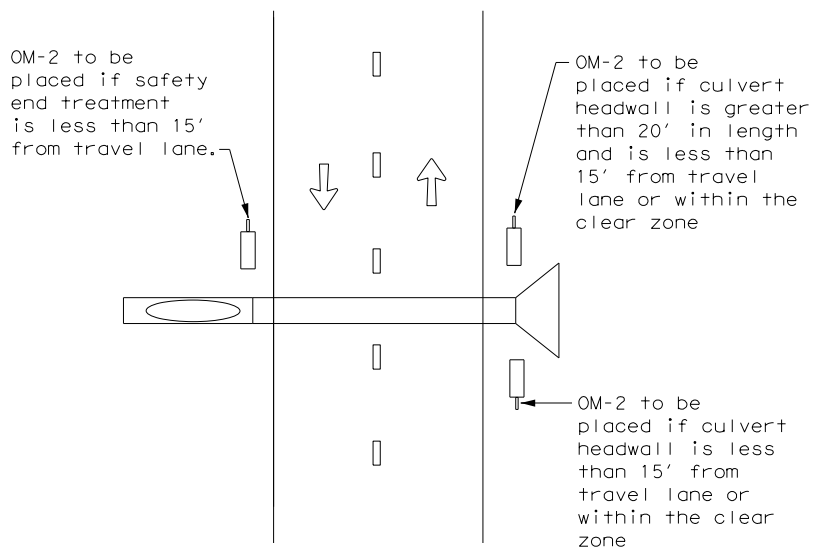
DATE: 10/3/2022 2:52:04 PM
 FILE: \\txdot.projectwiseonline.com:TXDOT14\Documents\14 - AUS\Design Projects\1409100101\1409100101.dgn
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CROSSOVERS



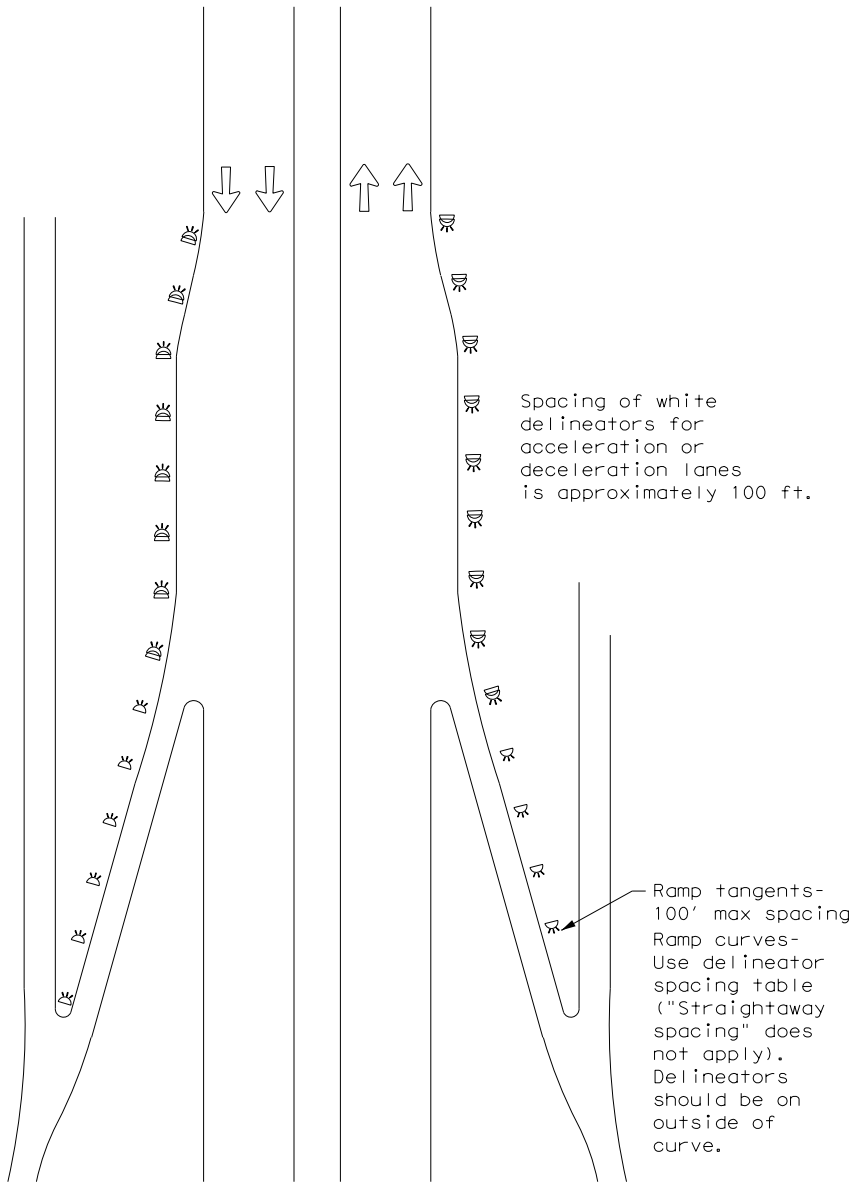
DETAIL 1

FOR CULVERTS WITHOUT MBGF



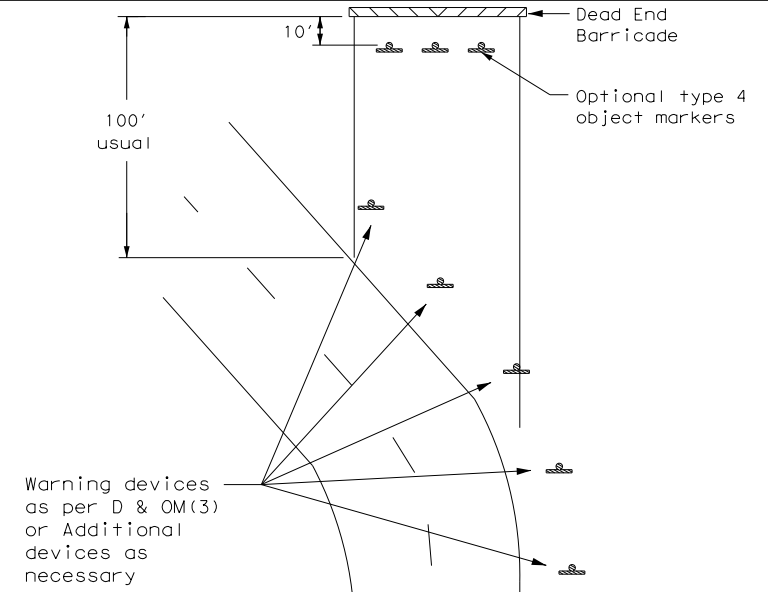
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



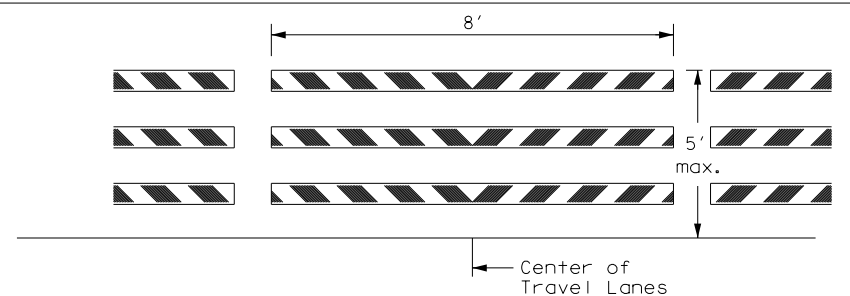
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

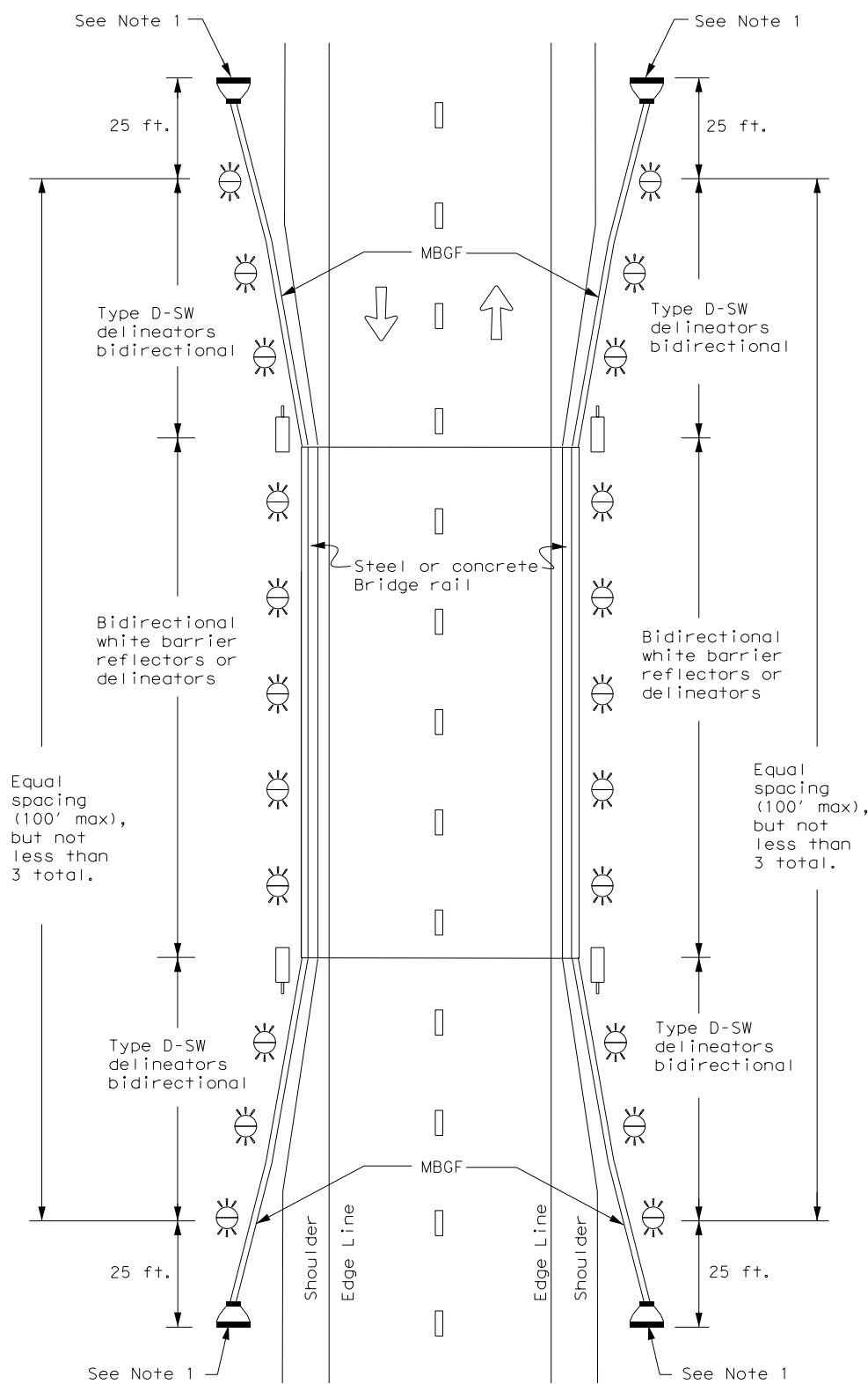


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4) - 20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690 01	038	FM 971	
3-15	DIST	COUNTY	SHEET NO.	
7-20	AUS	WILLIAMSON	143	

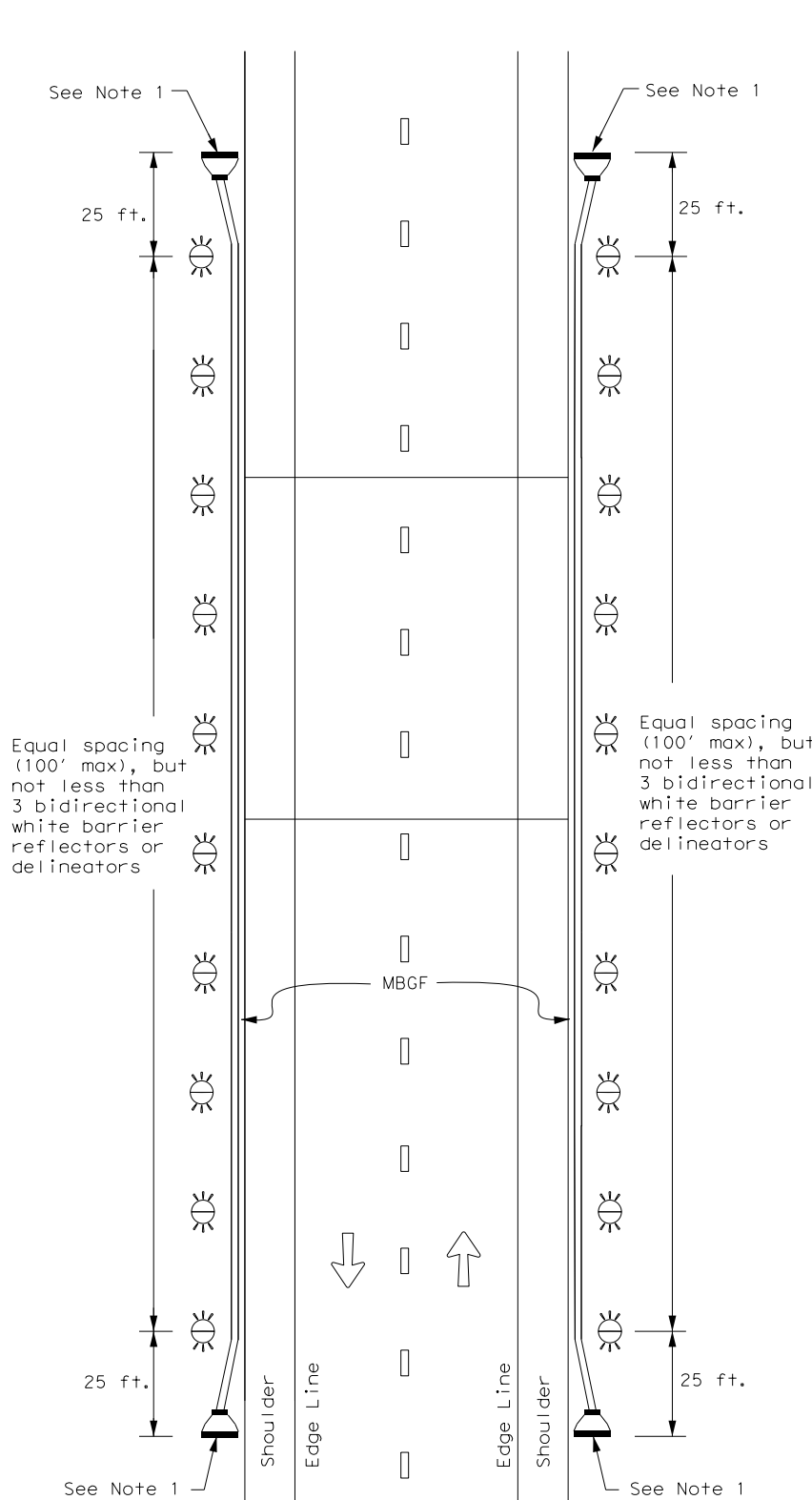
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



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.

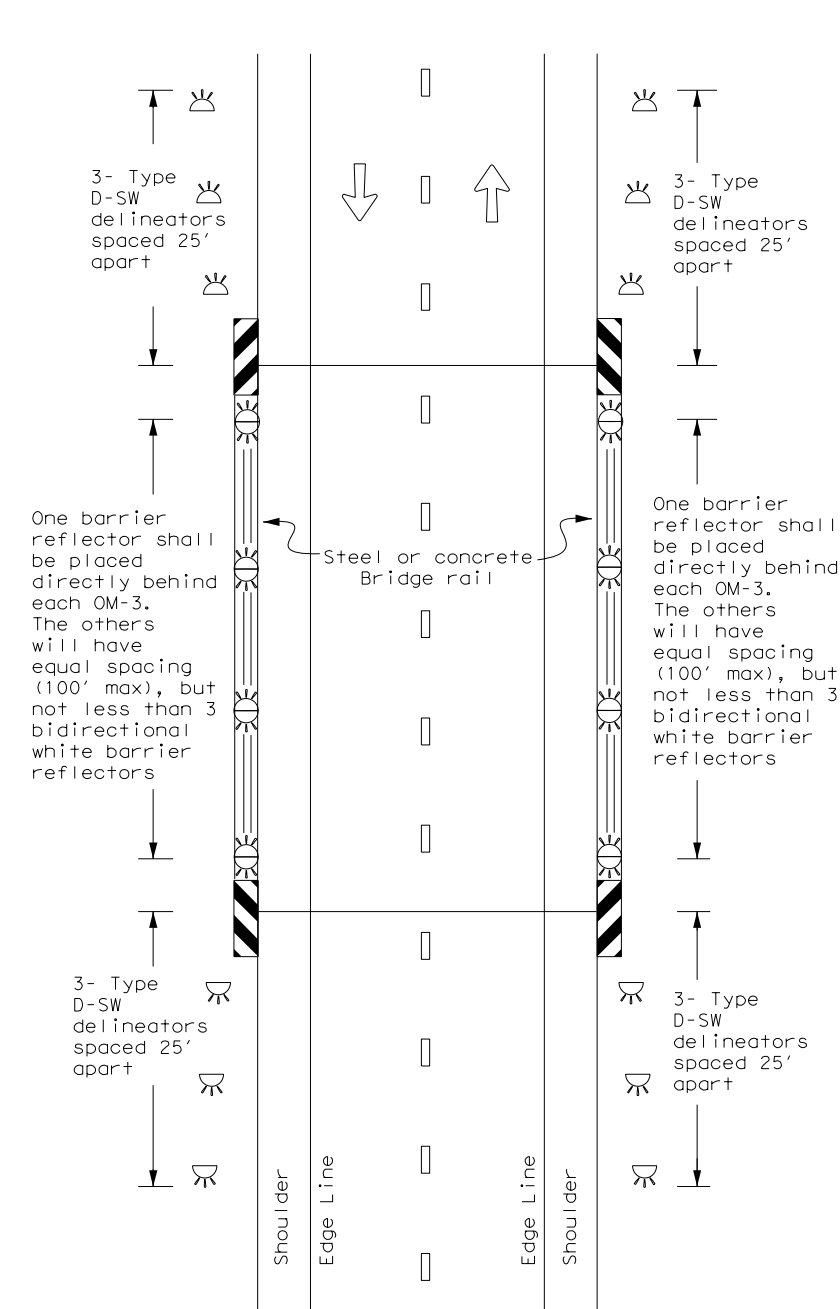
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



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**



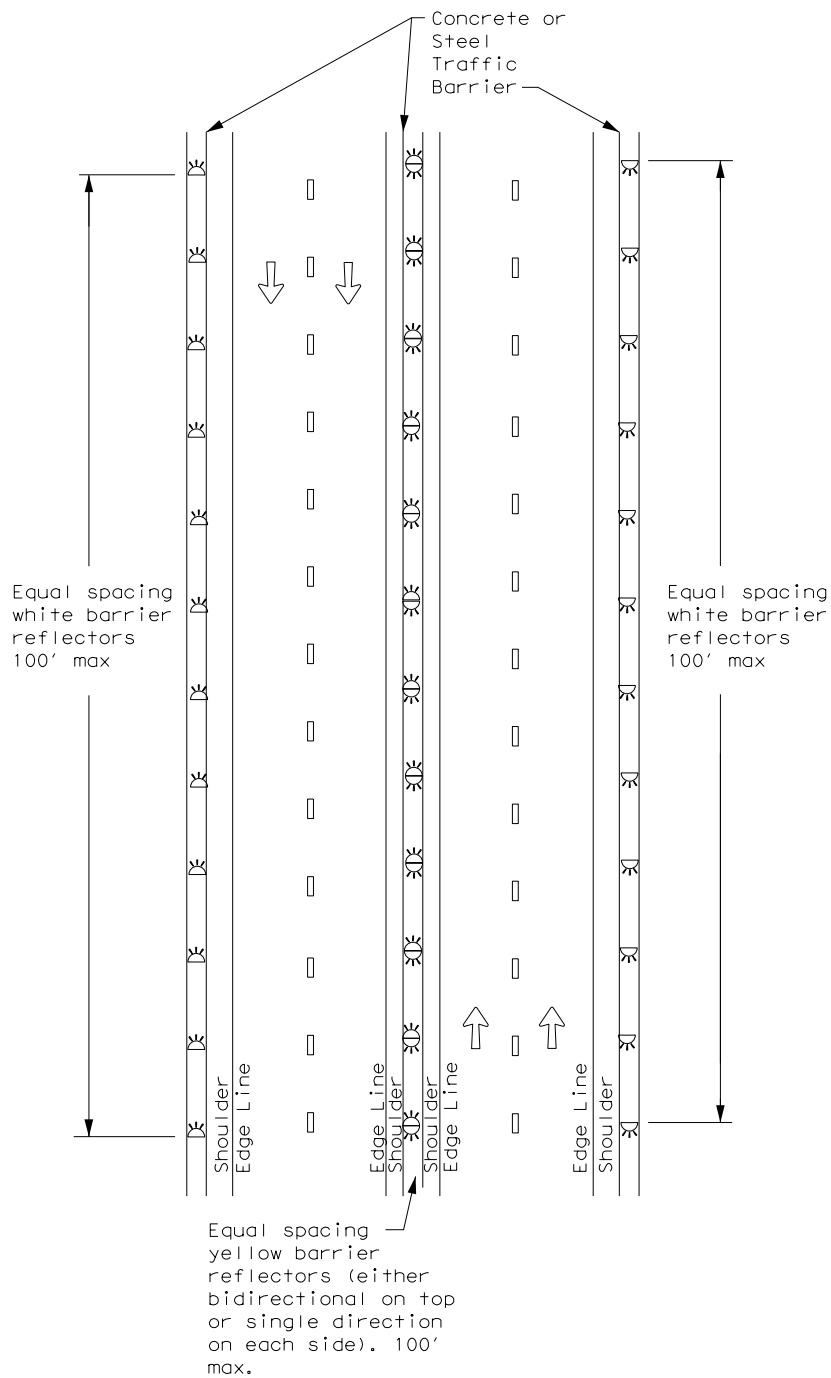
LEGEND

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

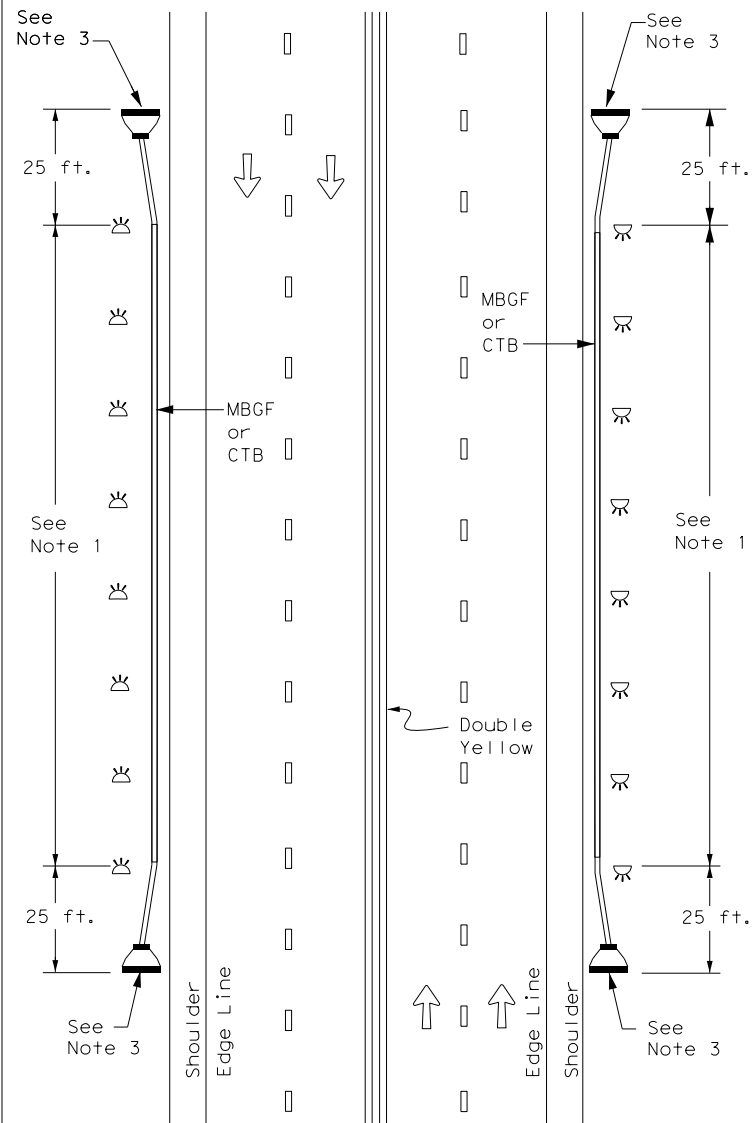
		Traffic Safety Division Standard	
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS			
D & OM(5) - 20			
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT August 2015	CONT	SECT	JOB
REVISIONS	2690	01	038
7-20	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	144

DATE: 10/3/2022 2:52:10 PM
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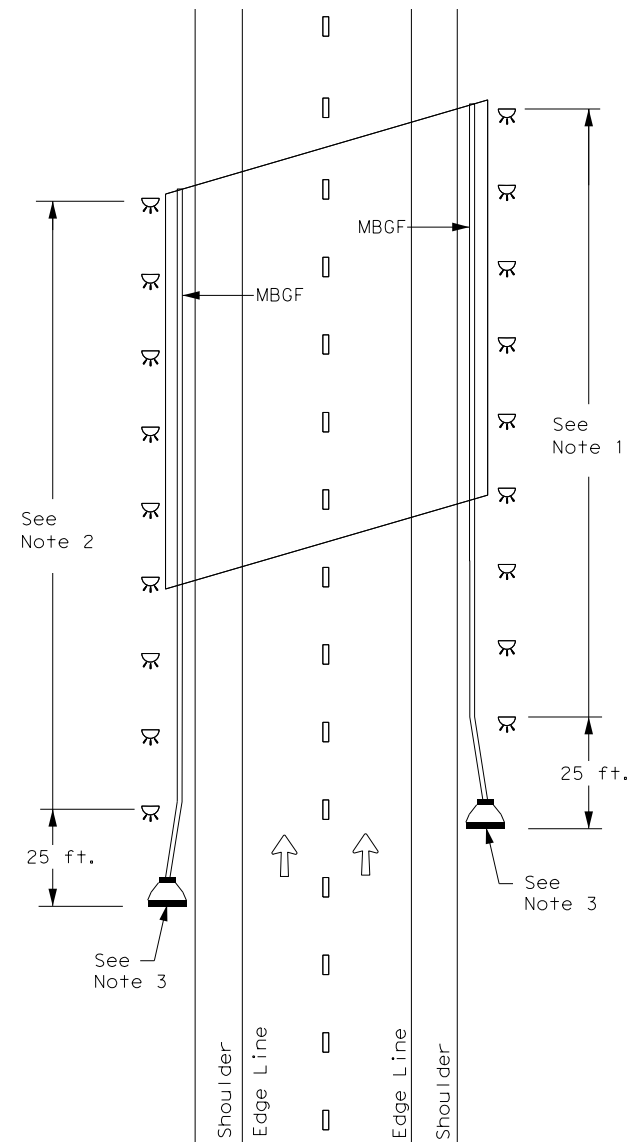
CONTINUOUS CONCRETE OR STEEL BARRIER



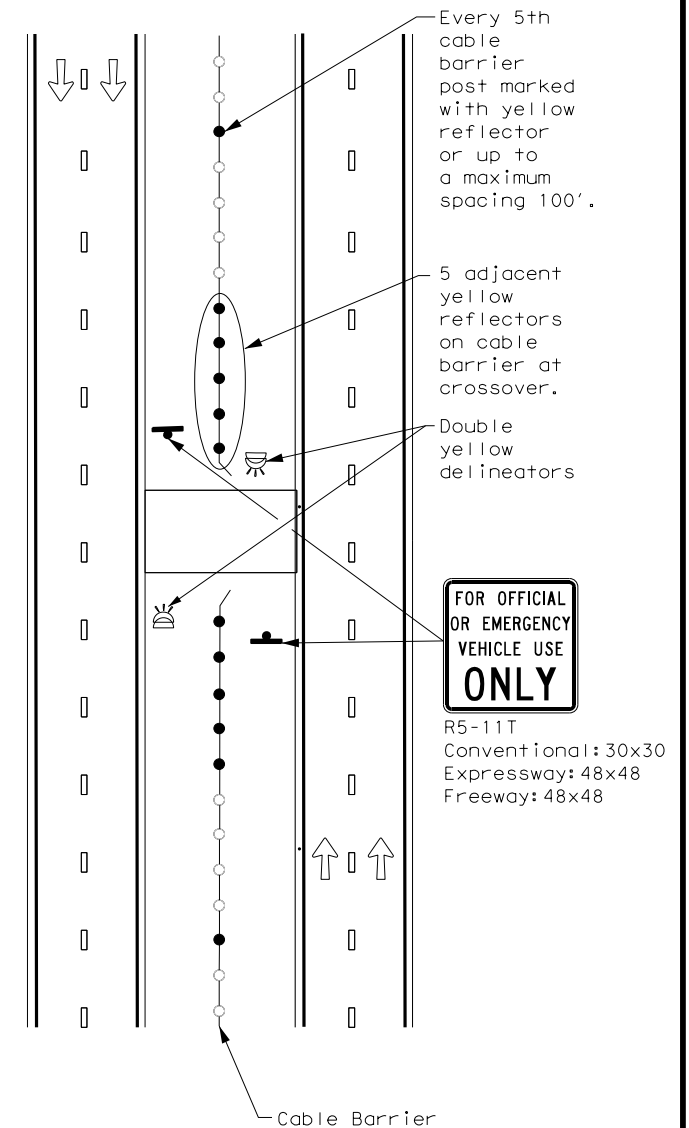
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



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 FILE: \\txdot.projectwiseonline.com:TXDOT14\Documents\14 - AUS\Design Projects\140922\140922.dwg

NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

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

Texas Department of Transportation *Traffic Safety Division Standard*

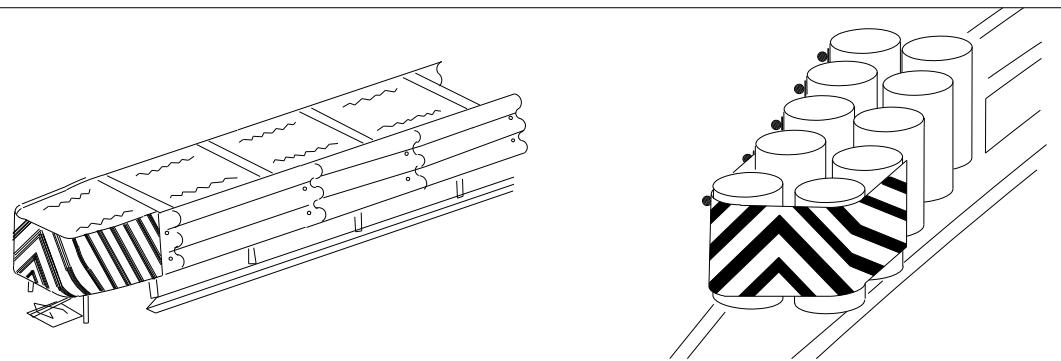
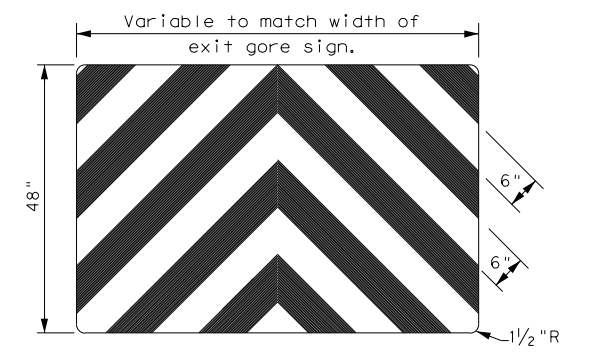
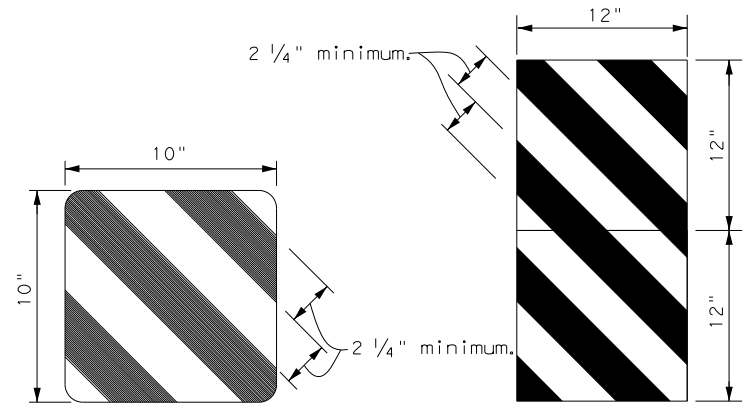
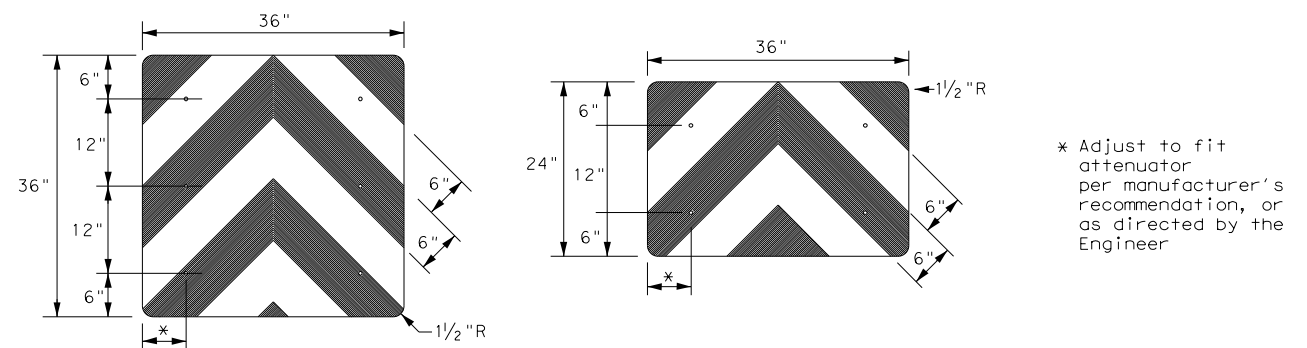
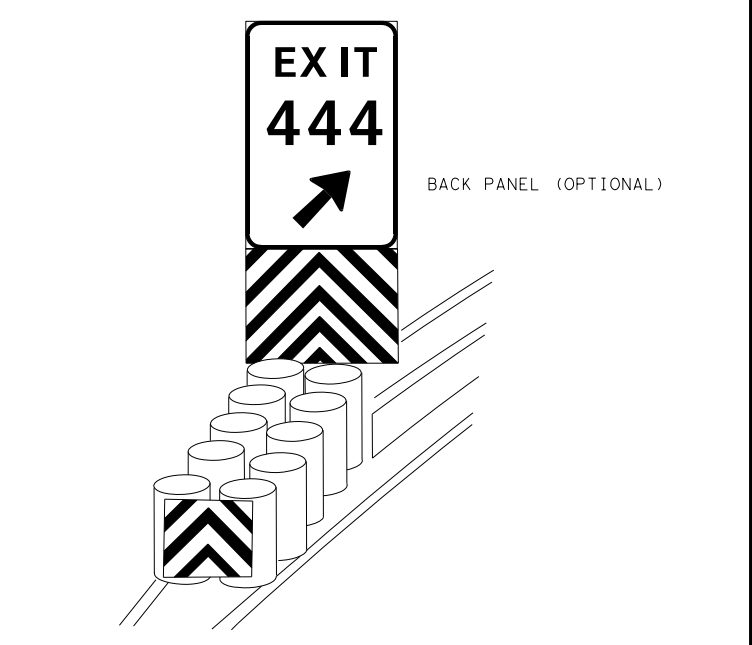
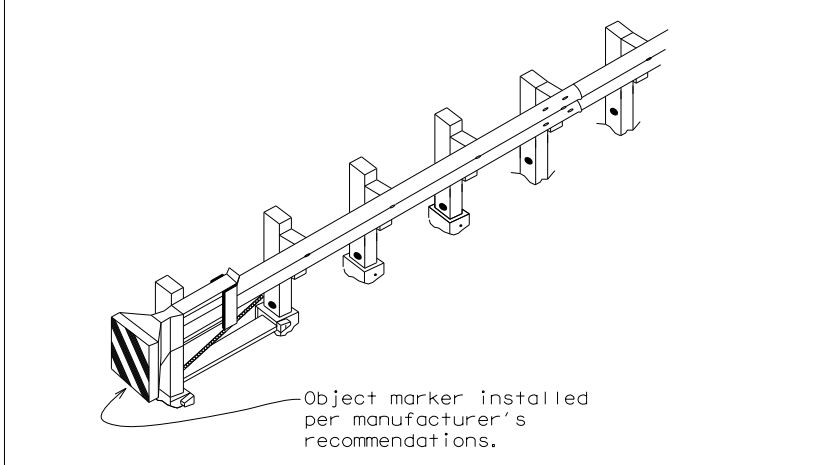
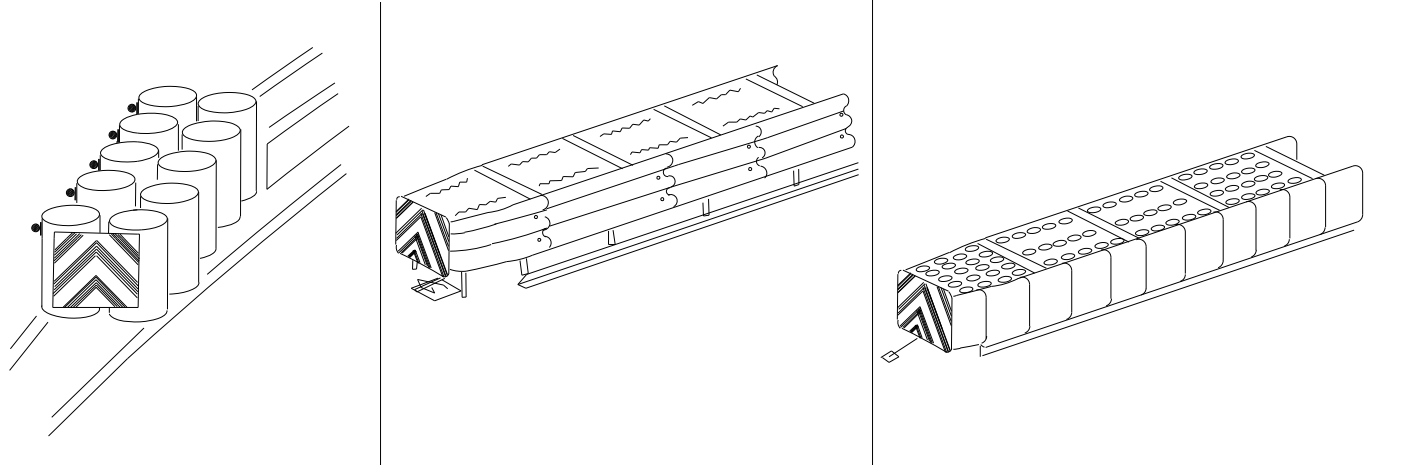
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

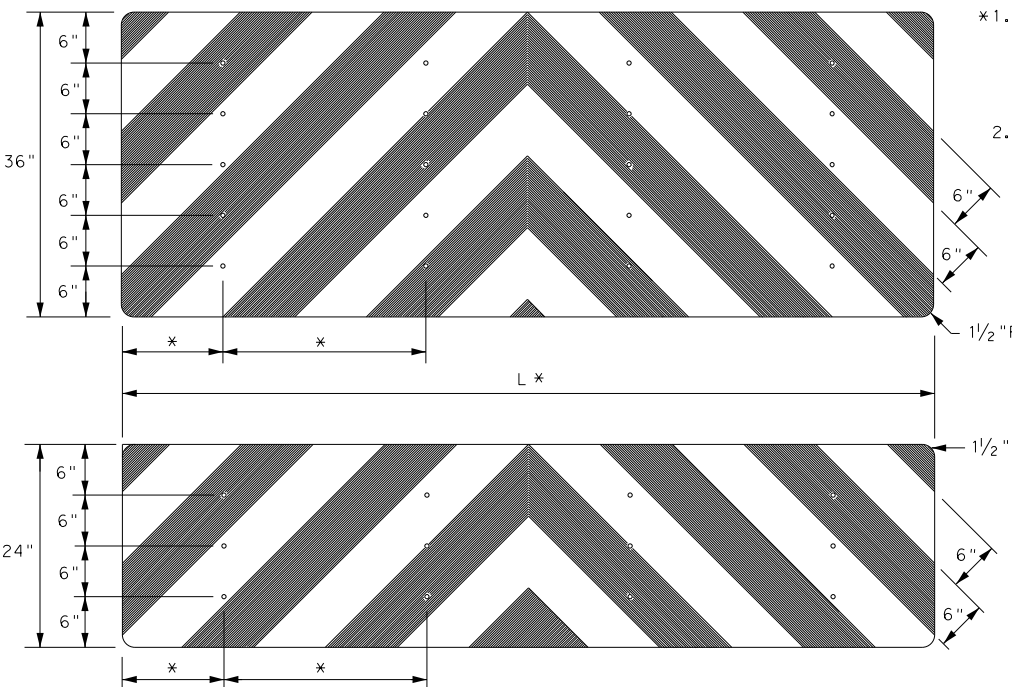
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2690	01	038	FM 971
7-20	DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON	145	

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OBJECT MARKERS SMALLER THAN 3 FT²



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

NOTES

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) - 20			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT
© TXDOT December 1989	CONT	SECT	HIGHWAY
REVISIONS		2690 01	038 FM 971
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	AUS	WILLIAMSON	146
4-98 7-20			
206			

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

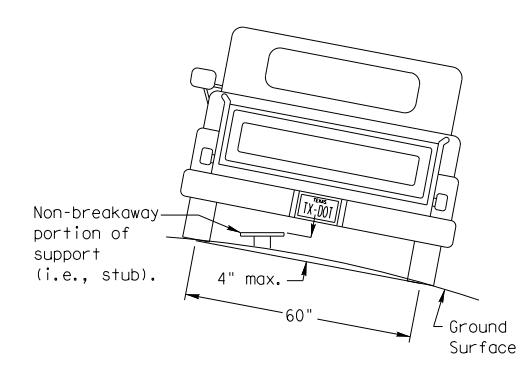
Post Type _____
 FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
 TWT = Thin-Walled Tubing (see SMD(TWT))
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

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))

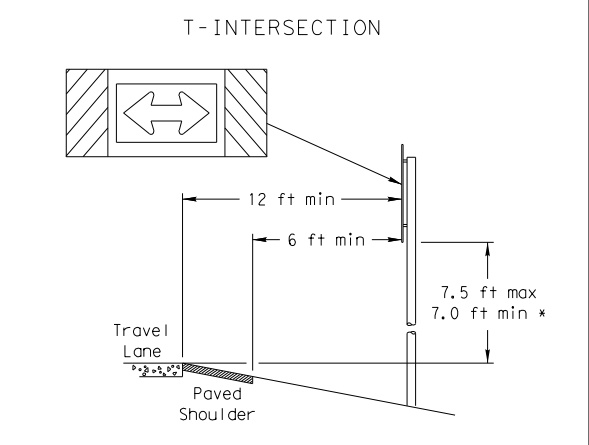
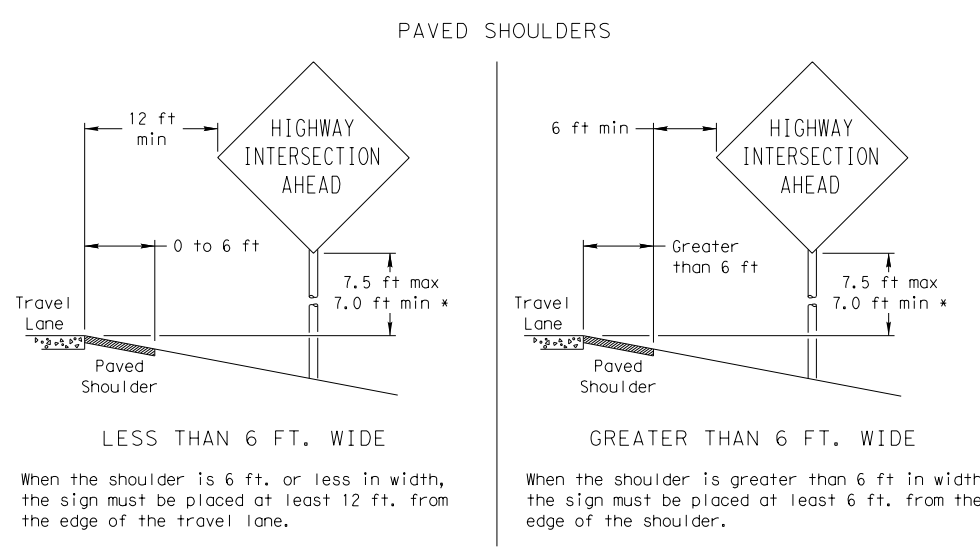
Sign Mounting Designation
 P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
 IF REQUIRED
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
 BM = Extruded Wind Beam (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-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

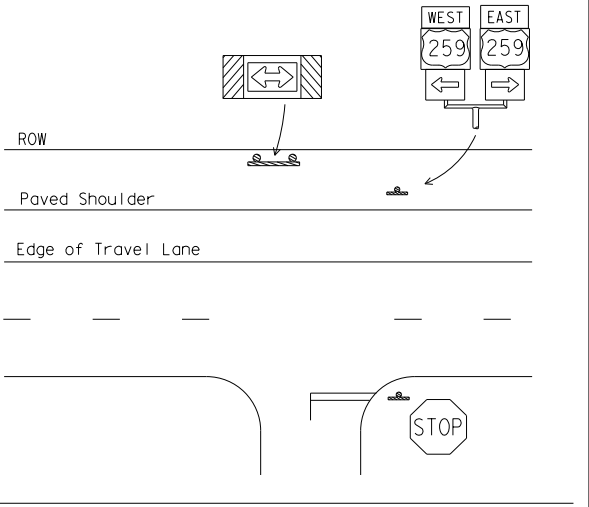
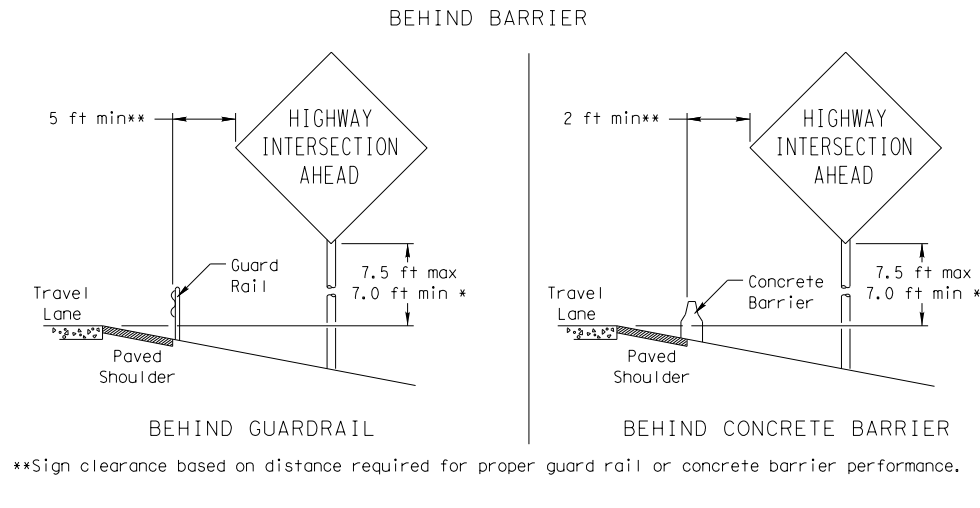
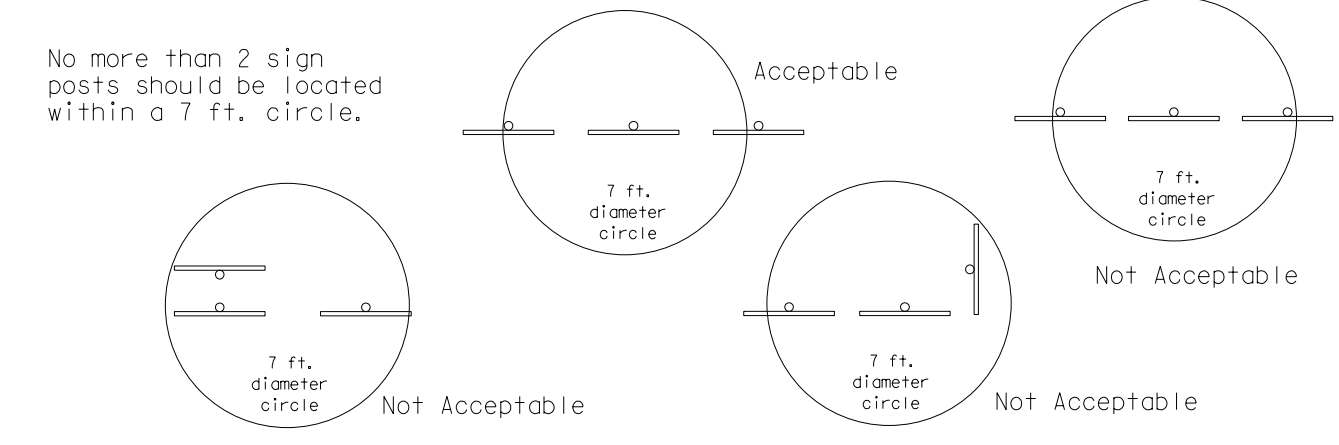


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

SIGN LOCATION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

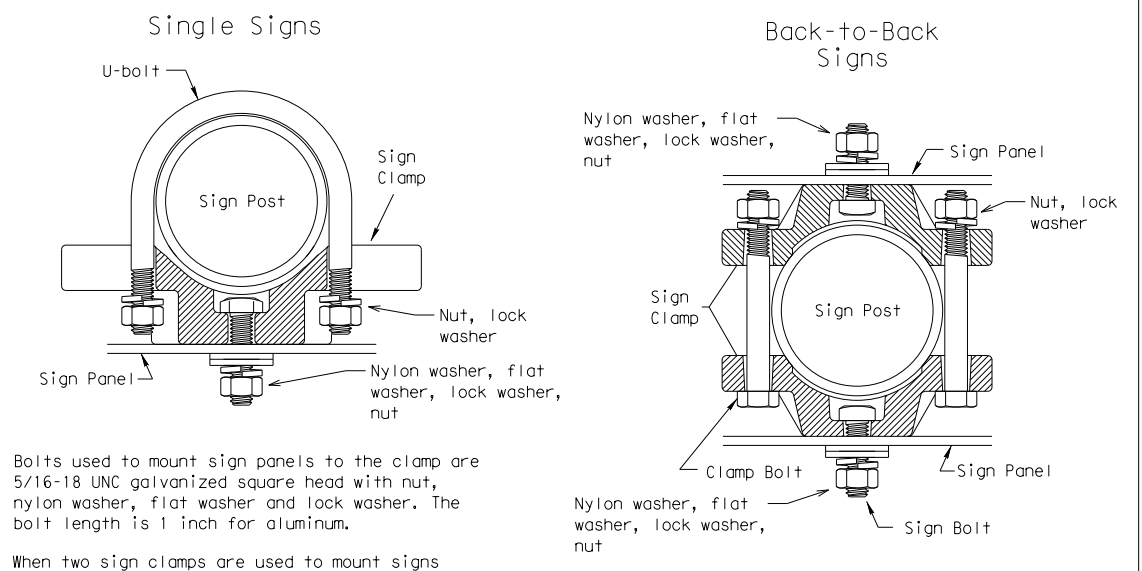
- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
<http://www.txdot.gov/publications/traffic.htm>

TYPICAL SIGN ATTACHMENT DETAIL



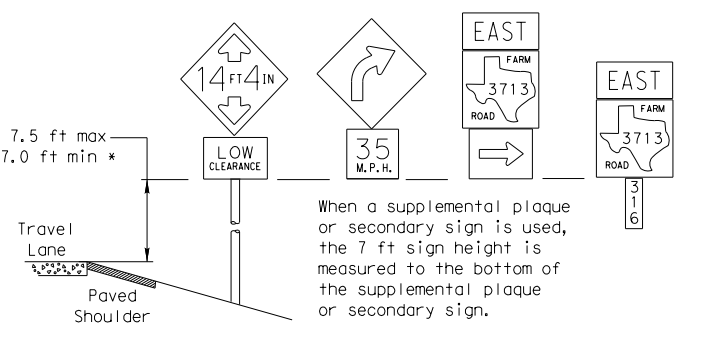
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

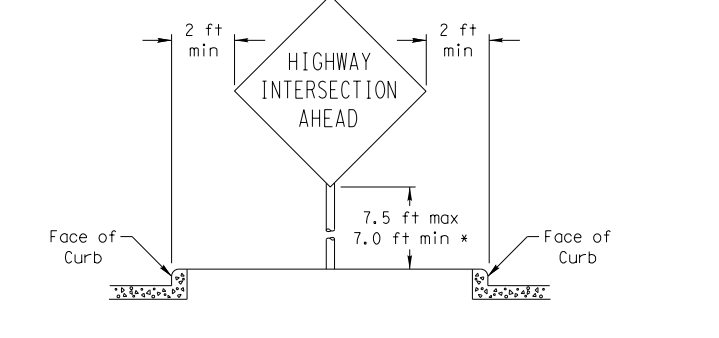
Sign clamps may be either the specific size clamp or the universal clamp.

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

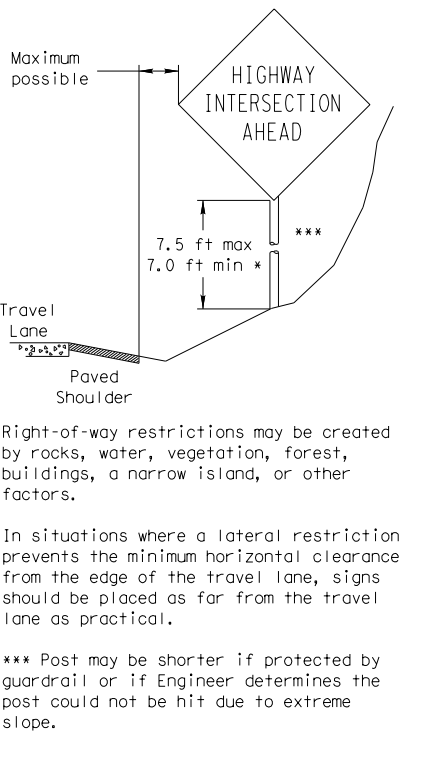


CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

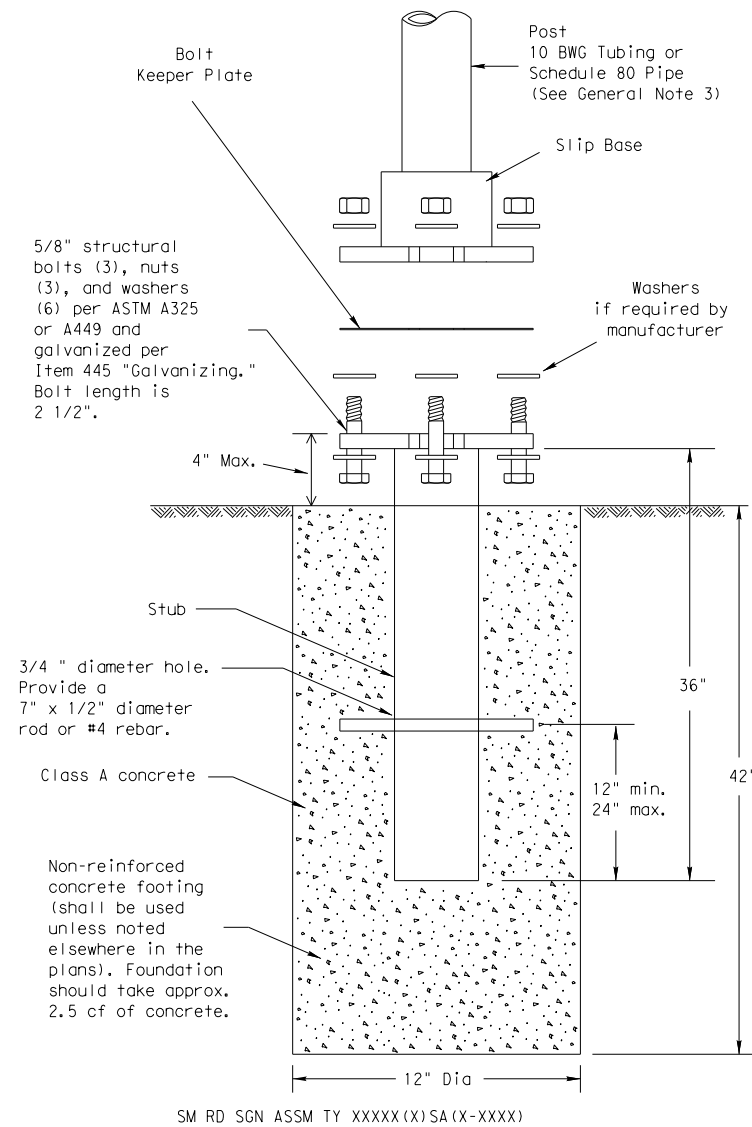
Texas Department of Transportation
 Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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		AUS	WILLIAMSON		147

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



5/8" structural bolts (3), nuts (3), and washers (6) per ASTM A325 or A449 and galvanized per Item 445 "Galvanizing." Bolt length is 2 1/2".

3/4" diameter hole. Provide a 7" x 1/2" diameter rod or #4 rebar.

Class A concrete

Non-reinforced concrete footing (shall be used unless noted elsewhere in the plans). Foundation should take approx. 2.5 cf of concrete.

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:

- 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.
- 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
- 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>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

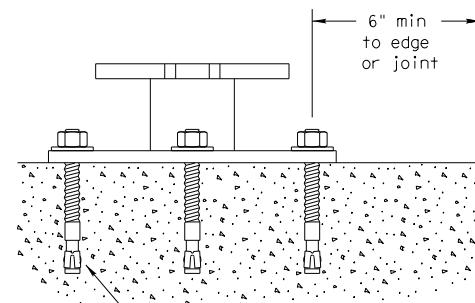
Foundation

- 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.
- 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.
- 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.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- 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.
- 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



5/8" diameter Concrete Anchor - 8 places (embed a minimum of 5 1/2" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.

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, "Epoxyes 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.



SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

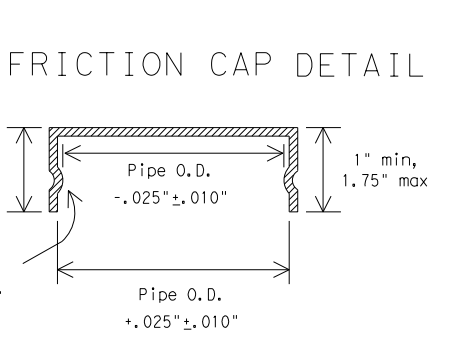
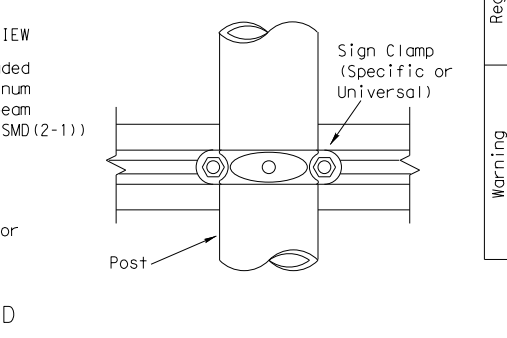
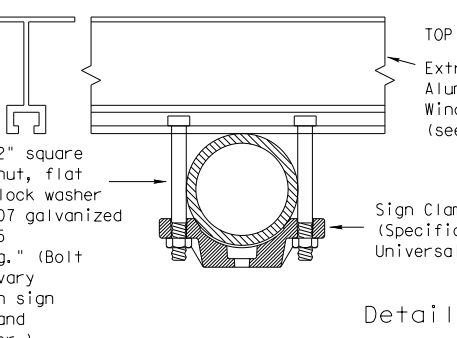
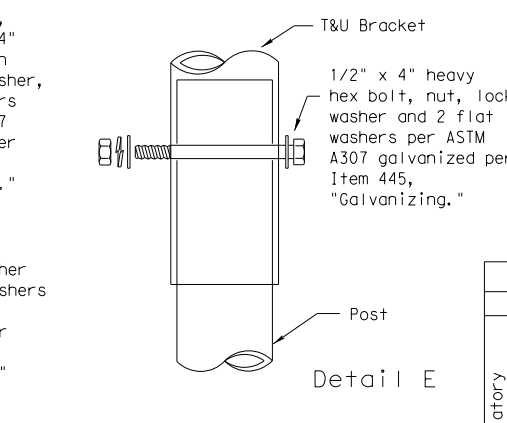
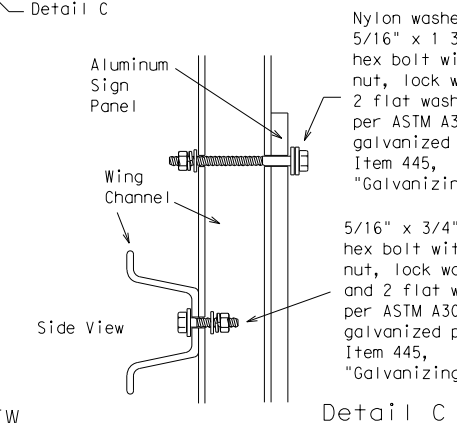
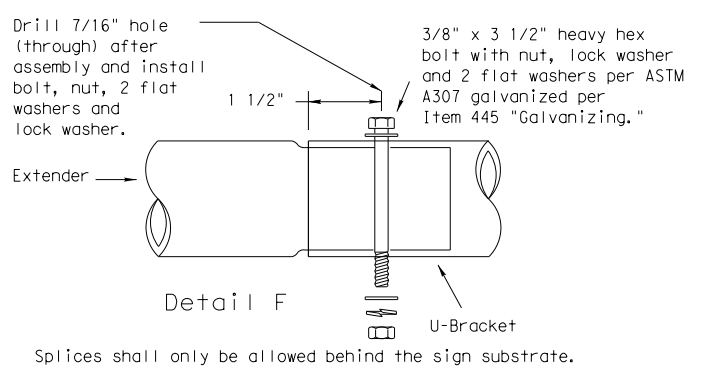
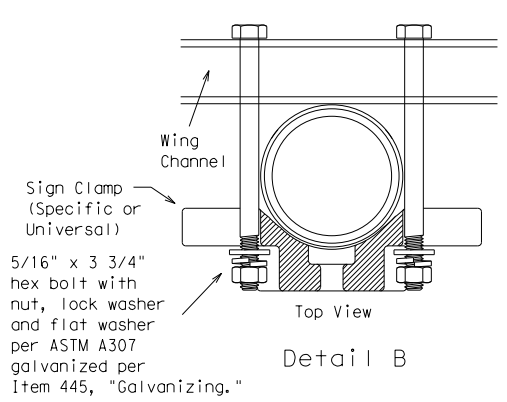
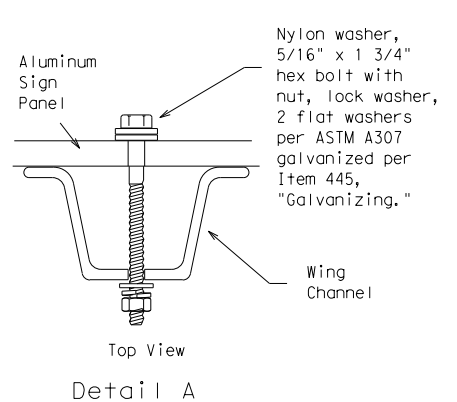
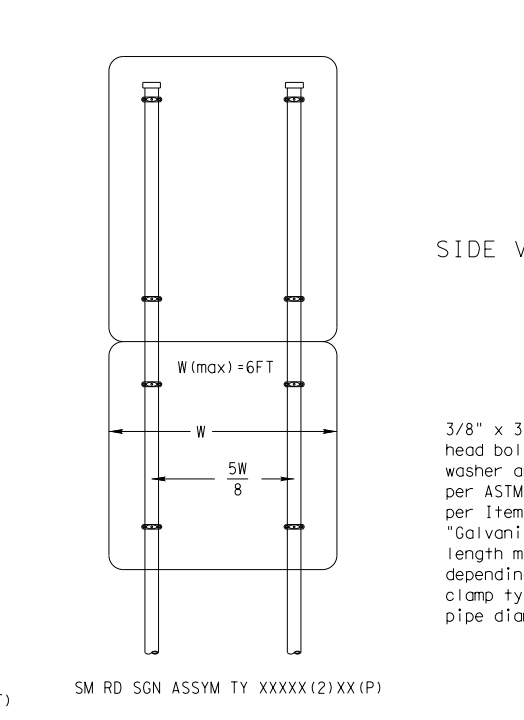
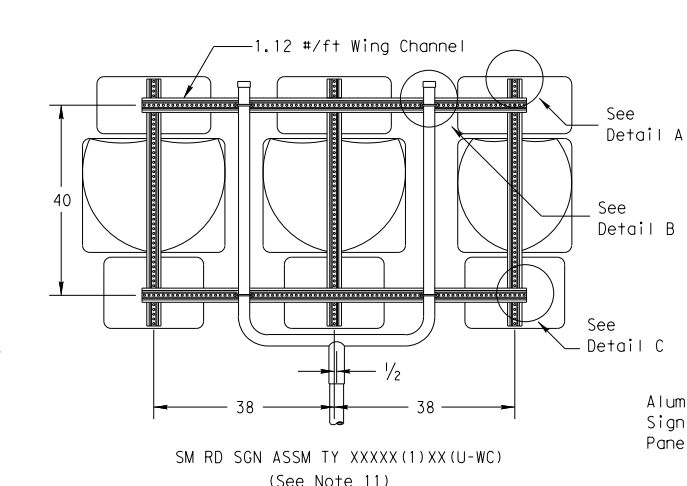
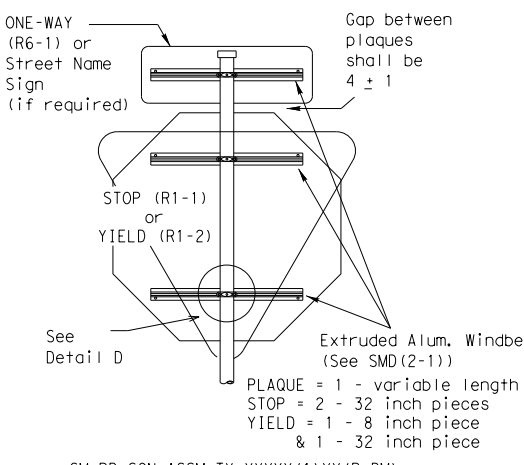
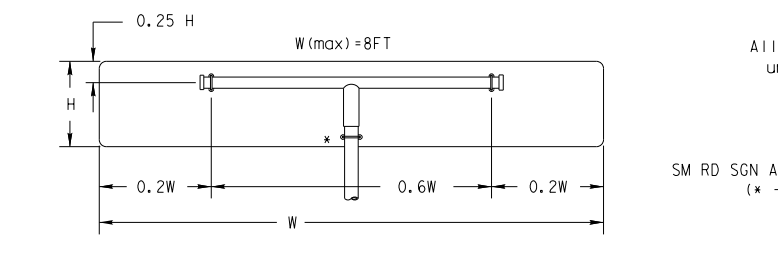
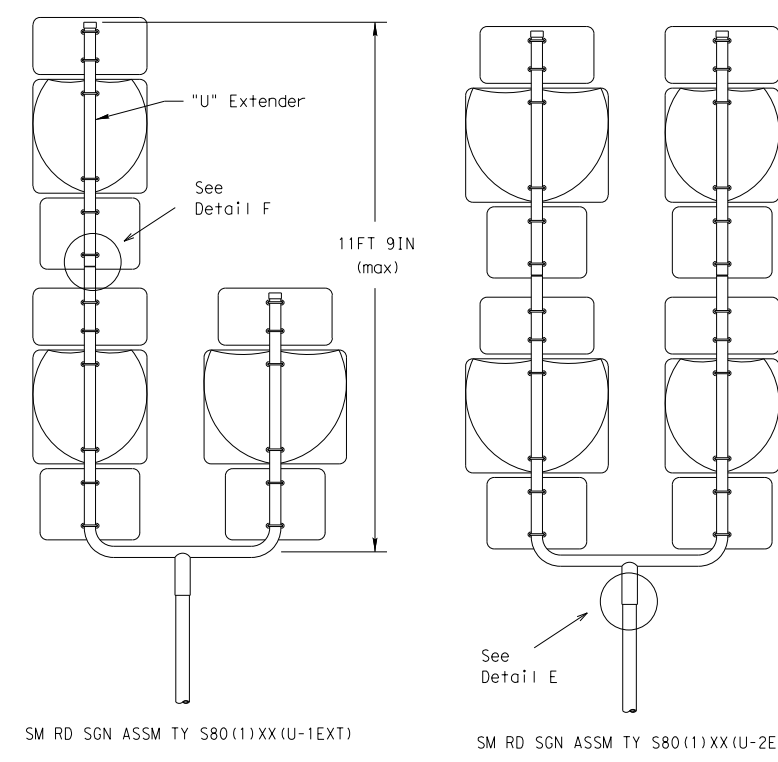
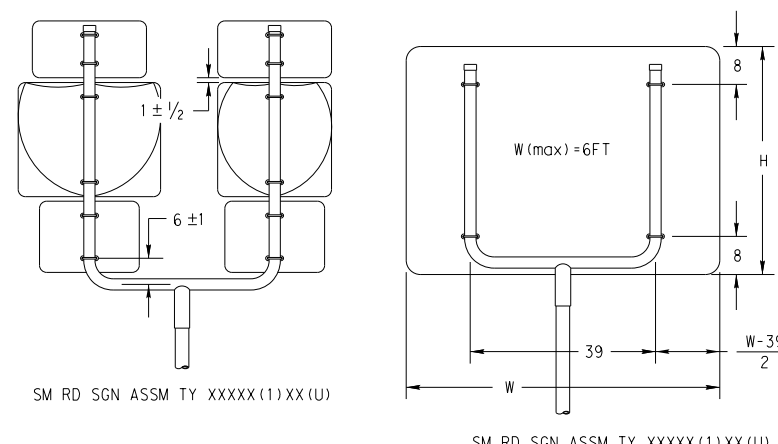
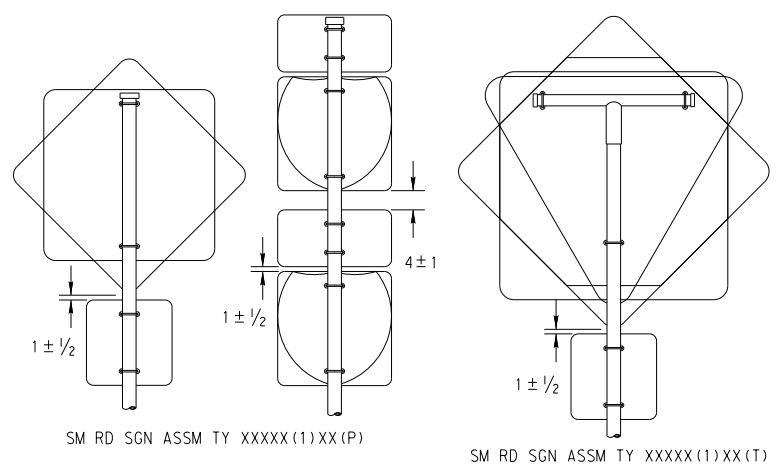
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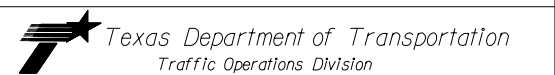
All dimensions are in english unless detailed otherwise.

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 |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- 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.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	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)

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.

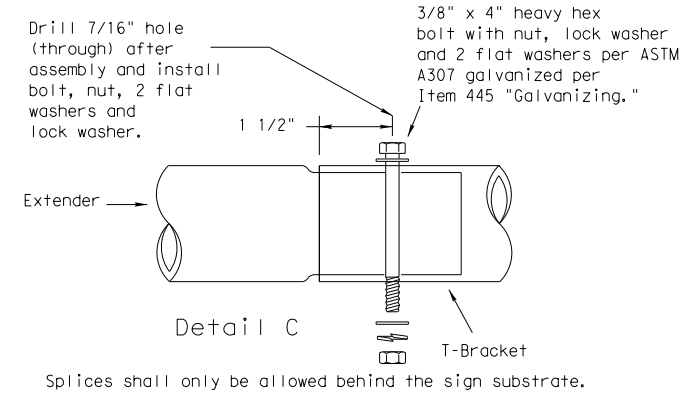
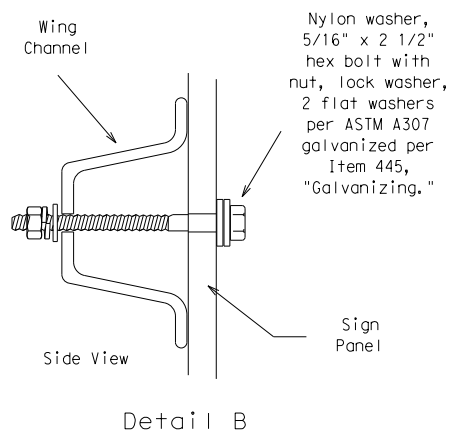
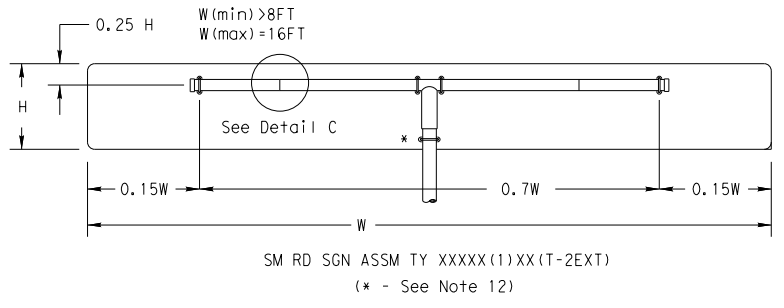


SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-2) - 08

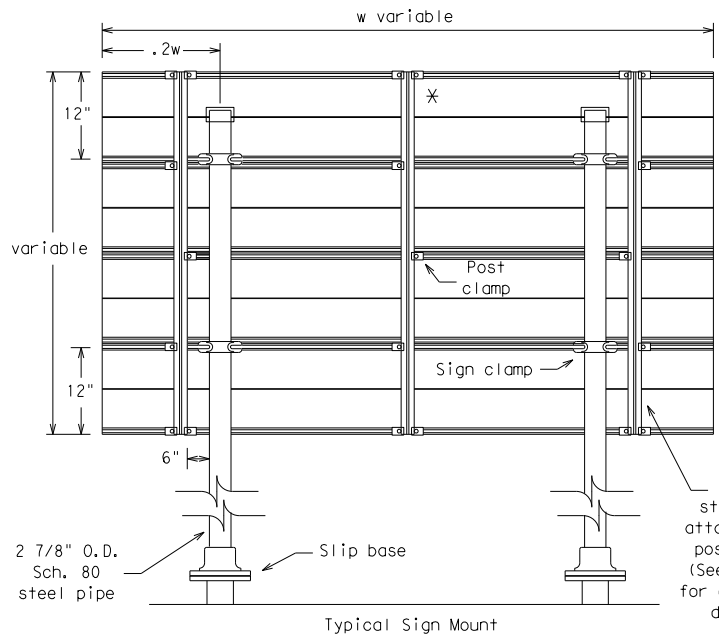
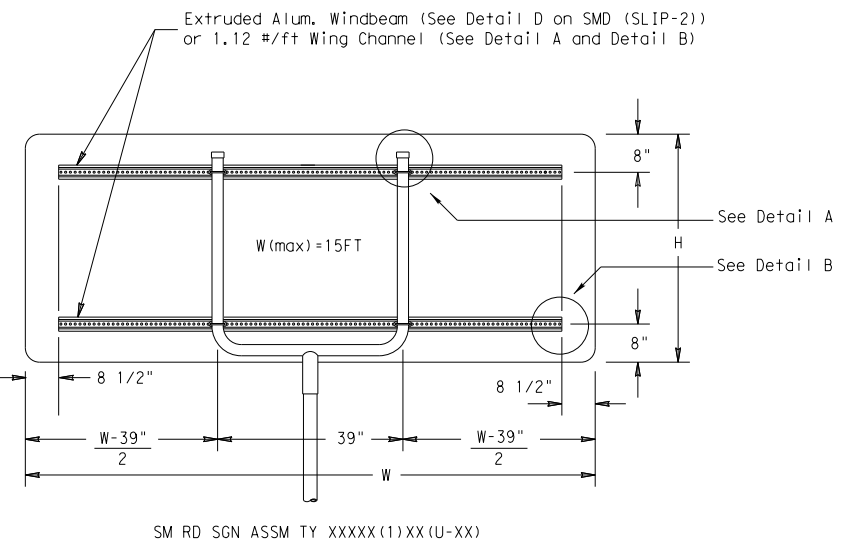
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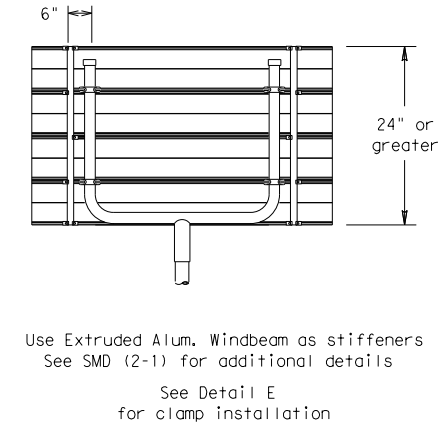
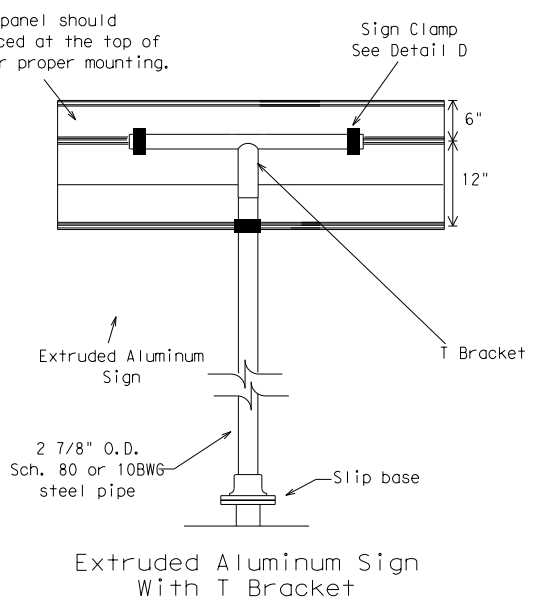
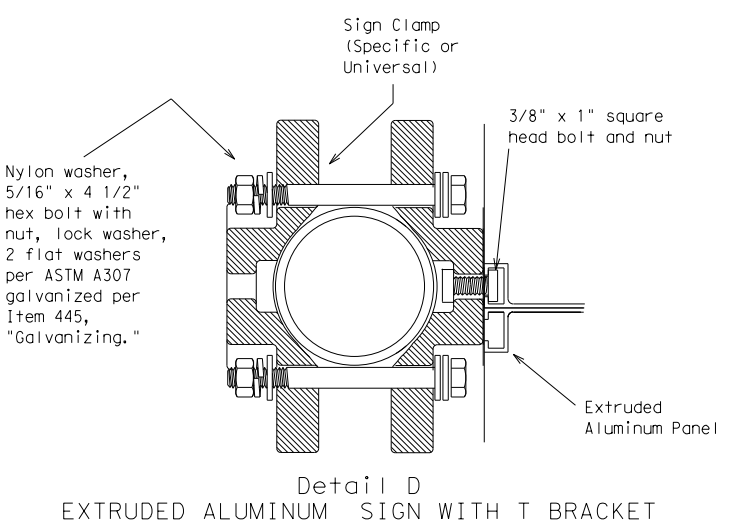
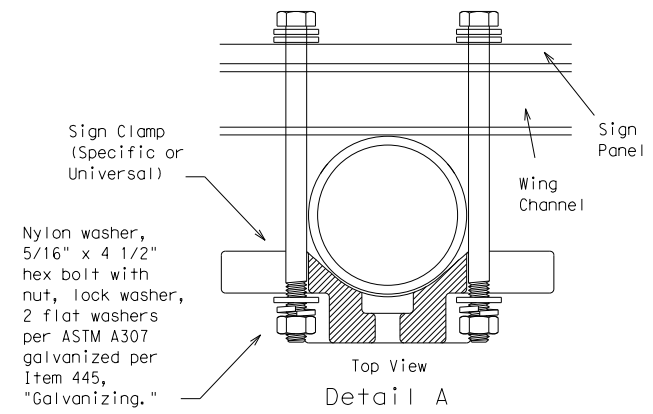
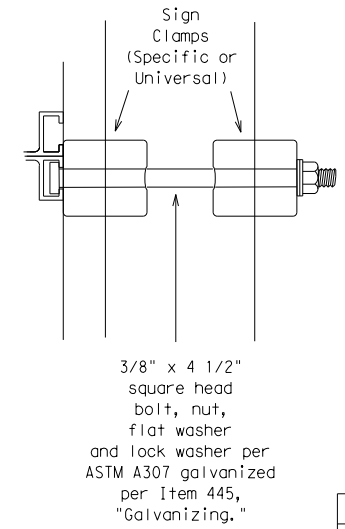
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Splices shall only be allowed behind the sign substrate.



* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



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 |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Sign blanks shall be the sizes and shapes shown on the plans.
- 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.
- 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)	
Warning	48x60-inch signs	TY S80(1)XX(T)	
	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)	



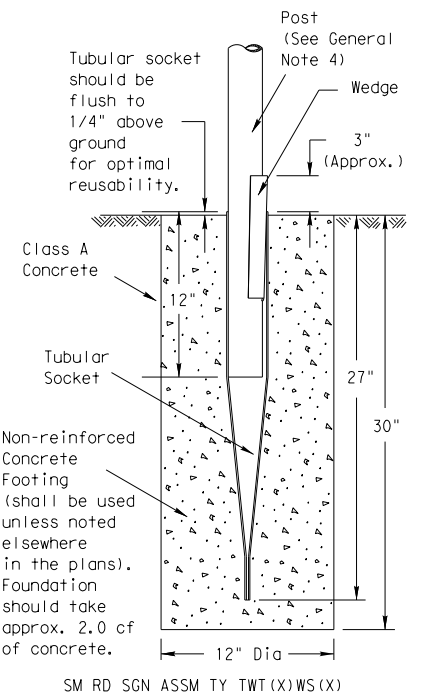
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-3) -08

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		AUS	WILLIAMSON		150

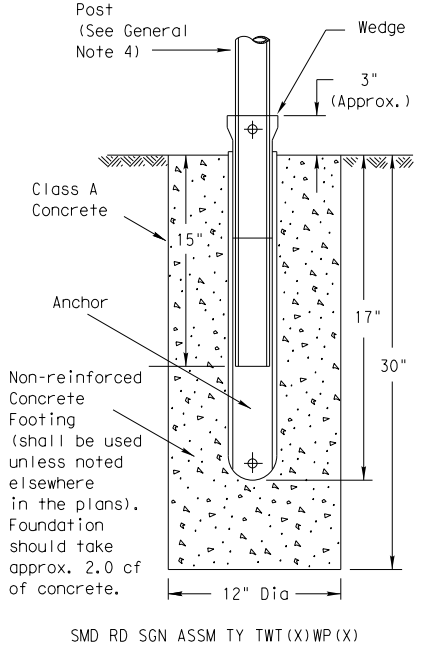
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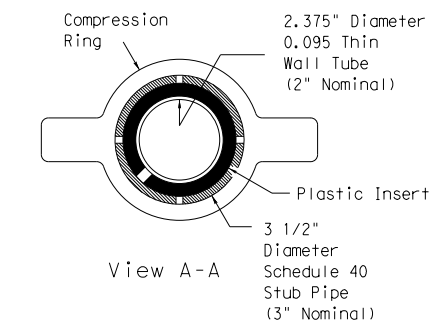
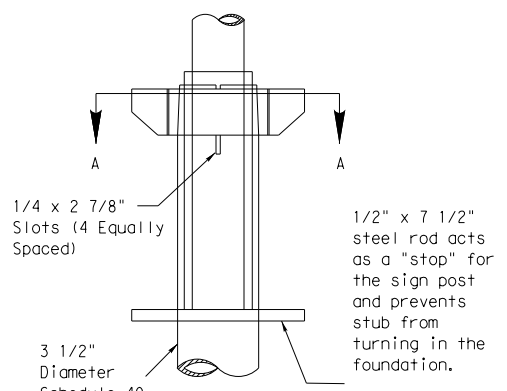
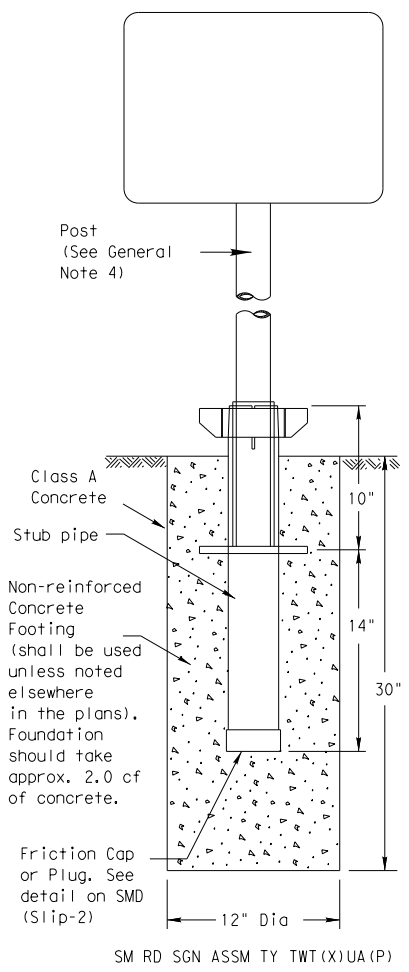
Wedge Anchor Steel System



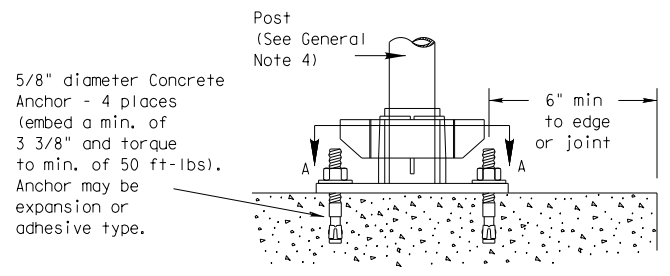
Wedge Anchor High Density Polyethylene (HDPE) System



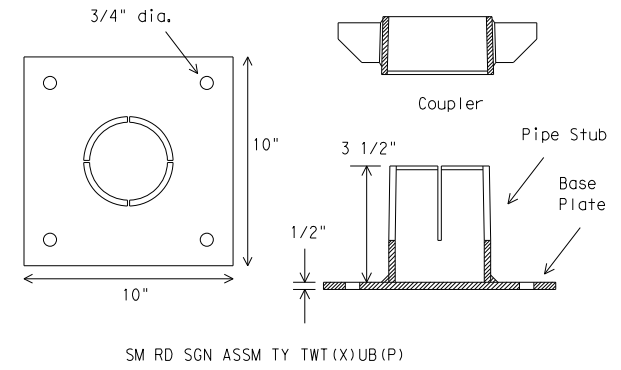
Universal Anchor System with Thin-Walled Tubing Post



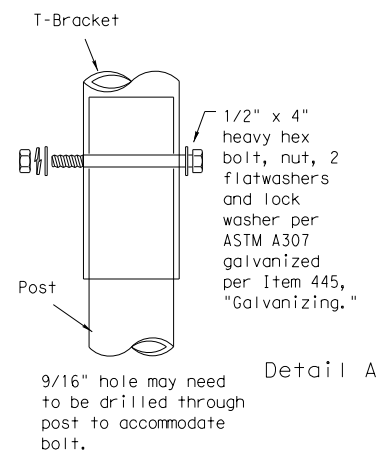
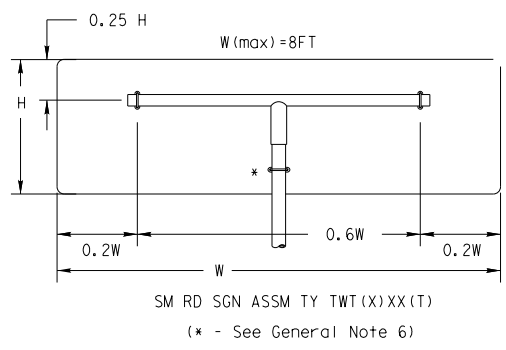
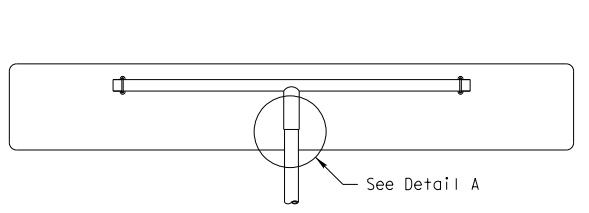
Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The 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, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post

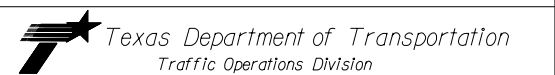


NOTE
The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

- GENERAL NOTES:
- 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.
 - 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.
 - 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
 - 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 metalizing with zinc wire per ASTM B833.
 - Sign blanks shall be the sizes and shapes shown on the plans.
 - Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
 - Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
 - 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
- 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.
 - 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.
 - Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
 - Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
 - Attach the sign to the sign post.
 - Insert the sign post into socket and align sign face with roadway.
 - Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

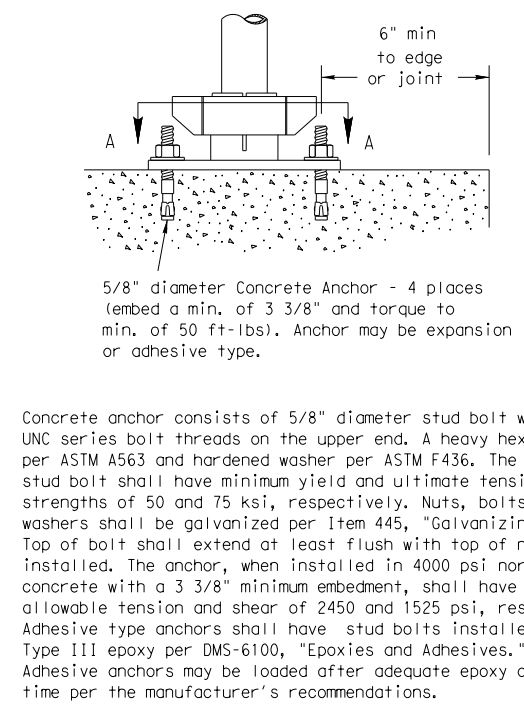
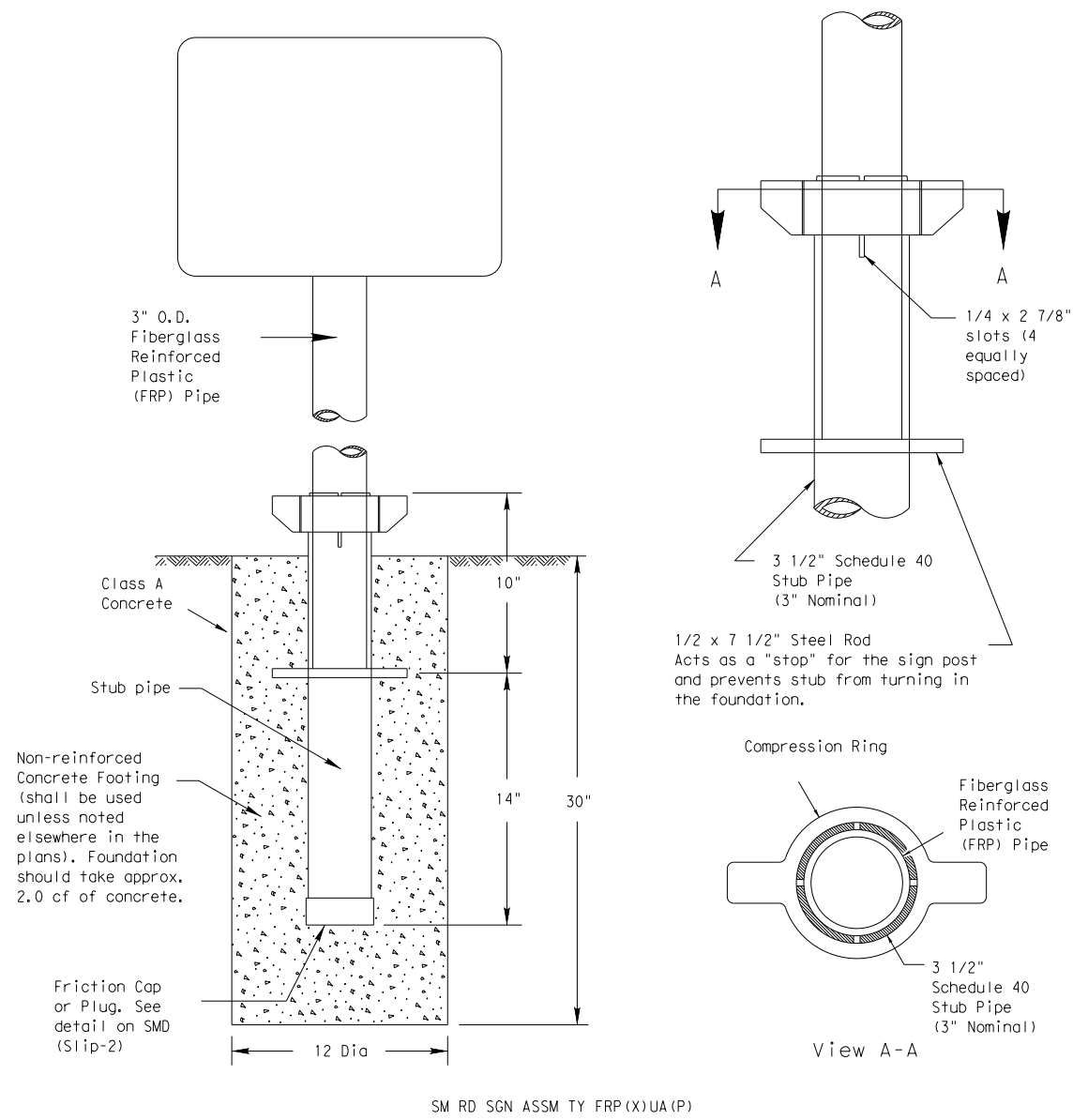
- UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE
- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a 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.
 - Insert base post in hole to depths shown and backfill hole with concrete.
 - 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.
 - Attach the sign to the sign post.
 - Install plastic insert around bottom of post.
 - Insert sign post into base post. Lower until the post comes to rest on steel rod.
 - Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
 - Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.



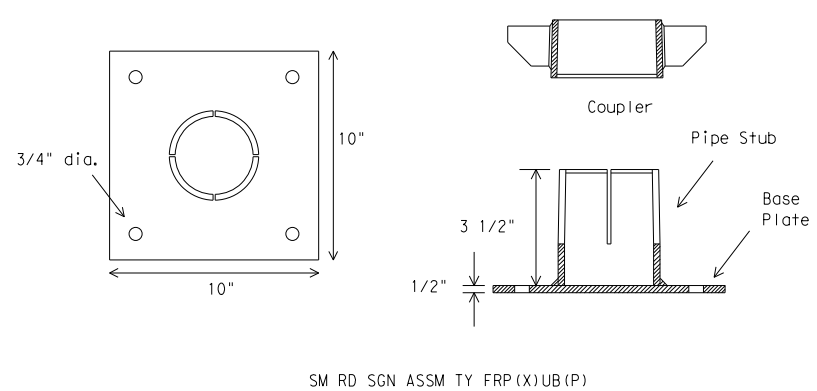
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD(TWT) - 08

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9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		AUS	WILLIAMSON		151

Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



BOLT-DOWN DETAILS



GENERAL NOTES:

- FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
- All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
- See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

FRP POST REQUIREMENTS

- Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
- Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
- FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing: Texas Department of Transportation Traffic Operations Division 125 East 11th Street Austin, Texas 78701-2483

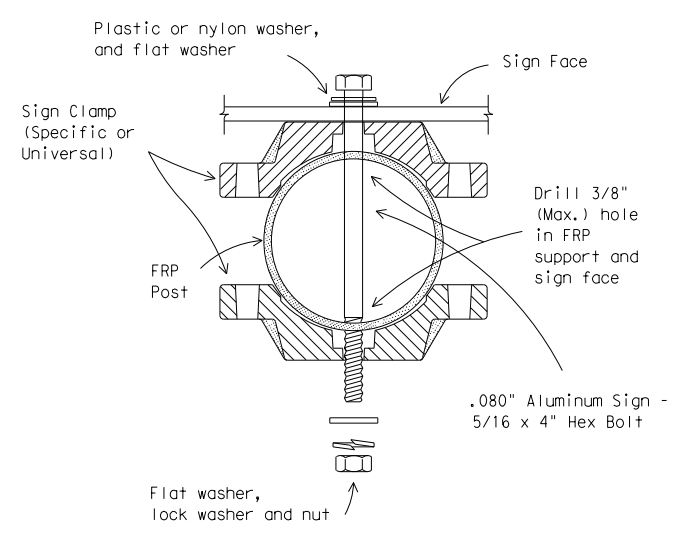
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

- 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.
- 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.
- Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
- Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
- Attach sign to FRP post.
- Insert sign post into base post. Lower until the post comes to rest on the steel rod.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

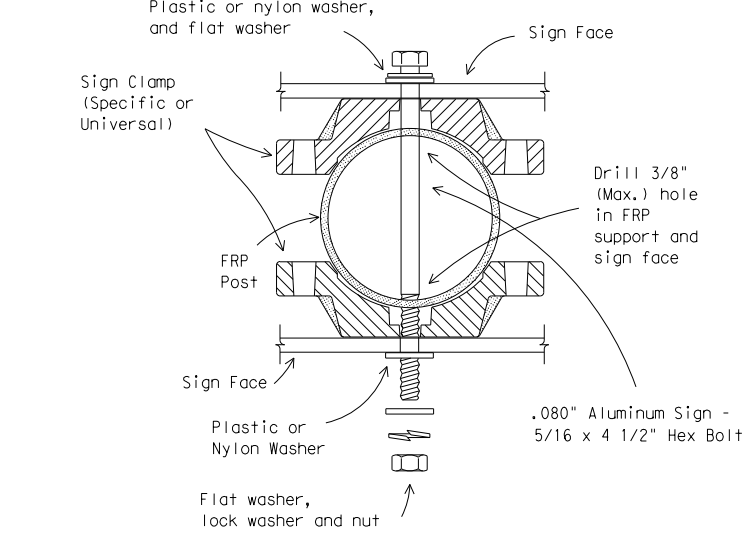
BOLT DOWN SIGN SUPPORT

- Position base plate with coupler on existing concrete.
- Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
- Attach sign to FRP post.
- Insert bottom of sign post into pipe stub.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.


Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



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Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD (FRP) -08

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			DIST	COUNTY	
		AUS	WILLIAMSON		SHEET NO. 152

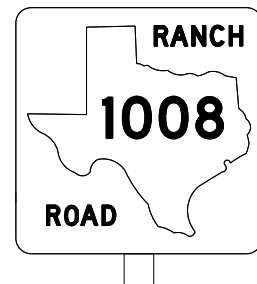
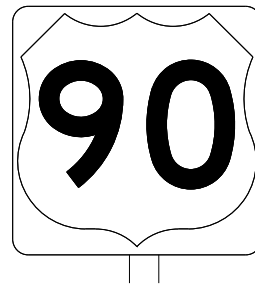
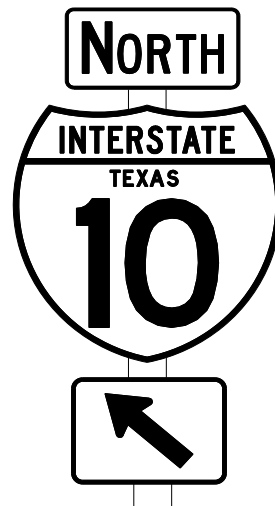
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REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

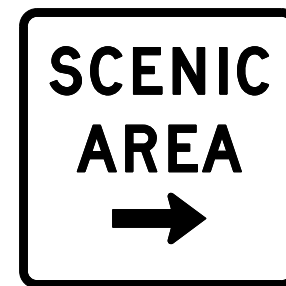
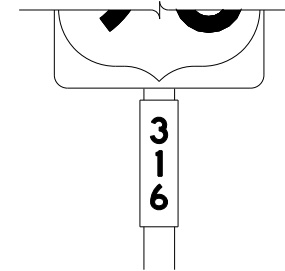
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

- 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).
- 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

- 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).
- 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.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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

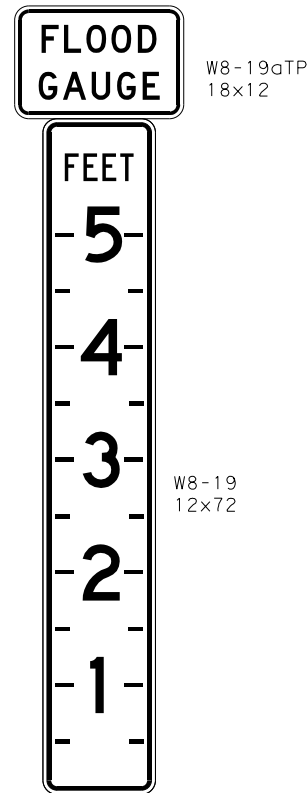
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

<http://www.txdot.gov/>

Texas Department of Transportation		Traffic Operations Division Standard							
<h3>TYPICAL SIGN REQUIREMENTS</h3> <h3>TSR(3) - 13</h3>									
FILE:	tsr3-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		2690	01	038	FM 971				
12-03	7-13	DIST	COUNTY		SHEET NO.				
9-08		AUS	WILLIAMSON		153				

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DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

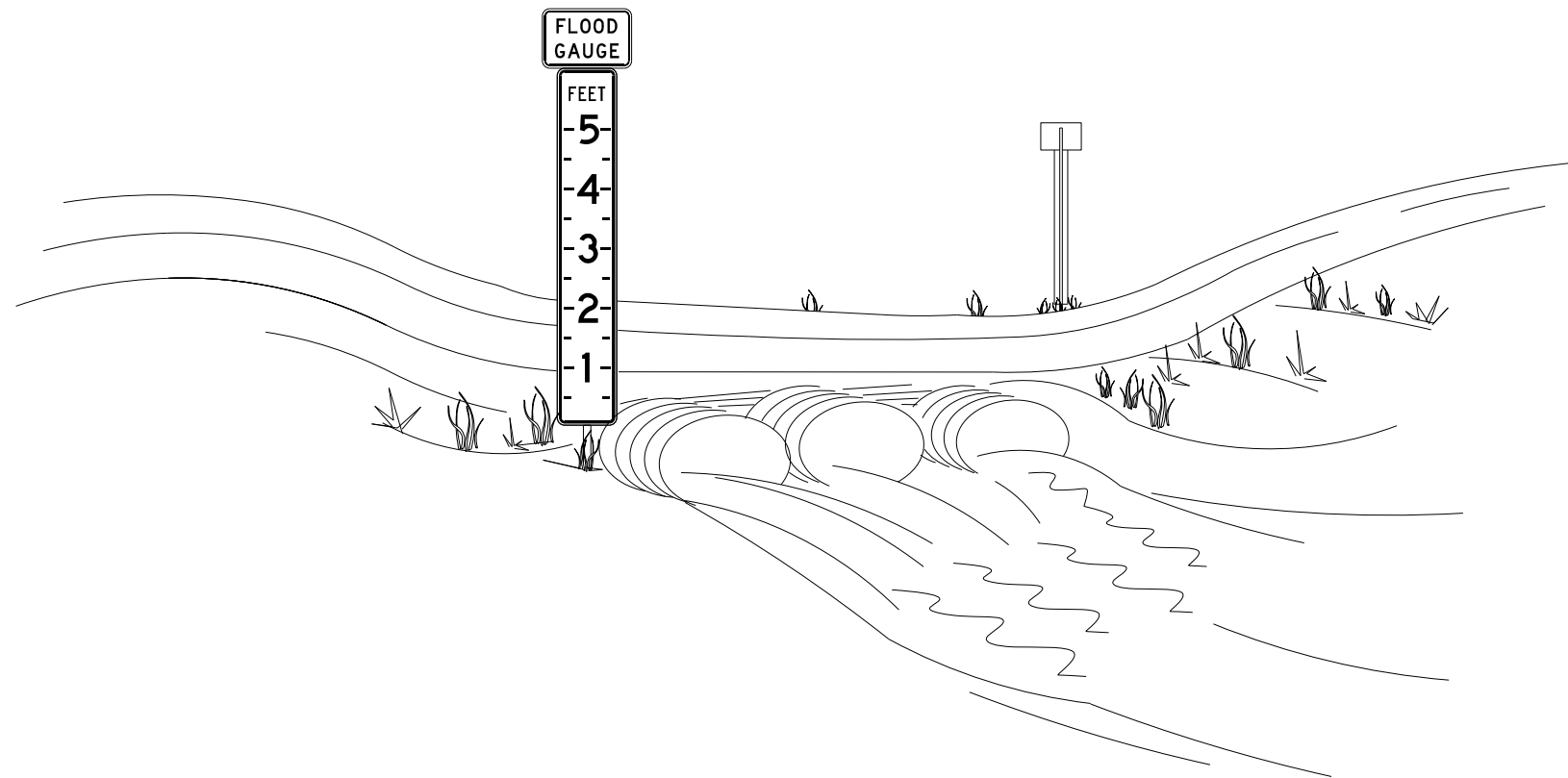
ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B _{FL} & C _{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM

GENERAL NOTES

- Each flood gauge assembly shall consist of the FLOOD GAUGE sign (W8-19aTP) and DEPTH MARKER (W8-19). Two assemblies should be erected, one along each approach, at the low water crossing location on the right side of the roadway.
- The flood gauge assembly should be of sufficient height to register depth of water to a minimum of five (5) Feet above the lowest travel lane pavement surface. Actual height of depth marker required for each location is shown elsewhere in the plans, but should not be in excess of ten (10) feet.
- The flood gauge assembly should be located not more than ten (10) feet from the pavement edge. Consideration should be given to placement with regard to the following factors:
 - Accurate register of depth of water over roadway.
 - Daytime and nighttime visibility of the flood gauge assembly along roadway approaches.
 - Outside the main flow of water during both normal and flood conditions.
- In areas where flood conditions would likely obscure the flood gauge assembly, a second pair of gauges, one on each approach, registering depths greater than shown on the first flood gauge assembly, is recommended.
- The Engineer will approve all flood gauge assembly locations before installation.
- The alphabets and lateral spacing between letters and numerals shall conform with the Texas "Manual on Uniform Traffic Control Devices for Streets and Highways", latest edition, and any approved changes thereto. Lateral Spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.
- FLOOD GAUGE signs and depth marker shall be mounted in accordance with Standard SMD (series). The recommended mounting is three (3) inch fiberglass reinforced pipe (FRP) pipe as shown on Standard SMD (GEN) and SMD (FRP). ROAD MAY FLOOD sign (W8-18) along the approach roadway may be required in areas where rainfall causes frequent roadway flooding.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>



				Traffic Operations Division Standard	
<h2>FLOOD GAUGE ASSEMBLY</h2> <h3>FGA-15</h3>					
FILE:	fga-15.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	January 1997	CONT	SECT	JOB	HIGHWAY
REVISIONS		2690	01	038	FM 971
3-15		DIST	COUNTY		SHEET NO.
		AUS	WILLIAMSON		156

A. GENERAL SITE DATA

1. PROJECT LIMITS: FROM 6.704 MILES EAST OF SH 130 TO CR 333
PROJECT LENGTH = 11,056.80 FT. = 2.094 MILES

- PROJECT COORDINATES: BEGIN PROJECT : X 3,176,999.47, Y 10,226,921.84
END PROJECT : X 3,186,228.66, Y 10,225,415.87

2. PROJECT SITE MAPS:
 - * PROJECT LOCATION MAP: TITLE SHEET
 - * DRAINAGE PATTERNS: DRAINAGE AREA MAP
 - * SLOPES ANTICIPATED AFTER MAJOR GRADINGS OR AREAS OF SOIL DISTURBANCE: EXISTING AND PROPOSED TYPICAL SECTIONS
 - * LOCATION OF EROSION AND SEDIMENT CONTROLS: EROSION CONTROL PLAN
 - * SURFACE WATERS AND DISCHARGE LOCATIONS: DRAINAGE AND CULVERT LAYOUTS
 - * PROJECT SPECIFIC LOCATIONS: TO BE SPECIFIED BY THE PROJECT FIELD OFFICE DURING CONSTRUCTION AND LOCATED IN THE PROJECT SW3P FILE. REFERENCE ITEM #10 BELOW

3. PROJECT DESCRIPTION: FULL DEPTH PAVEMENT REHABILITATION, ADD SHOULDERS & SAFETY TREAT 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 CONDITION OF SOIL & VEGETATIVE
COVER AND % OF EXISTING VEGETATIVE COVER: GRASS SLOPES, BRUSH, TREES, AND DITCHES; 80%

6. TOTAL PROJECT AREA: 133 ACRES

7. TOTAL AREA TO BE DISTURBED: 53 ACRES

8. WEIGHTED RUNOFF COEFFICIENT
BEFORE CONSTRUCTION: .48
AFTER CONSTRUCTION: .50

9. NAME OF RECEIVING WATERS: (SEGMENT NUMBER OF RECEIVING WATERS)

STORMWATER RUNOFF WOULD FLOW INTO OPOSSUM CREEK OF THE BRAZOS RIVER. THE PROJECT IS LOCATED IN THE BRAZOS RIVER BASIN - SEGMENT 1247.

10. PROJECT SW3P FILE: FOR PROJECTS DISTURBING ONE ACRE OR MORE, TXDOT WILL MAINTAIN AN SW3P FILE WITH ALL PERTINENT ENVIRONMENTAL DOCUMENTS, CORRESPONDENCE, ETC. AT THE PROJECT FIELD OFFICE. IF NO FIELD OFFICE IS AVAILABLE THEN THE SW3P FILE SHALL BE KEPT IN THE INSPECTOR'S TRUCK.

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES:

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER:

2. STRUCTURAL PRACTICES:

- SILT FENCES
- 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:

3. STORM WATER MANAGEMENT:

STORM WATER DRAINAGE WILL BE PROVIDED BY EXISTING DITCHES AND PROPOSED DITCHES. THIS SYSTEM WILL CARRY THE DRAINAGE WITHIN THE RIGHT-OF-WAY TO OPOSSUM CREEK OF THE BRAZOS RIVER BASIN

4. STORM WATER MANAGEMENT ACTIVITIES: (SEQUENCE OF CONSTRUCTION)

1. INSTALL TEMPORARY EROSION CONTROL DEVICES. ROCK FILTER DAMS AND TEMPORARY SEDIMENT CONTROL FENCE AS SHOWN IN EROSION CONTROL PLANS.
2. SET UP TRAFFIC CONTROL & ADVANCED WARNING SIGNS, REMOVE EXISTING HEADWALLS, AND ABUTMENTS, AS SHOWN ON PLANS.
3. EXCAVATE AND PREPARE SUBGRADE FOR PLACEMENT OF NEW PAVEMENT SECTION, WIDENED CULVERTS AS PER PLANS.
4. INSTALL PROPOSED FLOWLINES, BACKFILL AND ESTABLISH PGL GRADE AS PER PLAN AND PROFILE SHEETS AND TYPICAL SECTIONS.
5. COMPLETE TOPSOIL / SEED ON SLOPES.
6. ESTABLISH GRASS GROWTH ON PERMANENT SLOPES UTILIZING TOPSOIL / SEED.
7. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITE IS ESTABLISHED AND APPROVED BY THE PROJECT ENGINEER, THEN REMOVE ALL TEMPORARY STRUCTURAL CONTROLS AND RESEED ANY AREAS DISTURBED BY THEIR REMOVAL.

5. NON-STORM WATER DISCHARGES:

FILTER NON-STORM WATER DISCHARGES, OR HOLD RETENTION BASINS, BEFORE BEING ALLOWED TO MIX WITH STORM WATER. THESE DISCHARGES CONSIST OF NON-POLLUTED GROUND WATER, SPRING WATER, FOUNDATION AND/OR FOOTING DRAIN WATER; AND WATER USED FOR DUST CONTROL, PAVEMENT WASHING AND VEHICLE WASHWATER CONTAINING NO DETERGENTS.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

MAINTENANCE WILL BE PERFORMED AS INDICATED ON FIELD INSPECTION AND MAINTENANCE REPORT FORM 2118.

2. INSPECTION:

INSPECTION WILL BE PERFORMED AS INDICATED ON FIELD INSPECTION AND MAINTENANCE REPORT FORM 2118.

3. WASTE MATERIALS:

ALL WASTE MATERIALS WILL BE COLLECTED, STORED AND DISPOSED OF IN A LEGAL AND PROPER MANNER. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.

4. HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS. PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETECURING COMPOUNDS AND ADDITIVES. IN THE EVENT A SPILL WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR MUST BE CONTACTED IMMEDIATELY.

5. SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:


- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER:

REMARKS: DISPOSAL AREAS, STOCKPILES AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL SEDIMENT FROM ENTERING RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WATERBODY OR STREAMBED.

CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED TO MINIMIZE THE RUNOFF OF POLLUTANTS.

**Austin District
Central Design**



**STORM WATER
POLLUTION
PREVENTION PLAN
(SW3P)**

© 2023	CONT	SECT	JOB	HIGHWAY
	2690	01	038	FM 971
	DIST	COUNTY		SHEET NO.
	AUS	WILLIAMSON		157

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

- 1.
2.
 No Action Required Required Action

Action No.

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

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

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

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

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

Required Actions: Stream crossings within project limits (from Sta. 458+00.00 to Sta. 567+68.53) - Description: 2 stream crossings located at:

- 1. Unnamed tributary located at Sta. 479+50.70
2. Unnamed tributary located at Sta. 505+03.00

When temporary stream crossings are necessary, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing. Temporary fills within stream crossings must be removed in their entirety and the affected areas returned to preconstruction elevations.

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:

Table with 3 columns: Erosion, Sedimentation, Post-Construction TSS. Includes items like Temporary Vegetation, Silt Fence, Vegetative Filter Strips, etc.

III. CULTURAL RESOURCES

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

- No Action Required Required Action

Action No.

- 1.
2.
3.
4.

IV. VEGETATION RESOURCES

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

- No Action Required Required Action

Action No.

- 1. Implement Executive Order 13112 on Invasive Species when applicable.
2. Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided.
3.

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

- No Action Required Required Action

- 1. The contractor's attention is directed to the fact that there is the possibility that migratory birds may be nesting in any woody vegetation or existing structures within the project limits. The contractor shall remove all woody vegetation, and old migratory bird nests from any structures affected by construction, between September 16 and February 28 while any nests are not occupied by a bird. In addition, the contractor must be prepared to prevent migratory birds from re-nesting on any structures between March 1 and September 15. 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 50 ft. of the nest must stop. Contact the Engineer to determine how to proceed.
2. Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season.

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

Table listing abbreviations: BMP, CGP, DSHS, FHWA, MOA, MOU, MS4, MBTA, NOT, NMP, NOI, SPCC, SW3P, PCN, PSL, TCEQ, TPDES, TPWD, TxDOT, T&E, USACE, USFWS, etc.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

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

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

- Yes No

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

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

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

- Yes No

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

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

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

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

- No Action Required Required Action

Action No.

- 1.
2.
3.

VII. OTHER ENVIRONMENTAL ISSUES

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

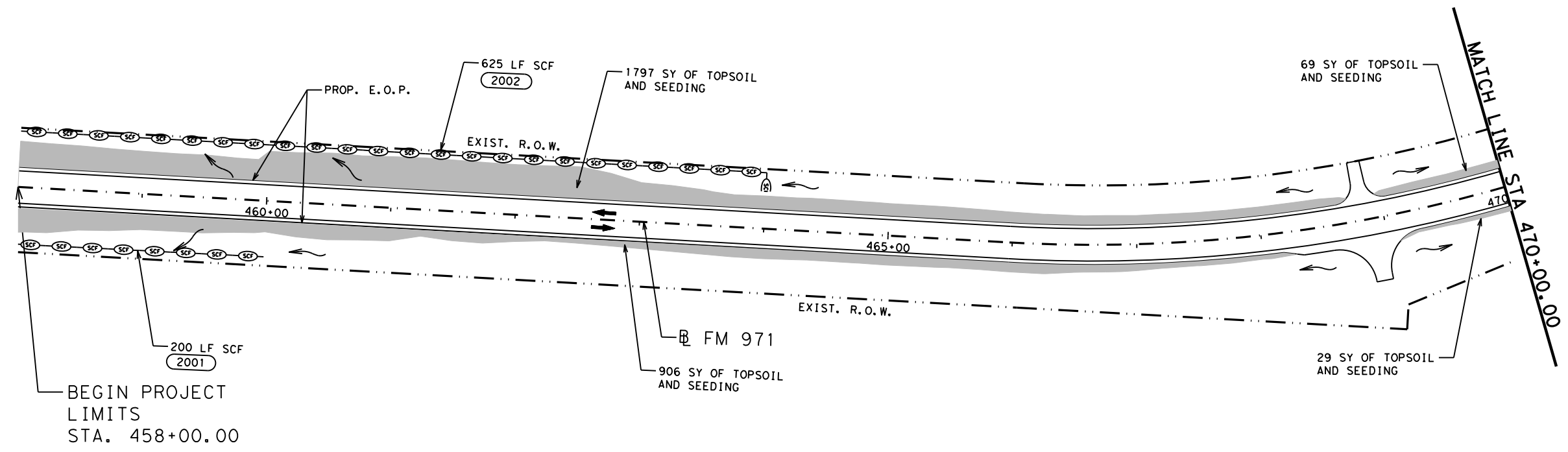
- No Action Required Required Action

Action No.

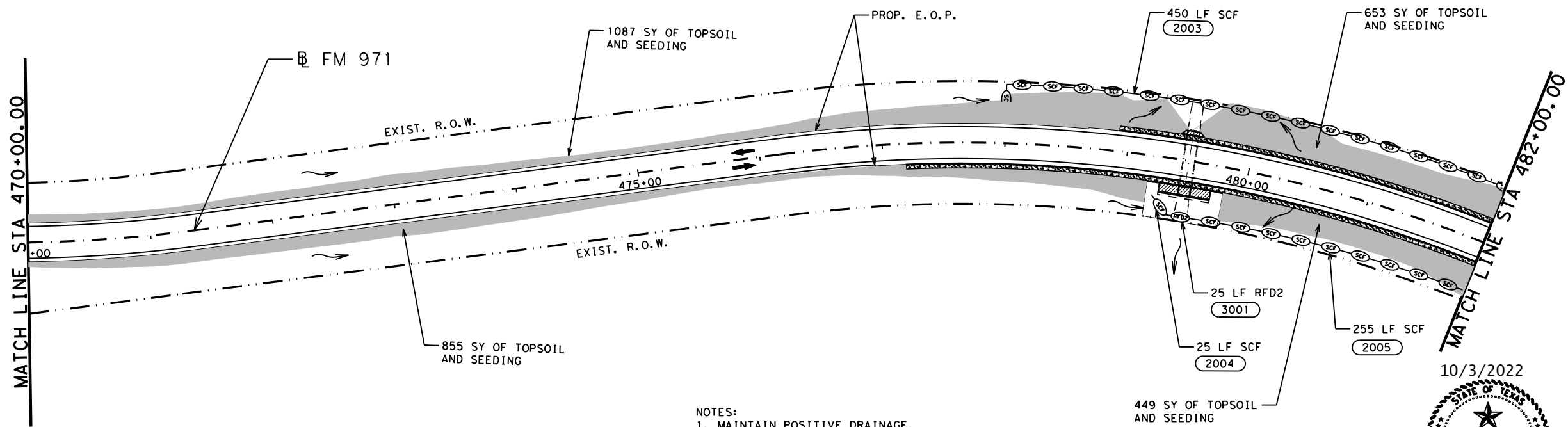
- 1. Coordinate with flood plain administration if needed.
2.

Design Division Standard logo, ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC, FILE: epic.dgn, 2690 01 038 FM 971, DIST COUNTY SHEET NO. AUS WILLIAMSON 158

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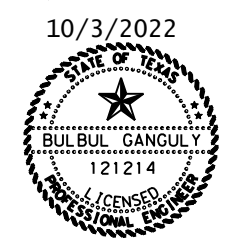


LEGEND	
	SILT FENCE
	ROCK FILTER DAM
	TOPSOIL & SEEDING
	FLOW



SCALE (IN FEET):
0 100

- NOTES:
1. MAINTAIN POSITIVE DRAINAGE.
 2. (XXX) REPRESENTS DEVICE DESIGNATION.
 3. SEDIMENT CONTROL FENCE LOCATION TO BE APPROVED BY THE ENGINEER.
 4. TEMPORARY EROSION CONTROL DEVICES SHALL REMAIN IN PLACE THROUGHOUT ALL PHASES OF CONSTRUCTION OR AS DIRECTED BY THE ENGINEER.
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Bulbul Ganguly

**Austin District
Central Design**

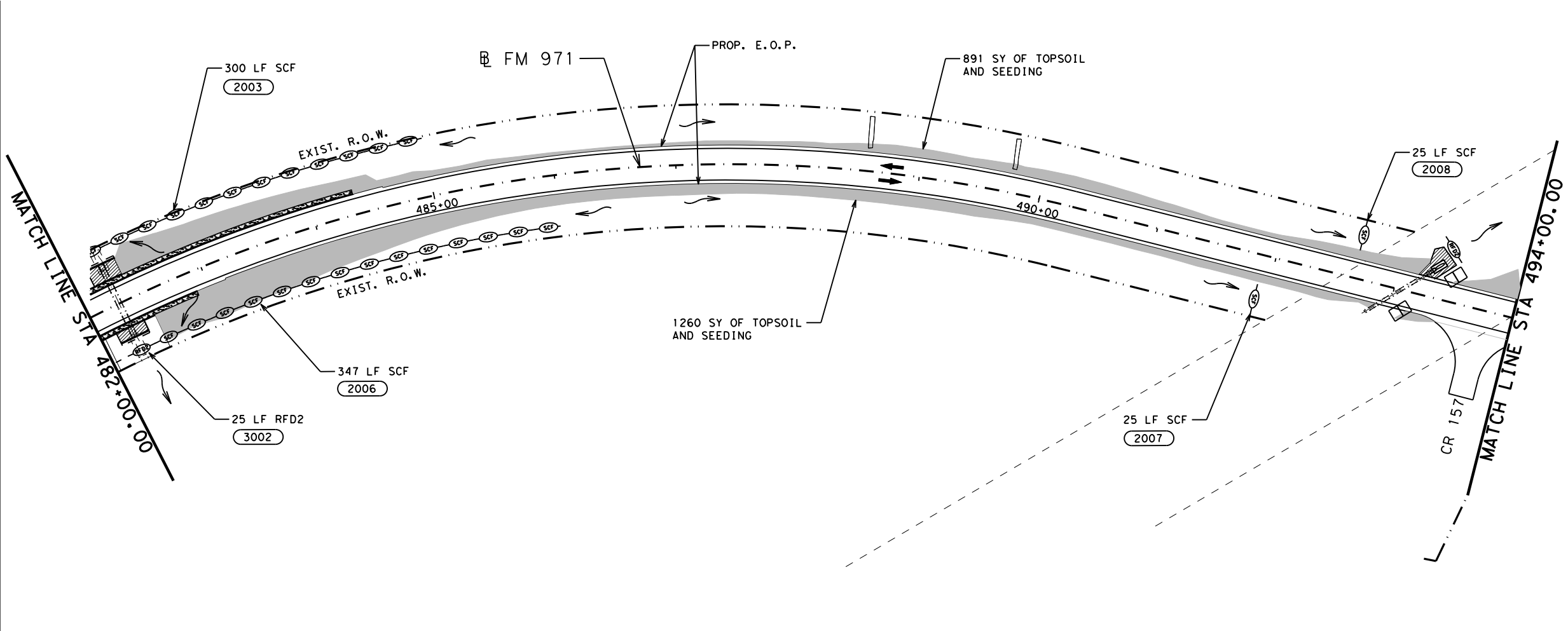
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**FM 971
EROSION CONTROL
LAYOUT**

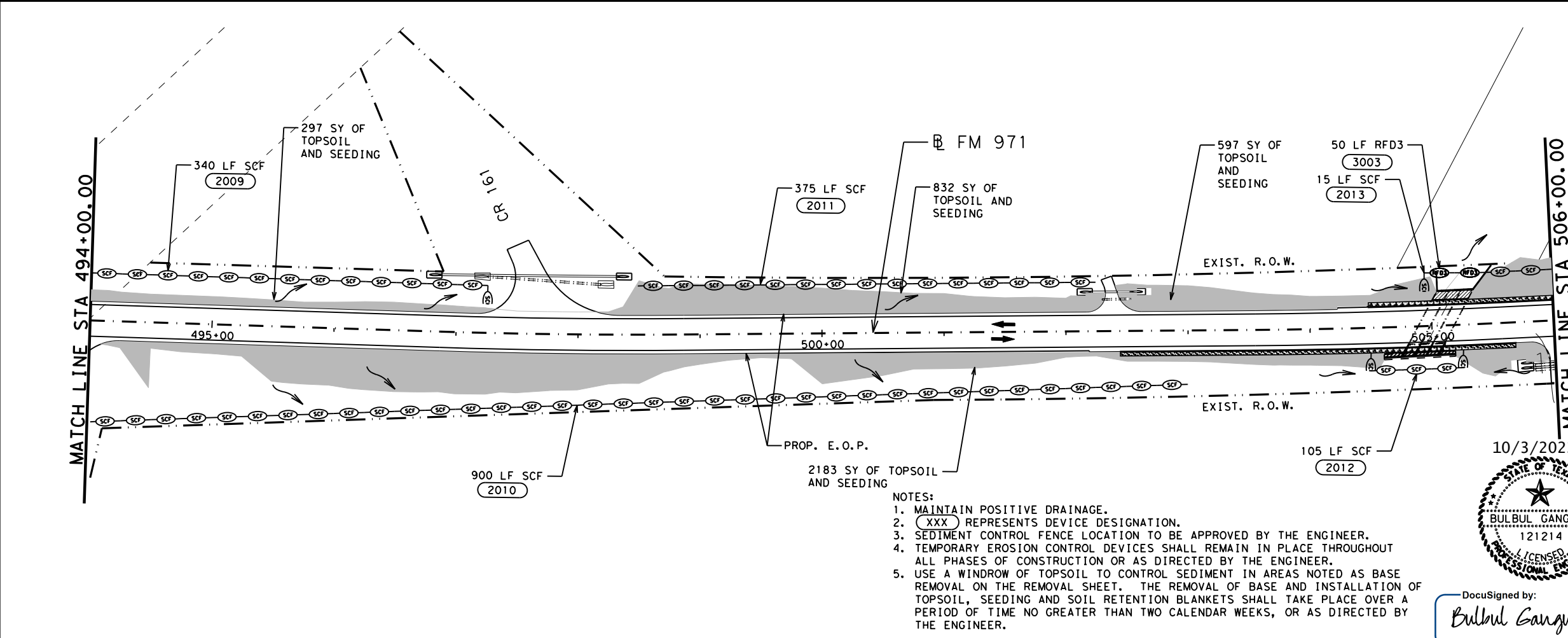
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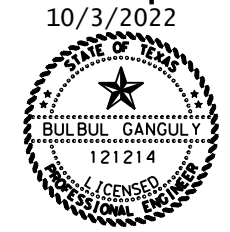
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LEGEND	
	SILT FENCE
	ROCK FILTER DAM
	TOPSOIL & SEEDING
	FLOW



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**Austin District
Central Design**

Texas Department of Transportation

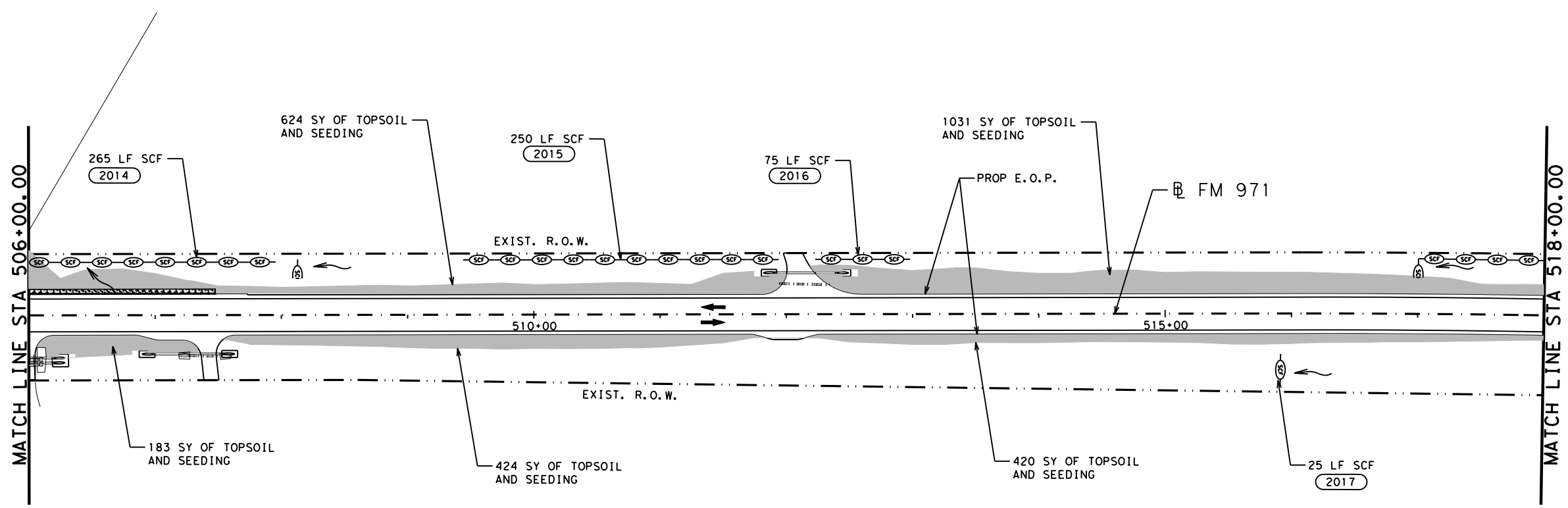
**FM 971
EROSION CONTROL
LAYOUT**

10/3/2022

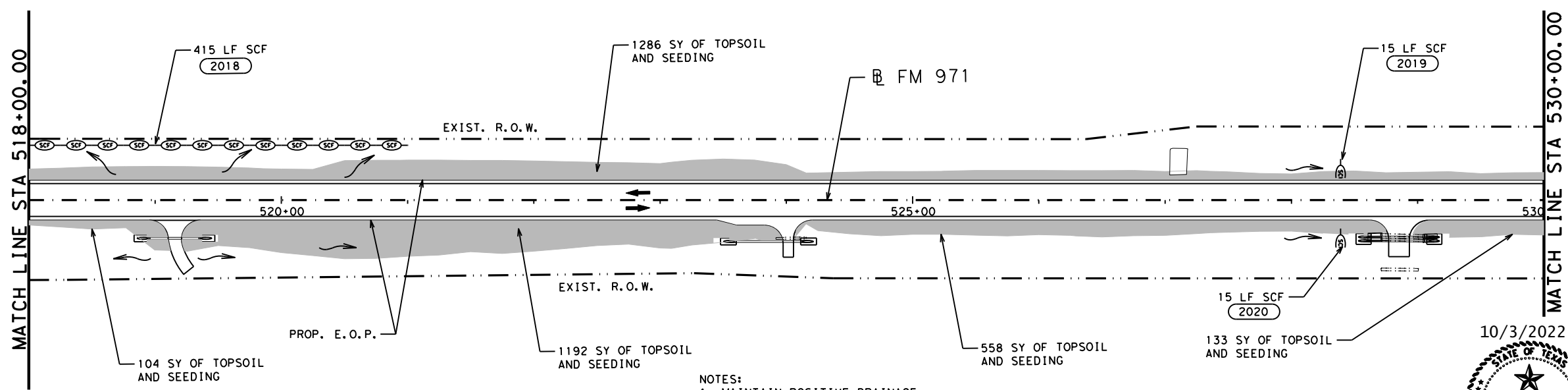
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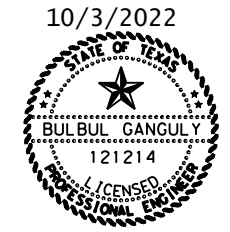
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LEGEND	
	SILT FENCE
	ROCK FILTER DAM
	TOPSOIL & SEEDING
	FLOW



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Texas Department of Transportation

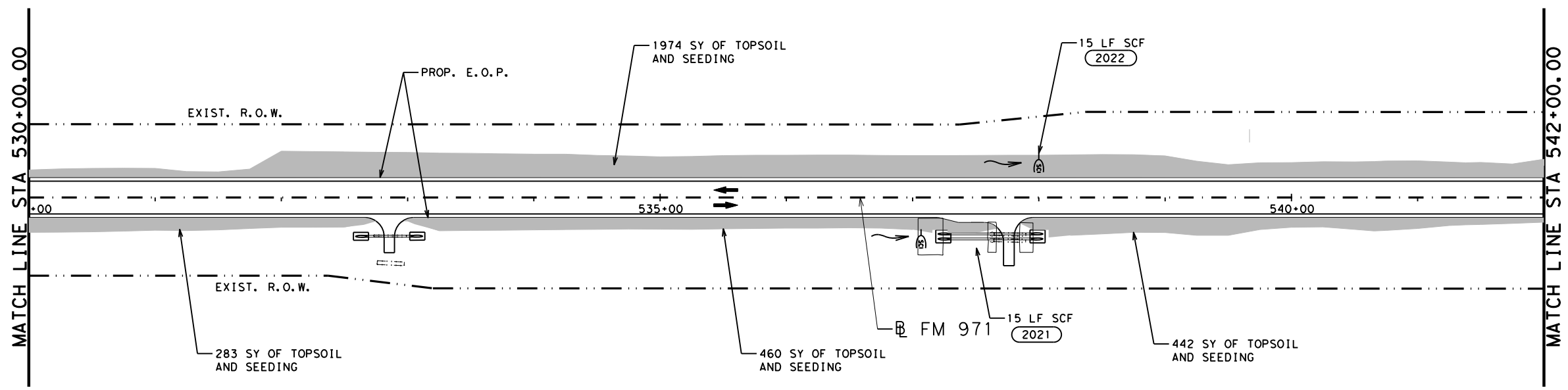
**FM 971
EROSION CONTROL
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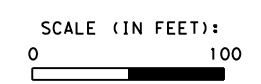
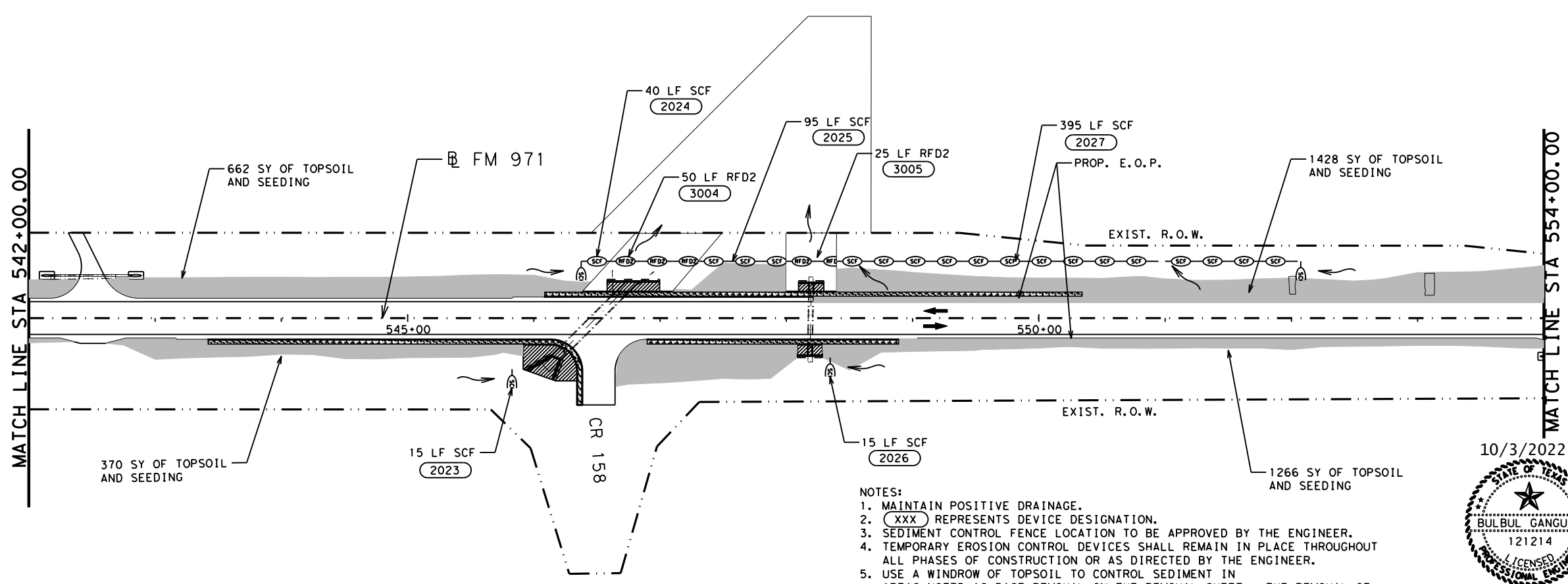
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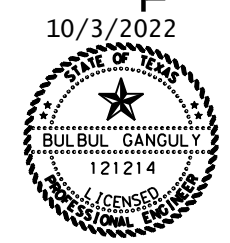
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LEGEND	
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	ROCK FILTER DAM
	TOPSOIL & SEEDING
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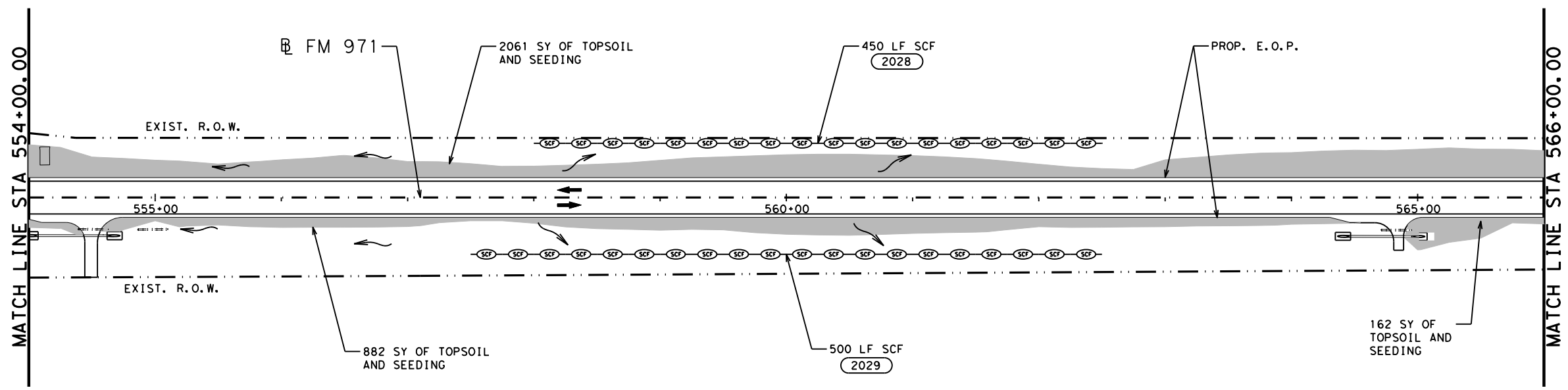
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**FM 971
 EROSION CONTROL
 LAYOUT**

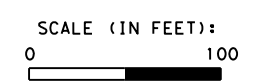
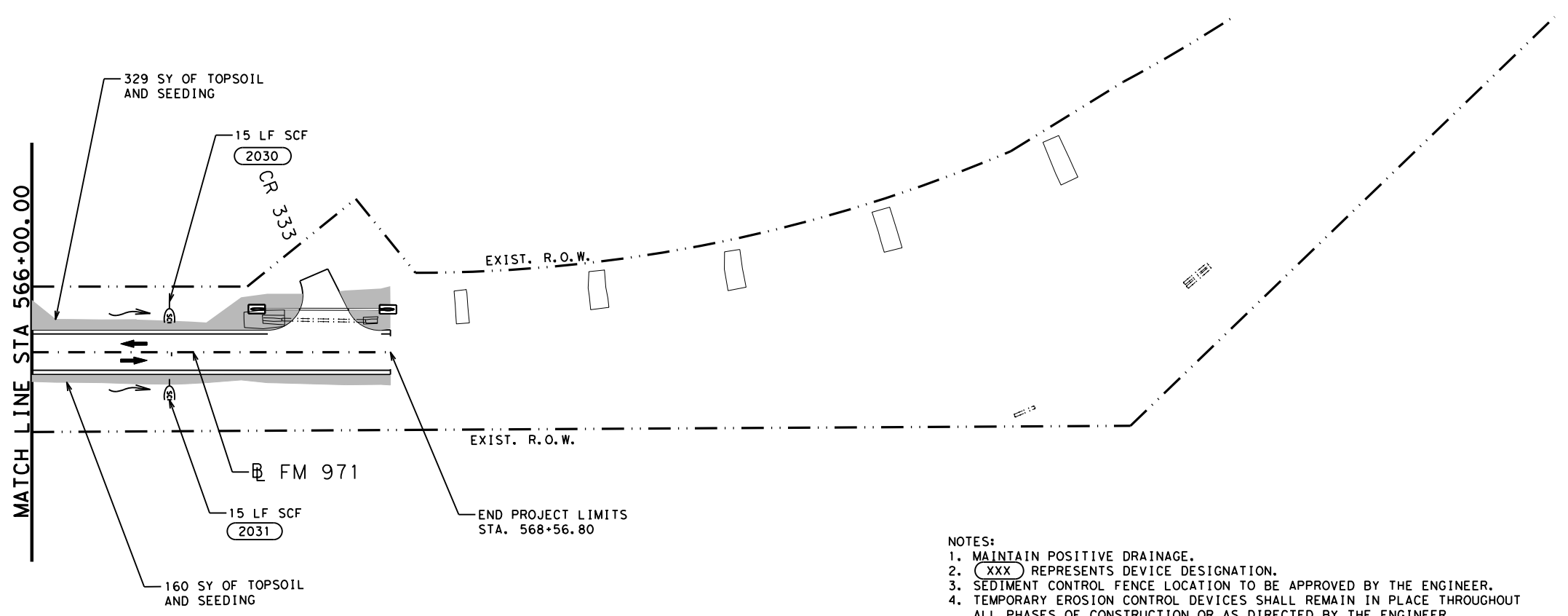
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LEGEND	
	SILT FENCE
	ROCK FILTER DAM
	TOPSOIL & SEEDING
	FLOW



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**Austin District
Central Design**

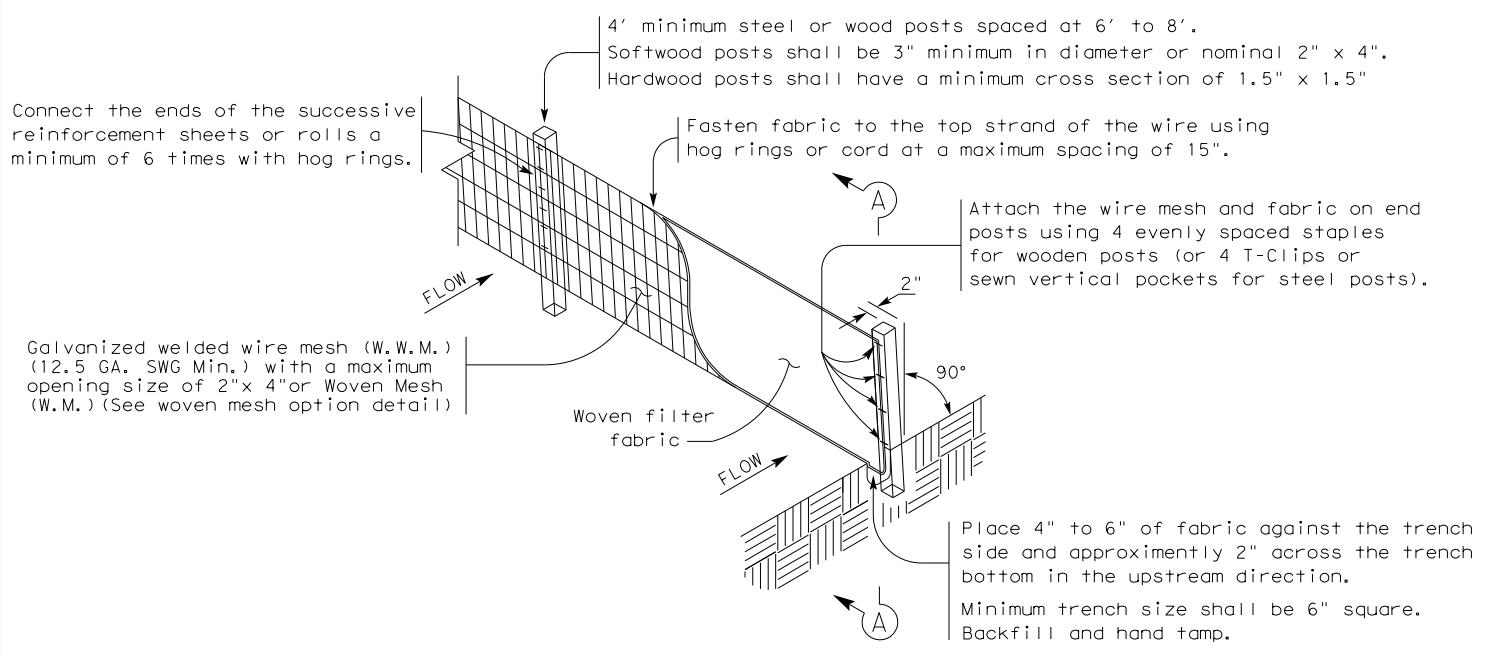
Texas Department of Transportation

**FM 971
EROSION CONTROL
LAYOUT**

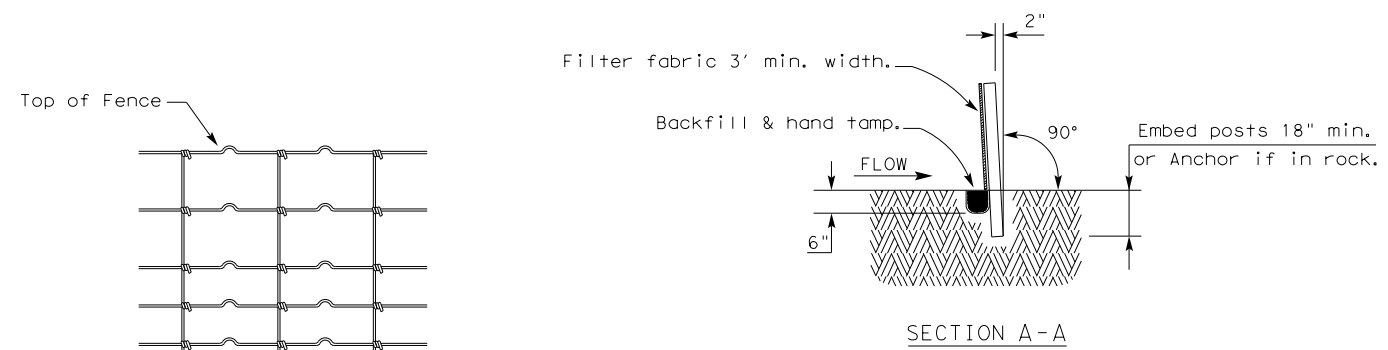
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		AUS	WILLIAMSON	163

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TEMPORARY SEDIMENT CONTROL FENCE
 SCF



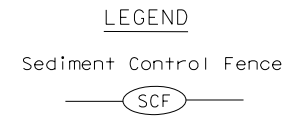
HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

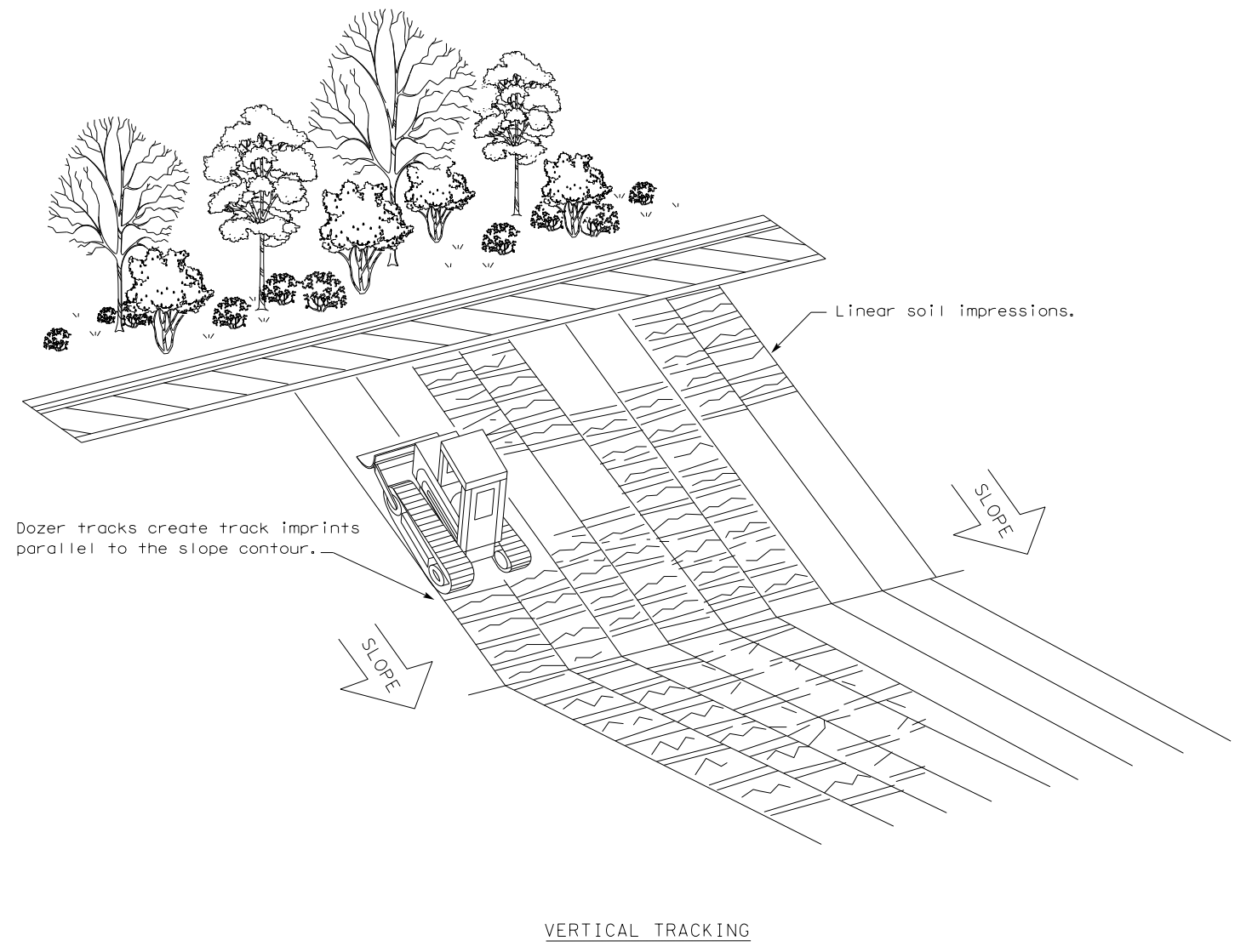
A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.



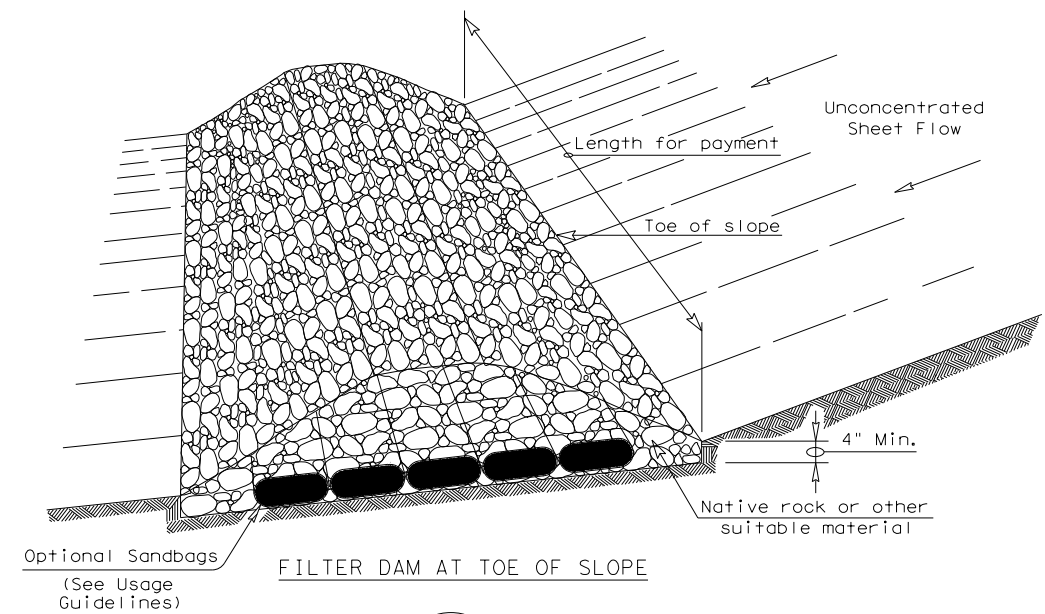
GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



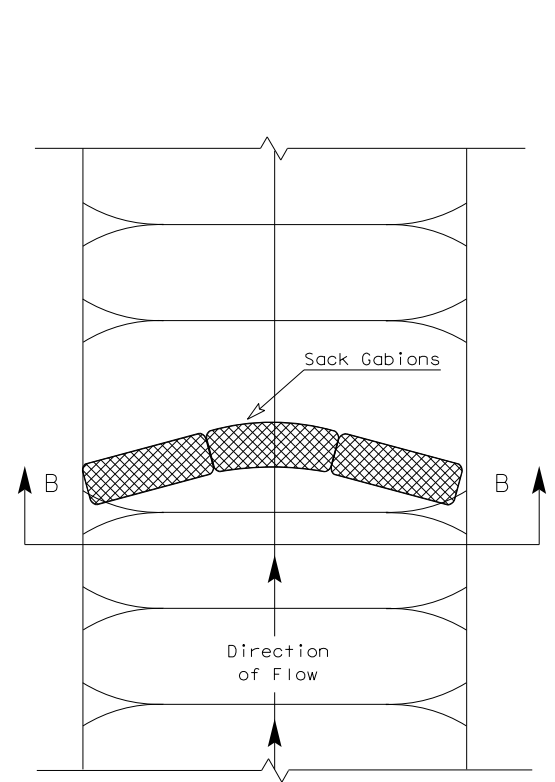
				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING					
EC(1) - 16					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2690	01	038	FM 971	
	DIST	COUNTY		SHEET NO.	
	AUS	WILLIAMSON		164	

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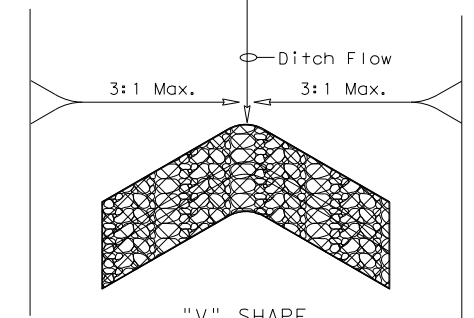


FILTER DAM AT TOE OF SLOPE

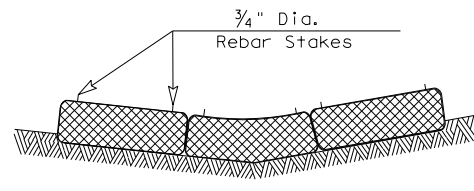
RFD1



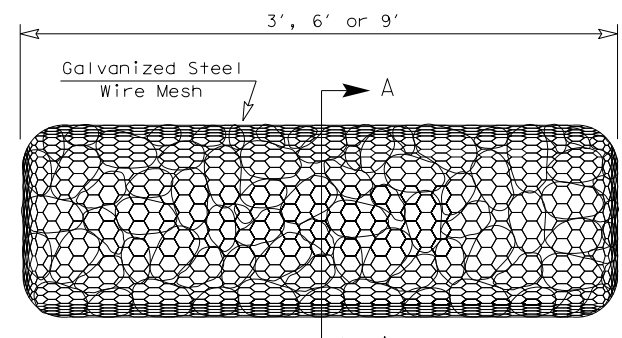
PLAN VIEW



"V" SHAPE PLAN VIEW

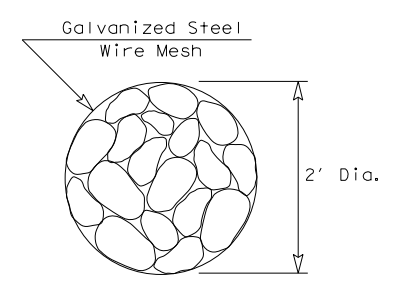


SECTION B-B

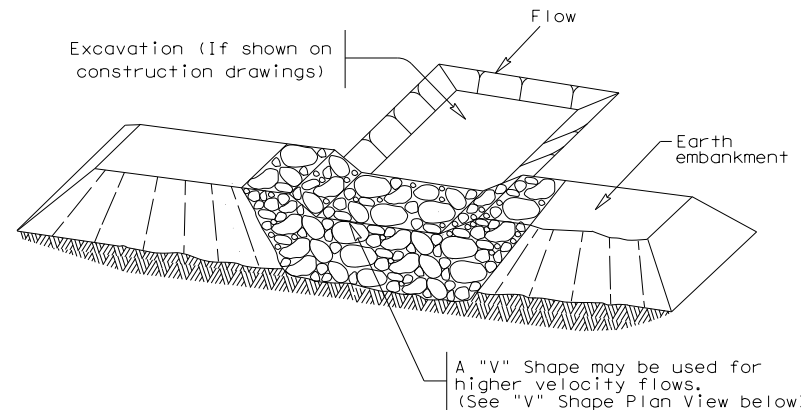


TYPE 4 (SACK GABIONS)

RFD4

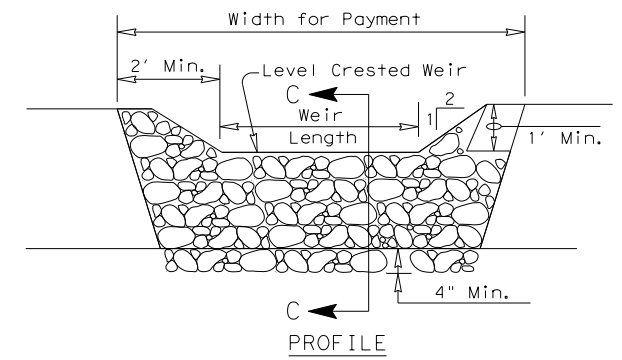


SECTION A-A

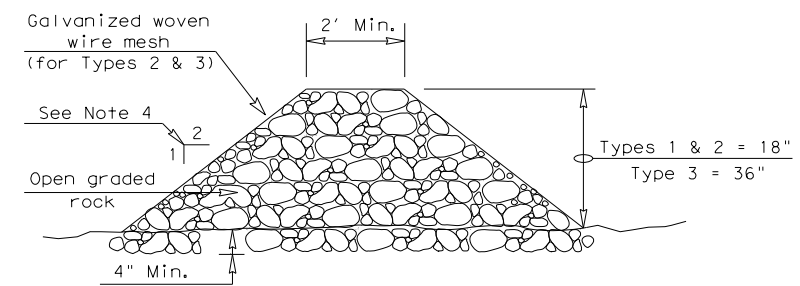


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

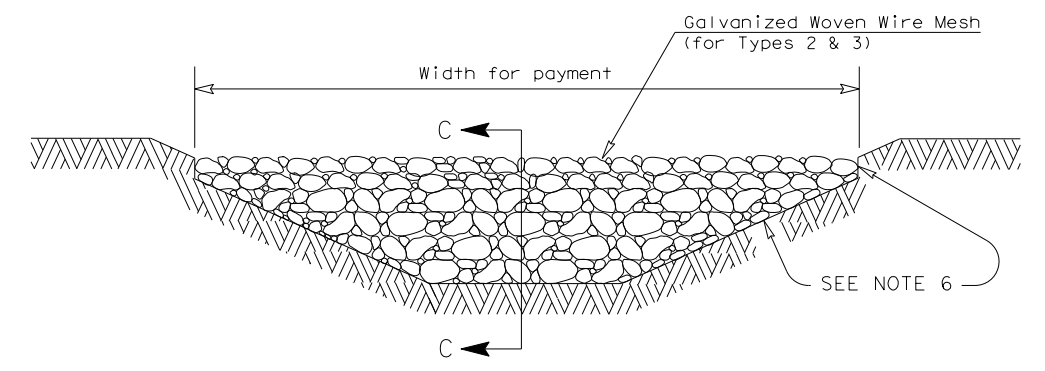
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
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.

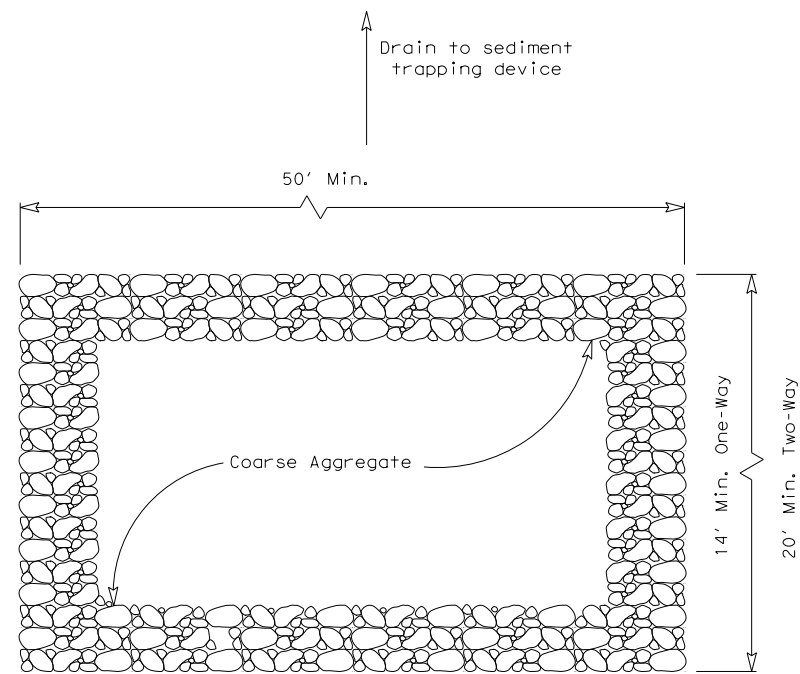
PLAN SHEET LEGEND

- Type 1 Rock Filter Dam — RFD1 —
- Type 2 Rock Filter Dam — RFD2 —
- Type 3 Rock Filter Dam — RFD3 —
- Type 4 Rock Filter Dam — RFD4 —

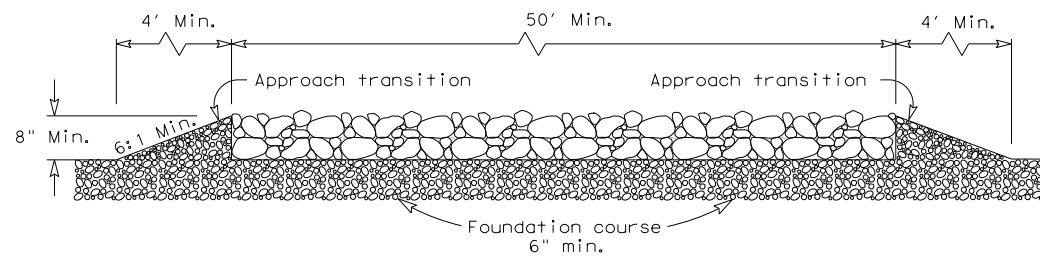
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC(2) - 16			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	2690 01	038	FM 971
	DIST	COUNTY	SHEET NO.
	AUS	WILLIAMSON	165

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PLAN VIEW

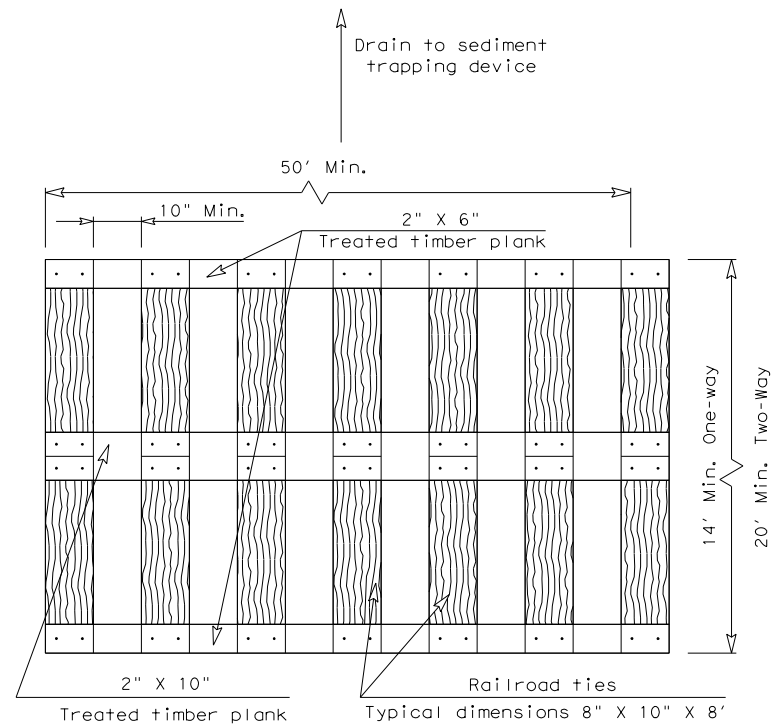


ELEVATION VIEW

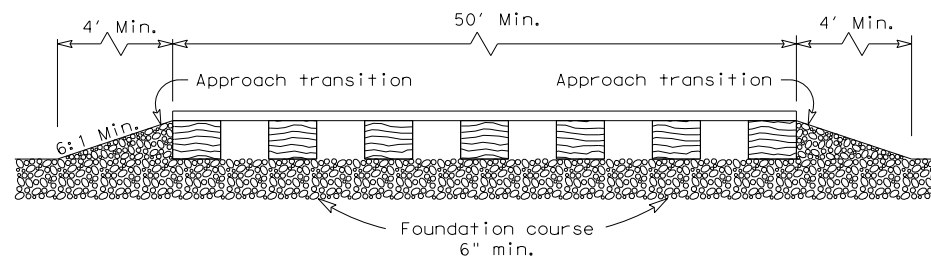
CONSTRUCTION EXIT (TYPE 1)
ROCK CONSTRUCTION (LONG TERM)

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 materials 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.



PLAN VIEW

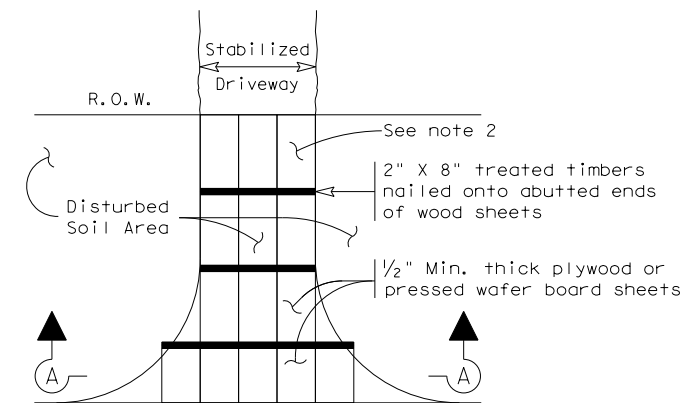


ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)
TIMBER CONSTRUCTION (LONG TERM)

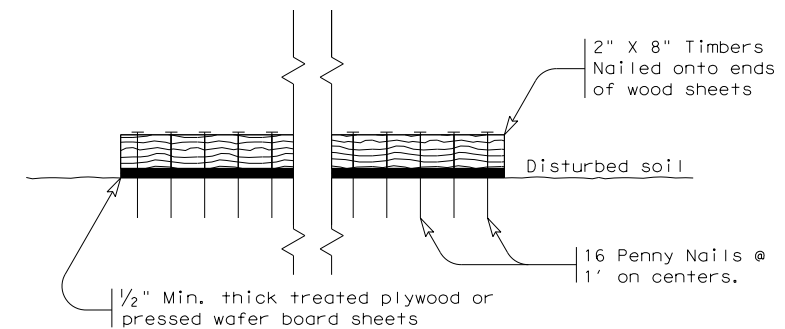
GENERAL NOTES (TYPE 2)

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 1/2" 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.



Paved Roadway

PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)
SHORT TERM

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.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16			
FILE: ec316	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	2690 01	038	FM 971
DIST	COUNTY	SHEET NO.	
AUS	WILLIAMSON	166	

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I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 414902A
 Crossing Type: **** AT GRADE**
 RR Company Owning Track at Crossing: GRR
 Operating RR Company at Track: GRR
 RR MP: 913.50
 RR Subdivision: GEORGETOWN
 City: GRANGER
 County: WILLIAMSON
 CSJ at this Crossing: 2690-01-038
 Highway/Roadway name crossing the railroad: FM971
 # of regularly scheduled trains per day at this crossing: 2
 # of switching movements per day at this crossing: 0
 % of estimated contract cost of work within railroad ROW: < 1%

Scope of Work at this Crossing to Be Performed by State Contractor:
REHABILITATE EXISTING PAVEMENT, PREPARE SUBGRADE FOR ROADWAY WIDENING AND EXTEND EXISTING CULVERT.

Scope of Work at this Crossing to Be Performed by Railroad Company:
RR FLAGGING

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

N/A

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 2
 On this project, night or weekend flagging is:
 Expected
 Not Expected
 Flagging services will be provided by:
 Railroad Company: TxDOT will pay flagging invoices
 Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

- Contact Information for Flagging:
- UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- UP.request@nrssinc.net
Call Center 877-984-6777
 - BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
 - KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630
 - OTHERS MARK DIXON
GEORGETOWN RAILROAD
512-863-2538
GOWNRAILROAD@MSN.COM

Contractor must incorporate Construction Inspection into anticipated construction schedule.

- Not Required
- Required: Contact Information for Construction Inspection:

MARK DIXON
GEORGETOWN RAILROAD
512-863-2538
GOWNRAILROAD@MSN.COM

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:
 Required
 Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.
 The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice. Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	\$500,000 / \$500,000 / \$500,000
Commercial General Liability	\$2,000,000 / \$4,000,000
Business Automobile	\$2,000,000 combined single limit

Railroad Protective Liability	
<input type="checkbox"/> Not Required	
<input checked="" type="checkbox"/> Non - Bridge Projects	\$2,000,000 / \$6,000,000
<input type="checkbox"/> Bridge Projects	\$5,000,000 / \$10,000,000
<input type="checkbox"/> Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

- Not Required
- Required: TxDOT CST to assist in obtaining ~~ROE~~ the UPRR (see Item 5, Article 8.3)
- Required: UPRR Maintenance Consent Letter. TxDOT CST to assist.
- Required: Contractor to obtain (see Item 5, Article 8.4)
With the following railroad companies: GEORGETOWN RAILROAD

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

<http://www.txdot.gov/inside-txdot/division/rail/samples.html>

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

- Not Required
- Required


See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
 Call DPS Railroad Emergency Line
 at 800-772-7677
 Location: DOT #414902A
 RR Milepost 913.50
 GEORGETOWN Subdivision

 Texas Department of Transportation				Rail Division	
RAILROAD SCOPE OF WORK FM 971 RAILROAD CROSSING STA 493+26.00					
FILE:	RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:
© TxDOT	June 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		2690 01	038	FM 971	
9/2021		DIST	COUNTY	SHEET NO.	
	AUS	WILLIAMSON		167	

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PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

- A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.
- B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.
- C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.
- D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.
- E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.
- F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.
- G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

- A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.
- B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.
- C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:
 - 1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.
 - 2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

- A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.
- B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.
- C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.
- D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
 - 1. Exactly what the work entails.
 - 2. The days and hours that work will be performed.
 - 3. The exact location of work, and proximity to the tracks.
 - 4. The type of window requested and the amount of time requested.
 - 5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.
- E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

- A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."
- B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.



3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
 A. 15' - 0" (BNSF) (UPRR) and 14' - 0" (KCS) horizontal from centerline of track
 B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

- A. Maintain minimum track clearances during construction as specified in Section 3.07.
- B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.
- C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

					
<p>RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS</p>					
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© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY	
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	AUS	WILLIAMSON	168		

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3.09 MAINTENANCE OF RAILROAD FACILITIES

- A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.
- B. Perform all such maintenance and repair of damages due to the Contractor's operations at Contractor's expense.
- C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD'S DESIGNATED REPRESENTATIVE

- A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
 1. Pre-construction meetings.
 2. Pile driving/drilling of caissons or drilled shafts.
 3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
 4. Erection of precast concrete or steel bridge superstructure.
 5. Placement of waterproofing (prior to placing ballast on bridge deck).
 6. Completion of the bridge structure.
- B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.
- C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

- A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.
- B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.
- C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.
- D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.
- E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

- A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".
- B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

UPRR 1-800-336-9193
 7:00 AM to 9:00 PM CST Monday-Friday except holidays,
 staffed 24 hrs/day for emergencies
 48 hrs notice required

BNSF 1-800-533-2891
 24 hour number
 5 working days notice required

KCS 1-800-344-8377
 Texas One Call, a 24 hour number
 48 hrs notice required, excluding weekends and holidays

If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.


- C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

 Texas Department of Transportation				Rail Division	
RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS					
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
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REVISIONS March 2020	2690	01	038	FM 971	
DIST	COUNTY			SHEET NO.	
AUS	WILLIAMSON			169	