INDEX OF SHEETS

SEE SHEET NO. 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT BR 2B24 (487)

US 190

CROCKETT COUNTY

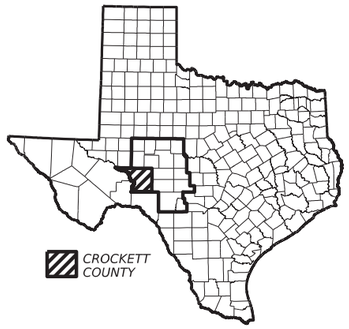
NET LENGTH OF PROJECT
ROADWAY = 1,150 FT = 0.217 MI
BRIDGE = 420 FT = 0.080 MI
TOTAL = 1,570 FT = 0.297 MI

LIMITS: AT LIVE OAK DRAW

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT
CONSISTING OF REPLACE BRIDGE AND APPROACHES

FUNCTIONAL CLASS = RURAL MINOR ARTERIAL
TERRAIN = LEVEL
DESIGN SPEED = 70 MPH
CURRENT ADT (2022) = 228
FUTURE ADT (2042) = 319

FEDERAL-AID PROJECT NUMBER			
BR 2B24 (487)			
CONT	SECT	JOB	HIGHWAY
2279	02	023	US 190
DIST	COUNTY		SHEET NO.
SJT	CROCKETT		1



STATE OF TEXAS

FINAL PLANS

Letting Date: _____

Name of Contractor: _____

Date Work Began: _____

Date Work Completed: _____

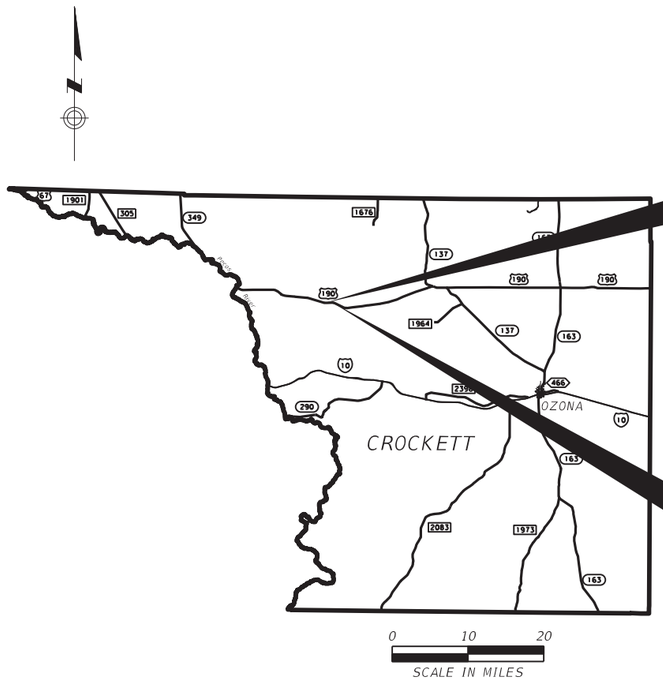
Date Work Accepted: _____

Final Contract Cost: _____

Project was built according to the Plans & Specifications. These final plans reflect the work done and the quantities shown thereon and on the Final Estimate are Final Quantities.

Area Engineer Date

Summary of Change Orders:



BEGIN PROJECT
BEGIN C-S-J 2279-02-023
STA 101+50.00
TRM 304+0.218
DFO 27.423
MILE POINT 12.149
LATITUDE 30.877308°
LONGITUDE -101.682558°

END PROJECT
END C-S-J 2279-02-023
STA 117+20.00
TRM 304+0.516
DFO 27.721
MILE POINT 12.447
LATITUDE 30.877449°
LONGITUDE -101.677559°

EXCEPTIONS
NONE

EQUATIONS
NONE

RAILROAD CROSSINGS
NONE

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

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION # 739

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER

SUBMITTED FOR LETTING: 8/1/2024

Consultant Engineer

2024
Texas Department of Transportation

SUBMITTED FOR LETTING: 8/2/2024

DocuSigned by:
Nicholas Greenly
DDF89C6522AF49E...
District Design Engineer

RECOMMENDED FOR LETTING: 8/2/2024

DocuSigned by:
826185212F51427...
District Director of TP&D

APPROVED FOR LETTING: 8/2/2024

DocuSigned by:
BC10B17FA709437...
District Engineer

DATE: 8/1/2024 3:46:08 PM
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GENERAL

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL STANDARDS

ROADWAY DETAILS

ROADWAY STANDARDS

DRAINAGE DETAILS

BRIDGE DETAILS

BRIDGE STANDARDS

MISCELLANEOUS

SIGN & PAVEMARK DETAILS

SIGN & PAVEMARK STANDARDS

ENVIRONMENTAL DETAILS

ENVIRONMENTAL STANDARDS

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
8/1/2024

$ THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS INDEX HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
8/1/2024

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

NO.	DATE	REVISION	APPROV.

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

INDEX OF SHEETS

SHEET 1 OF 1

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	2
CONTROL	SECTION	JOB	
2279	02	023	

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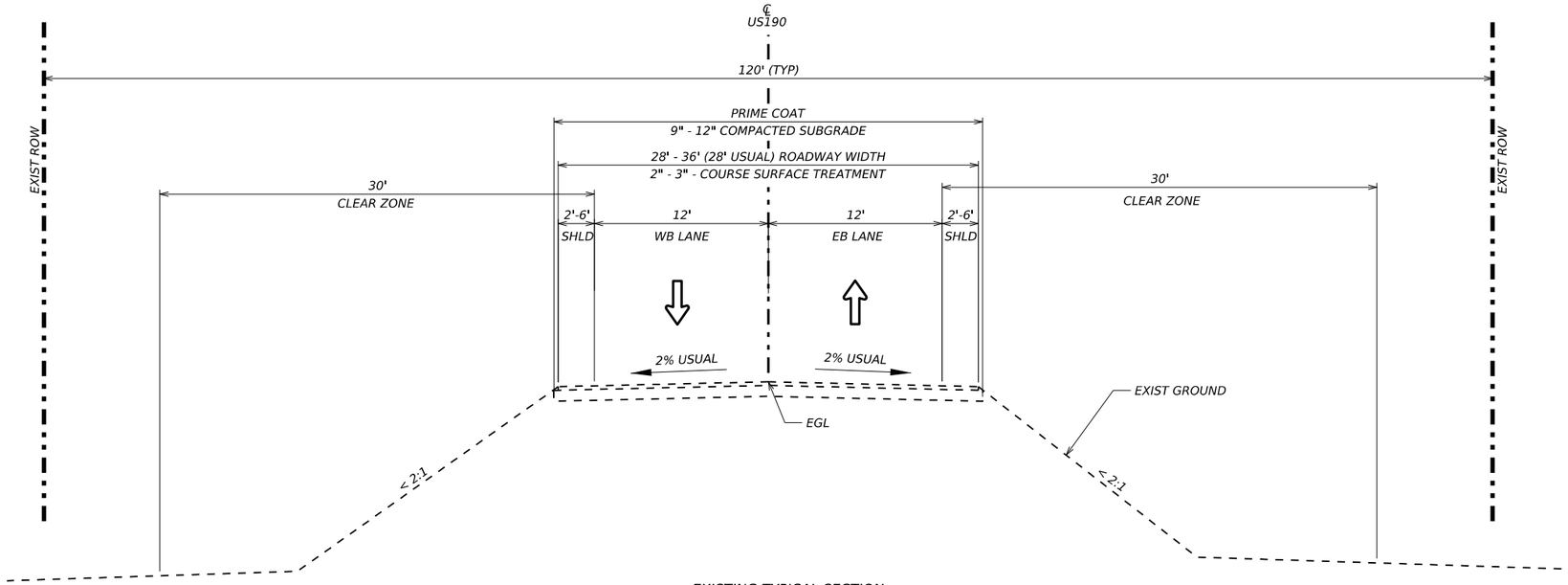
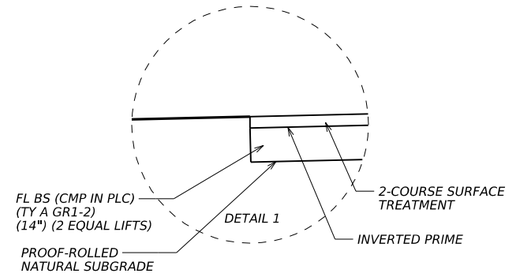


EXISTING TYPICAL SECTION

FROM STA. 101+50.00 TO STA. 108+25.00
FROM STA. 108+25.00 TO STA. 112+25.00 (BRIDGE)
FROM STA. 112+25.00 TO STA. 117+20.00

NOTES:

1. PRIME CONSISTS OF:
   0.2 GAL/SY ASPH (MC-30)
   140 SY/CY AGGR (TY-PB GR-5 SAC-B)
2. SURFACE TREATMENT 1ST COURSE CONSISTS OF:
   0.43 GAL/SY ASPH (AC-20-5TR)
   110 SY/CY AGGR (TY-PB GR-3 SAC-B)
3. SURFACE TREATMENT 2ND COURSE CONSISTS OF:
   0.38 GAL/SY ASPH (AC-20-5TR)
   130 SY/CY AGGR (TY-PB GR-4 SAC-B)
4. REFER TO PLAN AND PROFILE SHEETS FOR PROPOSED MBGF AND MOW STRIP LIMITS.
5. REFER TO HORIZONTAL ALIGNMENT DATA SHEETS FOR MORE DETAILED INFORMATION ON ALIGNMENT LOCATION.
6. EXISTING EMBANKMENT SLOPES TO BE BENCHED PRIOR TO PLACEMENT OF NEW FILL. BENCHES SHALL BE A MINIMUM OF 6' WIDE.



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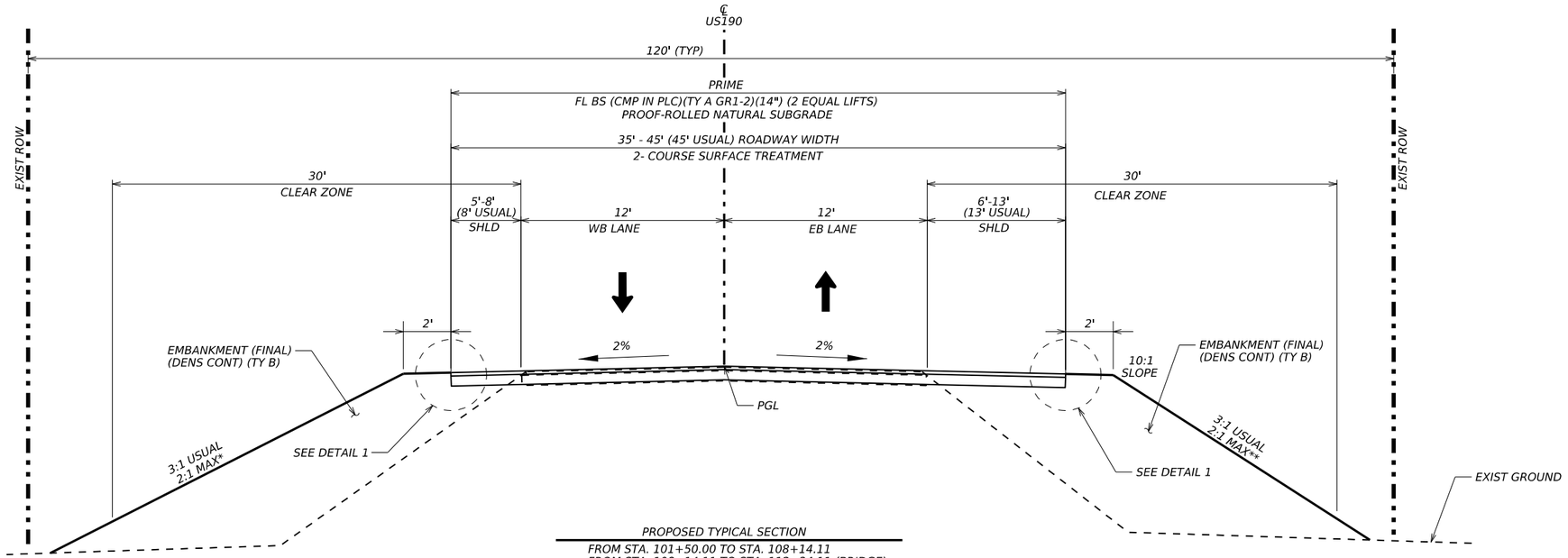

PROPOSED TYPICAL SECTION

FROM STA. 101+50.00 TO STA. 108+14.11
FROM STA. 108+14.11 TO STA. 112+34.11 (BRIDGE)
FROM STA. 112+34.11 TO STA. 117+20.00
* RIPRAP (STONE COMMON) (DRY) (8") (24" THICK) LT. REQ'D FROM STA. 103+00.00 TO 108+04.11
** RIPRAP (STONE COMMON) (DRY) (8") (24" THICK) RT. REQ'D FROM STA. 101+50.00 TO 108+04.11 & STA. 112+44.11 TO STA. 113+29.00

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TYPICAL SECTIONS

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6			US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	
CONTROL	SECTION	JOB	3
2279	02	023	

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BASIS OF ESTIMATE

Item No.	Description	Usage	Area or Length		Rate		Estimated Quantity	
310	Prime Coat	Flexible Base	5391	SY	0.20	GAL/SY	1077	GAL
316	Seal Coat	Asphalt	5391	SY	0.43	GAL/SY	2318	GAL
316	Seal Coat	Asphalt	5391	SY	0.38	GAL/SY	2048	GAL
316	Seal Coat	Aggregate	5391	SY	110	SY/CY	49	CY
316	Seal Coat	Aggregate	5391	SY	130	SY/CY	42	CY

COMPACTION REQUIREMENTS

Item No.	Description	Course	Percent Minimum Density
400	Excavation and Backfill for Structures	-	98%

Note: Density will be tested in accordance with Tex-113-E, Tex-114-E, and Tex-115-E.

GENERAL NOTES

The following Standard Sheets have been modified:

IGCS

Locate the project bulletin board at an approved location within the project limits such as at a field office, staging area, or stockpile, and make accessible to the public at all times. Do not remove the bulletin board from the project until approved. If a construction site notice is required for the project, post a copy at each geographically separated work location.

In those instances where fixed features require, vary the governing slopes indicated in these plans from within the limits to the extent determined.

If Contractor elects to establish a pit within 200 ft. of a public road, construct a barrier or other device in accordance with Natural Resources Code, Chapter 133, and Section 133.041.

Do not use salt water with solids in excess of 10,000 parts per million, as determined by evaporation.

Contractor questions on this project are to be addressed by the following individuals:

Jesus Garcia, P.E.; email Jesus.Garcia9@txdot.gov and Randy Baiza, P.E.; email Randy.Baiza@txdot.gov

County: Crockett **Sheet:** 4

Highway: US 190 **Control:** 2279-02-023

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

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following address: https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

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

A copy of the 3D model or cross-sections and earthwork data may be obtained by qualified bidders by sending a request to the following set of email addresses:

Jesus Garcia, P.E. and Randy Baiza, P.E.; emails Jesus.Garcia9@txdot.gov and Randy.Baiza@txdot.gov

Data as provided is for non-construction purposes only and it is the responsibility of the prospective bidder to validate this information with the appropriate plans and Specifications.

Item 5, "Control of the Work"

Place a row of 9 blue-tops at each station throughout the length of the proposed roadway for both subgrade and top lift of base course.

State Highway right of way markers destroyed by the Contractor shall be replaced by a Texas Registered Professional Land Surveyor (RPLS) at no cost to the State. Provide written documentation from the RPLS attesting to the replacement of the right of way markers.

Make suitable advance notification to affected non-participating municipalities regarding Class B underground facilities, call the Department's San Angelo District Traffic Office at telephone number (325) 947-9208 to have the Department's existing traffic signal and illumination utilities located, and call the Department's San Angelo District Maintenance Office at telephone number (325) 947-9322 to have the Department's existing irrigation utilities located.

Responsibility for construction surveying shall conform to Section 5.9.3., "Method C."

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.

Submit shop drawings electronically for the fabrication of structural items and other items specifically listed in the plans to SJT_ShopPlanReview@txdot.gov. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" at:

https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf

Item 6, "Control of Materials"

When allowed store materials and equipment in approved areas within the right of way.

Access the work area from the right of way.

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

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

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7, "Legal Relations and Responsibilities"

No significant traffic generator events have been identified.

Item 8, "Prosecution and Progress"

Submit the sequence of work and estimated progress schedule on paper or as a Portable Document Format (PDF) electronic file compatible with Adobe Systems Incorporated "Acrobat Reader XI". Construction schedules shall be submitted using the "Critical Path Method" per Section 5.5.2

A delayed start provision is included in the contract to allow time to procure construction materials including precast bridge beams and precast drainage components.

Item 9, "Measurement and Payment"

The progress payment period shall end two working days before the last working day of the month. Deliver invoices to be paid as material on hand on or before the end of the progress payment period.

County: Crockett **Sheet:** 4A

Highway: US 190 **Control:** 2279-02-023

Item 134, "Backfilling Pavement Edges"

Apply emulsified asphalt mixture in accordance with Item 314, "Emulsified Asphalt Treatment". Provide MS-2, MC-30 or AE-P asphalt.

For Type B backfill, blade the existing vegetation from the pavement edges prior to placement of final asphalt concrete pavement. Windrow and incorporate this material into the backfill after placing asphalt concrete pavement. Reclaimed asphalt pavement (RAP) salvaged from this project may be used to backfill pavement edges.

Item 204, "Sprinkling"

Apply water for dust control to un-surfaced bases during the work day, at the end of each work day, and on non-work days as directed.

Item 247, "Flexible Base"

Stockpile flexible base produced for this project separately from any other stockpiled material and label stockpile with project number, material type, and grade.

Place flexible base in lifts of 8 in. maximum.

Provide 24 hours written notice of intent to begin crushing operations. Materials produced prior to this notice will not be accepted.

Compact using ordinary compaction.

Item 310, "Prime Coat"

If planing operations expose base material:

1. Refinish exposed base material in accordance with Item 251, Type D. This work will not be measured or paid for separately, but will be considered as included in payment for Item 310.
2. Place prime coat on refinished base material in accordance with Item 310.
3. Place one-course seal coat on primed base material in accordance with Item 316.

Refinish material that does not receive prime coat within one working day following acceptance of flexible base.

Allow the prime coat to cure for a minimum of 7 days prior to applying additional courses, unless otherwise approved by the Engineer.

Item 316, “Seal Coat”

Cure the first surface treatment course a minimum of 3 days before placing the second course.

If cutback asphalt is used for the first surface treatment course, a minimum of 3 days curing time shall be required before placing the second course.

Cover or protect the following, as applicable: railings, bridge joints, utility covers, railroad crossings, and exposed concrete such as curbs, bridge approach slabs, bridge decks, sidewalks, mow strips, and concrete pavement.

Do not place wet aggregate.

Use medium pneumatic rollers that meet the requirements of Item 210, "Rolling.” If traprock aggregate is used, the Engineer may require steel wheel rollers.

Item 320, “Equipment for Asphalt Concrete Pavement”

Provide production equipment that ensures a uniform continuous production rate of at least 150 tons per hour.

A Type D Structure is required.

Item 400, “Excavation and Backfill for Structures”

If excavating beyond the dimensions shown on the plans, furnish and install cement stabilized backfill in such areas at no cost.

Use Class C bedding.

Item 416, “Drilled Shaft Foundations”

Furnish and install permanent steel casings as shown on the plans. Furnishing and installing permanent steel casings will not be measured or paid for directly but will be considered as included as payment for Item 416.

Item 421, “Hydraulic Cement Concrete”

Provide sulfate-resistant concrete (containing Type II cement) for all concrete identified as structural concrete in Table 8, except for the following: bridge railing, approach slabs, concrete traffic barrier, prestressed concrete panels, Class H concrete, and Class S concrete.

Entrained air is required in all slip formed concrete but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed by the Engineer. If entrained air is provided where not required, only the upper limits of the applicable Special Provision will be enforced.

County: Crockett **Sheet:** 4**B**

Highway: US 190 **Control:** 2279-02-023

Provide only the following items listed in 421.3.3, “Testing Equipment”: test molds and wheelbarrow.

Item 422, “Concrete Superstructures”

Saw-cut grooving of bridge deck and approach slab (if present) is required.

Item 427, “Surface Finishes for Concrete”

Provide rub finish to Surface Area I.

Item 432, “Riprap”

Furnish and install 1/2-in. thick joint filler board conforming to DMS-6310, “Joint Sealants and Fillers” between concrete riprap and adjacent existing concrete, and where directed.

Item 450, “Railing”

Furnish and install barrier reflectors on the top of concrete railing.

Obtain approval of drilled holes in existing concrete before placing anchor bars with epoxy.

Item 496, “Removing Structures”

Rail elements to be removed have metal components coated with lead-containing paint (hazardous materials). Remove these metal components by mechanical dismantling and/or by hydraulic cutting. Do not use a flame cutting torch or any other means that will produce fumes or will strip paint. Segregate these metal components from other construction waste and dispose of properly. Follow applicable safety standards. Only the following rail elements to be removed have metal components coated with lead-containing paint (hazardous materials):

Existing bridge structure at Live Oak Draw.

This item shall include the complete removal and proper disposal of existing structures, including but not limited to the following: railing, wingwalls, riprap, deck, overlay, approach slabs, joints, beams, bracing, drains, bents, abutments, columns, pilings, footings, drilled shafts, reinforcing steel, etc. Portions of the structure at least 2 ft. below the permanent ground line may be left in place as directed.

Item 502, “Barricades, Signs and Traffic Handling”

The Contractor Force Account “Safety Contingency” that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project 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.

Furnish regulatory speed limit signs. The Engineer will determine placement locations and will provide supervision to the Contractor in placing, removing and replacing these signs. The construction speed zones are as follows:

Highway	Begin Reference Marker	End Reference Marker	Existing Speed Limit (mph)	Work Zone Speed Limit (mph)
US 190	303+8.218	306+0.516	75	45

Furnish and install regulatory speed limit signs at the ends of the construction speed zones, if such signs do not exist.

Item 504, "Field Office and Laboratory"

Furnish one Type D structure. Provide equipment for performing tests referenced in the specifications for asphalt concrete pavement. Asphalt content will be determined by the ignition method. The Type D structure and test equipment will not be shared with the Contractor.

Item 644, "Small Roadside Sign Assemblies"

Where foundations protrude through riprap or other concrete areas, wrap the foundation with 1/4-in. thick bituminous fiber sheets before placing concrete or repairing the concrete area. Bituminous fiber sheet tubes may be used for forming sign foundations instead of removable forms and shall be left in place below the finished concrete or riprap surface. Neatly trim the bituminous fiber sheets flush with the finished surface after the concrete has cured.

Drill and pour small roadside sign foundations on the same day or suitably cover the drilled hole.

Cover each unfinished sign base with a reflectorized traffic cone.

Item 662, "Work Zone Pavement Markings"

Do not use temporary flexible-reflective roadway marker tabs to delineate words, symbols, shapes, or diagonal or transverse lines.

Paint and beads are allowed for nonremovable markings.

County: Crockett **Sheet:** 4C

Highway: US 190 **Control:** 2279-02-023

Item 666, "Retroreflectorized Pavement Markings"

Place glass beads for pavement markings in accordance with the following table:

Marking Types	Glass Bead (Double Drop) Types	Glass Bead Rates	
		Surface Treatment	Asphalt Concrete Pavement, Microsurfacing, Concrete Pavement
TY I markings	Type II	12 LB per 100 SF	6 LB per 100 SF
	Type III	12 LB per 100 SF	6 LB per 100 SF
TY II markings	Type II	12 LB per GAL	6 LB per GAL
	Type III	12 LB per GAL	6 LB per GAL

Apply TY II marking material at a rate of 25 gallons per mile.

The striper speed shall not exceed 5 MPH during application. Convert to gravity-flow beaders (if not in use) to obtain optimum bead application, when directed.

Clean striper tanks before use if there is a build-up of dry paint, as directed. Flush lines and guns before use.

Reference existing markings before performing work that disturbs the markings, so that the markings can be re-established.

Provide a double-drop of Type II and Type III glass beads.

For the purposes of this project, existing no-passing zone markings were not evaluated for adherence to current standards, but were re-established in their existing locations.

Item 677, "Eliminating Existing Pavement Markings and Markers"

Use the following method: Blasting.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2279-02-023 **DISTRICT** San Angelo **COUNTY** Crockett
HIGHWAY US 190

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2279-02-023**			
		PROJECT ID		**A00188549**			
		COUNTY		**Crockett**			
		HIGHWAY		**US 190**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-7002	PREPARING ROW	STA	15.700		15.700	
	100-7003	PREP ROW (TREE REMOVE) (0"-12" DIA)	EA	267.000		267.000	
	100-7004	PREP ROW (TREE REMOVE) (12"-24" DIA)	EA	46.000		46.000	
	100-7005	PREP ROW (TREE REMOVE) (24"-36" DIA)	EA	10.000		10.000	
	100-7006	PREP ROW (TREE REMOVE) (36"-48" DIA)	EA	2.000		2.000	
	104-7006	REMOV CONC (RIPRAP)	SY	782.000		782.000	
	105-7011	RMV (11"-15") TRT/UNTRT BASE & ASPH PAV	SY	4,235.000		4,235.000	
	110-7001	EXCAV (ROADWAY)	CY	7,783.000		7,783.000	
	132-7004	EMBANK (FNL)(DC)(TY B)	CY	13,877.000		13,877.000	
	164-7010	DRILL SEED (PERM_RURAL_CLAY)	SY	3,978.000		3,978.000	
	164-7015	DRILL SEED (TEMP_WARM_COOL)	SY	3,978.000		3,978.000	
	169-7002	SOIL RET BLKT(SL_MOD_CLAY_LONG)	SY	1,750.000		1,750.000	
	247-7176	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)	CY	2,096.000		2,096.000	
	310-7004	PRIME COAT (MC-30)	GAL	1,077.000		1,077.000	
	316-7007	ASPH (AC-20-5TR)	GAL	4,366.000		4,366.000	
	316-7208	AGGR (TY-PB, GR-3)(SAC-B)	CY	49.000		49.000	
	316-7211	AGGR (TY-PB, GR-4)(SAC-B)	CY	42.000		42.000	
	400-7010	CEM STABIL BKFL	CY	126.000		126.000	
	403-7001	TEMPORARY SPL SHORING	SF	132.000		132.000	
	416-7006	DRILL SHAFT (36 IN)	LF	1,070.000		1,070.000	
	420-7012	CL C CONC (ABUT)	CY	57.200		57.200	
	420-7022	CL C CONC (CAP)	CY	85.700		85.700	
	420-7038	CL C CONC (COLUMN)	CY	65.600		65.600	
	422-7001	REINF CONC SLAB	SF	19,741.000		19,741.000	
	422-7013	APPROACH SLAB	CY	72.200		72.200	
	425-7003	PRESTR CONC GIRDER (TX40)	LF	2,704.000		2,704.000	
	432-7013	RIPRAP (MOW STRIP)(4 IN)	CY	92.000		92.000	
	432-7030	RIPRAP (STONE COMMON)(DRY)(8 IN)	CY	2,836.000		2,836.000	
	432-7043	RIPRAP (STONE PROTECTION)(18 IN)	CY	958.000		958.000	
	450-7024	RAIL (TY SSTR)	LF	880.000		880.000	
	454-7004	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	141.000		141.000	
	496-7010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA	1.000		1.000	
	500-7001	MOBILIZATION	LS	1.000		1.000	
	502-7001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	10.000		10.000	
	503-7002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	505-7002	TMA (MOBILE OPERATION)	HR	40.000		40.000	
	506-7020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	156.000		156.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2279-02-023 **DISTRICT** San Angelo **COUNTY** Crockett
HIGHWAY US 190

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2279-02-023**			
		PROJECT ID		**A00188549**			
		COUNTY		**Crockett**			
		HIGHWAY		**US 190**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	506-7024	CONSTRUCTION EXITS (REMOVE)	SY	156.000		156.000	
	506-7043	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	2,635.000		2,635.000	
	506-7046	BIODEG EROSN CONT LOGS (REMOVE)	LF	2,635.000		2,635.000	
	510-7003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	10.000		10.000	
	512-7085	PTB (FUR&INST)(SSCB OR CSB)(TY1)OR(STL)	LF	480.000		480.000	
	512-7086	PTB (MOVE)(SSCB OR CSB)(TY1)OR(STL)	LF	480.000		480.000	
	512-7088	PTB (REMOVE)(SSCB OR CSB)(TY1)OR(STL)	LF	480.000		480.000	
	530-7016	DRIVEWAYS (SURF TREAT)	SY	102.000		102.000	
	540-7002	MTL W-BEAM GD FEN (STEEL POST)	LF	1,725.000		1,725.000	
	540-7005	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-7001	REMOVE METAL BEAM GUARD FENCE	LF	400.000		400.000	
	542-7002	REMOVE TERMINAL ANCHOR SECTION	EA	2.000		2.000	
	542-7004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000	
	544-7001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	544-7003	GUARDRAIL END TREATMENT (REMOVE)	EA	2.000		2.000	
	545-7002	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-7004	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-7014	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	552-7003	WIRE FENCE (TY C)	LF	1,250.000		1,250.000	
	552-7006	GATE (TY 1)	EA	2.000		2.000	
	644-7004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		2.000	
	644-7073	REMOVE SM RD SN SUP&AM	EA	2.000		2.000	
	658-7013	INSTL DEL ASSM (D-SW)SZ 1(BRF)CTB (BI)	EA	10.000		10.000	
	658-7019	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	20.000		20.000	
	662-7051	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA	212.000		212.000	
	662-7068	WK ZN PAV MRK REMOV (W)6"(SLD)	LF	7,120.000		7,120.000	
	662-7077	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	24.000		24.000	
	662-7100	WK ZN PAV MRK REMOV (Y)6"(SLD)	LF	8,400.000		8,400.000	
	666-7175	RE PM TY II (W) 6" (SLD)	LF	1,280.000		1,280.000	
	666-7211	RE PM TY II (Y) 6" (BRK)	LF	1,130.000		1,130.000	
	666-7213	RE PM TY II (Y) 6" (SLD)	LF	2,630.000		2,630.000	
	666-7266	RE PROFILE PM TY I(W)6"(SLD)(100MIL)	LF	3,580.000		3,580.000	
	666-7270	RE PROFILE PM TY I(Y)6"(SLD)(100MIL)	LF	3,198.000		3,198.000	
	666-7274	RE PROFILE PM TY I(Y)6"(BRK)(100MIL)	LF	1,575.000		1,575.000	
	668-7002	PRFB RUMBLE STRIP (BLK)(1')(CENTERLINE)	LF	575.000		575.000	
	672-7004	REFL PAV MRKR TY II-A-A	EA	119.000		119.000	
	677-7001	ELIM EXT PM & MRKS (4")	LF	14,550.000		14,550.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2279-02-023 **DISTRICT** San Angelo **COUNTY** Crockett
HIGHWAY US 190

			CONTROL SECTION JOB		**2279-02-023**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00188549**		
			COUNTY		**Crockett**		
			HIGHWAY		**US 190**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	677-7008	ELIM EXT PM & MRKS (24")	LF	246.000		246.000	
	678-7002	PAV SURF PREP FOR MRK (6")	LF	5,040.000		5,040.000	
	772-7001	POST AND CABLE FENCE (REMOVAL)	LF	736.000		736.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

SUMMARY OF REMOVAL ITEMS

LOCATION	100 7002	100 7003 *	100 7004 *	100 7005 *	100 7006 *	104 7006	105 7011	496 7010	542 7001	542 7002	542 7004	544 7003	644 7073	677 7001	677 7008	772 7001
	PREPARING ROW	PREP ROW (TREE REMOVE) (0"-12" DIA)	PREP ROW (TREE REMOVE) (12"-24" DIA)	PREP ROW (TREE REMOVE) (24"-36" DIA)	PREP ROW (TREE REMOVE) (36"-48" DIA)	REMOV CONC (RIPRAP)	RMV (11"-15") TRT/UNTRT BASE & ASPH PA	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM	ELIM EXT PM & MRKS (4")	ELIM EXT PM & MRKS (24")	POST AND CABLE FENCE (REMOVAL)
	STA	EA	EA	EA	EA	SY	SY	EA	LF	EA	EA	EA	EA	LF	LF	LF
BEGIN PROJECT TO STA 106+50	5.00	111	21	5	1		1931							6420	144	
STA 106+50 TO STA 112+00	5.50	71	3			459	489	1	200	1	2	1	1	1650		736
STA 112+00 TO END PROJECT	5.20	85	22	5	1	323	1815		200	1	2	1	1	6480	102	
PROJECT TOTALS	15.70	267	46	10	2	782	4235	1	400	2	4	2	2	14550	246	736

SUMMARY OF ROADWAY ITEMS

LOCATION	110 7001	132 7004	247 7176	310 7004	316 7007	316 7007	316 7208	316 7211	432 7013	432 7030	530 7016	540 7002	540 7005	544 7001	552 7003	552 7006
	EXCAV (ROADWAY)	EMBANK (FNL)(DC)(TY B)	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS	PRIME COAT (MC-30)	ASPH (AC-20-5TR)	ASPH (AC-20-5TR)	AGGR (TY-PB, GR-3)(SAC-B)	AGGR (TY-PB, GR-4)(SAC-B)	RIPRAP (MOW STRIP)(4 IN)	RIPRAP (STONE COMMON)(DRY) (8 IN)	DRIVEWAYS (SURF TREAT)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	WIRE FENCE (TY C)	GATE (TY 1)
	CY	CY	CY	GAL	GAL	GAL	CY	CY	CY	CY	SY	LF	EA	EA	LF	EA
			DEPTH	PRIME	1ST COURSE	2ND COURSE	1ST COURSE	2ND COURSE								
			14 IN	0.20 GAL/SY	0.43 GAL/SY	0.38 GAL/SY	110 SY/CY	130 SY/CY								
BEGIN PROJECT TO STA 106+50	3615	6455	942	484	1042	920	22	19	58	1915		1135		2		
STA 106+50 TO STA 112+00	1415	2662	280	144	310	274	7	6	13	728		290	2		1142	2
STA 112+00 TO END PROJECT	2753	4760	874	449	966	854	20	17	21	193	102	300	2	2	108	
PROJECT TOTALS	7783	13,877	2096	1077	2318	2048	49	42	92	2836	102	1725	4	4	1250	2

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	510 7003	512 7085	512 7086	512 7088	545 7002	545 7004	545 7014	662 7051	662 7068	662 7077	662 7100	503 7002	505 7002
	ONE-WAY TRAF CONT (PORT TRAF SIG)	PTB (FUR&INST)(SSCB OR CSB)(TY1)OR(STL)	PTB (MOVE)(SSCB OR CSB)(TY1)OR(STL)	PTB (REMOVE)(SSCB OR CSB)(TY1)OR(STL)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL 3)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)6"(SLD)	WK ZN PAV MRK REMOV (W)24*(SLD)	WK ZN PAV MRK REMOV (Y)6"(SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (MOBILE OPERATION)
	MO	LF	LF	LF	EA	EA	EA	EA	LF	LF	LF	EA	HR
PHASE 1	5	480					2	212	3560	24	8400	2	20
PHASE 2	5		480	480	2	2			3560				20
PROJECT TOTALS	10	480	480	480	2	2	2	212	7120	24	8400	2	40

* TREE REMOVAL QUANTITIES ARE APPROXIMATE, NOT BASED ON TREE SURVEY.

NO.	DATE	REVISION	APPROV.

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SUMMARY OF QUANTITIES

SHEET 1 OF 2

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	6
CONTROL	SECTION	JOB	
2279	02	023	

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SUMMARY OF SIGNING ITEMS			
LOCATION	644 7004	658 7013	658 7019
	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	INSTL DEL ASSM (D-SW)SZ 1(BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
	EA	EA	EA
BEGIN PROJECT TO STA 106+50			12
STA 106+50 TO STA 117+50	2	10	8
STA 117+50 TO END PROJECT			
PROJECT TOTALS	2	10	20

SUMMARY OF PAVEMENT MARKING ITEMS									
LOCATION	666 7175	666 7211	666 7213	666 7266	666 7274	666 7270	668 7002	672 7004	678 7002
	RE PM TY II (W) 6" (SLD)	RE PM TY II (Y) 6" (BRK)	RE PM TY II (Y) 6" (SLD)	RE PROFILE PM TY I(W)6"(SLD)(100 MIL)	RE PROFILE PM TY I(Y)6"(BRK)(100 MIL)	RE PROFILE PM TY I(Y)6"(SLD)(100 MIL)	PRFB RUMBLE STRIP (BLK)(1'))(CENTERLINE	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")
	LF	LF	LF	LF	LF	LF	LF	EA	LF
BEGIN PROJECT TO STA 106+50	220	440	1950	1220	715	2300	103	65	2610
STA 106+50 TO STA 117+50	900	110	376	2200	280	648	84	22	1500
STA 117+50 TO END PROJECT	160	580	304	160	580	250	388	32	930
PROJECT TOTALS	1280	1130	2630	3580	1575	3198	575	119	5040

SUMMARY OF EROSION CONTROL ITEMS							
LOCATION	164 7010	164 7015	169 7002	506 7020	506 7024	506 7043	506 7046
	DRILL SEED (PERM_RURAL_CLAY)	DRILL SEED (TEMP_WARM_COOL)	SOIL RET BLKT(SL_MOD_CLAY_LONG)	CONSTRUCTION EXITS (INSTALL) (TY 1	CONSTRUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	SY	SY	LF	LF
BEGIN PROJECT TO STA 106+50	1271	1271		78	78	1170	1170
STA 106+50 TO STA 112+00	0	0				990	990
STA 112+00 TO END PROJECT	2707	2707	1750	78	78	475	475
PROJECT TOTALS	3978	3978	1750	156	156	2635	2635

EARTHWORK				
ITEM			110	132
BID CODE			6001	6004
STATION TO STATION US190			EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
			CY	CY
101+50	TO	102+00	366	574
102+00	TO	102+50	523	946
102+50	TO	103+00	458	834
103+00	TO	103+50	378	672
103+50	TO	104+00	349	620
104+00	TO	104+50	323	580
104+50	TO	105+00	307	557
105+00	TO	105+50	297	544
105+50	TO	106+00	300	548
106+00	TO	106+50	316	579
106+50	TO	107+00	369	686
107+00	TO	107+50	445	839
107+50	TO	108+00	471	892
108+00	TO	108+14.11	129	245
108+14.11	TO	112+34.11		
112+34.11	TO	112+50	190	361
112+50	TO	113+00	577	1131
113+00	TO	113+50	573	955
113+50	TO	114+00	418	819
114+00	TO	114+50	275	537
114+50	TO	115+00	174	312
115+00	TO	115+50	158	254
115+50	TO	116+00	155	221
116+00	TO	116+50	121	125
116+50	TO	117+00	86	39
117+00	TO	117+20	26	6
		TOTAL	7,783	13,877

NO.	DATE	REVISION	APPROV.

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SUMMARY OF QUANTITIES

SHEET 2 OF 2

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	7
CONTROL	SECTION	JOB	
2279	02	023	

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SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
130	1	I-3	Live Oak Draw	18 X 38	X		10BWG	1	SA	T		
130	2	I-3	Live Oak Draw	18 X 38	X		10BWG	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
4-16 8-16	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		8

18

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GENERAL NOTES

1. When a contractor force account "Safety Contingency" has been established for the project, it is for work zone enhancements that were unforeseen in the project planning and design stage, but would improve the effectiveness of the traffic control plan. 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 doing so does not slow implementation of work zone enhancements.
2. Shadow, lead, trail, and ramp control vehicles shown on the plans are required.
3. Use high level warning flags on advance warning signs during daytime operations.
4. Provide flaggers at such times and locations as directed to ensure the safe passage of traffic through construction areas. When flaggers are used to control traffic, furnish and install signs CW20-7 "FLAGGER SYMBOL", CW20-7aD "FLAGGER AHEAD", and CW3-4 "BE PREPARED TO STOP". Flaggers shall use 24 in. STOP/SLOW paddles.
5. Temporarily relocate existing mailbox assemblies on portable mailbox stands as shown on the plans, or as directed. Use materials conforming to the Compliant Work Zone Traffic Control Device List (CWZTCDL).
6. Prior to each work day, make provisions to exclude vehicles from parking within work areas.
7. Temporarily relocate existing permanent sign assemblies to temporary supports as shown on the plans, or as directed.
8. Omit advance warning signs and furnish and install reduced size signs CW20-1 "ROAD WORK AHEAD" mounted back to back with reduced size signs G20-2 "END ROAD WORK" signs at intersecting city streets and county roads.
9. Furnish and install signs CW20-1D "ROAD WORK AHEAD", G20-1aT "ROAD WORK ←NEXT X MILES, NEXT X MILES→", and G20-2 "END ROAD WORK" at intersecting state highways.
10. Sign and buffer spacing may be altered to fit field conditions, as directed.
11. In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have employee(s) available to respond on the project for emergencies and for taking corrective measures within 30 minutes.
12. Cones may be used as the typical channelizing device for freeway surfacing projects.
13. 28 in. tall cones will be allowed only for short duration or short term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate term stationary work areas should use drums, vertical panels, or 42 in. tall two-piece cones.
14. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
15. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
16. Warning signs for long term stationary work should be mounted at 7 ft. to the bottom of the sign.
17. For long term stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
18. All motor vehicle equipment having an obstructed view to the rear shall have a reverse signal alarm audible above the surrounding noise level.
19. Traffic control devices denoted with the triangle symbol on the plans may be omitted.
20. When sheet WZ(RS) is included in the plans, furnish and install temporary rumble strips for daytime lane closures. Do not use temporary rumble strips on freeways or expressways.
21. When sheet WZ(BRK) is included in the plans, furnish and install signs CW21-1T "GIVE US A BRAKE".
22. Flags attached to signs shown in the plans are required.
23. Signs END ROAD WORK (G20-2) may be omitted when conflicting with G20-2 signs already in place on the project.
24. The Engineer will determine advisory speeds to be shown on plaques CW13-1P.
25. Temporary work zone devices (including portable barriers) manufactured after December 31, 2019 must have been successfully tested to the 2016 edition of Manual for Assessing Safety Hardware (MASH). Such devices manufactured on or before this date, and successfully tested to either National Cooperative Highway Research Program (NCHRP) Report 350 or the 2009 edition of MASH, may continue to be used.

TRUCK MOUNTED ATTENUATOR REQUIREMENTS

Provide the number of vehicles with truck mounted attenuators listed in the table below. The Contractor shall determine if multiple operations will occur at the same time, to determine the total number of truck mounted attenuators needed for the project.

WZ(BTS-1)	0	TCP(2-3)	0	TCP(6-1)	0
TCP(1-1)	0	TCP(2-4)	0	TCP(6-2)	0
TCP(1-2)	0	TCP(2-5)	0	TCP(6-3)	0
TCP(1-3)	0	TCP(2-6)	0	TCP(6-4)	0
TCP(1-4)	0	TCP(3-1)	2	TCP(6-5)	0
TCP(1-5)	0	TCP(3-2)	0	TCP(6-6)	0
TCP(1-6)	0	TCP(3-3)	2	TCP(6-7)	0
TCP(2-1)	0	TCP(3-4)	0	TCP(6-8)	0
TCP(2-2)	0	TCP(5-1)	0	TCP(6-9)	0
TRAFFIC CONTROL PLAN PILOT VEHICLE OPERATION					0
TRAFFIC CONTROL PLAN TWO LANE CLOSURES ON FOUR LANE UNDIVIDED HIGHWAYS					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN SHOULDER CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN WORK SPACE NEAR SHOULDER					0
TRAFFIC CONTROL PLAN CROSSOVER CLOSURE					0
TRAFFIC CONTROL PLAN TURNAROUND CLOSURE					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL AND BARRIER					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL					0
TRAFFIC CONTROL PLAN FREEWAY CLOSURE					0

PORTABLE CHANGEABLE MESSAGE SIGN REQUIREMENTS

Provide the portable changeable message signs listed in the table below. The Contractor shall determine if multiple operations will occur at the same time, to determine the total number of portable changeable message signs needed for the project.

TCP(6-1)	0	TCP(6-4)	0	TCP(6-8)	0
TCP(6-2)	0	TCP(6-6)	0	TCP(6-9)	0
TCP(6-3)	0	TCP(6-7)	0		
TRAFFIC CONTROL PLAN LANE CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN SHOULDER CLOSURES WITH BARRIER					0
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL AND BARRIER					2
TRAFFIC CONTROL PLAN LANE CLOSURES WITH TRAFFIC SIGNAL					0
TRAFFIC CONTROL PLAN FREEWAY CLOSURE					0

TYPICAL USAGE

MOBILE
Work that moves continuously or intermittently (stopping for up to approximately 15 minutes).

SHORT DURATION
Work that occupies a location up to 1 hour.

SHORT TERM STATIONARY
Daytime work that occupies a location for more than 1 hour in a single daylight period.

INTERMEDIATE TERM STATIONARY
Work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

LONG TERM STATIONARY
Work that occupies a location more than 3 days.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation | San Angelo District

TRAFFIC CONTROL PLAN GENERAL REQUIREMENTS

SHEET 1 OF 1 NOT TO SCALE

CONT	SECT	JOB	HIGHWAY
2279	02	023	US 190
DIST	COUNTY		SHEET NO.
SJT	CROCKETT		9

SHEET ISSUED OR LAST REVISED
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TRAFFIC CONTROL GENERAL NOTES

1. ACCESS SHALL ALWAYS BE MAINTAINED TO ALL PROPERTY OWNERS UNLESS OTHERWISE APPROVED BY THE ENGINEER. DRUMS AND SIGNS SHALL BE PLACED IN SUCH A MANNER THAT THEY DO NOT BLOCK THE DRIVEWAY OPERATIONS.

2. ALL EXISTING SIGNS ON OPEN ROADWAYS THAT ARE NOT IN CONFLICT WITH CONSTRUCTION AND TRAFFIC SHALL REMAIN IN PLACE UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

3. PORTABLE CHANGEABLE MESSAGE SIGNS SHALL BE INSTALLED 14 DAYS IN ADVANCE OF MAJOR SHIFTS IN TRAFFIC PATTERNS TO PROVIDE AMPLE NOTIFICATION TO TRAVELING PUBLIC. THE CONTRACTOR SHALL COORDINATE REQUIRED TEXT MESSAGES FOR EACH LOCATION WITH THE ENGINEER.

4. CONTRACTOR SHALL COORDINATE PLACEMENT OF FINAL STRIPING WITH THE ENGINEER. FINAL STRIPING SHALL BE PLACED ON THE FINAL SURFACE, WHEN APPROVED BY THE ENGINEER.

5. CONTRACTOR SHALL COORDINATE WITH THE ENGINEER FOR DRIVEWAY TIE-INS OR ANY WORK OUTSIDE THE ROW. A CONSTRUCTION LICENSE AGREEMENT MAY BE REQUIRED FOR THESE CONDITIONS AND NO WORK SHALL PROCEED WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

6. INSTALL AND REMOVE SW3P ITEMS FOR EACH TRAFFIC CONTROL PHASE/STEP AS SHOWN IN SW3P PLANS.

7. THE TRAFFIC CONTROL PLAN SHOWN HEREIN IS A SUGGESTED METHOD FOR ACCOMPLISHING THE WORK. THE CONTRACTOR MAY MODIFY OR DEVIATE FROM THE PLAN AS LONG AS A REVISED TCP, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER, IS APPROVED BY TXDOT.

8. IN GENERAL, WORK MAY PROGRESS IN EACH AREA INDEPENDENT OF THE OTHER AREAS AS LONG AS THE VARIOUS SAFETY AND SCHEDULE REQUIREMENTS ARE MET.

9. CONTRACTOR SHALL INSTALL ALL SIGNS, DELINEATORS, PAVEMENT MARKINGS, BARRICADES AND CHANNELIZING DEVICES PER THE CURRENT TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) AND/OR ITS APPLICABLE REVISIONS. THE CONTRACTOR IS TO MAINTAIN EXISITING ONE WAY, DO NOT ENTER, WRONG WAY, AND STOP SIGNS UNTIL PERMANENT SIGNS HAVE BEEN INSTALLED.

10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN DRAINAGE DURING ALL PHASES OF CONSTRUCTION.

11. PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED AS APPROPRIATE PRIOR TO OPENING COMPLETED BRIDGES.

12. WHERE PORTABLE CONCRETE TRAFFIC BARRIER IS CALLED OUT IN THE PLANS, THE ADJACENT ROADWAY IS NOT TO BE OPENED TO TRAFFIC PRIOR TO THE INSTALLATION OF AN APPROPRIATE ATTENUATOR OR PRIOR TO FLARING THE BARRIER AS SHOWN IN THE PLANS.

13. REFER TO BRIDGE TYPICAL SECTION AND CONSTRUCTION NARRATIVE FOR MORE INFORMATION.

14. AT THE END OF EACH DAY, 3:1 SAFETY SLOPE TO BE INSTALLED (SUBSIDIARY TO ITEM 502).

US 190 AT LIVE OAK DRAW
TRAFFIC CONTROL NARRATIVE

PHASE 1 - CONSTRUCT EASTBOUND SIDE OF US 190 BRIDGE:

1. PLACE ADVANCE WARNING SIGNS PER STANDARD BC(2)-21.

2. PLACE PCMS 1000' IN ADVANCE OF OTHER WARNING SIGNS ON US 190, OR AS OTHERWISE DIRECTED OR APPROVED BY THE ENGINEER, TO ALERT MOTORISTS TO THE ONE-LANE TWO-WAY TRAFFIC PATTERN. SET PCMS MESSAGE FOR THE PHASE 1 CONDITION TO "TRAFFIC SIGNAL XXX FT" AND FOR THE PHASE 2 COMPONENT TO "PREPARE TO STOP" OR AS OTHERWISE DIRECTED OR APPROVED BY THE ENGINEER.

3. INSTALL TEMPORARY STRIPING, CHANNELIZING DEVICES AND PORTABLE CONCRETE TRAFFIC BARRIER (PCTB) WITH CRASH CUSHION ATTENUATORS ALONG US 190 AS SHOWN ON THE PLANS.

4. IMPLEMENT WORK ZONE SPEED LIMIT OF 45 MPH ON US 190 PER STANDARD BC(3)-21. SPEED ZONE DECREASES SHALL BE MADE IN 15 MPH MAXIMUM INCREMENTS OVER DISTANCES OF NOT LESS THAN 0.5 MILES, OR AS DIRECTED BY THE ENGINEER.

5. ESTABLISH EROSION AND SEDIMENTATION CONTROLS. EROSION AND SEDIMENTATION CONTROL DEVICES ARE TO BE INSTALLED IN COORDINATION WITH THE WORK IN PROGRESS, OR AS DIRECTED BY THE ENGINEER.

6. INSTALL PROPOSED AND TEMPORARY FENCING AND GATES AND REMOVE EXISTING FENCING AND GATES.

7. INSTALL TEMPORARY SIGNAL PER STANDARD TCP(2-8)-18 TO MAINTAIN ONE-LANE TWO-WAY TRAFFIC ON THE EXISTING PORTION OF THE US 190 BRIDGE.

8. SAWCUT AND REMOVE EXISTING EASTBOUND SIDE OF US 190 PAVEMENT AND BRIDGE. CONSTRUCT EASTBOUND SIDE OF US 190 BRIDGE AS SHOWN ON THE PLANS AND STANDARDS.

PHASE 2 - CONSTRUCT WESTBOUND SIDE OF US 190 BRIDGE:

1. ADJUST ADVANCE WARNING SIGNS PER STANDARD BC(2)-21, ADJUST TEMPORARY STRIPING, ADJUST CHANNELIZING DEVICES AND PORTABLE CONCRETE TRAFFIC BARRIER (PCTB) WITH CRASH CUSHION ATTENUATORS ALONG US 190. MAINTAIN WORK ZONE SPEED LIMIT.

2. ADJUST EROSION AND SEDIMENTATION CONTROLS. EROSION AND SEDIMENTATION CONTROL DEVICES ARE TO BE INSTALLED IN COORDINATION WITH THE WORK IN PROGRESS, OR AS DIRECTED BY THE ENGINEER.

3. ADJUST TEMPORARY SIGNAL PER STANDARD TCP(2-8)-18 TO MAINTAIN ONE-LANE TWO-WAY TRAFFIC IN THE PROPOSED PORTION OF THE US 190 BRIDGE CONSTRUCTED IN PHASE 1.

4. CONSTRUCT PROPOSED PORTION OF WESTBOUND PAVEMENT AND BRIDGE AS SHOWN ON THE PLANS AND STANDARDS.

5. CONSTRUCT FINAL GRADING, BACKFILL PAVEMENT EDGES AND INSTALL PERMANENT SEEDING. REFER TO SW3P SHEETS FOR DETAILS.

6. PLACE PERMANENT PAVEMENT MARKINGS AND SIGNING.

7. PERFORM FINAL CLEANUP AND REMOVE TEMPORARY FENCING AND GATES.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
8/2/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL NARRATIVE

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	10
CONTROL	SECTION	JOB	
2279	02	023	

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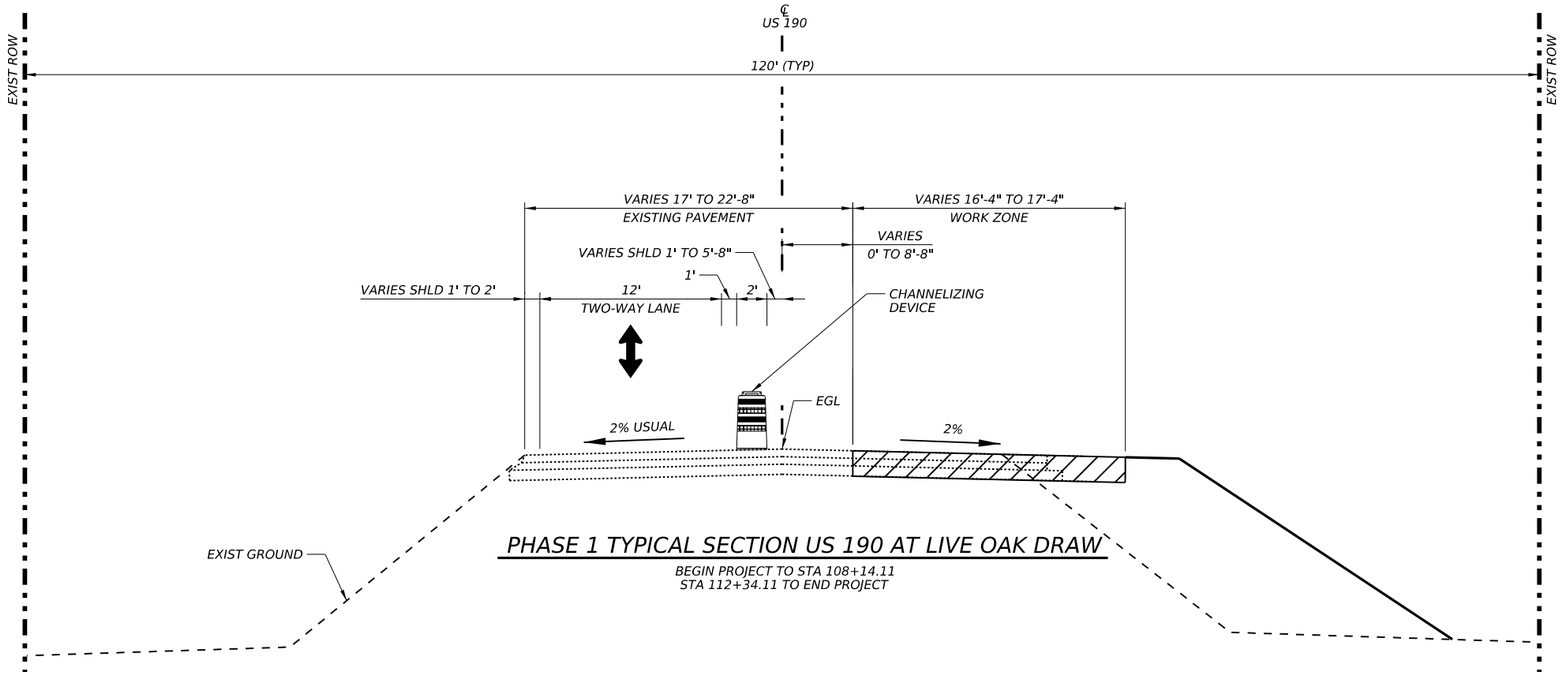
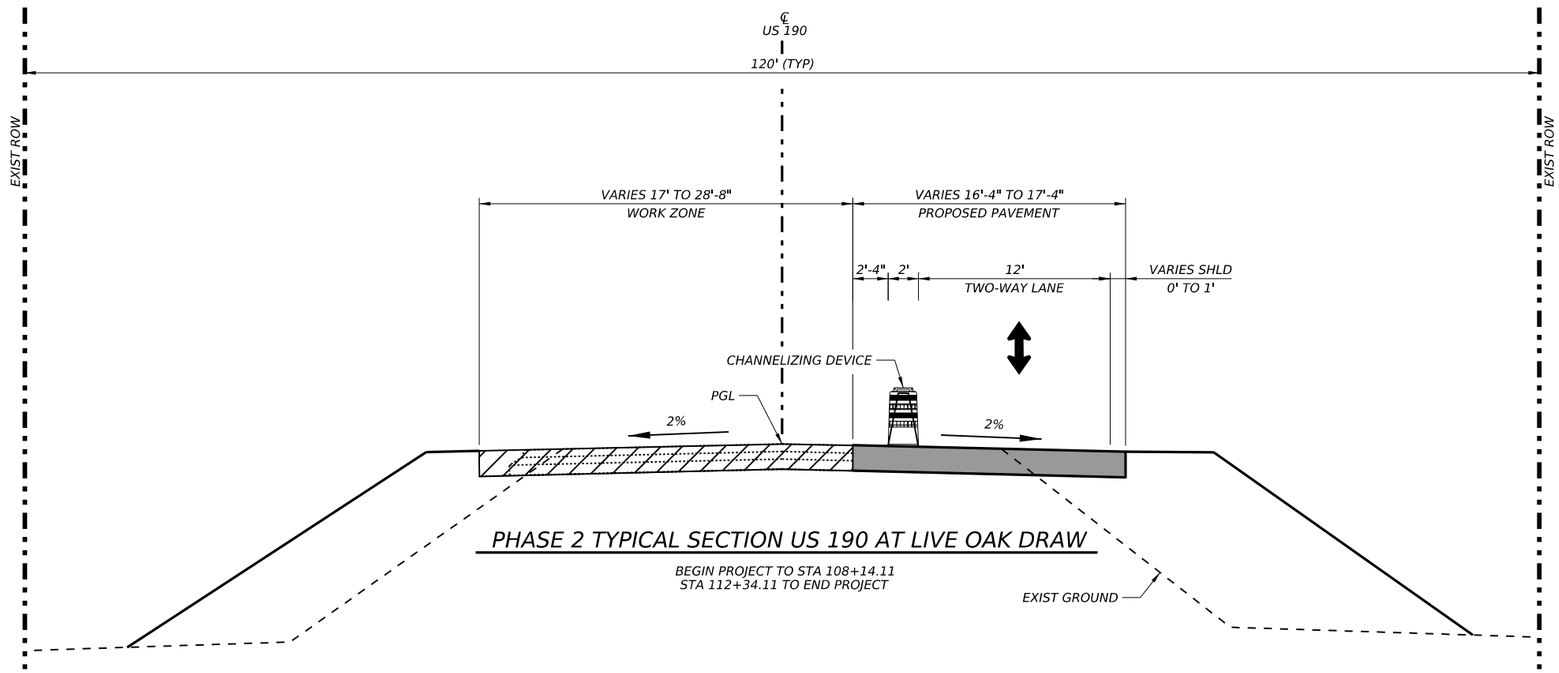


PHASE 1 TYPICAL SECTION US 190 AT LIVE OAK DRAW

BEGIN PROJECT TO STA 108+14.11
STA 112+34.11 TO END PROJECT



PHASE 2 TYPICAL SECTION US 190 AT LIVE OAK DRAW

BEGIN PROJECT TO STA 108+14.11
STA 112+34.11 TO END PROJECT

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE CONCRETE TRAFFIC BARRIER (PCTB)
- (A) WK ZN PAV MRK REMOV (Y) 4" (SLD)
- (B) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WK ZN PAV MRK REMOV (W) (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

NOTES:

1. SEE BRIDGE TYPICAL SECTIONS FOR BRIDGE PHASING.

0 5' 10'
SCALE: 1" = 10'

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL
TYPICAL SECTIONS

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6			US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	11
CONTROL	SECTION	JOB	
2279	02	023	

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6/1/2024
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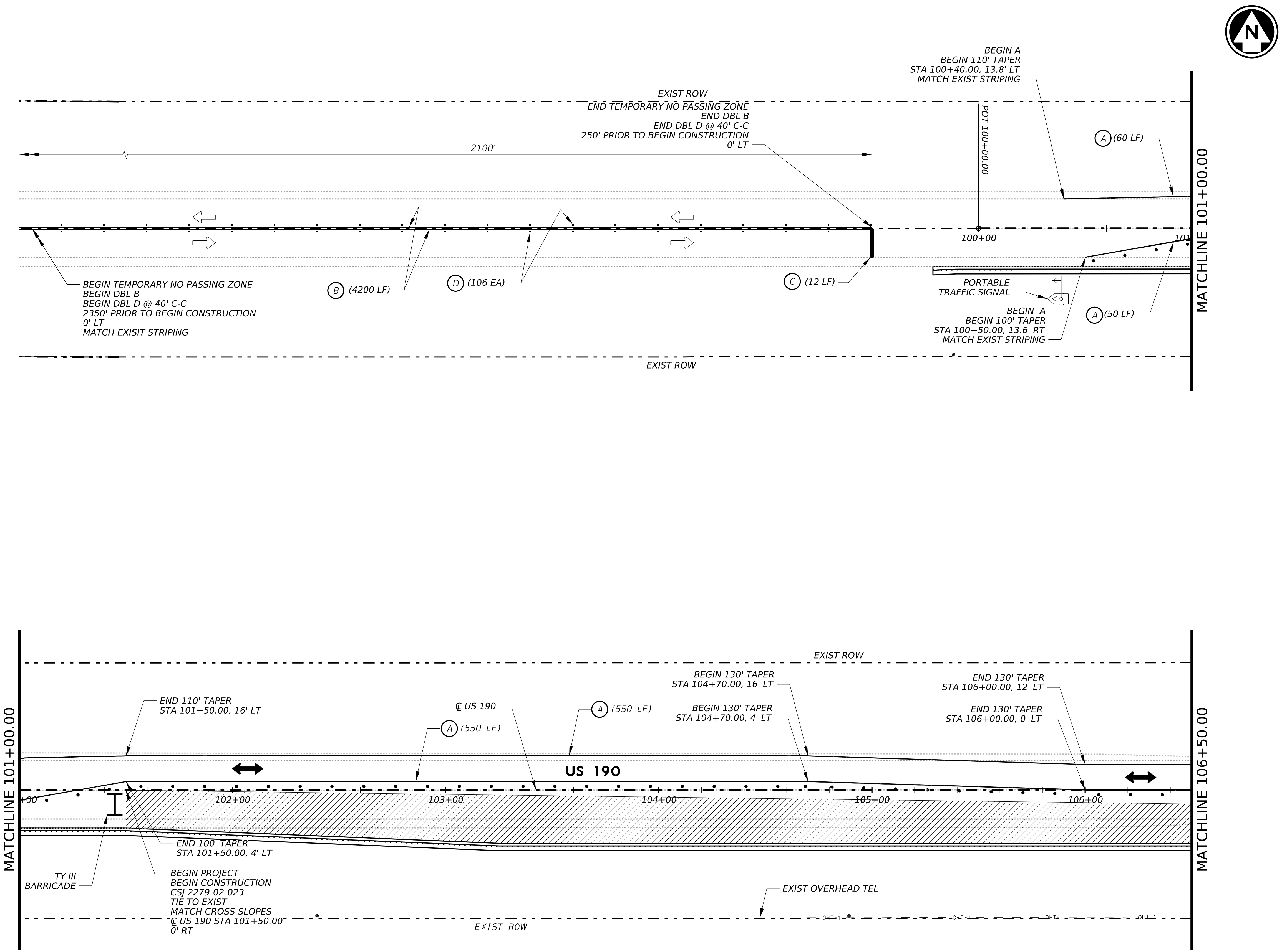

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

0 25' 50'

SCALE: 1" = 50'H
1" = 10'V

SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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PROFESSIONAL ENGINEER
06/03/2024

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ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 1
BEGIN TO STA 106+50

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	12
CONTROL	SECTION	JOB	
2279	02	023	

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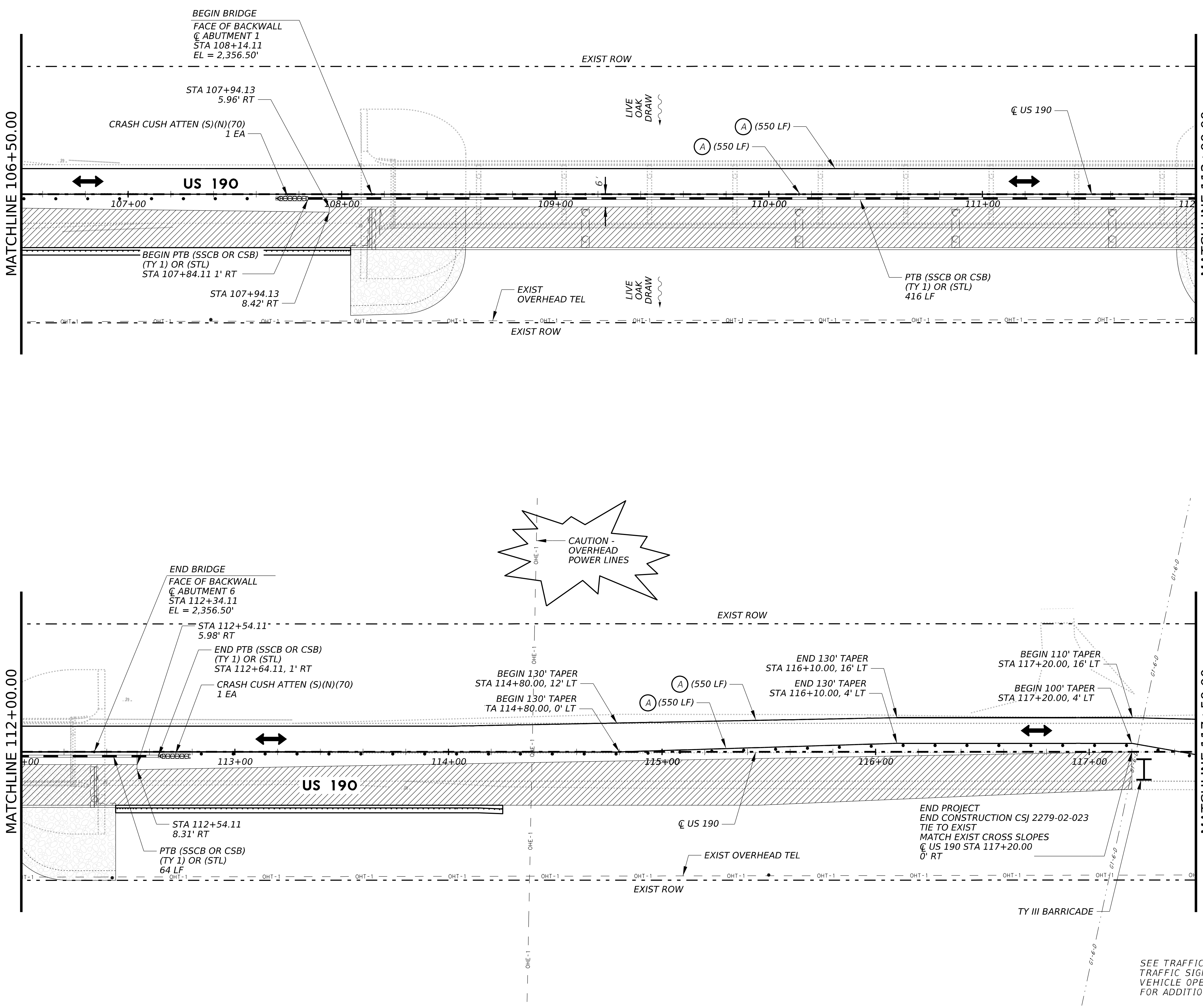

SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

0 25' 50'
SCALE: 1" = 50'H
1" = 10'V

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/03/2024

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ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 1
STA 106+50 TO 117+50

SHEET 2 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	13
CONTROL	SECTION	JOB	
2279	02	023	

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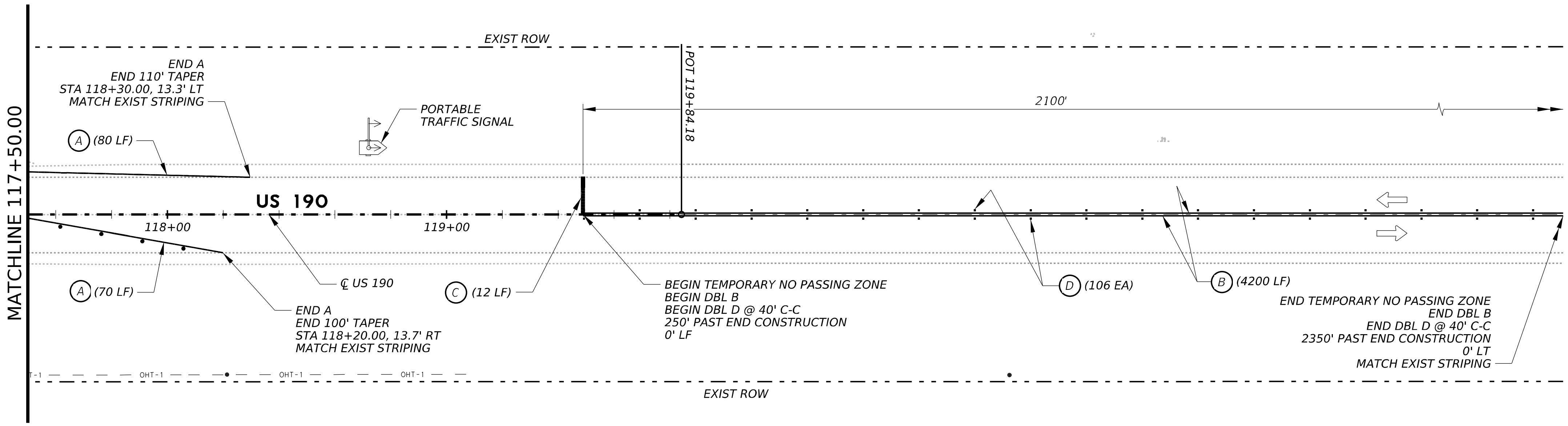

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
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- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

0 25' 50'
SCALE: 1" = 50'H
1" = 10'V

SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
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LICENSED
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06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 1
STA 117+50 TO END

SHEET 3 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	14
CONTROL	SECTION	JOB	
2279	02	023	

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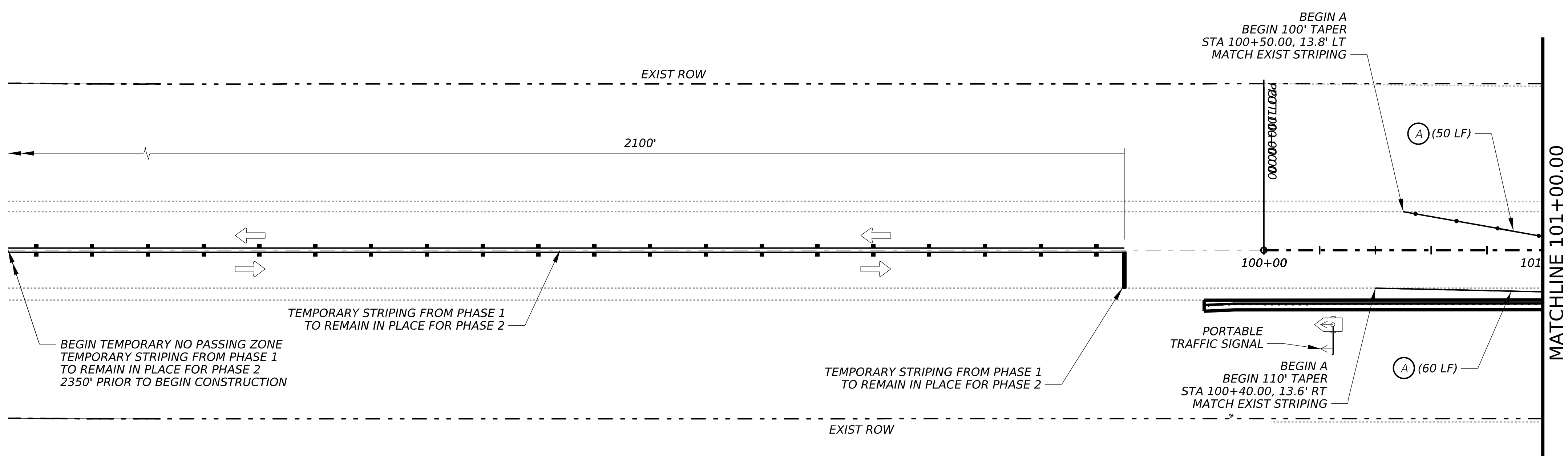


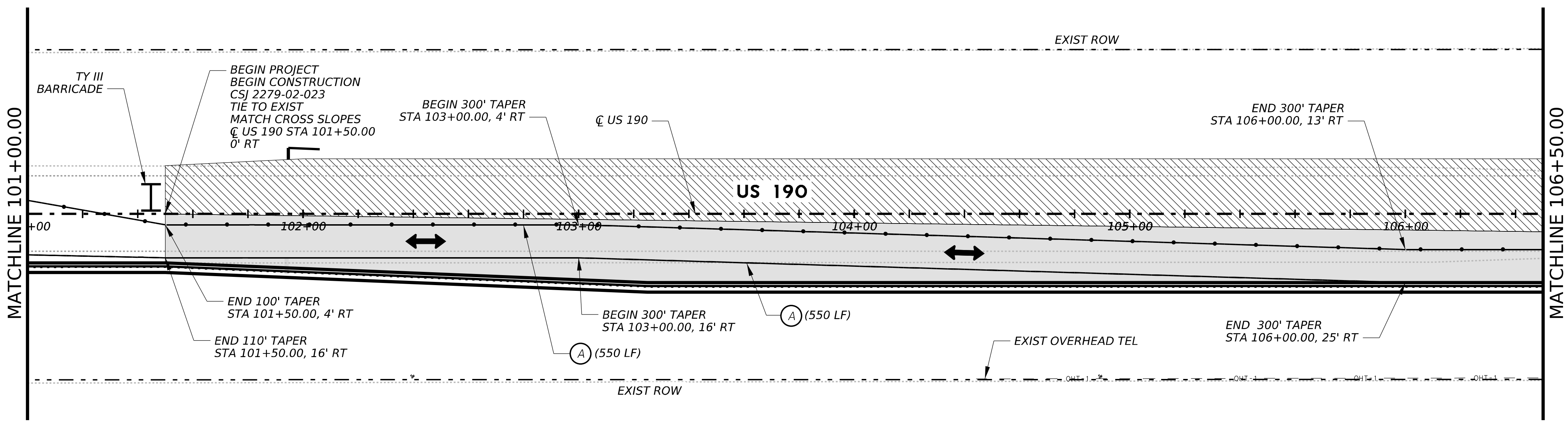
LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

NOTES:

1. SEE FOUNDATION LAYOUT SHEET FOR LIMITS AND ELEVATION OF TEMP SPL SHORING.

0 25' 50'
SCALE: 1" = 50'H
1" = 10'V



SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

NO.	DATE	REVISION	APPROV.

PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 2
BEGIN TO STA 106+50

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	15
CONTROL	SECTION	JOB	
2279	02	023	

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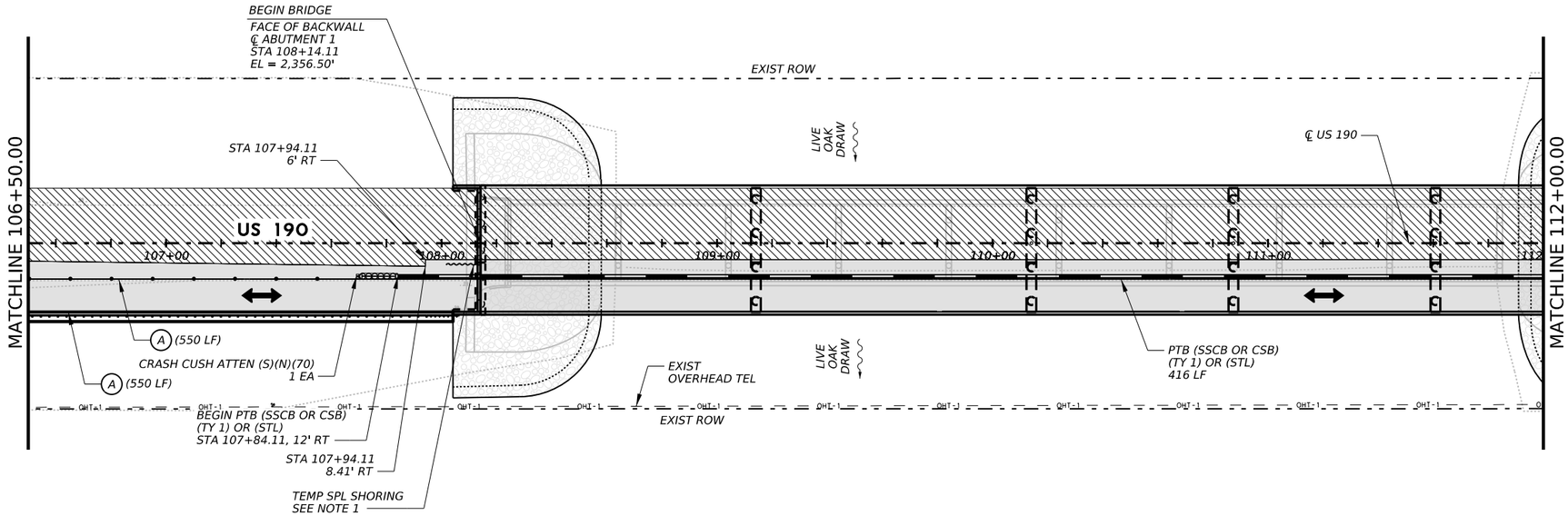

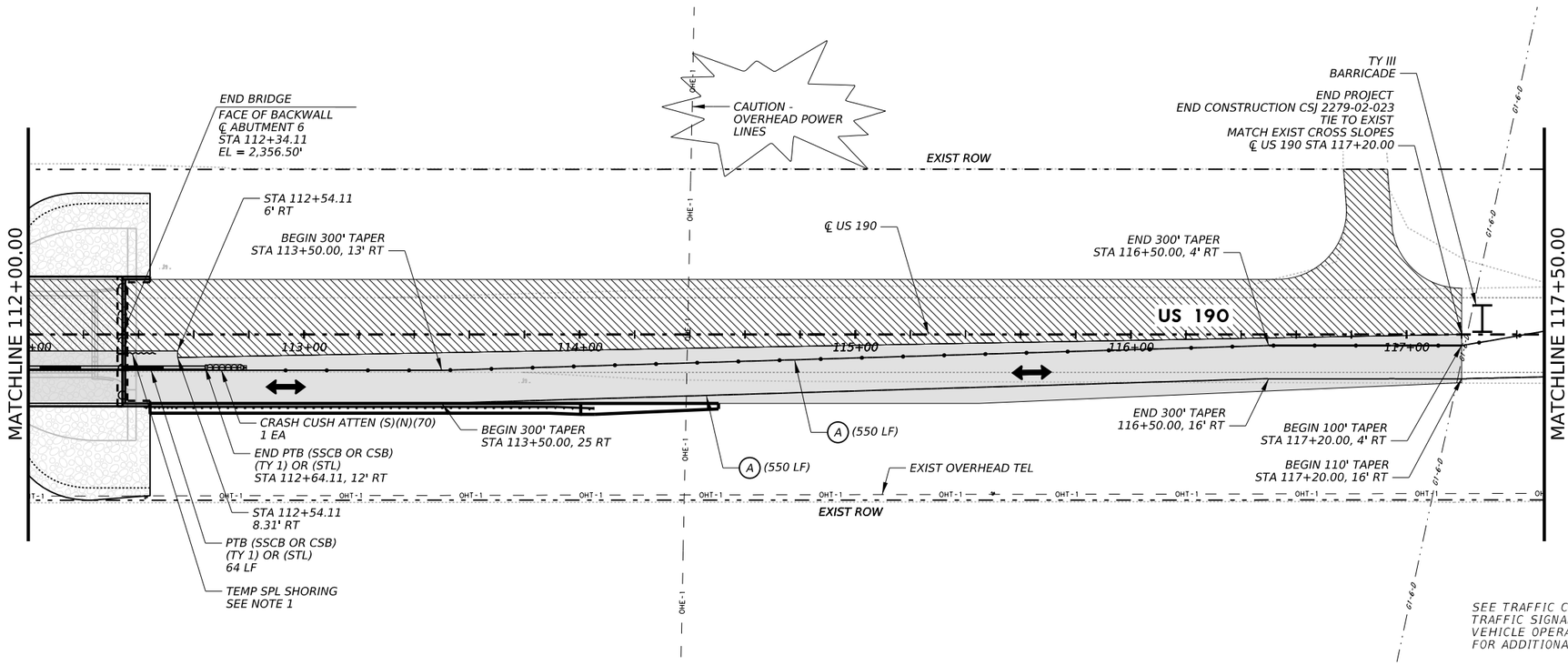

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

NOTES:

1. SEE FOUNDATION LAYOUT SHEET FOR LIMITS AND ELEVATION OF TEMP SPL SHORING.

0 25' 50'

SCALE: 1" = 50'H
1" = 10'V

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 2
STA 106+50 TO 117+50

SHEET 2 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	16
CONTROL	SECTION	JOB	
2279	02	023	

SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

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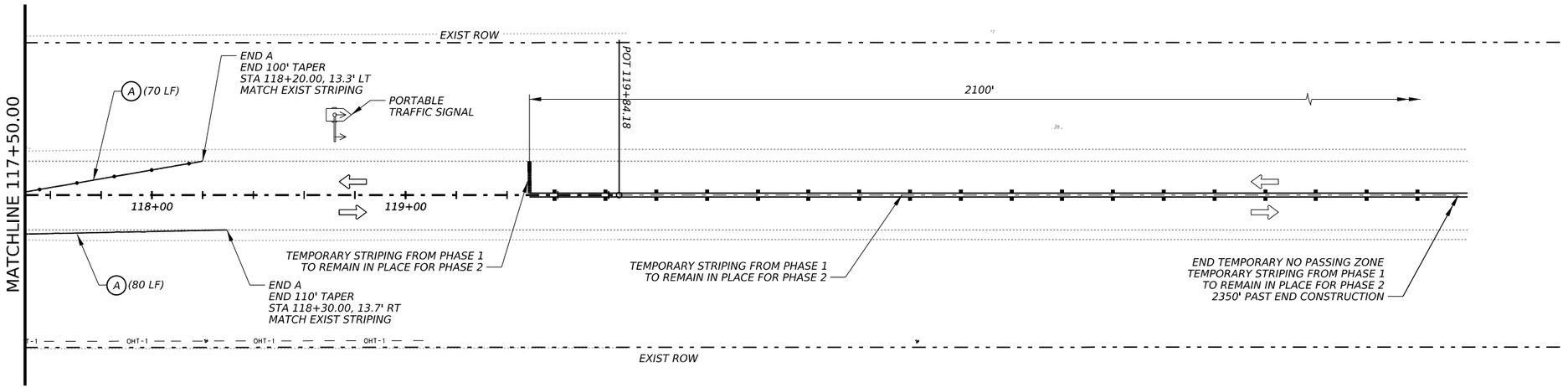

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- CURRENT CONSTRUCTION
- PREVIOUS CONSTRUCTION
- TY III BARRICADE
- PORTABLE TRAFFIC SIGNAL
- SIGN
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR
- PORTABLE TRAFFIC BARRIER (PTB)
- (A) WK ZN PAV MRK REMOV (W) 6" (SLD)
- (B) WK ZN PAV MRK REMOV (Y) 6" (SLD)
- (C) WK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WK ZN PAV MRK REMOV (REFL) TY II-A-A

NOTES:

1. SEE FOUNDATION LAYOUT SHEET FOR LIMITS AND ELEVATION OF TEMP SPL SHORING.

0 25' 50'

SCALE: 1" = 50'H
1" = 10'V

SEE TRAFFIC CONTROL PLAN
TRAFFIC SIGNAL AND PILOT
VEHICLE OPERATION STANDARD
FOR ADDITIONAL SIGNING REQUIREMENTS.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

TRAFFIC CONTROL PLAN
PHASE 2
STA 117+50 TO END

SHEET 3 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	17
CONTROL	SECTION	JOB	
2279	02	023	

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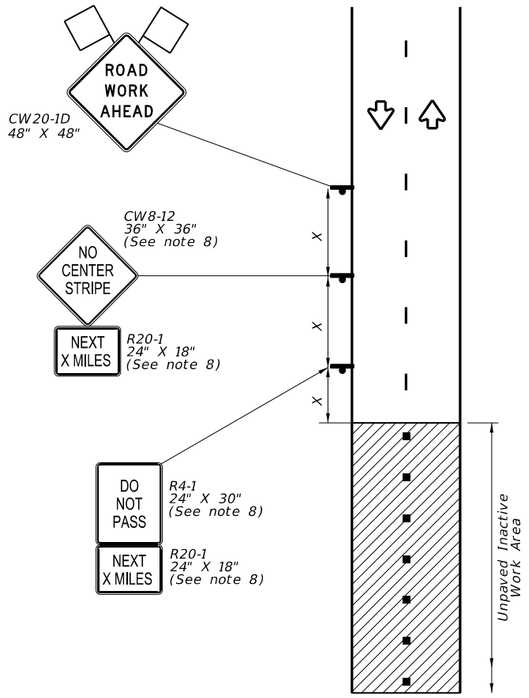
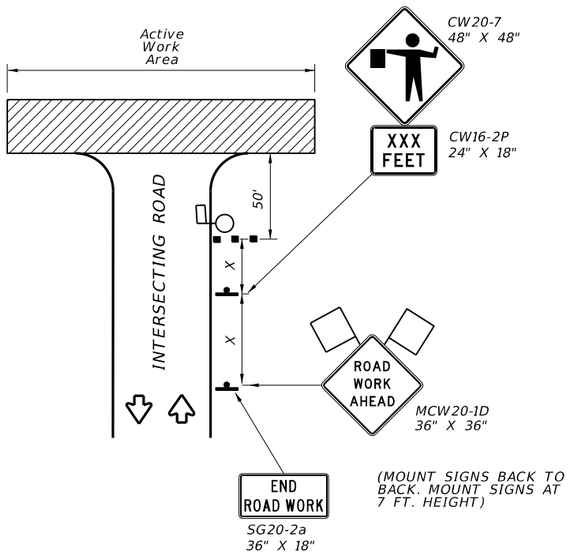
Warning Sign Sequence in opposite direction same as below. Mount all signs at 7 ft. height.



UNPAVED INACTIVE WORK AREA



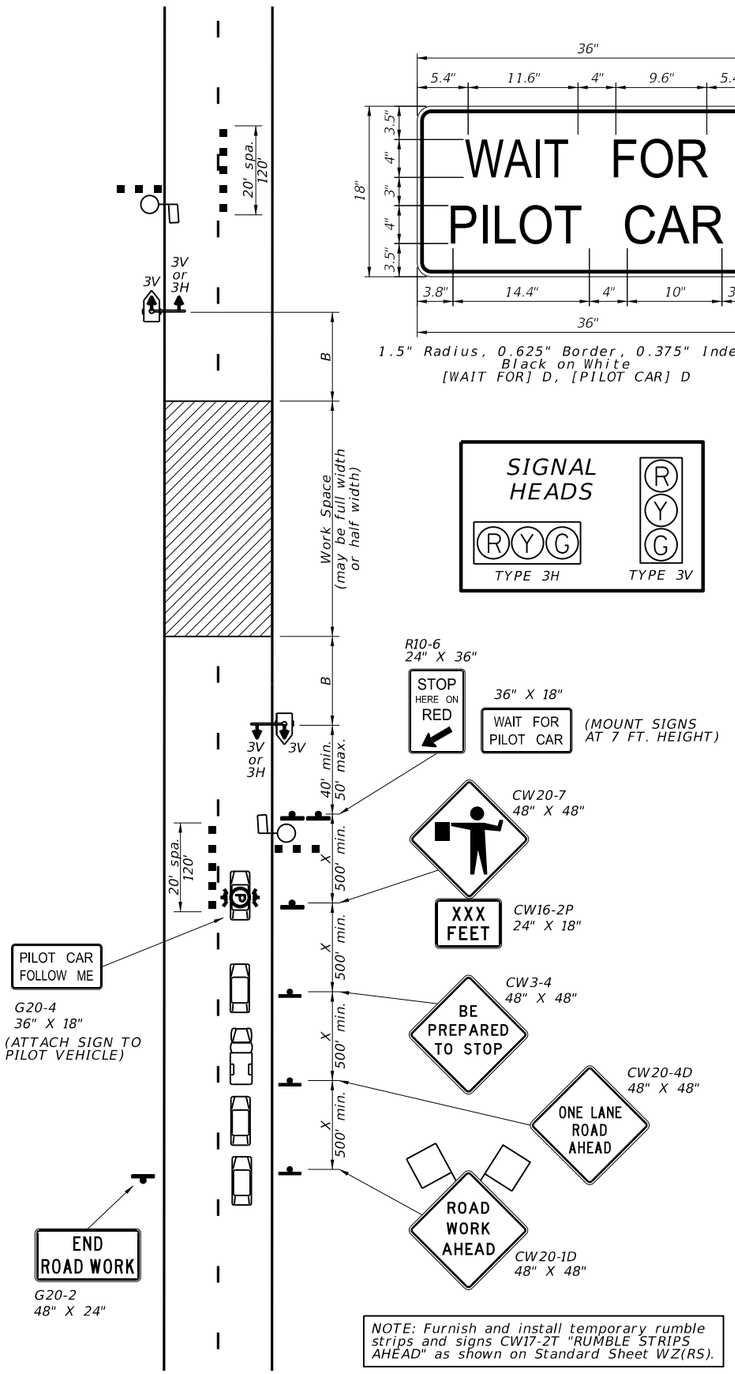
INTERSECTING STATE HIGHWAY OR COUNTY ROAD WITHIN ACTIVE WORK AREA

Warning Sign Sequence in opposite direction same as below.

PAY ITEMS

0510 6001	ONE-WAY TRAF CONT (FLAGGER CONT)	HR
0510 6002	ONE-WAY TRAF CONT (PILOT CAR)	HR
0510 6004	ONE-WAY TRAFFIC CONTROL (PORT TRAF SIG)	DAY

1.5" Radius, 0.625" Border, 0.375" Indent
Black on White
[WAIT FOR] D, [PILOT CAR] D



NOTE: Furnish and install temporary rumble strips and signs CW17-2T "RUMBLE STRIPS AHEAD" as shown on Standard Sheet WZ(RS).

ONE LANE TWO-WAY CONTROL WITH FLAGGER, PILOT VEHICLE, AND TRAFFIC SIGNAL

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Pilot Vehicle
	Temporary or Portable Traffic Signal		Automated Flagger Assistance Device (AFAD)

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'
80		800'	880'	960'	80'	160'	1000'	615'	910'

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

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

GENERAL NOTES

1. Flaggers shall hold traffic until the pilot vehicle is prepared to lead traffic through the work area.
2. Pilot vehicle shall have the name of the Contractor prominently displayed and shall utilize flashing light bar.
3. Actuate the signal phases manually.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles.
7. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.
8. Place additional signs at State Highway and County Road intersections. Place additional signs every mile to the end of the unpaved area.
9. The length of the unpaved work area shall not exceed two miles unless otherwise approved.
10. When the traffic signal is not in operation, the signal faces shall be covered, turned, or taken down.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation
San Angelo District

TRAFFIC CONTROL PLAN TRAFFIC SIGNAL AND PILOT VEHICLE OPERATION

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED	CONT.	SECT	JOB	HIGHWAY
11-19	2279	02	023	US 190
	DIST.	COUNTY		SHEET NO.
	SJT	CROCKETT		18

DATE: 6/2/2024 4:10:19 PM
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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
190-1	1	13	WESTERN ABUTMENT US 190	APPROX STA 107+85	70	BI	N/A	N/A	PCTB	24"	42"	30'	1								1	
190-2	1	13	EASTERN ABUTMENT US 190	APPROX STA 112+65	70	BI	N/A	N/A	PCTB	24"	42"	30'	1								1	
190-3	2	16	WESTERN ABUTMENT US 190	APPROX STA 107+85	70	BI	N/A	N/A	PCTB	24"	42"	30'		1	1	190-1					1	
190-4	2	16	EASTERN ABUTMENT US 190	APPROX STA 112+65	70	BI	N/A	N/A	PCTB	24"	42"	30'		1	1	190-2					1	

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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

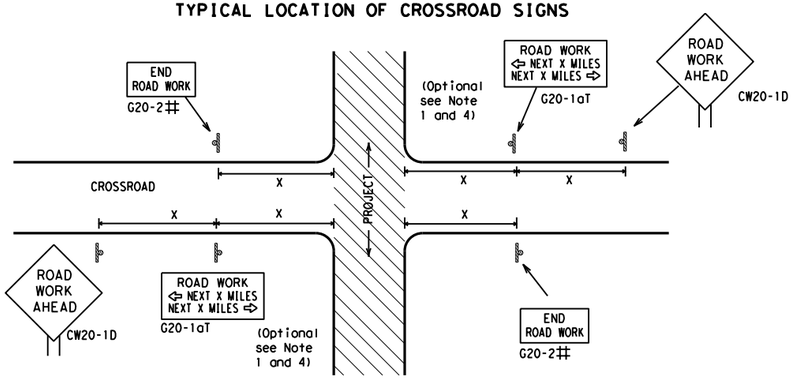
Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		20

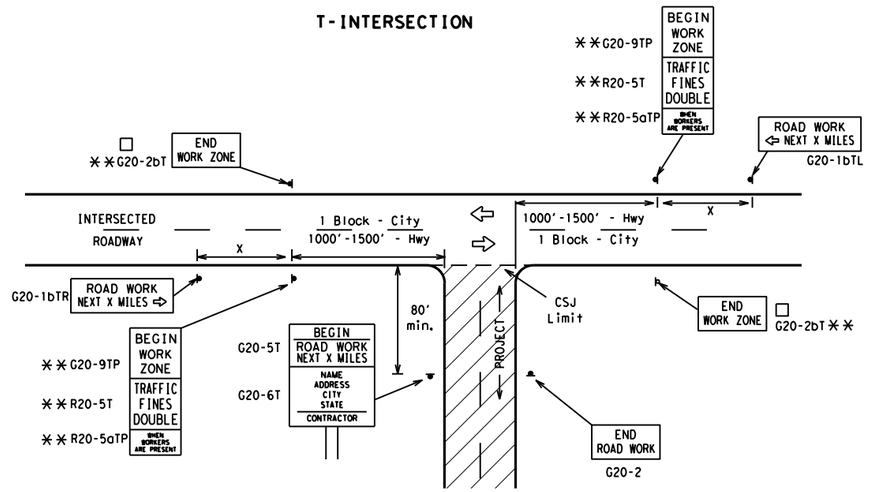
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

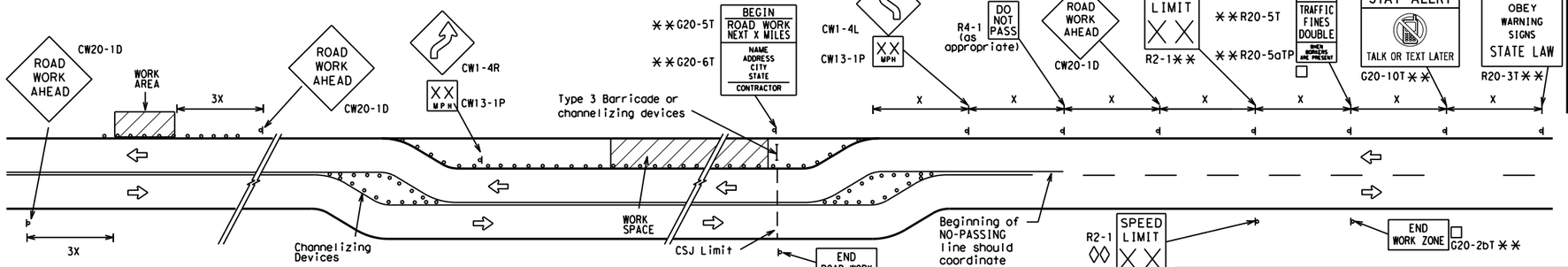
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

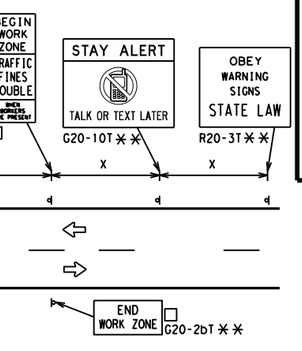
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

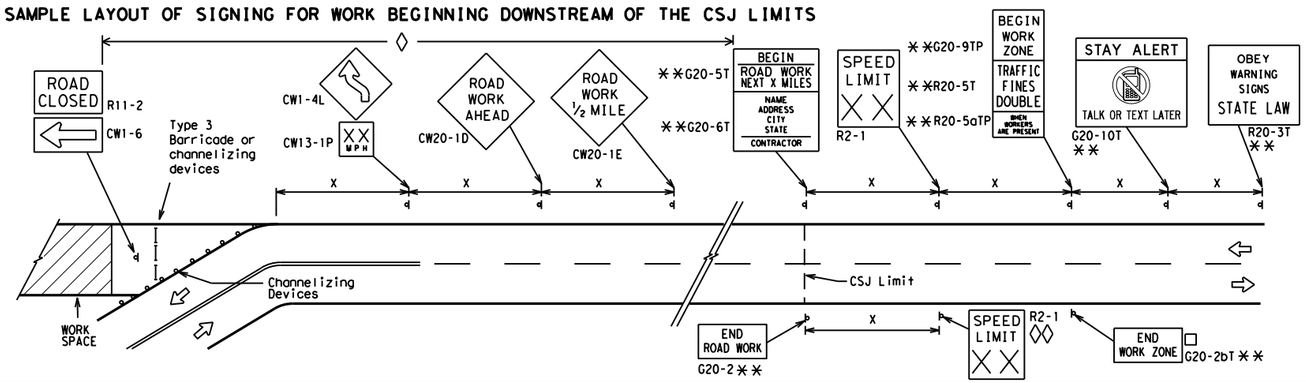


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

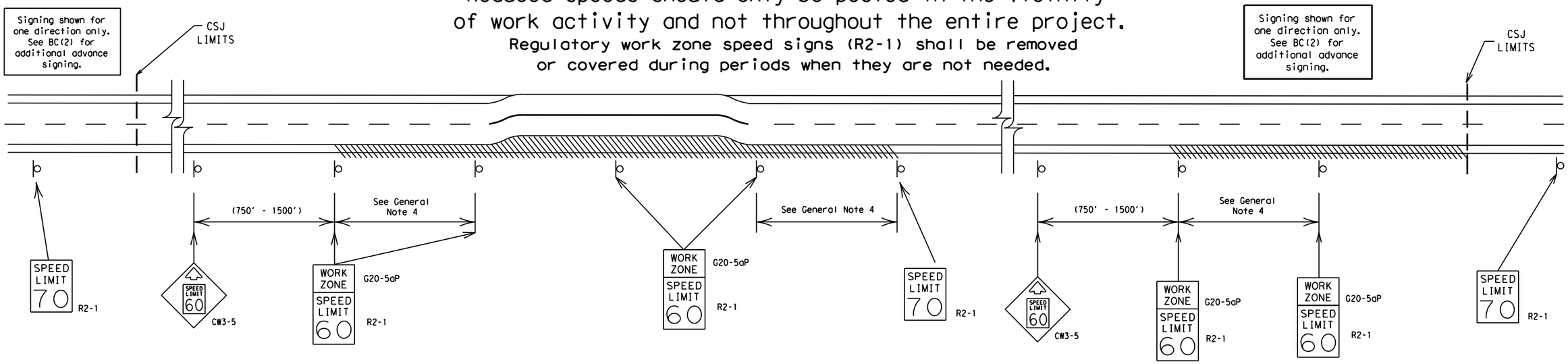
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		21

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		22

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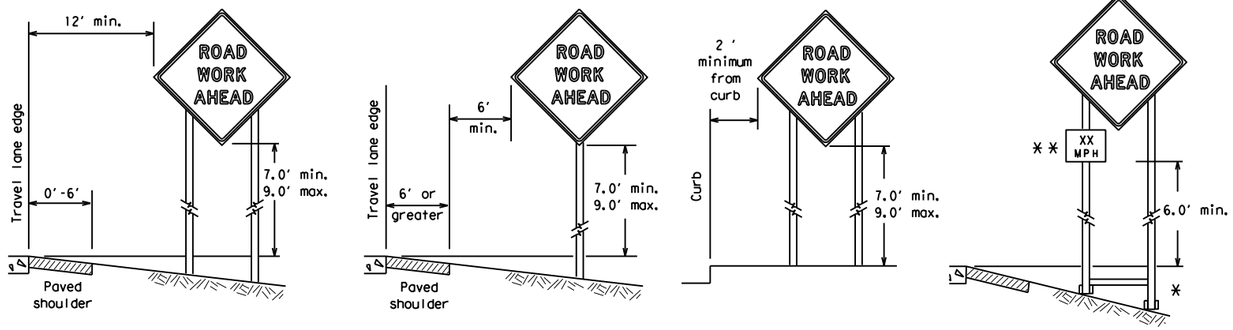
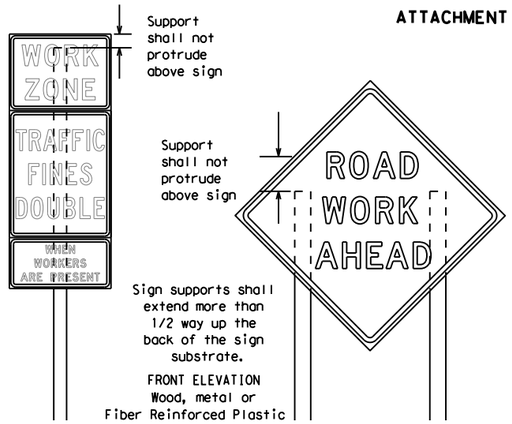
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

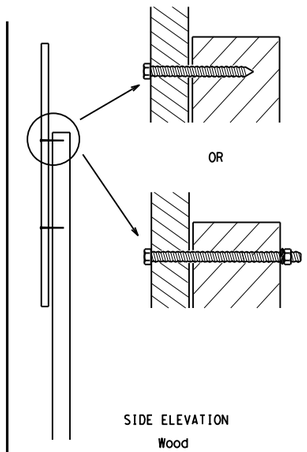


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





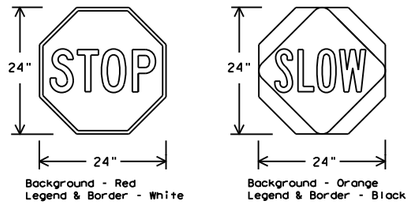
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	SJT	CROCKETT		23

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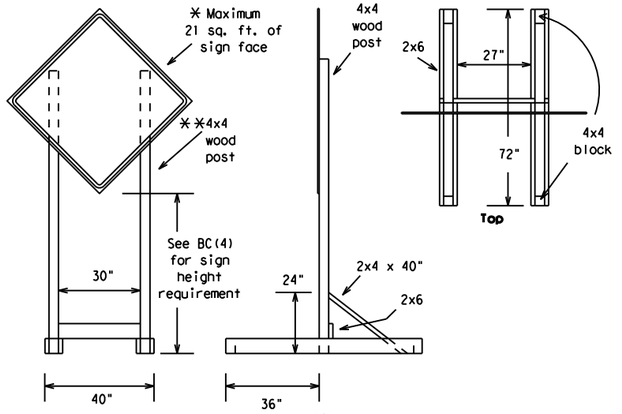
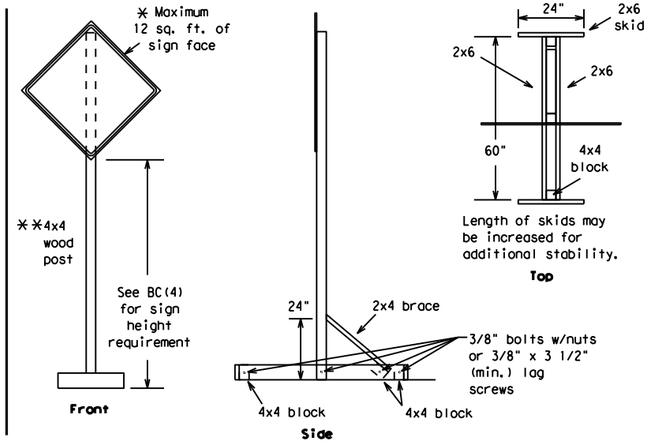
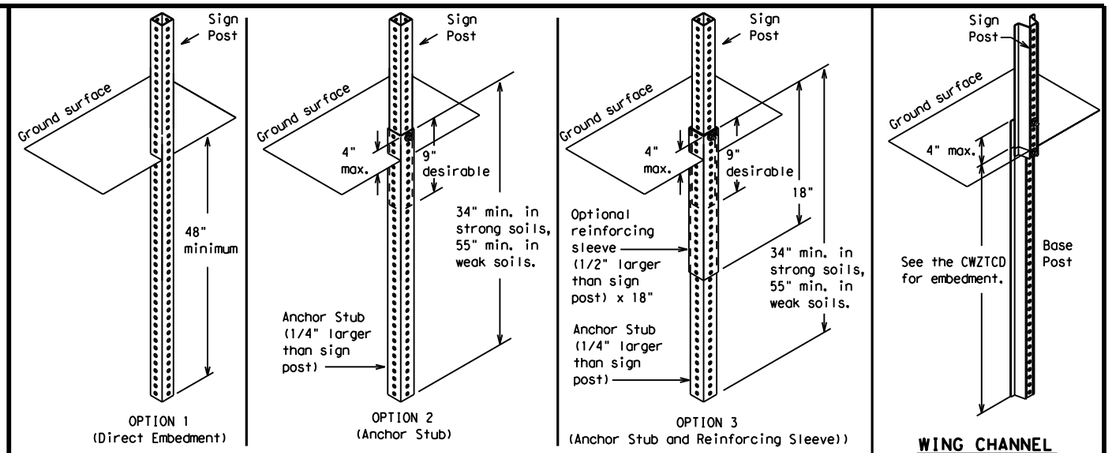




SKID MOUNTED WOOD SIGN SUPPORTS

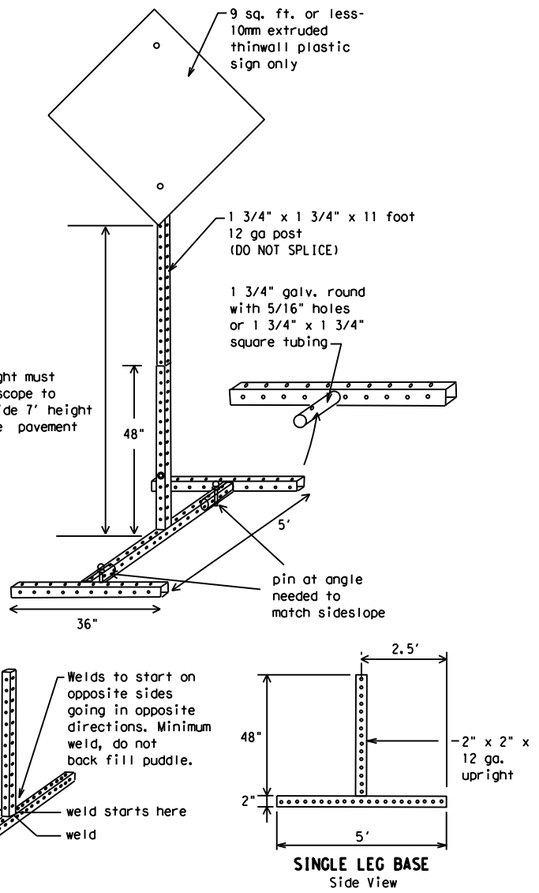
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

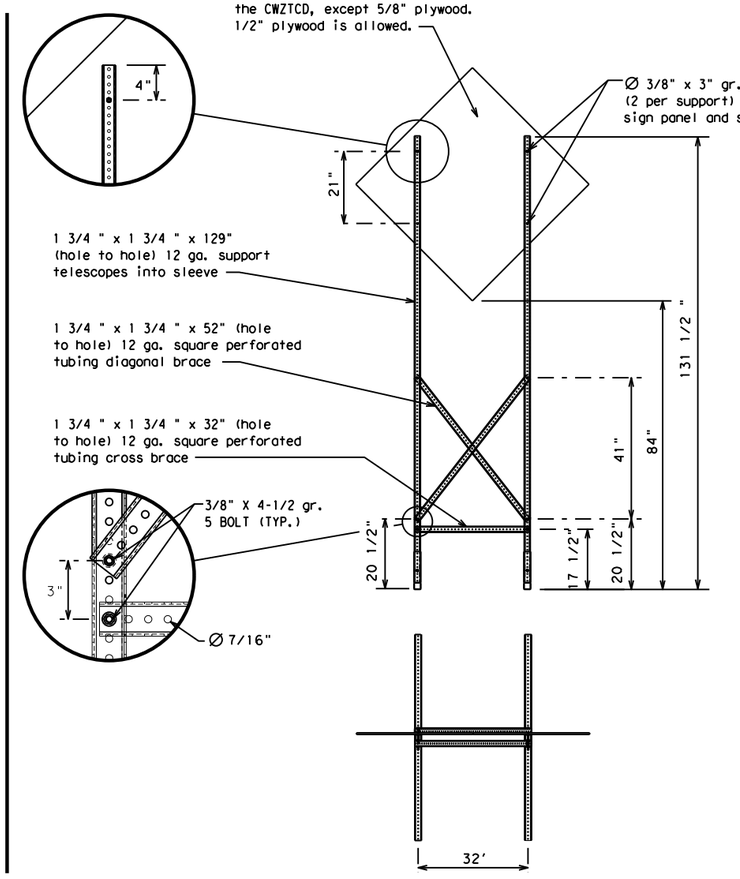


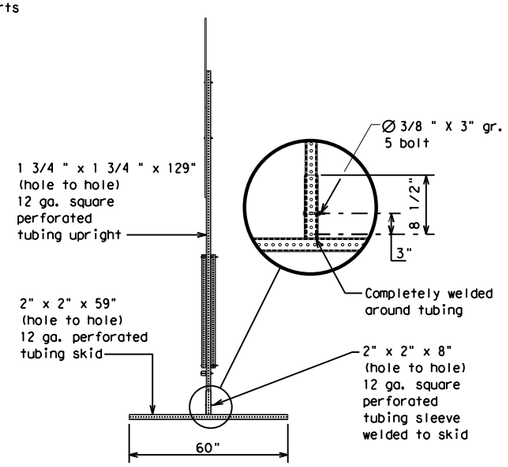
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

SHEET 5 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		24

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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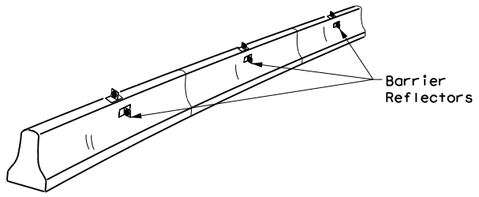
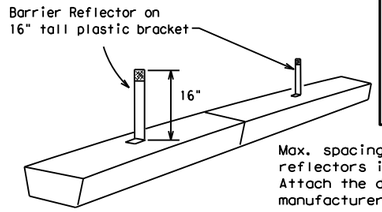
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

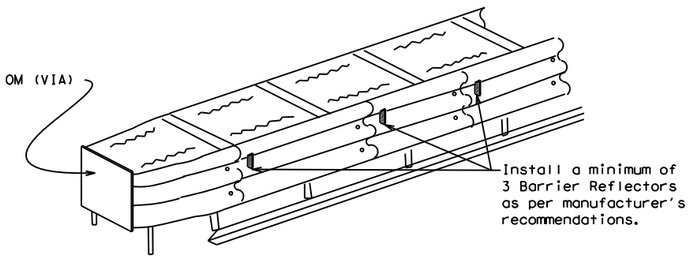


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

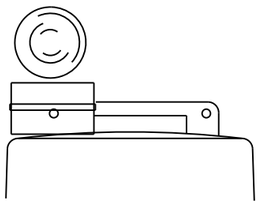


DELINEATION OF END TREATMENTS

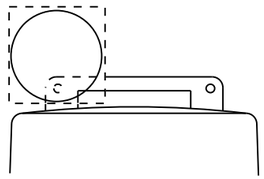
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

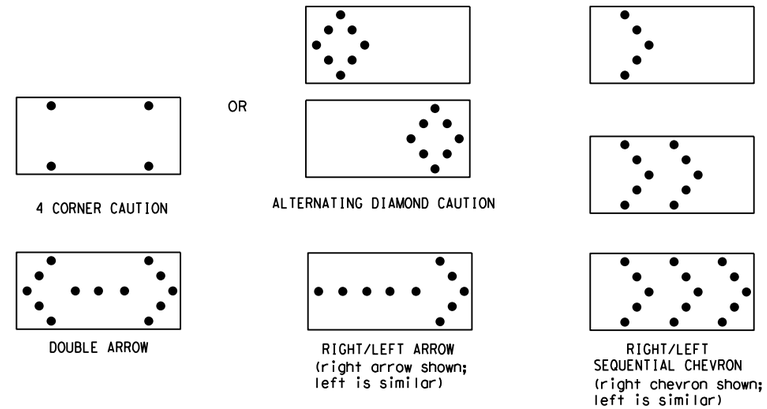
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		26

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

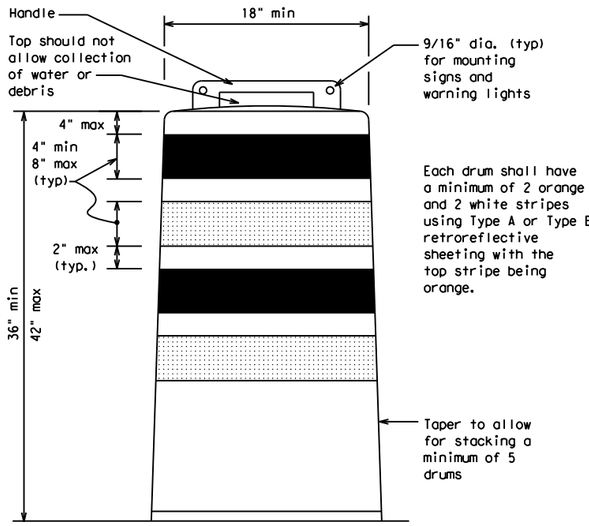
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

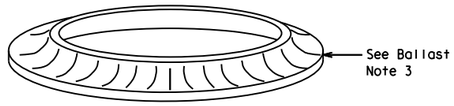
RETROREFLECTIVE SHEETING

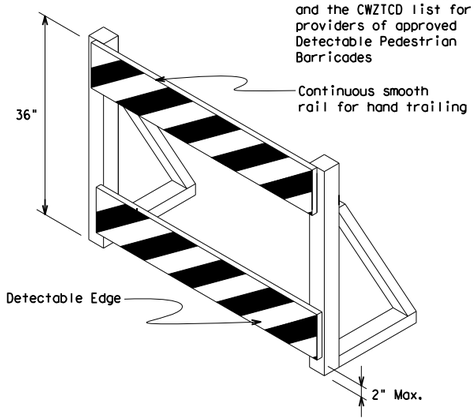
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

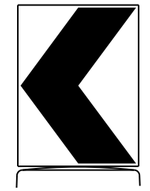




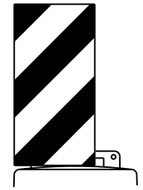


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	SJT	CROCKETT		27
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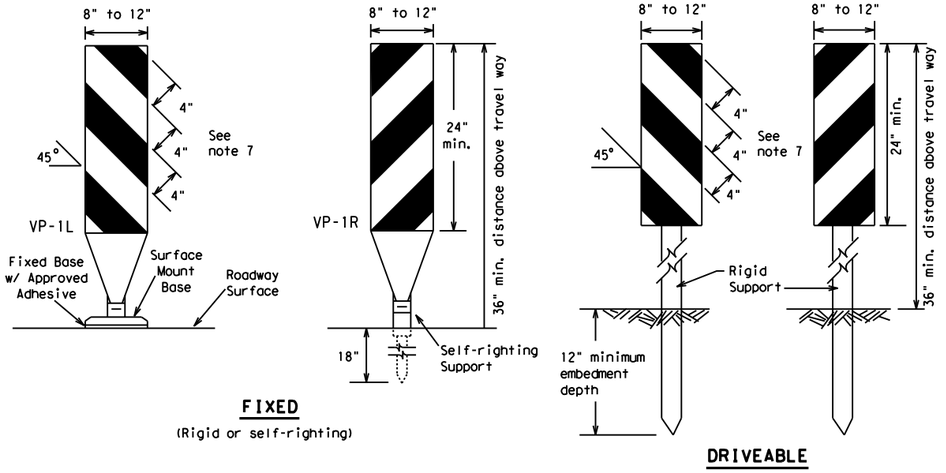
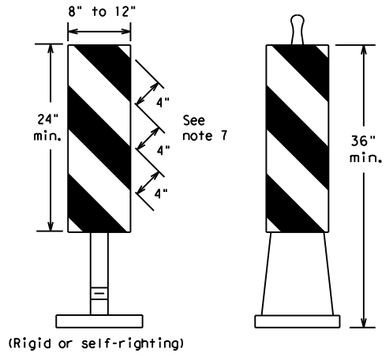


FIXED
(Rigid or self-righting)

DRIVEABLE

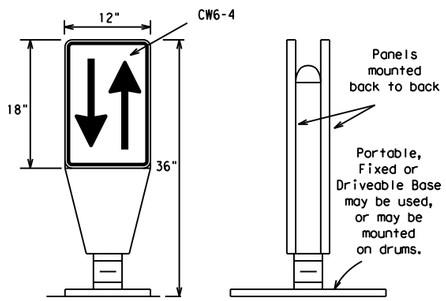


(Rigid or self-righting)

PORTABLE

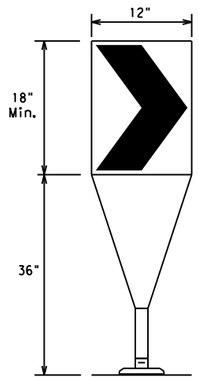
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



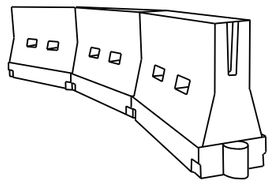
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		28

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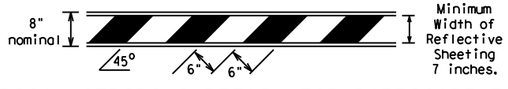
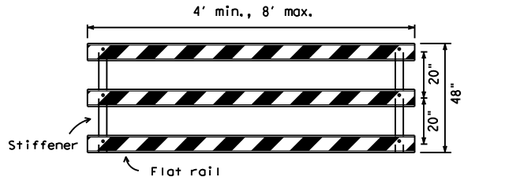
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



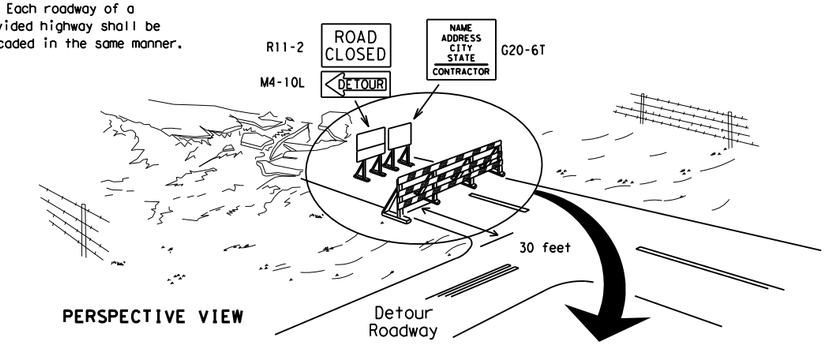
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

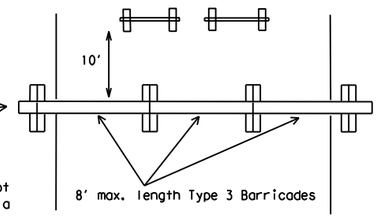
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

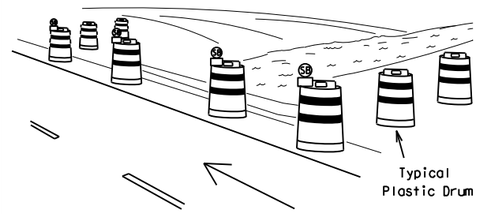
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

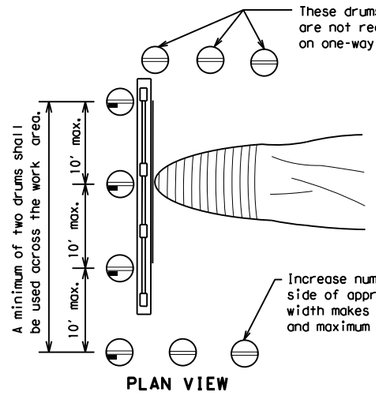
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

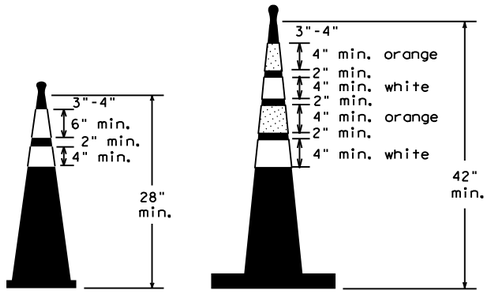
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



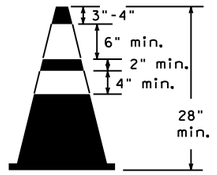
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

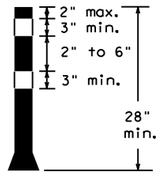
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

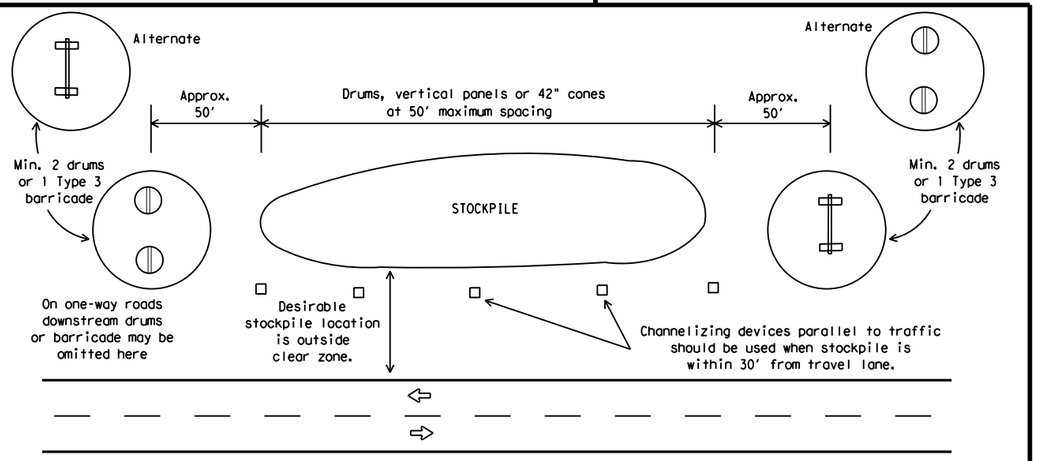


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SJT	CROCKETT		29

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

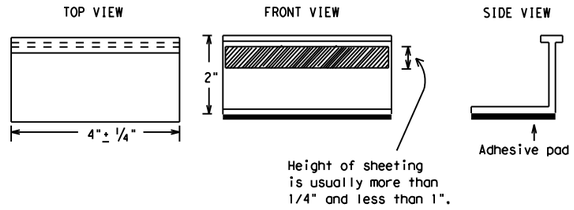
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21	2279	02	023	US 190
1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	SJT	CROCKETT		30

DATE: 6/1/2024 11:38:27 AM
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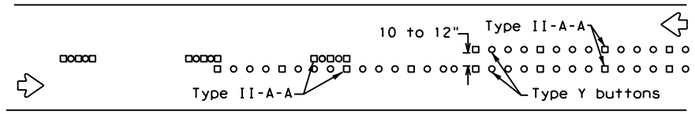
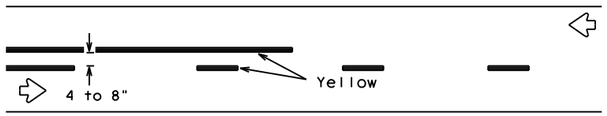
PAVEMENT MARKING PATTERNS

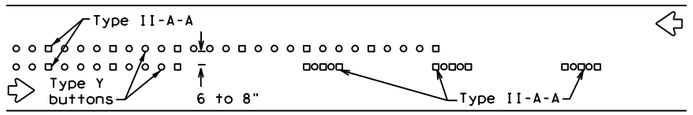
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



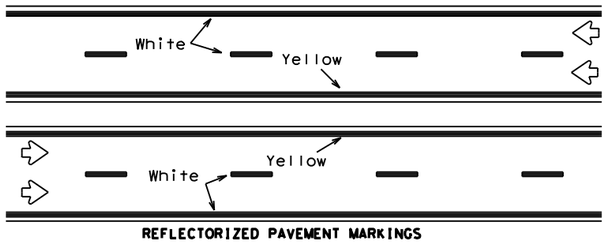
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



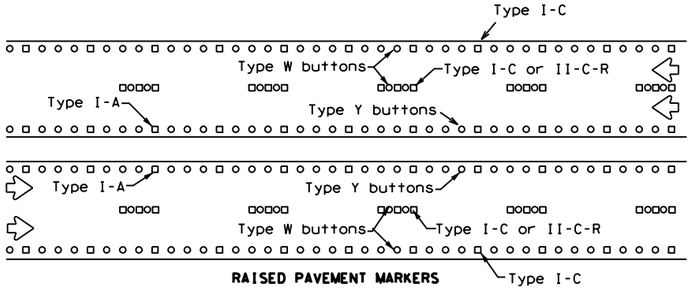
RAISED PAVEMENT MARKERS - PATTERN B

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

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



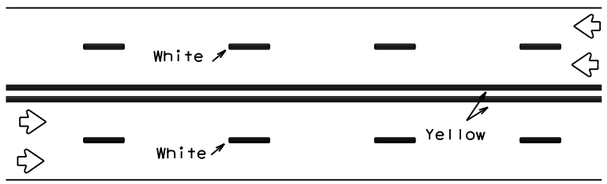
REFLECTORIZED PAVEMENT MARKINGS



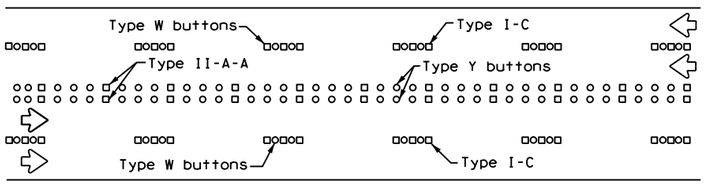
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



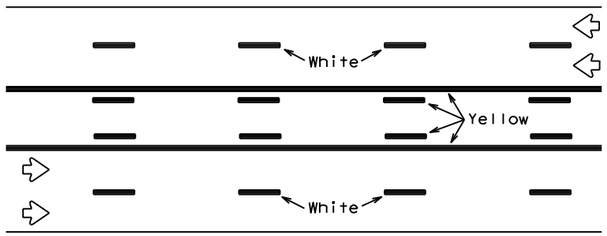
REFLECTORIZED PAVEMENT MARKINGS



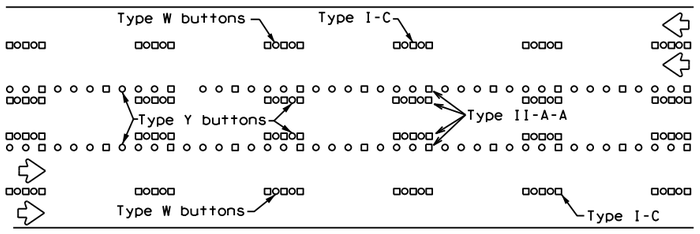
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

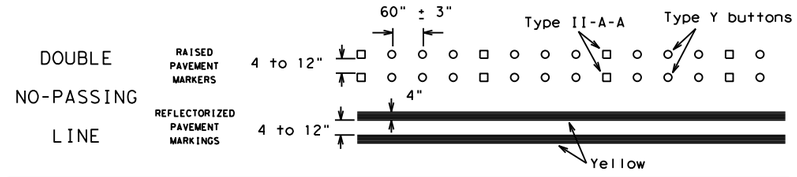
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

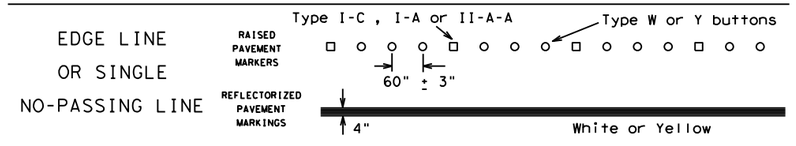
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

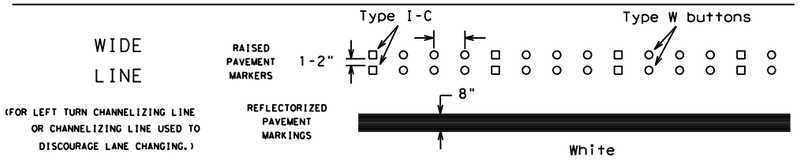


EDGE LINE OR SINGLE NO-PASSING LINE



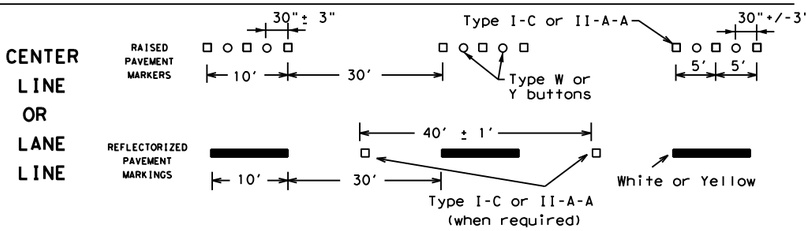
WIDE LINE

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

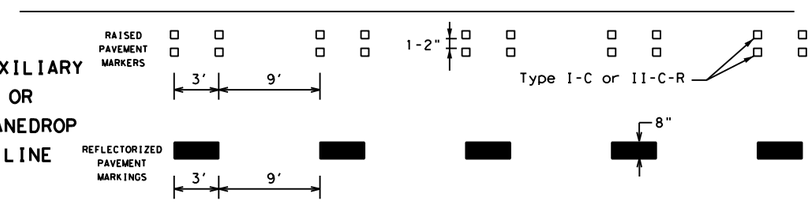


BROKEN LINES

CENTER LINE OR LANE LINE

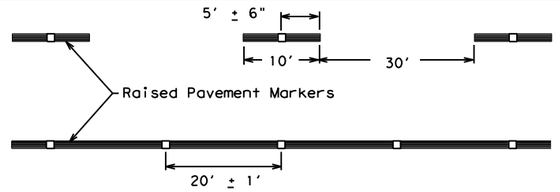


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	SJT	CROCKETT		31

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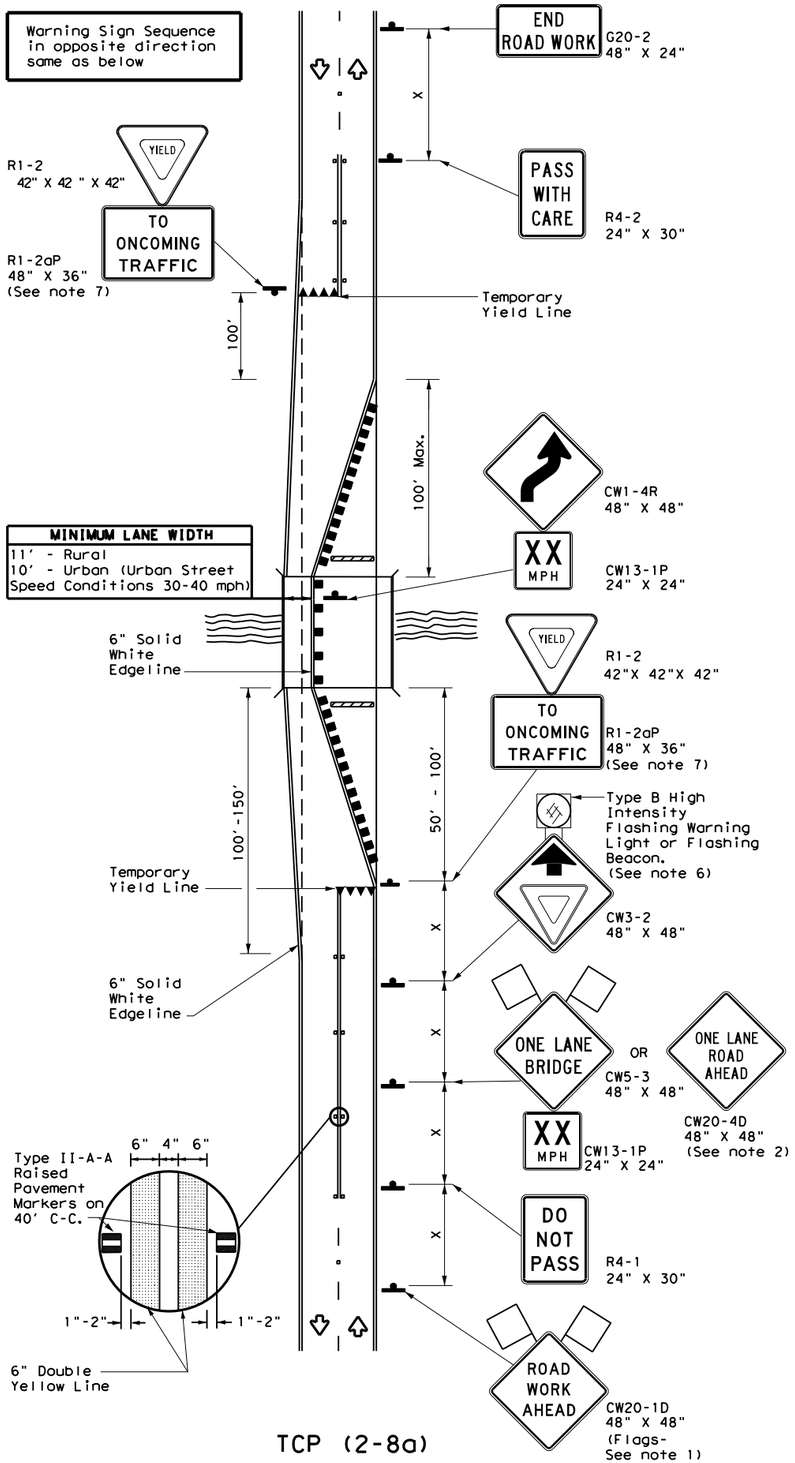
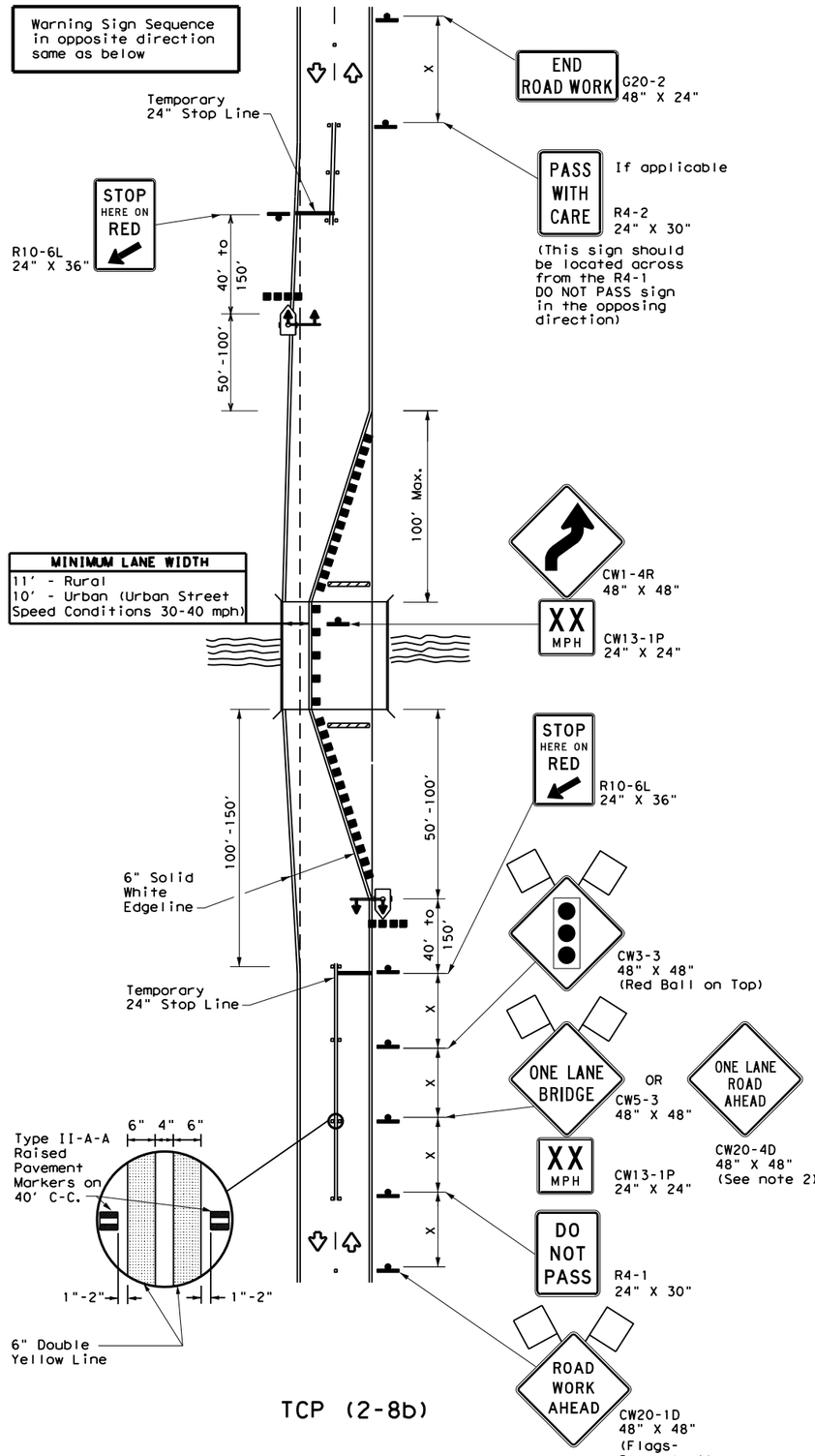


TCP (2-8a)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH YIELD SIGNS
(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.

TCP (2-8a)

5. Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
6. If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
7. The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.

TCP (2-8b)

8. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
9. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

Texas Department of Transportation | Traffic Safety Division Standard

TRAFFIC CONTROL PLAN LONG TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-23

FILE: tcp2-8-23.dgn	DN:	CK:	DW:	CK:
© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		32

168

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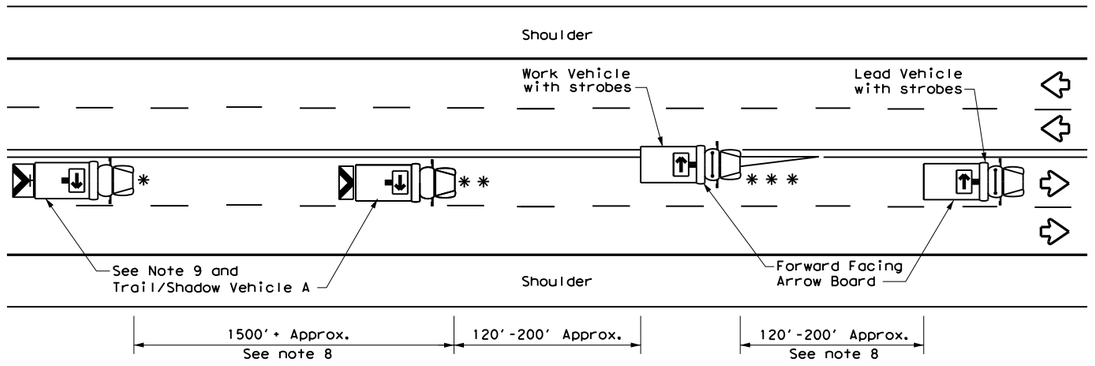
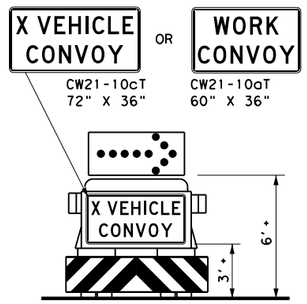


TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

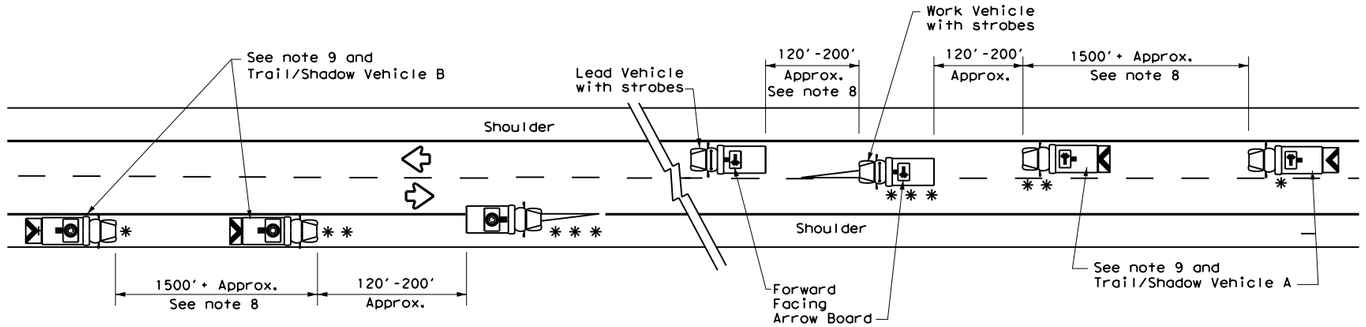
with RIGHT Directional display Flashing Arrow Board

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

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

GENERAL NOTES

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

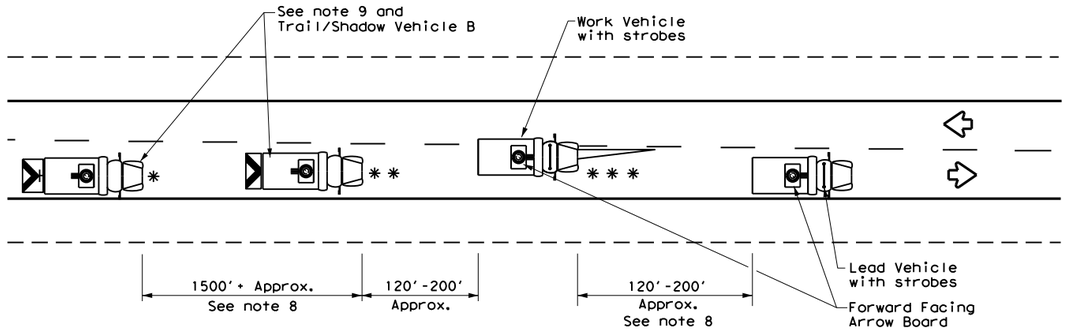


WORK ON SHOULDER

WORK ON TRAVEL LANE

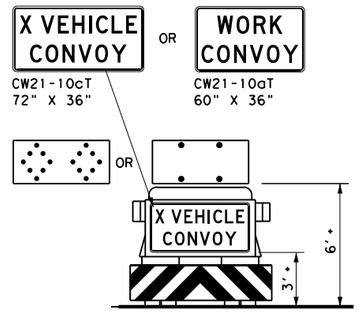
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



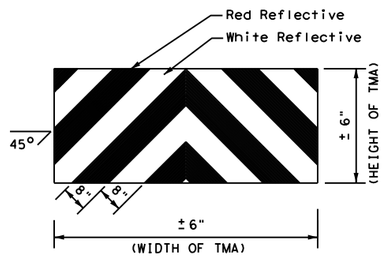
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		33

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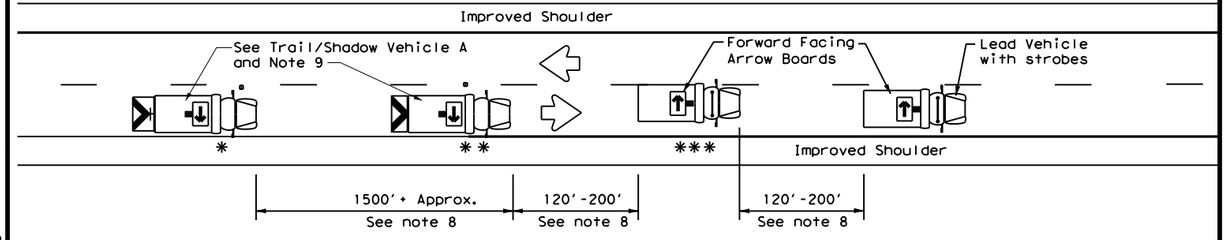
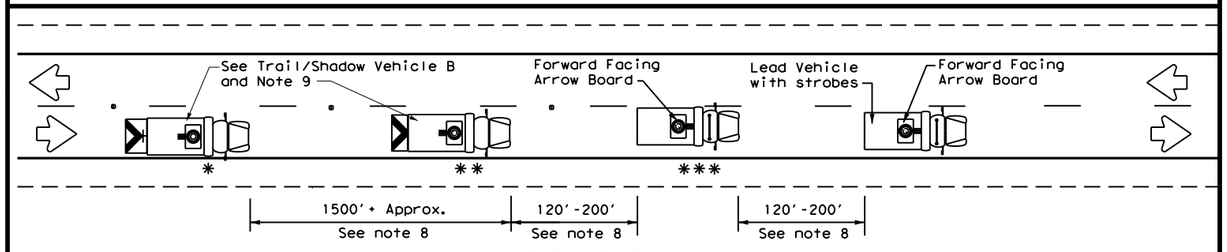


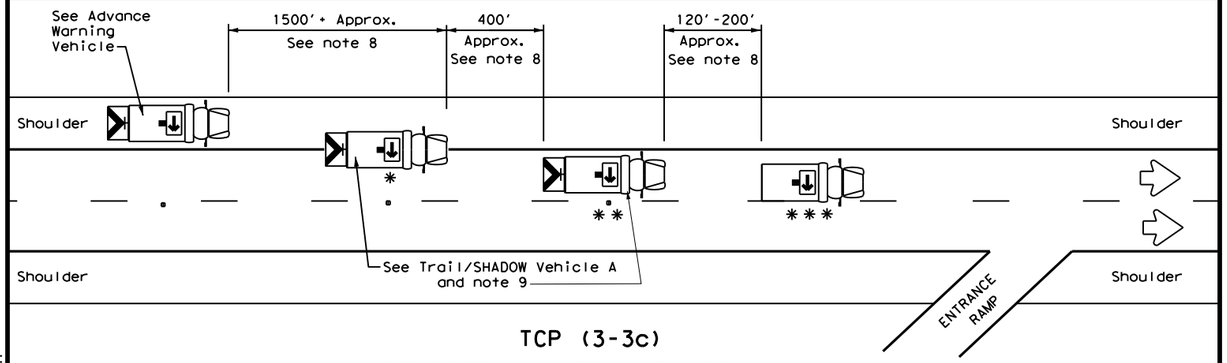
TCP (3-3a)

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



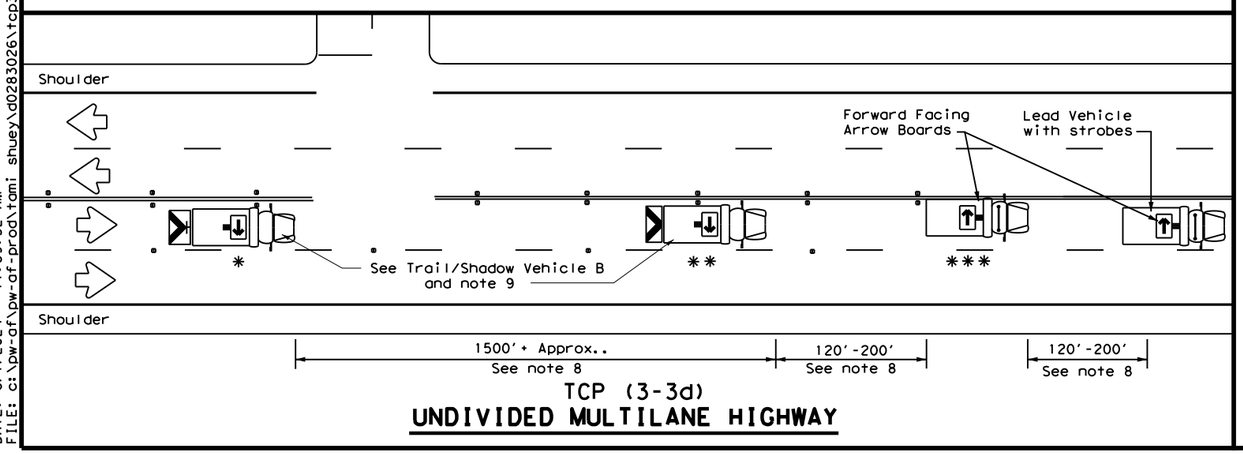
TCP (3-3b)

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



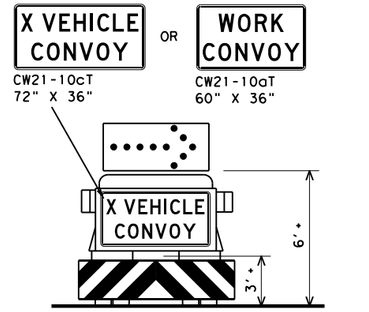
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



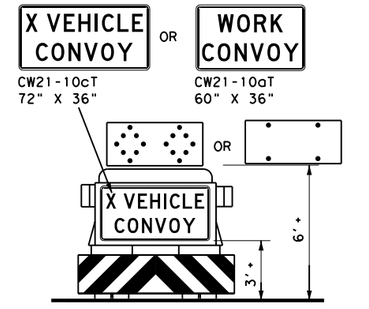
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



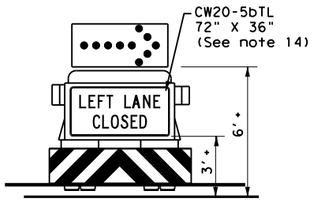
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

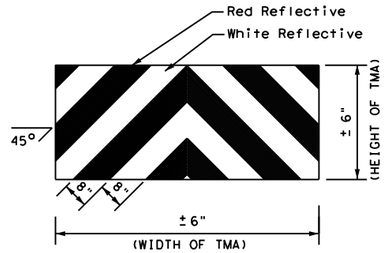


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	SJT	CROCKETT		34
1-97 7-14				

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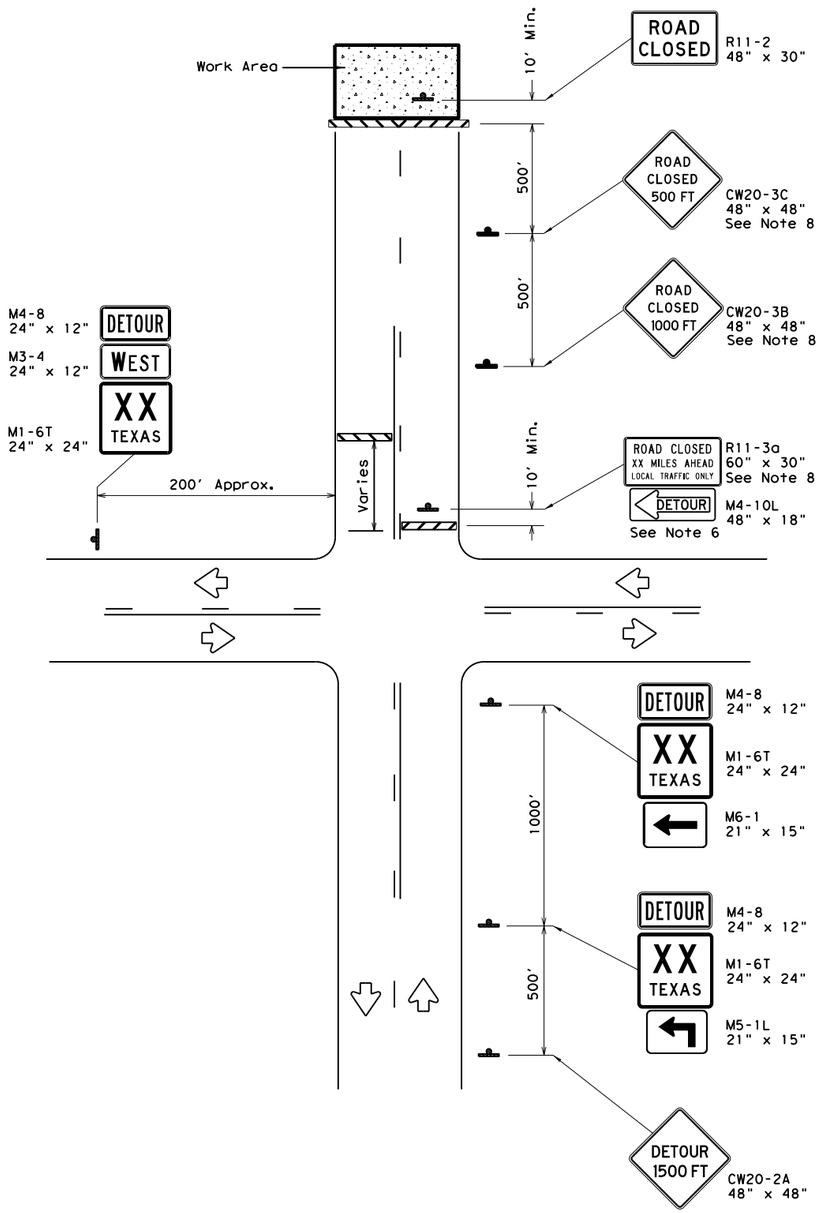
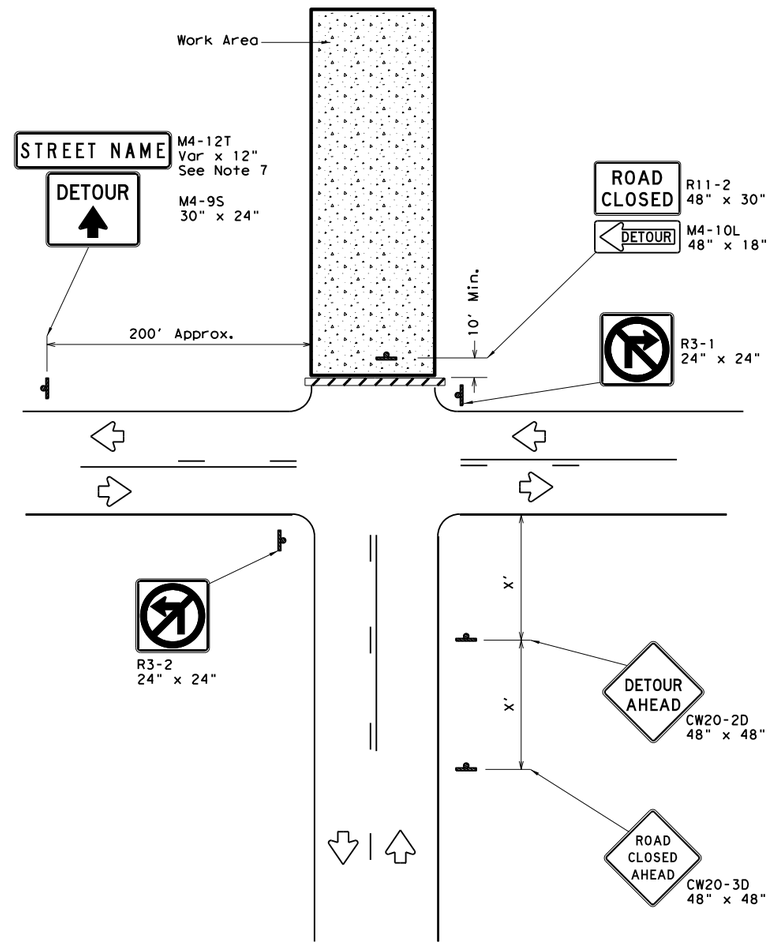


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	SJT	CROCKETT		35

113

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DATE: 6/1/2024 11:40:48 AM
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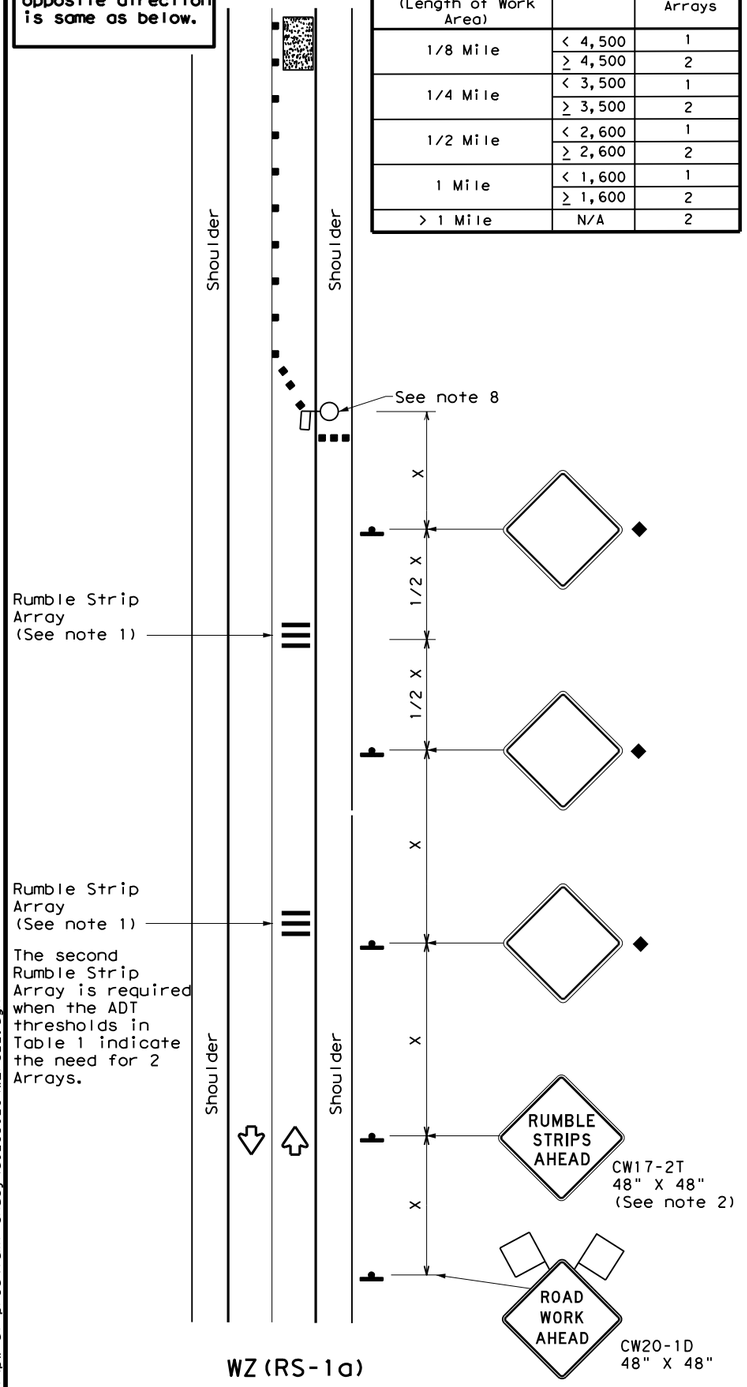
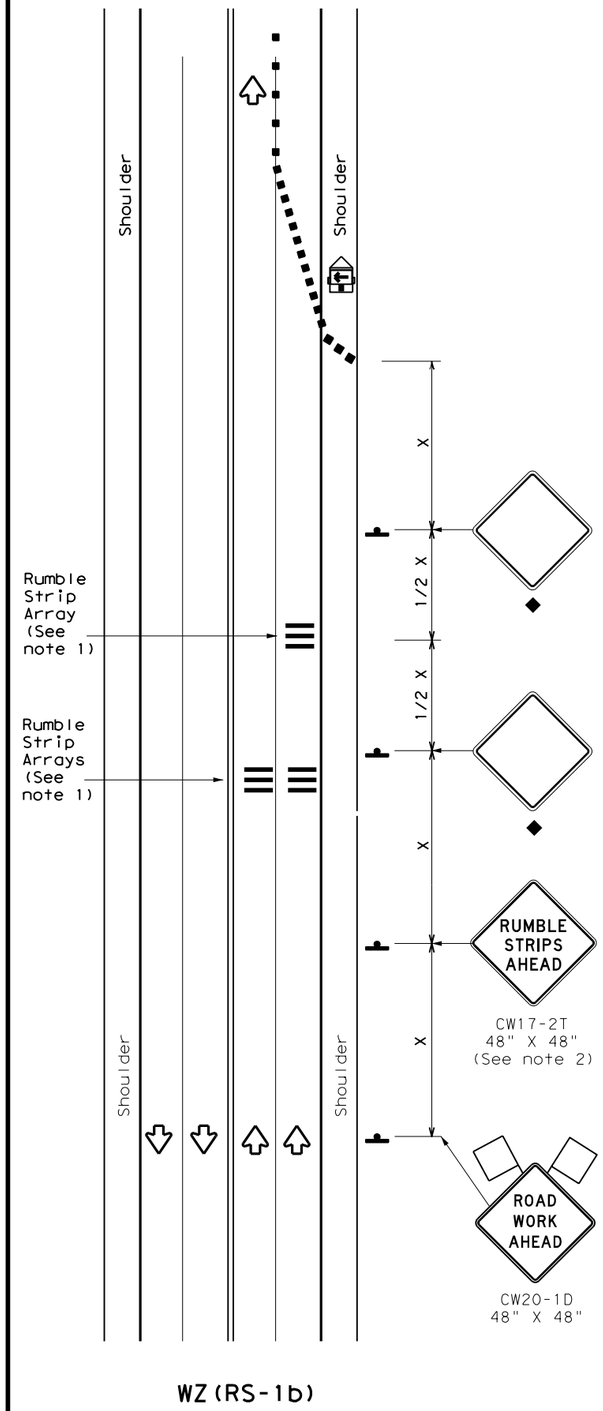
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

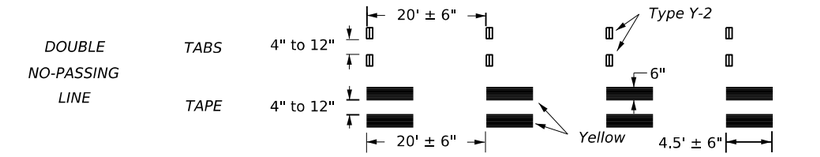
WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		36

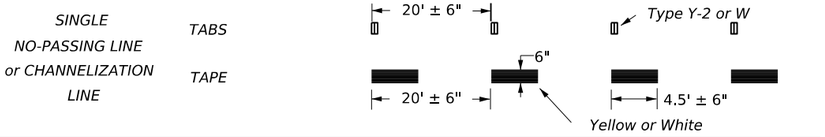
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

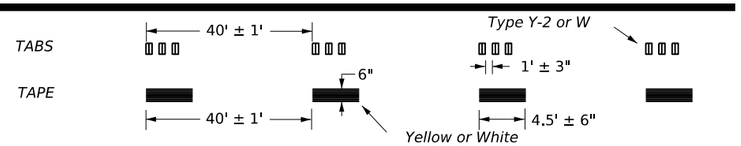


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



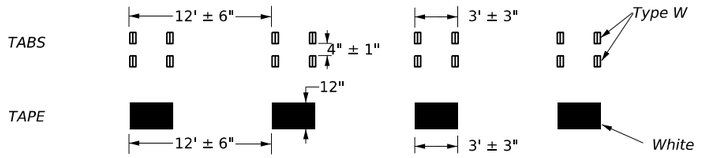
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

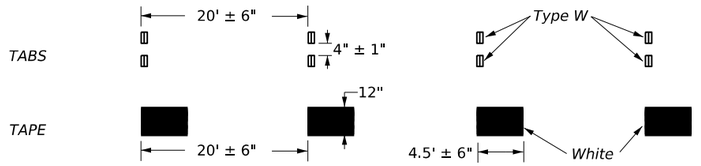


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



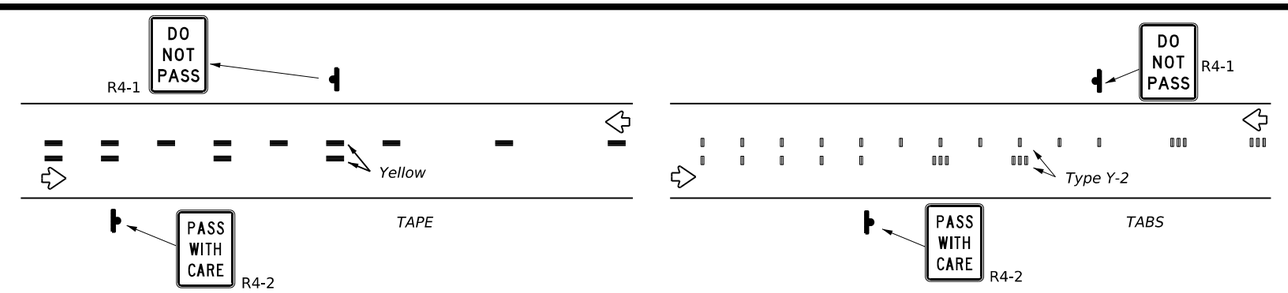
NOTES:

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

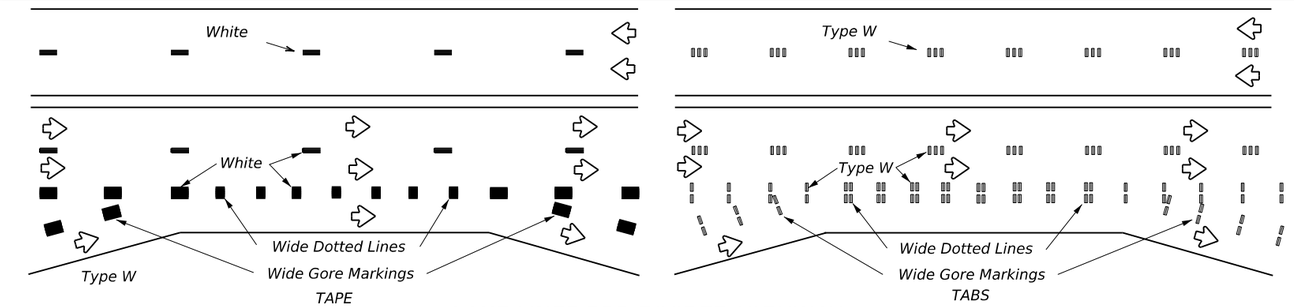
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

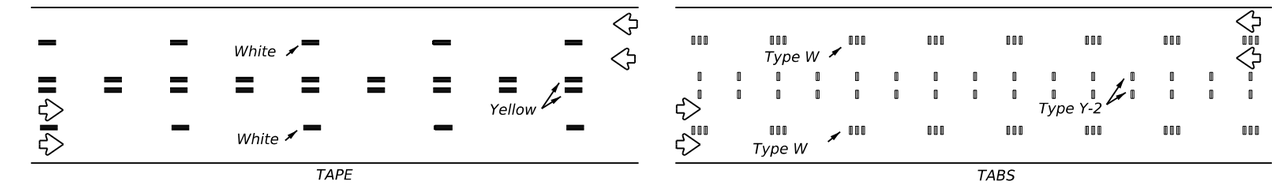
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



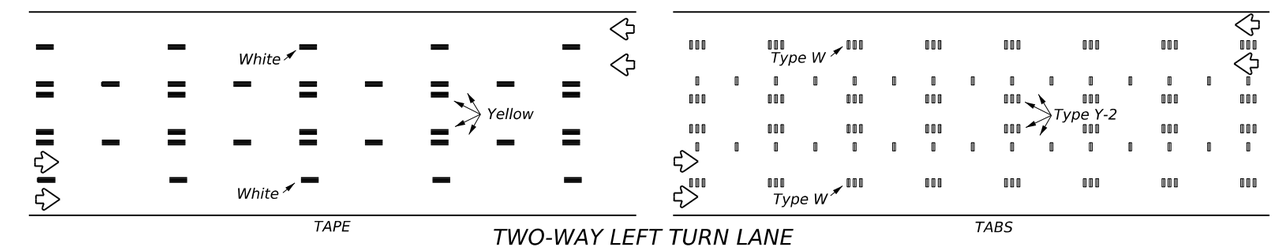
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



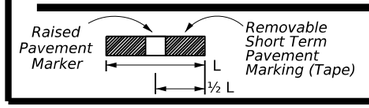
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

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©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
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1-97 2-23	SJT	CROCKETT		37
3-03				

111

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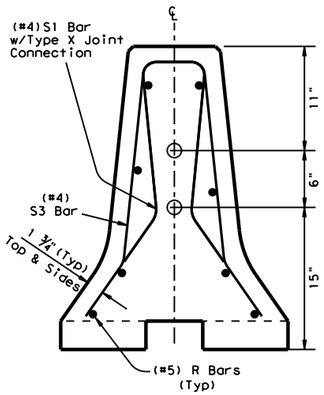
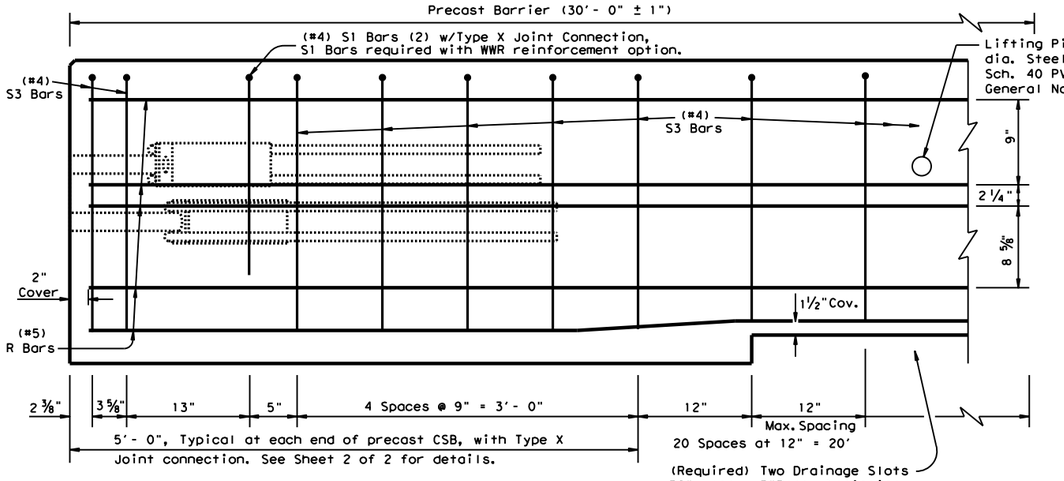


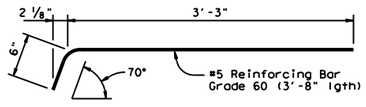
End View Precast Barrier

See sheet 2 of 3 for Joint connection Type X



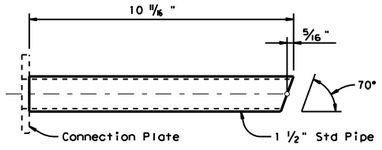
Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X



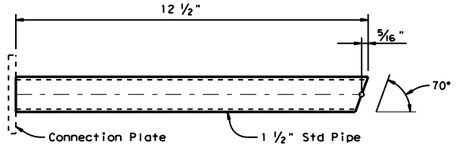
DEFORMED BAR ANCHOR DETAILS

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



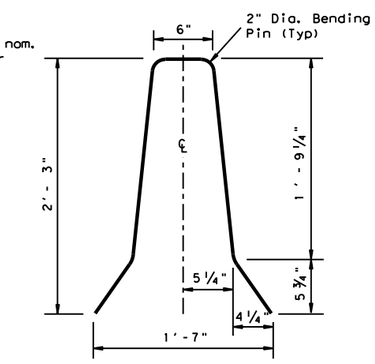
UPPER CONNECTION PIPE DETAILS

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



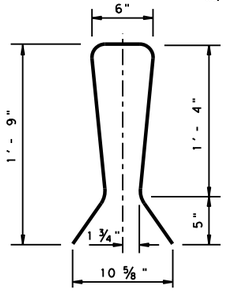
LOWER CONNECTION PIPE DETAILS

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



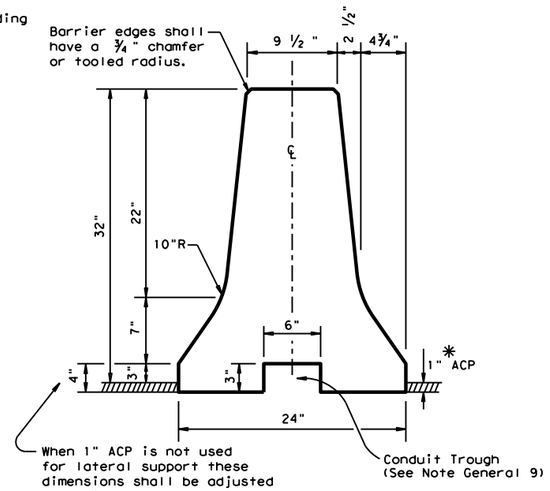
S3 Bar

#4 Bar



S1 Bar

#4 Bar (2)
(Joint Type X)

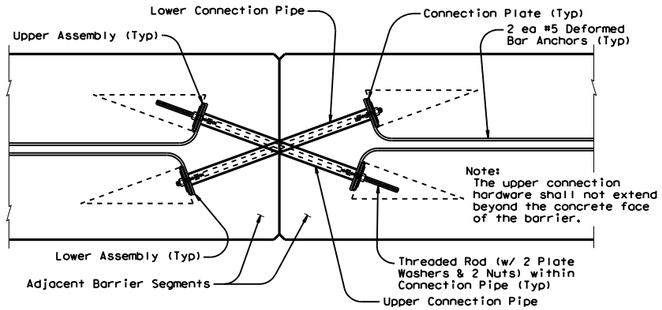


Concrete Safety Barrier

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

GENERAL NOTES

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



TYPE X JOINT INSTALLATION DETAIL

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

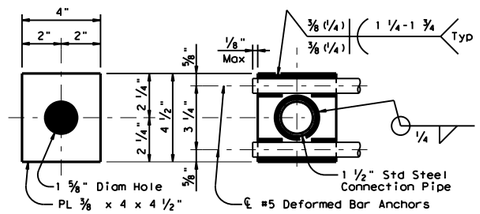
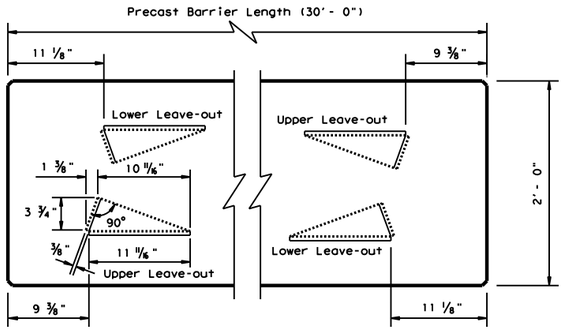


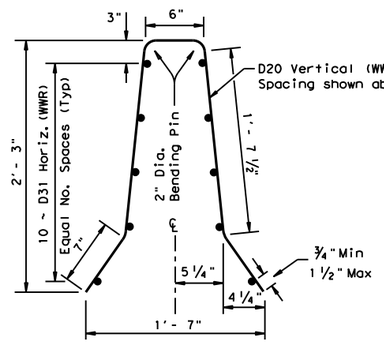
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

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



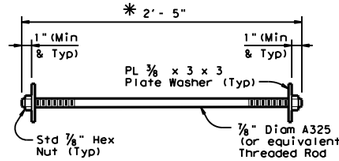
BARRIER PLAN AT END JOINTS



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

(WWR) General Notes

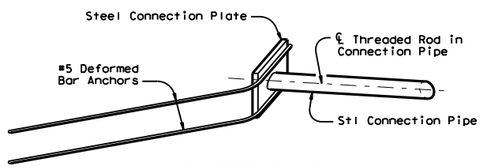
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing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



CONNECTION BOLT OR THREADED ROD DETAIL

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

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



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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

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

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER (TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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	SJT	CROCKETT		38

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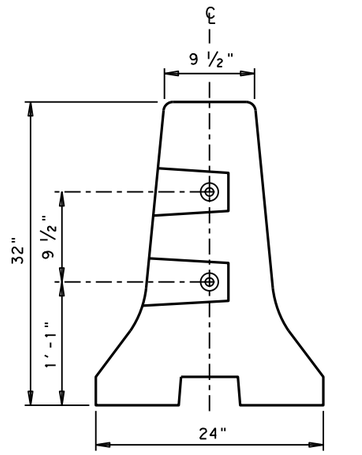
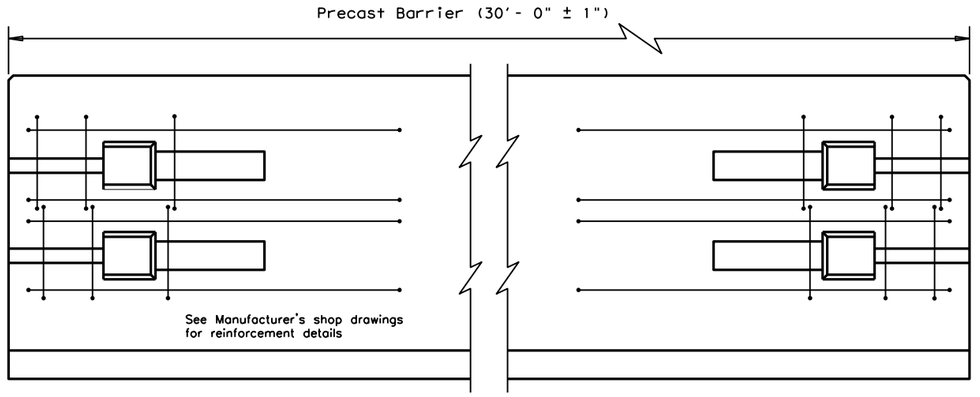
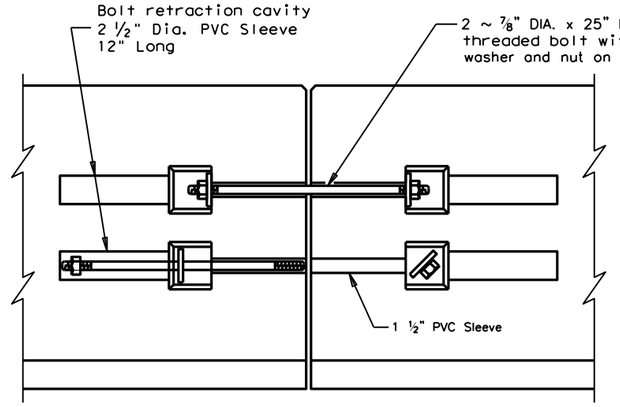


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

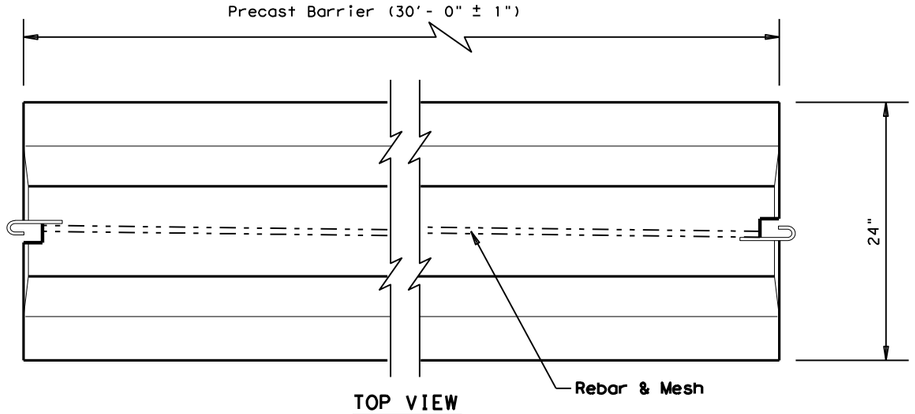


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

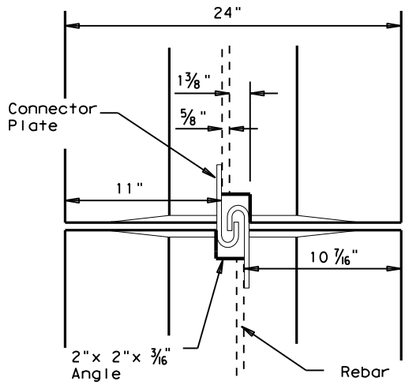


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

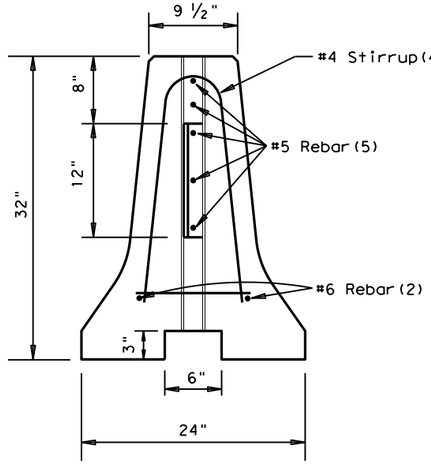
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

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

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

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

Texas Department of Transportation
Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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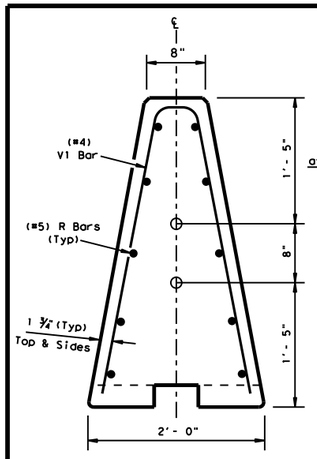
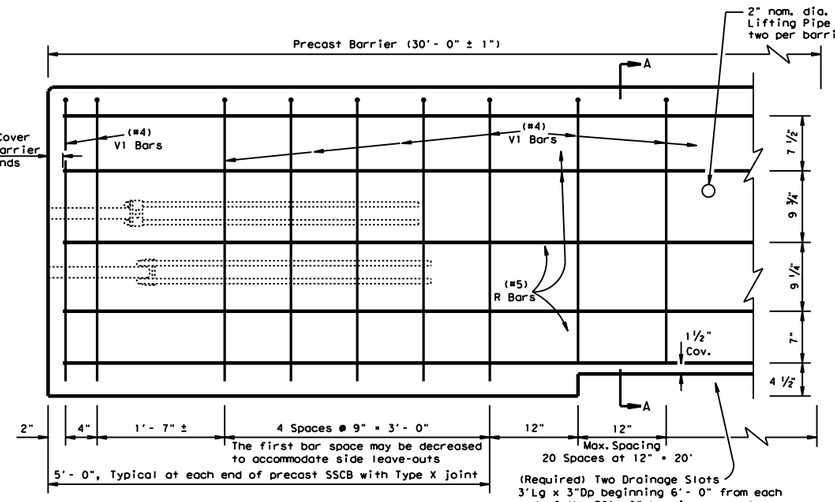


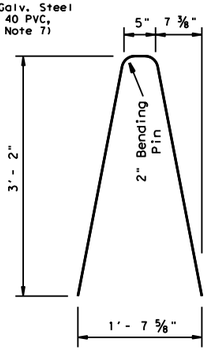
End View
Precast Barrier

Pipe locations for Joint Type X connection



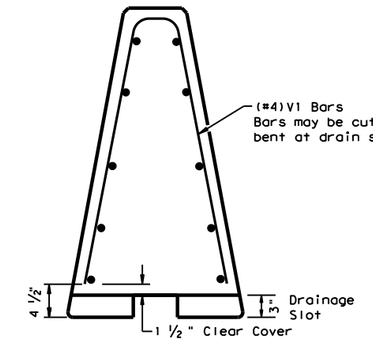
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



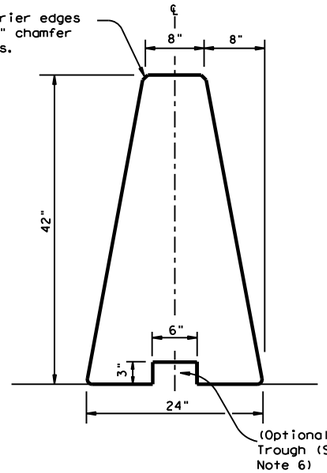
V1 Bar
#4 Rebar

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



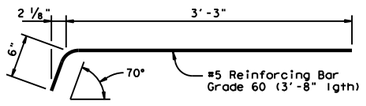
Section A-A
Steel Placement at (Required) Drainage Slots

All precast barrier edges shall have a ¾" chamfer or tooled radius.



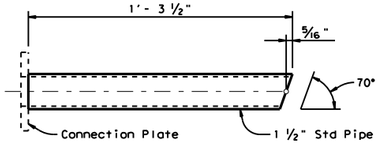
Single Slope Concrete Traffic Barrier

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



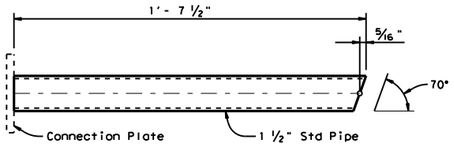
DEFORMED BAR ANCHOR DETAILS

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



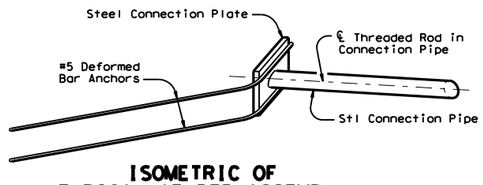
UPPER CONNECTION PIPE DETAILS

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



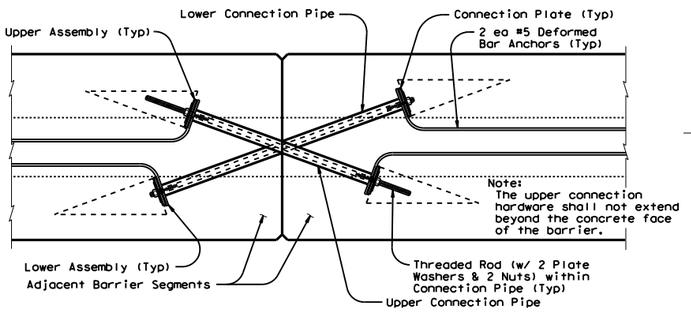
LOWER CONNECTION PIPE DETAILS

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



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

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



TYPE X JOINT INSTALLATION DETAIL

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

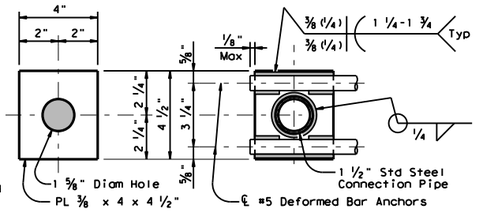
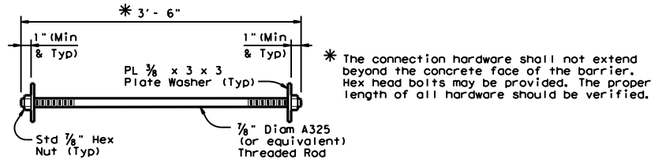


PLATE DIMENSIONS **WELDING DETAILS**

CONNECTION PLATE DETAILS

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



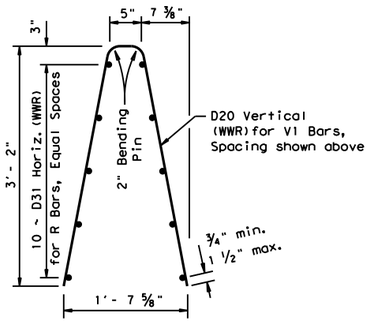
CONNECTION BOLT OR THREADED ROD DETAIL

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

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

General Notes

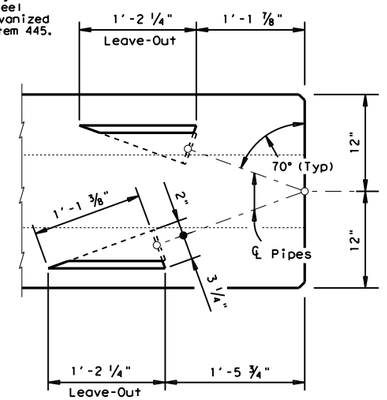
1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled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



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

(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

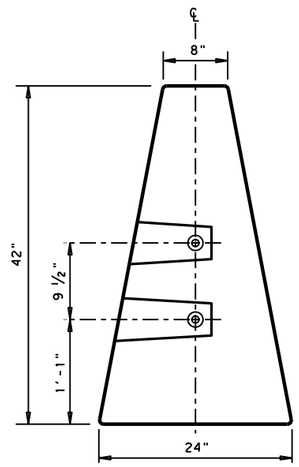
Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

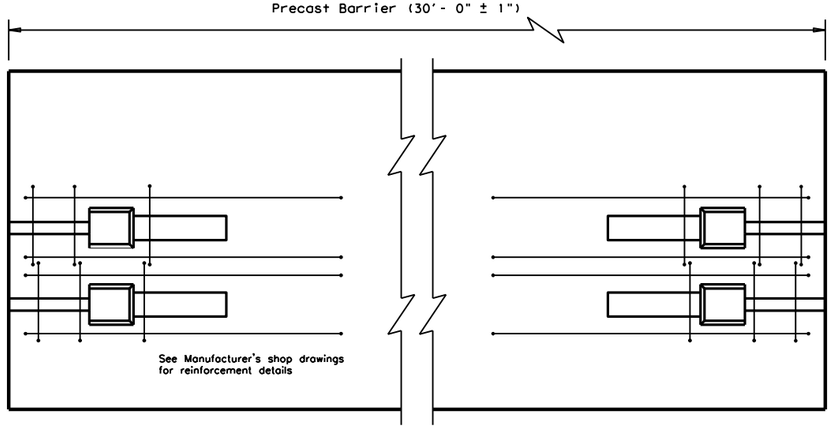
PRECAST BARRIER (TYPE 1)

SSCB(2)-10

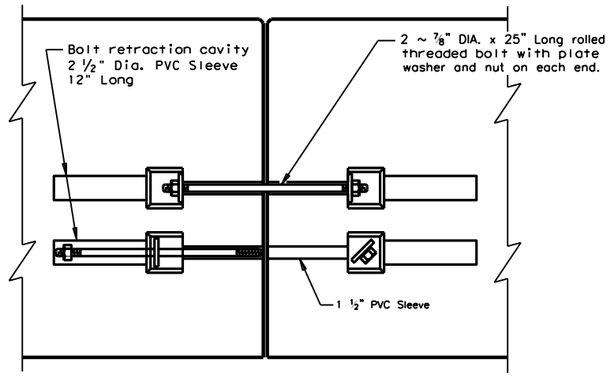
FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		40



END VIEW
"QUICK-BOLT" POCKET LOCATIONS

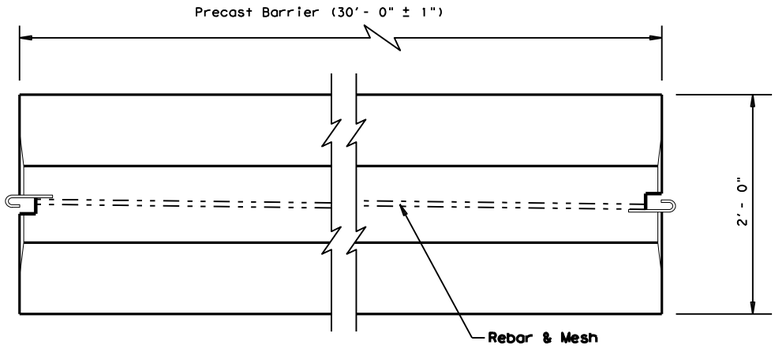


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

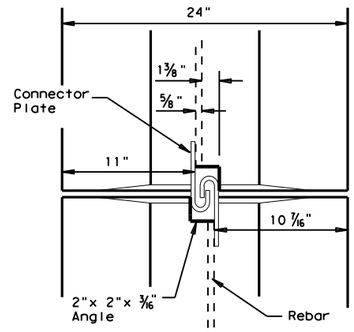


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

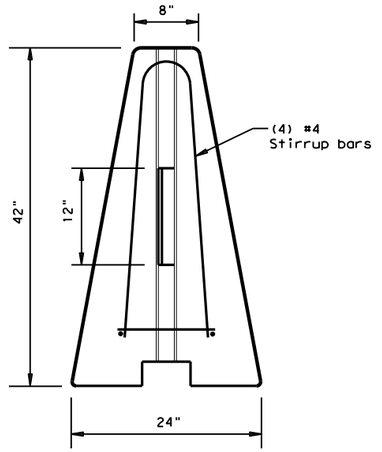
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



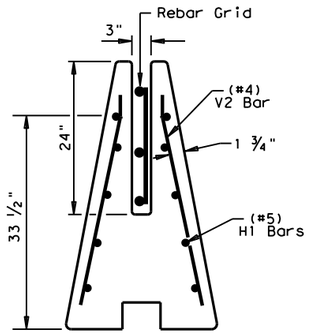
END VIEW

Proprietary Joint Connections (SSCB)

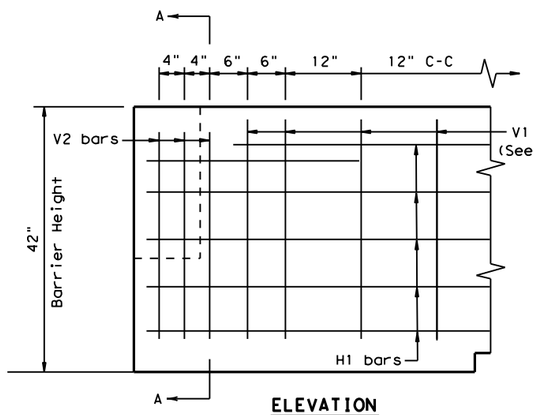
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

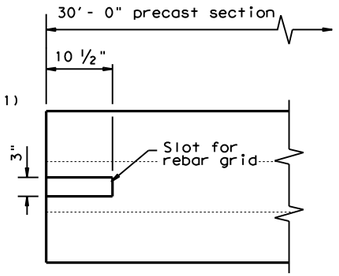
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



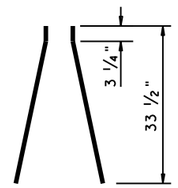
SECTION A-A
Showing (Type R) Rebar Grid



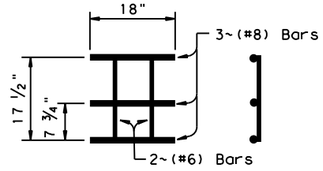
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



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



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

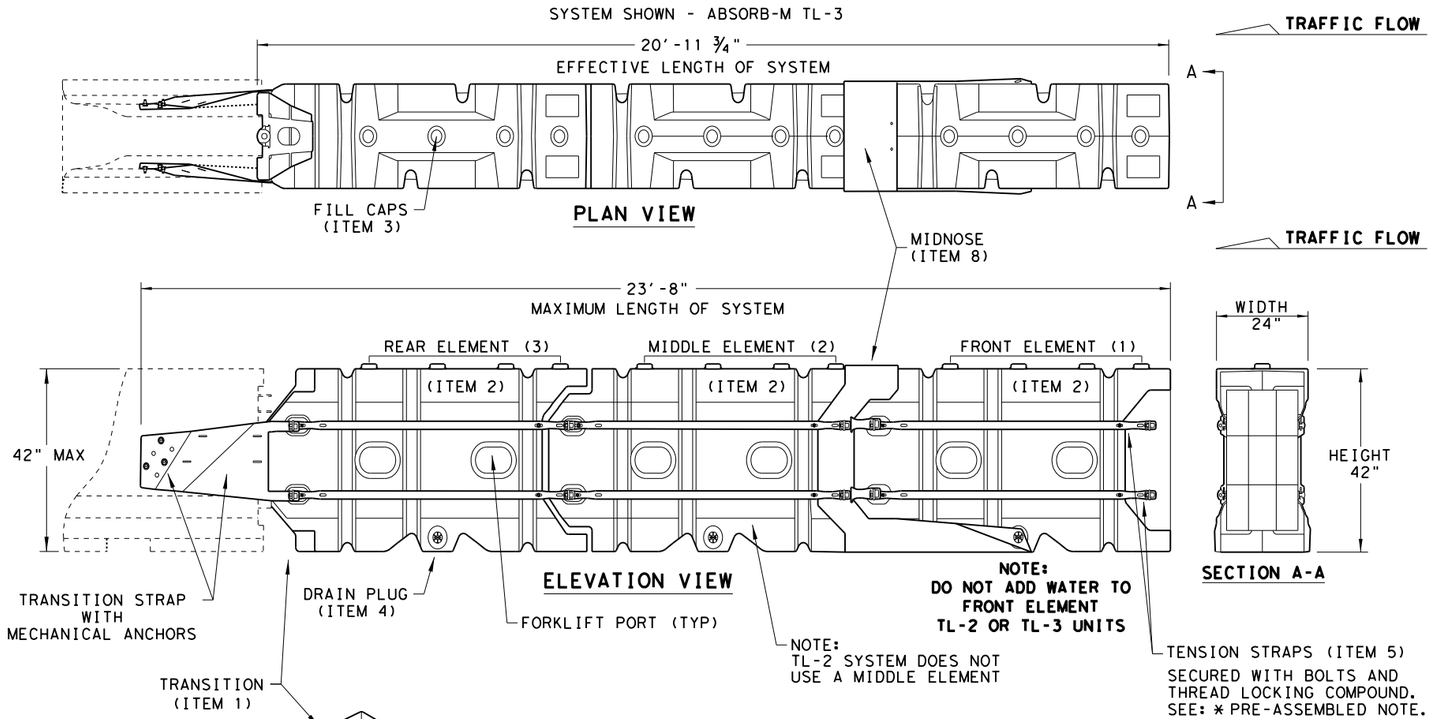
SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		41

DATE: 6/1/2024
FILE: c:\pw-df\pw-df-prod\tami shuey\d0283026\sscb210.dgn

DATE: 6/1/2024
FILE: c:\pw-df\pw-of-prod\tami shuey\d0283026\absorbm19.dgn

SYSTEM SHOWN - ABSORB-M TL-3



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

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

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

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

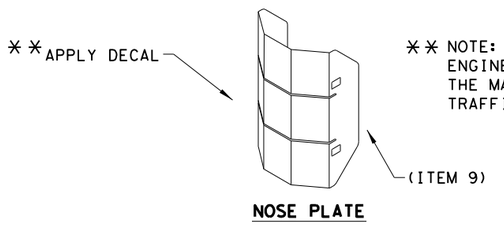
GENERAL NOTES

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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation
Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
REVISIONS	CONT	SECT	JOB	HIGHWAY
	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		42

DATE: 6/1/2024
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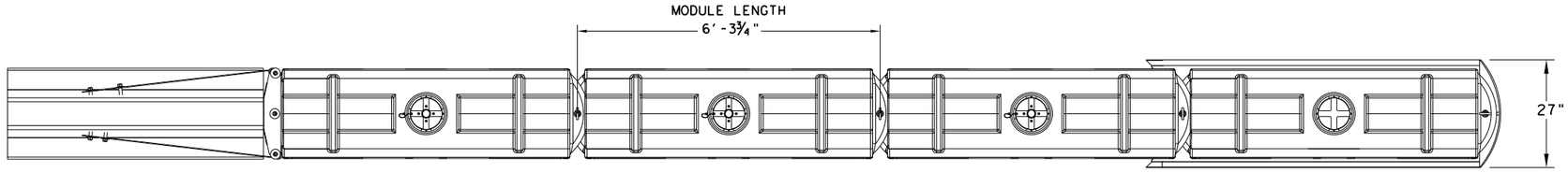
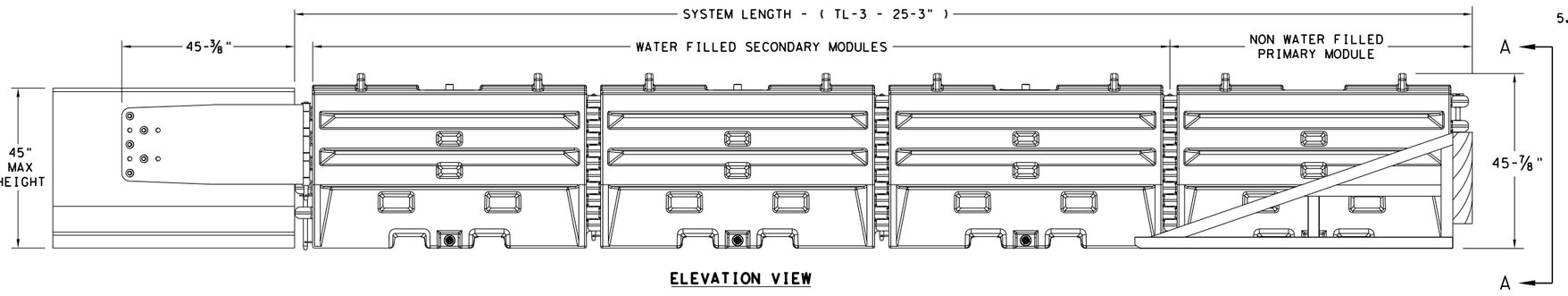


PLAN VIEW



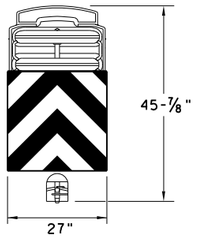
ELEVATION VIEW

GENERAL NOTES

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

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

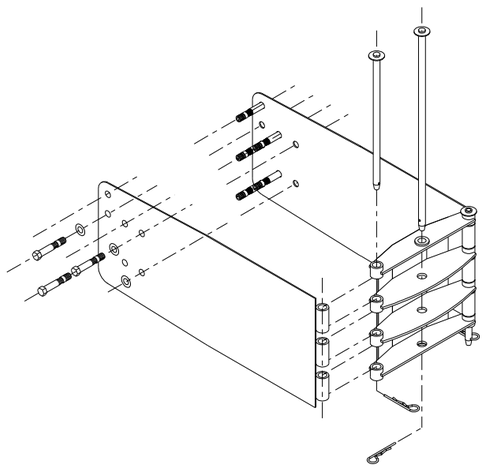
TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"



SECTION A-A

NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

BILL OF MATERIAL

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

Texas Department of Transportation

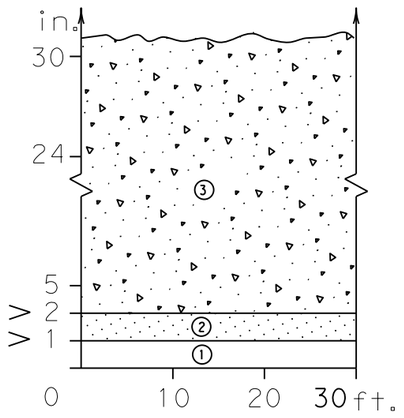
Design Division Standard

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

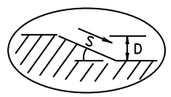
FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		43

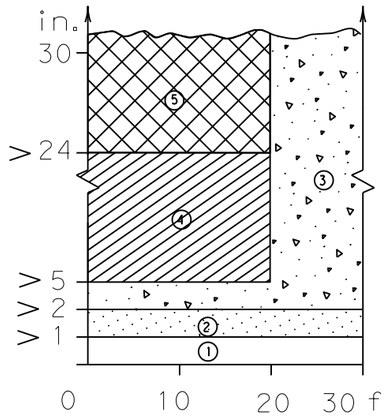
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

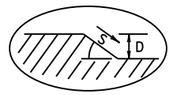


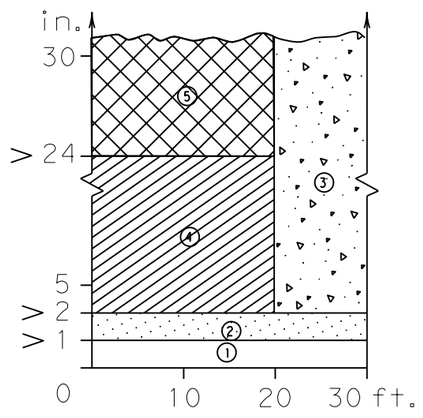
Edge Condition I
S = (3:1) (or flatter)



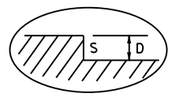


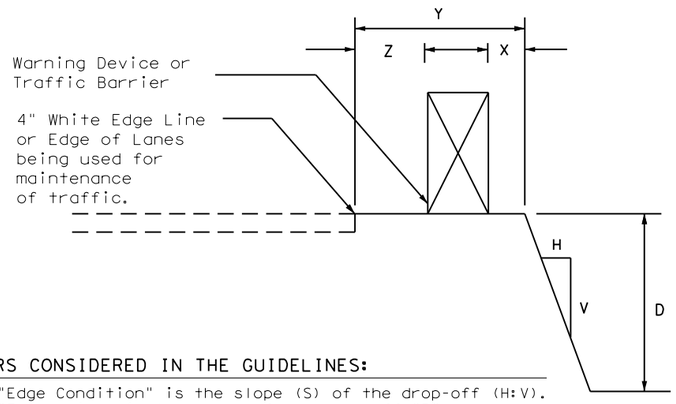
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

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

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

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

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

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

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

Edge Condition Notes:

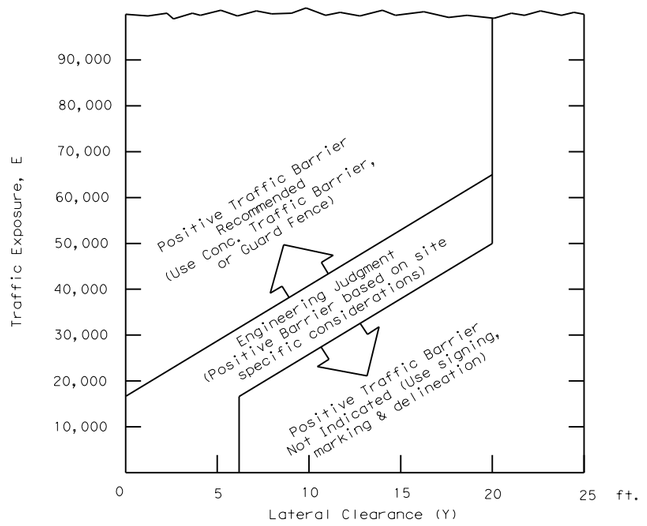
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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

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

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

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



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

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

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

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

Engineer's Seal

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
© TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		44

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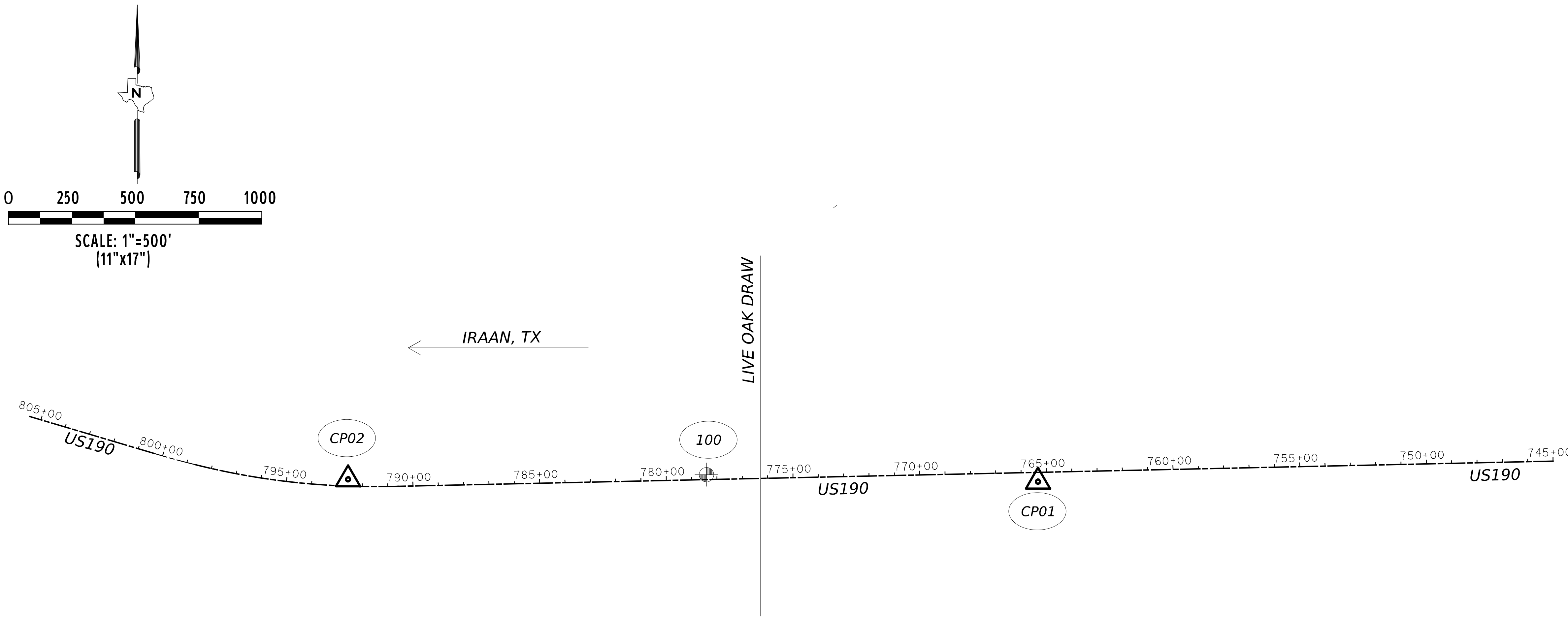
FILE: c:\pw-df\pw-df-prod\tami shuey\d0283026\TREATMENT FOR VARIOUS EDGE CONDITIONS.dgn



1) THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00.
2) ALL COORDINATES AND DISTANCES ARE US SURVEY FEET, DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY 1.00012 (SURFACE ADJUSTMENT FACTOR FOR CROCKETT COUNTY).
3) THE VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), GEOID 18.
4) HORIZONTAL AND VERTICAL CONTROL VALUES WERE ESTABLISHED USING THE TXDOT VRS NETWORK, IN DECEMBER, 2022.

△ 3 1/4" ALUMINUM DISK SET IN CONCRETE "TXDOT CONTROL MARK"

⌖ BENCH MARK

06/08/2023

NO.	DATE	REVISION	APPROV.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WERE DETERMINED UTILIZING THE TxDOT VRS NETWORK IN DECEMBER, 2022, AND CORRECTLY SHOWN HEREON.

Andrew Chavchalov

ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION # 739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SURVEY CONTROL INDEX

SHEET 1 OF 2

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
			US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	45
CONTROL	SECTION	JOB	
2279	02	023	

BENCH MARK

POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION	STATION	OFFSET
100	10,287,473.778	1,874,385.942	2,353.806	CUT X IN CONCRETE	778+41.02'	19.20' RT

PRIMARY CONTROL

POINT #	NORTHING (Y)	EASTING (X)	ELEVATION	DESCRIPTION	STATION	OFFSET
CP01	10,287,446.311	1,875,693.738	2,354.70	3 1/4" ALUMINUM DISK SET IN CONCRETE	765+38.87'	36.67' RT
CP02	10,287,455.647	1,872,971.781	2,369.62	3 1/4" ALUMINUM DISK SET IN CONCRETE	792+57.08'	26.66' LT

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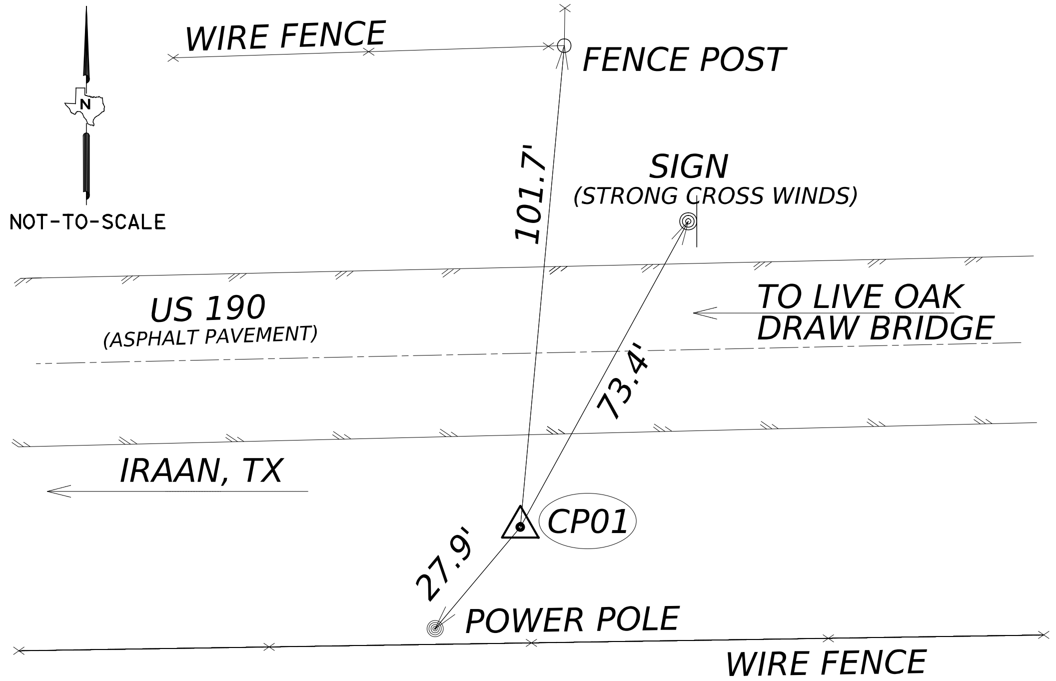

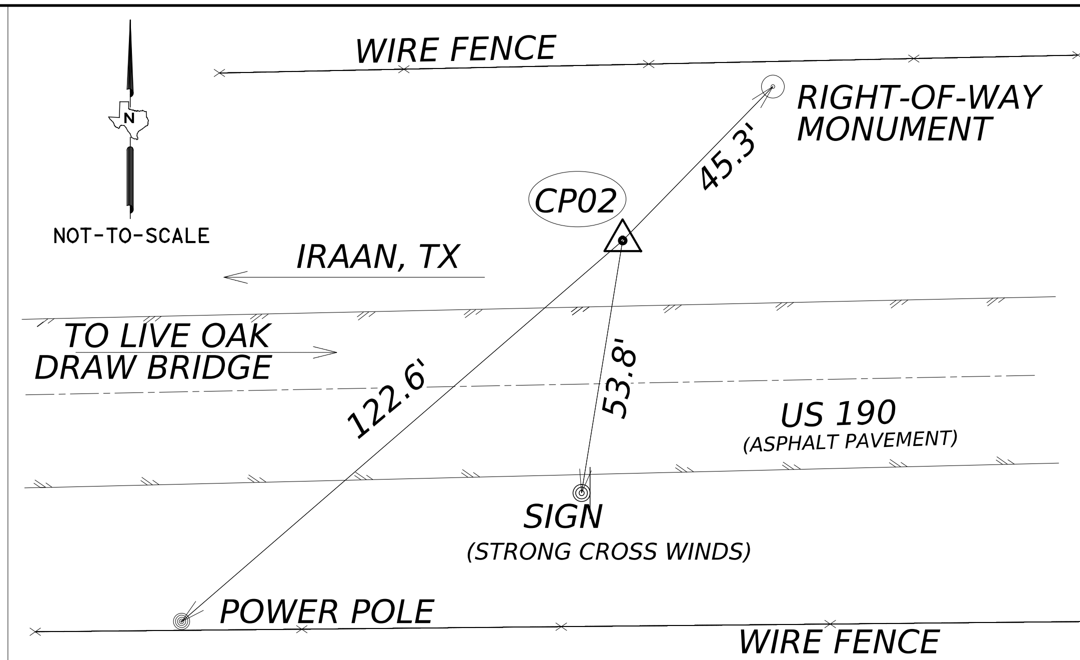

CONTROL POINT NO. 01

GEODETIC POSITION	GRID COORDINATES	SURFACE COORDINATES
LAT: 30°52'38.70897" N	NORTH: 10,285,389.233	NORTH: 10,287,446.311
LONG:101°40'34.56401" W	EAST: 1,875,318.674	EAST: 1,875,693.738
ELEV: 2,354.70'		

3-1/4" ALUMINUM CAP SET IN CONCRETE. LOCATED APPROXIMATELY 13.8 MILES EAST OF THE INTERSECTION OF DRAKE ST. (S.H. 349) AND U.S. 190 IN THE CITY OF IRAAN, TEXAS. SET ON THE SOUTH SIDE OF US 190 EAST OF BRIDGE AT LIVE OAK DRAW, 101.7' SOUTHWEST FROM A FENCE POST, 73.4' SOUTHWEST FROM A "STRONG CROSS WINDS"SIGN, 27.9' NORTHEAST FROM A POWER POLE.

CONTROL POINT NO. 02

GEODETIC POSITION	GRID COORDINATES	SURFACE COORDINATES
LAT: 30°52'38.47512" N	NORTH: 10,285,389.567	NORTH: 10,287,455.647
LONG:101°41'05.79403" W	EAST: 1,872,597.262	EAST: 1,872,971.781
ELEV: 2,369.62'		

3-1/4" ALUMINUM CAP SET IN CONCRETE. LOCATED ROUGHLY 13.3 MILES EAST OF THE INTERSECTION OF DRAKE ST. (S.H. 349) AND U.S. 190 IN THE CITY OF IRAAN, TEXAS. SET ON THE NORTH SIDE OF US 190 WEST OF LIVE OAK DRAW BRIDGE, 122.6' NORTHEAST FROM A POWER POLE, 53.8' NORTHEAST FROM "STRONG CROSS WINDS"SIGN, 45.3' SOUTHEAST FROM AN RIGHT-OF-WAY MONUMENT.

1) THE BASIS OF BEARING IS THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (NAD83) 2011 ADJUSTMENT, EPOCH 2010.00.
2) ALL COORDINATES AND DISTANCES ARE US SURVEY FEET, DISPLAYED IN SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY 1.00012 (SURFACE ADJUSTMENT FACTOR FOR CROCKETT COUNTY).
3) THE VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), GEOID 18.
4) HORIZONTAL AND VERTICAL CONTROL VALUES WERE ESTABLISHED USING THE TXDOT VRS NETWORK, IN DECEMBER, 2022.

△ 3 1/4" ALUMINUM DISK SET IN CONCRETE "TXDOT CONTROL MARK"

STATE OF TEXAS · REGISTERED · ANDREW CHAVCHALOV · 6708 · PROFESSIONAL · LAND SURVEYOR

06/08/2023

NO.	DATE	REVISION	APPROV.

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WERE DETERMINED UTILIZING THE TxDOT VRS NETWORK IN DECEMBER, 2022, AND CORRECTLY SHOWN HEREON.

Andrew Chavchalov

ANDREW CHAVCHALOV, R.P.L.S. TEXAS No. 6708

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION # 739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

HORIZONTAL AND VERTICAL CONTROL

SHEET 2 OF 2

FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
			US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	46
CONTROL	SECTION	JOB	
2279	02	023	

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Alignment Description:				
Alignment Style:	Alignment\Baseline			
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Element: Linear				
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POT	( )	11984.177 R1	10287479.97	1875557.105
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Tangential Length:		1984.177		

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NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

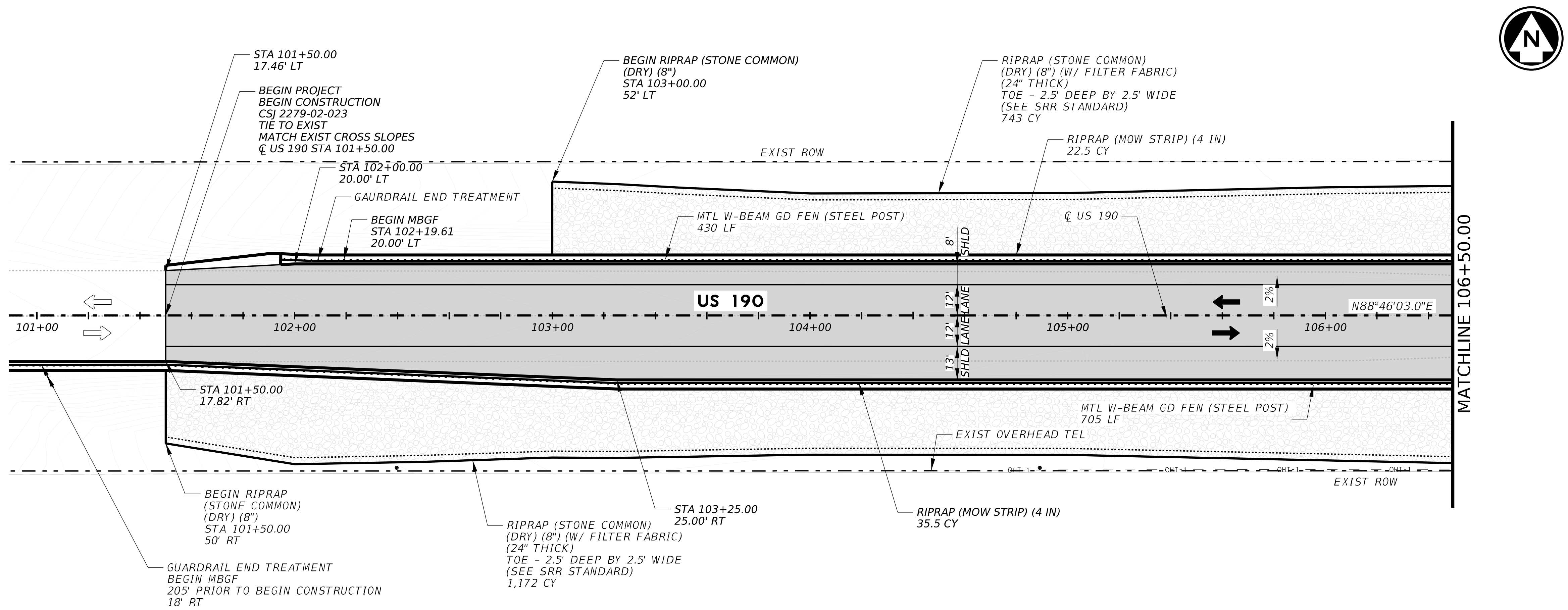
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

HORIZONTAL ALIGNMENT
DATA SHEET

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	47
CONTROL	SECTION	JOB	
2279	02	023	



LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- PROP PAVEMENT (SURFACE TREAT)
- RIPRAP (STONE COMMON) (DRY) (8") (W/ FILTER FABRIC) (24" THICK) TOE - 2.5' DEEP BY 2.5' WIDE
- PROP WIRE FENCE (TY C)
- TEMP WIRE FENCE (TY C)
- GATE (TY 1)

NOTES:

1. RIPRAP (STONE COMMON) (DRY) (8") TO BE PLACED ON SLOPES STEEPER THAN 3:1. RIPRAP LIMITS ARE WHERE THE SLOPE TIES TO EXISTING GROUND. FILTER FABRIC IS SUBSIDIARY TO THE RIPRAP PAY ITEM.

2. REMOVAL OF TEMPORARY FENCE WILL NOT BE PAID DIRECTLY BUT WILL BE SUBSIDIARY TO FENCE PAY ITEMS.

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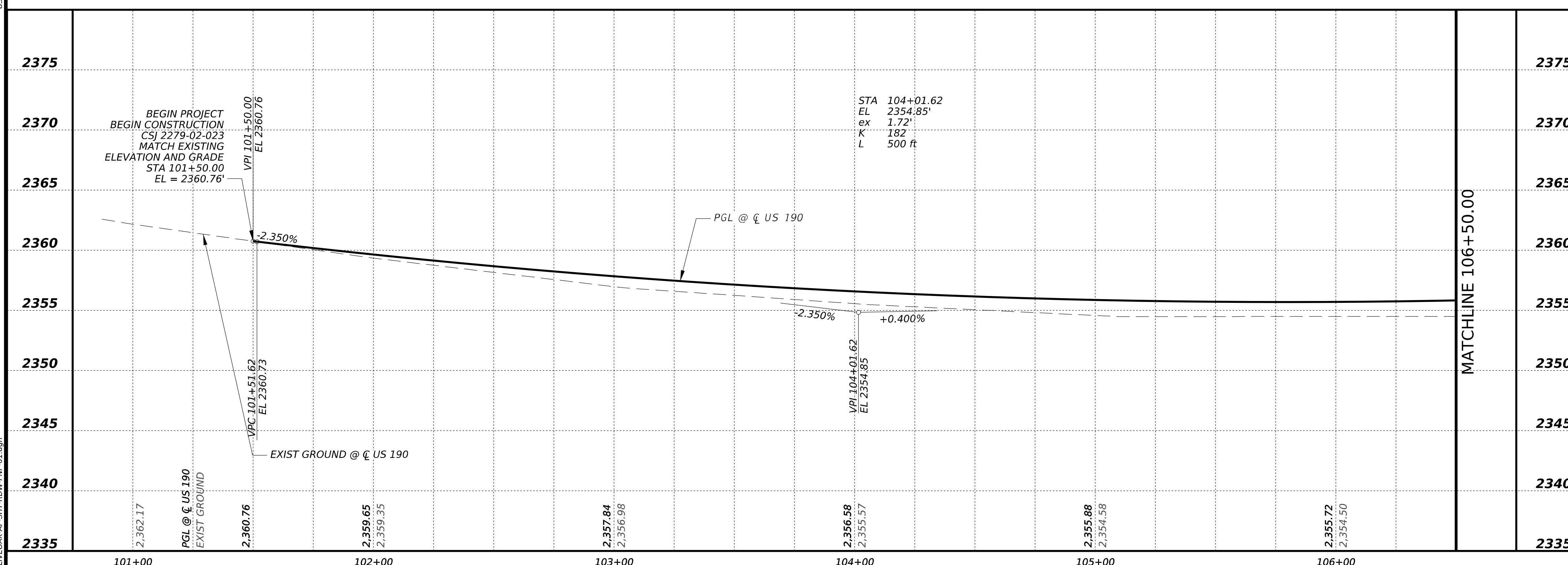
SCALE: 1" = 50'H
1" = 10'V



NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

PLAN & PROFILE
BEGIN TO STA 106+50

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH

FED RD DIV NO.	FEDERAL AID PROJECT	HIGHWAY
6	BR 2B24 (487)	US 190

STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	48
CONTROL	SECTION	JOB	
2279	02	023	

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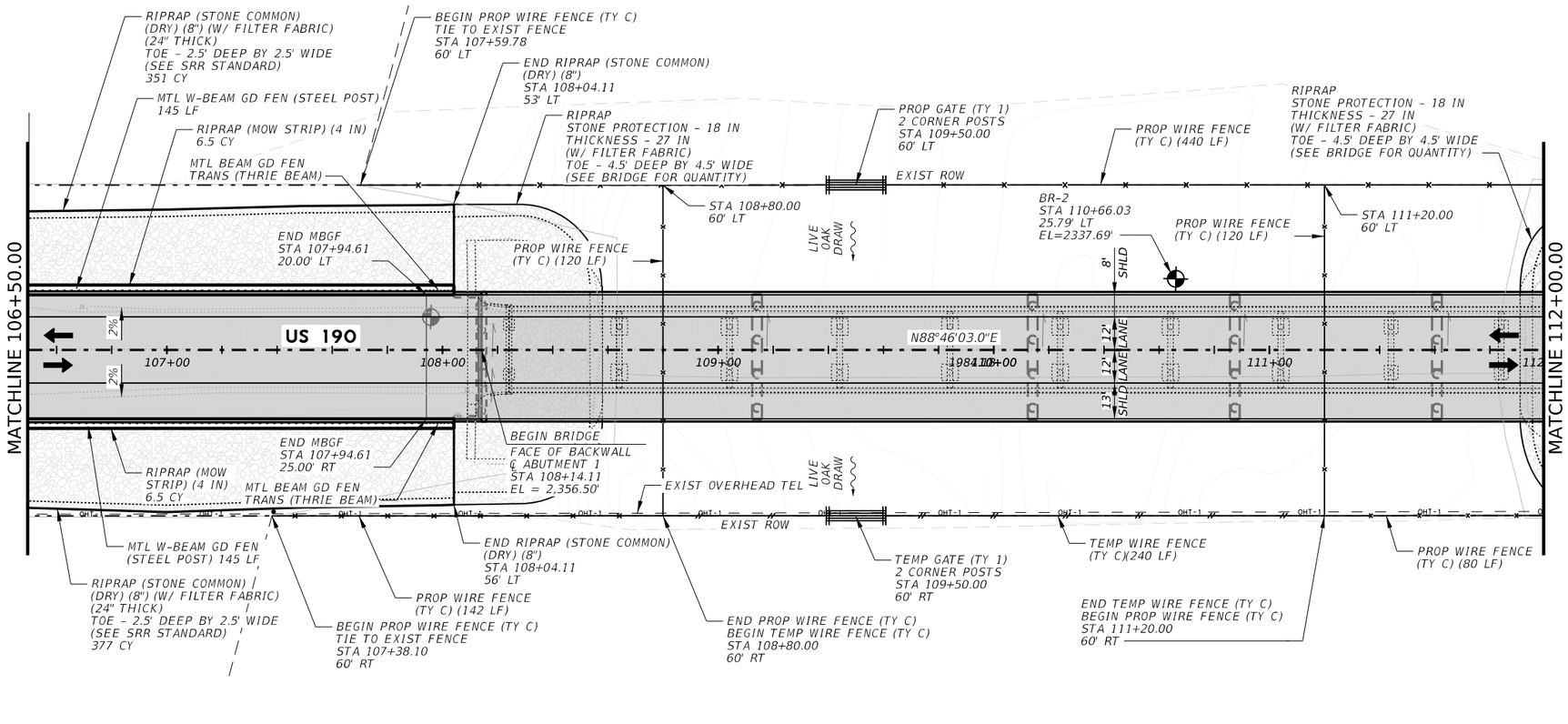

LEGEND

- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- PROP PAVEMENT (SURFACE TREAT)
- RIPRAP (STONE COMMON) (DRY) (8") (W/ FILTER FABRIC) (24" THICK) TOE - 2.5' DEEP BY 2.5' WIDE
- PROP WIRE FENCE (TY C)
- TEMP WIRE FENCE (TY C)
- GATE (TY 1)

NOTES:

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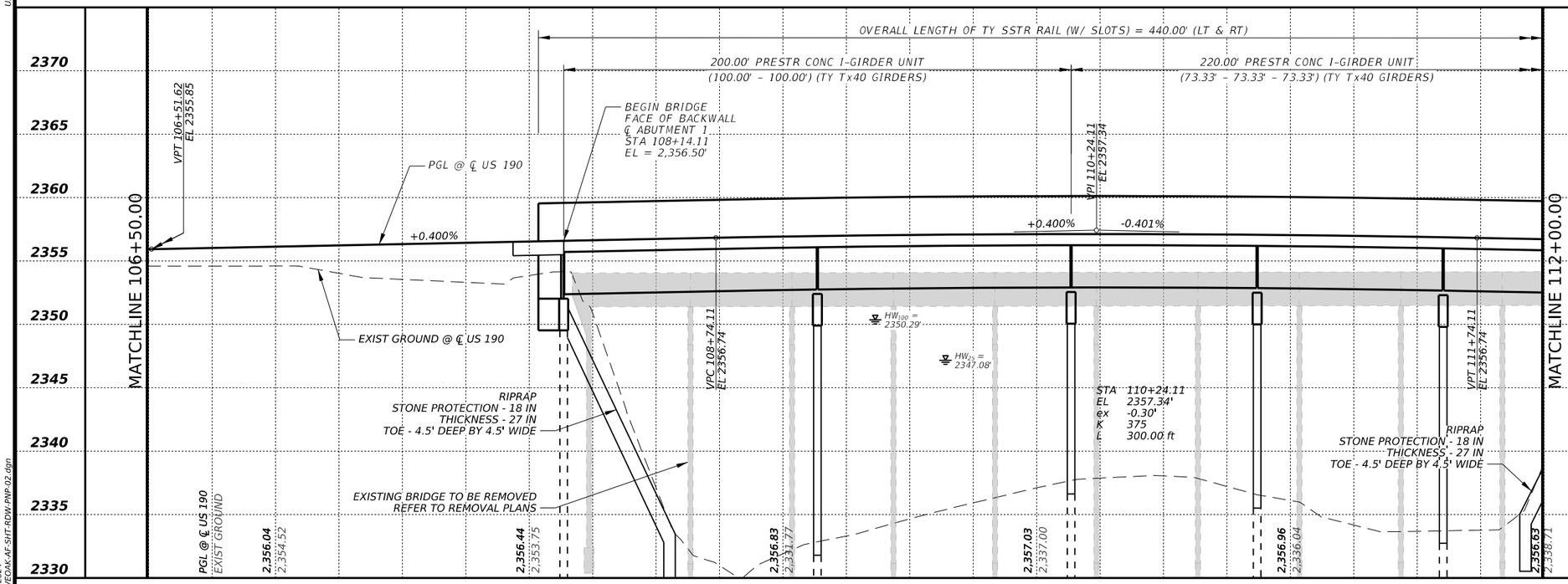
0 25' 50'
SCALE: 1" = 50'H
1" = 10'V



NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

PLAN & PROFILE
STA 106+50 TO STA 112+00

SHEET 2 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	49
CONTROL	SECTION	JOB	
2279	02	023	

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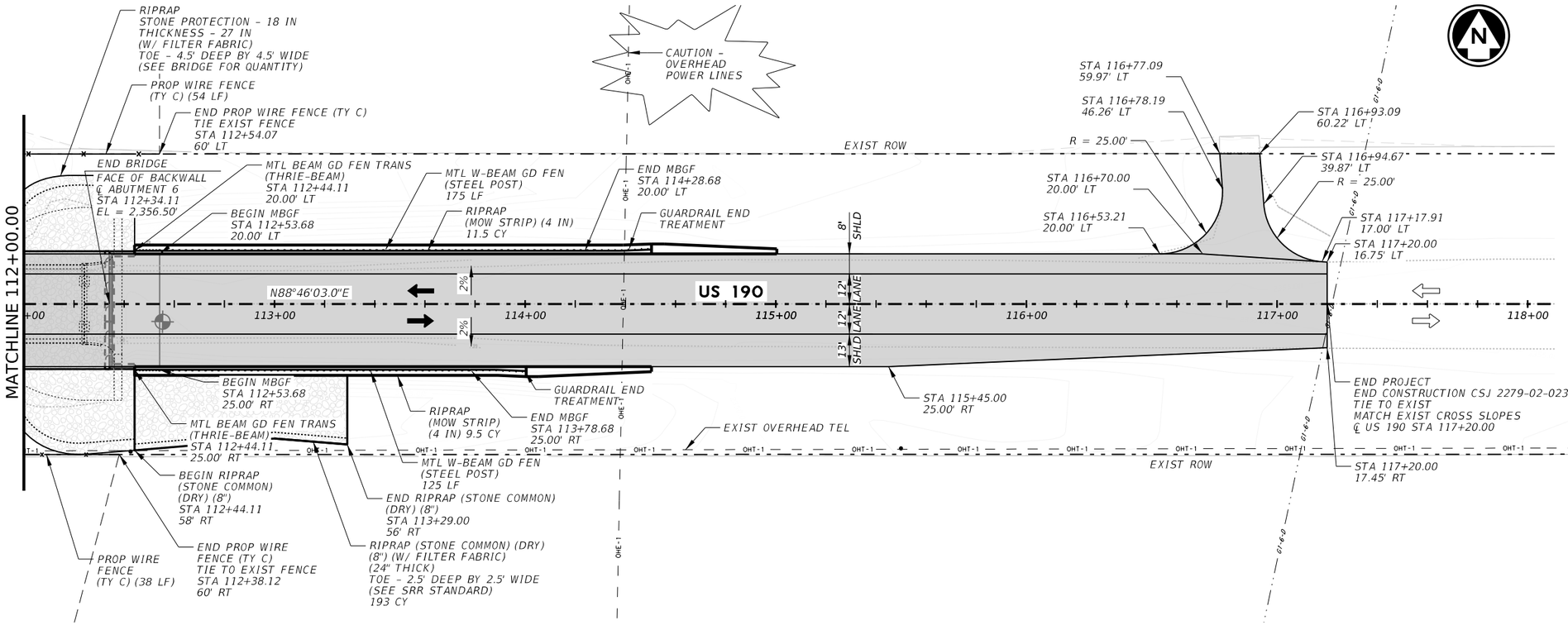

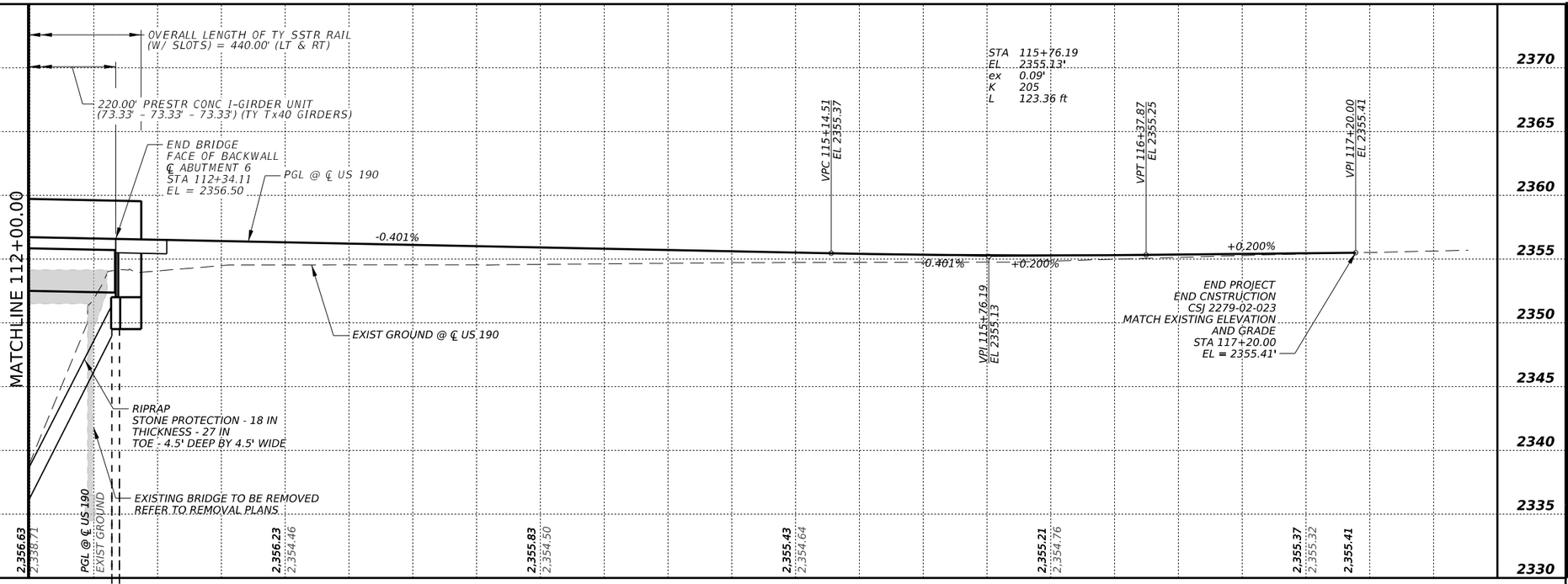

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/28/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

PLAN & PROFILE
STA 112+00 TO END

SHEET 3 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	50
CONTROL	SECTION	JOB	
2279	02	023	

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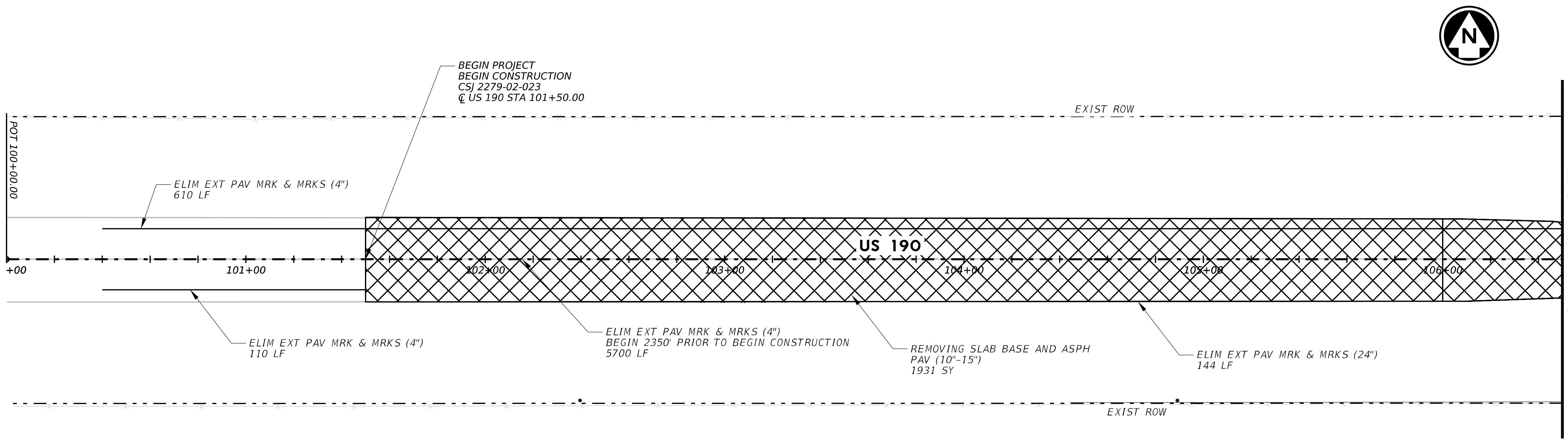

LEGEND

- EXISTING ROW
- REMOVE STR (SMALL FENCE)
- REMOVING CONC (RIPRAP)
- REMOVE STAB BASE AND ASPH PAV (10"-15")

NOTES:

1. REMOVE ALL TREES WITHIN ROW LIMITS. TREES UNDER 5" DIAMETER SHALL BE SUBSIDIARY TO ITEM 100-6002 PREPARING ROW. LARGER TREES SHALL BE PAID FOR INDIVIDUALLY PER PAY ITEMS 100-6003 (5"-12"), 100-6004 (12"-24"), 100-6011 (24"-36"), OR 100-6016 (36"-48").
2. INSTALL TEMPORARY FENCE PRIOR TO REMOVING EXISTING FENCE TO KEEP LIVESTOCK CONTAINED. REFER TO PLAN & PROFILE SHEETS FOR ADDITIONAL INFORMATION.
3. REMOVAL OF RPMS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS WILL NOT BE PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO STRIPING REMOVAL PAY ITEMS.
4. EXISTING 400'-0" (10 SPANS AT 40'-0") CONC PAN GIRDER BRIDGE (NBI NO. 07-053-0-2279-02-003) AND CONC SUBSTRUCTURE WITH CONCRETE FOOTING FOUNDATION TO BE REMOVED TO 2'-0" BELOW FINISHED GROUND.

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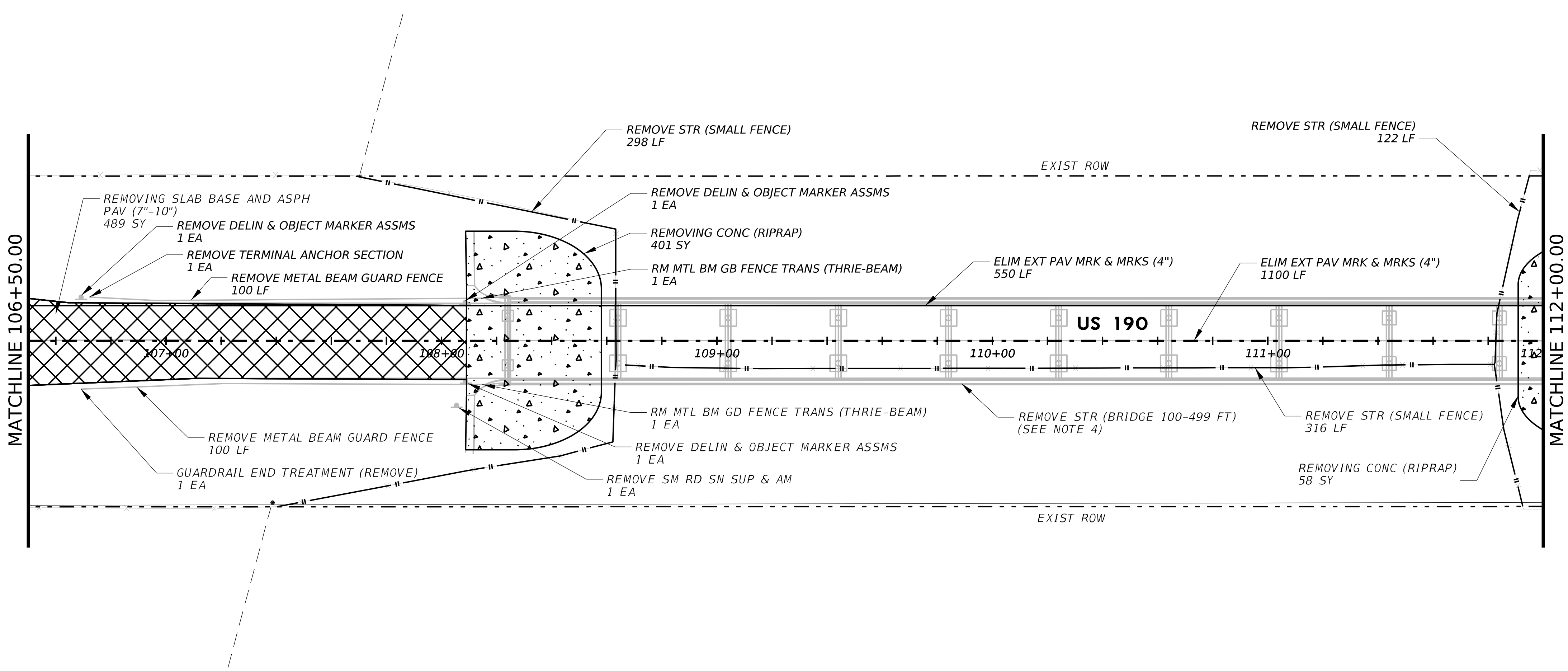

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

REMOVAL PLAN
BEGIN TO STA 112+00

SHEET 1 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS PRH	TLS BDS	PRH TLS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	51
CONTROL	SECTION	JOB	
2279	02	023	

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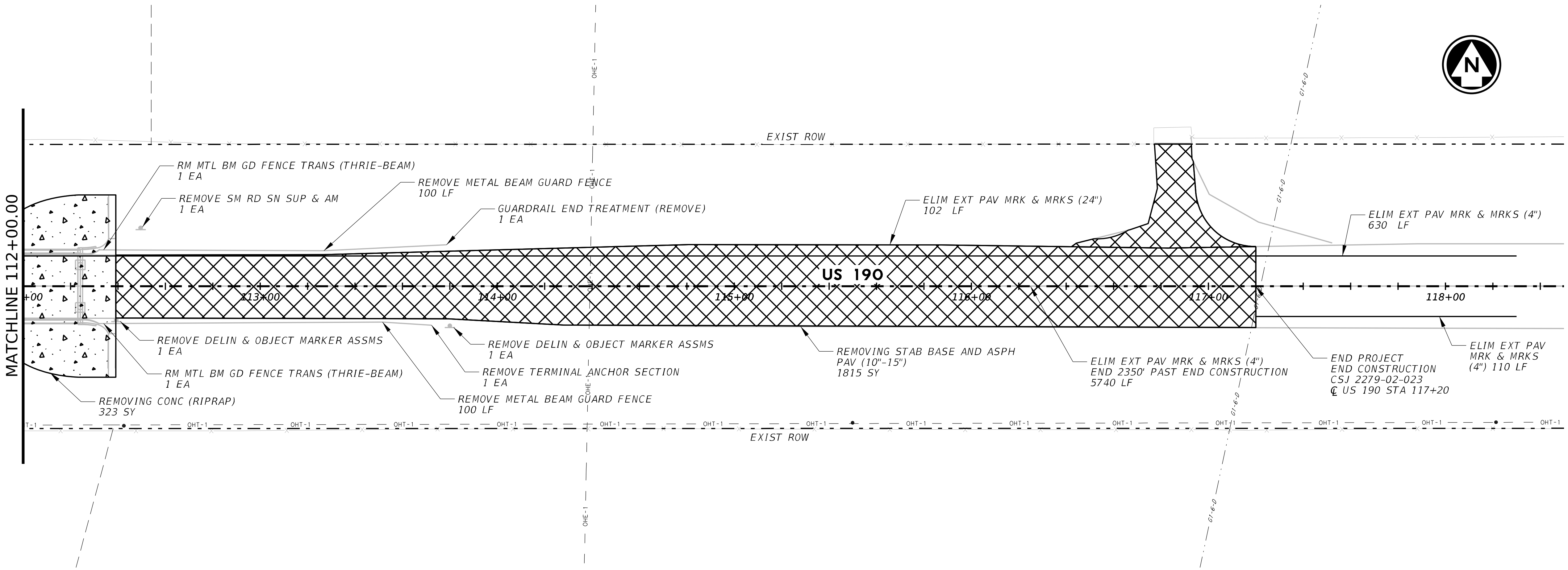

LEGEND

- EXISTING ROW
- REMOVE STR (SMALL FENCE)
- REMOVING CONC (RIPRAP)
- REMOVE STAB BASE AND ASPH PAV (10"-15")

NOTES:

1. REMOVE ALL TREES WITHIN ROW LIMITS. TREES UNDER 5" DIAMETER SHALL BE SUBSIDIARY TO ITEM 100-6002 PREPARING ROW. LARGER TREES SHALL BE PAID FOR INDIVIDUALLY PER PAY ITEMS 100-6003 (5"-12"), 100-6004 (12"-24"), 100-6011 (24"-36"), OR 100-6016 (36"-48").
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0 25' 50'
SCALE: 1" = 50'H

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

REMOVAL PLAN
STA 112+00 TO END

SHEET 2 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	52
CONTROL	SECTION	JOB	
2279	02	023	

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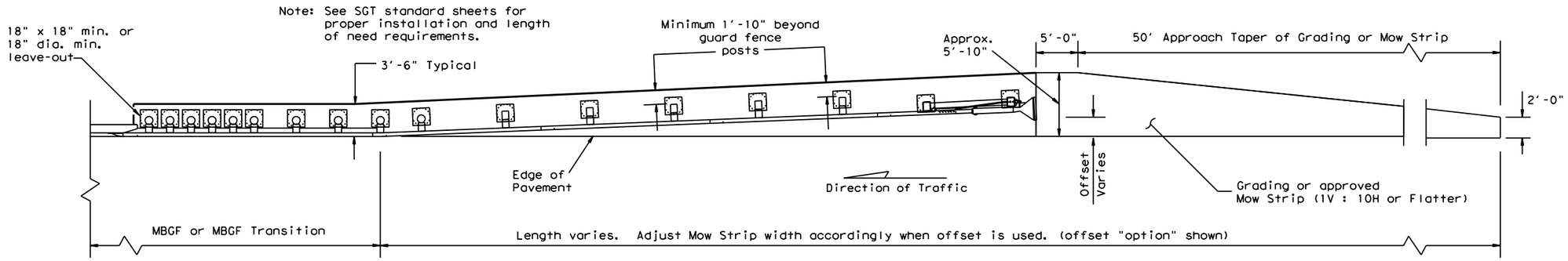
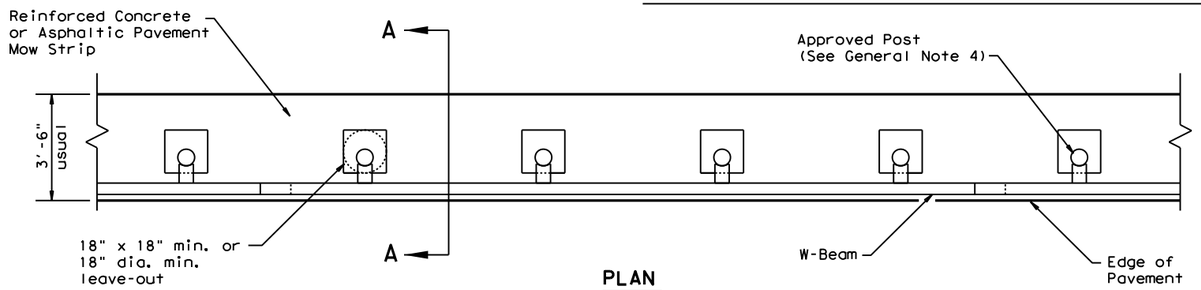
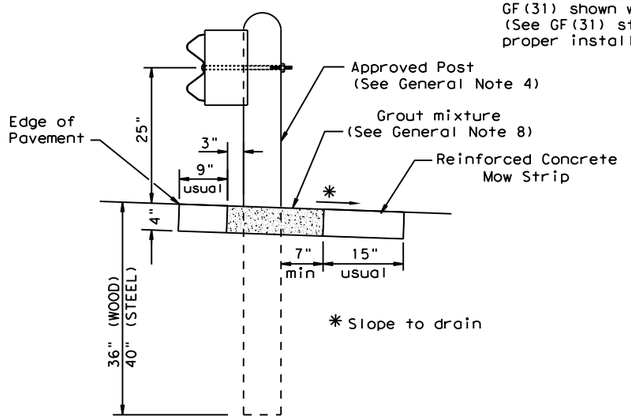


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



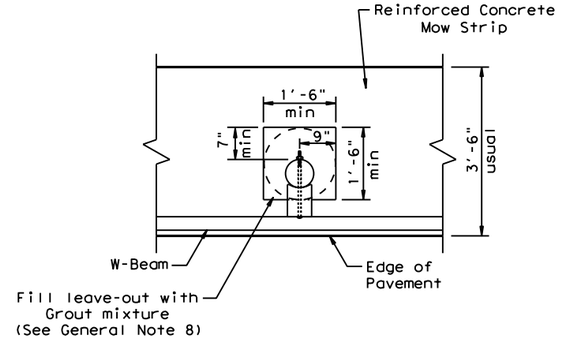
PLAN

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



SECTION A-A

Typical



MOW STRIP DETAIL

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

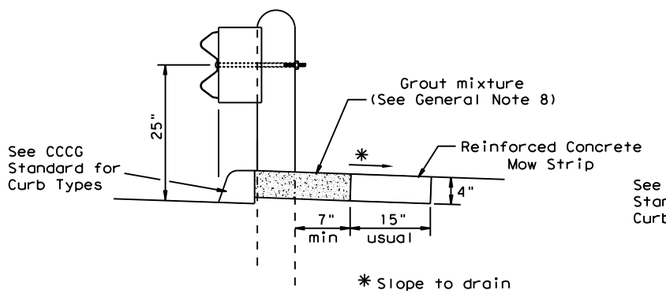
Note: Site Condition(s)

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

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

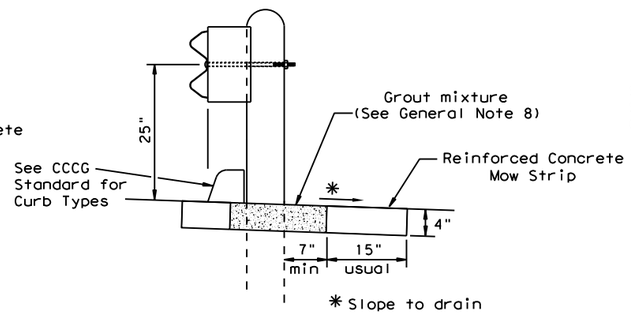
GENERAL NOTES

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



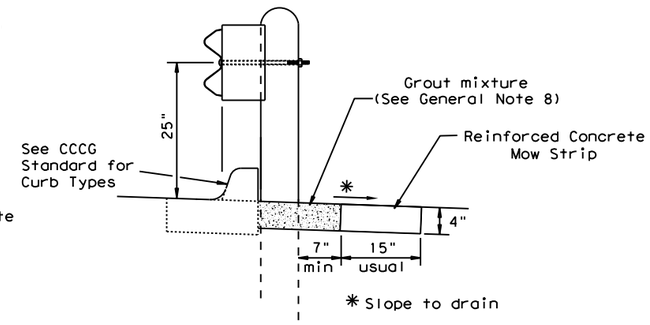
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2279	02	023	US 190	
	DIST	COUNTY		SHEET NO.	
	SJT	CROCKETT		53	

DATE: 6/1/2024
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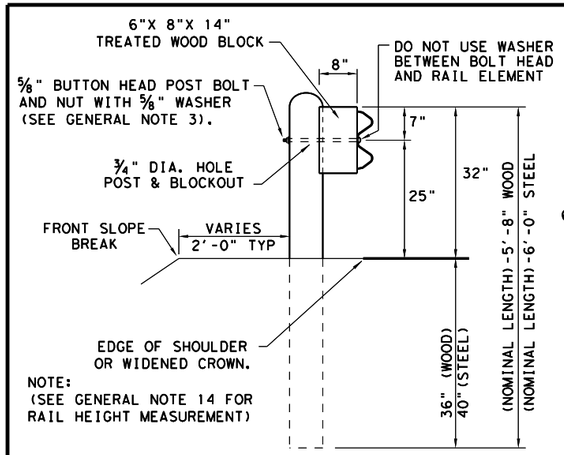
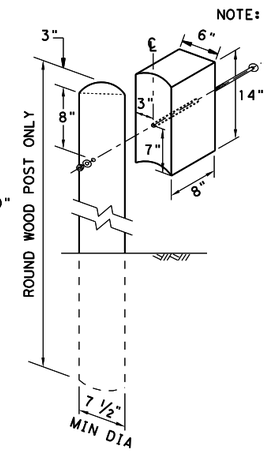
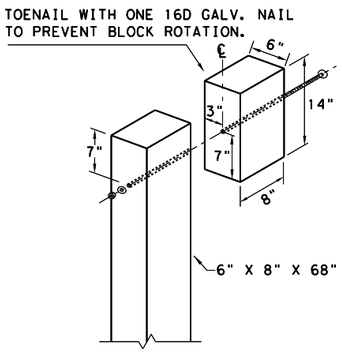


TYPICAL POST PLACEMENT

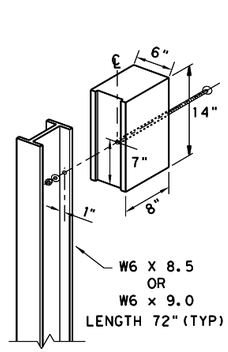


WOOD BLOCK TO ROUND WOOD POST

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

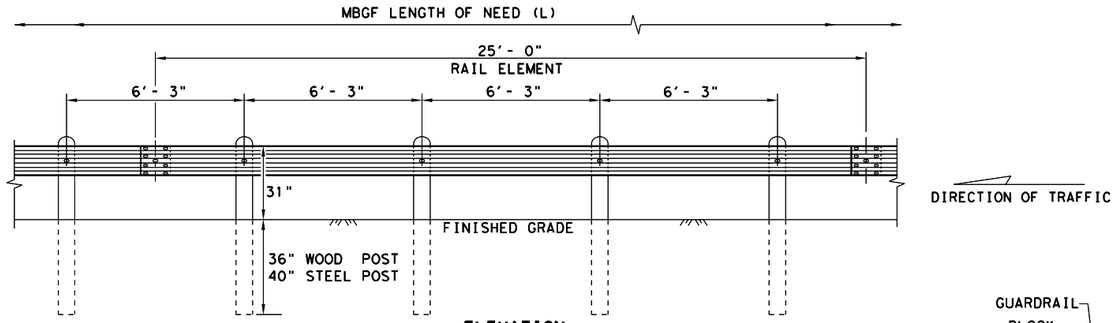


WOOD BLOCK TO RECTANGULAR WOOD POST



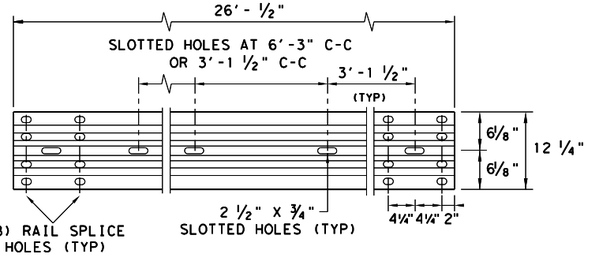
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



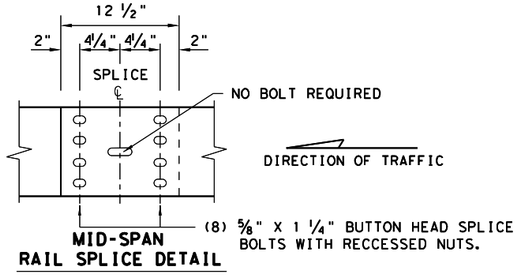
ELEVATION MID-SPAN RAIL SPLICE

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



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

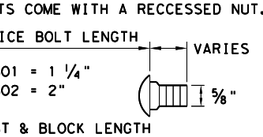
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



MID-SPAN RAIL SPLICE DETAIL

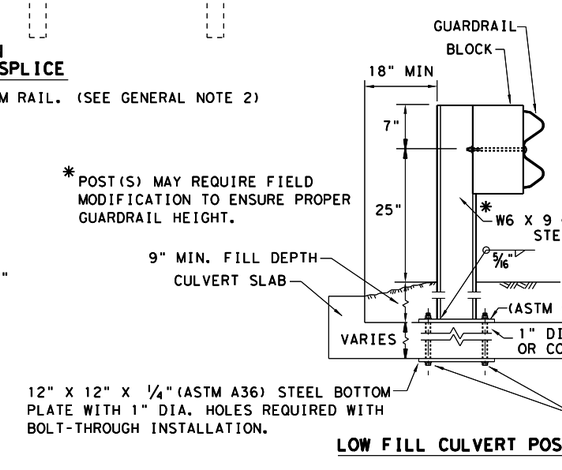
NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

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



BUTTON HEAD BOLT

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 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.

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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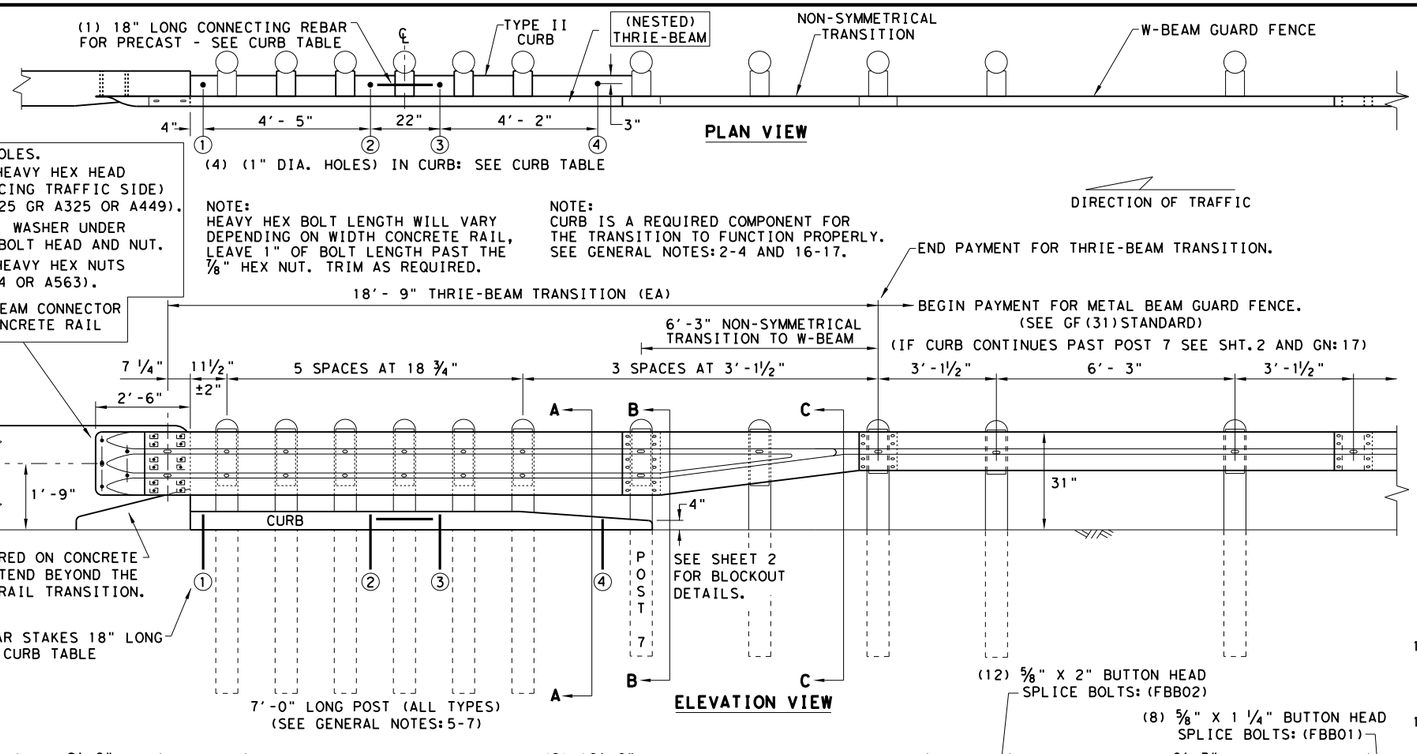


GENERAL NOTES

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

THRIE-BEAM TERMINAL - CURB TABLE

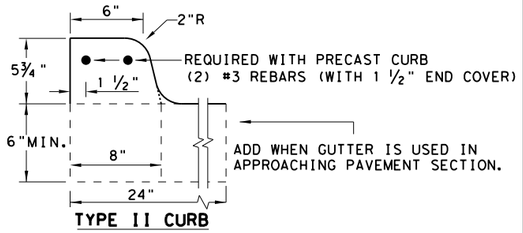
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7

CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.

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



TYPE II CURB

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
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	SJT	CROCKETT		55

DATE: 6/1/2024
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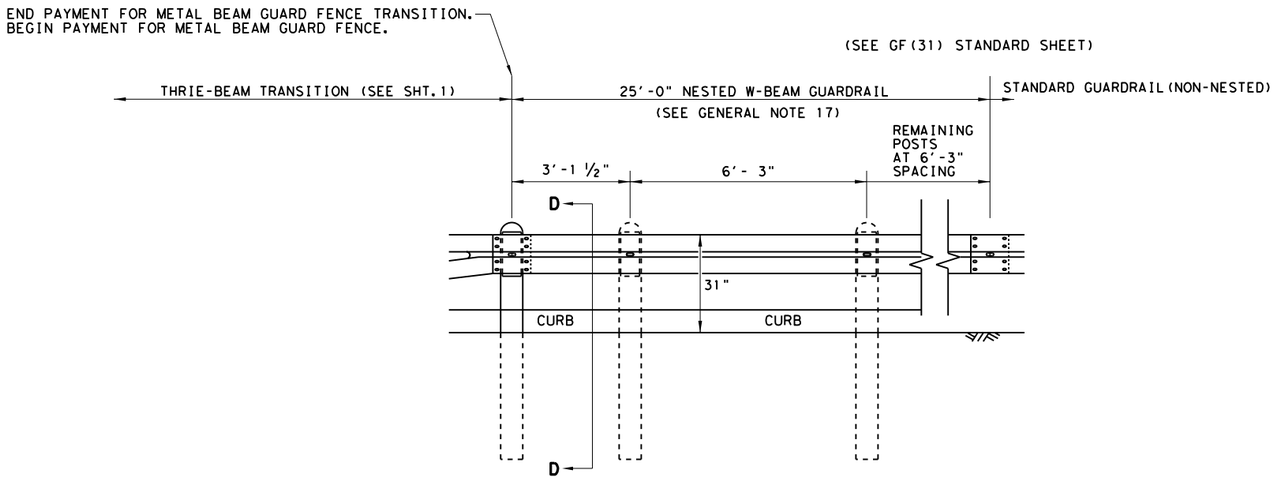
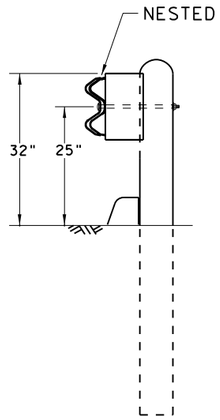
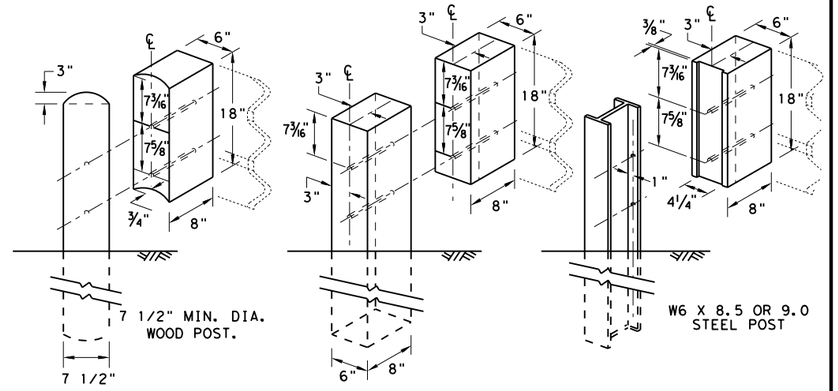
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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	SJT	CROCKETT		56

DATE: 6/1/2024
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NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

BEGIN LENGTH OF NEED

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")

PLAN VIEW

TRAFFIC FLOW

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼"

3'-1 ½" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"

OUTSIDE SLOTS CUTOUT (2)1½" X 6'-9 ⅝"

SoftStop FACE SEE GN(3) & NOTE:B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

3'-1 ½"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: C

SEE NOTE: A

POST 32" HEIGHT

31" RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

31" RAIL HEIGHT

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

ⅬⅥ" DIA. YIELDING HOLES

ⅬⅥ" DIA. YIELDING HOLES

6'-1⅜"

(8) ⅝"x 1-¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

(8) ⅝"x 1-¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"x 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

ALTERNATE BLOCKOUT SEE GENERAL NOTE:6

4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

ⅬⅥ"DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(1) ⅝" x 1-½" HEX HD BOLT-GR-5 PN: 105286

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE:6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'-1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

TRAFFIC FLOW

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

LINE POST (3, 4, 5, 6, 7 & 8)

FINISHED GRADE

SECTION VIEW B-B

6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

POST(2)

FINISHED GRADE

SECTION VIEW A-A

6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- ½" HEIGHT

4'-9 ½"

ⅬⅥ" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 ½" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX. RAIL OFFSET

APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

1. 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
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. 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.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" 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 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
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 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" 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	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

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

Texas Department of Transportation

Design Division Standard

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
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	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		57

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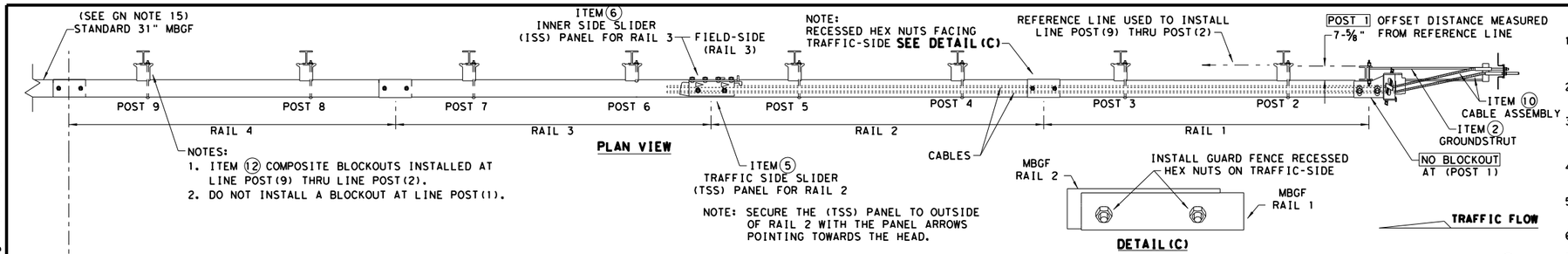
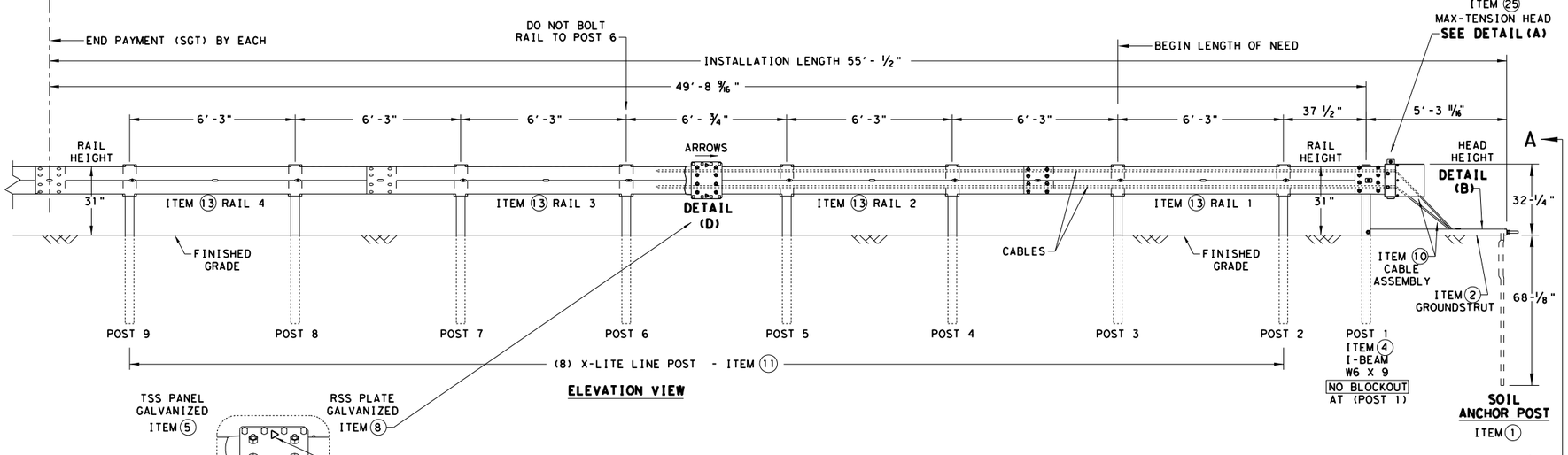


PLAN VIEW

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

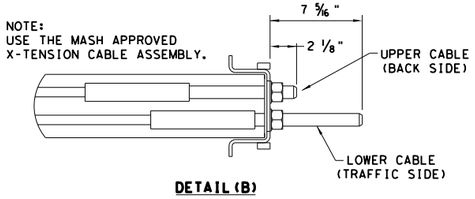
DETAIL (C)



ELEVATION VIEW

TSS PANEL AND RSS PLATE

DETAIL (D)



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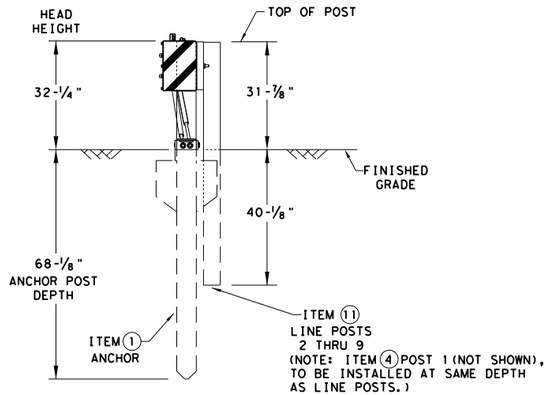
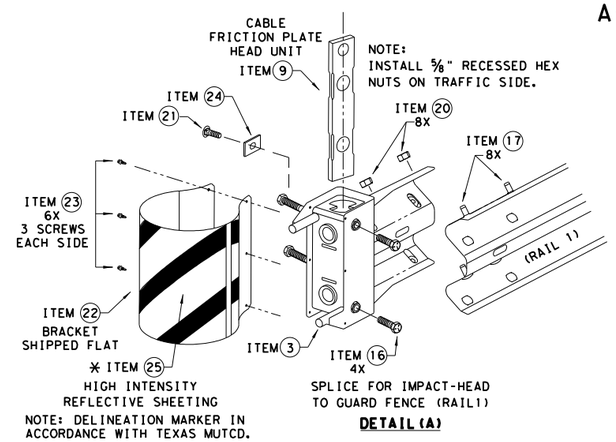


SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A



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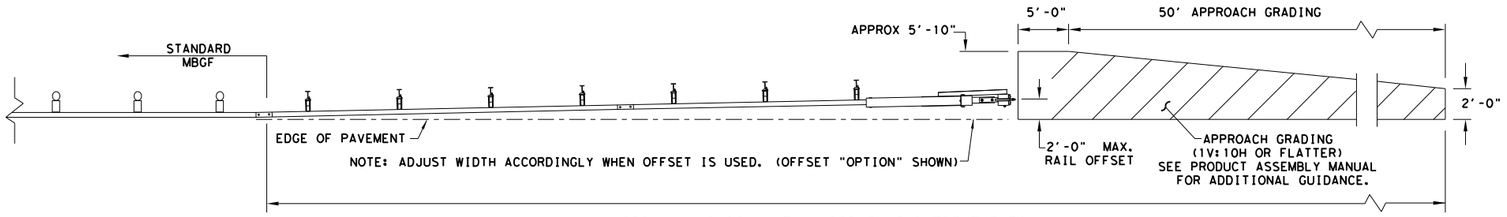

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. 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.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. 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.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. 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 FWR03	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

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

Texas Department of Transportation

Design Division Standard

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

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	DIST	COUNTY		SHEET NO.
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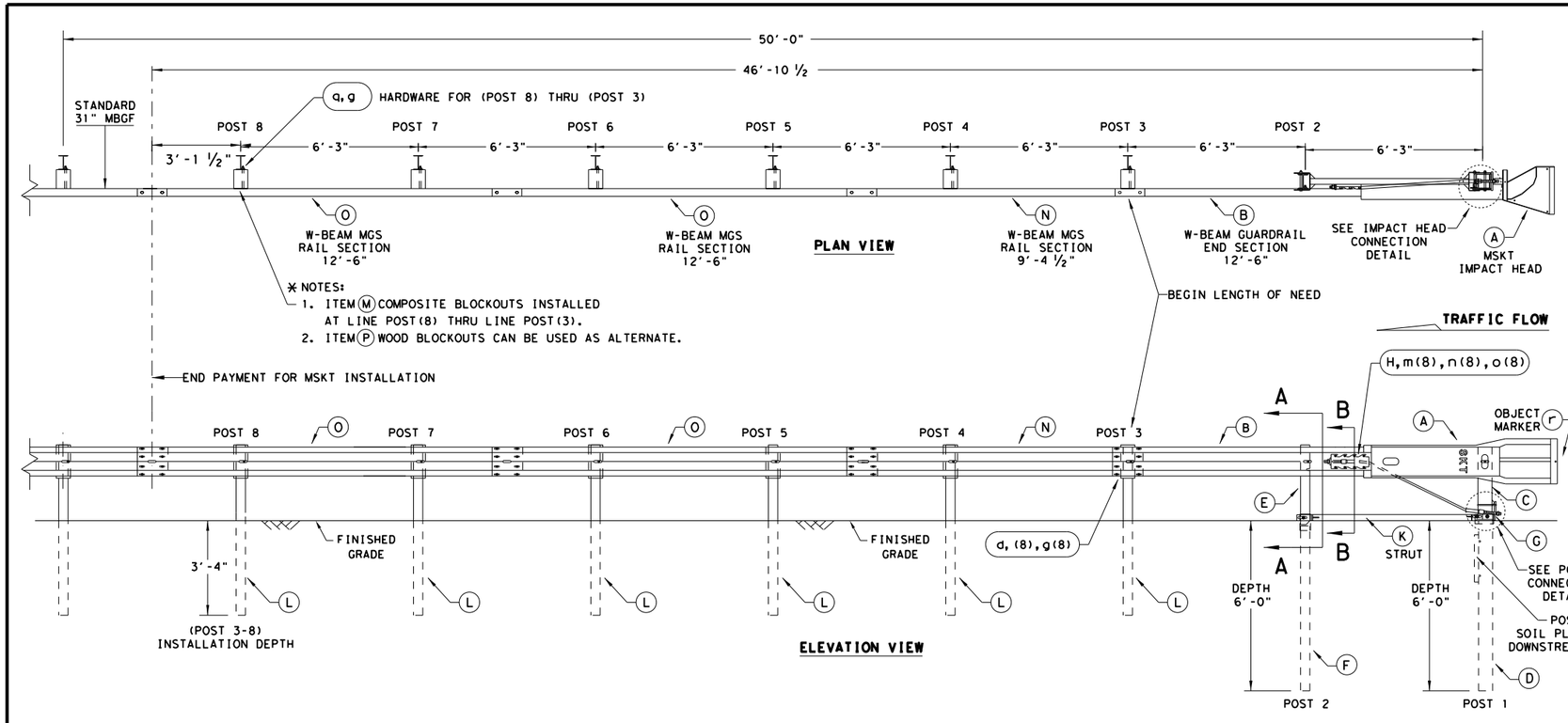


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

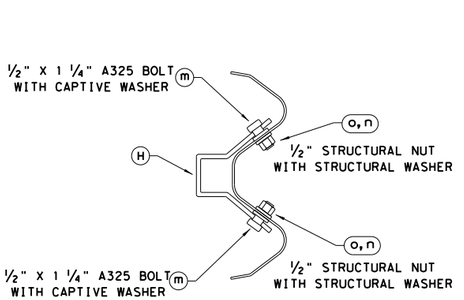
GENERAL NOTES

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

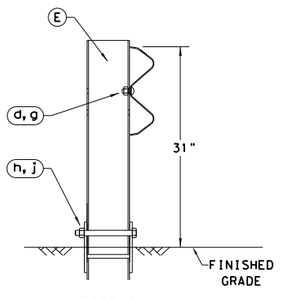
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

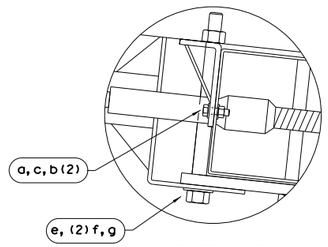
ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



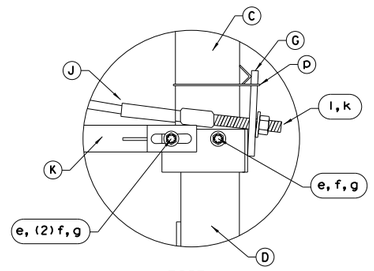
SECTION B-B
ANCHOR BRACKET



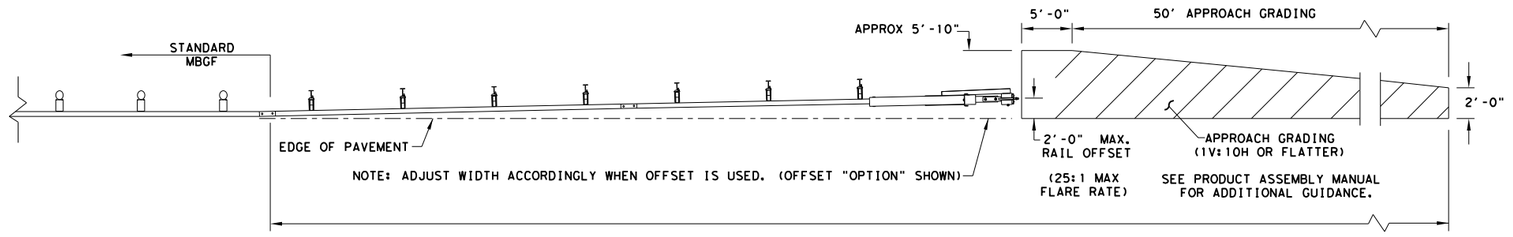
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2279	02	023	US 190	
	DIST	COUNTY		SHEET NO.	
	SJT	CROCKETT		59	

DATE: 6/1/2024
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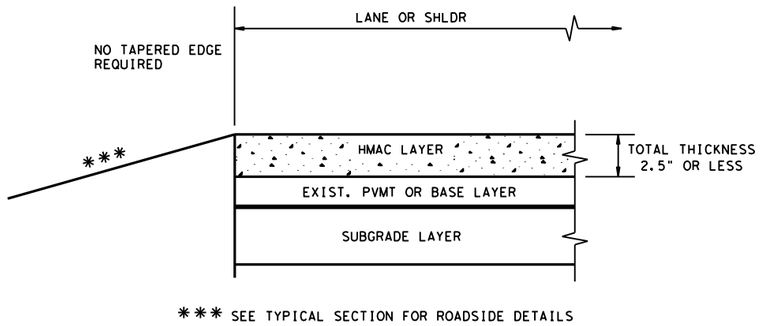
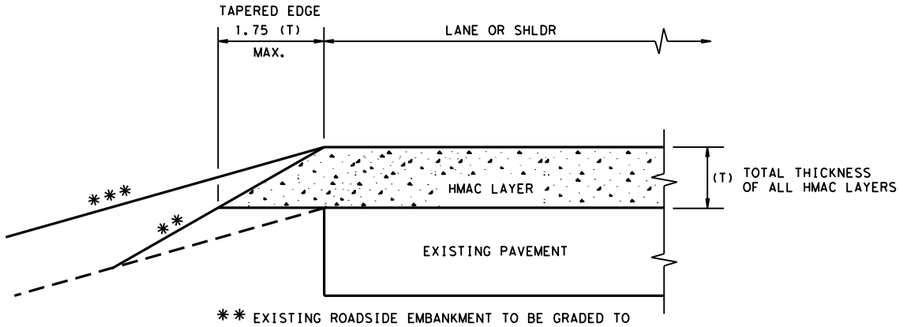


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

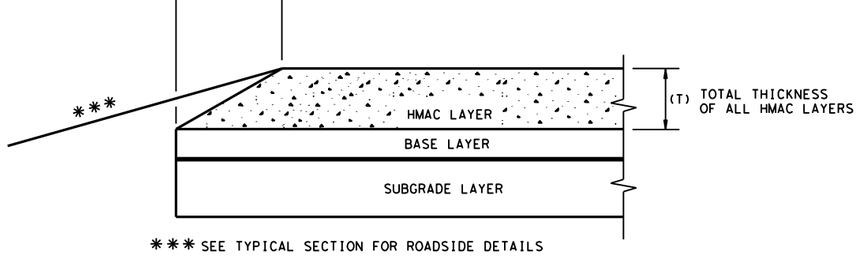
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

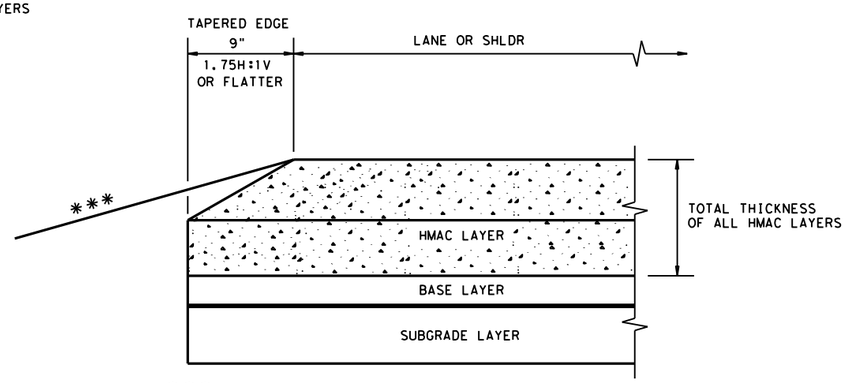
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
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DATE: 6/1/2024 12:02:44 PM
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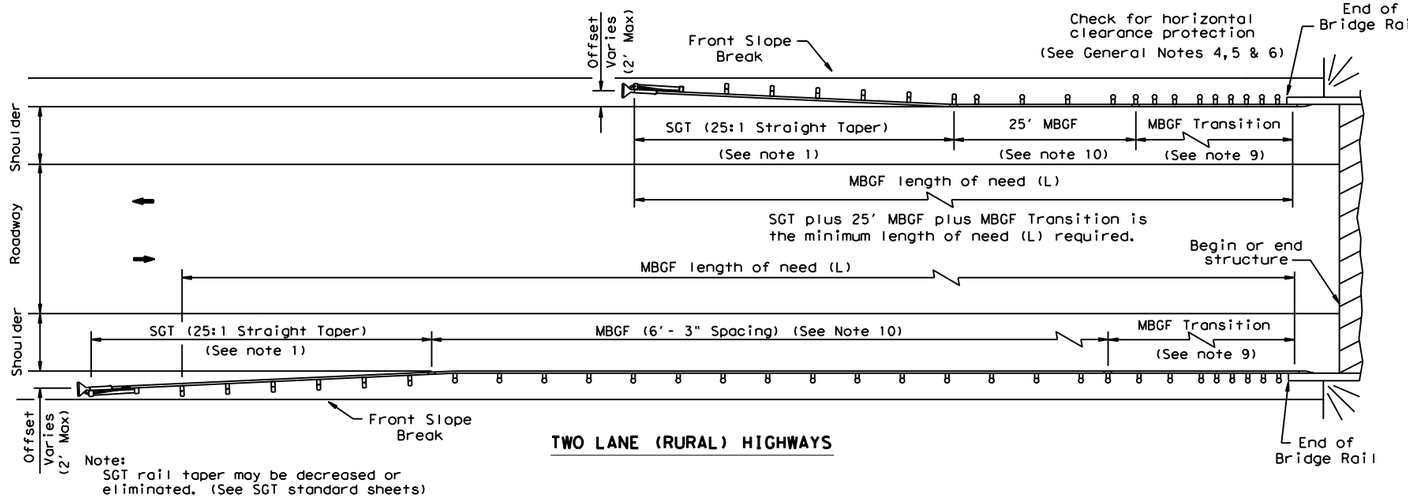
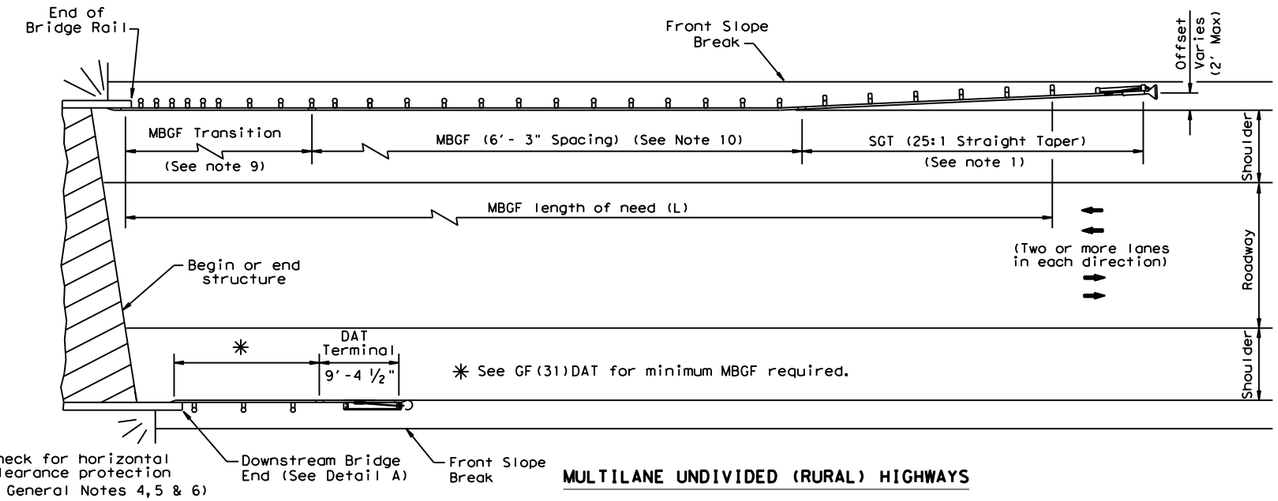
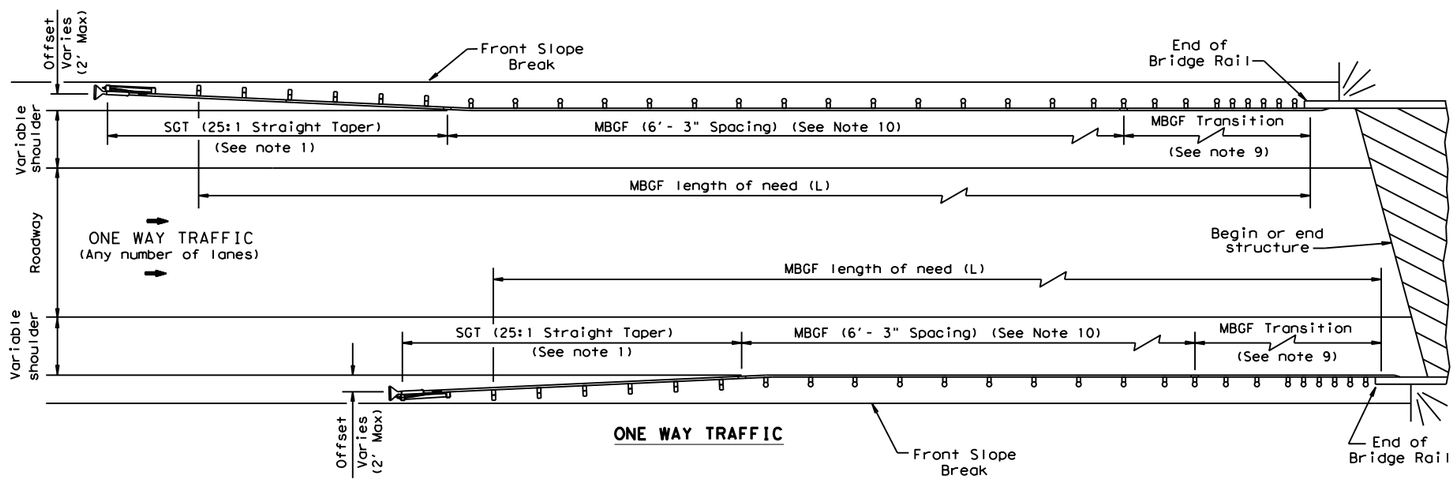


TWO LANE (RURAL) HIGHWAYS

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



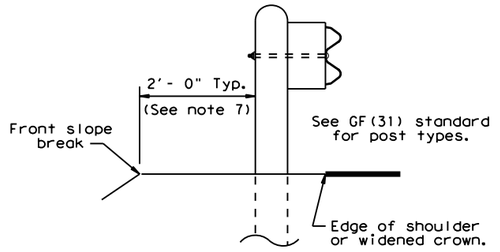
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF

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

DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

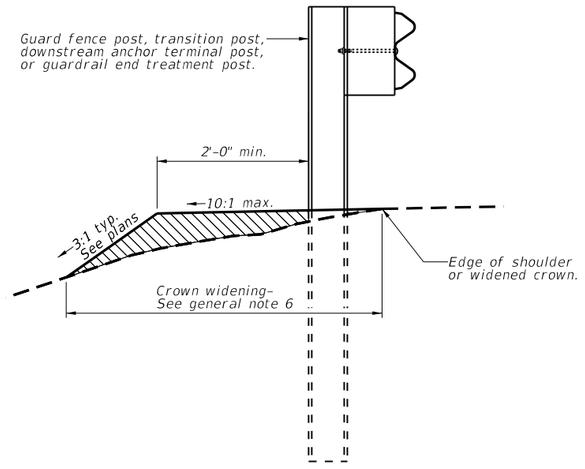
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

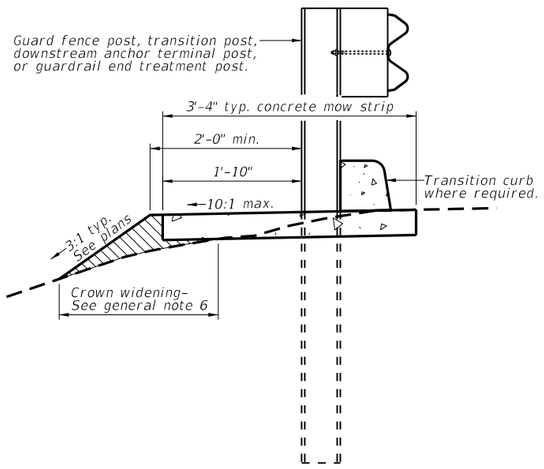
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		61

KEYED NOTES

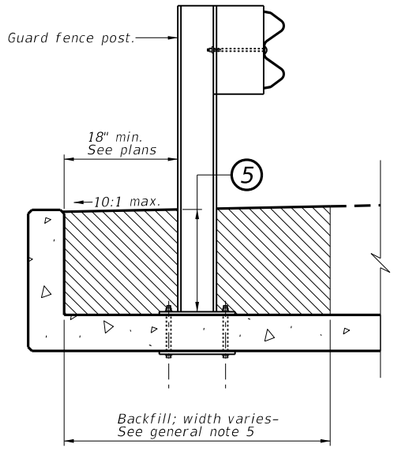
1. Transition curb. See general note 12 for measurement and payment.
2. Mow strip. Measure and pay as Item 432, "Riprap".
3. Transition curb height. Taper to 4 in. max. at terminal point if there is no adjacent curb; otherwise taper to adjacent curb height.
4. Extension of mow strip, if there is no adjacent curb.
5. 9" min. 36" max.
6. Extension of mow strip, if slope exceeds 3:1.



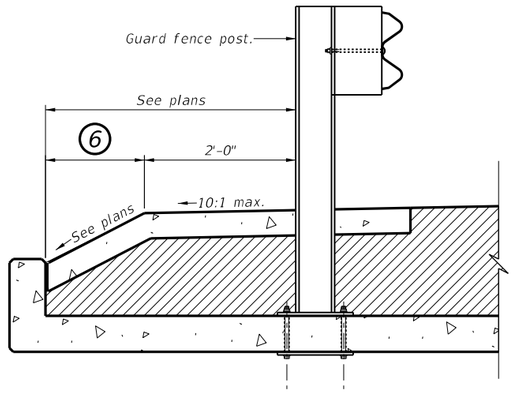
CROWN WIDENING DETAILS WITHOUT CONCRETE MOW STRIP



CROWN WIDENING DETAILS WITH CONCRETE MOW STRIP



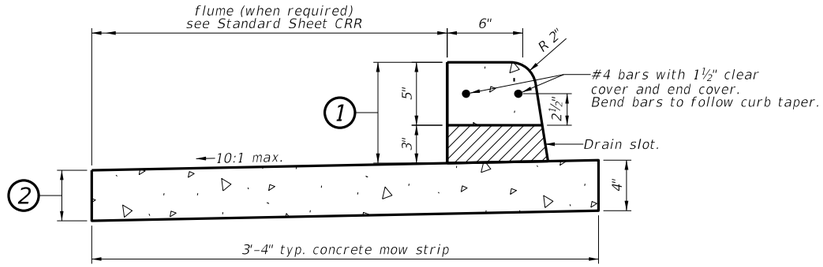
LOW FILL CULVERT POST DETAILS



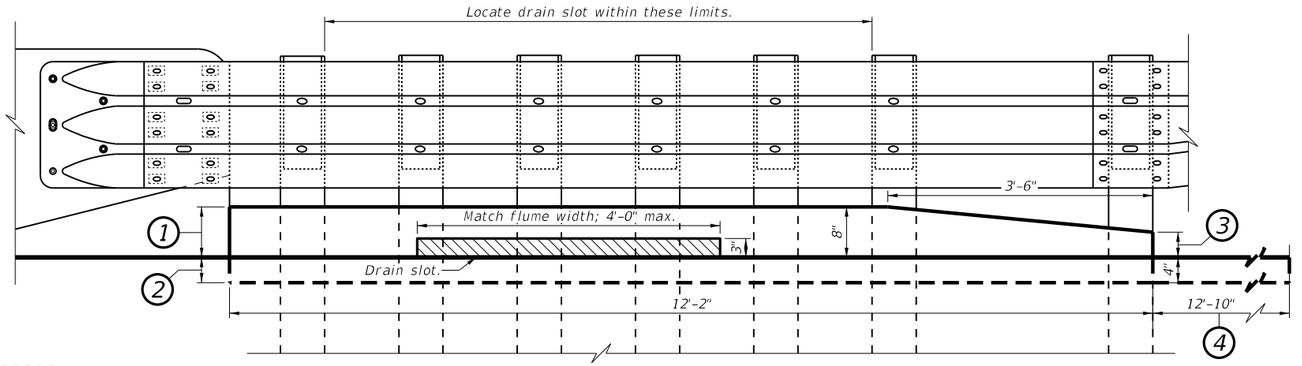
LOW FILL CULVERT POST DETAILS WITH CONCRETE MOW STRIP

GENERAL NOTES

1. Rail elements to be removed may have metal components coated with lead-containing paint (hazardous materials). Any such elements will be identified on the Environmental Permits, Issues, and Commitments (EPIC) plan sheet. Remove the metal components by mechanical dismantling and/or by hydraulic cutting. Do not use a flame cutting torch or any other means that will produce fumes or will strip paint. Segregate the metal components from other construction waste and dispose of properly. Follow applicable safety standards.
2. Steel posts to be removed may have concrete foundations.
3. Where posts are removed, backfill holes using approved materials and methods.
4. Sawcut and remove existing materials where required for installation of posts, mow strip, or transition curb. This work will not be measured or paid separately.
5. Where installing low fill culvert posts on existing structures, backfill excavations using approved materials and methods. The work and materials will be included in payment for this item.
6. Widen crown to accommodate guardrail, guardrail end treatments, downstream anchor terminals, and transitions as shown. Unless otherwise shown on the plans, this will be measured and paid for as Item 132, "Embankment".
7. Furnish steel posts for guard fence transitions.
8. Furnish and install object markers Type OB-3F on the front of the impact heads of single guardrail terminals as shown on Standard Sheet D&OM(VIA).
9. Transition curbs shall use Class B concrete and shall be cast-in-place monolithically with mow strip.
10. Transition curbs installed with new thrie-beam transitions will not be measured or paid for separately but will considered as included in payment for Item 540, "Metal Beam Guard Fence".
11. Drain slots are required where shown on the plans or as directed.
12. Synthetic fibers may be used in lieu of steel reinforcing in transition curb and mow strip.
13. Reinforcing steel shall conform to the requirements of Item 440, "Reinforcement for Concrete".
14. See Standard Sheets GF(31), CCCG, GF(31)TR, and CRR for additional information.
15. Concrete quantity for one 25 ft. mow strip is 1.0 CY.
16. Guard fence post spacing is 6'-3" usual and maximum. Non-standard rail sections are required for guard fence post spacing less than 6'-3".



SECTION THRU MOW STRIP AND TRANSITION CURB WITH OPTIONAL DRAIN SLOT



ELEVATION OF MOW STRIP AND TRANSITION CURB WITH OPTIONAL DRAIN SLOT

PAY ITEMS

0132 6017	EMBANKMENT (VEHICLE)(ORD COMP)(TY A)	CY
0432 6045	RIPRAP (MOW STRIP)(4 IN)	CY
0540 6002	MTL W-BEAM GD FEN (STEEL POST)	LF
0540 6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA
0540 6007	MTL BEAM GD FEN TRANS (TL2)	EA
0540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA
0540 6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF
0544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

San Angelo District

GUARD FENCE DETAILS

SHEET 1 OF 1 NOT TO SCALE

SHEET ISSUED OR LAST REVISED
11-19

CONT	SECT	JOB	HIGHWAY
2279	02	023	US 190
DIST	COUNTY		SHEET NO.
SJT	CROCKETT		62

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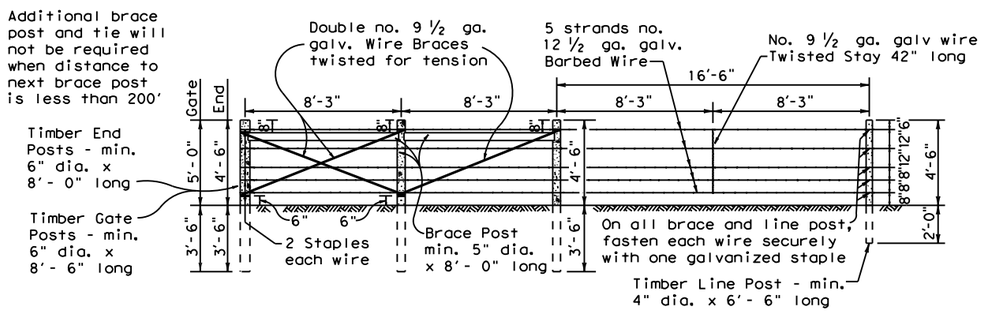
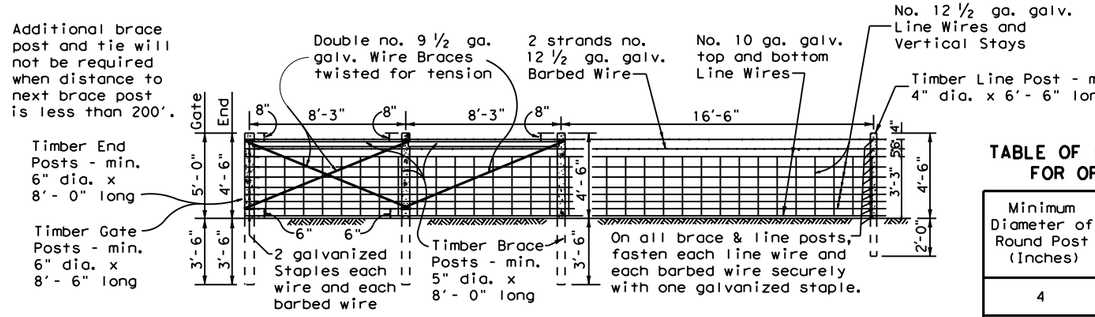


SECTION GALVANIZED BARBED WIRE FENCE WITH WOOD POSTS

Bracing Detail Used at Ends and Gates

TYPE "A" FENCE

(See General Note 6)



SECTION GALVANIZED WOVEN WIRE FENCE WITH WOOD POSTS

Bracing Detail Used at Ends and Gates

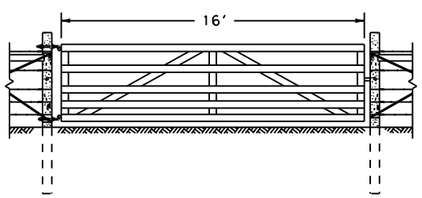
TYPE "B" FENCE

(See General Note 6)

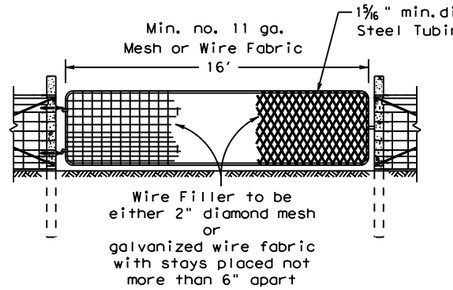
TABLE OF EQUIVALENT SIZES FOR OPTIONAL SHAPE

Minimum Diameter of Round Post (Inches)	Minimum Equivalent Dimension for Each Side of Square Post (Inches)
4	3 ½
5	4 ½
6	5 ¼

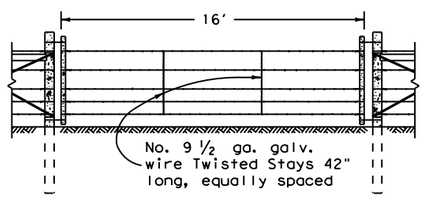
Metal gate shall consist of 5 panels not less than 4'- 4" high and shall be aluminum or galvanized metal and of good quality. Gate and hardware shall meet the approval of the Engineer.



DETAIL TYPE 1 GATE



DETAIL TYPE 2 GATE

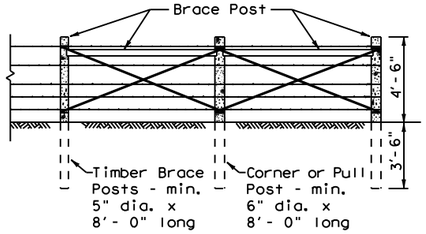


DETAIL TYPE 3 GATE

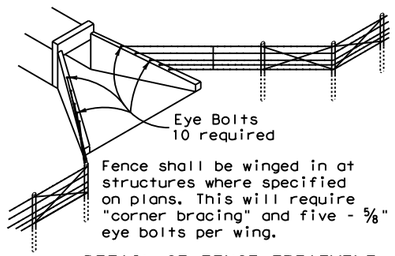
GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide 2" clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latches of the spring, fork or chain type. All latches shall be suitable for the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. If rock is encountered at a depth less than the embedded depth required, a 15" or larger diameter hole shall be drilled for the post and the post shall be set in concrete. If rock is encountered at a depth of 1'- 6" or more below the ground surface, the hole shall be drilled to the required depth. If rock is encountered at a depth less than 1'- 6" below the ground surface, the holes shall be drilled a minimum of 2'- 0" into the rock or to the depth whichever is the lesser depth.
6. Barbed Wire shall be in accordance with ASTM A 121 (Class 1) Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

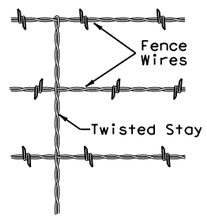
   Woven Wire Fence (Type B) shall be in accordance with ASTM A 116 (Class 1) No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
7. The location of gates and corner posts will be as indicated elsewhere on these plans.
8. Square wood posts may be used in lieu of round posts provided minimum equivalent size requirements, as shown are met. All wood posts shall be in accordance with Item 552, "Wire Fence."



CORNER OR PULL POST ASSEMBLY

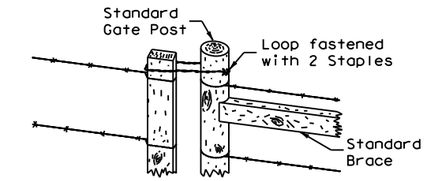


DETAIL OF FENCE TREATMENT AT STRUCTURES



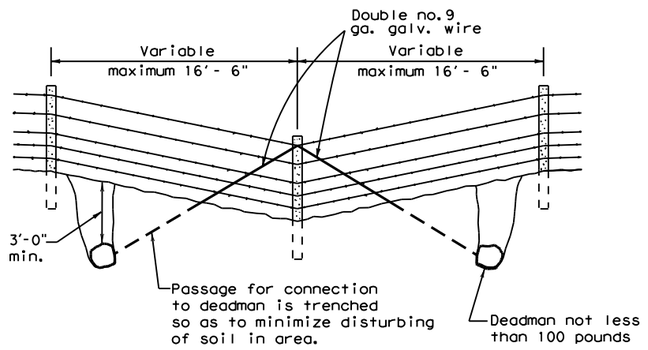
DETAIL OF STAY

(Barbed wire fence)



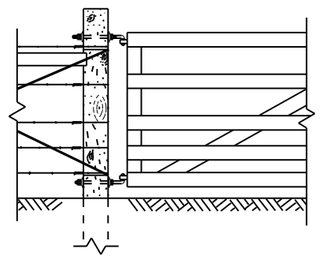
Loop to be made from two strands twisted no. 9 ½ ga. galv. smooth wire, and to be securely fastened to gate post with two galv. staples.

DETAIL FASTENER TYPE 3 GATE

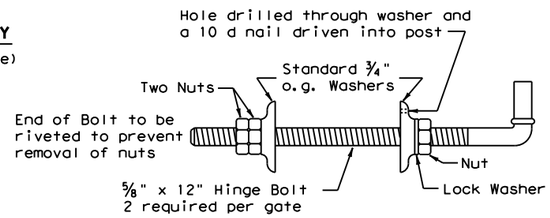


DETAIL OF FENCE SAG

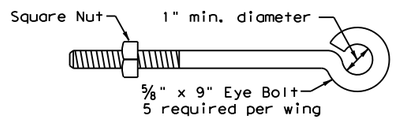
(Single Line Connection)



DETAIL SHOWING INSTALLATION OF HINGES OF TYPE 1 & 2 GATE



DETAIL OF GATE HINGE BOLT ASSEMBLY



DETAIL OF EYE BOLT

Texas Department of Transportation — Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE

(WOOD POSTS)

WF(1)-10

FILE: wf110.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
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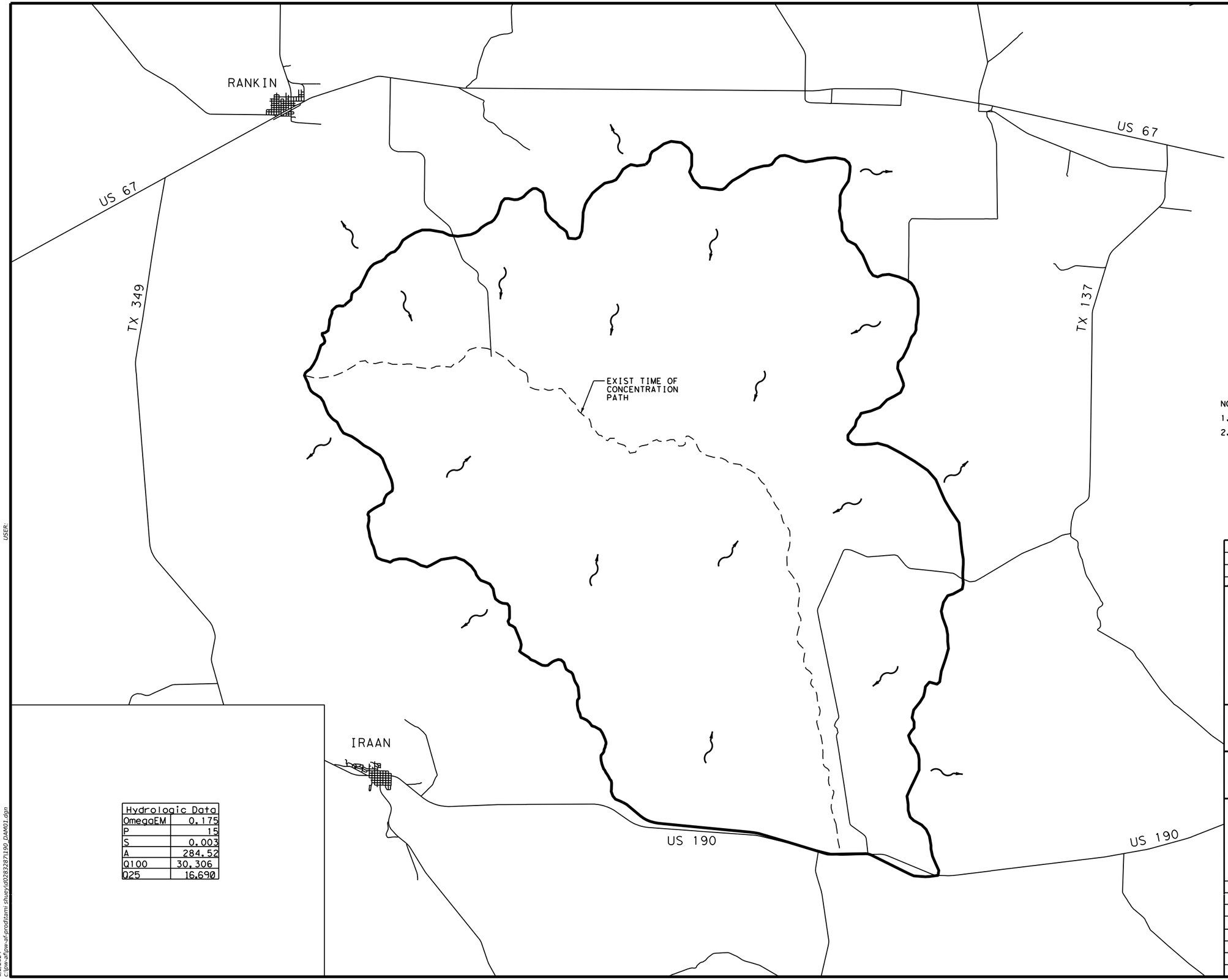
	SJT	CROCKETT		63



Hydrologic Data	
OmegaEM	0.175
P	15
S	0.003
A	284.52
Q100	30,306
Q25	16,690

NOTES:

1. US 190 IS LOCATED WITHIN FEMA ZONE A.
2. EMAIL COORDINATION WAS SENT TO FRED DEATON ON DECEMBER 11, 2023 AS THEY WERE LISTED ON TEXASFLOOD.ORG AS THE CONTACT PERSON

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
CANDYCE WARD
108949
LICENSED PROFESSIONAL ENGINEER

CobbFendley

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

DRAINAGE AREA MAP

LIVE OAK DRAW

DES BY:	DES CK:	DRN BY:	DRN CK:
SM	CW	AW	CW
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	64
CONTROL	SECTION	JOB	
2279	02	023	

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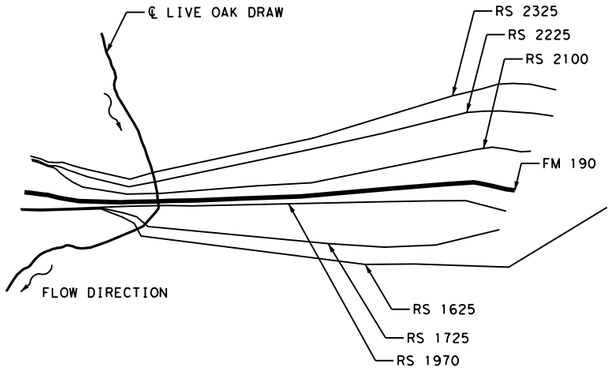


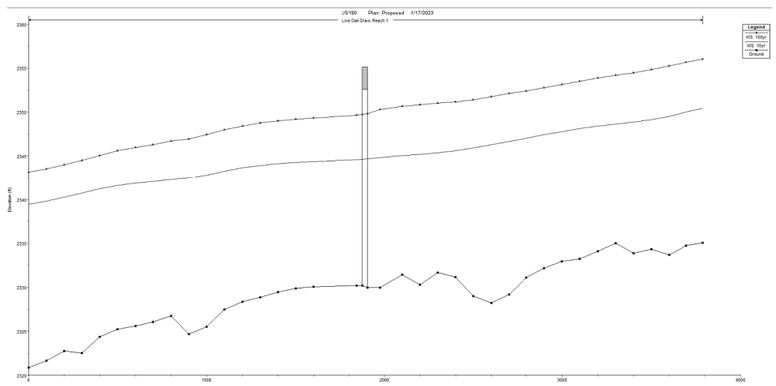
N. T. S.

HEC-RAS CROSS SECTION LAYOUT MAP

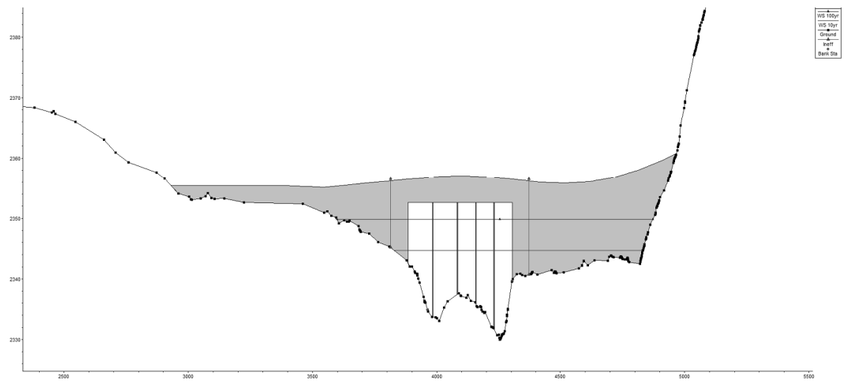
HEC-RAS RIVER STA	25-YR						100-YR					
	FLOW (CFS)	COMPUTED WATER SURFACE ELEVATIONS (FT)			CHAN VELOCITIES (FPS)		FLOW (CFS)	COMPUTED WATER SURFACE ELEVATIONS (FT)			CHAN VELOCITIES (FPS)	
		EXIST	PROP	DIFF	EXIST	PROP		EXIST	PROP	DIFF	EXIST	PROP
2325	16690	2347.55	2347.49	-0.06	3.30	3.33	30306	2350.95	2350.85	-0.10	3.67	3.71
2225	16690	2347.39	2347.33	-0.06	3.13	3.16	30306	2350.78	2350.67	-0.11	3.72	3.77
2100	16690	2347.15	2347.08	-0.07	3.35	3.37	30306	2350.40	2350.29	-0.11	4.52	4.56
2030	FM 190											
1970	16690	2346.73	2346.73	0.00	3.19	3.19	30306	2349.67	2349.67	0.00	4.69	4.69
1725	16690	2346.48	2346.48	0.00	2.66	2.66	30306	2349.35	2349.35	0.00	3.42	3.42
1625	16690	2346.36	2346.36	0.00	2.92	2.92	30306	2349.20	2349.20	0.00	3.70	3.70

NOTES:

1. HEC-RAS 6.3 WAS USED TO MODEL STORMWATER FLOWS FOR THE FM 190 BRIDGE CROSSING.
2. TAILWATER: NORMAL DEPTH: SLOPE 0.4%
3. CROCKETT COUNTY DOES NOT HAVE MAPPED FLOODPLAINS, SO THERE IS NO REGULATORY FLOODPLAIN ASSOCIATED WITH THIS CROSSING
4. EMAIL COORDINATION WAS SENT TO FRED DEATON ON DECEMBER 11, 2023 AS THEY WERE LISTED ON TEXASFLOOD.ORG AS THE CONTACT PERSON.



HEC-RAS PROFILE VIEW



HEC-RAS CROSS-SECTION VIEW

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
CANDYCE WARD
108949
LICENSED
PROFESSIONAL ENGINEER

CobbFendley

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

HYDRAULIC DATA SHEET

LIVE OAK DRAW

DES BY:	DES CK:	DRN BY:	DRN CK:
SM	CW	AW	CW
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	65
CONTROL	SECTION	JOB	
2279	02	023	

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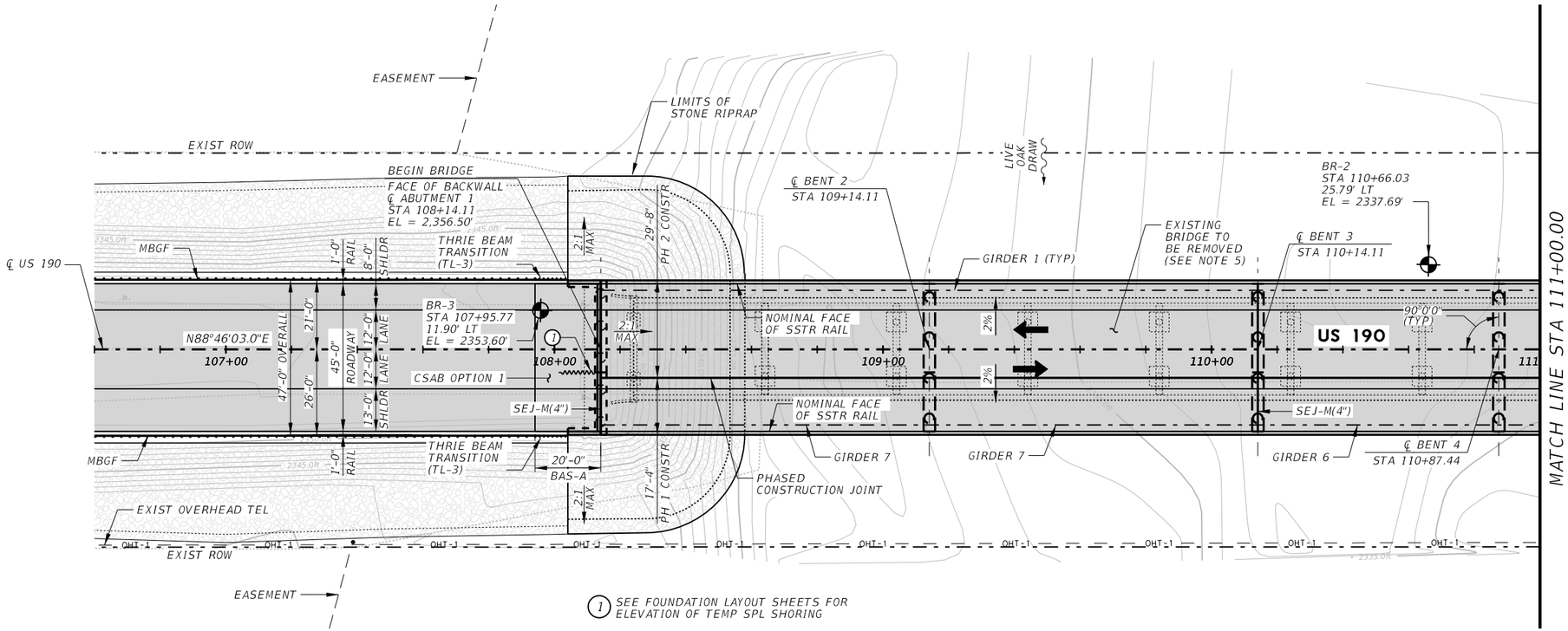
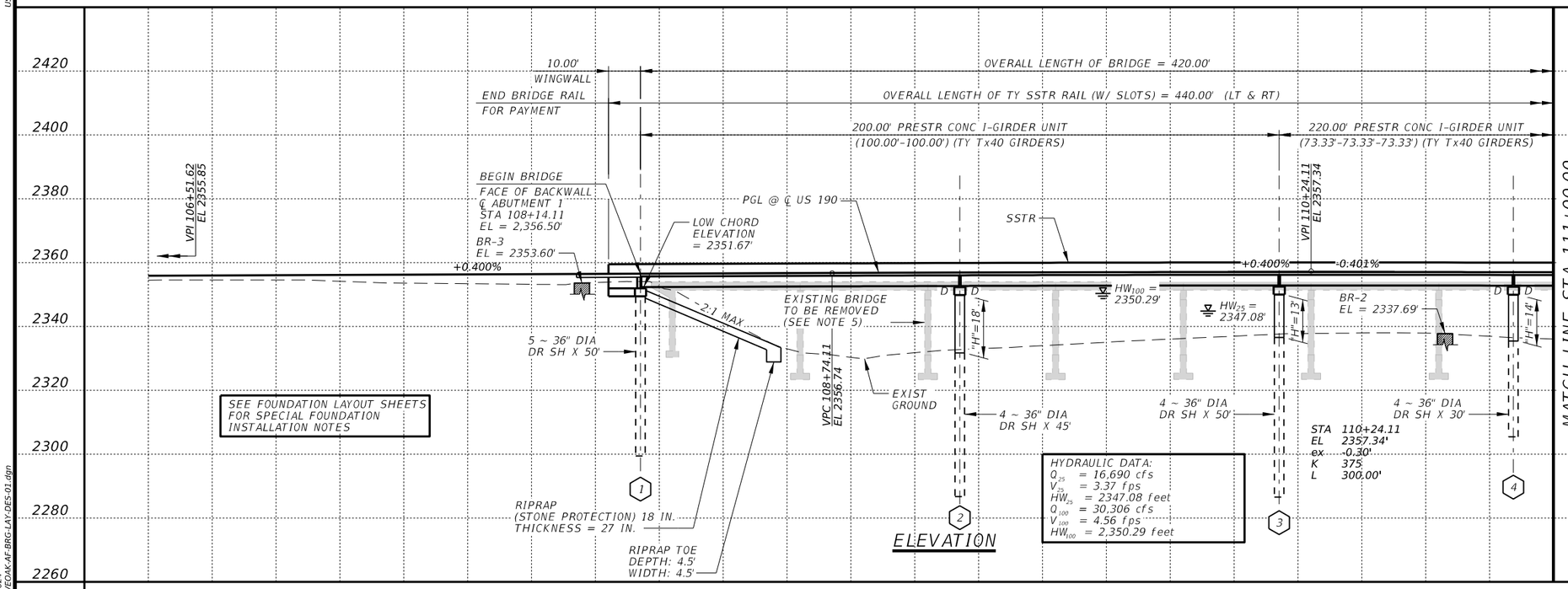


PLAN



ELEVATION

0 20' 40'
SCALE: 1" = 40'

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. ALL ABUTMENTS AND BENTS ARE AT BEARING N01°13'57.0"W.
3. CONTRACTOR SHALL CONFIRM LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.
4. SEE "BRIDGE TYPICAL SECTIONS" FOR PROPOSED TYPICAL SECTIONS.
5. EXISTING 400'-0" (10 SPANS AT 40'-0") CONC PAN GIRDER BRIDGE (NBI NO. 07-053-0-2279-02-003) AND CONC SUBSTRUCTURE WITH CONCRETE FOOTING FOUNDATION TO BE REMOVED TO 2'-0" BELOW FINISHED GROUND.
6. SIDE SLOT DRAINS ARE REQUIRED IN SSTR BRIDGE RAIL. SEE "TYPE SSTR" STANDARD FOR DETAILS.
7. THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
8. ALL DIMENSIONS ARE EITHER HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR GRADE AND CROWN.
9. SEE "BRIDGE BORING LOGS" SHEETS FOR TEST HOLE DATA. PLAN VIEW LOCATIONS ARE APPROXIMATE.

DESIGN SPEED: 70 MPH
ADT: 228 (2022)
319 (2042)
FC: RURAL MINOR ARTERIAL
EXIST NBI: 07-053-0-2279-02-003
PROP NBI: 07-053-0-2279-02-011

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS 1.05/1.88

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
7/1/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE LAYOUT

SHEET 1 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	66
CONTROL	SECTION	JOB	
2279	02	023	

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7/1/2024
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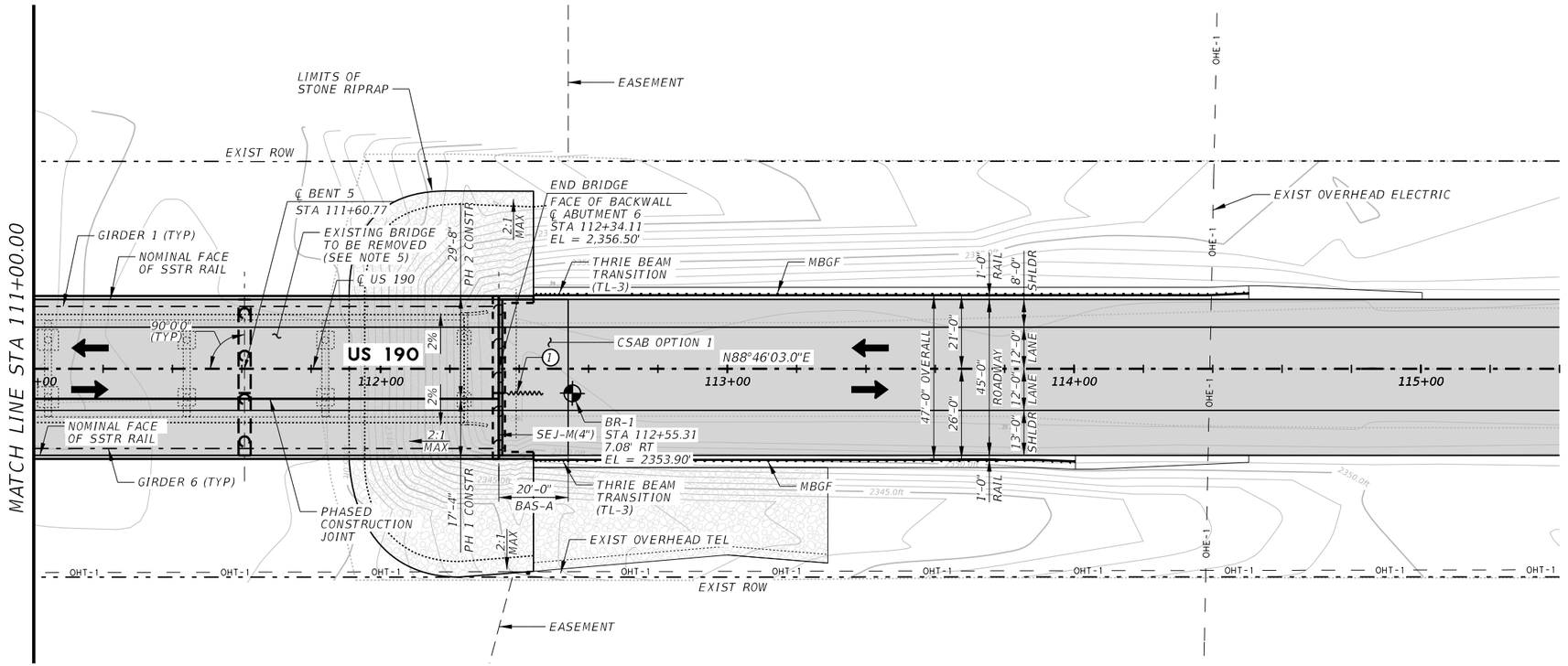
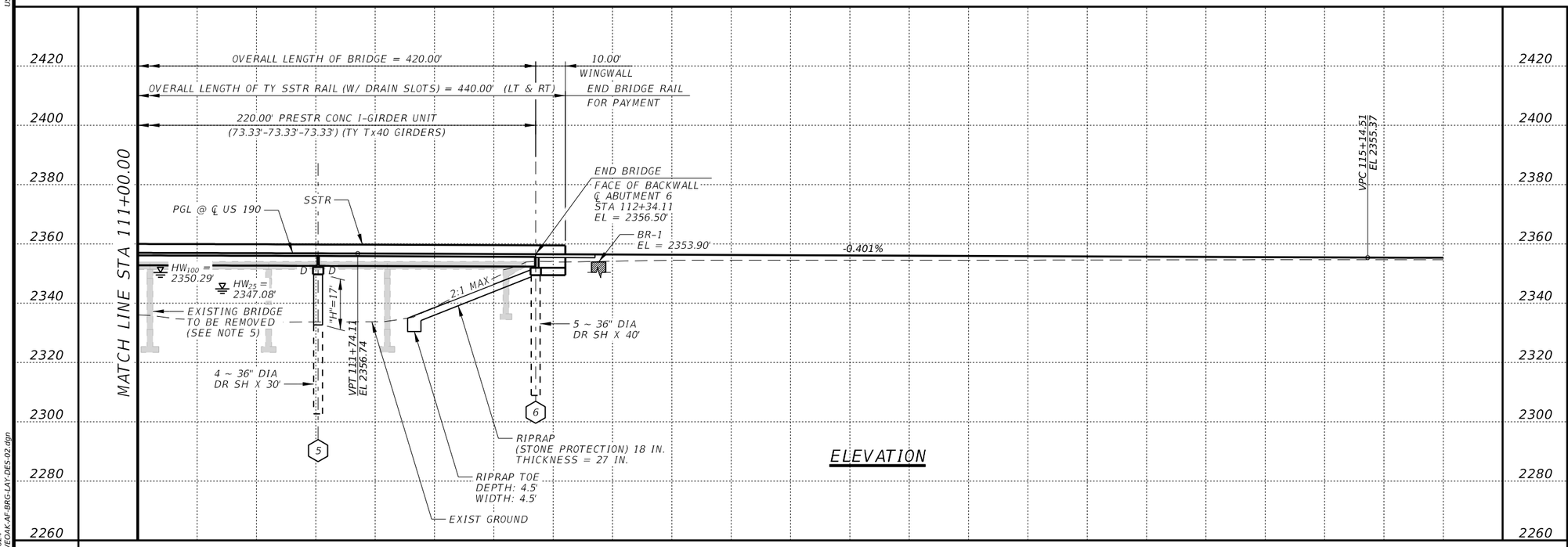


PLAN

(1) SEE FOUNDATION LAYOUT SHEETS FOR ELEVATION OF TEMP SPL SHORING



ELEVATION

0 20' 40'

SCALE: 1" = 40'

FOR GENERAL NOTES SEE SHEET 1 OF 2.

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS 1.05/1.88

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
7/1/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE LAYOUT

SHEET 2 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	67
CONTROL	SECTION	JOB	
2279	02	023	

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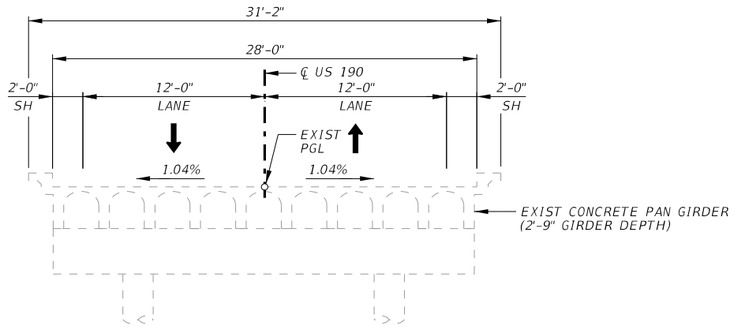
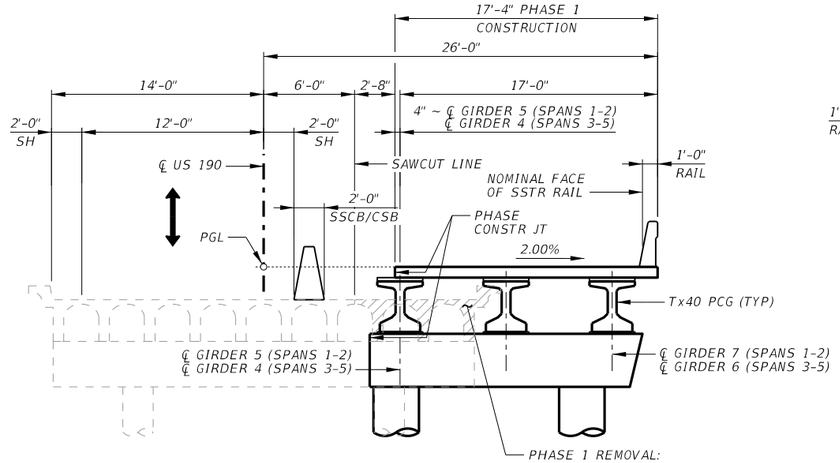


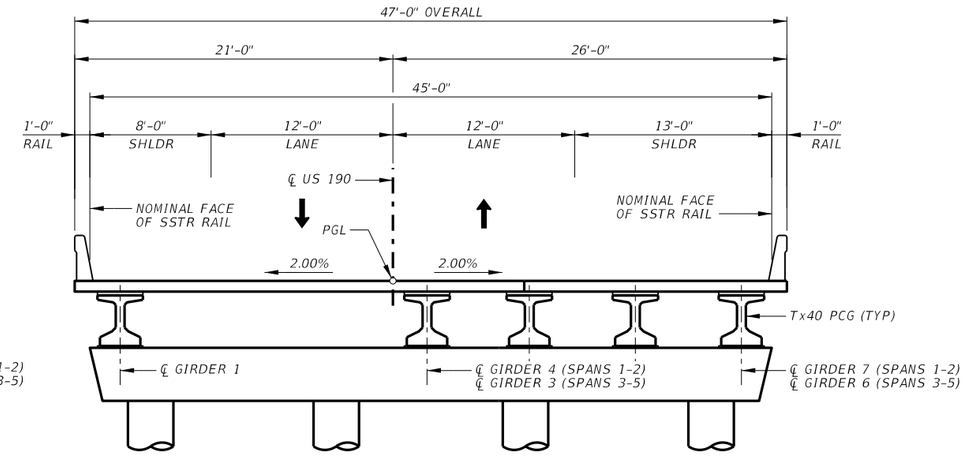
EXISTING TYPICAL SECTION

SCALE: 1"=10'



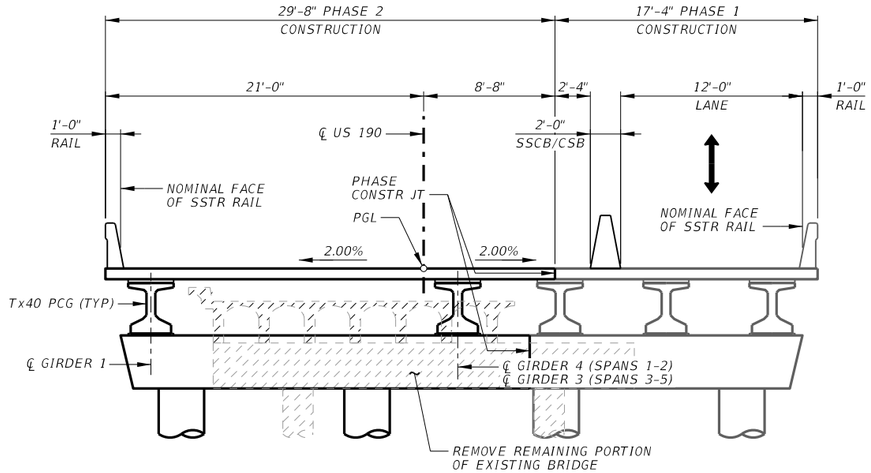
PHASE 1 CONSTRUCTION

SCALE: 1"=10'



COMPLETED TYPICAL SECTION

SCALE: 1"=10'



PHASE 2 CONSTRUCTION

SCALE: 1"=10'

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER

6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE TYPICAL SECTIONS

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	68
CONTROL	SECTION	JOB	
2279	02	023	

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DRILLING LOG

WinCore Version 3.0	County	Crockett	Hole	BR-1	District
	Highway	US 190	Structure	Bridge	Date 01/11/23
	CSJ	2279-02-023	Station	112+55.31	Grnd. Elev. 2353.90 ft
			Offset	7.08 RT	GW Elev. N/A

Elev. (ft)	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
2353.7		ASPHALT, 2-1/2 inches							
2352.9		BASE, 9 inches			5				Sulfate Concentration: 1,280 ppm
		FILL, Hard, Dry, Brown to White, with clay, limestone fragments, and chalk			1				Sulfate Concentration: 240 ppm
5	19 (6) 30 (6)				0				Passing No. 4, 40, 200 Sieve: 42%, 19%, 14%
					2				pH: 9.7
10	24 (6) 16 (6)								
2340.9		CLAY, Reddish-brown, Very Stiff to Hard, with sand (CL)			9	33	18		Passing No. 4, 40, 200 Sieve: 97%, 95%, 90%
15	12 (6) 17 (6)								
					5				- with gravel below 18 ft Resistivity: 1,770 Ohm-cm
2333.9 20	50 (4) 50 (2)	CONGLOMERATE, Hard, Moist, Reddish-Brown, with sand, indurated with calcium carbonate (Caliche)							
25	50 (2.5) 50 (2)				1				Sulfate Concentration: 120 ppm pH: 8.9
30	50 (3) 50 (2)				8				
35	50 (1) 50 (1)				8				

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877418°, -101.679028°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 4a

DRILLING LOG

WinCore Version 3.0	County	Crockett	Hole	BR-1	District
	Highway	US 190	Structure	Bridge	Date 01/11/23
	CSJ	2279-02-023	Station	112+55.31	Grnd. Elev. 2353.90 ft
			Offset	7.08 RT	GW Elev. N/A

Elev. (ft)	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
		CONGLOMERATE, Hard, Moist, Reddish-Brown, with sand, indurated with calcium carbonate (Caliche)							
40	42 (6) 41 (6)				14	45	27		Passing No. 4, 40, 200 Sieve: 95%, 70%, 64%
					2				pH: 9.1
45	50 (0.5) 50 (1)								
2307.9		CLAY, Very Stiff to Hard, Dry, Reddish-Brown, lean, sandy (CL)			10				
50	17 (6) 11 (6)								
					24	38	21		Passing No. 4, 40, 200 Sieve: 100%, 98%, 96%
55	27 (6) 50 (3.5)								
2297.9		CONGLOMERATE, Hard, Moist, Brown, with sand, indurated with calcium carbonate (Caliche)			13				
60	50 (3) 50 (2.5)								
					19				- dense from 63 to 65 ft
65	43 (6) 50 (1)								
					21				
70	50 (3.5) 50 (2)								

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877418°, -101.679028°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 4b

GENERAL NOTES:

1. BORING INFORMATION SHOWN FOR EASE OF REFERENCE. FOR COMPLETE BORING INFORMATION AND ADDITIONAL GEOTECHNICAL DATA, SEE GEOTECHNICAL ENGINEERING STUDY (AAA22-151-00) BY RABA KISTNER, INC.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE BORING LOGS

SHEET 1 OF 5

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	69
CONTROL	SECTION	JOB	
2279	02	023	

DRILLING LOG

WinCore Version 3.0

County	Crockett	Hole	BR-1	District	
Highway	US 190	Structure	Bridge	Date	01/11/23
CSJ	2279-02-023	Station	112+55.31	Grnd. Elev.	2353.90 ft
		Offset	7.08 RT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CONGLOMERATE, Hard, Moist, Brown, with sand, indurated with calcium carbonate (Caliche)							
75		50 (2) 50 (1)				15				Sulfate Concentration: 100 ppm pH: 9.3
80		27 (6) 50 (5.5)				22	40	23		Passing No. 4, 40, 200 Sieve: 95%, 92%, 85%
85		50 (2) 40 (6)				13				
90		50 (2.5) 50 (2)				14	32	18		Passing No. 4, 40, 200 Sieve: 73%, 29%, 16%
95		50 (1.5) 50 (1.5)				14				
2253.9 100		50 (2) 50 (3)				10				Sulfate Concentration: 120 ppm pH: 8.9
105										

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877418°, -101.679028°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 4c

DRILLING LOG

WinCore Version 3.0

County	Crockett	Hole	BR-2	District	
Highway	US 190	Structure	Bridge	Date	01/13/23
CSJ	2279-02-023	Station	110+66.03	Grnd. Elev.	2337.69 ft
		Offset	25.79 LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, Loose to Very Dense, Dry, Brown to Reddish, clayey, with gravel			4				Sulfate Concentration: 120 ppm
						5				Passing No. 4, 40, 200 Sieve: 33%, 9%, 6%
5		9 (6) 9 (6)				2				pH: 10.1
						7	33	20		Passing No. 4, 40, 200 Sieve: 72%, 31%, 24%
10		9 (6) 9 (6)				2				Resistivity: 5,140 Ohm-cm
2322.7 15		50 (2) 50 (2)	CONGLOMERATE, Hard, Dry, Brown, clayey, with gravel (Caliche)			8				Sulfate Concentration: 120 ppm
20		50 (4) 50 (3)				6	56	38		Passing No. 4, 40, 200 Sieve: 74%, 33%, 27%
25		50 (3) 50 (4)				11				
2307.7 30		50 (1.5) 50 (1)				4				Sulfate Concentration: 100 ppm pH: 9.0
			CLAY, Very Stiff, Dry, Brown, with sand (CL)							
35		17 (6) 18 (6)								

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings and bentonite plugs.
3. Approximate Boring Location: 30.877495°, -101.679630°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 5a

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE BORING LOGS

SHEET 2 OF 5

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	70
CONTROL	SECTION	JOB	
2279	02	023	

DRILLING LOG

WinCore Version 3.0

County	Crockett	Hole	BR-2	District	
Highway	US 190	Structure	Bridge	Date	01/13/23
CSJ	2279-02-023	Station	110+66.03	Grnd. Elev.	2337.69 ft
		Offset	25.79 LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Very Stiff, Dry, Brown, with sand (CL)			16	42	26		Passing No. 4, 40, 200 Sieve: 94%, 87%, 77%
40		27 (6) 37 (6)								
						10				
2292.7 45		50 (3) 50 (1)	CONGLOMERATE, Hard, Dry, Brown, clayey, with gravel (Caliche)			9				Passing No. 4, 40, 200 Sieve: 75%, 32%, 22%
50		50 (1.5) 50 (1.5)				10				
55		50 (1.5) 50 (1)				10				Sulfate Concentration: 100 ppm pH: 8.9
2277.7 60		21 (6) 39 (6)	CLAY, Very Stiff to Hard, Moist, Brown, lean (CL)			13	58	39		Passing No. 4, 40, 200 Sieve: 75%, 44%, 35%
65		20 (6) 16 (6)				21				
70		19 (6) 16 (6)								

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings and bentonite plugs.
3. Approximate Boring Location: 30.877495°, -101.679630°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 5b

DRILLING LOG

WinCore Version 3.0

County	Crockett	Hole	BR-2	District	
Highway	US 190	Structure	Bridge	Date	01/13/23
CSJ	2279-02-023	Station	110+66.03	Grnd. Elev.	2337.69 ft
		Offset	25.79 LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Very Stiff to Hard, Moist, Brown, lean (CL)			23				
2263.7 75		50 (1) 50 (3)	CONGLOMERATE, Hard, Moist, Reddish-Brown, with sand, indurated with calcium carbonate (Caliche)			21	40	25		- with gravel below 76 ft Passing No. 4, 40, 200 Sieve: 99.5%, 96%, 90% - indurated with calcium carbonate (Caliche) from 75 to 81 ft
80		50 (1) 50 (2)				18				Sulfate Concentration: 120 ppm pH: 8.8
85		50 (2) 50 (1)				15				
90		50 (2) 50 (2)				13				Passing No. 4, 40, 200 Sieve: 74%, 33%, 26%
95		25 (6) 37 (6)				13				
2237.7 100		50 (0.5) 50 (0.13)								
105										

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings and bentonite plugs.
3. Approximate Boring Location: 30.877495°, -101.679630°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 5c

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE BORING LOGS

SHEET 3 OF 5

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	71
CONTROL	SECTION	JOB	
2279	02	023	

DRILLING LOG

WinCore Version 3.0	County	Crockett	Hole	BR-3	District
	Highway	US 190	Structure	Bridge	Date 01/14/23
	CSJ	2279-02-023	Station	107+95.77	Grnd. Elev. 2353.60 ft
			Offset	11.90 LT	GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
2353.4			ASPHALT, 3 inches			8	29	10		
2352.4			BASE, 12 inches							
			FILL, Dense, Dry, Tan and Gray, with clay			9				
						9				Passing No. 4, 40, 200 Sieve: 26%, 12%, 8%
5		30 (6) 50 (3)								
						7				Sulfate Concentration: 100 ppm
						4				Resistivity: 3,030 Ohm-cm
10		16 (6) 31 (6)								
2340.6			SAND, Medium Dense to Very Dense, Dry, Brown, clayey			6				pH: 8.5
15		19 (6) 21 (6)								
						7	38	24		Passing No. 4, 40, 200 Sieve: 73%, 29%, 16%
20		28 (6) 28 (6)								
25		34 (6) 50 (4)				4				
2323.6 30		50 (2) 50 (2)	CONGLOMERATE, Hard, Dry, Brown, clayey, with gravel (Caliche)			10				- with limestone fragments from 31 to 33 ft
35		50 (3) 50 (2)								

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877432°, -101.680486°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 6a

DRILLING LOG

WinCore Version 3.0	County	Crockett	Hole	BR-3	District
	Highway	US 190	Structure	Bridge	Date 01/14/23
	CSJ	2279-02-023	Station	107+95.77	Grnd. Elev. 2353.60 ft
			Offset	11.90 LT	GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CONGLOMERATE, Hard, Dry, Brown, clayey, with gravel (Caliche)			7				Sulfate Concentration: 100 ppm pH: 8.7
2313.640		27 (6) 25 (6)								
			CLAY, Hard, Dry, Reddish-brown, lean and sandy (CL)			12	42	23		Passing No. 4, 40, 200 Sieve: 82%, 68%, 62%
2308.645		23 (6) 17 (6)								
			CLAY, Very Stiff to Hard, Dry, Reddish-Brown, lean (CL)			18				
50		26 (6) 28 (6)								
						16	32	19		Passing No. 4, 40, 200 Sieve: 100%, 99%, 94%
55		50 (4) 50 (3)								
2297.6			CONGLOMERATE, Dense to Very Dense, Moist, Reddish-Brown, clayey, with gravel, indurated with calcium carbonate (Caliche)			14				- with calcareous deposits from 56 to 66 ft
60		50 (2) 50 (1)				10				Sulfate Concentration: 100 ppm pH: 8.8
65		50 (2) 50 (1)				14	29	16		Passing No. 4, 40, 200 Sieve: 65%, 21%, 14%
70		50 (1.5) 50 (1)								

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877432°, -101.680486°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic Logger: Mahima Organization: Raba-Kistner Consultants, Inc.

FIGURE: 6b

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE BORING LOGS

SHEET 4 OF 5

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	72
CONTROL	SECTION	JOB	
2279	02	023	

DRILLING LOG

WinCore Version 3.0	County	Crockett	Hole	BR-3	District		
	Highway	US 190	Structure	Bridge	Date	01/14/23	
	CSJ	2279-02-023	Station	107+95.77	Grnd. Elev.	2353.60 ft	
			Offset	11.90 LT	GW Elev.	N/A	

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
2353.60			CONGLOMERATE, Dense to Very Dense, Moist, Reddish-Brown, clayey, with gravel, indurated with calcium carbonate (Caliche)			13				
75		50 (1.5) 50 (1)				12				
80		50 (3) 50 (2.5)				14	40	26		Passing No. 4, 40, 200 Sieve: 79%, 62%, 58%
85		50 (1.5) 50 (1.5)				10				Sulfate Concentration: 100 ppm pH: 8.8
90		50 (1.5) 50 (1)				25				Passing No. 4, 40, 200 Sieve: 91%, 28%, 14%
95		50 (1.5) 50 (0.5)				12				
2253.60		50 (1.5) 50 (0.13)								
105										

Remarks:
1. Groundwater was not encountered prior to introduction of water for mud rotary drilling operations.
2. Borehole backfilled with auger cuttings, bentonite plugs, and patched with asphalt.
3. Approximate Boring Location: 30.877432°, -101.680486°

The ground water elevation was not determined during the course of this boring.

Driller: Austin Geologic **Logger: Mahima** **Organization: Raba-Kistner Consultants, Inc.**

FIGURE: 6c

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BRIDGE BORING LOGS

SHEET 5 OF 5

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	73
CONTROL	SECTION	JOB	
2279	02	023	

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SUMMARY OF ESTIMATED BRIDGE QUANTITIES

ITEM	400	403	416	420	420	420	422	422	425	432	450	454
BID CODE	7010	7001	7006	7012	7022	7038	7001	7013	7003	7043	7024	7004
DESCRIPTION	CEM STABIL BKFL (3)	TEMPORARY SPL SHORING	DRILL SHAFT (36 IN) (4)	CL C CONC (ABUT) (1)	CL C CONC (CAP) (1)	CL C CONC (COLUMN)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX40)	RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY SSTR) (5)	SEALED EXPANSION JOINT (4 IN) (SEJ-M)
UNITS	CY	SF	LF	CY	CY	CY	SF	CY	LF	CY	LF	LF
PHASE 1												
2 ~ ABUTMENTS	46		180	24.4				26.2			20.0	36 (2)
4 ~ BENTS			310		34.4	32.8						
1 ~ 200.00' PRESTRESSED CONCRETE GIRDER UNIT							3,466		597.00		200.0	18 (2)
1 ~ 220.00' PRESTRESSED CONCRETE GIRDER UNIT							3,813		655.50		220.0	
PHASE 1 TOTAL	46	0	490	24.4	34.4	32.8	7,279	26.2	1,252.50	0	440.0	54 (2)
PHASE 2												
2 ~ ABUTMENTS	80	132	270	32.8				46.0		958	20.0	58
4 ~ BENTS			310		51.3	32.8						
1 ~ 200.00' PRESTR CONC GIRDER UNIT							5,934		796.00		200.0	29
1 ~ 220.00' PRESTR CONC GIRDER UNIT							6,528		655.50		220.0	
PHASE 2 TOTAL	80	132	580	32.8	51.3	32.8	12,462	46.0	1,451.50	958	440.0	87
TOTAL	126	132	1,070	57.2	85.7	65.6	19,741	72.2	2,704.00	958	880.0	141

1. INCLUDES SHEAR KEY CONCRETE.
2. INCLUDES 1 FOOT EXTENSION PAST PHASE 1 SLAB EDGE.
3. FORMWORK REQUIRED FOR PHASE 1 PLACEMENT OF CSAB SHALL BE CONSIDERED SUBSIDIARY TO ITEM 400-7010 CEMENT STABILIZED BACKFILL.
4. PROVIDE SULFATE RESISTANT CONCRETE.
5. PROVIDE SIDE SLOT DRAINS PER SSTR STANDARD. SPACE AT 6'-0" (MIN) BETWEEN SLOTS OR AS DIRECTED BY THE ENGINEER. INSTALLATION OF SIDE SLOT DRAINS IS CONSIDERED SUBSIDIARY TO ITEM 450-7024.

BEARING SEAT ELEVATIONS

		GRDR 1	GRDR 2	GRDR 3	GRDR 4	GRDR 5	GRDR 6	GRDR 7
ABUT 1	(FWD)	2351.537	2351.672	2351.807	2351.852	2351.717	2351.577	2351.437
BENT 2	(BK)	2351.911	2352.046	2352.181	2352.226	2352.091	2351.951	2351.811
	(FWD)	2351.938	2352.073	2352.208	2352.253	2352.118	2351.978	2351.838
BENT 3	(BK)	2352.093	2352.228	2352.363	2352.408	2352.273	2352.133	2351.993
	(FWD)	2352.114	2352.294	2352.474	2352.294	2352.154	2352.014	
BENT 4	(BK)	2352.061	2352.241	2352.421	2352.241	2352.101	2351.961	
	(FWD)	2352.057	2352.237	2352.417	2352.237	2352.097	2351.957	
BENT 5	(BK)	2351.863	2352.043	2352.223	2352.043	2351.903	2351.763	
	(FWD)	2351.856	2352.036	2352.216	2352.036	2351.896	2351.756	
ABUT 6	(BK)	2351.572	2351.752	2351.932	2351.752	2351.612	2351.472	

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	74
CONTROL	SECTION	JOB	
2279	02	023	

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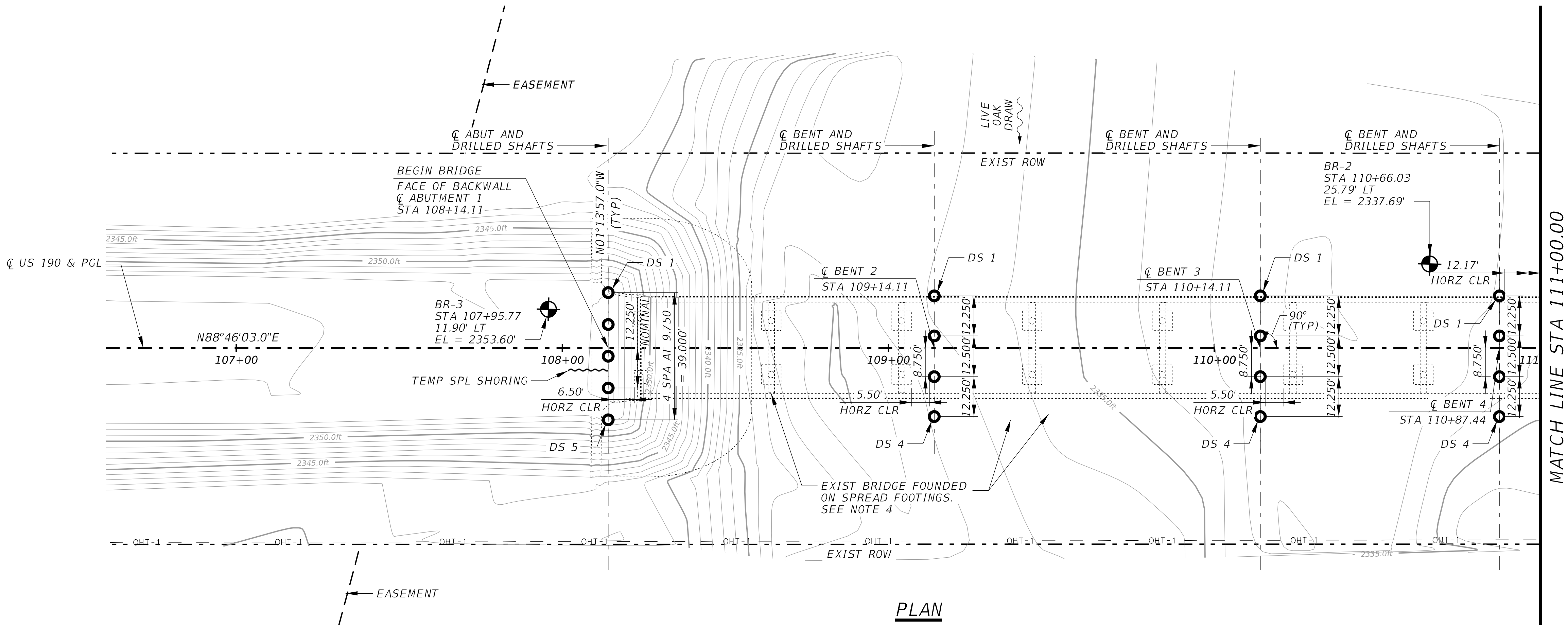
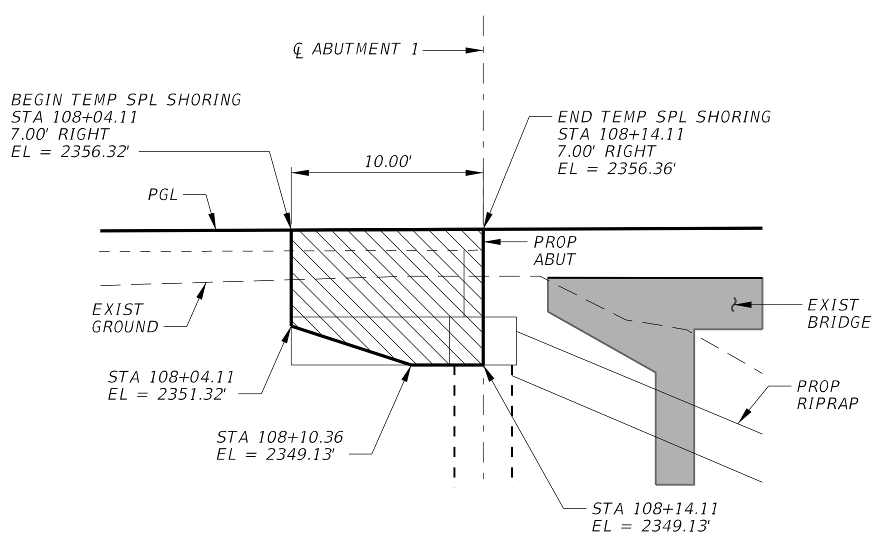


PLAN

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND CURRENT INTERIMS.
2. ALL ABUTMENTS AND BENTS ARE AT A BEARING OF N 01°13'57.0" W.
3. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
4. EXISTING 400'-0" (10 SPANS AT 40'-0") CONC PAN GIRDER (NBI NO. 07-053-0-2279-02-003) AND FOUNDATION TO BE REMOVED TO 2'-0" BELOW FINISHED GROUND.
5. HORIZONTAL CLEARANCES BETWEEN EXISTING FOUNDATION ELEMENTS AND PROPOSED STRUCTURES ARE APPROXIMATE. CONTRACTOR SHALL VERIFY PRIOR TO STARTING CONSTRUCTION. SEE SPECIAL FOUNDATION INSTALLATION NOTES FOR ADDITIONAL INFORMATION.
6. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
7. SEE "BRIDGE BORING LOGS" SHEET FOR TEST HOLE DATA. PLAN VIEW LOCATIONS ARE APPROXIMATE.
8. REFER TO GEOTECHNICAL ENGINEERING STUDY (AAA22-151-00) BY RABA KISTNER, INC. FOR ADDITIONAL GEOTECHNICAL INFORMATION.
9. AS-BUILT FOOTING DATA PROVIDED ON SHEET 2 OF 2.



TEMP SPL SHORING ELEVATION - ABUT 1

SPECIAL FOUNDATION INSTALLATION NOTES:

1. INSTALLATION OF DRILLED SHAFTS IN CLOSE PROXIMITY TO EXISTING FOUNDATIONS.

   PHASE 1 CONSTRUCTION:

   PERMANENT STEEL CASING SHALL BE USED FOR EXCAVATION AND INSTALLATION OF DRILLED SHAFTS LOCATED A HORIZONTAL DISTANCE CLOSER THAN TWO EXISTING FOOTING WIDTHS FROM THE EDGE OF THE EXISTING ABUTMENT AND COLUMN FOOTINGS.

   THIS CASING SHALL EXTEND FROM THE PROPOSED TOP OF THE DRILLED SHAFT TO A DISTANCE VERTICALLY 3 TIMES THE WIDTH OF THE EXISTING FOOTING BELOW THE BOTTOM OF THE EXISTING FOOTING. BASED ON THE FOOTING DIMENSIONS AND ELEVATIONS PROVIDED IN THE AS-BUILT PLANS, THE DESIGN BOTTOM OF CASING ELEVATIONS ARE:

LOCATION	BOTTOM OF CASING (ELEV)
ABUT 1	2317
BENT 2	2304
BENT 3	2304
BENT 4	~
BENT 5	~
ABUT 6	2323

   DRILLED SHAFT DESIGN LENGTHS AND CAPACITIES ARE BASED ON THE BOTTOM OF CASING ELEVATIONS PROVIDED ASSUMING SKIN FRICTION ONLY ON THE UNCASED PORTION OF THE SHAFT.

   DRILLED SHAFTS ARE DESIGNED USING SKIN FRICTION ONLY. END BEARING CAPACITY IS NOT UTILIZED IN THE DESIGN AND SHOULD NOT BE CONSIDERED AS PART OF THE SHAFT CAPACITY.

   IF THE CONTRACTOR NEEDS TO ADJUST THE BOTTOM OF CASING ELEVATIONS, THE ENGINEER SHALL BE NOTIFIED PRIOR TO INSTALLING THE DRILLED SHAFTS, IN ORDER TO VERIFY THE ADJUSTMENTS DO NOT REDUCE THE CAPACITY OF THE EXISTING FOOTING OR THE PROPOSED DRILLED SHAFT.

   PHASE 2 CONSTRUCTION:

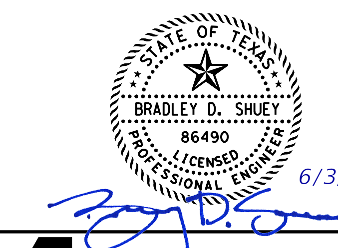
   THE REQUIREMENTS FOR PHASE 1 CONSTRUCTION PERMANENT STEEL CASING SHALL APPLY FOR ALL PORTIONS (INCLUDING PARTIAL REMOVAL) OF THE EXISTING BRIDGE THAT REMAIN IN PLACE DURING PHASE 2 CONSTRUCTION.

   THE USE OF PERMANENT STEEL CASINGS MAY BE OMITTED FOR PHASE 2 CONSTRUCTION IF THE REMAINING PORTION OF THE EXISTING BRIDGE IS COMPLETELY REMOVED PRIOR TO STARTING DRILLED SHAFT CONSTRUCTION.

2. FURNISHING AND INSTALLING PERMANENT STEEL CASING WILL NOT BE PAID FOR DIRECTLY AND SHALL BE SUBSIDIARY TO ITEM 416.
3. ALTHOUGH NOT ENCOUNTERED IN THE BORINGS, GROUND WATER MAY BE ENCOUNTERED AT THIS SITE. THE CONTRACTOR SHOULD ANTICIPATE UTILIZING CASING AND SLURRY TO CONTROL SLOUGHING AND/OR GROUNDWATER SEEPAGE.
4. THE CONTRACTOR SHALL PROVIDE A DRILLED SHAFT INSTALLATION PLAN IN ACCORDANCE WITH ITEM 416.

HL93 LOADING

NO.	DATE	REVISION	APPROV.



AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FOUNDATION LAYOUT

SHEET 1 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	75
CONTROL	SECTION	JOB	
2279	02	023	

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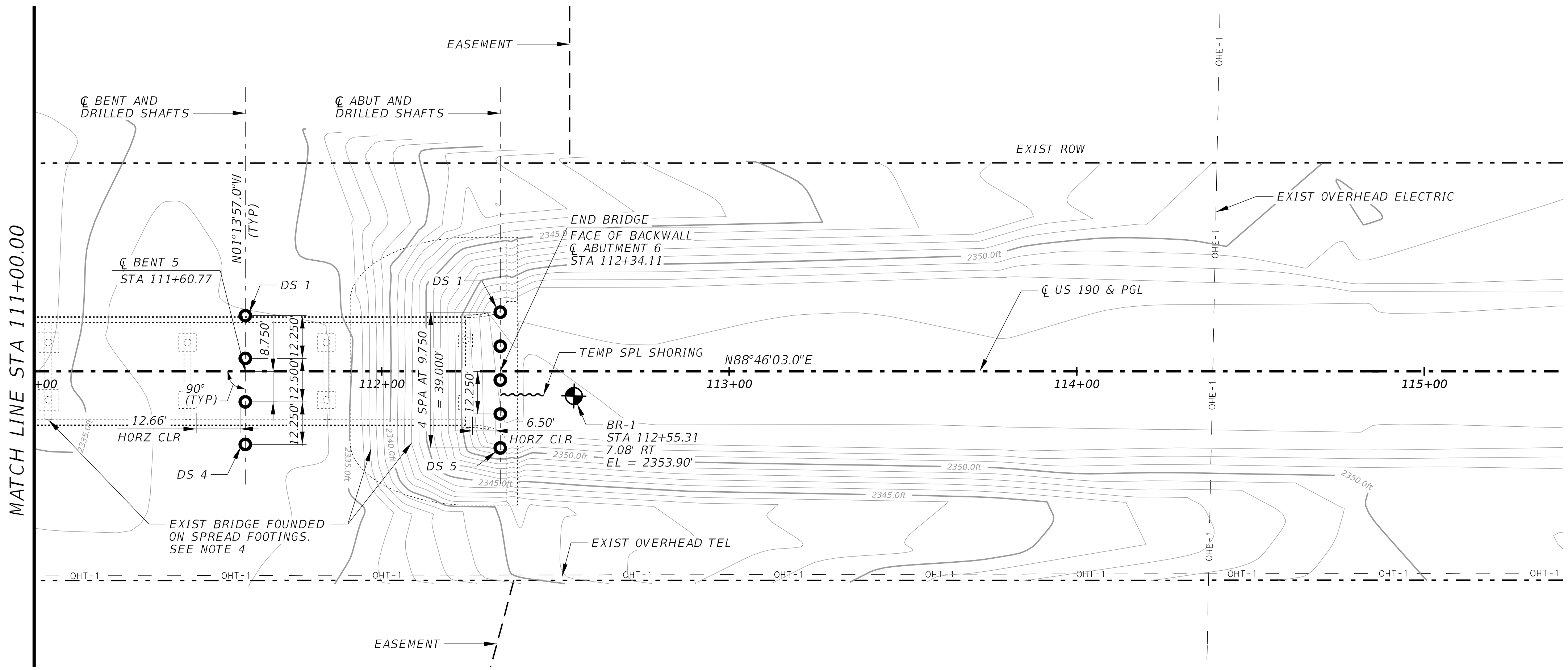
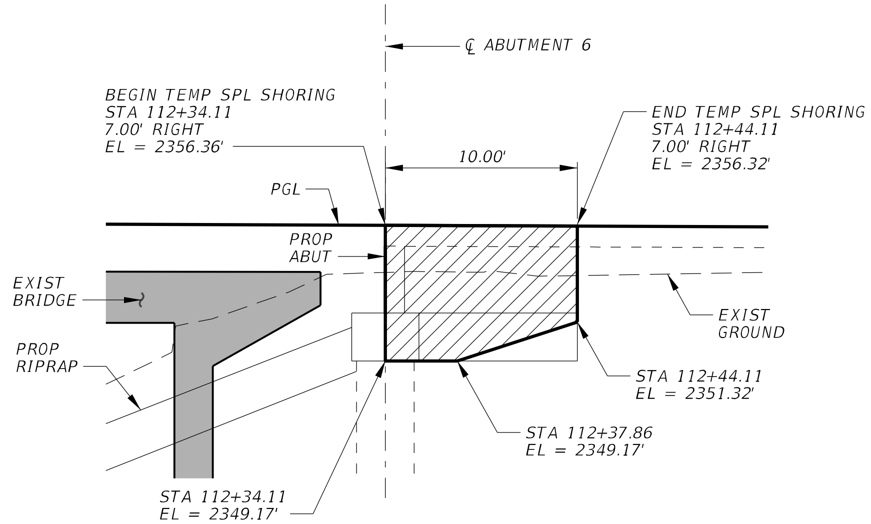


PLAN

FOR GENERAL NOTES SEE SHEET 1 OF 2.



TEMP SPL SHORING ELEVATION - ABUT 6

AS-BUILT FOOTING DATA

EXISTING BRIDGE ELEMENT	AS-BUILT STATION	PROPOSED STATION	BOTTOM OF FOOTING (ELEV)	FOOTING WIDTH (W)
ABUT 1	774+30.00	108+24.11	2329.75	4 ft
BENT 2	774+70.00	108+64.11	2322.75	6 ft
BENT 3	775+10.00	109+04.11	2322.75	6 ft
BENT 4	775+50.00	109+44.11	2322.75	6 ft
BENT 5	775+90.00	109+84.11	2322.75	6 ft
BENT 6	776+30.00	110+24.11	2322.75	6 ft
BENT 7	776+70.00	110+64.11	2322.75	6 ft
BENT 8	777+10.00	111+04.11	2322.75	6 ft
BENT 9	777+50.00	111+44.11	2322.75	5 ft
BENT 10	777+90.00	111+84.11	2322.75	5 ft
ABUT 11	778+30.00	112+24.11	2335.75	4 ft

AS-BUILT FOOTING DATA TABLE NOTES:

1. ALL FOOTINGS ARE SQUARE AND FOOTINGS ON BOTH SIDES OF EACH BENT ARE EQUAL IN SIZE.
2. DATA PROVIDED IS BASED ON FINAL AS-BUILT PLANS DATED MARCH 1961 AND SHOULD BE CONSIDERED APPROXIMATE. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO, FOOTING LOCATIONS, DIMENSIONS, AND ELEVATIONS PRIOR TO STARTING FOUNDATION INSTALLATIONS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN THE DATA PROVIDED AND ACTUAL FIELD CONDITIONS PRIOR TO STARTING DRILLED SHAFT CONSTRUCTION.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FOUNDATION LAYOUT

SHEET 2 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	76
CONTROL	SECTION	JOB	
2279	02	023	

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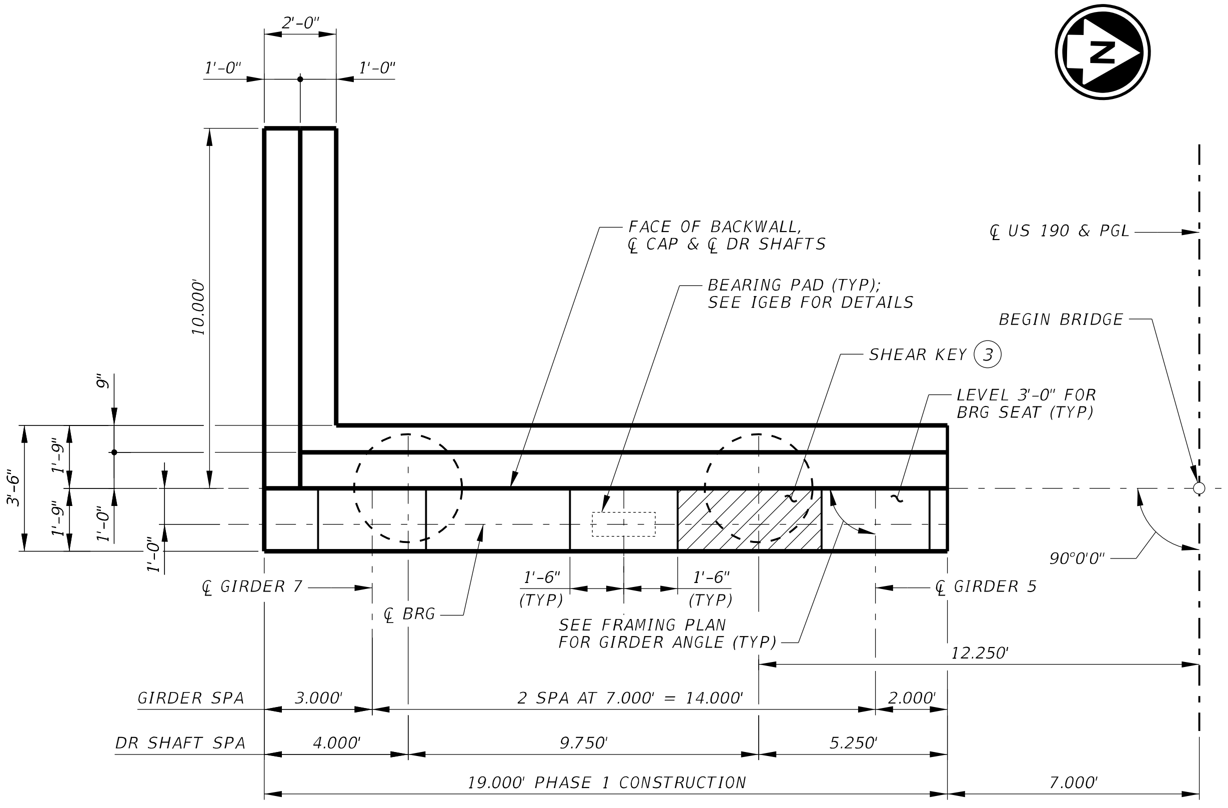
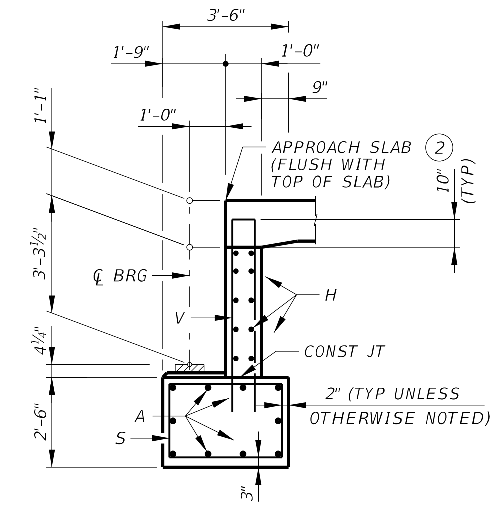


PLAN



SECTION A–A

TABLE OF ESTIMATED ABUTMENT QUANTITIES PHASE 1

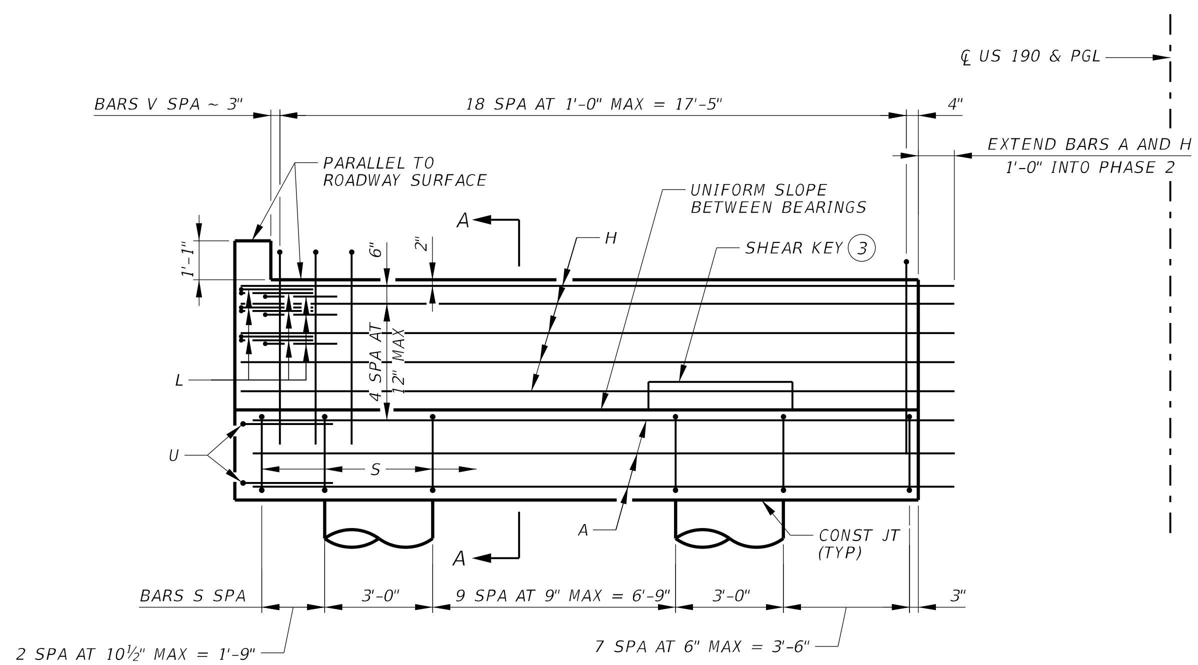
BAR	NO	SIZE	LENGTH	WEIGHT
A	10	#11	19'-6"	1,037
H	10	#6	19'-10"	298
L	9	#6	4'-0"	55
S	21	#5	11'-6"	252
U	2	#6	8'-1"	25
V	19	#5	13'-6"	267
wH1	7	#6	11'-5"	121
wH2	12	#6	9'-8"	175
wS	11	#4	7'-10"	58
wV	11	#5	13'-6"	155
REINFORCING STEEL (1)			LB	2,443
CLASS "C" CONC (ABUT) (4)			CY	12.2

(1) FOR CONTRACTOR'S INFORMATION ONLY.

(2) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.

(3) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(4) QUANTITY INCLUDES 0.2 CY FOR SHEAR KEY.



ELEVATION

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
4. SEE STONE RIPRAP (SRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.
5. SEE SSTR RAILING STANDARDS FOR RAIL ANCHORAGE IN WINGWALLS.
6. SEE SEALED EXPANSION JOINT (SEJ-M) STANDARD SHEET FOR DETAILS.
7. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
9. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
10. CALCULATED FOUNDATION LOADS = 130 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER

6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

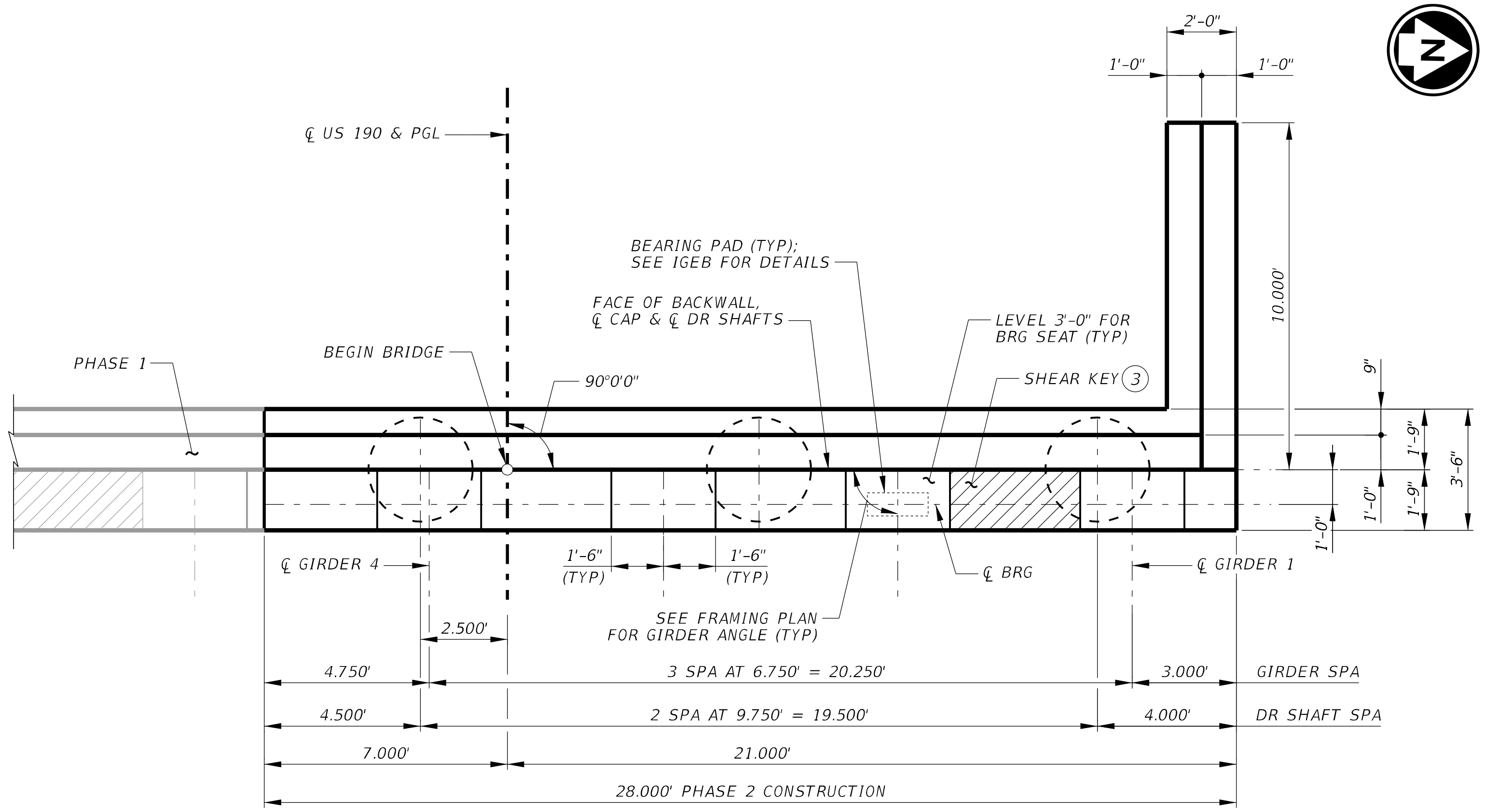
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

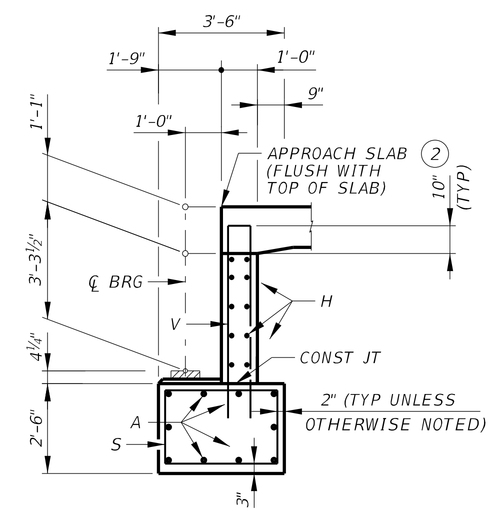
ABUTMENT 1 DETAILS PHASE 1

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	77
CONTROL	SECTION	JOB	
2279	02	023	



PLAN



SECTION A-A

TABLE OF ESTIMATED ABUTMENT QUANTITIES PHASE 2

BAR	NO	SIZE	LENGTH	WEIGHT
A	10	#11	26'-6"	1,408
H	10	#6	26'-10"	404
L	9	#6	4'-0"	55
S	30	#5	11'-6"	360
U	2	#6	8'-1"	25
V	28	#5	13'-6"	394
wH1	7	#6	11'-5"	121
wH2	12	#6	9'-8"	175
wS	11	#4	7'-10"	58
wV	11	#5	13'-6"	155
REINFORCING STEEL (1)			LB	3,155
CLASS "C" CONC (ABUT) (4)			CY	16.4

(1) FOR CONTRACTOR'S INFORMATION ONLY.

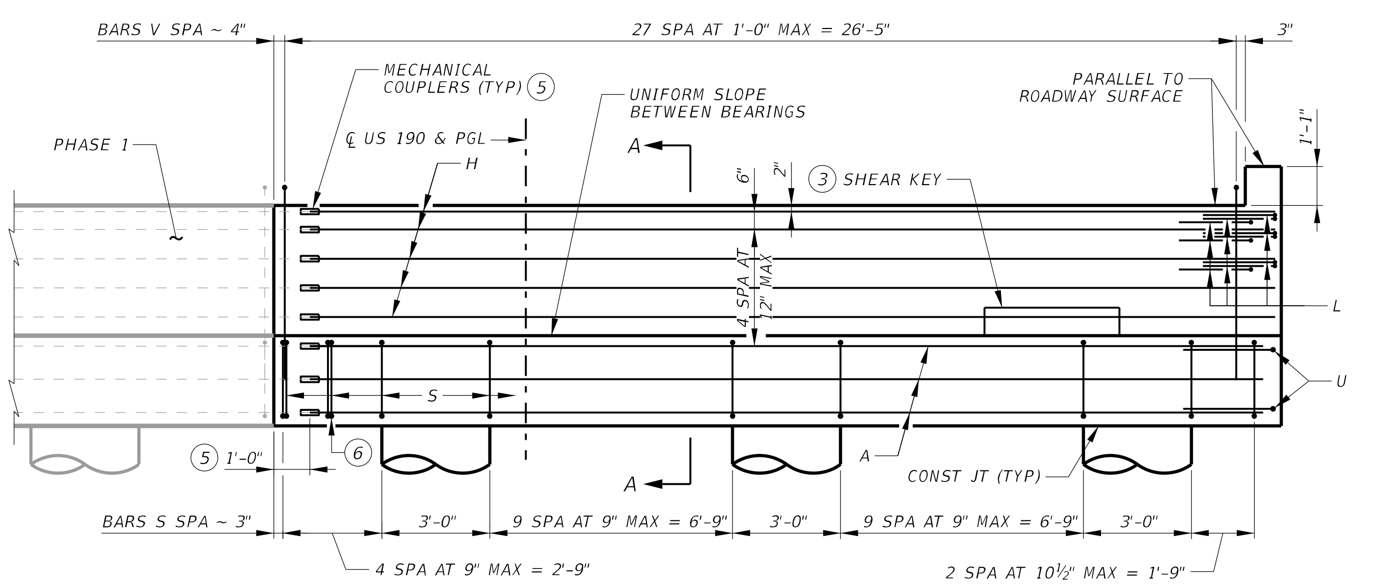
(2) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.

(3) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(4) QUANTITY INCLUDES 0.2 CY FOR SHEAR KEY.

(5) SPLICE BARS A AND BARS H USING MECHANICAL COUPLERS IN ACCORDANCE WITH ITEM 440, "REINFORCEMENT FOR CONCRETE". PAYMENT FOR COUPLERS IS SUBSIDIARY TO PERTINENT ITEMS.

(6) IF BARS S CONFLICT WITH THE MECHANICAL COUPLER, IT IS PERMISSIBLE TO PLACE TWO BARS S (BUNDLED) TO EACH SIDE OF THE MECHANICAL COUPLER (15" MAX SPA) AS SHOWN. TWO ADDTN'L BARS ADDED TO BAR QUANTITIES.



ELEVATION

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
4. SEE STONE RIPRAP (SRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.
5. SEE SSTR RAILING STANDARDS FOR RAIL ANCHORAGE IN WINGWALLS.
6. SEE SEALED EXPANSION JOINT (SEJ-M) STANDARD SHEET FOR DETAILS.
7. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
9. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
10. CALCULATED FOUNDATION LOADS = 130 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS — BRADLEY D. SHUEY — 86490 — LICENSED PROFESSIONAL ENGINEER — 6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ABUTMENT 1 DETAILS
PHASE 2

SHEET 2 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	78
CONTROL	SECTION	JOB	
2279	02	023	

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5/31/2024
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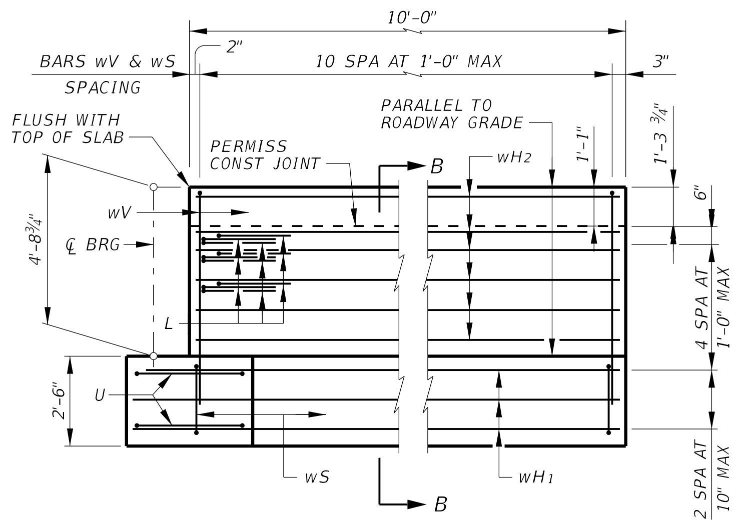
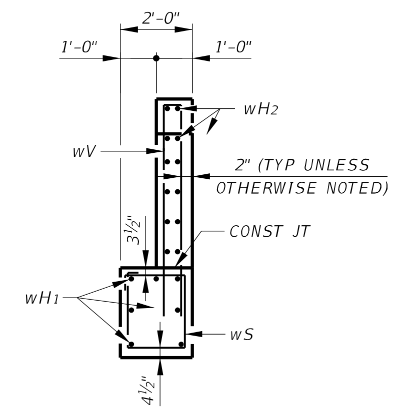
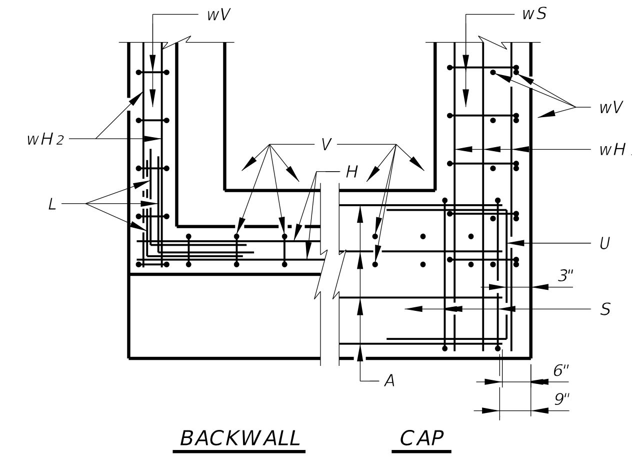


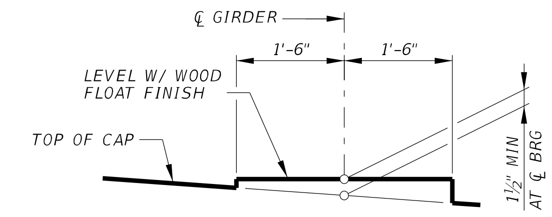
WINGWALL ELEVATION



SECTION B-B

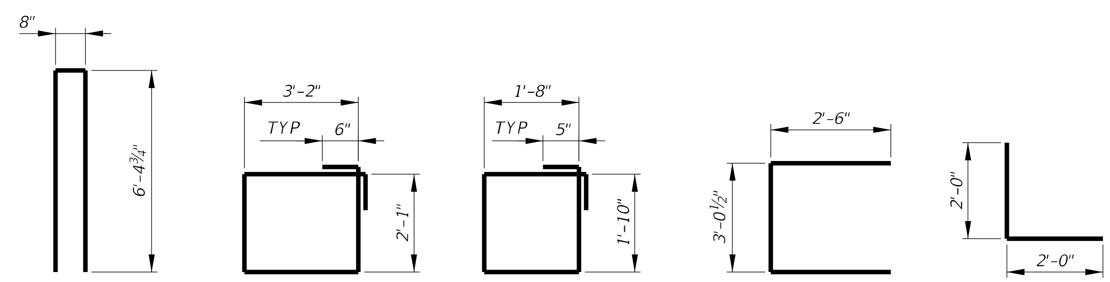


CORNER DETAILS



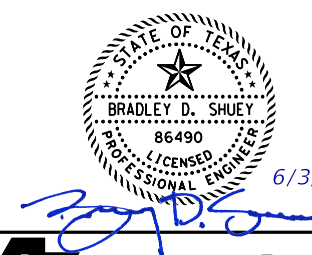
BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



HL93 LOADING

NO.	DATE	REVISION	APPROV.



AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ABUTMENT 1 DETAILS

SHEET 3 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	79
CONTROL	SECTION	JOB	
2279	02	023	

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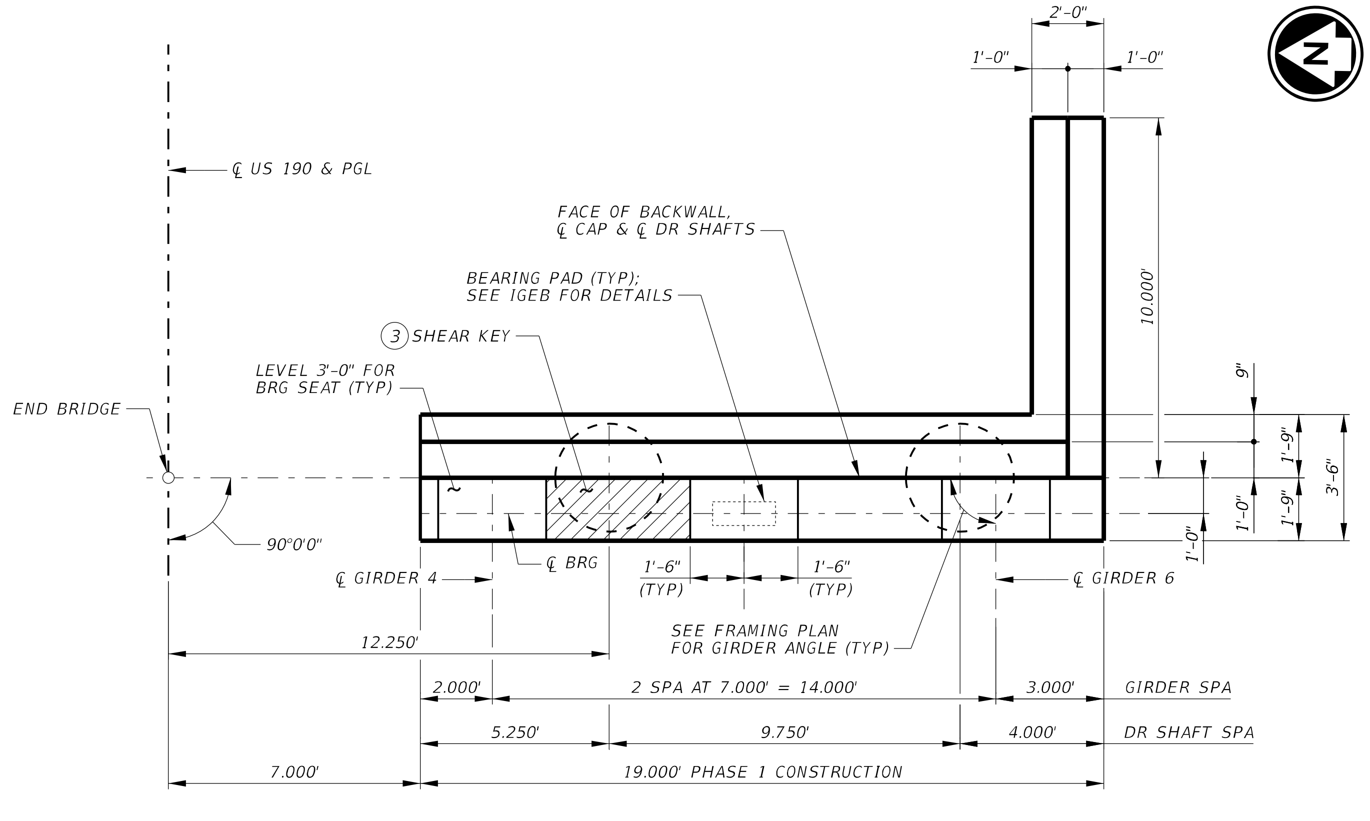

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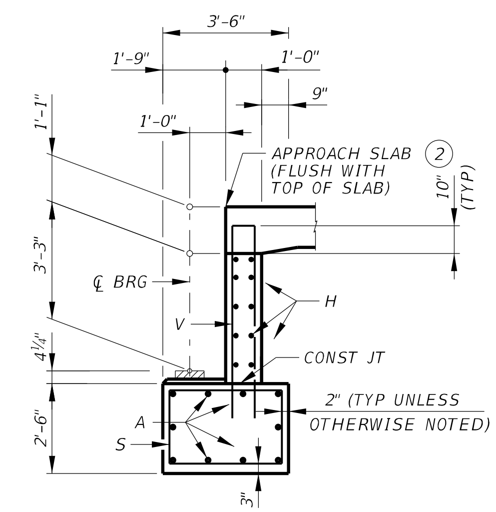


SECTION A–A

TABLE OF ESTIMATED ABUTMENT QUANTITIES PHASE 1

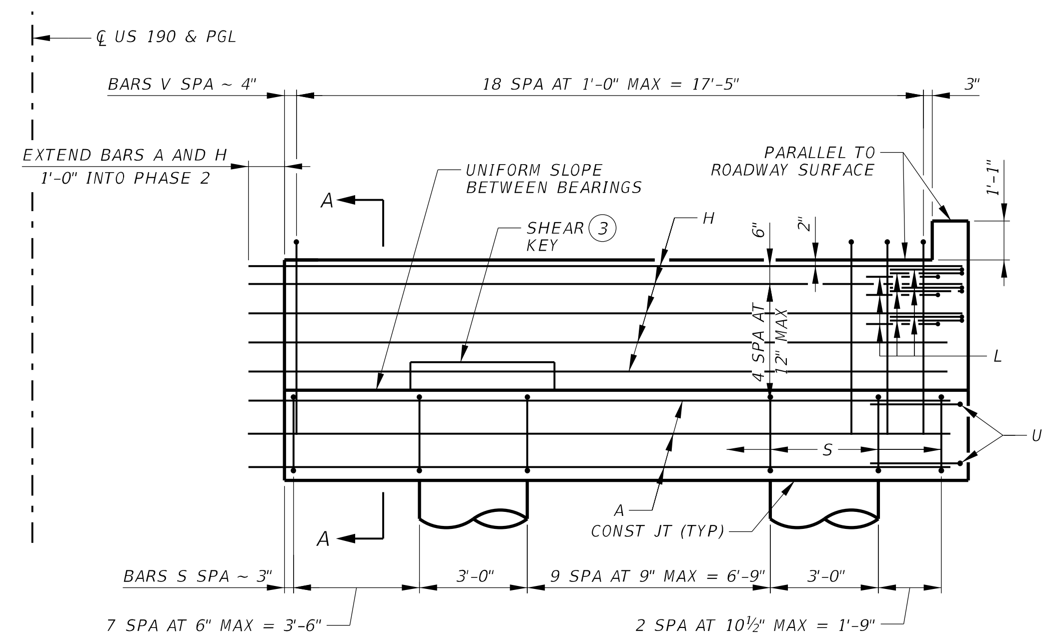
BAR	NO	SIZE	LENGTH	WEIGHT
A	10	#11	19'-6"	1,037
H	10	#6	19'-10"	298
L	9	#6	4'-0"	55
S	21	#5	11'-6"	252
U	2	#6	8'-1"	25
V	19	#5	13'-5"	266
wH1	7	#6	11'-5"	121
wH2	12	#6	9'-8"	175
wS	11	#4	7'-10"	58
wV	11	#5	13'-5"	154
REINFORCING STEEL (1)			LB	2,441
CLASS "C" CONC (ABUT) (4)			CY	12.2

(1) FOR CONTRACTOR'S INFORMATION ONLY.

(2) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.

(3) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(4) QUANTITY INCLUDES 0.2 CY FOR SHEAR KEY.



ELEVATION

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
4. SEE STONE RIPRAP (SRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.
5. SEE SSTR RAILING STANDARDS FOR RAIL ANCHORAGE IN WINGWALLS.
6. SEE SEALED EXPANSION JOINT (SEJ-M) STANDARD SHEET FOR DETAILS.
7. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
9. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
10. CALCULATED FOUNDATION LOADS = 110 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ABUTMENT 6 DETAILS
PHASE 1

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	80
CONTROL	SECTION	JOB	
2279	02	023	

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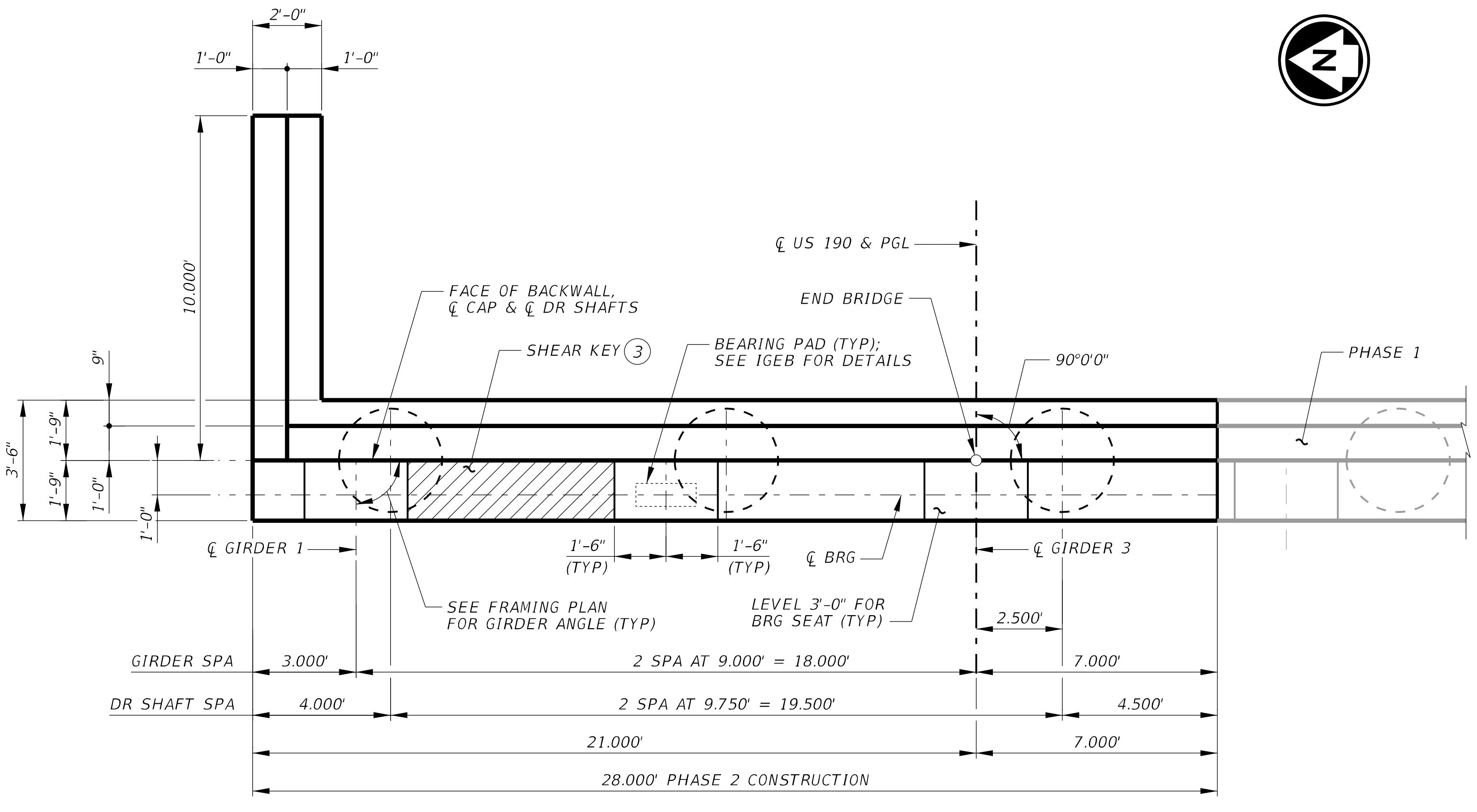

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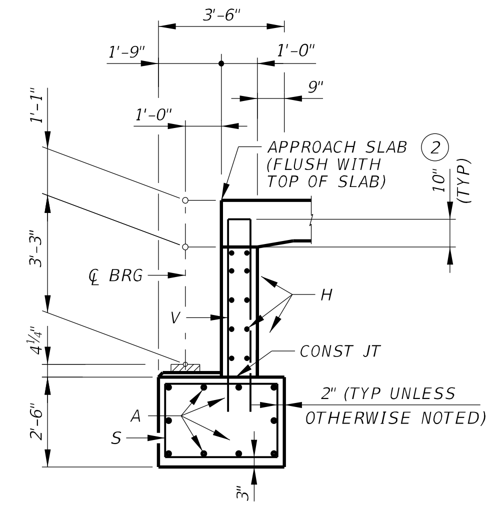
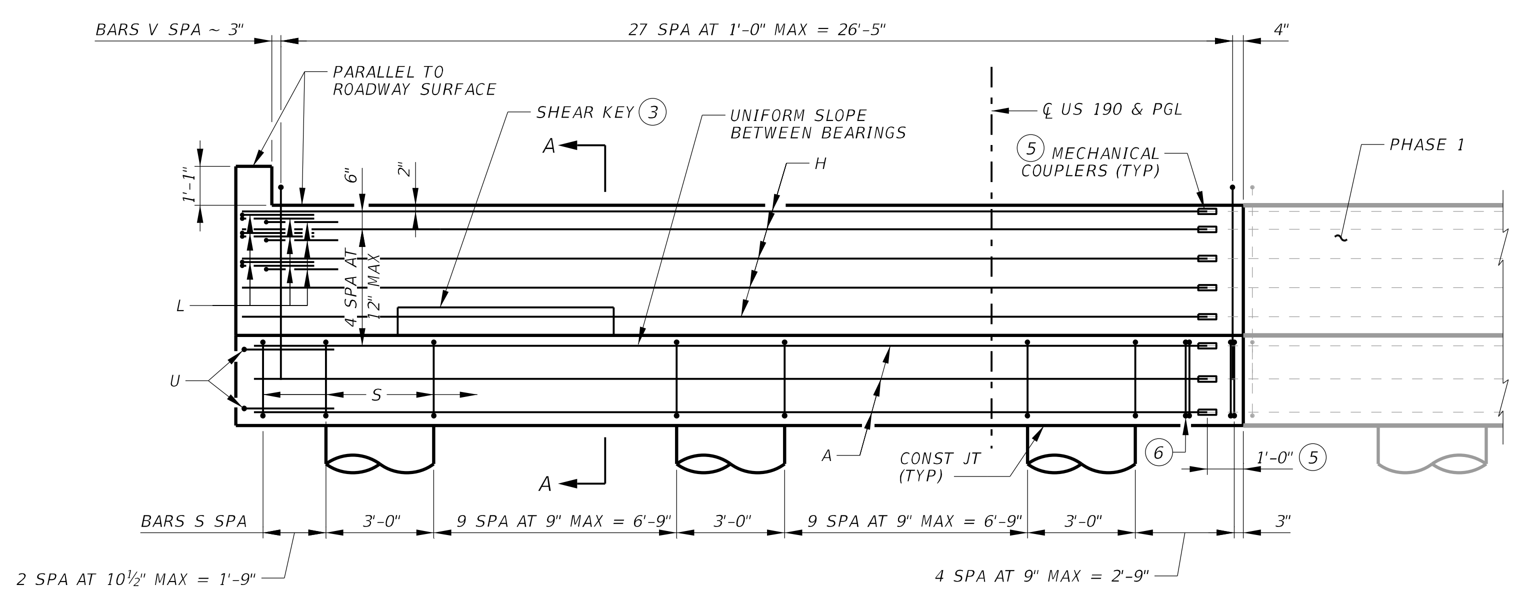


SECTION A-A

TABLE OF ESTIMATED ABUTMENT QUANTITIES PHASE 2

BAR	NO	SIZE	LENGTH	WEIGHT
A	10	#11	26'-6"	1,408
H	10	#6	26'-10"	404
L	9	#6	4'-0"	55
S	30	#5	11'-6"	360
U	2	#6	8'-1"	25
V	28	#5	13'-5"	391
wH1	7	#6	11'-5"	121
wH2	12	#6	9'-8"	175
wS	11	#4	7'-10"	58
wV	11	#5	13'-5"	154
REINFORCING STEEL (1)			LB	3,151
CLASS "C" CONC (ABUT) (4)			CY	16.4

1. FOR CONTRACTOR'S INFORMATION ONLY.
2. INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.
3. SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.
4. QUANTITY INCLUDES 0.3 CY FOR SHEAR KEY.
5. SPLICE BARS A AND BARS H USING MECHANICAL COUPLERS IN ACCORDANCE WITH ITEM 440, "REINFORCEMENT FOR CONCRETE". PAYMENT FOR COUPLERS IS SUBSIDIARY TO PERTINENT ITEMS.
6. IF BARS S CONFLICT WITH THE MECHANICAL COUPLER, IT IS PERMISSIBLE TO PLACE TWO BARS S (BUNDLED) TO EACH SIDE OF THE MECHANICAL COUPLER (15" MAX SPA) AS SHOWN. TWO ADDT'NL BARS ADDED TO BAR QUANTITIES.



ELEVATION

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES NOT SHOWN.
4. SEE STONE RIPRAP (SRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.
5. SEE SSTR RAILING STANDARDS FOR RAIL ANCHORAGE IN WINGWALLS.
6. SEE SEALED EXPANSION JOINT (SEJ-M) STANDARD SHEET FOR DETAILS.
7. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
9. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
10. CALCULATED FOUNDATION LOADS = 110 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS — BRADLEY D. SHUEY — 86490 — LICENSED PROFESSIONAL ENGINEER

6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ABUTMENT 6 DETAILS
PHASE 2

SHEET 2 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	81
CONTROL	SECTION	JOB	
2279	02	023	

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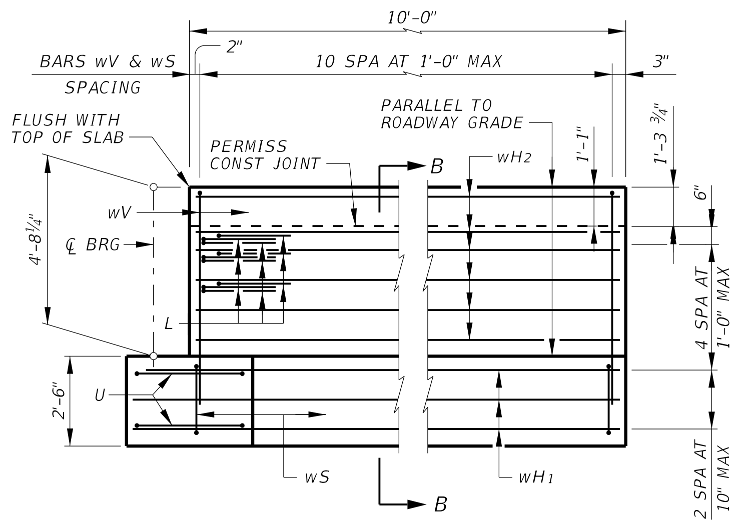
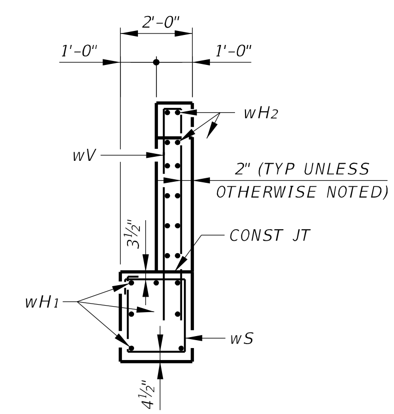
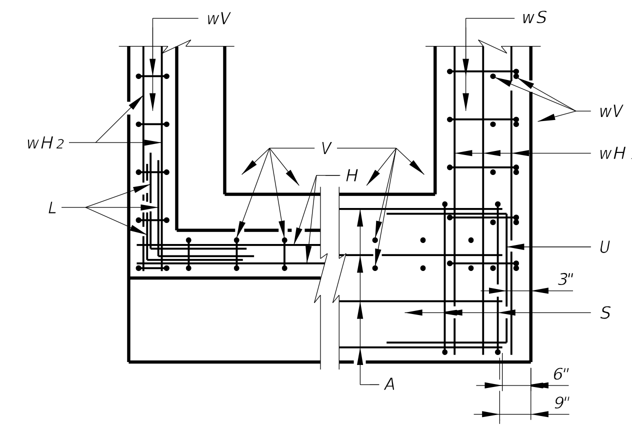


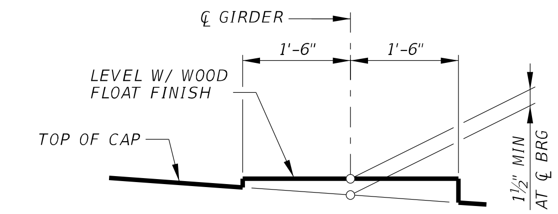
WINGWALL ELEVATION



SECTION B-B

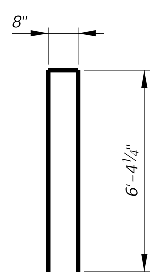


CORNER DETAILS

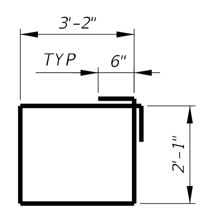


BEARING SEAT DETAIL

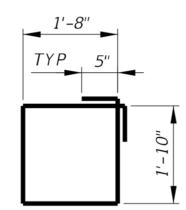
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



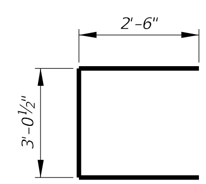
BARS V & wV



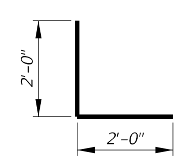
BARS S



BARS wS



BARS U



BARS L

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER

6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

ABUTMENT 6 DETAILS

SHEET 3 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	82
CONTROL	SECTION	JOB	
2279	02	023	

USER:

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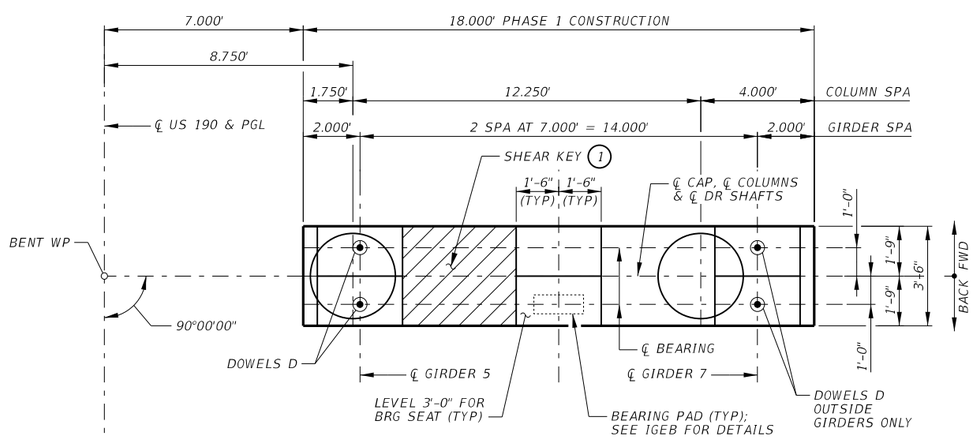

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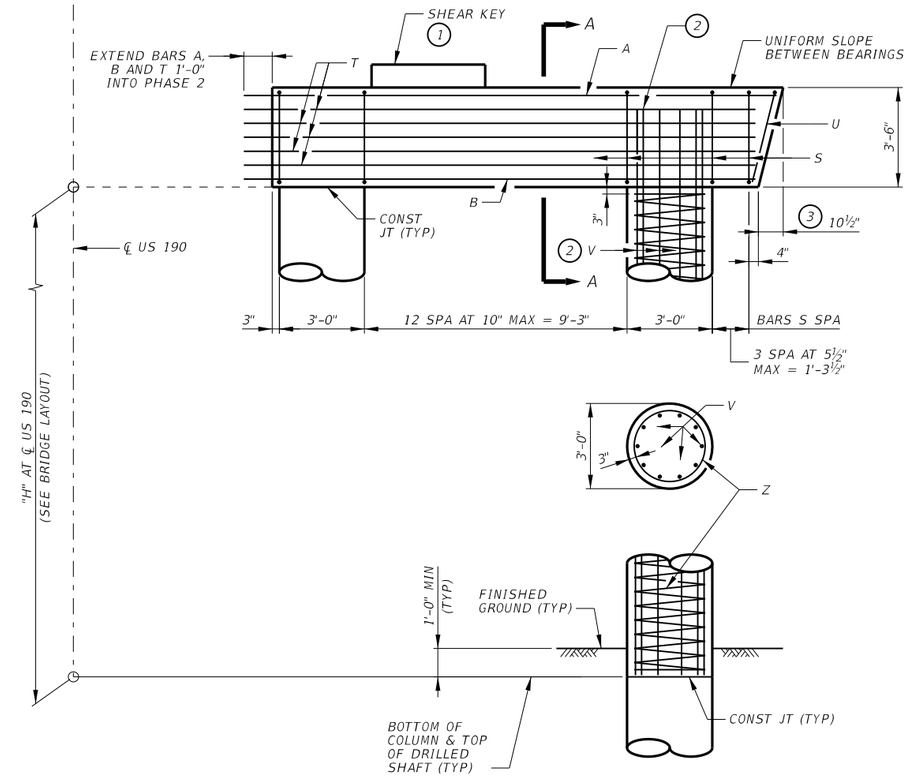


ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES - PHASE 1 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
2	18	9.5	20'-9"	1,411	589'-4"	787	2,198

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

TABLE OF ESTIMATED CAP QUANTITIES - PHASE 1

BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	18'-9"	598
B	6	#11	18'-0"	574
D	4	#9	1'-8"	23
S	18	#5	13'-8"	257
T	10	#5	18'-0"	188
U	1	#5	9'-8"	11
REINFORCING STEEL (4)			LB	1,651
CLASS "C" CONC (CAP) (5)			CY	8.6

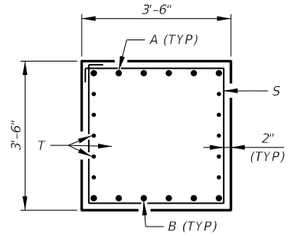
GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 210 TONS/DR SH.

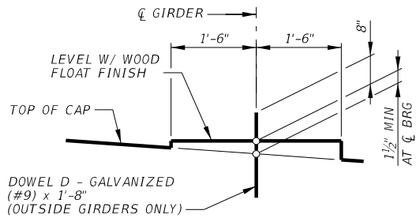
MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. GALVANIZE DOWEL BARS D.

HL93 LOADING

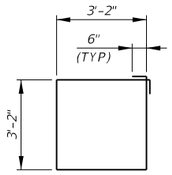


SECTION A-A

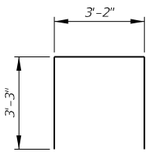


BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



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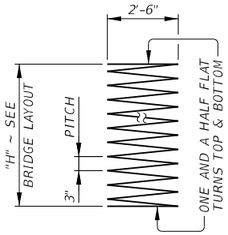


BARS Z

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

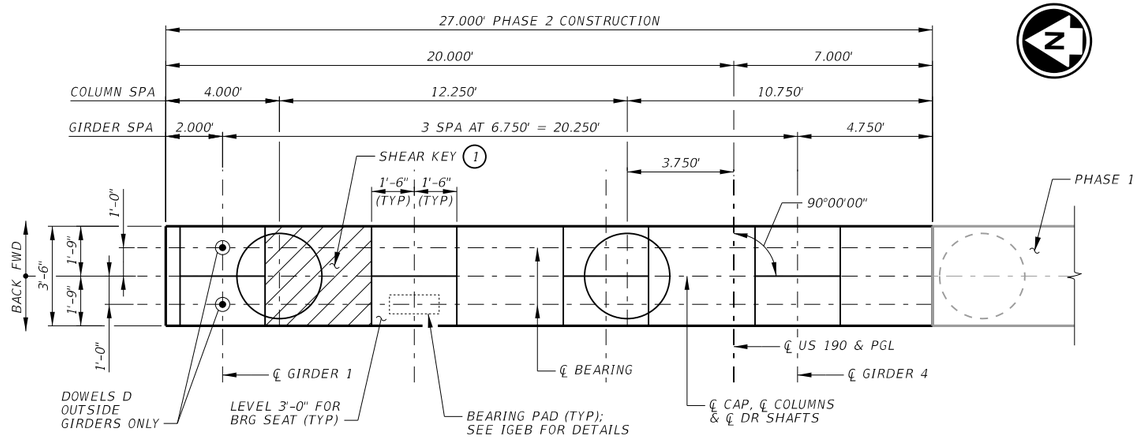
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

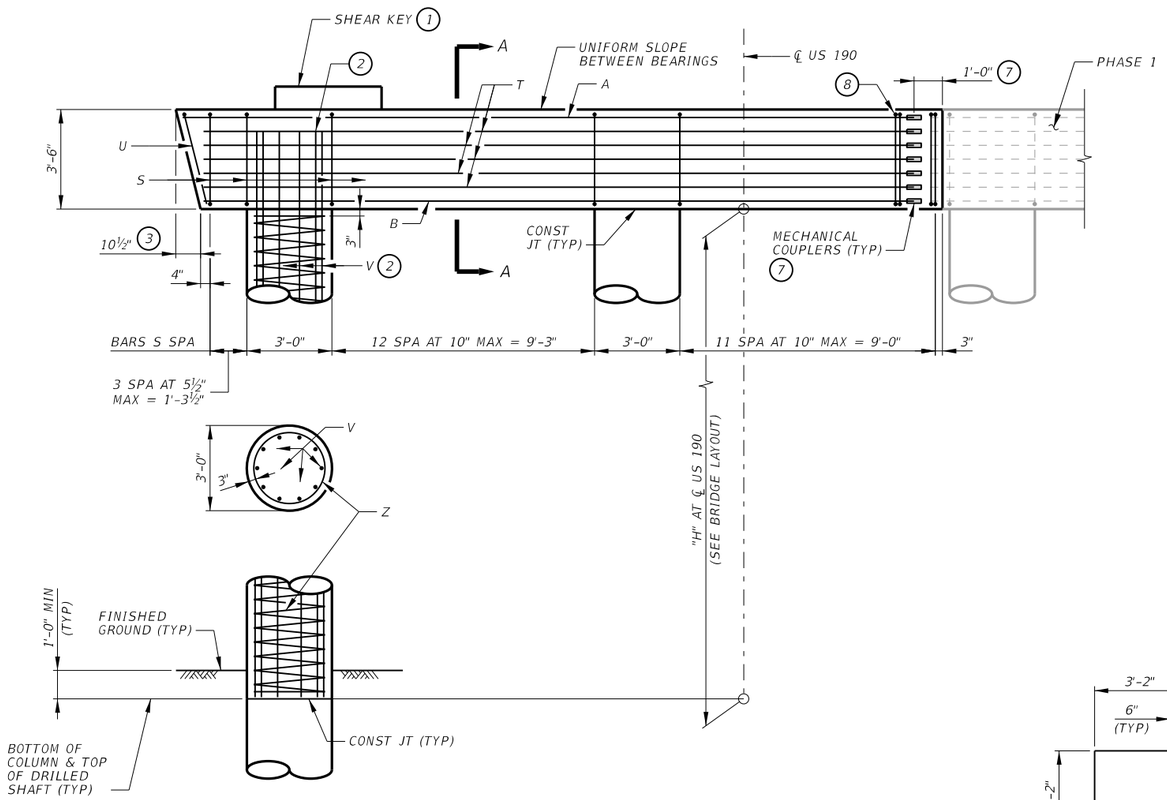
BENT 2 DETAILS
PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	83
CONTROL	SECTION	JOB	
2279	02	023	



PLAN



ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES – PHASE 2 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
2	18	9.5	20'-9"	1,411	589'-4"	787	2,198

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

(7) FOR BARS A, B, AND T, PROVIDE MECHANICAL COUPLERS IN ACCORDANCE WITH ITEM 440 "REINFORCEMENT FOR CONCRETE." PAYMENT FOR COUPLERS IS SUBSIDIARY TO PERTINENT ITEMS.

(8) IF BARS S CONFLICT WITH THE MECHANICAL COUPLER, IT IS PERMISSIBLE TO PLACE TWO BARS S (BUNDLED) TO EACH SIDE OF THE MECHANICAL COUPLER (15" MAX SPA) AS SHOWN. TWO ADDTN'L BARS ADDED TO BAR QUANTITIES.

TABLE OF ESTIMATED CAP QUANTITIES – PHASE 2

BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	25'-9"	821
B	6	#11	25'-0"	797
D	2	#9	1'-8"	12
S	31	#5	13'-8"	442
T	10	#5	25'-0"	261
U	1	#5	9'-8"	11
REINFORCING STEEL (4)		LB		2,344
CLASS "C" CONC (CAP) (5)		CY		12.7

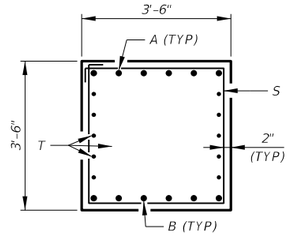
GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 210 TONS/DR SH.

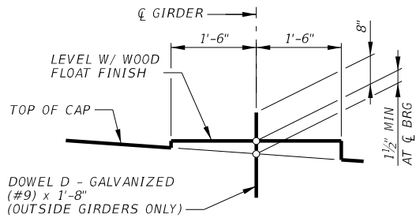
MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. GALVANIZE DOWEL BARS D.

HL93 LOADING

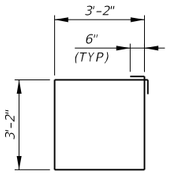


SECTION A-A

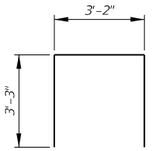


BEARING SEAT DETAIL

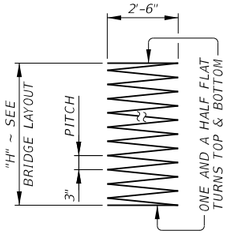
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



BARS U



BARS Z

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

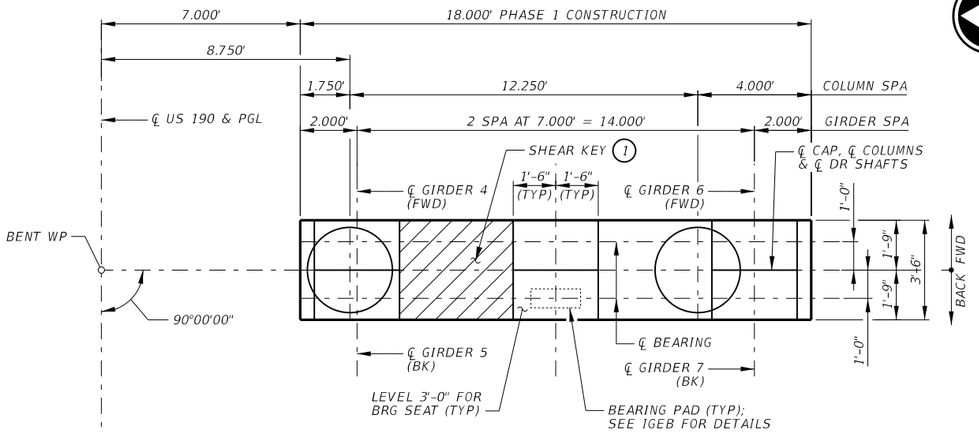
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

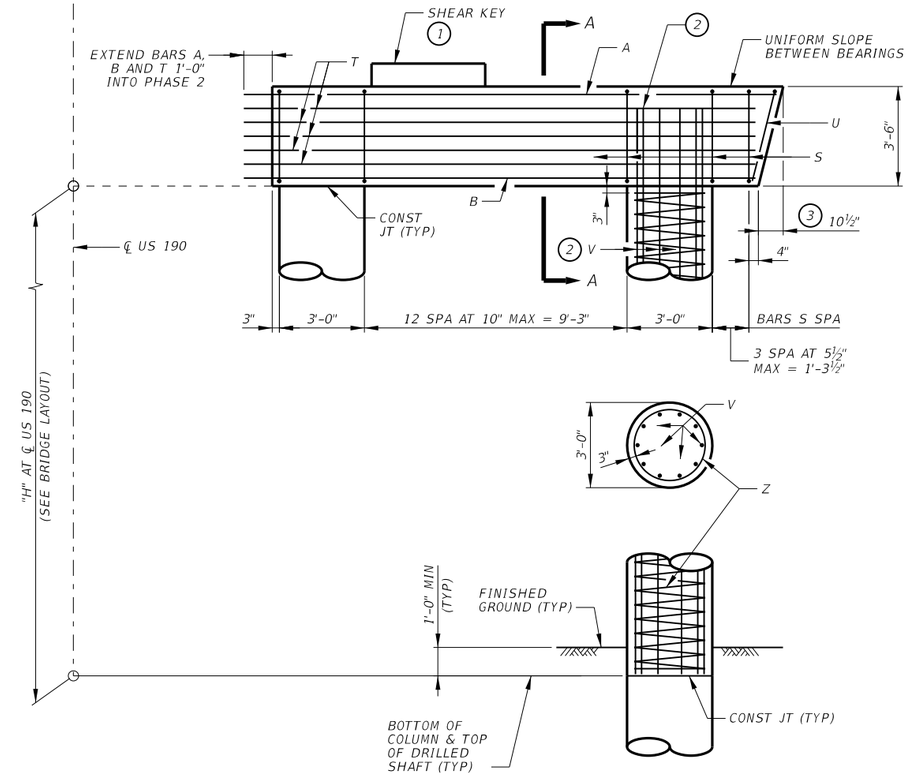
BENT 2 DETAILS
PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	84
CONTROL	SECTION	JOB	
2279	02	023	



PLAN



ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES - PHASE 1 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
3	13	6.9	15'-9"	1,071	432'-2"	577	1,648

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

TABLE OF ESTIMATED CAP QUANTITIES - PHASE 1

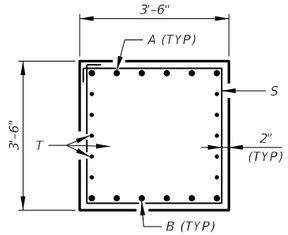
BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	18'-9"	598
B	6	#11	18'-0"	574
S	18	#5	13'-8"	257
T	10	#5	18'-0"	188
U	1	#5	9'-8"	11
REINFORCING STEEL (4)			LB	1,628
CLASS "C" CONC (CAP) (5)			CY	8.6

GENERAL NOTES:

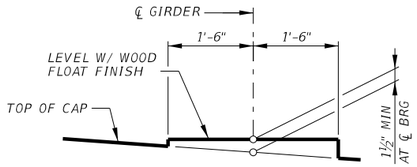
1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 180 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

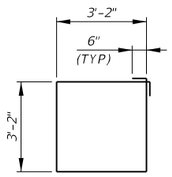


SECTION A-A

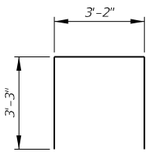


BEARING SEAT DETAIL

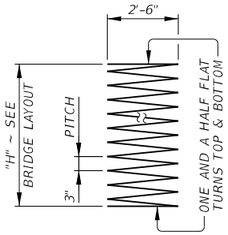
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



BARS U



BARS Z

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BENT 3 DETAILS
PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	85
CONTROL	SECTION	JOB	
2279	02	023	

USER:
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5/31/2024
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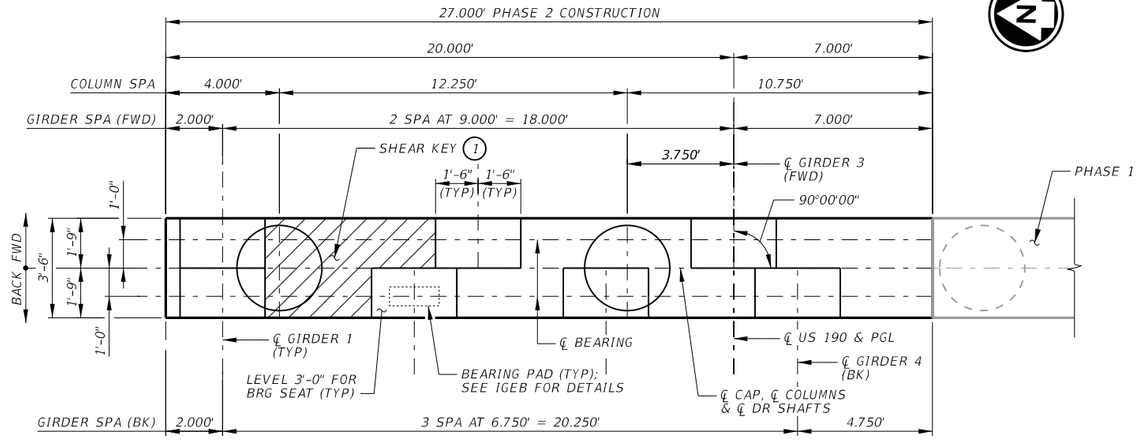
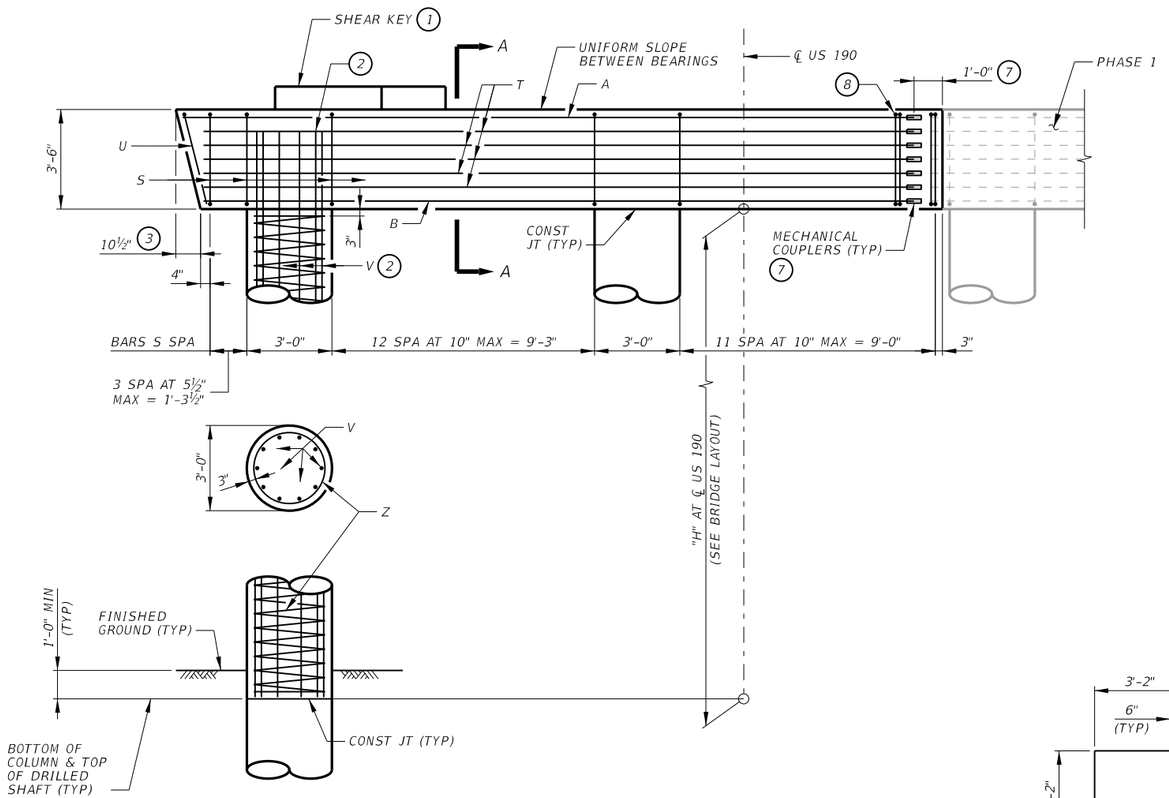


PLAN



ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES - PHASE 2 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
3	13	6.9	15'-9"	1,071	432'-2"	577	1,648

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

(7) FOR BARS A, B, AND T, PROVIDE MECHANICAL COUPLERS IN ACCORDANCE WITH ITEM 440 "REINFORCEMENT FOR CONCRETE." PAYMENT FOR COUPLERS IS SUBSIDIARY TO PERTINENT ITEMS.

(8) IF BARS S CONFLICT WITH THE MECHANICAL COUPLER, IT IS PERMISSIBLE TO PLACE TWO BARS S (BUNDLED) TO EACH SIDE OF THE MECHANICAL COUPLER (15" MAX SPA) AS SHOWN. TWO ADDTN'L BARS ADDED TO BAR QUANTITIES.

TABLE OF ESTIMATED CAP QUANTITIES - PHASE 2

BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	25'-9"	821
B	6	#11	25'-0"	797
S	31	#5	13'-8"	442
T	10	#5	25'-0"	261
U	1	#5	9'-8"	11
REINFORCING STEEL (4)			LB	2,332
CLASS "C" CONC (CAP) (5)			CY	12.8

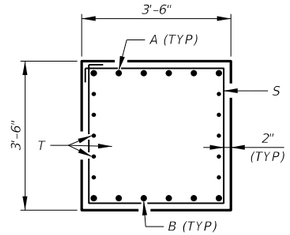
GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 180 TONS/DR SH.

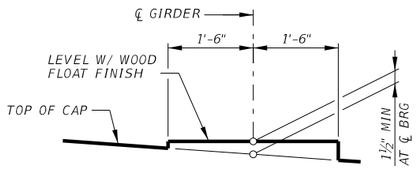
MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

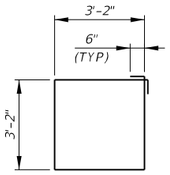


SECTION A-A

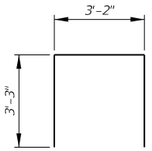


BEARING SEAT DETAIL

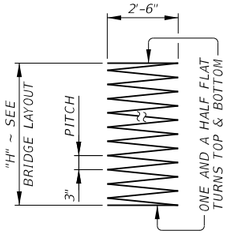
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



BARS U



BARS Z

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BENT 3 DETAILS
PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	86
CONTROL	SECTION	JOB	
2279	02	023	

USER:
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5/31/2024
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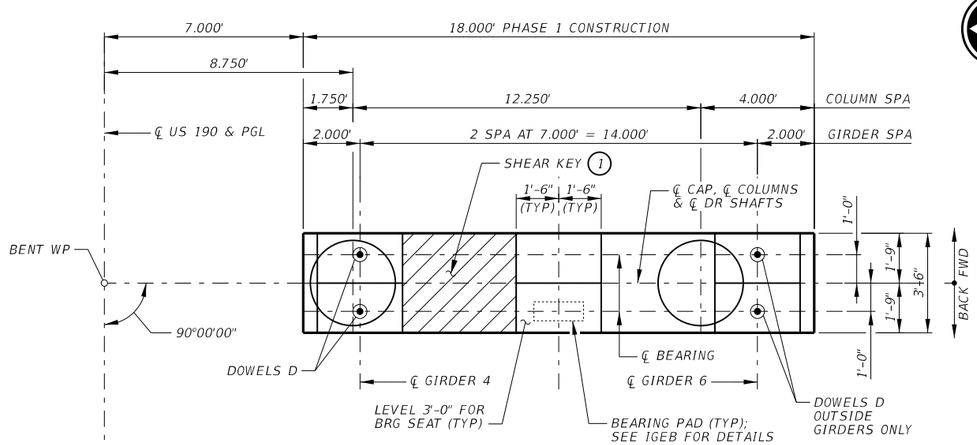
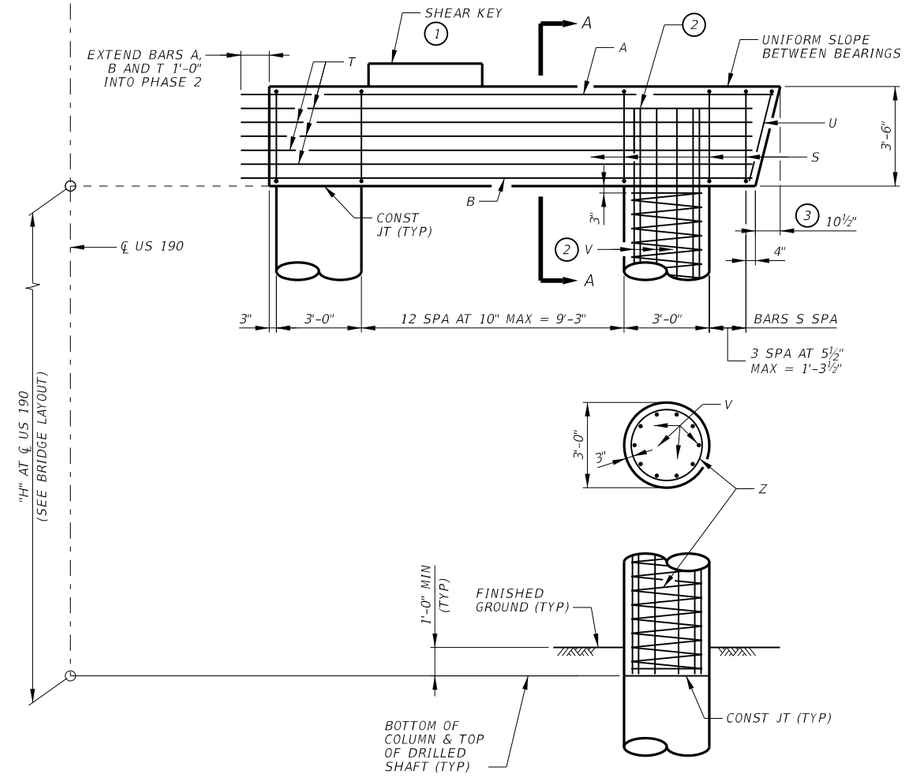


PLAN



ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES - PHASE 1 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
4	14	7.4	16'-9"	1,139	463'-7"	619	1,758
5	17	9.0	19'-9"	1,343	557'-11"	745	2,088

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

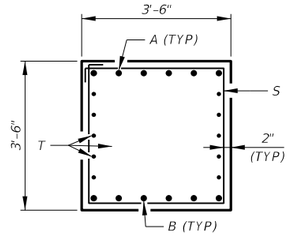
(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

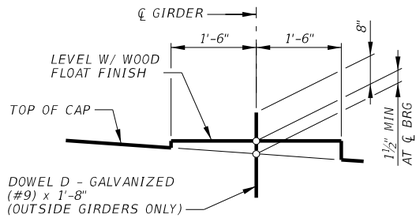
(7) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

TABLE OF ESTIMATED CAP QUANTITIES - PHASE 1 (7)

BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	18'-9"	598
B	6	#11	18'-0"	574
D	4	#9	1'-8"	23
S	18	#5	13'-8"	257
T	10	#5	18'-0"	188
U	1	#5	9'-8"	11
REINFORCING STEEL (4)			LB	1,651
CLASS "C" CONC (CAP) (5)			CY	8.6

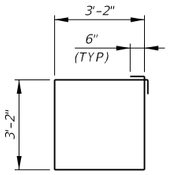


SECTION A-A

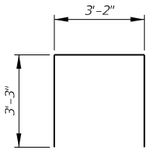


BEARING SEAT DETAIL

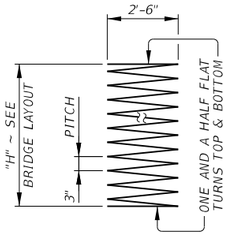
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



BARS U



BARS Z

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 155 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. GALVANIZE DOWEL BARS D.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BENTS 4 & 5 DETAILS
PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	87
CONTROL	SECTION	JOB	
2279	02	023	

USER:
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5/31/2024
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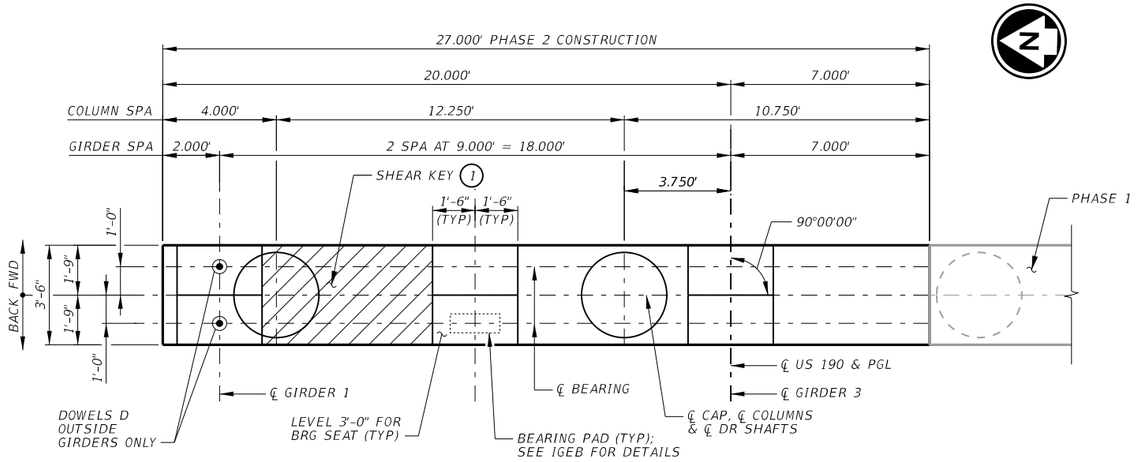
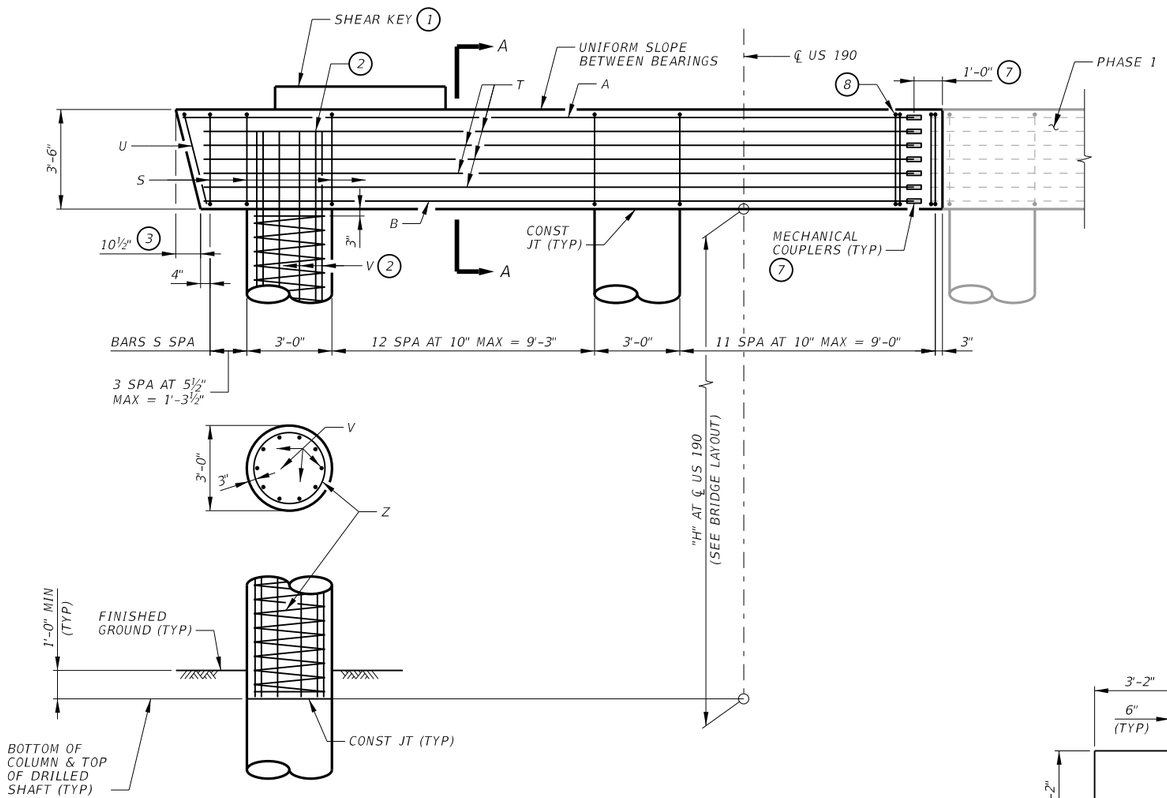


PLAN



ELEVATION

TABLE OF VARIABLE COLUMN QUANTITIES - PHASE 2 (6)

BENT	"H"	CLASS "C" CONC (COLUMN)	BARS V 20 ~ #9		BARS Z 2 ~ #4 SPIRALS		REINF STEEL (4)
	FT	CY	LENGTH	WEIGHT	LENGTH	WEIGHT	LB
4	14	7.4	16'-9"	1,139	463'-7"	619	1,758
5	17	9.0	19'-9"	1,343	557'-11"	745	2,088

(1) SEE IGSK FOR SHEAR KEY DETAILS NOT SHOWN.

(2) 2'-9" MIN EXTENSION INTO CAP.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(4) FOR CONTRACTOR'S INFORMATION ONLY.

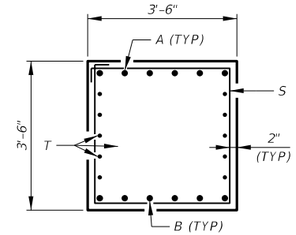
(5) INCLUDES SHEAR KEY QUANTITY. SEE IGSK STANDARD FOR SHEAR KEY REINFORCEMENT DETAILS.

(6) FOR EACH LINEAR FOOT OF VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31'-5"
REINFORCING STEEL, 110 LB (FOR 2 COLUMNS)
CLASS C CONCRETE (COLUMN), 0.52 CY (FOR 2 COLUMNS)

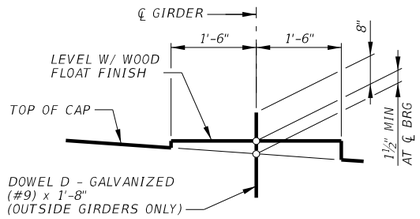
(7) FOR BARS A, B, AND T, PROVIDE MECHANICAL COUPLERS IN ACCORDANCE WITH ITEM 440 "REINFORCEMENT FOR CONCRETE." PAYMENT FOR COUPLERS IS SUBSIDIARY TO PERTINENT ITEMS.

(8) IF BARS S CONFLICT WITH THE MECHANICAL COUPLER, IT IS PERMISSIBLE TO PLACE TWO BARS S (BUNDLED) TO EACH SIDE OF THE MECHANICAL COUPLER (15" MAX SPA) AS SHOWN. TWO ADDTN'L BARS ADDED TO BAR QUANTITIES.

(9) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

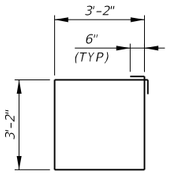


SECTION A-A

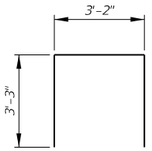


BEARING SEAT DETAIL

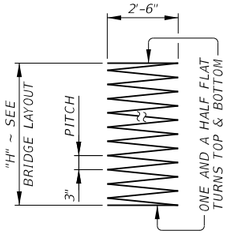
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS S



BARS U



BARS Z

TABLE OF ESTIMATED CAP QUANTITIES - PHASE 2 (9)

BAR	NO	SIZE	LENGTH	WEIGHT
A	6	#11	25'-9"	821
B	6	#11	25'-0"	797
D	2	#9	1'-8"	12
S	31	#5	13'-8"	442
T	10	#5	25'-0"	261
U	1	#5	9'-8"	11
REINFORCING STEEL (4)		LB		2,344
CLASS "C" CONC (CAP) (5)		CY		12.9

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.
3. SEE COMMON FOUNDATION DETAILS (FD) STANDARD SHEET FOR ALL FOUNDATION DETAILS AND NOTES.
4. SEE SHEAR KEY DETAILS (IGSK) STANDARD SHEET FOR DETAILS NOT SHOWN.
5. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.
6. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.
7. CALCULATED FOUNDATION LOADS = 155 TONS/DR SH.

MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE (f'_c = 3,600 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. GALVANIZE DOWEL BARS D.

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

BENTS 4 & 5 DETAILS
PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	88
CONTROL	SECTION	JOB	
2279	02	023	

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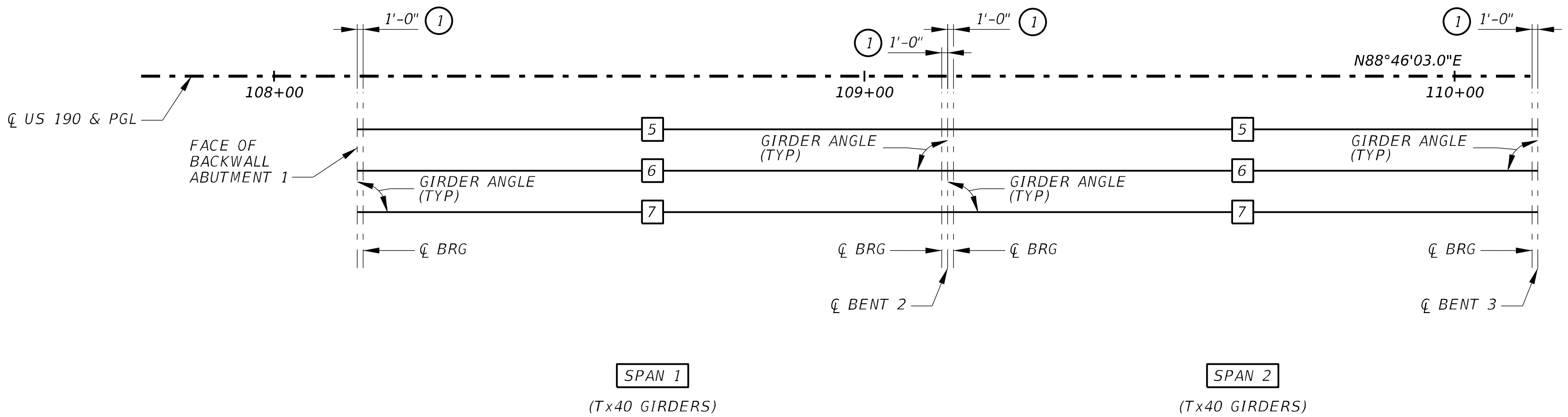

(1) SEE IGEB STANDARD FOR ORIENTATION OF DIMENSION.

(2) GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

[X] DENOTES GIRDER NUMBER.

BENT REPORT

ABUT NO. 1 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 5, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 1	GRDR 5	0.000	90	0	0
	GRDR 6	7.000	90	0	0
	GRDR 7	7.000	90	0	0
	TOTAL	14.000			

BENT NO. 2 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 5, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 1	GRDR 5	0.000	90	0	0
	GRDR 6	7.000	90	0	0
	GRDR 7	7.000	90	0	0
	TOTAL	14.000			
SPAN 2	GRDR 5	0.000	90	0	0
	GRDR 6	7.000	90	0	0
	GRDR 7	7.000	90	0	0
	TOTAL	14.000			

BENT NO. 3 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 5, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 2	GRDR 5	0.000	90	0	0
	GRDR 6	7.000	90	0	0
	GRDR 7	7.000	90	0	0
	TOTAL	14.000			

GIRDER REPORT

GRDR REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 5	100.000	98.000	99.50	0.0038
GRDR 6	100.000	98.000	99.50	0.0038
GRDR 7	100.000	98.000	99.50	0.0038

GRDR REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 5	100.000	98.000	99.50	0.0016
GRDR 6	100.000	98.000	99.50	0.0016
GRDR 7	100.000	98.000	99.50	0.0016

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FRAMING PLAN UNIT 1
(SPANS 1-2) - PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	89
CONTROL	SECTION	JOB	
2279	02	023	

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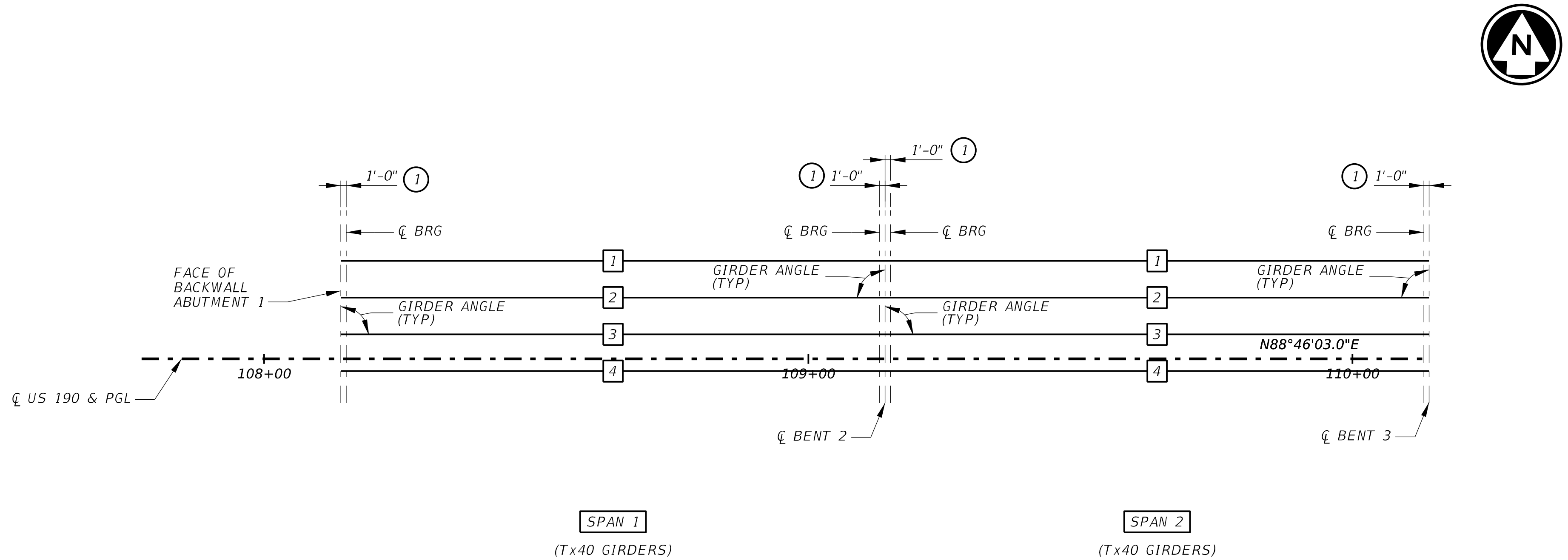

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(2) GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

[X] DENOTES GIRDER NUMBER.

BENT REPORT

ABUT NO. 1 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 1	GRDR 1	0.000	90	0	0
	GRDR 2	6.750	90	0	0
	GRDR 3	6.750	90	0	0
	GRDR 4	6.750	90	0	0
	TOTAL	20.250			

BENT NO. 2 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 1	GRDR 1	0.000	90	0	0
	GRDR 2	6.750	90	0	0
	GRDR 3	6.750	90	0	0
	GRDR 4	6.750	90	0	0
	TOTAL	20.250			
SPAN 2	GRDR 1	0.000	90	0	0
	GRDR 2	6.750	90	0	0
	GRDR 3	6.750	90	0	0
	GRDR 4	6.750	90	0	0
	TOTAL	20.250			

BENT NO. 3 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 2	GRDR 1	0.000	90	0	0
	GRDR 2	6.750	90	0	0
	GRDR 3	6.750	90	0	0
	GRDR 4	6.750	90	0	0
	TOTAL	20.250			

GIRDER REPORT

GRDR REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 1	100.000	98.000	99.50	0.0038
GRDR 2	100.000	98.000	99.50	0.0038
GRDR 3	100.000	98.000	99.50	0.0038
GRDR 4	100.000	98.000	99.50	0.0038

GRDR REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 1	100.000	98.000	99.50	0.0016
GRDR 2	100.000	98.000	99.50	0.0016
GRDR 3	100.000	98.000	99.50	0.0016
GRDR 4	100.000	98.000	99.50	0.0016

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FRAMING PLAN UNIT 1
(SPANS 1-2) - PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	90
CONTROL	SECTION	JOB	
2279	02	023	

USER:

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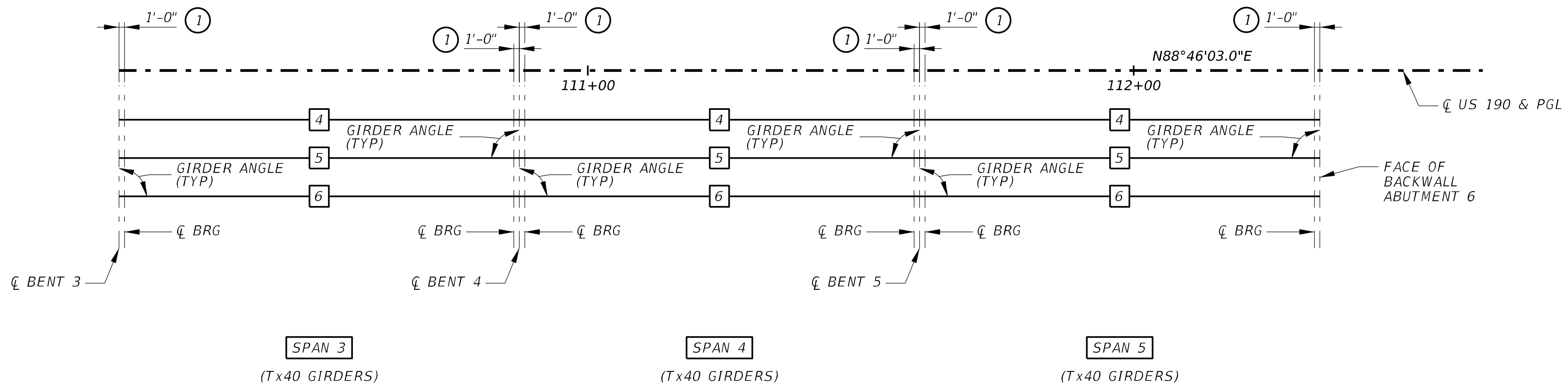

(1) SEE IGEB STANDARD FOR ORIENTATION OF DIMENSION.

(2) GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

[X] DENOTES GIRDER NUMBER.

BENT REPORT

BENT NO. 3 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 4, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 3	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			

BENT NO. 4 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 4, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 3	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			
SPAN 4	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			

BENT NO. 5 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 4, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 4	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			
SPAN 5	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			

ABUT NO. 6 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 4, 9.000 R

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 5	GRDR 4	0.000	90	0	0
	GRDR 5	7.000	90	0	0
	GRDR 6	7.000	90	0	0
	TOTAL	14.000			

GIRDER REPORT

GRDR REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 4	73.333	71.333	72.83	-0.0007
GRDR 5	73.333	71.333	72.83	-0.0007
GRDR 6	73.333	71.333	72.83	-0.0007

GRDR REPORT, SPAN 4

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 4	73.333	71.333	72.83	-0.0027
GRDR 5	73.333	71.333	72.83	-0.0027
GRDR 6	73.333	71.333	72.83	-0.0027

GRDR REPORT, SPAN 5

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 4	73.333	71.333	72.83	-0.0040
GRDR 5	73.333	71.333	72.83	-0.0040
GRDR 6	73.333	71.333	72.83	-0.0040

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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AGUIRRE & FIELDS
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TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FRAMING PLAN UNIT 2
(SPANS 3-5) - PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	91
CONTROL	SECTION	JOB	
2279	02	023	

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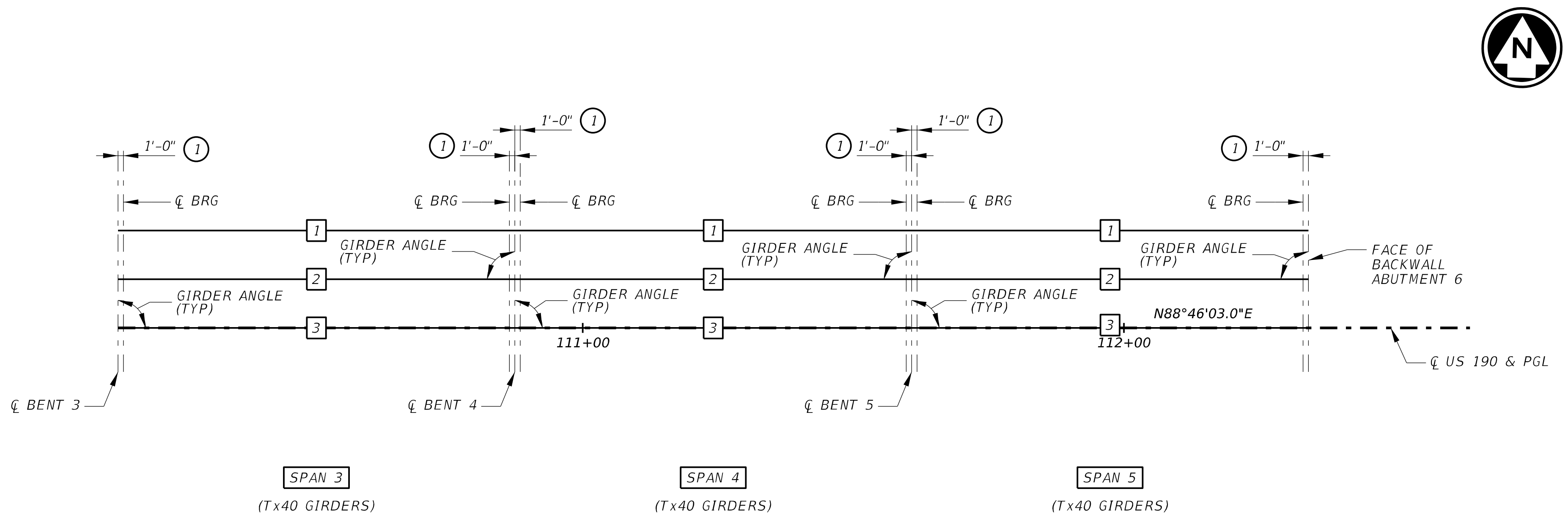

(1) SEE IGEB STANDARD FOR ORIENTATION OF DIMENSION.

(2) GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

[X] DENOTES GIRDER NUMBER.

BENT REPORT

BENT NO. 3 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 3	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			

BENT NO. 4 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 3	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			
SPAN 4	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			

BENT NO. 5 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 4	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			
SPAN 5	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			

ABUT NO. 6 (S 1 13 56.99 E)
DISTANCE BETWEEN STATION LINE AND GRDR 1, 18.000 L

		GRDR SPAC. (C.L. BENT)	GRDR ANGLE D	M	S
SPAN 5	GRDR 1	0.000	90	0	0
	GRDR 2	9.000	90	0	0
	GRDR 3	9.000	90	0	0
	TOTAL	18.000			

GIRDER REPORT

GRDR REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 1	73.333	71.333	72.83	-0.0007
GRDR 2	73.333	71.333	72.83	-0.0007
GRDR 3	73.333	71.333	72.83	-0.0007

GRDR REPORT, SPAN 4

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 1	73.333	71.333	72.83	-0.0027
GRDR 2	73.333	71.333	72.83	-0.0027
GRDR 3	73.333	71.333	72.83	-0.0027

GRDR REPORT, SPAN 5

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE (2) BOT. GD. FLG.	GRDR SLOPE
GRDR 1	73.333	71.333	72.83	-0.0040
GRDR 2	73.333	71.333	72.83	-0.0040
GRDR 3	73.333	71.333	72.83	-0.0040

HL93 LOADING

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

FRAMING PLAN UNIT 2
(SPANS 3-5) - PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	92
CONTROL	SECTION	JOB	
2279	02	023	

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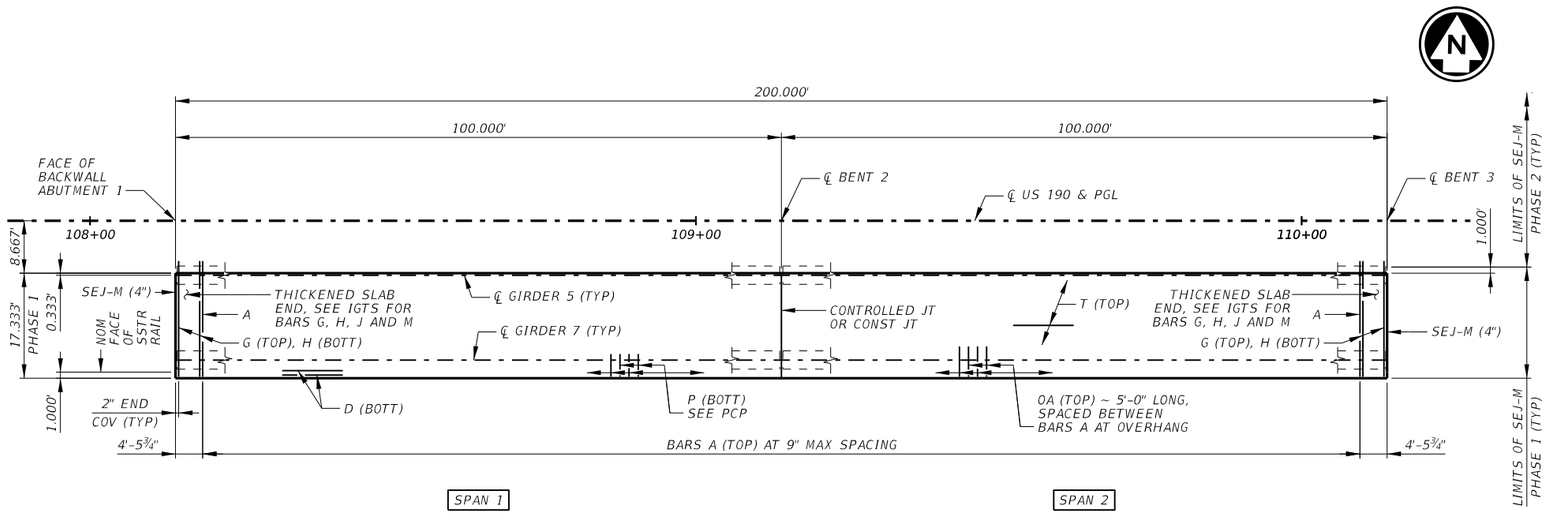


PLAN

1. GIRDER LENGTHS SHOWN ARE BOTTOM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE. SEE FRAMING PLAN FOR GIRDER LENGTHS.
2. REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LB/SF.
3. FOR CONTRACTOR'S INFORMATION ONLY.

TABLE OF ESTIMATED QUANTITIES – PHASE 1

SPAN	REINF CONC SLAB	PRESTR CONC GIRDERS (1)	TOTAL REINF STEEL (2) (3)
	SF	LF	LB
1	1,733	298.50	3,986
2	1,733	298.50	3,986
TOTAL	3,466	597.00	7,972

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS NOT SHOWN.
3. SEE PMDF STANDARD FOR DETAILS IF THIS OPTION IS USED.
4. SEE IGCS(MOD) STANDARD FOR CONTINUOUS SLAB DETAILS OVER INTERIOR BENTS.
5. SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
6. SEE IGMS STANDARD FOR MISCELLANEOUS SLAB DETAILS NOT SHOWN.
7. SEE SSTR STANDARD FOR RAIL ANCHORAGE IN SLAB.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS: UNCOATED ~ #4 = 1'-7"
4. IF APPROVED BY THE ENGINEER, DEFORMED WELDED WIRE REINFORCEMENT (WWR)(ASTM A1064) OF EQUAL SIZE AND SPACING MAY BE SUBSTITUTED FOR BARS A, D OA, P OR T.

HL93 LOADING

TABLE OF SECTION DEPTHS PHASE 1

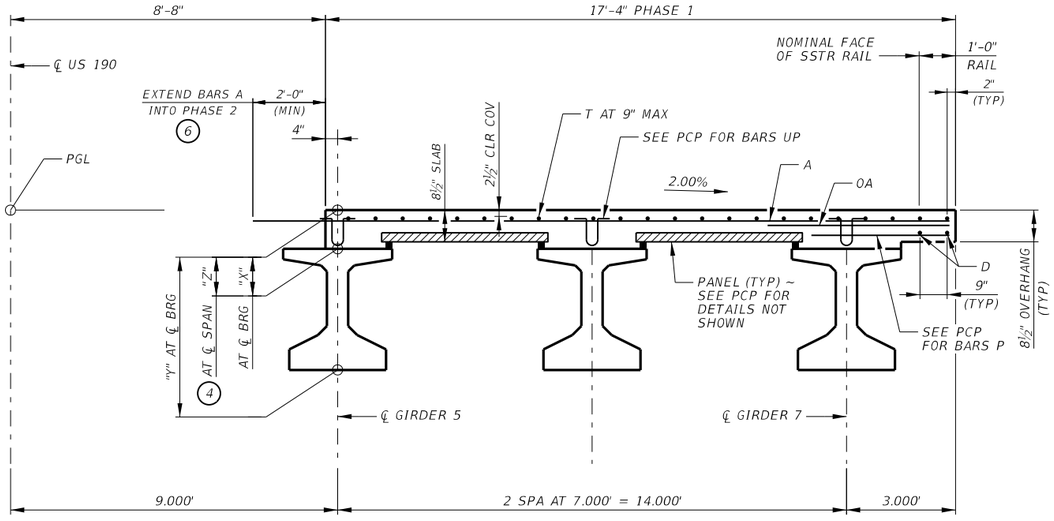
SPAN	GIRDER	"X" AT CL BRG	"Y" AT CL BRG	"Z" AT CL SPAN (4)
1	5	1'-0 1/2"	4'-4 1/2"	9 5/8" (5)
	6			10 1/2"
	7			10 1/4"
2	5	1'-0 1/4"	4'-4 1/4"	9 5/8" (5)
	6			10 1/2"
	7			10 3/8"

(4) THEORETICAL DIMENSION

(5) CALCULATED BASED ON PHASE 1 CONSTRUCTION FOR PARTIAL DECK WIDTH CONTRIBUTING TO DEFLECTION ONLY

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4
UP	#4

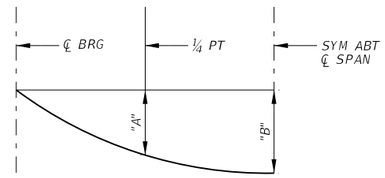


TYPICAL TRANSVERSE SECTION

(6) FOR OTHER SLAB BAR CONDITIONS NOT SHOWN, EXTEND BARS SIMILARLY INTO PHASE 2.

TABLE OF DEAD LOAD DEFLECTIONS

SPAN	GIRDER	"A"	"B"
-	-	ft.	ft.
1 & 2	(5) 5	0.073	0.104
	6	0.134	0.191
	7	0.124	0.177



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO PRESTRESSED CONCRETE PANELS AND CAST-IN-PLACE CONCRETE SLAB ONLY (EC= 5,000 KSI). ADJUST VALUES IF OPTIONAL SLAB FORMING IS USED. ADJUST DEFLECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

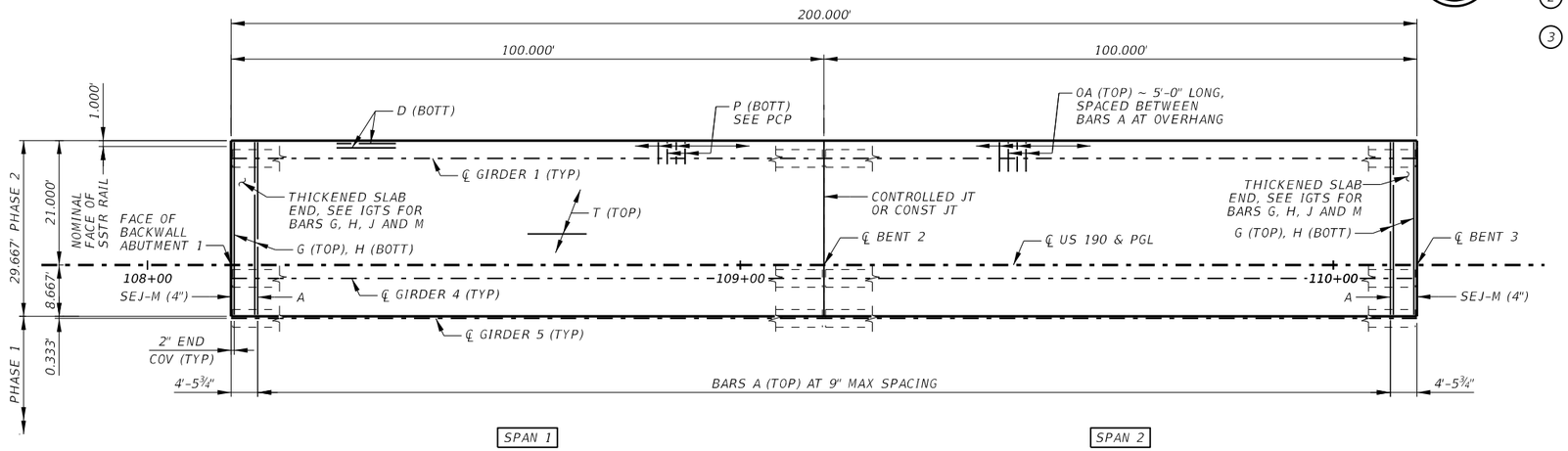
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

200.00' PRESTR CONC I-GIRDER UNIT (SPANS 1-2) PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	93
CONTROL	SECTION	JOB	
2279	02	023	



PLAN

TABLE OF ESTIMATED QUANTITIES – PHASE 2			
SPAN	REINF CONC SLAB	PRESTR CONC GIRDERS (1)	TOTAL REINF STEEL (2) (3)
	SF	LF	LB
1	2,967	398.00	6,824
2	2,967	398.00	6,824
TOTAL	5,934	796.00	13,648

(1) GIRDER LENGTHS SHOWN ARE BOTTOM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE. SEE FRAMING PLAN FOR GIRDER LENGTHS.

(2) REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LB/SF.

(3) FOR CONTRACTOR'S INFORMATION ONLY.

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS NOT SHOWN.
3. SEE PMDF STANDARD FOR DETAILS IF THIS OPTION IS USED.
4. SEE IGCS(MOD) STANDARD FOR CONTINUOUS SLAB DETAILS OVER INTERIOR BENTS.
5. SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
6. SEE IGMS STANDARD FOR MISCELLANEOUS SLAB DETAILS NOT SHOWN.
7. SEE SSTR STANDARD FOR RAIL ANCHORAGE IN SLAB.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

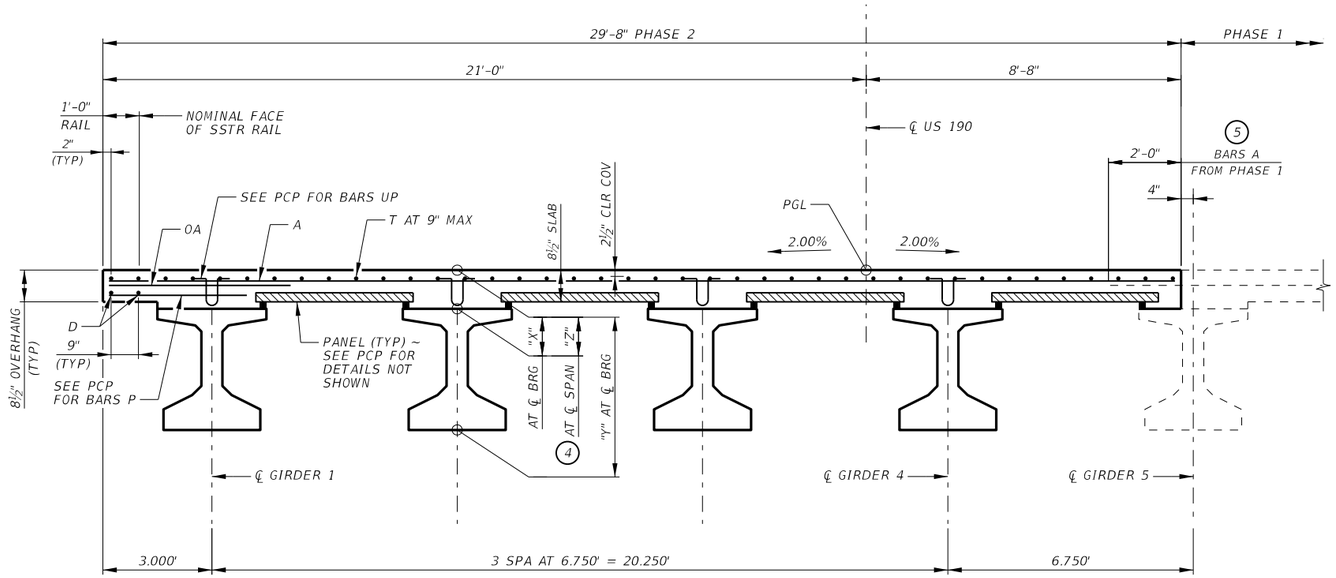
1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS: UNCOATED ~ #4 = 1'-7"
4. IF APPROVED BY THE ENGINEER, DEFORMED WELDED WIRE REINFORCEMENT (WWR)(ASTM A1064) OF EQUAL SIZE AND SPACING MAY BE SUBSTITUTED FOR BARS A, D OA, P OR T.

HL93 LOADING

TABLE OF SECTION DEPTHS PHASE 2				
SPAN	GIRDER	"X" AT CL BRG	"Y" AT CL BRG	"Z" AT CL SPAN (4)
1	1	1'-0 1/2"	4'-4 1/2"	10 1/4"
	2-4			10 3/8"
2	1	1'-0 1/4"	4'-4 1/4"	10 1/4"
	2-4			10 3/8"

(4) THEORETICAL DIMENSION

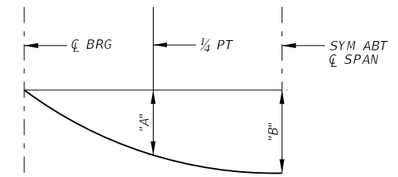
BAR TABLE	
BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4
UP	#4



TYPICAL TRANSVERSE SECTION

(5) FOR OTHER SLAB BAR CONDITIONS NOT SHOWN, EXTEND BARS SIMILARLY INTO PHASE 2.

TABLE OF DEAD LOAD DEFLECTIONS			
SPAN	GIRDER	"A"	"B"
-	-	ft.	ft.
1 & 2	1	0.122	0.174
	2-4	0.129	0.184



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO PRESTRESSED CONCRETE PANELS AND CAST-IN-PLACE CONCRETE SLAB ONLY (E<= 5,000 KSI). ADJUST VALUES IF OPTIONAL SLAB FORMING IS USED. ADJUST DEFLECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

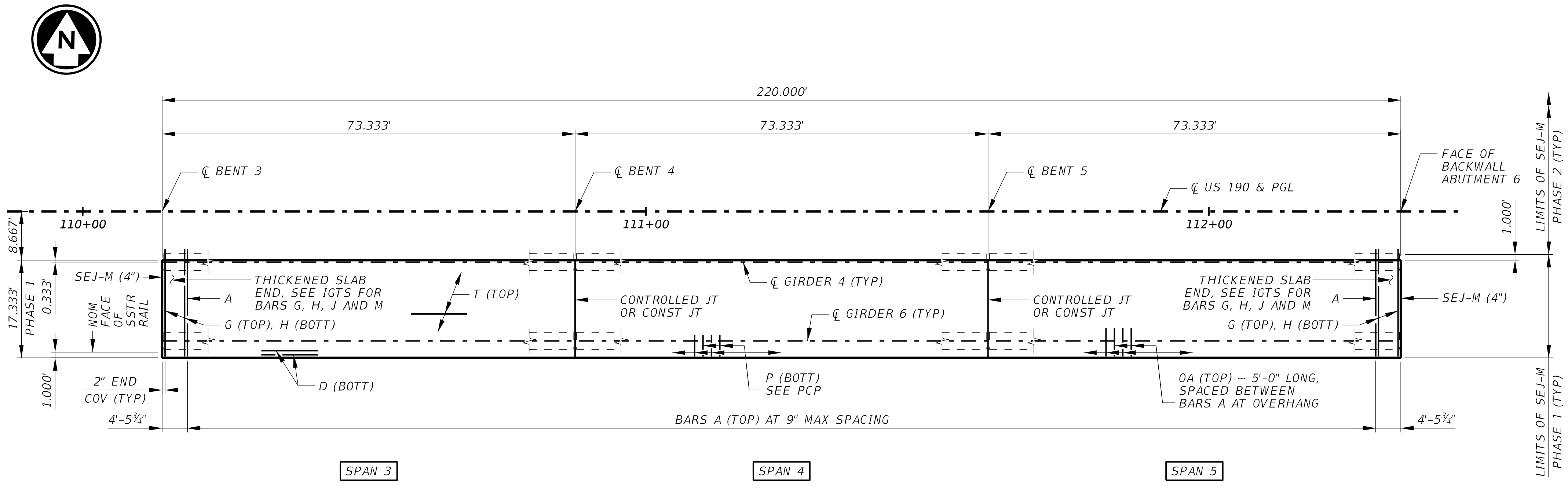
Texas Department of Transportation

US 190 AT LIVE OAK DRAW

200.00' PRESTR CONC I-GIRDER UNIT (SPANS 1-2) PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	94
CONTROL	SECTION	JOB	
2279	02	023	



PLAN

1. GIRDER LENGTHS SHOWN ARE BOTTOM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE. SEE FRAMING PLAN FOR GIRDER LENGTHS.
2. REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LB/SF.
3. FOR CONTRACTOR'S INFORMATION ONLY.

TABLE OF ESTIMATED QUANTITIES - PHASE 1

SPAN	REINF CONC SLAB	PRESTR CONC GIRDERS (1)	TOTAL REINF STEEL (2)(3)
	SF	LF	LB
3	1,271	218.50	2,923
4	1,271	218.50	2,923
5	1,271	218.50	2,923
TOTAL	3,813	655.50	8,769

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS NOT SHOWN.
3. SEE PMDF STANDARD FOR DETAILS IF THIS OPTION IS USED.
4. SEE IGCS(MOD) STANDARD FOR CONTINUOUS SLAB DETAILS OVER INTERIOR BENTS.
5. SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
6. SEE IGMS STANDARD FOR MISCELLANEOUS SLAB DETAILS NOT SHOWN.
7. SEE SSTR STANDARD FOR RAIL ANCHORAGE IN SLAB.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'c = 4,000 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS: UNCOATED ~ #4 = 1'-7"
4. IF APPROVED BY THE ENGINEER, DEFORMED WELDED WIRE REINFORCEMENT (WWR)(ASTM A1064) OF EQUAL SIZE AND SPACING MAY BE SUBSTITUTED FOR BARS A, D OA, P OR T.

HL93 LOADING

TABLE OF SECTION DEPTHS PHASE 1

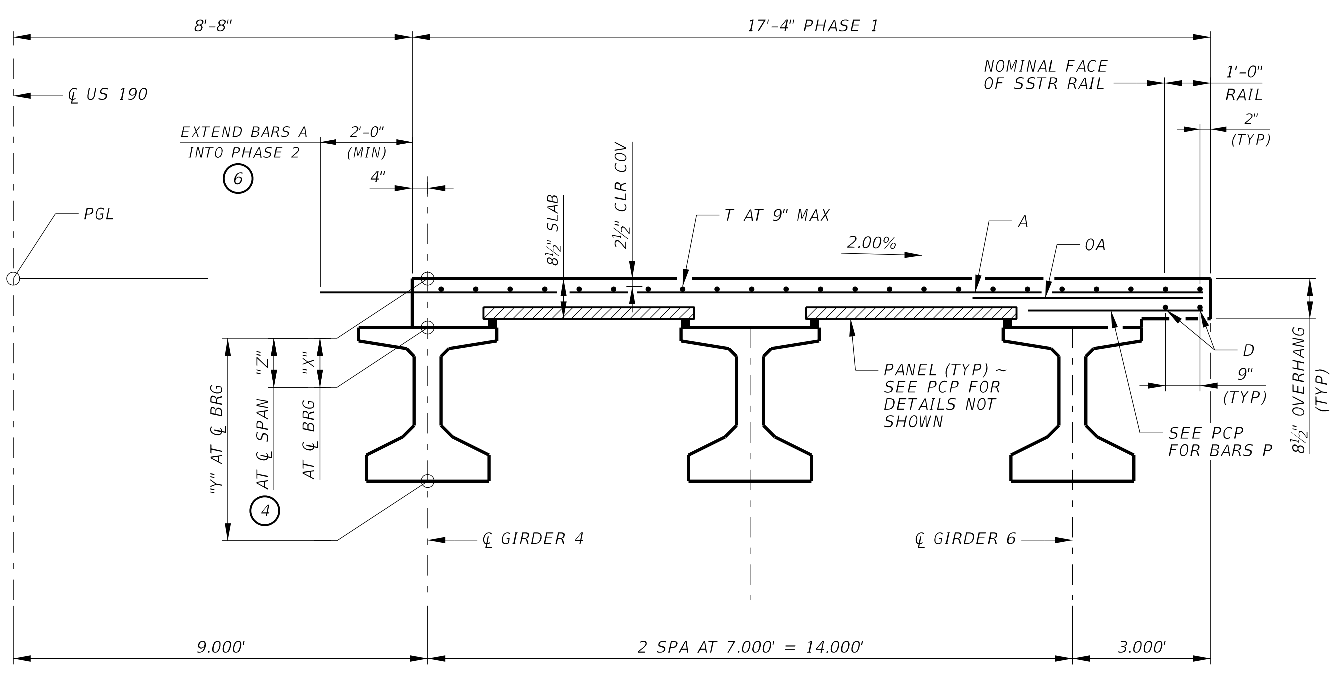
SPAN	GIRDER	"X" AT CL BRG	"Y" AT CL BRG	"Z" AT CL SPAN (4)
3 & 4	4	1'-0"	4'-4"	10 1/4" (5)
	5 & 6			10 1/2"
5	4	1'-0"	4'-4"	10 1/8" (5)
	5 & 6			10 3/8"

(4) THEORETICAL DIMENSION

(5) CALCULATED BASED ON PHASE 1 CONSTRUCTION FOR PARTIAL DECK WIDTH CONTRIBUTING TO DEFLECTION ONLY

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

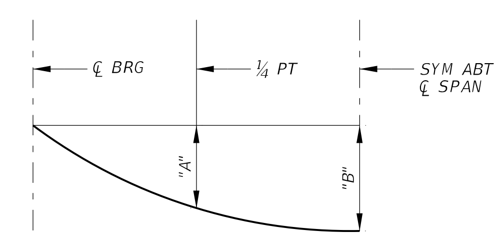


TYPICAL TRANSVERSE SECTION

(6) FOR OTHER SLAB BAR CONDITIONS NOT SHOWN, EXTEND BARS SIMILARLY INTO PHASE 2.

TABLE OF DEAD LOAD DEFLECTIONS

SPAN	GIRDER	"A"	"B"
-	-	ft.	ft.
3 - 5	(5) 4	0.021	0.029
	5	0.038	0.053
	6	0.035	0.050



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO PRESTRESSED CONCRETE PANELS AND CAST-IN-PLACE CONCRETE SLAB ONLY (E = 5,000 KSI). ADJUST VALUES IF OPTIONAL SLAB FORMING IS USED. ADJUST DEFLECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS — BRADLEY D. SHUEY — 86490 — LICENSED PROFESSIONAL ENGINEER — 6/3/2024

AGUIRRE & FIELDS ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation ©2024

US 190 AT LIVE OAK DRAW

220.00' PRESTR CONC I-GIRDER UNIT (SPANS 3-5) PHASE 1

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	95
CONTROL	SECTION	JOB	
2279	02	023	

USER:

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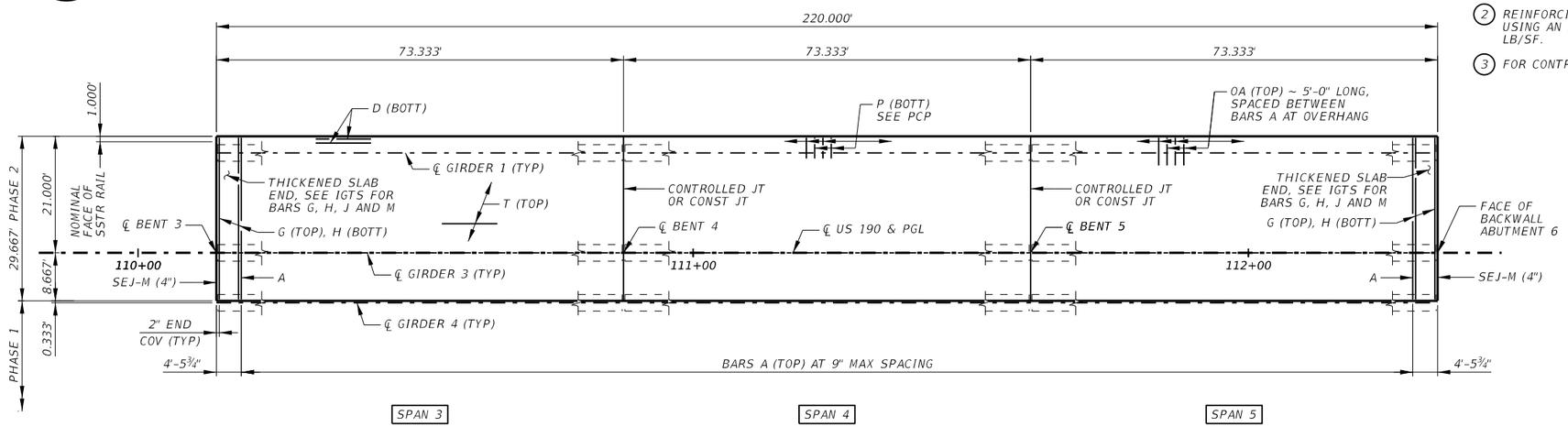


PLAN

1. GIRDER LENGTHS SHOWN ARE BOTTOM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE. SEE FRAMING PLAN FOR GIRDER LENGTHS.
2. REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LB/SF.
3. FOR CONTRACTOR'S INFORMATION ONLY.

TABLE OF ESTIMATED QUANTITIES – PHASE 2

SPAN	REINF CONC SLAB	PRESTR CONC GIRDERS (1)	TOTAL REINF STEEL (2) (3)
	SF	LF	LB
3	2,176	218.50	5,005
4	2,176	218.50	5,005
5	2,176	218.50	5,005
TOTAL	6,528	655.50	15,015

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (JAN 2023).
2. SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS NOT SHOWN.
3. SEE PMDF STANDARD FOR DETAILS IF THIS OPTION IS USED.
4. SEE IGCS(MOD) STANDARD FOR CONTINUOUS SLAB DETAILS OVER INTERIOR BENTS.
5. SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
6. SEE IGMS STANDARD FOR MISCELLANEOUS SLAB DETAILS NOT SHOWN.
7. SEE SSTR STANDARD FOR RAIL ANCHORAGE IN SLAB.
8. COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI).
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
   UNCOATED ~ #4 = 1'-7"
4. IF APPROVED BY THE ENGINEER, DEFORMED WELDED WIRE REINFORCEMENT (WWR)(ASTM A1064) OF EQUAL SIZE AND SPACING MAY BE SUBSTITUTED FOR BARS A, D OA, P OR T.

HL93 LOADING

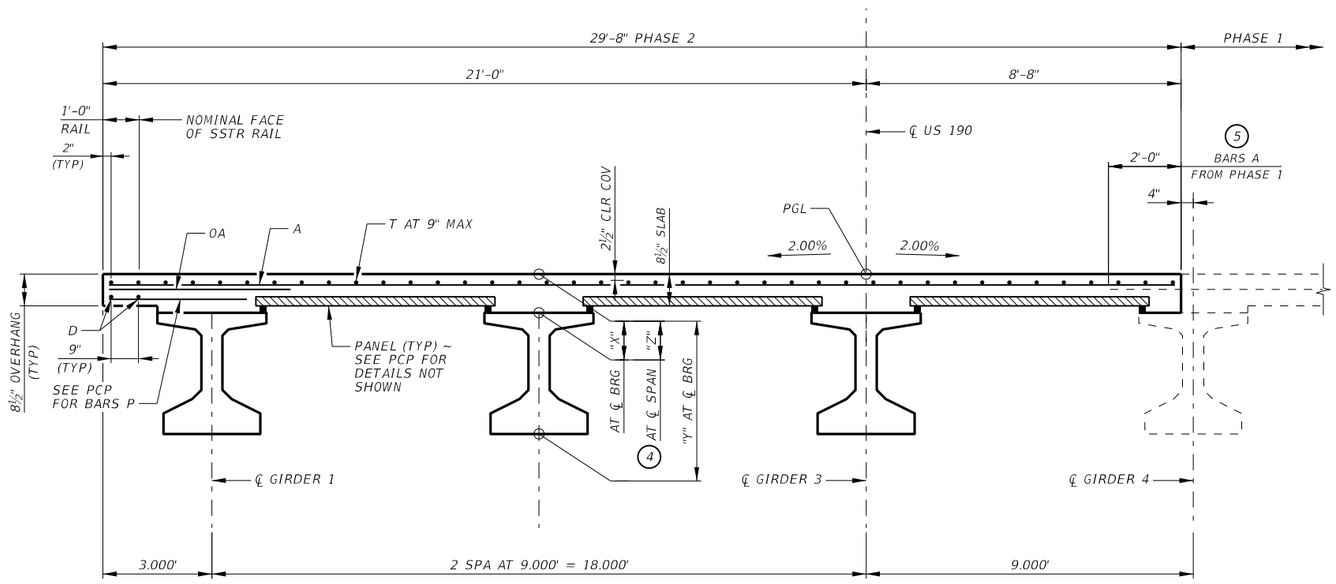
TABLE OF SECTION DEPTHS PHASE 2

SPAN	GIRDER	"X" AT CL BRG	"Y" AT CL BRG	"Z" AT CL SPAN (4)
3 & 4	1	1'-0"	4'-4"	10 5/8"
	2 & 3			10 3/4"
5	1	1'-0"	4'-4"	10 3/8"
	2 & 3			10 1/2"

(4) THEORETICAL DIMENSION

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

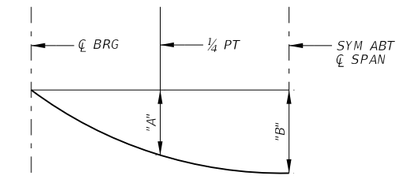


TYPICAL TRANSVERSE SECTION

(5) FOR OTHER SLAB BAR CONDITIONS NOT SHOWN, EXTEND BARS SIMILARLY INTO PHASE 2.

TABLE OF DEAD LOAD DEFLECTIONS

SPAN	GIRDER	"A"	"B"
-	-	ft.	ft.
3 - 5	1	0.040	0.057
	2 & 3	0.048	0.069



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO PRESTRESSED CONCRETE PANELS AND CAST-IN-PLACE CONCRETE SLAB ONLY (E<= 5,000 KSI). ADJUST VALUES IF OPTIONAL SLAB FORMING IS USED. ADJUST DEFLECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

220.00' PRESTR CONC I-GIRDER UNIT (SPANS 3-5) PHASE 2

SHEET 1 OF 1

DES BY:	DES CK:	DRN BY:	DRN CK:
JCE	BDS	TLS	BDS
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	96
CONTROL	SECTION	JOB	
2279	02	023	

DATE: 6/2/2024
FILE: c:\pw-of\pw-of-prod\ami shuey\d0283039\igndsts1-22.dgn

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS			
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
US 190 AT	1-2	ALL	Tx40		36	0.6	270	13.93	8.93	6	36.5	5.800	6.600	4.087	-4.391	5194	0.557	0.743	1.67	2.17	1.05
LIVE OAK DRAW	3-5	ALL	Tx40		22	0.6	270	14.87	11.24	4	24.5	4.000	5.000	2.457	-2.879	3708	0.723	0.884	1.45	1.88	1.13

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

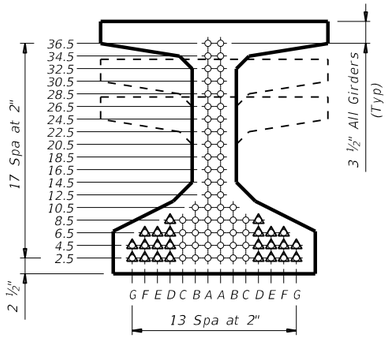
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked Δ. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

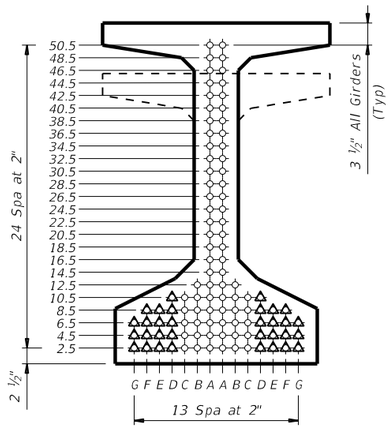
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

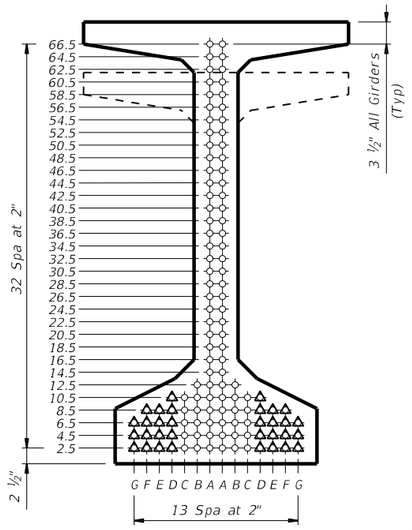
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED
PROFESSIONAL ENGINEER

6/3/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

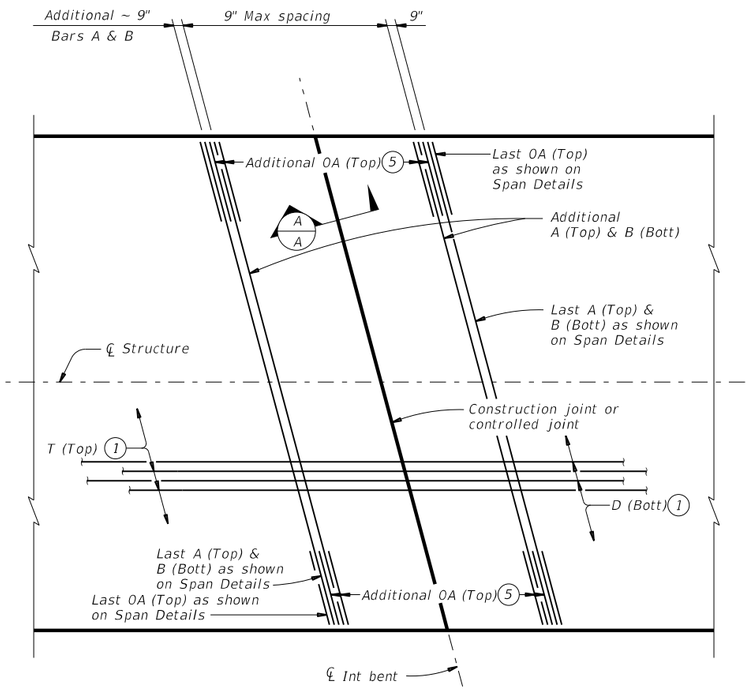
Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

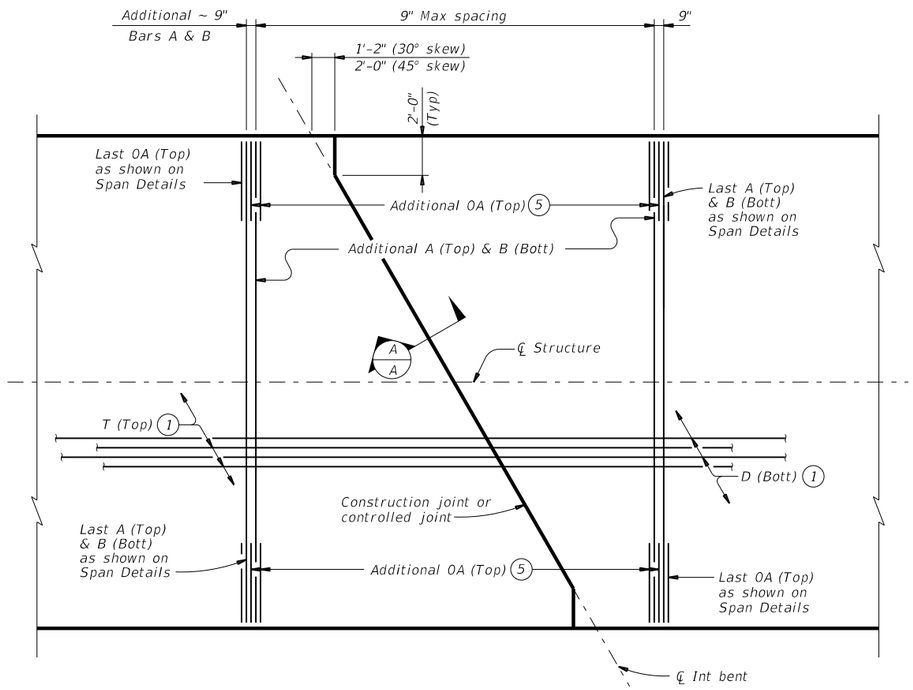
FILE: igndsts1-22.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only. 3-22: Added Load Rating.	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		97

DATE: 6/2/2024
FILE: c:\pw-of\pw-of-prod\tami.shuey\d0283039\IG-IGCS-23 (1).dgn



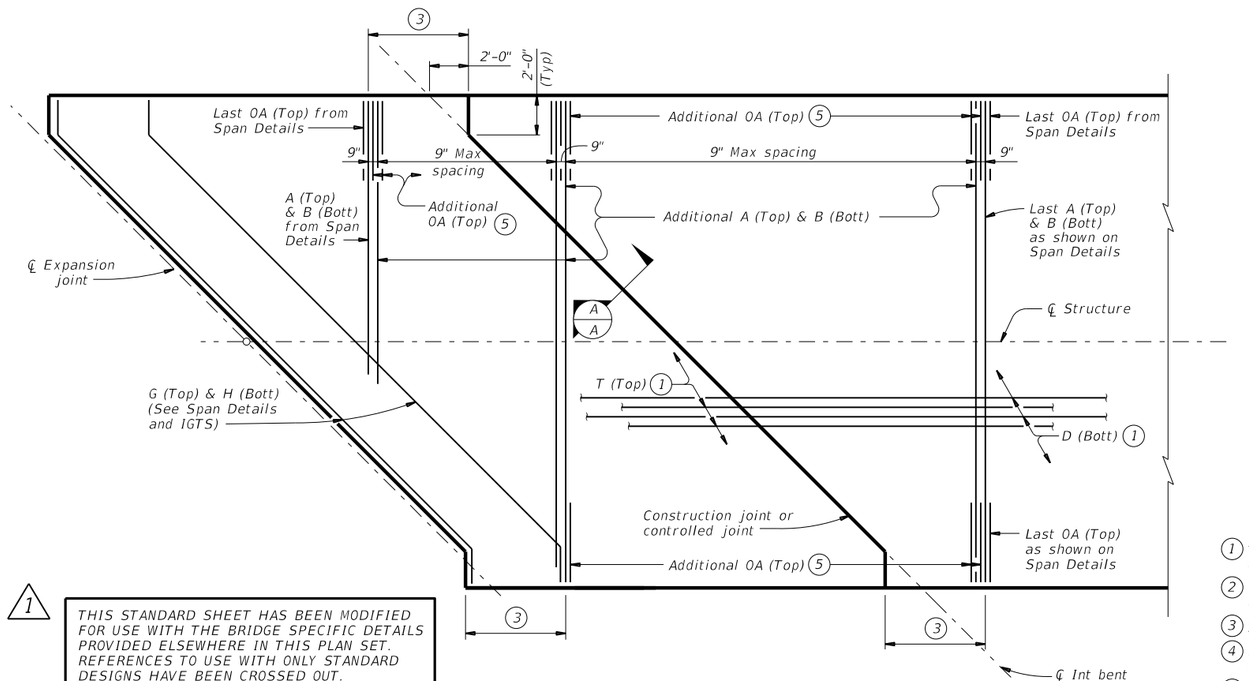
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



PLAN FOR 30° OR 45° SKEW

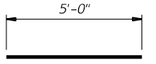
(Showing 30° skew)



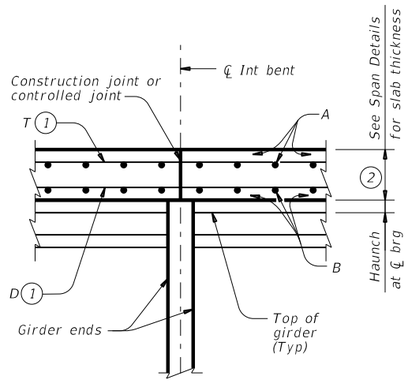
PLAN FOR 45° SKEW 4

(Showing short span condition.)

1 THIS STANDARD SHEET HAS BEEN MODIFIED FOR USE WITH THE BRIDGE SPECIFIC DETAILS PROVIDED ELSEWHERE IN THIS PLAN SET. REFERENCES TO USE WITH ONLY STANDARD DESIGNS HAVE BEEN CROSSED OUT.



BARS 0A (#5)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars 0A (Top) at 9" Max spacing between Bars A (Top).
6. Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

TABLE OF ALLOWABLE UNIT LENGTH 6

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type.
Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).
Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).
See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

1 ~~The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-34, IGSD-38, IGSD-40 and IGSD-44.~~

HL93 LOADING

STATE OF TEXAS
BRADLEY D. SHUEY
86490
LICENSED PROFESSIONAL ENGINEER
6/3/2024

AGUIRRE & FIELDS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS
PRESTR CONC I-GIRDER SPANS

IGCS(MOD)

FILE:	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added bubble note 6. 01-23: Added 34' Rdwy.	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		98

DATE: 5/31/2024
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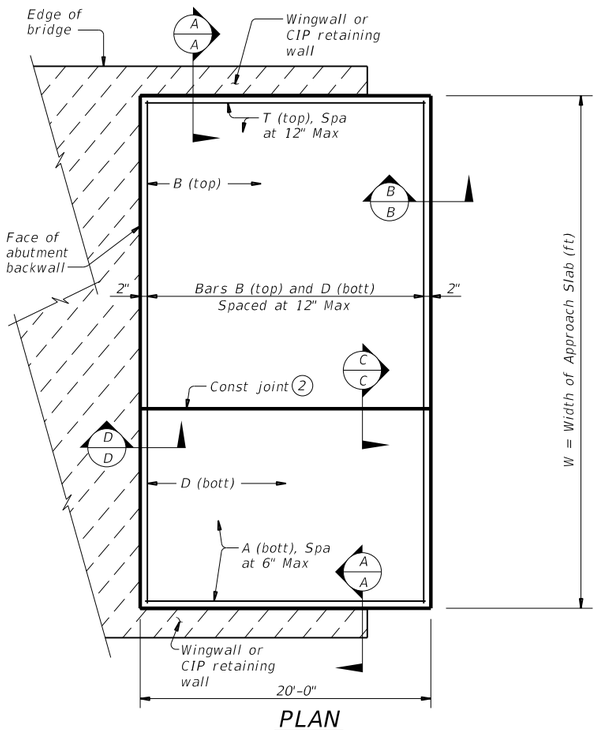
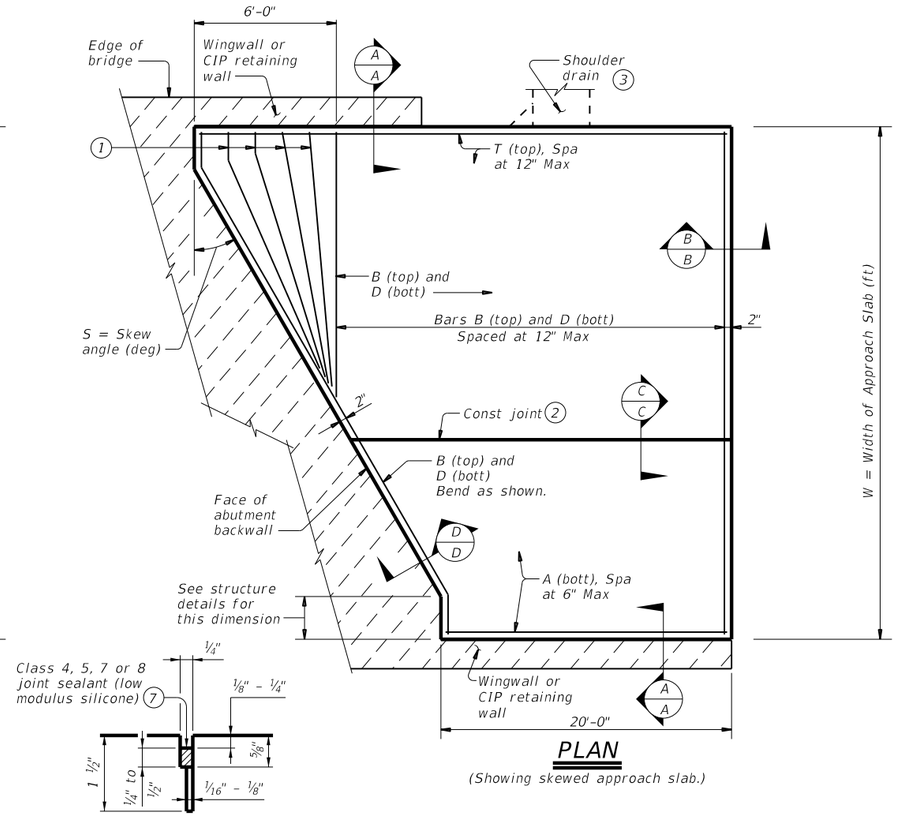


PLAN

(Showing non-skewed approach slab.)



PLAN

(Showing skewed approach slab.)

LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = $0.802W + 0.02W^2 \tan S$

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

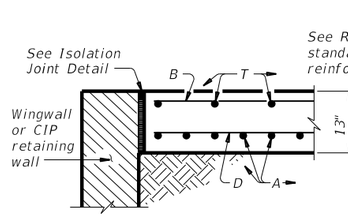
(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

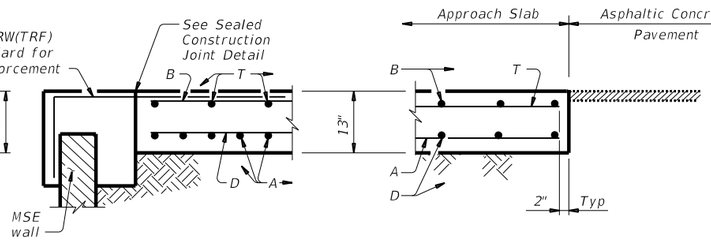
(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

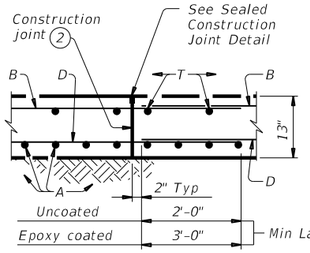
(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

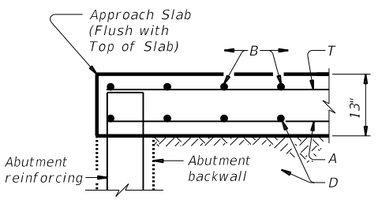


SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL



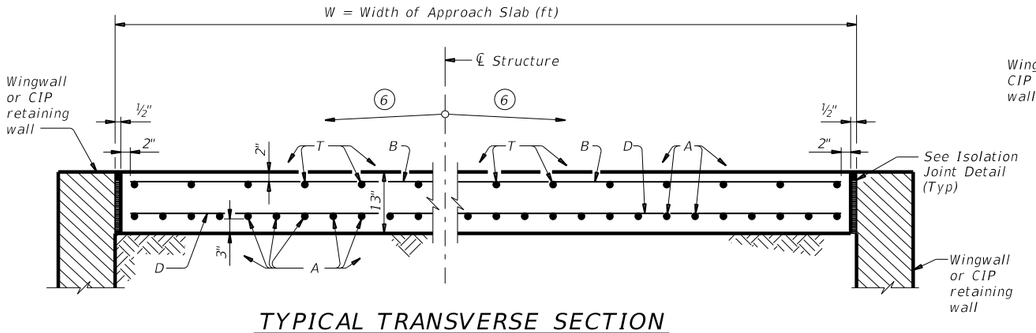


SECTION A-A

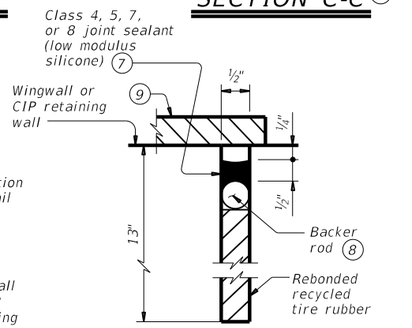
SECTION B-B

SECTION C-C (5)

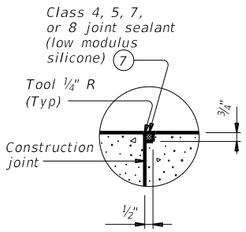
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation

Bridge Division Standard

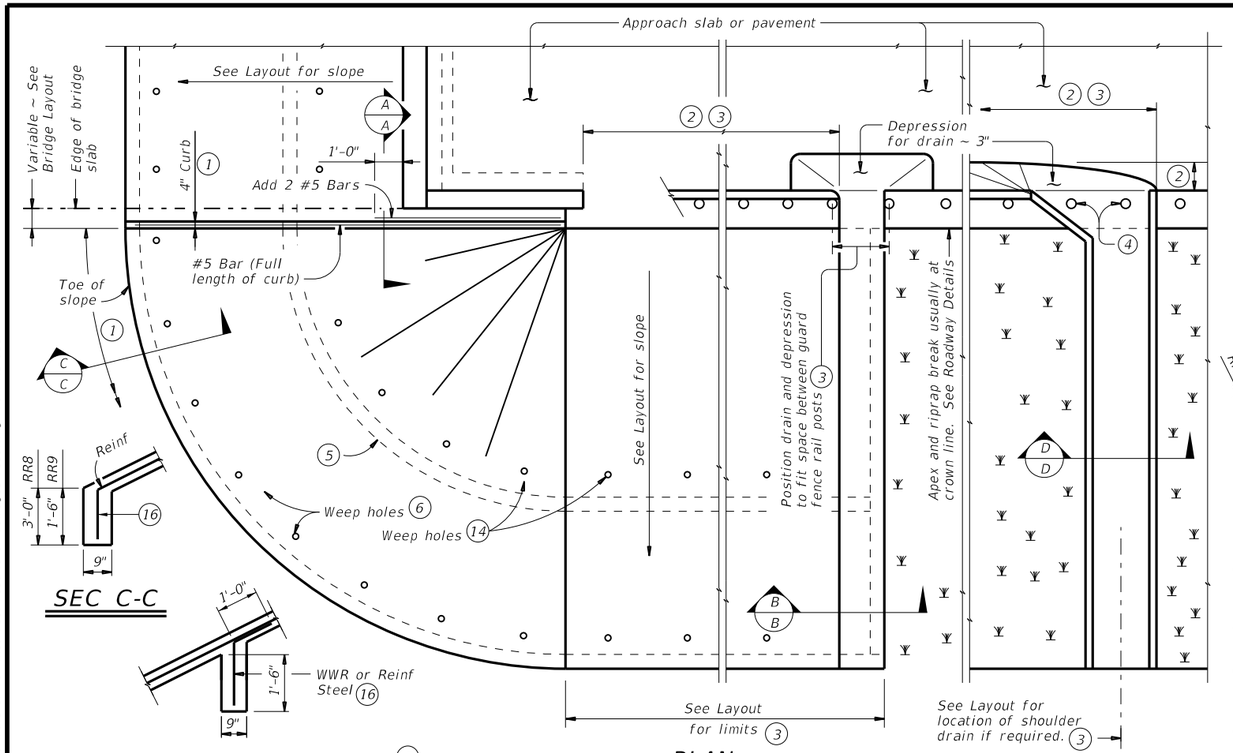
BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		99

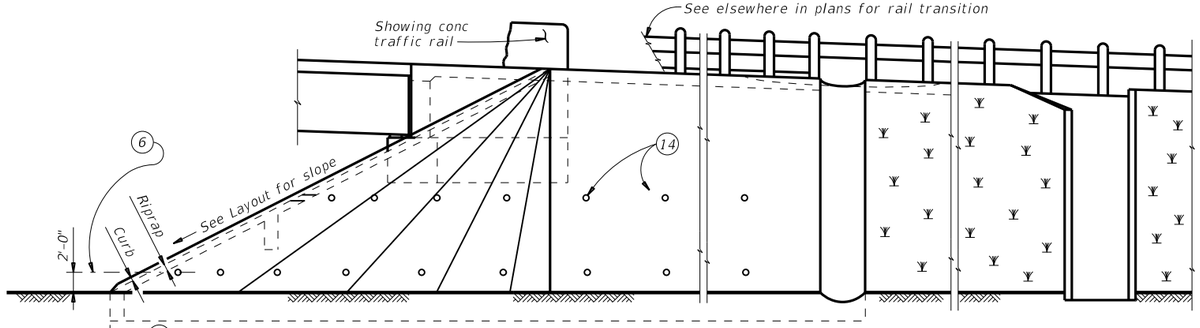
DATE: 5/31/2024
FILE: c:\pw-of\pw-of-prod\tami shuey\d0283039\crrstde1-19.dgn



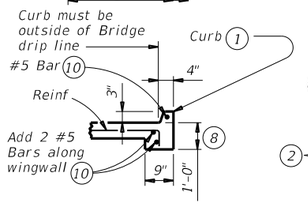
PLAN

SEC C-C

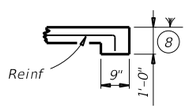
INTERMEDIATE TOEWALL (5)



ELEVATION

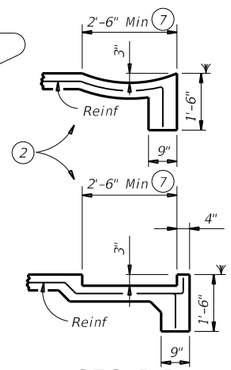


SEC A-A



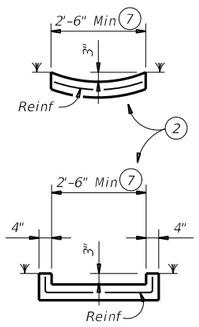
SEC B-B

(No drain)



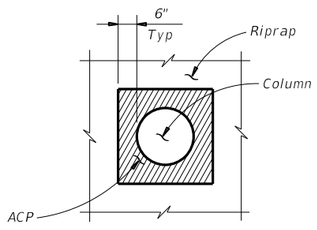
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

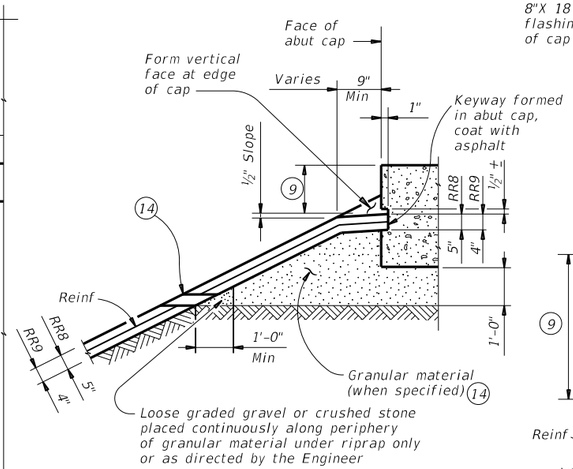
(Shoulder drain)



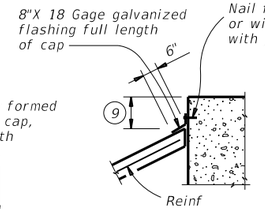
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

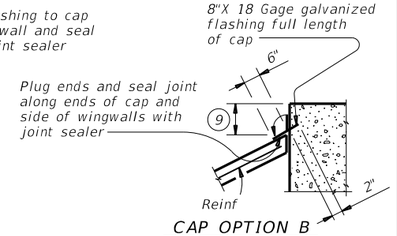
(As directed by the Engineer)



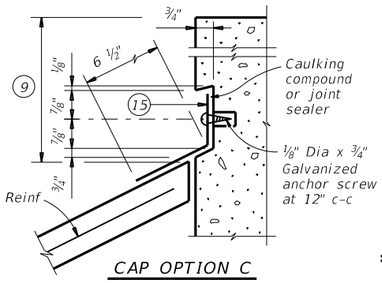
SHOWING KEYWAY OPTION



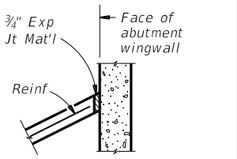
CAP OPTION A



CAP OPTION B

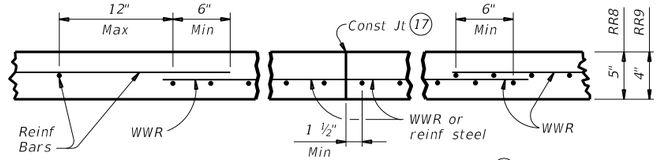


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		100

DATE: 5/31/2024
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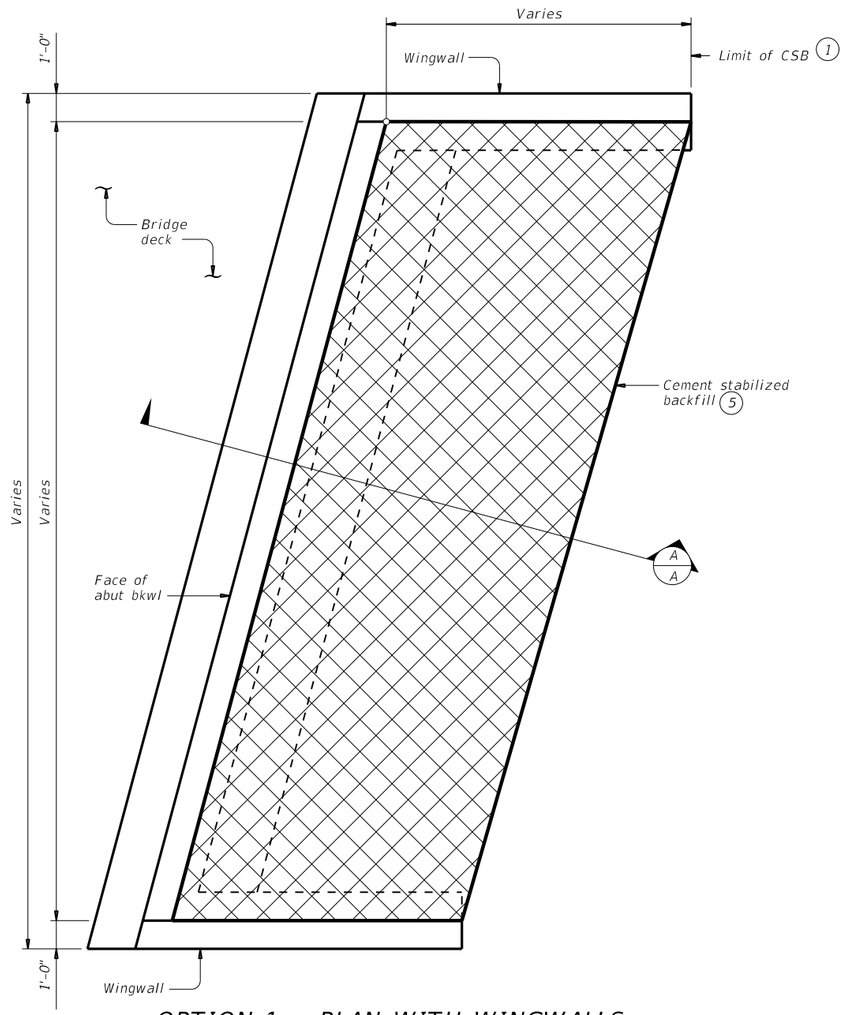
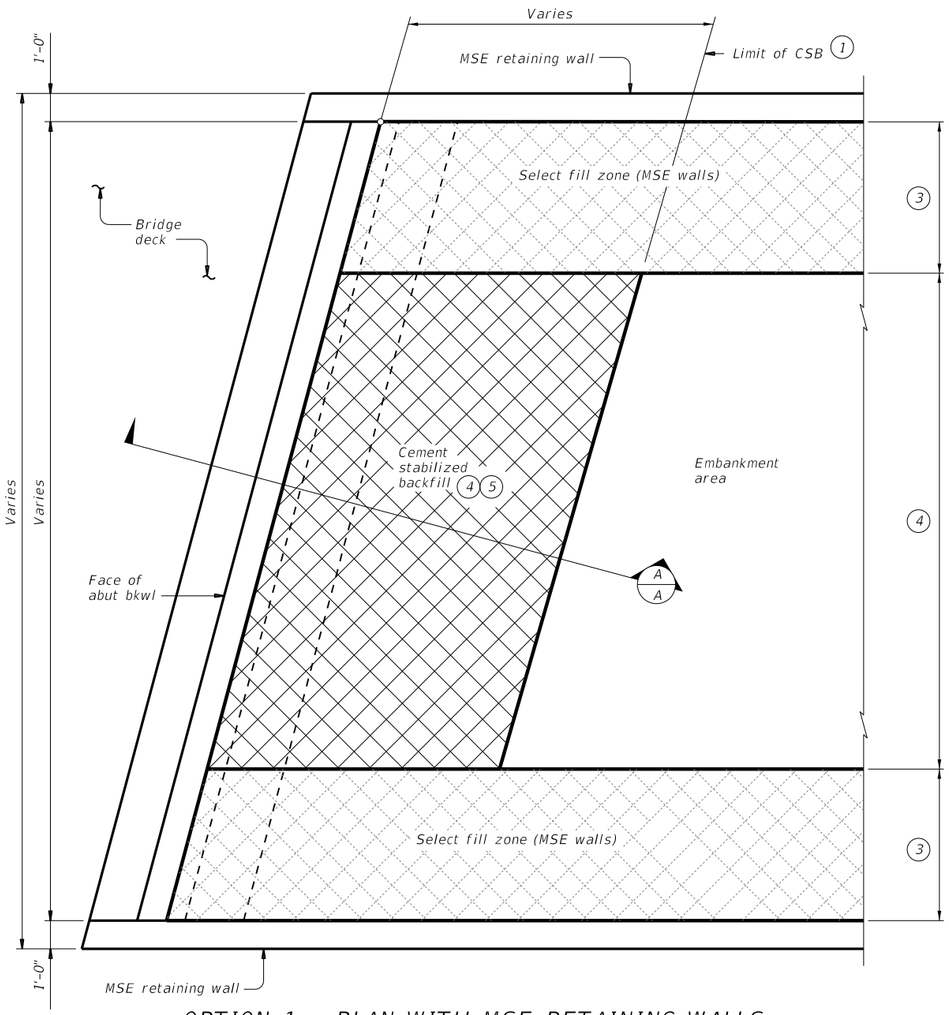
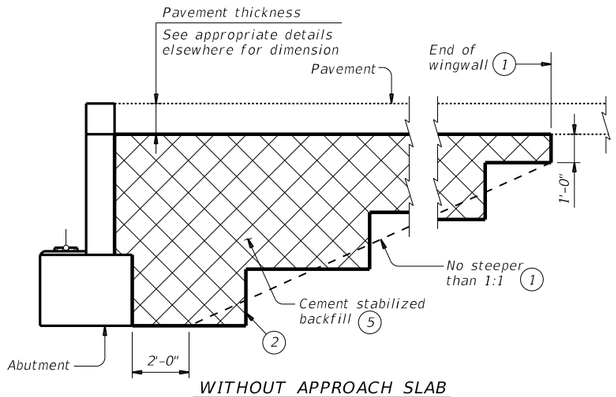


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



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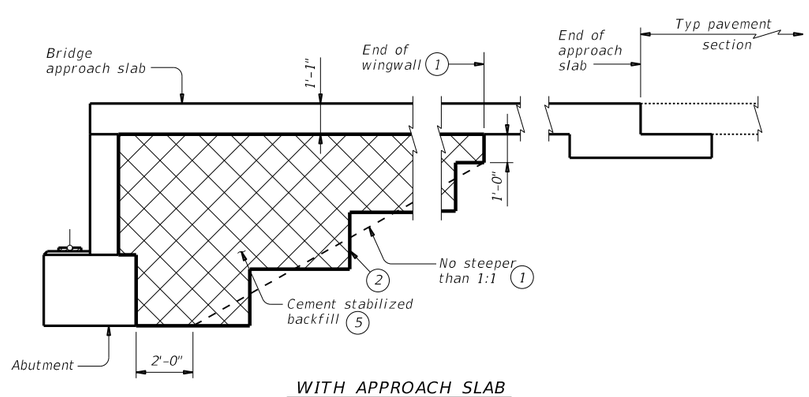

WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

See the Bridge Layout for selected Option. Option 1 is intended for construction only requiring plasticity index (PI) controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment. Option 2 is intended for new construction requiring high plasticity embankment fill with a PI greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays.

Construct abutment backfill in accordance with Item 400, "Excavation and Backfill for Structures".

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		101

DATE: 5/31/2024
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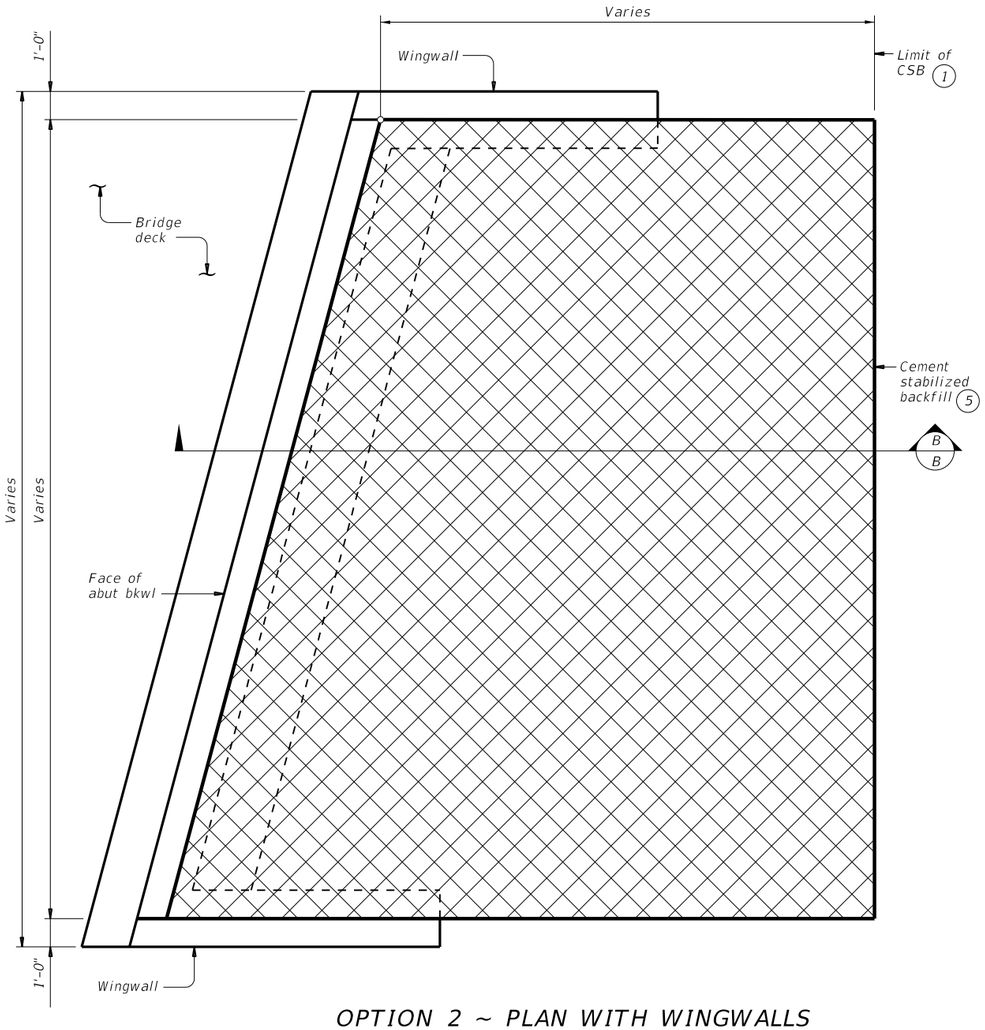
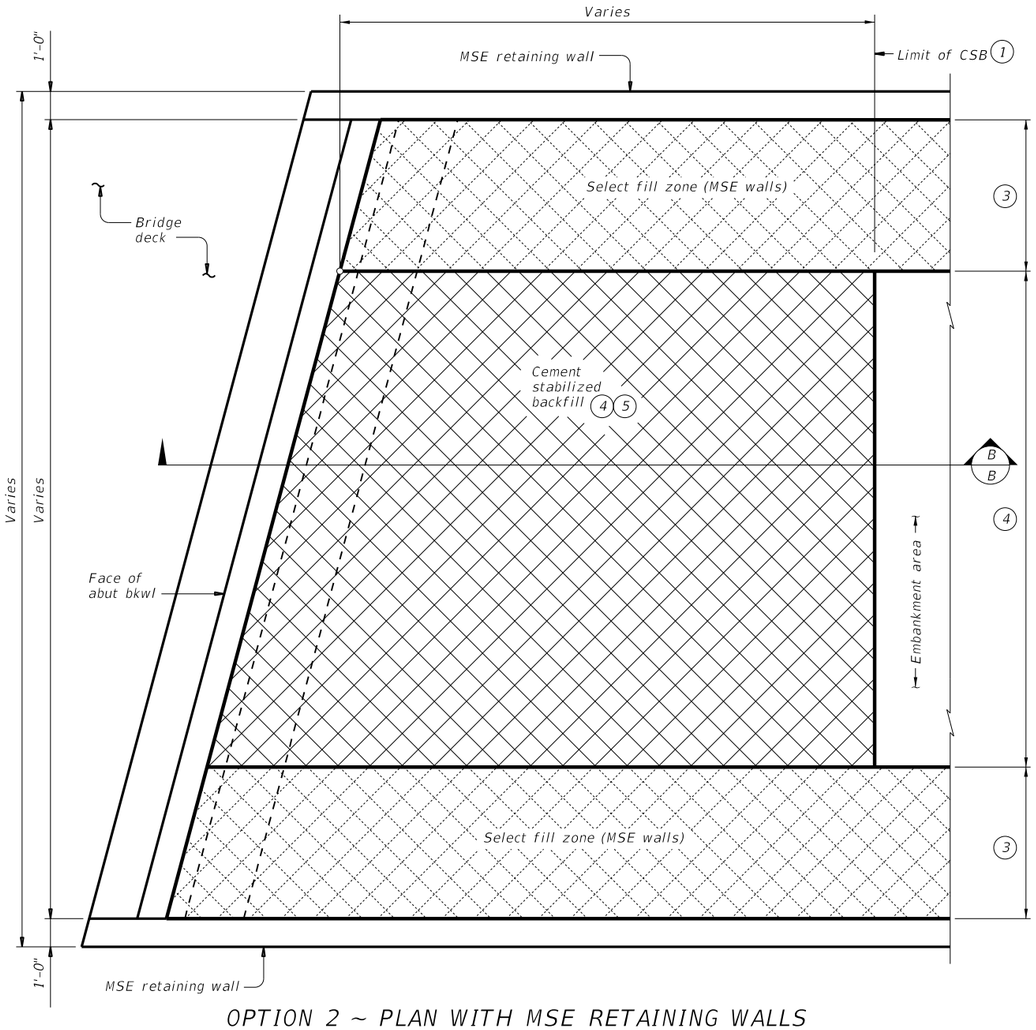


OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

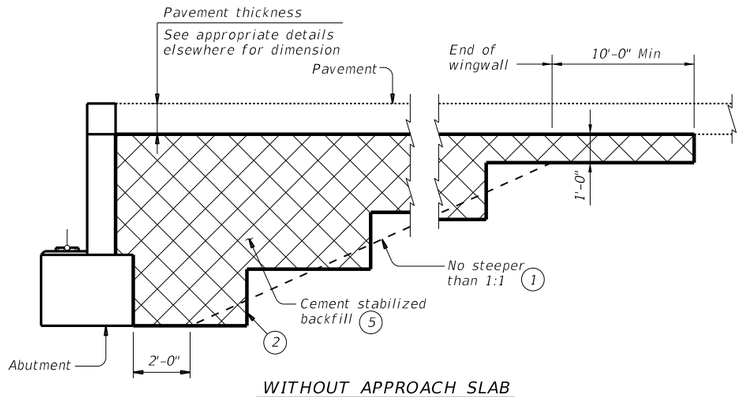
(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

(6) 1'-0" for BAS-A
1'-10" for BAS-C



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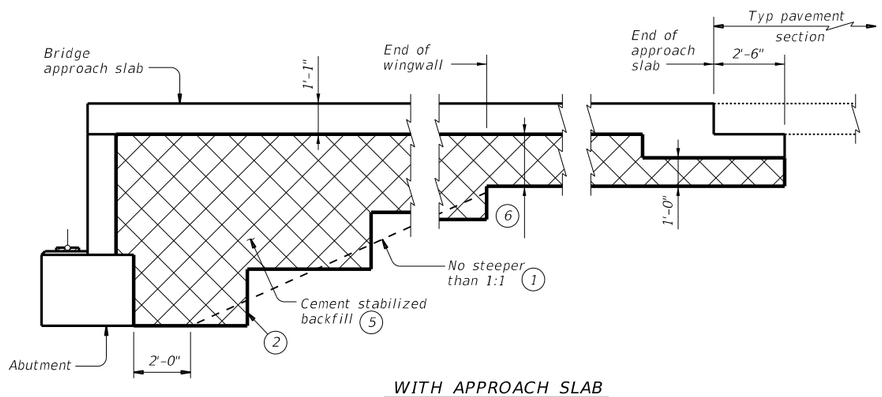

WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
03-23: Updated General Notes.	SJT	CROCKETT		102

DATE: 5/31/2024
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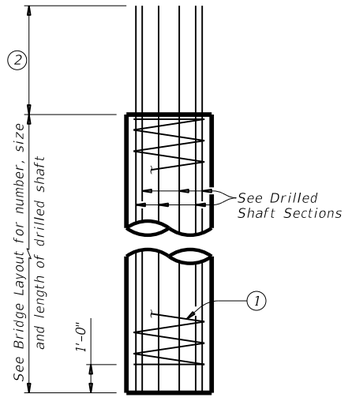
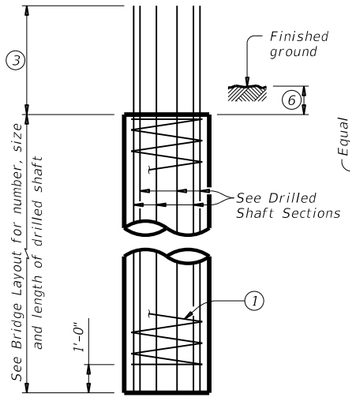
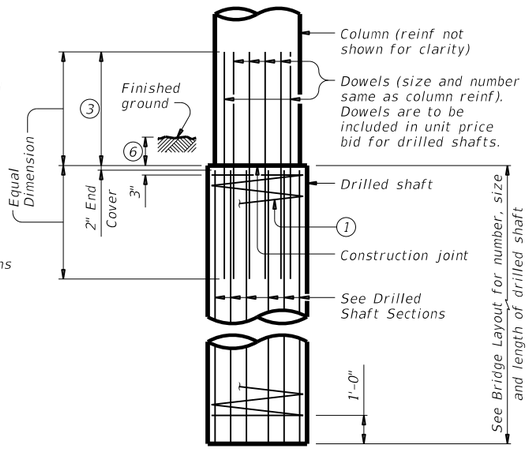


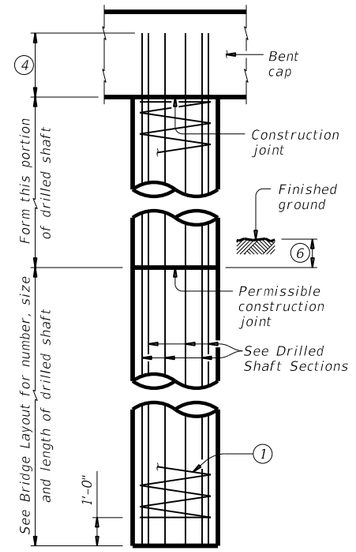
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



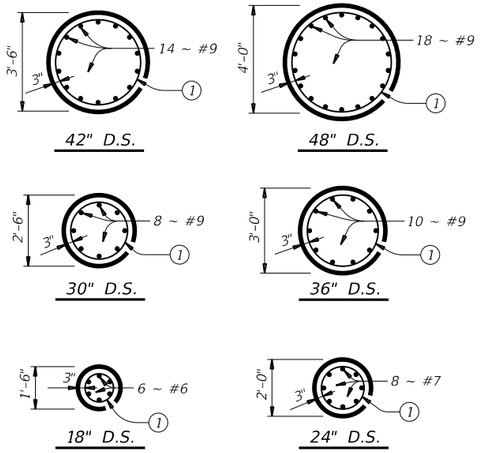
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

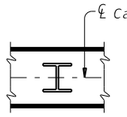


DRILLED SHAFT SECTIONS

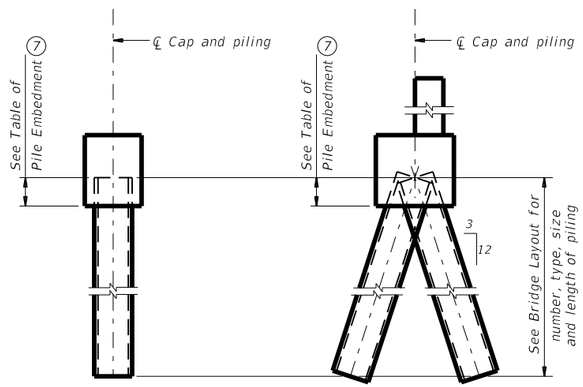
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

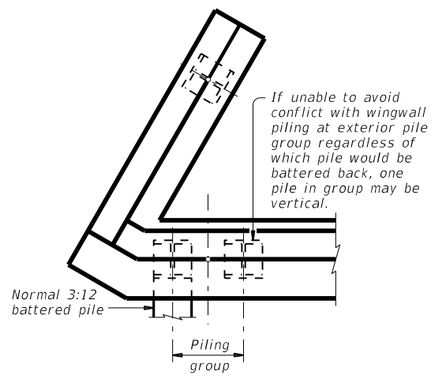
See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



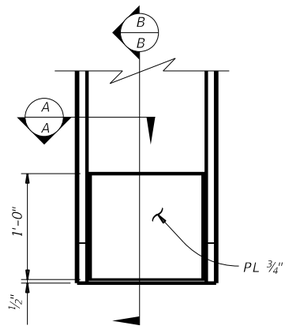
ORIENTATION OF STEEL H-PILING



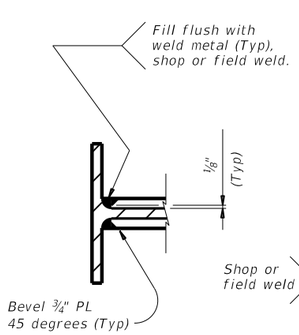
PILING DETAILS
(Concrete or steel H)



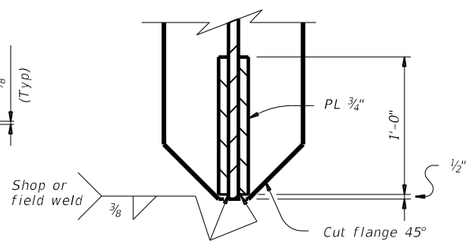
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION



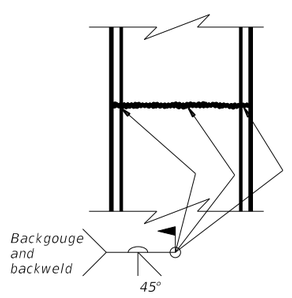
SECTION A-A

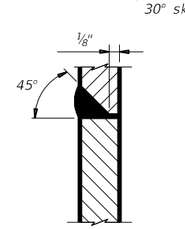


SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.





SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

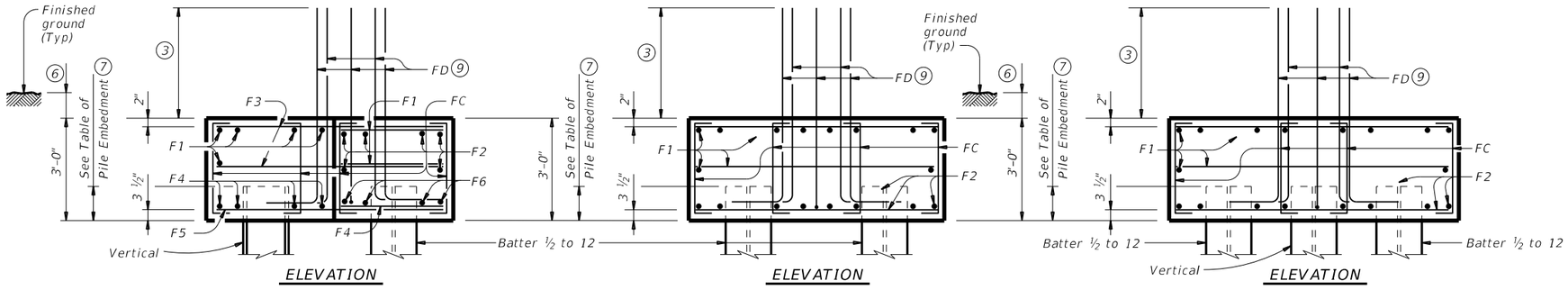
Texas Department of Transportation

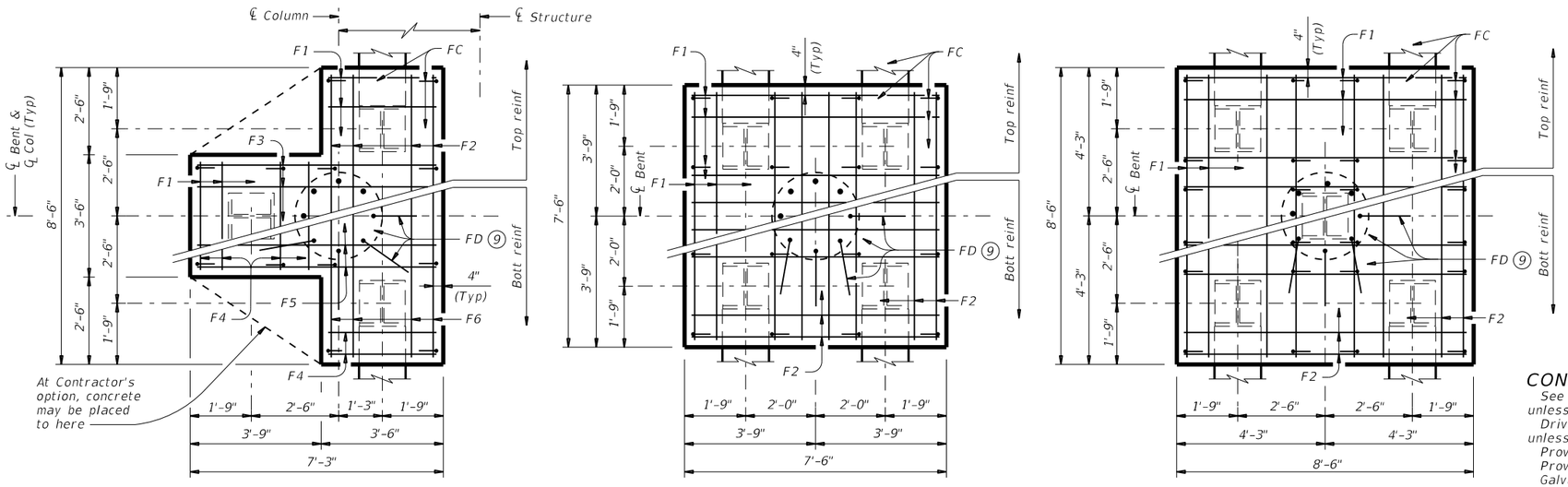
Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		103





THREE PILE FOOTING (8)

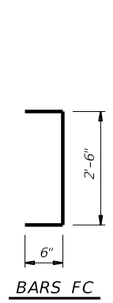
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

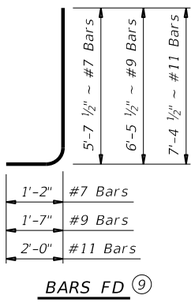
For 42" Dia and smaller columns.

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(3) *Min lap with column reinforcing:*
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) *1'-0" Min, unless shown otherwise on plans.*

(7) *Or as shown on plans.*

(8) *See Bridge Layout for type, size and length of piling.*

(9) *Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.*

(10) *Adjust FD quantity, size and weight as needed to match column reinforcing.*

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		104

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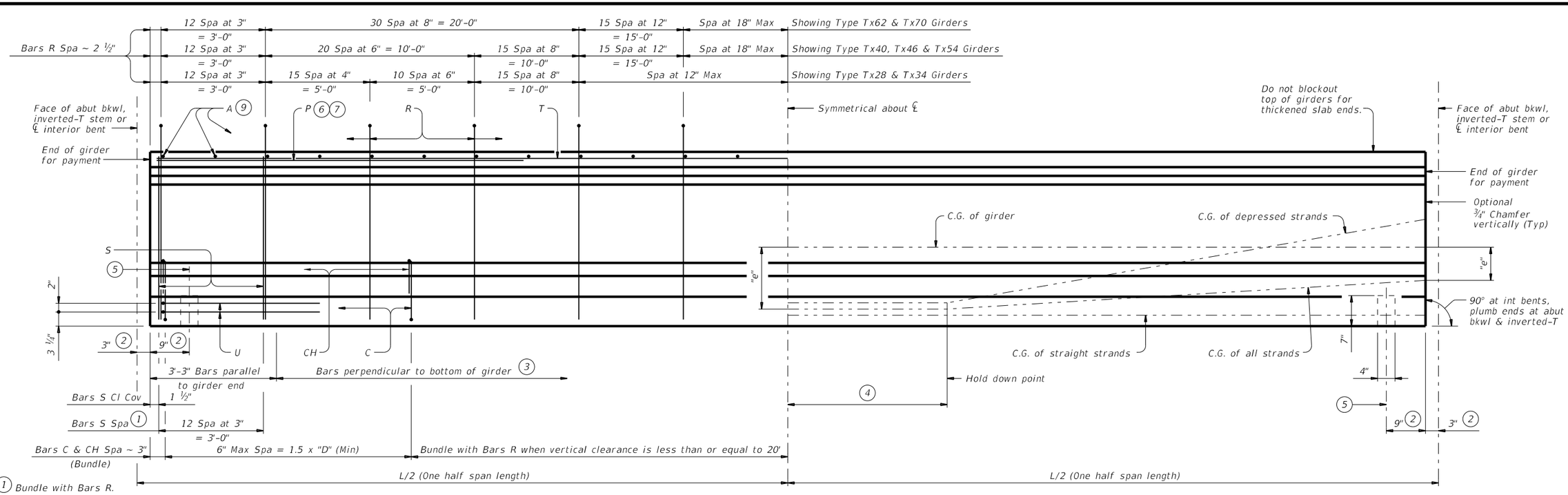


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 5/8") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

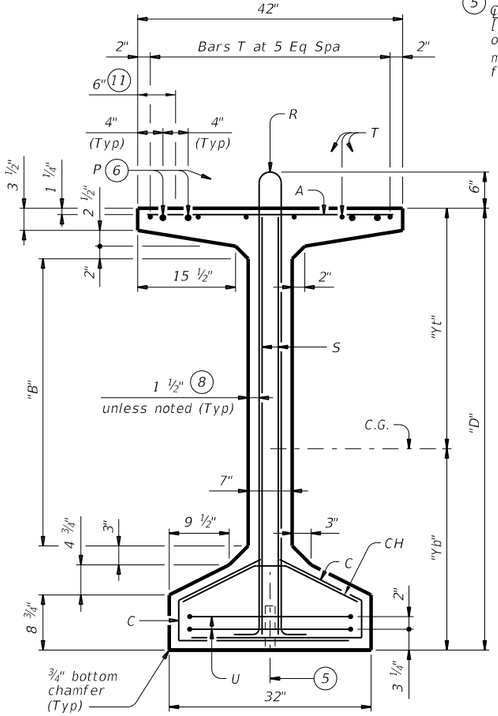
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

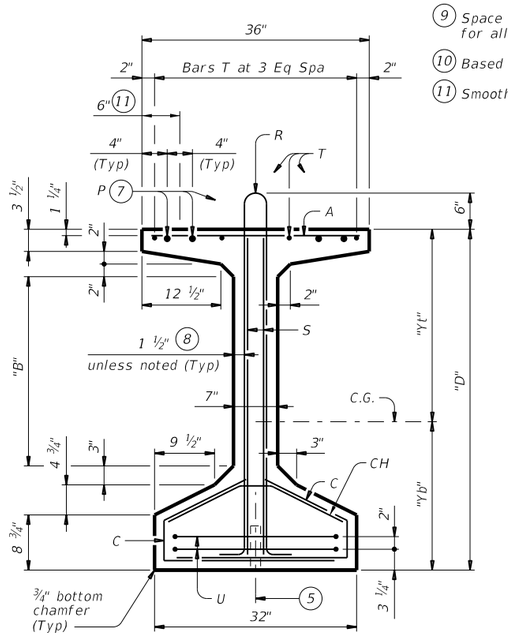
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

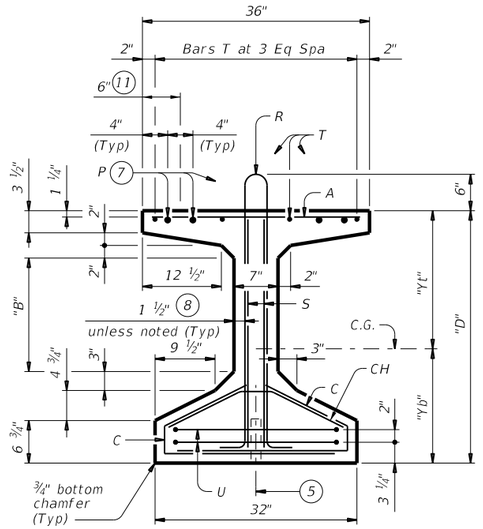
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.
When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

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

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH if full length for VC<= 20' 3-23: Clarified C and CH requirement	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		105

DATE: 5/31/2024 5:05:15 PM
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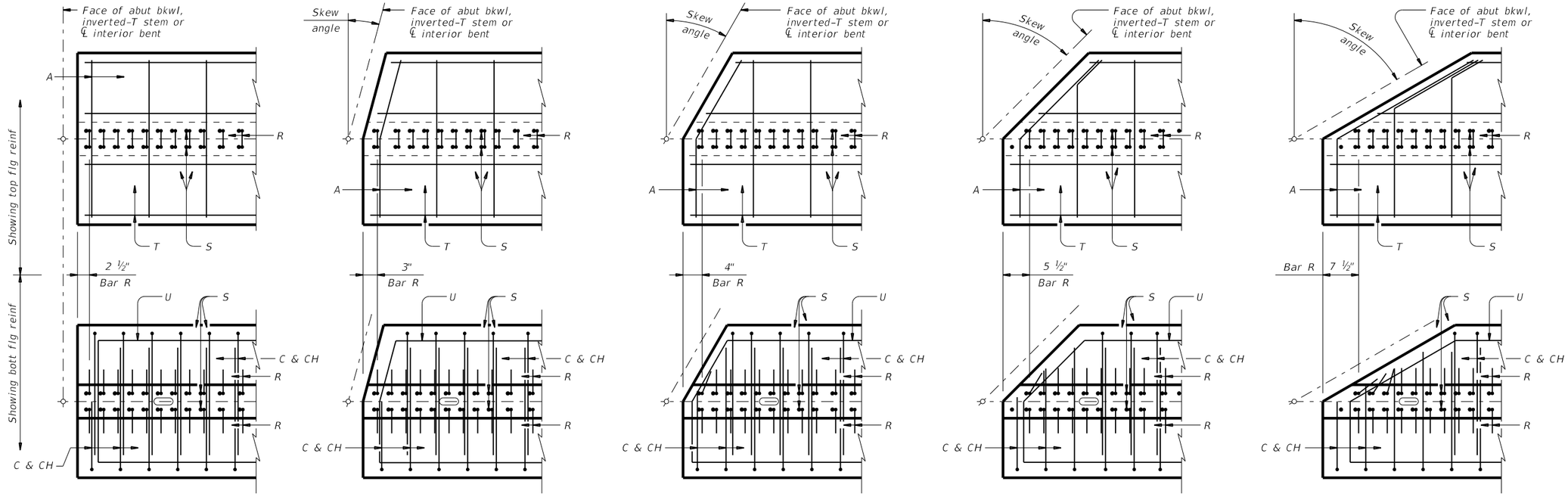
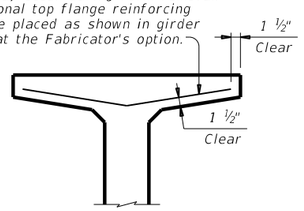
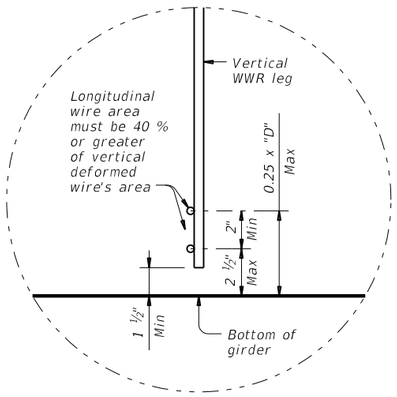


PLAN OF GIRDER ENDS (12)

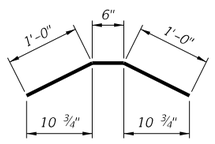
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



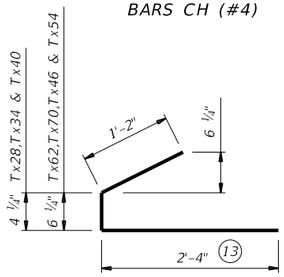
OPTIONAL TOP FLANGE REINFORCING DETAIL



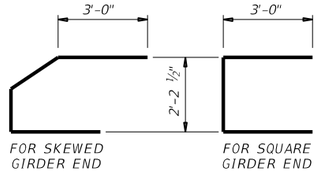
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



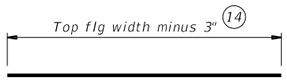
BARS CH (#4)



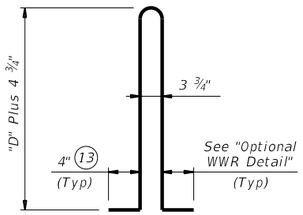
BARS C (#4)



BARS U (#5)

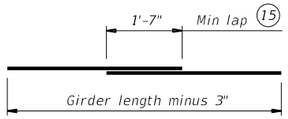


BARS A (#3)



BARS R (#4) (16)

BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		106

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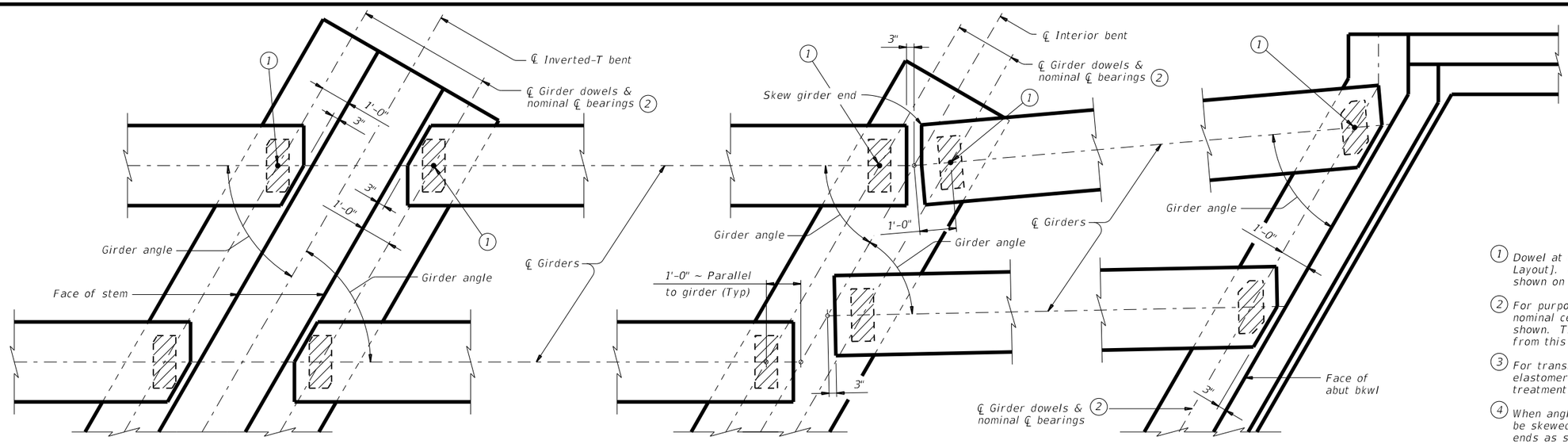


AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

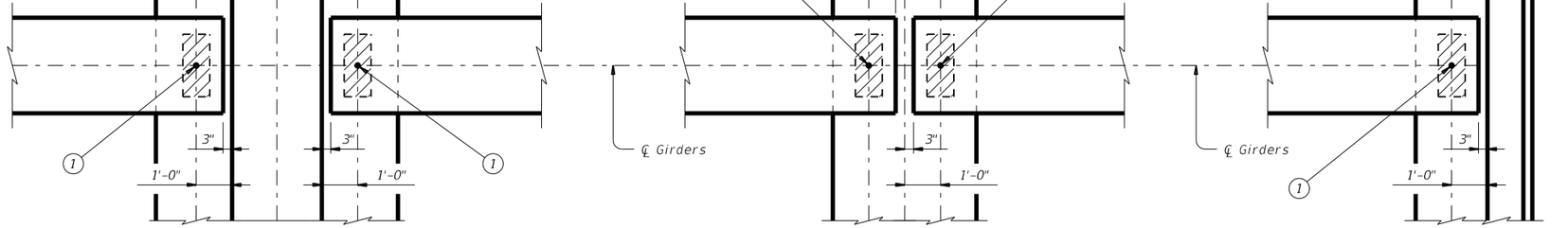
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.

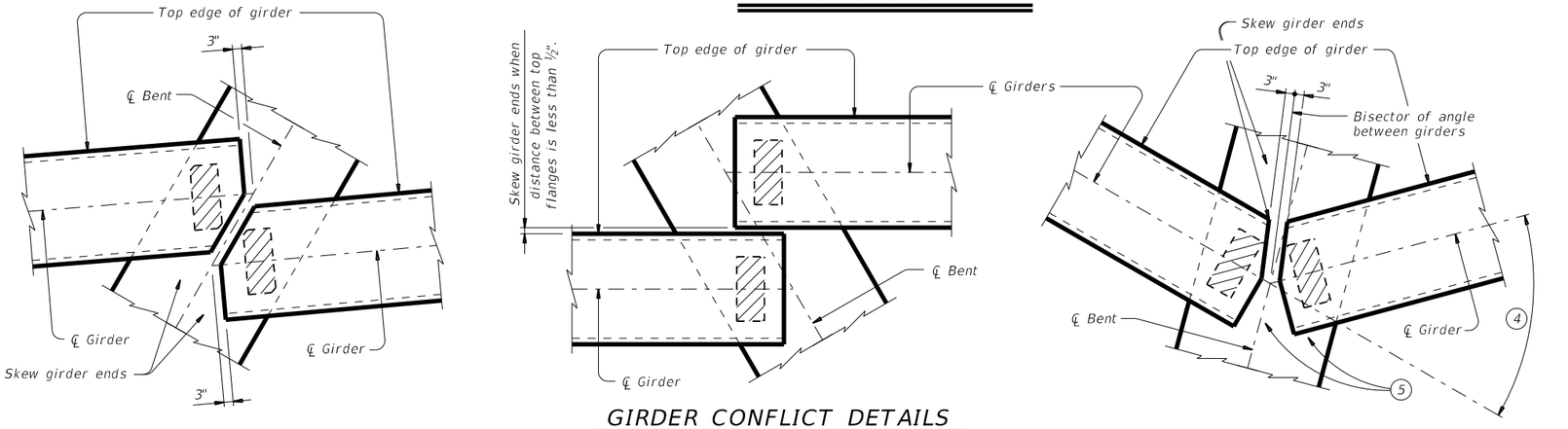


AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

GENERAL NOTES:

These details accommodate skew angles up to 60°.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		107

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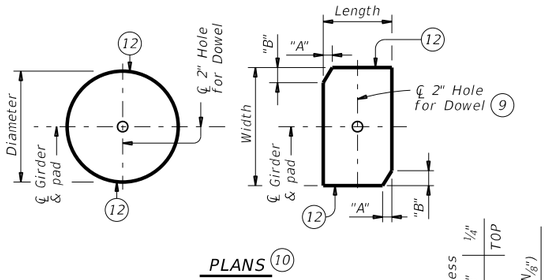
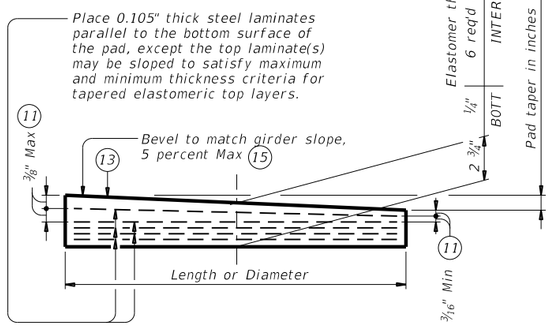


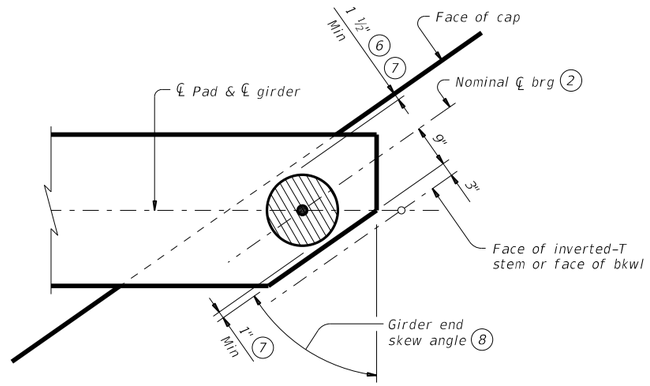
PLANS (10)



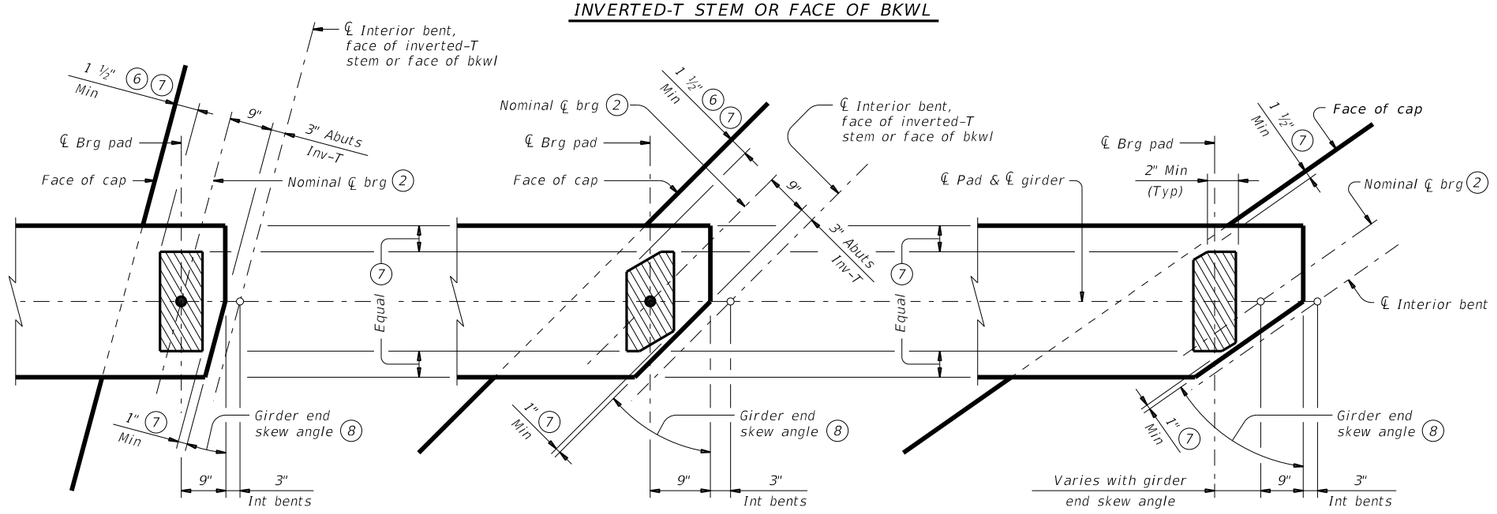
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)
(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation
Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
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	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		108

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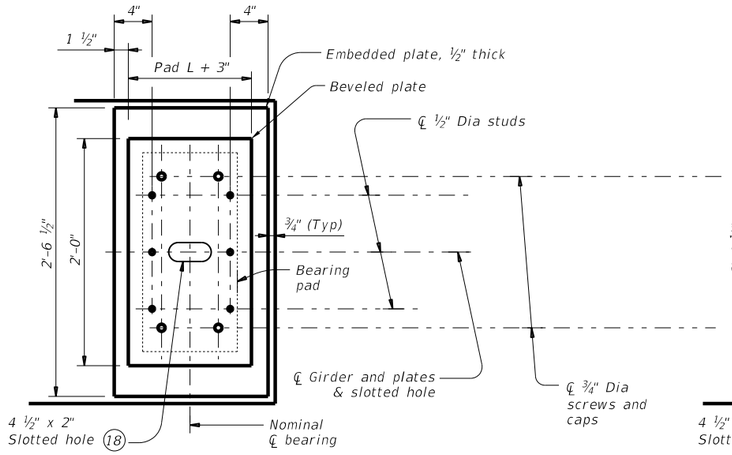
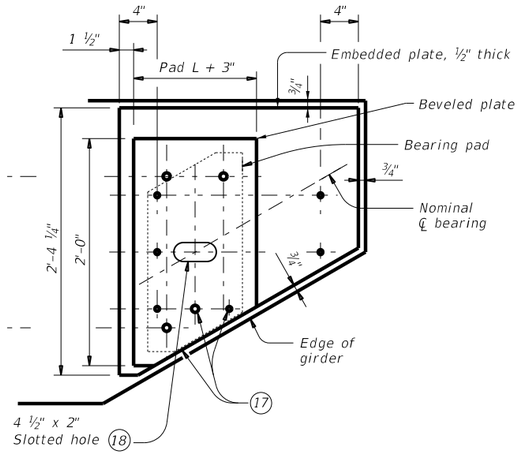
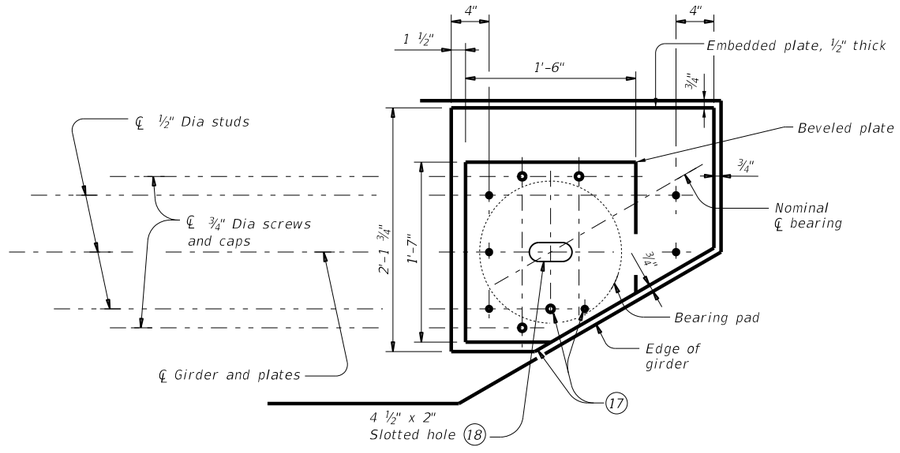


NORMAL GIRDER END
RECTANGULAR BEARING PAD

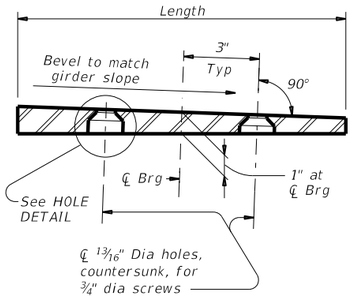


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

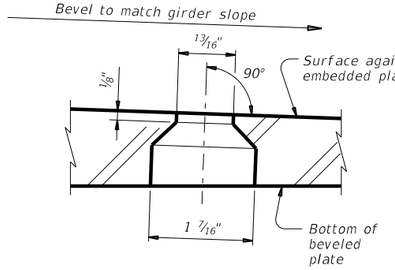


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

BEVELED PLATE DETAILS

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1⁄16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1⁄16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1⁄16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

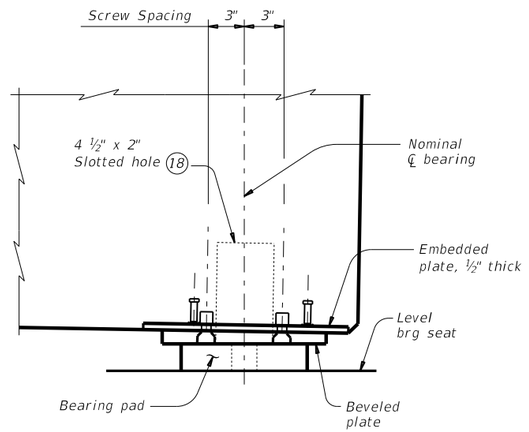
Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

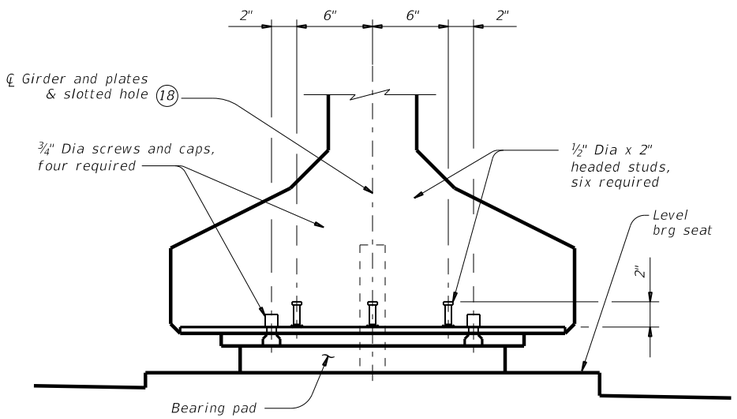
Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation
Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		109

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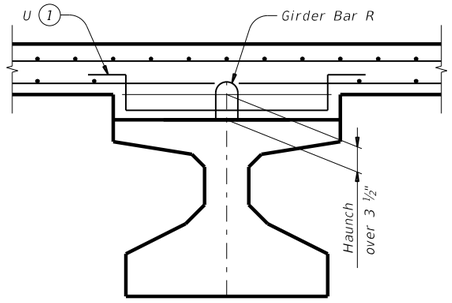
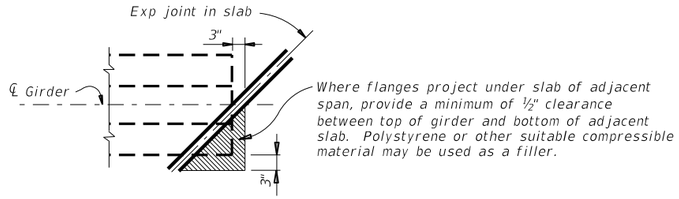
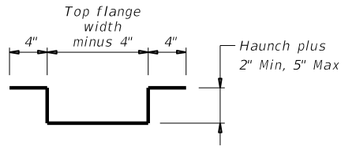


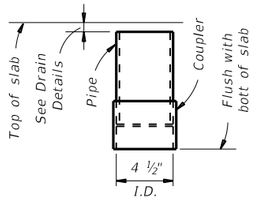
HAUNCH REINFORCING DETAIL



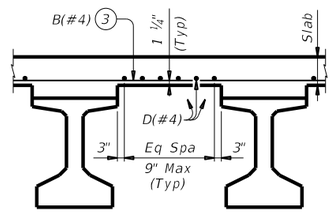
TREATMENT AT GIRDER END FOR SKEWED SPANS



BARS U (#4)

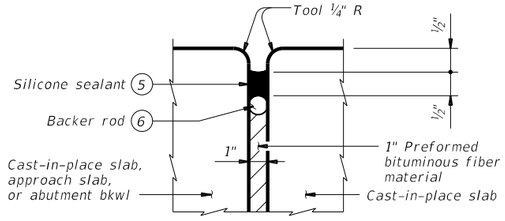


C-I-P DRAIN DETAIL (2)

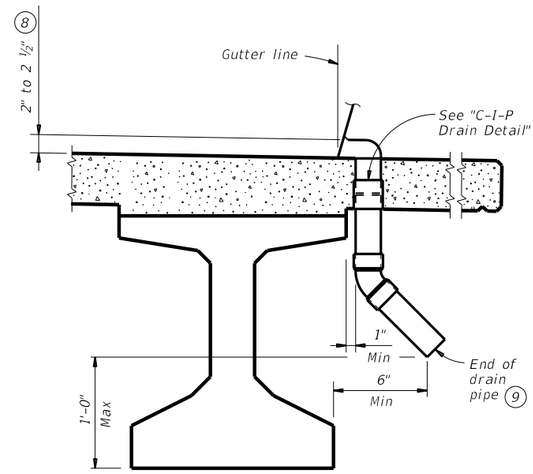


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



TYPE A JOINT DETAIL (7)



DRAIN DETAIL (10)

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

DECK FORMWORK NOTES:

Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

SHEET 1 OF 2

Texas Department of Transportation

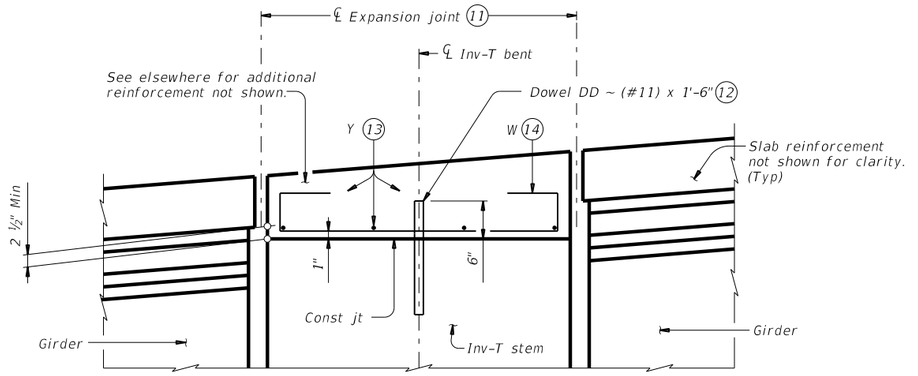
Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

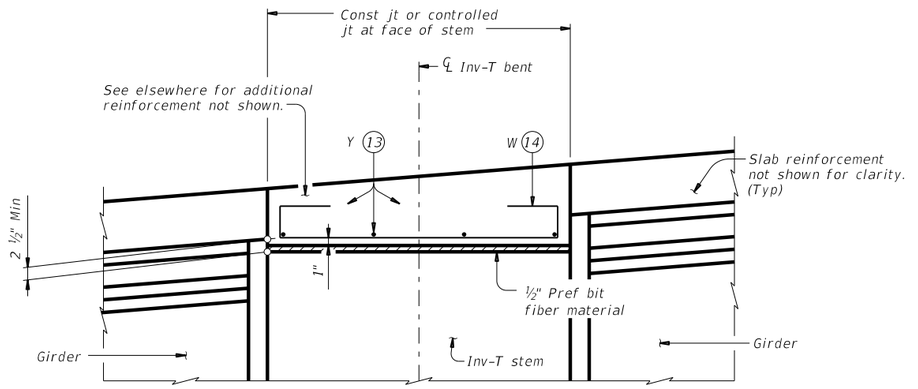
PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		110

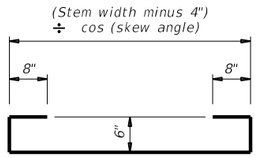


SHOWING EXPANSION JOINTS

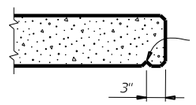


SHOWING CONST JTS OR CONTROLLED JTS

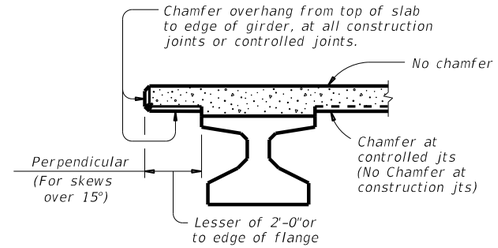
REINFORCEMENT OVER INV-T BENTS



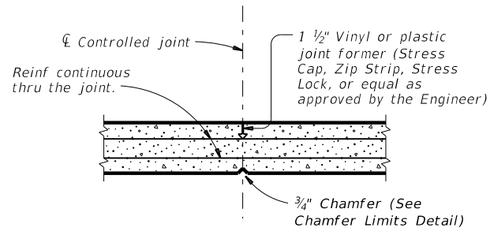
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

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SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

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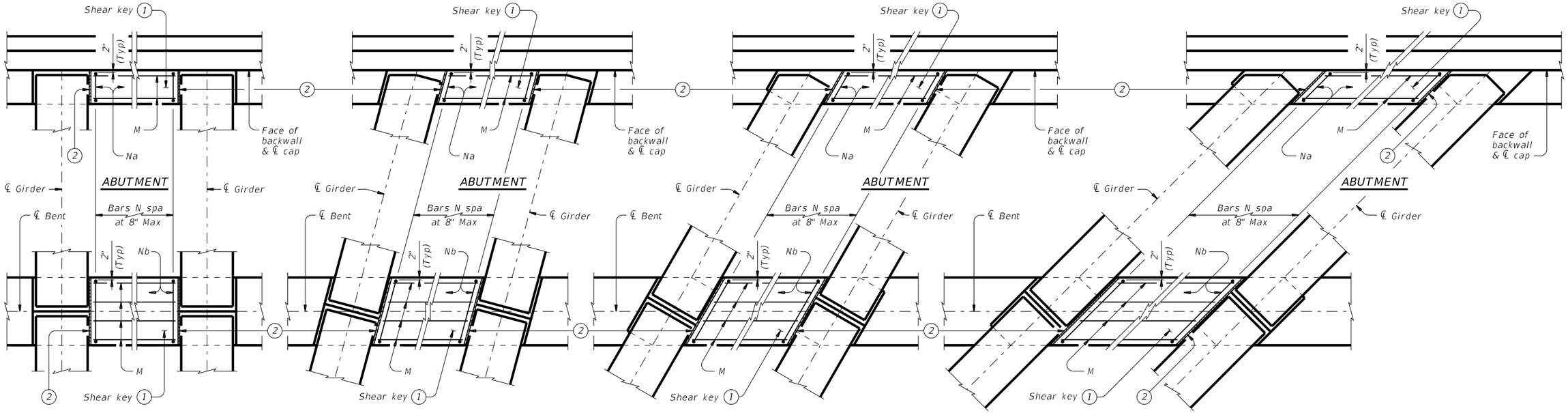


PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

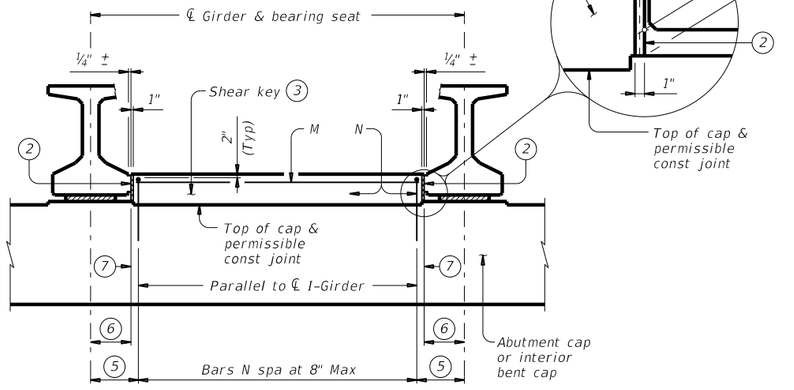
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ✱ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ✱ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

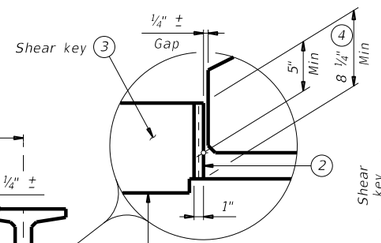
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

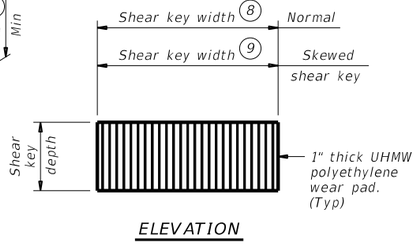
(9) Abutments = ½ Cap width ✱ Cos Skew.
Interior bents = Cap width ✱ Cos Skew.



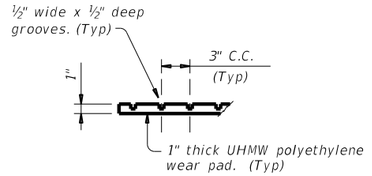
PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

Showing shear key with girder Type Tx46. Other I-Girder types similar.



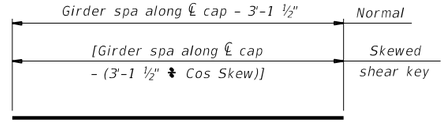


ELEVATION

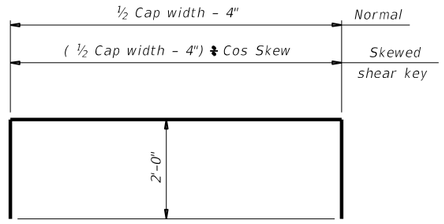


PART SECTION

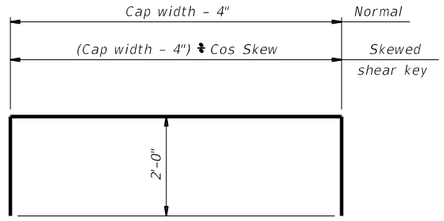
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I-Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

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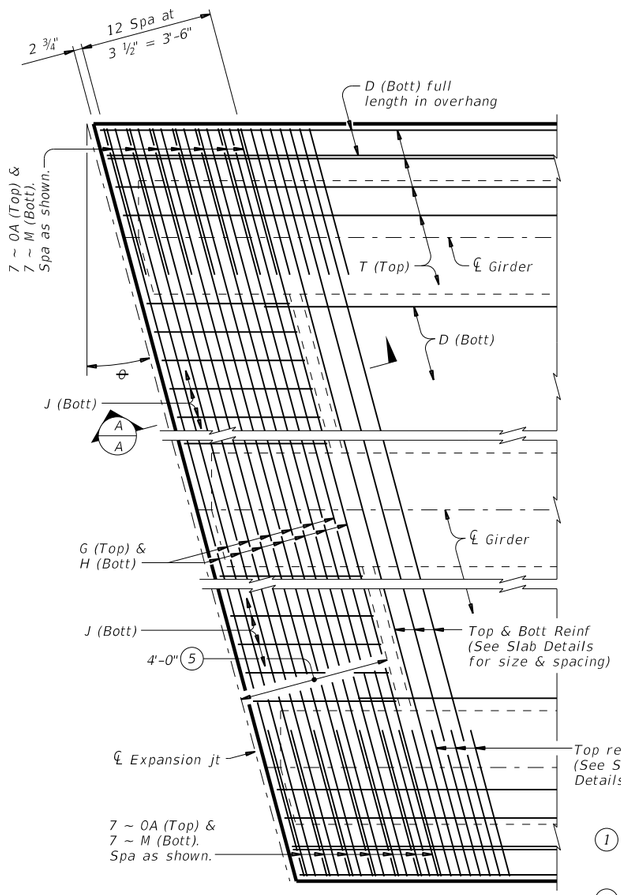
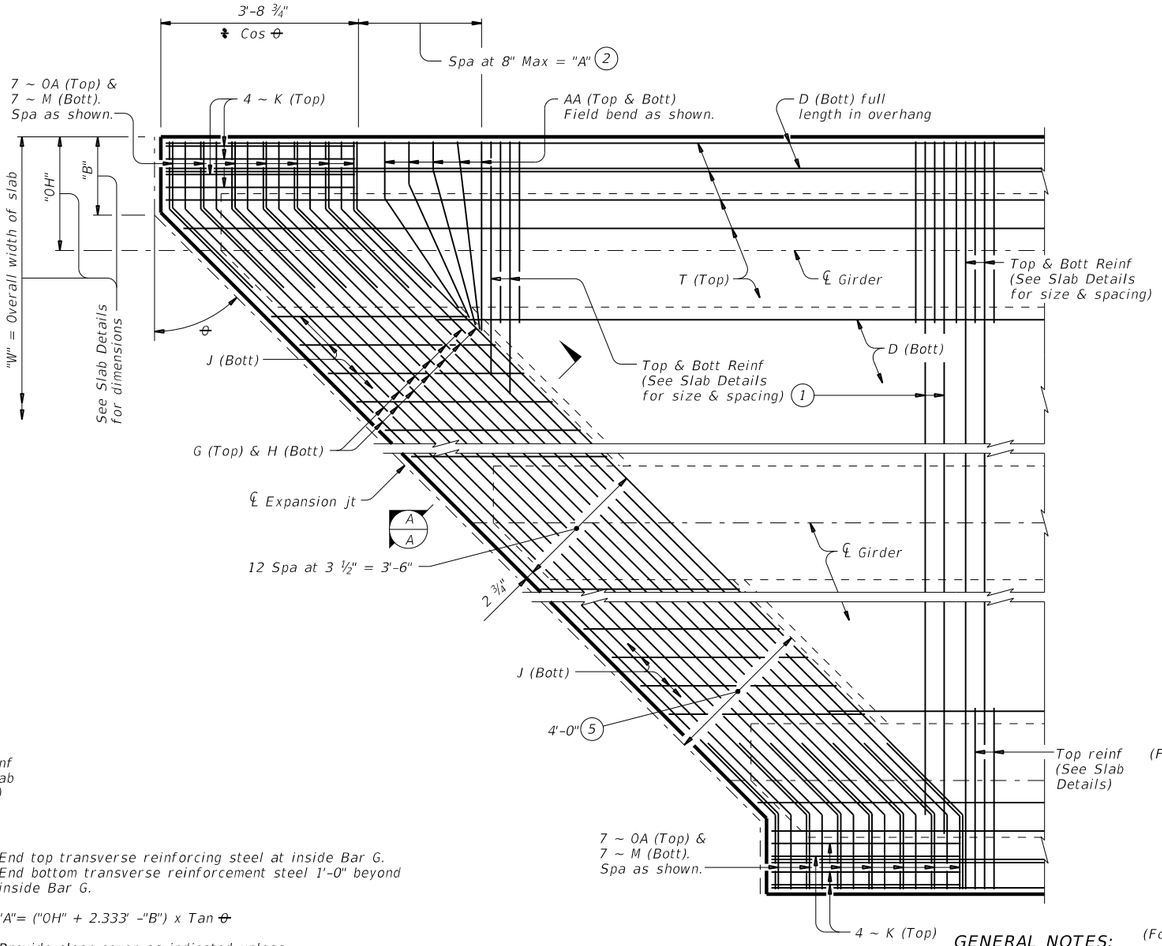


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

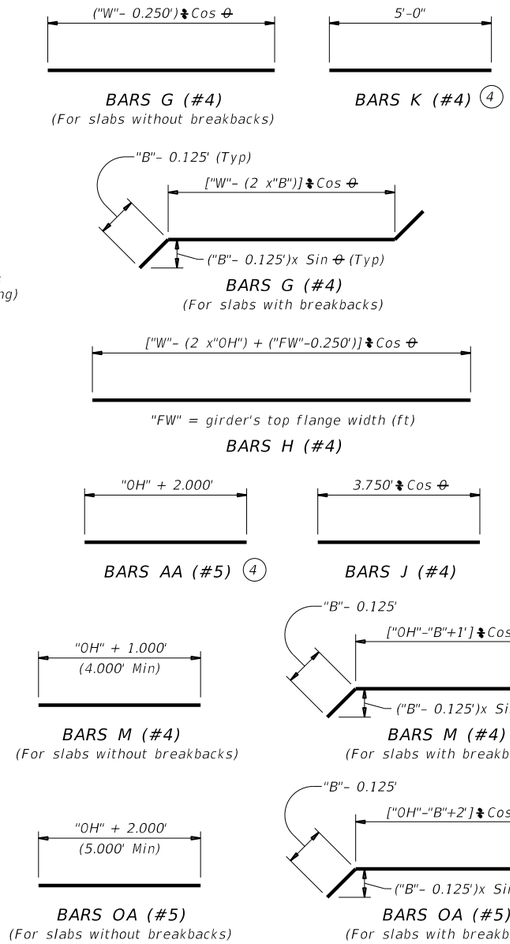
(1) End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.

(2) "A"= ("OH" + 2.333' -"B") x Tan θ

(3) Provide clear cover as indicated unless otherwise shown on Span Details.

(4) Only required on slabs with breakbacks.

(5) Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



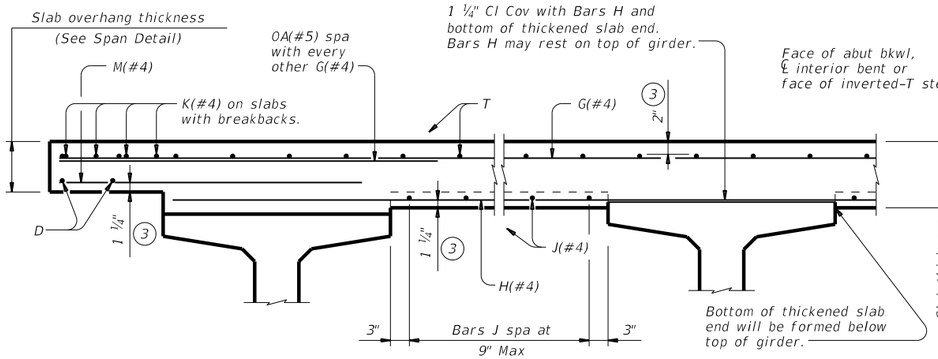
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

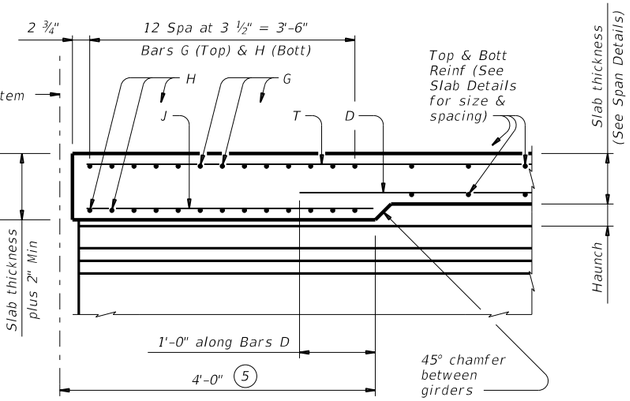
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



2" AND MORE OF HAUNCH — LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

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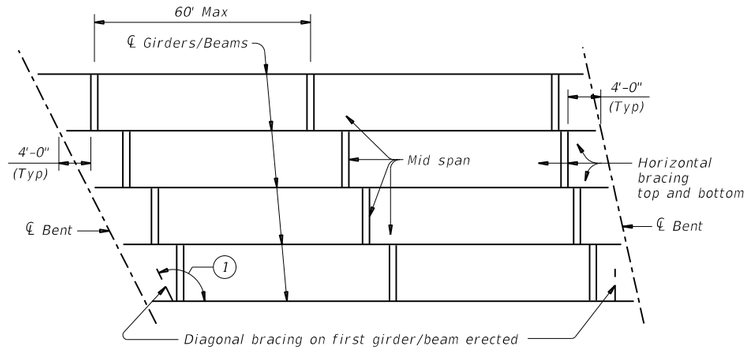
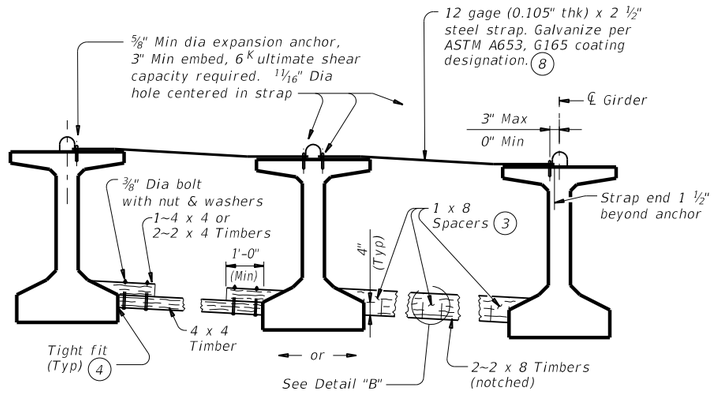
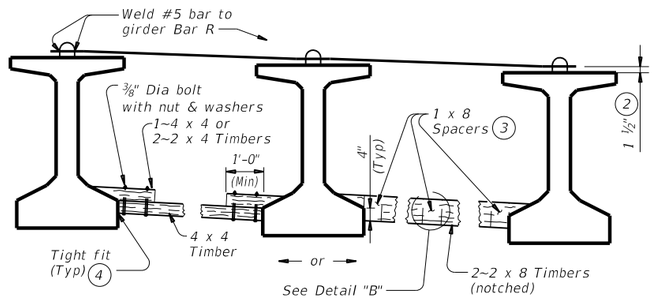


ERECTION BRACING



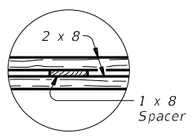
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



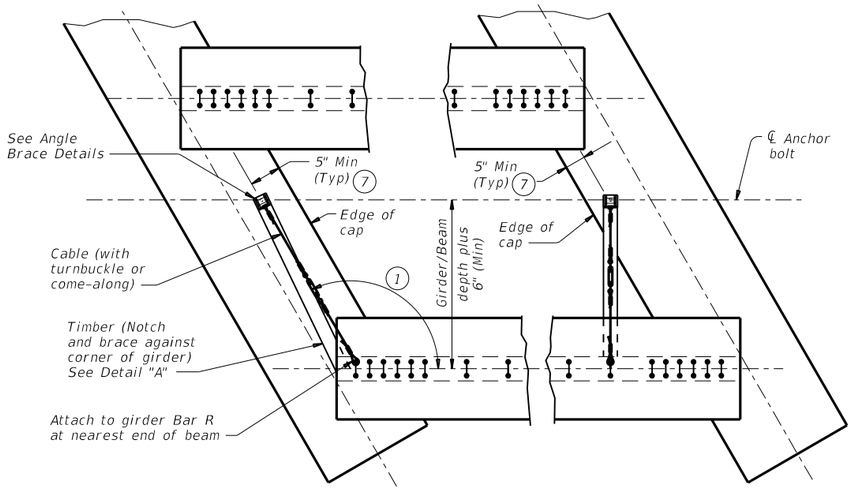
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"



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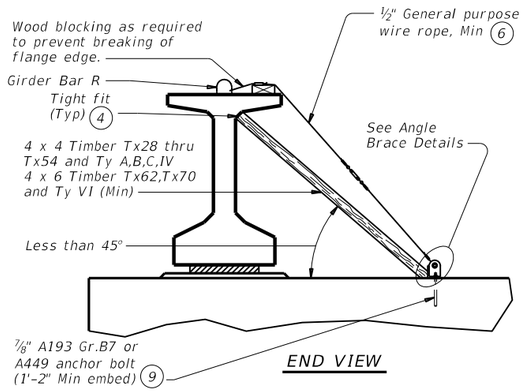
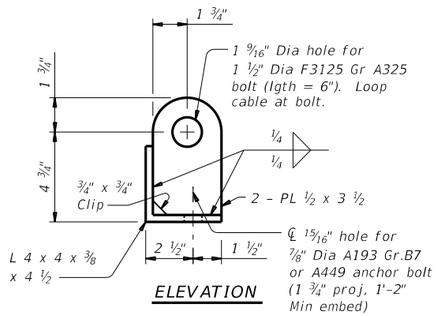


END VIEW

DIAGONAL BRACING DETAILS (5)

(To be used on both ends of the first girder/beam erected in the span in each phase.)



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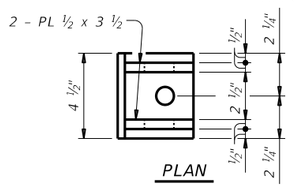
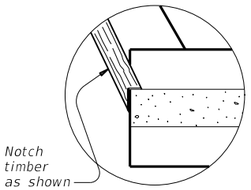


PLAN

ANGLE BRACE DETAILS



DETAIL "A"

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

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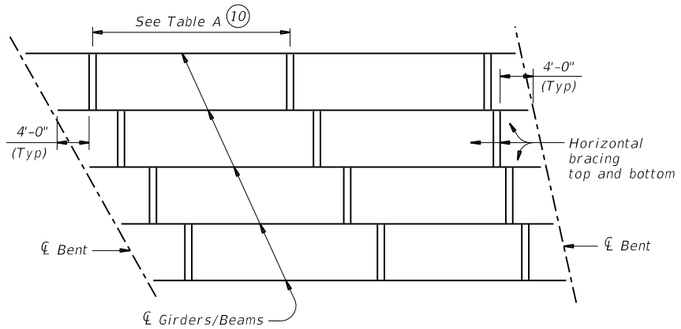


SLAB PLACEMENT BRACING

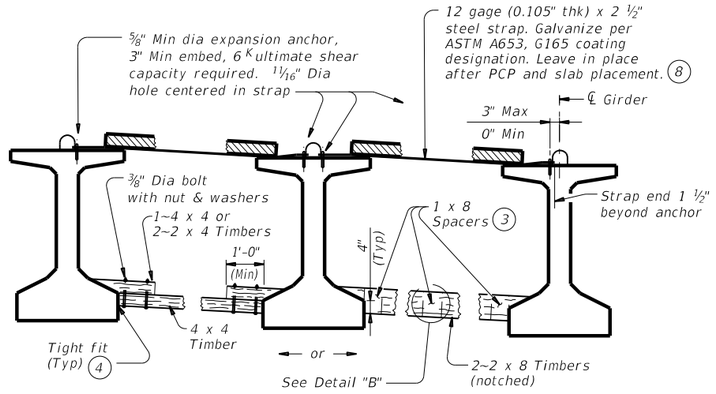
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

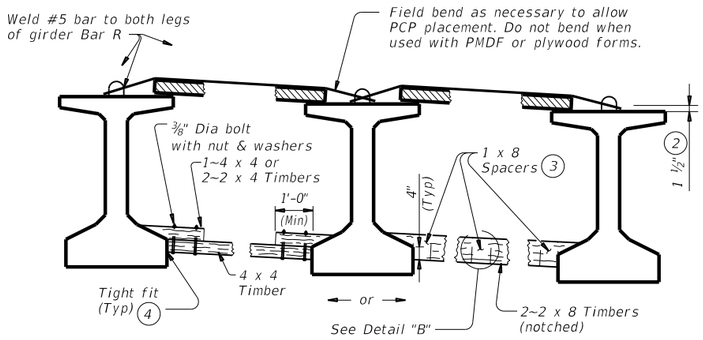
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

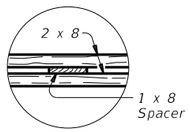
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	SJT	CROCKETT		115

DATE: 5/31/2024 5:08:05 PM
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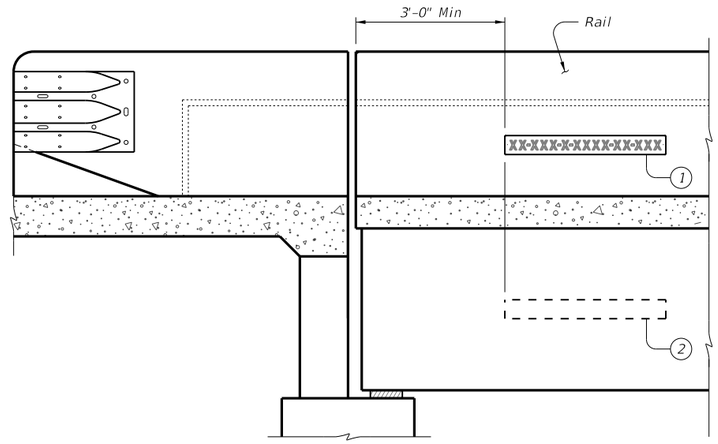
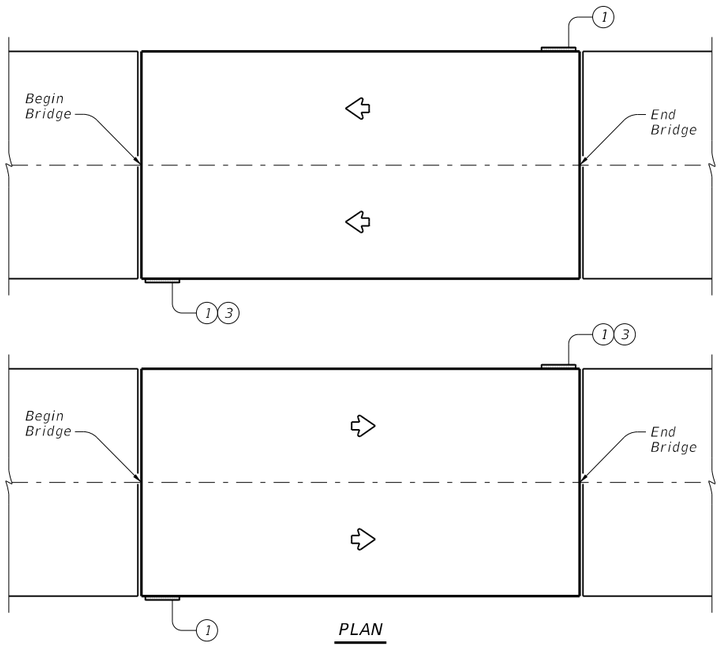
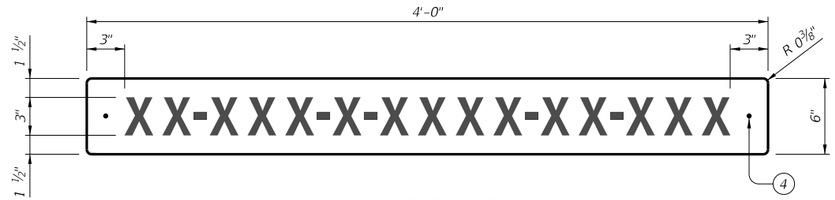


ELEVATION

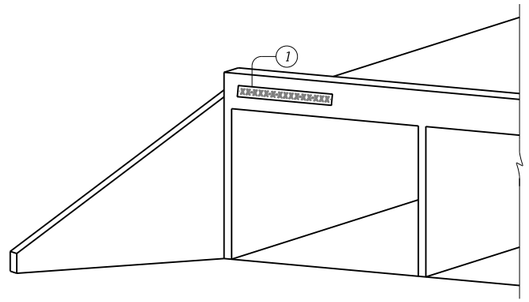


PLAN

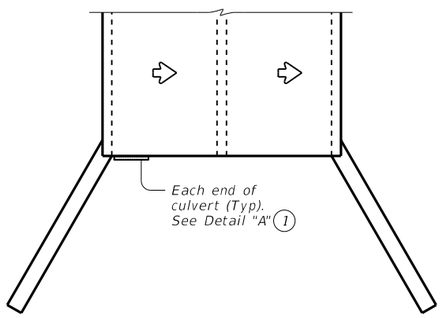
BRIDGE SIGN LOCATIONS



BRIDGE IDENTIFICATION SIGN

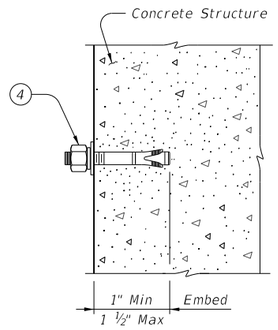


DETAIL "A"



PLAN

BRIDGE CLASS CULVERT SIGN PLACEMENT



ANCHOR DETAIL

SHEETING REQUIREMENTS		
Usage	Color	Sign Face Material
Background	White	Type B or C Sheeting
Letters and Symbols	Black	Type B or C Sheeting

(1) Bridge identification sign location

(2) Alternate sign placement location for exterior concrete beams.

(3) If adjacent bridges are less than 2 feet apart, these signs may be omitted.

(4) ¼" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

SIGN NOTES:

Standard sign designs can be found in the Standard Highway Sign Designs for Texas (SHSD).

Use the Clearview Alphabet CV-2W for the letters and symbols.

MATERIAL NOTES:

Provide lateral spacing between letters and numerals conforming with the SHSD, and any approved changes thereto. Provide a balanced appearance when spacing is not shown.

Provide aluminum sign blanks with a minimum thickness of 0.080" that meet the requirements of DMS-7110.

Provide sign face materials that meet the requirements of DMS-8300 and the sheeting requirements shown in the table.

Provide ¼" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). Provide anchor products that have a designated ICC-ES Evaluation Report number. The approval status must be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environments, provide both stainless steel anchor bodies and expansion wedges.

GENERAL NOTES:

Prior to hole drilling, locate rebar to ensure clearing of existing reinforcement and/or strands.

Prior to installation, obtain approval of sign locations from the Engineer. Avoid placement of sign over travel lanes and pedestrian walkways. Submit proposed installation method to Engineer prior to beginning work. Install anchors as shown on plans and in accordance with the anchor manufacturer's published installation instructions.

Do not install anchors sections of members under tension.

For new construction, the signs and anchors are subsidiary to the bridge. For installations on existing structures, the signs and anchors are paid under Item 442, "Metal for Structures." Each sign weighs 28 lbs.

Texas Department of Transportation

Bridge Division Standard

NBIS BRIDGE IDENTIFICATION SIGN STANDARD

NBIS

FILE: MS-NBIS-23 (1).dgn	DN: TAR	CK: TxDOT	DW: JER	CK: TAR
©TxDOT March 2023 REVISIONS	CONT	SECT	JOB	HIGHWAY
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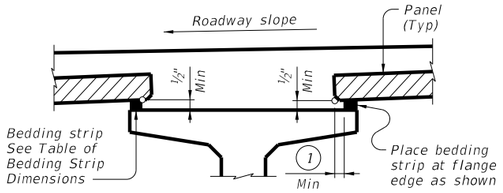
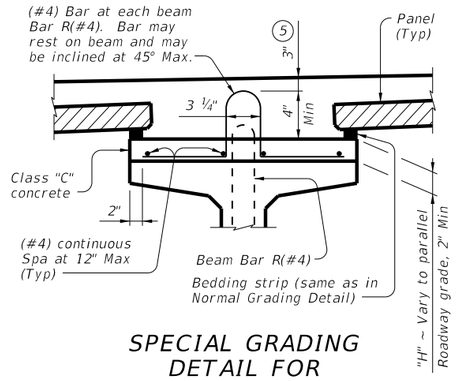
	SJT	CROCKETT		116



NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

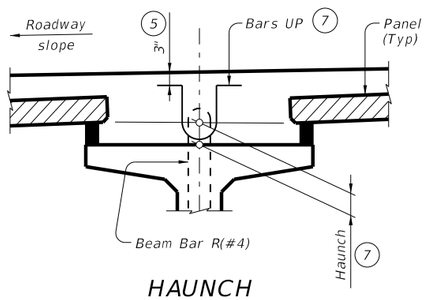
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

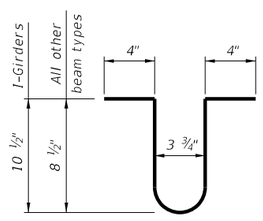
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

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

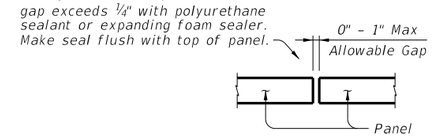


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

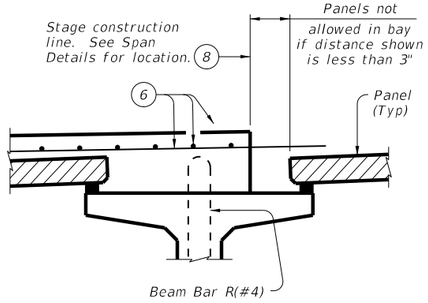


BARS UP (#4) (7)

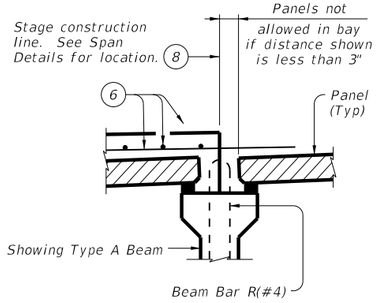


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



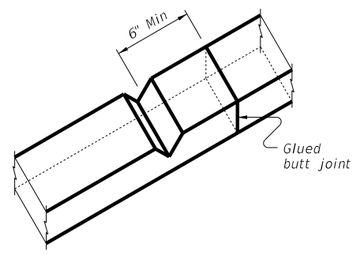
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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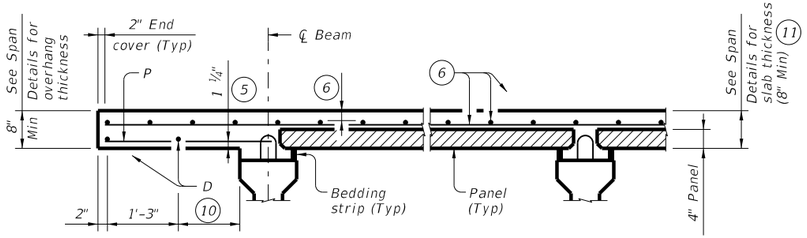
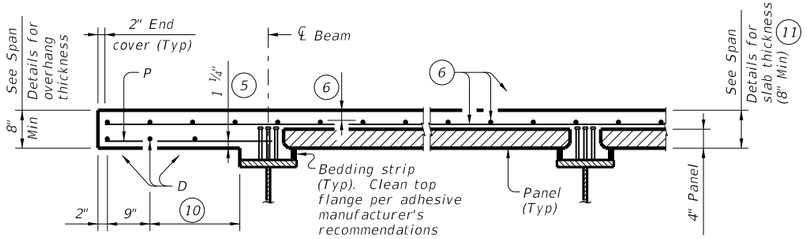
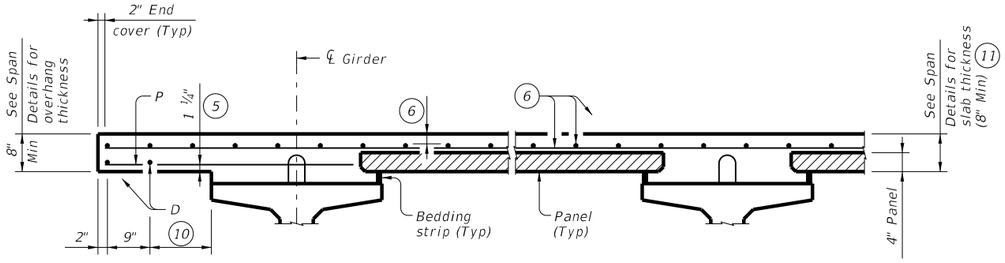


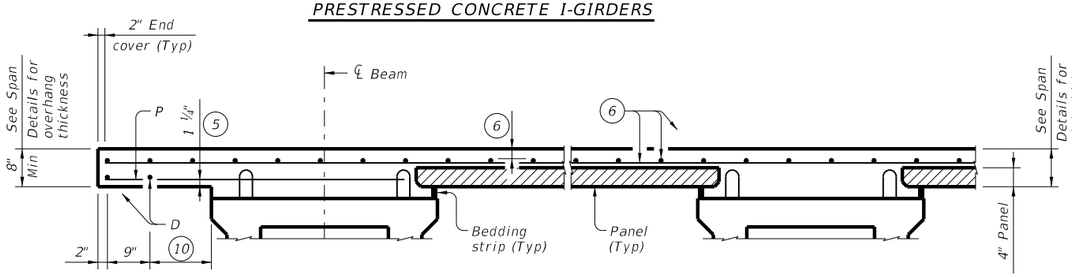
PRESTRESSED CONCRETE I-BEAMS



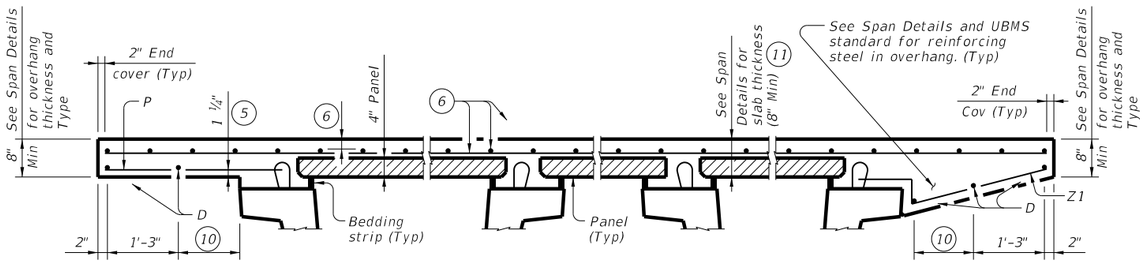
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



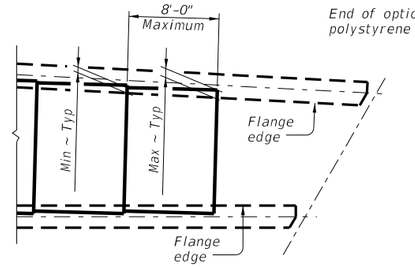
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

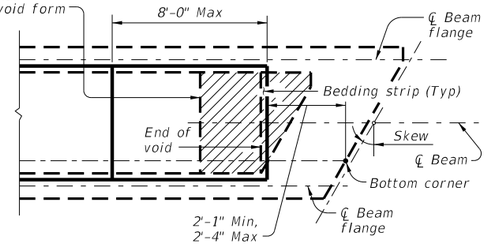
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

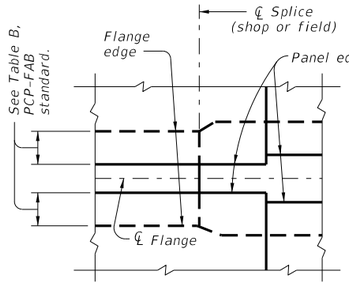
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

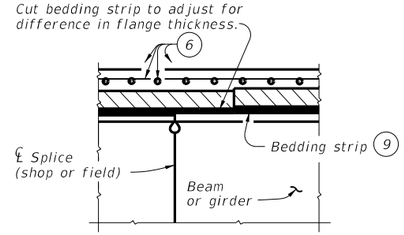
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



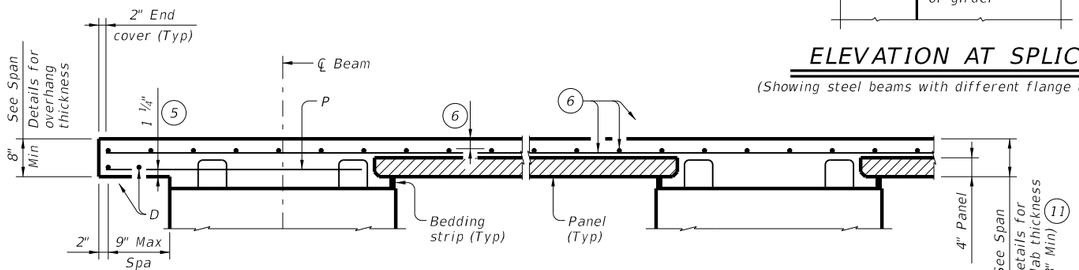
PLAN AT SPLICE

(Showing steel beams with flange width transition)



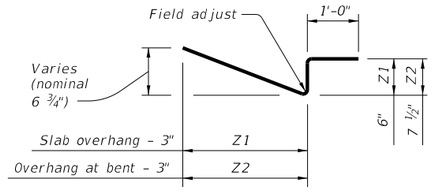
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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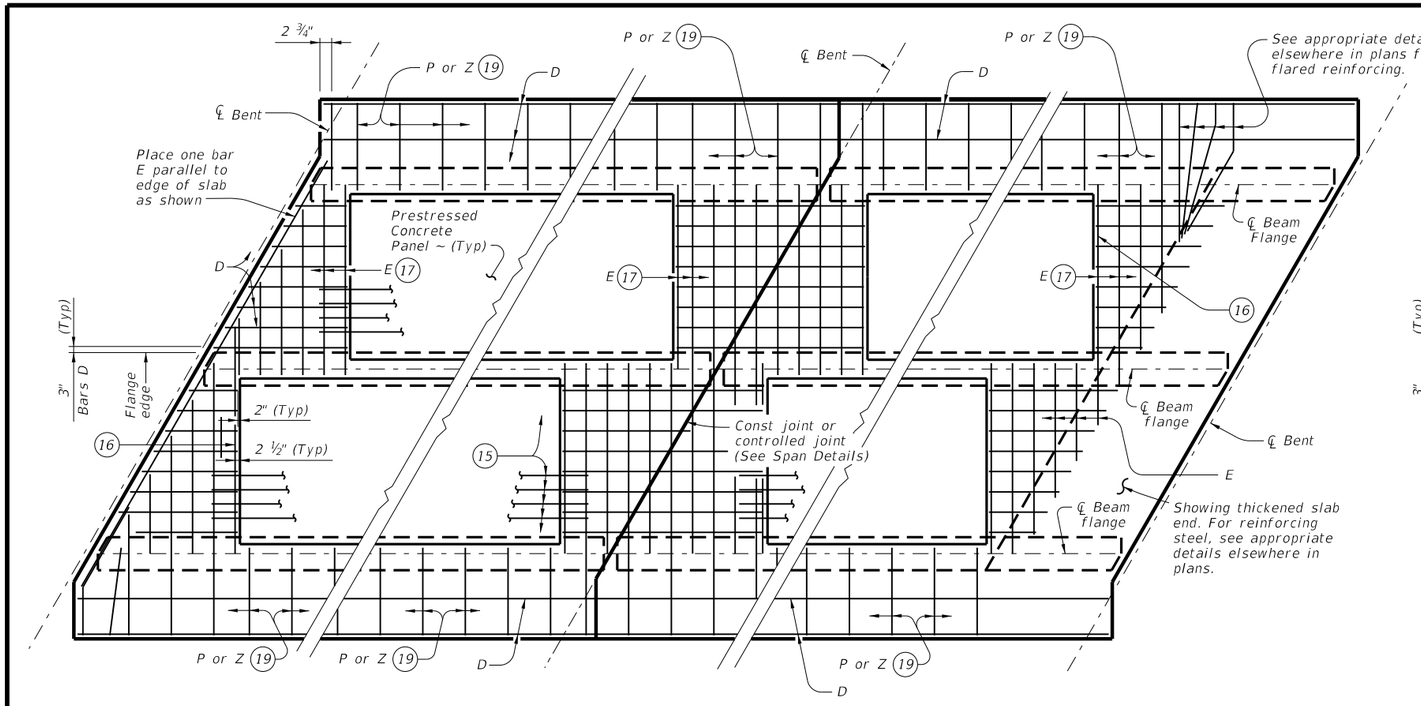
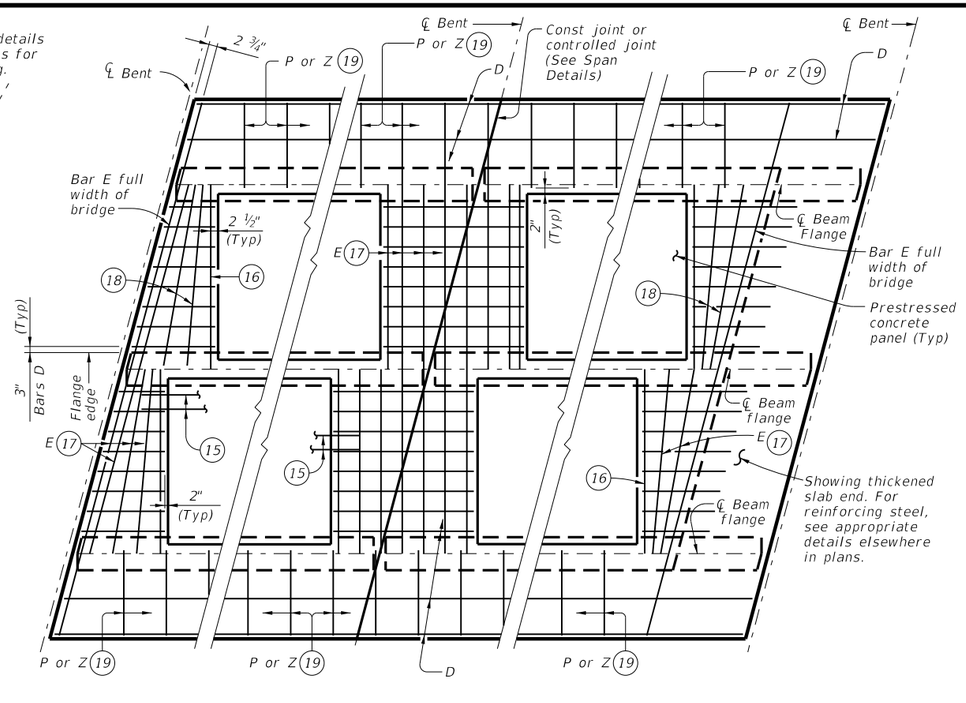


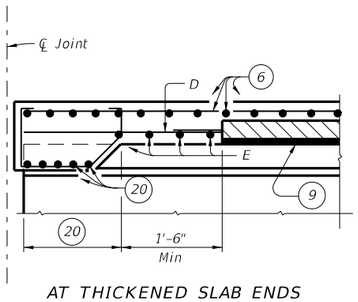
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

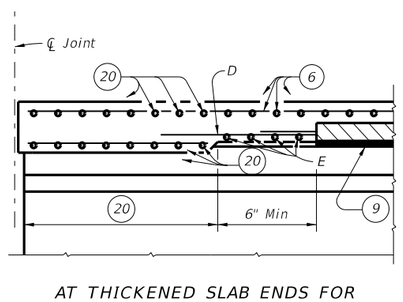


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

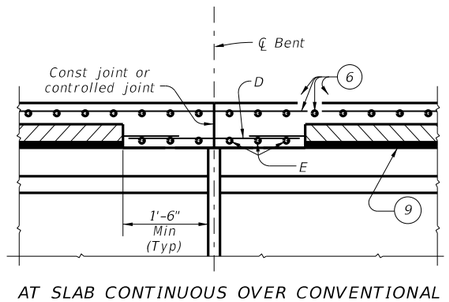
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



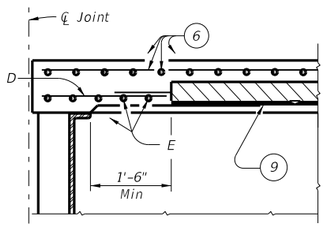
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



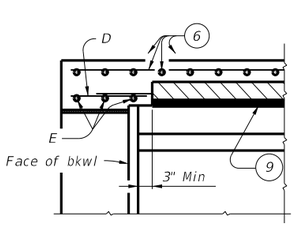
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



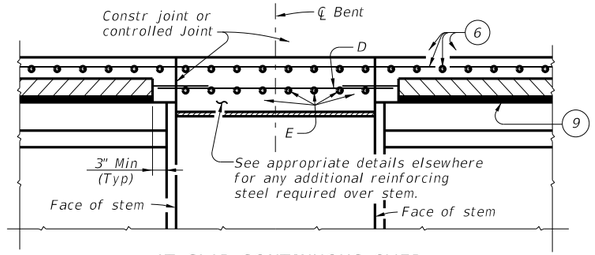
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		119

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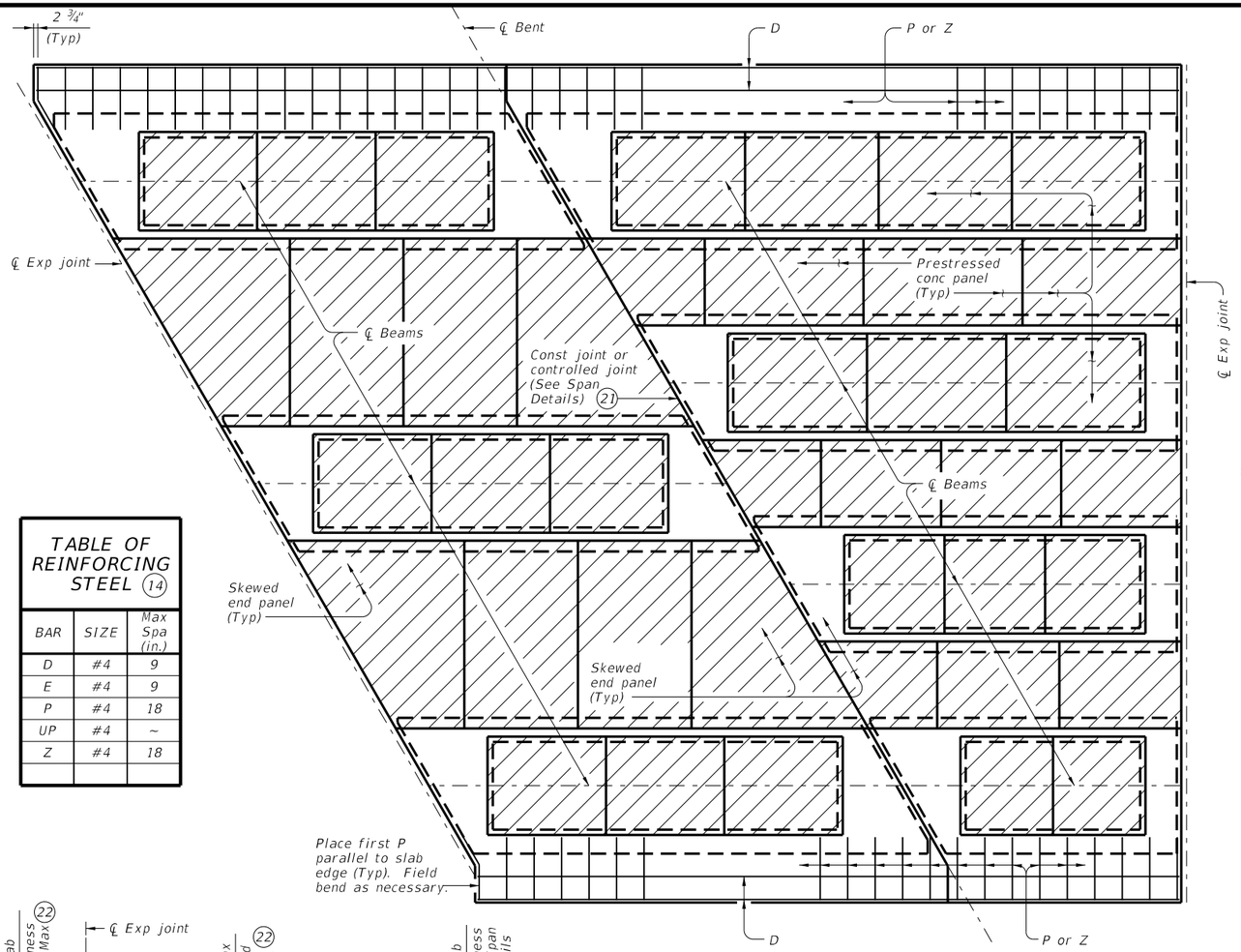
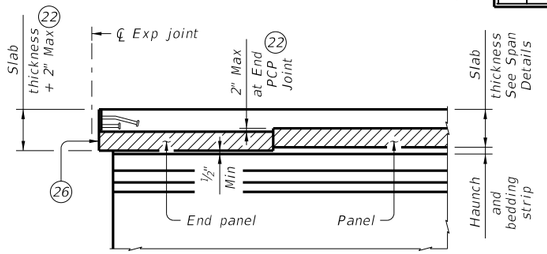


OPTION 2 ~ PLAN OF SLAB

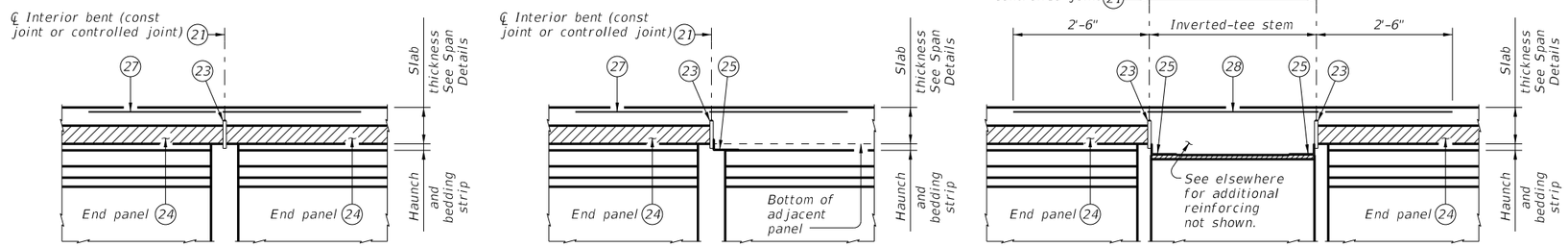
(Showing U-Beams; other beams similar)

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.

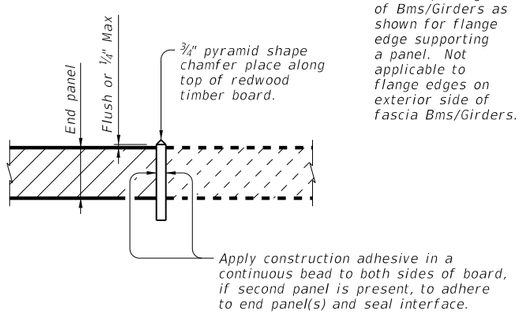
CONVENTIONAL INTERIOR BENT

Panel against beam/girder end in adjacent span.

INVERTED-T BENT

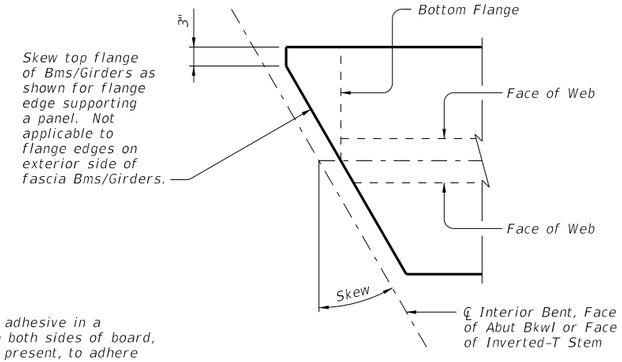
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab Bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

FILE: MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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3/2023: Removed top flange tension limit.	DIST	COUNTY		SHEET NO.
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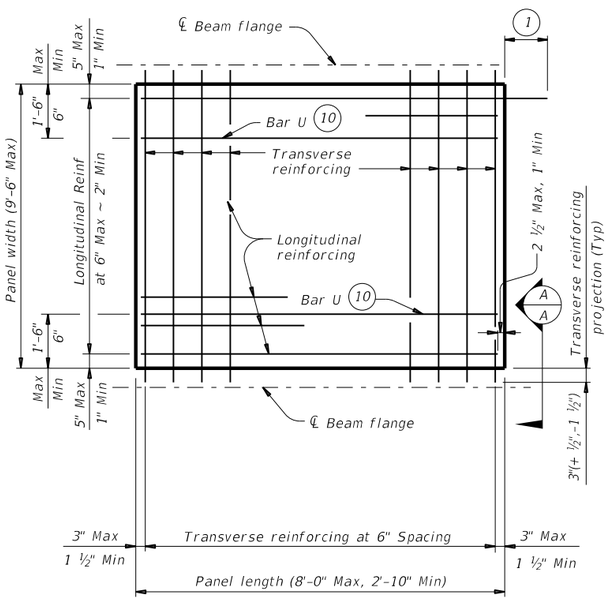
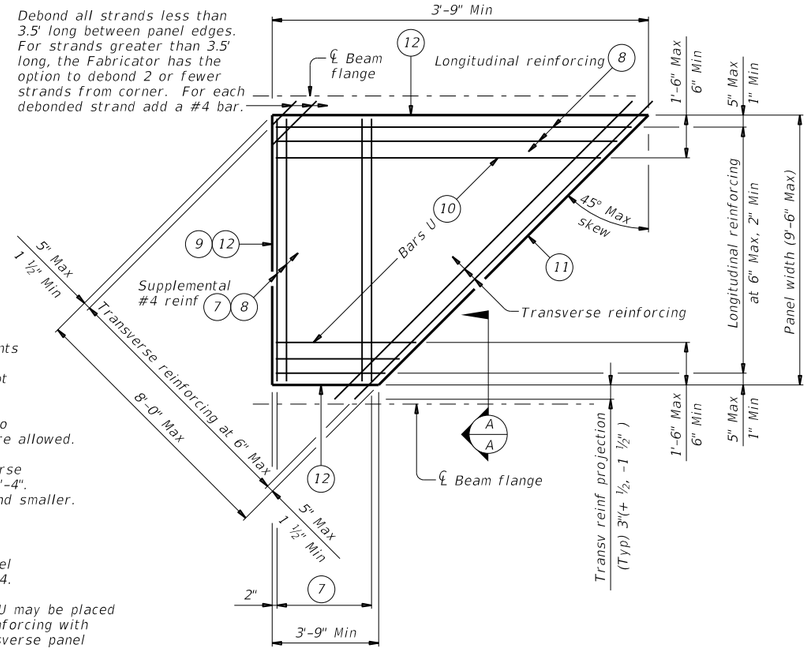


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

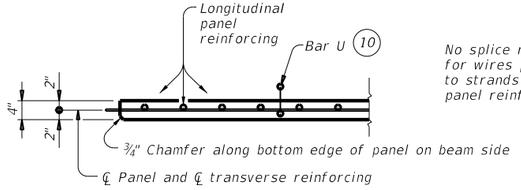
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

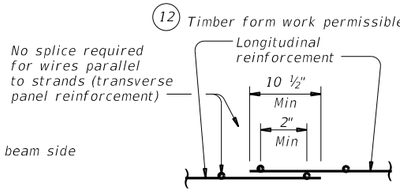
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

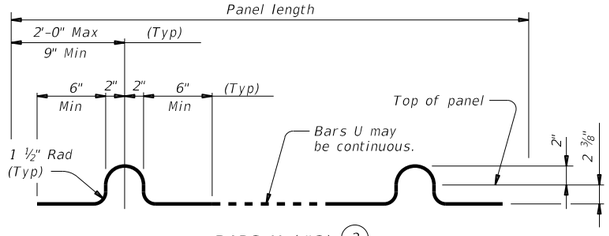


SECTION A-A

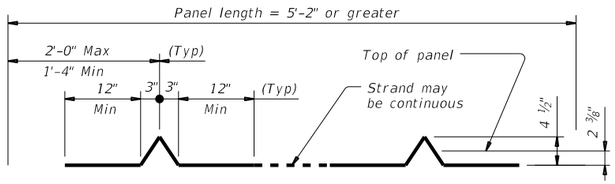
(Not showing supplemental #4 bars for skewed end panels.)



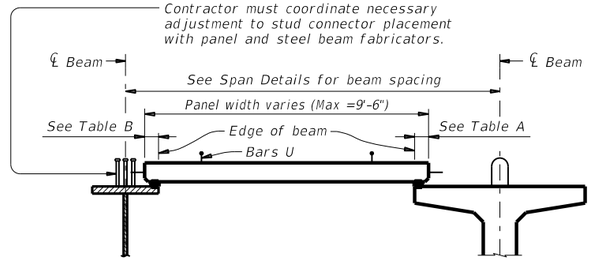
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



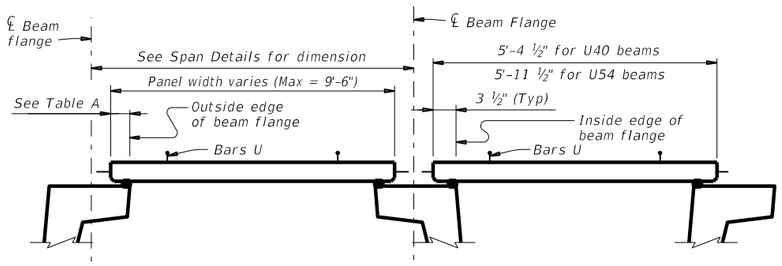
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

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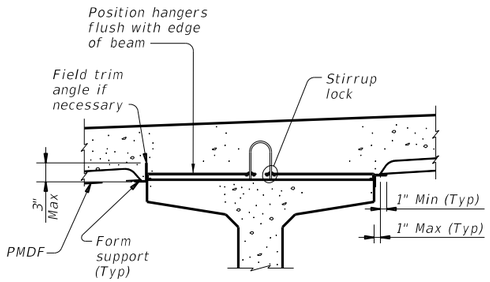
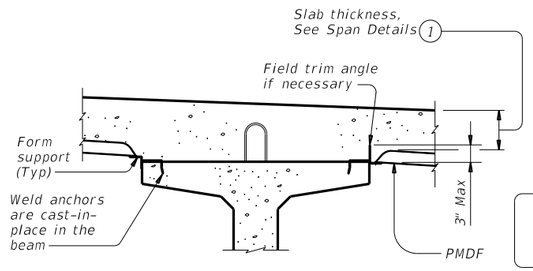
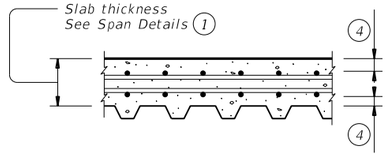


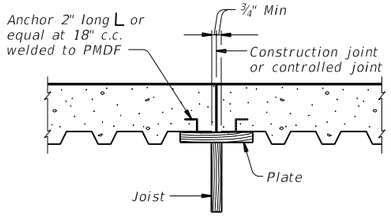
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

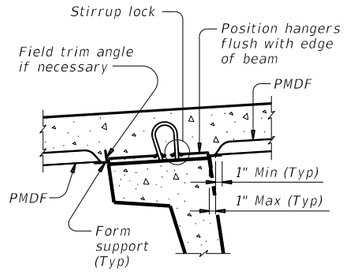


TYP LONGITUDINAL SLAB SECTION

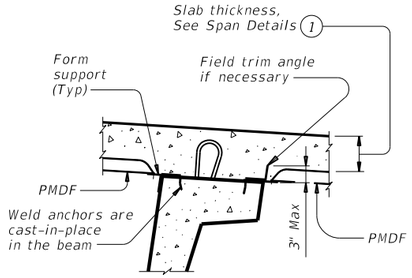


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

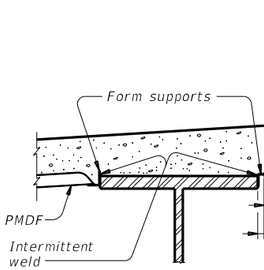
SECTION THRU CONSTRUCTION JOINT



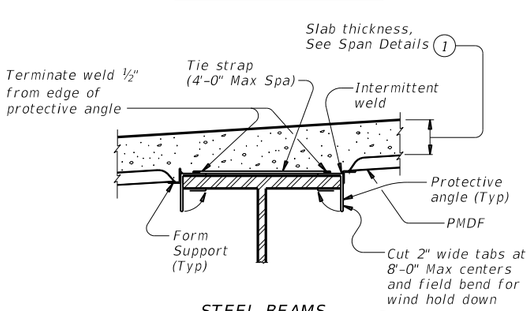
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

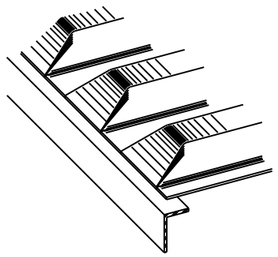


STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



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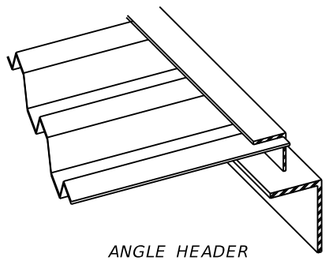
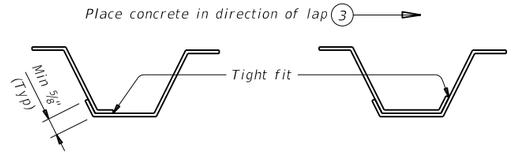


ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES



SIDE LAP DETAILS

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

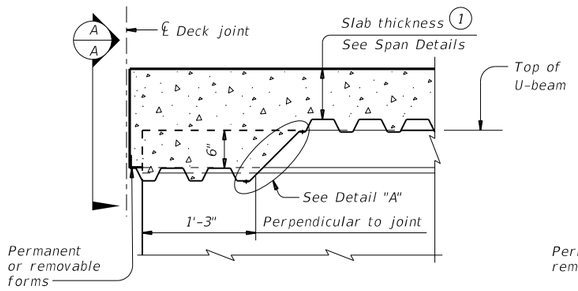
Texas Department of Transportation

Bridge Division Standard

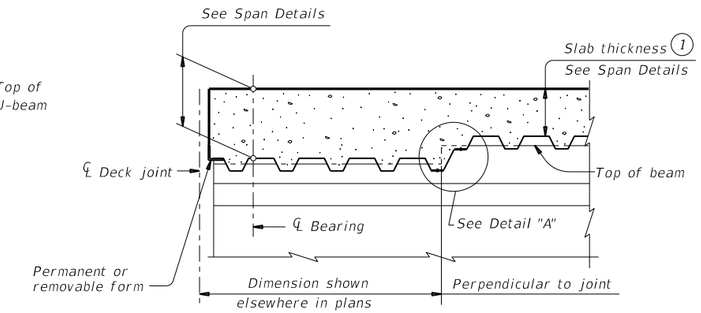
PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	SJT	CROCKETT		122

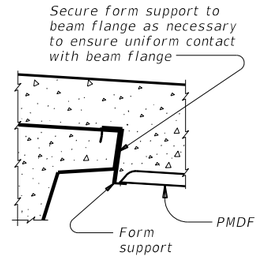


AT THICKENED SLAB END FOR U-BEAMS

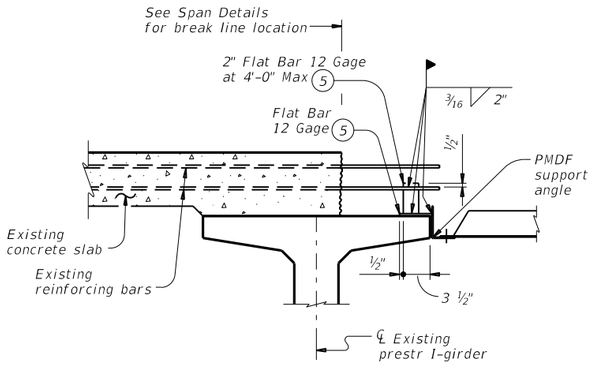


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

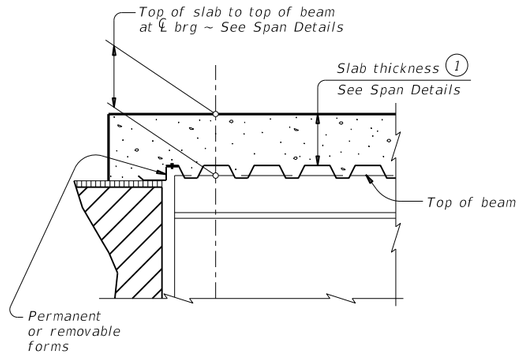
Showing I-beam block-out. No block-out for I-girders or steel beams.



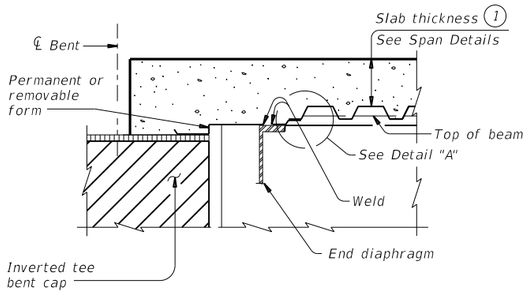
SECTION A-A



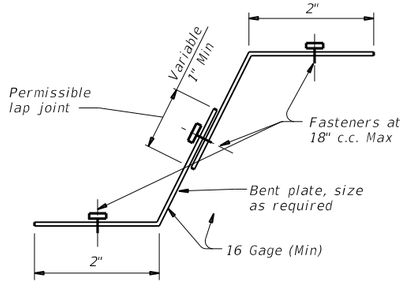
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



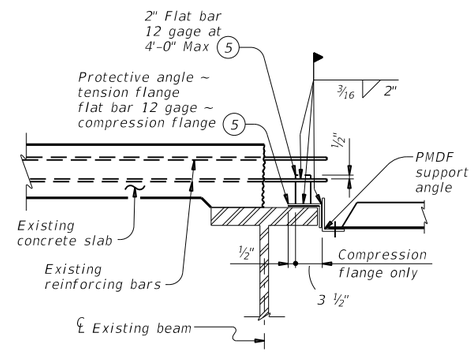
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

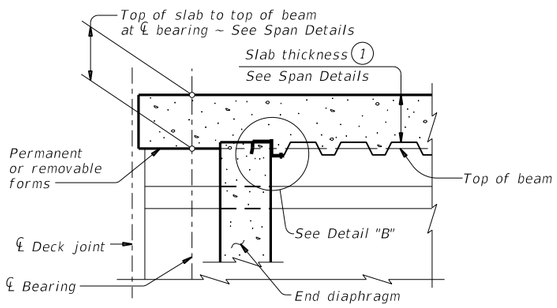


DETAIL "A"

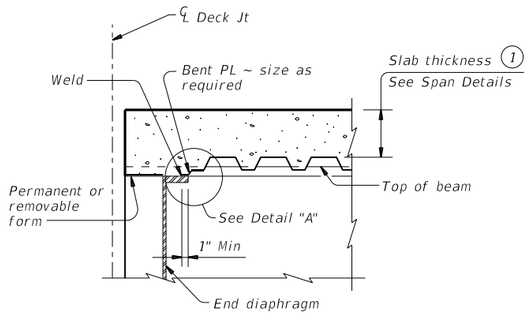


SHOWING STEEL BEAMS

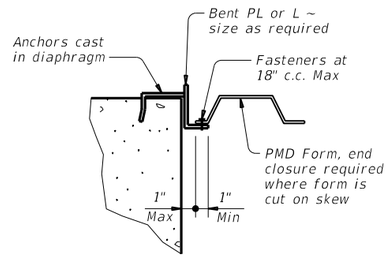
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfstel-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	SJT	CROCKETT		123

DATE: 5/31/2024 5:09:28 PM
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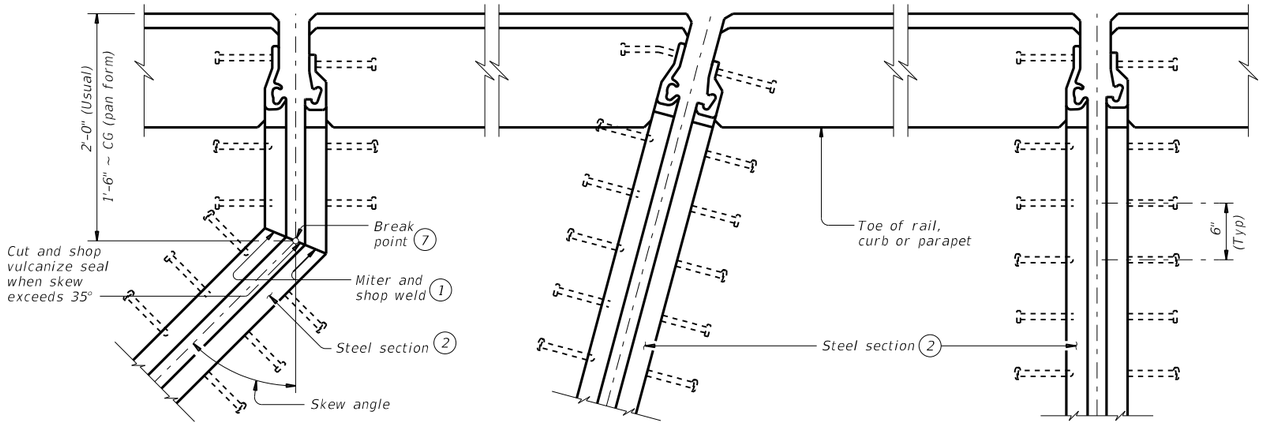
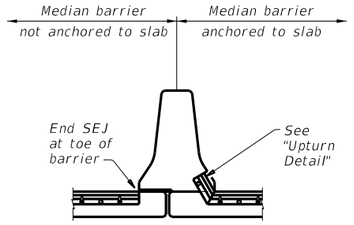
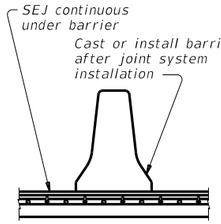


SHOWING SKEWS WITH SLAB BREAKBACKS | SHOWING SKEWS WITHOUT SLAB BREAKBACKS | SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

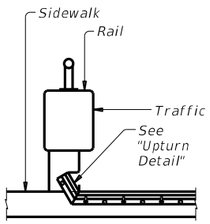
PLANS OF END CONDITIONS



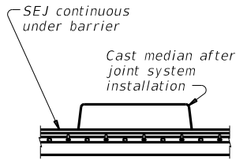
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



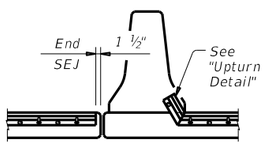
AT MEDIAN BARRIER



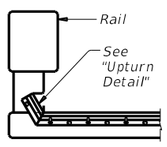
AT SIDEWALK BEHIND BRIDGE RAIL



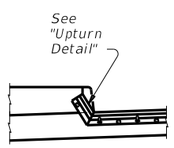
AT RAISED MEDIAN



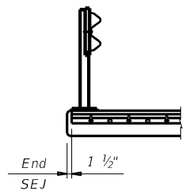
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

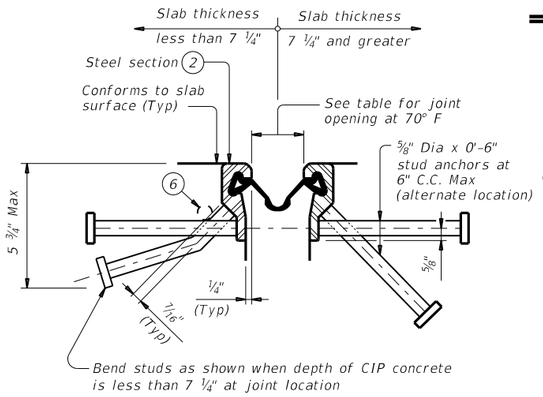


AT SIDEWALK

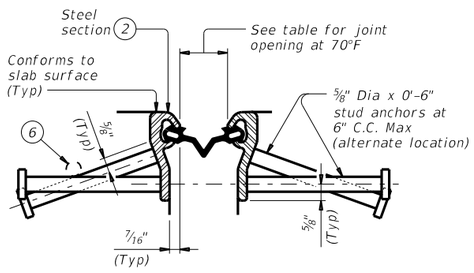


AT STEEL POST BRIDGE RAIL

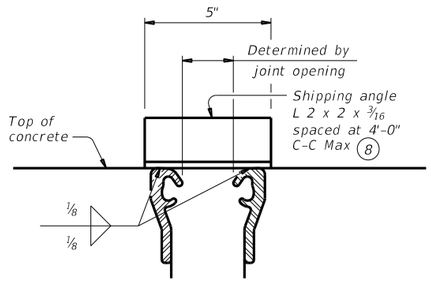
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

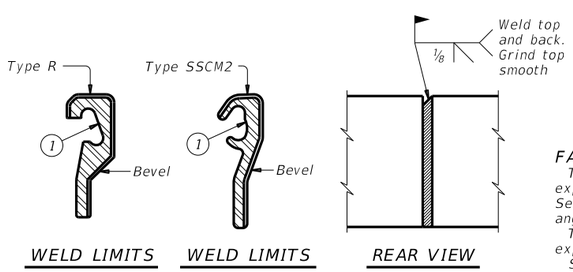
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



WELD LIMITS | WELD LIMITS | REAR VIEW

FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Field Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

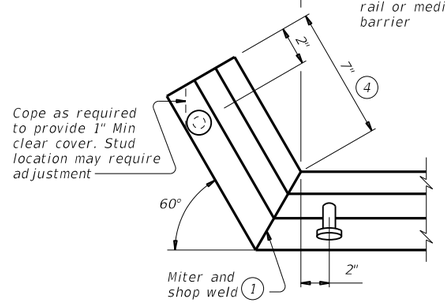
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-M is 6 ½".



UPTURN DETAIL

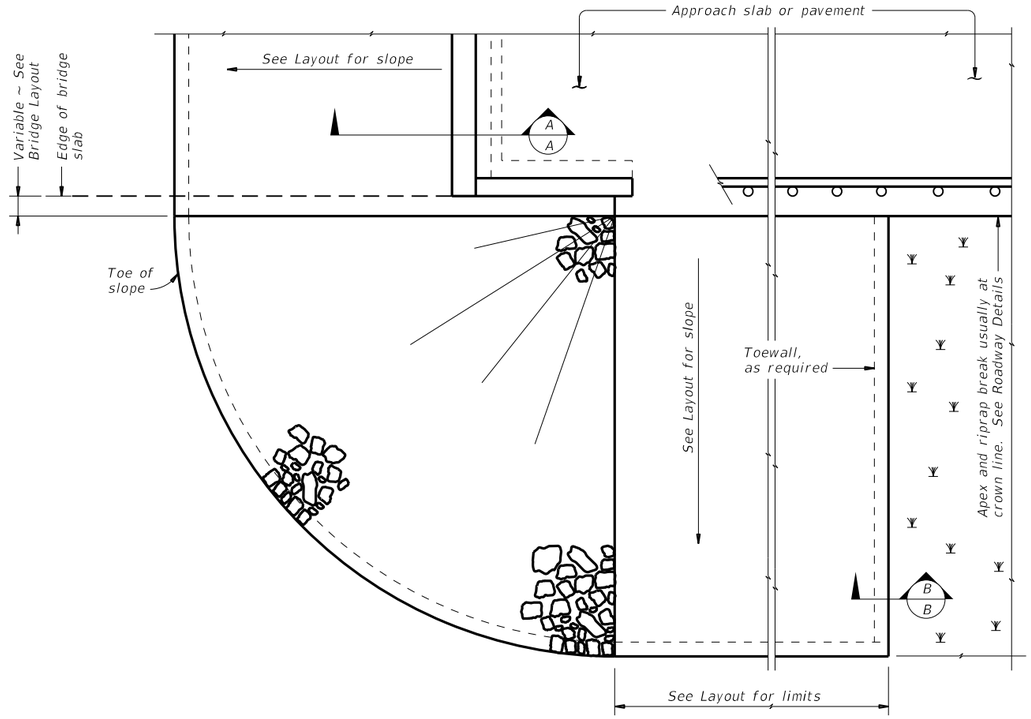
Texas Department of Transportation

Bridge Division Standard

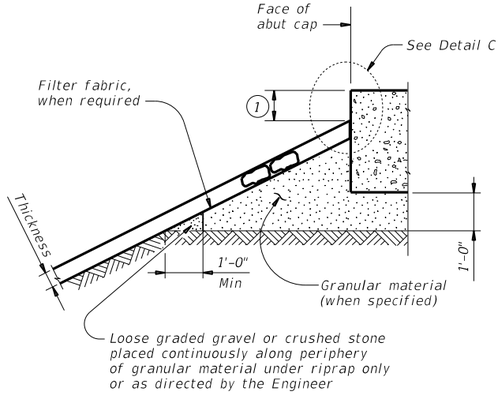
SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

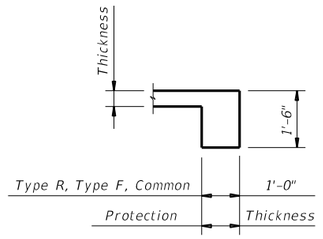
FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		124



PLAN

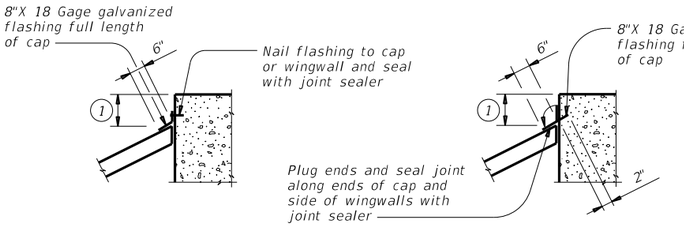


SECTION A-A AT CAP



SECTION B-B

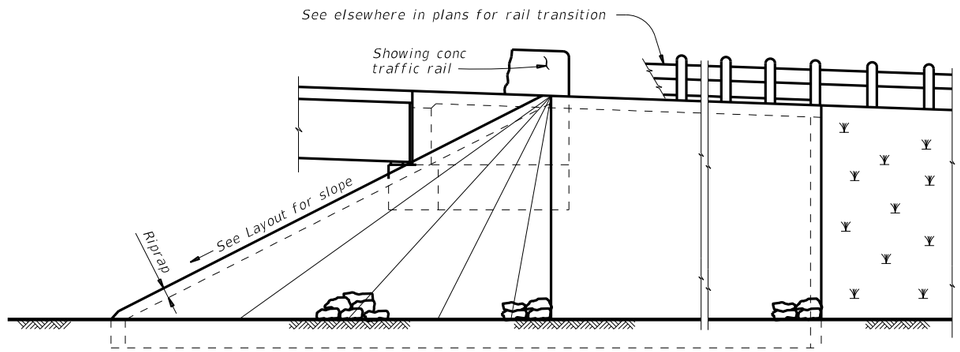
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		125

DATE: 5/31/2024 5:10:24 PM
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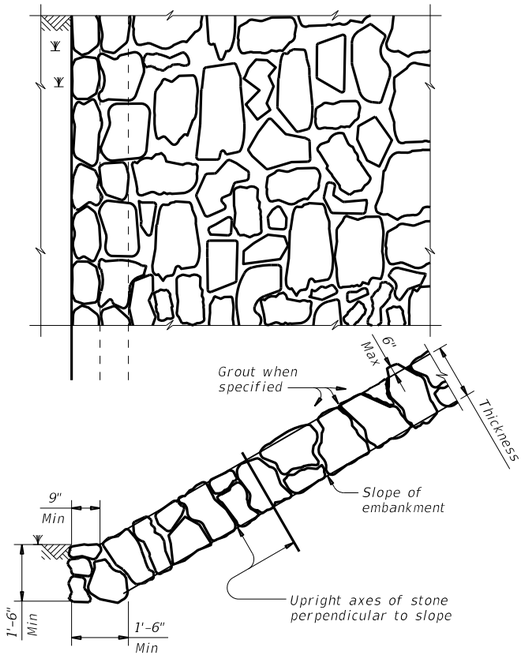


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

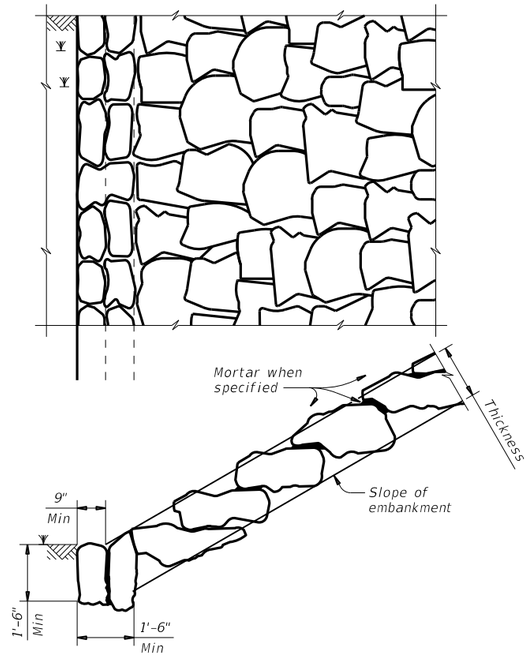


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

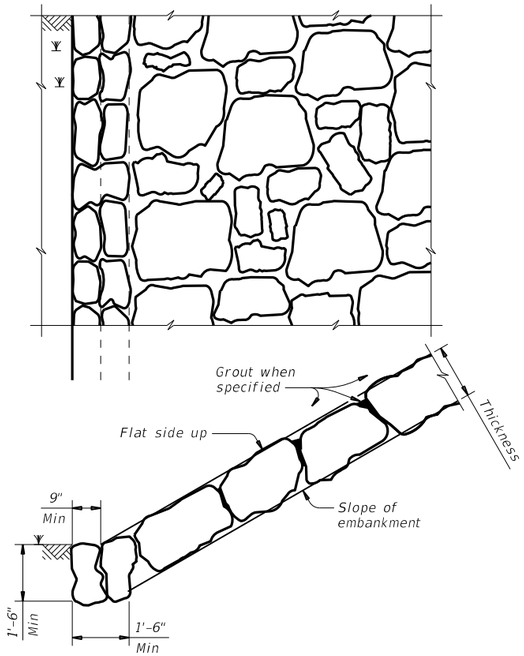


FIGURE 3 ~ TYPE F STONE RIPRAP

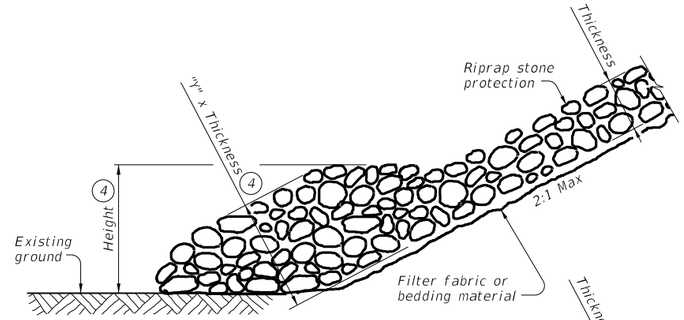
grouted

2 *Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.*

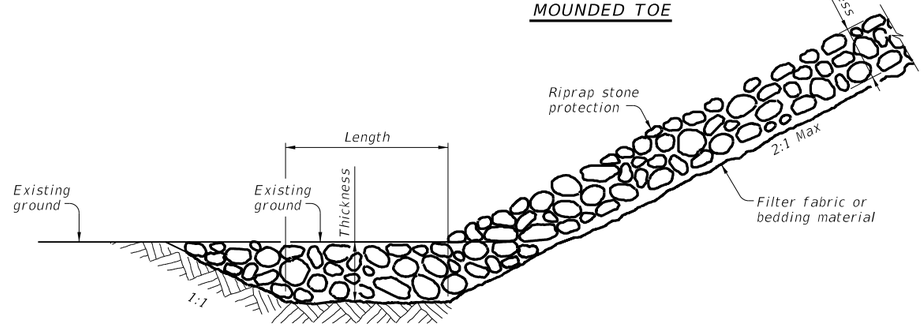
3 *Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.*

4 *"Y" and Height need to be defined. See layout or detail sheet for values if this option is used.*

5 *List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.*
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS 5

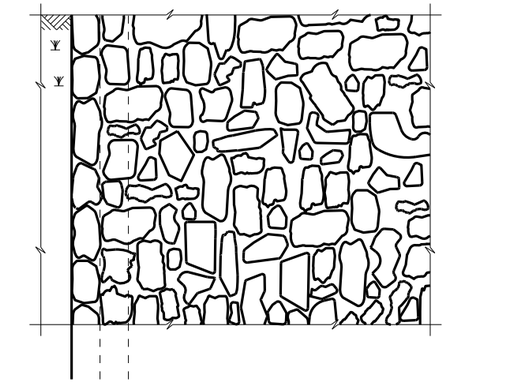


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

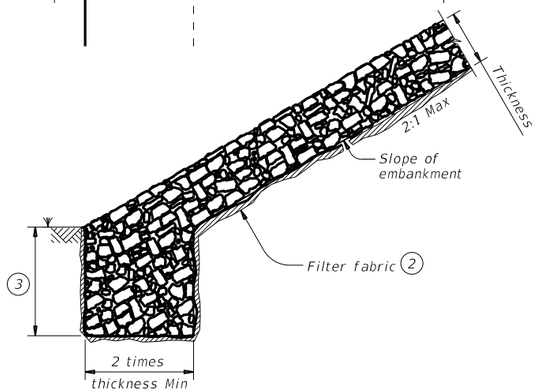


FIGURE 5 ~ PROTECTION STONE RIPRAP 5

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		126

DATE: 5/31/2024 5:10:24 PM
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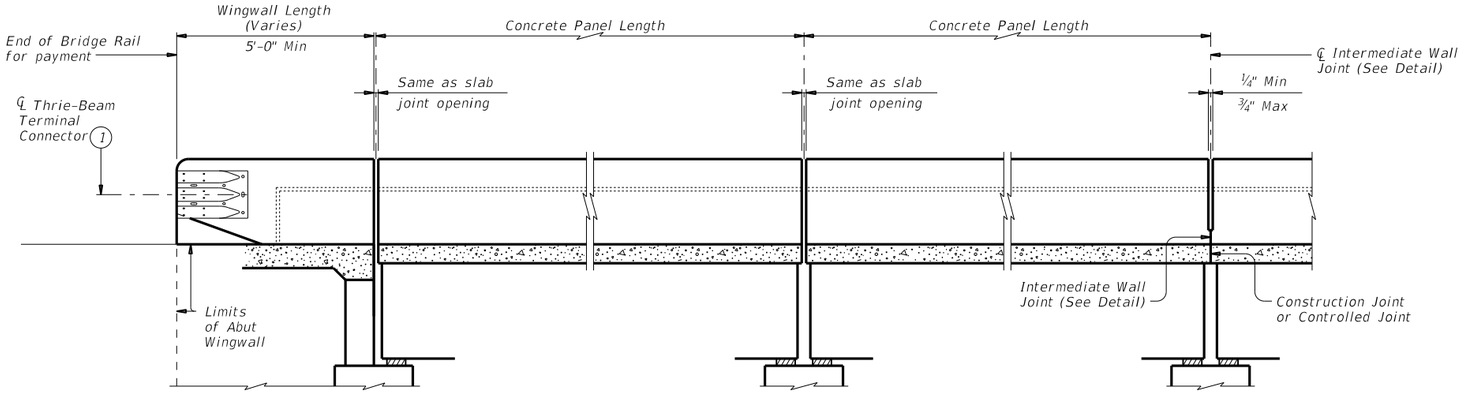
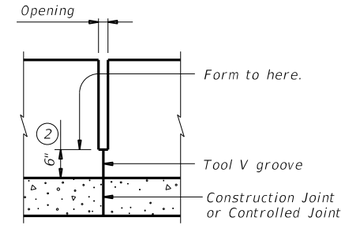


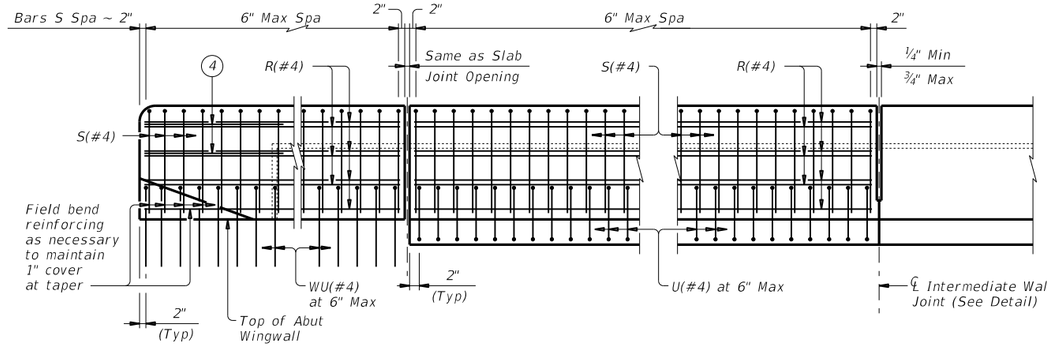
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

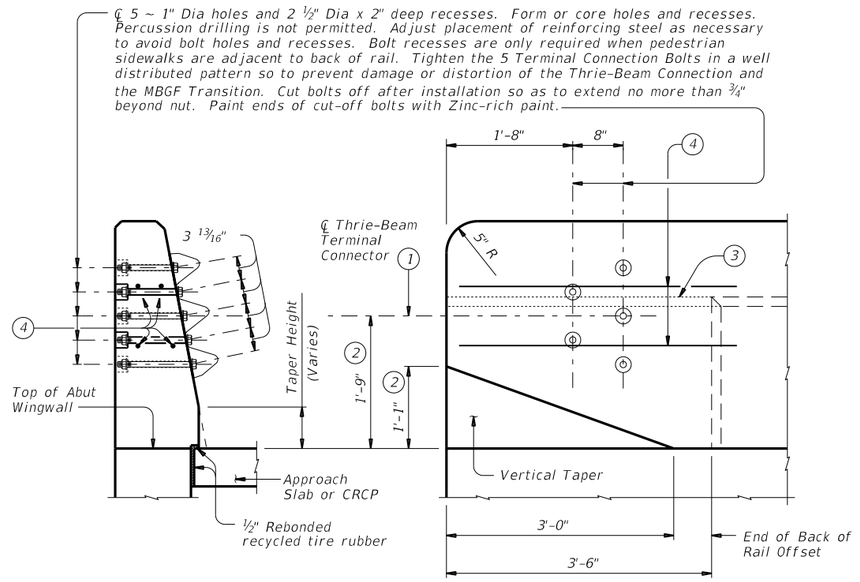


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.

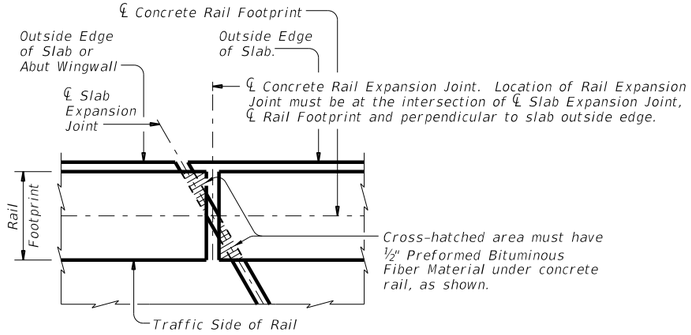


ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

1. Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence." Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
2. Increase 2" for structures with Overlay.
3. Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
4. Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: RL-SSTR-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
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	SJT	CROCKETT		127

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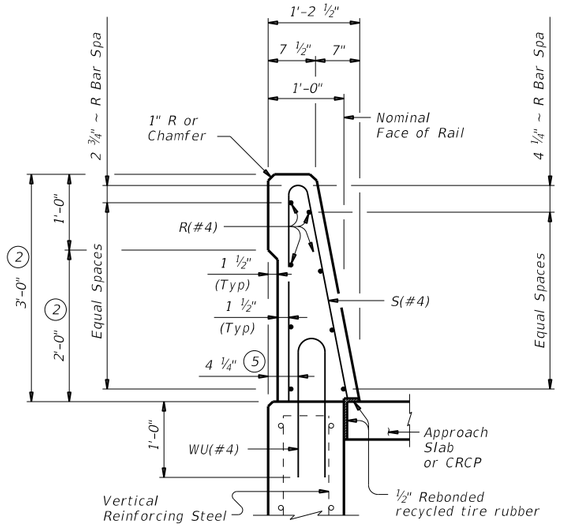
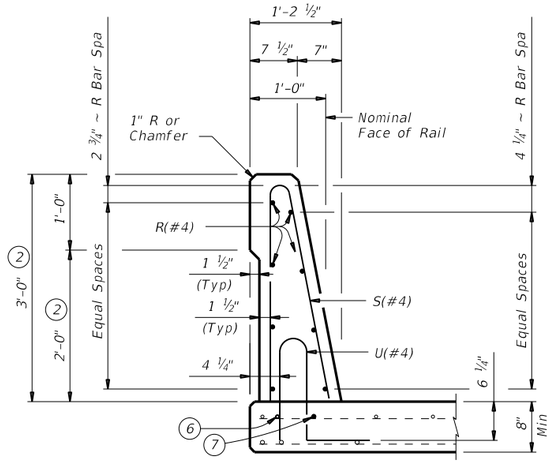


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.

(7) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(8) No longitudinal wires may be within upper bend.

(9) Bend or cut as required to clear drain slots.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

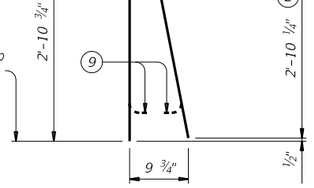
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

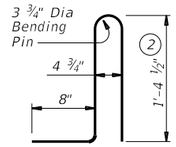
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

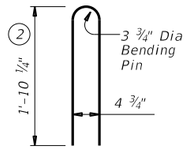
Reinforcing bar dimensions shown are out-to-out of bar.



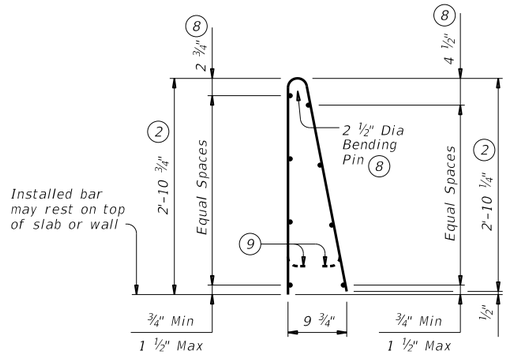
BARS S (#4)



BARS U (#4)

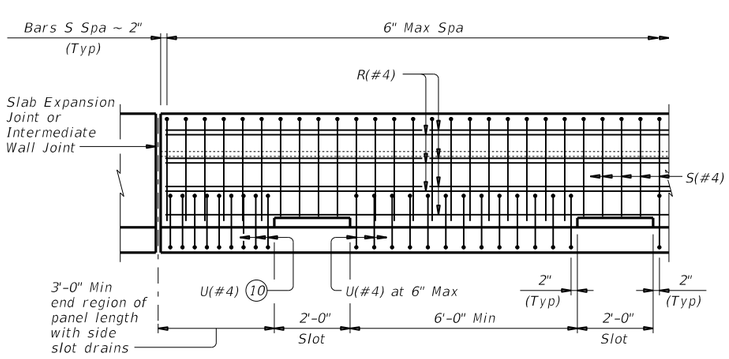


BARS WU (#4)



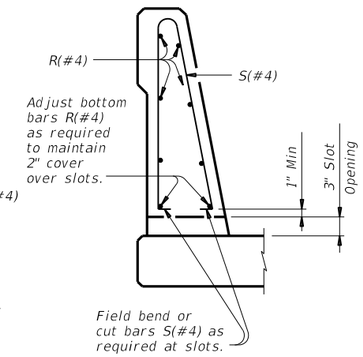
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

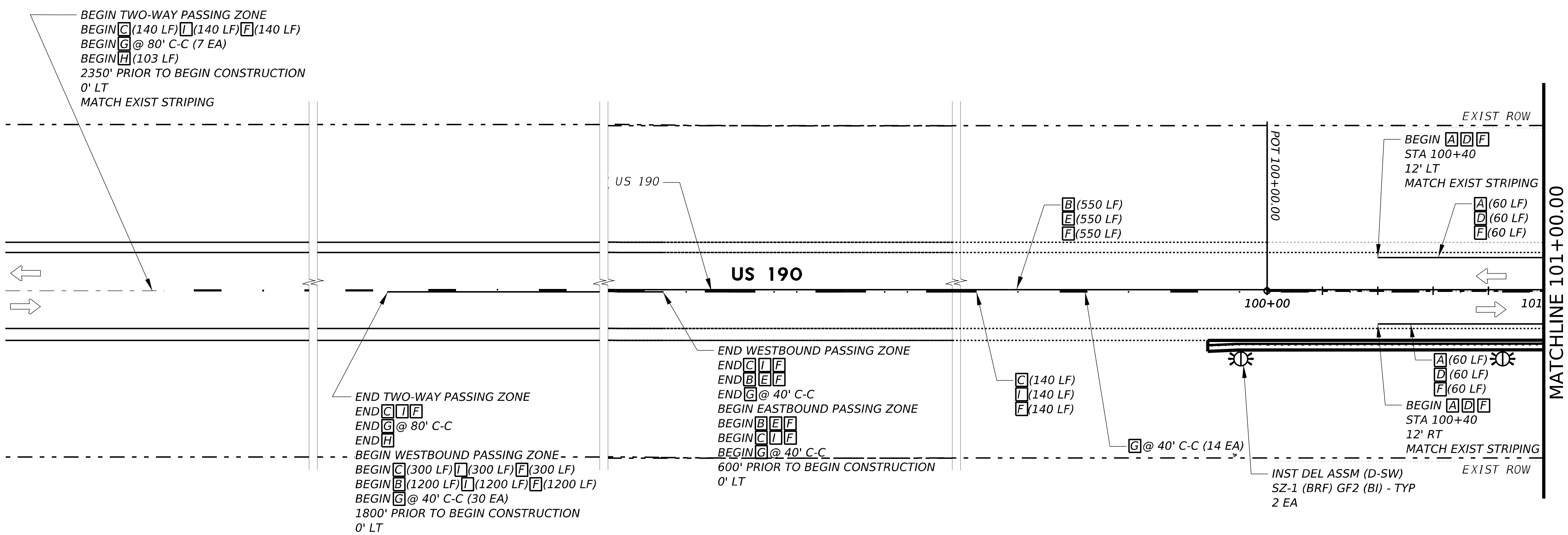
SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

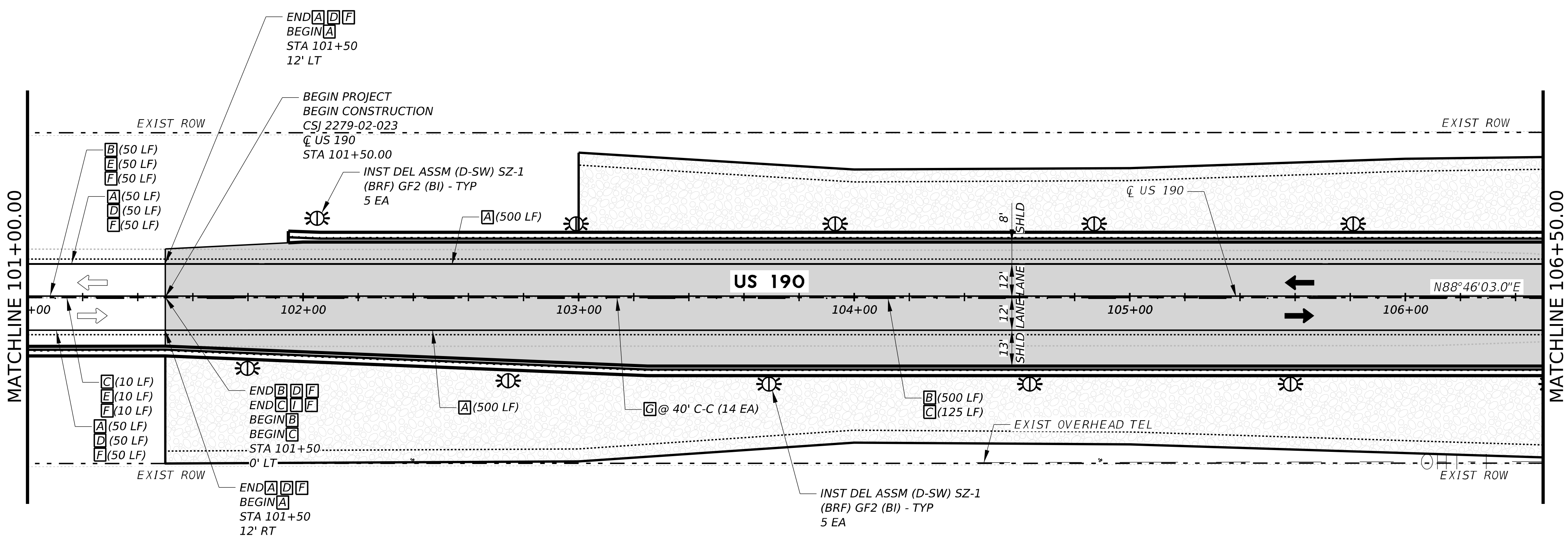
FILE: RL-SSTR-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		128



LEGEND

- EXISTING ROW
- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- PROP SIGN
- INST DEL ASSM (D-SW) SZ-1 (BRF) GF2 (BI)
- INST DEL ASSM (D-SW) SZ-1 (BRF) CTB (BI)
- # INSTALL PROP SIGN
- A REF PROF PAV MRK TY I (W) 6" (SLD) (100 MIL)
- B REF PROF PAV MRK TY I (Y) 6" (SLD) (100 MIL)
- C REF PROF PAV MRK TY I (Y) 6" (BRK) (100 MIL)
- D REFL PAV MRK TY II (W) 6" (SLD)
- E REFL PAV MRK TY II (Y) 6" (SLD)
- F PAV SURF PREP FOR MRK (6")
- G REFL PAV MRK TY II-A-A
- H PREFORMED CENTERLINE RUMBLE STRIP
- I REFL PAV MRK TY II (Y)6" (BRK)

0 25' 50'
SCALE: 1" = 50'H



NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

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Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SIGNS AND PAVEMENT MARKINGS BEGIN TO STA 106+50

SHEET 1 OF 3

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
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6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	129
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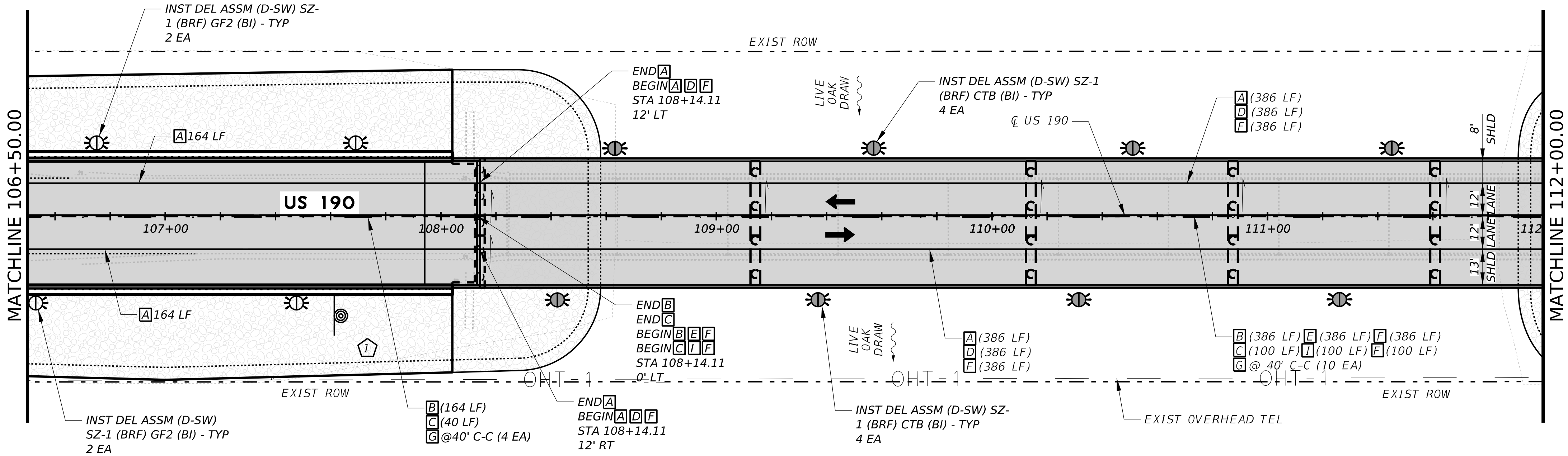

LEGEND

- EXISTING ROW
- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- PROP SIGN
- INST DEL ASSM (D-SW) SZ-1 (BRF) GF2 (BI)
- INST DEL ASSM (D-SW) SZ-1 (BRF) CTB (BI)
- INSTALL PROP SIGN
- A REF PROF PAV MRK TY I (W) 6" (SLD) (100 MIL)
- B REF PROF PAV MRK TY I (Y) 6" (SLD) (100 MIL)
- C REF PROF PAV MRK TY I (Y) 6" (BRK) (100 MIL)
- D REFL PAV MRK TY II (W) 6" (SLD)
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- H PREFORMED CENTERLINE RUMBLE STRIP
- I REFL PAV MRK TY II (Y)6" (BRK)

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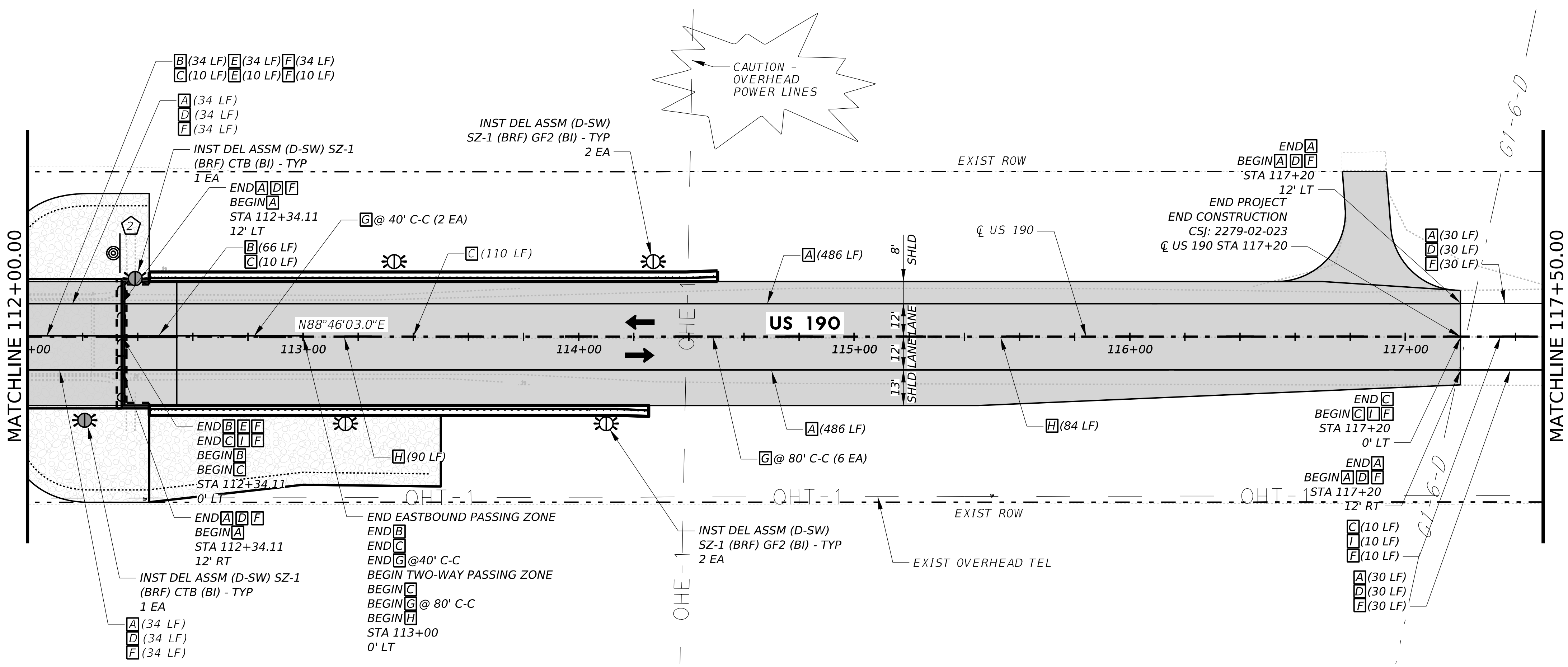

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LICENSED PROFESSIONAL ENGINEER
06/03/2024

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ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SIGNS AND PAVEMENT MARKINGS STA 112+00 TO 117+50

SHEET 2 OF 3

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6	BR 2B24 (487)		US 190
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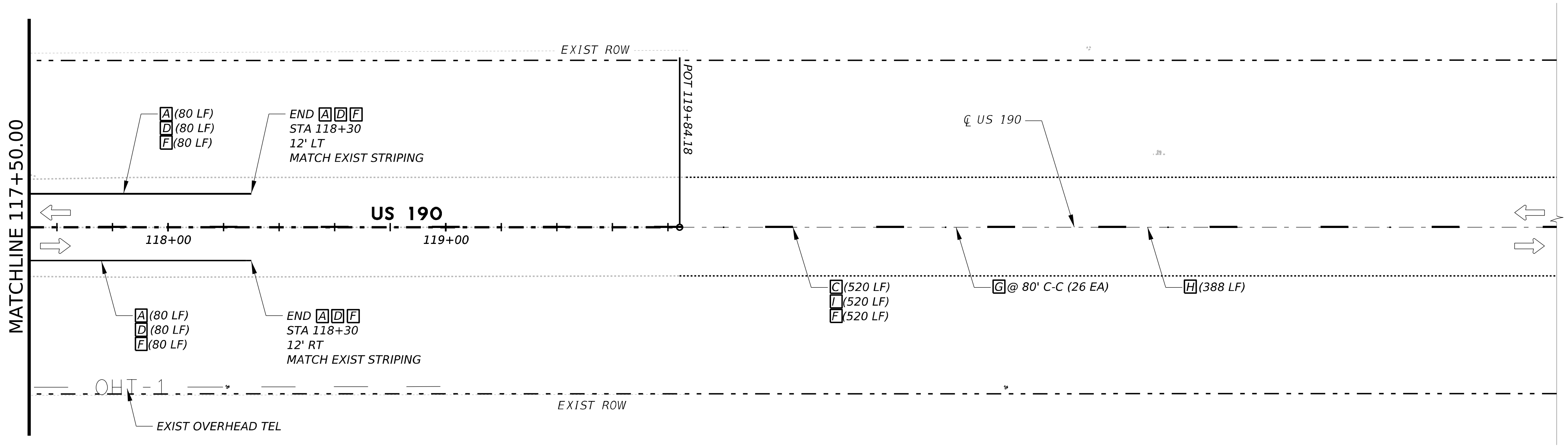

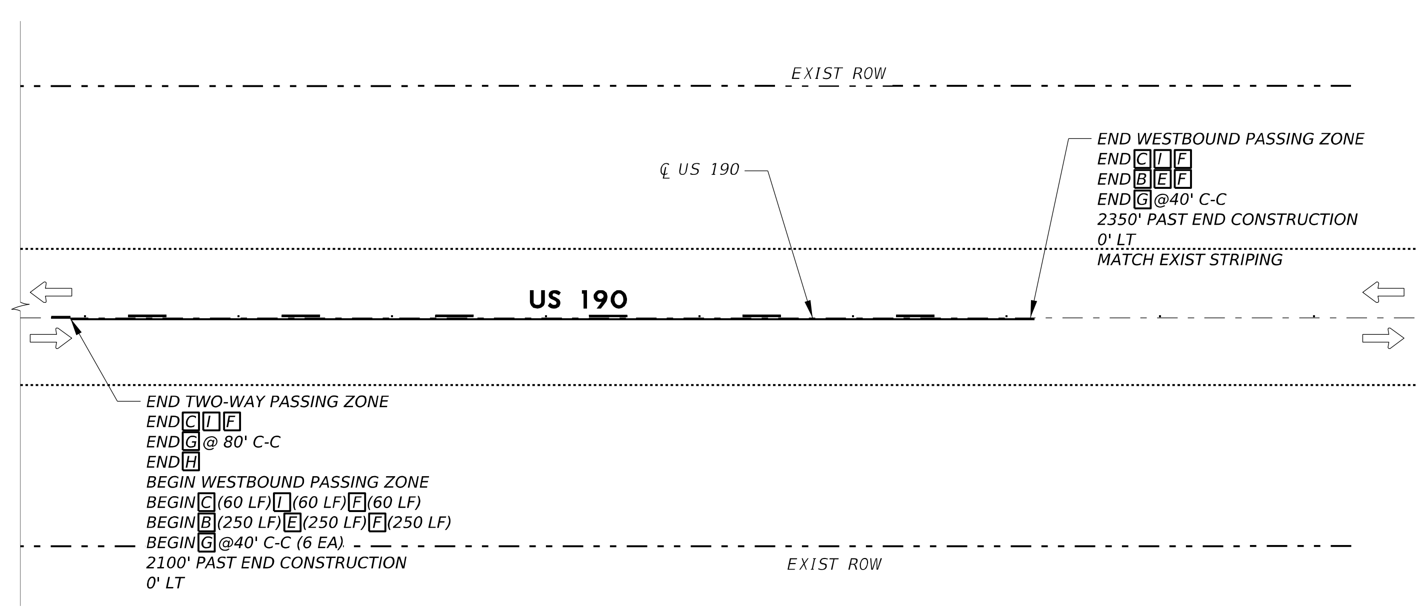

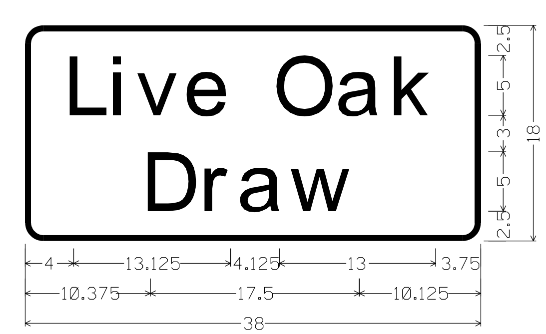

1.500" Radius, 0.500" Border, White on Green;
[Live Oak] ClearviewHwy-3-W;
[Draw] ClearviewHwy-3-W;

N

LEGEND

- EXISTING ROW
- EXIST LANE DIRECTION
- PROP LANE DIRECTION
- PROP SIGN
- INST DEL ASSM (D-SW) SZ-1 (BRF) GF2 (BI)
- INST DEL ASSM (D-SW) SZ-1 (BRF) CTB (BI)
- INSTALL PROP SIGN
- A — REF PROF PAV MRK TY I (W) 6" (SLD) (100 MIL)
- B — REF PROF PAV MRK TY I (Y) 6" (SLD) (100 MIL)
- C — REF PROF PAV MRK TY I (Y) 6" (BRK) (100 MIL)
- D — REFL PAV MRK TY II (W) 6" (SLD)
- E — REFL PAV MRK TY II (Y) 6" (SLD)
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- G — REFL PAV MRK TY II-A-A
- H — PREFORMED CENTERLINE RUMBLE STRIP
- I — REFL PAV MRK TY II (Y)6" (BRK)

0 25' 50'
SCALE: 1" = 50'H

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
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TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SIGNS AND PAVEMENT MARKINGS
STA 117+50 TO END

SHEET 3 OF 3

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PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	131
CONTROL	SECTION	JOB	
2279	02	023	

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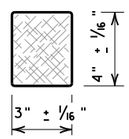
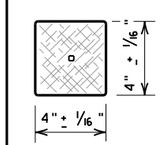
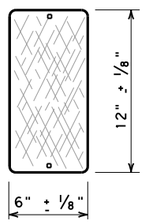
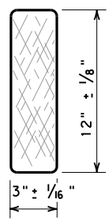
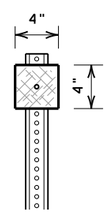
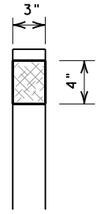
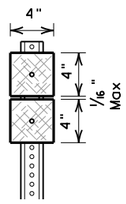
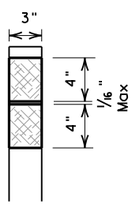
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

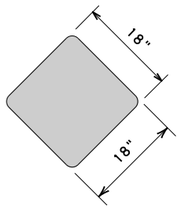
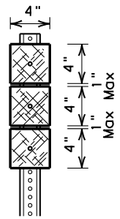
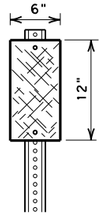
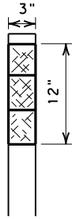
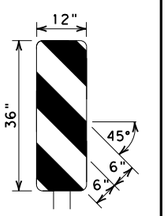
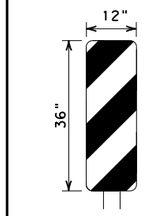
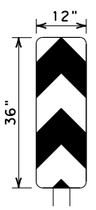
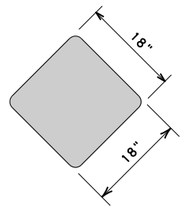
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

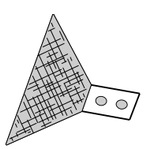
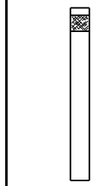
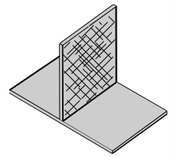
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

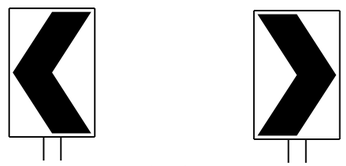
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



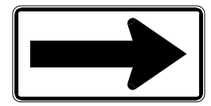
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SJT	CROCKETT		132

20A

DATE: 6/1/2024 12:29:52 PM
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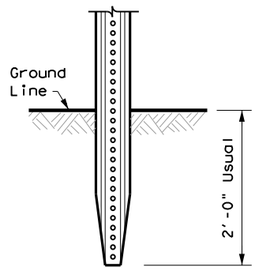
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

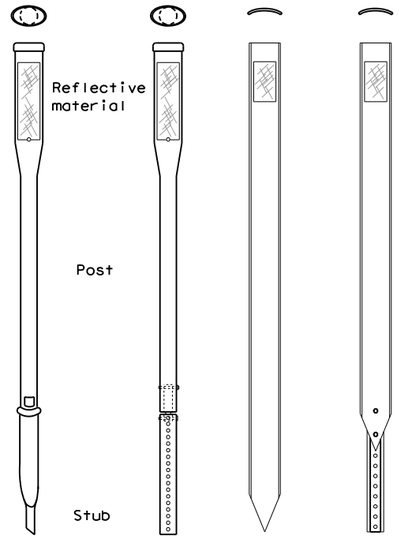


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

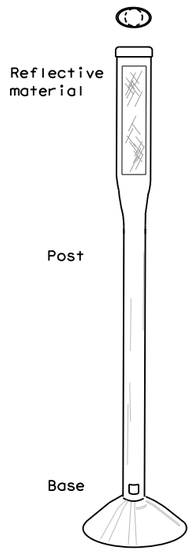
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



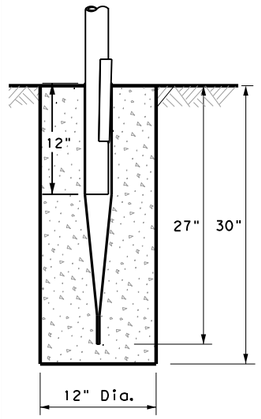
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

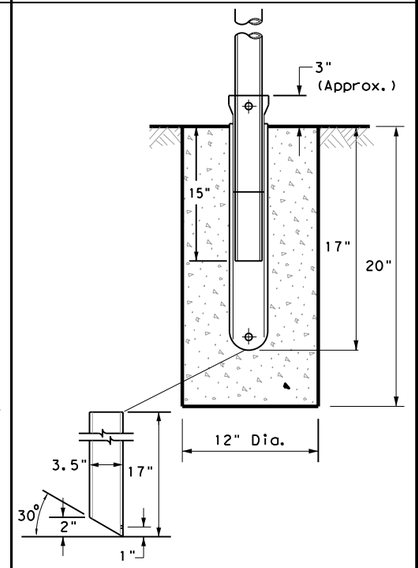
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

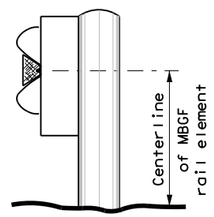
NOTE

1. Install per manufacturer's recommendations.

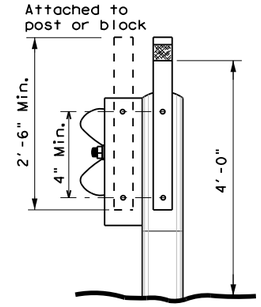
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

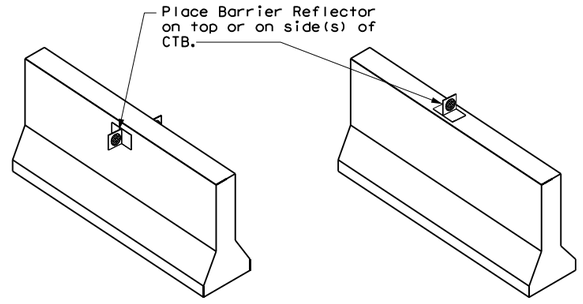
GF1



GF2



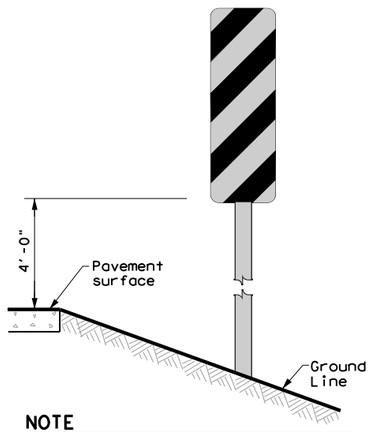
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

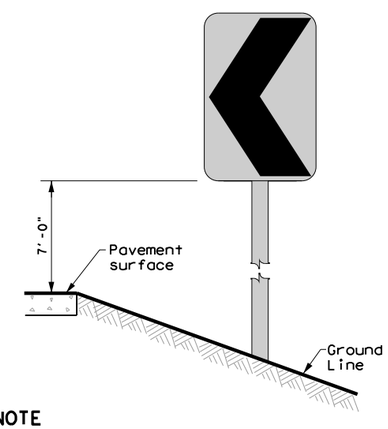
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

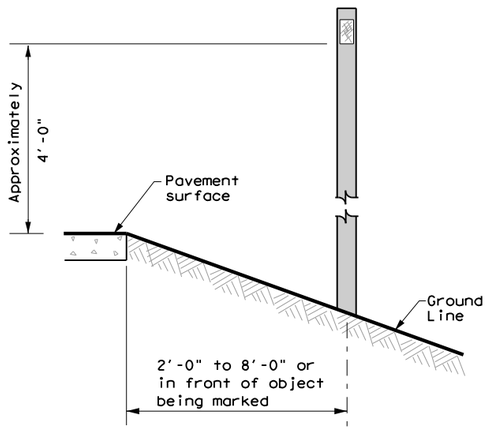
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SJT	CROCKETT		133

20B

DATE: 6/1/2024 12:30:19 PM
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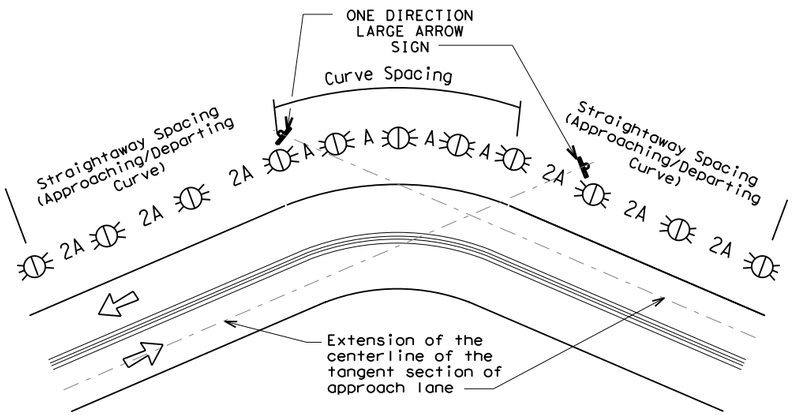
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

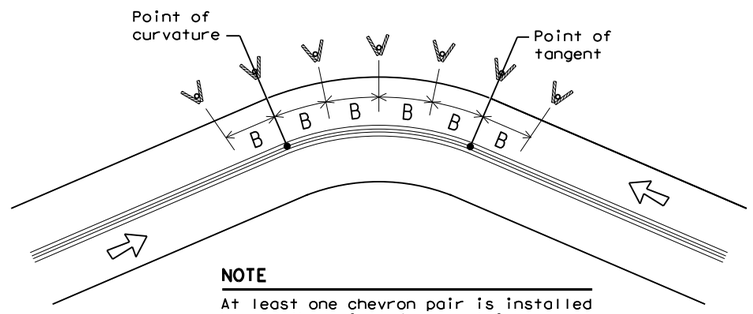
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	SJT	CROCKETT		134

20C

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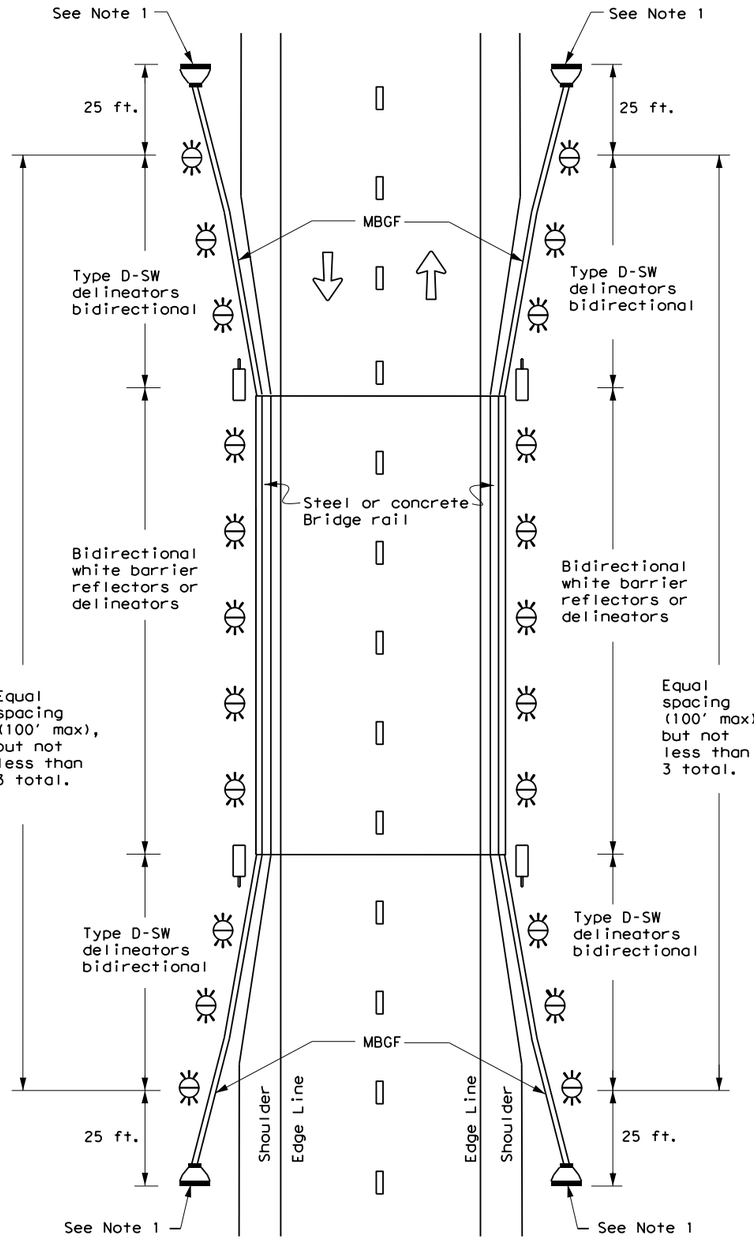
DATE: 6/1/2024 12:31:17 PM
FILE: c:\pw-of\pw-of-prod\fami shuey\d0283047\dom5-20.dgn

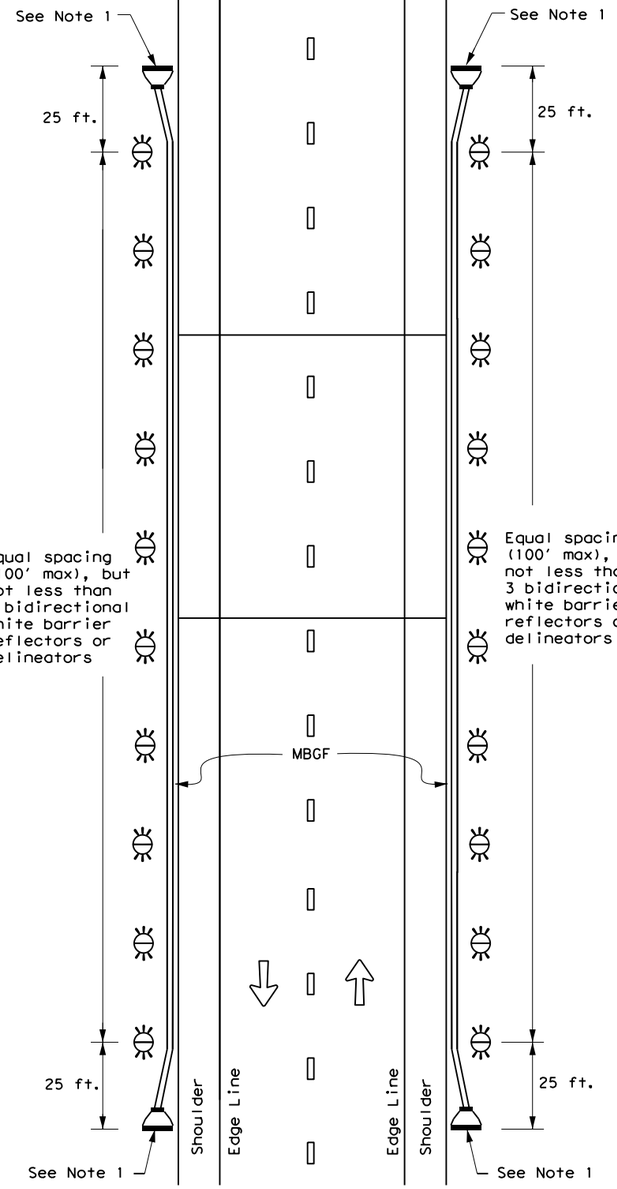
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

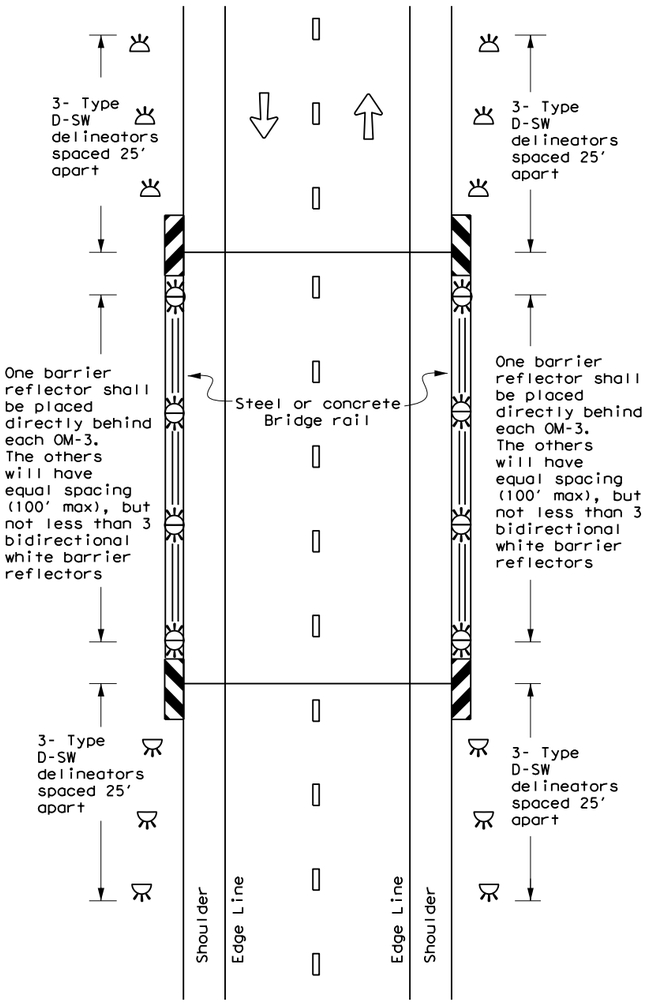
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

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

Texas Department of Transportation

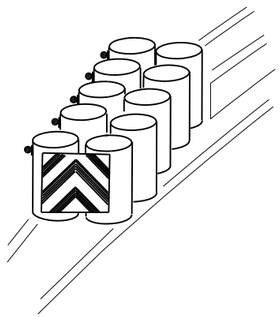
Traffic Safety Division Standard

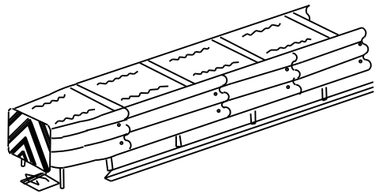
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

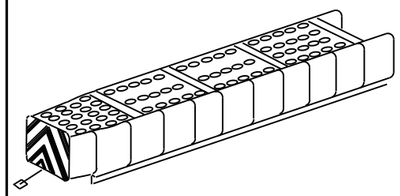
D & OM(5)-20

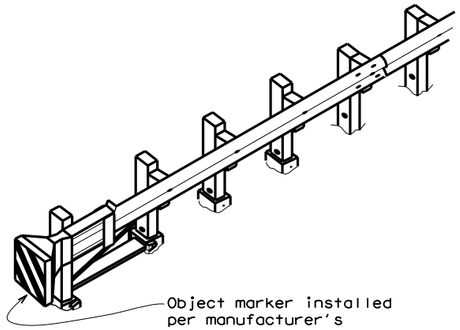
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
7-20	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		135

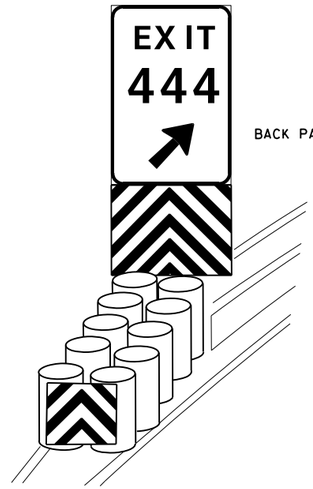
20E

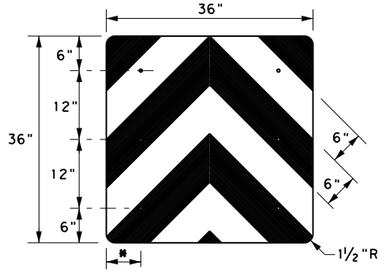


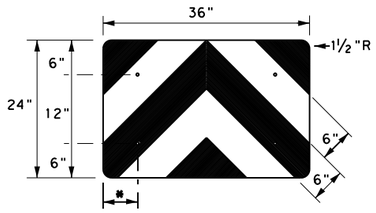




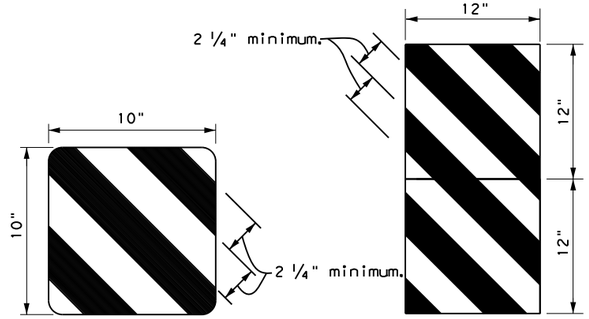




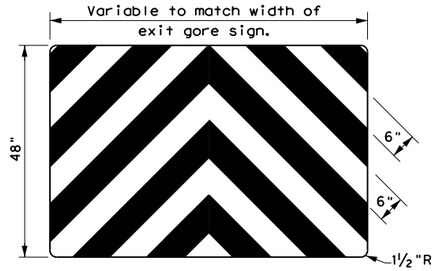


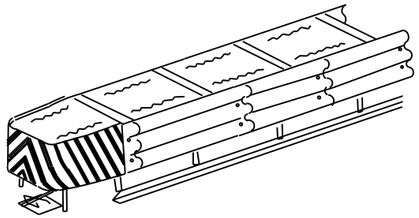


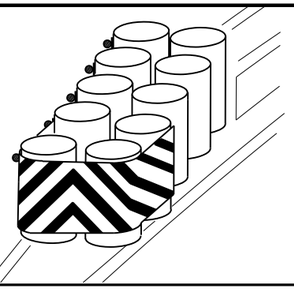
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

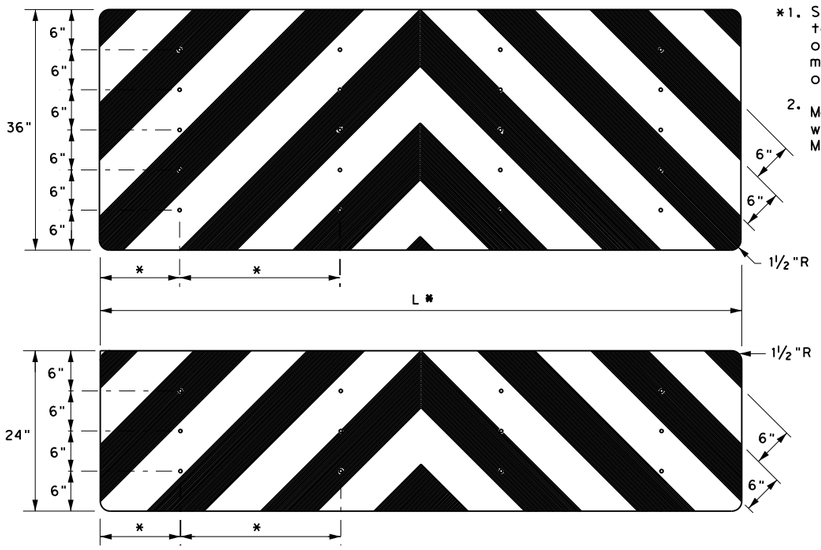


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	SJT	CROCKETT		136
4-98 7-20				

20G

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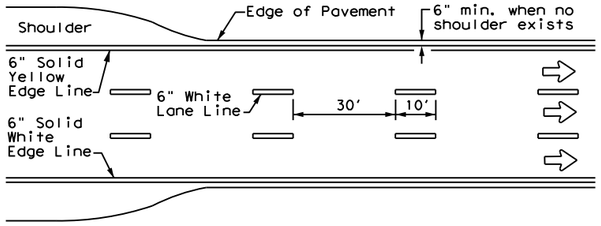
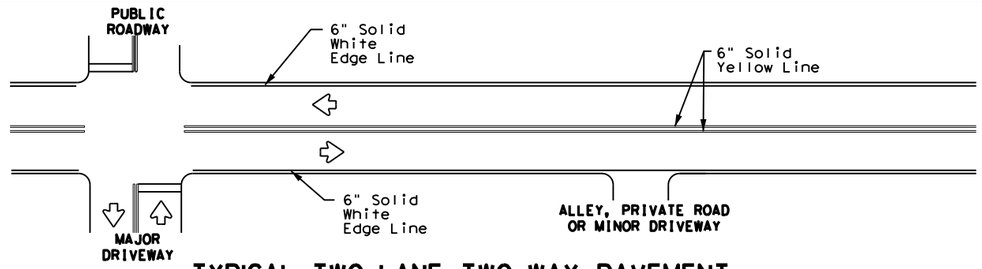
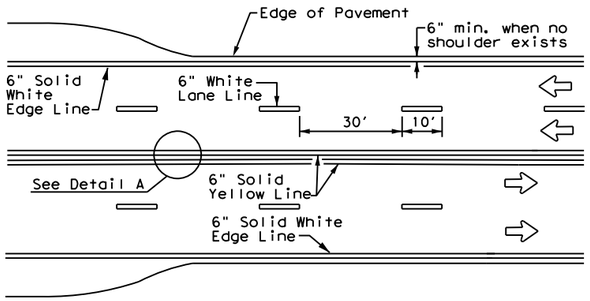
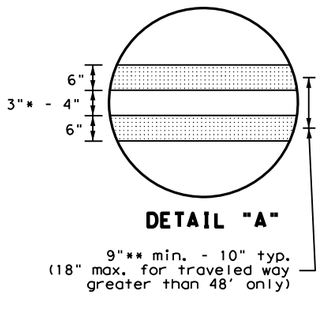


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

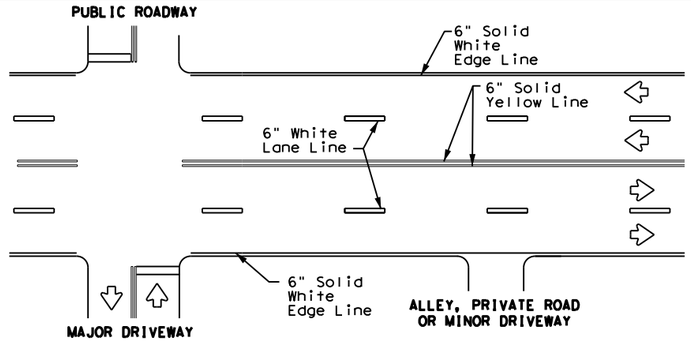




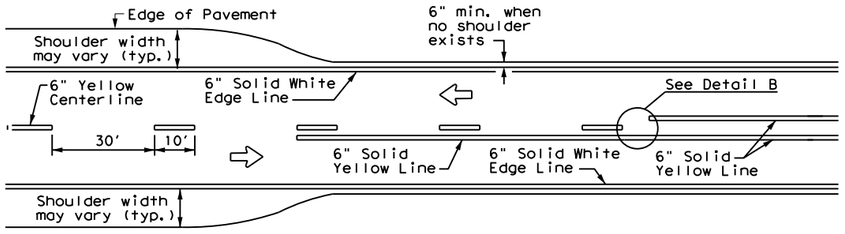
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

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

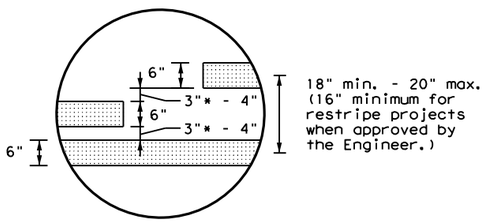
** 8" minimum for restripe projects when approved by the Engineer.



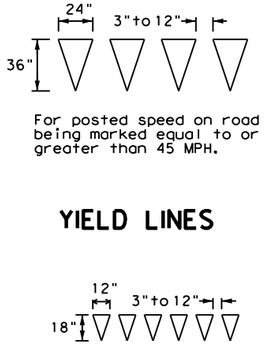
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

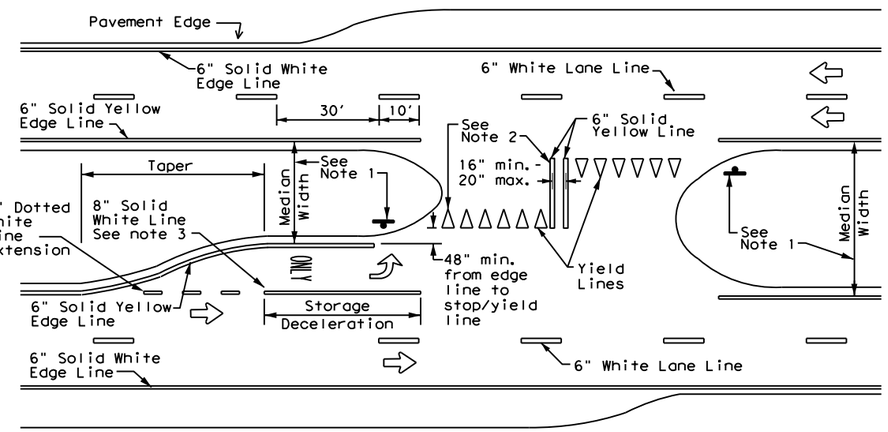


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

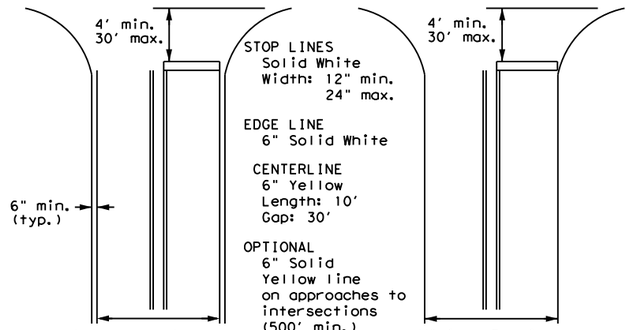
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

GENERAL NOTES

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

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

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



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

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		137

22A

DATE: 6/1/2024 12:32:15 PM
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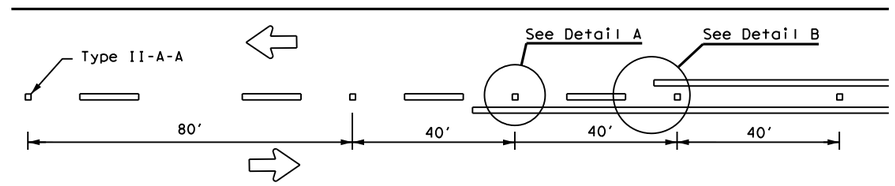
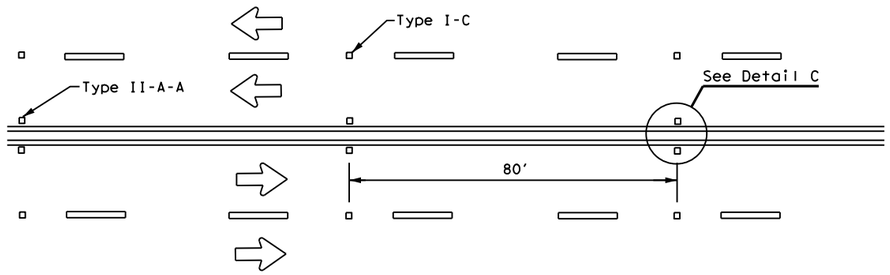
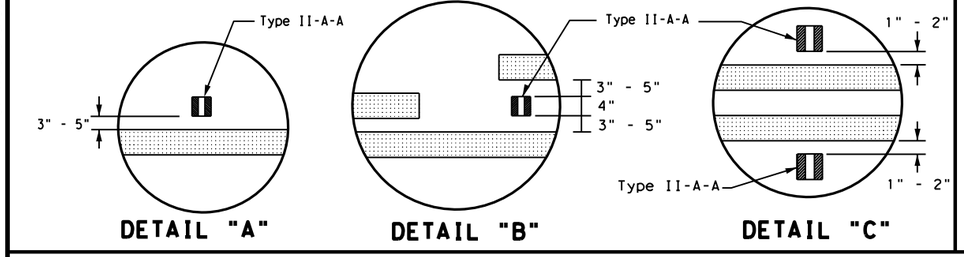
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

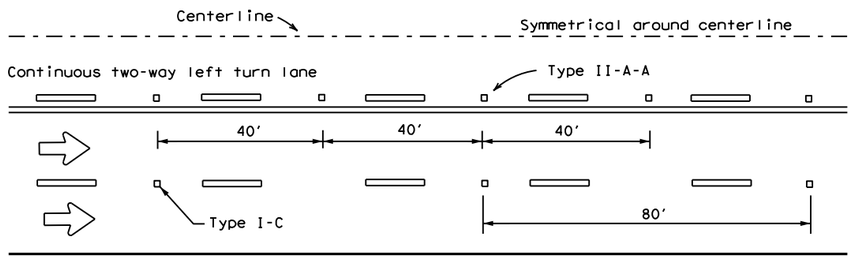


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

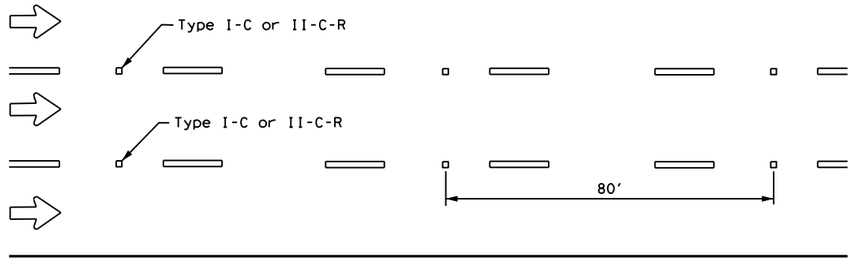


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



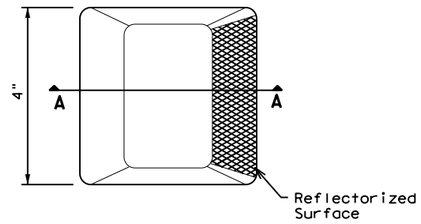
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

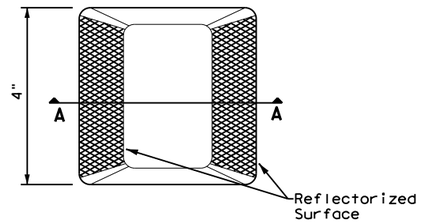
See Note 3.

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

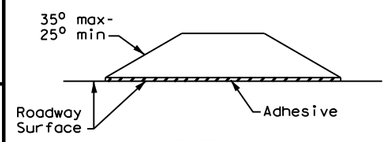
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

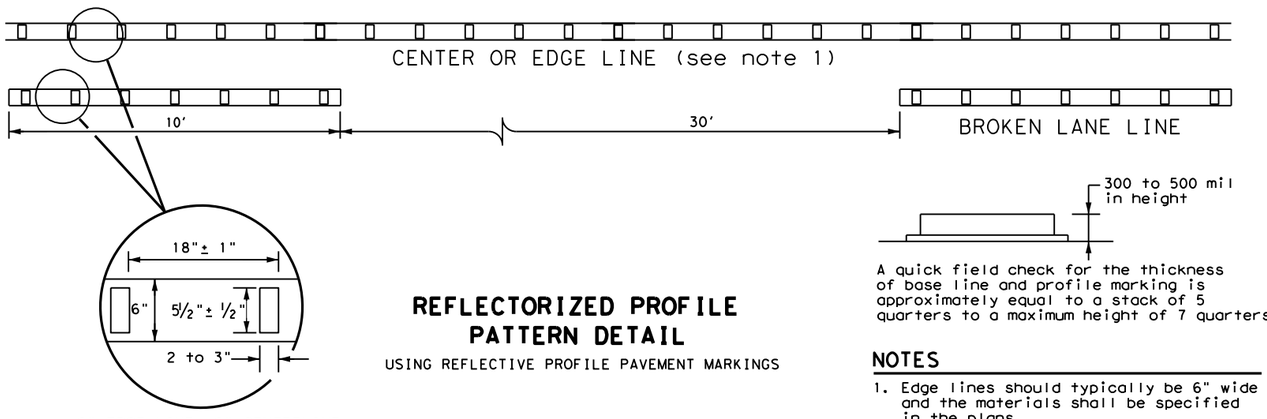


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



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

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
4-77 8-00 6-20	DIST	COUNTY		SHEET NO.
4-92 2-10 12-22	SJT	CROCKETT		138
5-00 2-12				

22B

DATE: 6/1/2024 12:32:43 PM
FILE: c:\pw-of\pw-of-prod\tami shuey\d0283047\pm2-22.dgn

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)

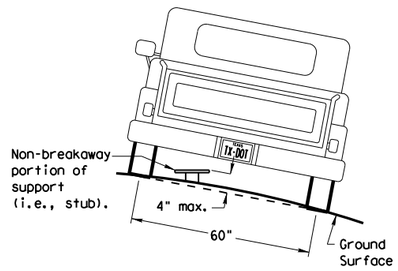
Anchor Type

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))

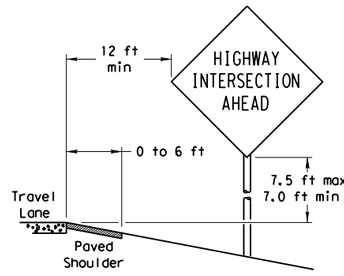
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

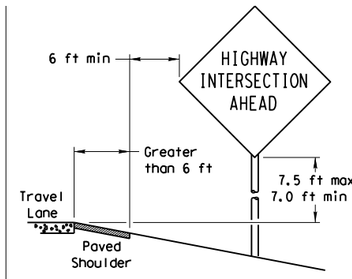
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

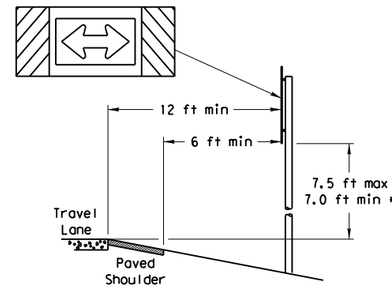
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



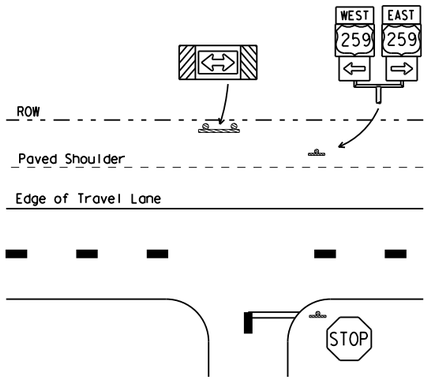
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

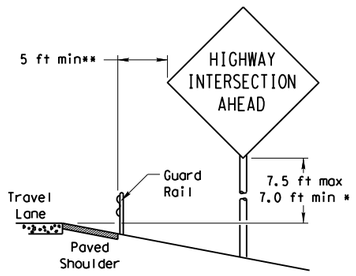
T-INTERSECTION



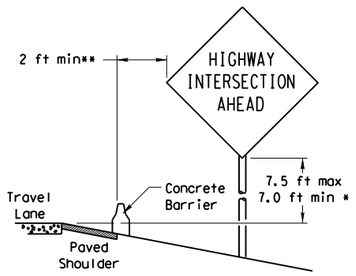
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* 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

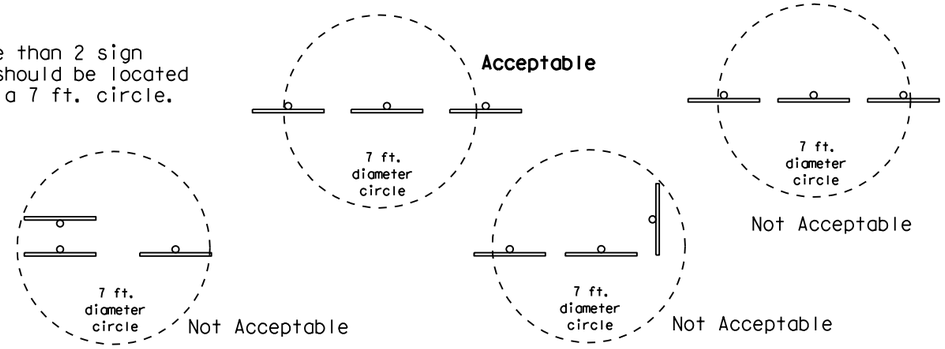
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

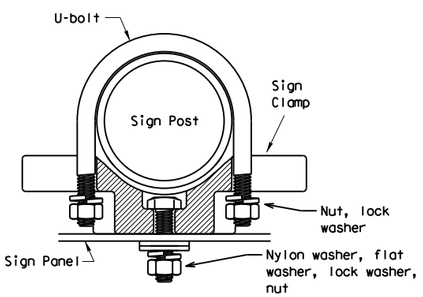
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

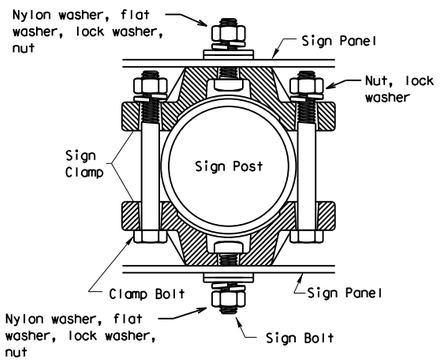


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

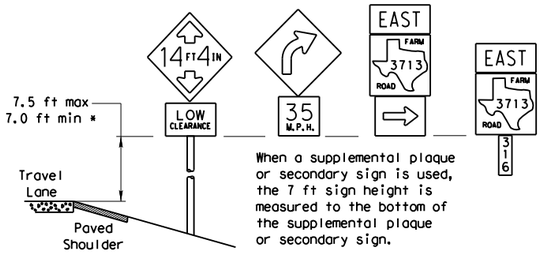
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



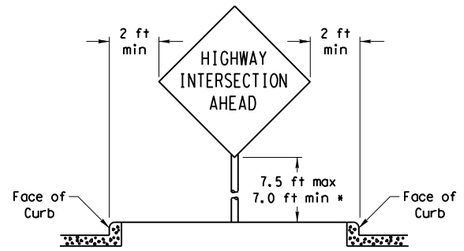
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



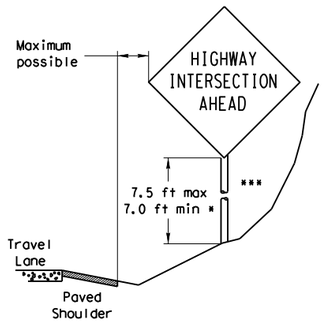
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2279	02	023	US 190

DIST	COUNTY	SHEET NO.
SJT	CROCKETT	139

26A

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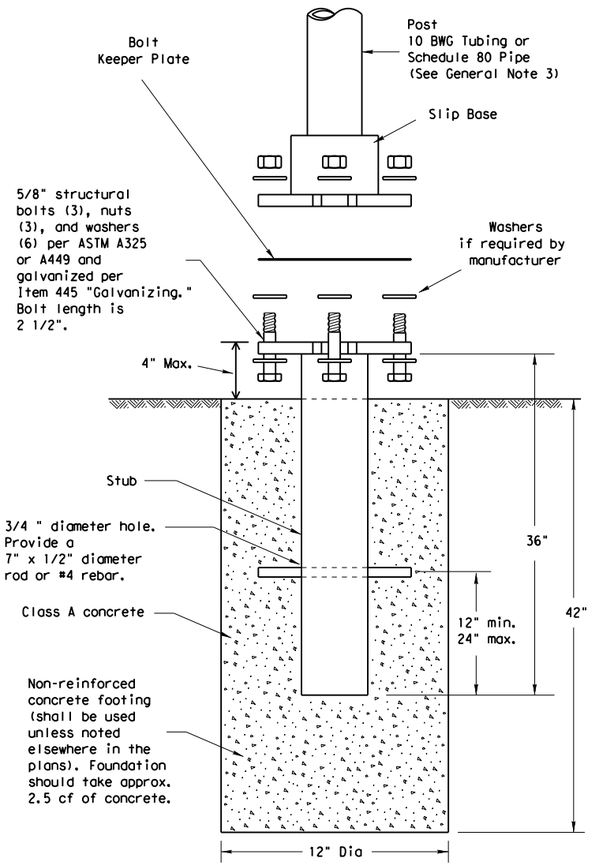
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

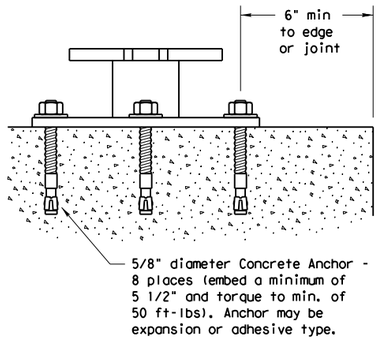
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
2279	02	023	US 190

DIST	COUNTY	SHEET NO.
SJT	CROCKETT	140

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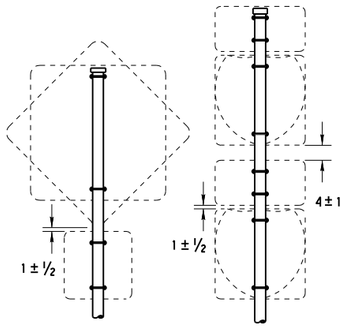

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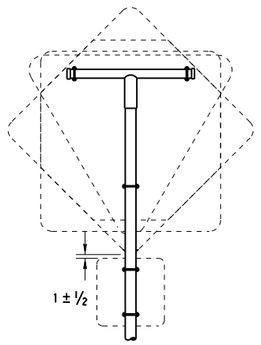

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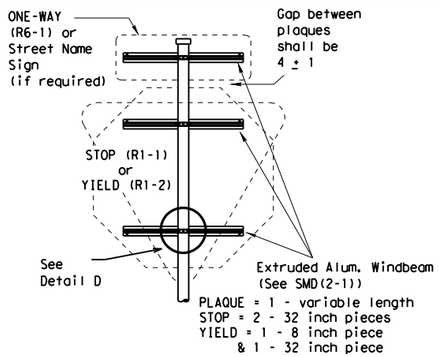

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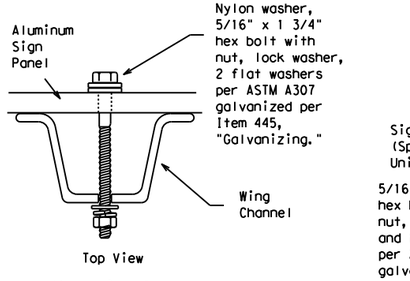
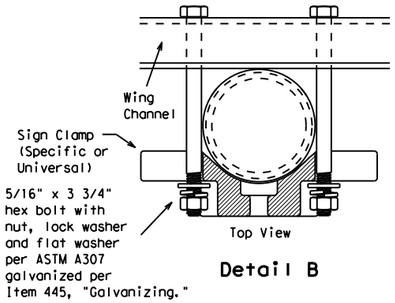
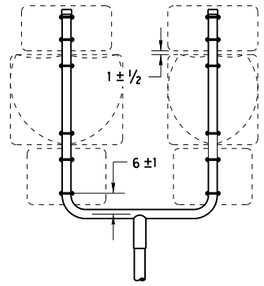


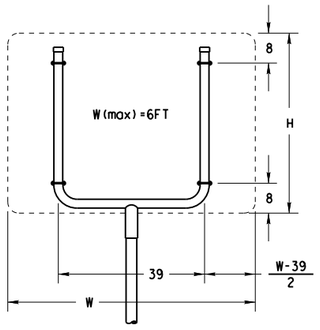
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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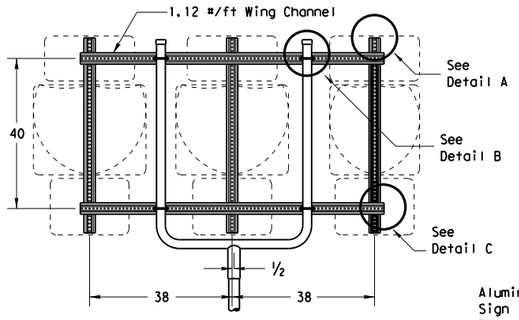
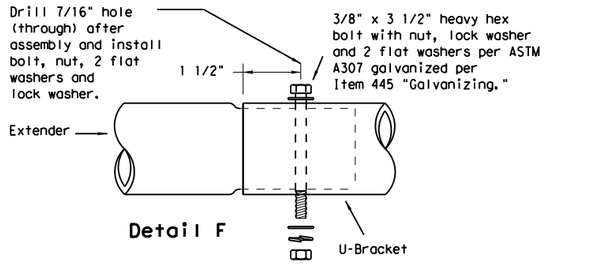
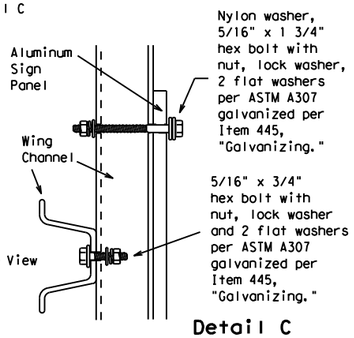


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

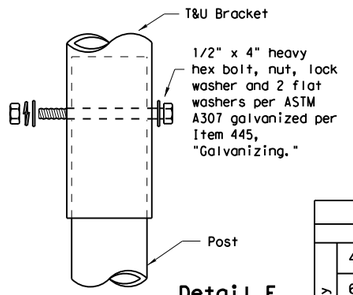


Detail F

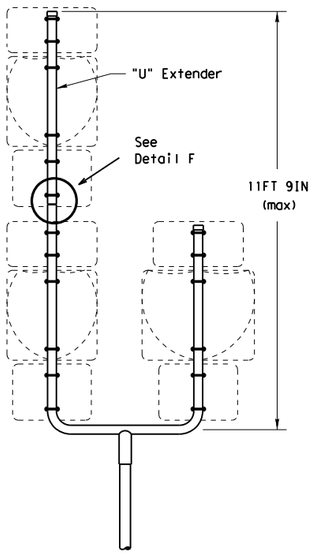
Splices shall only be allowed behind the sign substrate.



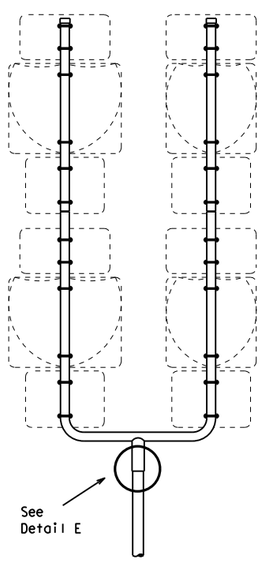
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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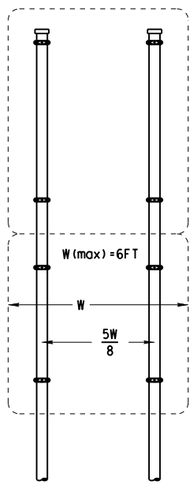
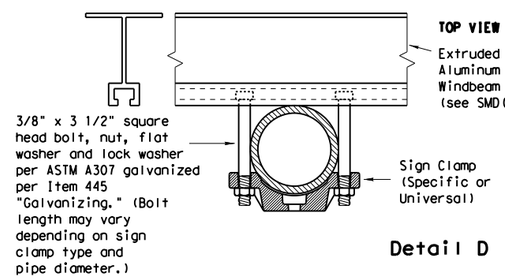
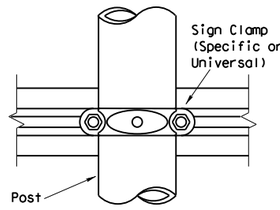


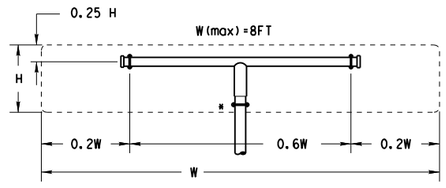
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

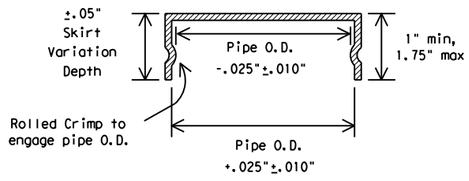




All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		141

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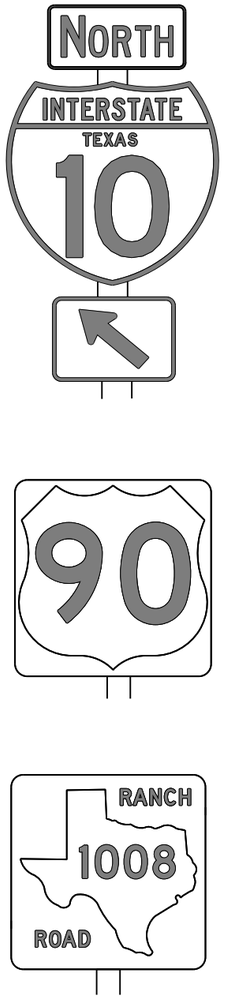
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

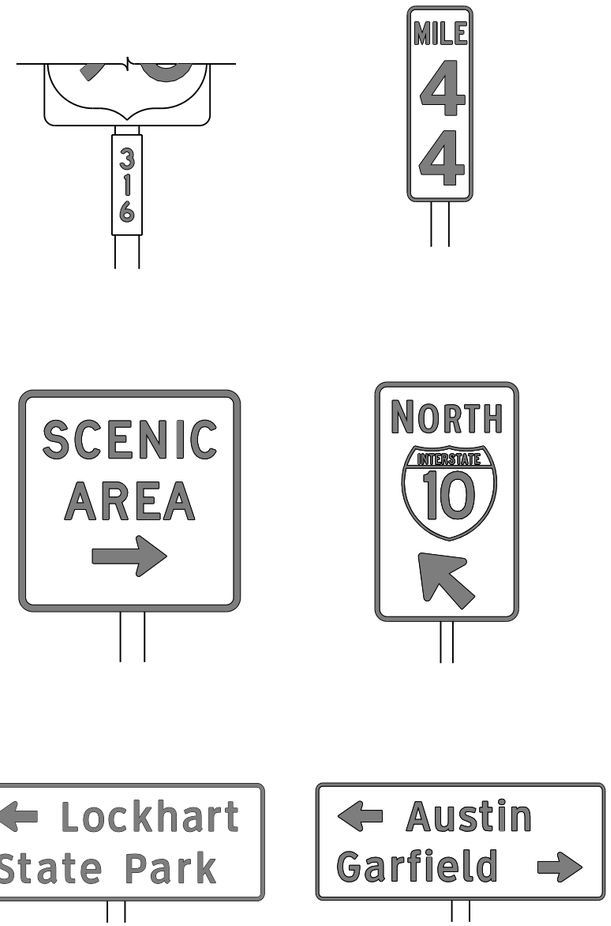
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

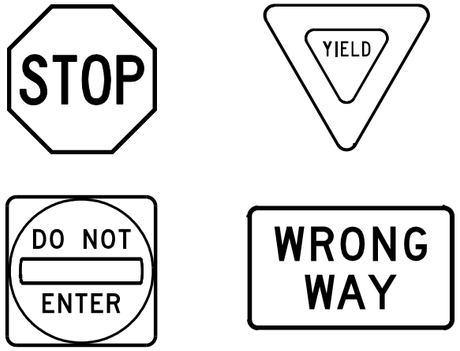
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SJT	CROCKETT		142

DATE: 6/1/2024 12:35:04 PM
FILE: c:\pw-df\pw-df-prod\tami shuey\d0283047\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

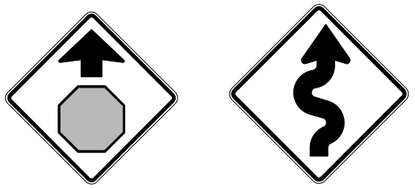
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

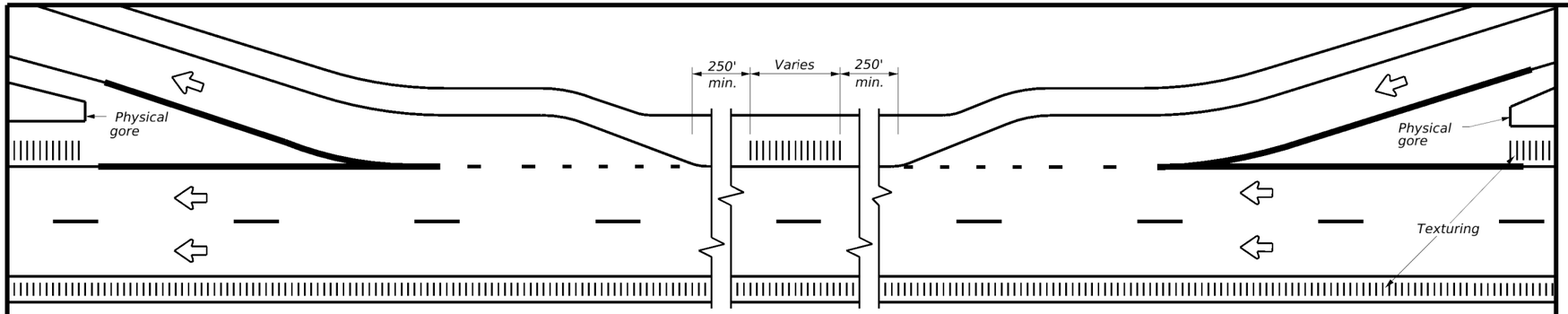
Texas Department of Transportation

Traffic Operations Division Standard

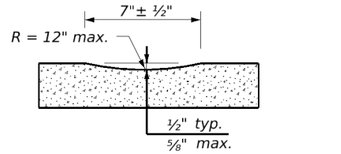
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

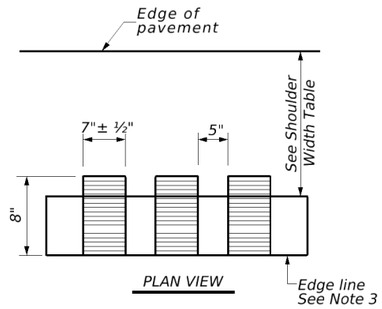
FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		143



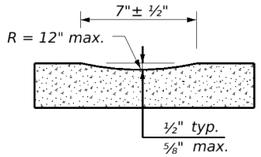
TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS



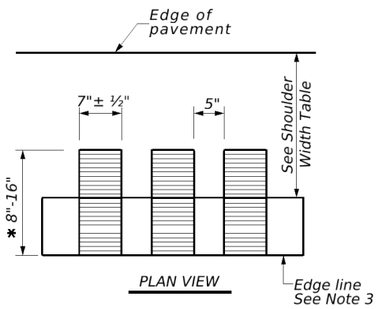
PROFILE VIEW
OPTION 1



CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

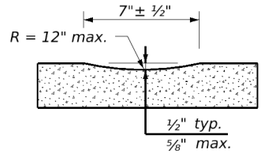


PROFILE VIEW
OPTION 2

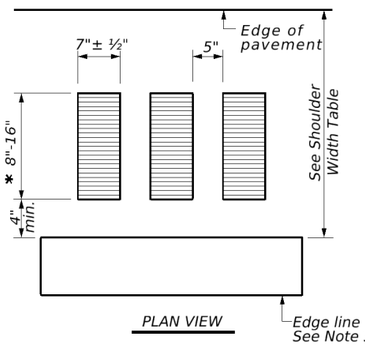


* This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

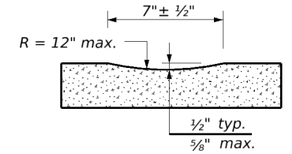


PROFILE VIEW
OPTION 3

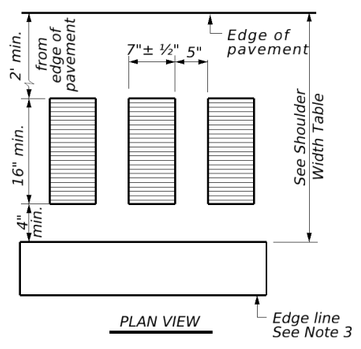


* This distance may vary based on width of shoulder

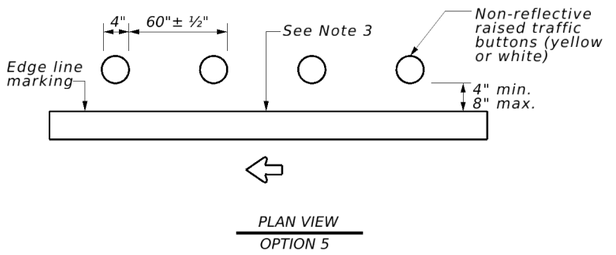
CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PROFILE VIEW
OPTION 4

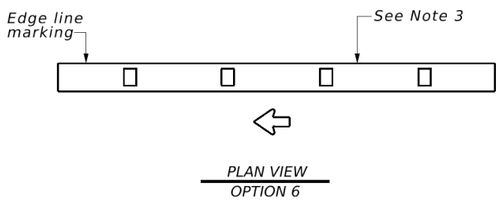


CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGE LINE
(Rumble Strips)



PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS
(Rumble Strips)

GENERAL NOTES

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

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

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

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

SHOULDER WIDTH TABLE

EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, or 6	Option 1, 2, 3, 5, or 6	Option 2, 4, 5, or 6

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS RS(1)-23

FILE: rs(1)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
4-06 1-23	DIST	COUNTY		SHEET NO.
2-10	SJT	CROCKETT		144
10-13				

DATE: 6/1/2024 12:35:33 PM
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DATE: 6/1/2024 12:36:04 PM
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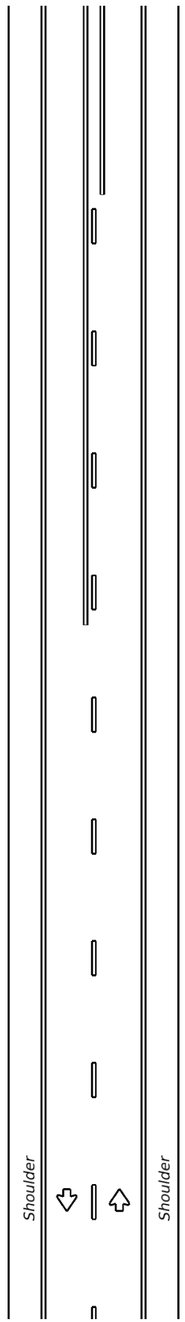
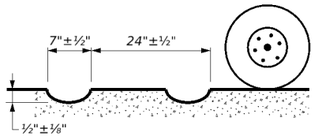
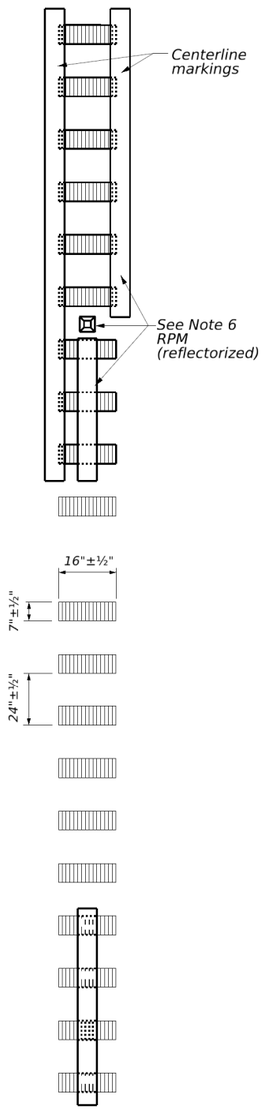
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

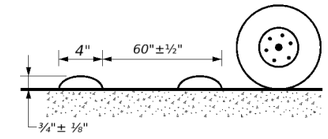


PROFILE VIEW

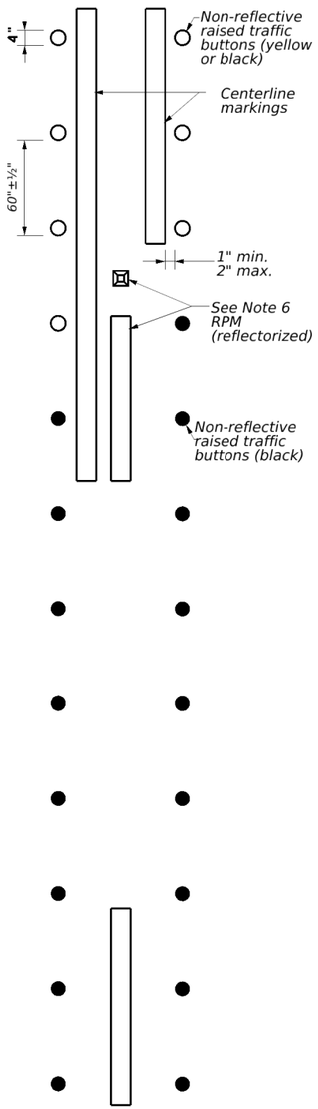


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

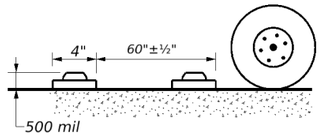


PROFILE VIEW

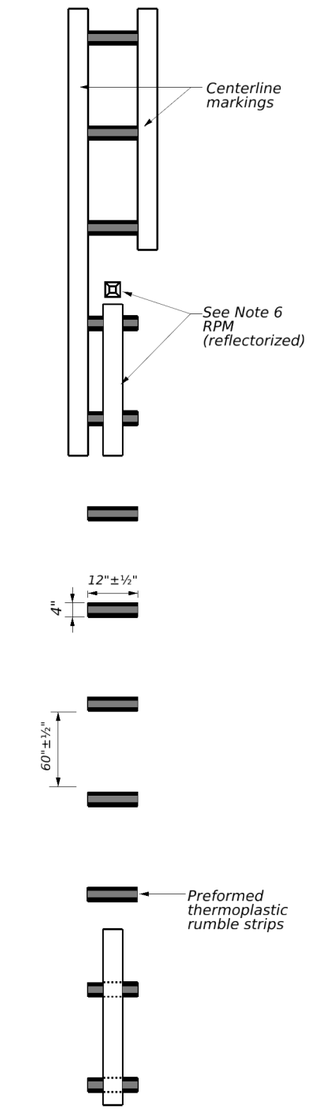


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

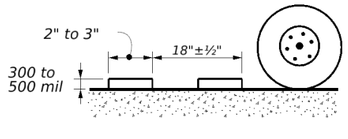


PROFILE VIEW

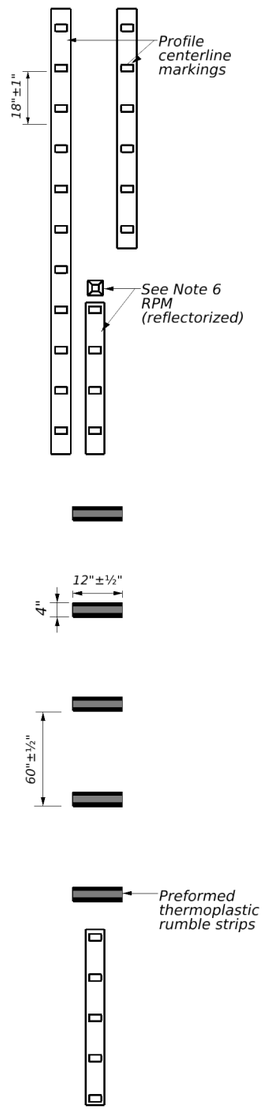


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

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

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

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
10-13	DIST	COUNTY		SHEET NO.
1-23	SJT	CROCKETT		145

DATE: 6/2/2024
FILE: c:\pw-af\pw-af-prod\tami shuey\d0283050\epic.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1.

2.

☐ No Action Required ☒ Required Action

Action No.

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

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

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

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

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

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

1. US 190 over Live Oak Draw - NBI - 070530227902003

2.

3.

4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

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

☐ No Action Required ☒ Required Action

Action No.

1. Tree removal to be done in accordance with the Migratory Bird Treaty Act (see Section V).
2.
3.
4.

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

☐ No Action Required ☒ Required Action

Action No.

1. Do not kill snakes or other animals!
2. Do not destroy nests on structures within the project limits.
3. Bird BMP's: a) Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season; b) avoid the removal of unoccupied, inactive nests, as practicable; c) do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.
4. The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, egg in part or in whole, without a Federal permit issued in accordance within the Act's policies and regulations. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young would be avoided.

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

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

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

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ Yes ☒ No

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

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

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

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

☐ No Action Required ☒ Required Action

Action No.

1. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by the Act, and that violates applicable water quality standards or causes a film or sheen on water require reporting to the TCEQ and local authorities. Contact the San Angelo Environmental Section at 325-947-9323.
2. If potentially hazardous material and/or contaminated media (i.e. soil, groundwater, surface water, sediments, building materials) are unexpectedly encountered during construction, immediately cease work in the vicinity and contract the Engineer.
3. Refer to 2014 TxDOT Standard Specification Items:
   6.10 Hazardous Materials
   7.12 Responsibility for Hazardous Materials
4. The paint system on the bridge rail is confirmed to contain lead-based paint. The torching, grinding or mechanical cutting of the rail or its components is not recommended without the use of proper personal protective equipment (i.e., respirators). The contractor must remove the rail by unbolting the rail supports from the bridge. Only licensed professionals trained in lead abatement should remove by means other than mechanical.
5. Guard rail and guard rail supports contain LCP and should be removed by mechanical means only.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required

☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	2279	02	023	US 190
05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		146

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

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

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
2279-02-023

1.2 PROJECT LIMITS:
From: AT LIVE OAK DRAW

To:

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.877308° ,(Long) -101.682558°

END: (Lat) 30.877449° ,(Long) -101.677559°

1.4 TOTAL PROJECT AREA (Acres): 4.35

1.5 TOTAL AREA TO BE DISTURBED (Acres): 3.43

1.6 NATURE OF CONSTRUCTION ACTIVITY:
CONSISTING OF REPLACE BRIDGE AND APPROACHES

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Iraan and Dev soils, 0 to 2% slopes, occasionally flooded	70% Iraan and similar, well drained, low runoff rate
Ector-Rock outcrop complex, moist, 1 to 20% slopes	65% Ector and similar, well drained, high runoff rate
Pandale-Upton complex, 0 to 5% slopes	65% Pandale and similar, well drained, low runoff rate
Reagan silty clay loam, 0 to 2% slopes	93% Reagan and similar, well drained, low runoff rate

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

☐ PSLs determined during preconstruction meeting
☒ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s
Construction Exit	151-152

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

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

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

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

Tributaries	Classified Waterbody
LIVE OAK DRAW	*Upper Pecos River (2311); impaired for depressed dissolved oxygen in water
No TMDLs or I-Plans were identified	

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			147
STATE	STATE DIST.	COUNTY	
TEXAS	SJT	CROCKETT	
CONT.	SECT.	JOB	HIGHWAY NO.
2279	02	023	US 190

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

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

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

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

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

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - X Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

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

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
RIPRAP	103+00 (LT)	108+14.11 (RT)
RIPRAP	102+00 (RT)	108+14.11 (RT)
RIPRAP	112+44.11 (RT)	113+50 (RT)

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

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

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

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

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 MAINTENANCE:

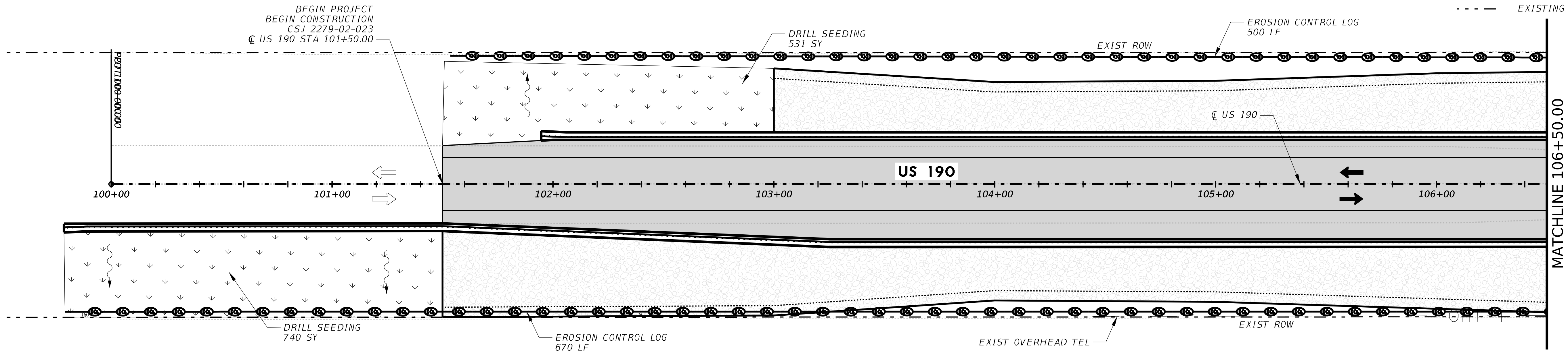
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			148
STATE	STATE DIST.	COUNTY	
TEXAS	SJT	CROCKETT	
CONT.	SECT.	JOB	HIGHWAY NO.
2279	02	023	US 190



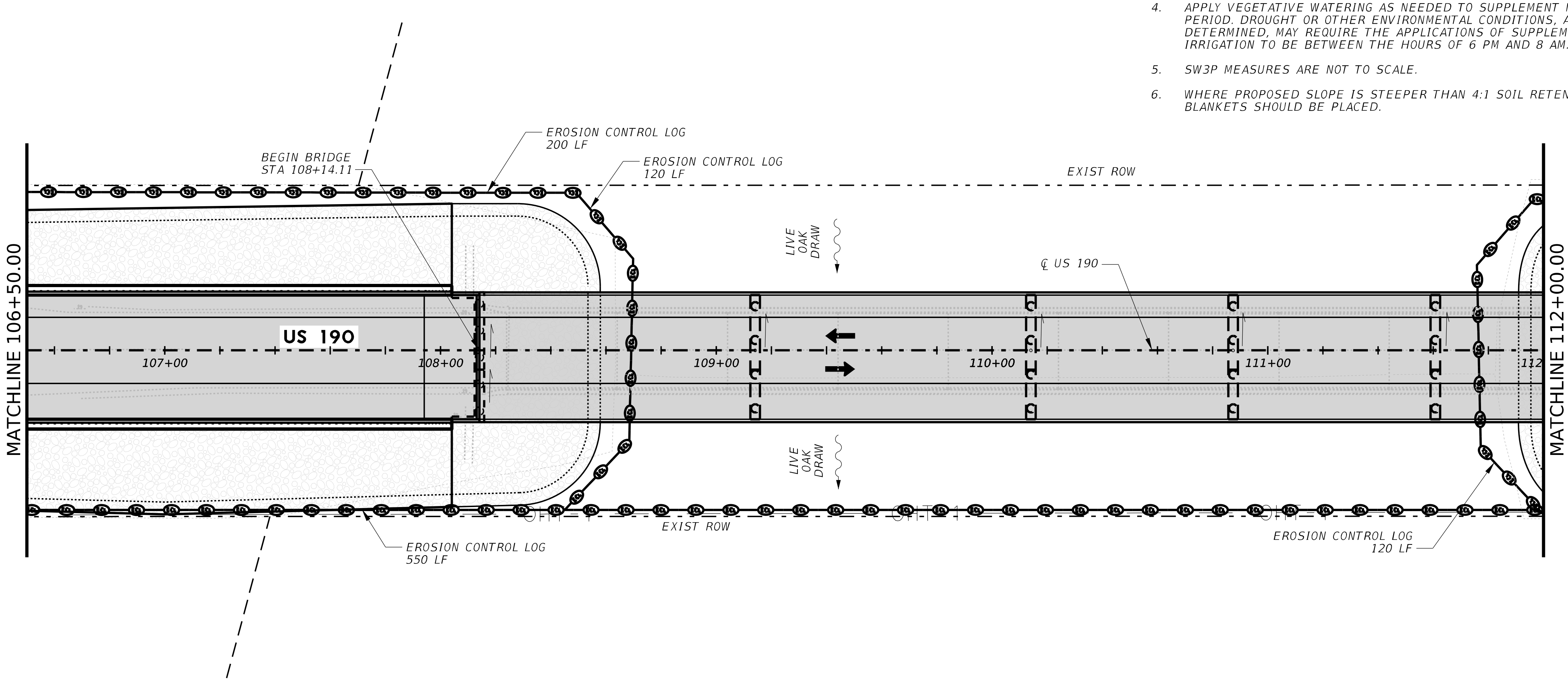
LEGEND

- DRILL SEEDING
- SOIL RETENTION BLANKETS (CL 1)(TY A)
- EROSION CONTROL LOG
- DIRECTION OF FLOW
- EXISTING ROW

NOTES:

1. CONSTRUCTION EXIT/ENTRANCE LOCATIONS ARE TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. FIELD VERIFY LOCATIONS OF BMPs SHOWN AND ALTER LOCATIONS AS NEEDED TO ACHIEVE INTENDED PURPOSE AS APPROVED.
3. MAINTAIN SW3P CONTROL MEASURES THROUGHOUT CONSTRUCTION.
4. APPLY VEGETATIVE WATERING AS NEEDED TO SUPPLEMENT NATURAL PERIOD. DROUGHT OR OTHER ENVIRONMENTAL CONDITIONS, AS DETERMINED, MAY REQUIRE THE APPLICATIONS OF SUPPLEMENTAL IRRIGATION TO BE BETWEEN THE HOURS OF 6 PM AND 8 AM.
5. SW3P MEASURES ARE NOT TO SCALE.
6. WHERE PROPOSED SLOPE IS STEEPER THAN 4:1 SOIL RETENTION BLANKETS SHOULD BE PLACED.

0 25' 50'
SCALE: 1" = 50'H



NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SW3P LAYOUT
BEGIN TO STA 112+00

SHEET 1 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	149
CONTROL	SECTION	JOB	
2279	02	023	

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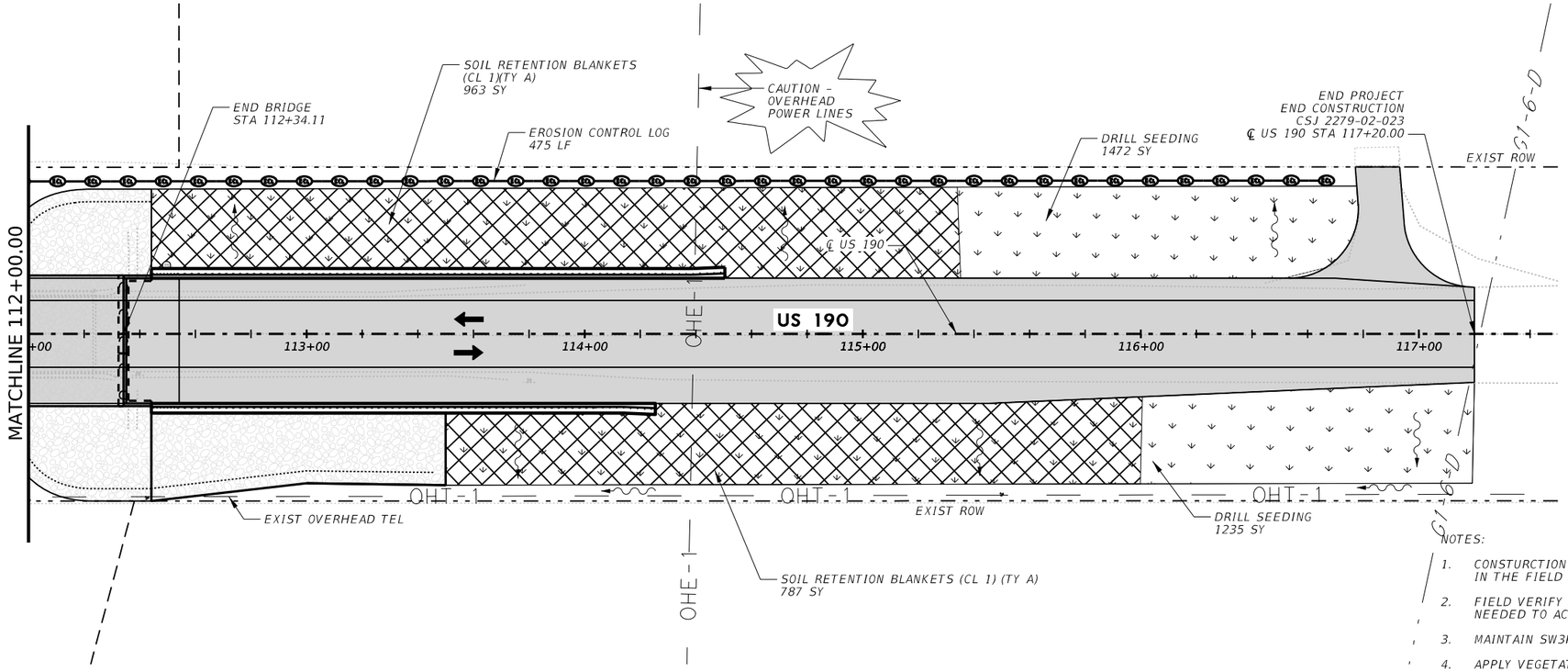

LEGEND

- DRILL SEEDING
- SOIL RETENTION BLANKETS (CL 1)(TY A)
- EROSION CONTROL LOG
- DIRECTION OF FLOW
- EXISTING ROW

NOTES:

1. CONSTURCTION EXIT/ENTRANCE LOCATIONS ARE TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. FIELD VERIFY LOCATIONS OF BMPs SHOWN AND ALERT LOCATIONS AS NEEDED TO ACHIEVE INTENDED PURPOSE AS APPROVED.
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0 25' 50'
SCALE: 1" = 50'H

NO.	DATE	REVISION	APPROV.

STATE OF TEXAS
PAUL R. HAHN III
107365
LICENSED
PROFESSIONAL ENGINEER
06/03/2024

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TEXAS REGISTERED ENGINEERING FIRM F-739

Texas Department of Transportation

US 190 AT LIVE OAK DRAW

SW3P LAYOUT
STA 112+00 TO END

SHEET 2 OF 2

DES BY:	DES CK:	DRN BY:	DRN CK:
PRH	BDS	TLS	PRH
FED RD DIV NO.	FEDERAL AID PROJECT		HIGHWAY
6	BR 2B24 (487)		US 190
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	SJT	CROCKETT	150
CONTROL	SECTION	JOB	
2279	02	023	

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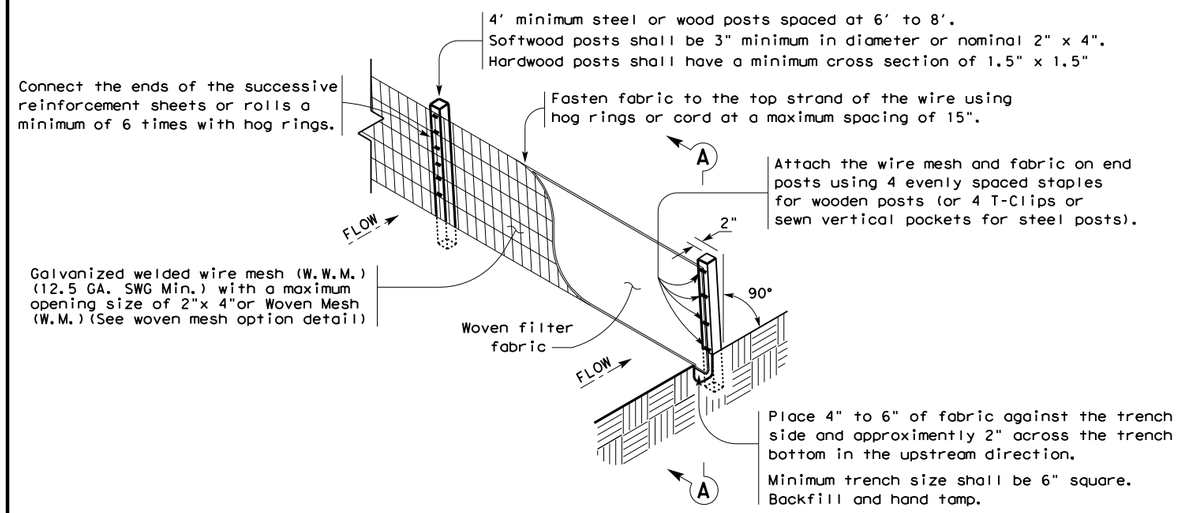
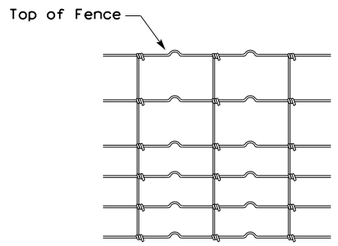
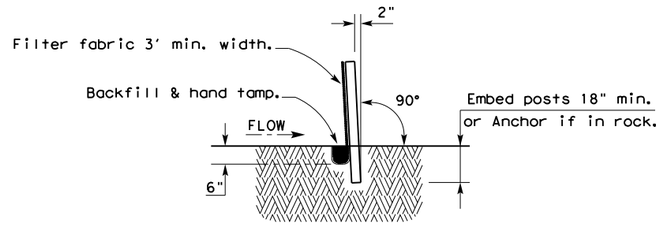


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

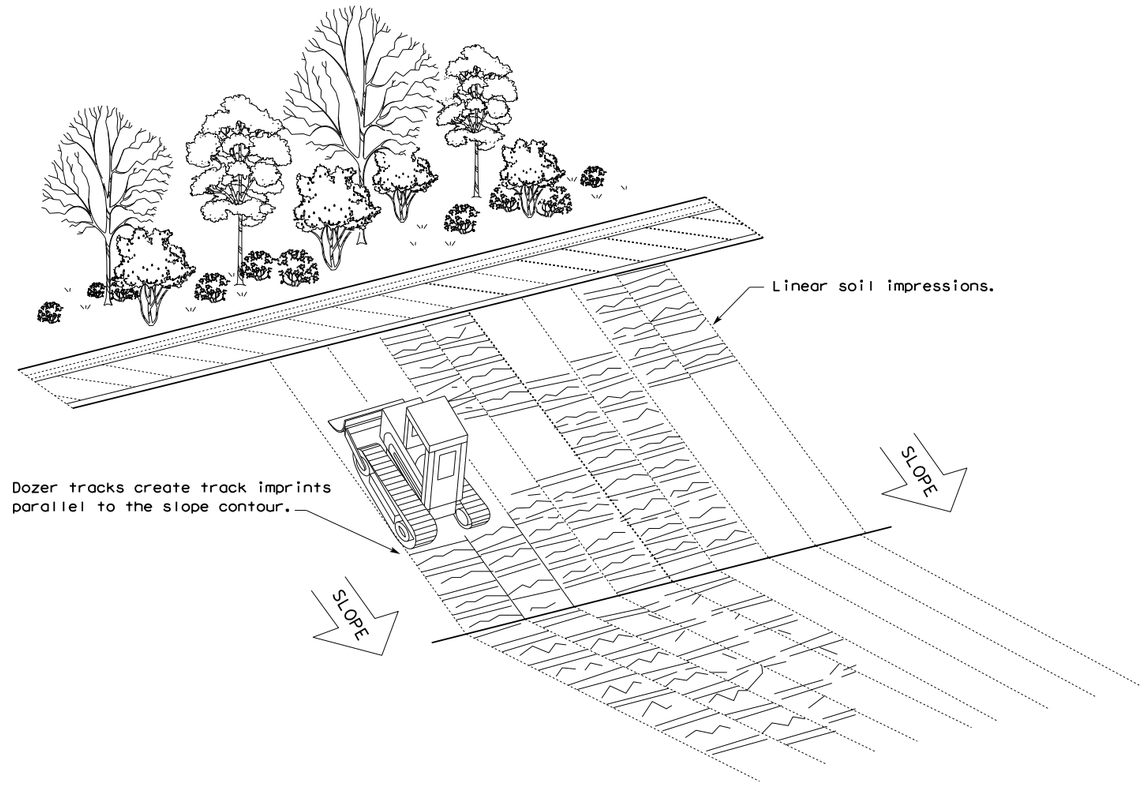
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		151

DATE: 6/1/2024
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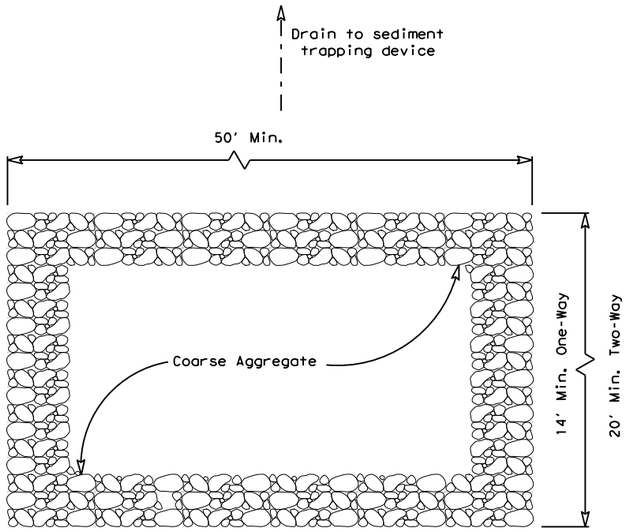
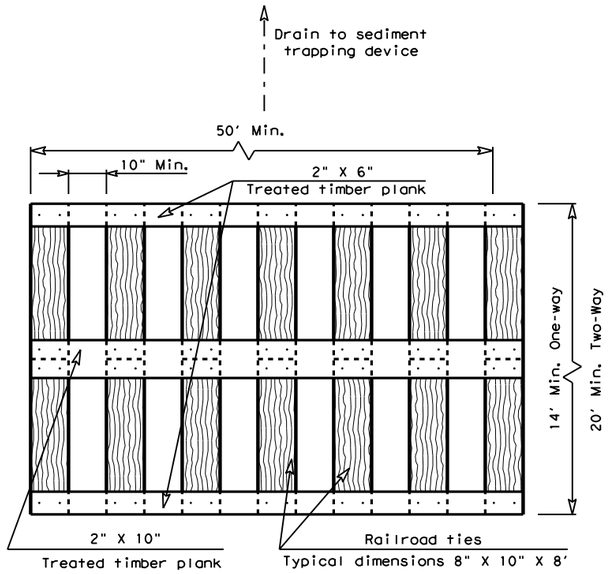
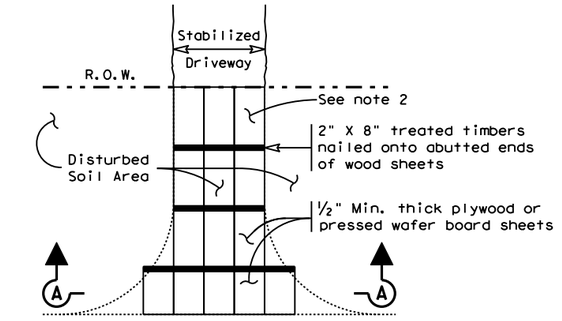


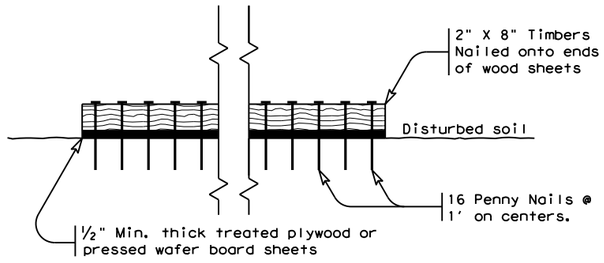
PLAN VIEW



PLAN VIEW



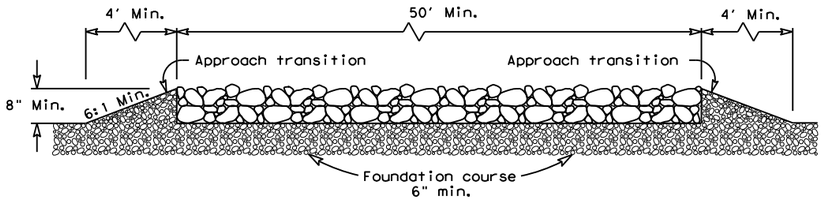
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

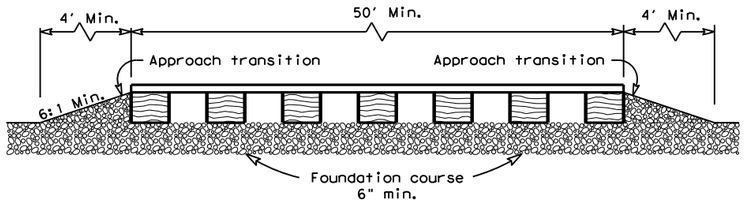
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

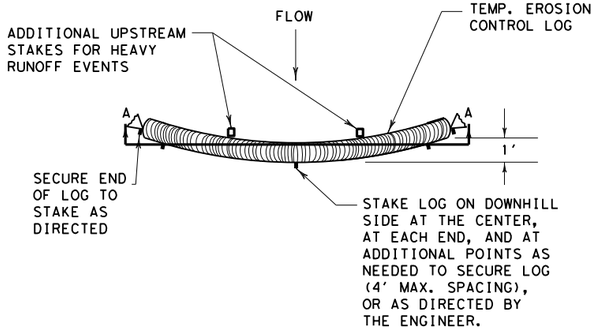
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

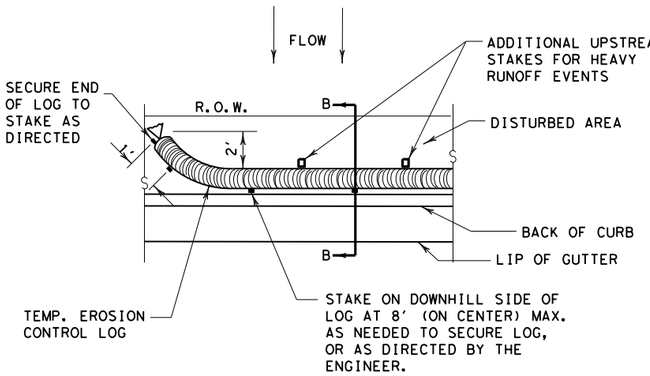
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2279	02	023	US 190
	DIST	COUNTY		SHEET NO.
	SJT	CROCKETT		152

DATE:
FILE:



PLAN VIEW



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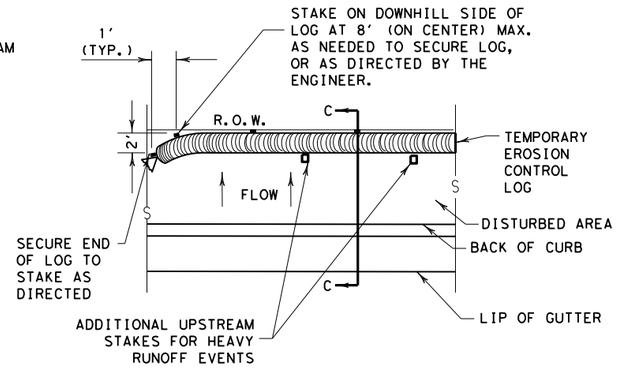
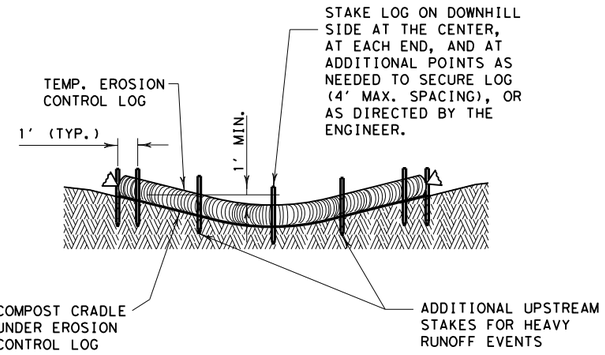


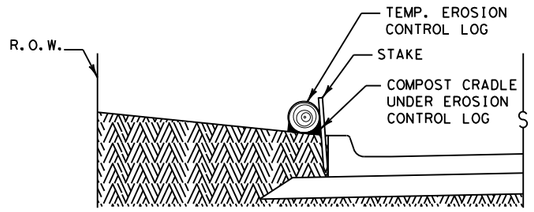
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

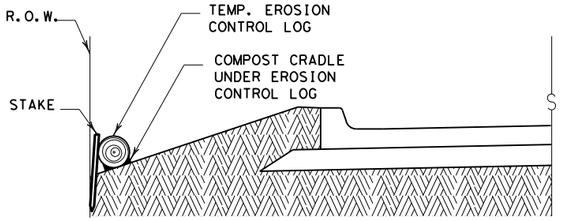
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

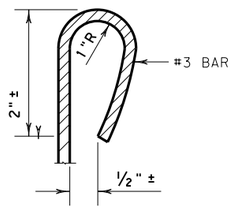
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

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

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

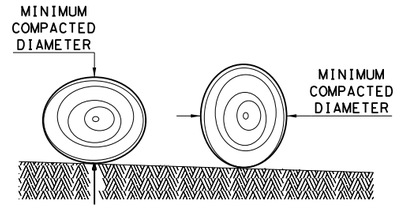
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2279	02	023		US 190	
	DIST	COUNTY			SHEET NO.	
	SJT	CROCKETT			153	

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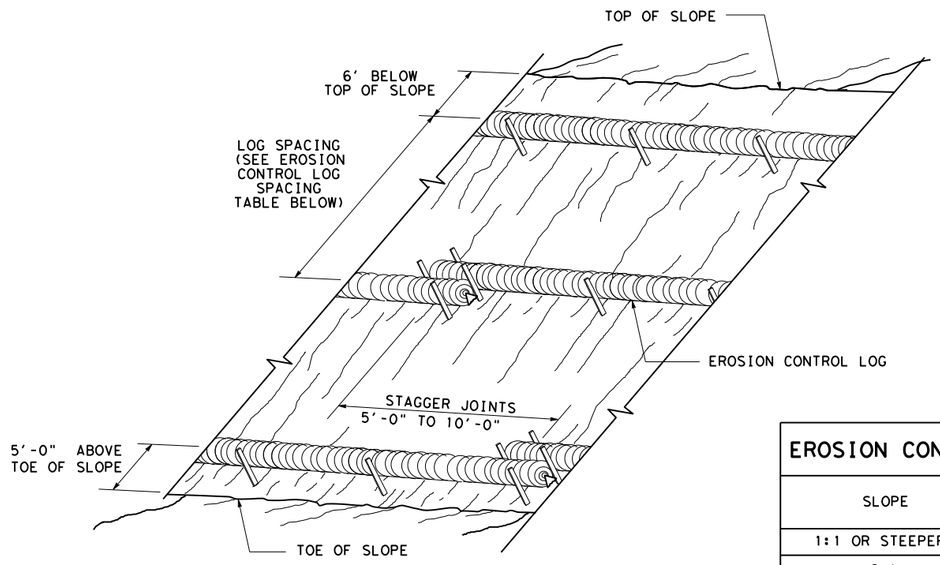
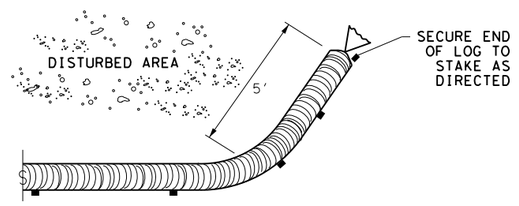


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

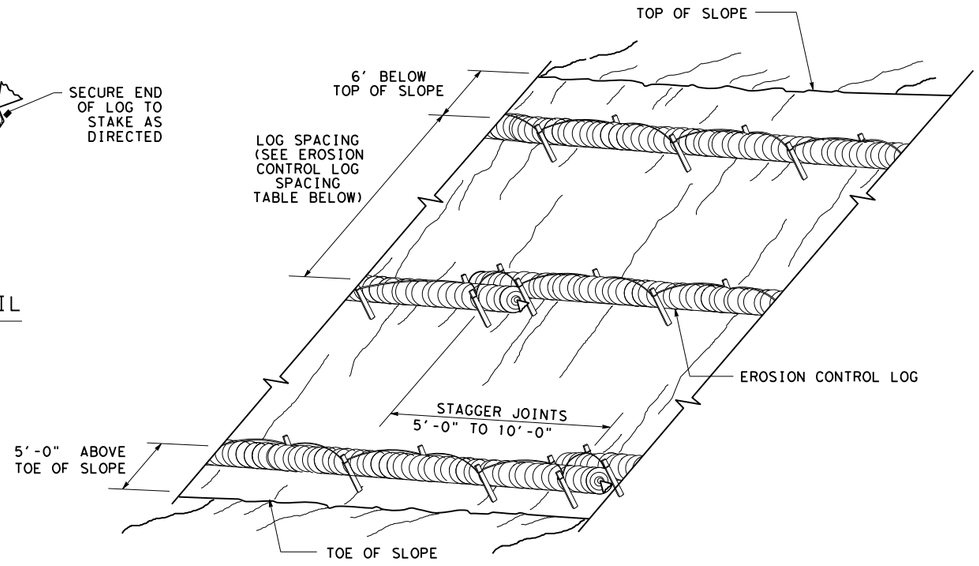
CL-SST



END SECTION RAP DETAIL

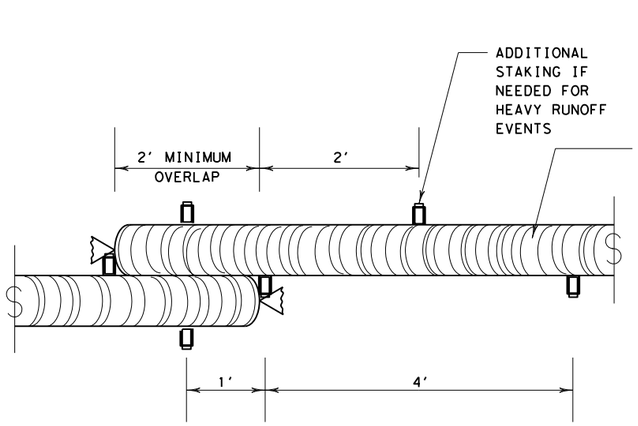
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

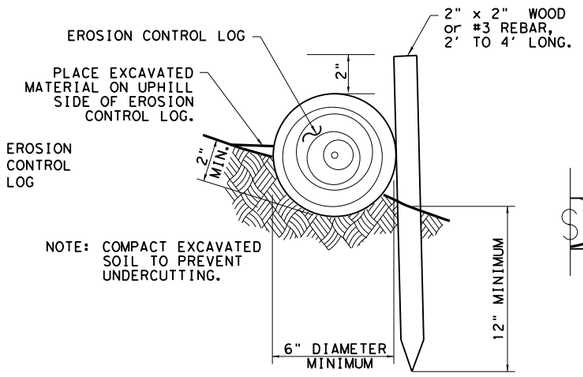
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

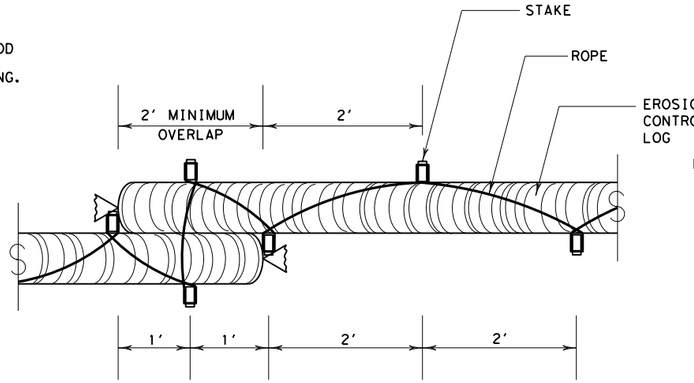


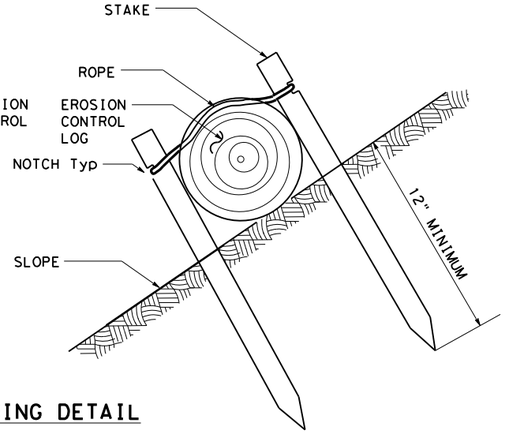


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

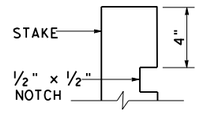
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS		
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REVISIONS	2279	02	023	US 190		
	DIST	COUNTY		SHEET NO.		
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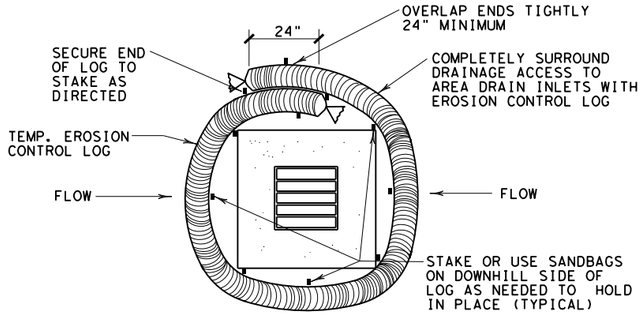
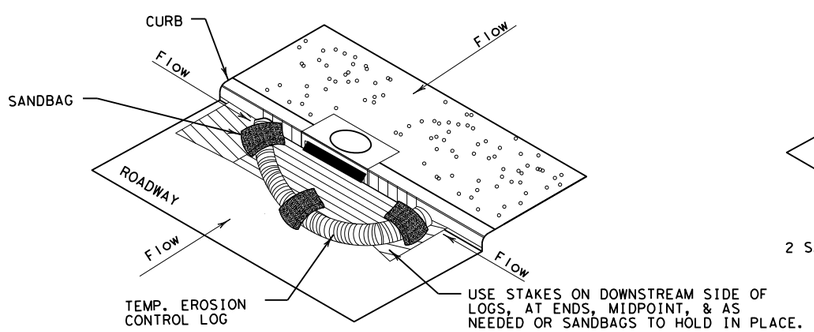


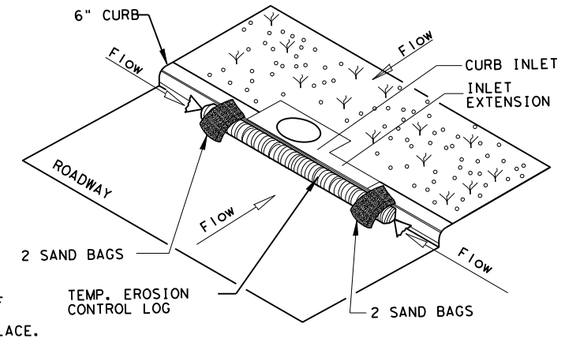
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

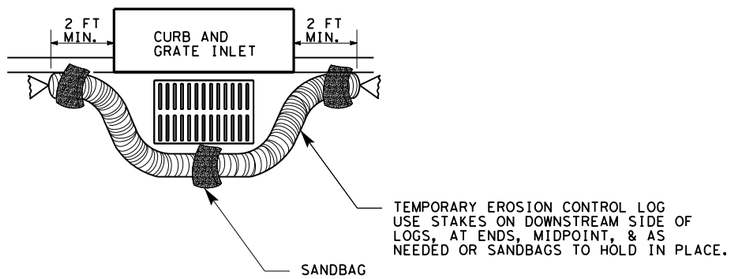
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

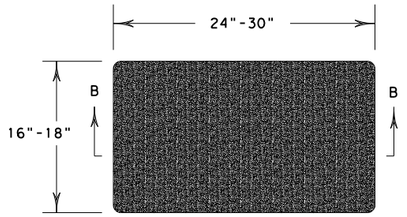
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

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