FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	BR 2021(588)		1
STATE	STATE DIST.	COUNTY	
TEXAS	23	EASTLAND	
CONT.	SECT.	JOB	HIGHWAY NO.
0288	03	032, ETC	SH 16, ETC

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. BR 2021(588)

SH 16

Eastland County

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

LIMITS: ON SH 16 at Bear Creek

DESIGN SPEED = 70 MPH
ADT(2018) = 980
ADT(2033) = 1120
MAJOR COLLECTOR

LENGTH OF PROJECT

ROADWAY	=	790.00 FT	= 0.150 MI
BRIDGE	=	110.00 FT	= 0.021 MI
TOTAL	=	900.00 FT	= 0.171 MI

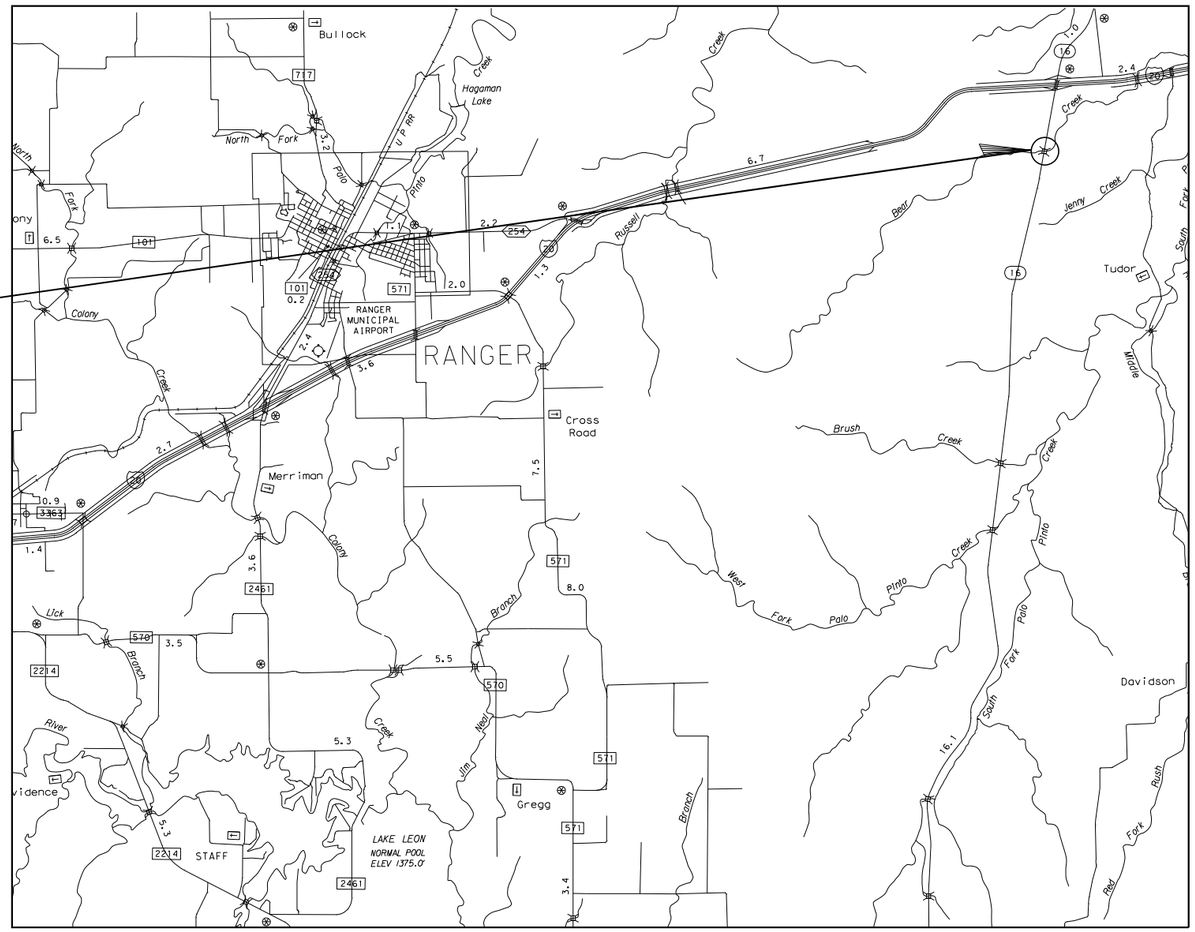
INDEX OF SHEETS

FINAL PLANS

PROJECT LETTING DATE:
CONTRACTOR:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS COMPLETED AND ACCEPTED:
FINAL CONTRACT COST:

STATE OF TEXAS
GEORGE E. TILLETT
80310
LICENSED PROFESSIONAL ENGINEER
3/12/2021

BEG PROJECT
STA 1381+60.00
0288-03-032
END PROJECT
STA 1390+60.00
0288-03-032



REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 14 THRU BC (12)- 14 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

VOLUME I
CONTRACT CSJ: 0288-03-032)

THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS AND CONTRACT.

AREA ENGINEER, P.E. _____ DATE _____

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 2014 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, MAY, 2012).

EQUATIONS: NONE
EXCEPTIONS: NONE
NO RAILROAD CROSSINGS - NONE ELIMINATED

Texas Department of Transportation

SUBMITTED FOR LETTING: 4/1/2021
DocuSigned by: Dan A. Hodmann, P.E.
2E74F333C7B14AA...
DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING: 4/1/2021
DocuSigned by: J.H. Stitt, P.E.
77D147778346466F...
DISTRICT DIRECTOR OF TRANSPORTATION
PLANNING AND DEVELOPMENT

RECOMMENDED FOR LETTING: 4/1/2021
DocuSigned by: Elias Rmeili, P.E.
BB9FD402431A4A3...
DISTRICT ENGINEER

INDEX OF SHEETS

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER

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

SIGNATURE 3/24/2021 DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER

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

SIGNATURE 3/24/2021 DATE

NO.	REVISION	BY	DATE

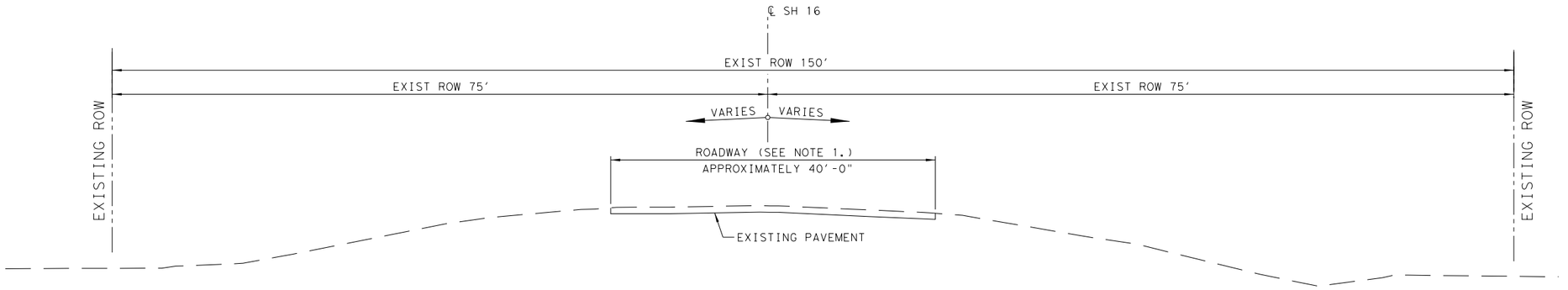
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK
INDEX OF SHEETS

SHEET 1 OF 1

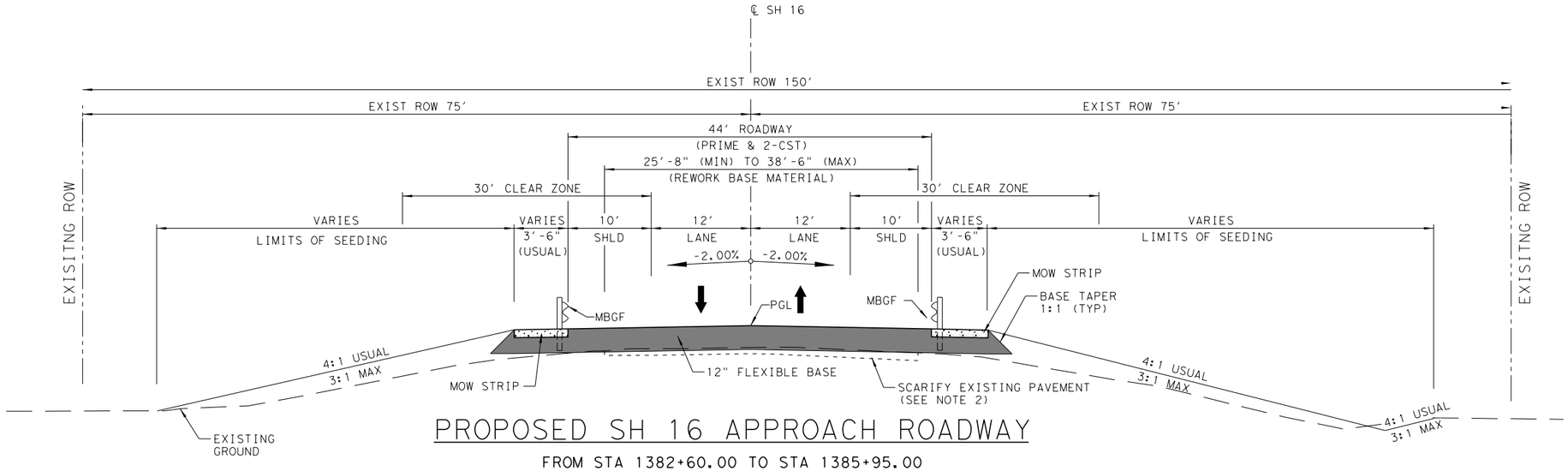
FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		2

pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/General/SH16_Index-01.dgn
3/24/2021 3:59 Joel1immerman TTS_PDF_Grayscale.pltcfg



EXISTING SH 16 APPROACH ROADWAY

(SEE NOTE 1. FOR EXIST BRIDGE TYPICAL SECTION INFO.)



PROPOSED SH 16 APPROACH ROADWAY

FROM STA 1382+60.00 TO STA 1385+95.00
FROM STA 1387+05.00 TO STA 1389+60.00

PROPOSED BRIDGE STA 1385+95.00 TO STA 1387+05.00

TRANSITION FROM EXISTING WIDTH TO PROPOSED WIDTH
STA 1381+60.00 TO STA 1382+60.00
STA 1389+60.00 TO STA 1390+60.00

LIMITS OF 2ND CST: STA 1353+20.00 TO STA 1419+00.00

TRANSITION FROM EXISTING CROSS SLOPE AT STA 1381+60.00 TO 2% CROSS SLOPE AT STA 1382+60.00
TRANSITION FROM 2% CROSS SLOPE AT STA 1389+60.00 TO EXISTING CROSS SLOPE AT STA 1390+60.00

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
247	6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	CY	1420

FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS) EST. @ 163 CY/STA (TOTAL 962 CY)
ADDITIONAL FLEX BASE EST. @ 312 CY TOTAL FOR TRANS
ADDITIONAL FLEX BASE EST. @ 117 CY TOTAL FOR MBGF
ADDITIONAL FLEX BASE EST. @ 29 CY TOTAL FOR BASE TAPERS

NOTES:

1. BRIDGE CLEAR ROADWAY WIDTH IS 26'-0" AND OVERALL WIDTH IS 29'-2".
2. SCARIFYING OF EXISTING PAVEMENT WILL OCCUR BETWEEN STA 1384+75.00 AND STA 1389+00.00, EXCLUDING BRIDGE STRUCTURE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED
PROFESSIONAL ENGINEER
4/22/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19207

SH 16 AT BEAR CREEK

TYPICAL SECTIONS

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		3

pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/Roadway/SH16_RDW_TYP_01.dgn
4/22/2021 10:59 rpeggar TTS_PDF_Grayscale_RTG.pltcfg

GENERAL NOTES

TEST TO BE IN ACCORDANCE WITH
TEXAS DEPARTMENT OF TRANSPORTATION
STANDARD TEST METHODS.

Item	Description	Soil Constants		
		Max LL.	Max. PI	Min. PI
132	Embankment (Final)(Dens Cont)(Ty C)	40	30	3
132	Embankment (Final)(Ord Cont)(Ty C)	40	30	3
247	Fl Bs (Cmp In Plc) (Ty D Gr 3)(Fnal Pos)			3
247	Fl Bs (Cmp In Plc) (Ty D Gr1&2)(Fnal Pos)			3

Job control samples for gradation and P.I. testing will be taken from the windrow after blade mixing.

Asphalt Surface Areas-SY
0288-03-032

Item	Description	Course	Roadway
310	Asph (RC-250)	Prime	3,818
316	Aggr (TY-B GR-5)	Prime	3,818
316	Asph (AC-20-5TR)	1st	3,818
316	Aggr (TY-PB GR-3)(SAC-B)	1st	3,818
316	Asph (AC-20-5TR)	2nd	29,062
316	Aggr (TY-PB GR-4)(SAC-B)	2nd	29,062

Basis of Estimate

Item	Description	Course	Rate	SY	Quantity
310	Asph (RC-250)	Prime	0.25 Gal/SY	3,818	955 Gal
316	Aggr (TY-B GR-5)(SAC-B)	Prime	130 SY/CY	3,818	30 CY
316	Asph (AC-20-5TR)	1st	0.42 Gal/SY	3,818	1,604 Gal
316	Aggr (TY-PB GR-3)(SAC-B)	1st	90 SY/CY	3,818	43 CY
316	Asph (AC-20-5TR)	2nd	0.34 Gal/SY	29,062	9,881 Gal
316	Aggr (TY-PB GR-4)(SAC-B)	2nd	120 SY/CY	29,062	243 CY

County: EASTLAND **Sheet 4**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

Asphalt Surface Areas-SY
0923-09-064

Item	Description	Course	Roadway
310	Asph (RC-250)	Prime	1,026
316	Aggr (TY-B GR-5)	Prime	1,026
316	Asph (AC-20-5TR)	1st	1,026
316	Aggr (TY-PB GR-3)(SAC-B)	1st	1,026

Basis of Estimate

Item	Description	Course	Rate	SY	Quantity
310	Asph (RC-250)	Prime	0.25 Gal/SY	1,026	257 Gal
316	Aggr (TY-B GR-5)(SAC-B)	Prime	130 SY/CY	1,026	8 CY
316	Asph (AC-20-5TR)	1st	0.42 Gal/SY	1,026	431 Gal
316	Aggr (TY-PB GR-3)(SAC-B)	1st	90 SY/CY	1,026	12 CY

CSJ: 0923-09-064
"During demolition, the contractor will carefully remove and save several stones from the bridge's masonry substructure. The stones will be collected by the TxDOT inspector or other TxDOT employee to provide to the Eastland County Museum for display."

Trees that are to be trimmed and brush that is to be trimmed or removed that are not over the roadway or bridge(s), will be trimmed or removed in accordance with the Roadside Vegetation Management Manual to a height of fourteen feet. Remove limbs at the trunk with less than twenty-one feet of clearance above the pavement or bridge(s).

See the "Environmental" section of the plans for additional information.

TEXAS ONE CALL

Fiber optic cable systems, gas lines, underground power lines, water lines, sewer lines, and other various utilities may be buried within the project limits. Protection of these utility systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. The Contractor shall telephone Texas One Call at 1-800-344-8377 (a 24-hour number), to determine if utilities are buried anywhere on the project in accordance with all UNDERGROUND FACILITY DAMAGE PREVENTION AND SAFETY laws. This action, however, will in no way be interpreted as relief of responsibilities under the terms of the Contract as set out in the plans and specifications. Coordinate the repair of all damages caused by daily operations and have facilities restored to service in a timely manner as directed at no additional cost to TxDOT.

GENERAL

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

Name	Email Address
Jordan Perry, P.E.	Jordan.perry@txdot.gov

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

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

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

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

The term "Article" or "Section" referred to hereon is defined in the forward of the *Standard Specifications for Construction and Maintenance of Highways, Streets, And Bridges* adopted by the Texas Department of Transportation November 2014.

The total disturbed area is shown on the SW3P sheet(s).

The Contractor will establish drainage in ditches before seeding or as directed by the Engineer.

Watering for dust control will be required as Directed by the Engineer and will be considered subsidiary to the various bid items.

ITEM 5 CONTROL OF WORK

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.1. "Method A".

The contractor will be required to place and maintain Blue Tops with wooden hubs for new flexible base.

Prior to contract letting, bidders may obtain a free computer diskette or a computerized transfer of files (from the Engineer's office) that contains the earthwork information. If copies of the actual cross-sections in addition to, or instead of, the diskette are requested, they will be available at the Engineers office for borrowing by copying companies for the purpose of making copies for the bidder at the bidder's expense.

Precast Alternate Proposals:
When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of

County: EASTLAND **Sheet 4A**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor."

ITEM 6 CONTROL OF MATERIALS

In accordance with **Section 6.10.2**, the Contractor will dispose of all painted steel at a steel recycling or smelting facility and a receipt will be required. In lieu of this, the Contractor has the option to either show proof that the paint is lead free or show proof that the lead paint has been abated by an abatement certified company. The Department will not be obligated for the cost of paint testing and/or abatement materials, processes, personnel, incidentals, etc.

Lead Containing Paint (LCP):

CSJ: 0288-03-032
The steel piles and bridge rails to be removed contain lead paint. Submit a proposed demolition plan for approval by the Engineer at least 60 days prior to the desired demolition date to allow the Department time to provide for a separate contractor (third party) to remove LCP. Demolition plan should limit disturbance where lead paint is located when possible.

CSJ: 0923-09-064
The bridge components to be removed may contain lead paint. Submit a proposed demolition plan for approval by the Engineer at least 60 days prior to the desired demolition date to allow the Department time to provide for a separate contractor (third party) to remove LCP. Demolition plan should limit disturbance where lead paint is located when possible.

See **Special Provision 006-012** for additional information.

ACM Removal:

No asbestos have been found in tested materials. If suspect materials are encountered during bridge removal, contact Andrew Chisholm with the Department of Transportation for report and additional details

ITEM 7 LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

ITEM 8 PROSECUTION AND PROGRESS

Working days will be computed and charged in accordance with Section 8.3.1.4. "Standard Workweek".

Work will not be performed without time being charged unless otherwise exempted by the Section as defined above.

Work on Sunday(s) will not be allowed.

Working day charges will be in accordance with **SP 008---003** (90 calendar days after the date of the written authorization to begin work. Do not begin any work before the end of this period unless authorized in writing by the Engineer.) **This delay is for the manufacturing of bridge beams.**

Work on each location must be considered substantially complete and open to full traffic before moving to the next location. Only one location will be under construction at a time and will be constructed in the following order:

1st 0288-03-032 SH 16
2nd 092309-064

PROJECT SCHEDULES

Critical Path Method (CPM) scheduling will be required to be submitted and maintained monthly by the Contractor unless otherwise directed by the Engineer. (8.5.2.)

For monthly submittals, the Contractor will provide the schedule in an Adobe Acrobat compatible format (PDF file). If the Engineer requests the schedule in an electronic format, the Contractor will submit a schedule that is fully compatible with Primavera P6 Professional Release 15.

ITEM 100 PREPARING RIGHT OF WAY

Perform “Preparing Right of Way” operations in the usual manner within the limits of the excavation and fill areas. Remove only such trees and brush as designated by the Engineer. Exercise care to avoid disturbing the native grasses unnecessarily during construction, removal of the existing bridge, and during the installation of the temporary fence.

Within the construction limits, blade and windrow the top 8 inches of vegetative material to just outside the construction limits. Once ditch slopes and drainage have been established and approved, blade the windrow evenly over the disturbed area within the construction limits. This work is to be done as the job progresses and in conjunction with seeding. Work on the project may be suspended, if in the opinion of the Engineer, the Contractor does not make a good faith effort to stabilize loose material as the project progresses. Time will not be suspended. This work is subsidiary to Item 100.

The removal of existing and temporary fence will not be paid for directly but will be considered subsidiary to Item 100 “Preparing Right Of Way”.

ITEM 164 SEEDING FOR EROSION CONTROL

The Contractor should anticipate two (2) separate mobilizations for seeding at each project location. Blade and windrow outside construction limits, grass, weeds, and topsoil to grass roots depth.

TEM 166 FERTILIZER

Fertilize all areas of project to be seeded.

County: EASTLAND **Sheet 4B**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

Furnish and apply fertilizer with analysis of 20-10-10 at a rate of 300 bulk pounds per acre.

ITEM 168 VEGETATIVE WATERING

Water all areas of project to be seeded.

Vegetative watering is estimated at 1 inch per week for 4 weeks.

Vegetative watering may be adjusted as directed by the Engineer to ensure saturation for vegetative establishment.

ITEM 169 SOIL RETENTION BLANKETS

An approved Bonded Fiber Matrix Soil Retention Blanket will be used at the TTI tested rate shown below:

Cocoflex ET-FGM	3500 lbs/acre
Earthguard Fiber Matrix	3000 lbs/acre
EcoFlex HP	3500 lbs/acre
Flexterra HP-FGM	3500 lbs/acre
Flexterra FGM	3500lbs/acre
Fleterra ultra	3500 lbs/acre
Hy-C3	3500 lbs/acre
HY-C4	4000 lbs/acre
Hyrda-CX2	4000 lbs/acre
Hydra CM	3500 lbs/acre
Hydroblanket BFM	3500 lbs/acre
Hydrostraw BFM	3500 lbs/acre
ProMatrix EFM	3500 lbs/acre
Soil Guard	3700 lbs/acre sand, 3500 lbs/acre clay
Terra Matrix	3000 Lbs/acre
SprayMatrix FRM	3500 lbs/acre
Wood-Lok HPM	3500 lbs/acre
Proganics Dual	5500 lbs/acre
ProGuard	3000 lbs/acre
Conwed Fiber 2000	2500 lbs/acre

ITEM 216 PROOF ROLLING

CSJ 0288-03-032
Proof Rolling will be required for each traffic lane (travel lanes, center turn lanes, right-hand/left-hand turn lanes, deceleration lanes, acceleration lanes, etc.) throughout the entire project and is estimated at 2 hours.

ITEM 247 FLEXIBLE BASE

A grader (a road grader, a blade, a maintainer, or a motor grader) will be used to process base unless otherwise approved by the Engineer.

Do not add field sand to modify the finish material to meet requirements.

Place new flexible base in lifts of approximately equal depth not to exceed 6 inches unless otherwise directed.

Density requirements for this item may be waived for the construction of detours as directed by the Engineer.

ITEM 310 PRIME COAT

Cure prime placed with a cutback asphalt binder for 7 days before placing subsequent surface courses unless otherwise directed by the Engineer.

Finished base must be dampened before the application of a cutback asphalt binder is placed. The cutback asphalt binder will not be placed if standing water is visible on the finished base. This work will not be paid for directly but will be considered subsidiary to Item 310.

ITEM 316 SURFACE TREATMENTS

All precoated aggregate will use PG 64-22 asphalt.

Furnish aggregate with a minimum B surface aggregate classification.

The asphalt rates shown hereon are for average conditions. The rate may be varied as determined by the Engineer to obtain proper embedment of aggregate.

Warm season asphalts are not to be placed between September 1st and April 30th unless otherwise directed/approved.

Protect all existing bridges, and other exposed concrete surfaces within the limits of this project(s), as much as practicable, from asphalt materials by any means approved by the Engineer at the contractor's expense.

Use a medium pneumatic roller meeting the requirements of Item 210 as directed by the Engineer. This work will be subsidiary to the various bid items.

ITEM 416 DRILLED SHAFT FOUNDATIONS

Casing is anticipated for the installation of the drilled shafts. Refer to **Section 416.3.3** for requirements.

The Contractor Force Account "Other" that has been established for this project is intended to be utilized for core holes. In accordance with Section 416.5.2 core holes will be paid at $200 each. 4 core holes are estimated for this project.

County: EASTLAND **Sheet 4C**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

ITEM 420 CONCRETE SUBSTRUCTURES

All Class C Concrete has been measured for plan quantity payment.

ITEM 421 HYDRAULIC CEMENT CONCRETE

Furnish dome lids with 4" x 8" cylinder test molds.

Strength testing equipment is not required for Contract controlling test.

ITEM 422 CONCRETE SUPERSTRUCTURES

CSJ: 0288-03-032
Transverse saw-cut grooves will be required in the bridge deck and will not be paid for directly but will be considered subsidiary to the various bridge items.

ITEM 427 SURFACE FINISHES FOR CONCRETE

Surface Area II will receive a rub finish.

ITEM 432 RIPRAP

Locations and quantities may be varied as directed by the Engineer to accommodate field conditions.

Limit excavation to within 1' of riprap. If excavation exceeds these limits without the Engineer's approval, riprap will be extended to the limits of the disturbance. No additional compensation will be allowed for this work.

ITEM 459 GABIONS AND GABION MATTRESSES

Locations and quantities may be varied as directed by the Engineer to accommodate field conditions.

Due to field conditions changing during the removal of the existing bridge and the construction of the new structure, gabion installation will be verified by the Engineer before the Contractor installs the gabion(s) or gabion mattress(s). Gabion(s) or gabion mattress(s) located under the bridge will be installed before the bridge beams are installed.

Limit excavation to within 1' of the gabion(s) or gabion mattress(s). If excavation exceeds these limits without the Engineer's approval, the gabion(s) or gabion mattress(s) will be extended to the limits of the disturbance. No compensation for the additional work will be allowed.

ITEM 496 REMOVING STRUCTURES

Handle materials when removing structures in accordance with Item 6.

Exercise care to avoid disturbing the native grasses unnecessarily during removal of the existing bridge.

Notify TxDOT at least 60 days prior to any bridge removal. The Texas Department of State Health Services (DSHS) requires TxDOT to notify the DSHS of the bridge removal even if no asbestos is present. The notification form to retain/notify the DSHS licensed asbestos consultant must be postmarked at least 10 working days prior to the scheduled abatement and/or demolition. If the work does not happen on the notified date, then another 10 Working-Day, Prior-To-Work Notification will be required.

Provide a detailed plan for the removal of the existing structure to include the schedule of removal and list of all equipment to be used.

The structure or structures to be removed may have surface coatings, which may contain hazardous materials. Provide for the safety and health of employees and abide by all OSHA Standards and Regulations as well as those set by Texas Department of State Health Services (DSHS).

ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING

A construction speed zone is included in this project. The Engineer will determine the locations of speed zone signs. The Contractor will furnish, install and remove reduction in speed signs and speed zone signs.

The Contractor will be required to keep all TCP devices clean. If notified by the Engineer to clean the TCP devices, the Contractor will have until the end of that daylight period to comply. Failure to comply will result in a suspension of all work until the TCP devices are clean. Time will not be suspended.

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.

All equipment operated by the Contractor on or within thirty feet (30’) of the roadway will have a functioning flashing beacon mounted on it. Motor graders will have two standard orange warning flags mounted on them in addition to the flashing beacon.

The Contractor will be responsible for maintaining the edge of the roadway throughout the project in a traversable condition and/or as directed by the Engineer. Salvaged milling may be used as directed by the Engineer. This work will not be paid for directly and will be considered subsidiary to Item 502 “Barricades, Signs, and Traffic Handling”.

All devices shown on the TCP Standards are required and considered subsidiary to Item 502 unless specifically outlined elsewhere in the plans.

County: EASTLAND **Sheet 4D**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

All signs will be constructed in accordance with the details shown in the current Standard Highway Sign Designs for Texas manual.

ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

BMP’s will not be installed until authorized by the Engineer.
The Engineer will determine actual time and placement locations of BMP's and temporary measures once construction has begun.

Stockpile sites may be cleared of cover vegetation, but the vegetation root system will not be destroyed.

ITEM 552 WIRE FENCE

Wire fence quantities shown on the plans are approximate and may be adjusted in the field as approved by the Engineer.

Notify the Engineer three weeks prior to beginning any fence work.

ITEM 644 SMALL ROADSIDE SIGN ASSEMBLIES

The Contractor will notify the Engineer 5 working days before installing any sign base. The Engineer will coordinate with the Contractor and the Maintenance office to assure proposed sign placements are in accordance with the current version of the Sign Crew Field Book and the TMUTCD. Any signs that are placed without this coordination by the Contractor that are not located correctly will be removed and relocated at the Contractor’s expense.

For Triangular Slip Base systems use HWYCOM (3 way set screw), Southern Plains (2 bolt clamp), or approved equivalent.

Build signs not detailed in the plans according to the latest edition of the Standard Highway Sign Designs for Texas.

TxDOT will mark the locations of the SPEED LIMIT (R2-1) and REDUCED SPEED LIMIT AHEAD (W3-5) signs.

Existing roadside signs are to be removed/relocated and mounted on temporary supports and placed during construction as directed by the Engineer. The removal/relocation and temporary mounting of any existing sign (stop, yield, warning, etc.) will not be paid for directly but will be considered subsidiary to Item 644 unless otherwise directed by the Engineer.

Signs that are to be transferred to new posts must be placed upon the new supports before the end of the working day. Regulatory signs must be transferred immediately.

Conformable Retroreflective Sheeting in accordance with DMS 8300 will be required on all Warning, Stop, and Yield signs. Retroreflective sheeting wrapped around a sign support is yellow unless the sign on the

support is a Stop or Yield, in which case the sheeting will be red. Retroreflective sheeting will have a height on the post of 12 inches and the bottom of the sheeting will be 4 feet above the edge of the travel lane. Retroreflective sheeting will not be paid for directly but will be considered subsidiary to Item 644 Small Roadside Sign Assemblies.

ITEM 662 WORK ZONE PAVEMENT MARKINGS

Removable work zone pavement markings will be raised pavement markers unless otherwise approved by the Engineer.

The temporary tabs will be removed once final striping has been placed.

Temporary tabs will be placed in accordance with WZ (STPM) standard.

ITEM 666 RETROREFLECTORIZED PAVEMENT MARKINGS

A mobile retroreflectometer is not required for this project.

Furnish a needlepoint micrometer gauge Mitutoyo - Model 342-711-30 or equivalent.

Sealed roadways will be allowed to cure for 3 days before final striping is placed unless otherwise directed by the Engineer.

ITEM 672 RAISED PAVEMENT MARKERS

Place raised pavement markers no sooner than 24 hours after final striping has been placed or as directed.

ITEM 677 ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS

Eliminate existing pavement markings utilizing the Blasting Method (677.4.3) or the Mechanical Method (677.4.4). Surface Treatment Method (677.4.1) and Burn Method (677.4.2) will not be allowed on concrete surfaces.

ITEM 6185 TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)

Provide the number of vehicles with truck mounted attenuators (TMA) listed in the table below. The Contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

STANDARD	# TMA'S REQUIRED
TCP(2-1)	1
TCP(2-2)	1
TCP(3-1)	2
TCP(3-3)	2

County: EASTLAND **Sheet 4E**

Highway: SH 16, ETC. **Control:** 0288-03-032, ETC.

CSJ 0288-03-032: Stationary shadow vehicle(s) with TMA are estimated at 5 days for this project.
CSJ 0288-03-032: Stationary shadow vehicle(s) with TMA are estimated at 24 hours for this project.

QUANTITY SHEET

CONTROLLING PROJECT ID 0288-03-032 **DISTRICT** Brownwood **COUNTY** Eastland
HIGHWAY CR 136, SH 16

				CONTROL SECTION JOB	**0288-03-032**		**0923-09-064**		TOTAL EST.	TOTAL FINAL
				PROJECT ID	**A00129559**		**A00062923**			
				COUNTY	**Eastland**		**Eastland**			
				HIGHWAY	**SH 16**		**CR 136**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**		EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA		9.000		3.700		12.700	
	110-6001	EXCAVATION (ROADWAY)	CY		780.000		135.000		915.000	
	110-6002	EXCAVATION (CHANNEL)	CY		864.000		545.000		1,409.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)	CY				25.000		25.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY		1,274.000				1,274.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY		2,556.000		954.000		3,510.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY		1,278.000		477.000		1,755.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY		1,278.000		477.000		1,755.000	
	168-6001	VEGETATIVE WATERING	MG		116.000		43.000		159.000	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY		2,556.000				2,556.000	
	169-6003	SOIL RETENTION BLANKETS (CL 1) (TY C)	SY				300.000		300.000	
	216-6001	PROOF ROLLING	HR		2.000				2.000	
	247-6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	CY		1,420.000				1,420.000	
	247-6055	FL BS (CMP IN PLC)(TY D GR 3)(FNAL POS)	CY				171.000		171.000	
	251-6344	REWRK BS MTL (TY A)(2"- 4")(ORD COMP)	SY		882.000				882.000	
	310-6012	PRIME COAT (RC-250)	GAL		955.000		257.000		1,212.000	
	316-6017	ASPH (AC-20-5TR)	GAL		11,485.000		431.000		11,916.000	
	316-6177	AGGR(TY-B GR-5 SAC-B)	CY		30.000		8.000		38.000	
	316-6222	AGGR(TY-PB GR-3 SAC-B)	CY		43.000		12.000		55.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY		243.000				243.000	
	400-6005	CEM STABIL BKFL	CY		186.000		39.000		225.000	
	403-6001	TEMPORARY SPL SHORING	SF		111.000				111.000	
	416-6001	DRILL SHAFT (18 IN)	LF		126.000				126.000	
	416-6002	DRILL SHAFT (24 IN)	LF				183.000		183.000	
	416-6004	DRILL SHAFT (36 IN)	LF		315.000				315.000	
	416-6087	CORE HOLE	EA		2.000		2.000		4.000	
	420-6013	CL C CONC (ABUT)	CY		70.600		23.400		94.000	
	422-6001	REINF CONC SLAB	SF		5,060.000				5,060.000	
	422-6007	REINF CONC SLAB (SLAB BEAM)	SF				1,300.000		1,300.000	
	422-6015	APPROACH SLAB	CY		113.400				113.400	
	425-6012	PRESTR CONC SLAB BEAM (5SB15)	LF				247.110		247.110	
	425-6038	PRESTR CONC GIRDER (TX46)	LF		765.990				765.990	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY		40.000				40.000	
	450-6006	RAIL (TY T223)	LF		276.000		128.000		404.000	
	454-6004	ARMOR JOINT (SEALED)	LF		97.000				97.000	
	459-6007	GABION MATTRESSES (GALV)(12 IN)	SY		844.000		238.000		1,082.000	
	459-6009	GABIONS (3' X 3')(GALV)	CY		169.000		102.000		271.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0288-03-032 **DISTRICT** Brownwood **COUNTY** Eastland
HIGHWAY CR 136, SH 16

				CONTROL SECTION JOB	0288-03-032		0923-09-064		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00129559		A00062923			
				COUNTY	Eastland		Eastland			
				HIGHWAY	SH 16		CR 136			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA				1.000		1.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	EA		1.000				1.000	
	500-6001	MOBILIZATION	LS		50.00%		50.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO		12.000		4.000		16.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF		30.000				30.000	
	506-6004	ROCK FILTER DAMS (INSTALL) (TY 4)	LF				30.000		30.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF		30.000		30.000		60.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF		1,928.000		852.000		2,780.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF		1,928.000		852.000		2,780.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF				45.000		45.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF				45.000		45.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO		12.000				12.000	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF		570.000				570.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF		570.000				570.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF		570.000				570.000	
	530-6006	DRIVEWAYS (SURF TREAT)	SY		102.000				102.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF		350.000		100.000		450.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA		4.000				4.000	
	540-6007	MTL BEAM GD FEN TRANS (TL2)	EA				4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF		650.000				650.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA		4.000		4.000		8.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA		4.000				4.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA		2.000				2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA		2.000				2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA		2.000				2.000	
	552-6003	WIRE FENCE (TY C)	LF		270.000				270.000	
	560-6004	MAILBOX INSTALL-S (TWG-POST) TY 2	EA		1.000				1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA		4.000				4.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA		1.000				1.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA		6.000		6.000		12.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA		18.000				18.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA		18.000		12.000		30.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF		2,070.000				2,070.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF		10,800.000				10,800.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A	EA		270.000				270.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF		24.000				24.000	
	666-6302	RE PM W/RET REQ TY I (W)4"(SLD)(090MIL)	LF		1,800.000				1,800.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0288-03-032 **DISTRICT** Brownwood **COUNTY** Eastland
HIGHWAY CR 136, SH 16

				CONTROL SECTION JOB	0288-03-032		0923-09-064		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00129559		A00062923			
				COUNTY	Eastland		Eastland			
				HIGHWAY	SH 16		CR 136			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF		1,470.000				1,470.000	
	666-6314	RE PM W/RET REQ TY I (Y)4"(SLD)(090MIL)	LF		4,310.000				4,310.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA		131.000				131.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF		7,090.000				7,090.000	
	677-6028	ELIM EXT PV MRK & MRKS (RUMBLE STRIP)	LF		32.000				32.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF		440.000				440.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY		90.000				90.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF		160.000				160.000	
	6185-6002	TMA (STATIONARY)	DAY		5.000				5.000	
	6185-6003	TMA (MOBILE OPERATION)	HR		24.000				24.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS		1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS		1.000				1.000	

ROADWAY SUMMARY

LOCATION STA - STA	110-6001	110-6002	132-6006	164-6001	164-6009	164-6011	SUBSIDIARY	168-6001	169-6002	247-6053	251-6344
	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	BROADCAST SEED (PERM) (RURAL) (SANDY)	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	FERTILIZER	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY B)	FL BS (CMP IN PLC)(TYD GR1 -2)(FNAL POS)	REWRK BS MTL (TY A)(2"-4")(ORD COMP)
	CY	CY	CY	SY	SY	SY	TON	MG	SY	CY	SY
1353+20.00 TO 1381+60.00											
1381+60.00 TO 1384+00.00	436	0	38	570	285	285	0.02	26	570	400	
1384+00.00 TO 1388+40.00	130	864	1054	1464	732	732	0.05	66	1464	634	636
1388+40.00 TO 1390+60.00	214	0	182	522	261	261	0.02	24	522	386	246
1390+60.00 TO 1419+00.00											
TOTAL	**780**	**864**	**1274**	**2556**	**1278**	**1278**	**0.09**	**116**	**2556**	**1420**	**882**

ROADWAY SUMMARY

LOCATION STA - STA	502-6001	506-6002	506-6011	506-6038	506-6039	530-6006	560-6004
	BARRICADES, SIGNS AND TRAFFIC HANDLING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	DRIVEWAYS (SURF TREAT)	MAILBOX INSTALL-S (TWG-POST) TY 2
	MO	LF	LF	LF	LF	SY	EA
1353+20.00 TO 1381+60.00							
1381+60.00 TO 1384+00.00				480	480		
1384+00.00 TO 1388+40.00		30	30	1078	1078		
1388+40.00 TO 1390+60.00				370	370	102	1
1390+60.00 TO 1419+00.00							
TOTAL	**12**	**30**	**30**	**1928**	**1928**	**102**	**1**

TRAFFIC SUMMARY

LOCATION STA - STA	644-6001	644-6076	658-6014	658-6062	666-6302	666-6312	666-6314	672-6009	678-6001
	IN SM RD SN SUP&AM TY10BWG (1)SA(P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	RE PM W/RET REQ TY I (W)4"(SLD) (090MIL)	RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD) (090MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (4")
	EA	EA	EA	EA	LF	LF	LF	EA	LF
1353+20.00 TO 1381+60.00						670	2000	58	
1381+60.00 TO 1384+00.00	1				480	70	740	13	
1384+00.00 TO 1388+40.00	2		6	17	880		880	11	440
1388+40.00 TO 1390+60.00	1	1		1	440	100	440	11	
1390+60.00 TO 1419+00.00						630	250	38	
TOTAL	**4**	**1**	**6**	**18**	**1800**	**1470**	**4310**	**131**	**440**

TRAFFIC CONTROL SUMMARY - PHASE 1

LOCATION STA - STA	403-6001	512-6001	512-6025	512-6049	545-6003	545-6005	545-6019	662-6004	662-6034	662-6050	662-6075	677-6001	677-6028	510-6003
	TEMPORARY SPL SHORING	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4" (SLD)	WK ZN PAV MRK NON-REMOV (Y)4" (SLD)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)24" (SLD)	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PV MRK & MRKS (RUMBLE STRIP)	ONE-WAY TRAF CONT (PORT TRAF SIG)
	SF	LF	LF	LF	EA	EA	EA	LF	LF	EA	LF	LF	LF	MO
1381+60.00 TO 1384+00.00		40					1	290	5400	135	12	3790		
1384+00.00 TO 1388+40.00	28	500						500				1000		
1388+40.00 TO 1390+60.00		30					1	250	5400	135	12	1690		
TOTAL	**28**	**570**					**2**	**1040**	**10800**	**270**	**24**	**6480**		**2**

TRAFFIC CONTROL SUMMARY - PHASE 1

LOCATION STA - STA	6001-6001	6056-6001	6185-6002	6185-6003
	PORTABLE CHANGEABLE MESSAGE SIGN	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	DAY	LF	DAY	HR
1381+60.00 TO 1384+00.00		80		
1384+00.00 TO 1388+40.00				
1388+40.00 TO 1390+60.00		80		
TOTAL	**30**	**160**	**2**	**8**

NO.	REVISION	BY	DATE

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19397

SH 16 AT BEAR CREEK

QUANTITY SUMMARIES

SHEET 1 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		6

TRAFFIC CONTROL SUMMARY - PHASE 2

LOCATION STA - STA	403-6001	512-6001	512-6025	512-6049	545-6003	545-6005	545-6019	662-6004	662-6034	662-6050	662-6075	677-6001	677-6028	510-6003	6001-6001	6056-6001	6185-6002	6185-6003
	TEMPORARY SPL SHORING	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4" (SLD)	WK ZN PAV MRK NON-REMOV (Y)4" (SLD)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)24" (SLD)	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PV MRK & MRKS (RUMBLE STRIP)	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORTABLE CHANGEABLE MESSAGE SIGN	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	SF	LF	LF	LF	EA	EA	EA	LF	LF	EA	LF	LF	LF	MO	DAY	LF	DAY	HR
1381+60.00 TO 1384+00.00																		
1384+00.00 TO 1388+40.00	83																	
1388+40.00 TO 1390+60.00																		
TOTAL	**83**													**5**	**30**			

TRAFFIC CONTROL SUMMARY - PHASE 3

LOCATION STA - STA	403-6001	512-6001	512-6025	512-6049	545-6003	545-6005	545-6019	662-6004	662-6034	662-6050	662-6075	677-6001	677-6028	510-6003	6001-6001	6056-6001	6185-6002	6185-6003
	TEMPORARY SPL SHORING	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S)(N)(TL3)	WK ZN PAV MRK NON-REMOV (W)4" (SLD)	WK ZN PAV MRK NON-REMOV (Y)4" (SLD)	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W)24" (SLD)	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PV MRK & MRKS (RUMBLE STRIP)	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORTABLE CHANGEABLE MESSAGE SIGN	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	SF	LF	LF	LF	EA	EA	EA	LF	LF	EA	LF	LF	LF	MO	DAY	LF	DAY	HR
1381+60.00 TO 1384+00.00			40	40	1	1		320				340	16					
1384+00.00 TO 1388+40.00			500	500				500										
1388+40.00 TO 1390+60.00			30	30	1	1		210				270	16					
TOTAL			**570**	**570**	**2**	**2**		**1030**				**610**	**32**	**5**	**30**		**3**	**16**

FENCE SUMMARY

LOCATION STA - STA	552-6003
	WIRE FENCE (TY C)
	LF
1381+60.00 TO 1384+00.00	
1384+00.00 TO 1388+40.00	270
1388+40.00 TO 1390+60.00	
TOTAL	**270**

ITEM 552-6003 WILL BE USED FOR PERMANENT FENCING:
BRACES ESTIMATED @ 10 EA
CONTRACTOR WILL SURVEY THE EXISTING FENCE AND PLACE THE PROPOSED FENCE IN THE SAME LOCATION UNLESS DIRECTED BY THE ENGINEER

MBGF & RAIL SUMMARY

LOCATION STA - STA	432-6045	540-6002	540-6006	544-6001
	RIPRAP (MOW STRIP)(4 IN)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)
	CY	LF	EA	EA
1381+60.00 TO 1384+00.00	3			
1384+00.00 TO 1388+40.00	27	350	4	4
1388+40.00 TO 1390+60.00	10			
TOTAL	**40**	**350**	**4**	**4**

* SEE STRUCTURE SUMMARY FOR BRIDGE RAIL PAYMENT

REMOVAL SUMMARY

LOCATION STA - STA	496-6010	542-6001	544-6003	658-6060
	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (REMOVE)	REMOVE DELIN & OBJECT MARKER ASSMS
	EA	LF	EA	EA
1381+60.00 TO 1384+00.00			1	1
1384+00.00 TO 1388+40.00	1	650	2	17
1388+40.00 TO 1390+60.00			1	
TOTAL	**1**	**650**	**4**	**18**

REMOVE ONLY PORTIONS OF BRIDGE DURING PHASE 1 AND REMAINING PORTIONS IN PHASE 3. SEE BRIDGE PHASED REMOVAL DETAILS FOR MORE INFORMATION.

PREPARING ROW SUMMARY

LOCATION STA - STA	100-6002
	PREPARING ROW
	STA
1381+60.00 TO 1384+00.00	2.4
1384+00.00 TO 1388+40.00	4.4
1388+40.00 TO 1390+60.00	2.2
TOTAL	**9.0**

REMOVAL OF ALL TREES IN THE ROW WILL BE PAID UNDER PREPARING ROW BY STATION

NO.	REVISION	BY	DATE

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm # F-19297

SH 16 AT BEAR CREEK

QUANTITY SUMMARIES

SHEET 2 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		7

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
	1	M3-3		24	X	12	X		10BWG	1	SA	P		
		M1-6T	SOUTH 16 TEXAS	24	X	24	X							
	2	I-3		30	X	18	X		10BWG	1	SA	P		
			BEAR CREEK											
	3	I-3		30	X	18	X		10BWG	1	SA	P		
			BEAR CREEK											
	4	M3-1		24	X	12	X		10BWG	1	SA	P		
		M1-6T	NORTH 16 TEXAS	24	X	24	X							

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).

SHEET 1 OF 1

Texas Department of Transportation

Traffic Operations Division Standard

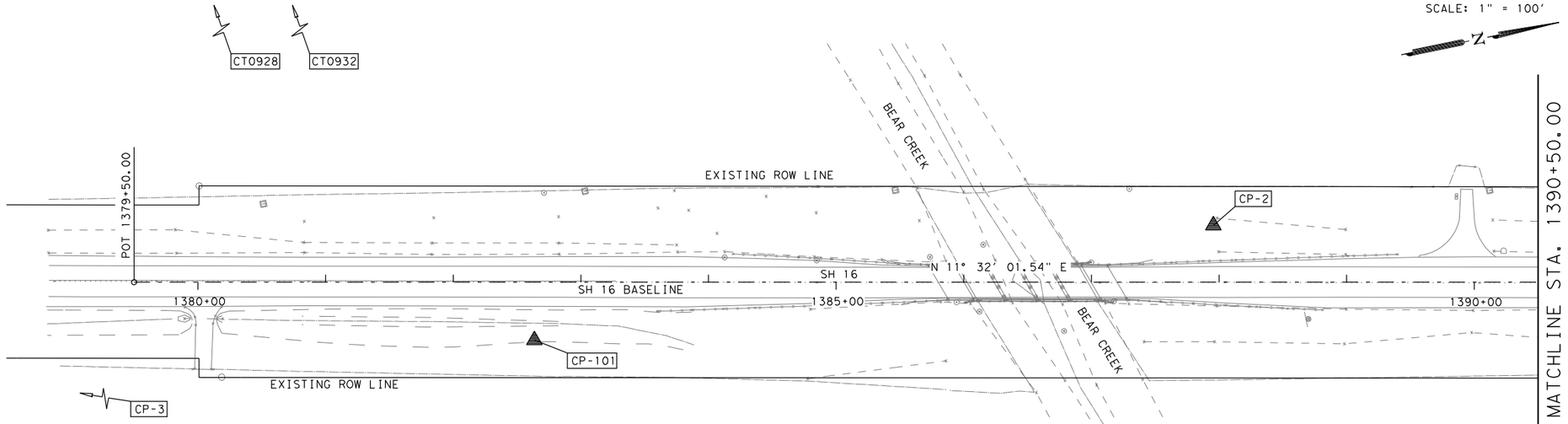
SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
4-16 8-16	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		8

18

DATE: DATE TIME
FILE: DOCUMENT NAME



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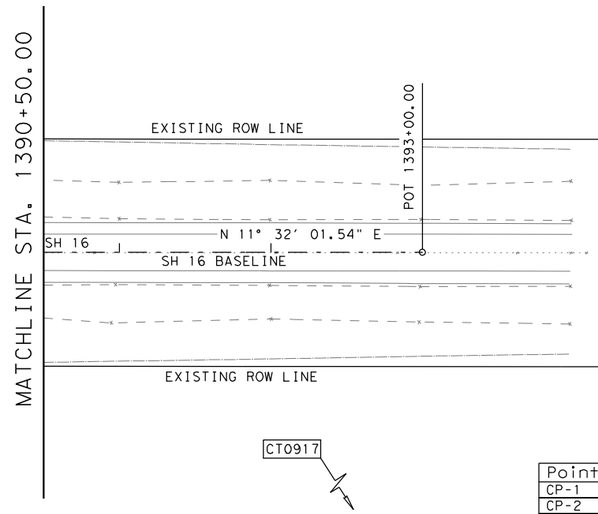
SCALE: 1" = 100'



0 50 100

SCALE: 1" = 100'

Point	North	East	Elevation	Station	Offset	Description
CP-1	6,861,759.71	1,962,792.47	1,072.91'	Off Chain	Off Chain	SET 5/8" IR W/TXDOT ALUM DISK IN CONC
CP-2	6,860,920.26	1,962,634.78	1,075.12'	1387+95.60	44.51' LT	SET 5/8" IR W/TXDOT ALUM DISK IN CONC
CP-3	6,859,780.58	1,962,505.50	1,099.29'	Off Chain	Off Chain	SET 5/8" IR W/TXDOT ALUM DISK IN CONC
CP-101	6,860,381.03	1,962,616.47	1,086.27'	1382+63.60	45.37' RT	SET 5/8" IR W/RODS CAP
CT0917	6,869,293.01	2,001,351.84	1,035.41'	Off Chain	Off Chain	DATUM ROD IN SLV (V 1479 1983)
CT0928	6,860,308.90	1,946,909.26	1,376.59'	Off Chain	Off Chain	DISK IN ROCK OUT CROP (F 1480 1983)
CT0932	6,855,555.15	1,922,413.48	1,453.22'	Off Chain	Off Chain	DISK IN ROCK OUT CROP (K 1480 1983)

NGS Benchmark Deferent Table			
Control Name	Published Elevation	Measured Elevation	Deferent (Pub. - Meas.)
	Elev.	Elev.	Elev.
CT0917	1,035.39	1,035.41	-0.02
CT0928	1,376.30	1,376.59	-0.29
CT0932	1,453.11	1,453.22	-0.11

Notes:

1. Measured values are based on redundant GPS VRS observations.

2. CT0917 is of First Vertical Order, Class II; published elevation based on NAVD88.

3. CT0928 is of First Vertical Order, Class II; published elevation based on NAVD88.

4. CT0932 is of First Vertical Order, Class II; published elevation based on NAVD88.

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).

2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).

3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TxDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR EASTLAND COUNTY, CAF = 1.00012, USING THE FORMULA: SURFACE / CAF = GRID

4. HORIZONTAL COORDINATES ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS MEASURED FROM TxDOT CORS TXEA AND TXST DURING OCTOBER, 2019.

5. ELEVATIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, ADJUSTED WITH DIGITAL LEVELING, AND HOLDING FIXED THE GPS DERIVED ELEVATIONS FOR CP-1 AND CP-3.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
JIMMY D. WALTON
5889
PROFESSIONAL
LAND SURVEYOR

10-8-2020

Survey Date: October, 2019

NO.	REVISION	BY	DATE

RODS Surveying, Inc.
6810 LEE ROAD, STE.100
SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS FIRM REGISTRATION No. 10030700

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm # F-10287

SURVEY CONROL INDEX SHEET SH 16 AT BEAR CREEK

Sheet 1 of 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		9

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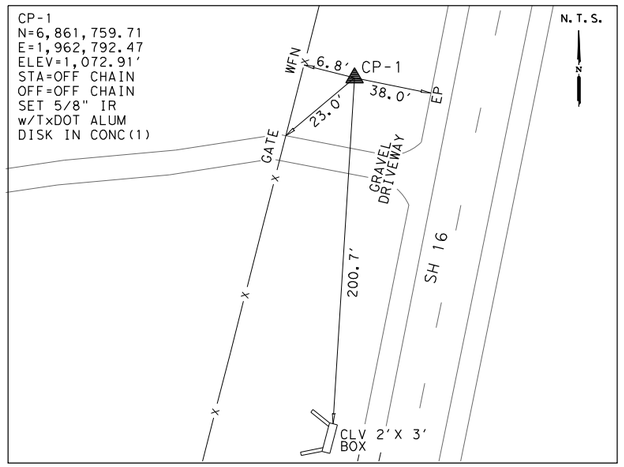
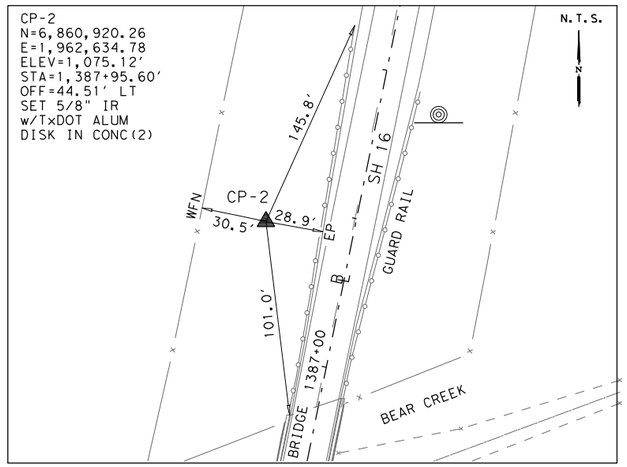


STATION IS LOCATED ON THE WEST SIDE OF SH 16, AND LYING 0.67 MILE SOUTH OF IH 20.



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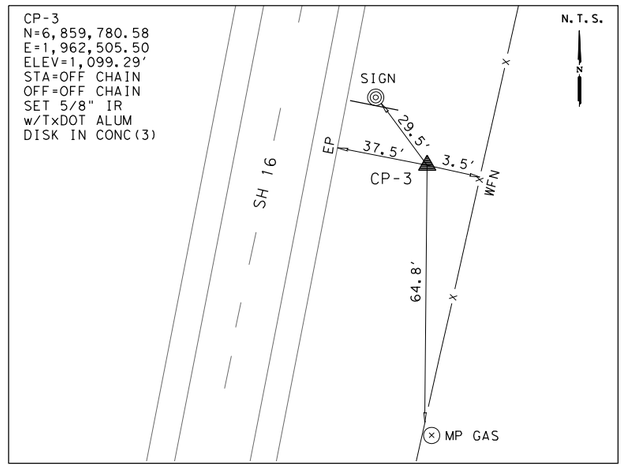

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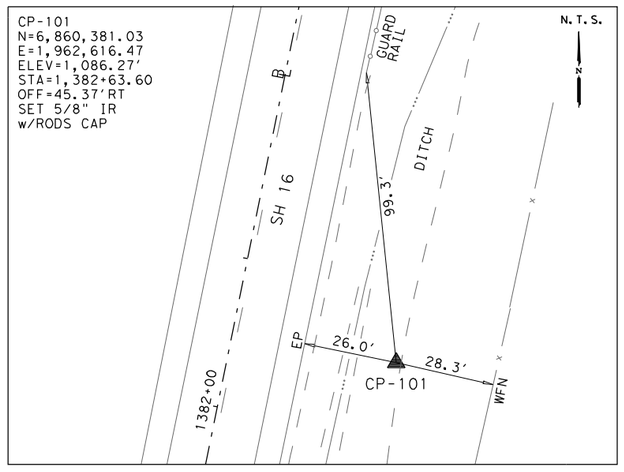

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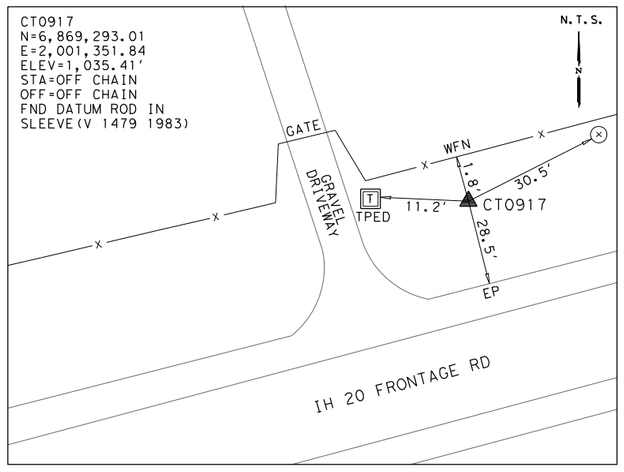
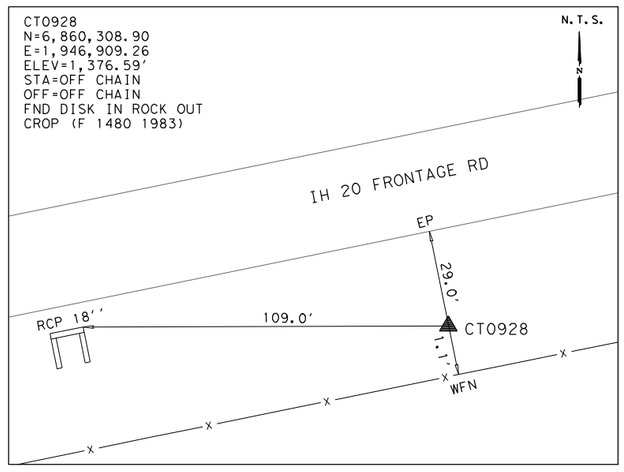
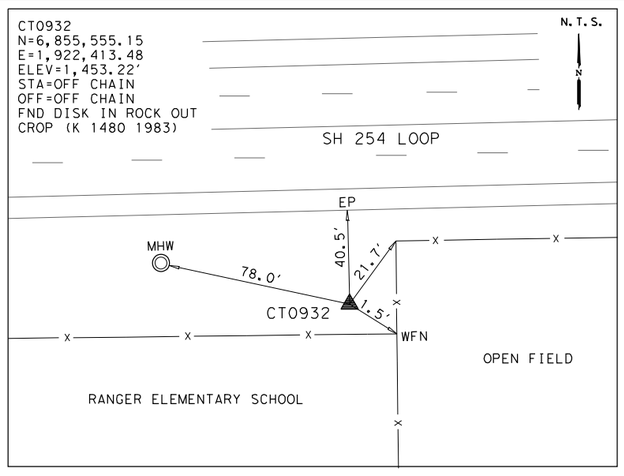


STATION IS LOCATED ON THE NORTH SIDE OF IH 20 FRONTAGE RD, AND LYING 1.38 MILE EAST OF SH 108.



STATION IS LOCATED ON THE SOUTH SIDE OF IH 20 FRONTAGE RD, AND LYING 2.90 MILES EAST OF SH 16.



STATION IS LOCATED ON THE SOUTH SIDE OF SH 254 LOOP, AND LYING 180' EAST OF COUNTY CLUB RD.

NOTES:

1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).

2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).

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5. ELEVATIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, ADJUSTED WITH DIGITAL LEVELING, AND HOLDING FIXED THE GPS DERIVED ELEVATIONS FOR CP-1 AND CP-3.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
JIMMY D. WALTON
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PROFESSIONAL
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10-8-2020

Survey Date: October, 2019

NO.	REVISION	BY	DATE

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SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS FIRM REGISTRATION
No. 10030700

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-10207

HORIZONTAL & VERTICAL CONTROL SHEET
SH 16 AT BEAR CREEK

Sheet 1 of 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		10

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SEQUENCE OF CONSTRUCTION NARRATIVE

PHASE 1

1. INSTALL ADVANCE WARNING SIGNS AND RUMBLE STRIPS ACCORDING TO THE BC AND WZ STANDARDS AND LATEST TMUTCD AND/OR AS DIRECTED BY THE ENGINEER.

2. PLACE PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) 7 CALENDAR DAYS IN ADVANCE OF THE CHANGE TO TRAFFIC PATTERN. LOCATION OF THE PCMS AND MESSAGE TO BE DISPLAYED TO BE APPROVED BY THE ENGINEER.

3. INSTALL TEMPORARY EROSION CONTROL IN ACCORDANCE WITH THE SW3P PLANS AND/OR AS DIRECTED AND APPROVED BY ENGINEER.

4. SET UP TRAFFIC CONTROL IN ACCORDANCE WITH TCP PLANS AND TCP(2-8b)-18. DRIVEWAY LOCATED AT STA 1390+00 TO BE CONTROLLED WITH ADDITIONAL TEMPORARY TRAFFIC SIGNAL.

5. INSTALL TEMPORARY SPECIAL SHORING AND REMOVE EXISTING PORTION OF BRIDGE AS SHOWN ON BRIDGE PHASED REMOVAL DETAILS.

PHASE 2

1. MAINTAIN TRAFFIC CONTROL SETUP FROM PHASE 1.

2. INSTALL TEMPORARY SPECIAL SHORING AND CONSTRUCT PHASE 2 PORTION OF PROPOSED BRIDGE.

3. CONSTRUCT FLEX BASE, PRIME COAT AND 2-CST ON SB SIDE OF ROADWAY.

4. CONSTRUCT T223 RAIL, MBGF, SGT AND MOW STRIP.

5. FINAL GRADING AND PLACEMENT OF PERMANENT SEEDING.

PHASE 3

1. PLACE PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) 7 CALENDAR DAYS IN ADVANCE OF THE CHANGE TO TRAFFIC PATTERN. LOCATION OF THE PCMS AND MESSAGE TO BE DISPLAYED TO BE APPROVED BY THE ENGINEER

2. SET UP TRAFFIC CONTROL IN ACCORDANCE WITH TCP PLANS AND TCP(2-8b)-18. DRIVEWAY LOCATED AT STA 1390+00 TO BE CONTROLLED WITH ADDITIONAL TEMPORARY TRAFFIC SIGNAL.

3. REMOVE REMAINING PORTION OF EXISTING ROADWAY AND BRIDGE AS SHOWN ON BRIDGE PHASED REMOVAL DETAILS.

4. REMOVE TEMPORARY SPECIAL SHORING AND CONSTRUCT PHASE 3 PORTION OF PROPOSED BRIDGE.

5. CONSTRUCT FLEX BASE, PRIME COAT AND 2-CST ON NB SIDE OF ROADWAY.

6. CONSTRUCT T223 RAIL, MBGF, SGT AND MOW STRIP.

7. FINAL GRADING AND PLACEMENT OF PERMANENT SEEDING.

PHASE 4

1. PLACE REMAINING 2-CST TO COVER WORK ZONE PAVEMENT MARKINGS. PLACE FINAL PAVEMENT MARKINGS UTILIZING TCP(3-1)-13 AND TCP(3-3)-14.

2. REGRADE SLOPES (IF NECESSARY) AND PERFORM FINAL CLEAN-UP.

3. REMOVE TEMPORARY EROSION CONTROL DEVICES AND ADVANCE WARNING SIGNS WHEN APPROVED BY ENGINEER.

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER
3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN NARRATIVE

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		11

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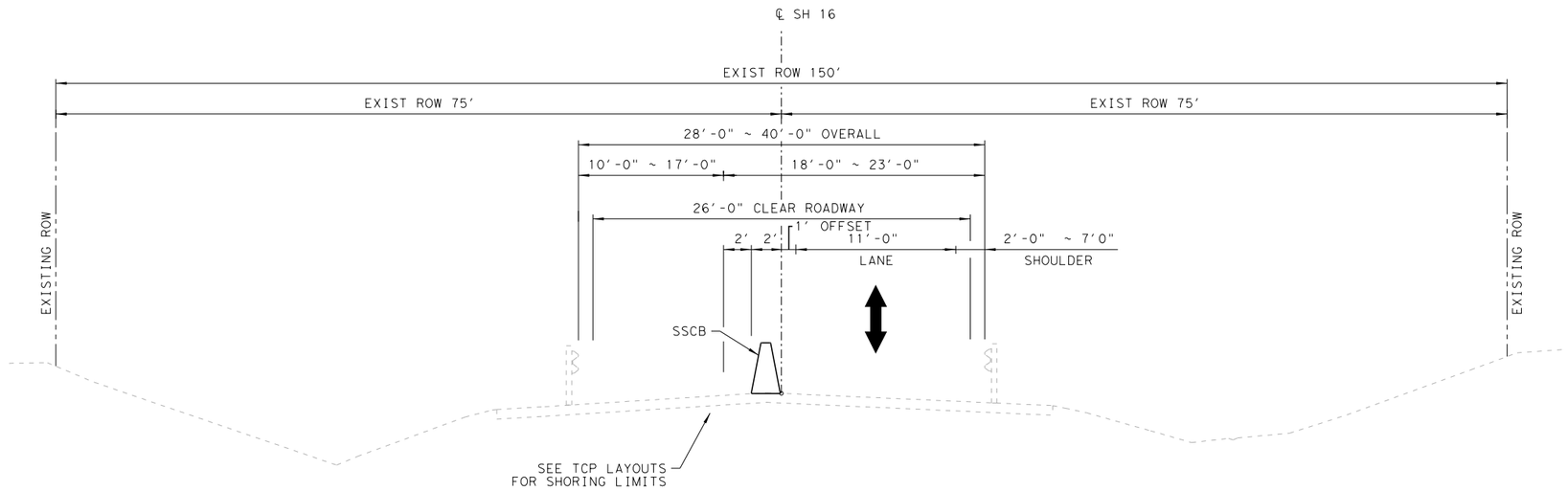
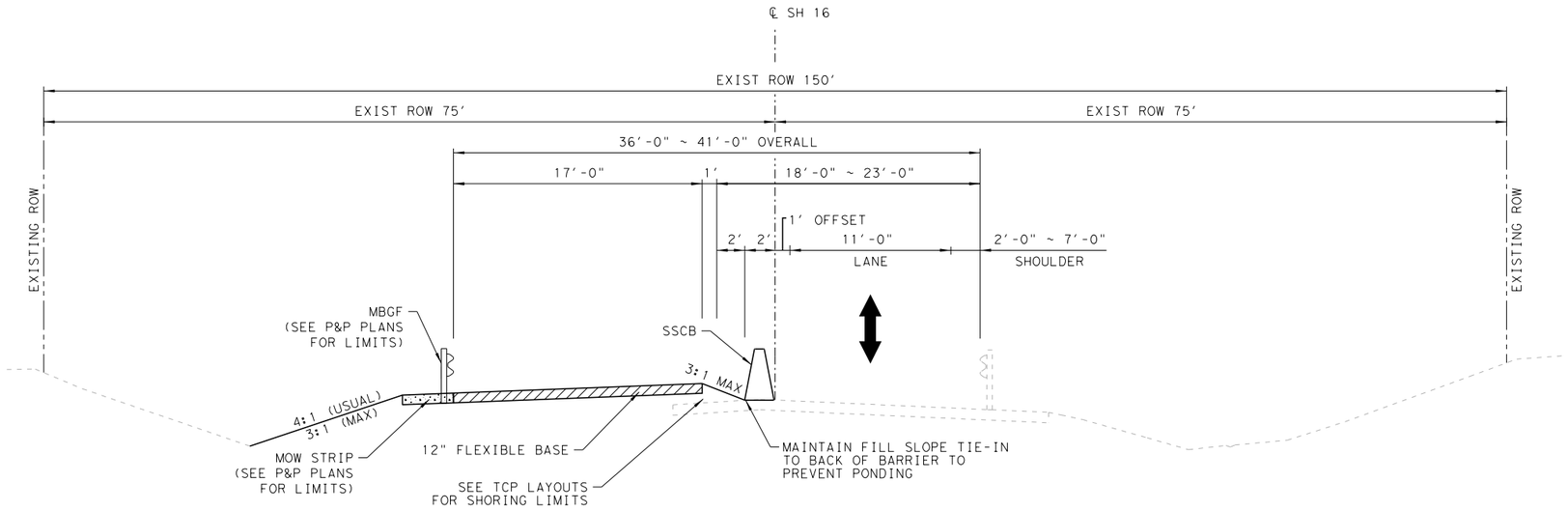


PHASE 1 TYPICAL SECTION

STA 1383+60.00 TO STA 1385+95.00
STA 1386+95.00 TO STA 1389+30.00



PHASE 2 TYPICAL SECTION

STA 1381+60.00 TO STA 1385+95.00
STA 1387+05.00 TO STA 1390+60.00

0 5 10
SCALE: 1" = 10'

LEGEND

CONSTRUCTION (THIS PHASE)

CONSTRUCTION (PREVIOUS PHASE)

NOTE:

REFER TO BRIDGE PHASED REMOVAL DETAILS FOR ADDITIONAL INFORMATION.

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED
PROFESSIONAL ENGINEER
3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

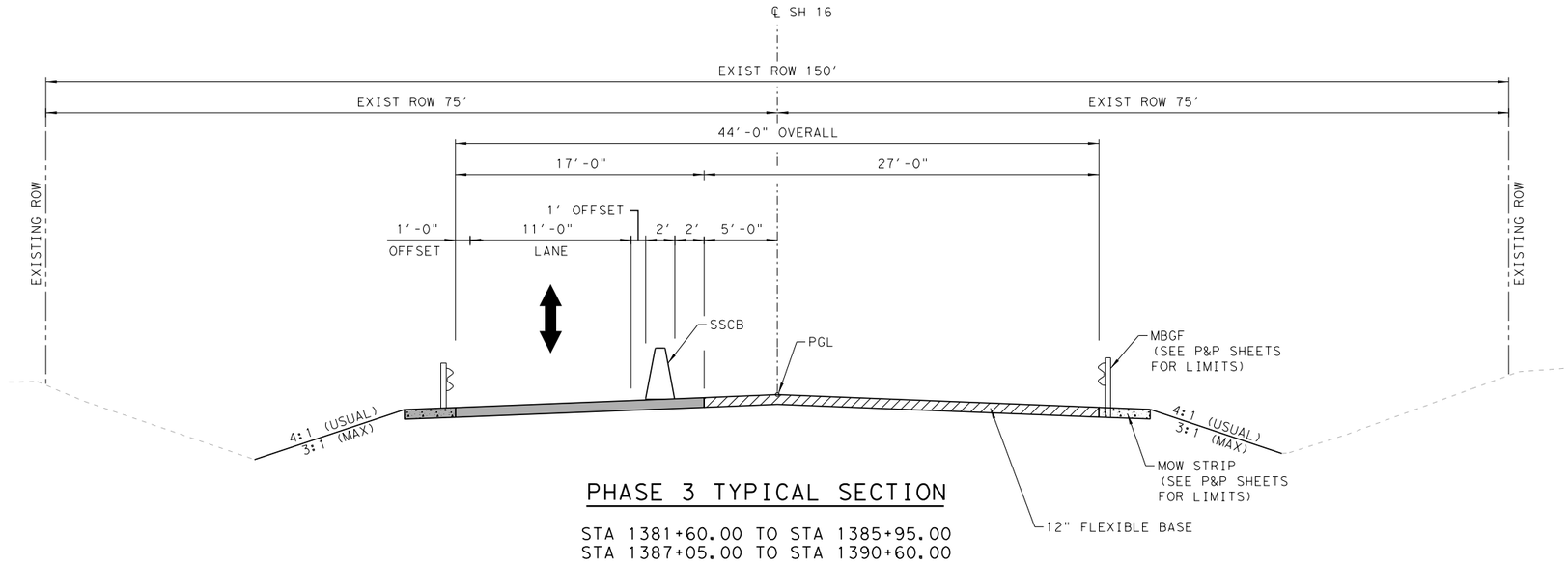
TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19097

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN TYPICAL SECTIONS

SHEET 1 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		12



PHASE 3 TYPICAL SECTION

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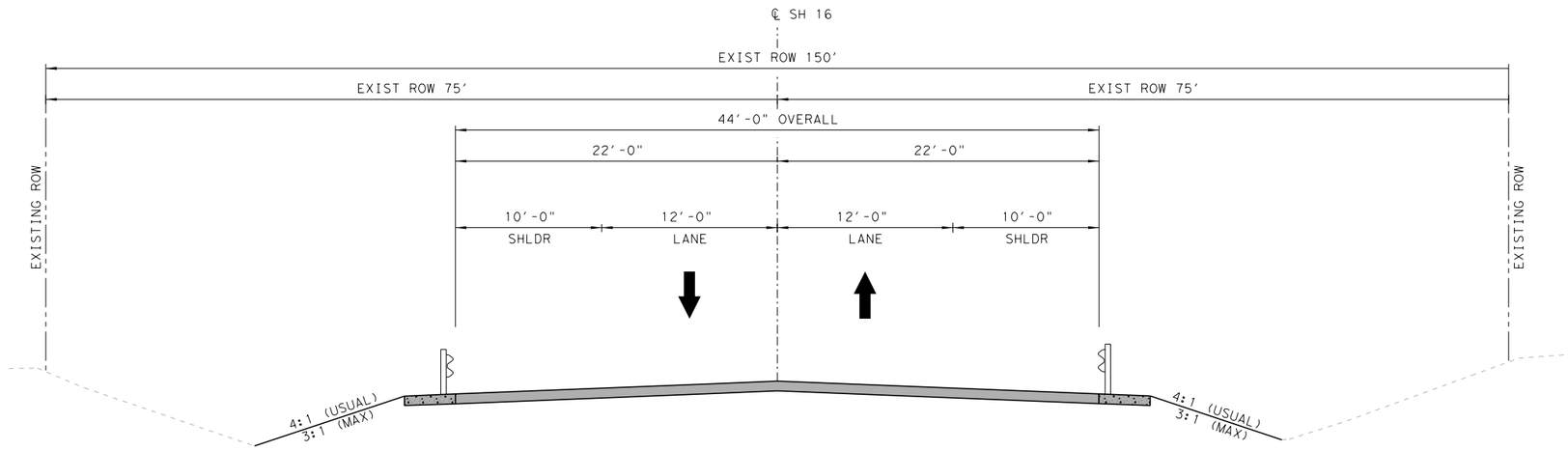
STA 1387+05.00 TO STA 1390+60.00



PHASE 4 TYPICAL SECTION

STA 1381+60.00 TO STA 1385+95.00
STA 1387+05.00 TO STA 1390+60.00

0 5 10
SCALE: 1" = 10'

LEGEND

CONSTRUCTION (THIS PHASE)

CONSTRUCTION (PREVIOUS PHASE)

NOTE:

REFER TO BRIDGE PHASED REMOVAL DETAILS FOR ADDITIONAL INFORMATION.

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER
3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

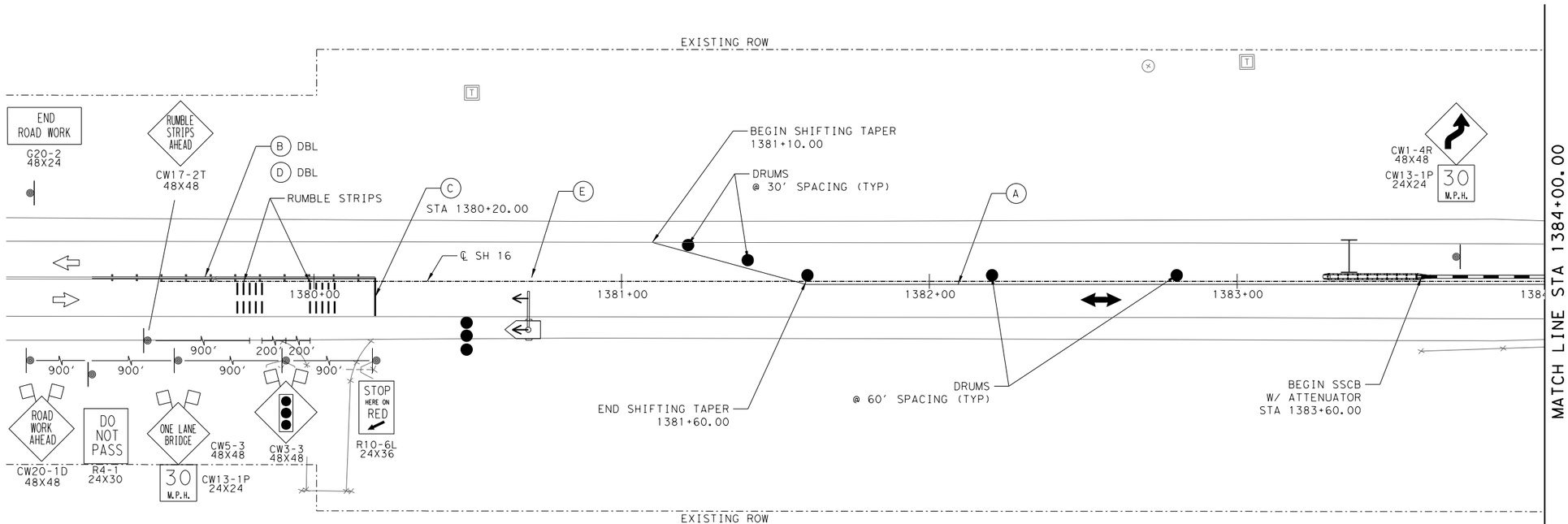
TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN TYPICAL SECTIONS

SHEET 2 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		13



N

0 20 40

SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
- TEMPORARY SHORING
- TYPE 3 BARRICADE
- (A) WRK ZN PAV MRK NON-REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK NON-REMOV (Y) (4") (SLD)
- (C) WRK ZN PAV MRK REMOV (W) (24") (SLD)
- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER

3/24/2021

RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 1

SHEET 1 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		14

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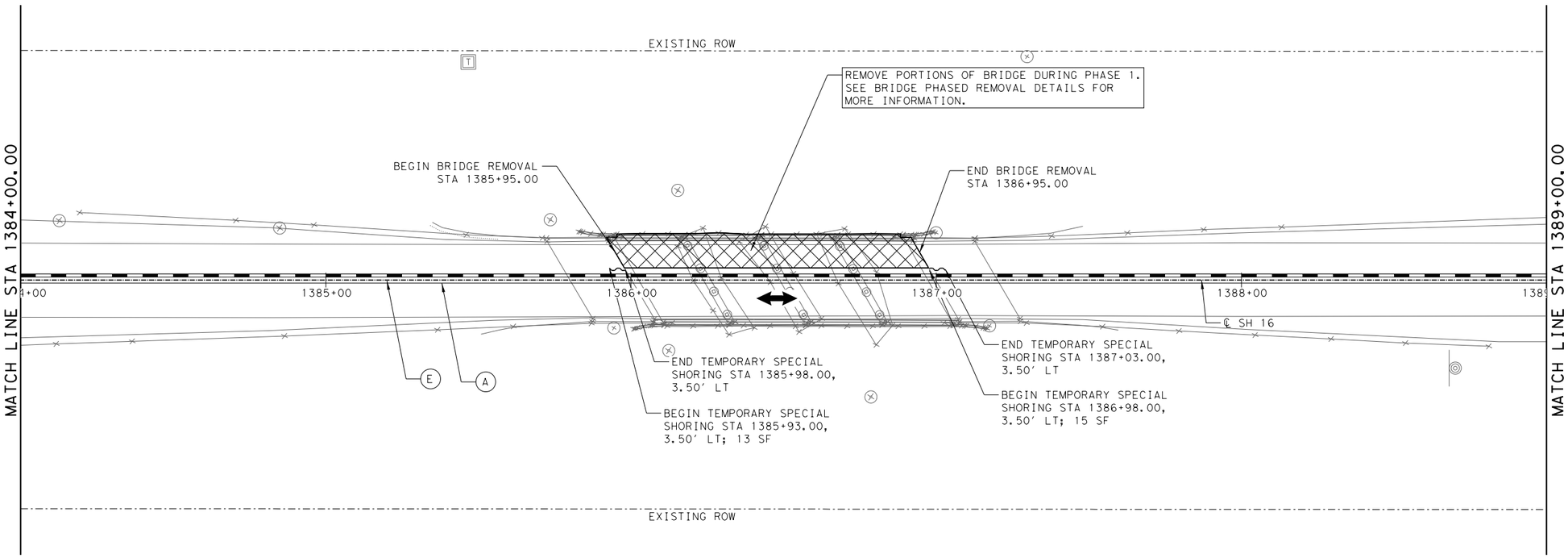

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
- TEMPORARY SHORING
- TYPE 3 BARRICADE
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- (B) WRK ZN PAV MRK NON-REMOV (Y) (4") (SLD)
- (C) WRK ZN PAV MRK REMOV (W) (24") (SLD)
- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER
3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

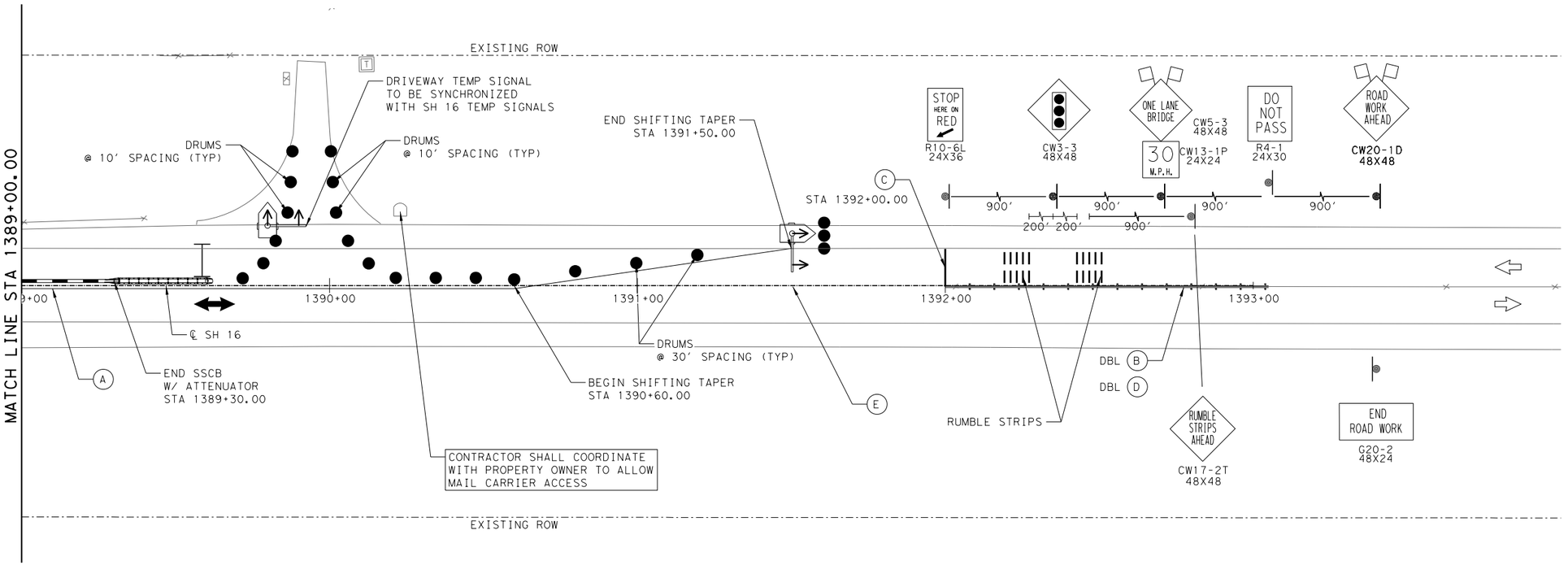
TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 1

SHEET 2 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		15



N

0 20 40

SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
- TEMPORARY SHORING
- TYPE 3 BARRICADE
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- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED
PROFESSIONAL ENGINEER

3/24/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19289

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 1

SHEET 3 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		16

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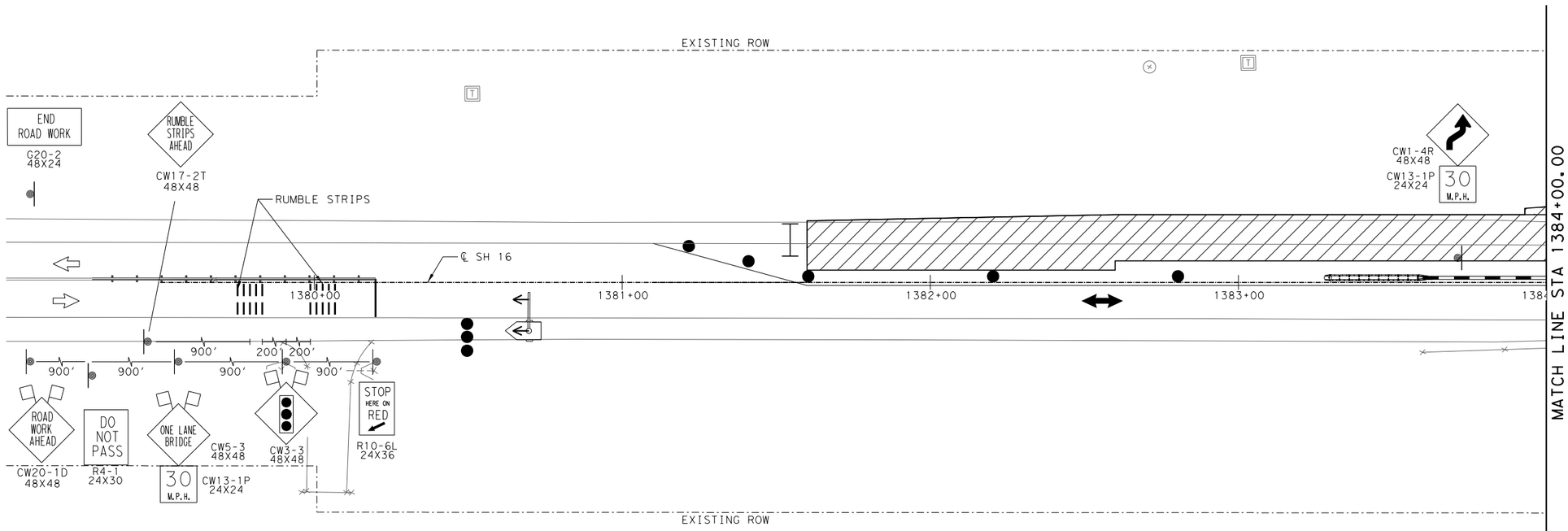

N

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SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
- TEMPORARY SHORING
- TYPE 3 BARRICADE
- (A) WRK ZN PAV MRK NON-REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK NON-REMOV (Y) (4") (SLD)
- (C) WRK ZN PAV MRK REMOV (W) (24") (SLD)
- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER
3/24/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

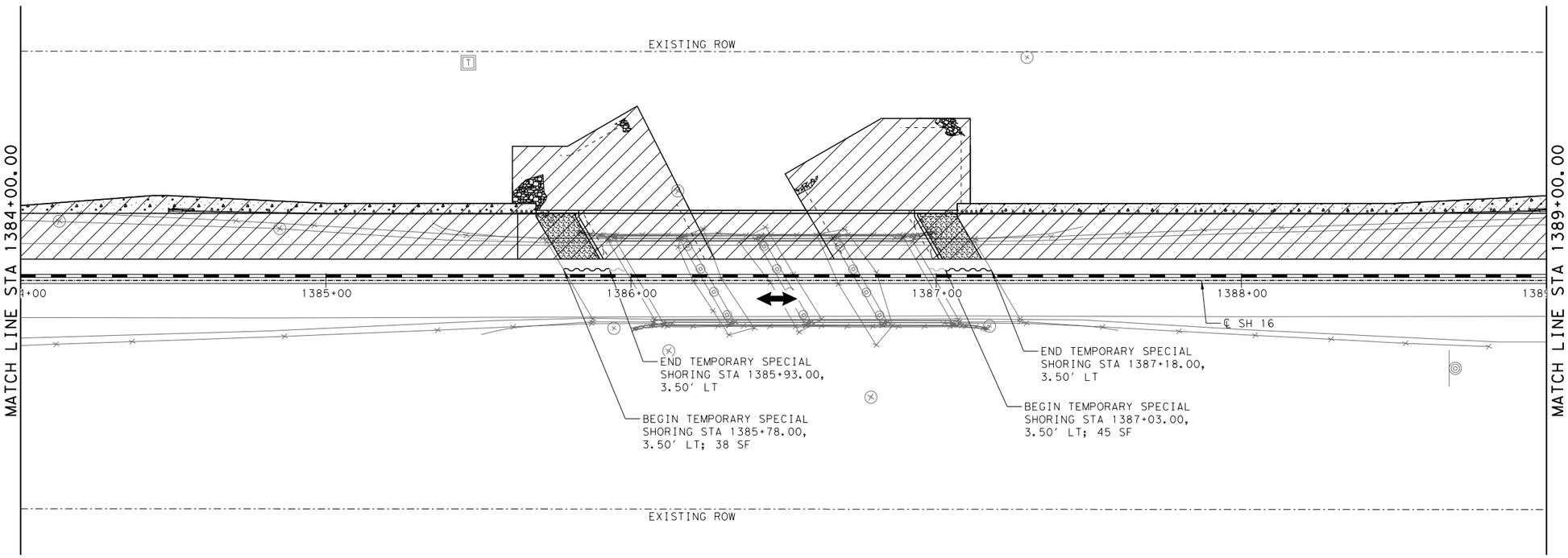
TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19207

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 2

SHEET 1 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		17



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SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
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- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
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LICENSED PROFESSIONAL ENGINEER
3/19/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19287

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 2

SHEET 2 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		18

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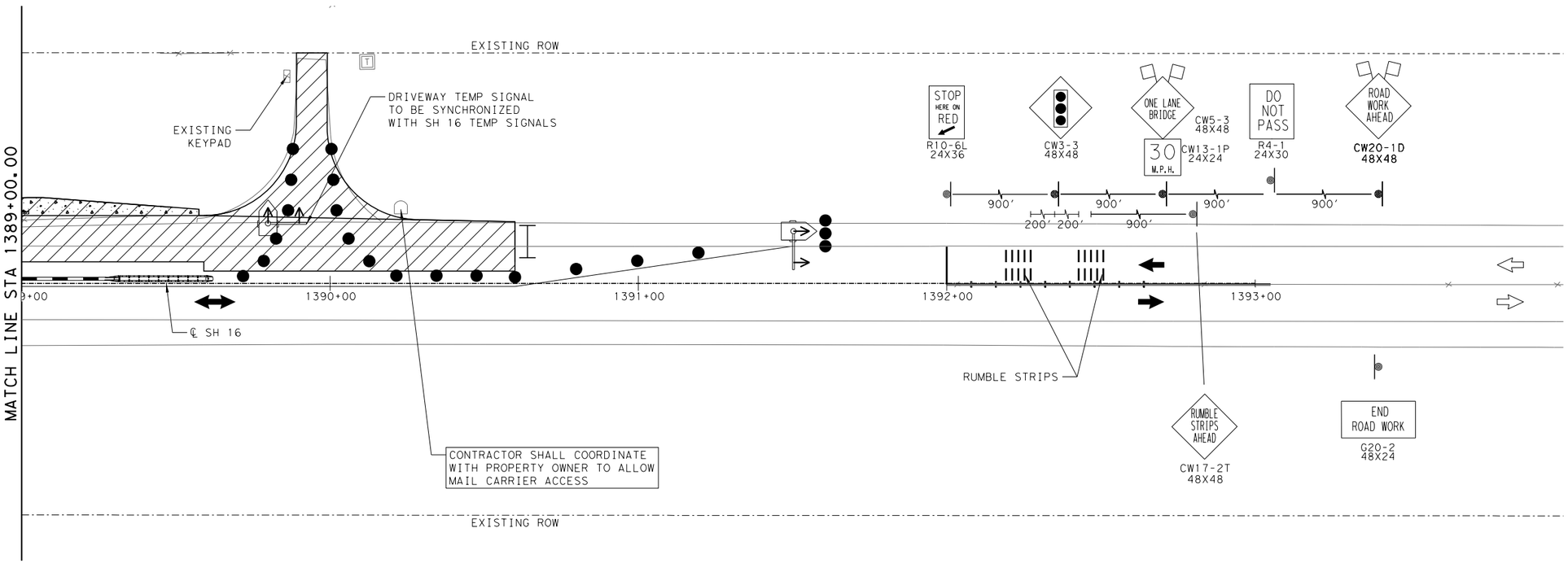

N

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SCALE: 1" = 40′

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
- TEMPORARY SHORING
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- (C) WRK ZN PAV MRK REMOV (W) (24") (SLD)
- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER

3/24/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19289

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 2

SHEET 3 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		19

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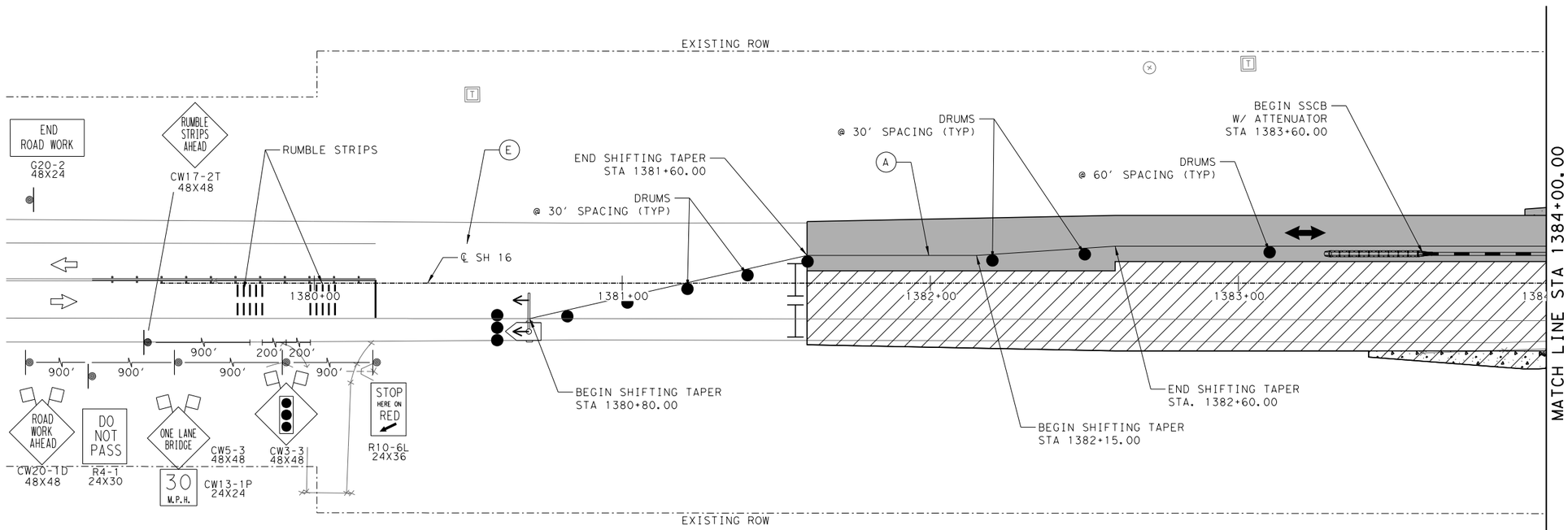

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
- PORT CTB (SGL SLOPE)(TY 1)
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- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
3/24/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19397

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 3

SHEET 1 OF 3

FED. RD DIV. NO.	CONTROL NO.	SECTION NO.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		20

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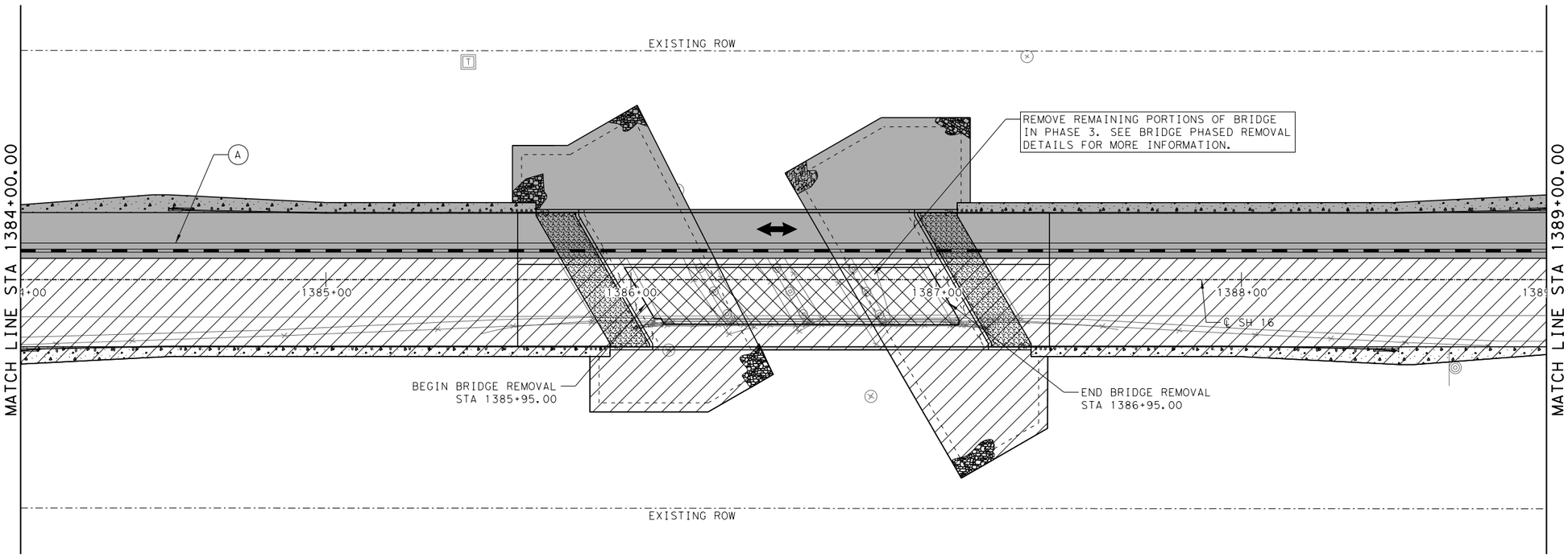

N

0 20 40
SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
- CONSTRUCTION SIGN
- TEMPORARY TRAFFIC SIGNAL
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- (D) WRK ZN PAV MRK REMOV (REFL) TY II-A-A
- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED PROFESSIONAL ENGINEER
3/19/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 3

SHEET 2 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		21

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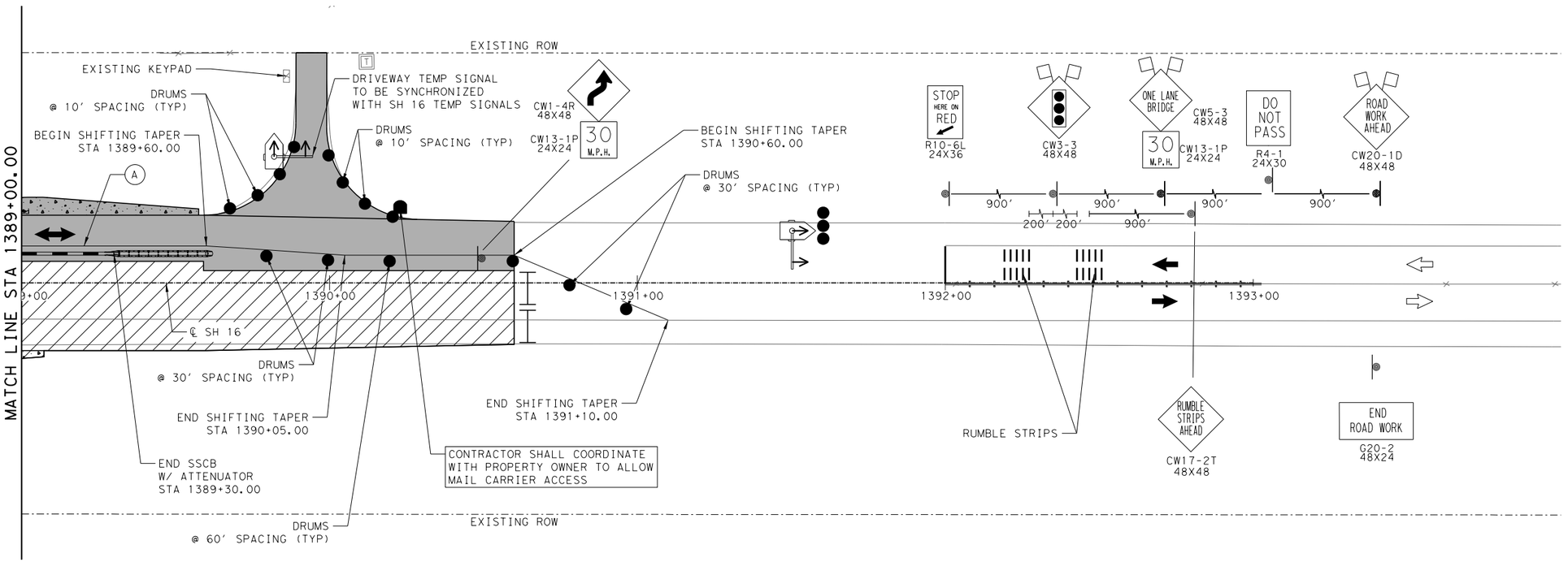

N

0 20 40

SCALE: 1" = 40'

LEGEND

- REMOVALS (THIS PHASE)
- CONSTRUCTION (THIS PHASE)
- CONSTRUCTION (PREVIOUS PHASE)
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- (E) ELIM EXT PAV MRK & MRKR (4")

NO.	REVISION	BY	DATE

STATE OF TEXAS
RICK N. PEGGAR
135080
LICENSED
PROFESSIONAL ENGINEER

3/24/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

TRAFFIC CONTROL PLAN PHASE 3

SHEET 3 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		22

DISCLAIMER:
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TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

LOC NO.	TCP PHASE	SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
1	PHASE 1	1 OF 3	SH 16	1383+60	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A	1								X	
2	PHASE 1	3 OF 3	SH 16	1389+30	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A	1								X	
3	PHASE 3	1 OF 3	SH 16	1383+60	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A			1	1					X	
4	PHASE 3	3 OF 3	SH 16	1389+30	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A			1	2					X	
3	PHASE 3	1 OF 3	SH 16	1383+60	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A		1								
4	PHASE 3	3 OF 3	SH 16	1389+30	3	BI	N/A	N/A	SINGLE SLOPE CONCRETE BARRIER	24"	42"	N/A		1								
												TOTALS	2	2	2							

LEGEND:

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

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm

CRASH CUSHION SUMMARY SHEET

SHEET 1 OF 1

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT / SECT / JOB		HIGHWAY
REVISIONS	0288 / 03 / 032		SH 16
	DIST	COUNTY	
	BWD	EASTLAND	
	FEDERAL AID PROJECT		SHEET NO.
			23

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

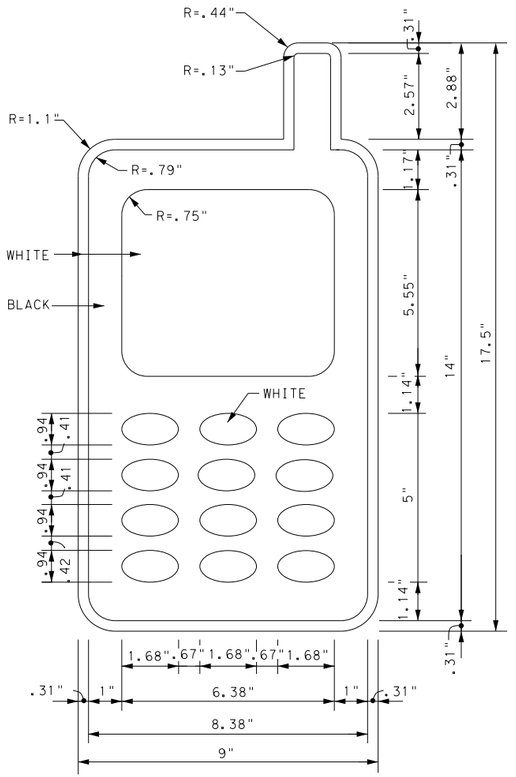
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

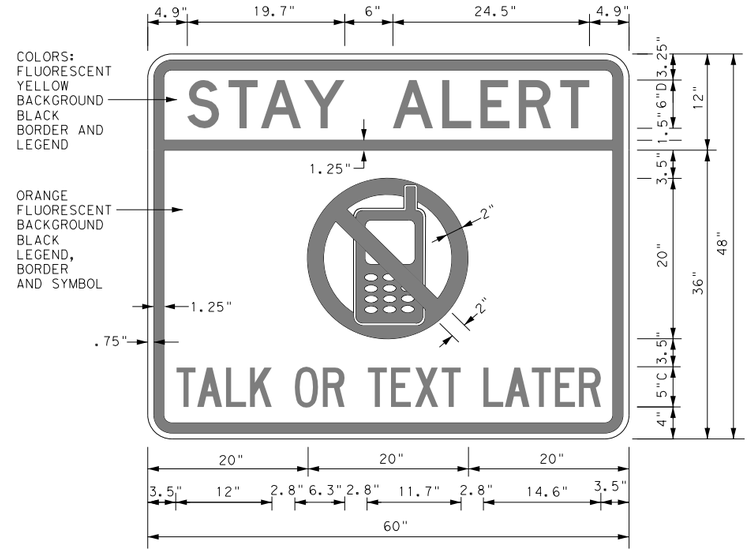
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	BWD	EASTLAND		24

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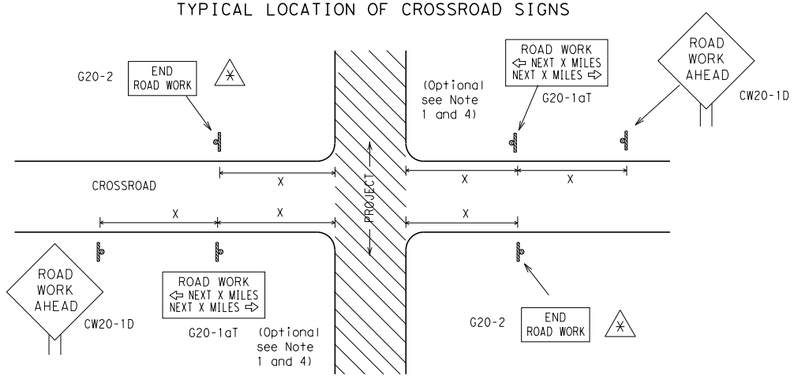
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland/Eastland Co/Cadd/Standards/TCP/BC-14.dgn

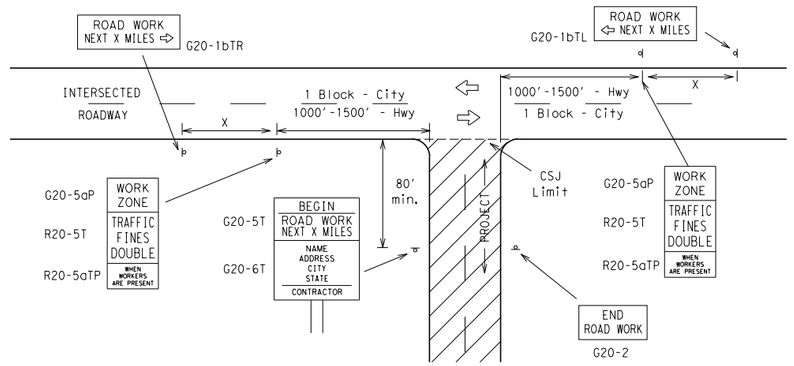
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

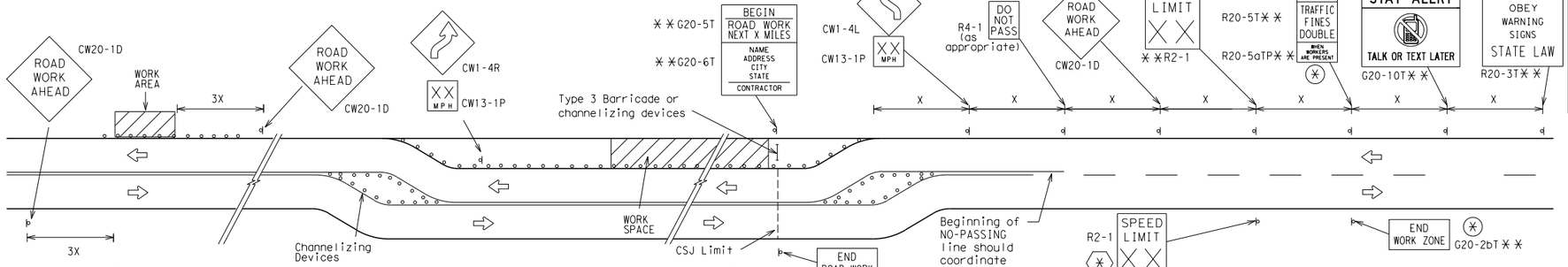
⁂ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

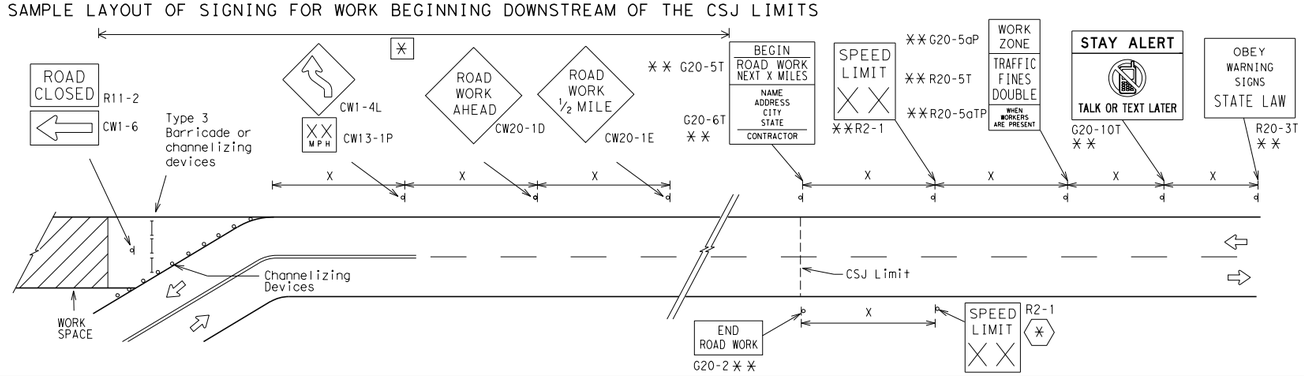
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING 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.

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0288	03	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BWD	EASTLAND		25

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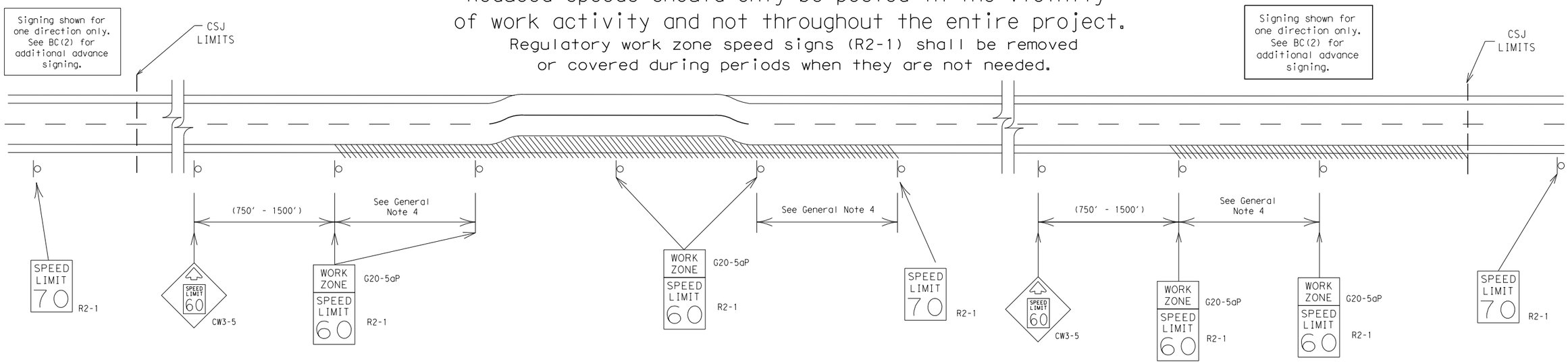
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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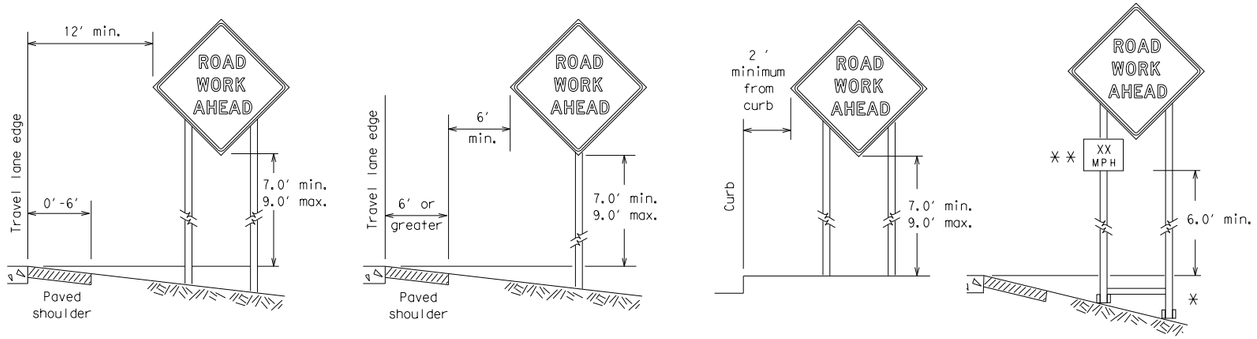
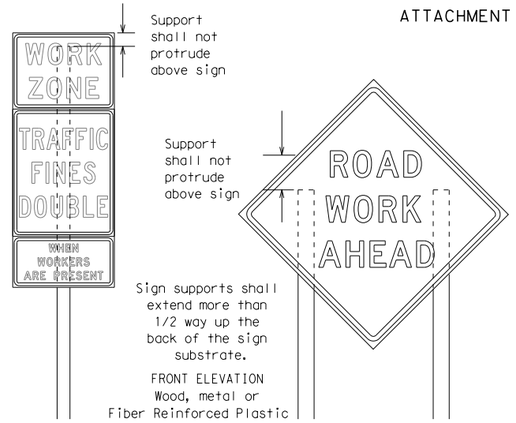
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



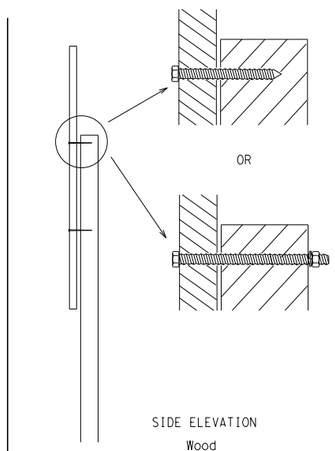
⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

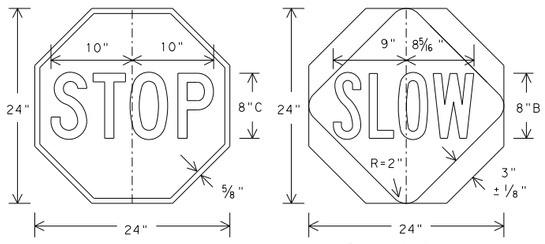


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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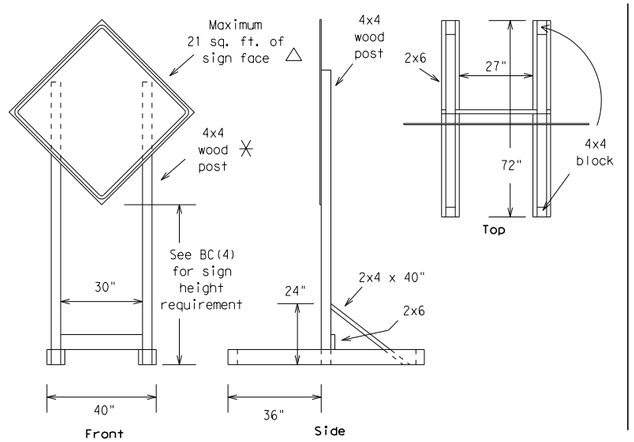
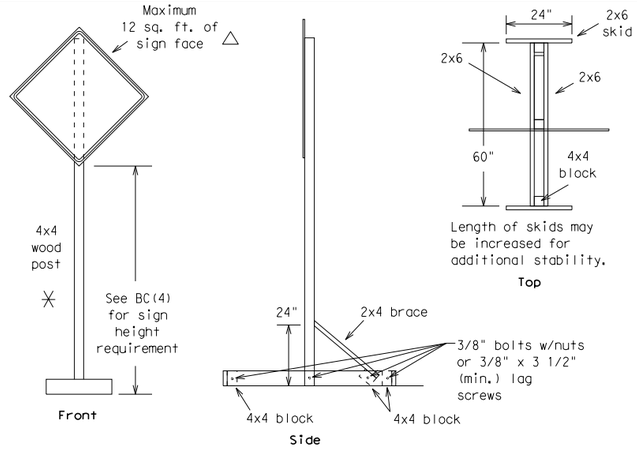
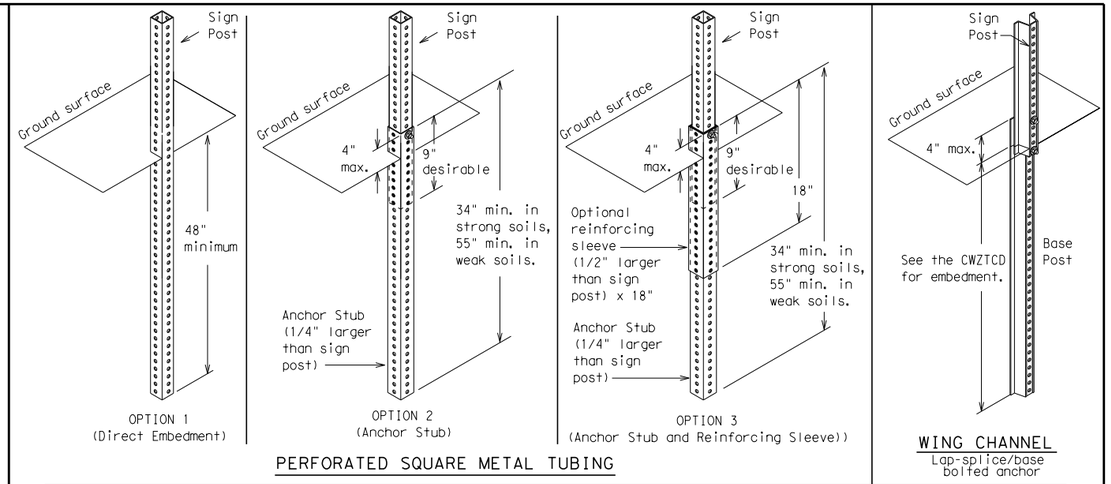




SKID MOUNTED WOOD SIGN SUPPORTS

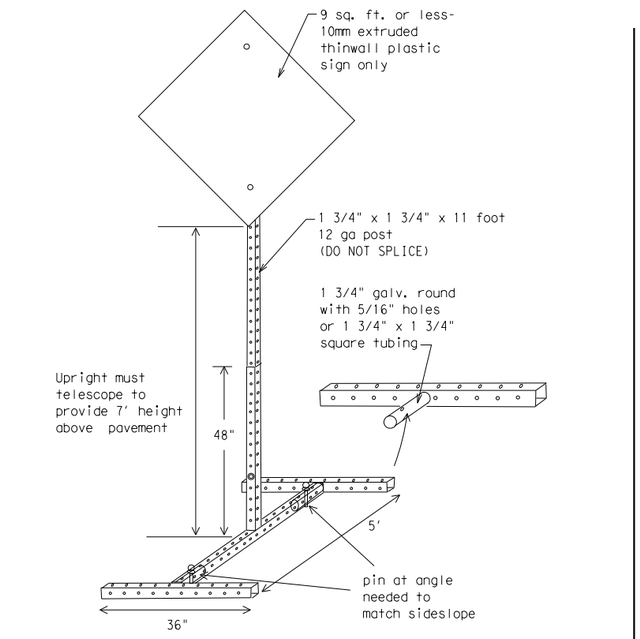
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

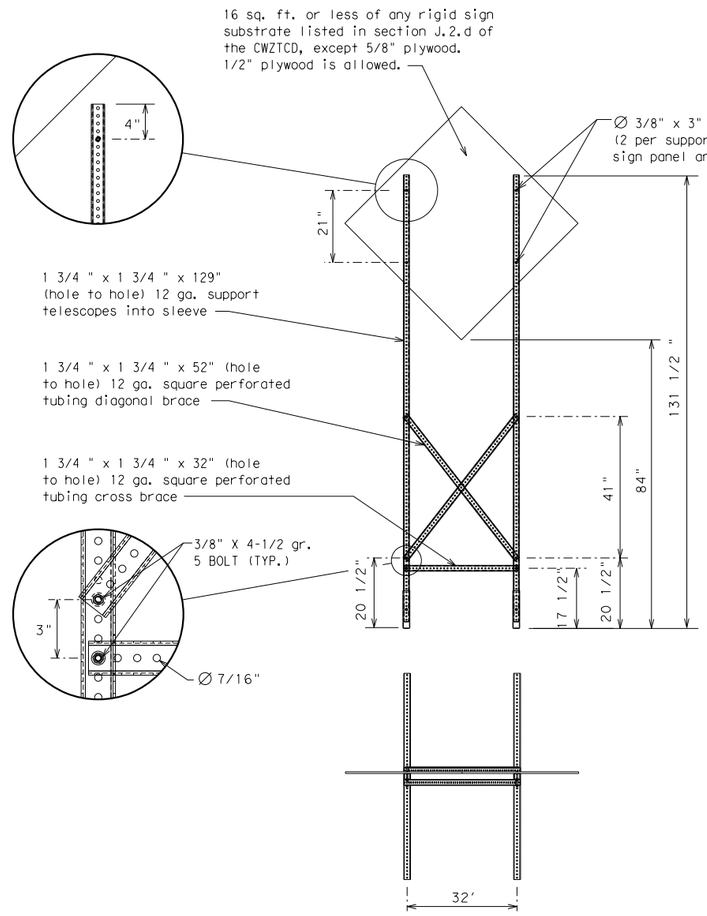


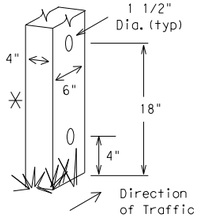
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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

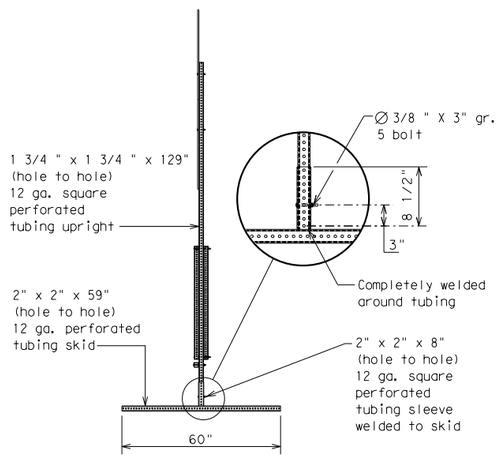






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

* 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 Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

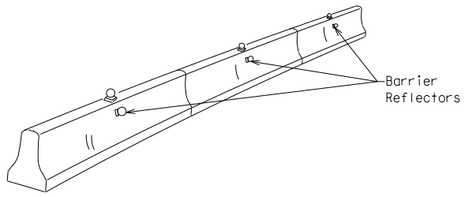
BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BWD	EASTLAND		29

100

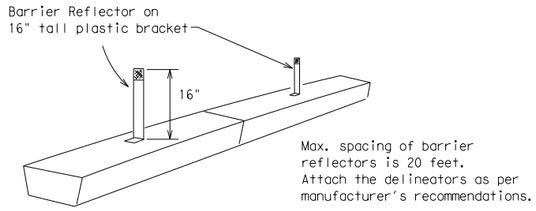
DATE: 3/12/2021 12:51
FILE: pw://ts-pw.bentley.com:ts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/BC-14.dgn

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

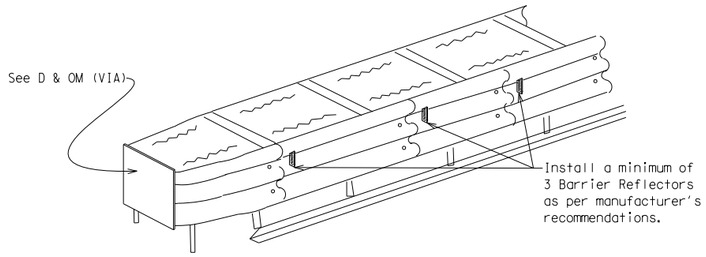


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

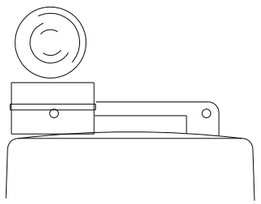


DELINEATION OF END TREATMENTS

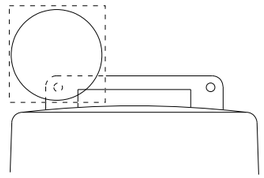
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

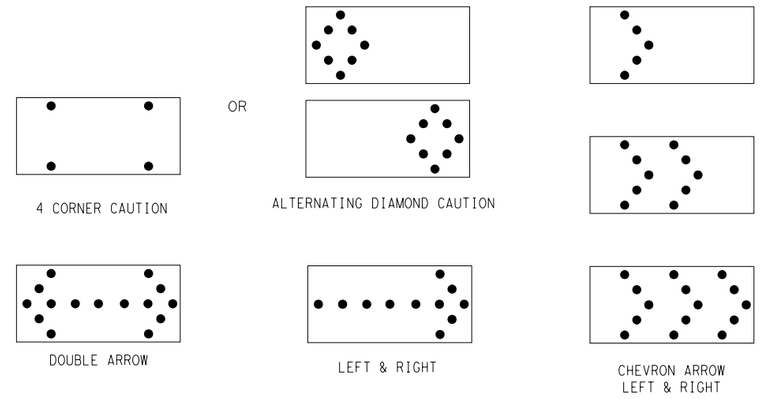
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BWD	EASTLAND		30

101

DATE: 3/12/2021 12:51
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/BC-14.dgn

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

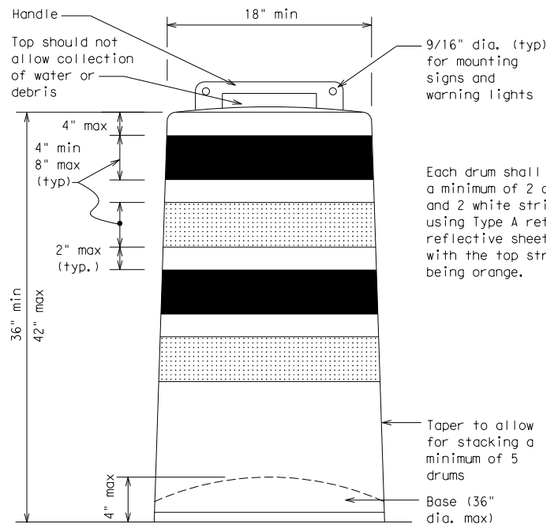
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

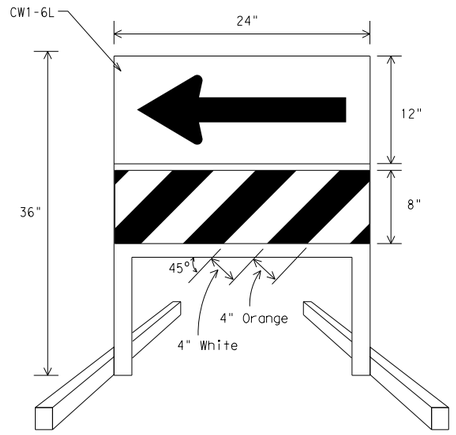
RETROREFLECTIVE SHEETING

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

BALLAST

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

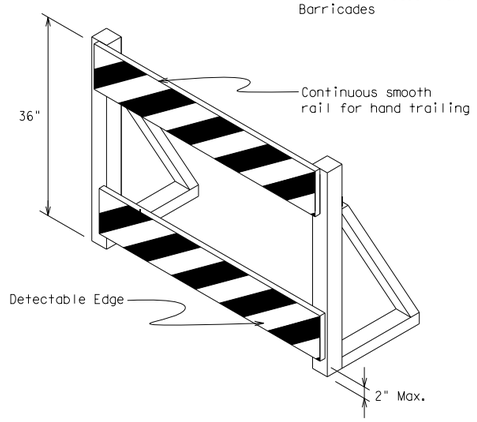




DIRECTION INDICATOR BARRICADE

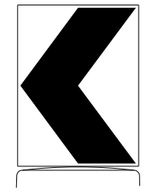
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3.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

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

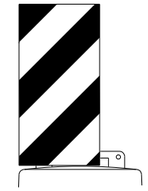


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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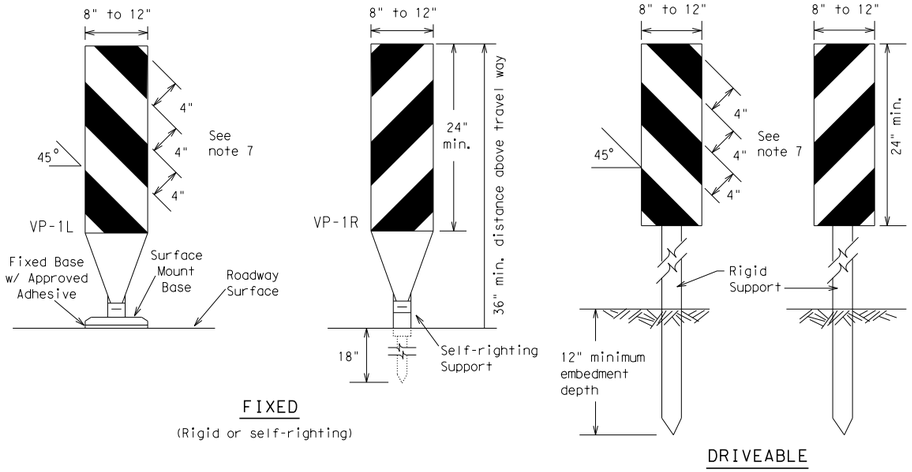
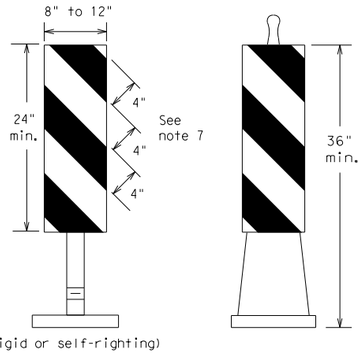


FIXED
(Rigid or self-righting)

DRIVEABLE

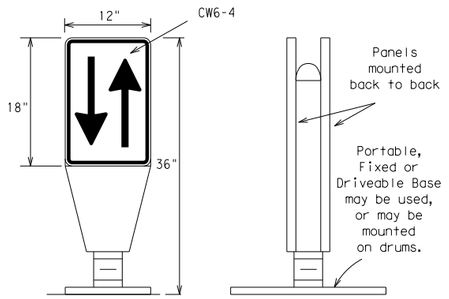


(Rigid or self-righting)

PORTABLE

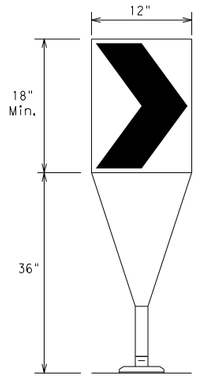
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

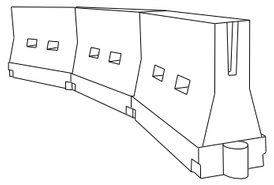
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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.

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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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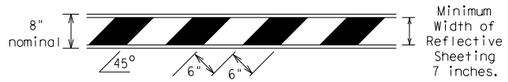
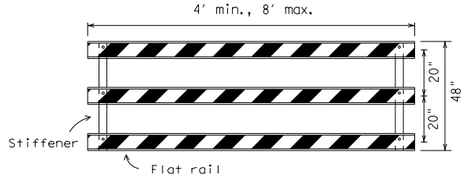
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



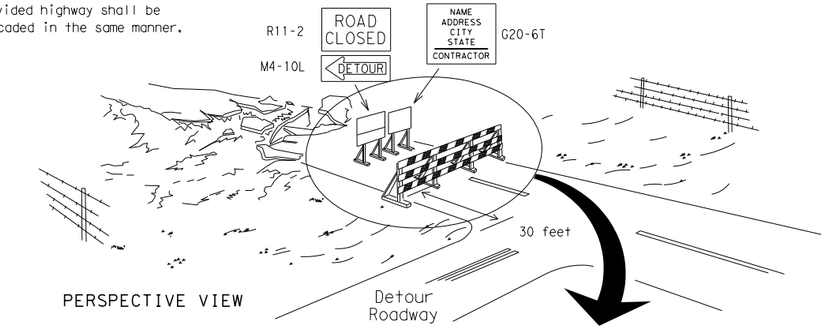
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

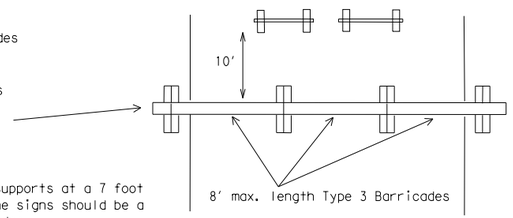
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

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

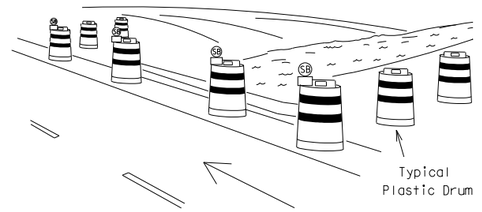
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

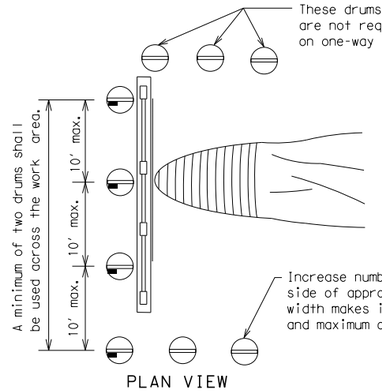
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

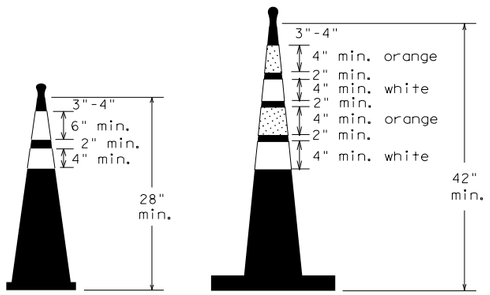
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

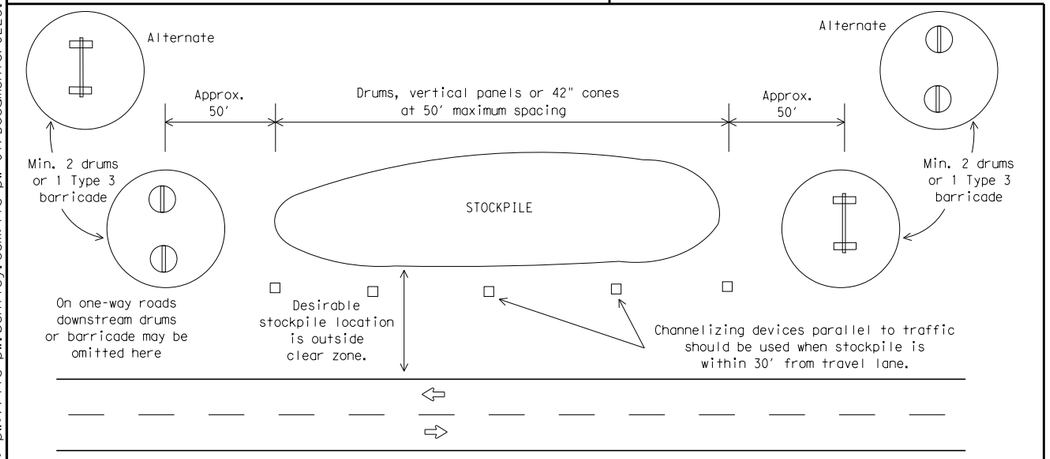
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

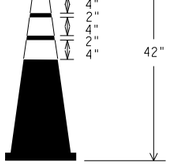
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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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.

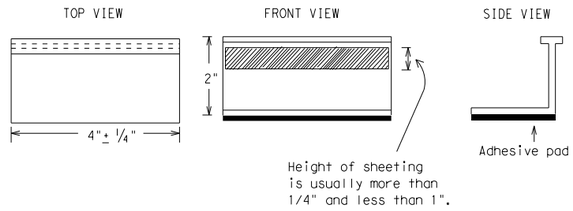
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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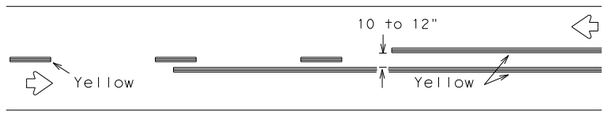
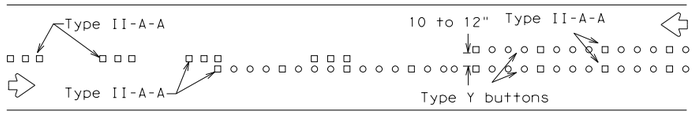
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland CoVCadd/Standards/TCP/BC-14.dgn

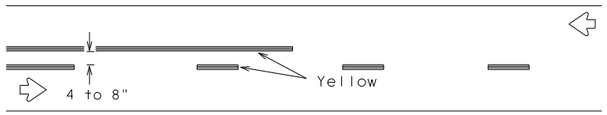
PAVEMENT MARKING PATTERNS



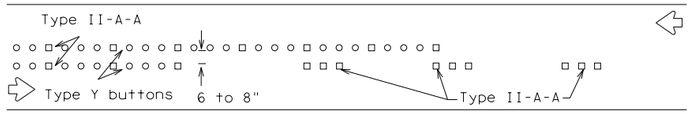
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



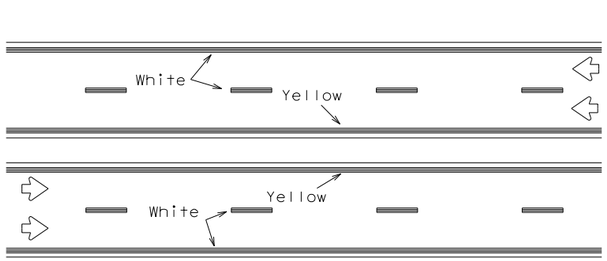
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



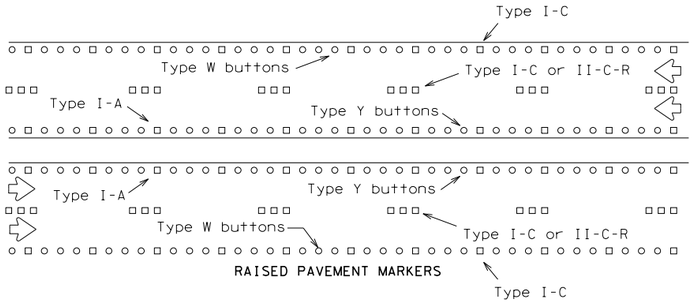
RAISED PAVEMENT MARKERS - PATTERN B

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



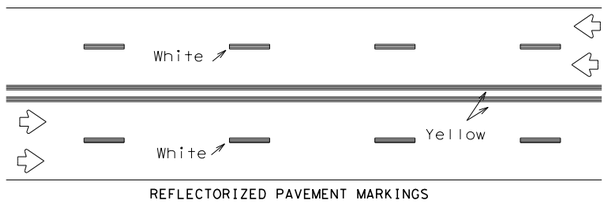
REFLECTORIZED PAVEMENT MARKINGS



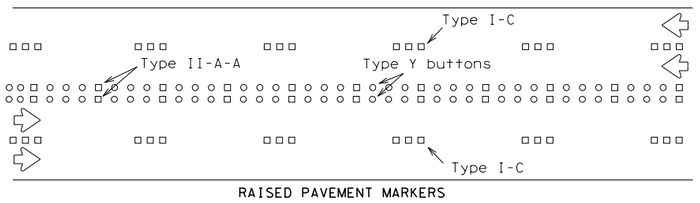
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



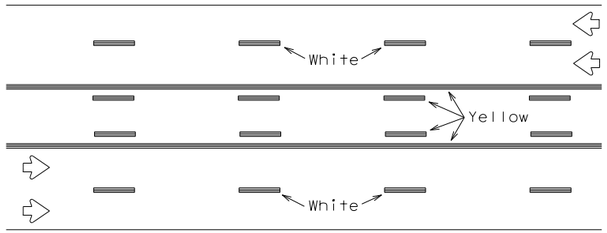
REFLECTORIZED PAVEMENT MARKINGS



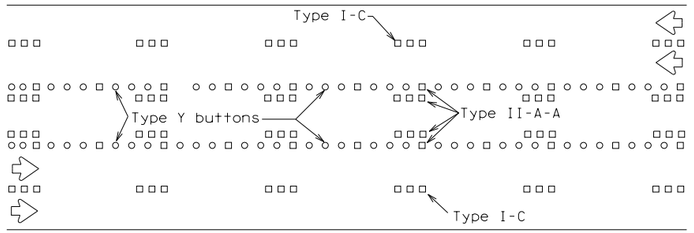
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

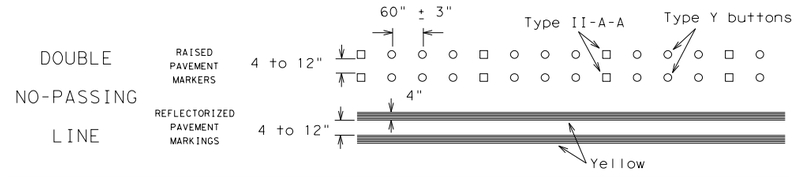
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

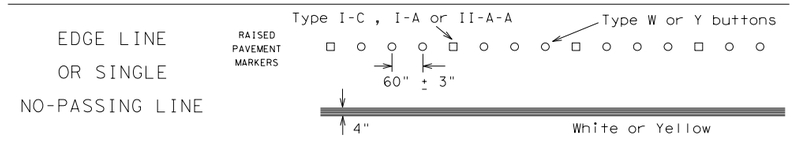
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

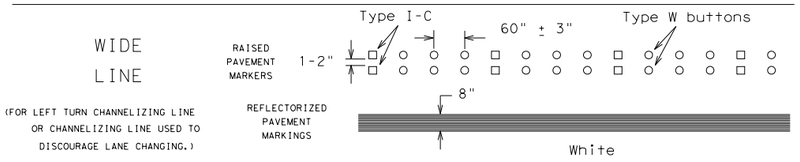


EDGE LINE OR SINGLE NO-PASSING LINE



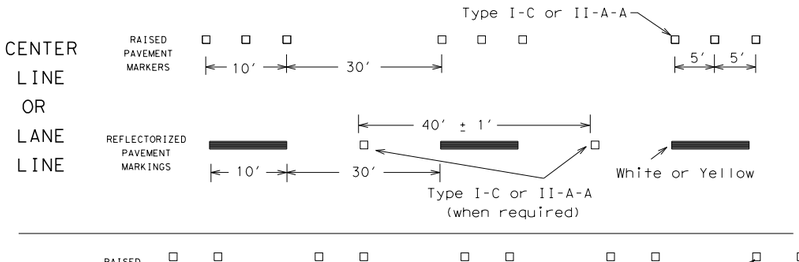
WIDE LINE

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

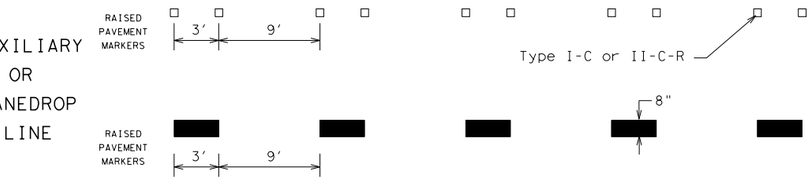


BROKEN LINES

CENTER LINE OR LANE LINE

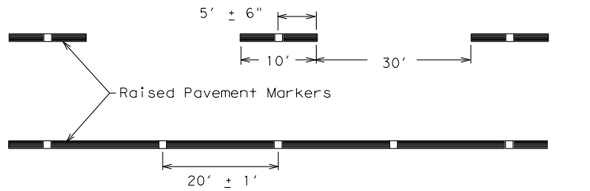


AUXILIARY OR LANEDROP LINE



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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

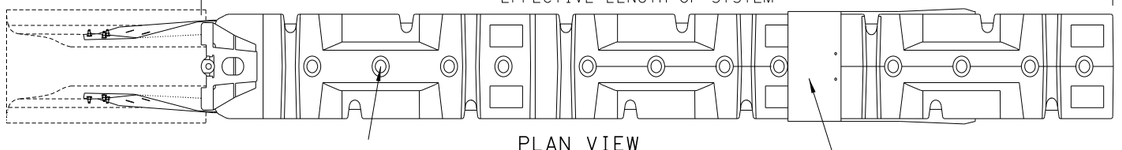
BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	BWD	EASTLAND		35
11-02 8-14				

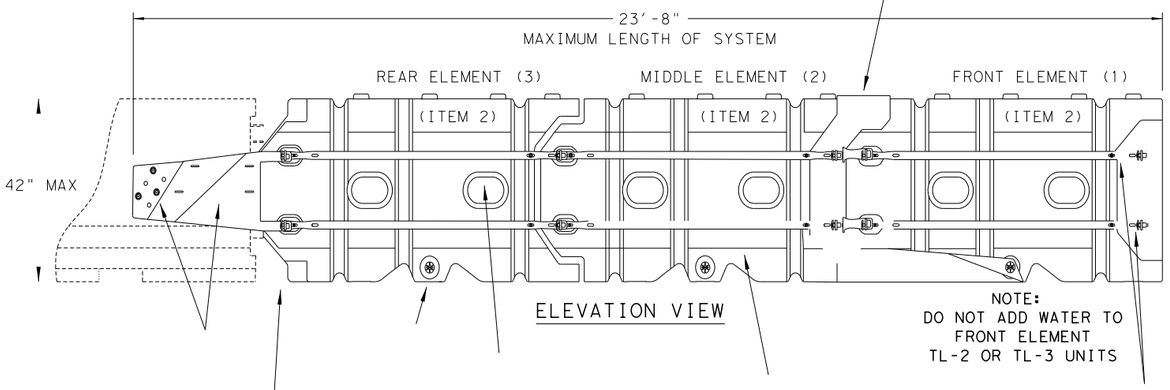
106

DATE: 3/12/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/ABSORB (M)-19.dgn

SYSTEM SHOWN - ABSORB-M TL-3



PLAN VIEW

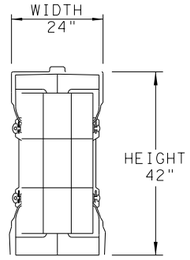


ELEVATION VIEW

NOTE:
DO NOT ADD WATER TO
FRONT ELEMENT
TL-2 OR TL-3 UNITS

TRAFFIC FLOW

TRAFFIC FLOW



SECTION A-A

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"

GENERAL NOTES

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

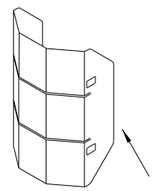
BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00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

* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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

** APPLY DECAL



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.

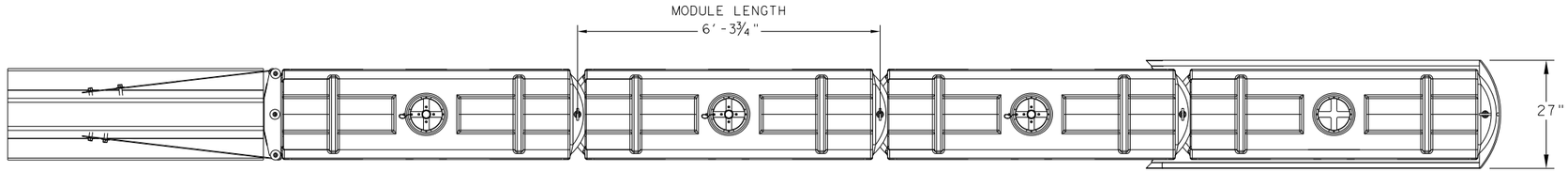
SACRIFICIAL

Texas Department of Transportation — Design Division Standard

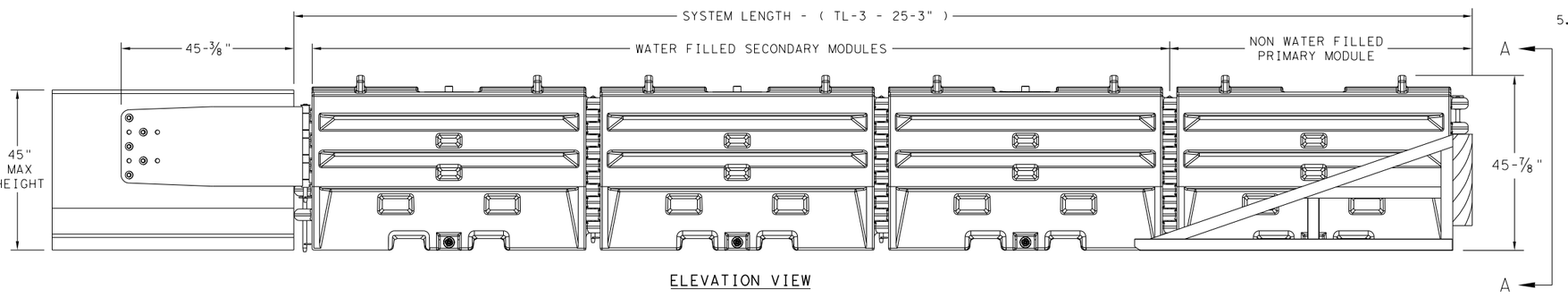
LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		36

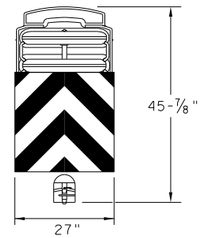
DATE: 3/12/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche East\and Co/Cadd/Standards/Roadway/SLED-19.dgn



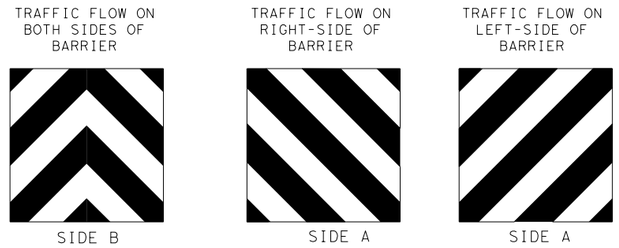
PLAN VIEW



ELEVATION VIEW

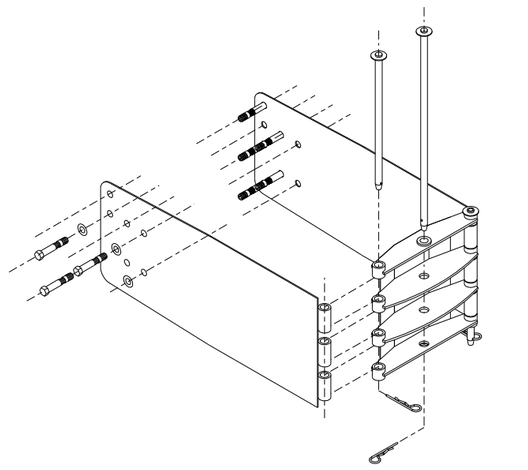


SECTION A-A



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.

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

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

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

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

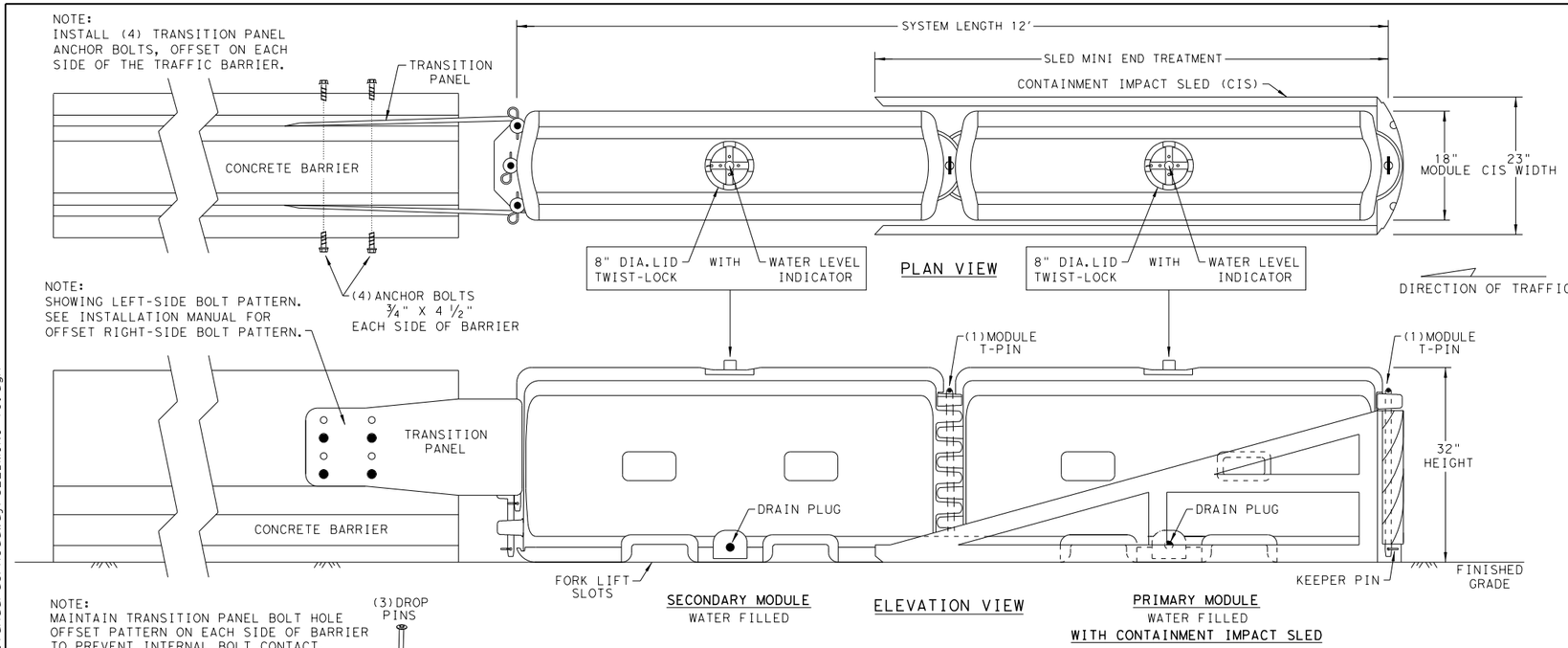
Texas Department of Transportation

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	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		37

DATE: 3/12/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche East\and Co/Cadd/Standards/Roadway/SLEDMINI-19.dgn



GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT TrafFix Devices, Inc. AT 1(949)361-5663
2. THE SLED MINI IS A MASH APPROVED TEST LEVEL 2 (TL-2) CRASH CUSHION APPROVED FOR USE WITHIN TEMPORARY WORK ZONE LOCATIONS. TL-2 IS APPROVED FOR SPEEDS OF 45 MPH OR LESS.
3. THE SLED MINI IS A GATING, NON-REDIRECTIVE CRASH CUSHION THAT DOES NOT NEED TO BE BOLTED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, AND DEPRESSIONS.
5. THE SLED MINI CAN BE ATTACHED TO CONCRETE BRIDGE ABUTMENTS, CONCRETE BARRIER, STEEL BARRIER AND PLASTIC BARRIER.

SLED MINI TL-2 - BILL OF MATERIALS

QTY:	PART #	PART DESCRIPTIONS
2	45332-MY	WATER FILLED MODULE
2	45032-CPGAL	T-PINS - LENGTH 26" WITH KEEPER PINS - FOR MODULES
2	18009-B-I	WATER LEVEL INDICATOR FLOAT LID
1	45032-S	CONTAINMENT IMPACT SLED (CIS)
2	45151	UNIVERSAL TRANSITION PANELS
1	45132	TRANSITION FRAME
1	45141	DROP PIN - LENGTH 26.50" WITH KEEPER PIN
2	45142	DROP PINS - LENGTH 18.50" WITH KEEPER PINS
8	45050	TRANSITION PANEL ANCHOR BOLTS 3/4" X 4 1/2" (4 EA. SIDE)

MODULE SPECIFICATIONS	(CIS) SPECIFICATIONS
LENGTH: 73" (PIN TO PIN)	LENGTH: 87 7/8"
HEIGHT: 32"	HEIGHT: 32"
WIDTH: 18"	WIDTH: 23"
EMPTY WEIGHT: 110 lbs.	APPROX. WEIGHT: 1250 lbs.
FILLED WEIGHT: 1100 lbs.	
FILL CAPACITY: 118.5 Gal	

NOTES:
✳ SEE DELINEATION GUIDE FOR DECAL PLACEMENT.
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

DELINEATION DECAL PLACEMENT GUIDE

✳ NOTE:
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. THE ORIENTATION BETWEEN THE LEFT-SIDE AND RIGHT-SIDE TRAFFIC IS CHANGED BY ROTATING THE DECAL 90 DEGREES AND REINSTALLING.

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

SACRIFICIAL

Texas Department of Transportation

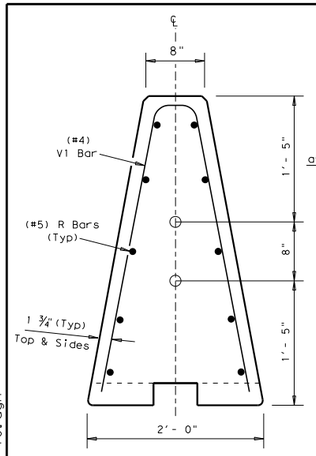
Design Division Standard

SLED MINI END TREATMENT TL-2 MASH COMPLIANT (TEMPORARY, WORK ZONE)

SLEDMINI-19

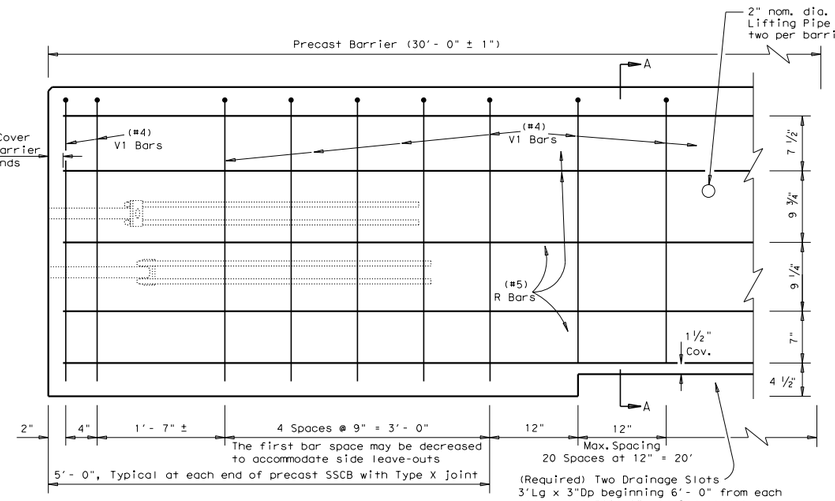
FILE: sledmini19	DN: TxDOT	CK: KM	DN: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		38

DATE: 3/12/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/SSCB(2)-10.dgn



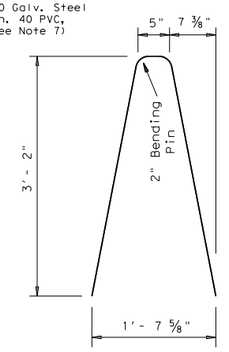
End View
Precast Barrier

Pipe locations for Joint Type X connection



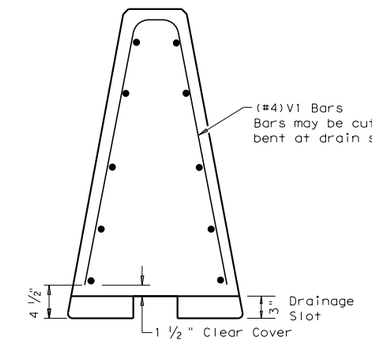
Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)



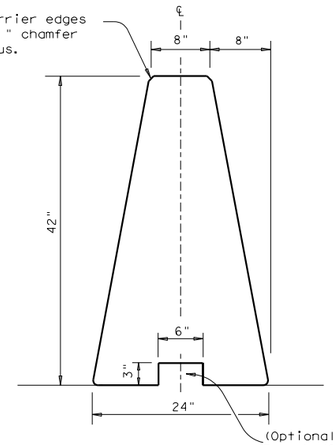
V1 Bar
#4 Rebar

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



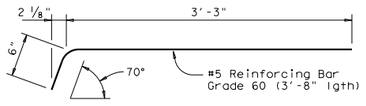
Section A-A
Steel Placement at (Required) Drainage Slots

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



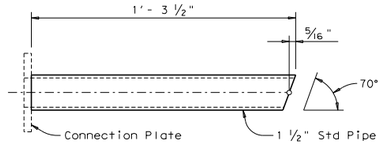
Single Slope Concrete Traffic Barrier

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.



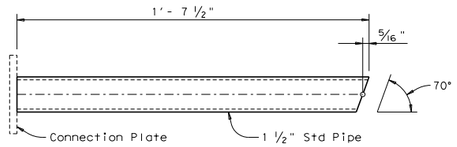
DEFORMED BAR ANCHOR DETAILS

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



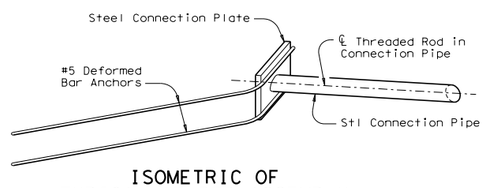
UPPER CONNECTION PIPE DETAILS

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.

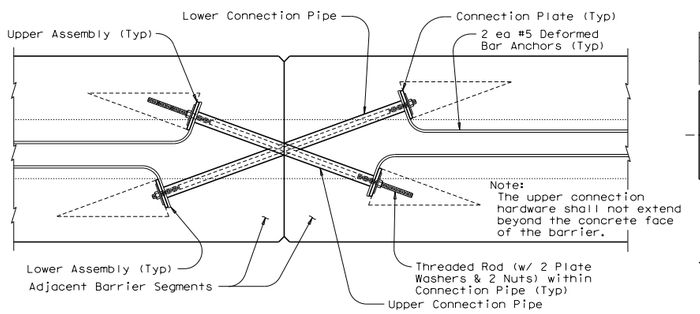


ISOMETRIC OF
TYPICAL WELDED ASSEMBLY

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

General Notes

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



TYPE X JOINT INSTALLATION DETAIL

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

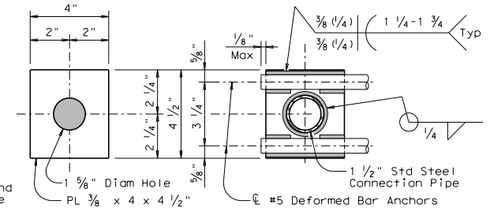
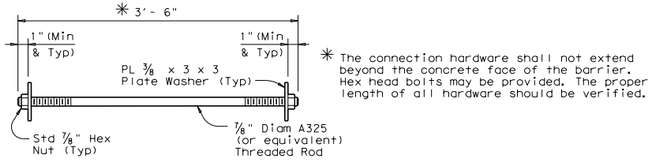


PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

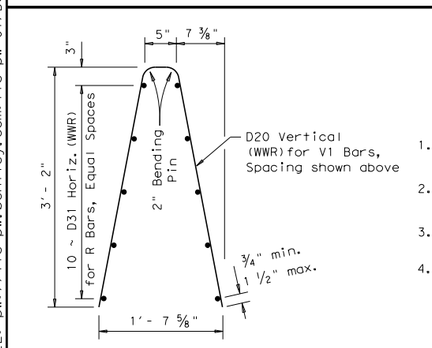
One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



CONNECTION BOLT OR
THREADED ROD DETAIL

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

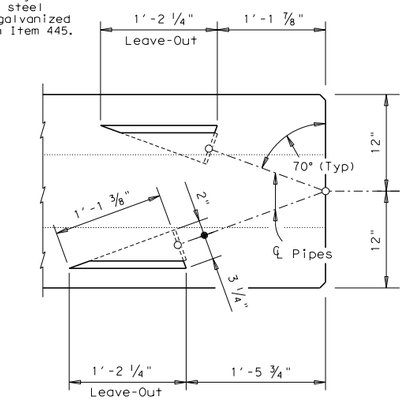
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



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

(WWR) General Notes

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



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		39

DATE: 3/12/2021
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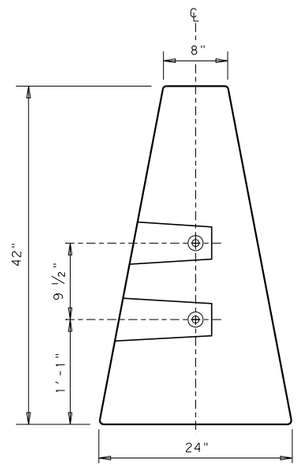
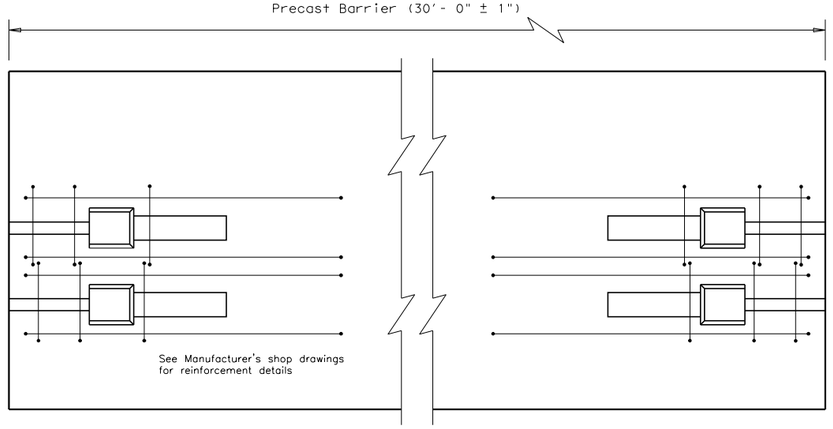
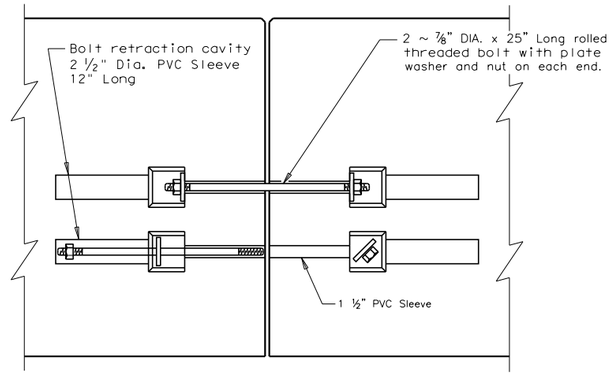


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

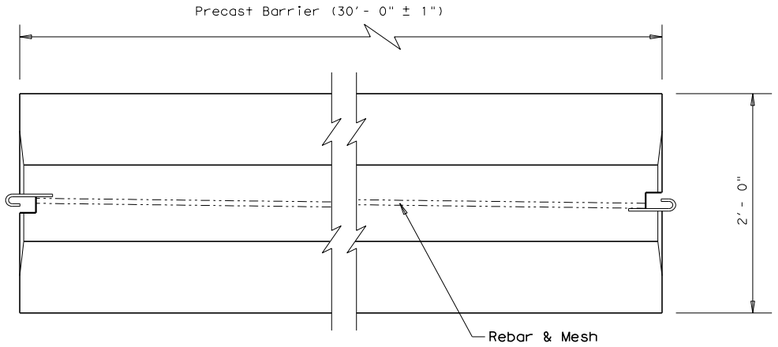


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

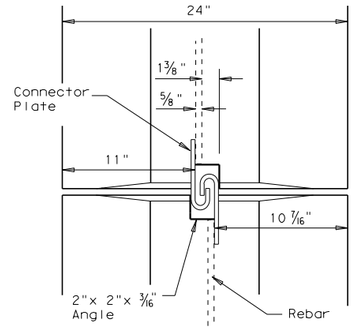


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

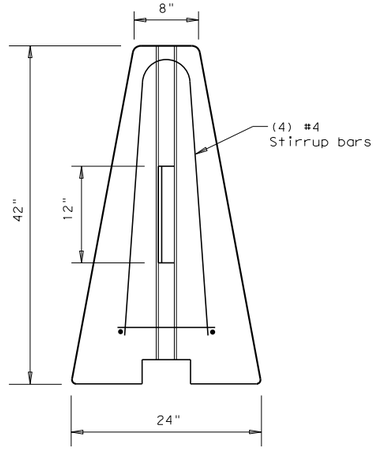
Joint Connection (Type Q)



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



VIEW FROM ABOVE
J-J HOOK CONNECTION



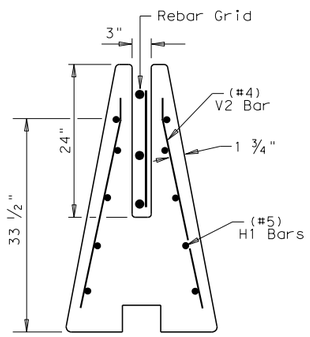
END VIEW

Proprietary Joint Connections (SSCB)

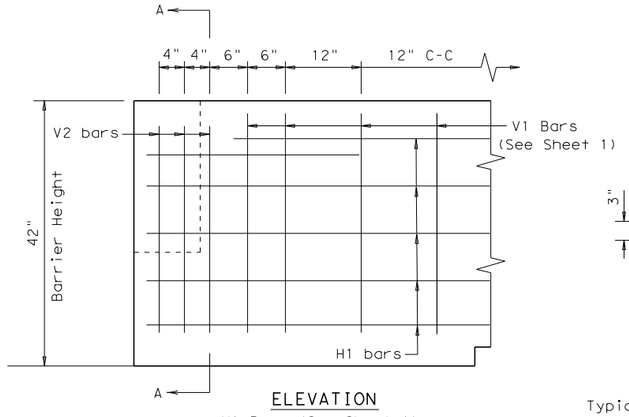
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

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

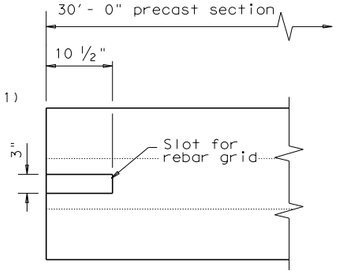
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



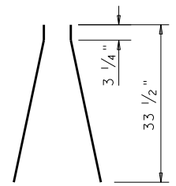
SECTION A-A
Showing (Type R) Rebar Grid



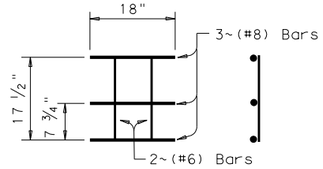
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



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



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

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© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
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	BWD	EASTLAND		40

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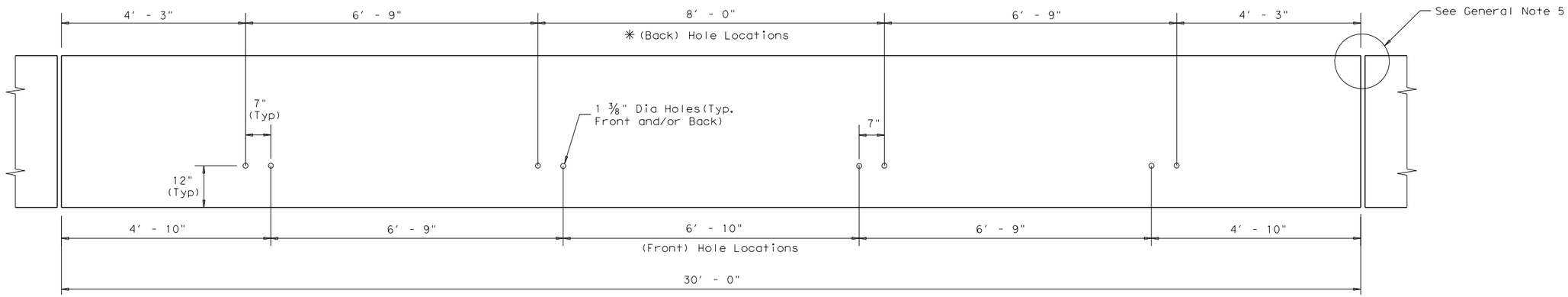
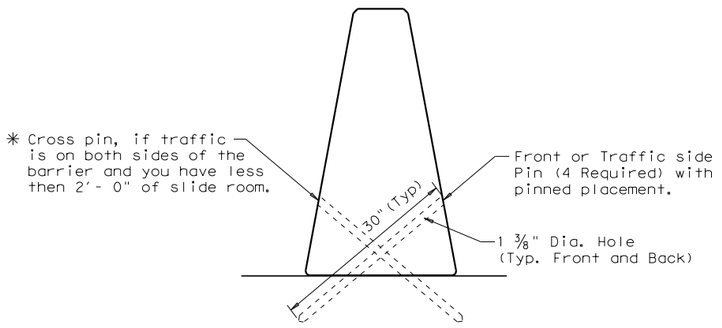


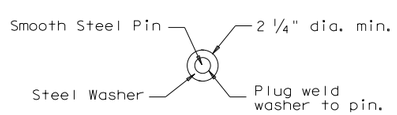
DETAIL 1

Precast SSCB(42")
Showing hole locations

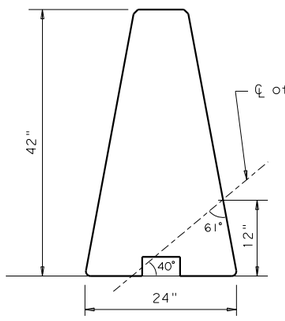


DETAIL 2

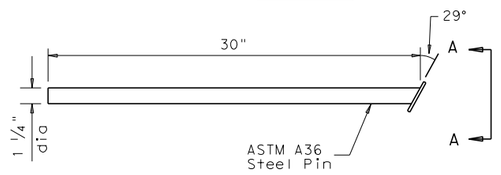
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



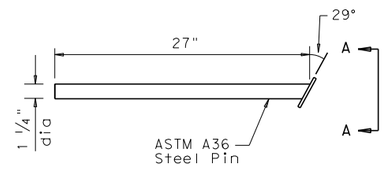
VIEW A-A



HOLE LOCATION DETAIL



(30") PIN DETAIL
See Detail 2

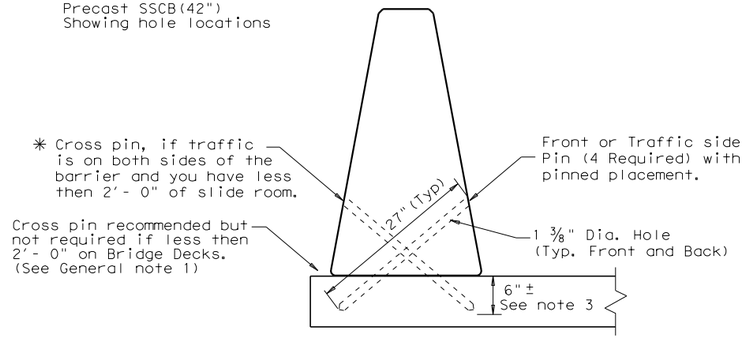


(27") PIN DETAIL
See Detail 3

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

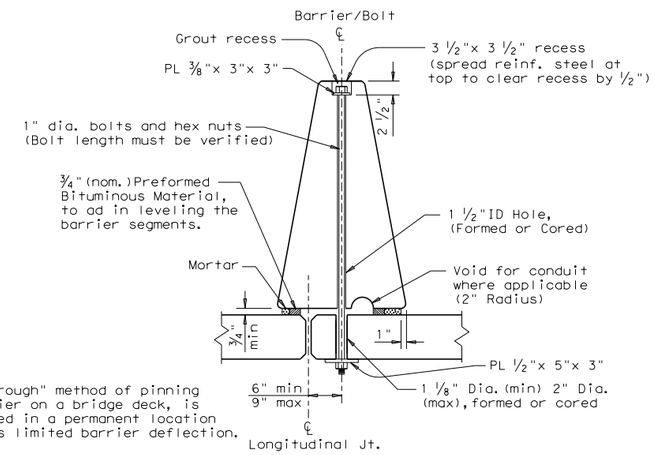
DETAIL 3

Bridge Deck or CRCP
(27" Pin required).



CORE DRILLING EXISTING BARRIER

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



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

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

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

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 ⅜in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

SSCB(5)-10

FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
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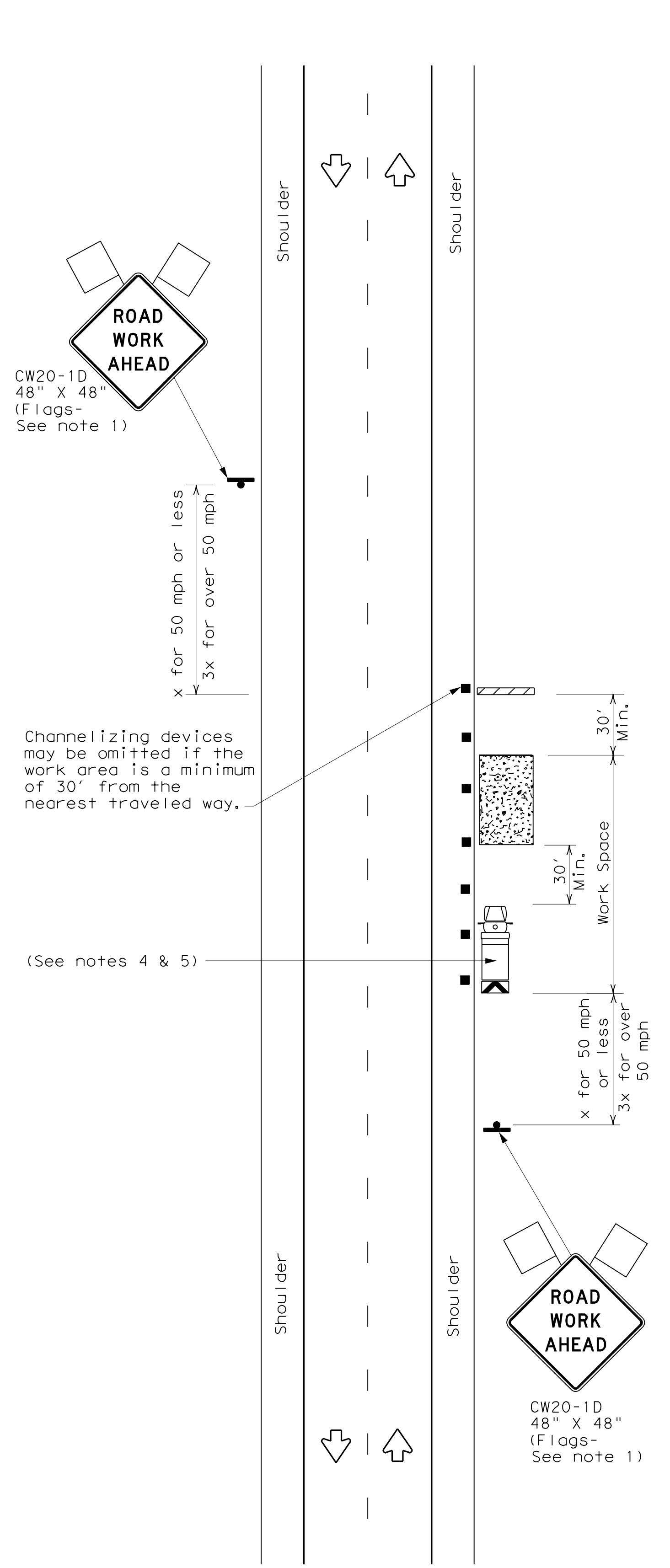
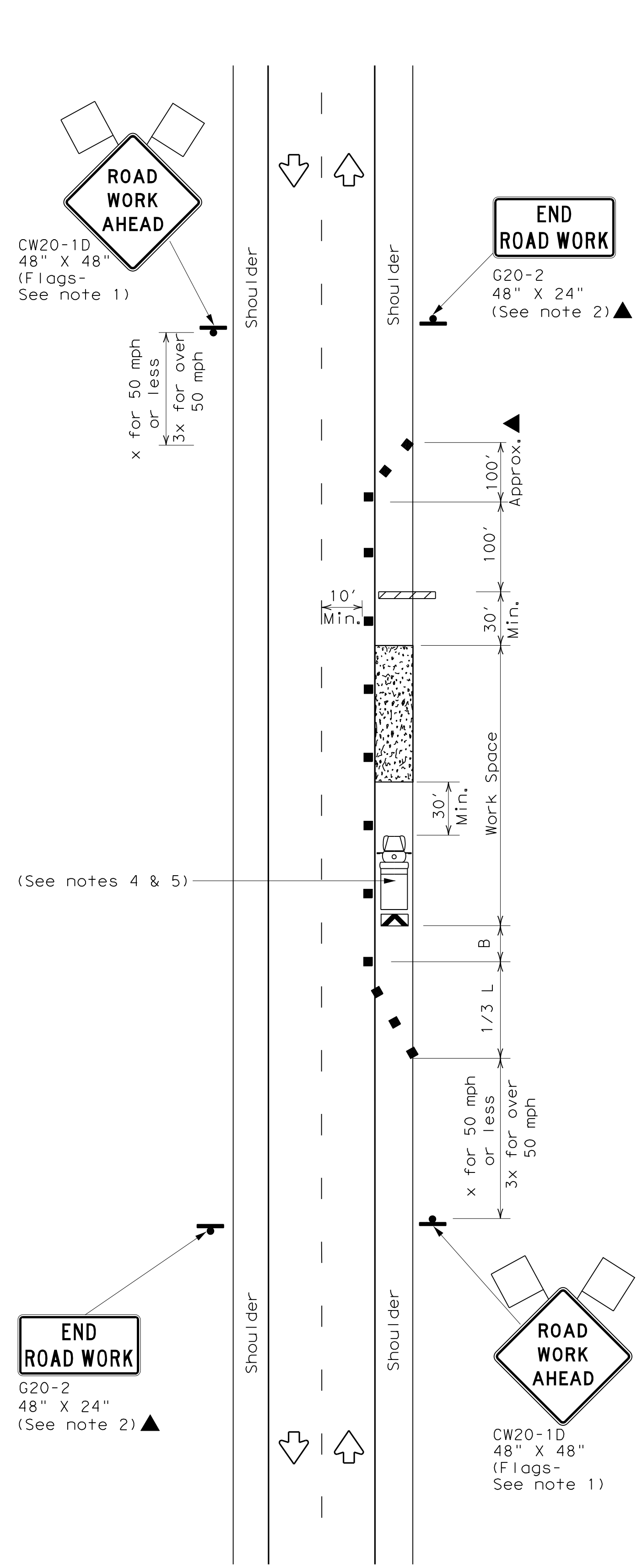


TCP (2-1a)

WORK SPACE NEAR SHOULDER

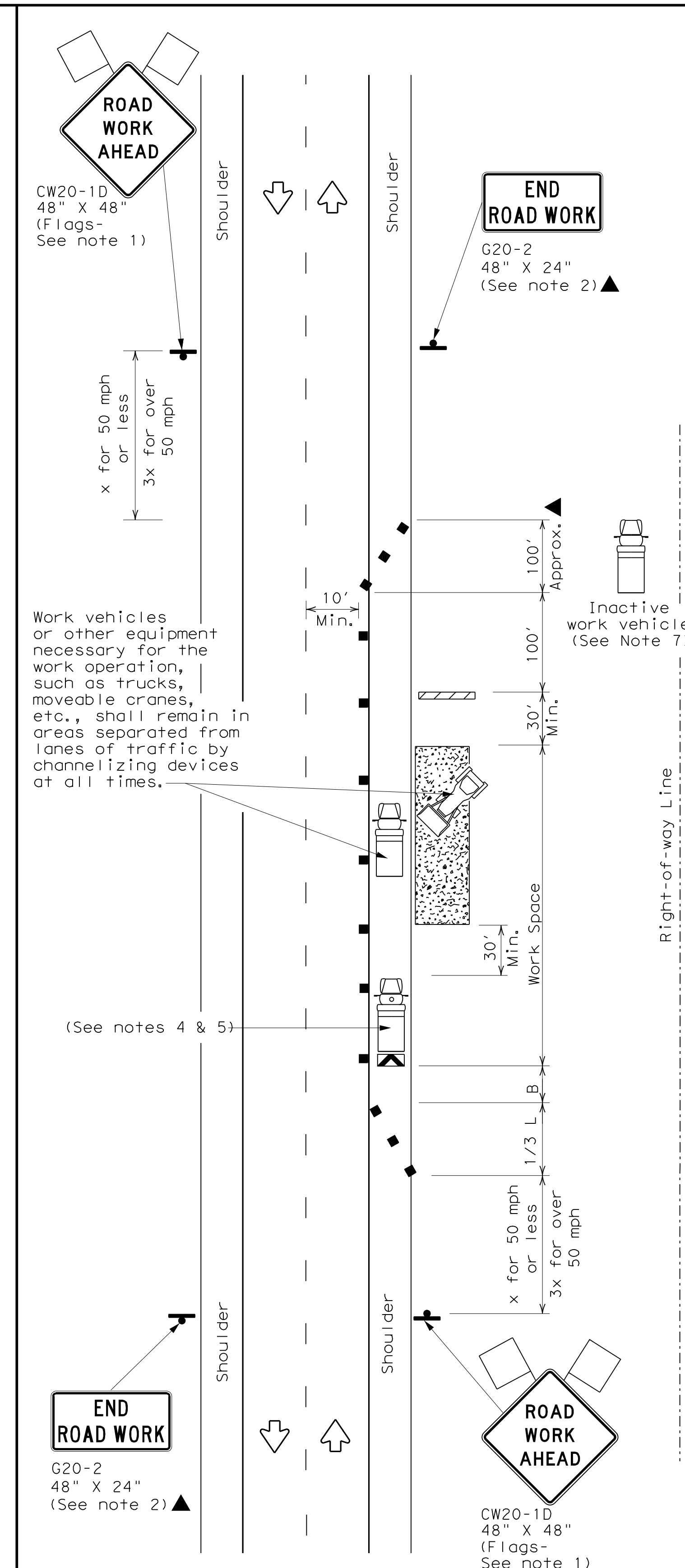
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

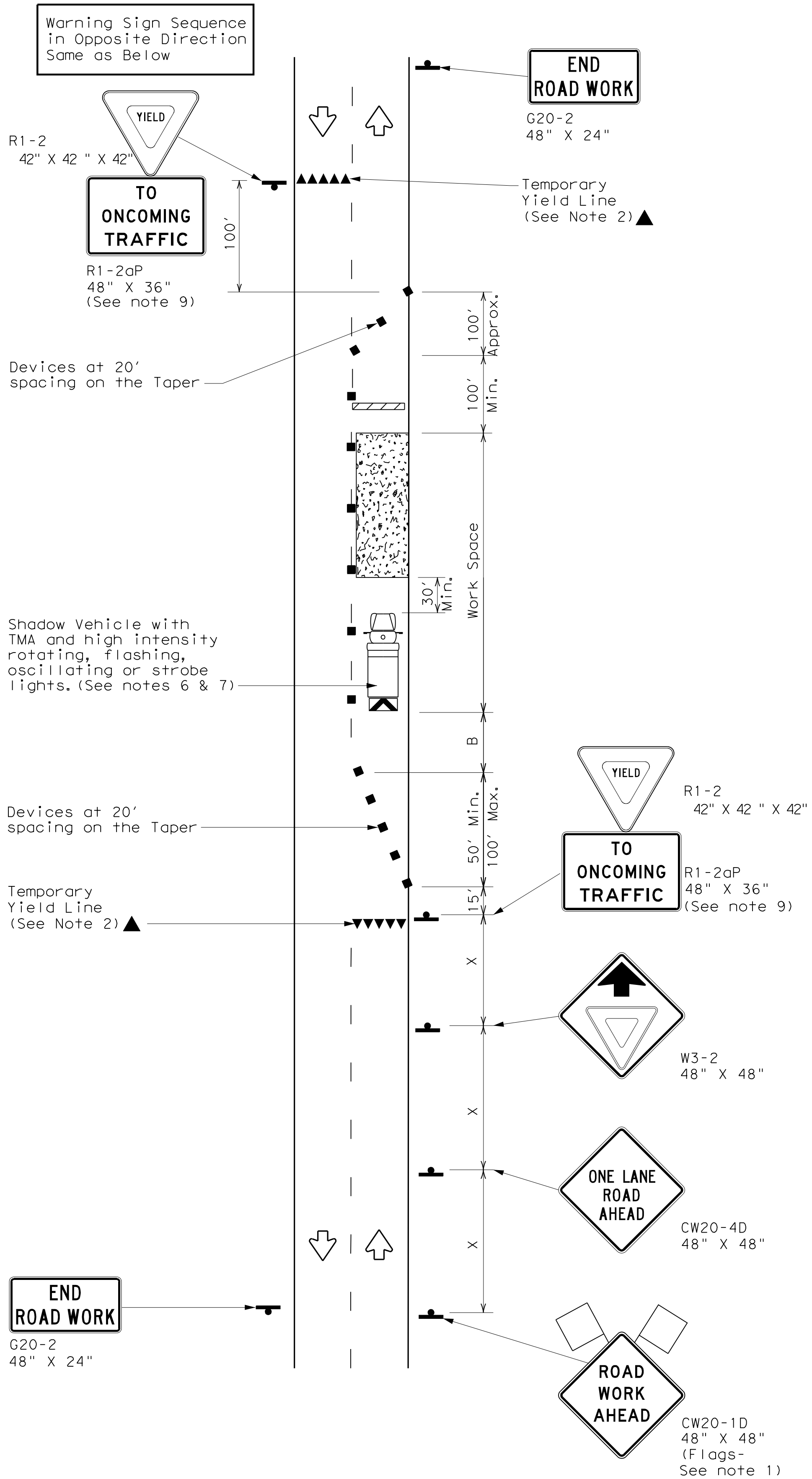
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
2-94 4-98 / 8-95 2-12 / 1-97 2-18	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	41A



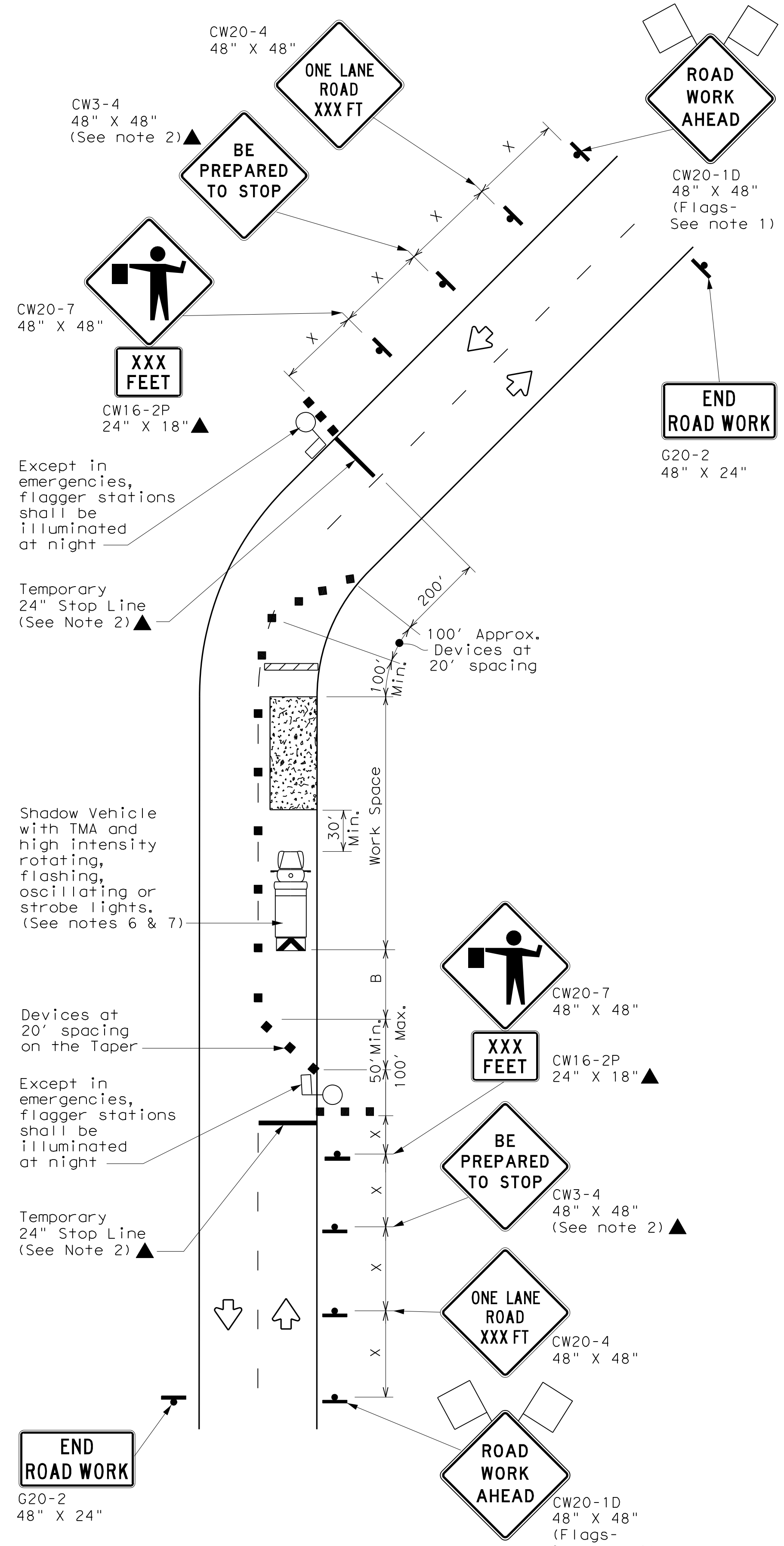
TCP (2-2a)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY

CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See Note 9)



TCP (2-2b)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY

CONTROL WITH FLAGGERS

LEGEND

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

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

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

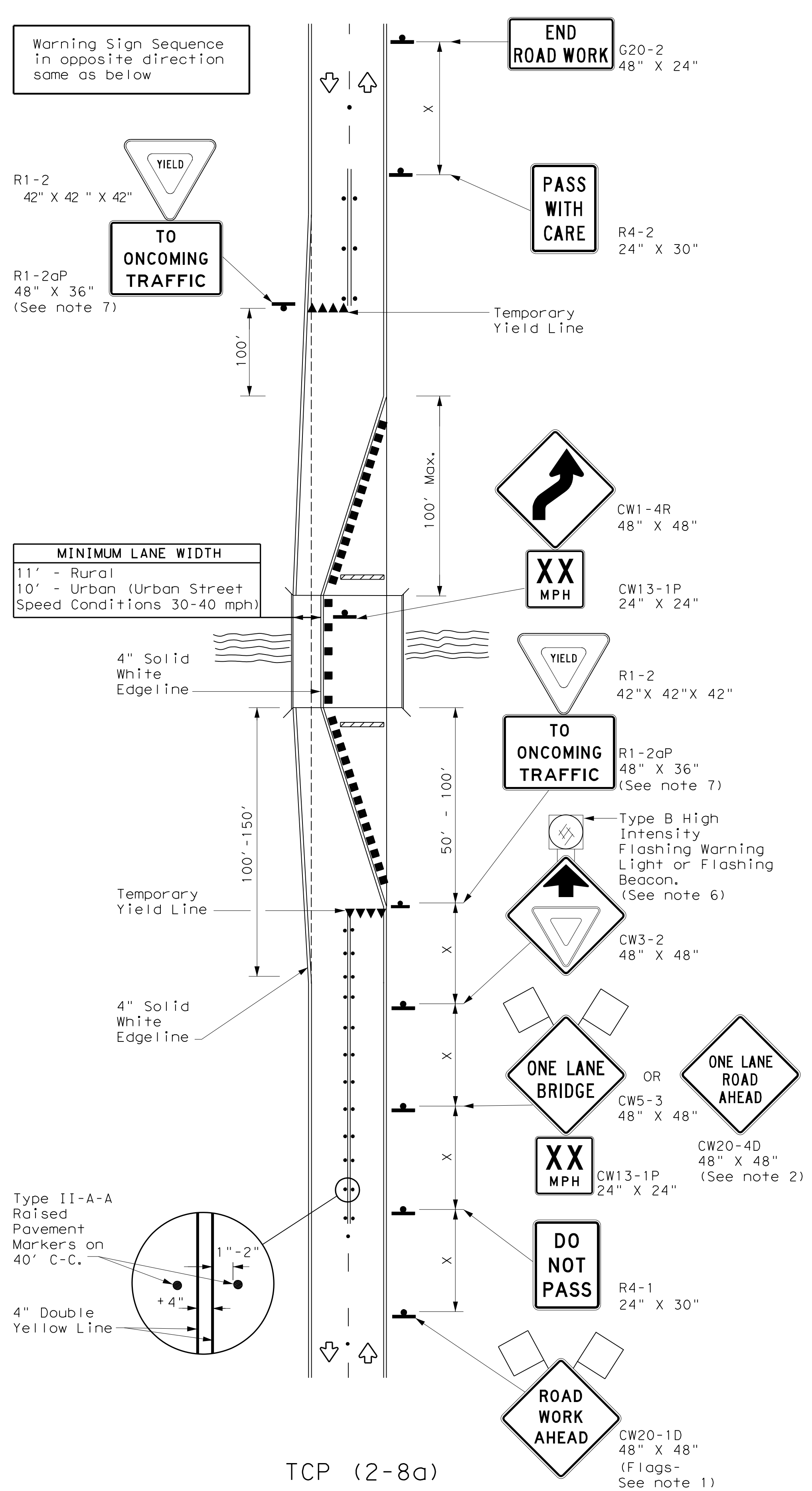
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	41B

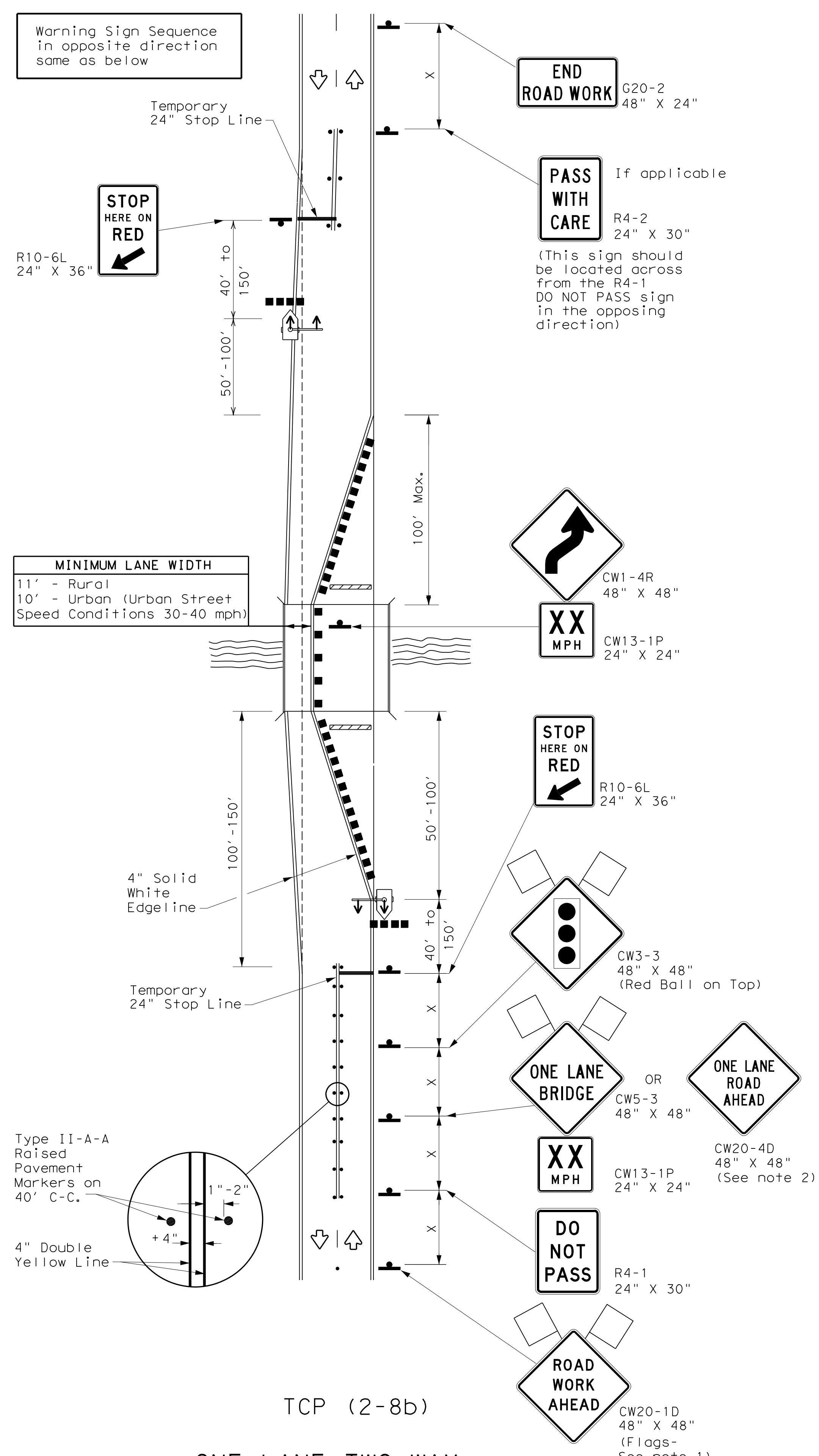
162



ONE LANE TWO-WAY

TRAFFIC CONTROL WITH YIELD SIGNS

(Less Than 2000 ADT-See Note 5)



ONE LANE TWO-WAY

TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND

Symbol	Description	Symbol	Description
	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 Operations Division Standard

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

TCP(2-8)-18

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REVISIONS 8-95 3-03, 1-97 2-12, 4-98 2-18	DIST BWD		COUNTY EASTLAND	SHEET NO. 42

DATE: 3/12/2021 12:52
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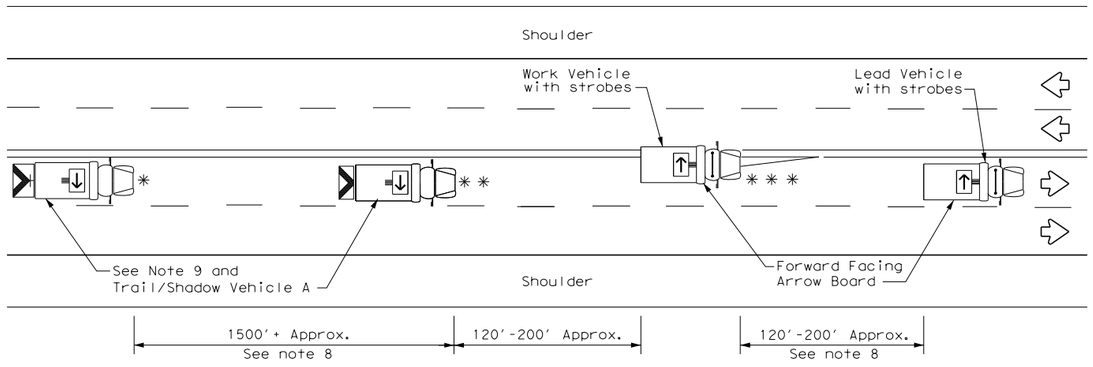
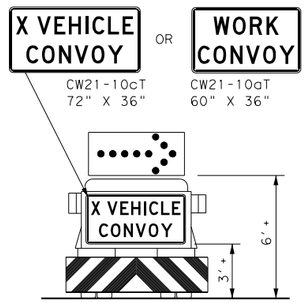


TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

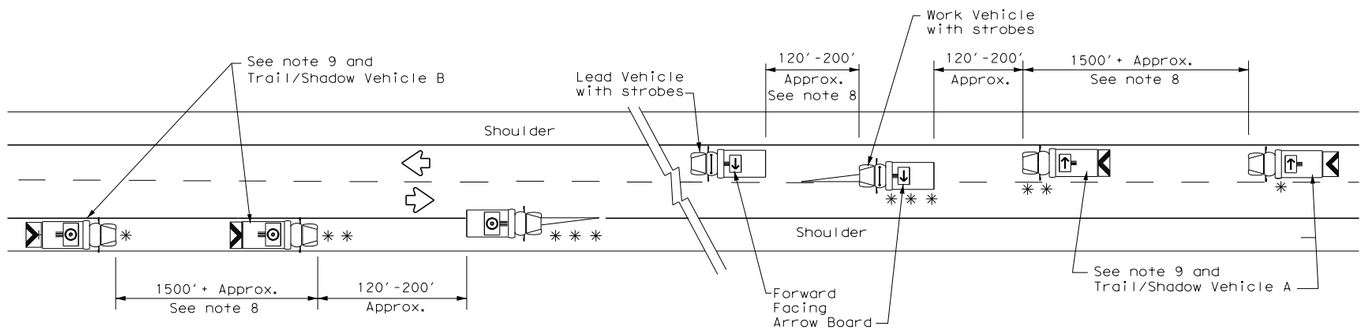
with RIGHT Directional display Flashing Arrow Board

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.

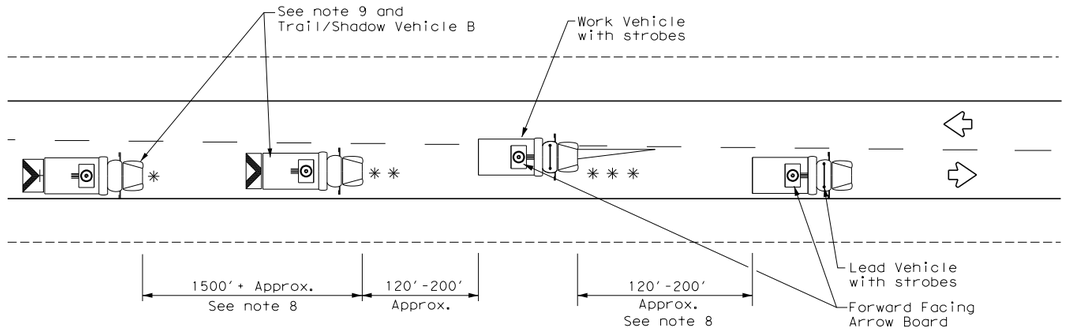


WORK ON SHOULDER

WORK ON TRAVEL LANE

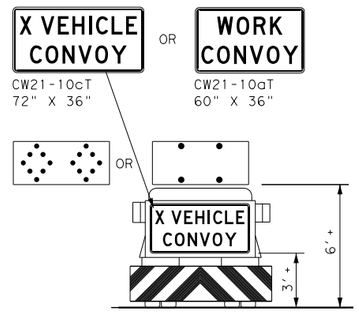
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



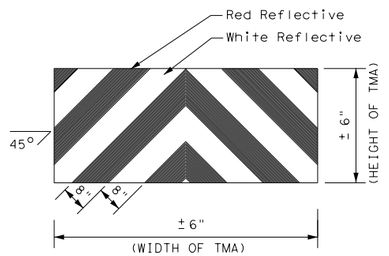
TCP (3-1c)

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	0288	03	032	SH 16
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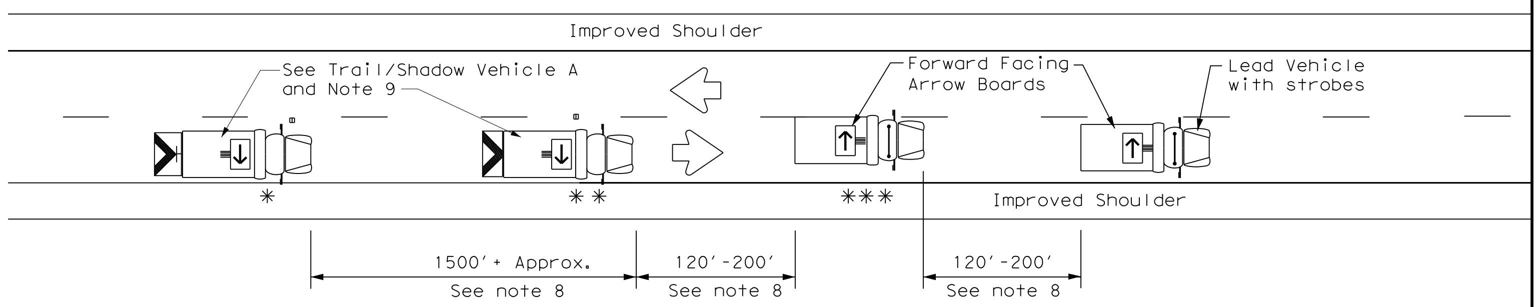
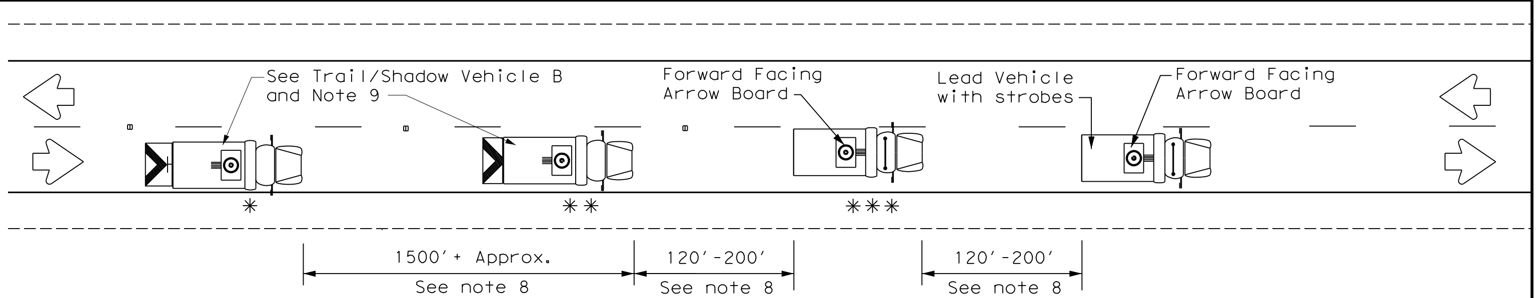
	BWD	EASTLAND		43



TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS

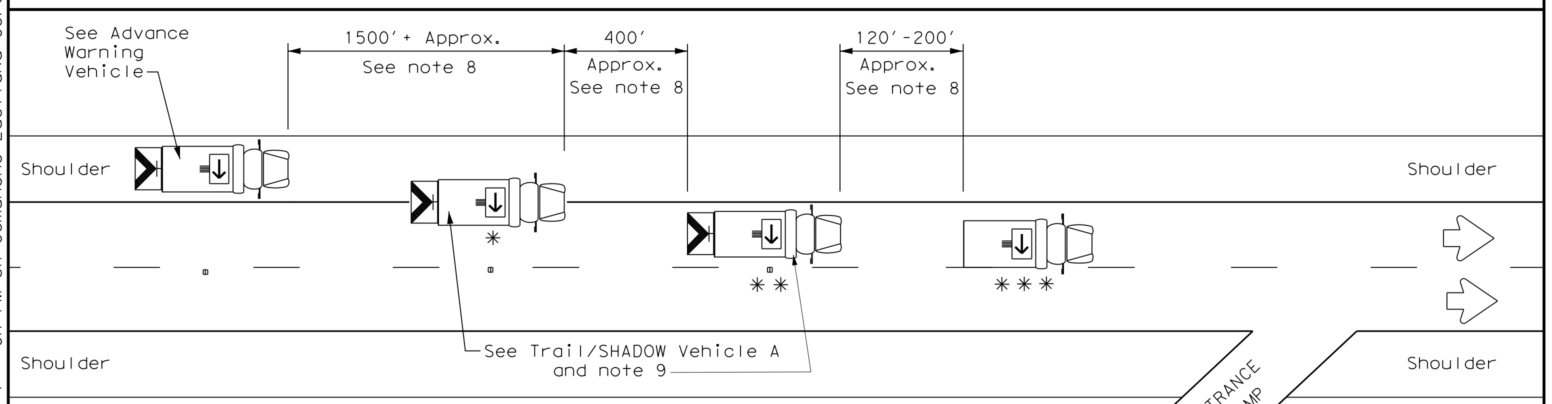
(WORK ON TRAVEL LANE)



TCP (3-3b)

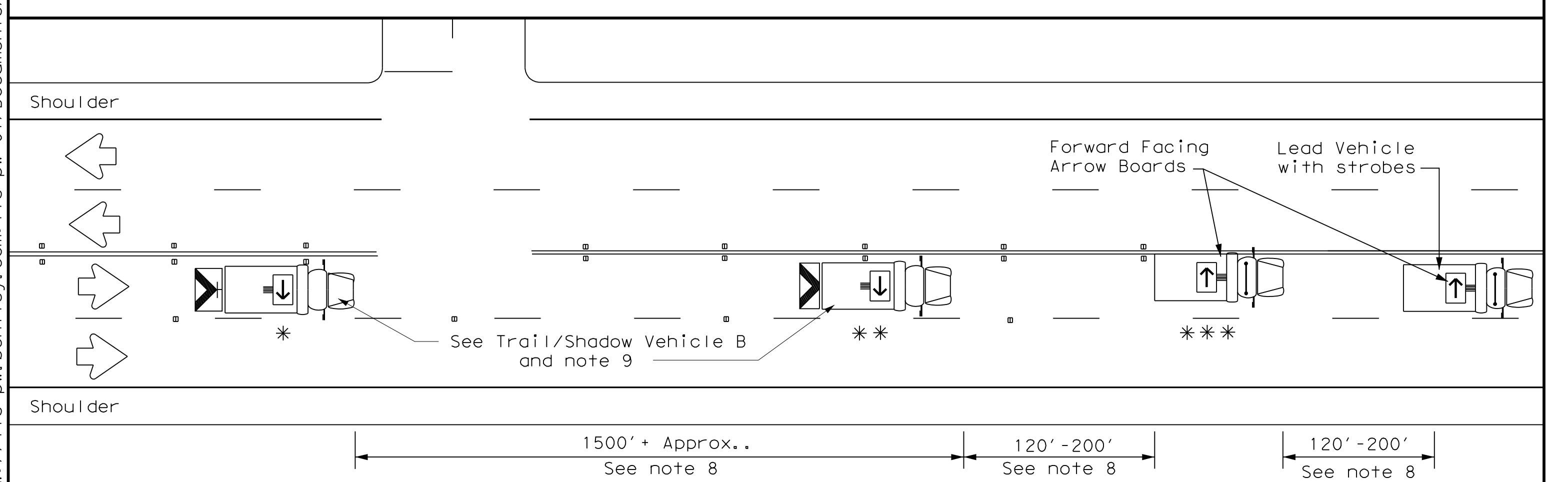
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS

(WORK ON TRAVEL LANE)



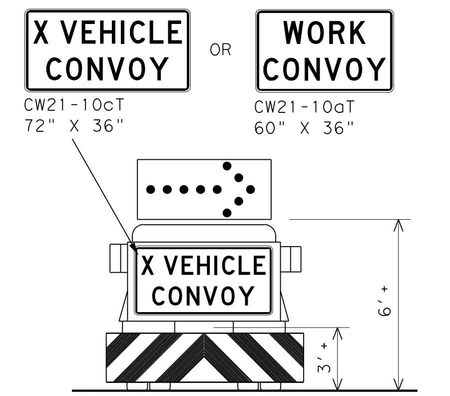
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



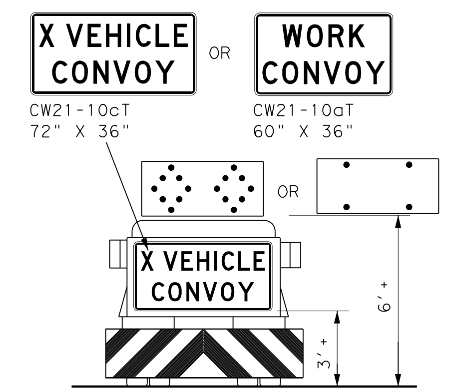
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



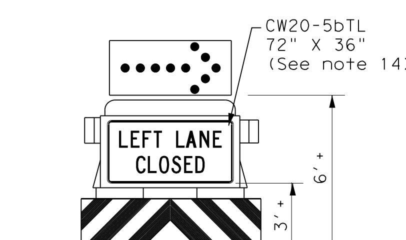
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

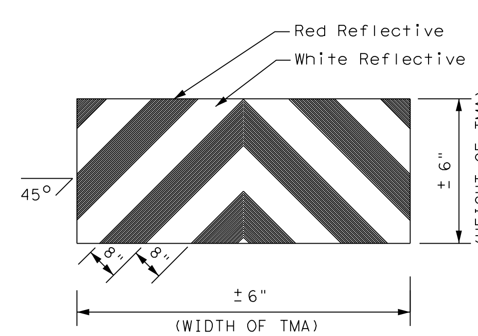


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

Symbol	Description	Symbol	ARROW BOARD DISPLAY
*	Trail Vehicle		
**	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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98 8-95 7-13 1-97 7-14	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	44

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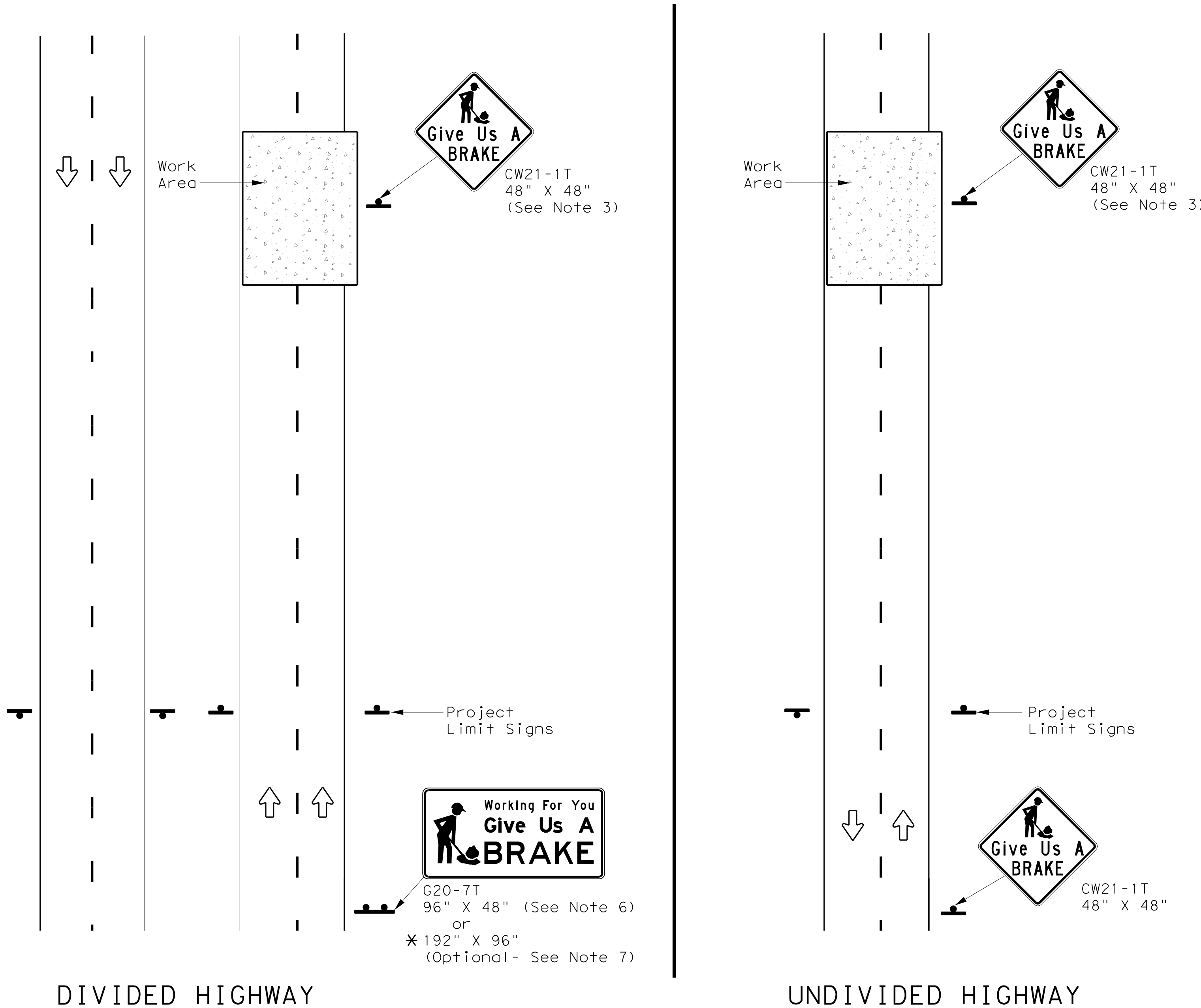


SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL Size	(LF) ①	(LF) ②	DRILLED SHAFT 24" DIA. (LF)
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND

Symbol	Meaning
(symbol)	Sign
(symbol)	Large Sign
(arrow)	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS

PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

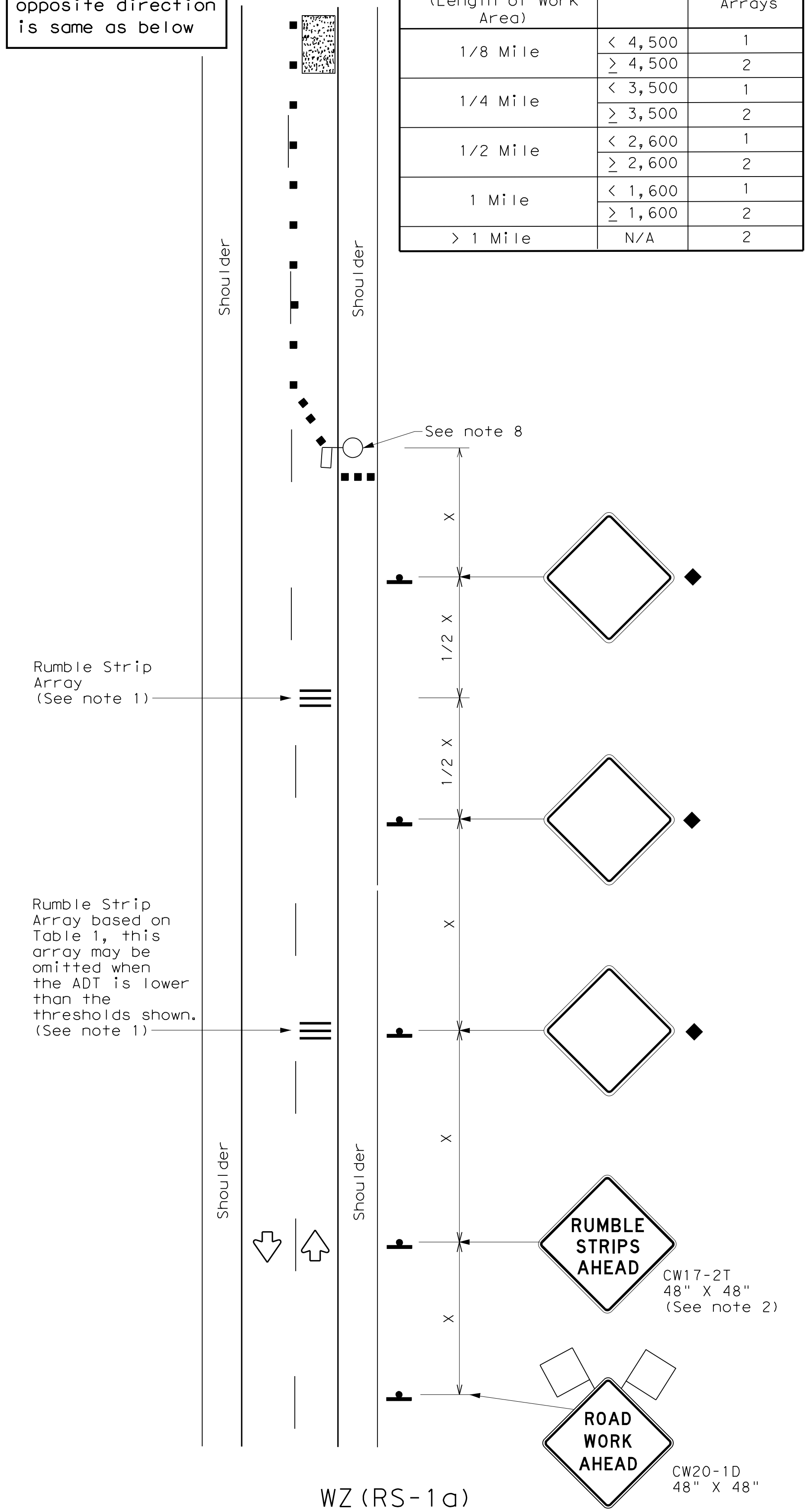
WZ(BRK)-13

FILE:	wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS		0288	03	032	SH 16
6-96 5-98 7-13		DIST		COUNTY	SHEET NO.
8-96 3-03		BWD		EASTLAND	45

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

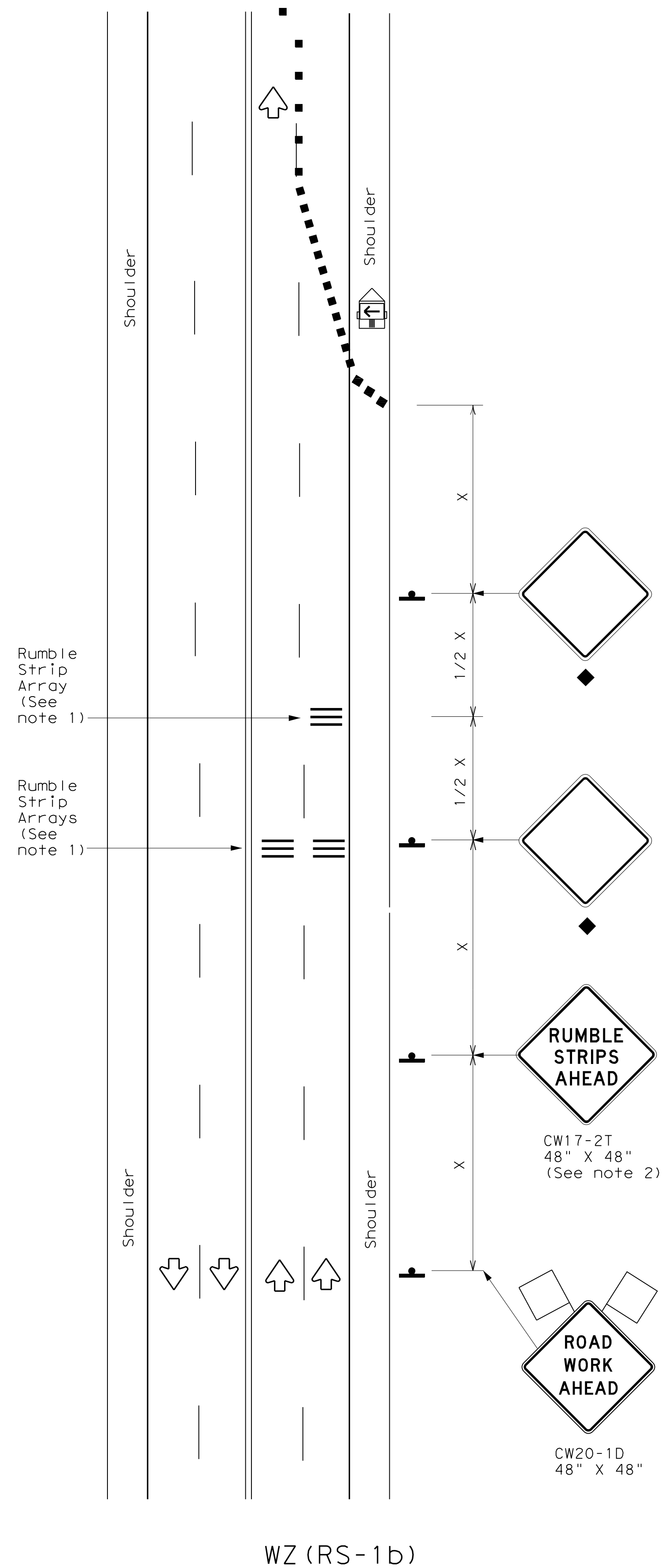
TABLE 1

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

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

TABLE 2

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

Texas Department of Transportation

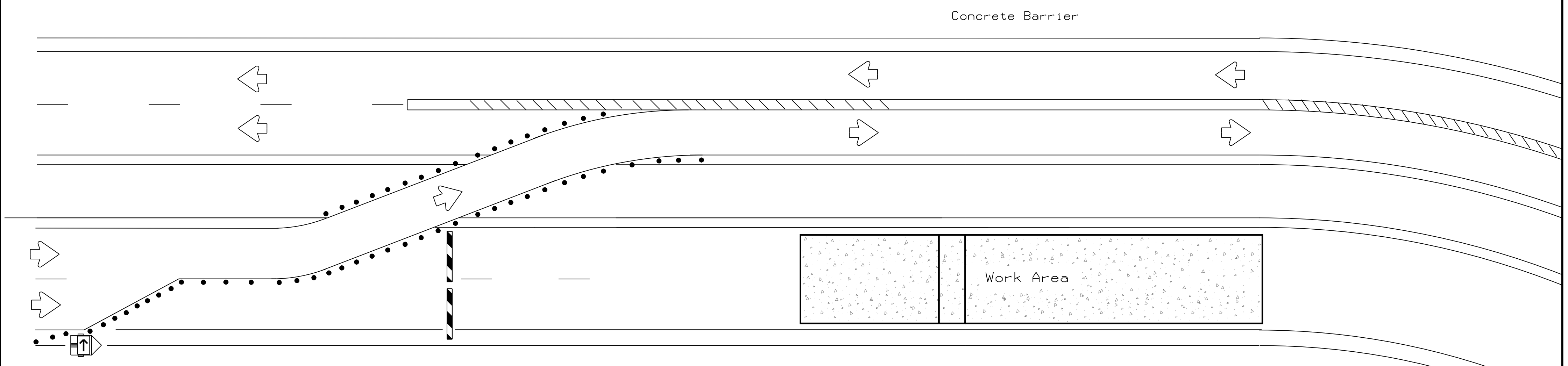
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 4-16	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	46

117



NOTES:

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

BARRIER DELINEATION WITH MODULAR GLARE SCREENS

LEGEND

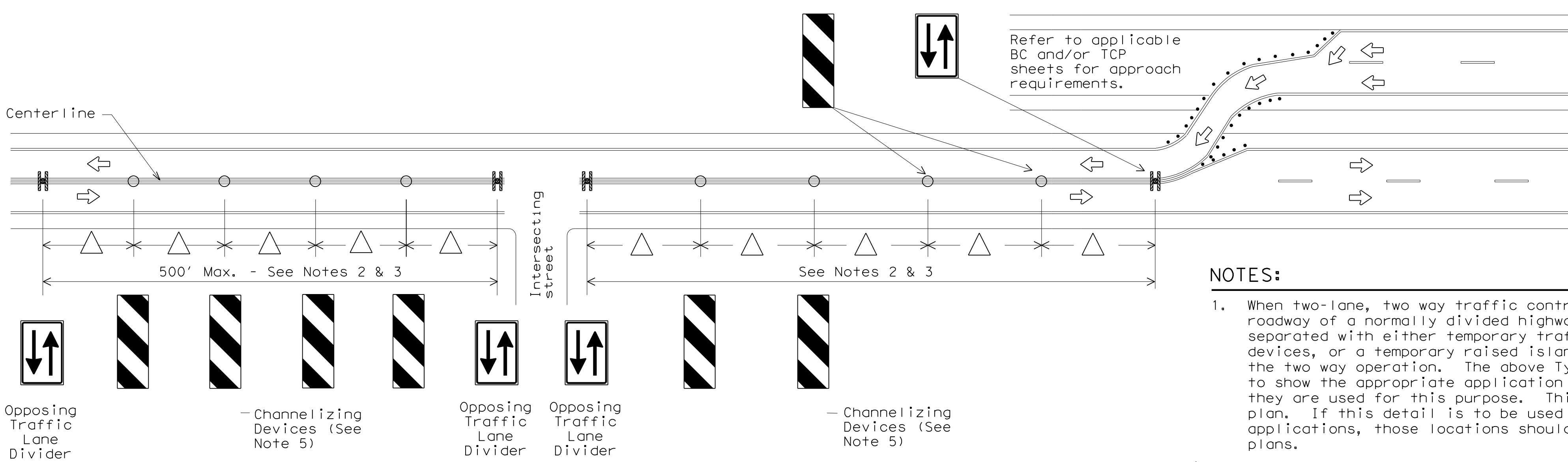
Symbol	Description
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

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

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



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. △ Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	47

110

DATE: 3/12/2021 12:52
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

DATE: 3/24/2021 5:48
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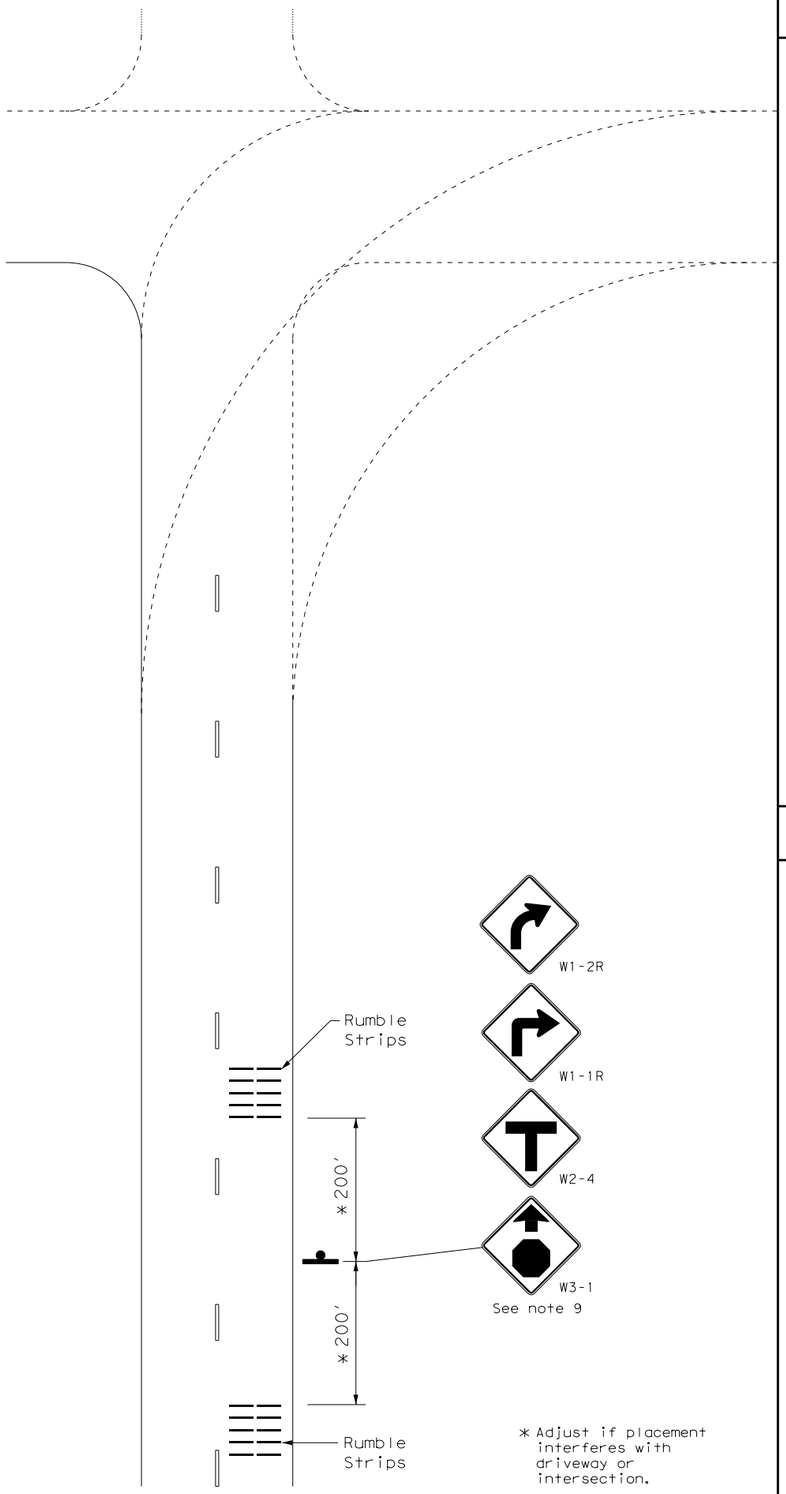
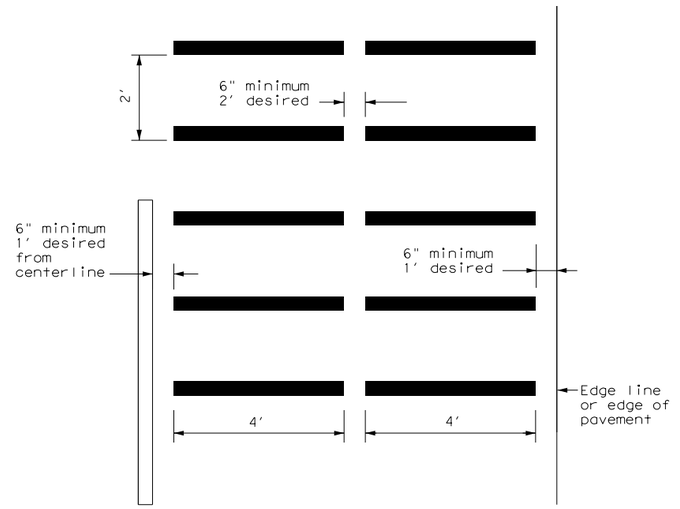
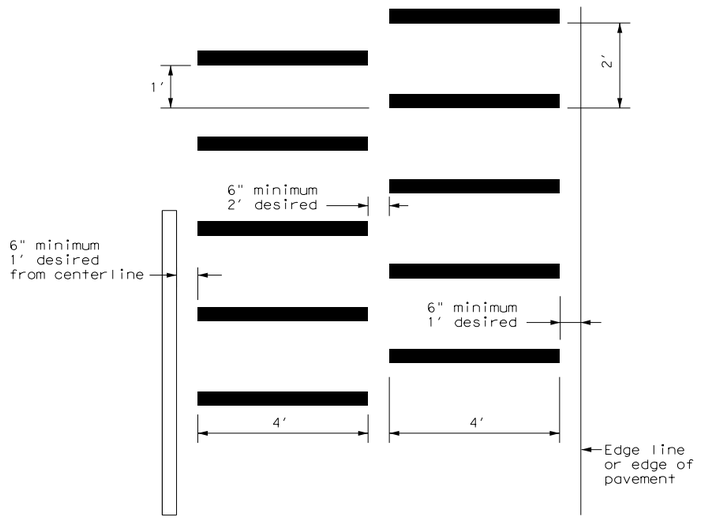


STANDARD PATTERN



ALTERNATIVE PATTERN



GENERAL NOTES

1. Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or Stop -controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed Stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.

2. When used, the rumble strips shall be placed 200 feet prior to and after the placement of the warning device.

3. The use of rumble strips should not be widespread or used indiscriminately.

4. Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.

5. A list of approved, preformed raised rumble strips can be obtained from the Traffic Operations Division.

6. Consideration should be given to noise levels when in -lane or transverse rumble strips are installed near residential areas, schools, churches, etc.

7. The use of the "Rumble Strips Ahead" sign may be used in advance of in -lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the guidelines for advance placement of warning sign included in the "Texas Manual on Uniform Traffic Control Devices".

W17-2T

8. Consideration should be given to bicyclists. A 12 inch gap from the edge line may be used to accommodate bicyclists when a usable shoulder is not available. Additional gaps in the in -lane or transverse rumble strips are not recommended since they could cause motorists to swerve to avoid the rumble strips.

9. Other signs can be used as conditions warrant.

Texas Department of Transportation

Traffic Operations Division Standard

TRANSVERSE OR IN-LANE RUMBLE STRIPS

RS(5)-13

FILE: rs(5)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
2-10	DIST	COUNTY		SHEET NO.
10-13	BWD	EASTLAND		47A

Beginning chain SH16 description

Point SH16200	X	1,962,509.3144	Y	6,860,082.8315	Sta 1379+50.00
Course from SH16200 to SH16201 N 11° 32' 01.5424" E Dist 1,350.0000					
Point SH16201	X	1,962,779.2406	Y	6,861,405.5710	Sta 1393+00.00

Ending chain SH16 description

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED
PROFESSIONAL ENGINEER

3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19287

HORIZONTAL ALIGNMENT DATA SH 16 AT BEAR CREEK

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		48

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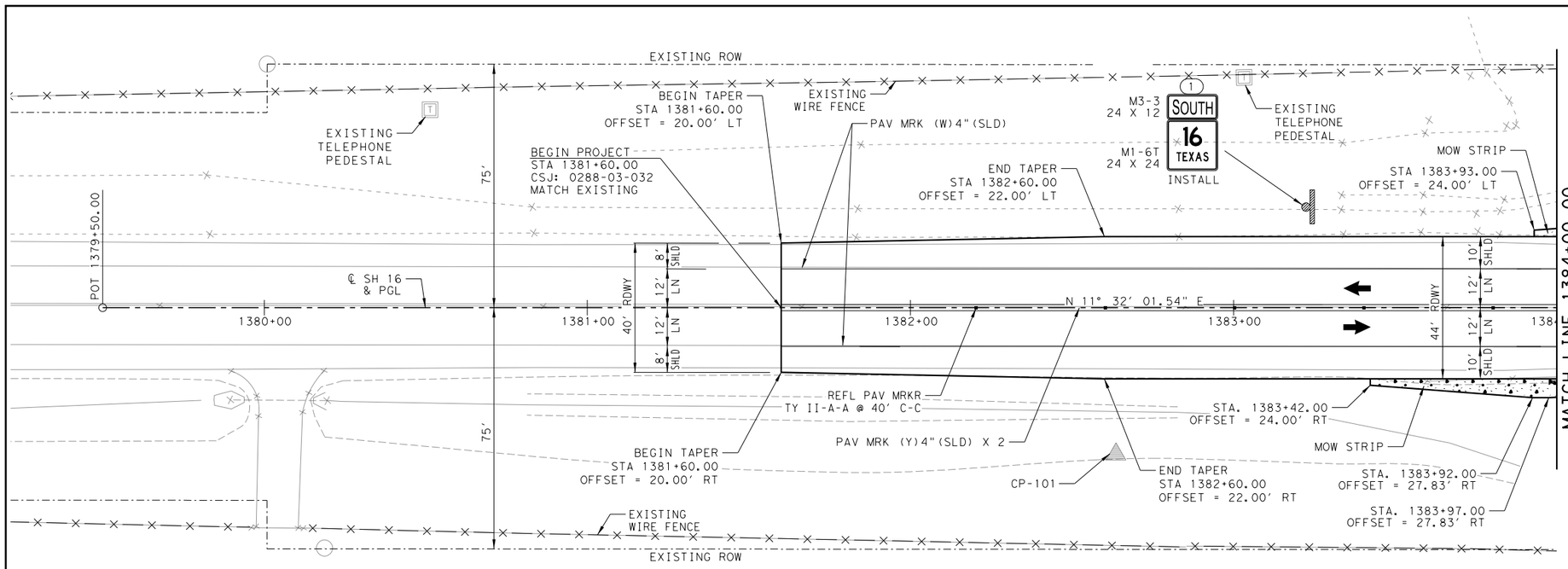


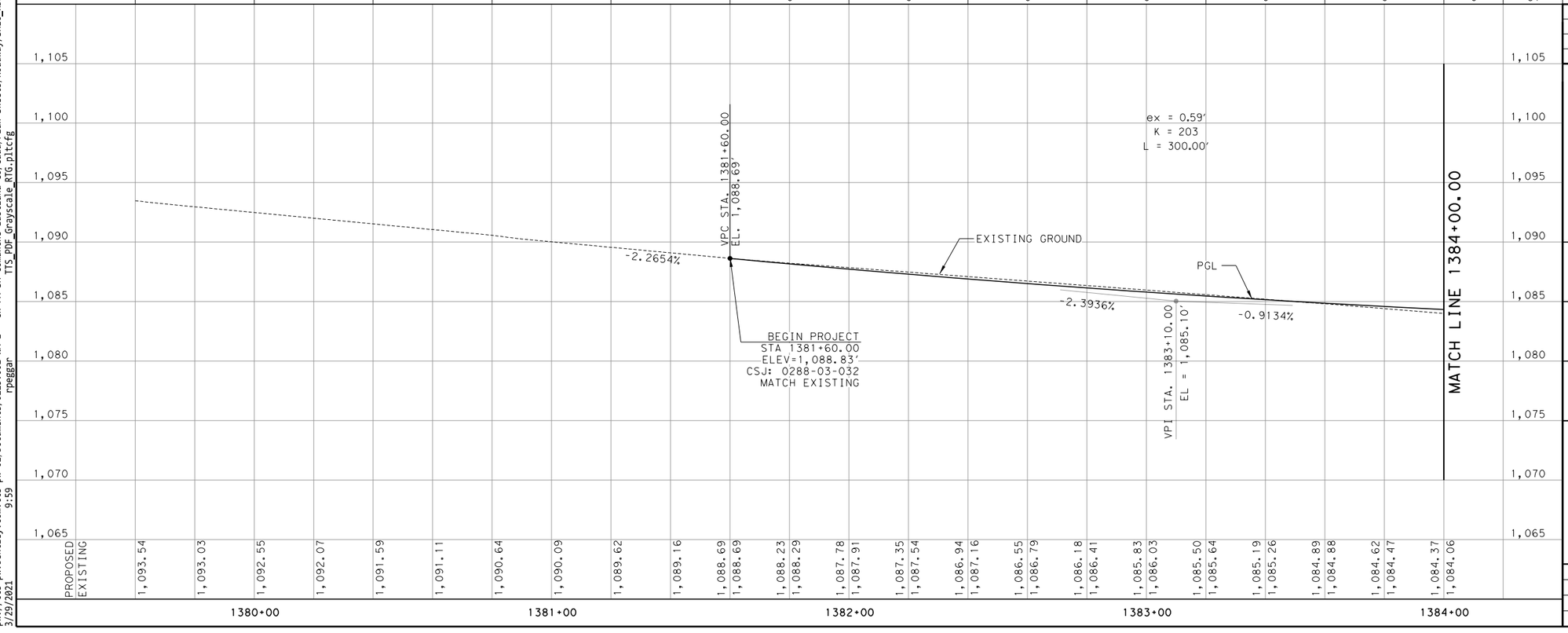
0 20 40
SCALE: 1" = 40'

LEGEND

- DIRECTION OF TRAFFIC
- MBGF
- DIRECTION OF FLOW
- TYPE C EXISTING FENCE

EST	UNIT	DESCRIPTION
38	CY	EMBANK (FINAL)(DENS CONT)(TY C)
436	CY	EXCAV (RDWY)
0	CY	EXCAVATION (CHANNEL)

					2	1	1	1	16	17	38	CY	EMBANK (FINAL)(DENS CONT)(TY C)
					72	50	109	55	104	46	436	CY	EXCAV (RDWY)
					0	0	0	0	0	0	0	CY	EXCAVATION (CHANNEL)



NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/29/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19289

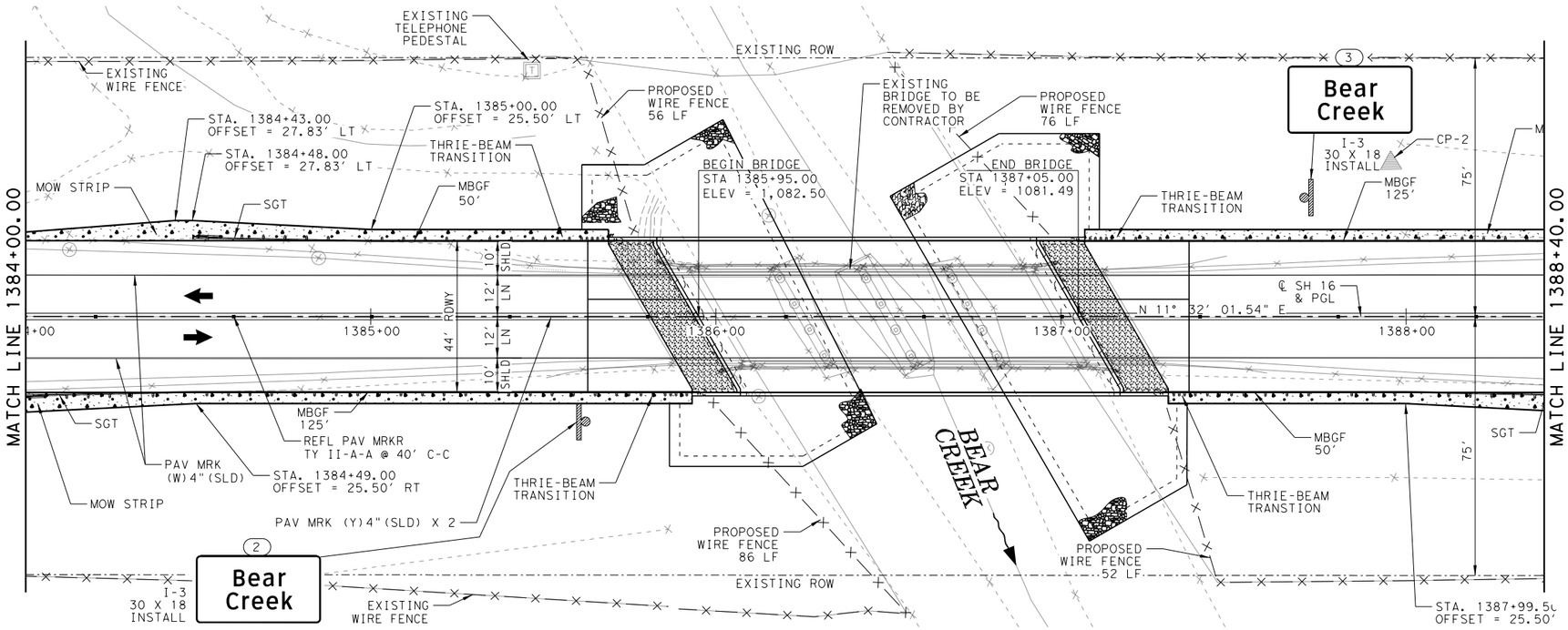
SH 16 AT BEAR CREEK

PLAN AND PROFILE

SCALE: HORIZ 1"=40'
VERT 1"=10'

SHEET 1 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		49

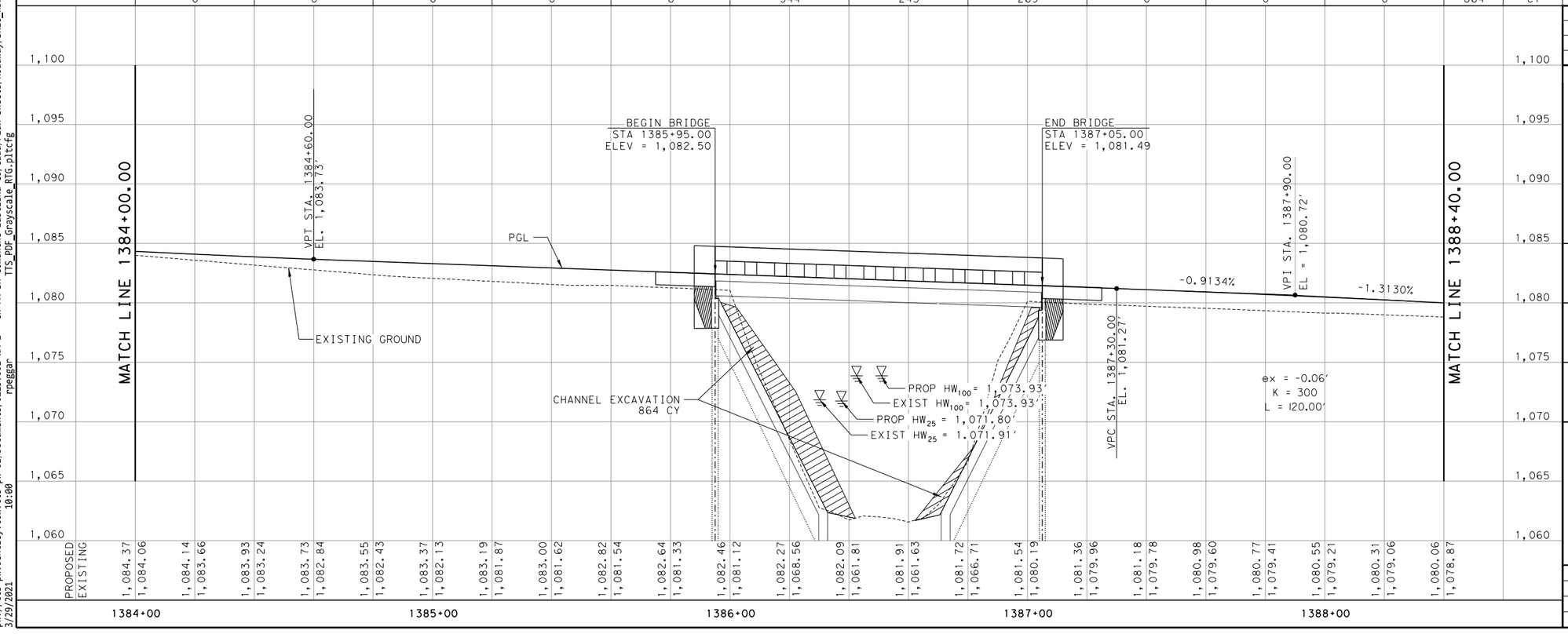


0 20 40
SCALE: 1" = 40'

LEGEND

- DIRECTION OF TRAFFIC
- MBGF
- DIRECTION OF FLOW
- TYPE C EXISTING FENCE

											EST	UNIT	DESCRIPTION
112	235	59	194	241	0	0	66	24	74	49	1054	CY	EMBANK (FINAL)(DENS CONT)(TY C)
70	30	4	5	4	0	0	5	5	5	2	130	CY	EXCAV (RDWY)
0	0	0	0	8	344	243	269	0	0	0	864	CY	EXCAVATION (CHANNEL)



NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/29/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19289

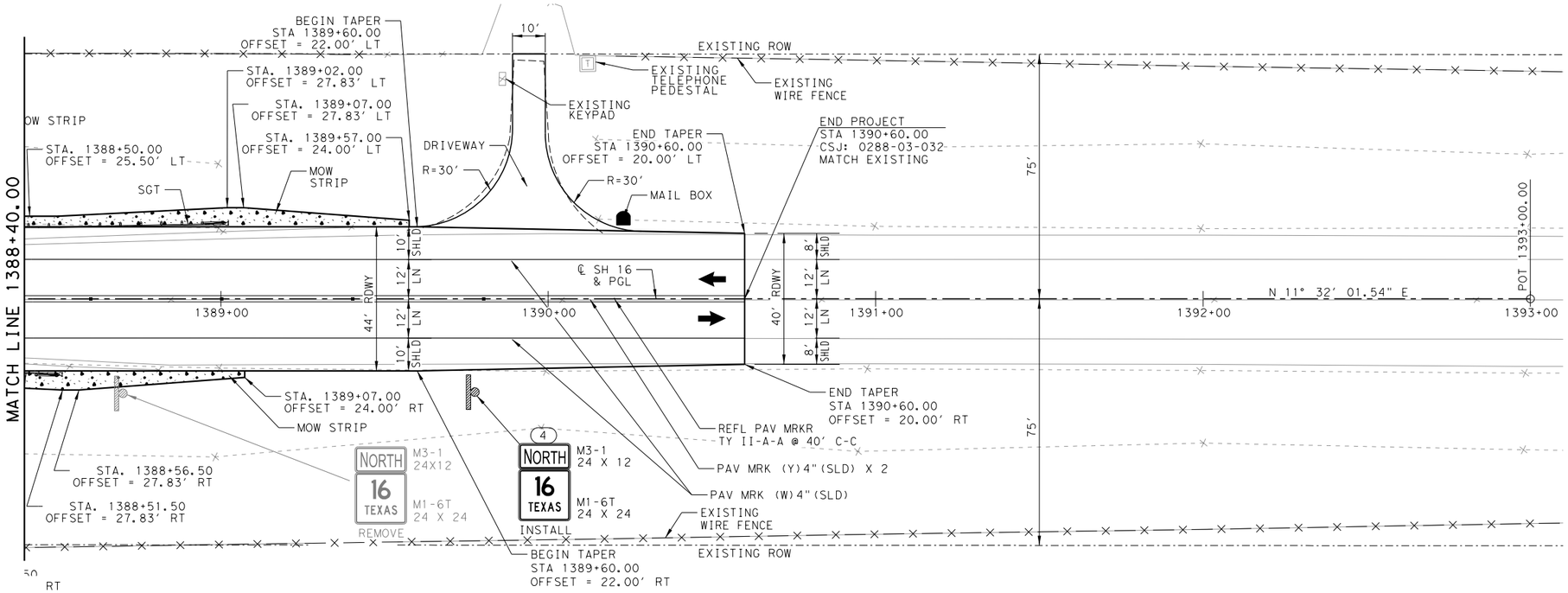
SH 16 AT BEAR CREEK

PLAN AND PROFILE

SCALE: HORIZ 1"=40'
VERT 1"=10'

SHEET 2 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		50



0 20 40
SCALE: 1" = 40'

LEGEND

- DIRECTION OF TRAFFIC
- MBGF
- DIRECTION OF FLOW
- TYPE C EXISTING FENCE

EST	UNIT	DESCRIPTION
182	CY	EMBANK (FINAL)(DENS CONT)(TY C)
214	CY	EXCAV (RDWY)
0	CY	EXCAVATION (CHANNEL)

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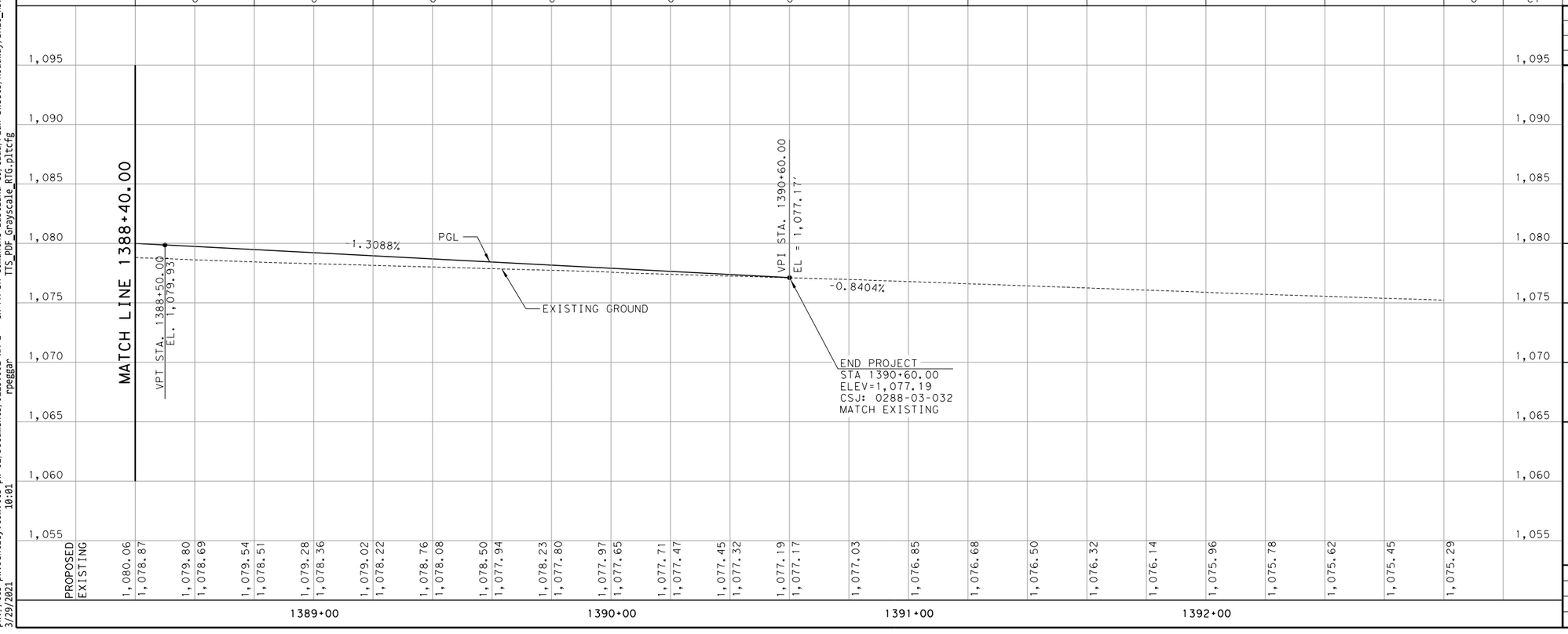
	8	10	35	63	43	55					
	0	0	0	0	0	0					



NO.	REVISION	BY	DATE

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CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/29/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19289

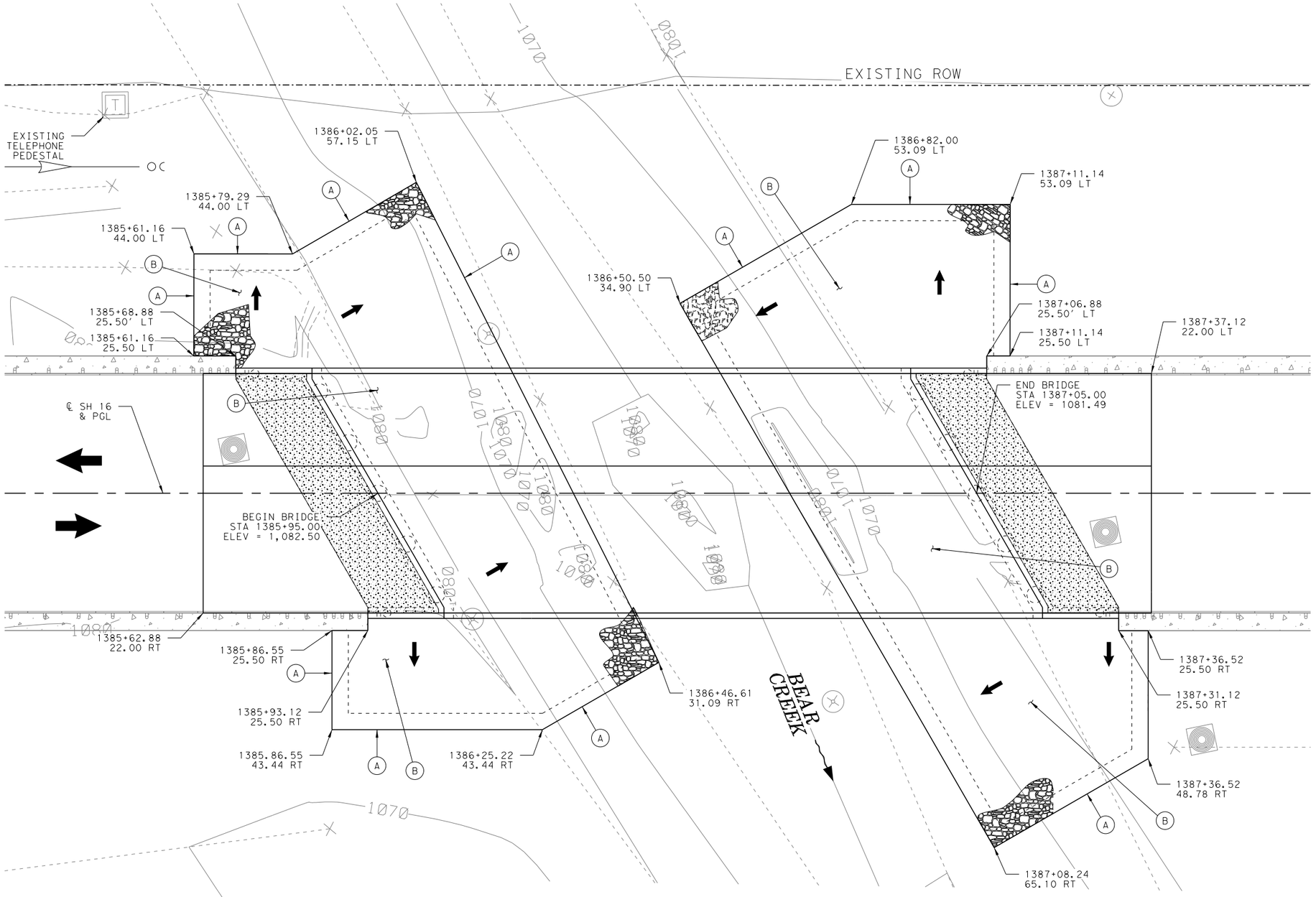
SH 16 AT BEAR CREEK

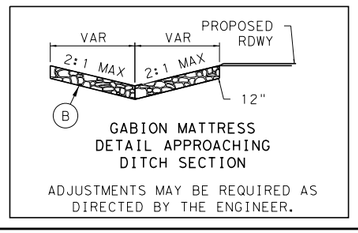
PLAN AND PROFILE

SCALE: HORIZ 1"=40'
VERT 1"=10'

SHEET 3 OF 3

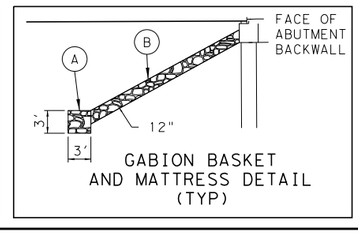
FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		51





GABION MATTRESS DETAIL APPROACHING DITCH SECTION

ADJUSTMENTS MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.



GABION BASKET AND MATTRESS DETAIL (TYP)

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/19/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19097

SH 16 AT BEAR CREEK

GABION LAYOUT

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		52

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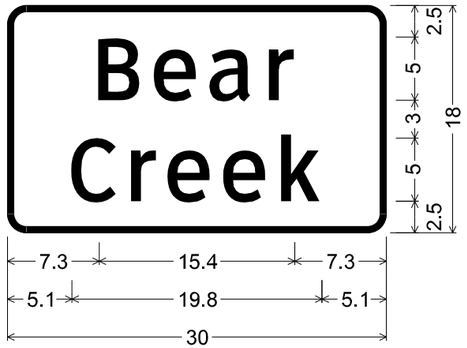

Identifier : I-3 (30 X 18);
1.5" Radius, 0.5" Border, White on Green;
[Bear] ClearviewHwy-3-W;
[Creek] ClearviewHwy-3-W;
Table of widths and spaces.

7.3	B 3.4	0.9	e 3.4	1.0	a 3.4	1.3	r 2.0	7.3

5.1	C 3.6	1.1	r 2.0	0.9	e 3.4	1.0	e 3.4	1.2	k 3.2	5.1

SIGN NO. 2 AND 3

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED
PROFESSIONAL ENGINEER
3/17/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

SIGN DETAILS

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		53

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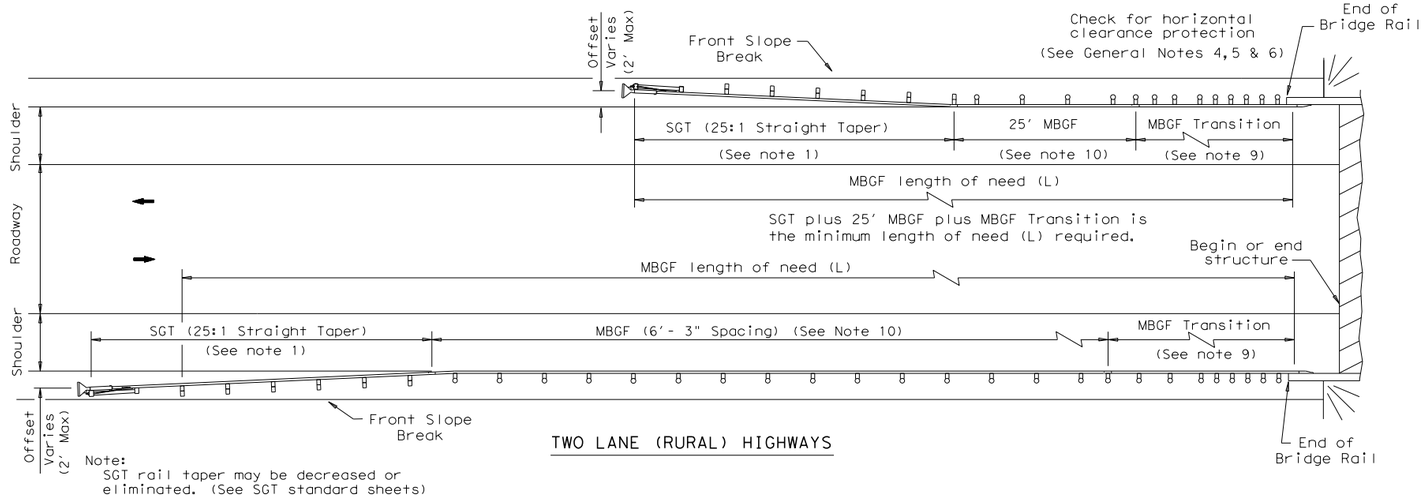
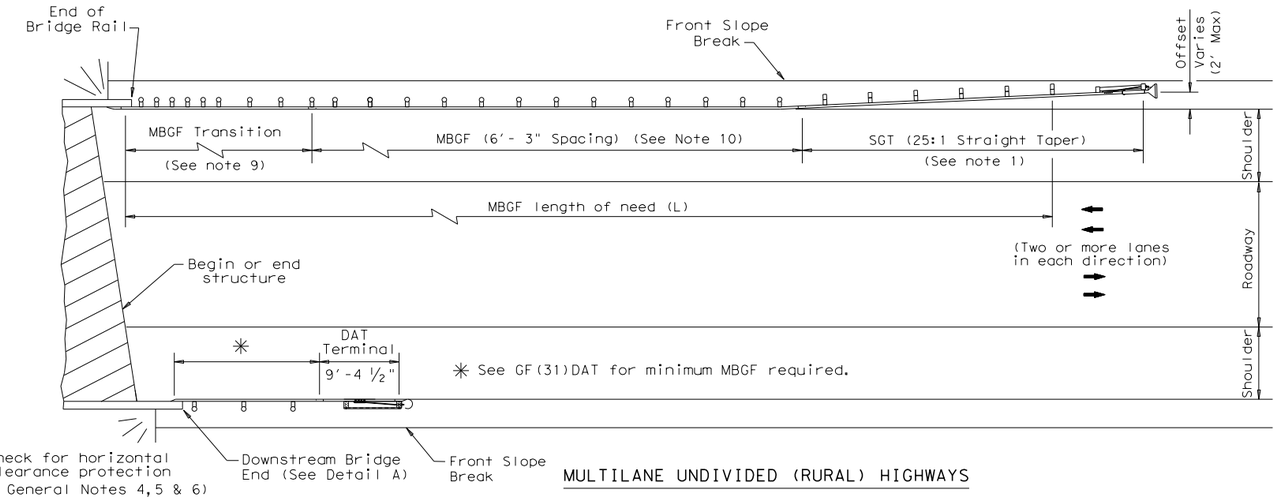
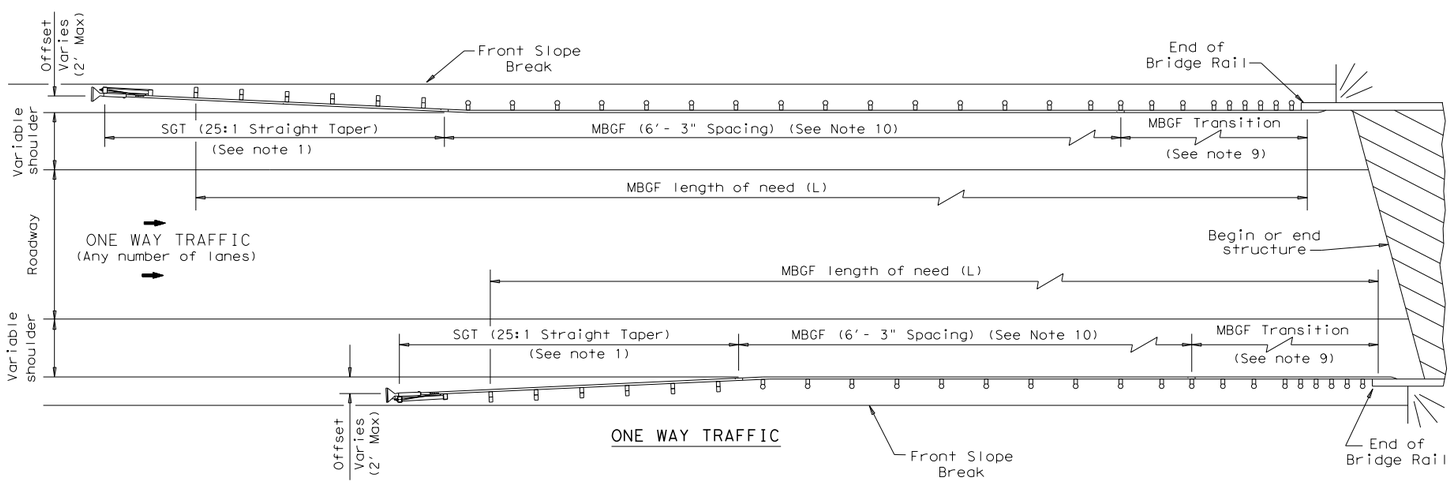


TWO LANE (RURAL) HIGHWAYS

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



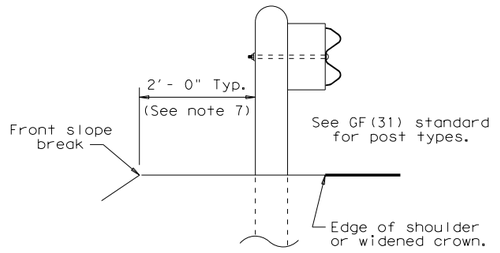
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



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

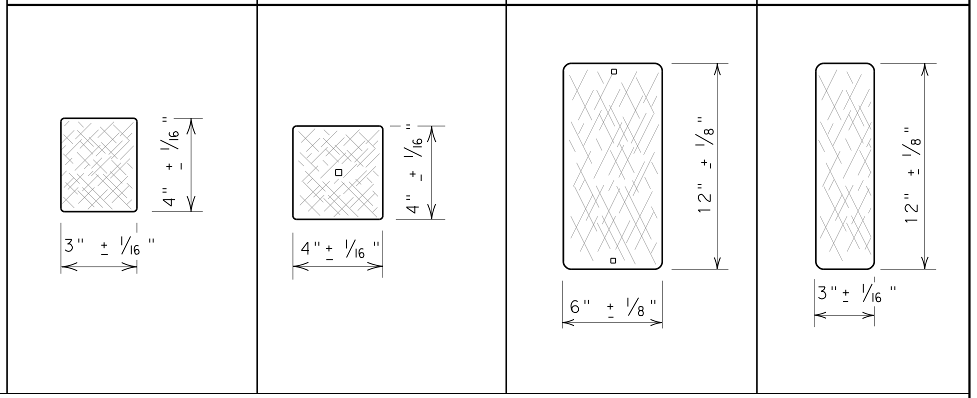
BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

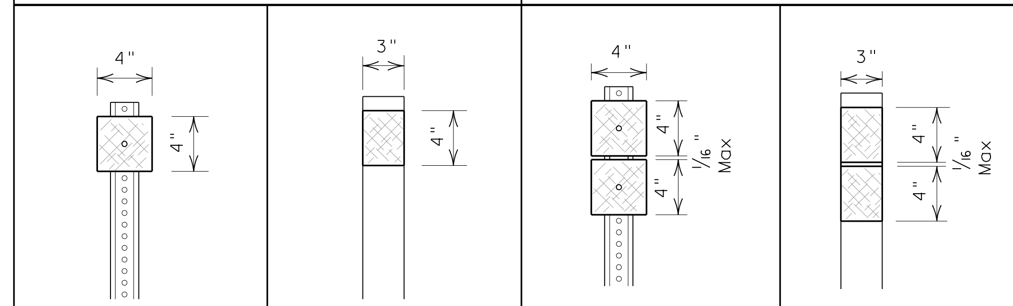
FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		54

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS



	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS



	SINGLE		DOUBLE	
DEVICE	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

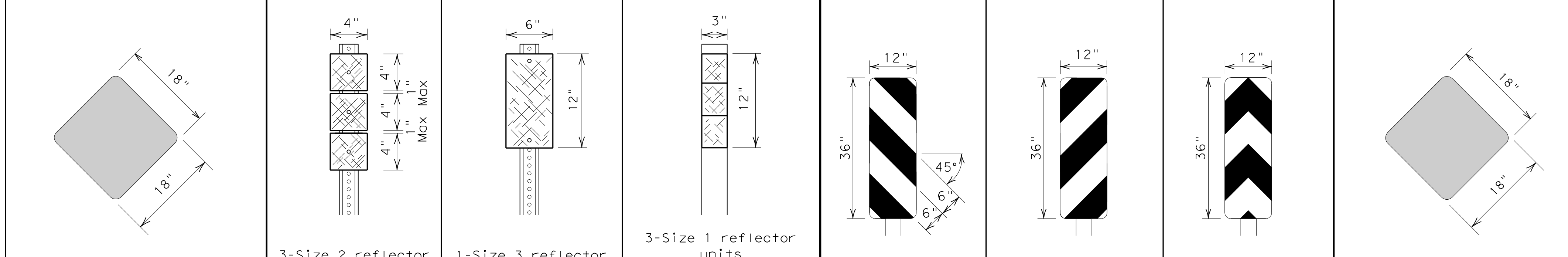
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

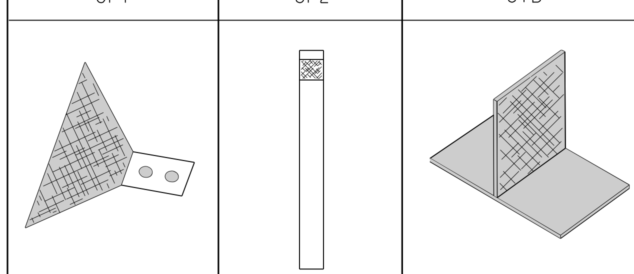
DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

OBJECT MARKERS



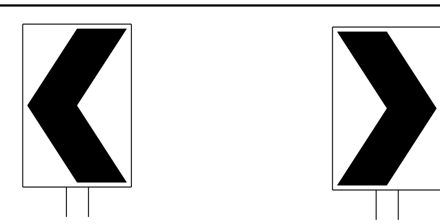
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating 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

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.		

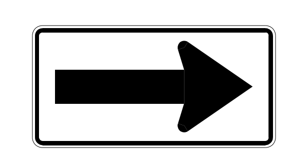
CHEVRONS



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	

ONE DIRECTION LARGE ARROW



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

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
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REVISIONS 10-09 3-15 4-10 7-20	DIST BWD	COUNTY EASTLAND		SHEET NO. 55

20A

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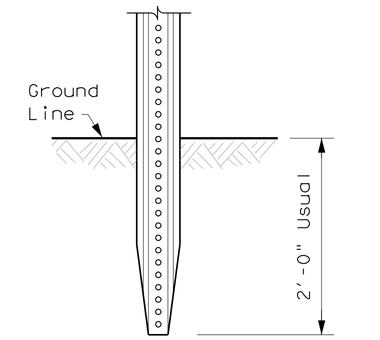
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

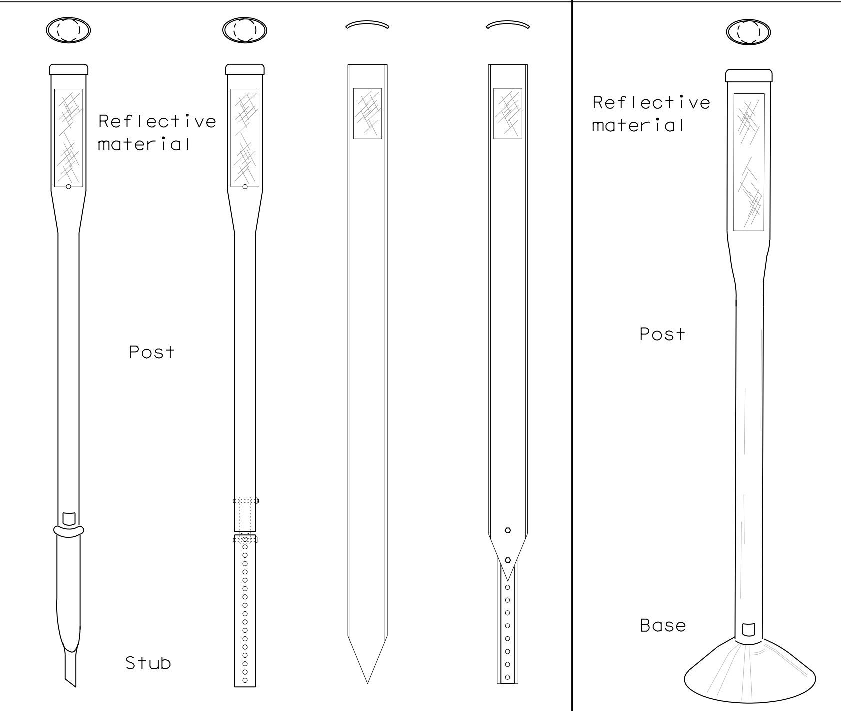


NOTES

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 | SRF



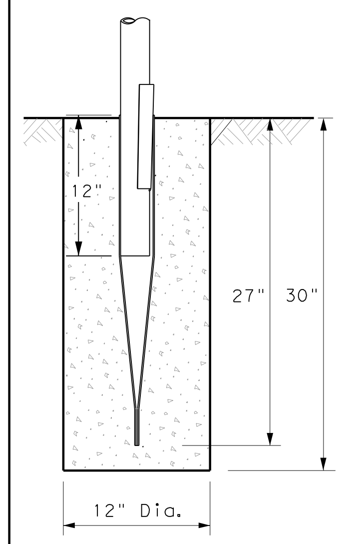
EMBEDDED | SURFACE MOUNT

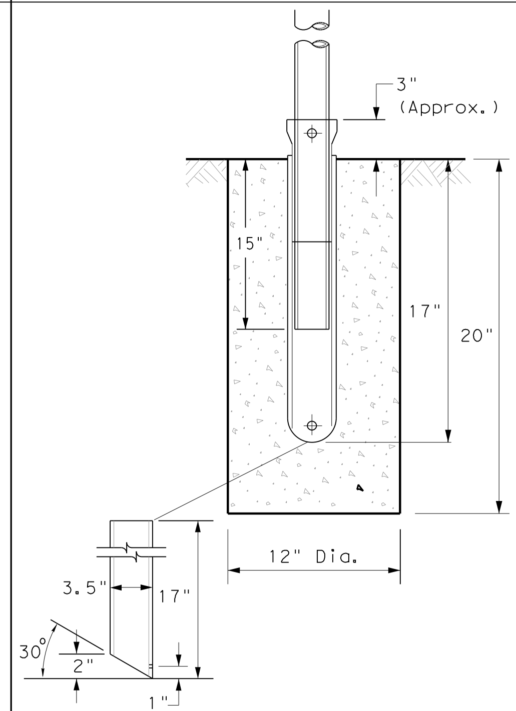
NOTES

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 | WAP





STEEL | PLASTIC

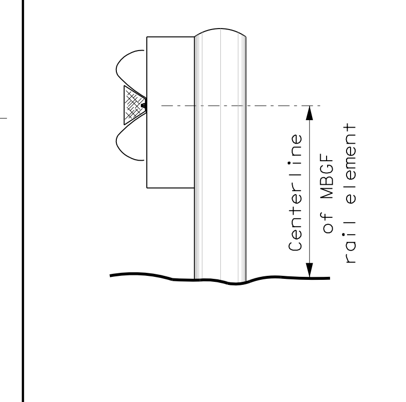
NOTE

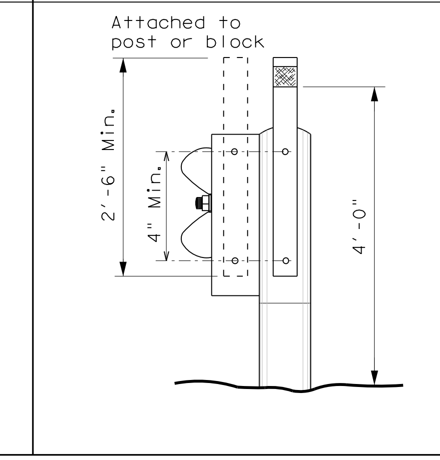
1. Install per manufacturer's recommendations.

TYPE OF BARRIER MOUNTS

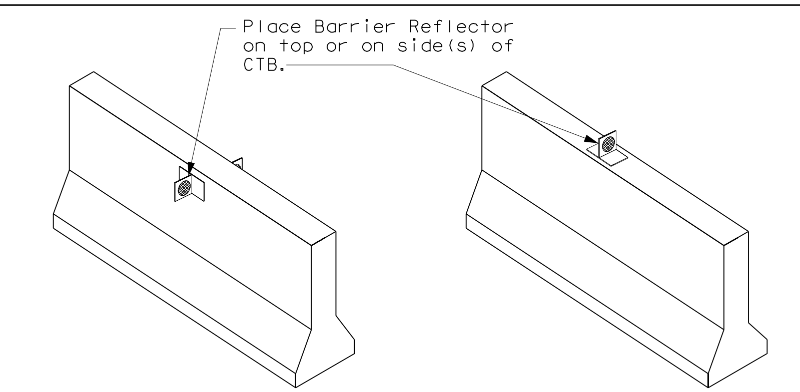
GUARD FENCE ATTACHMENT

GF1 | GF2





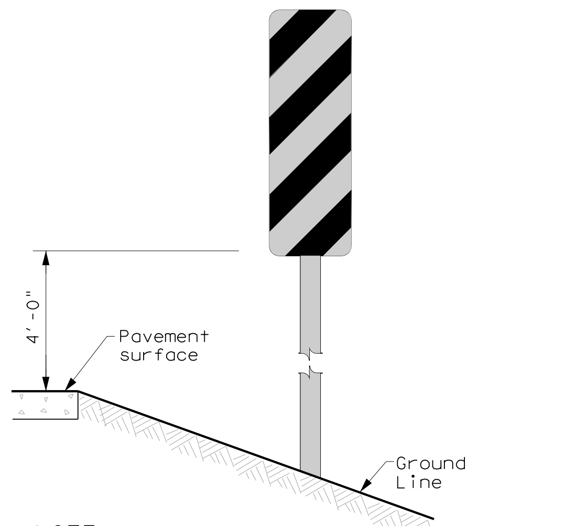
CONCRETE TRAFFIC BARRIER (CTB)



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.

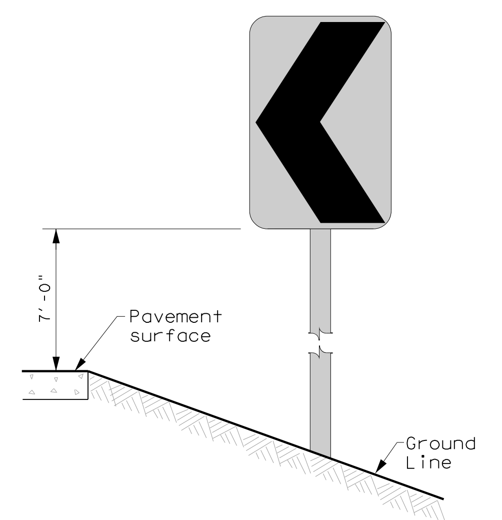
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

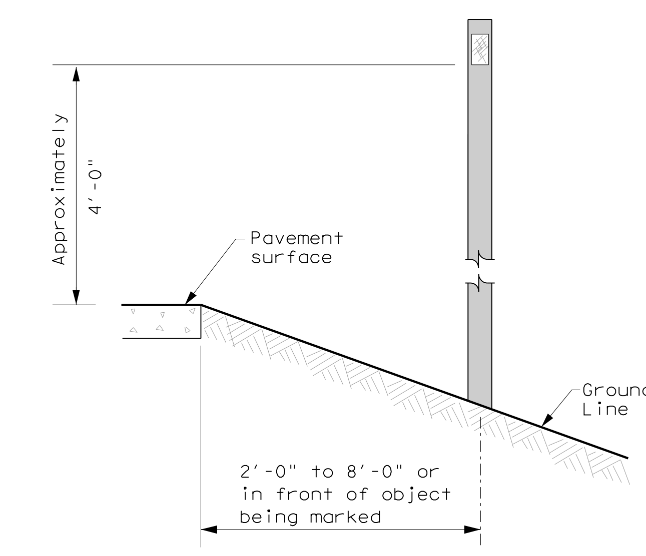
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

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DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

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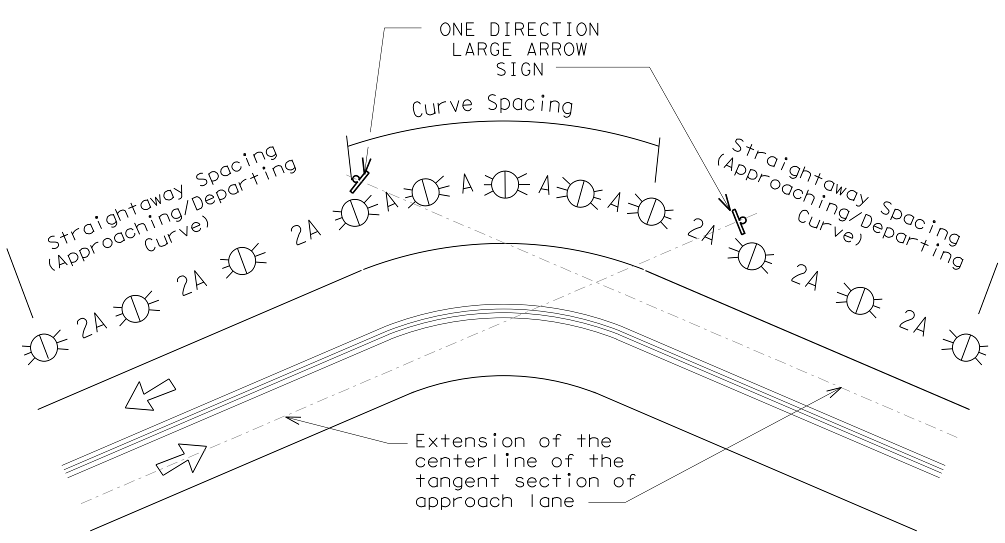
20B

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 Advisory Speed: 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

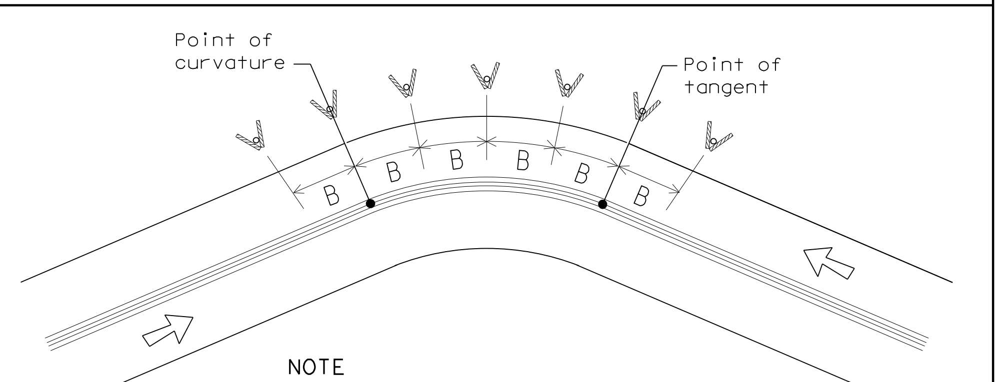
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		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

Symbol	Meaning
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

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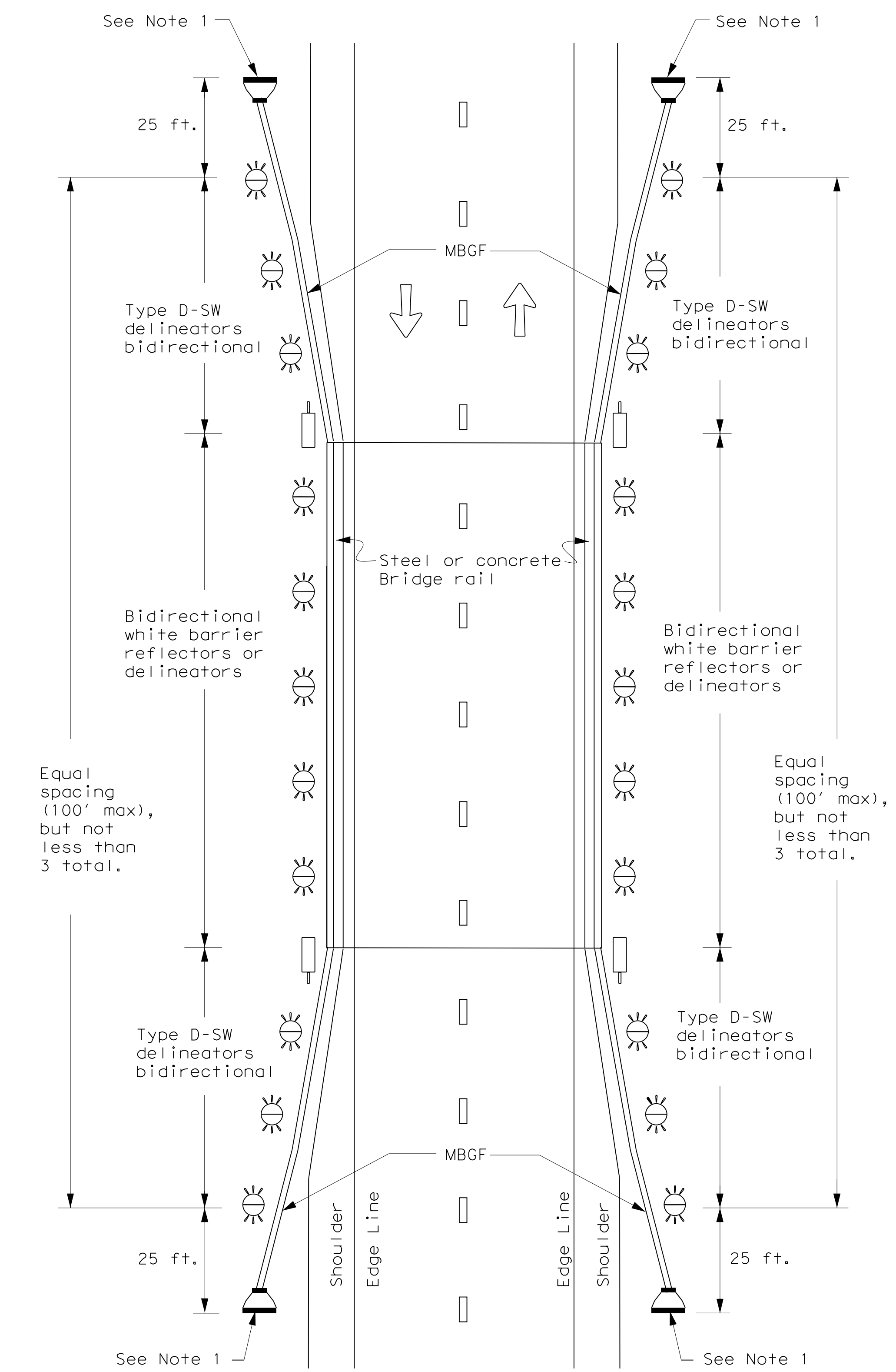
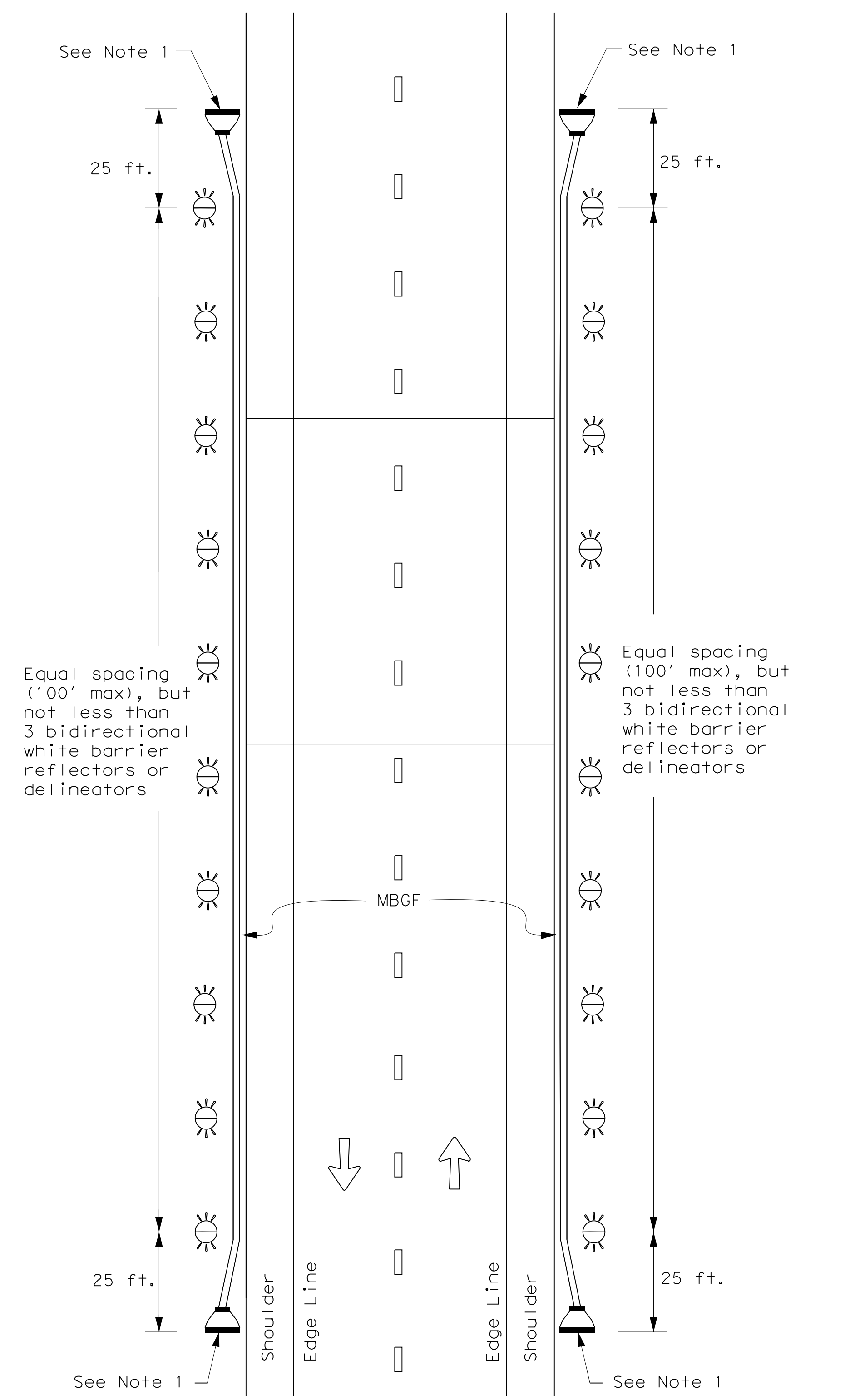
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

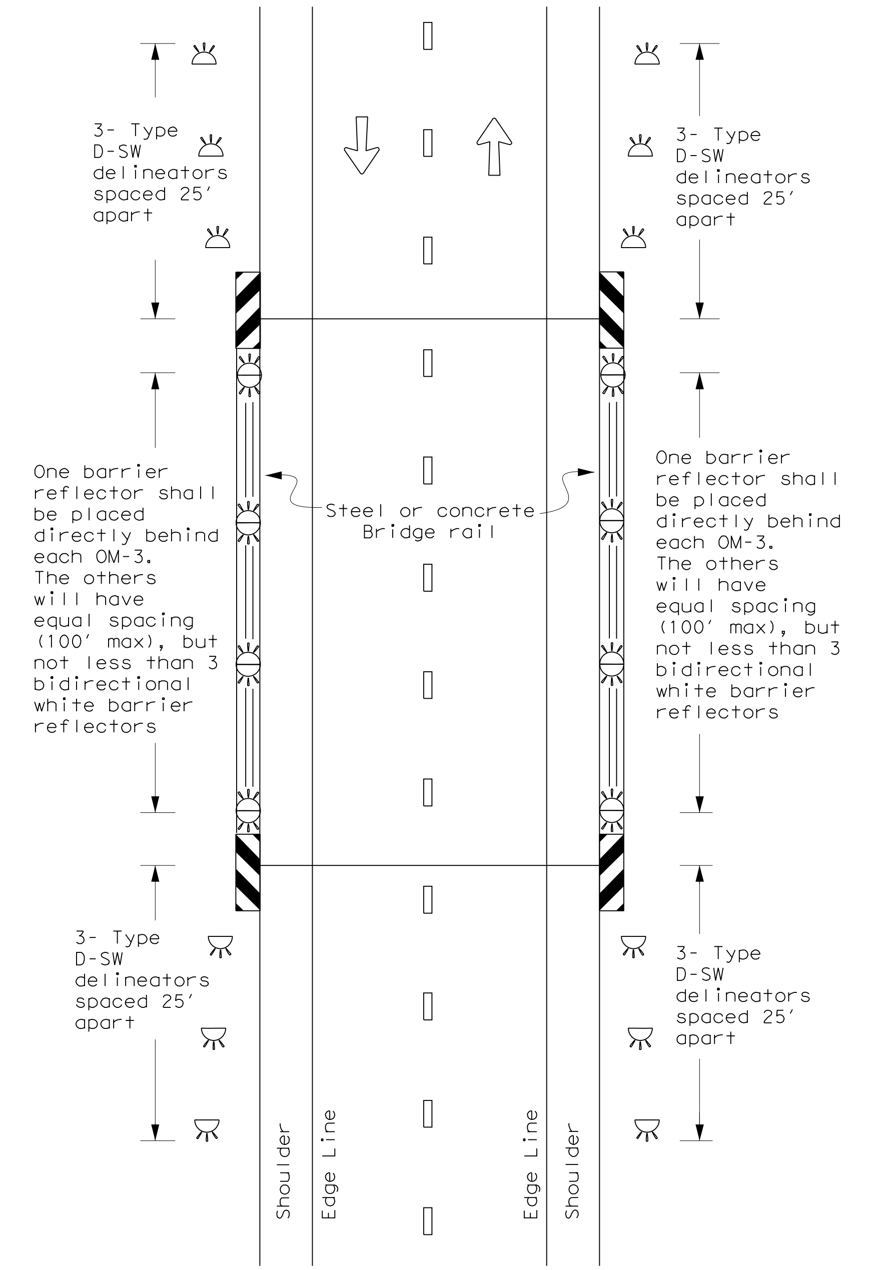
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

Symbol	Description
	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

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20E

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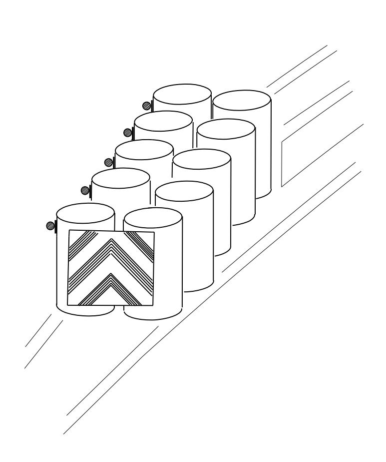
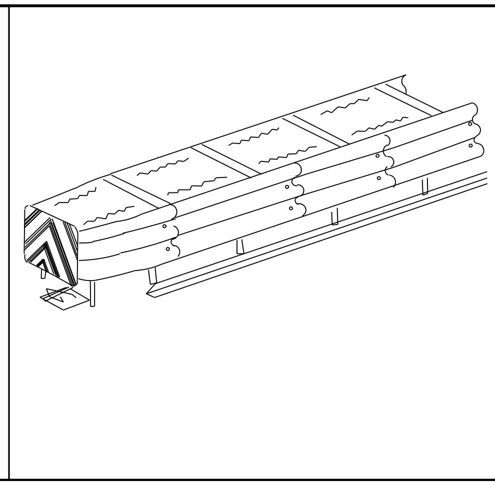
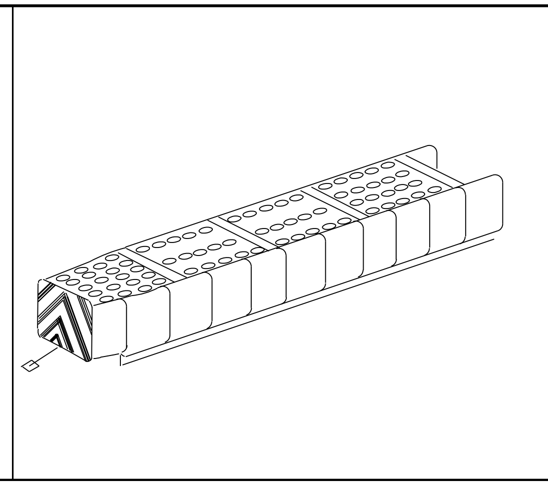
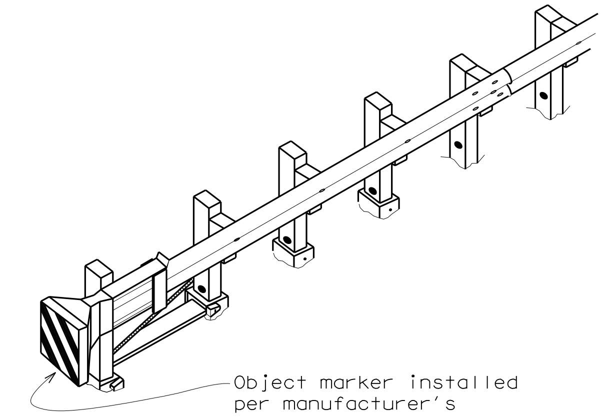
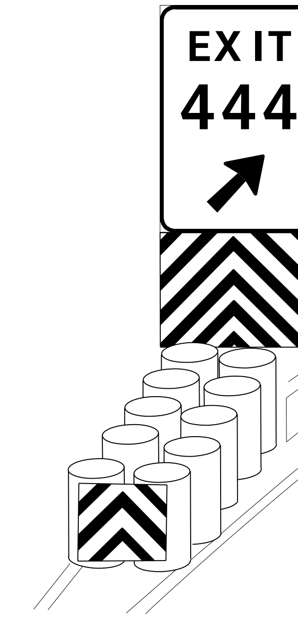




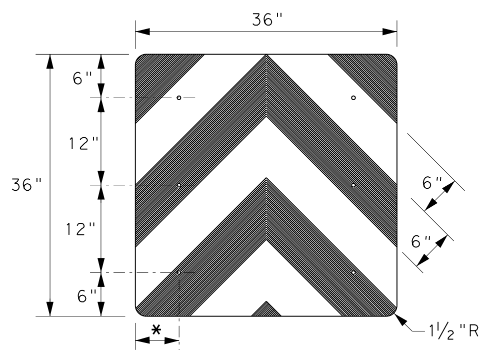


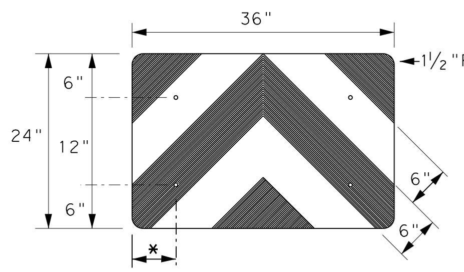


Object marker installed per manufacturer's recommendations.

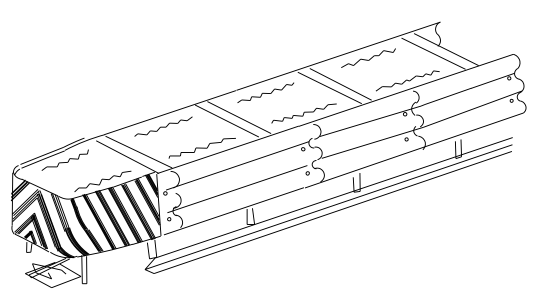


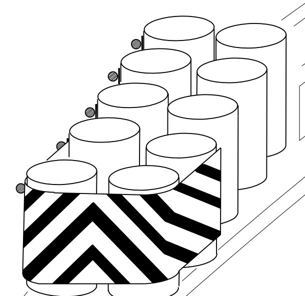
BACK PANEL (OPTIONAL)

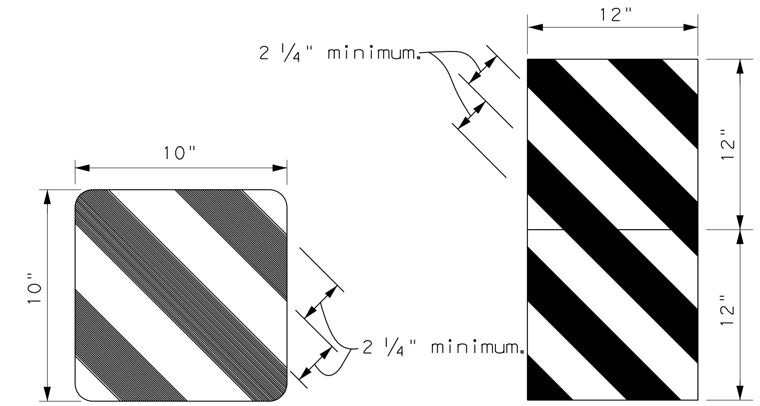




* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

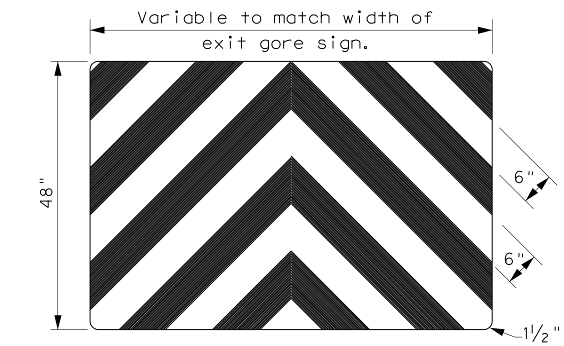


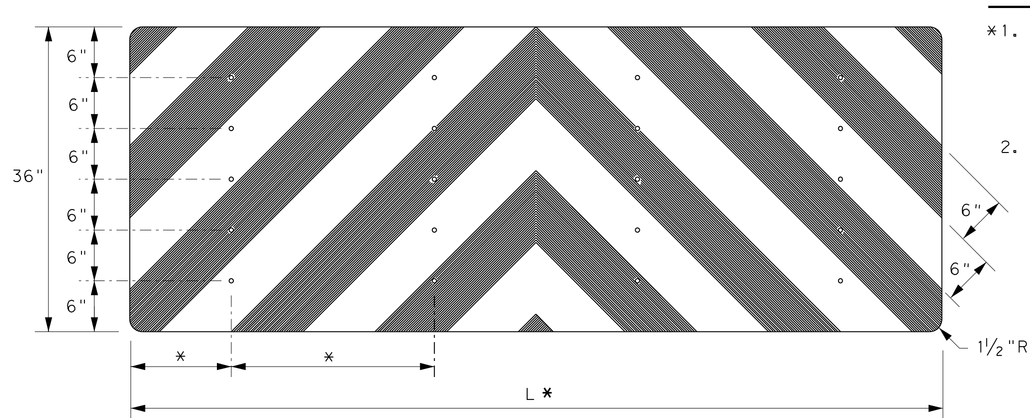


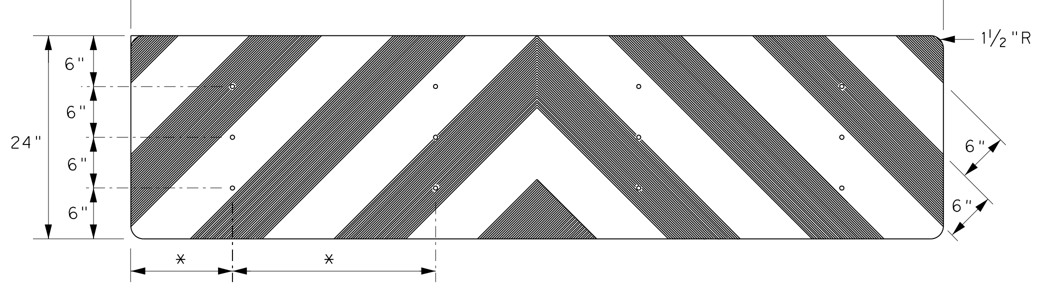


OBJECT MARKERS SMALLER THAN 3 FT^2

Variable to match width of exit gore sign.







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 1/4".

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

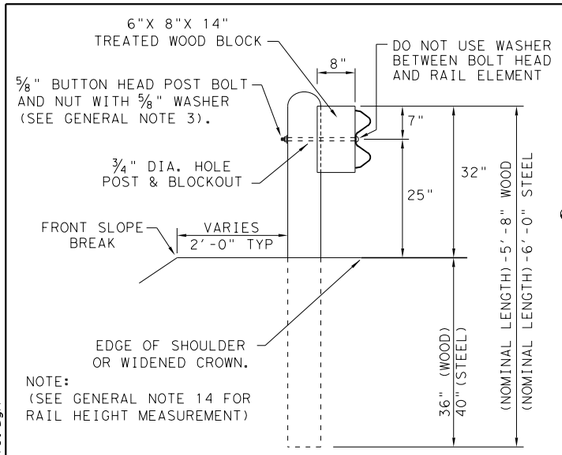
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

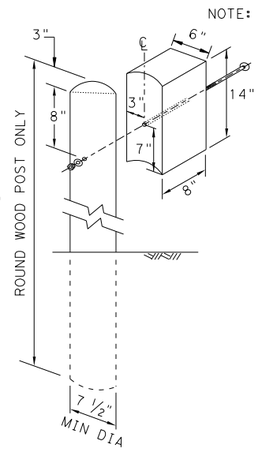
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
4-92 8-04 8-95 3-15 4-98 7-20	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	59

20G

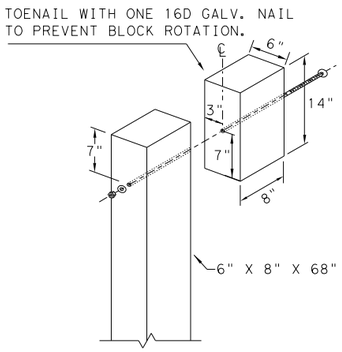
DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche East\Land Co\Cadd\Standards\Roadway\GF(31)-19.dgn



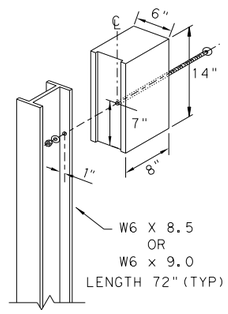
TYPICAL POST PLACEMENT



WOOD BLOCK TO
ROUND WOOD POST

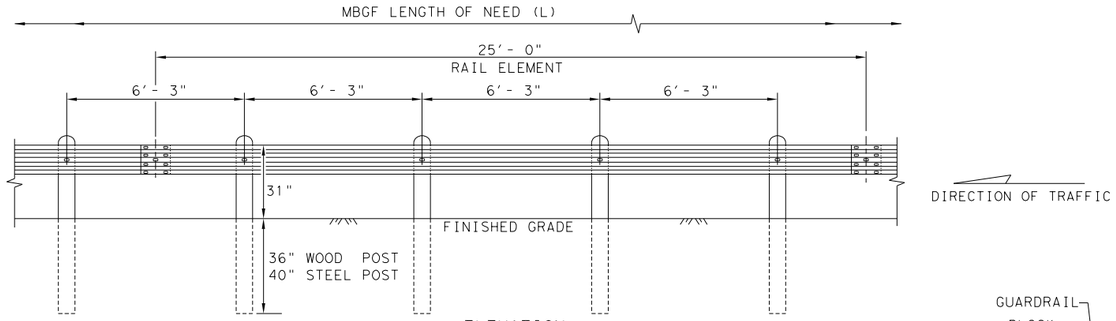


WOOD BLOCK TO
RECTANGULAR WOOD POST



ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

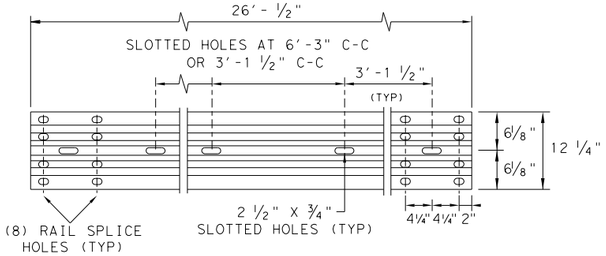
NOTE: ✳✳ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

ELEVATION
MID-SPAN RAIL SPLICE

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



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

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

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

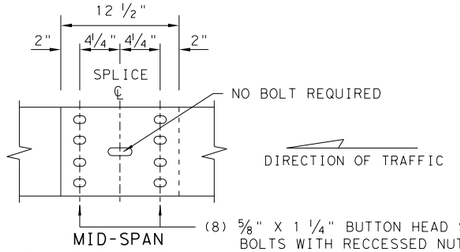
SPLICE BOLT LENGTH — VARIES

FBB01 = 1 ¼"
FBB02 = 2"

⅝"

POST & BLOCK LENGTH
FBB03 = 10"
FBB04 = 18"

BUTTON HEAD BOLT

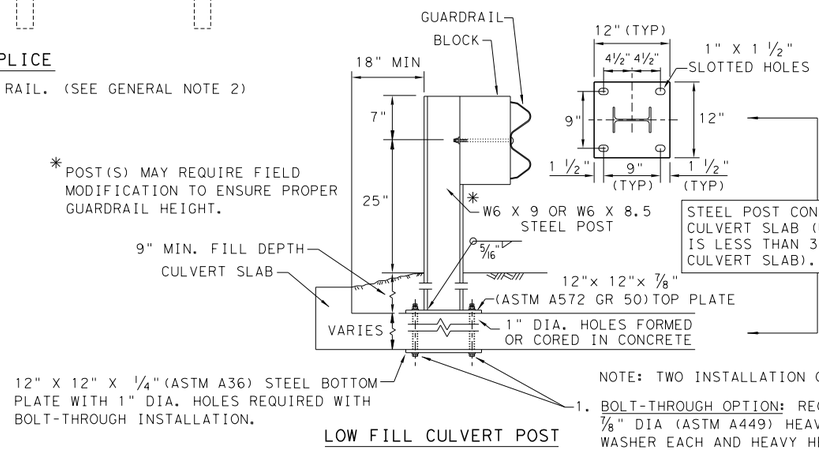


DIRECTION OF TRAFFIC

MID-SPAN
RAIL SPLICE DETAIL

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

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



✳POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

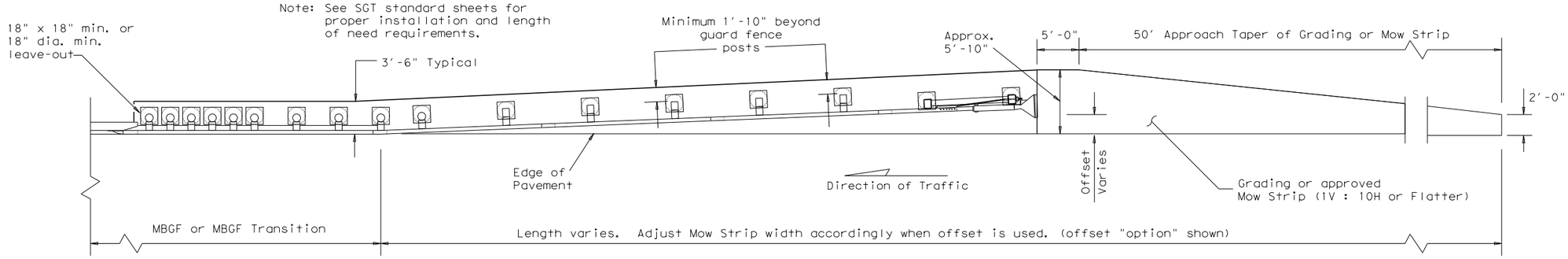
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS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

Texas Department of Transportation — Design Division Standard

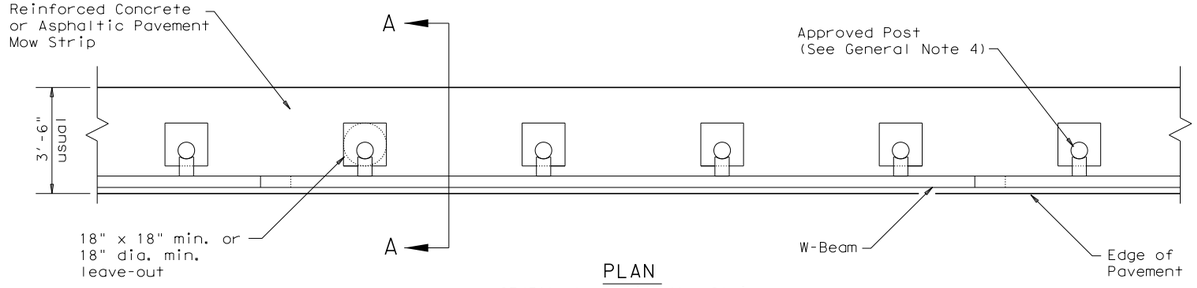
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0288	03	032	SH 16	
	DIST	COUNTY		SHEET NO.	
	BWD	EASTLAND		60	

DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/GF(31)MS-19.dgn

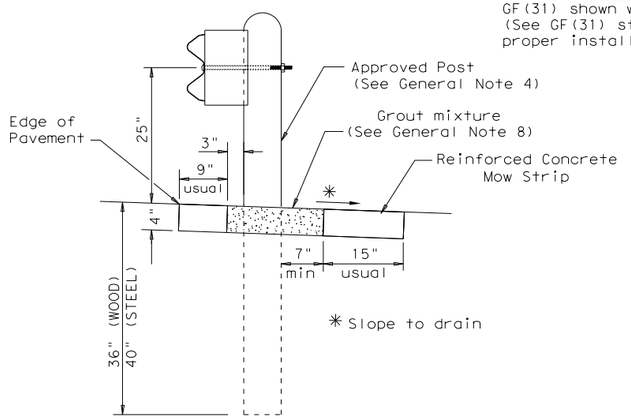


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



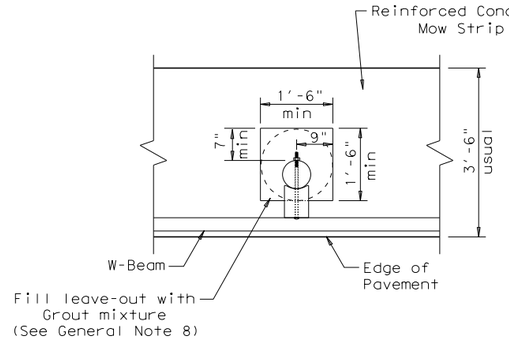
PLAN

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



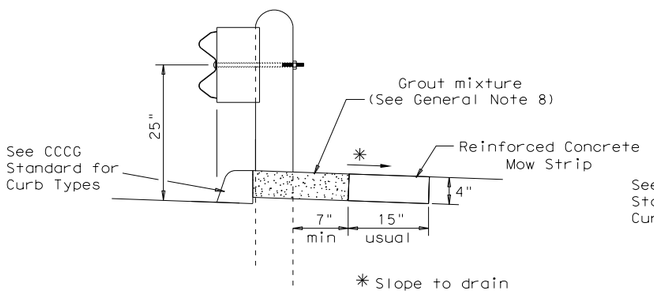
SECTION A-A

Typical



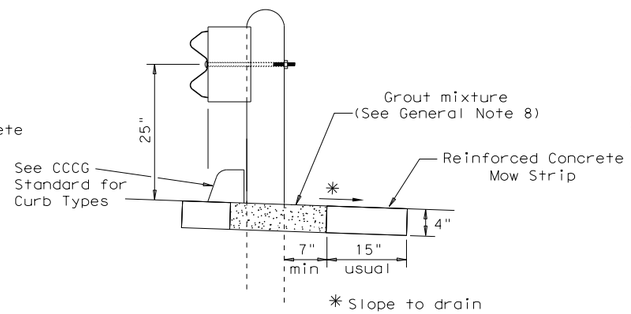
MOW STRIP DETAIL

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



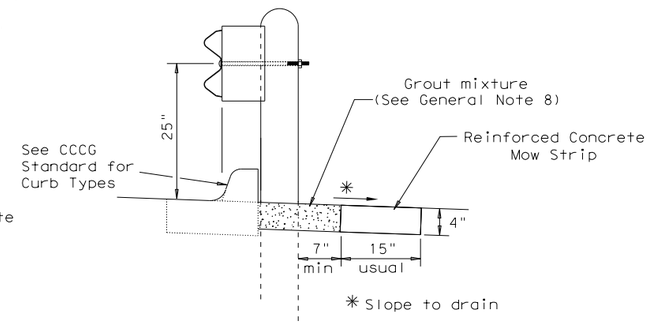
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		61

DATE: 3/16/2021
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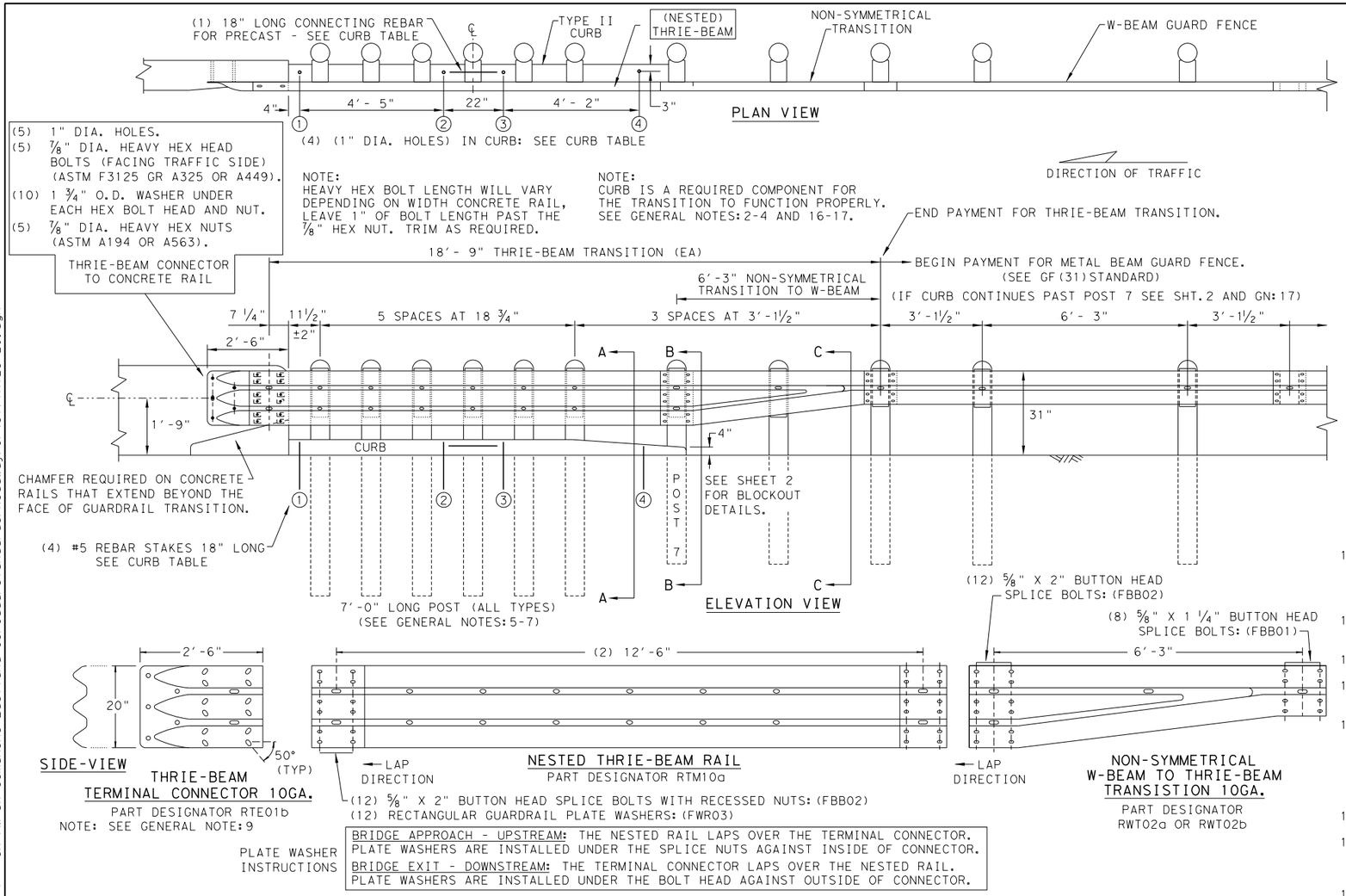
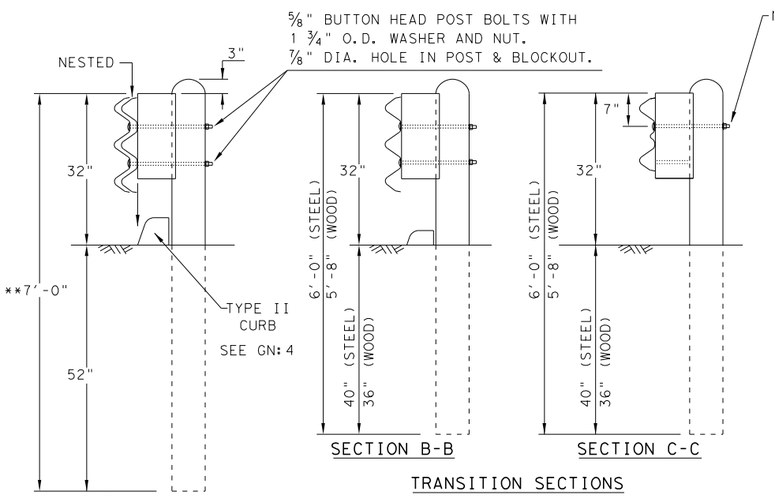
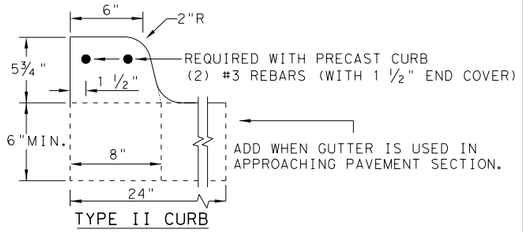




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB 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.



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

* 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 DETAILS

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 (FWC16a) 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.

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

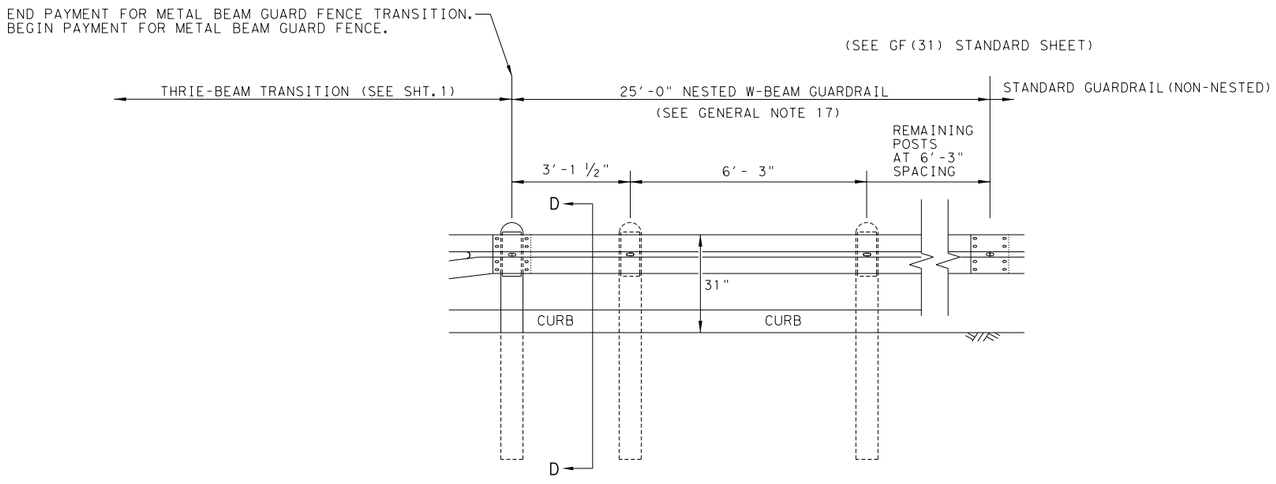
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

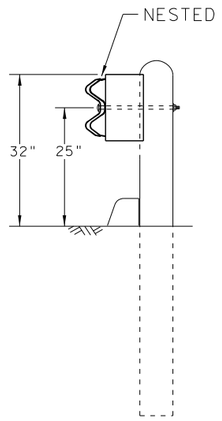
FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0288	03	032	SH 16		
	DIST	COUNTY		SHEET NO.		
	BWD	EASTLAND		62		

DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/GF(31)TRTL3-20.dgn

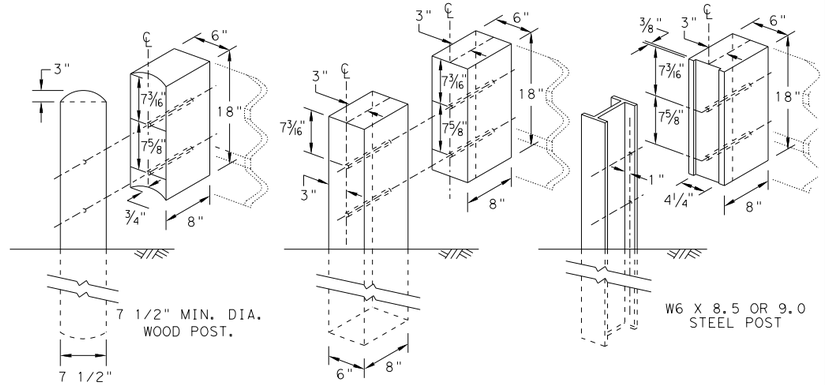
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

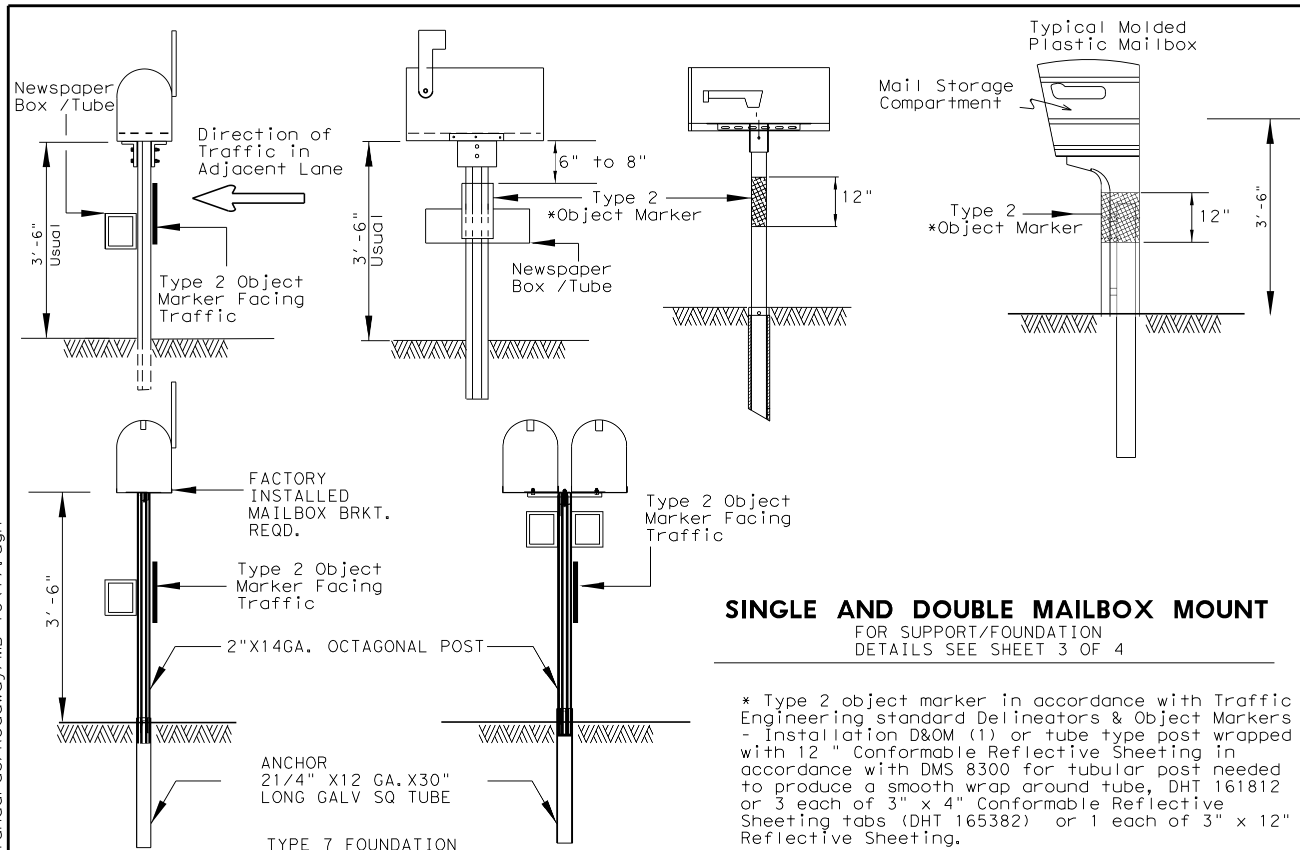
SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trtl320.dgn	DN: TxDOT		CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0288	03	032		SH 16	
	DIST	COUNTY			SHEET NO.	
	BWD	EASTLAND			63	



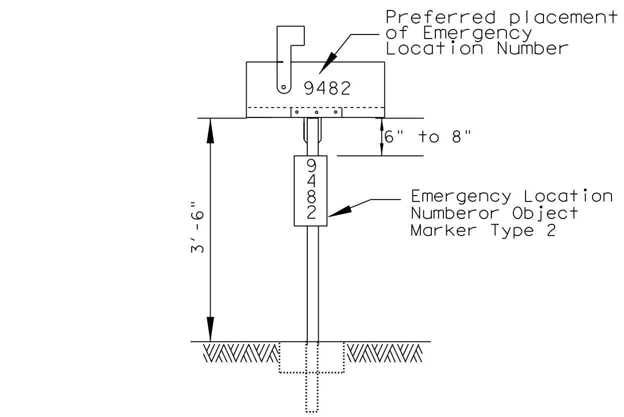
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

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

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

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



PLACEMENT OF EMERGENCY LOCATION NUMBER

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

MAILBOX SIZES

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH	WIDTH	HEIGHT	MAXIMUM WEIGHT	
	INCHES			POUNDS	
SMALL	19 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

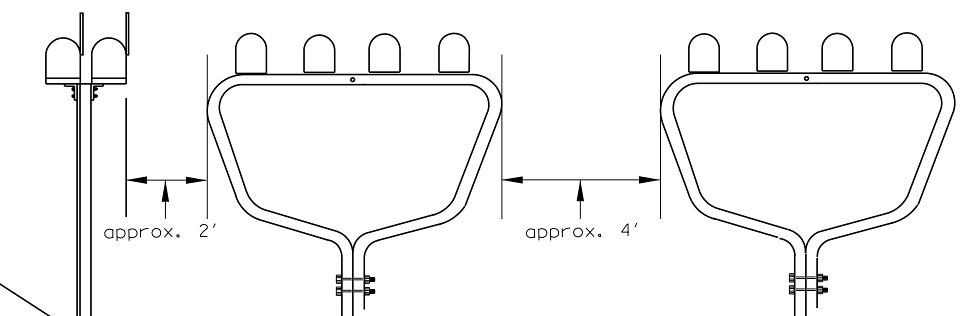
* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT
SIDE	18	15	18.3	15	(POUNDS)
BACK	11 1/2	11 1/2		15	22.4

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

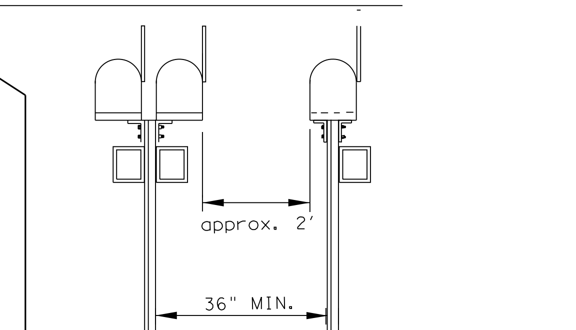
Mailboxes shall be made of light weight sheet metal or light weight plastic.
Lockable architectural mailboxes shall meet the requirements of the above table.

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



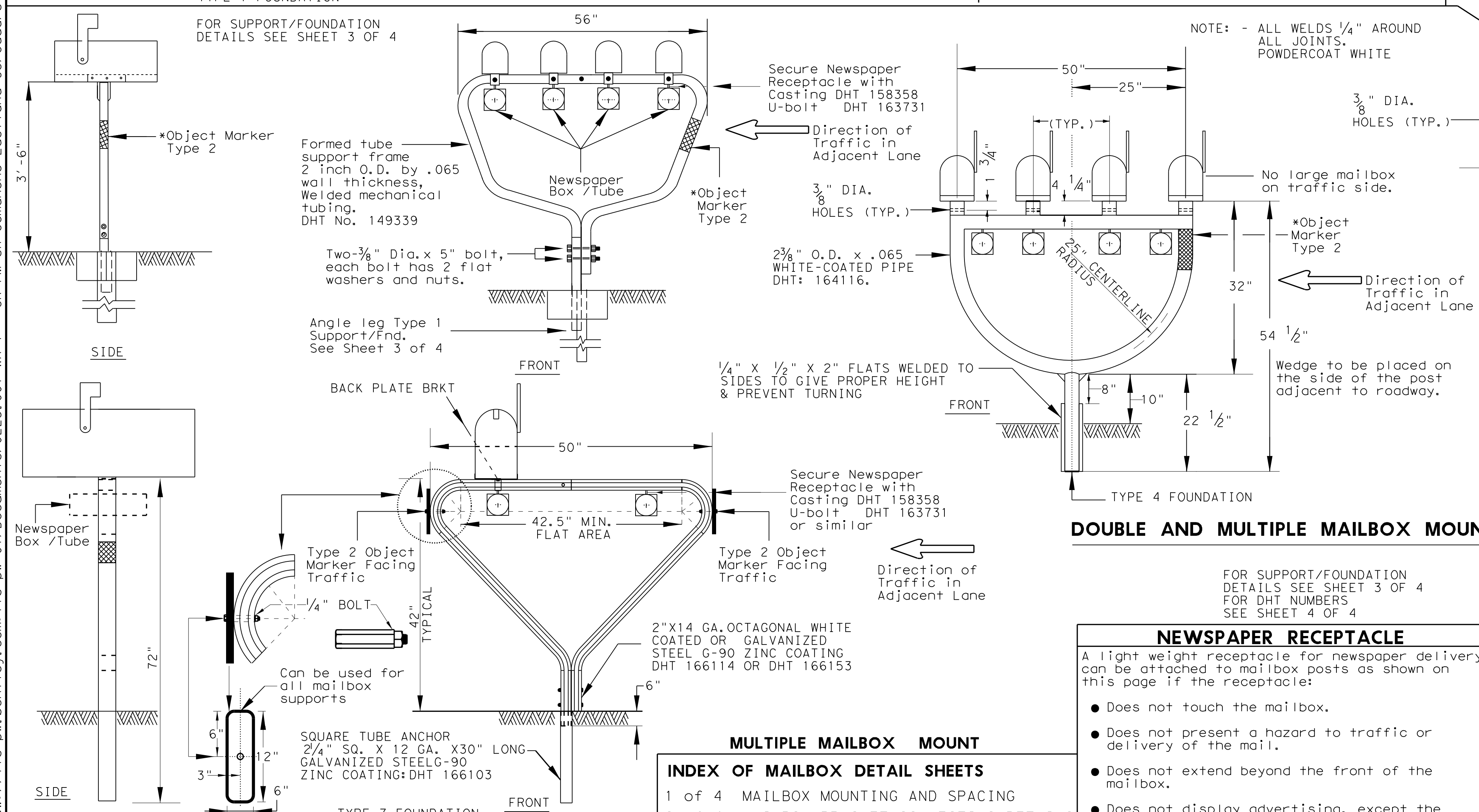
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

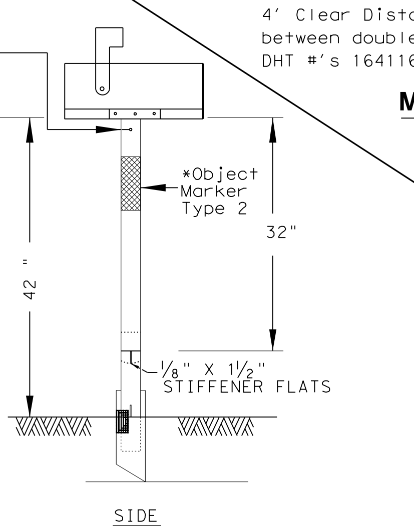
MULTIPLE MAILBOX PLACEMENT



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

SINGLE & DOUBLE MAILBOX PLACEMENT





MULTIPLE MAILBOX MOUNT

DOUBLE AND MULTIPLE MAILBOX MOUNT

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

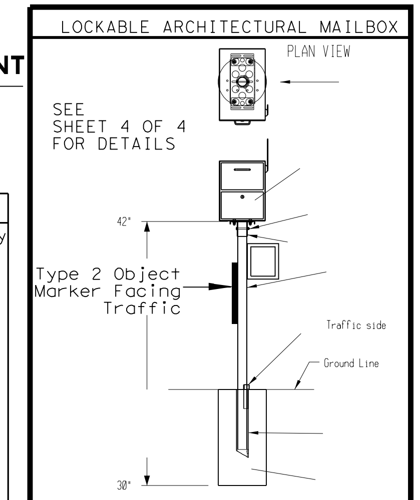
INDEX OF MAILBOX DETAIL SHEETS

NEWSPAPER RECEPTACLE

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

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

LOCKABLE ARCHITECTURAL MAILBOX



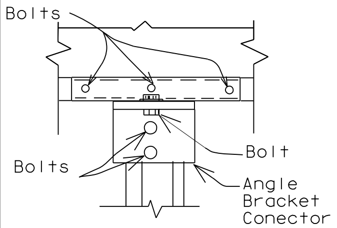
Texas Department of Transportation | Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

MB-15(1)

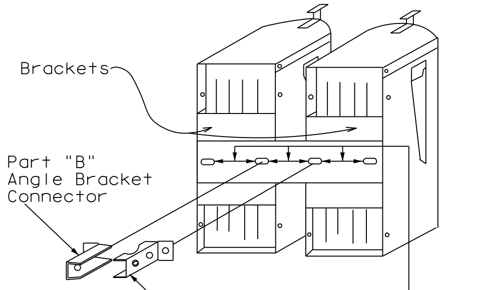
FILE: MB14(1).DGN	DN: JEO		CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB		HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	0288	03	032		SH 16
	DIST		COUNTY		SHEET NO.
	BWD		EASTLAND		64

SINGLE MAILBOX



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

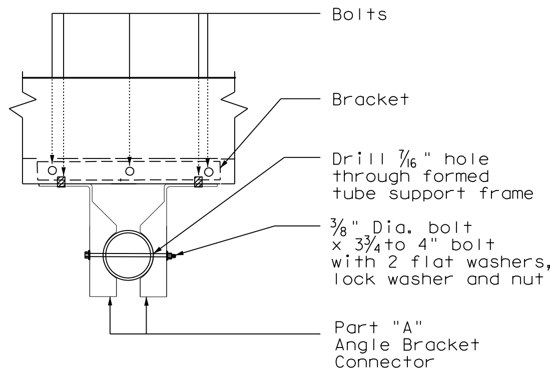
DOUBLE MAILBOX



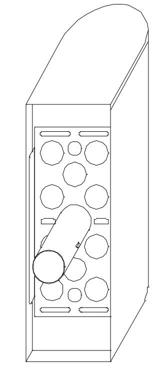
Adapter Plate to Bracket Attachment, 4 - 3/8" Dia. x 3/4" bolt; each bolt has 2 flat washers, lock washer and nut per each bolt

(Not permitted for Large Mailboxes)

MULTIPLE MAILBOX

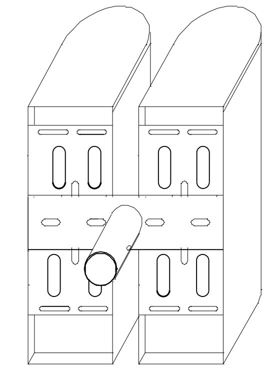


WELDED SINGLE MAILBOXBRACKET



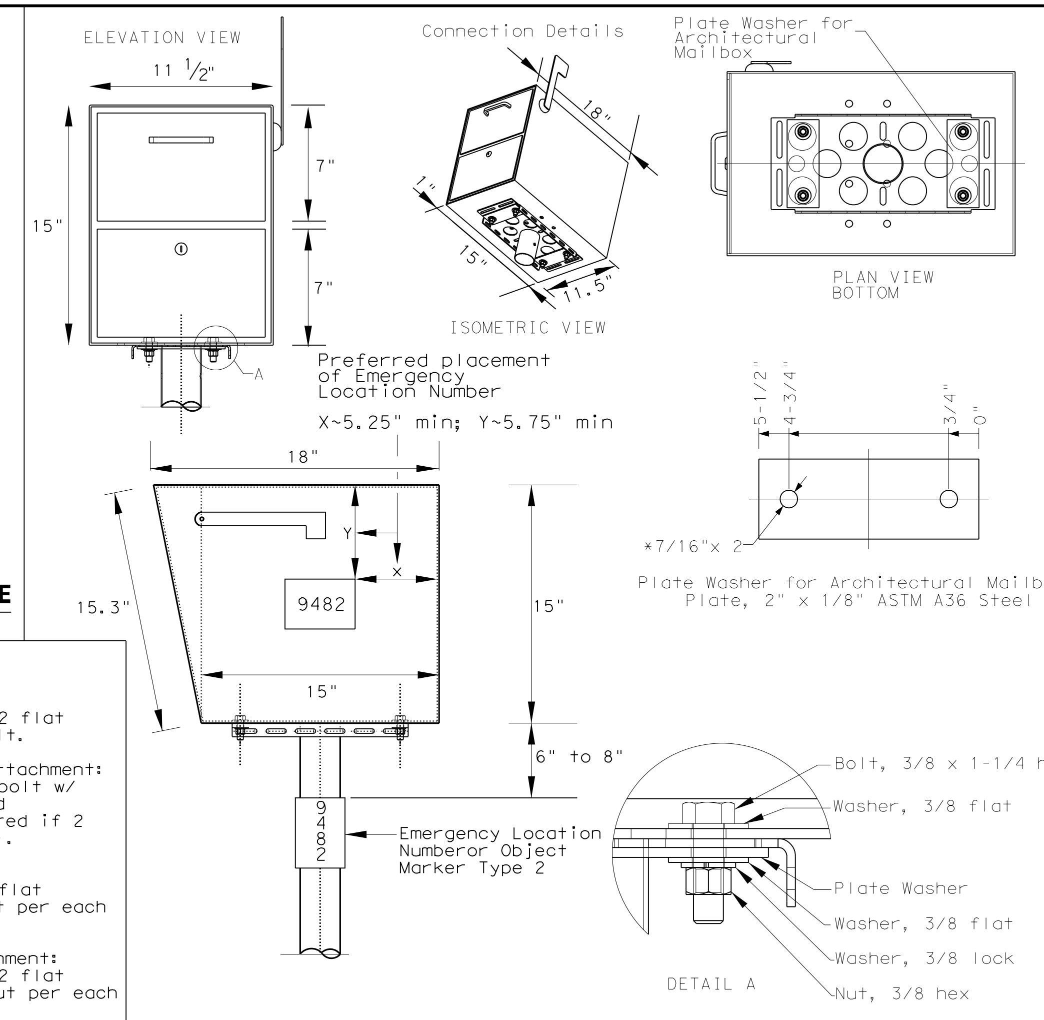
To be used with 2 3/8" OD RR or thinwall Steel posts.

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE

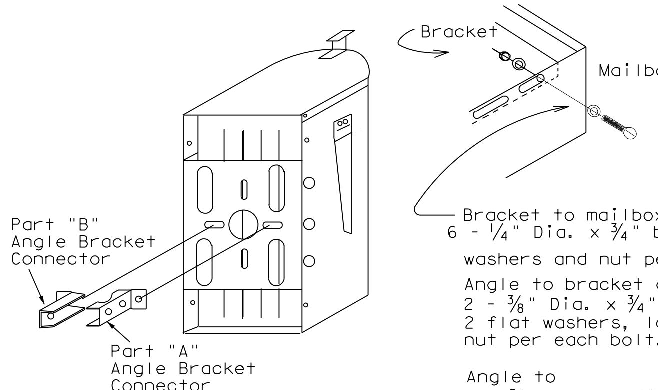


To be used with thinwall Steel posts. Not to be used with RR posts.

LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS



SMALL MAILBOX

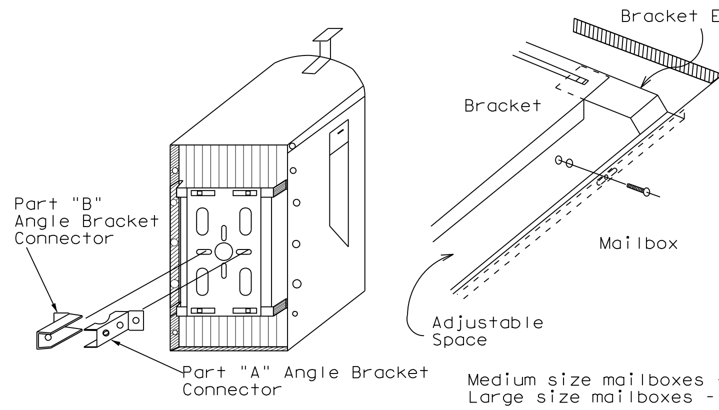


Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/ 2 flat washers and nut per each bolt.

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to
2 - 3/8" Dia. x 2 1/2" bolt with 2 flat washers, lock washer and nut per each bolt.

MEDIUM AND LARGE MAILBOXES



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

Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/2 flat washers and nut per each bolt.

Bracket to bracket extension attachment:
2 - 1/4" Dia. x 3/4" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

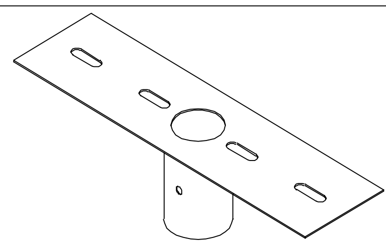
Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt w/2 flat washers, lock washer and nut per each bolt.

Angle to mailbox support attachment:
2 - 3/8" Dia. x 2 1/2" bolt w/2 flat washers, lock washer, and nut per each bolt.

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

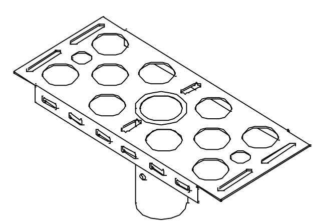
GENERAL NOTES

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



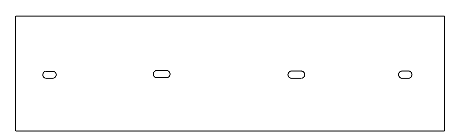
DHT 162323

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



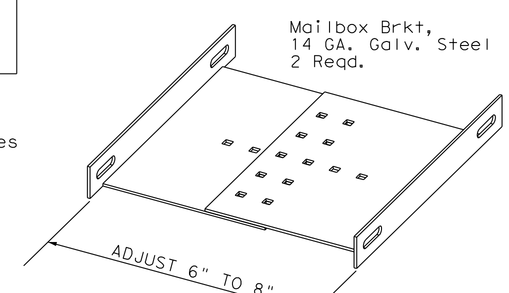
DHT 161443

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

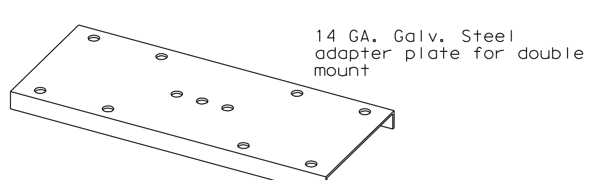


DHT #3789

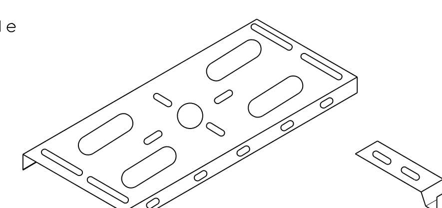
Used for mounting two Mailboxes on the same post.



DHT 166105

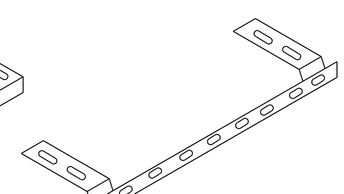


DHT 166108



DHT 148939

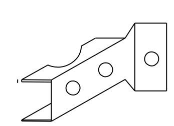
Mailbox Bracket



DHT 148938

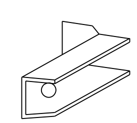
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



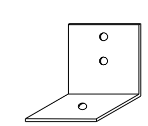
DHT 159489

Part "A"
Angle Bracket
Connector



DHT 159490

Part "B"
Angle Bracket
Connector



DHT 2917

Angle Bracket For Temporary Mailbox

HARDWARE AT TXDOT REGIONAL WAREHOUSES

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

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

Texas Department of Transportation

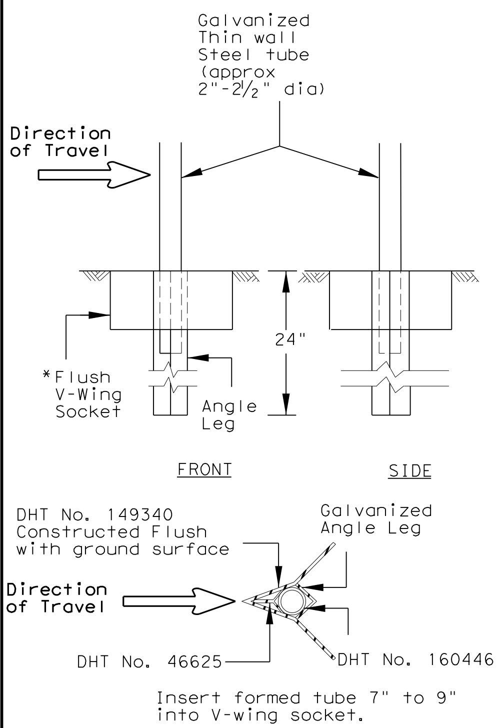
Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

MB-15(1)

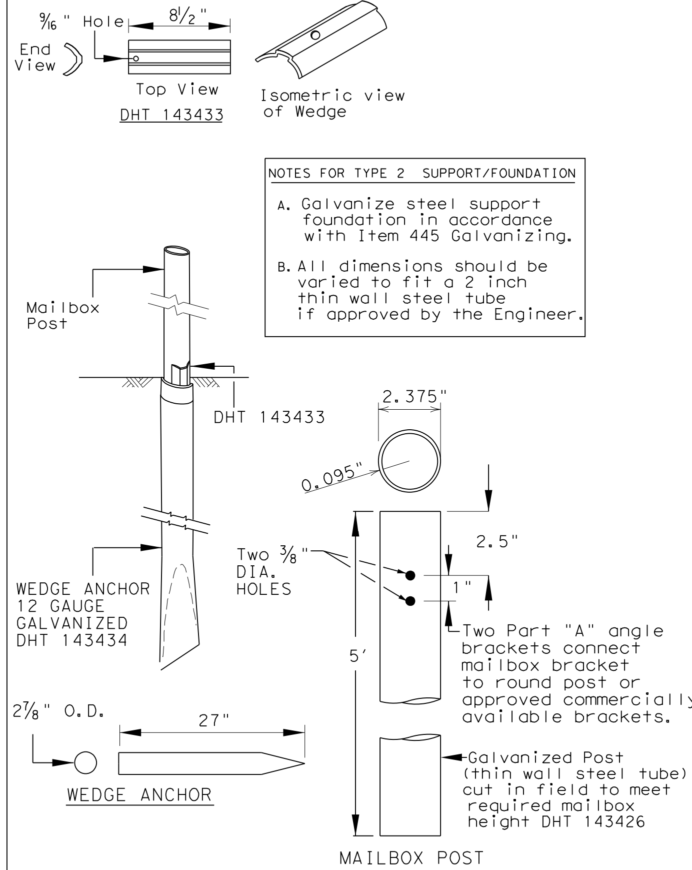
FILE: MB14(1).DGN	DN: JEO		CK:		DW: JEO		CK:
© TxDOT APRIL 2015	CONT	SECT	JOB		HIGHWAY		
REVISIONS ADDED DHT 163730	0288	03	032		SH 16		
	DIST		COUNTY			SHEET NO.	
	BWD		EASTLAND			65	

3/16/2021 1:12
pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Contracts



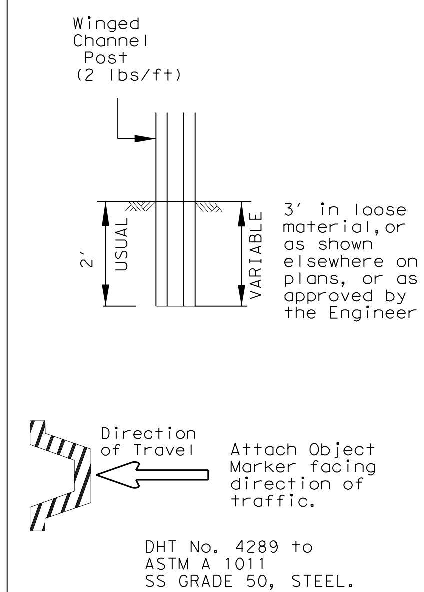
TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



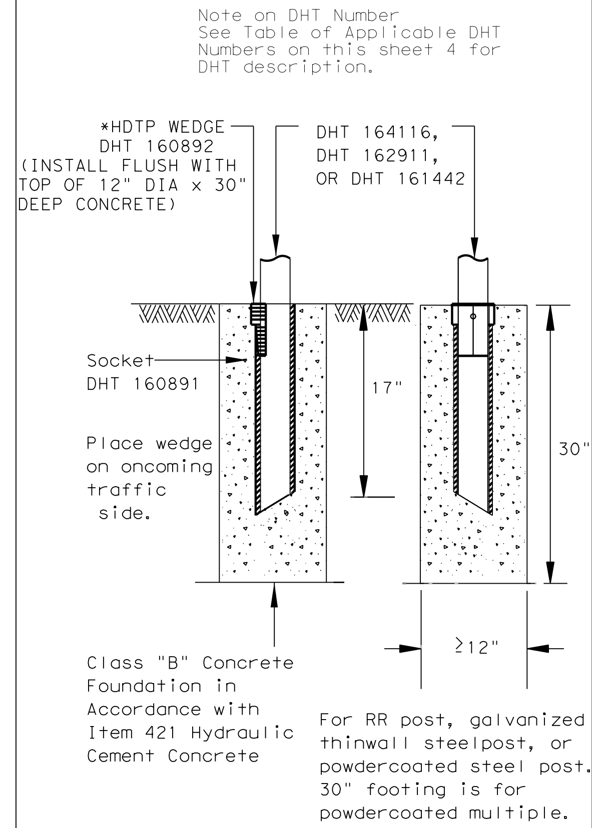
TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



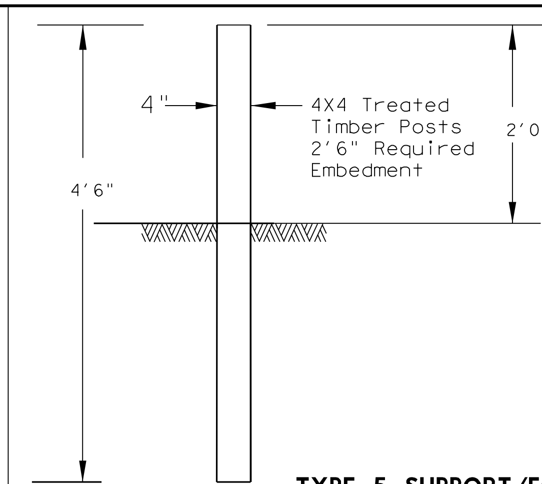
TYPE 3 SUPPORT/FOUNDATION

WINGED CHANNEL POST



TYPE 4 SUPPORT/FOUNDATION

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

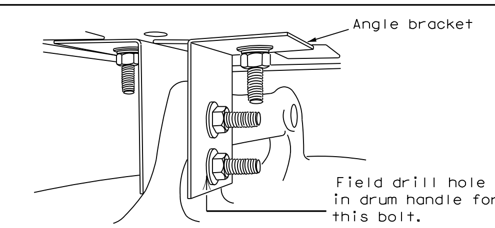


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

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



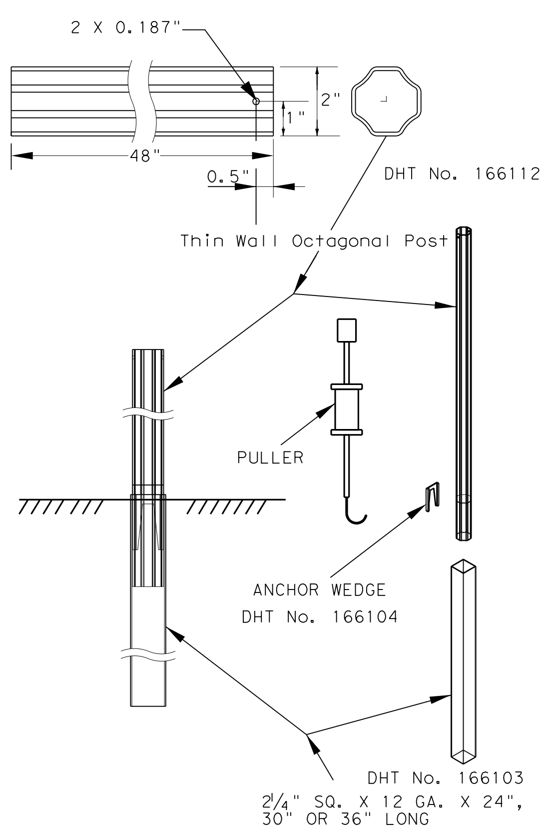
Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL

GENERAL NOTES

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



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

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

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

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

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

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

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

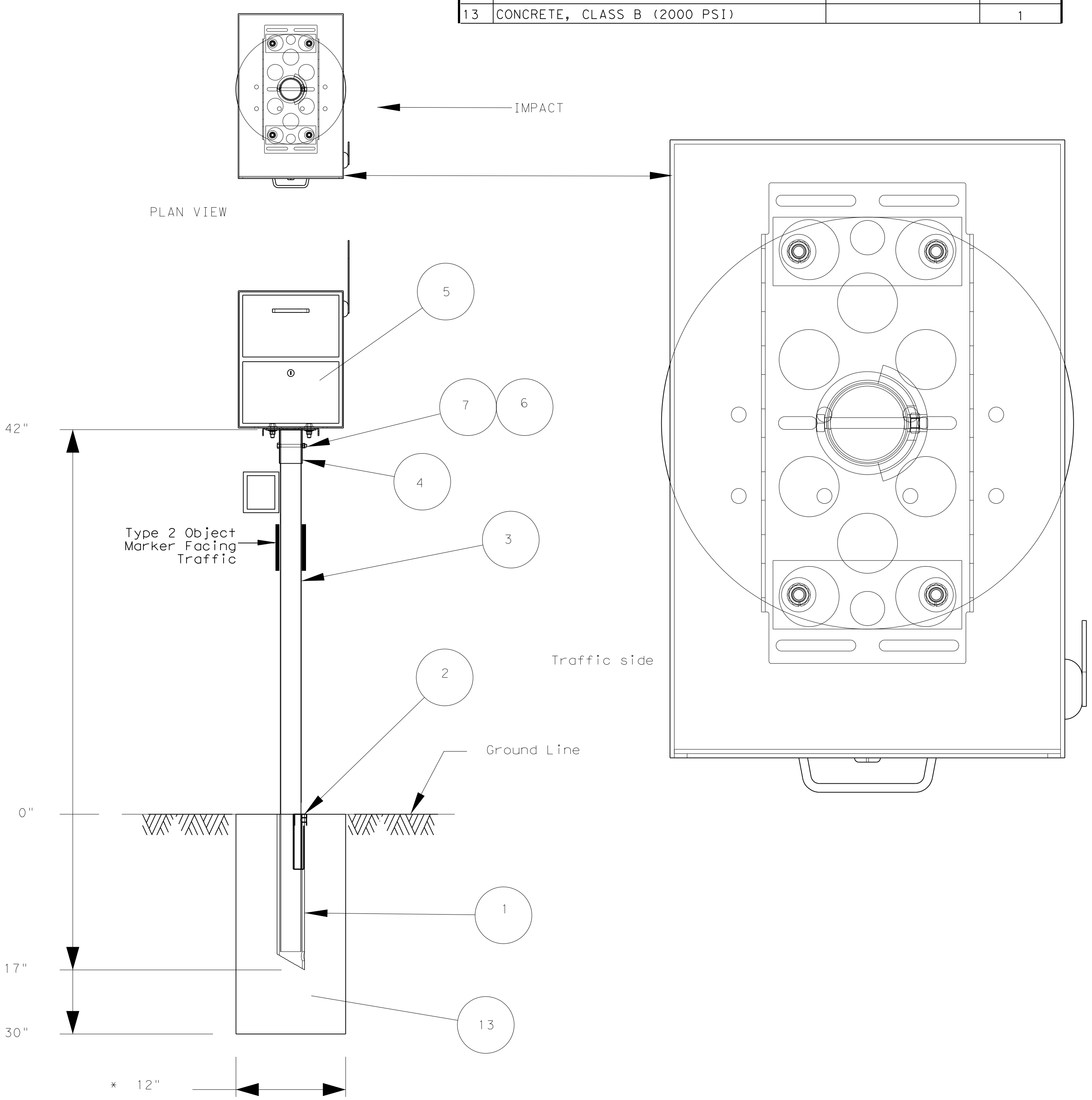
FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	66

3/16/2021 1:12
pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

LOCKABLE ARCHITECTURAL MAILBOX

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

LOCKABLE ARCHITECTURAL MAILBOX DETAILS



ELEVATION VIEW

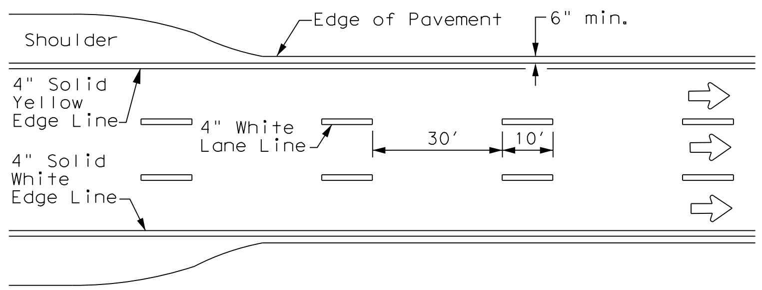
TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION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

Texas Department of Transportation
Maintenance Division Standard

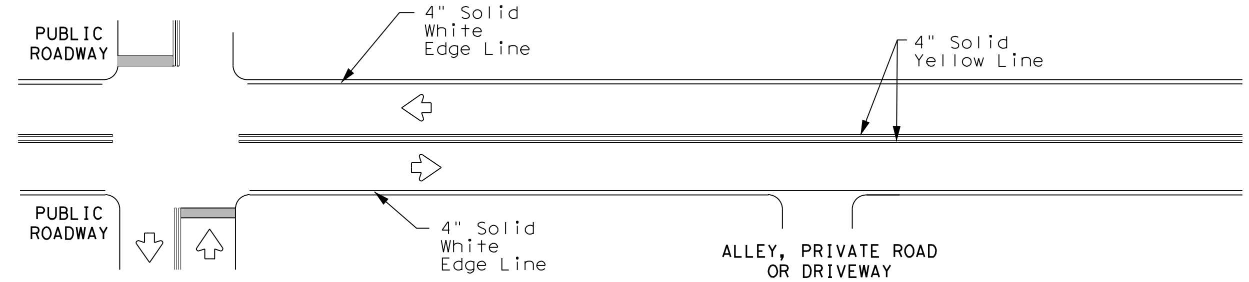
DHT NUMBERS TABLE

MB-15(1)

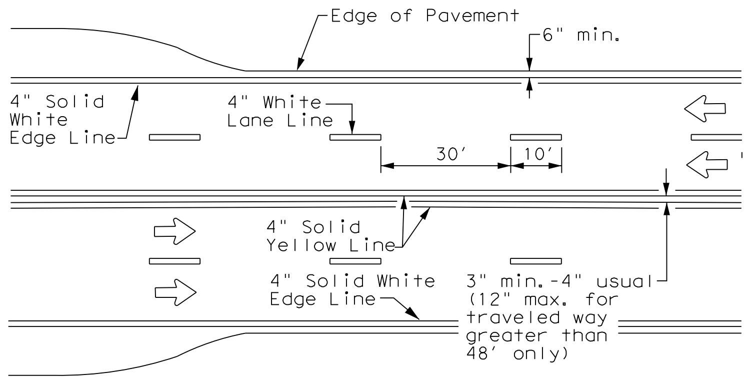
FILE: MB14(1).DGN		DN:	CK:	DW:		CK:	
©TxDOT APRIL 2015		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0288	03	032		SH 16	
		DIST		COUNTY		SHEET NO.	
		BWD		EASTLAND		67	



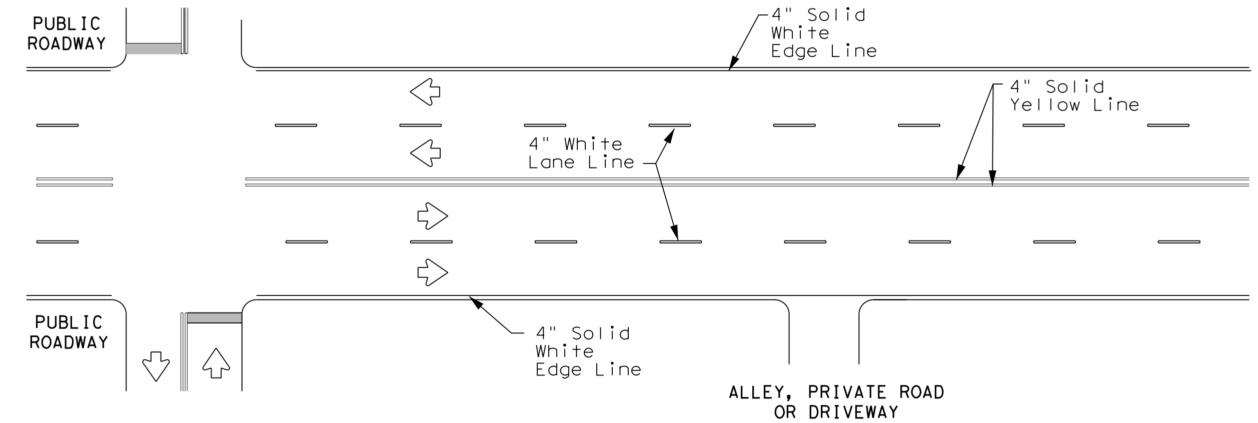
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



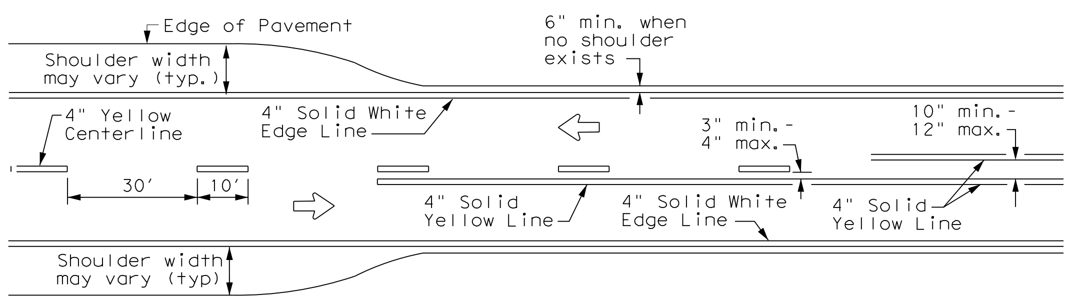
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



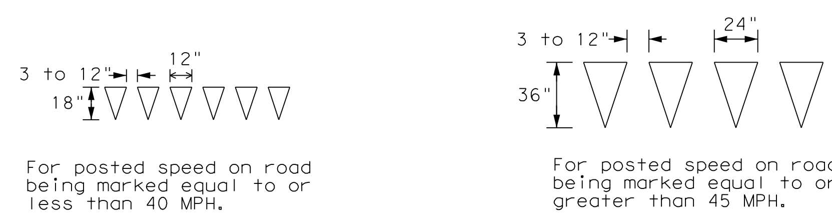
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



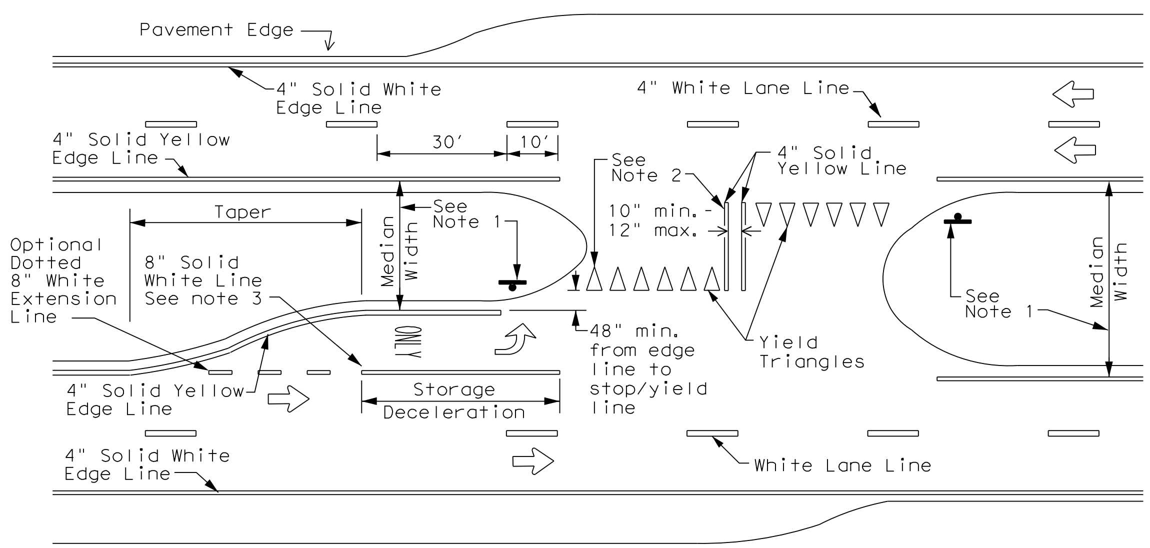
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

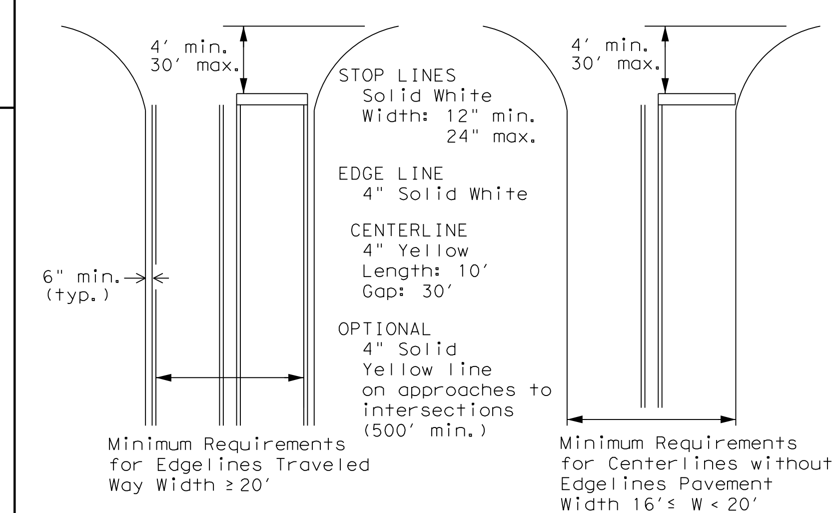
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

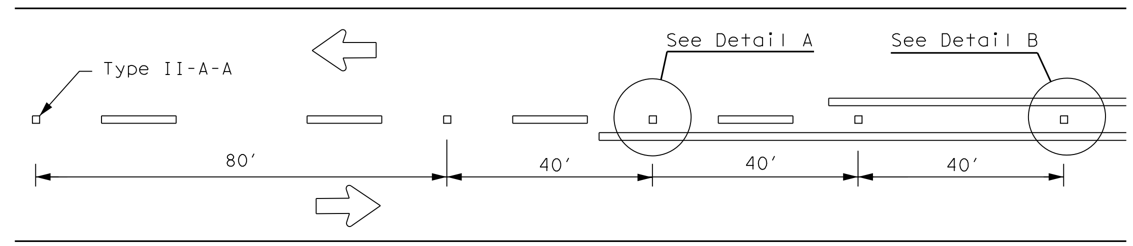
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0288	03	032	SH 16
5-00 2-12	DIST		COUNTY	SHEET NO.
8-00 6-20	BWD		EASTLAND	68

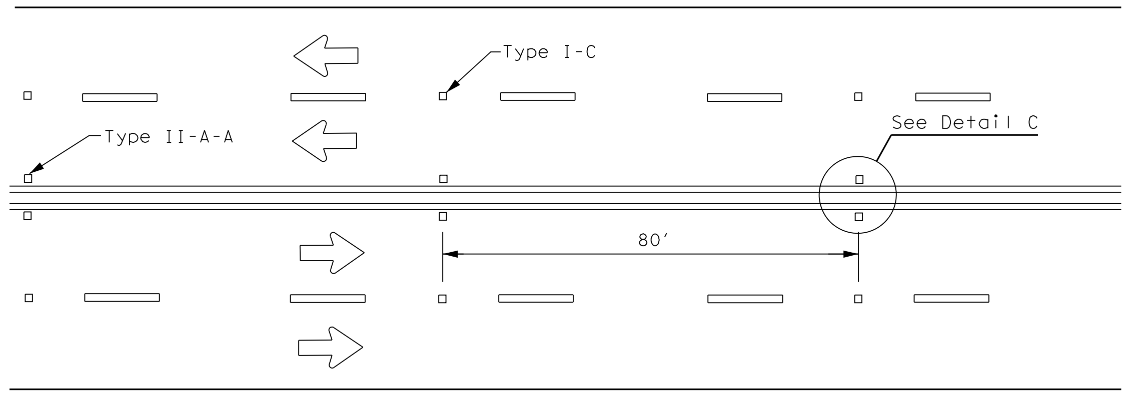
22B

DATE: 3/16/2021 12:14
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

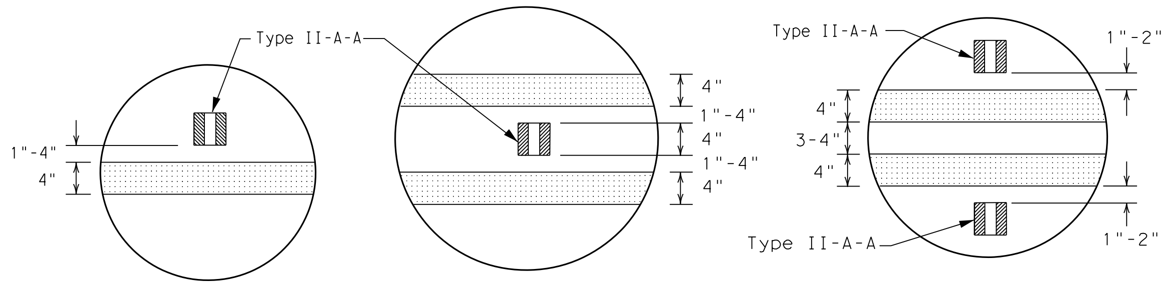
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



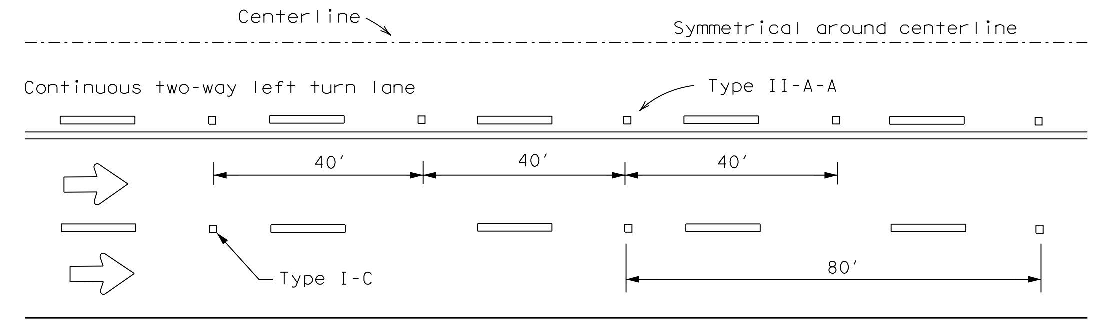
CENTERLINE FOR ALL TWO LANE ROADWAYS



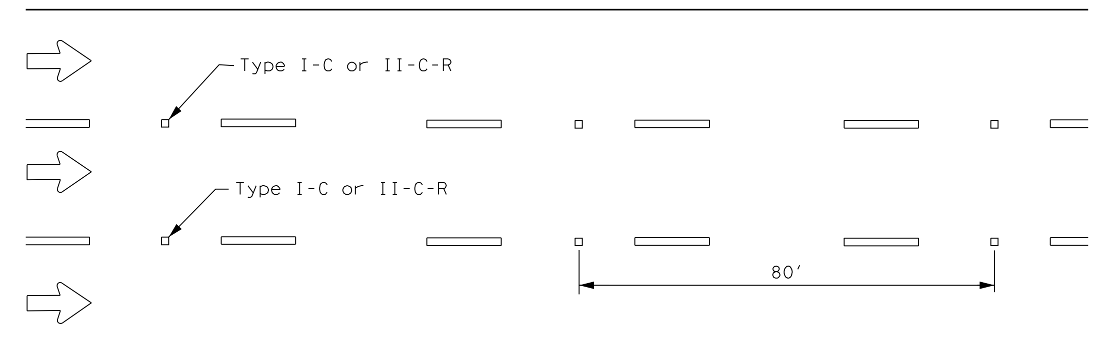
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"

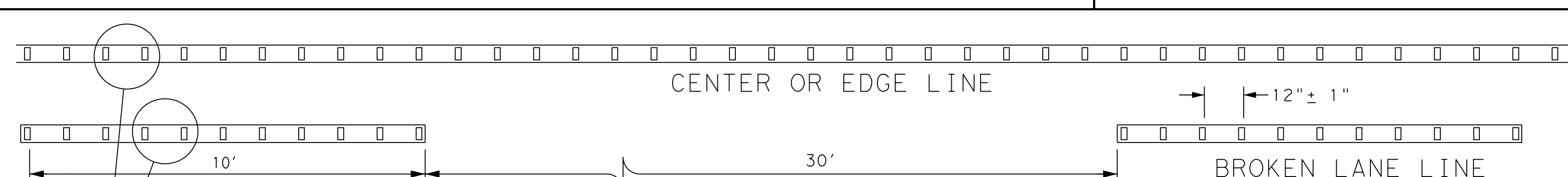


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



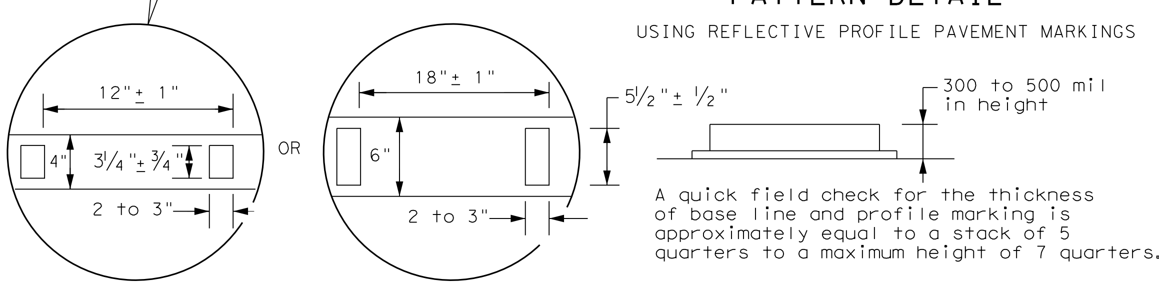
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



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.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

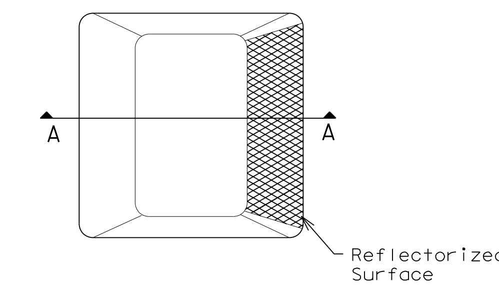
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

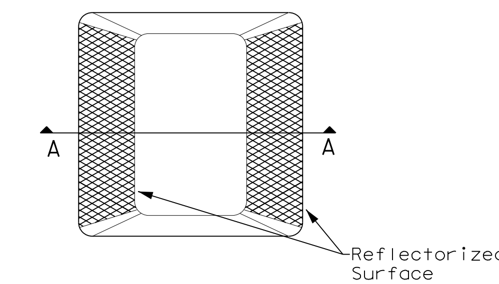
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

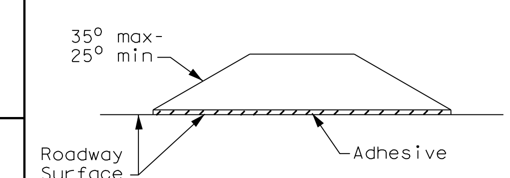
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

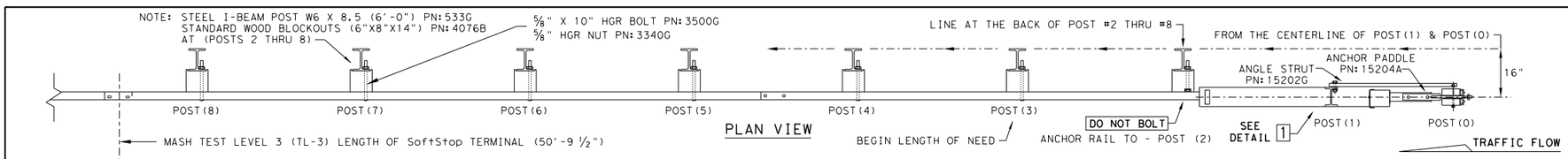
POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

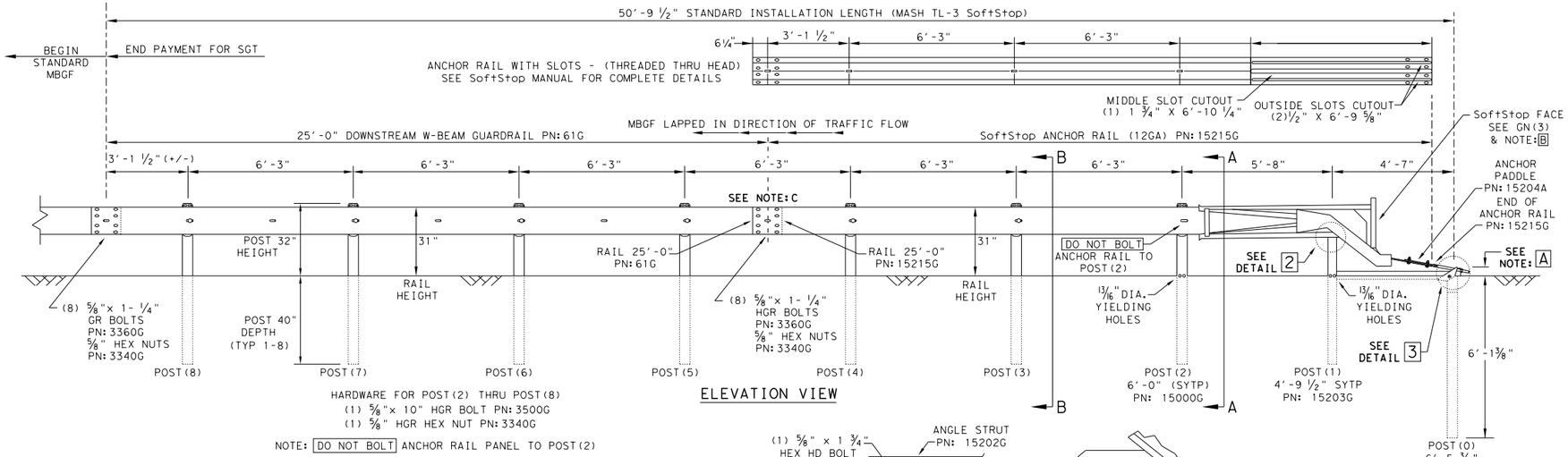
FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0288	03	032	SH 16
5-00 2-12	DIST		COUNTY	SHEET NO.
8-00 6-20	BWD		EASTLAND	69

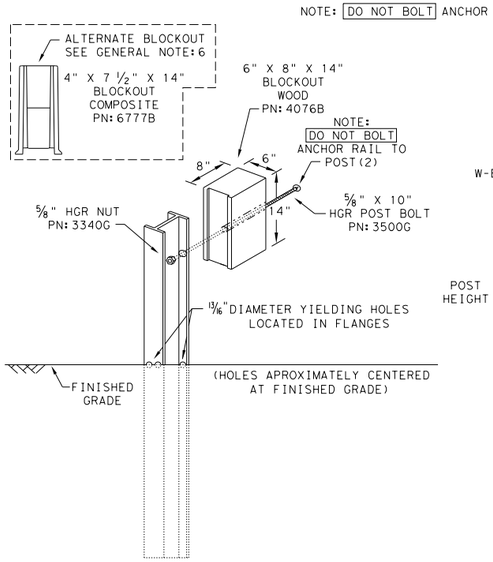
22B

DATE: 3/16/2021 12:14
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

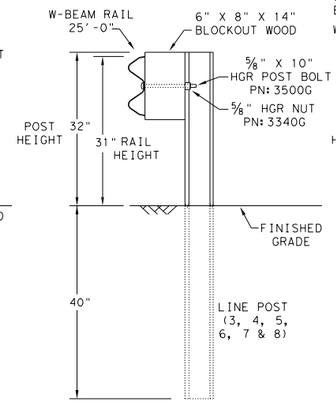
DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche East Land Co/Cadd/Standards/Roadway/SGT(10S)31-16.dgn



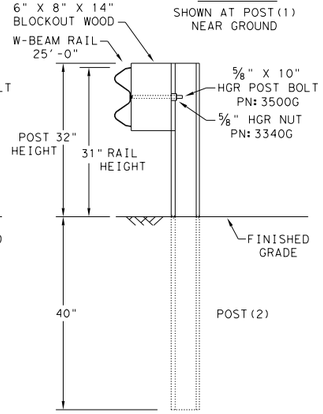




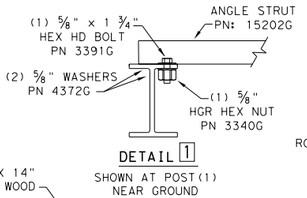
ISOMETRIC VIEW
POST(1 & 2)
W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT
NOTE: NO BLOCKOUT INSTALLED AT POST(1)



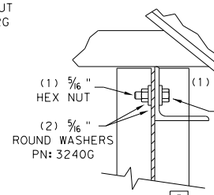
SECTION VIEW B-B
6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G



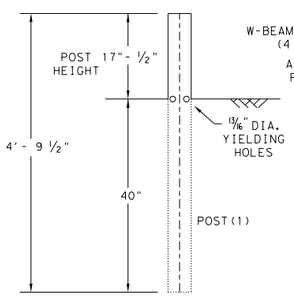
SECTION VIEW A-A
6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G
NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)



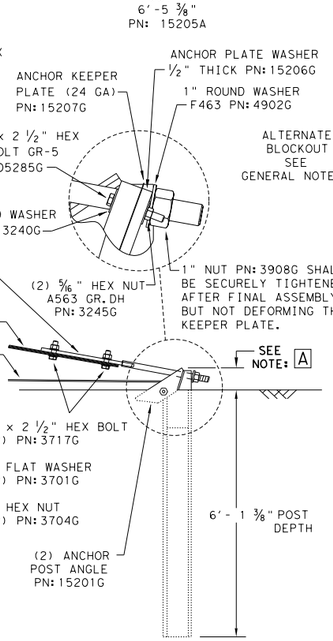
DETAIL 1
SHOWN AT POST(1) NEAR GROUND



DETAIL 2
SHOWN AT POST(1)

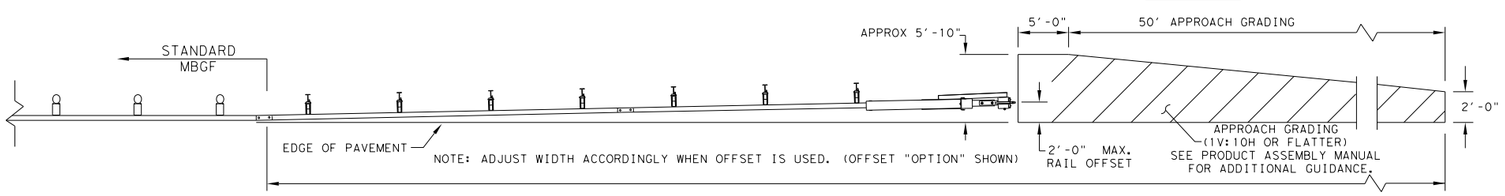


FRONT VIEW POST(1)
4'-9 1/2" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G
NOTE: NO BLOCKOUT INSTALLED AT POST(1)



DETAIL 3
AT POST(0)
6'-5 3/8" (W6 X 15)
I-BEAM POST PN: 15205A

TRAFFIC FLOW



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

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 5/8")
15203G	1	POST #1 - (SYTP) (4'- 9 1/2")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 1/2" x 14") ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" x 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" x 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" x 10" HGR POST BOLT A307
3391G	1	5/8" x 1 3/4" HEX HD BOLT A325
4489G	1	5/8" x 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" x 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" x 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

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

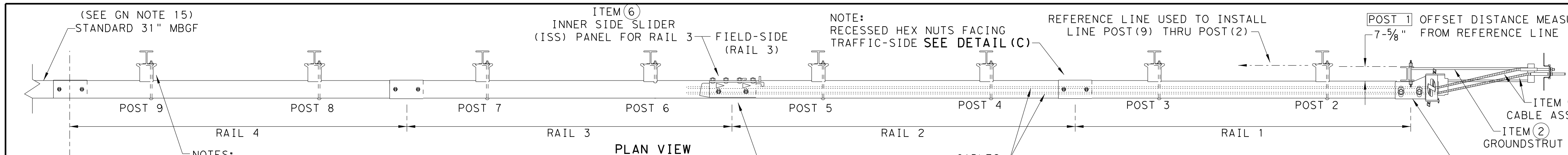
Texas Department of Transportation

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
	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0288	03	032		SH 16		
	DIST	COUNTY			SHEET NO.		
	BWD	EASTLAND			70		

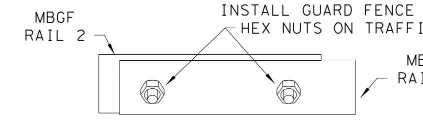
DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH



PLAN VIEW

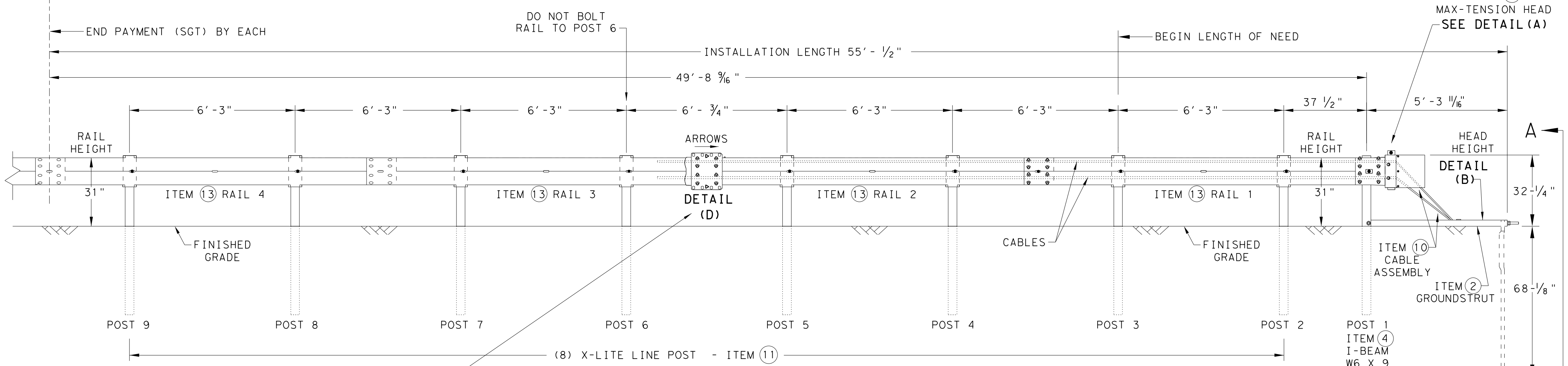
NOTES:
1. ITEM 12 COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

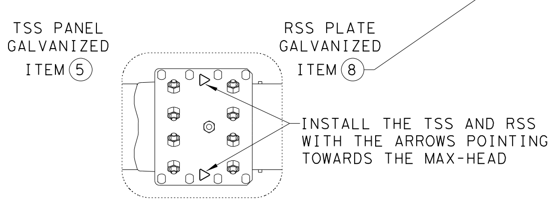


DETAIL (C)

TRAFFIC FLOW

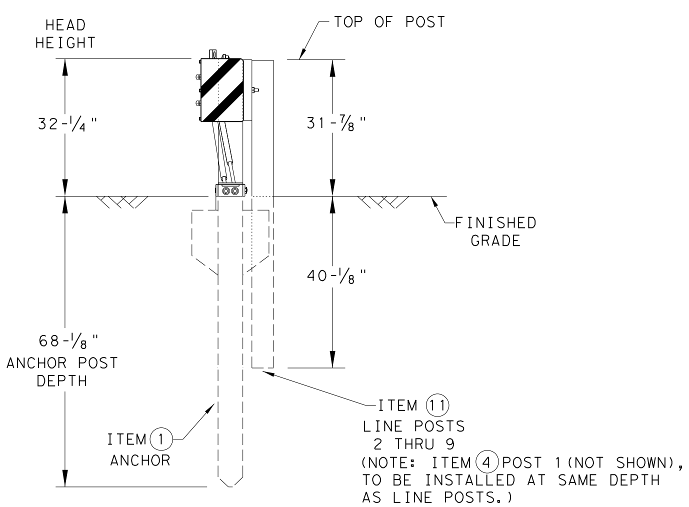


ELEVATION VIEW



TSS PANEL AND RSS PLATE

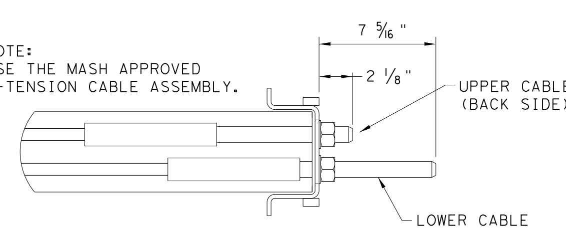
DETAIL (D)



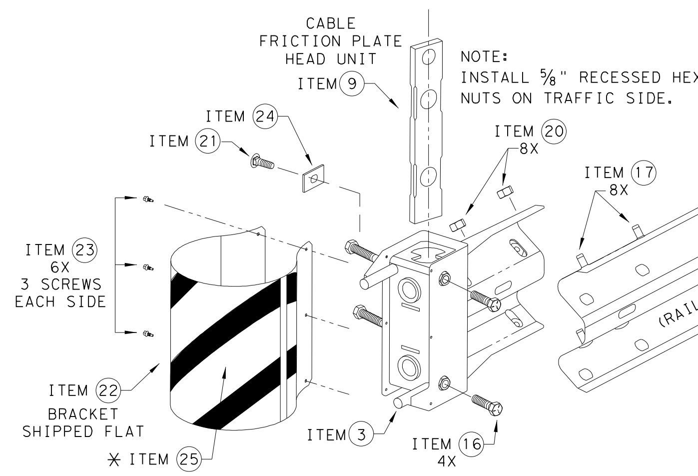
SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED X-TENSION CABLE ASSEMBLY.



DETAIL (B)



NOTE: DELINEATION MARKER IN ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD TO GUARD FENCE (RAIL1)

DETAIL (A)

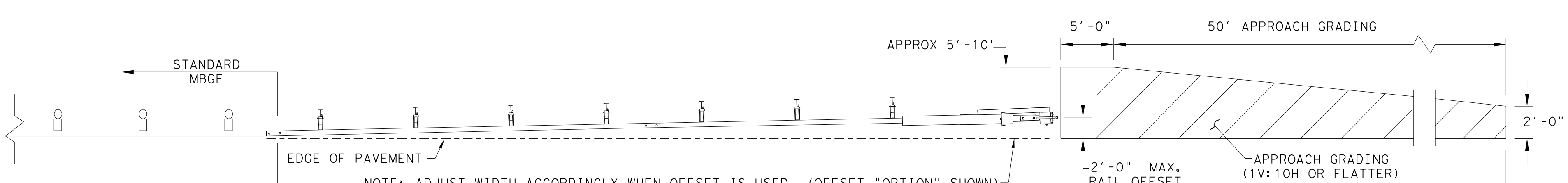
GENERAL NOTES

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

TRAFFIC FLOW

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 MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

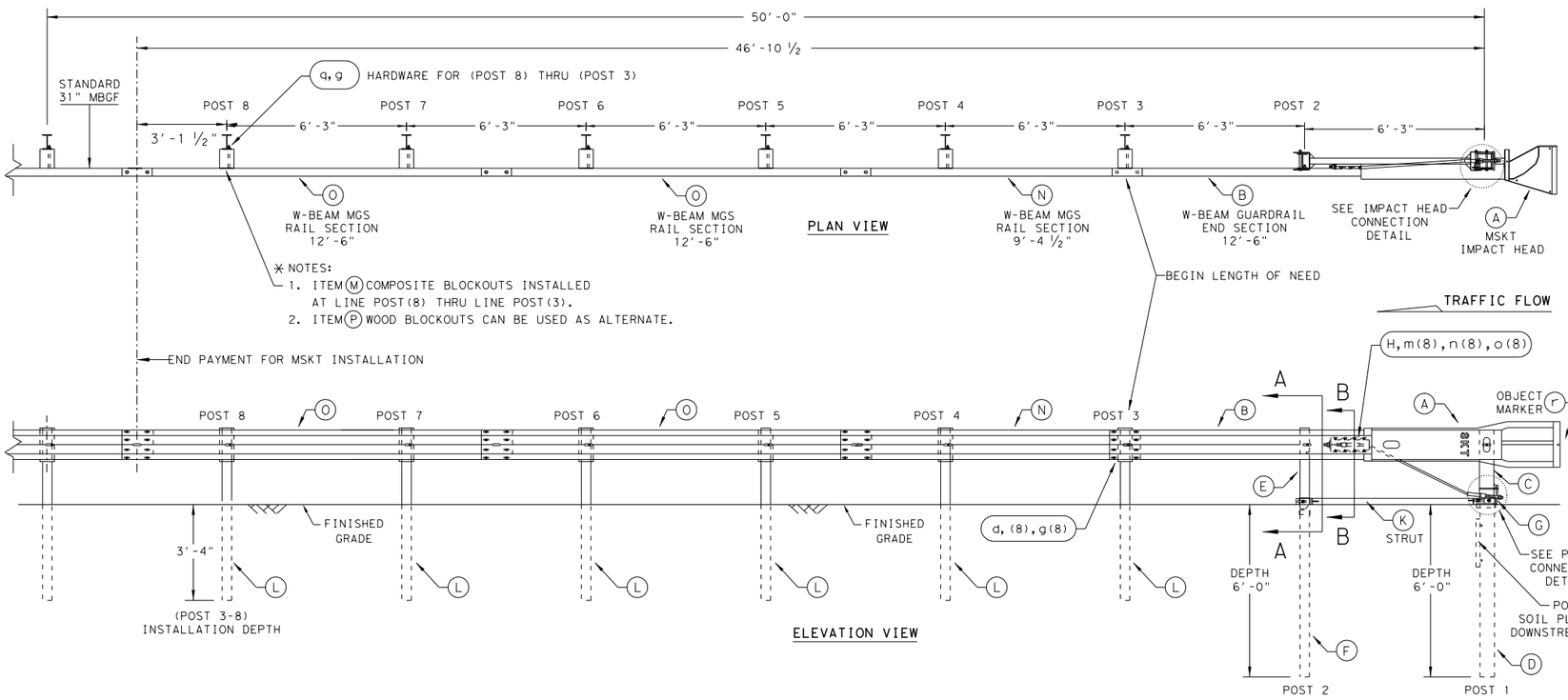
Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	71

DATE: 3/16/2021
FILE: pw://ts-pw.bentley.com:ts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/SGT(12S)31-18.dgn



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

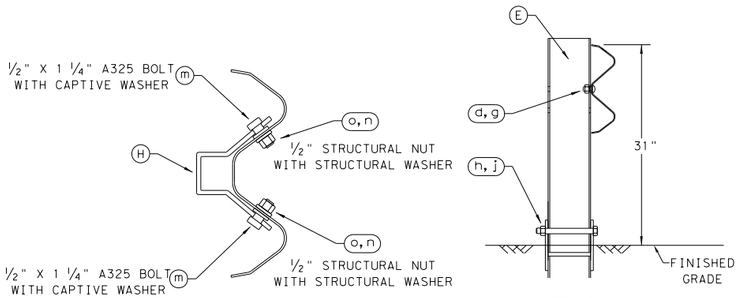
GENERAL NOTES

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.

SEE NOTES: ✳

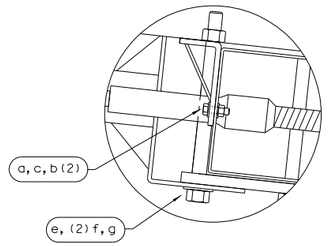
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE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

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

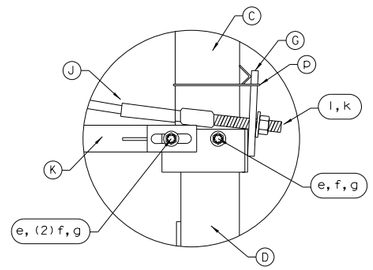


SECTION B-B
ANCHOR BRACKET

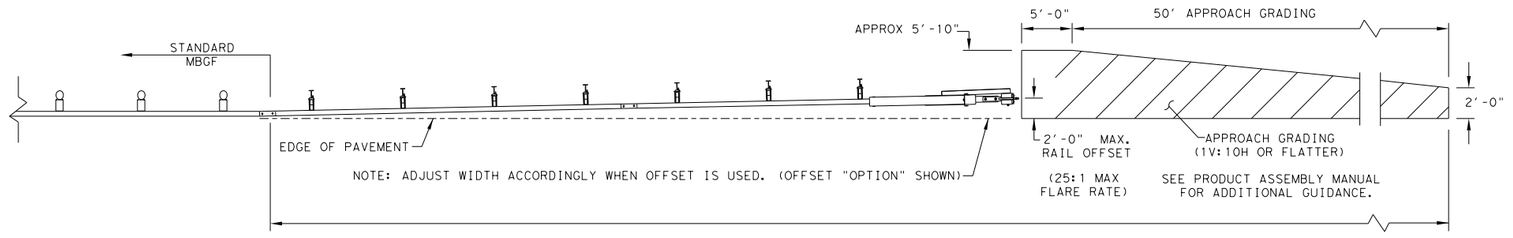
POST 2
SECTION A-A



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	0288	03	032	SH 16	
	DIST	COUNTY		SHEET NO.	
	BWD	EASTLAND		72	

DATE: 3/16/2021
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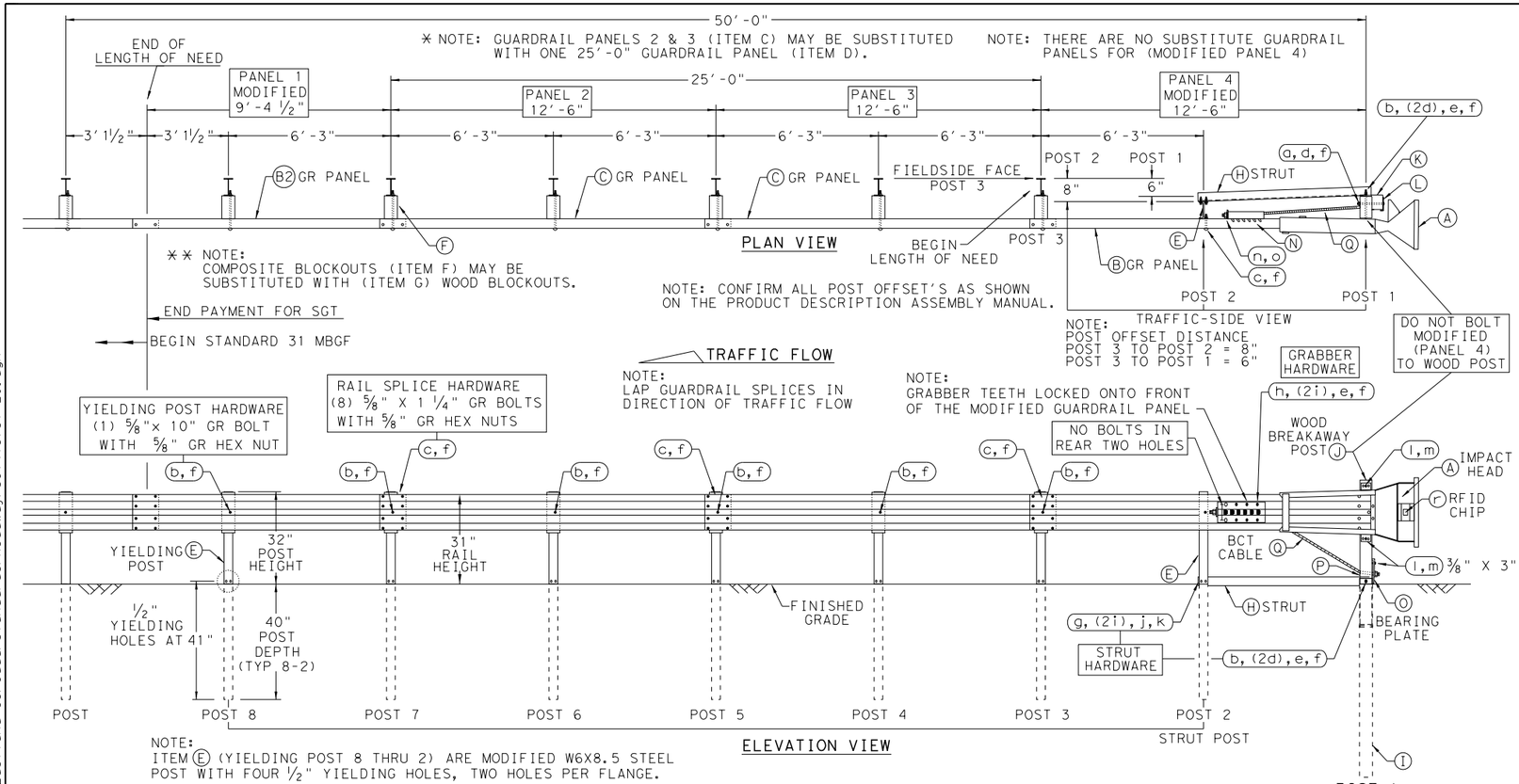
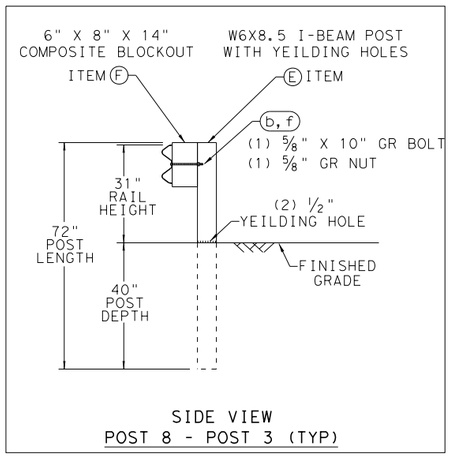


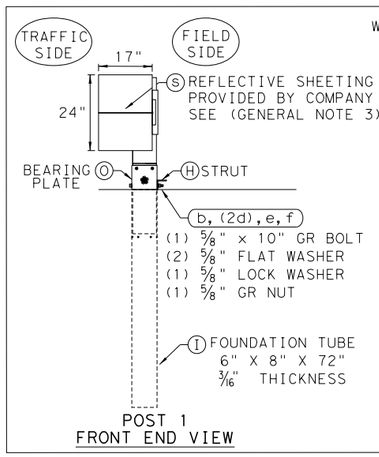
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

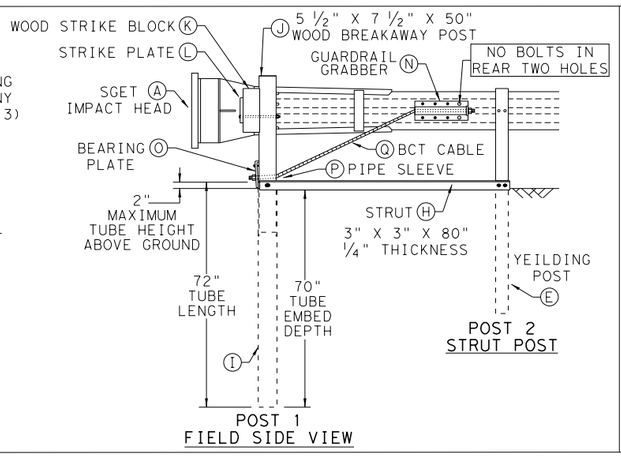
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
SMALL HARDWARE			
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M



SIDE VIEW
POST 8 - POST 3 (TYP)

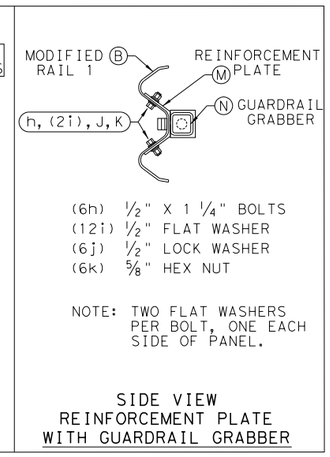


POST 1
FRONT END VIEW

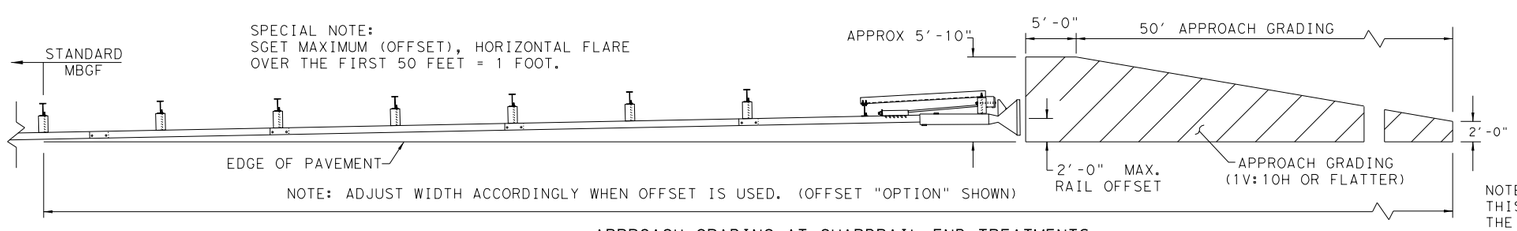


POST 1
FIELD SIDE VIEW

POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0288	03	032	SH 16	
	DIST	COUNTY		SHEET NO.	
	BWD	EASTLAND		73	

DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/SMD(GEN)-08.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)

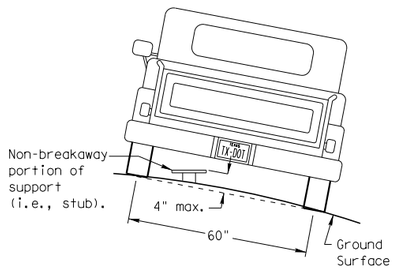
Anchor Type

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

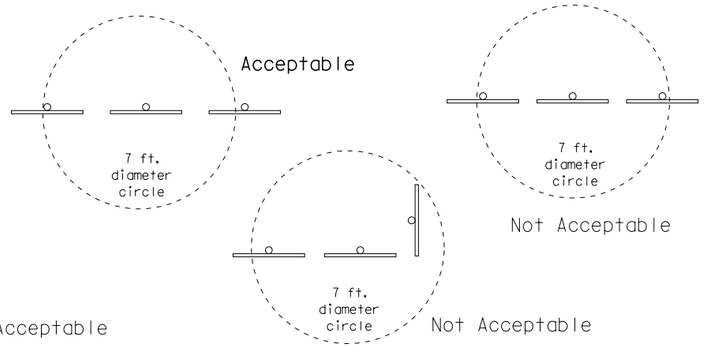
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



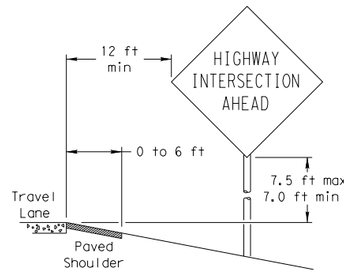
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



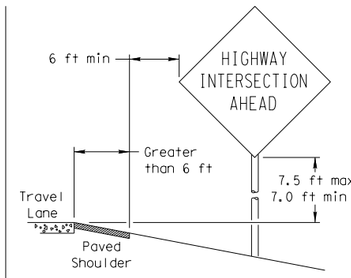
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

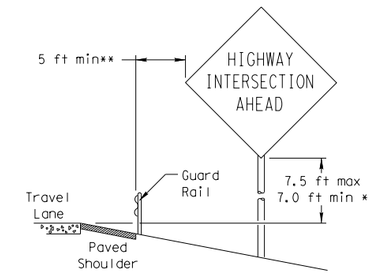
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



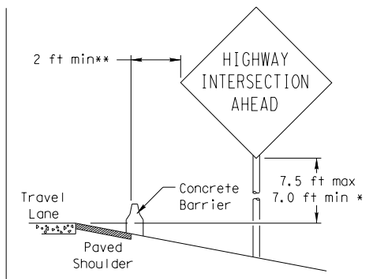
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



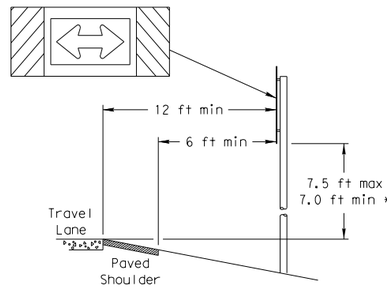
BEHIND GUARDRAIL



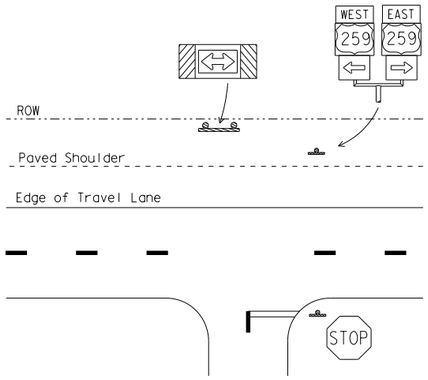
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

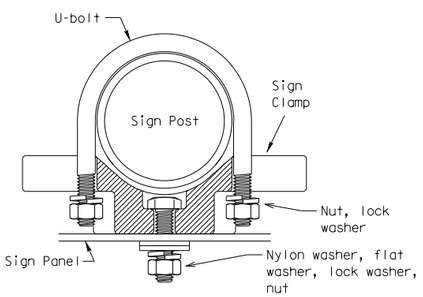
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

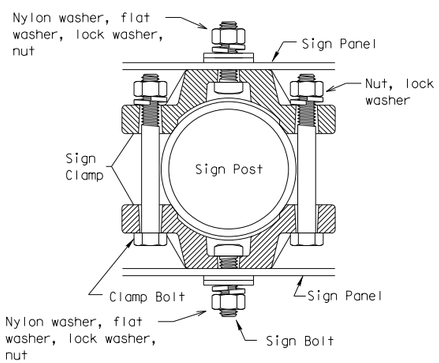


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

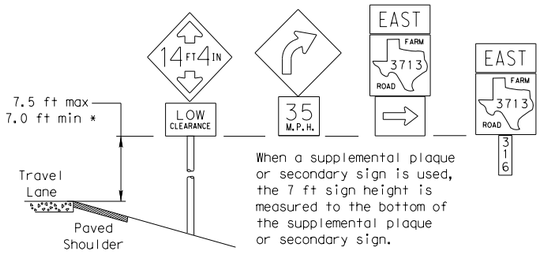
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



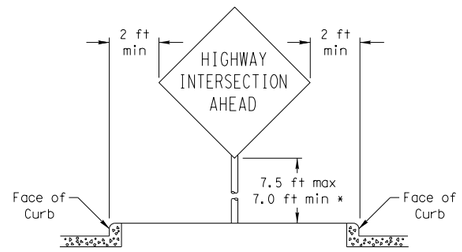
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



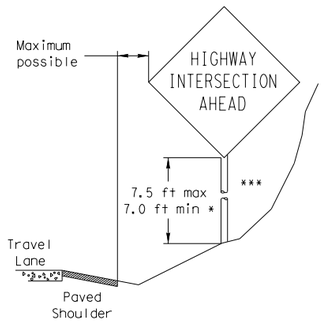
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

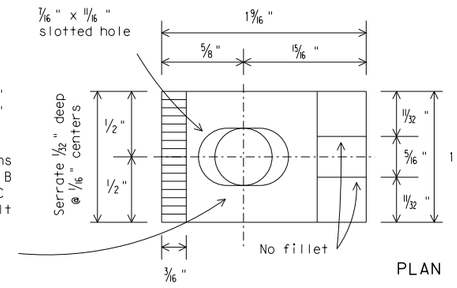
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		74

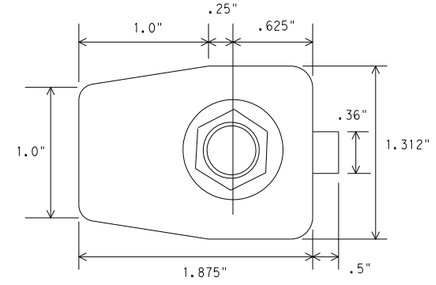
26A

DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/SMD(2-1)-08.dgn

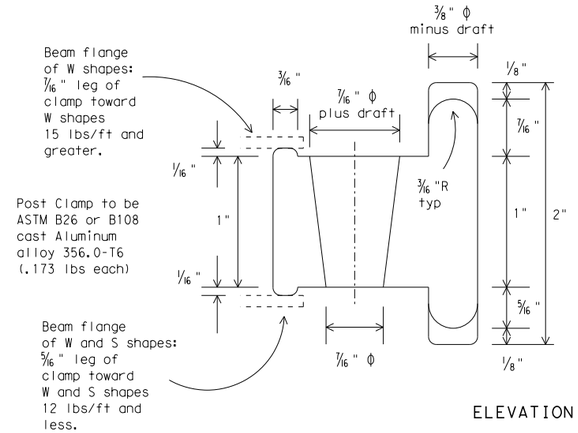
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



PLAN

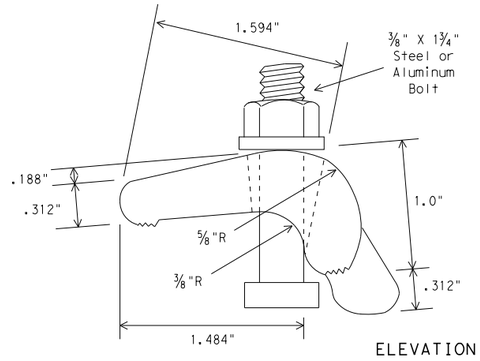


PLAN



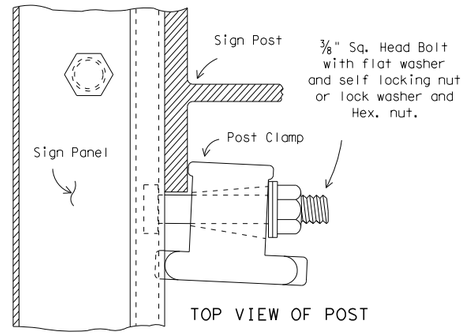
ELEVATION

POST CLAMP DETAIL

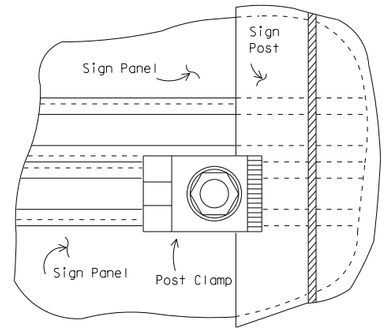


ELEVATION

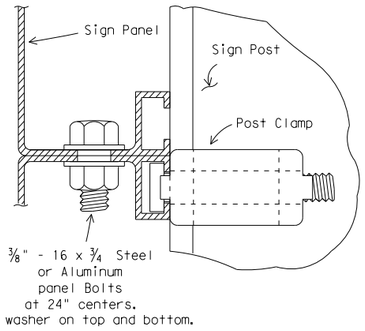
ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



TOP VIEW OF CLAMP



SIDE VIEW OF PANELS

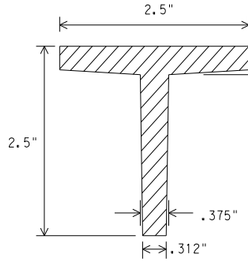
CONNECTION DETAILS

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.

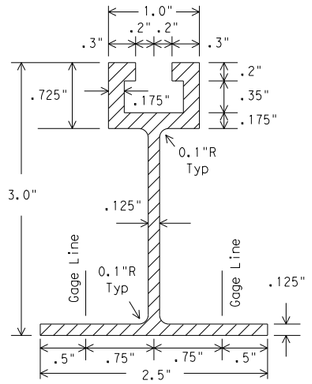


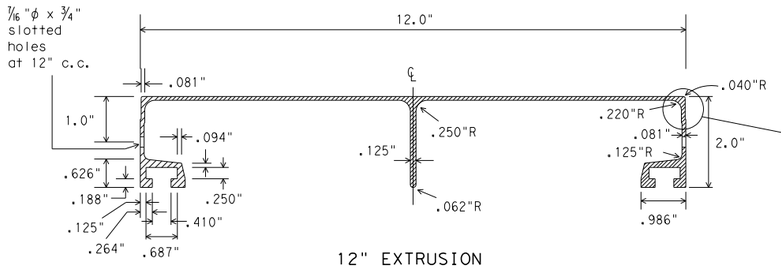
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

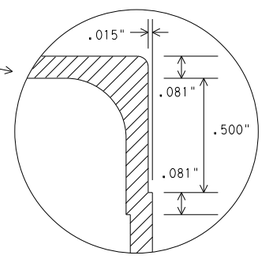
WINDBEAM CROSS SECTION

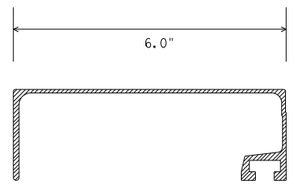
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



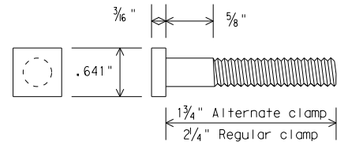


12" EXTRUSION





6" EXTRUSION



POST CLAMP BOLT DETAIL

ALUMINUM SIGN PANEL EXTRUSION DETAILS

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0288	03	032	SH 16

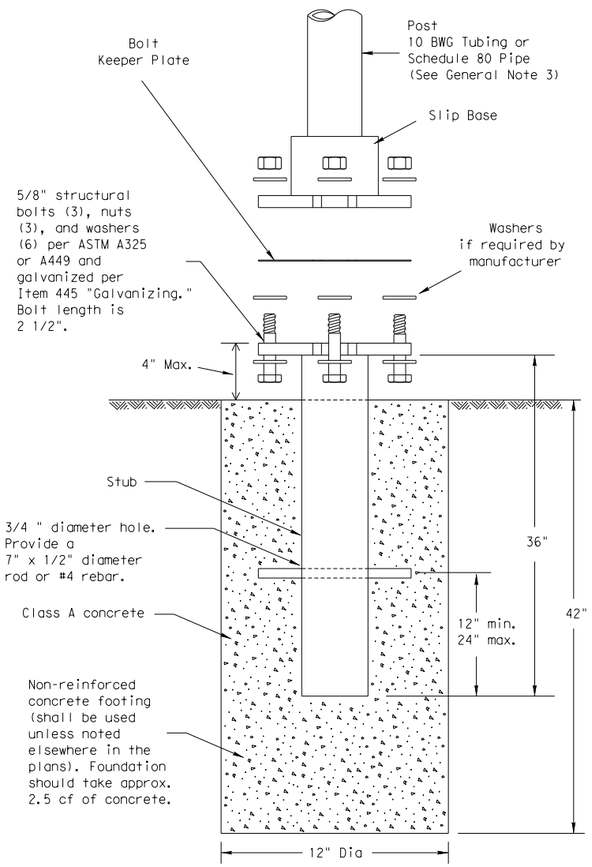
DIST	COUNTY	SHEET NO.
BWD	EASTLAND	75

9-08 REVISIONS

27A

DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/SMD(SLIP-1)-08.dgn

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.

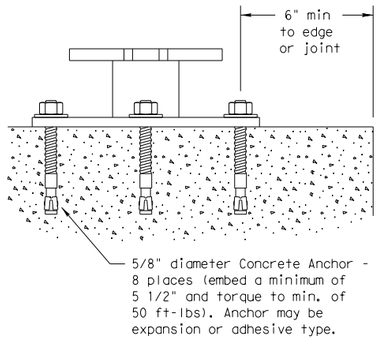
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
0288	03	032	SH 16

DIST	COUNTY	SHEET NO.
BWD	EASTLAND	76

DATE: 3/16/2021 12:15
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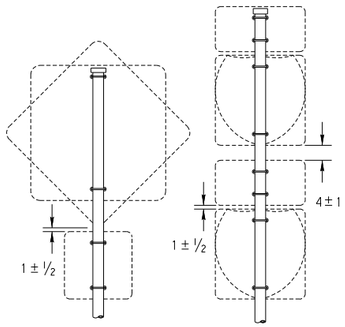
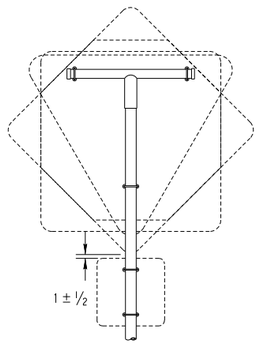
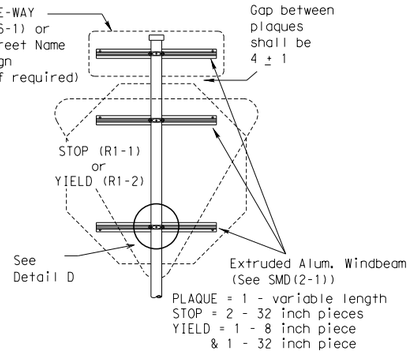


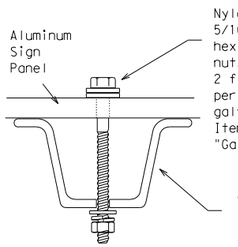
SM RD SGN ASSM TY XXXXX(1)XX(P)



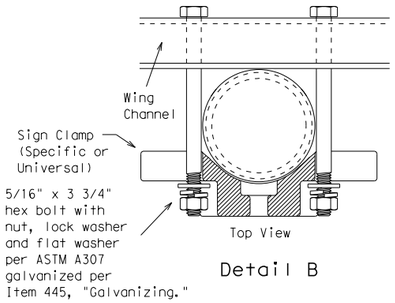
SM RD SGN ASSM TY XXXXX(1)XX(T)



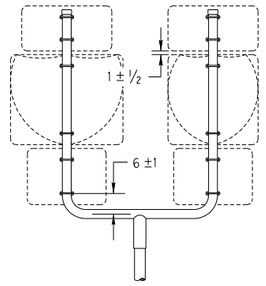
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



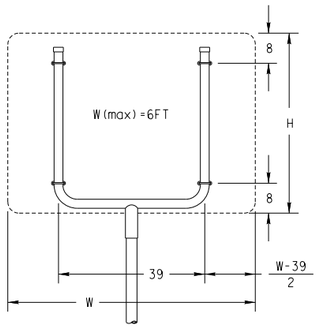
Detail A



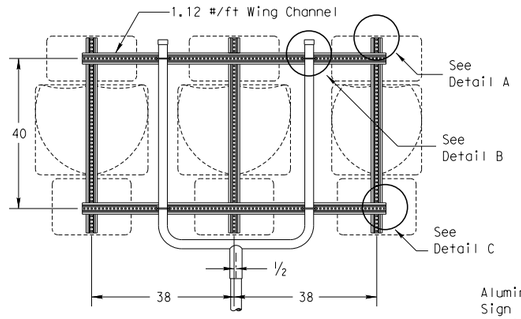
Detail B



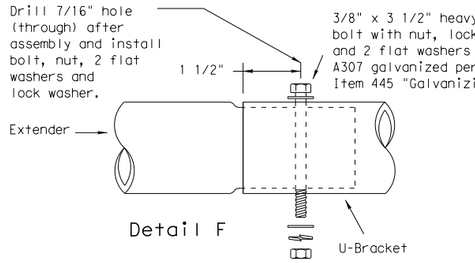
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

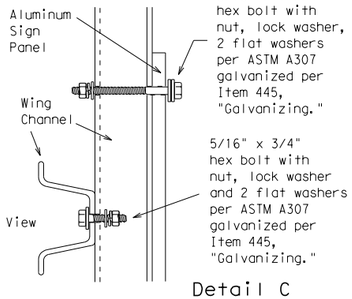


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

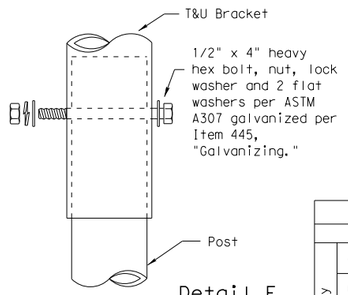


Detail F

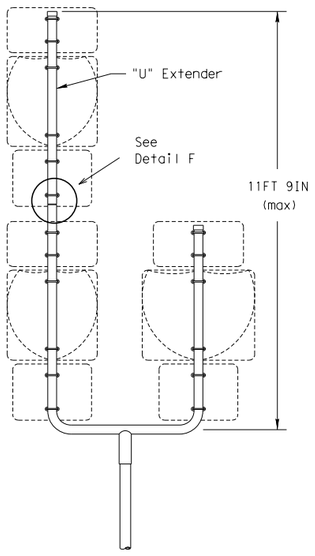
Splices shall only be allowed behind the sign substrate.



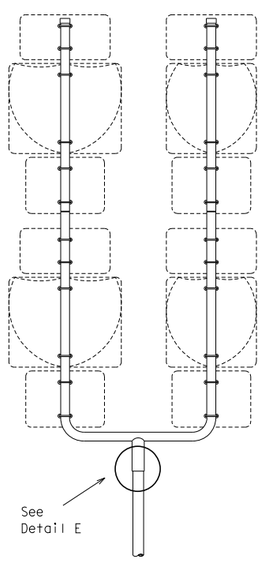
Detail C



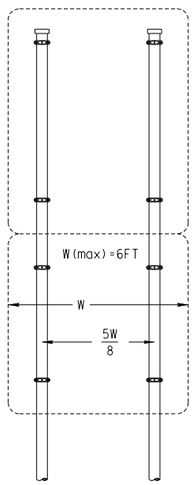
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

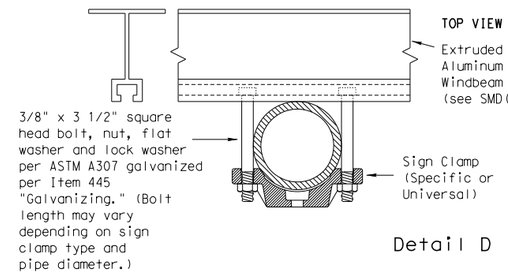


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

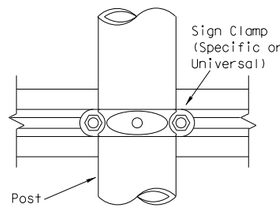


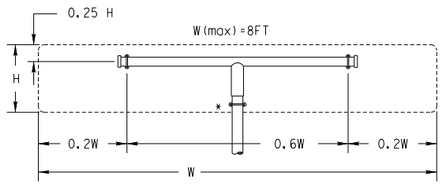
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

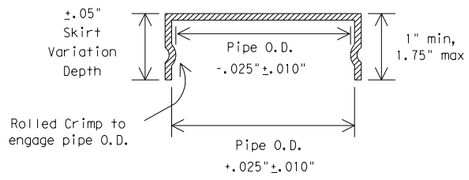




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

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

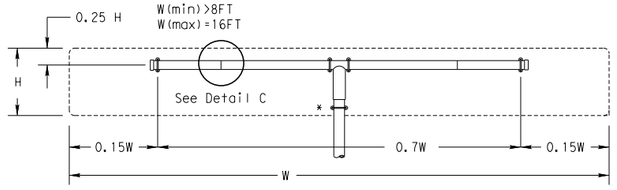
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

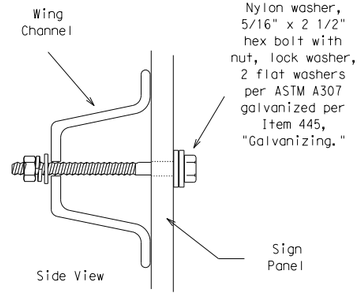
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		77

26C

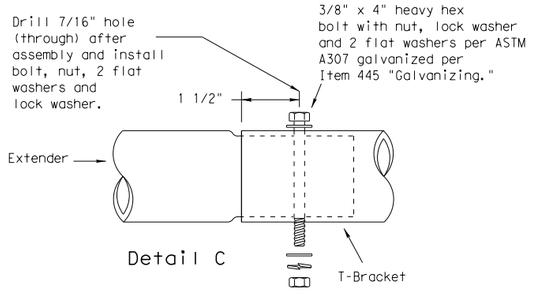
DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/TCP/SMD(SLIP-3)-08.dgn



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



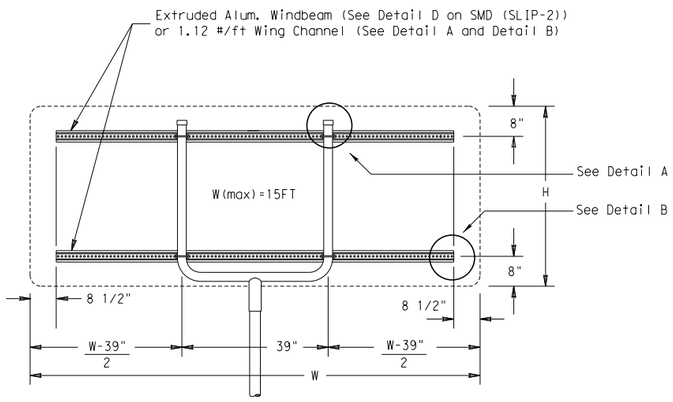
Detail C

Splices shall only be allowed behind the sign substrate.

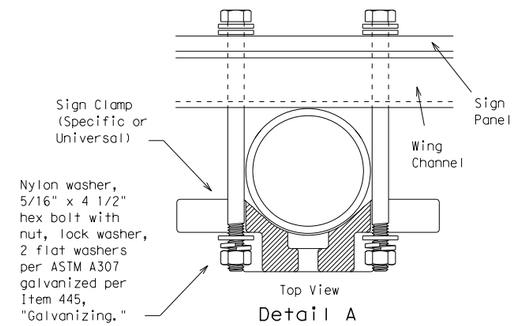
GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

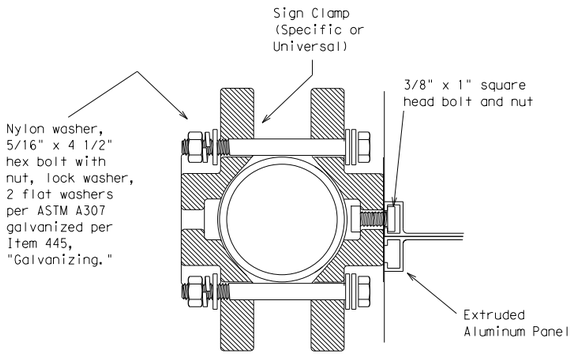
1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.



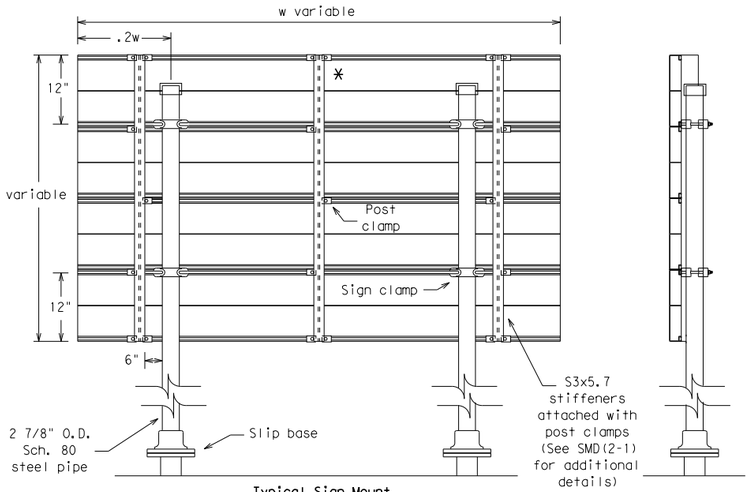
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

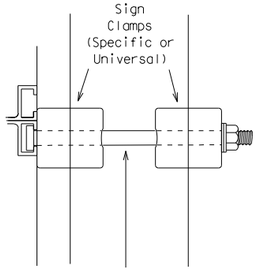


Typical Sign Mount

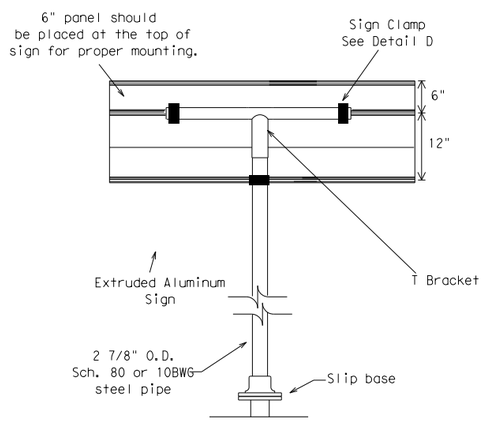
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

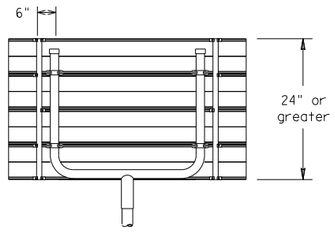
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

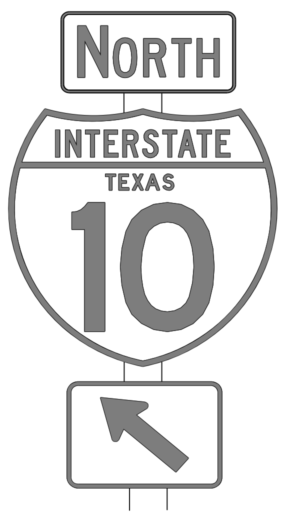
CONT	SECT	JOB	HIGHWAY
0288	03	032	SH 16

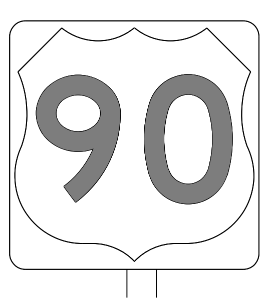
DIST	COUNTY	SHEET NO.
BWD	EASTLAND	78

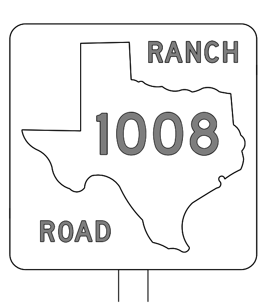
DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

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



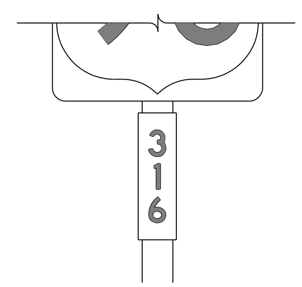


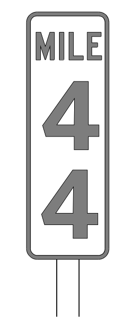


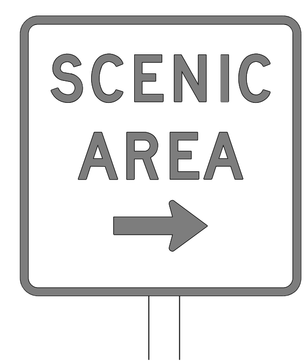
TYPICAL EXAMPLES

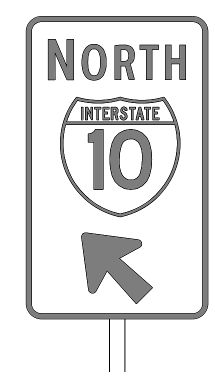
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

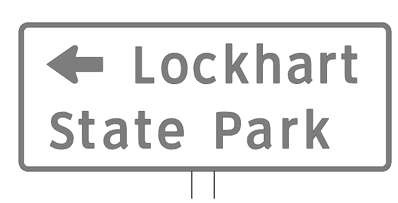
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

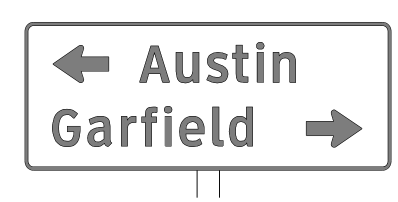












TYPICAL EXAMPLES

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

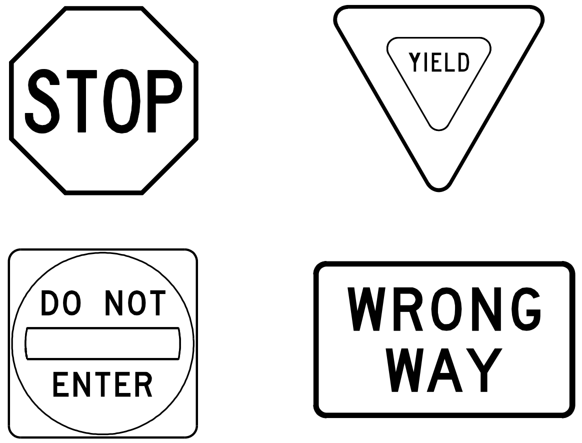
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0288	03	032	SH 16	
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.	
	BWD	EASTLAND		79	

3

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

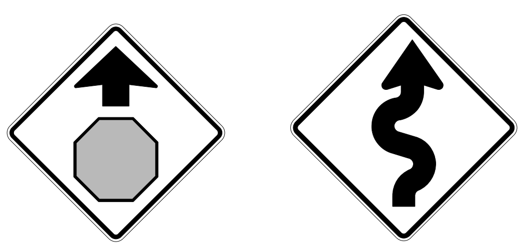
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

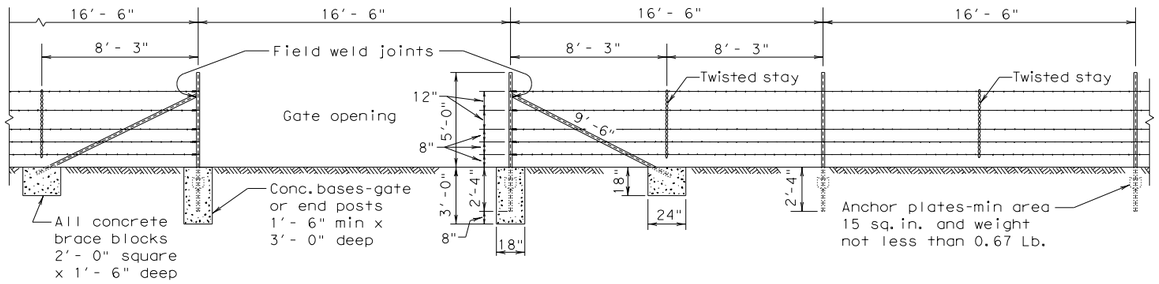
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY		
REVISIONS 12-03 7-13 9-08	0288	03	032	SH 16		
	DIST	COUNTY		SHEET NO.		
	BWD	EASTLAND		80		

4

DATE: 3/16/2021 12:15
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

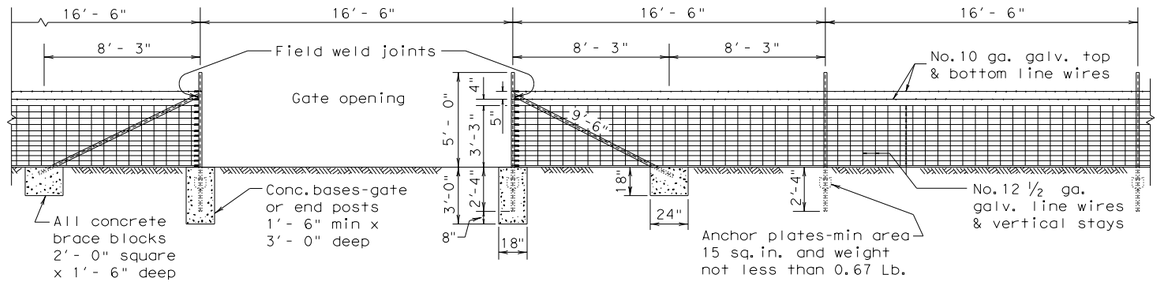


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS

BRACING DETAIL USED AT ENDS AND GATES

TYPE "C" FENCE

(See General Note 8)



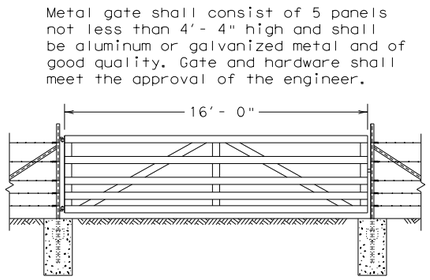
SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS

BRACING DETAIL USED AT ENDS AND GATES

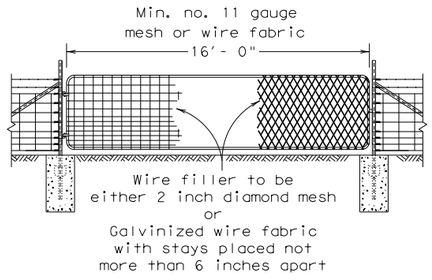
TYPE "D" FENCE

(See General Note 8)

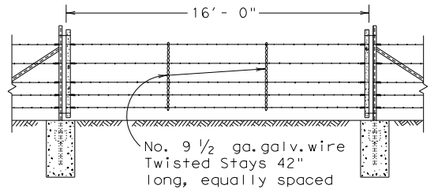
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



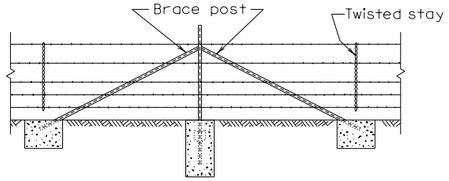
DETAIL TYPE 1 GATE



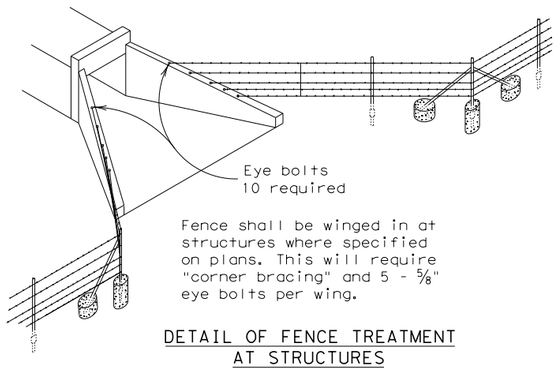
DETAIL TYPE 2 GATE



DETAIL TYPE 3 GATE

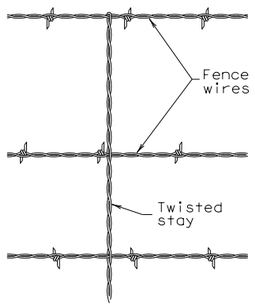


CORNER OR PULL POST ASSEMBLY



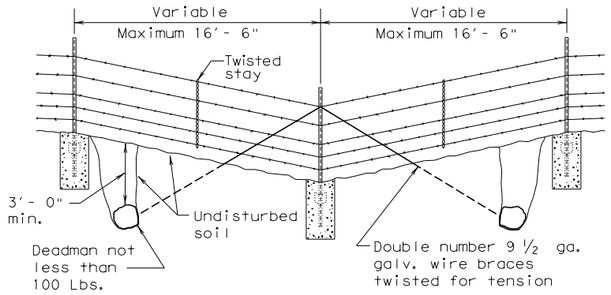
Fence shall be winged in at structures where specified on plans. This will require "corner bracing" and 5 - ⅝" eye bolts per wing.

DETAIL OF FENCE TREATMENT AT STRUCTURES

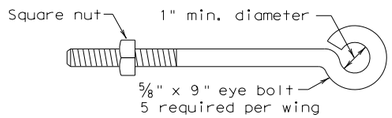


DETAIL OF STAY

(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a 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. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6′-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. 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 D) 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.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.

Texas Department of Transportation

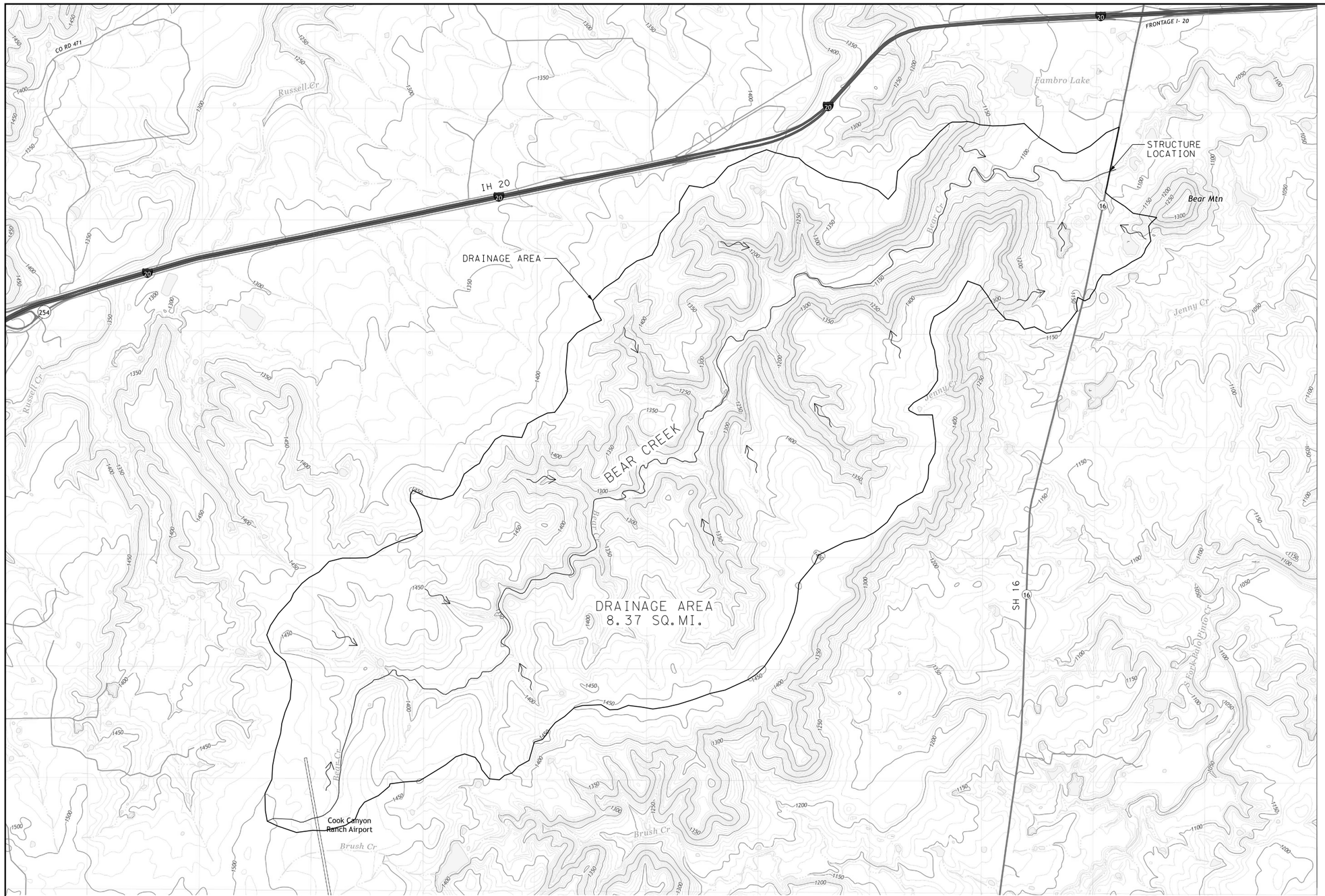
Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE (STEEL POSTS)

WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		81

DATE: 3/16/2021
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Roadway/WF(2)-10.dgn



N

0 1500' 3000'

SCALE: 1" = 3000'

RUNOFF COMPUTATIONS FOR LARGE WATERSHEDS (NRCS METHOD)												
DA ID	AREA (ACRES)	AREA (SQ MI)	Tc (HR)	LAG TIME (HR)	LAG TIME (MIN)	BASE RCN	USED RCN	% IMPERVIOUS %	INITIAL ABSTR (IN)	24-HOUR PRECIPITATION (IN) 25-YR	24-HOUR PRECIPITATION (IN) 100-YR	PEAK DISCHARGE (CFS) 25-YR	PEAK DISCHARGE (CFS) 100-YR
SH 16	5354.6	8.37	3.60	2.16	129.54	75	64	0.5	1.127	6.9	9.2	3335	5338

NRCS METHOD MODELED IN HEC-HMS VERSION 4.3.
PRECIPITATION DATA FOR SH 16 DERIVED FROM "NOAA ATLAS 14, VOLUME 11, VERSION 2 CRESSON, LAT: 32.4867° LONG: -98.5197° " FROM THE NOAA PRECIPITATION FREQUENCY SERVER.
SOILS DATA OBTAINED FROM NRCS WEB SOIL SURVEY UTILITY.
LAND USE DATA OBTAINED FROM AERIAL PHOTOGRAMMETRY.
THE BASE RCN WAS ADJUSTED BASED ON THE LOWER BOUND EQUIVALENT TO THE CURVE NUMBER FOR AMC I, A CURVE NUMBER OF 60,
OR THE RECOMMENDED REDUCTION FROM TxDOT HYDRAULIC MANUAL, FIGURE 4-22, WHICHEVER IS HIGHER.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ELIZABETH M. GASTON
114280
LICENSED
PROFESSIONAL ENGINEER

E. Gaston

3-16-21

FIRM REGISTRATION NO. F-230

tnp

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19397

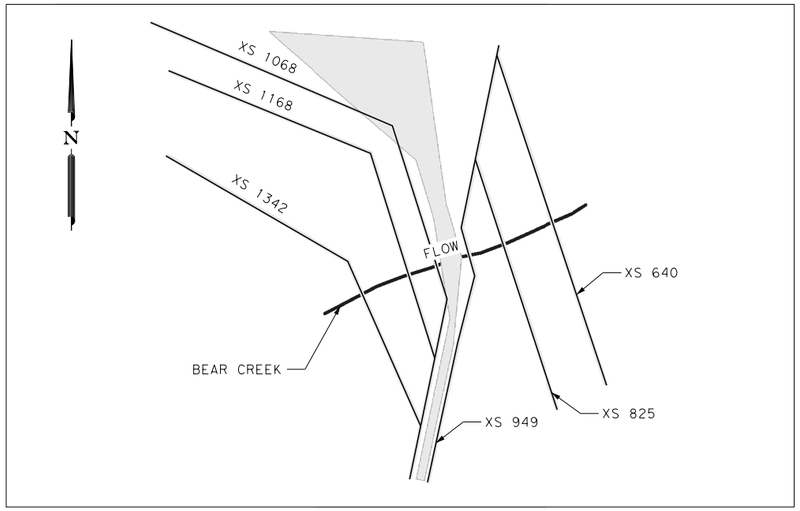
SH 16 AT BEAR CREEK

DRAINAGE AREA MAP

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		82

pw://tts-pw.bentley.com:tts-pw-01/Documents/8223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/Drainage/SH16_DRN_DA.dgn
3/16/2021 4:44



CROSS SECTION LAYOUT
N.T.S.

HEC-RAS RIVER: BEAR CREEK REACH: SH16

REACH	RIVER STA	PROFILE	PLAN	Q TOTAL (CFS)	MIN CH EL (FT)	W.S. ELEV (FT)	CRIT W.S. (FT)	E.G. ELEV (FT)	E.G. SLOPE (FT/FT)	VEL CHNL (FT/S)	FLOW AREA (SQ FT)	TOP WIDTH (FT)	FROUDE # CHL
SH 16	1342	25-yr	EXIST	3335	1065.03	1075.07	1072.41	1076.05	0.003104	7.96	419.04	101.32	0.55
SH 16	1342	25-yr	PROP_V12	3335	1065.03	1075.10	1072.41	1076.08	0.003062	7.92	421.13	101.68	0.54
SH 16	1342	100-yr	EXIST	5338	1065.03	1077.42	1074.42	1078.74	0.003243	9.21	579.33	126.44	0.57
SH 16	1342	100-yr	PROP_V12	5338	1065.03	1077.42	1074.42	1078.74	0.003244	9.21	579.30	126.44	0.57
SH 16	1168	25-yr	EXIST	3335	1065.13	1074.08	1072.40	1075.37	0.004669	9.10	366.53	97.46	0.66
SH 16	1168	25-yr	PROP_V12	3335	1065.13	1074.15	1072.40	1075.41	0.004518	8.99	370.89	98.52	0.65
SH 16	1168	100-yr	EXIST	5338	1065.13	1076.46	1074.36	1078.06	0.004389	10.13	527.06	133.09	0.66
SH 16	1168	100-yr	PROP_V12	5338	1065.13	1076.46	1074.36	1078.06	0.00439	10.13	527.03	133.08	0.66
SH 16	1068	25-yr	EXIST	3335	1063.54	1071.91	1071.83	1074.34	0.010963	12.50	266.70	52.04	0.97
SH 16	1068	25-yr	PROP_V12	3335	1063.54	1071.80	1071.80	1074.34	0.011642	12.77	261.08	51.63	1.00
SH 16	1068	100-yr	EXIST	5338	1063.54	1073.93	1073.93	1076.97	0.010801	14.00	381.37	62.16	1.00
SH 16	1068	100-yr	PROP_V12	5338	1063.54	1073.93	1073.93	1076.97	0.010797	14.00	381.42	62.16	1.00
SH 16	1000			BRIDGE									
SH 16	949	25-yr	EXIST	3335	1061.03	1071.91	1068.62	1072.78	0.002535	7.51	444.07	61.95	0.49
SH 16	949	25-yr	PROP_V12	3335	1061.03	1071.91	1068.62	1072.78	0.002535	7.51	444.07	61.95	0.49
SH 16	949	100-yr	EXIST	5338	1061.03	1073.49	1070.68	1074.98	0.003642	9.77	546.41	66.99	0.60
SH 16	949	100-yr	PROP_V12	5338	1061.03	1073.49	1070.70	1074.98	0.003642	9.77	546.41	66.99	0.60
SH 16	825	25-yr	EXIST	3335	1062.07	1069.56	1069.56	1071.79	0.011684	11.98	278.46	63.07	1.00
SH 16	825	25-yr	PROP_V12	3335	1062.07	1069.56	1069.56	1071.79	0.011684	11.98	278.46	63.07	1.00
SH 16	825	100-yr	EXIST	5338	1062.07	1071.50	1071.50	1074.00	0.009027	12.81	440.90	99.27	0.93
SH 16	825	100-yr	PROP_V12	5338	1062.07	1071.50	1071.50	1074.00	0.009027	12.81	440.90	99.27	0.93
SH 16	640	25-yr	EXIST	3335	1061.69	1068.66	1067.38	1069.75	0.005002	8.36	398.93	84.13	0.68
SH 16	640	25-yr	PROP_V12	3335	1061.69	1068.66	1067.38	1069.75	0.005002	8.36	398.93	84.13	0.68
SH 16	640	100-yr	EXIST	5338	1061.69	1070.35	1068.95	1071.83	0.005003	9.76	547.11	90.71	0.70
SH 16	640	100-yr	PROP_V12	5338	1061.69	1070.35	1068.95	1071.83	0.005003	9.76	547.11	90.71	0.70

RIVER: BEAR CREEK PROFILE: 25-YR

REACH: SH 16 RS: 1000 PLAN: PROP_V12

PLAN: PROP_V12 BEAR CREEK SH 16 RS: 1000 PROFILE 25-YR				
E.G. US (FT)	1074.34	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US (FT)	1071.80	E.G. ELEV (FT)	1073.02	1072.96
Q TOTAL (CFS)	3335.00	W.S. ELEV (FT)	1072.59	1072.53
Q BRIDGE (CFS)	3335.00	CRIT W.S. (FT)	1067.55	1067.55
Q WEIR (CFS)		MAX CHL DPTH (FT)	10.99	10.93
WEIR STA LFT (FT)		VEL TOTAL (FT/S)	5.22	5.27
WEIR STA RGT (FT)		FLOW AREA (SQ FT)	638.53	633.06
WEIR SUBMERG		FROUDE # CHL	0.33	0.33
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)	3509.25	3471.32
MIN EL WEIR FLOW (FT)	1074.82	HYDR DEPTH (FT)	7.80	7.76
MIN EL PRS (FT)	1077.21	W.P. TOTAL (FT)	86.71	86.41
DELTA EG (FT)	1.56	CONV. TOTAL (CFS)	102608.10	101379.90
DELTA WS (FT)	-0.10	TOP WIDTH (FT)	81.82	81.55
BR OPEN AREA (SQ FT)	1007.22	FRCTN LOSS (FT)	0.06	0.04
BR OPEN VEL (FT/S)	5.27	C & E LOSS (FT)	0.00	0.13
COEF OF Q		SHEAR TOTAL (LB/SQ FT)	0.49	0.49
BR SEL METHOD	ENERGY ONLY	POWER TOTAL (LB/FT S)	2.54	2.61

RIVER: BEAR CREEK PROFILE: 100-YR

REACH: SH 16 RS: 1000 PLAN: PROP_V12

PLAN: PROP_V12 BEAR CREEK SH 16 RS: 1000 PROFILE 100-YR				
E.G. US (FT)	1076.97	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US (FT)	1073.93	E.G. ELEV (FT)	1075.39	1075.34
Q TOTAL (CFS)	5338.00	W.S. ELEV (FT)	1074.99	1074.94
Q BRIDGE (CFS)	4274.62	CRIT W.S. (FT)	1069.35	1069.35
Q WEIR (CFS)	1063.38	MAX CHL DPTH (FT)	13.39	13.34
WEIR STA LFT (FT)	352.92	VEL TOTAL (FT/S)	5.05	5.08
WEIR STA RGT (FT)	621.57	FLOW AREA (SQ FT)	846.12	841.76
WEIR SUBMERG	0.00	FROUDE # CHL	0.29	0.29
WEIR MAX DEPTH (FT)	2.16	SPECIF FORCE (CU FT)	5413.64	5376.84
MIN EL WEIR FLOW (FT)	1074.82	HYDR DEPTH (FT)	9.26	9.23
MIN EL PRS (FT)	1077.21	W.P. TOTAL (FT)	97.43	97.22
DELTA EG (FT)	2.00	CONV. TOTAL (CFS)	151771.80	150691.20
DELTA WS (FT)	0.43	TOP WIDTH (FT)	91.41	91.22
BR OPEN AREA (SQ FT)	1007.22	FRCTN LOSS (FT)	0.04	0.04
BR OPEN VEL (FT/S)	5.08	C & E LOSS (FT)	0.00	0.32
COEF OF Q		SHEAR TOTAL (LB/SQ FT)	0.67	0.68
BR SEL METHOD	ENERGY/WEIR	POWER TOTAL (LB/FT S)	3.39	3.44

NOTES:

1. WATER SURFACE ELEVATION COMPUTED USING HEC-RAS VERSION 5.0.7.
2. THE TAILWATER WAS DETERMINED USING NORMAL DEPTH COMPUTATION WITH A SLOPE OF 0.005 FT/FT.
3. THIS CROSSING IS LOCATED IN A FEMA DESIGNATED ZONE "A" AS SHOWN ON MAP PANEL 48133C0275D EFFECTIVE APRIL 5, 2019.
4. FLOODPLAIN ADMINISTRATOR COORDINATION ON FEBRUARY 25, 2021.
5. PROPOSED BRIDGE 25 YEAR DISCHARGE: 3335 CFS
   BOTTOM GIRDER ELEV = 1077.21 FT
   FREEBOARD = 5.41 FT
   PERCENT OF FLOW OVERTOPPING ROAD = 0.0%
6. PROPOSED BRIDGE 100 YEAR DISCHARGE: 5338 CFS
   BOTTOM GIRDER ELEV = 1077.21 FT
   FREEBOARD = 3.28 FT
   PERCENT OF FLOW OVERTOPPING ROAD = 0.0%

NO.	REVISION	BY	DATE

STATE OF TEXAS
ELIZABETH M. GASTON
114280
LICENSED
PROFESSIONAL ENGINEER
E. Gaston
3-16-21

FIRM REGISTRATION NO. F-230

tnp

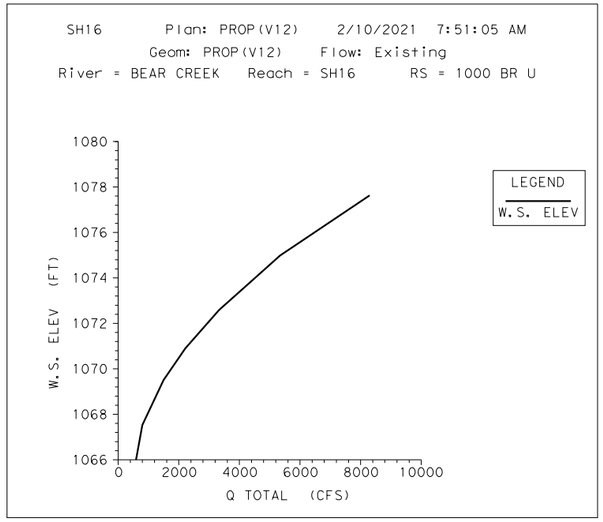
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19397

SH 16 AT BEAR CREEK

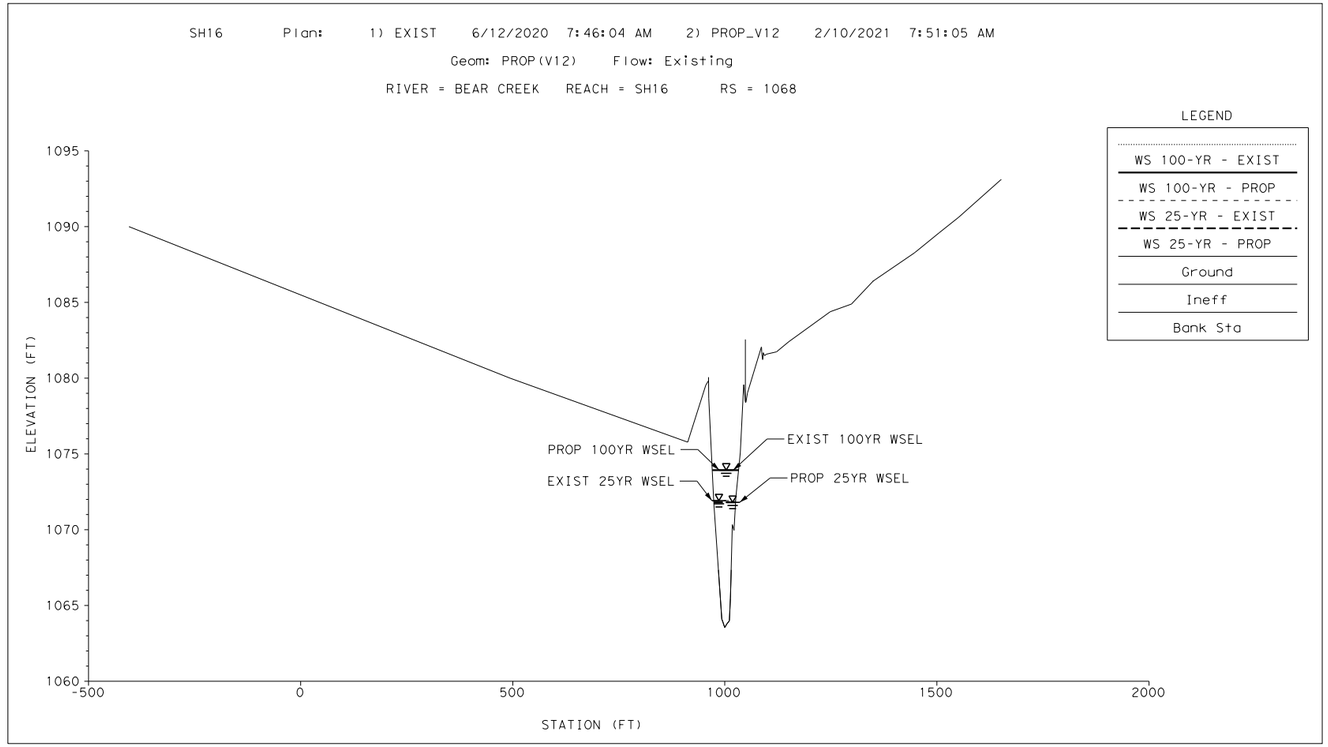
HYDRAULIC DATA

SHEET 1 OF 2

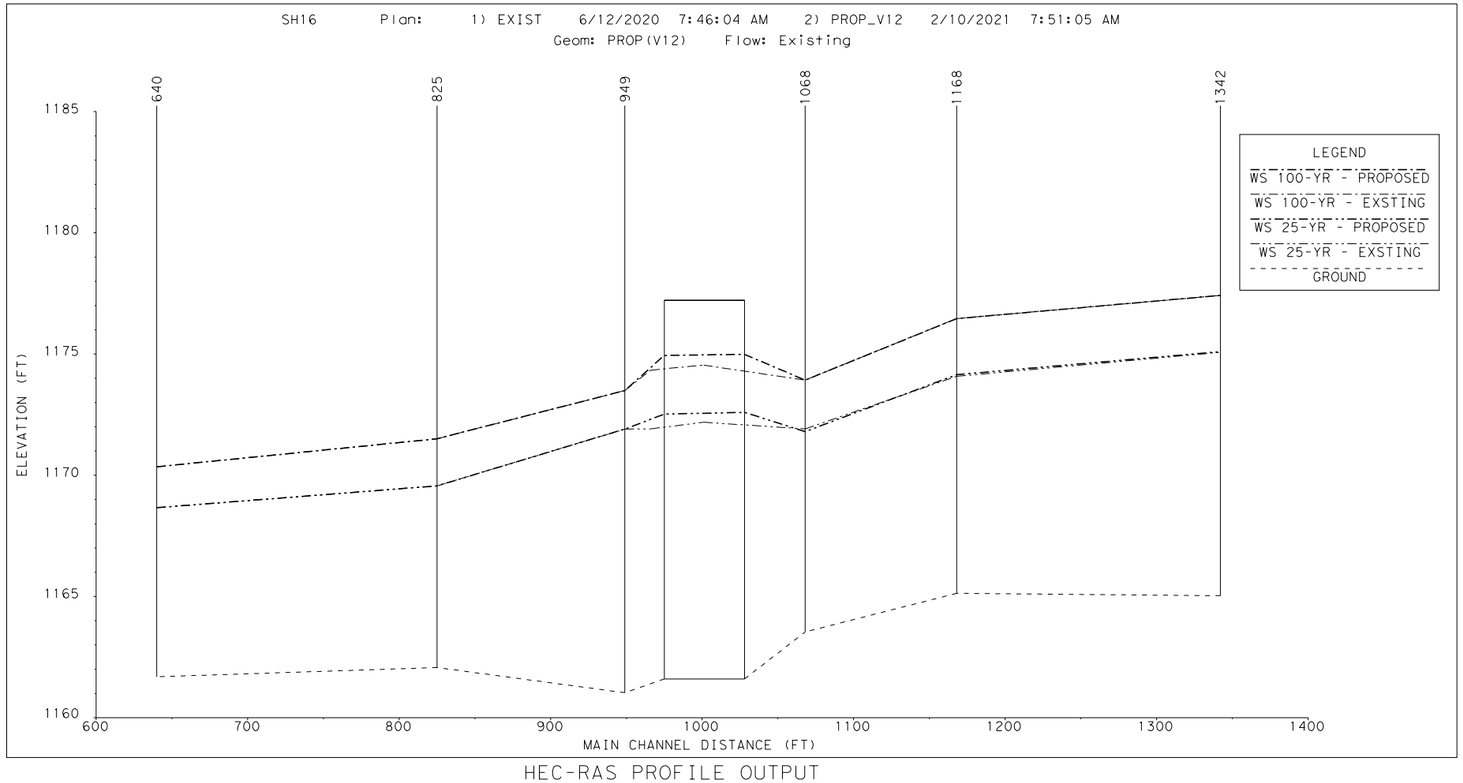
FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		83



HEC-RAS RATING CURVE



HEC-RAS CROSS SECTION OUTPUT



HEC-RAS PROFILE OUTPUT

NOTES:

1. WATER SURFACE ELEVATION COMPUTED USING HEC-RAS VERSION 5.0.7.
2. THE TAILWATER WAS DETERMINED USING NORMAL DEPTH COMPUTATION WITH A SLOPE OF 0.005 FT/FT.
3. THIS CROSSING IS LOCATED IN A FEMA DESIGNATED ZONE "A" AS SHOWN ON MAP PANEL 48133C0275D EFFECTIVE APRIL 5, 2019.
4. FLOODPLAIN ADMINISTRATOR COORDINATION ON FEBRUARY 25, 2021.
5. PROPOSED BRIDGE 25 YEAR DISCHARGE: 3335 CFS
   BOTTOM GIRDER ELEV = 1077.21 FT
   FREEBOARD = 5.41 FT
   PERCENT OF FLOW OVERTOPPING ROAD = 0.0%
6. PROPOSED BRIDGE 100 YEAR DISCHARGE: 5338 CFS
   BOTTOM GIRDER ELEV = 1077.21 FT
   FREEBOARD = 3.28 FT
   PERCENT OF FLOW OVERTOPPING ROAD = 0.0%

NO.	REVISION	BY	DATE

STATE OF TEXAS
ELIZABETH M. GASTON
114280
LICENSED
PROFESSIONAL ENGINEER

E. Gaston 3-16-21

FIRM REGISTRATION NO. F-230

tnp

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm # F-19297

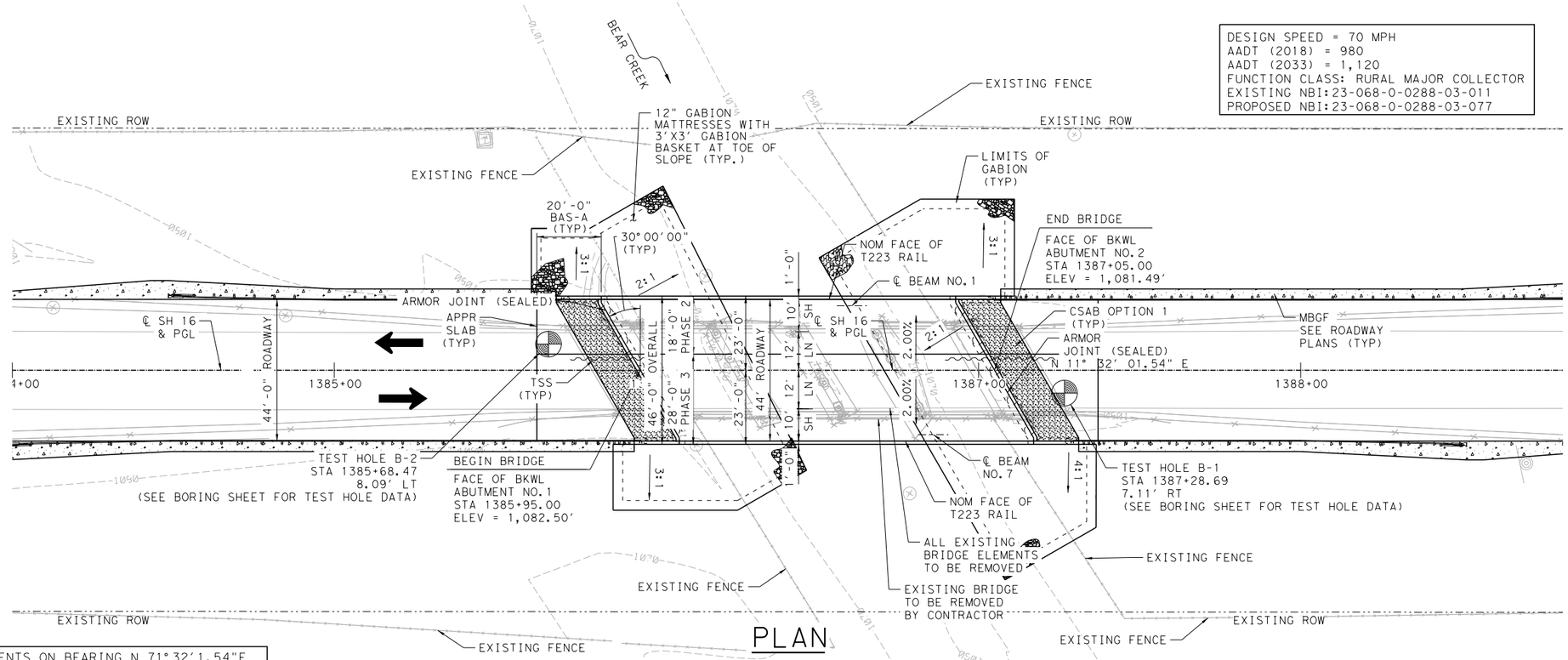
SH 16 AT BEAR CREEK

HYDRAULIC DATA

SHEET 2 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		84

DESIGN SPEED = 70 MPH
AADT (2018) = 980
AADT (2033) = 1,120
FUNCTION CLASS: RURAL MAJOR COLLECTOR
EXISTING NBI:23-068-0-0288-03-011
PROPOSED NBI:23-068-0-0288-03-077



PLAN

ALL BENTS ON BEARING N 71°32'1.54"E

HL93 LOADING

GENERAL NOTES

1. SEE "BRIDGE TYPICAL SECTION" SHEETS FOR TYPICAL SECTION.

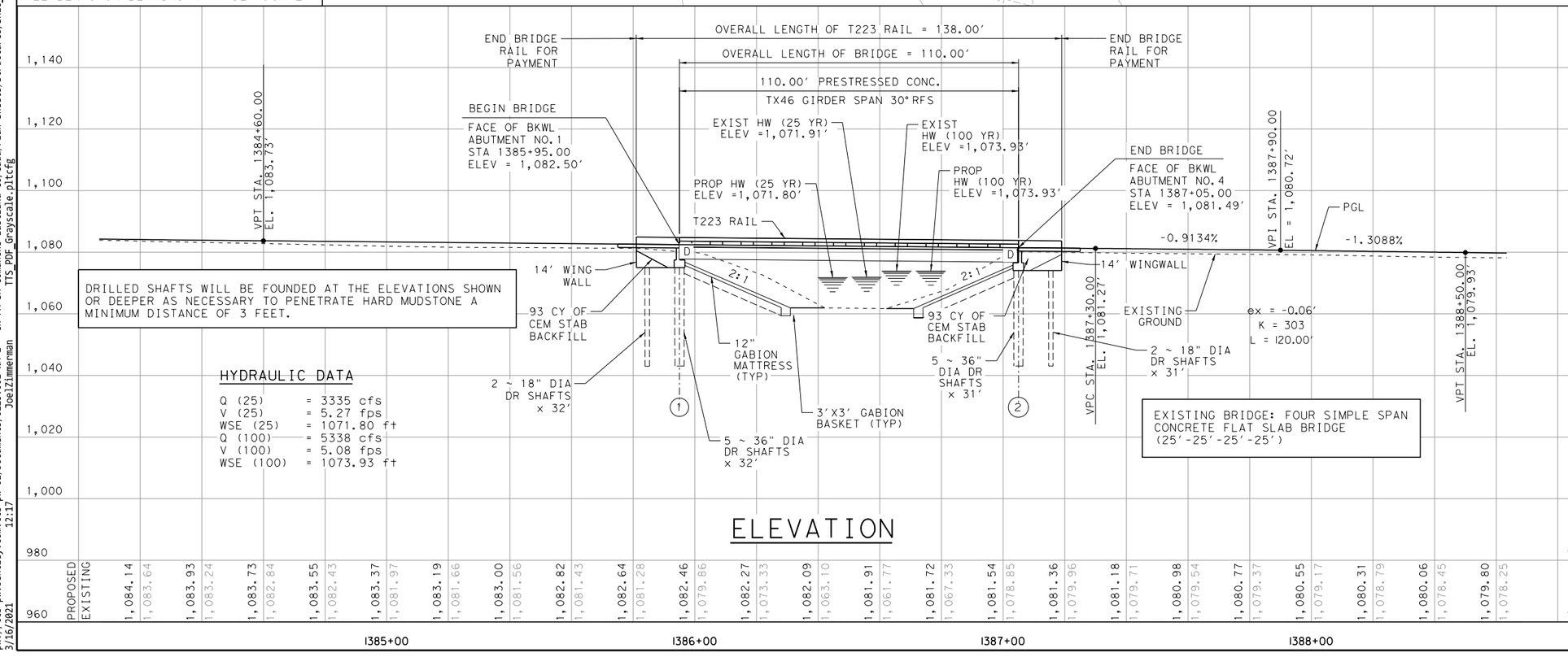
2. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION 2017.

3. CONTRACTOR'S ATTENTION IS DRAWN TO THE SAND FOUND IN PORTIONS OF THE SOIL PROFILE. SANDS ARE EXPECTED TO BE WATER BEARING AND WILL REQUIRE CARE IN ADVANCING DRILLED SHAFT FOUNDATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR HOLE STABILITY.

4. "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.

5. SEE "BRIDGE PHASED REMOVAL DETAILS" FOR EXISTING STRUCTURE REMOVAL.

0 20 40
SCALE: 1" = 40'



ELEVATION

DRILLED SHAFTS WILL BE FOUNDED AT THE ELEVATIONS SHOWN OR DEEPER AS NECESSARY TO PENETRATE HARD MUDSTONE A MINIMUM DISTANCE OF 3 FEET.

HYDRAULIC DATA

Q (25)	=	3335 cfs
V (25)	=	5.27 fps
WSE (25)	=	1071.80 ft
Q (100)	=	5338 cfs
V (100)	=	5.08 fps
WSE (100)	=	1073.93 ft

EXISTING BRIDGE: FOUR SIMPLE SPAN CONCRETE FLAT SLAB BRIDGE (25'-25'-25'-25')

NO.	REVISION	BY	DATE

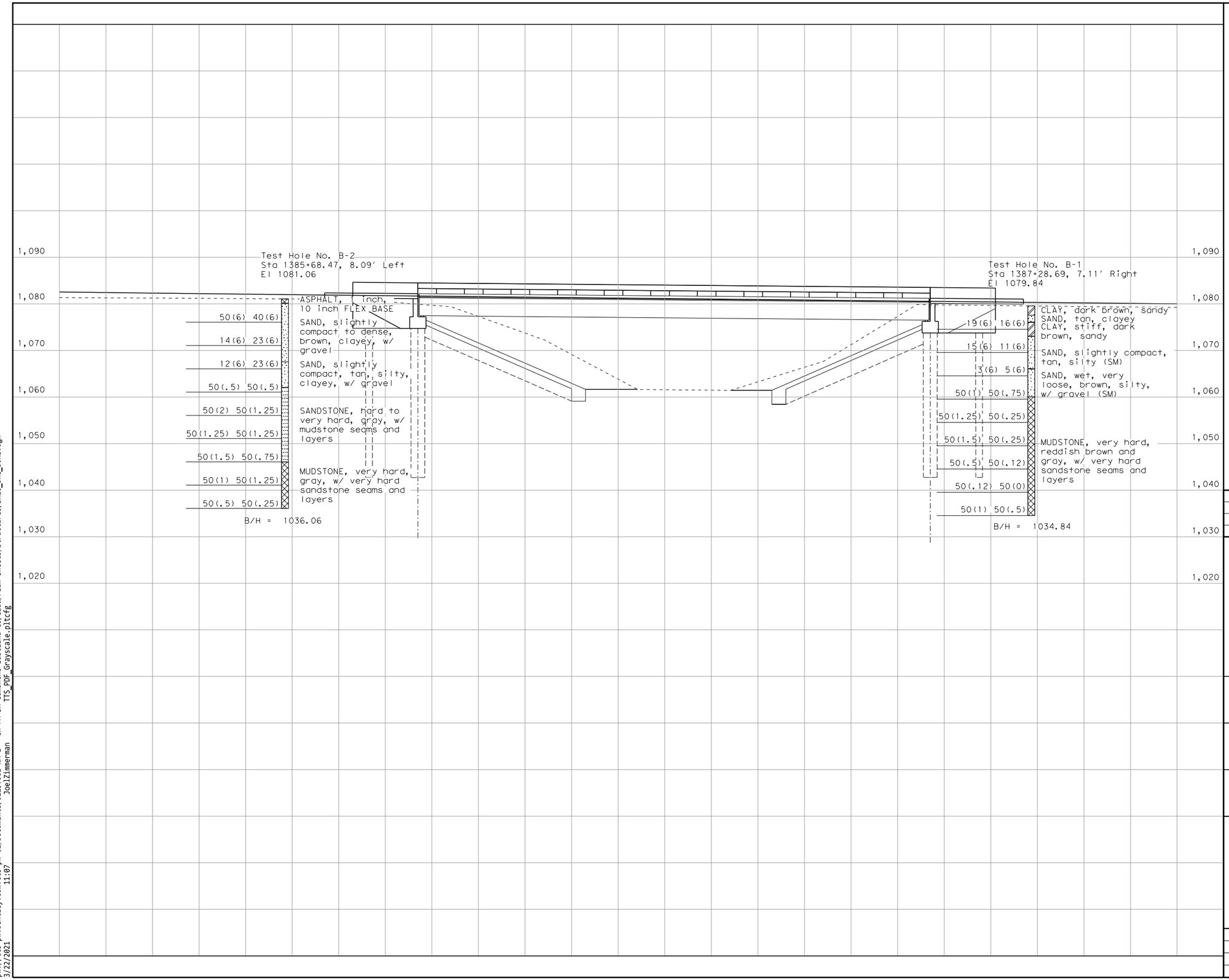
STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER
3/16/2021

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK
BRIDGE LAYOUT

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		85



0 20 40

SCALE: 1" = 40'

NO.	REVISION	BY	DATE

STATE OF TEXAS
MICHAEL DAINE ROLAND
96043
LICENSED
PROFESSIONAL ENGINEER

3/22/2021

ALLIANCE GEOTECHNICAL GROUP
Firm Registration No. F-1970

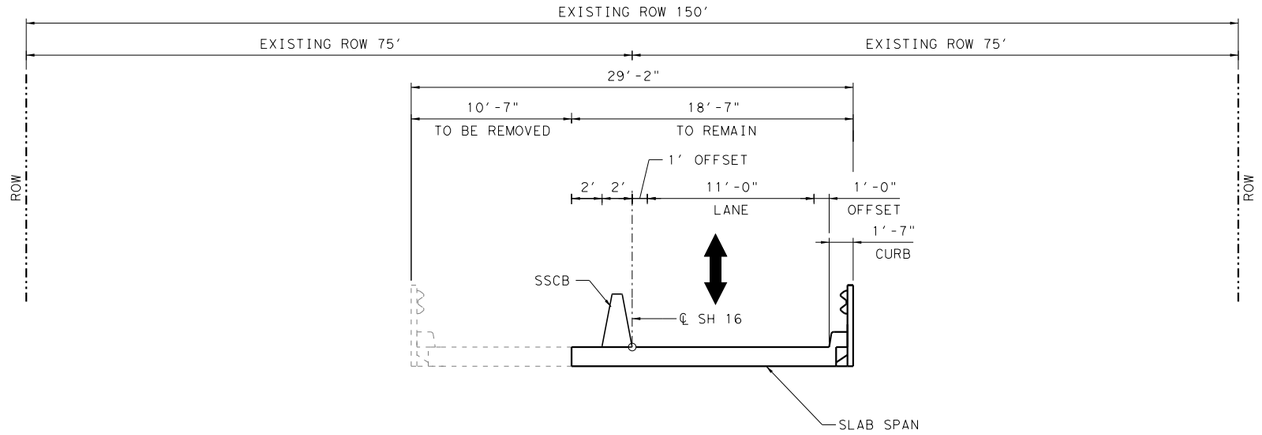
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

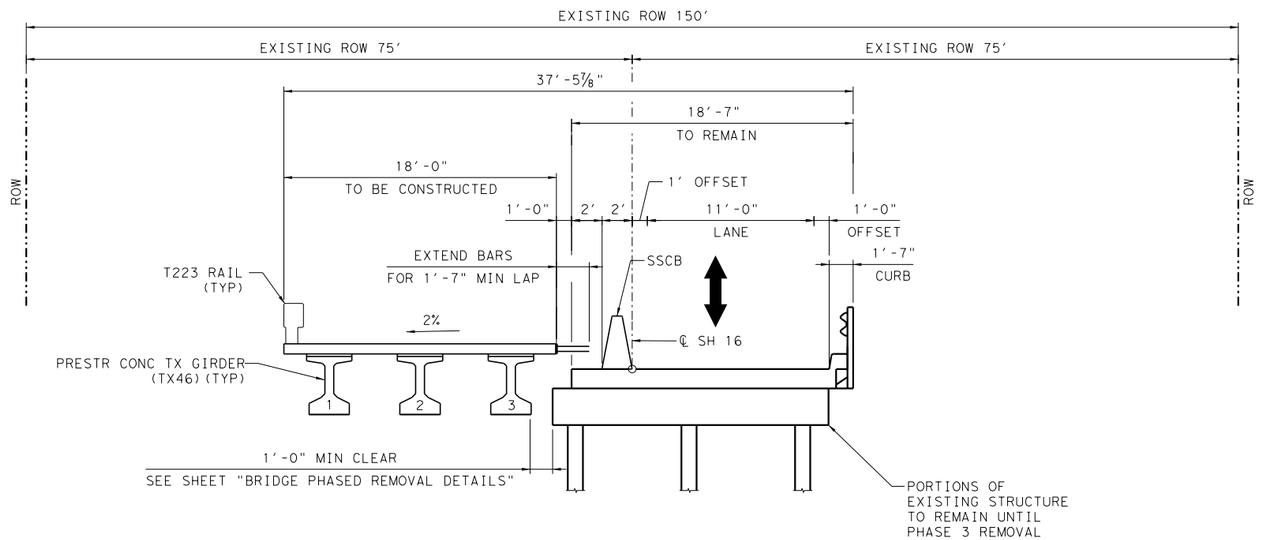
SOIL BORINGS

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		86



PHASE 1 TYPICAL SECTION



PHASE 2 TYPICAL SECTION

0 5 10

SCALE: 1" = 10'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER

3/16/2021

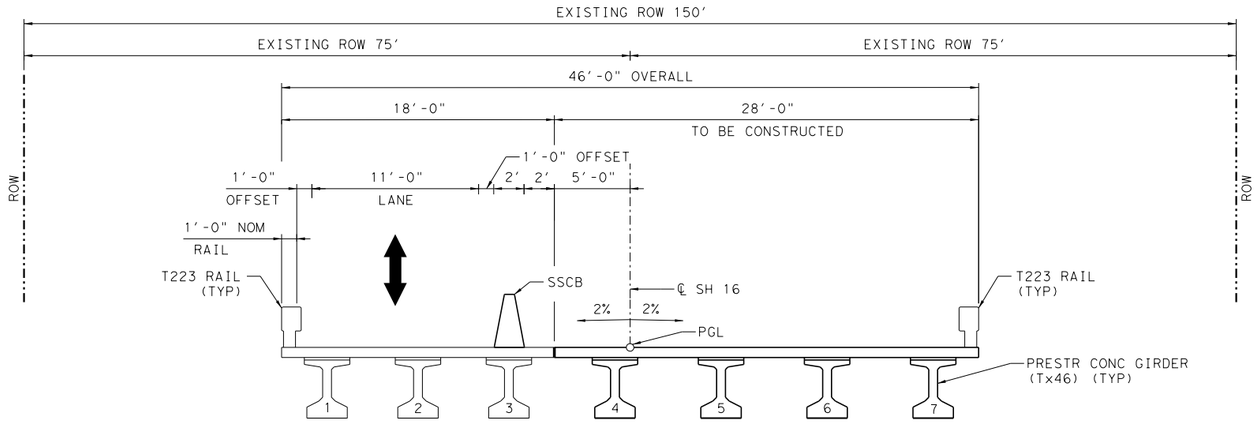
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

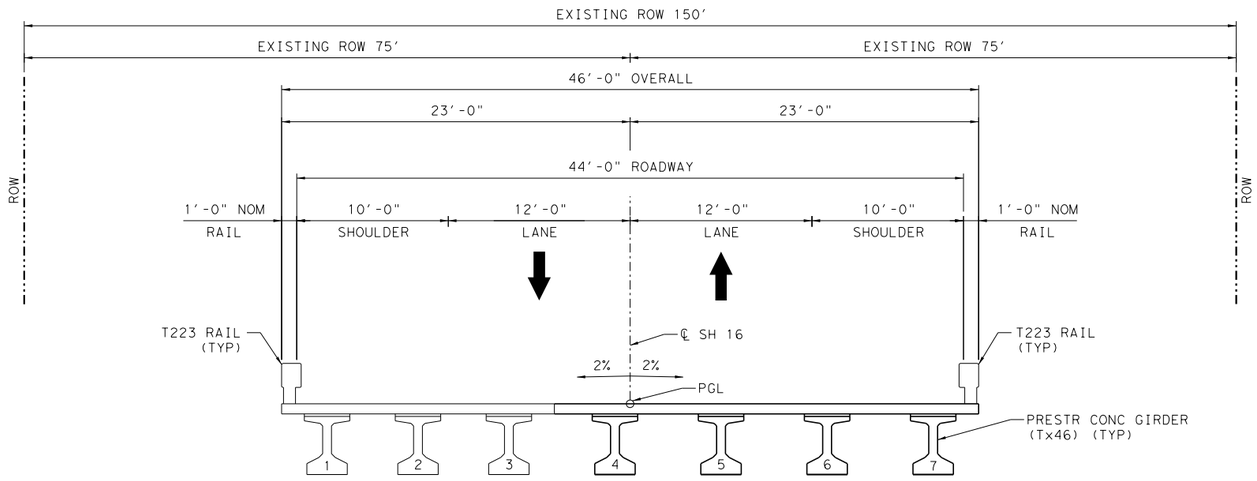
BRIDGE TYPICAL SECTION

SHEET 1 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		87



PHASE 3 TYPICAL SECTION



FINAL TYPICAL SECTION

0 5 10

SCALE: 1" = 10'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED
PROFESSIONAL ENGINEER

3/16/2021

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

BRIDGE TYPICAL SECTION

SHEET 2 OF 2

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		88

BID ITEM	400 6005	416 6001	416 6004	420 6013	422 6001	422 6015	425 6038	450 6006	454 6004	459 6007	459 6009
BID ITEM DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX46)	RAIL (TY T223)	ARMOR JOINT (SEALED)	GABION MATTRESSES (GALV)(12 IN)	GABIONS (3' X 3')(GALV)
	CY	LF	LF	CY	SF	CY	LF	LF	LF	SY	CY
PHASE 2: 2 - ABUTMENTS	73	63	126	29.0		44.4		28.0	38	400	83
PHASE 2: 1 - 110.00' PRESTRESSED CONC GIRDER SPAN					1,980		328.28	110.0			
PHASE 3: 2 - ABUTMENTS	113	63	189	41.6		69.0		28.0	59	444	86
PHASE 3: 1 - 110.00' PRESTRESSED CONC GIRDER SPAN					3,080		437.71	110.0			
TOTAL	**186**	**126**	**315**	**70.6**	**5,060**	**113.4**	**765.99**	**276.0**	**97**	**844**	**169**

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5	BEAM 6	BEAM 7
BENT 1 (FWD)	1077.133	1077.221	1077.310	1077.413	1077.276	1077.099	1076.922
BENT 2 (BK)	1076.151	1076.240	1076.328	1076.432	1076.295	1076.118	1075.941

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER

3/19/2021

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

ESTIMATED QUANTITIES & CAP ELEVATIONS

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		89

pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/Structures/SH16_BRG_EQ.dgn
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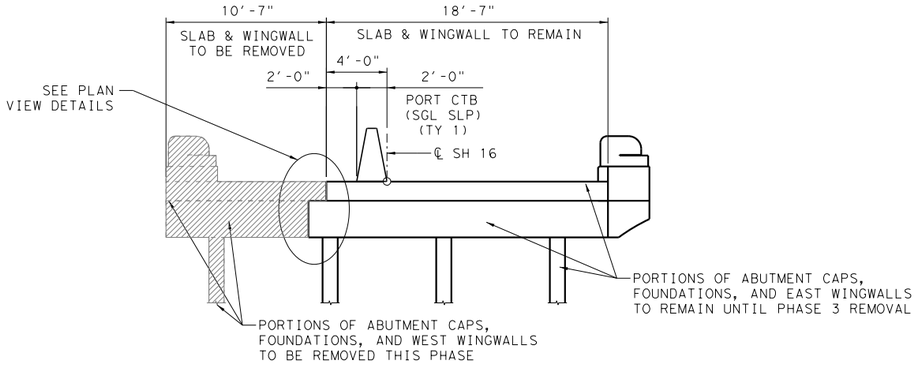
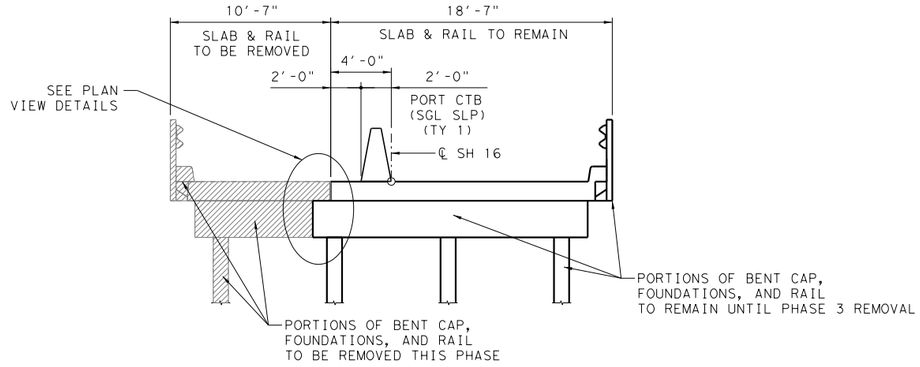


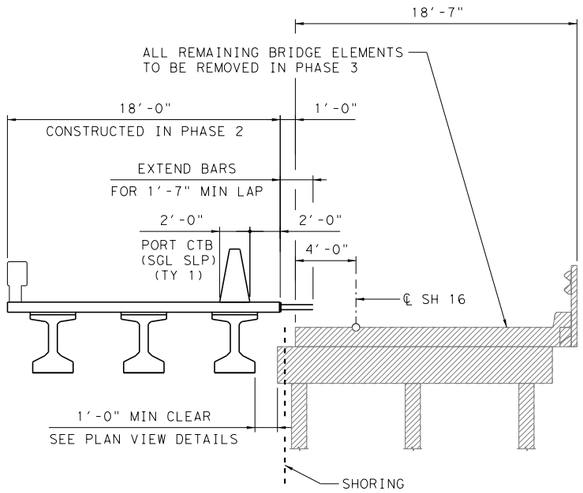
PHASE 1 ABUTMENT REMOVAL TYPICAL SECTION

SHOWING ABUTMENT 5
ABUTMENT 1 OPPOSITE HAND

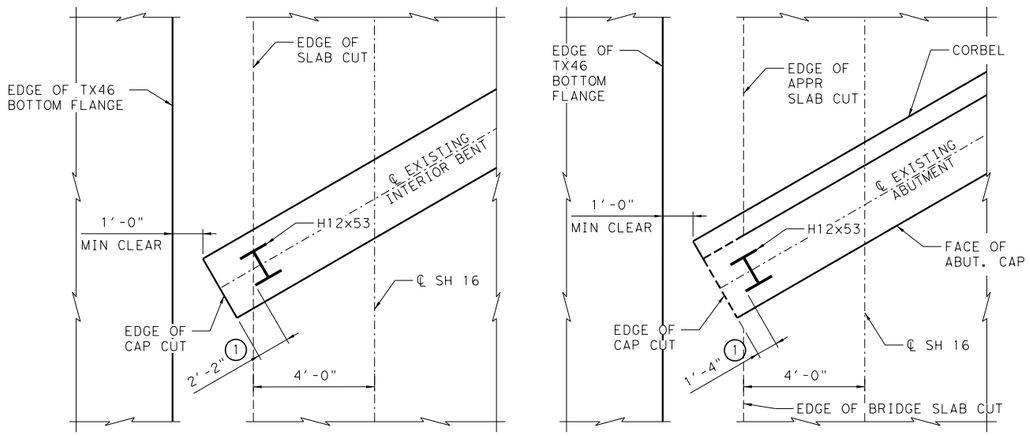


PHASE 1 INTERIOR BENT REMOVAL TYPICAL SECTION

NOT TO SCALE



PHASE 3 REMOVAL TYPICAL SECTION



PLAN VIEW DETAILS

(1) APPROXIMATE DIMENSION. CONTRACTOR TO FIELD VERIFY ACTUAL DIMENSION AND NOTIFY THE ENGINEER IF THIS DIMENSION VARIES FROM THE VALUE SHOWN HERE.

NO.	REVISION	BY	DATE

STATE OF TEXAS
JASON H. SCANTLING
96633
LICENSED
PROFESSIONAL ENGINEER

3/25/2021

SH 16 AT BEAR CREEK
BRIDGE PHASED REMOVAL DETAILS

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		90

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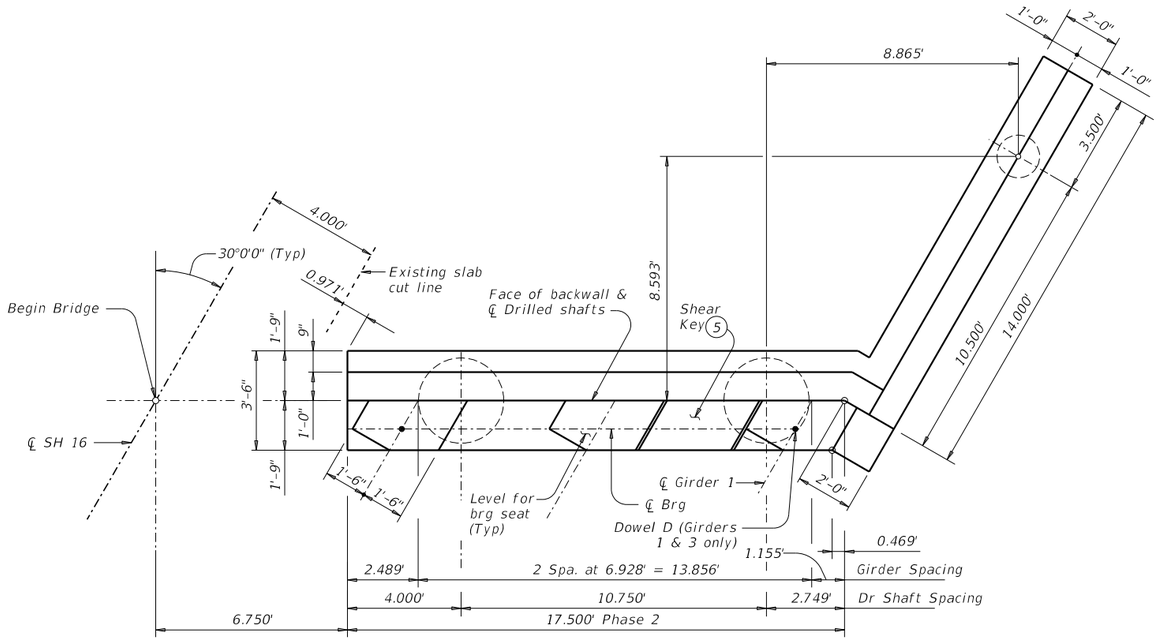
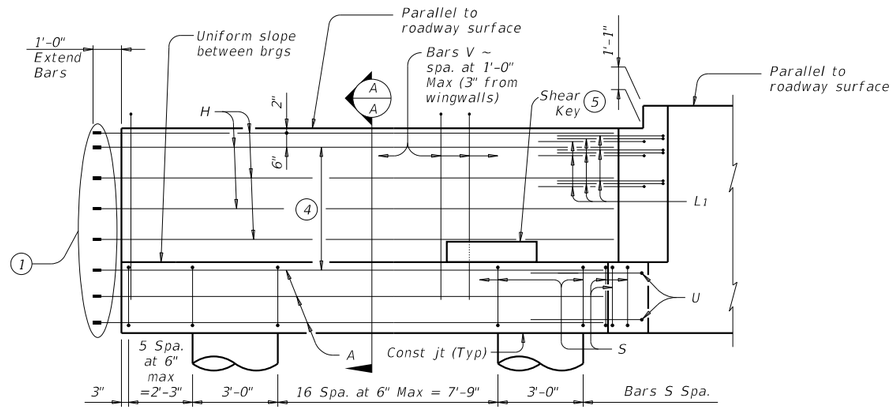
$USER$
$TIME$
$FILE$
$DATE$



PLAN - ABUTMENT 1 PHASE 2



ELEVATION - ABUTMENT 1 PHASE 2

GENERAL NOTES:

1. Designed according to AASHTO LRFD Bridge Design Specifications 8th Edition 2017.
2. See BRIDGE LAYOUT for foundation type, size, and length.
3. See T223 rail details for rail anchorage in wingwalls.
4. See COMMON FOUNDATION DETAILS standard "FD" for all foundation detail and notes.
5. Calculated foundation load: 106 tons/shaft.
6. See ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS for bearing seat elevations.
7. Cover dimensions are clear dimensions, unless noted otherwise.
8. Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

1. Provide Class C concrete (f'c = 3,600 psi).
2. Provide Grade 60 reinforcing steel.

TABLE OF ESTIMATED (2) QUANTITIES (Abut. 1 Ph 2)

Bar	No.	Size	Length	Weight
A	10	#11	18' -6"	983
D	2	#9	1' -8"	11
H	10	#6	18' -6"	278
L1	9	#6	5' -11"	80
L2	0	#6	5' -9"	0
S	27	#5	11' -6"	324
U	2	#6	11' -7"	35
V	18	#5	14' -4"	269
wH1	7	#6	15' -5"	162
wH2	12	#6	13' -8"	246
wS	15	#4	7' -10"	78
wV	15	#5	14' -4"	224
Reinforcing Steel			Lb	2,691
Cl "C" Conc (Abut) (6)			CY	14.5

(1) Splice bars in accordance with Item 448 "Structural Field Welding" or by using mechanical couplers in accordance with Item 440 "Reinforcing Steel".

(2) Quantities shown are for one abutment in Phase 2.

(4) 4 spaces at 1'-0" Max

(5) See IGSK standard for shear key details.

(6) Concrete quantity includes 0.2 cy for shear key.

HL93 LOADING

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER
3/16/2021

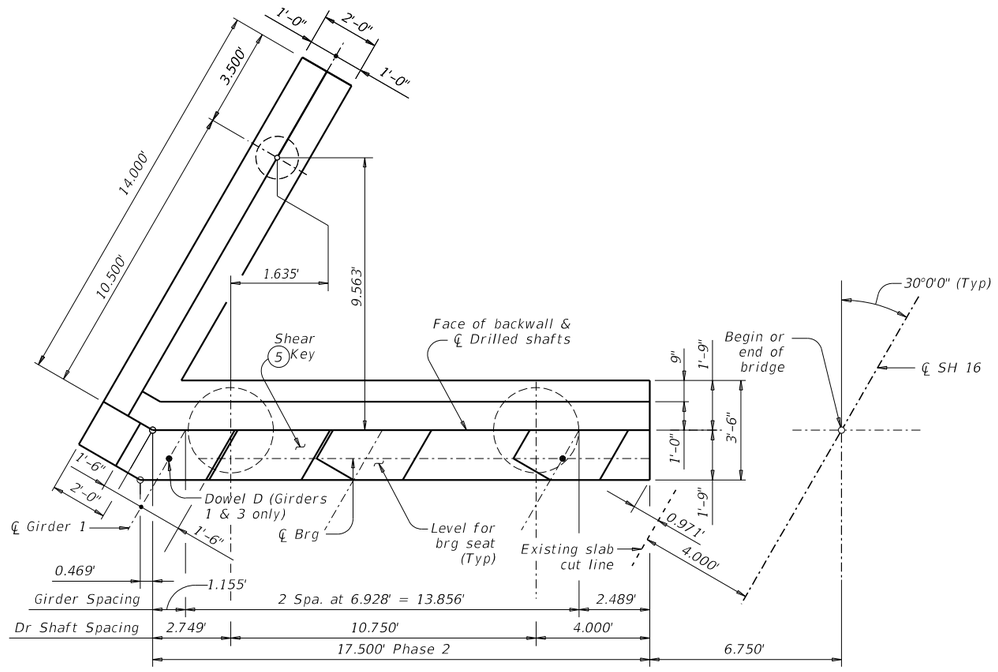
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19287

SH 16 AT BEAR CREEK

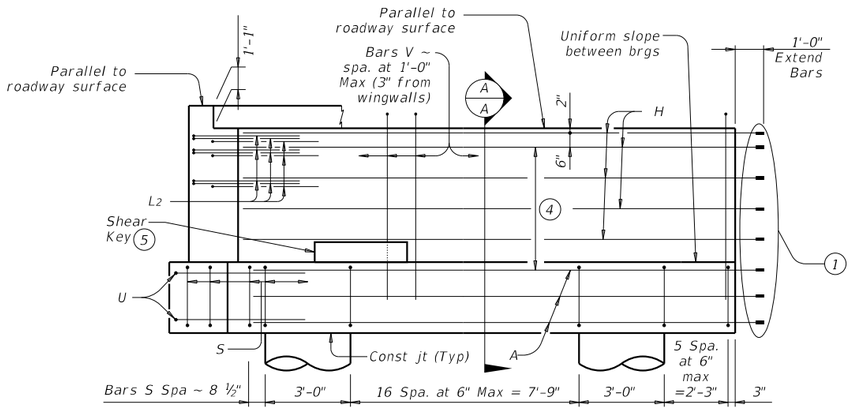
ABUTMENTS 1 & 2

SHEET 1 OF 5

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		91



PLAN - ABUTMENT 2 PHASE 2



ELEVATION - ABUTMENT 2 PHASE 2

TABLE OF ESTIMATED (2) QUANTITIES (Abut. 2 Ph 2)

Bar	No.	Size	Length	Weight
A	10	#11	18' -6"	983
D	2	#9	1' -8"	11
H	10	#6	18' -6"	278
L1	0	#6	5' -11"	0
L2	9	#6	5' -9"	78
S	27	#5	11' -6"	324
U	2	#6	11' -7"	35
V	18	#5	14' -4"	269
wH1	7	#6	15' -5"	162
wH2	12	#6	13' -8"	246
wS	15	#4	7' -10"	78
wV	15	#5	14' -4"	224
Reinforcing Steel			Lb	2,689
Cl "C" Conc (Abut) (6)			CY	14.5

(1) Splice bars in accordance with Item 448 "Structural Field Welding" or by using mechanical couplers in accordance with Item 440 "Reinforcing Steel".

(2) Quantities shown are for one abutment in Phase 2.

(4) 4 spaces at 1'-0" Max

(5) See IGSK standard for shear key details.

(6) Concrete quantity includes 0.2 cy for shear key.

HL93 LOADING

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER
3/16/2021

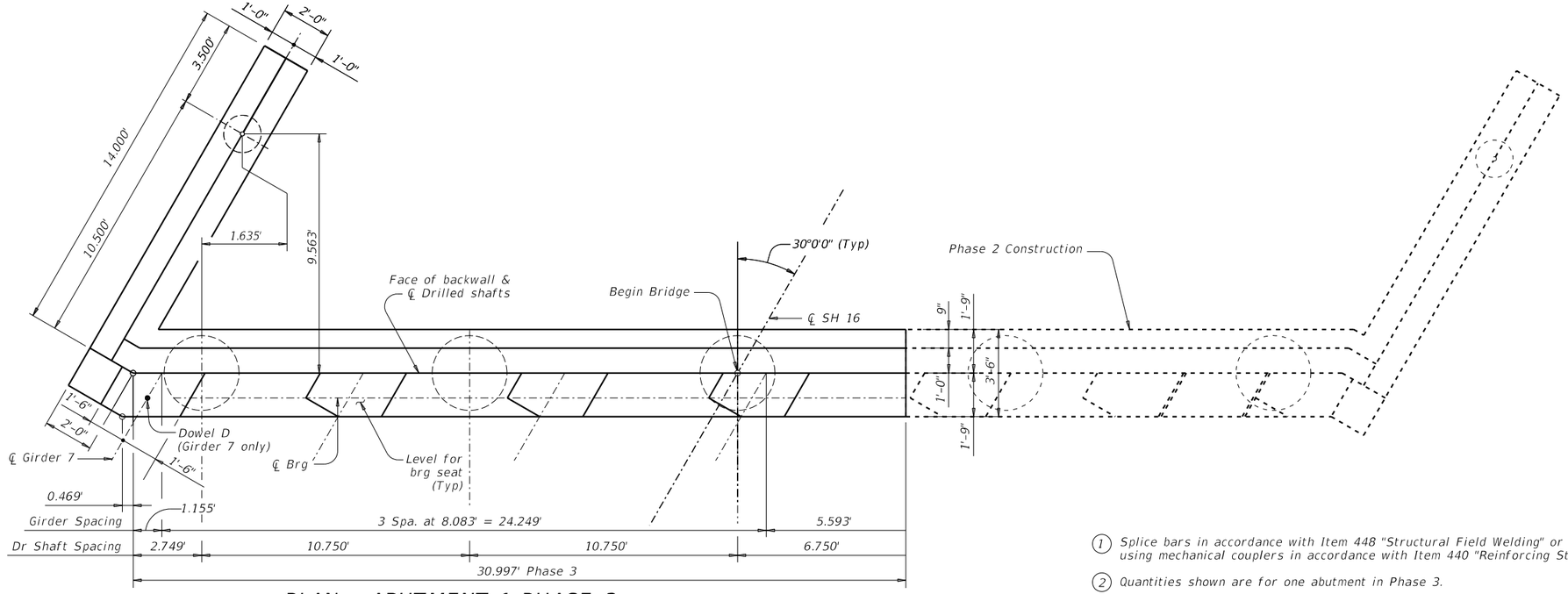
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19207

SH 16 AT BEAR CREEK

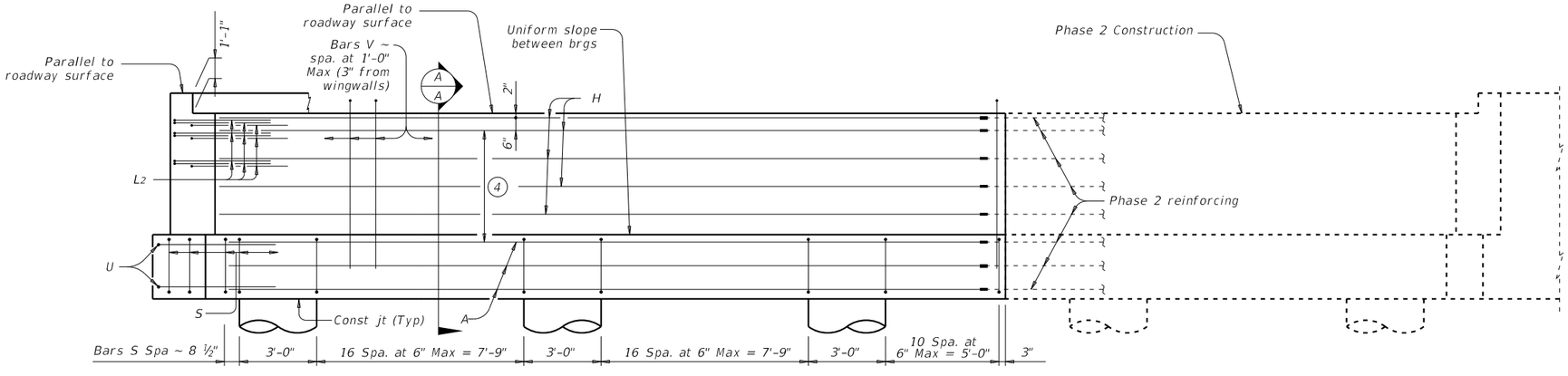
ABUTMENTS 1 & 2

SHEET 2 OF 5

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		92



PLAN - ABUTMENT 1 PHASE 3



ELEVATION - ABUTMENT 1 PHASE 3

TABLE OF ESTIMATED ② QUANTITIES (Abut 1 Ph 3)

Bar	No.	Size	Length	Weight
A	10	#11	30' - 0"	1,594
D	1	#9	1' - 8"	6
H	10	#6	30' - 0"	451
L1	0	#6	5' - 11"	0
L2	9	#6	5' - 9"	78
S	49	#5	11' - 6"	588
U	2	#6	11' - 7"	35
V	32	#5	14' - 4"	478
wH1	7	#6	15' - 5"	162
wH2	12	#6	13' - 8"	246
wS	15	#4	7' - 10"	78
wV	15	#5	14' - 4"	224
Reinforcing Steel			Lb	3,940
Cl "C" Conc (Abut)			CY	20.8

(1) Splice bars in accordance with Item 448 "Structural Field Welding" or by using mechanical couplers in accordance with Item 440 "Reinforcing Steel".

(2) Quantities shown are for one abutment in Phase 3.

(4) 4 spaces at 1'-0" Max

HL93 LOADING

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED
PROFESSIONAL ENGINEER

3/16/2021

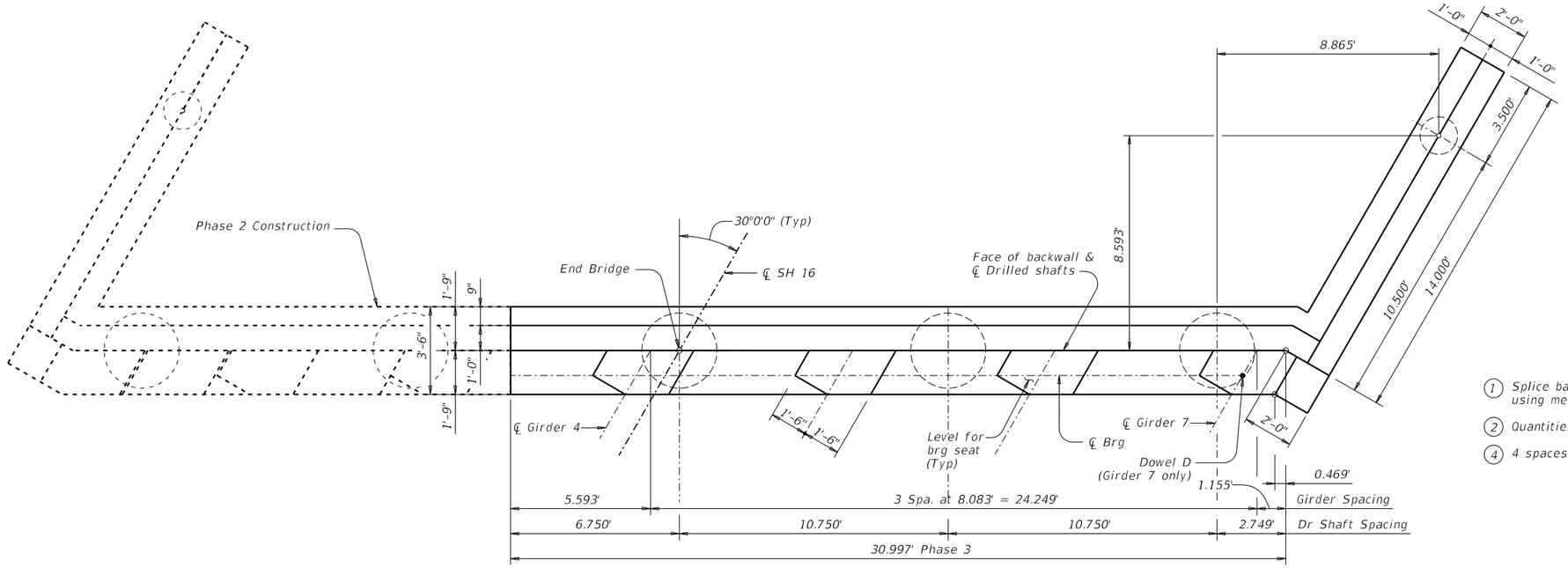
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19397

SH 16 AT BEAR CREEK

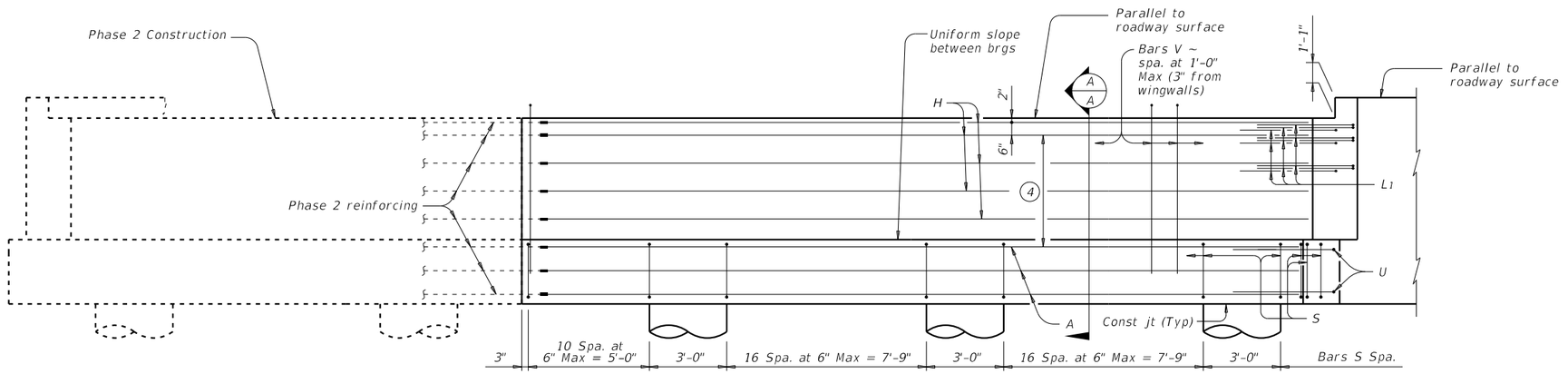
ABUTMENTS 1 & 2

SHEET 3 OF 5

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		93



PLAN - ABUTMENT 2 PHASE 3



ELEVATION - ABUTMENT 2 PHASE 3

TABLE OF ESTIMATED (2) QUANTITIES (Abut 2 Ph 3)

Bar	No.	Size	Length	Weight
A	10	#11	30' - 0"	1,594
D	1	#9	1' - 8"	6
H	10	#6	30' - 0"	451
L1	9	#6	5' - 11"	80
L2	0	#6	5' - 9"	0
S	49	#5	11' - 6"	588
U	2	#6	11' - 7"	35
V	32	#5	14' - 4"	478
wH1	7	#6	15' - 5"	162
wH2	12	#6	13' - 8"	246
wS	15	#4	7' - 10"	78
wV	15	#5	14' - 4"	224
Reinforcing Steel			Lb	3,942
Cl "C" Conc (Abut)			CY	20.8

(1) Splice bars in accordance with Item 448 "Structural Field Welding" or by using mechanical couplers in accordance with Item 440 "Reinforcing Steel".

(2) Quantities shown are for one abutment in Phase 3.

(4) 4 spaces at 1'-0" Max

HL93 LOADING

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER

3/16/2021

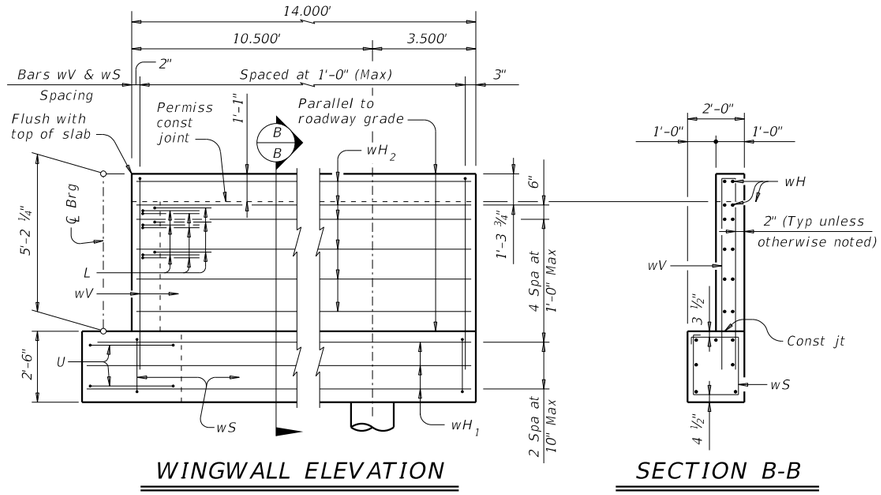
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

ABUTMENTS 1 & 2

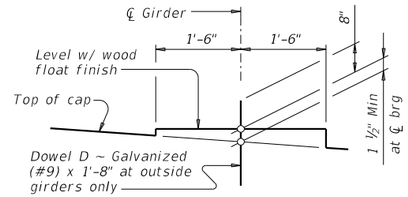
SHEET 4 OF 5

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		94



WINGWALL ELEVATION

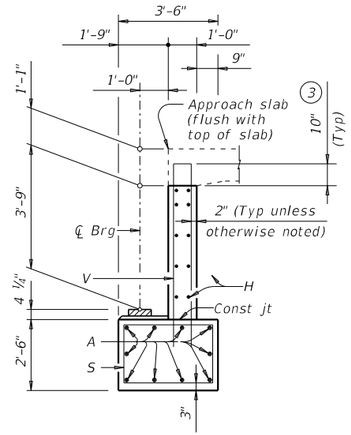
SECTION B-B



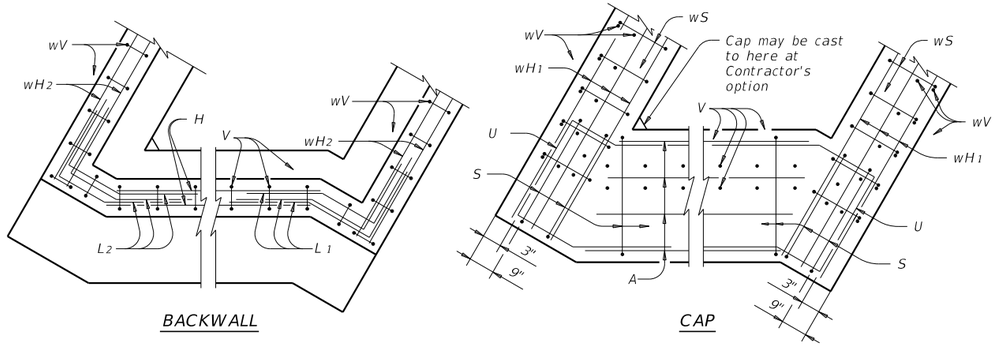
BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

③ Increase as required to maintain 3" from finished grade.



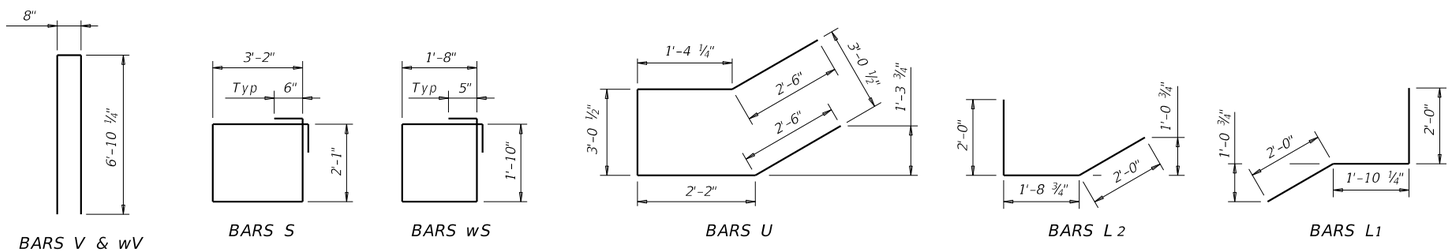
SECTION A-A



BACKWALL

CAP

CORNER DETAILS



BARS V & wV

BARS S

BARS wS

BARS U

BARS L2

BARS L1

HL93 LOADING

NO.	REVISION	BY	DATE

JEFFREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
3/16/2021

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

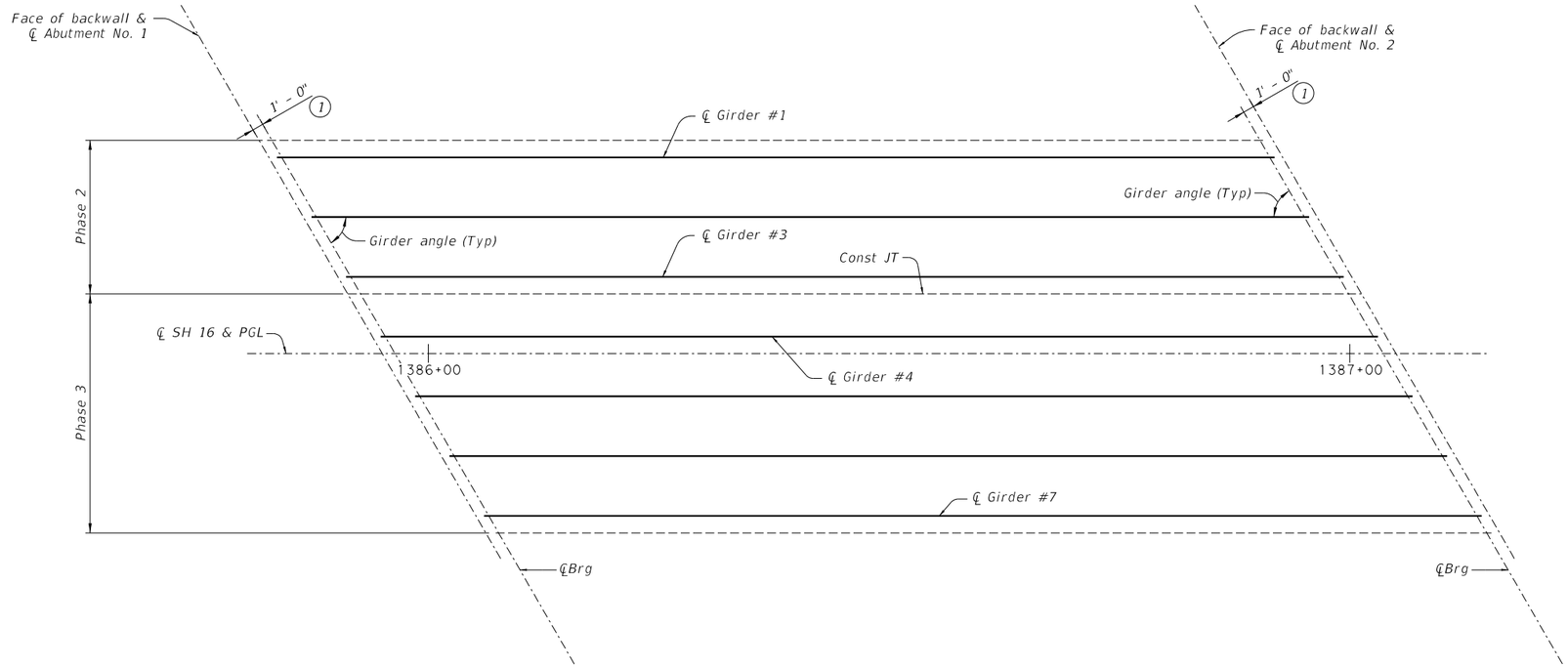
 Texas Department of Transportation

SH 16 AT BEAR CREEK

ABUTMENTS 1 & 2

SHEET 5 OF 5

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		95



Z

1. See IGEB standard for orientation of dimension.
2. Girder lengths shown are bottom girder flange lengths with adjustments made for girder slope.

SPAN 1
(Tx46 GIRDERS)

FRAMING PLAN

HL93 LOADING

BENT REPORT

BENT NO. 1 (N 71 32 1.54 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.0940 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	60 0 0.00
	BEAM 2	6.9282	60 0 0.00
	BEAM 3	6.9282	60 0 0.00
	BEAM 4	8.0829	60 0 0.00
	BEAM 5	8.0829	60 0 0.00
	BEAM 6	8.0829	60 0 0.00
	BEAM 7	8.0829	60 0 0.00
	TOTAL	46.1880	

BENT NO. 2 (N 71 32 1.54 E)

DISTANCE BETWEEN STATION LINE AND BEAM 1, 23.0940 L

		BEAM SPAC. (CL BENT)	BEAM ANGLE D M S
SPAN 1	BEAM 1	0.0000	60 0 0.00
	BEAM 2	6.9282	60 0 0.00
	BEAM 3	6.9282	60 0 0.00
	BEAM 4	8.0829	60 0 0.00
	BEAM 5	8.0829	60 0 0.00
	BEAM 6	8.0829	60 0 0.00
	BEAM 7	8.0829	60 0 0.00
	TOTAL	46.1880	

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL C-C BENT	DISTANCE C-C BRG.	TRUE DISTANCE BOT. BM. FLG (2)	BEAM SLOPE
BEAM 1	110.0000	107.6906	109.4272	-0.00911
BEAM 2	110.0000	107.6906	109.4272	-0.00911
BEAM 3	110.0000	107.6906	109.4272	-0.00911
BEAM 4	110.0000	107.6906	109.4272	-0.00911
BEAM 5	110.0000	107.6906	109.4272	-0.00911
BEAM 6	110.0000	107.6906	109.4272	-0.00911
BEAM 7	110.0000	107.6906	109.4272	-0.00911

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED
PROFESSIONAL ENGINEER

3/16/2021

TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19397

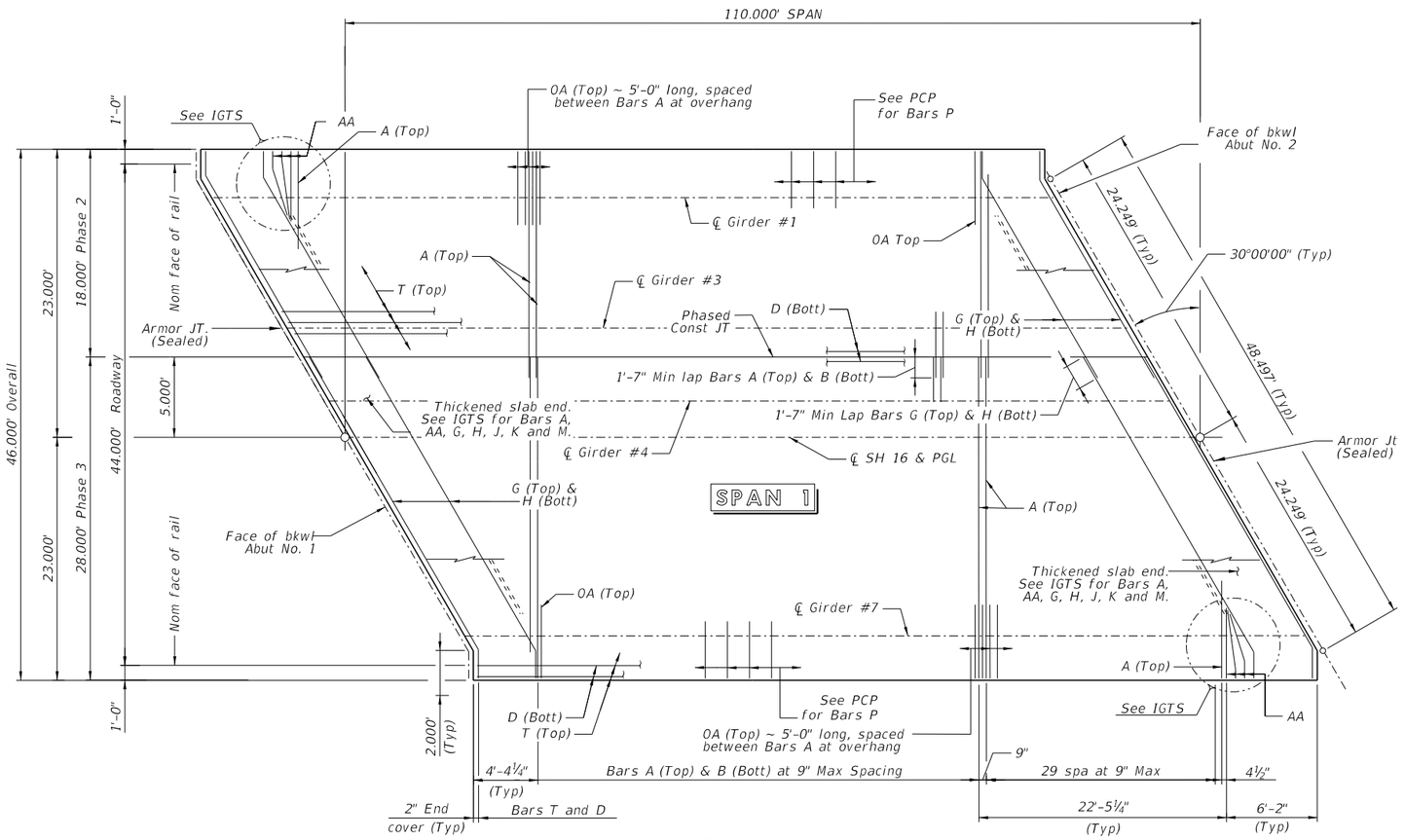
SH 16 AT BEAR CREEK

FRAMING PLAN

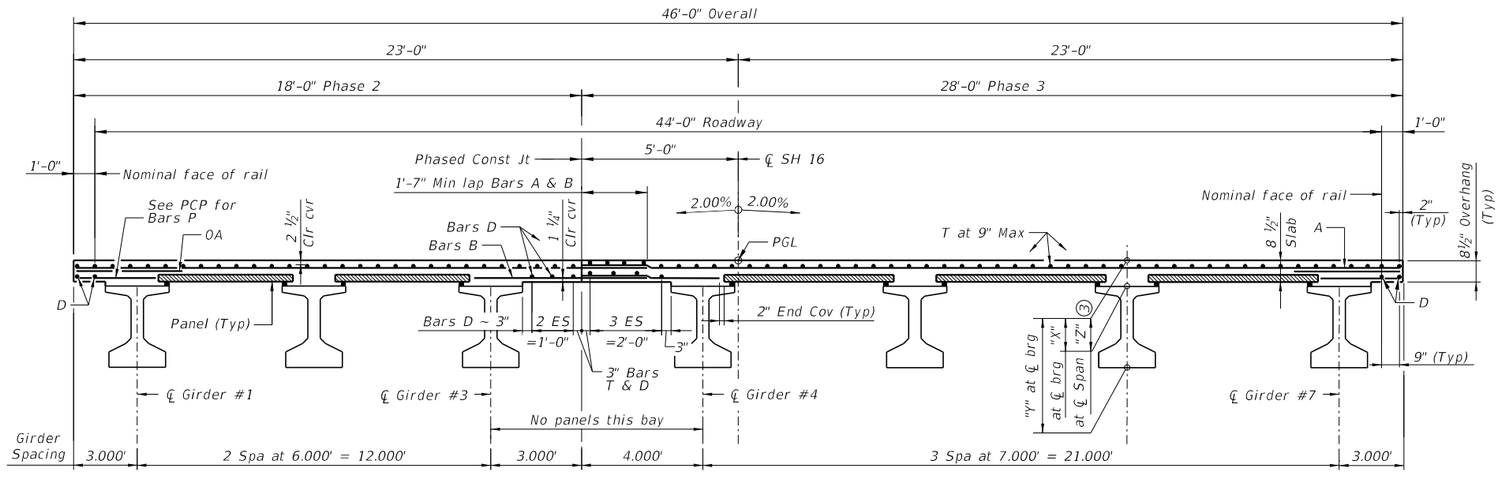
SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		96

pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/Structures/SH16_BRG_FP_01.dgn
3/16/2021 12:18 Joel2immerman TTS_PDF_Grayscale.pltcfg



PLAN



TYPICAL TRANSVERSE SECTION

BAR TABLE	
BAR	SIZE
A	#4
AA	#5
B	#4
D	#4
G	#4
H	#4
J	#4
K	#4
M	#4
0A	#5
P	#4
T	#4

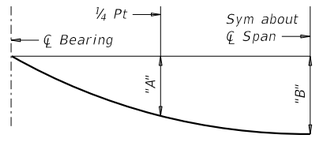
TABLE OF ESTIMATED QUANTITIES

Phase	Reinf Concrete Slab	Prestr Concrete Girder (Tx 46) ②	Reinf Steel ①
No.	SF	LF	LB.
2	1,980	328.28	4,554
3	3,080	437.71	7,084
Total	5,060	765.99	11,638

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications, 8th Edition (2018).
See IGTS standard for Thickened Slab End details and quantity adjustments.
All concrete shall be Class S, f'c = 4000 psi.
All reinforcing steel shall be Grade 60.
See rail standard for anchorage in slab.
See PCP and PCP-FAB standards for panel details not shown.
See IGMS standard for miscellaneous details.
See PMDF standard for details and quantity adjustments if this option is used.
Cover dimensions are clear dimensions, unless noted otherwise.
Bar laps, where required shall be as follows:
Uncoated ~ #4 = 1'-7"
Deformed Welded Wire Reinforcement (WRR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, 0A, P or T unless noted otherwise.

① Reinforcing steel weight is calculated using an approximate factor of 2.3 Lbs/SF.
② Fabricator will adjust lengths for girder slopes as required.
③ Theoretical dimension



DEAD LOAD DEFLECTION DIAGRAM

NOTE: Deflections shown are due to concrete slab only (E_c = 5,000 ksi). Calculated deflections shown are theoretical and actual dimensions may vary. Adjust based on field verification.

TABLE OF DEAD LOAD DEFLECTIONS

Span No.	Girder No.	"A"	"B"
		Ft	Ft
1	ALL	0.129	0.181

TABLE OF SECTION DEPTHS

Span No.	"X" at ℄ Brg	"Y" at ℄ Brg	"Z" at ℄ Span ③
1	1'-0"	4'-10"	9⅞"

HL93 LOADING

NO.	REVISION	BY	DATE

STATE OF TEXAS
JEFFEREY PAUL TOMKINS
90329
LICENSED PROFESSIONAL ENGINEER
3/16/2021

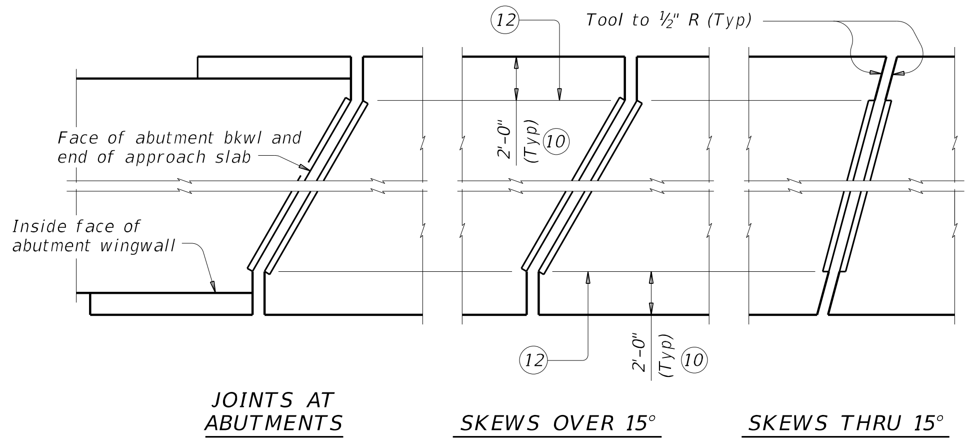
TEXAS TRANSPORTATION SOLUTIONS, INC.
Firm #F-19297

SH 16 AT BEAR CREEK

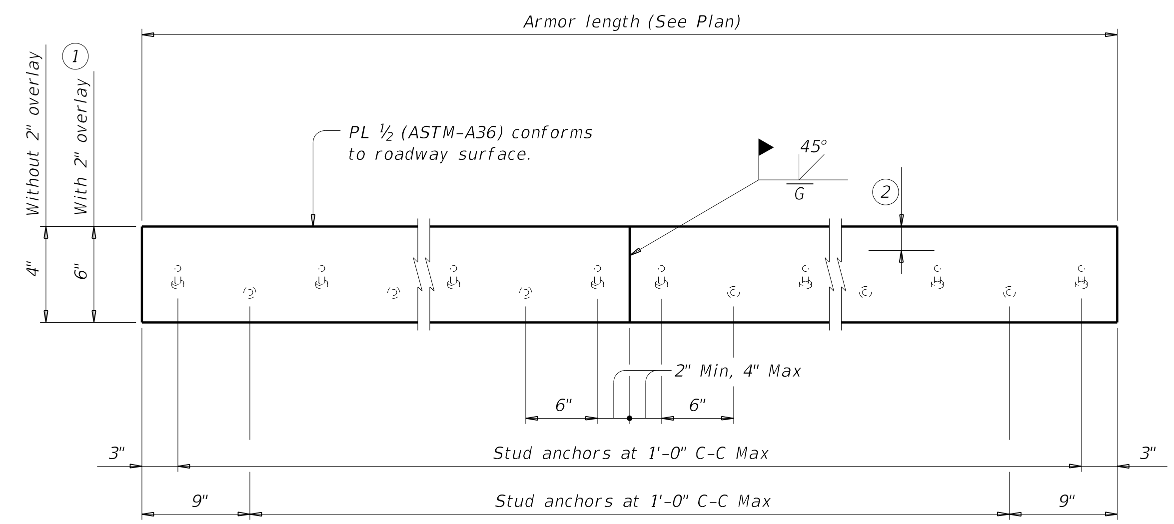
110.00' PRESTRESSED CONCRETE I-GIRDER SPAN

SHEET 1 OF 1

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		97

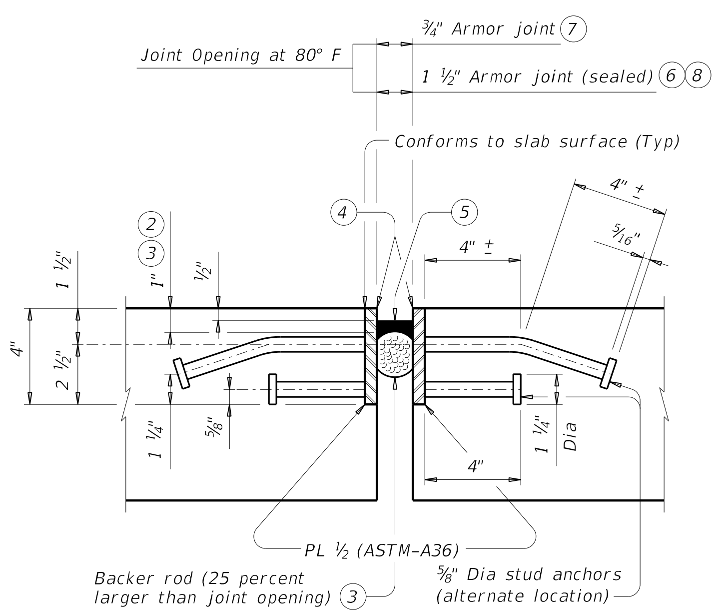


PLANS OF ARMOR PLATES

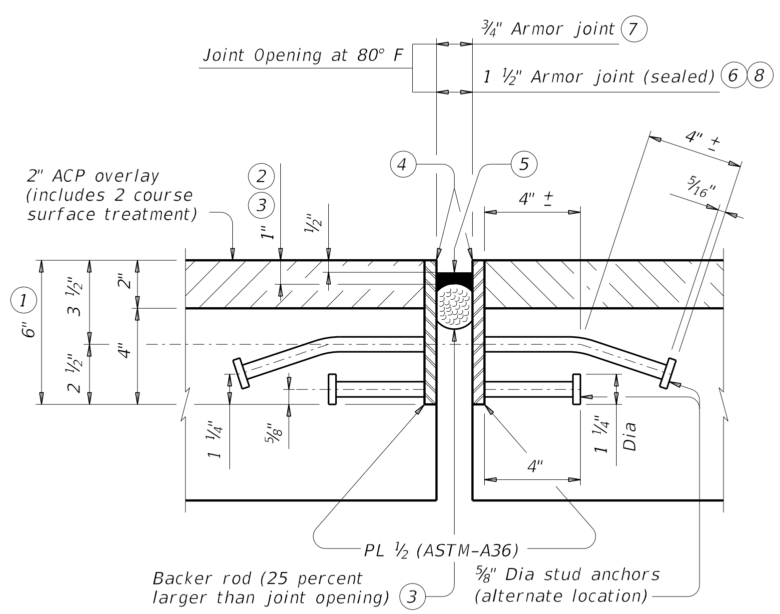


ELEVATION OF BASIC ARMOR PLATE

1. Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each ½" variation in thickness.
2. Do not paint top 1 ½" of plate if using sealed armor joint.
3. Set top of backer rod 1" below top of armor plate. 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.
4. Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
5. Use Class 7 joint sealant that conforms to DMS-6310.
6. Place sealant while ambient temperature is between 55°F and 80°F and is rising.
7. Armor joint does not include joint sealant or backer rod.
8. Armor joint (sealed) includes Class 7 joint sealant and backer rod.
9. Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
10. Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
11. See "Plans of Armor Plates".
12. At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
13. Align shipping angle perpendicular to joint.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



SHOWN WITH 2" OVERLAY AT JOINT LOCATION (1)

ARMOR JOINT SECTIONS

Showing Armor Joint (Sealed)

FABRICATION NOTES:

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.

Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage 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.

Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure armor joints in position and place to 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 Armor Joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

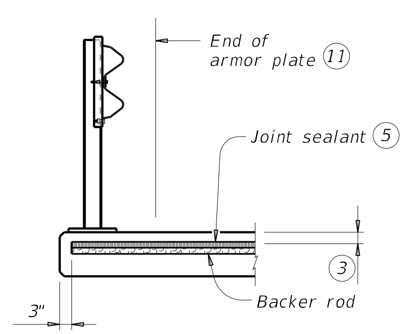
GENERAL NOTES:

Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.

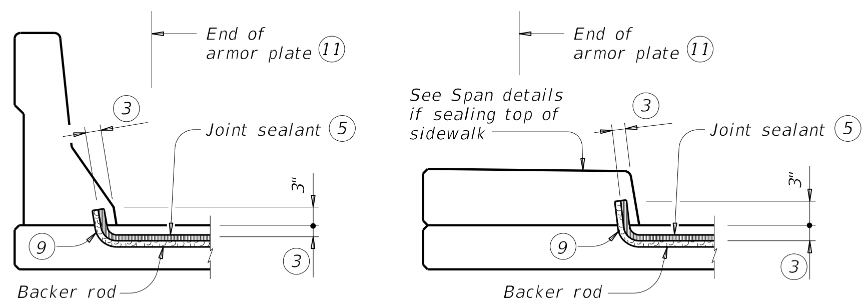
These joint details accommodate a joint movement range of 1 ⅜" (¾" opening movement and ⅝" closure movement).

Payment for armor joint, with or without seal, is based on length of armor plate.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY (1)	22.90 plf



AT STEEL POST BRIDGE RAIL

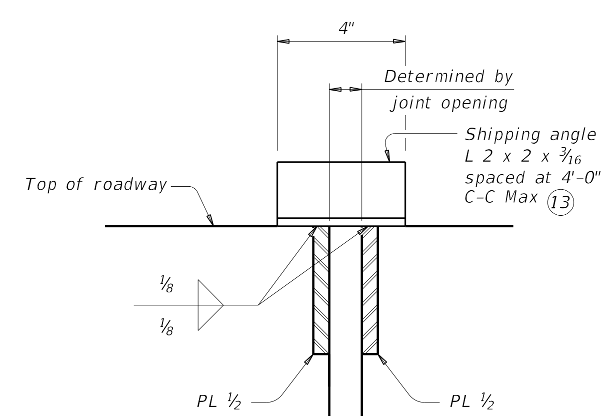


AT CONCRETE BRIDGE RAIL

AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

Armor joint (sealed) only. Armor plate is not shown for clarity.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

DATE: 3/16/2021 12:18
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Standards/Structures/AJ.dgn

Texas Department of Transportation — Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE: ajstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT 0288	SECT 03	JOB 032	HIGHWAY SH 16
REVISIONS	DIST BWD	COUNTY EASTLAND		SHEET NO. 98

DATE: 3/16/2021 12:18
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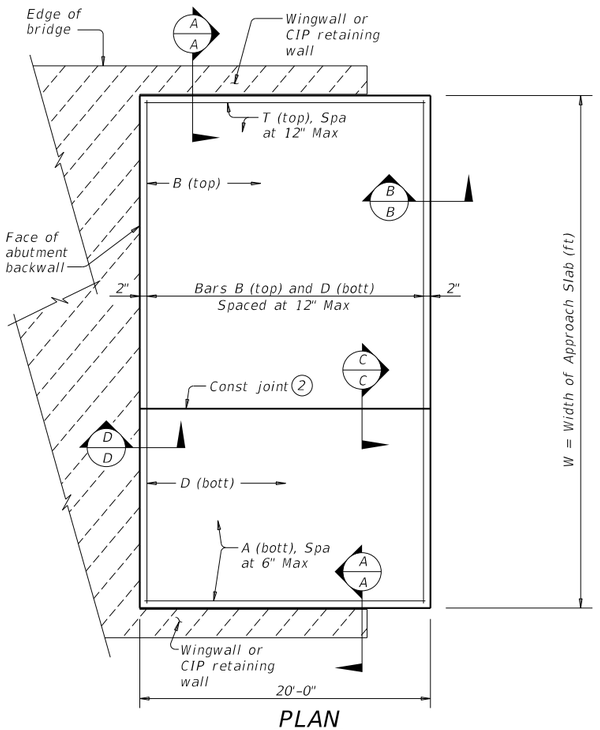
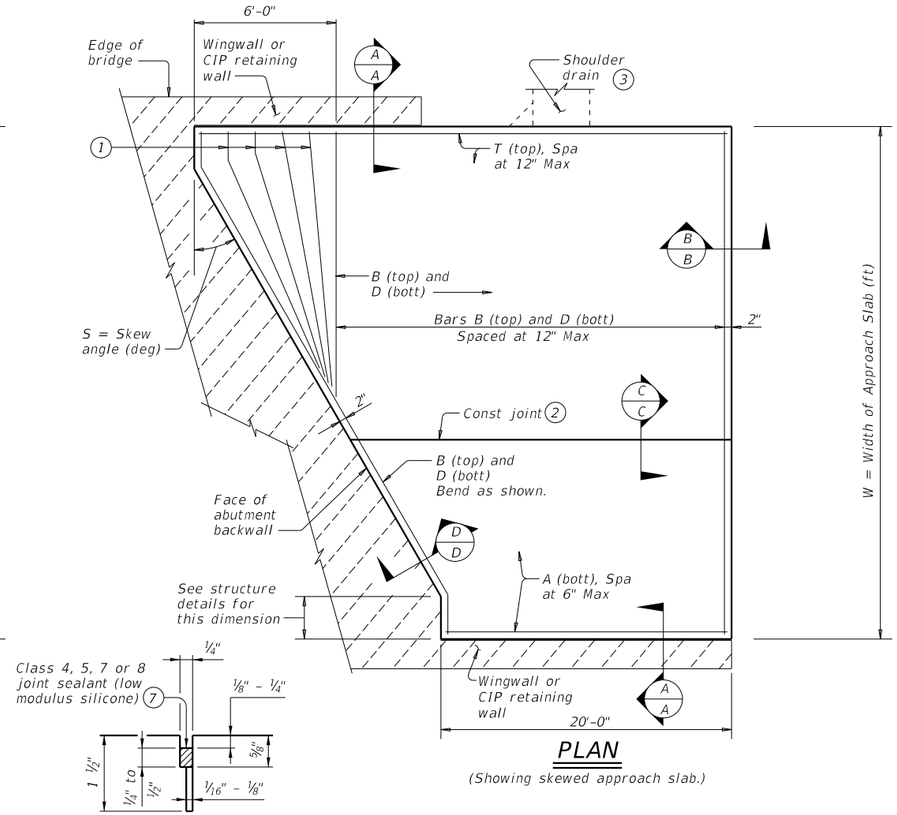


PLAN

(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 + 0.02W² 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.

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."

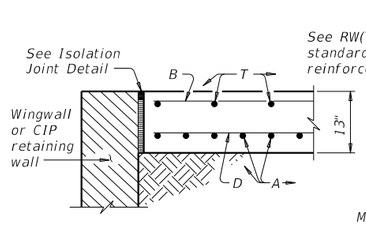
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

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.

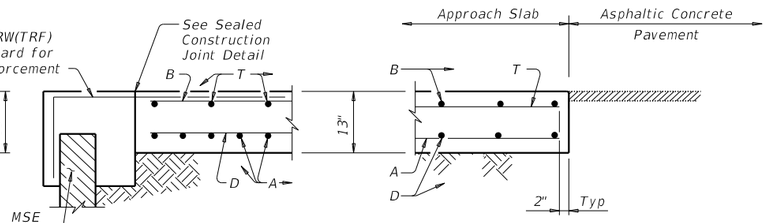
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

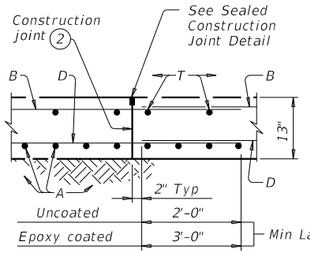
Cover dimensions are clear dimensions, unless noted otherwise.

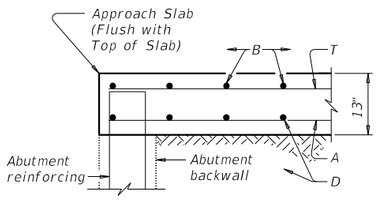


SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL



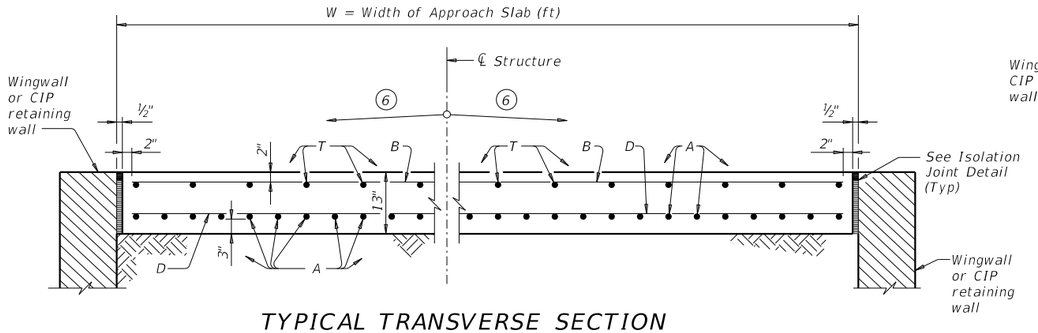


SECTION A-A

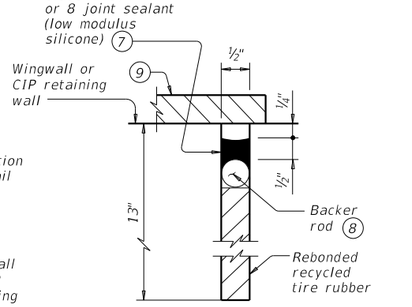
SECTION B-B

SECTION C-C (5)

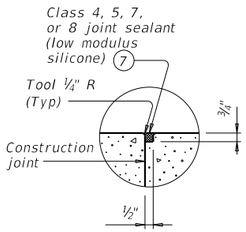
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

Bridge Division Standard

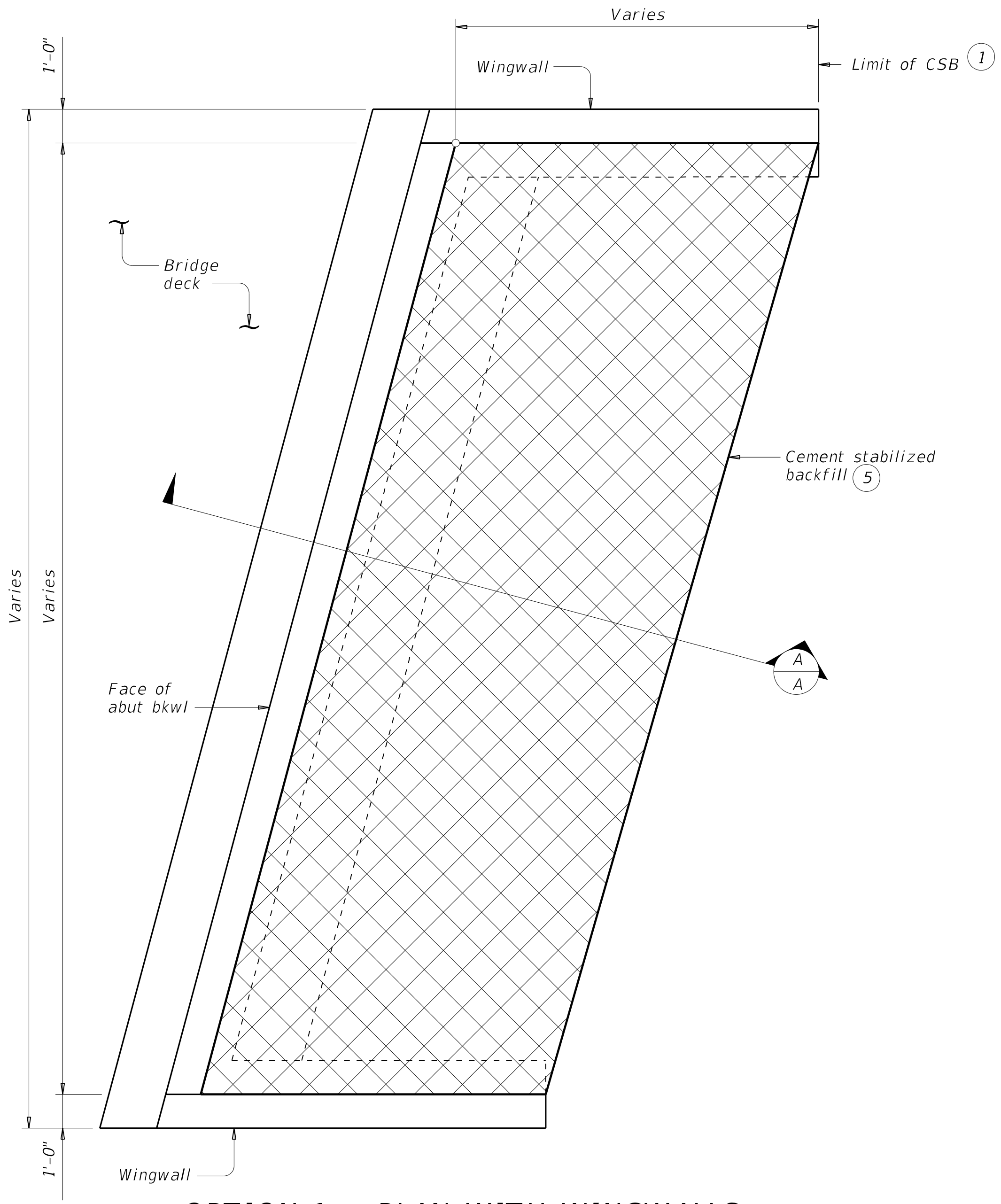
BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

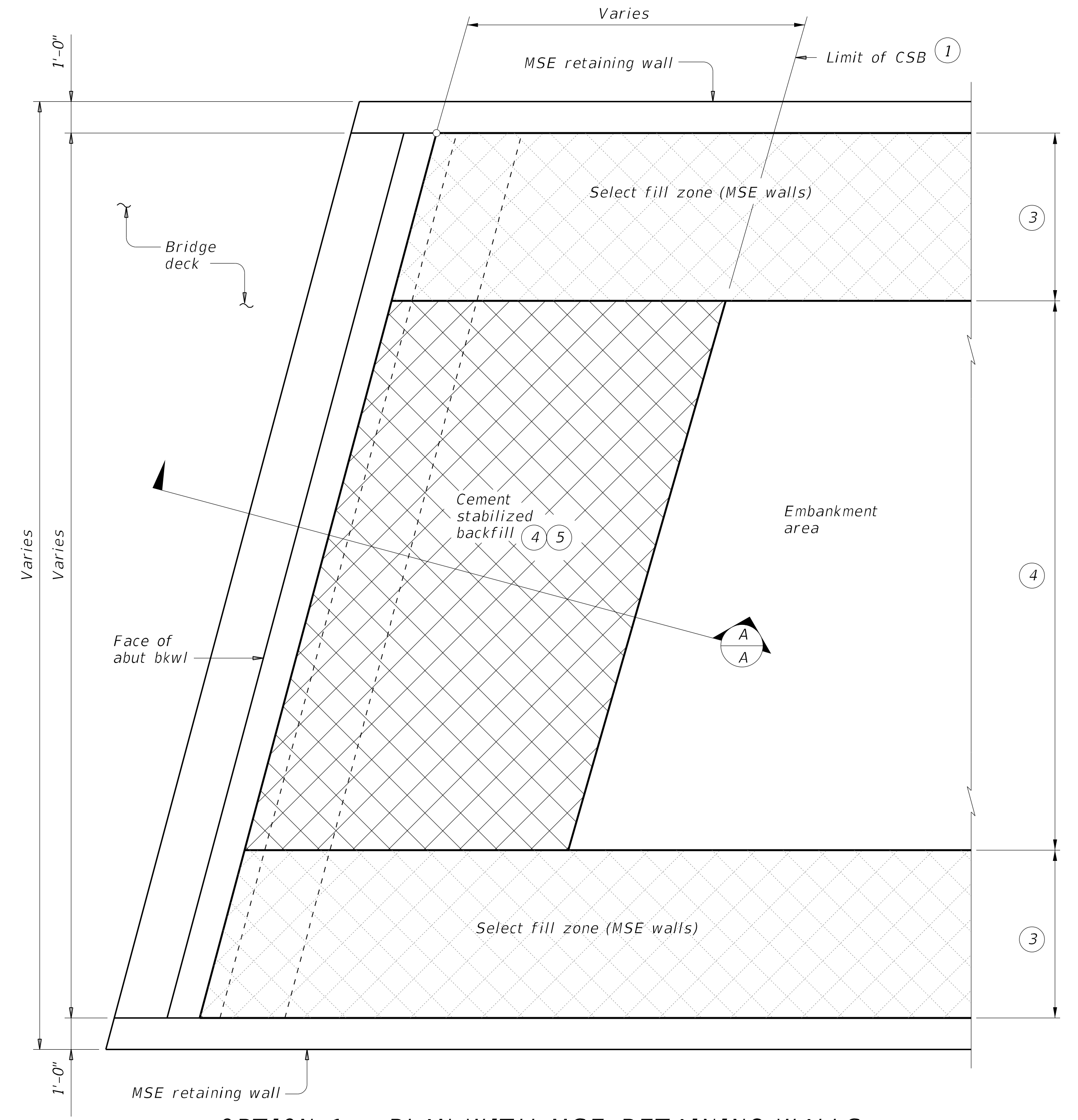
FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		99

DATE: 3/16/2021 12:18
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH



OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ 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).

GENERAL NOTES:

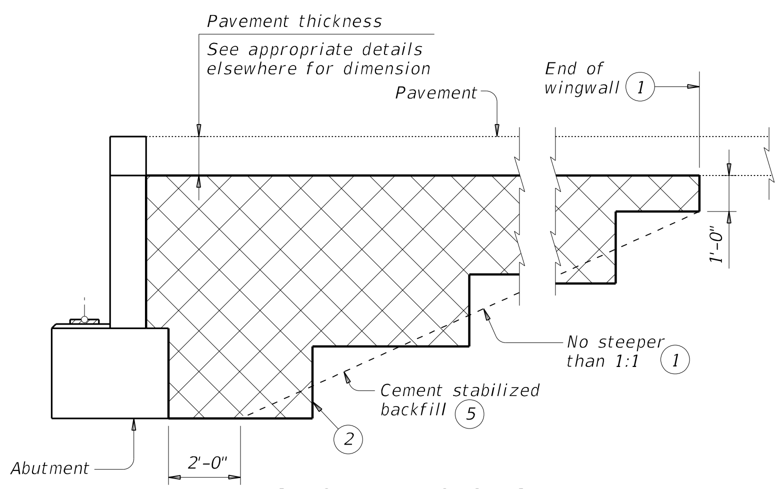
See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

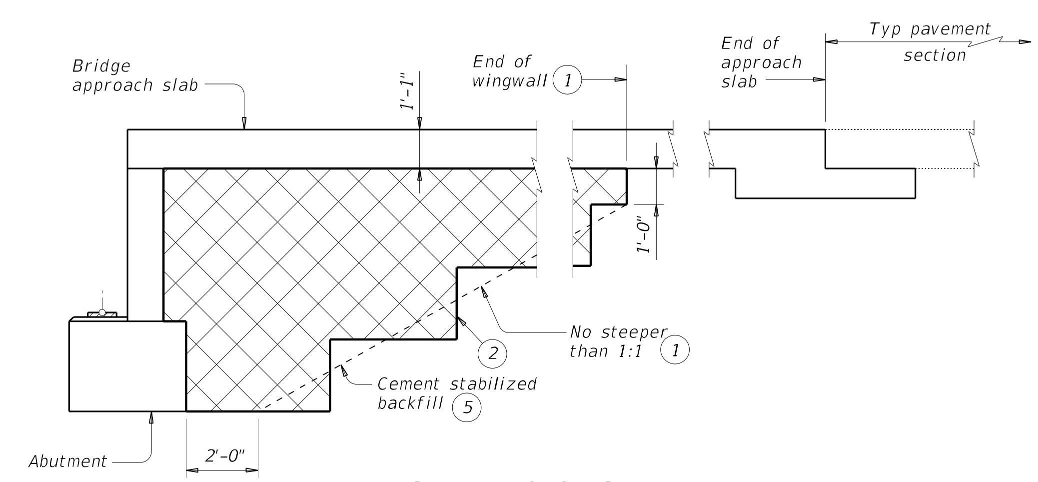
If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

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.



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

SHEET 1 OF 2

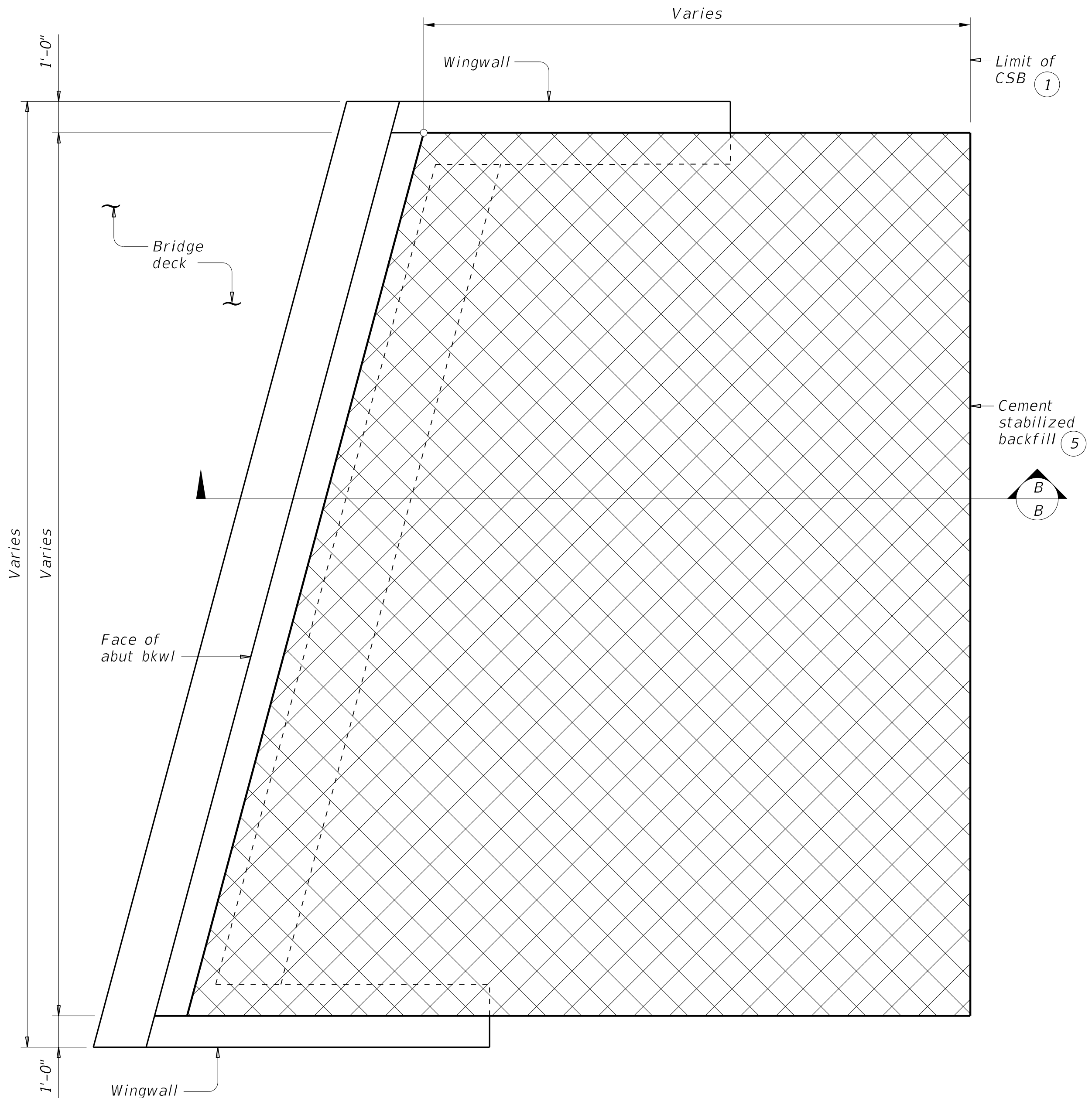
Texas Department of Transportation | Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL
BRIDGE ABUTMENT

CSAB

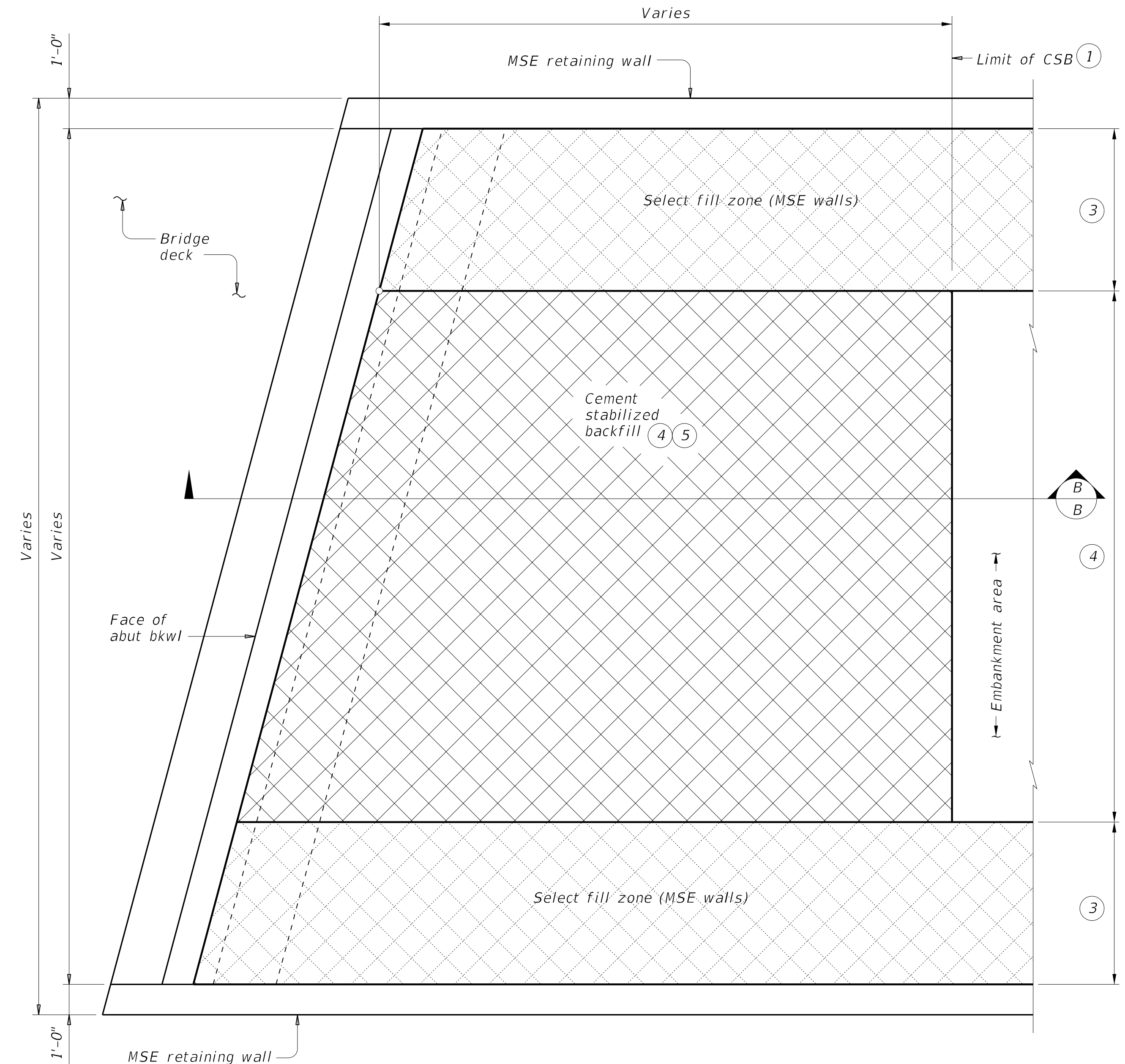
FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
02-20: Added Option 2.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	100

DATE: 3/16/2021 12:18
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH



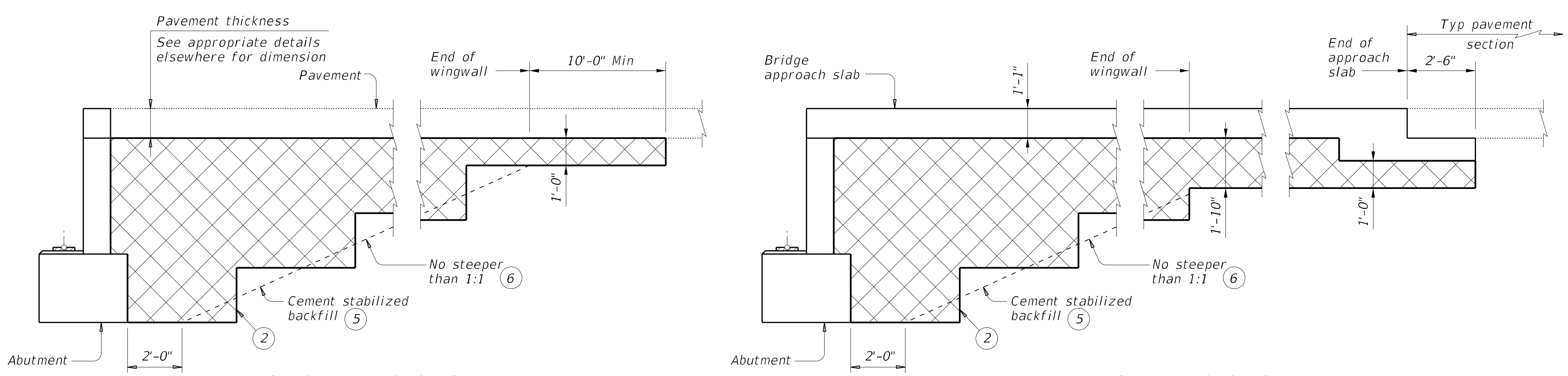
OPTION 2 ~ PLAN WITH WINGWALLS

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).



WITHOUT APPROACH SLAB

WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

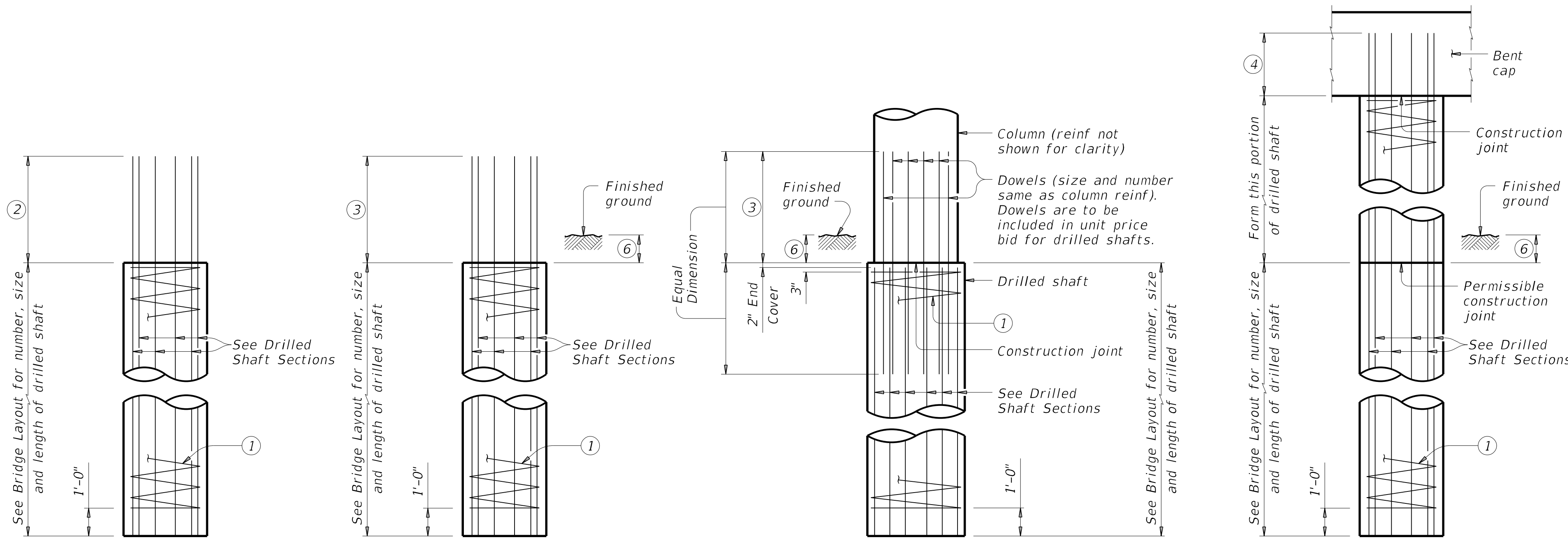
SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL
BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
02-20: Added Option 2.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	101

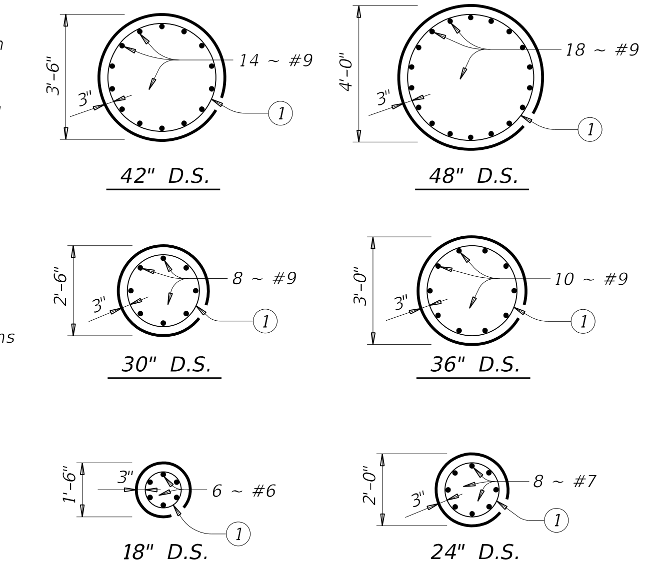


ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS

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

(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.

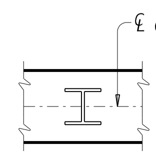
(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

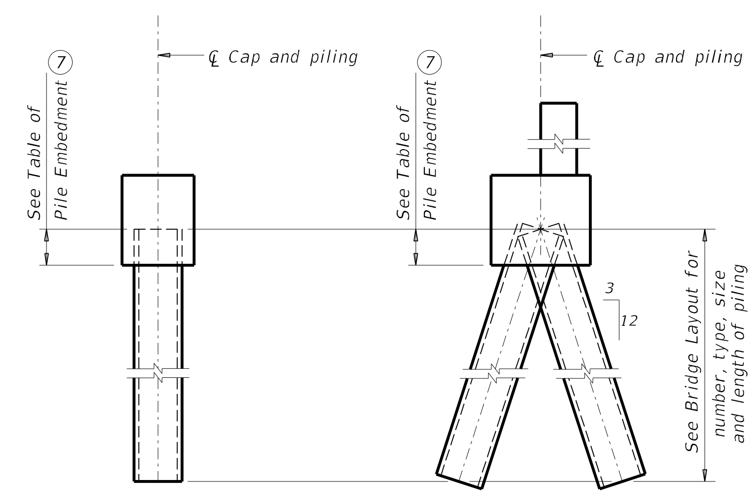
TABLE OF PILE EMBEDMENT

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

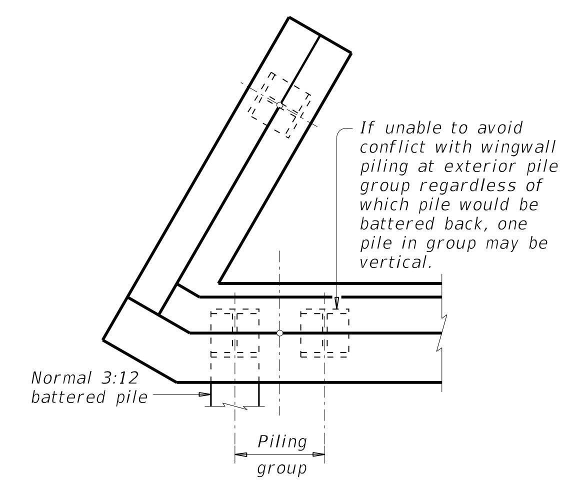


VERTICAL PILE

BATTERED PILE

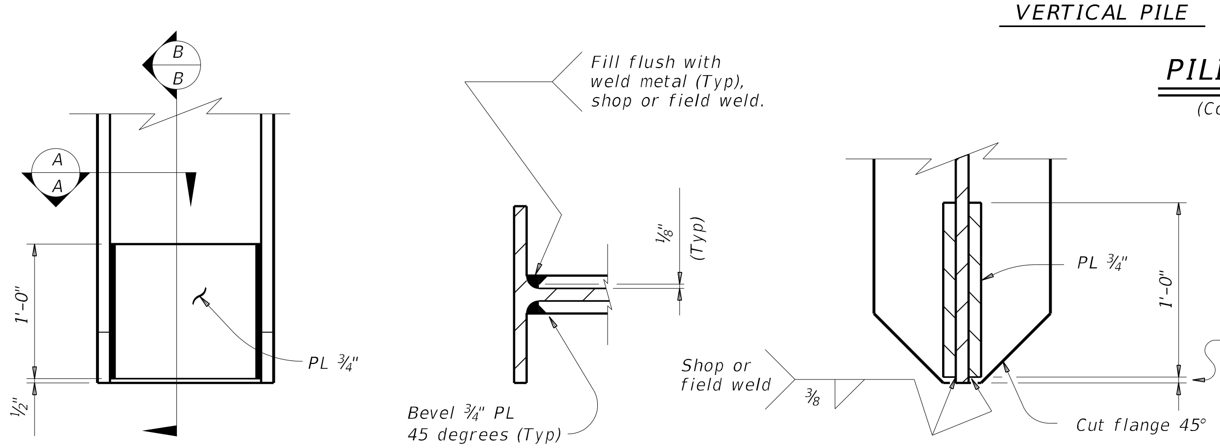
PILING DETAILS

(Concrete or steel H)



DETAIL "A"

(Showing plan view of a 30° skewed abutment)



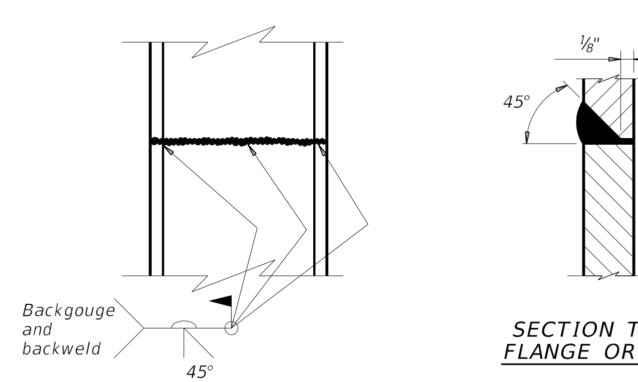
ELEVATION

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.

SHEET 1 OF 2

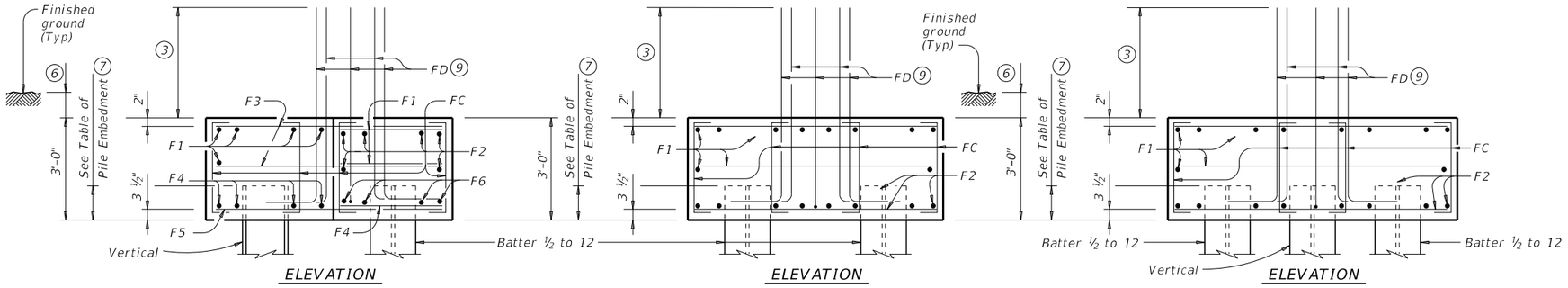
Texas Department of Transportation | Bridge Division Standard

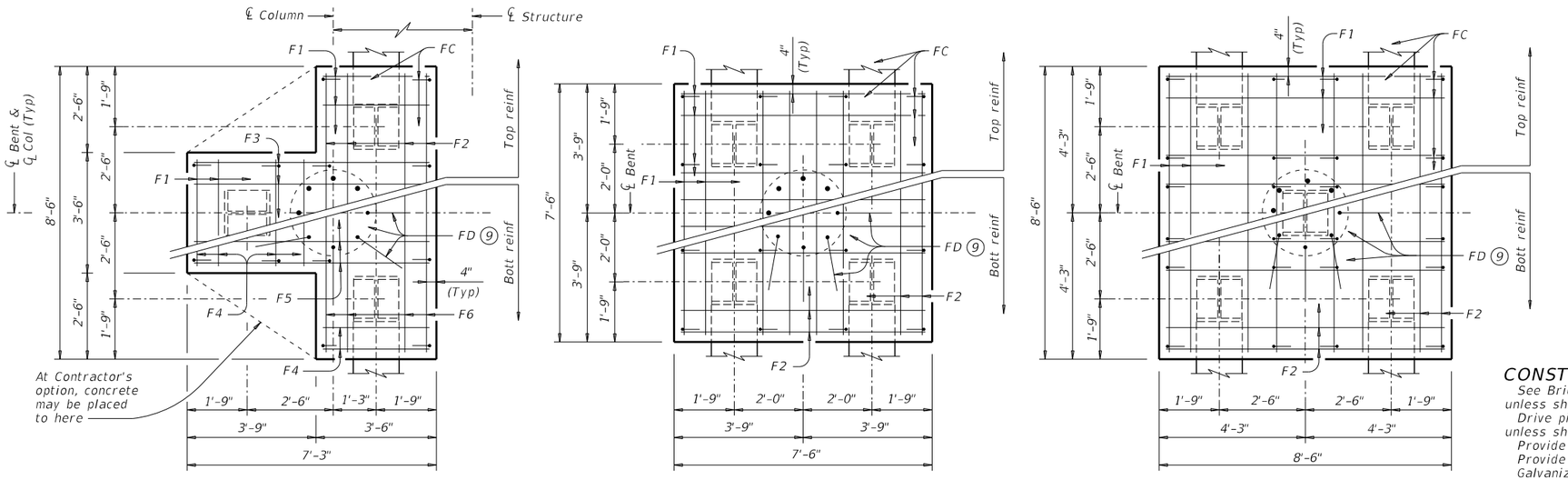
COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-20: Added #11 bars to the FD bars.	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	102

DATE: 3/16/2021 12:18
FILE: pw://ts-pw.bentley.com:ts-pw-01/Documents/0223,001 WA 1 - CR FM SH 16/Common Details/fdstde01-20.dgn





THREE PILE FOOTING (8)

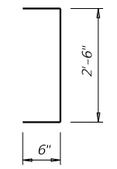
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

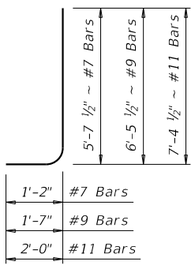
For 42" Dia and smaller columns.

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

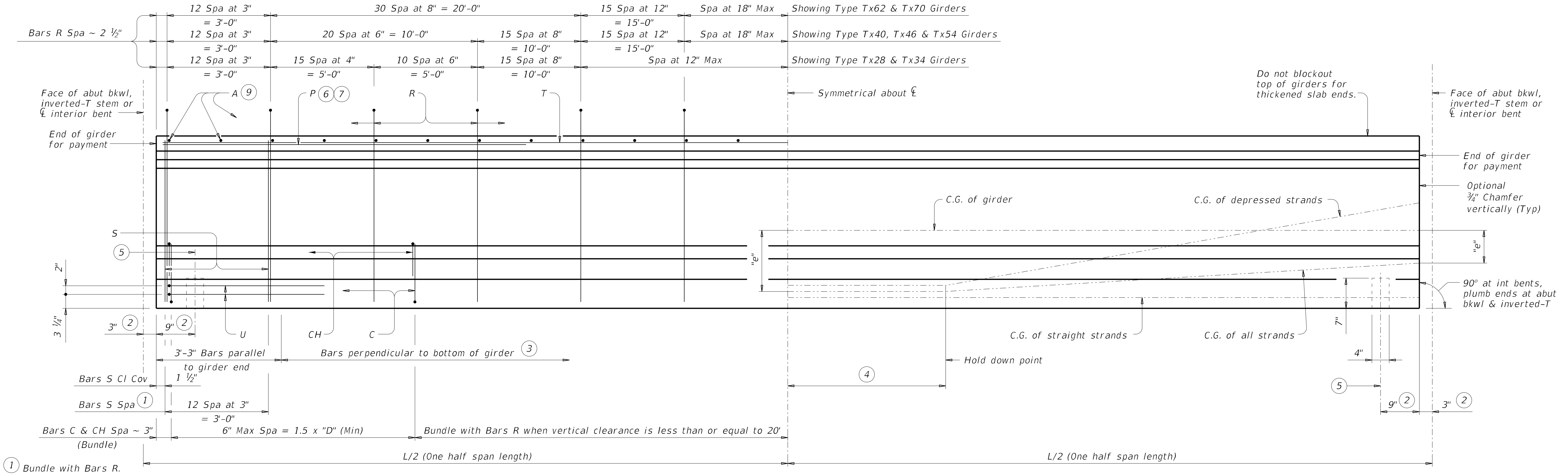
Texas Department of Transportation

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	0288	03	032	SH 16
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		103



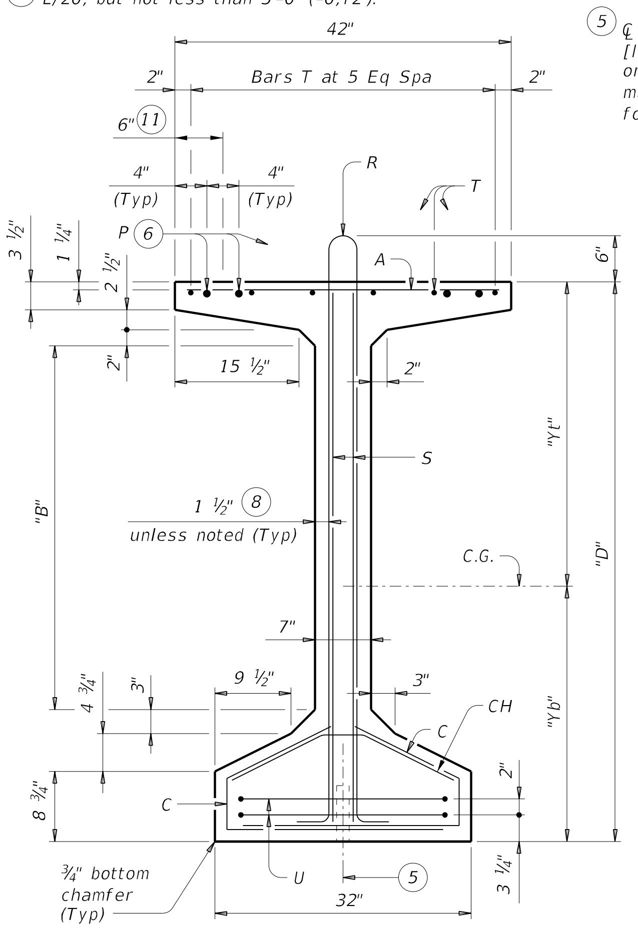
1. Bundle with Bars R.
2. Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
3. The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
4. L/20, but not less than 5'-0" (-0,+2').
5. ℄ 4" x 1 ½" Vertical Slotted Hole at doweled 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 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

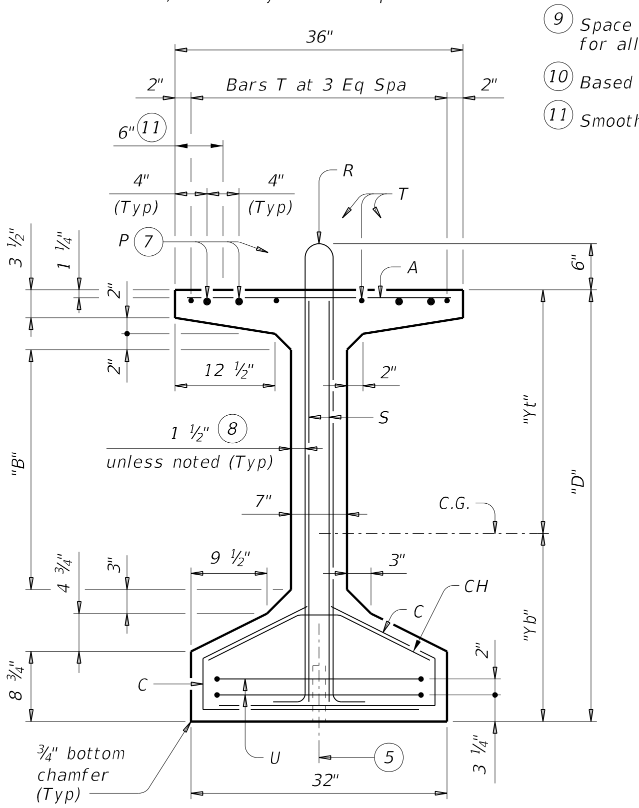
6. Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
7. Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 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.

GIRDER DIMENSIONS AND SECTION PROPERTIES

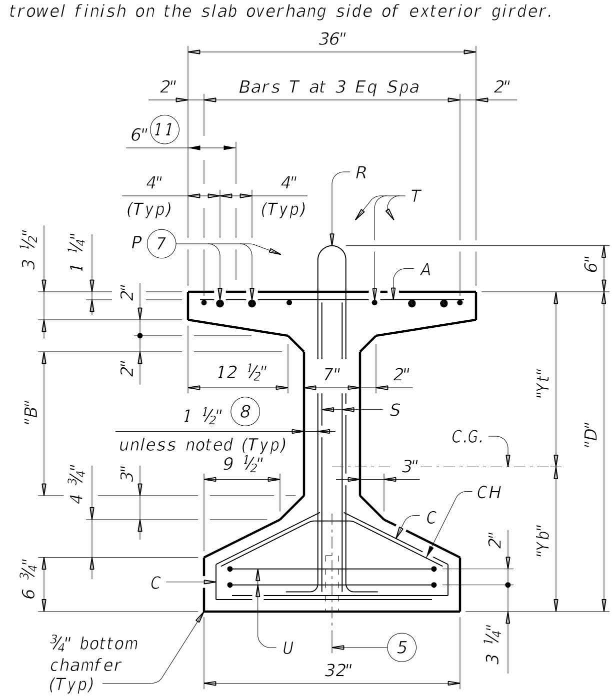
Girder Type	"D"	"B"	"Yt"	"Yb"	Area	"Ix"	"Iy"	Weight (10)
	(in.)	(in.)	(in.)	(in.)	(in.^{2})	(in.^{4})	(in.^{4})	(plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	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



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

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.

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

HL93 LOADING

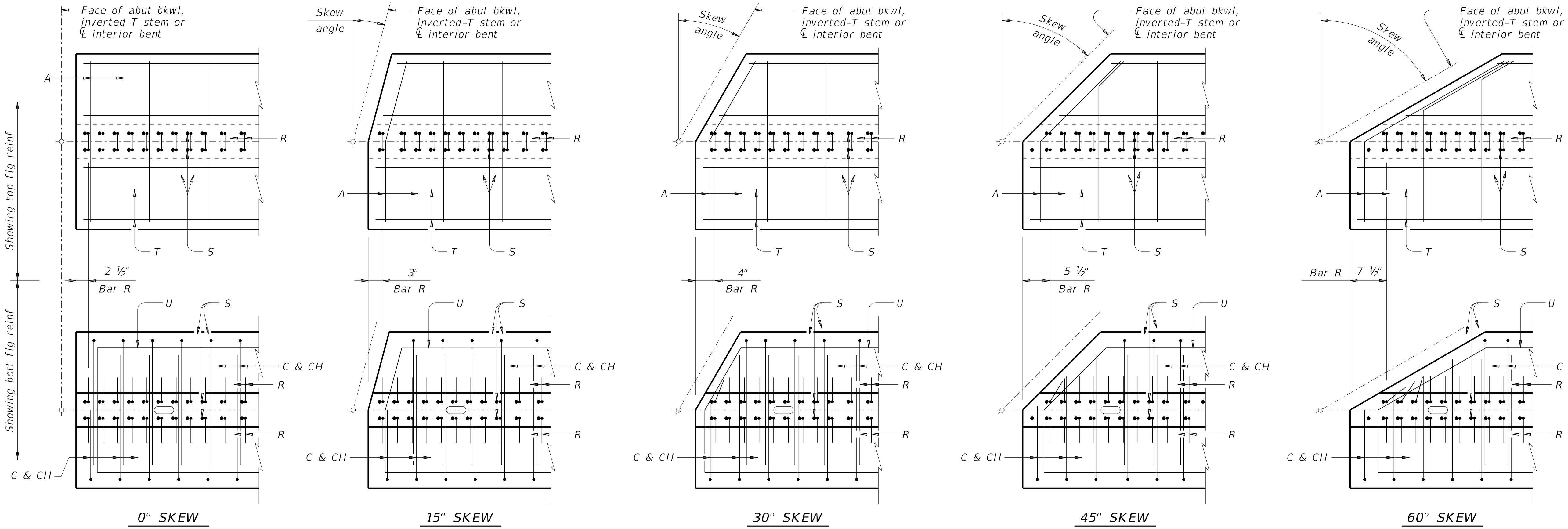
Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

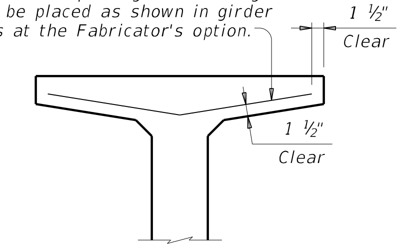
FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT 0288	SECT 03	JOB 032	HIGHWAY SH 16
REVISIONS: 10-19: Added Bars C and CH full length for VC<= 20'	DIST BWD	COUNTY EASTLAND		SHEET NO. 104

DATE: 3/16/2021 12:18
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH

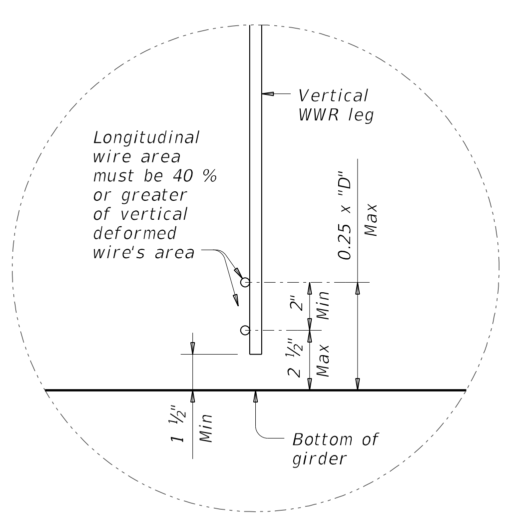


PLAN OF GIRDER ENDS (12)

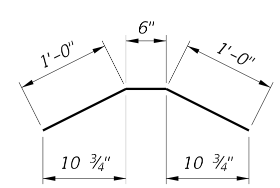
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



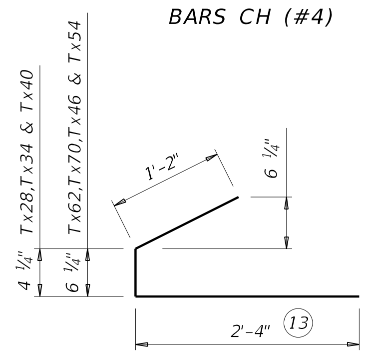
OPTIONAL TOP FLANGE REINFORCING DETAIL



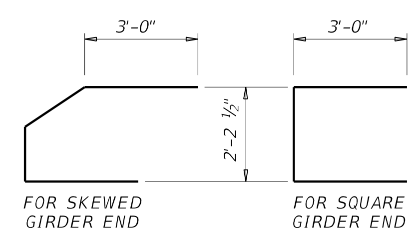
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



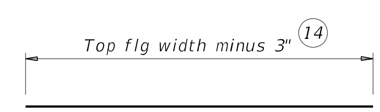
BARS CH (#4)



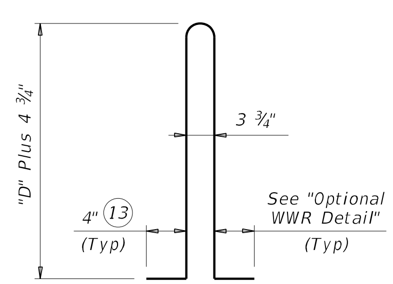
BARS C (#4)



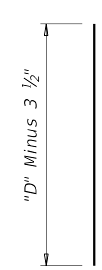
BARS U (#5)



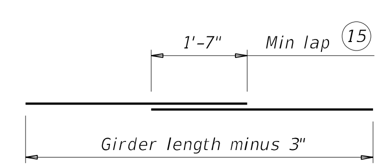
BARS A (#3)



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: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR	
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0288	03	032	SH 16	
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.	
	BWD	EASTLAND		105	

DATE: 3/16/2021 12:18
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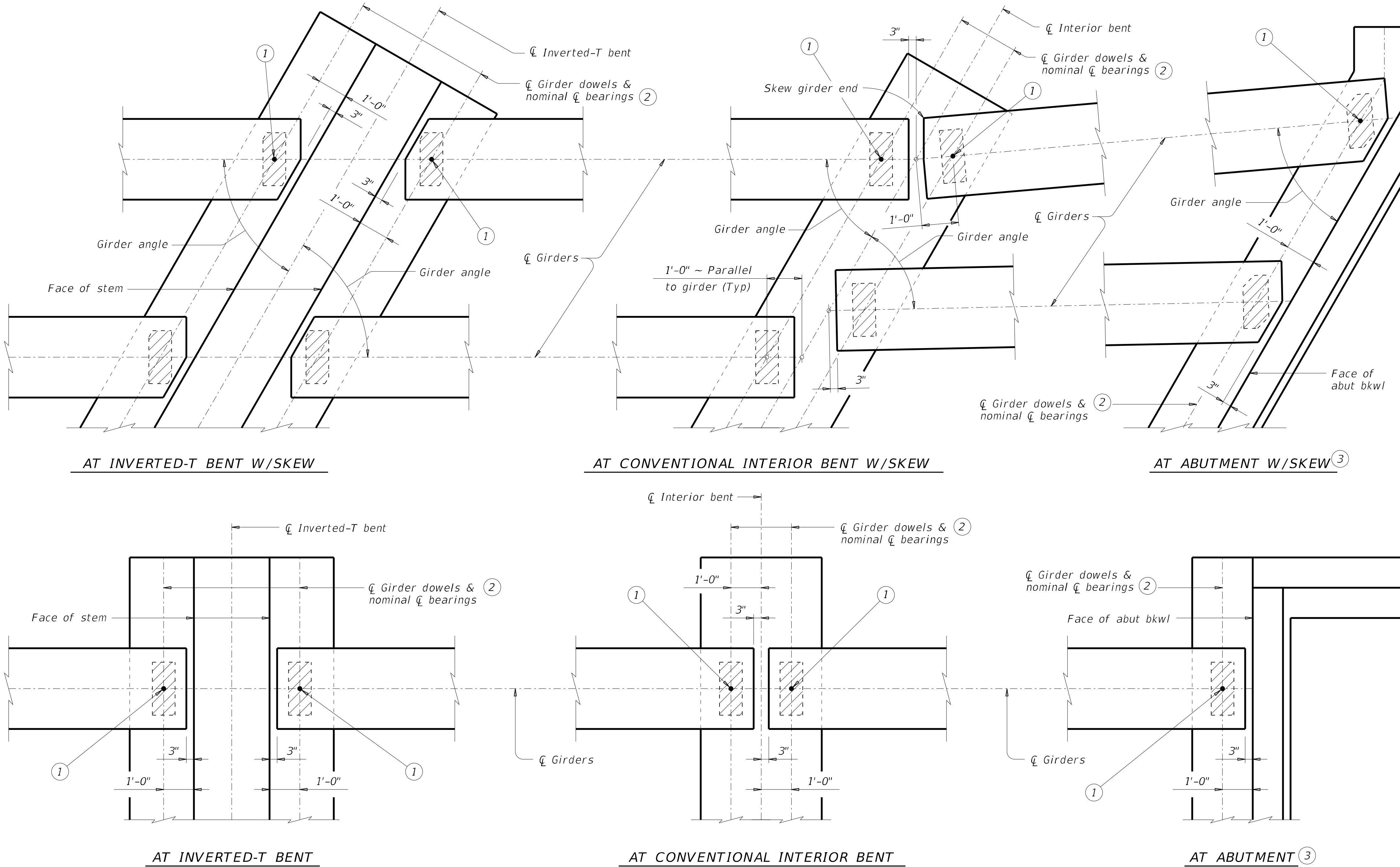
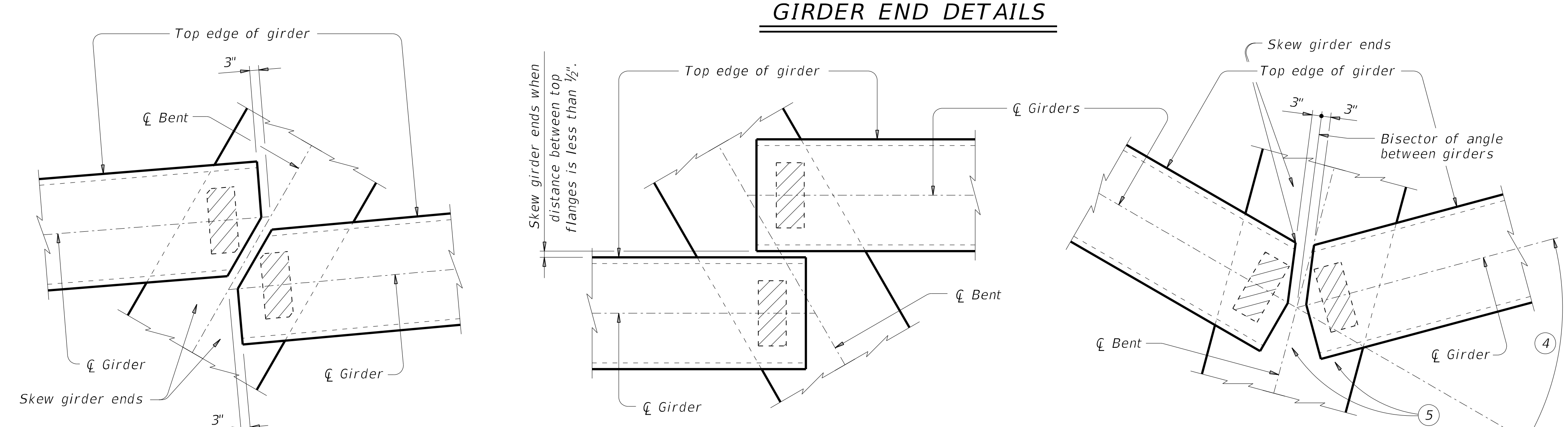


GIRDER END DETAILS



GIRDER CONFLICT DETAILS

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.

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".

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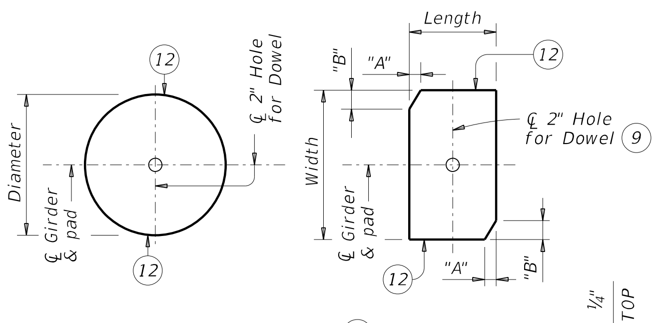
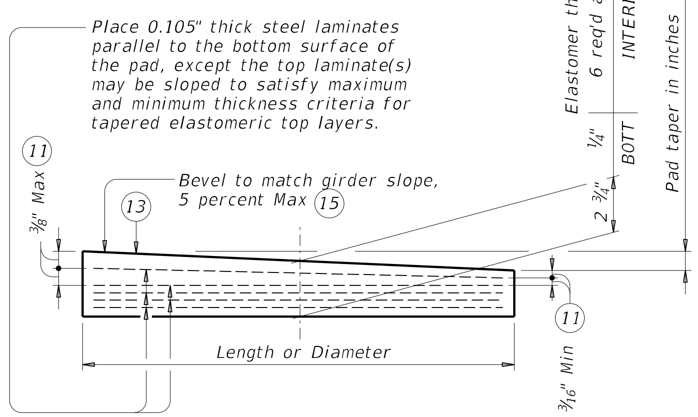
ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT 0288	SECT 03	JOB 032	HIGHWAY SH 16
REVISIONS	DIST BWD	COUNTY EASTLAND		SHEET NO. 106



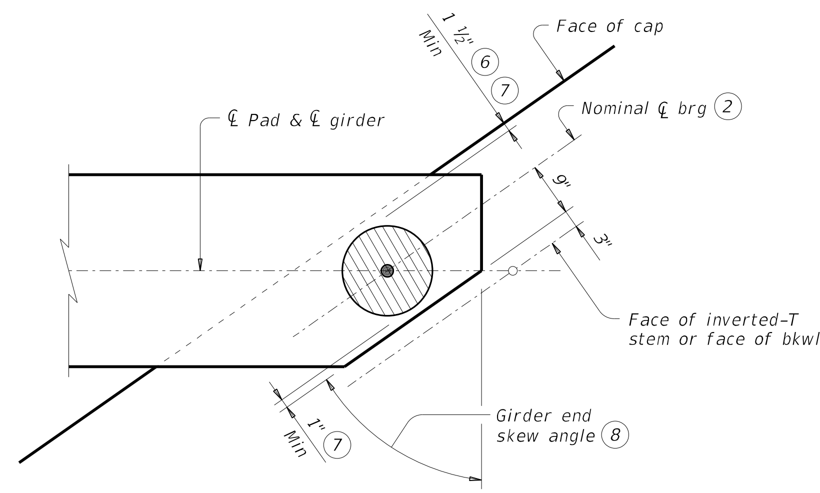
PLANS (10)



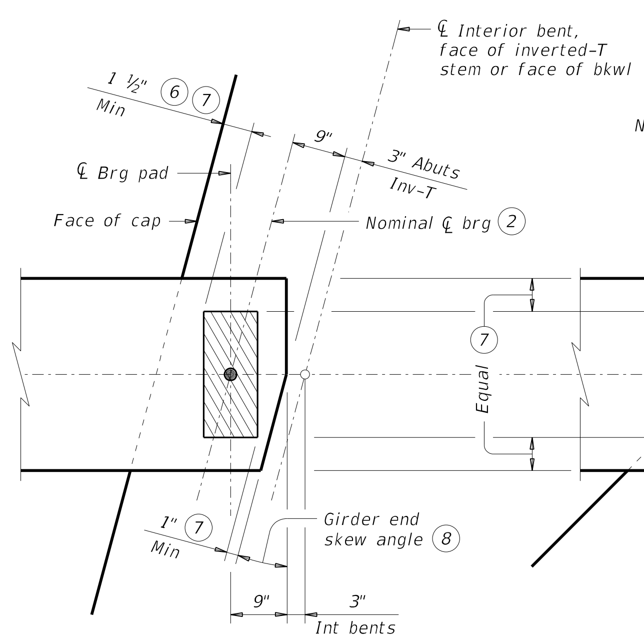
ELEVATION

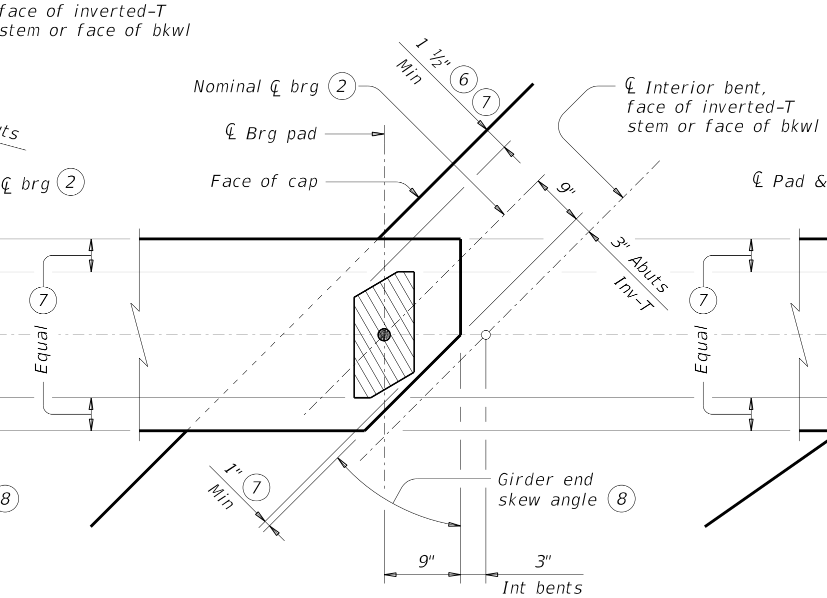
LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)

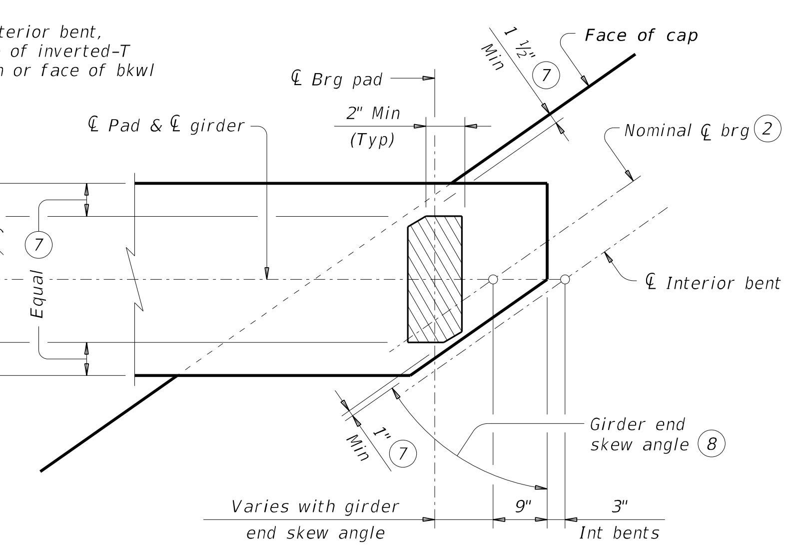


ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL





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: Face of Bkwl to Face of Cap	Int Bents: Overall Cap Width	Inv-T Bents: 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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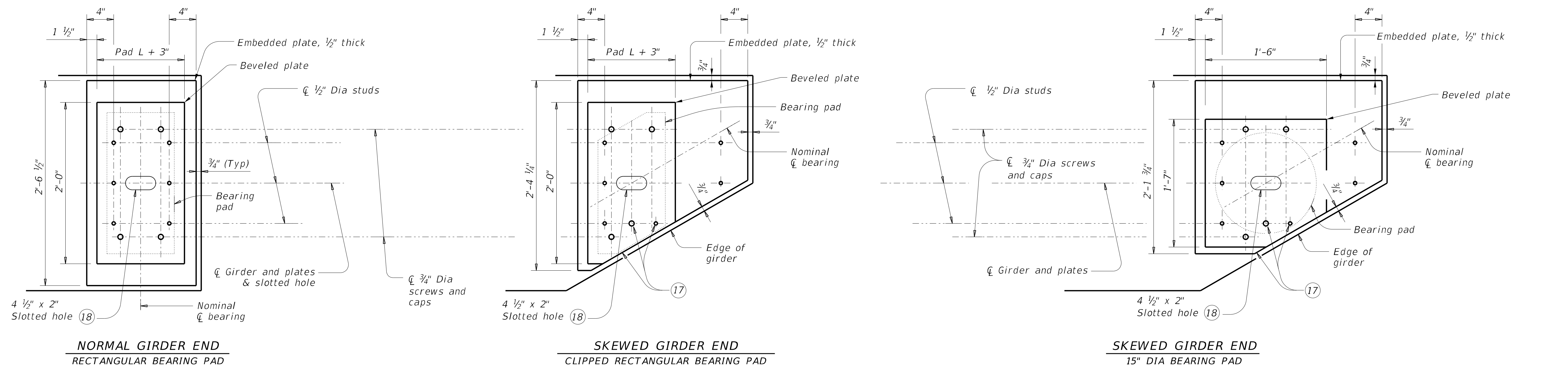
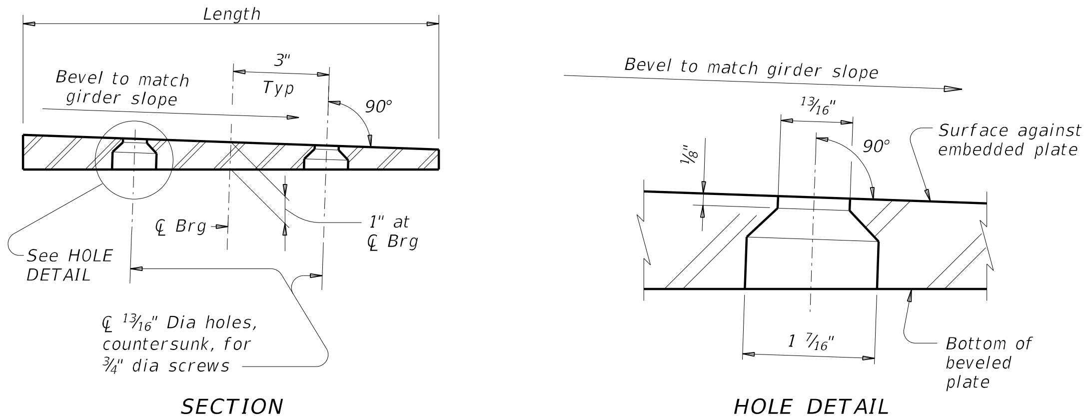
REVISIONS	DIST BWD	COUNTY EASTLAND		SHEET NO. 107

DATE: 3/16/2021 12:18
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH ...



PLAN VIEW OF SOLE PLATE DETAILS



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.

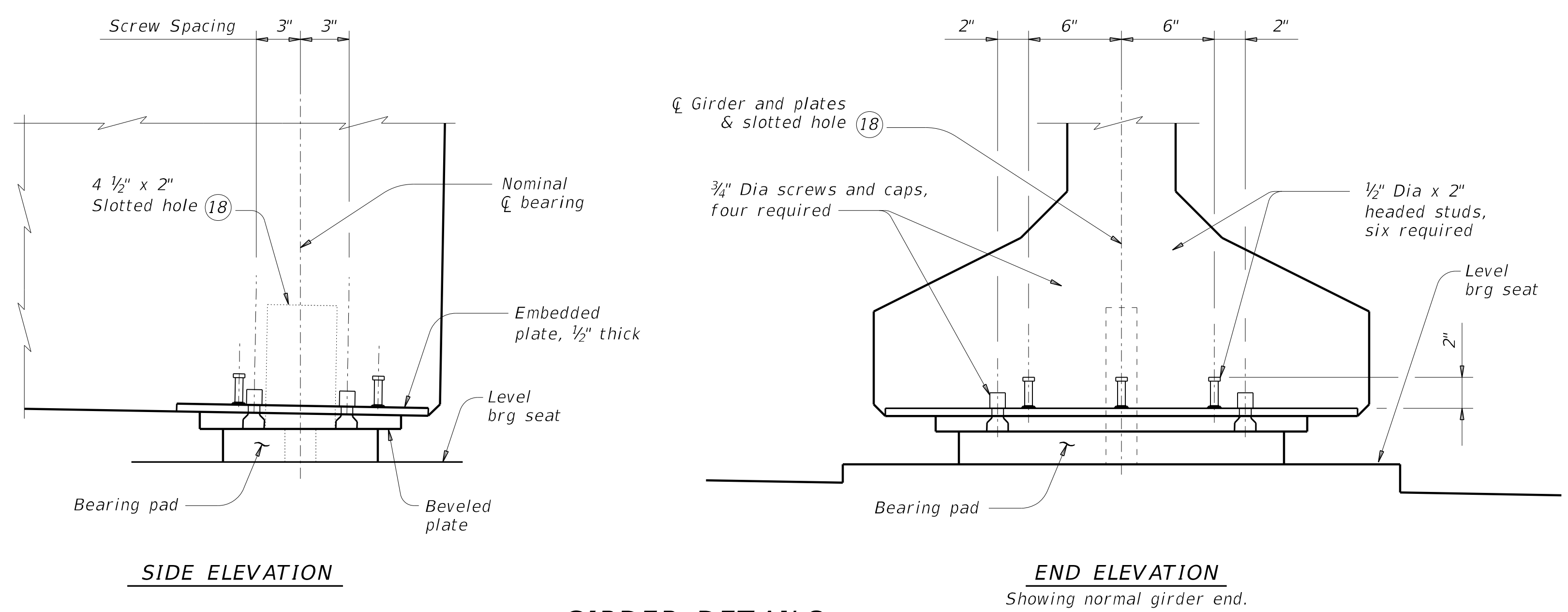
Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

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.



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

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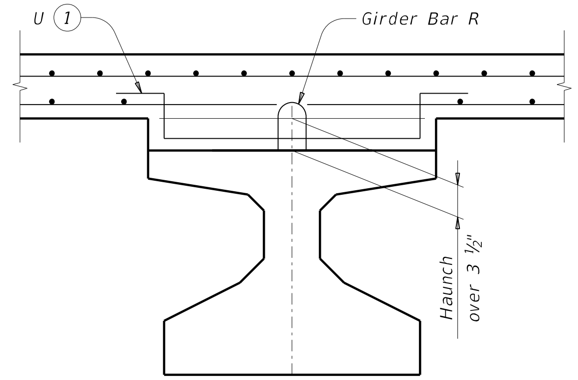
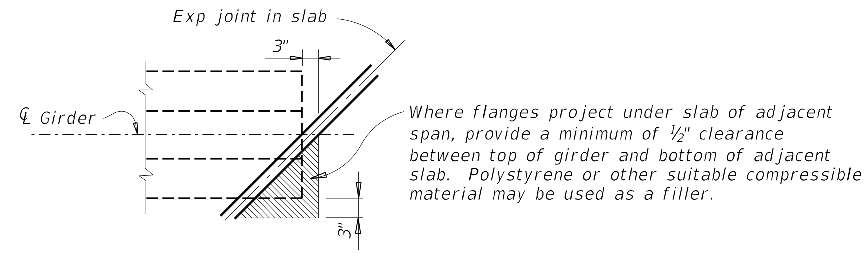
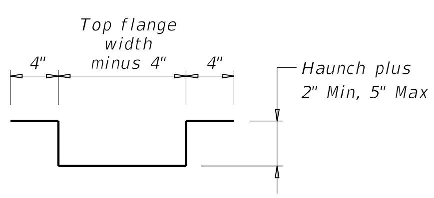


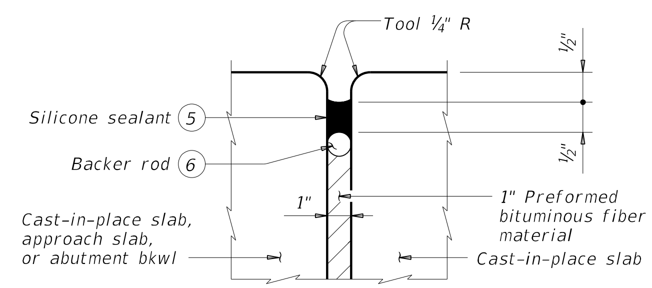
HAUNCH REINFORCING DETAIL



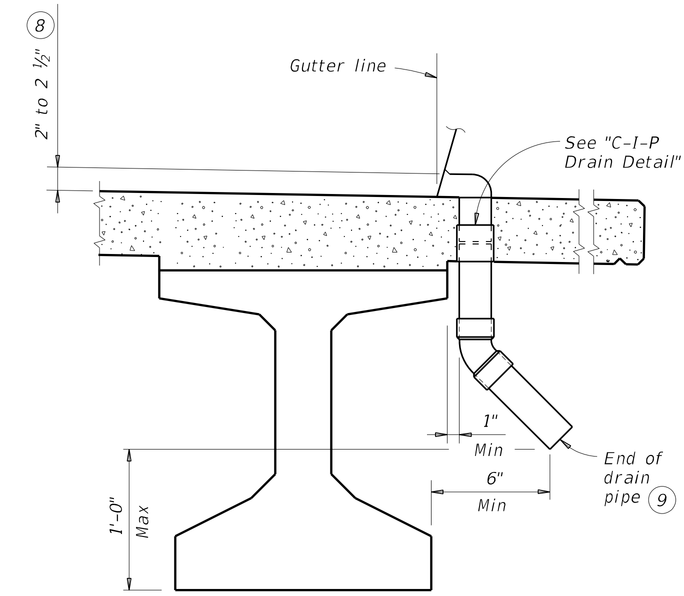
TREATMENT AT GIRDER END FOR SKEWED SPANS



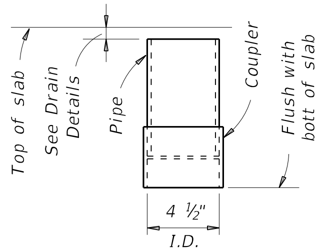
BARS U (#4)



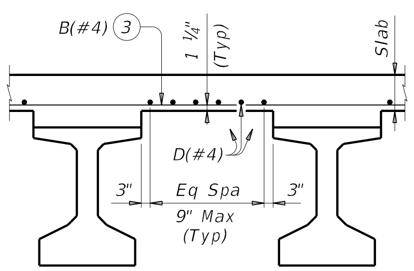
TYPE A JOINT DETAIL (7)



DRAIN DETAIL (10)



C-I-P DRAIN DETAIL (2)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.

(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

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10-19: Modified Note 7. Type A now a pay item.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	109

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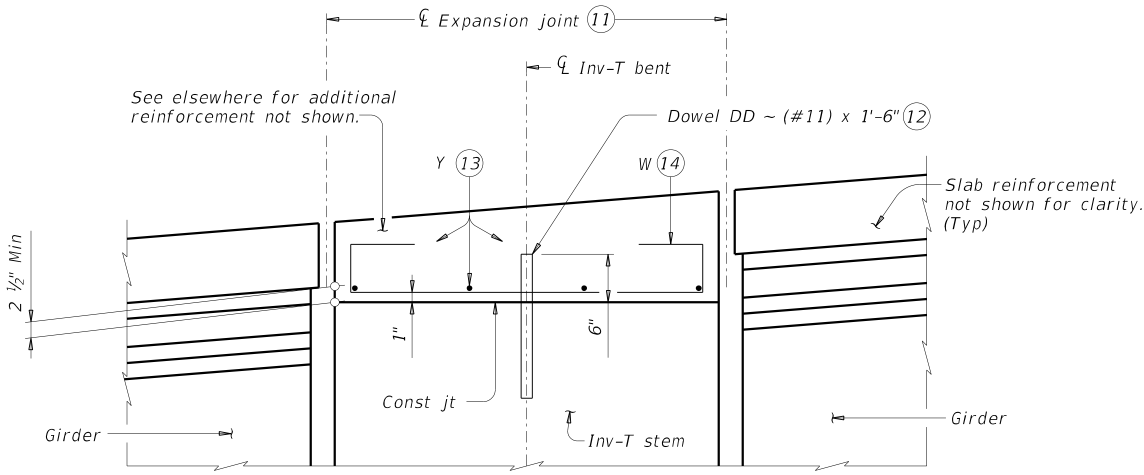
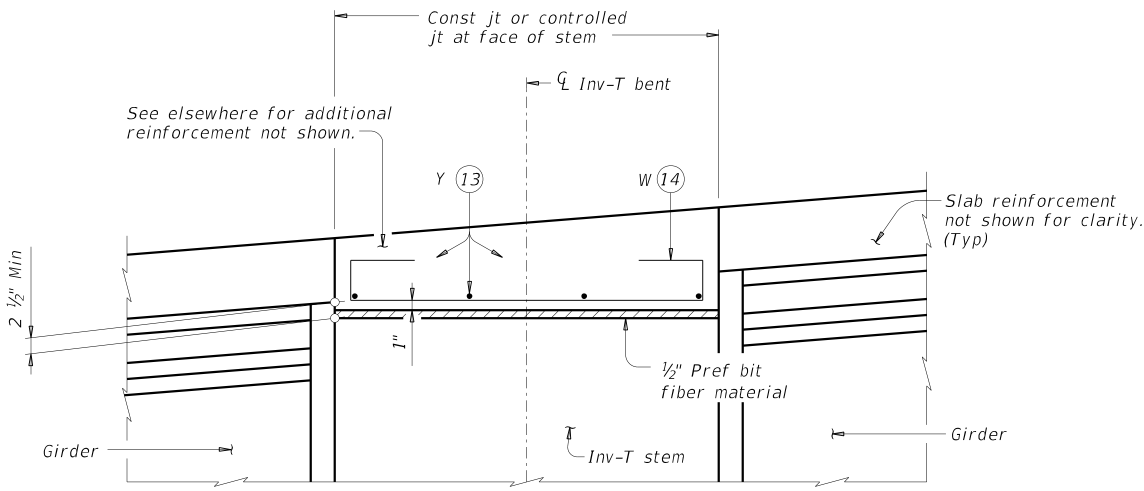
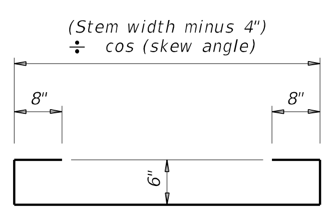


SHOWING EXPANSION JOINTS

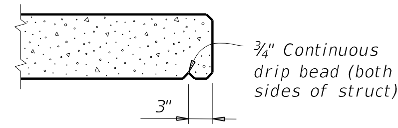


SHOWING CONST JTS OR CONTROLLED JTS

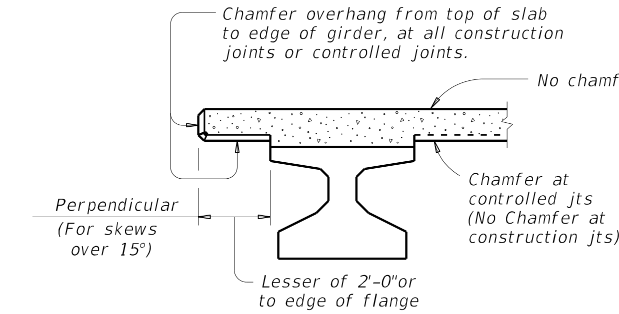
REINFORCEMENT OVER INV-T BENTS



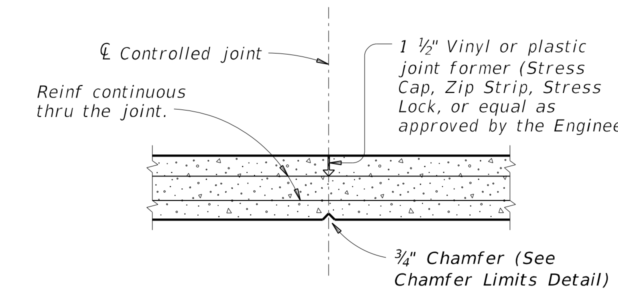
BARS W (#4)



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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MISCELLANEOUS SLAB DETAILS PRESTR CONCRETE I-GIRDERS

IGMS

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REVISIONS	0288	03	032	SH 16		
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	BWD	EASTLAND		110		

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS														
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	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) Moment	LIVE LOAD DISTRIBUTION FACTOR (2) Shear
SH 16 AT BEAR CREEK	1	ALL	Tx46		38	0.6	270	15.81	11.39	6	34.5	5.600	6.700	4.382	-4.228	6325	0.546	0.826

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.

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 △. Double wrap full-length debonded strands in outer most position of each row.

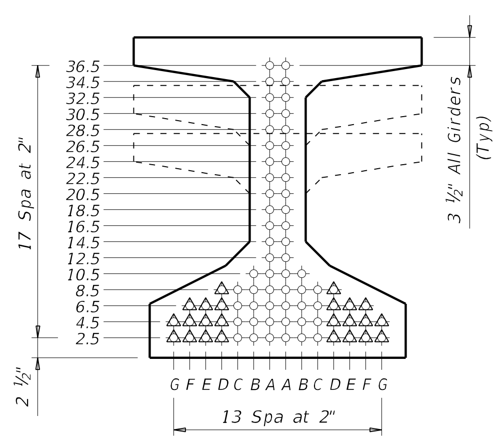
When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

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.

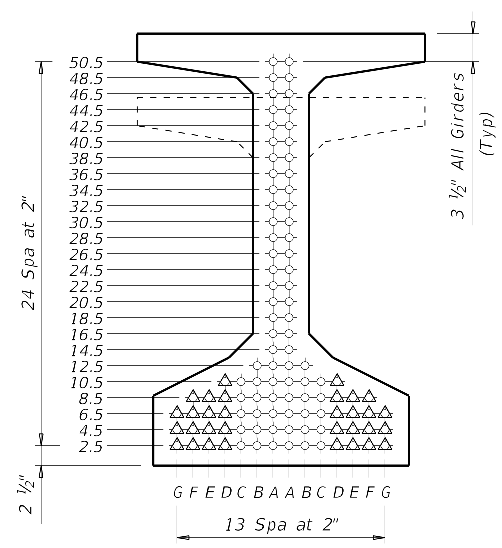
DEPRESSED STRAND DESIGNS:

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.

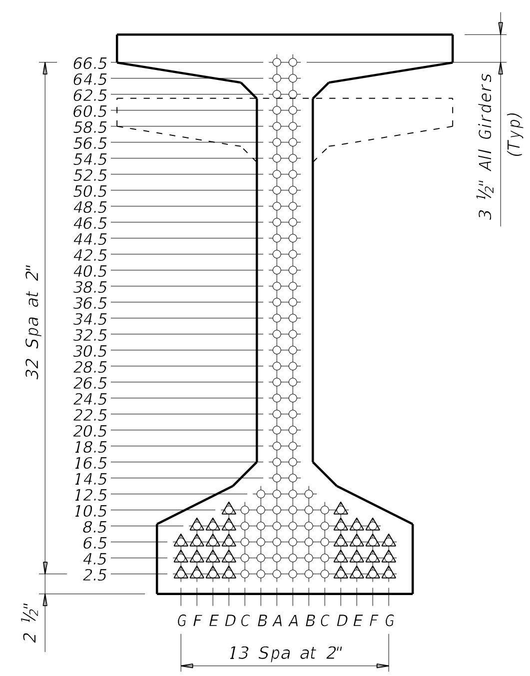
To complete this sheet input the girder designs in the table and the relative humidity under Design Notes. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

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10-19: Modified for depressed strands only.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	111

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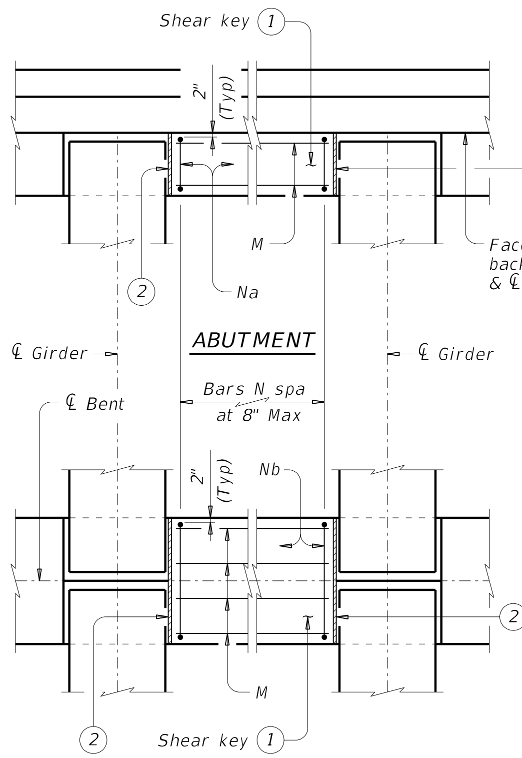
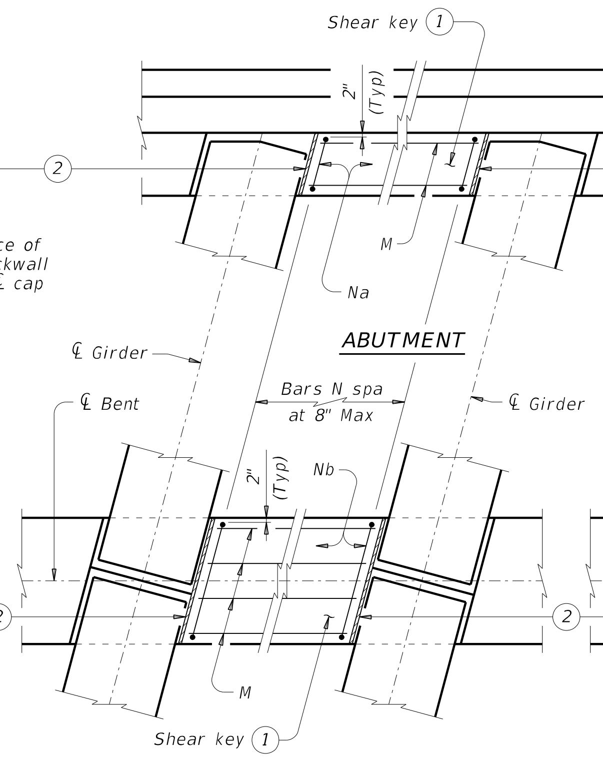


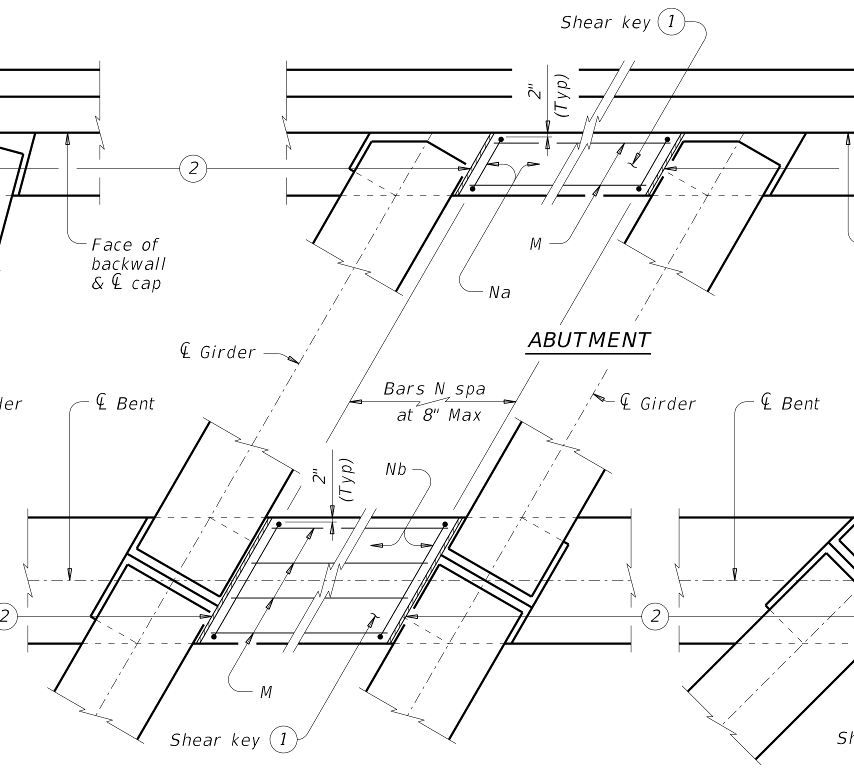
PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.



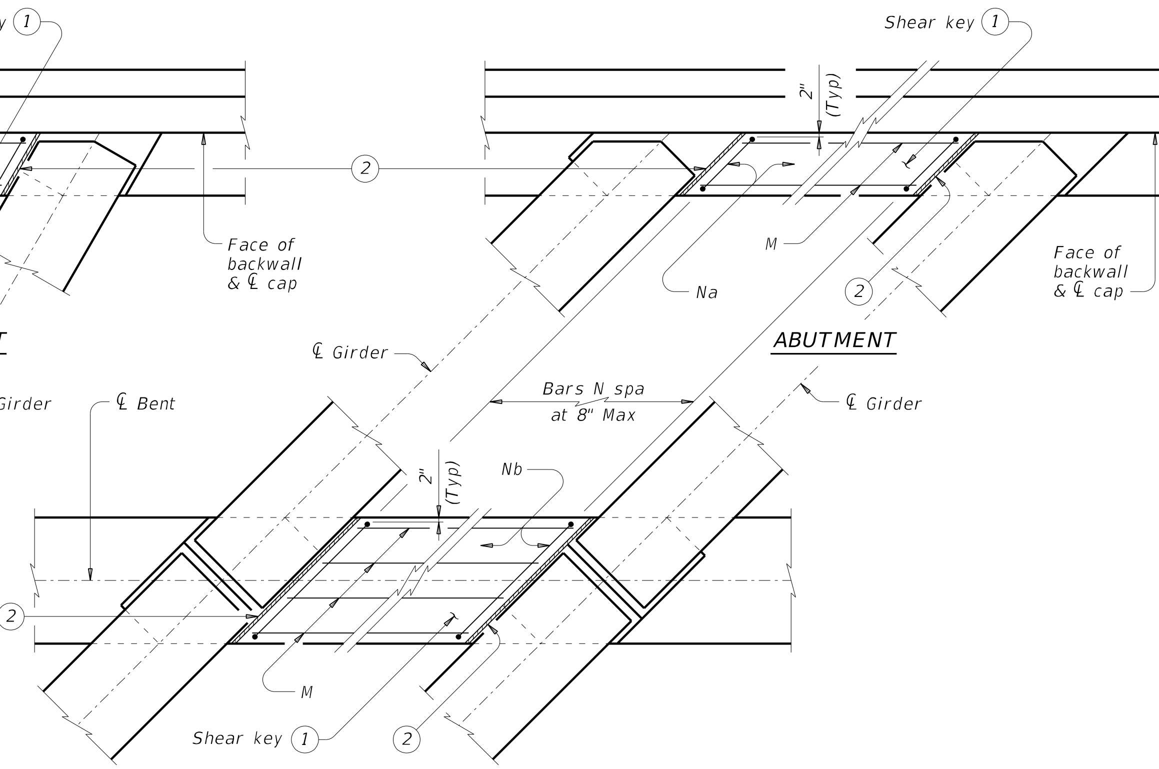
PARTIAL PLANS WITH 15° SKEW

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.

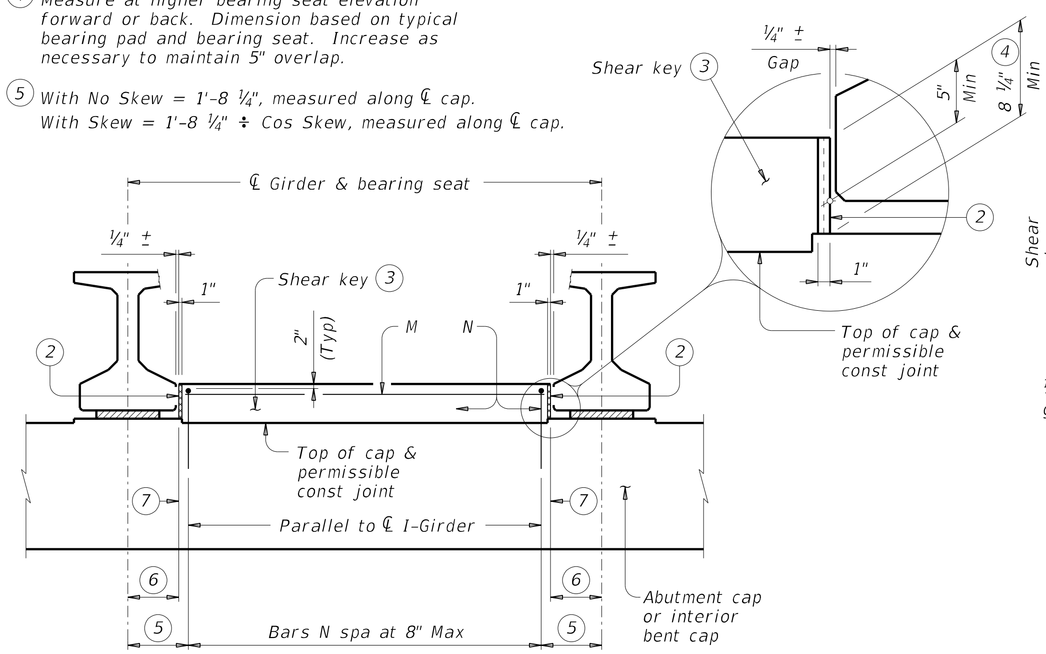
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(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.

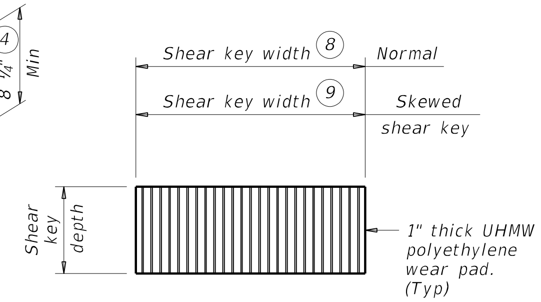
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.

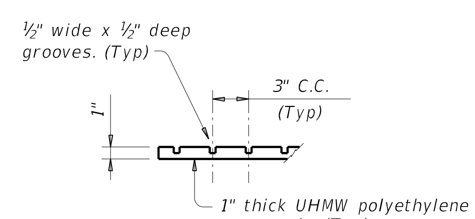


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

Showing shear key with girder Type Tx46. Other I-Girder types similar.

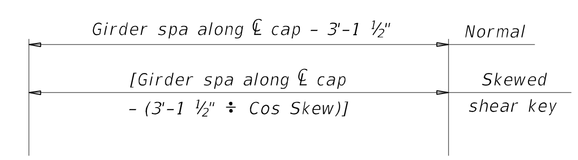


ELEVATION

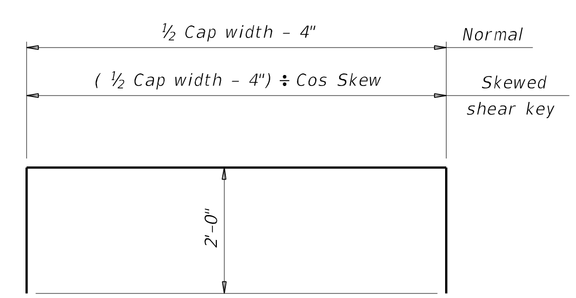


PART SECTION

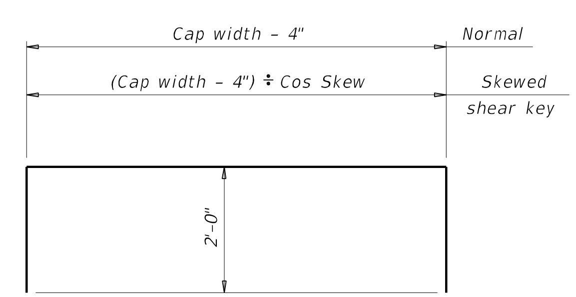
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



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

FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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REVISIONS	0288	03	032	SH 16
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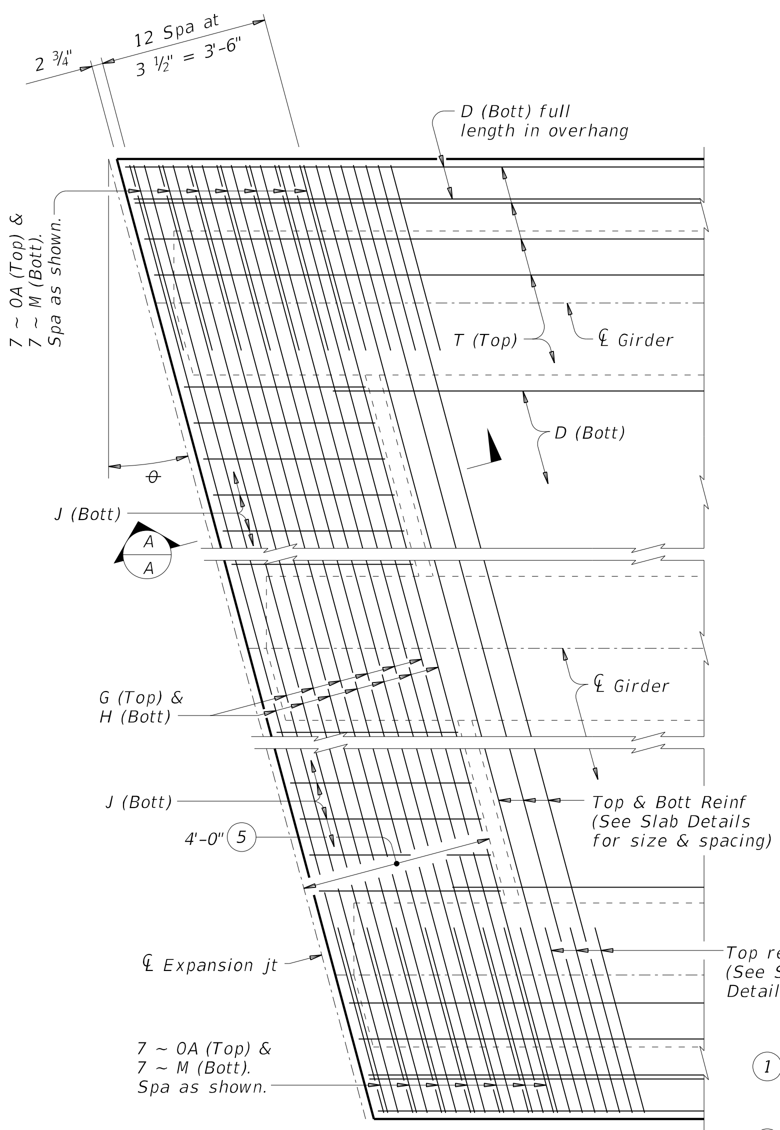
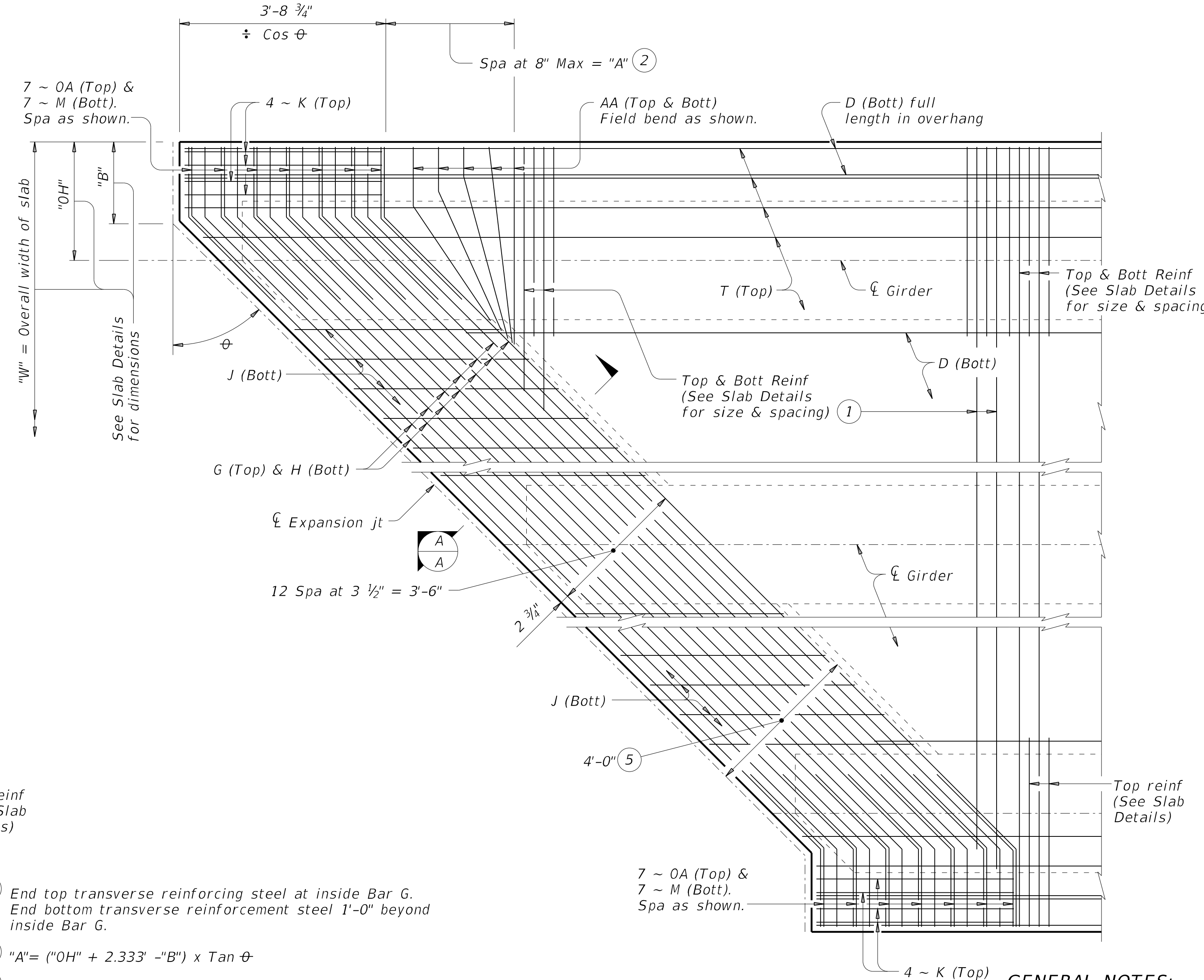
	BWD		EASTLAND	112

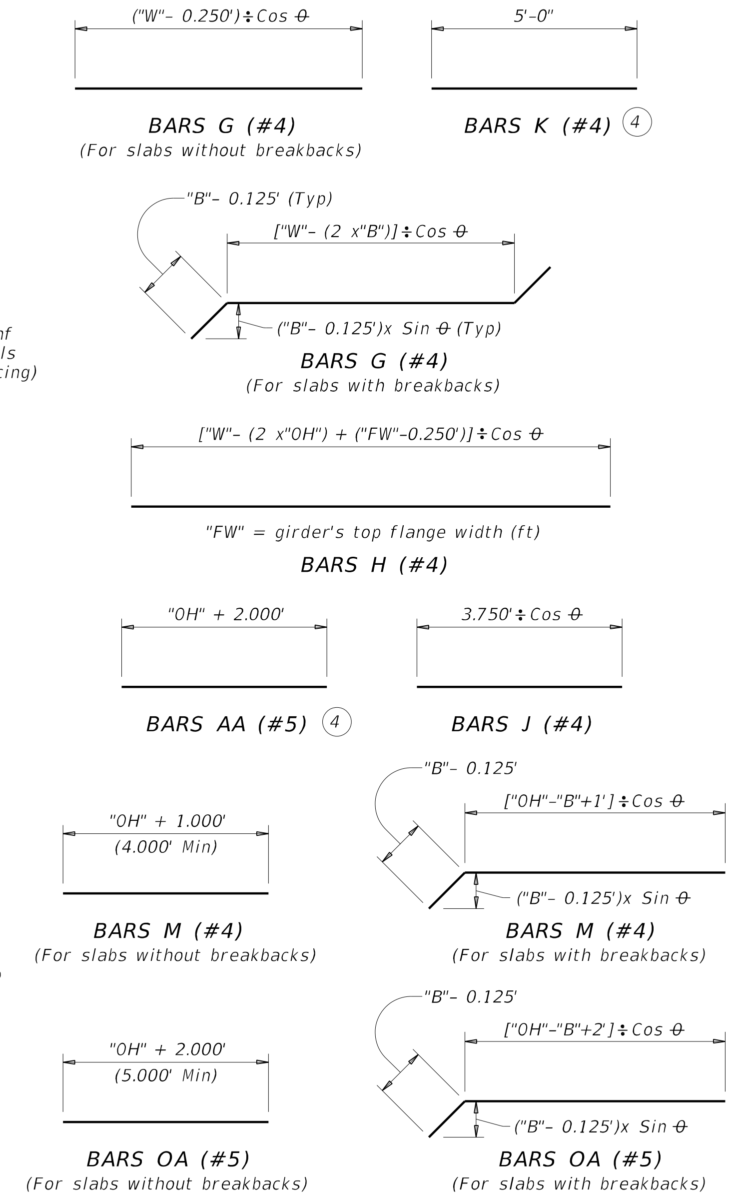


PARTIAL PLAN FOR
SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR
SLABS WITH BREAKBACK

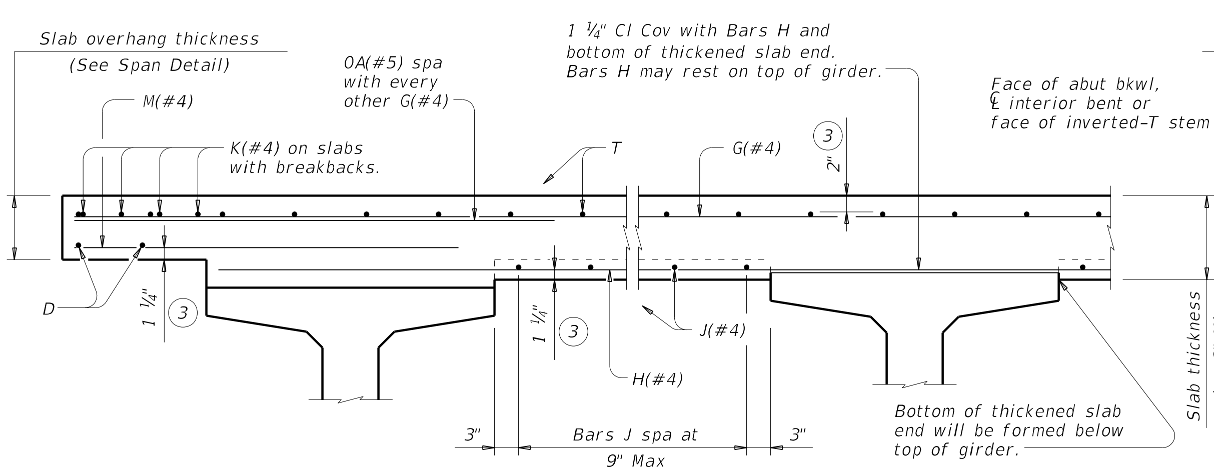
1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("OH" + 2.333' –"B") x Tan θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



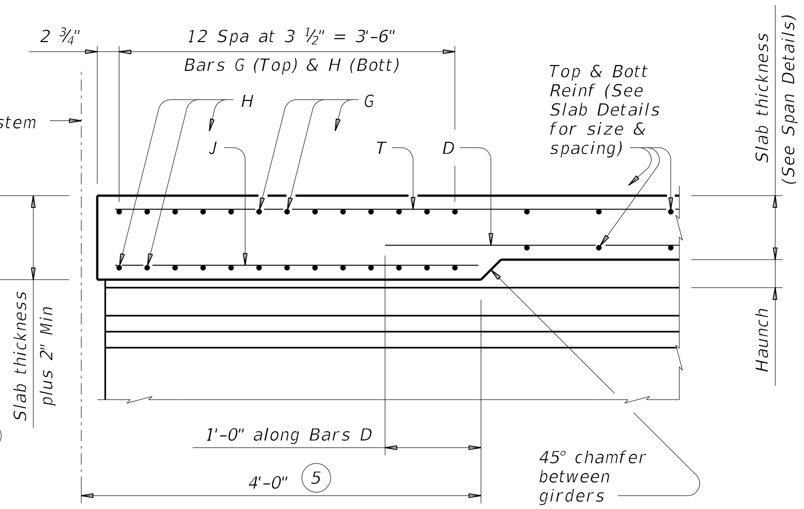
GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard 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.



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

FILE: igtssts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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REVISIONS	0288	03	032	SH 16
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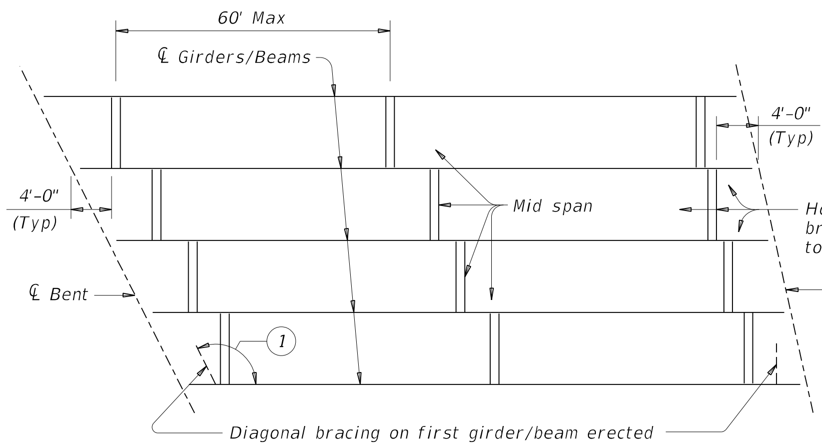
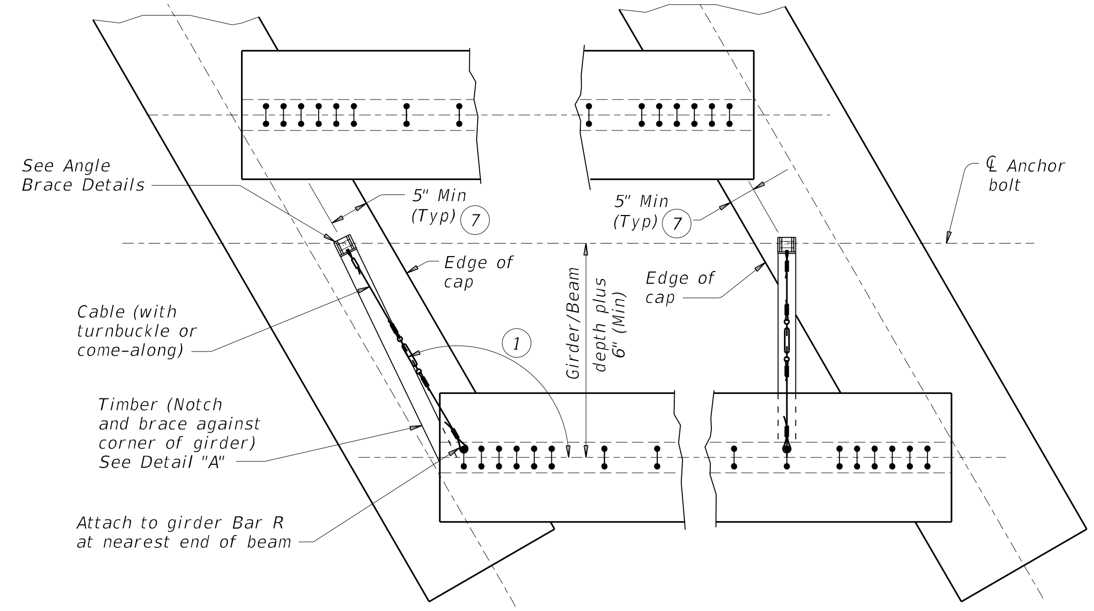
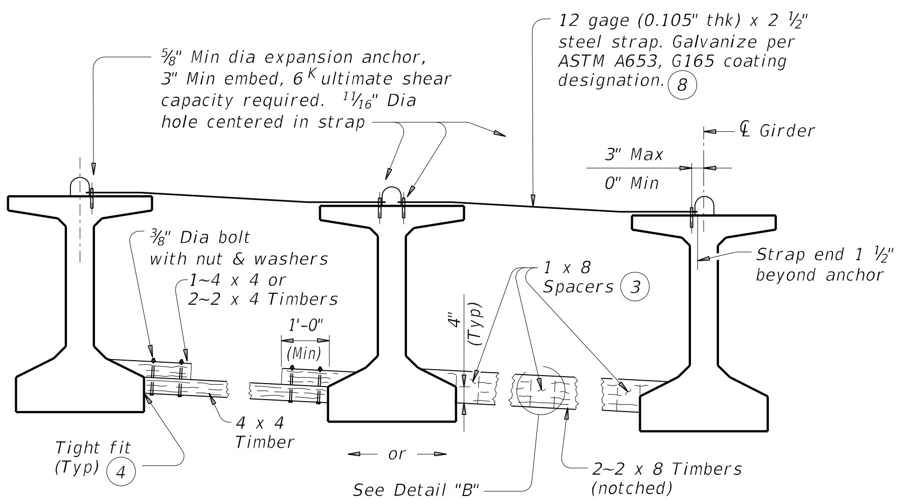


ERECTION BRACING

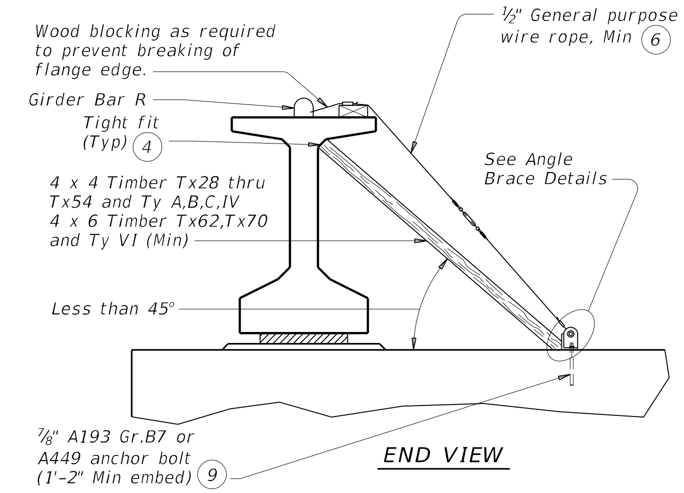


PLAN



FOR ERECTION BRACING, OPTION 1

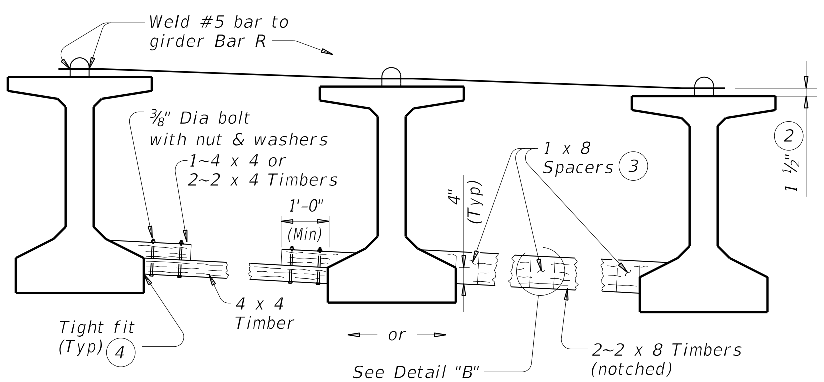
(This option is not allowed when slab is formed with PMDF or plywood.)



END VIEW

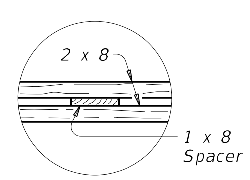
DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



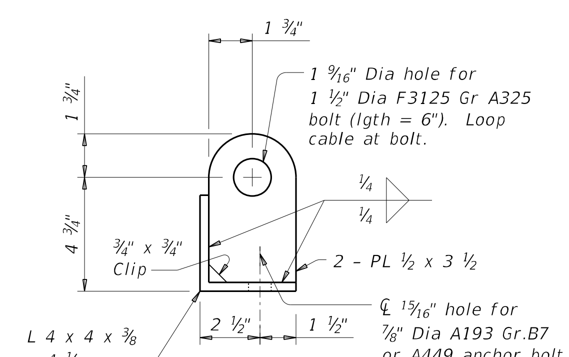
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5

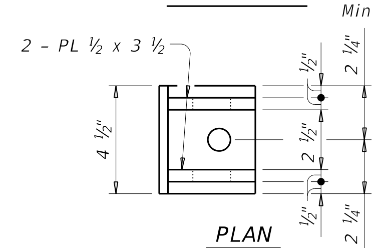


PLAN

DETAIL "B"



ELEVATION



PLAN

ANGLE BRACE DETAILS

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.

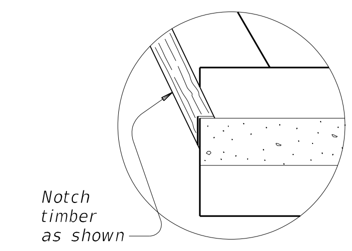
ERECTION BRACING:

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.



DETAIL "A"

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

MEBR(C)

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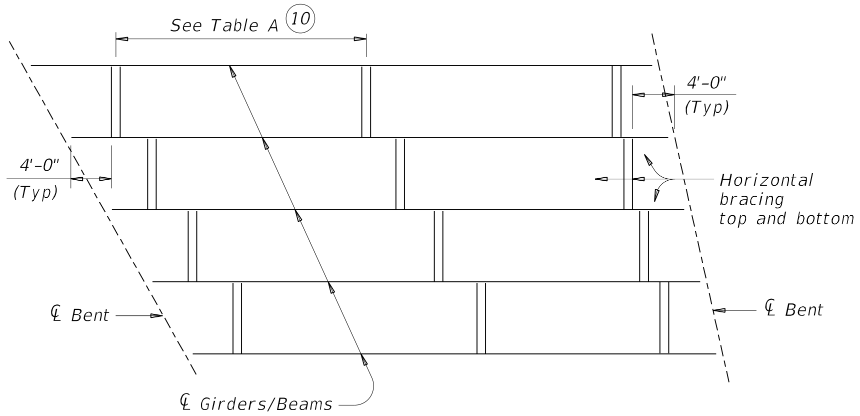
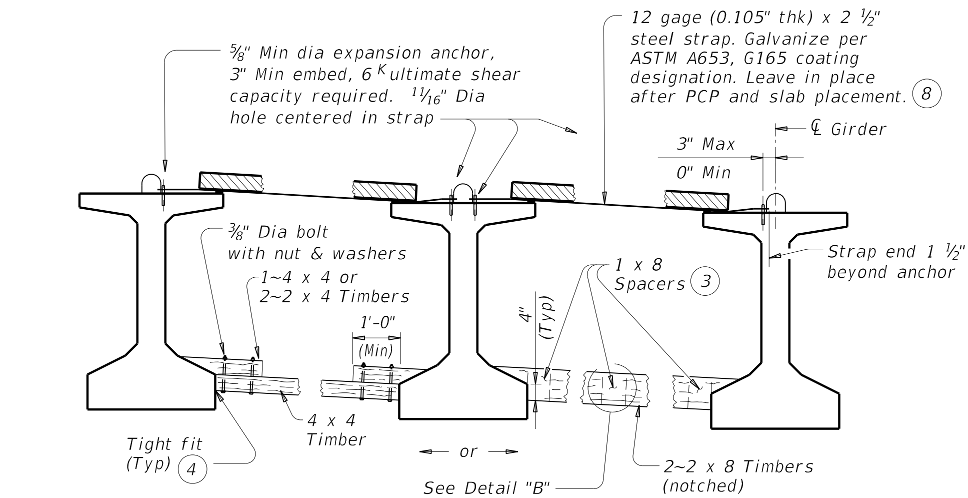


SLAB PLACEMENT BRACING

TABLE A

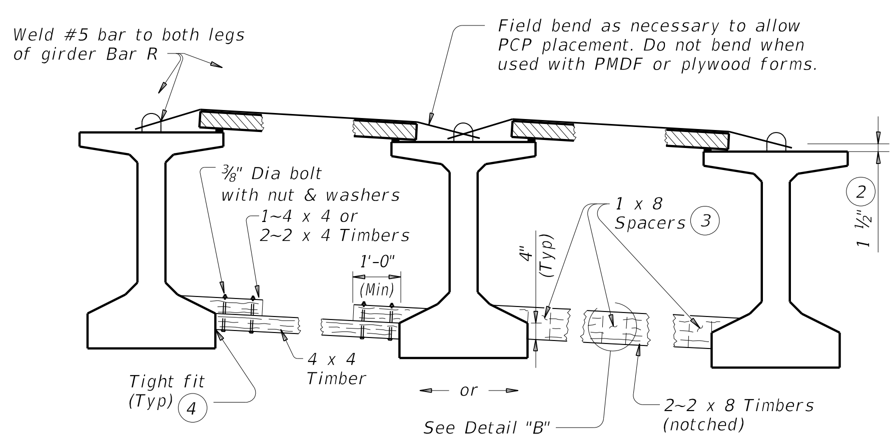
OPTION 1-RIGID BRACING (STEEL STRAP)		
Girder or Beam Type	Maximum Bracing Spacing: Slab Overhang less than 4'-0" (11)	Maximum Bracing Spacing: Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	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)	Maximum Bracing Spacing: 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

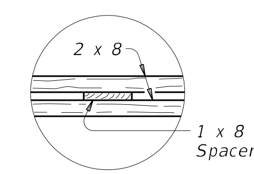
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



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".

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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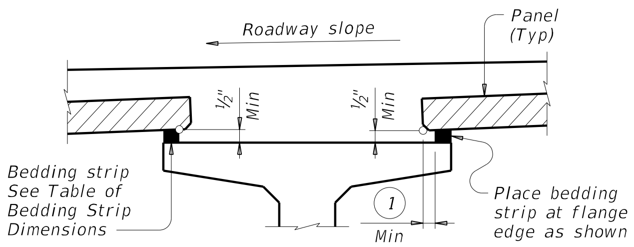
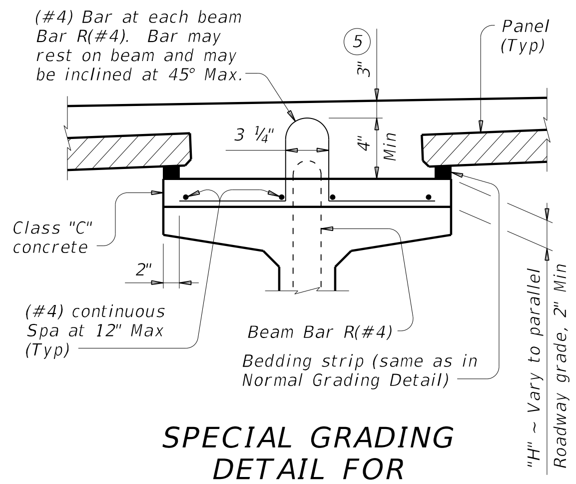


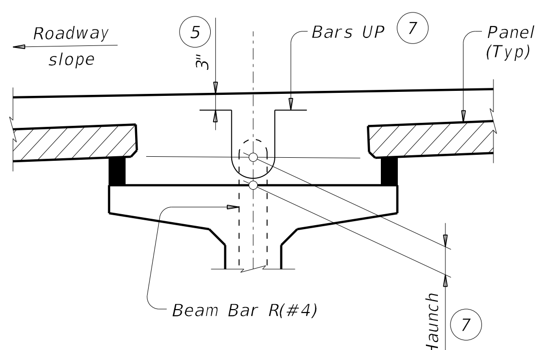
NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

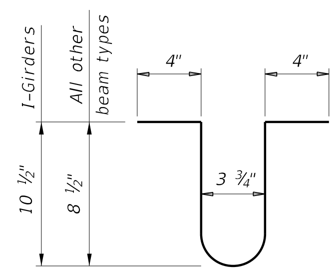
Showing prestressed concrete I-girders.
(Other beam types similar)



HAUNCH REINFORCING DETAIL

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)



BARS UP (#4) (7)

(1) 2" Min for I-giders, 1 ½" Min for all other beam types.

(2) Allowed for 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.

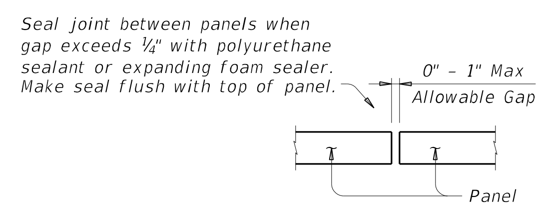
(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(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..



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.)

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.

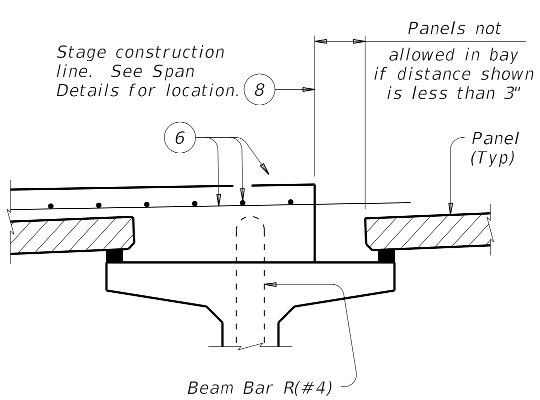
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

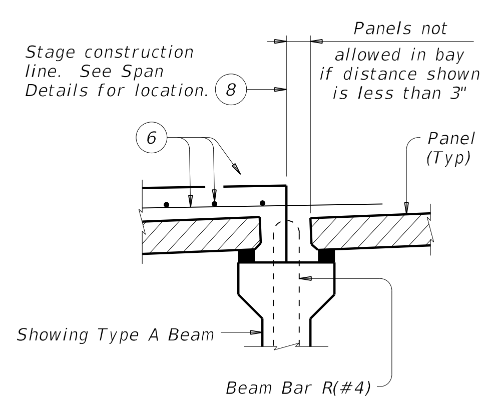
When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

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.



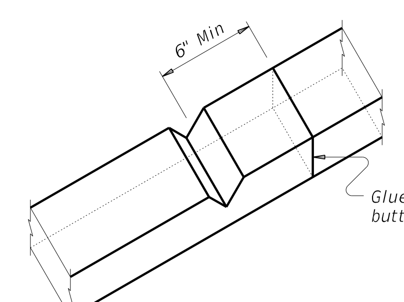
PRESTR CONC I-GIRDERS



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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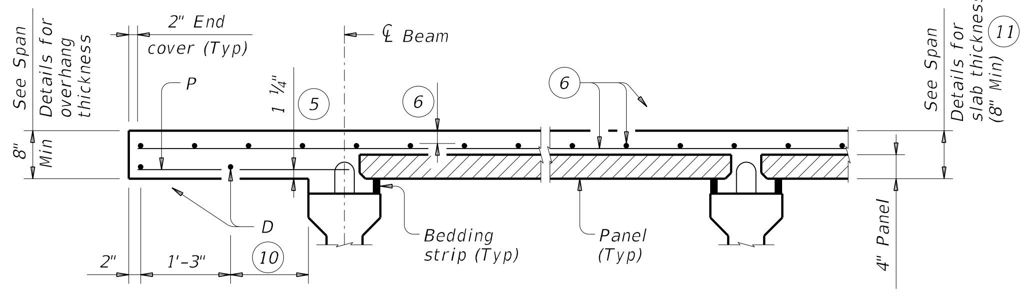
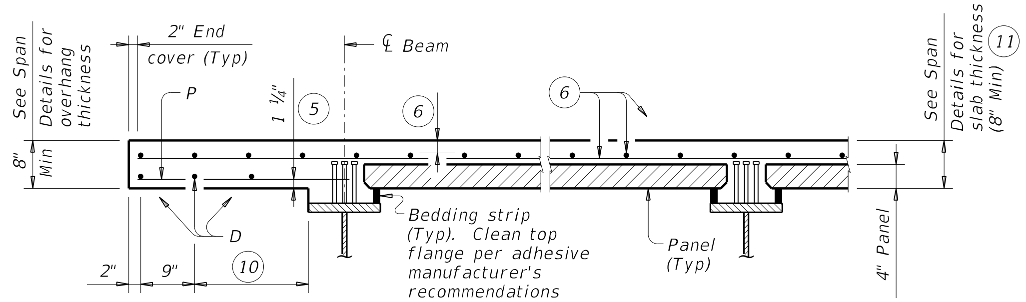
	BWD		EASTLAND	116

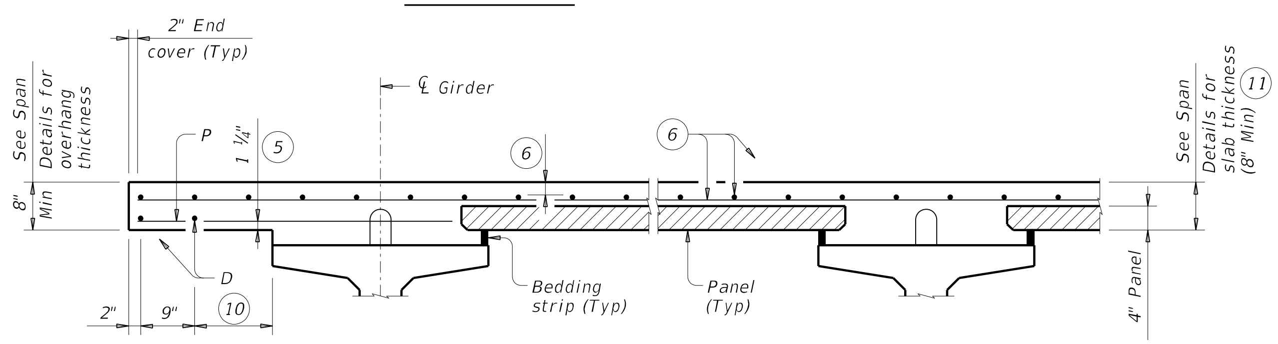
TYPICAL PART TRANSVERSE SECTIONS



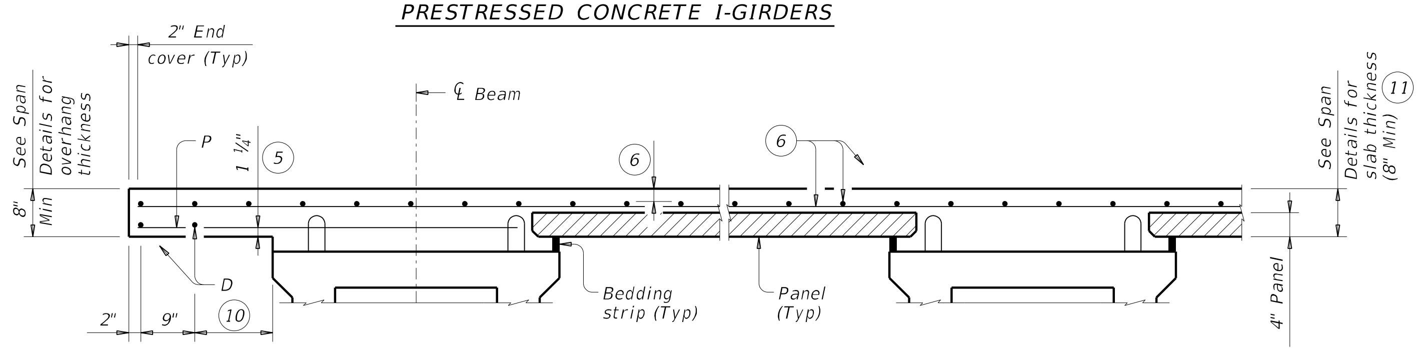
PRESTRESSED CONCRETE I-BEAMS



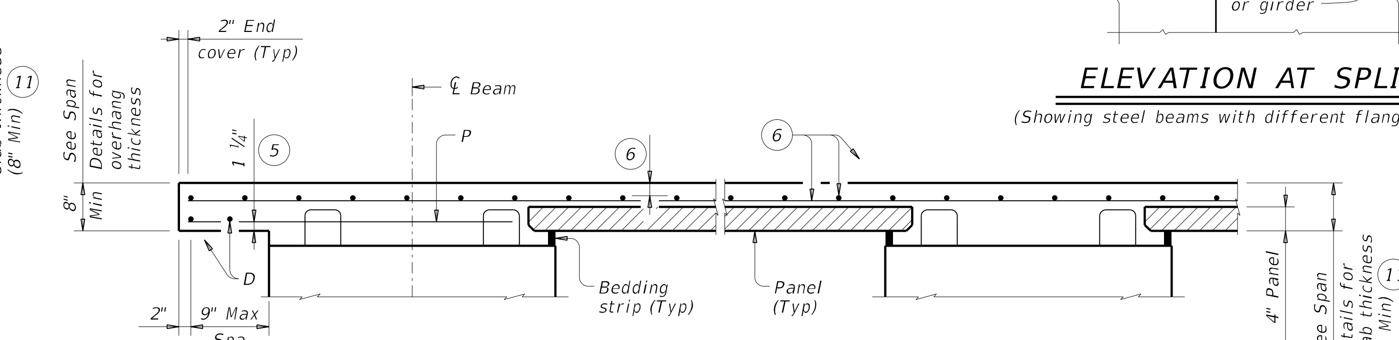
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS

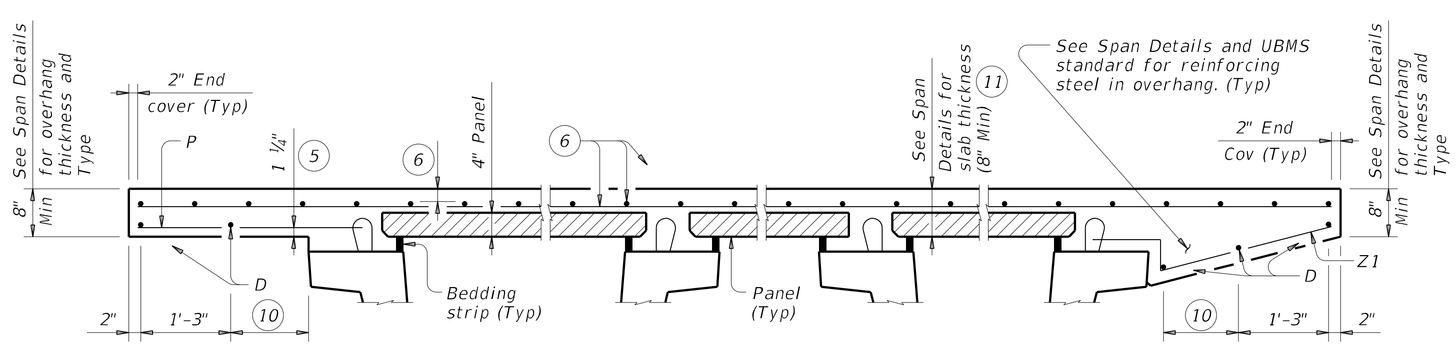


PRESTRESSED CONCRETE X-BEAMS



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.

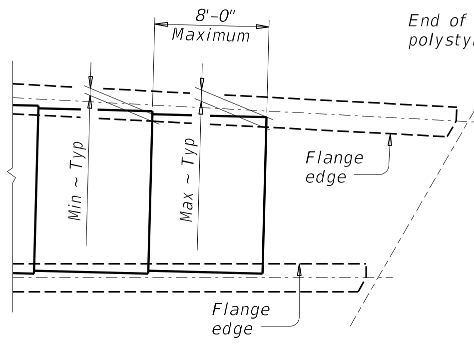


NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

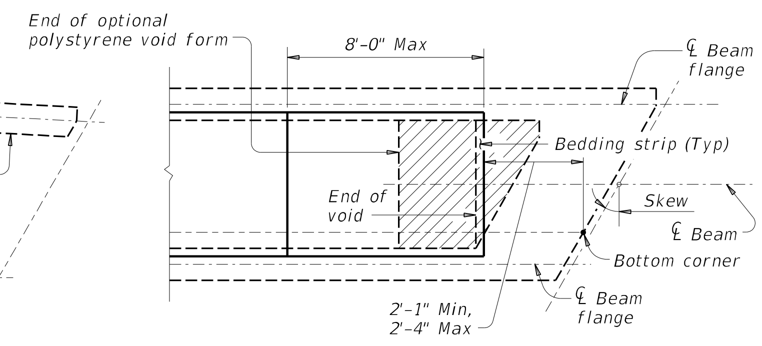
TYPICAL PART TRANSVERSE SECTIONS

PART PLANS OF PANEL PLACEMENT

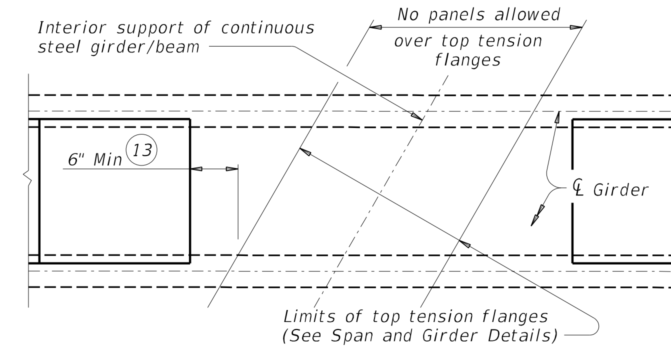


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on bemm/girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

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.

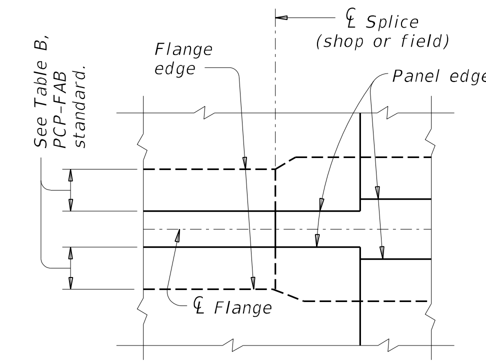
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(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.

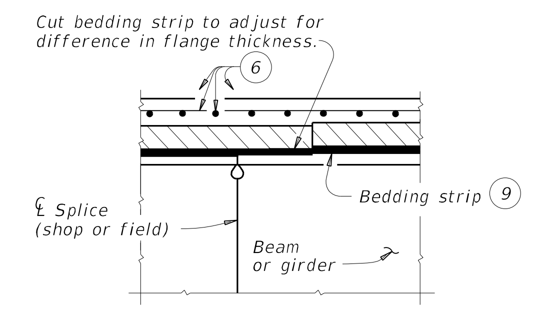
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



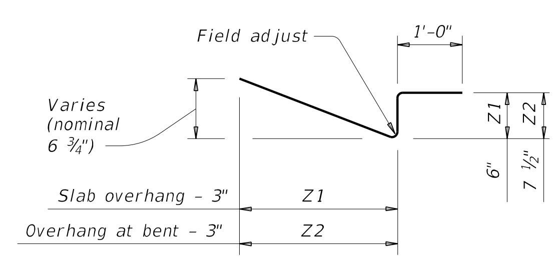
PLAN AT SPLICE

(Showing steel beams with flange width transition)



ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



BARS Z (#4) (12)

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP

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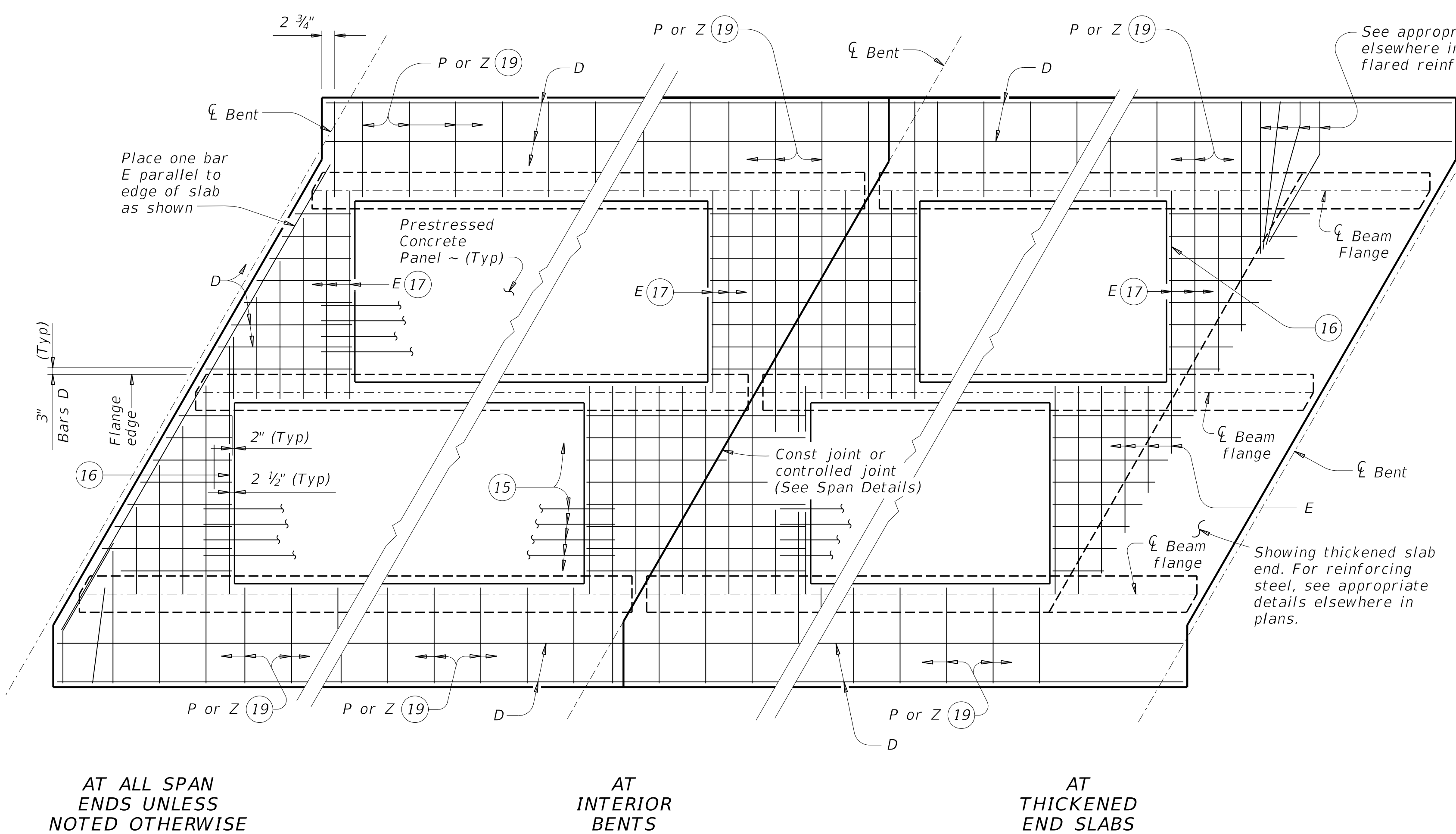
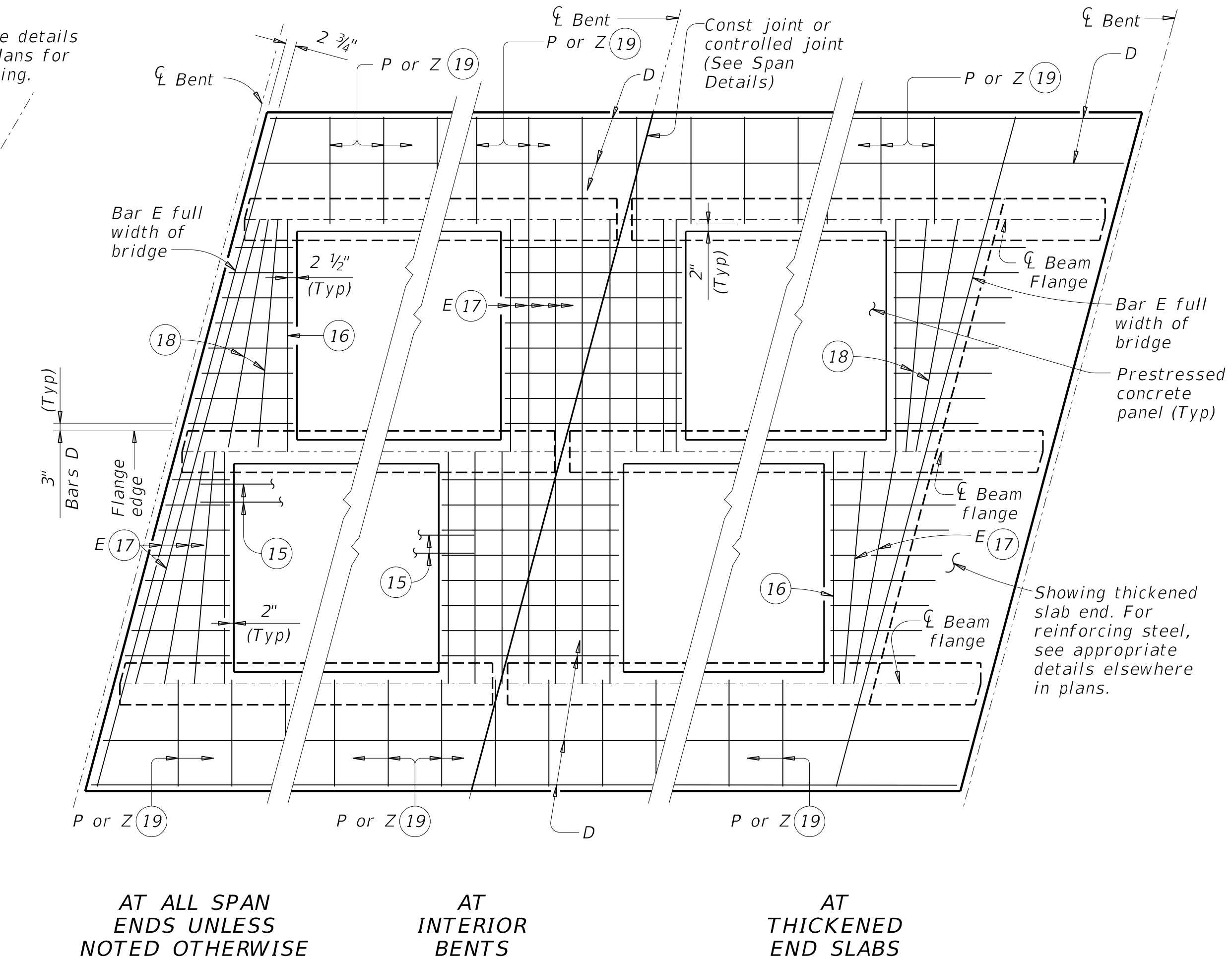
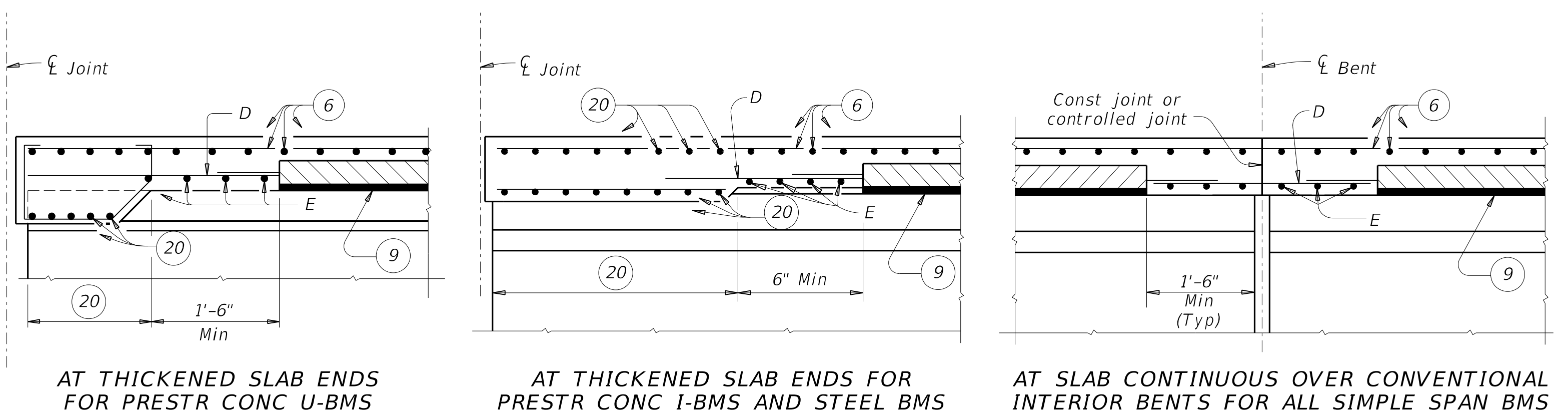
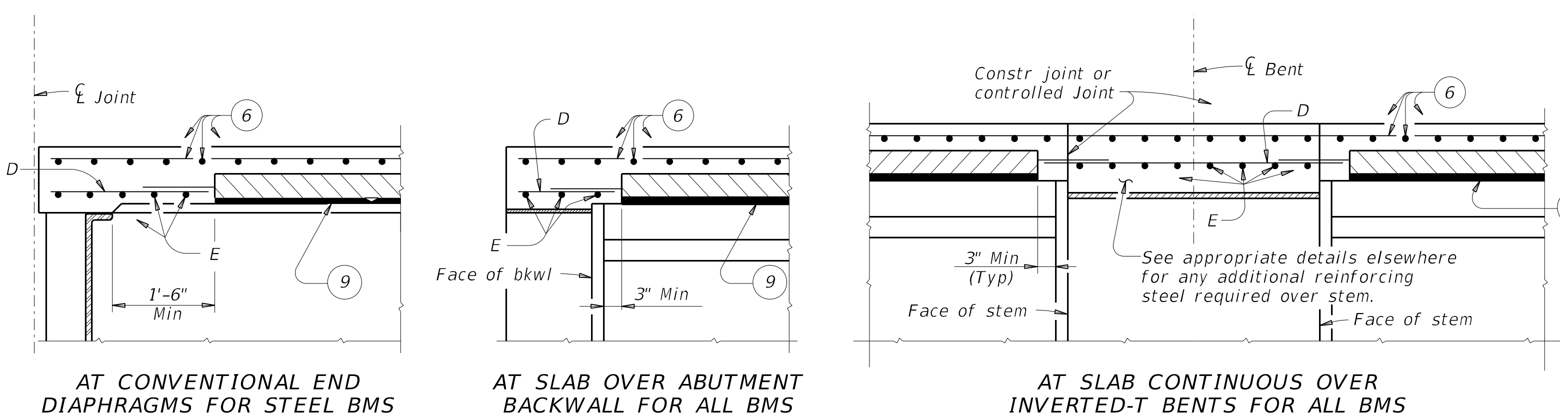


OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT



OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT





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

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PRESTRESSED CONCRETE PANELS
DECK DETAILS

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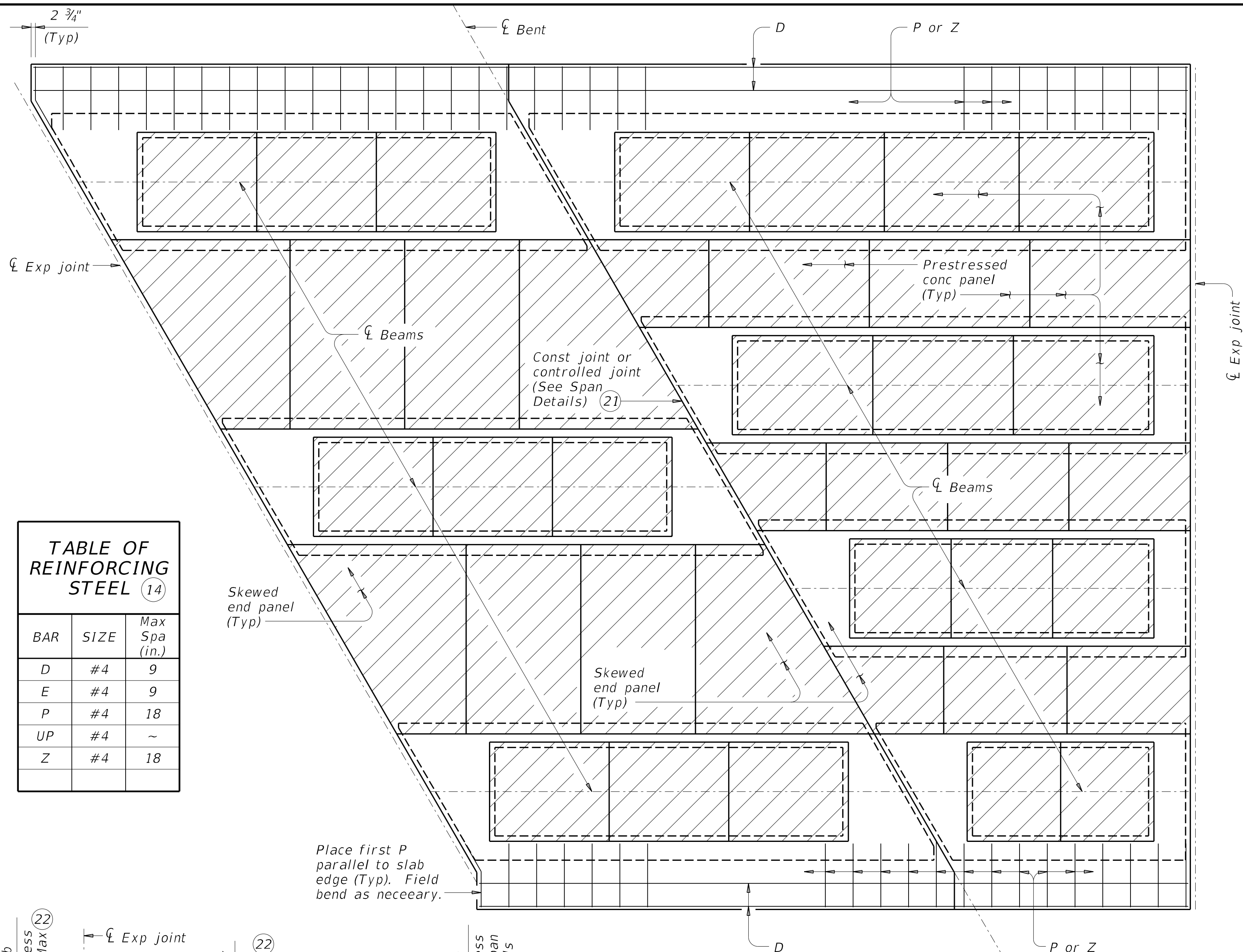
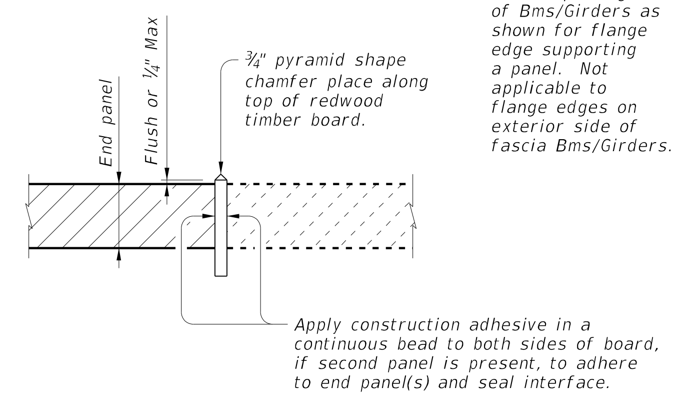


OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)

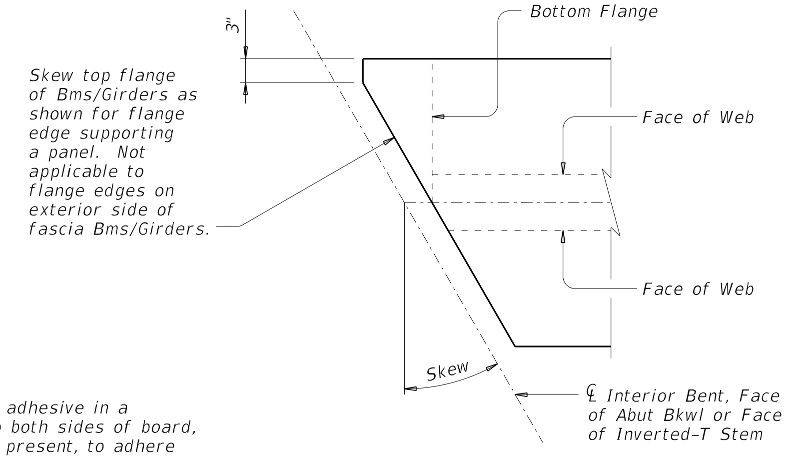
TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



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-Bm/I-Girder, U-Bms and Steel Bms 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.

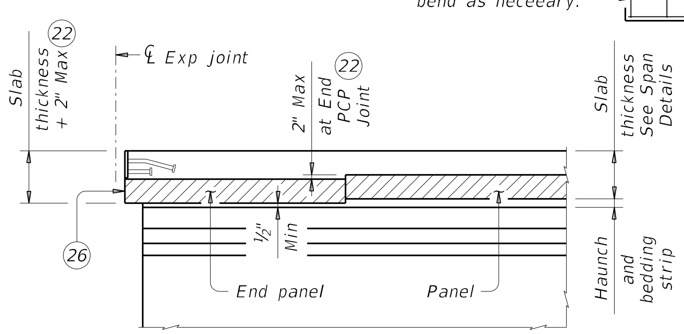
Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

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-A 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.

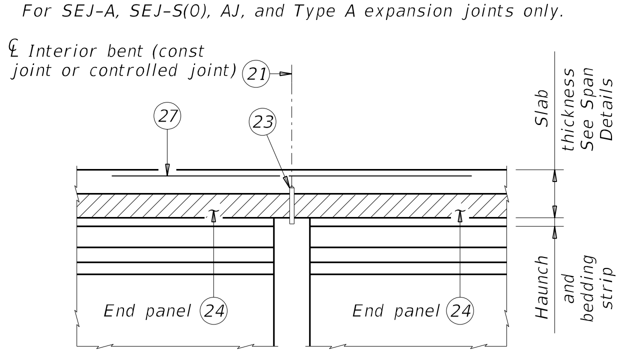
Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and OA from standard IGTS in the slab.



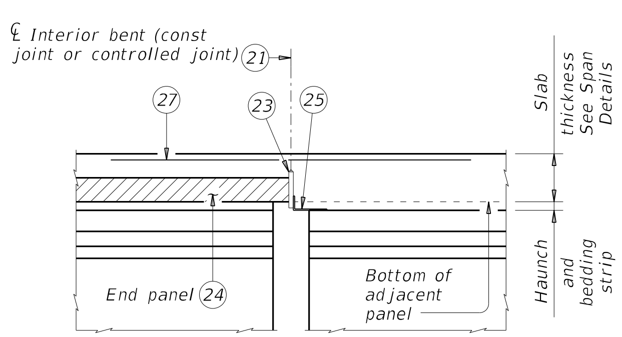
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



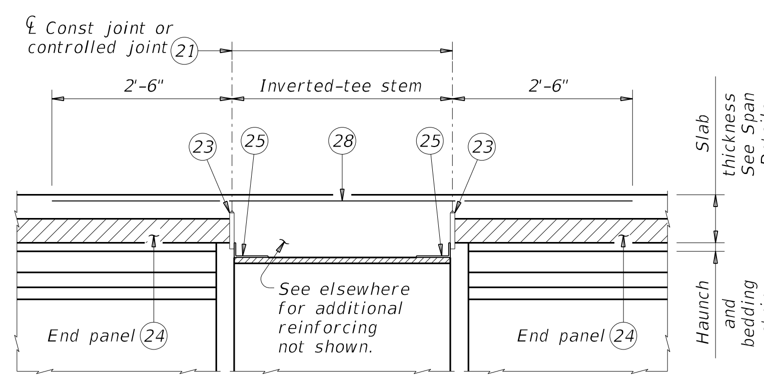
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

Panel against beam/girder end in adacent span.



INVERTED-T BENT

Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)

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PRESTRESSED CONCRETE PANELS

DECK DETAILS

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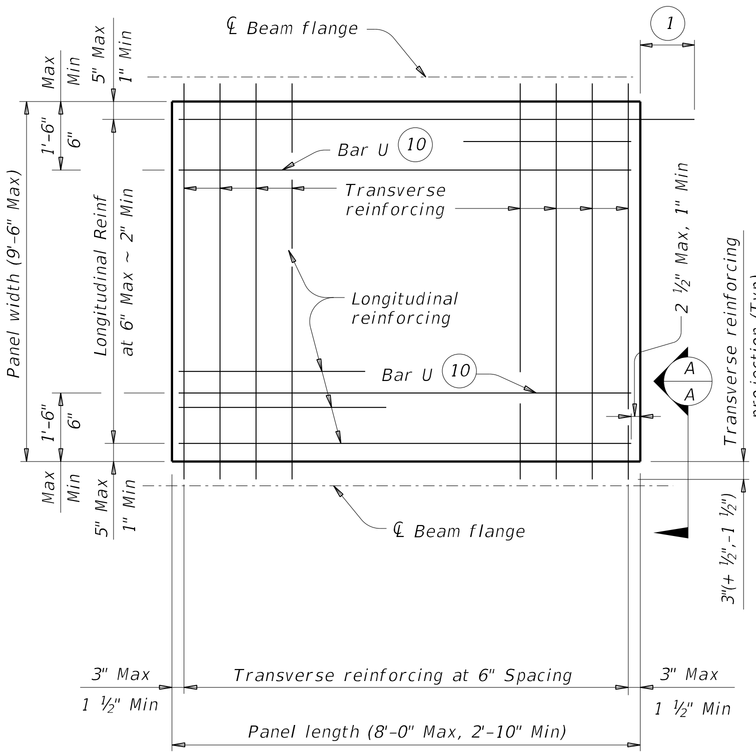
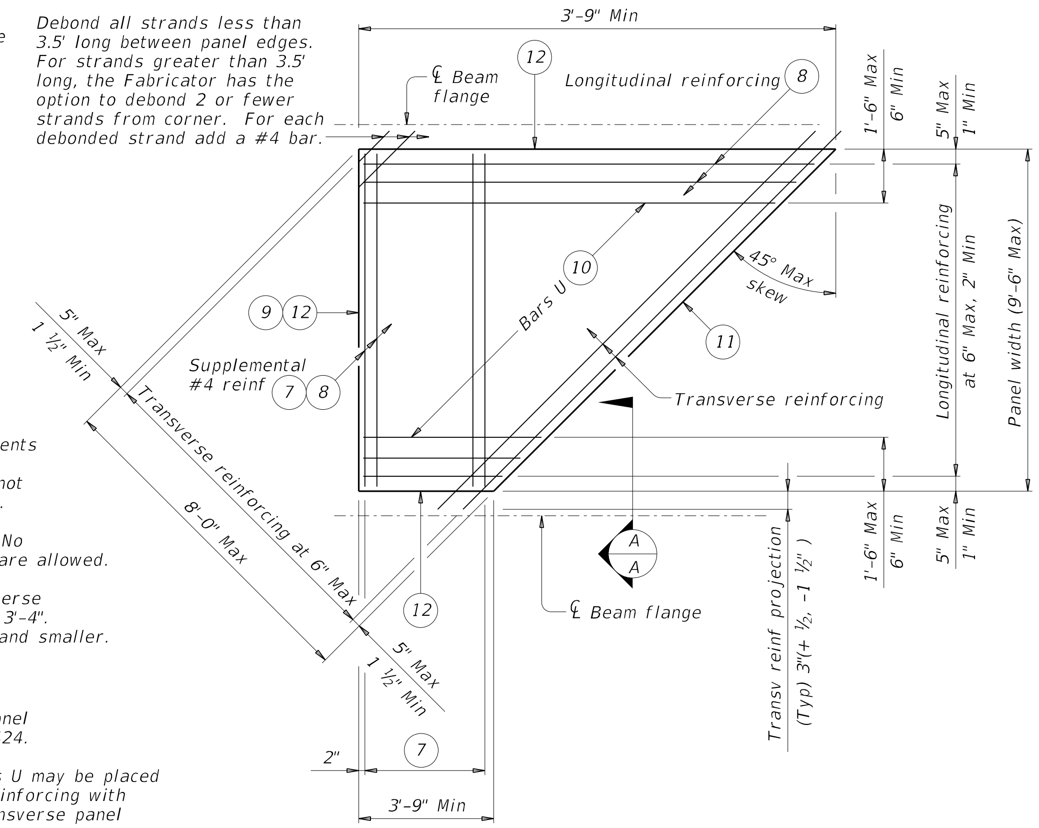


TYPICAL NON-SKEWED PANEL PLAN

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.

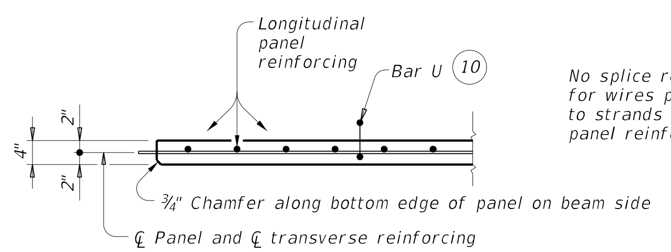


TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

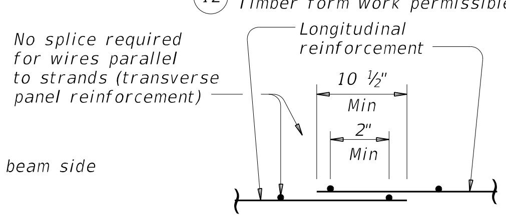
TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 - 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 - 40	4	3	4 ½
XSB12 - 15	4	3	4 ½

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

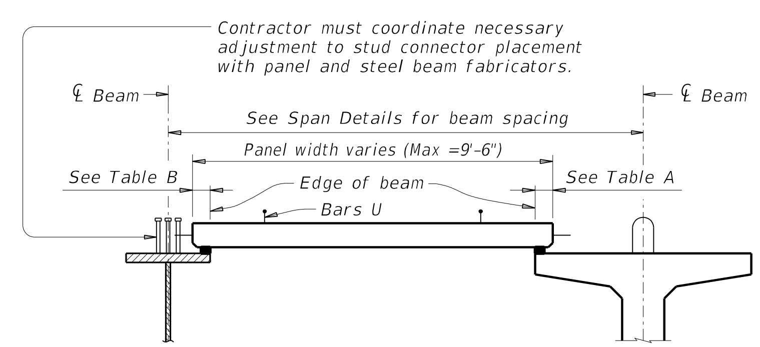


SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)



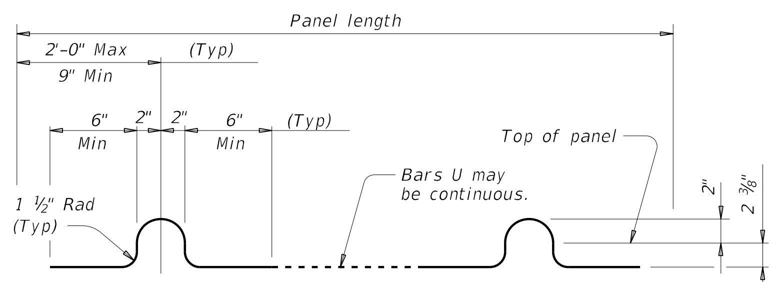
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



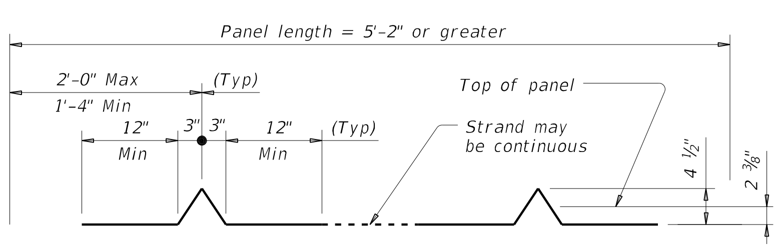
STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

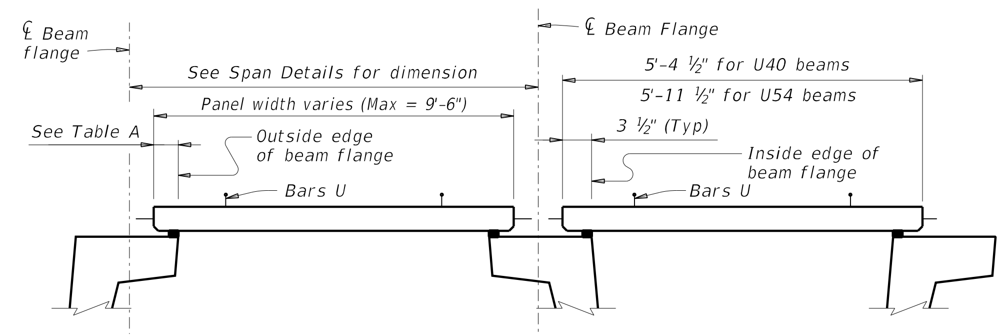
Typ unless noted otherwise



BARS U (#3) (2)



OPTIONAL STRAND FOR BARS U (3)



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

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.

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PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

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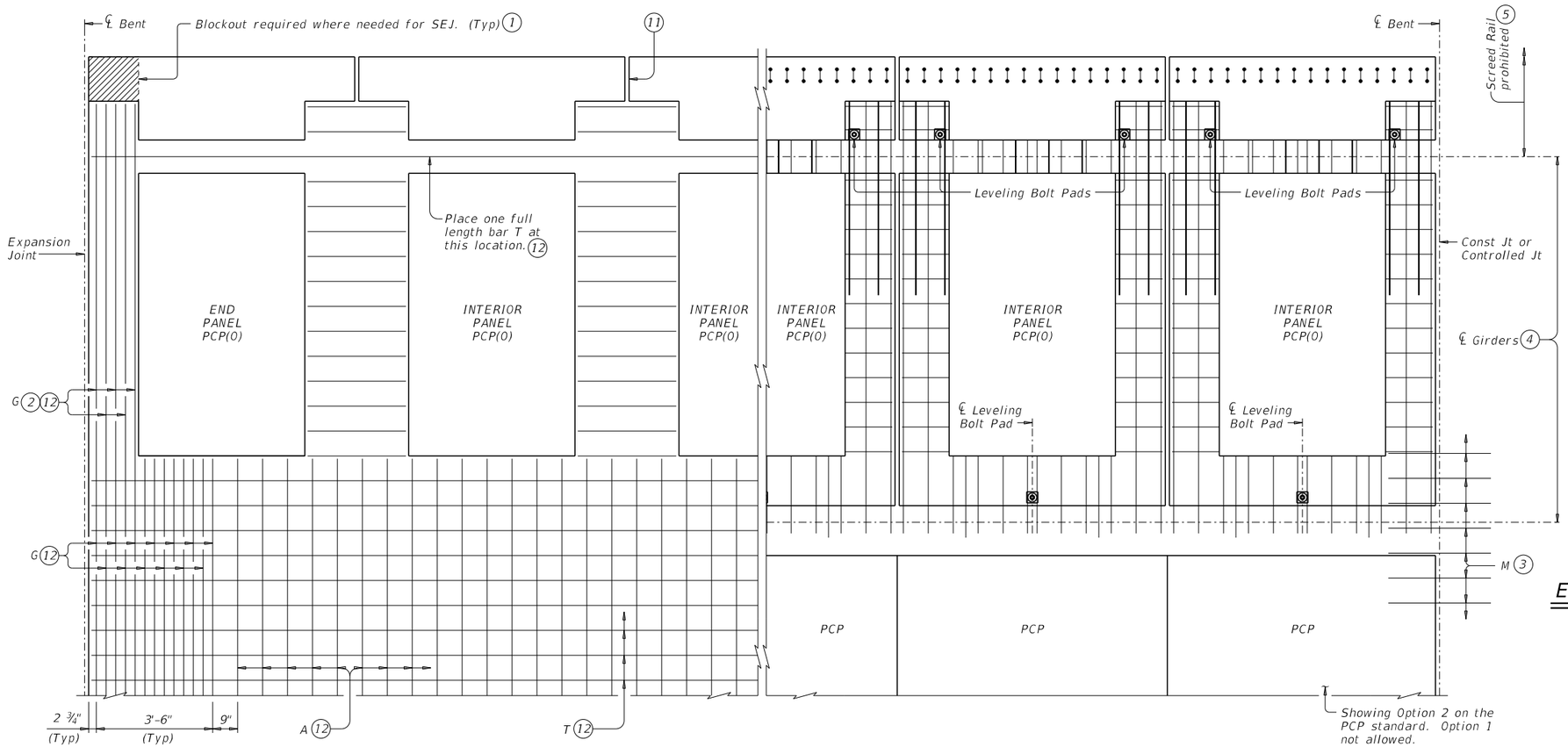


SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

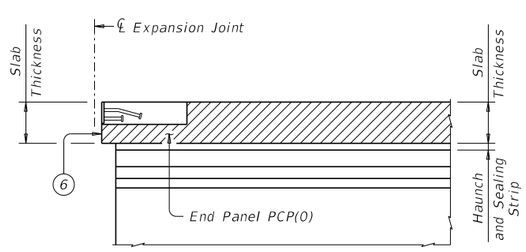
SHOWING PCP(0) EXPOSED REINFORCING STEEL

Field placed bars M shown for clarity.

PANEL LAYOUT

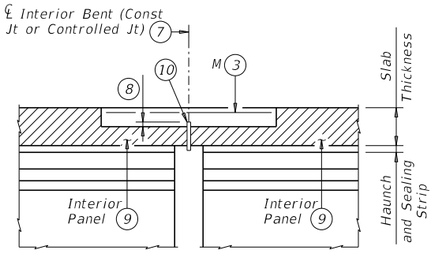
PCP(0) shown with gaps between panels for clarity.
The gap cannot be considered as a panel fabrication tolerance.

1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. When blockout is required, extend bars G into blockout.
3. Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 ~ Elevations At Beam Ends. Option 1 not allowed.
4. It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.
5. Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
6. Place end panel PCP(0) within ½" of expansion joint opening. Do not encroach on required expansion joint opening.
7. Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
8. 0" Min, ¾" Max, support as necessary.
9. Place panel within ½" of ¾" thick board.
10. ¾" thick wood/timber board, leave in place. Place straight, within ¼" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
11. Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
12. 1 ½" End Cover. (Typ)



EXPANSION JOINT

For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

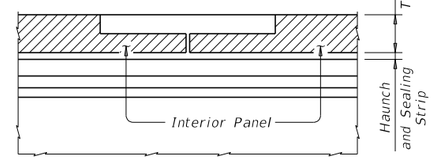


CONST JT OR CONTROLLED JT

Panel against Panel between Bms/Girders.

ELEVATIONS AT GIRDER ENDS WITH PCP(0)

Reinforcing steel not shown for clarity.



ELEVATION BETWEEN PCP(O)

The gap cannot be considered as a panel fabrication tolerance.
Reinforcing steel not shown for clarity.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

FILE: pcpostd1-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		121

DATE: 3/16/2021 12:19
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Structures/PCP(O).dgn

BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12)(17)	#4	9"
G (12)(17)	#4	3½"
M	#4	9"
T (12)(17)	#4	9"

(4) It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

(5) Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.

(12) 1 ½" End Cover on bars. (Typ)

(13) Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(14) 6" plus or minus.

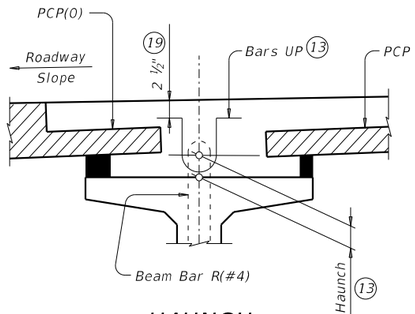
(15) Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.

(16) (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.

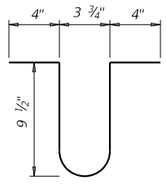
(17) Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.

(18) ℄ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(0) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 ½" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.

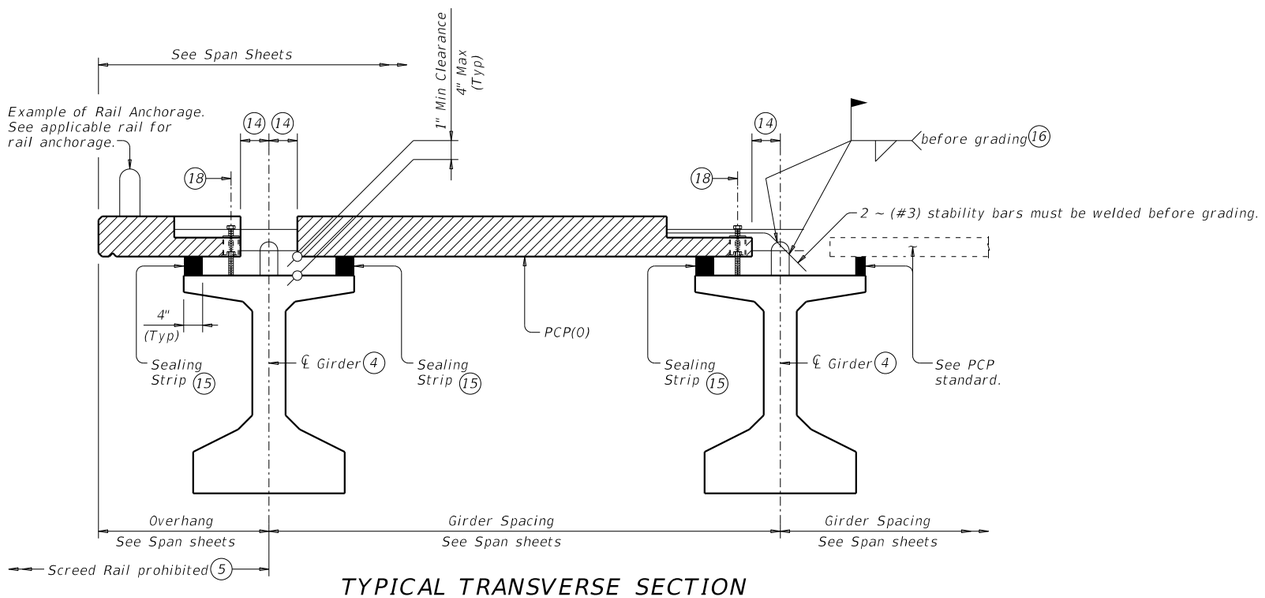
(19) Unless shown otherwise on Span Details.



HAUNCH REINFORCING DETAIL (4)



BARS UP (#4) (13)



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended.

Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed.

Panel placement with Option 1 on the PCP standard is not allowed.

It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required.

Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch ® 4693 or equivalent adhesive compatible with sealing strips.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(0)-FAB, PCP and applicable Standard sheets.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement or concrete required on these details is 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.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

FILE: pcpostd1-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		122

DATE: 3/16/2021 12:19
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Standards/Structures/PCP(0).dgn

BAR TABLE	
BAR	SIZE
A (2)	#4
B (2)	#4
D (2) (3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2) (3)	#8
T (2) (3)	#4

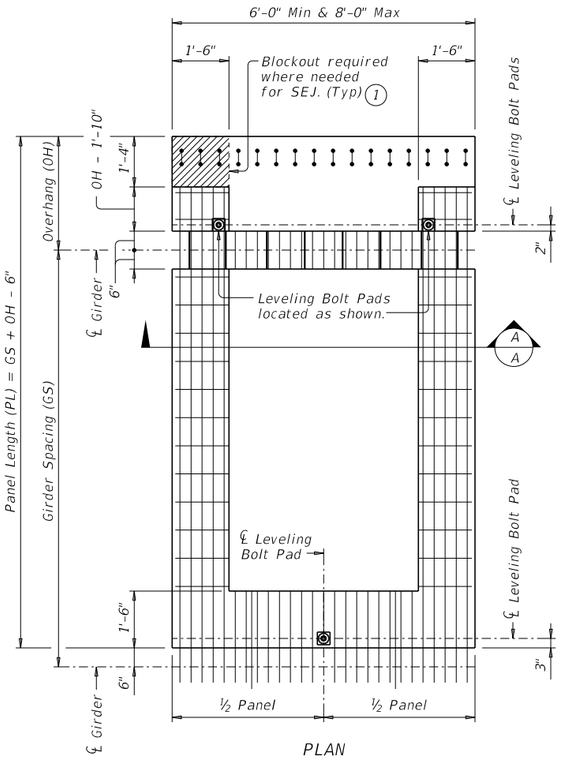
(1) 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.

(2) 1 ½" End Cover on bars. (Typ)

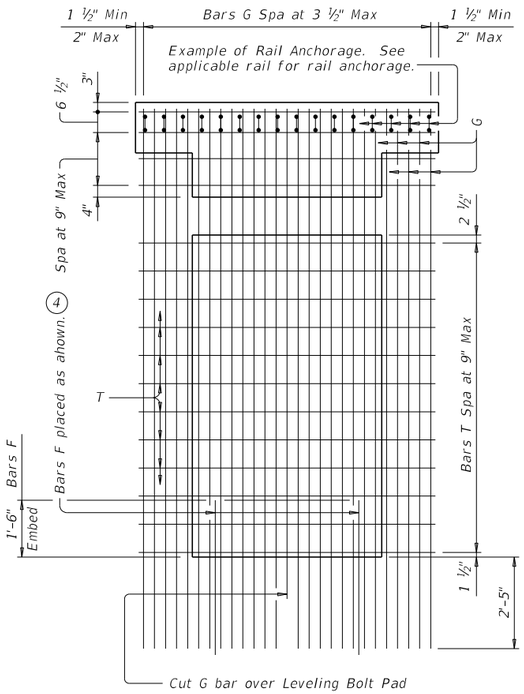
(3) Bars that are not allowed to have lap splices.

(4) Place F bars under bars T and against bars G.

(5) Place F bars under bars T and between bars A.

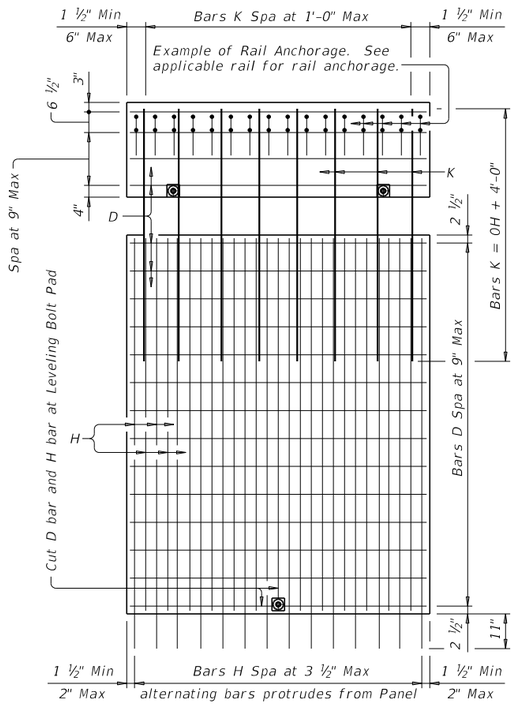


PLAN

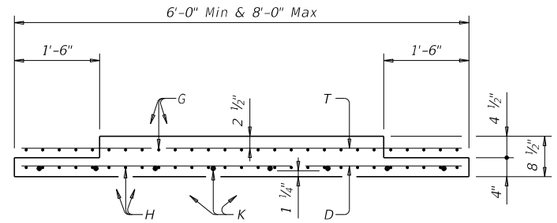


TOP REINFORCING STEEL

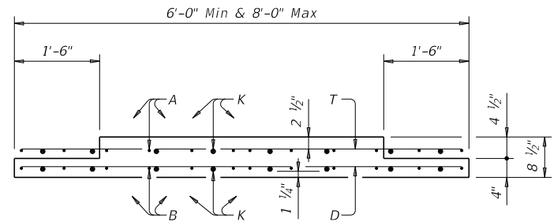
END PANEL



BOTTOM REINFORCING STEEL



SECTION A-A



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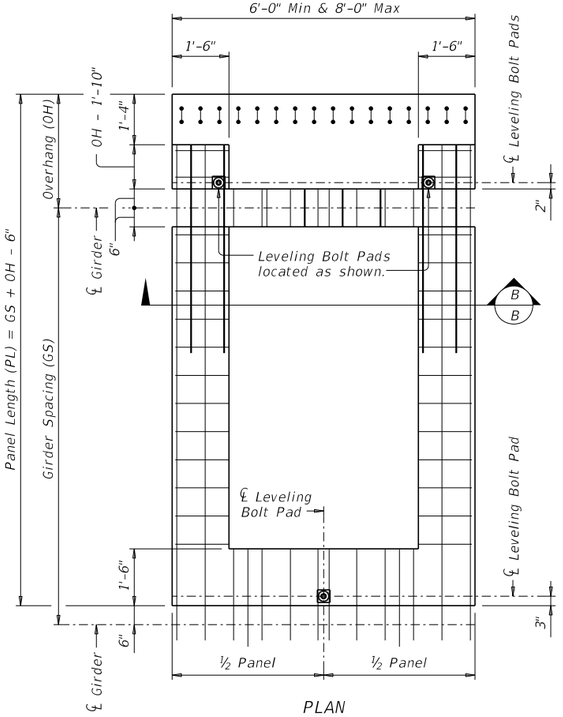
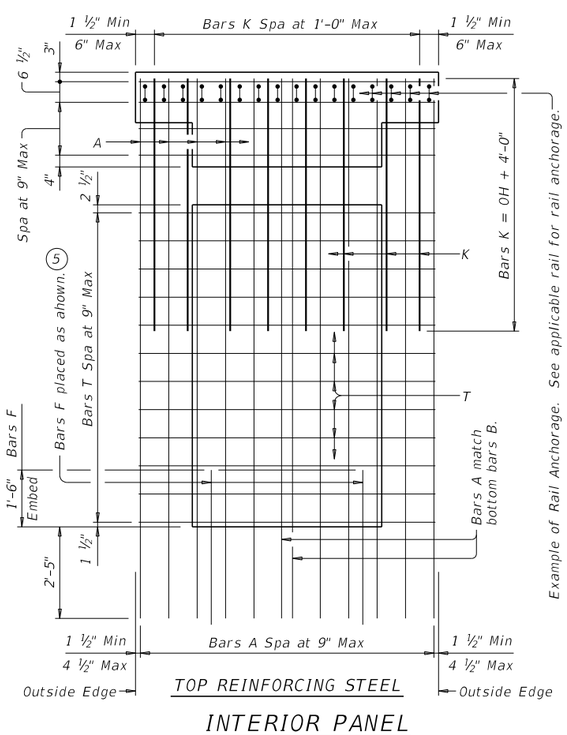
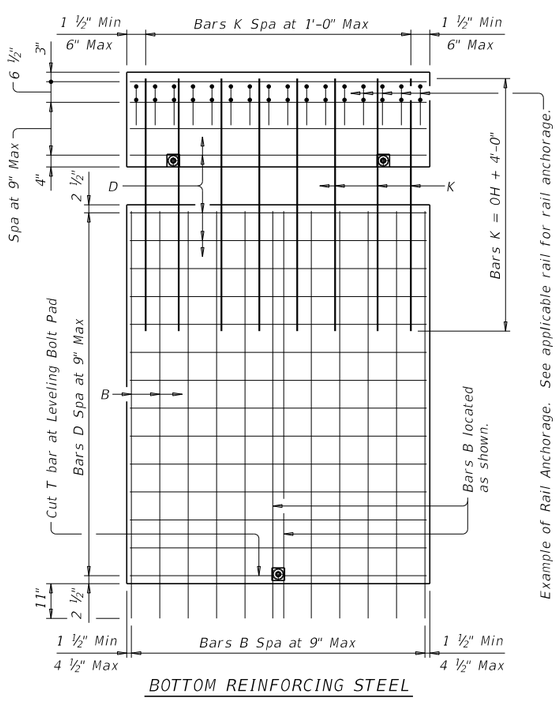


PLAN



TOP REINFORCING STEEL

INTERIOR PANEL



BOTTOM REINFORCING STEEL

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

FILE: pcpostd2-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
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REVISIONS	0288	03	032	SH 16
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	BWD	EASTLAND		123

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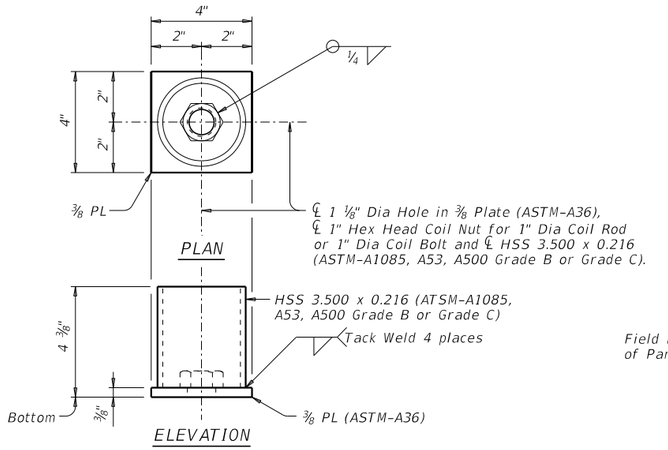
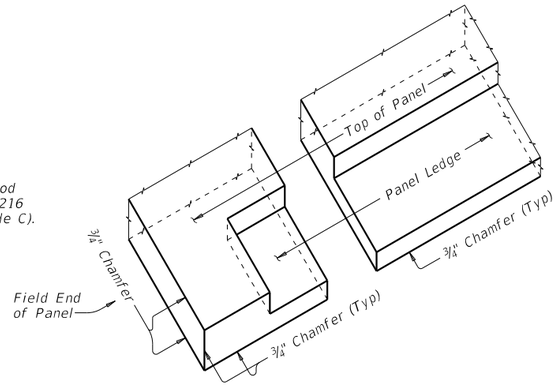


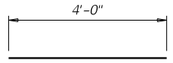
LEVELING BOLT PAD DETAILS

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.

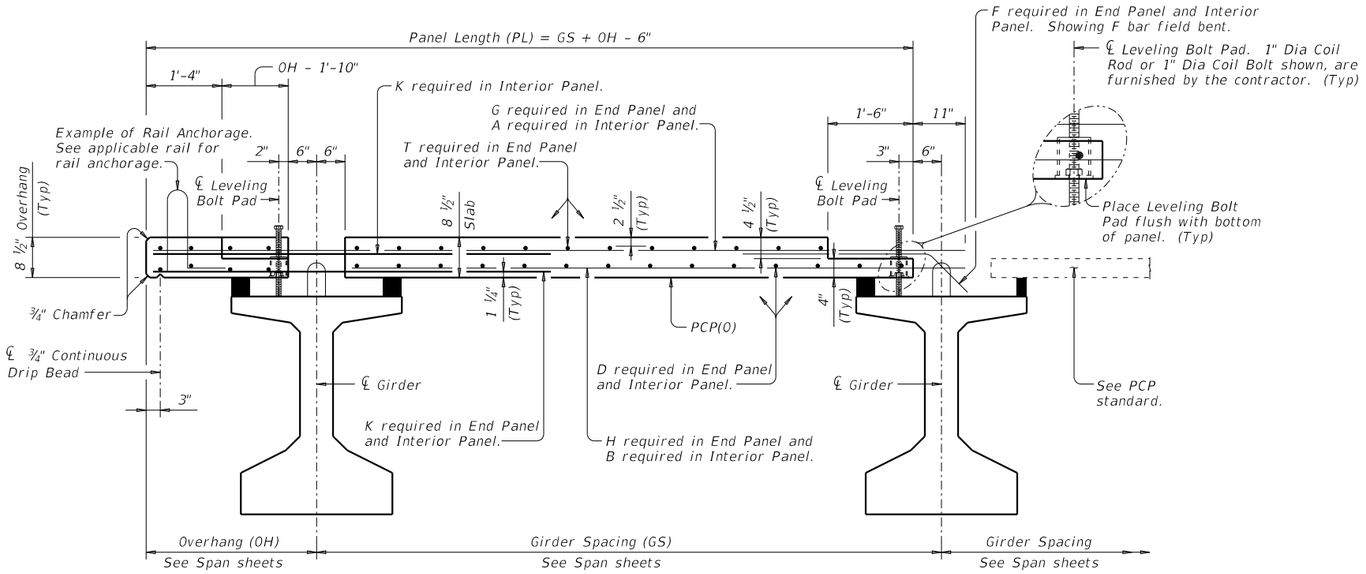


ISOMETRIC VIEW AT CORNER OF PANEL

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



BARS F



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION/FABRICATION NOTES:

Remove laitance from top panel surface.

Finish top surface area of panel with a broom finish. Finish top ledge 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).

Provide ¾" concrete chamfers as shown on these details.

Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.

Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

MATERIAL NOTES:

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".

Provide material as shown on this standard for the Leveling Bolt Pad.

Provide Grade 60 conventional reinforcing steel.

Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.

An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.

Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".

See railing details for rail anchorage in panel overhang.

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.

Submit stable lifting methods and devices to the Engineer for approval.

Shop drawings for the fabrication of panels will require the Engineer's approval.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

FILE: pcpostd2-17.dgn	DN: KLM	CK: DVL	DW: JTR	CK: KLM
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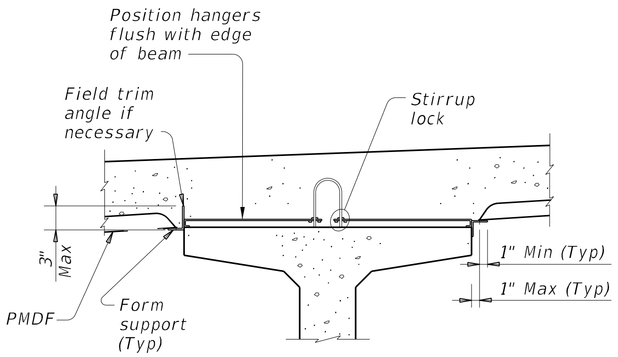
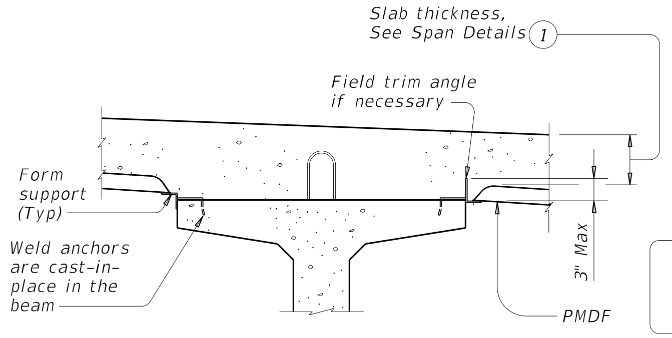
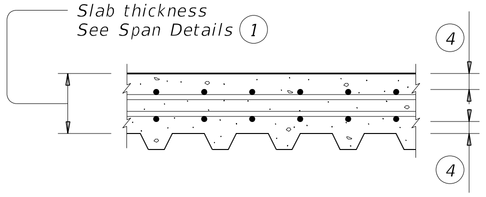


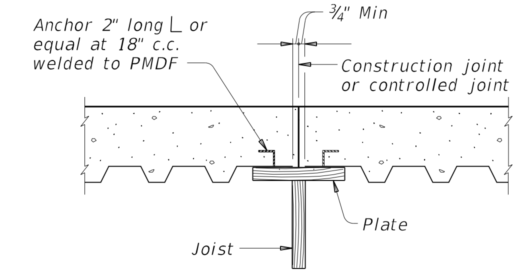
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



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

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'.

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 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.

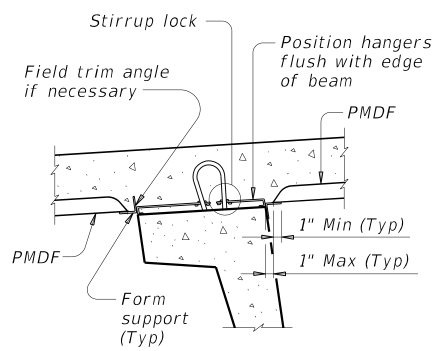
Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

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.

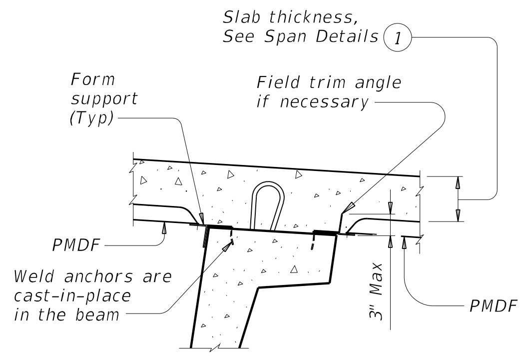
Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

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.

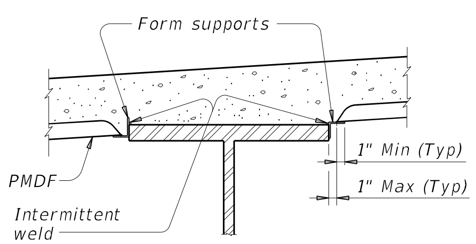


U-BEAMS WITH STIRRUP LOCKS

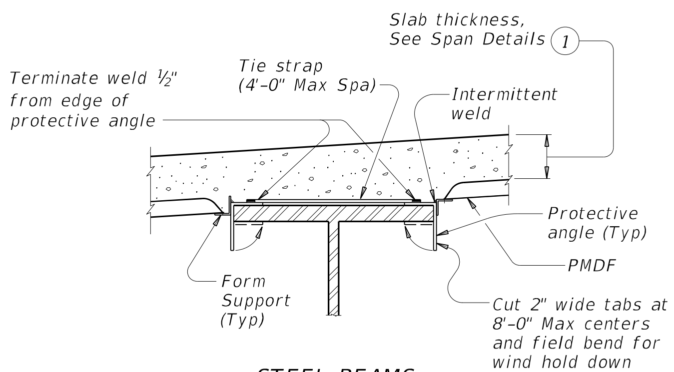


U-BEAMS WITH WELD ANCHORS

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.

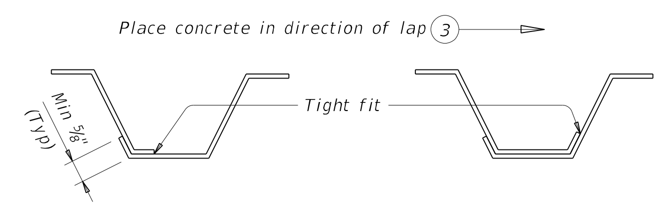


STEEL BEAMS AT COMPRESSION FLANGES



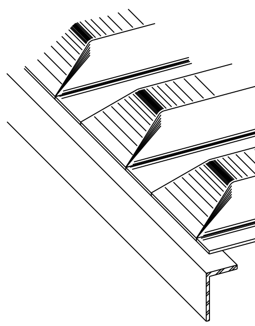
STEEL BEAMS AT TENSION FLANGES 2

TYPICAL TRANSVERSE SECTIONS



SIDE LAP DETAILS

1. Slab thickness minus ⅜" 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.



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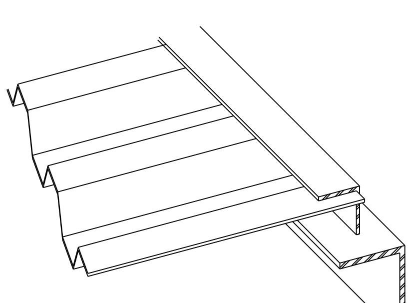

ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES

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".

SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	125

DATE: 3/16/2021 12:19
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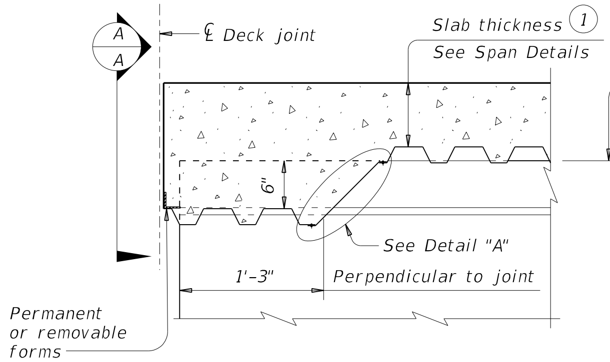
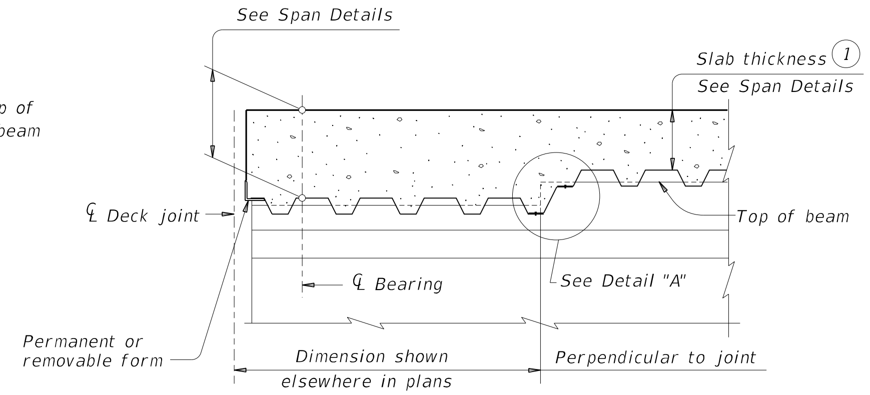
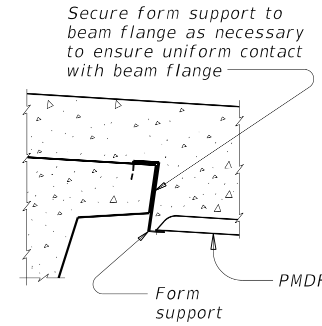


AT THICKENED SLAB END
FOR U-BEAMS

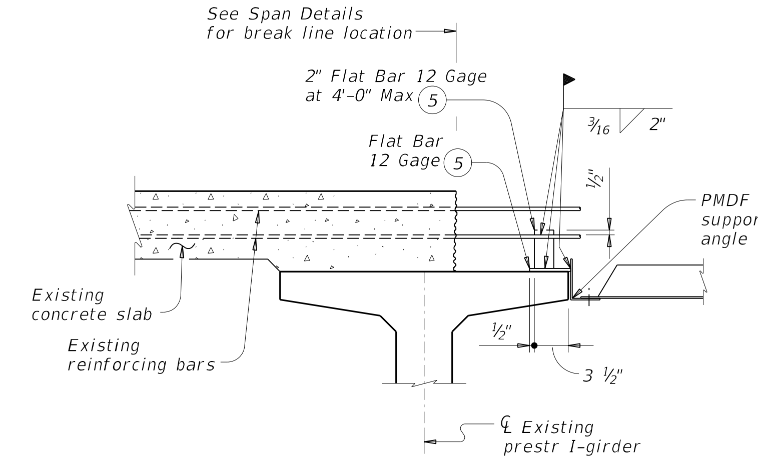


AT THICKENED SLAB END
FOR PRESTRESSED I-BEAMS,
I-GIRDERS AND STEEL BEAMS

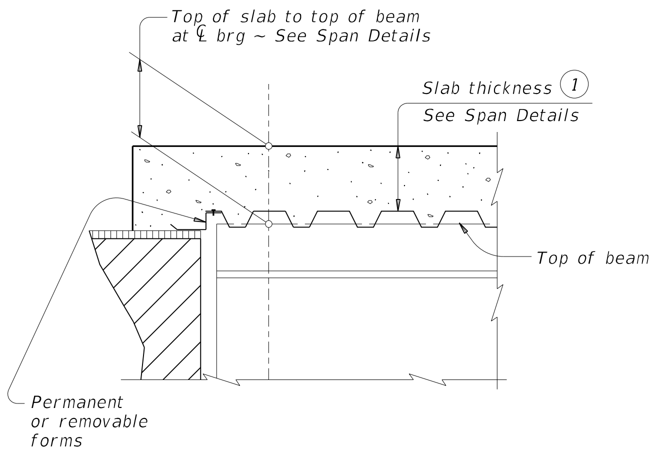
Showing I-beam block-out. No block-out for I-girders or steel beams.



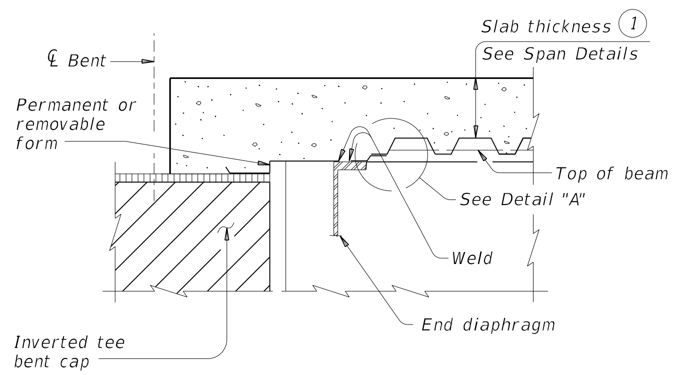
SECTION A-A



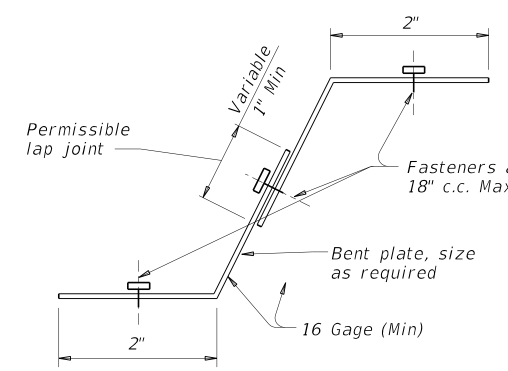
SHOWING PRESTRESSED CONCRETE
I-BEAMS, I-GIRDERS AND U-BEAMS



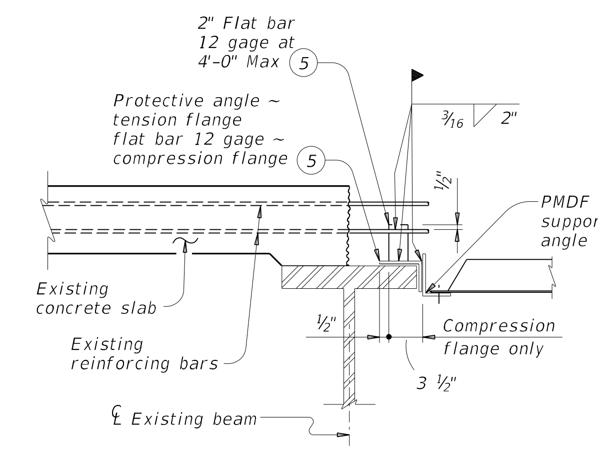
AT SLAB OVER ABUT BKWL OR
INV TEE STEM FOR CONC BEAMS
WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM
FOR STEEL BEAMS
WITHOUT THICKENED SLAB END

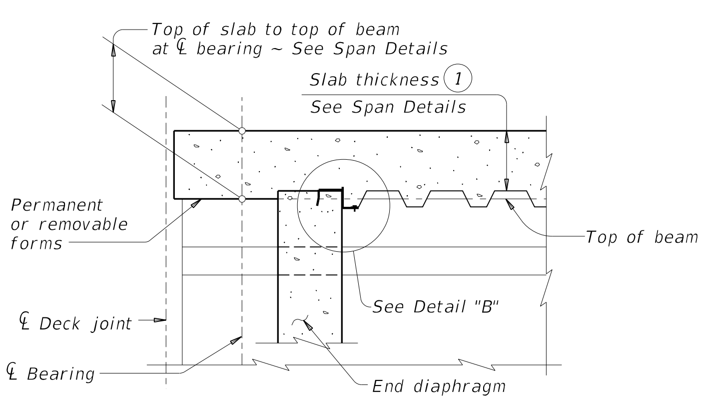


DETAIL "A"

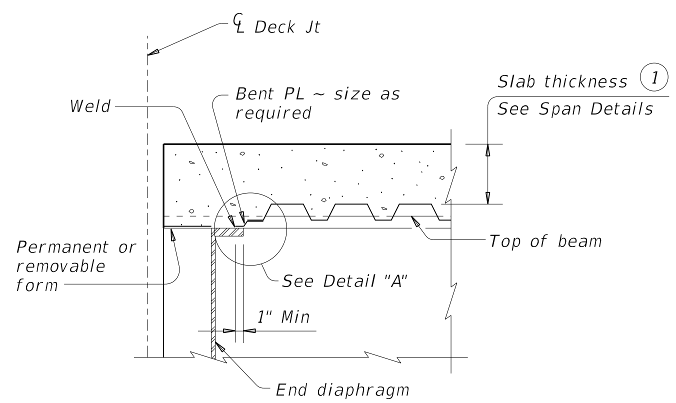


SHOWING STEEL BEAMS

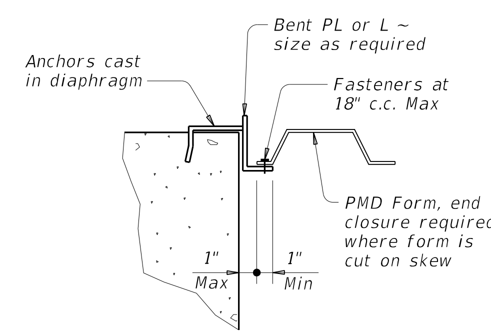
WIDENING DETAILS



AT CONC END DIAPHRAGM
FOR PRESTRESSED I-BEAMS
AND STEEL BEAMS



AT END DIAPHRAGM
FOR STEEL BEAMS
WITHOUT THICKENED SLAB END



DETAIL "B"

DETAILS AT ENDS OF BEAMS

(1) Slab thickness minus ⅜" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

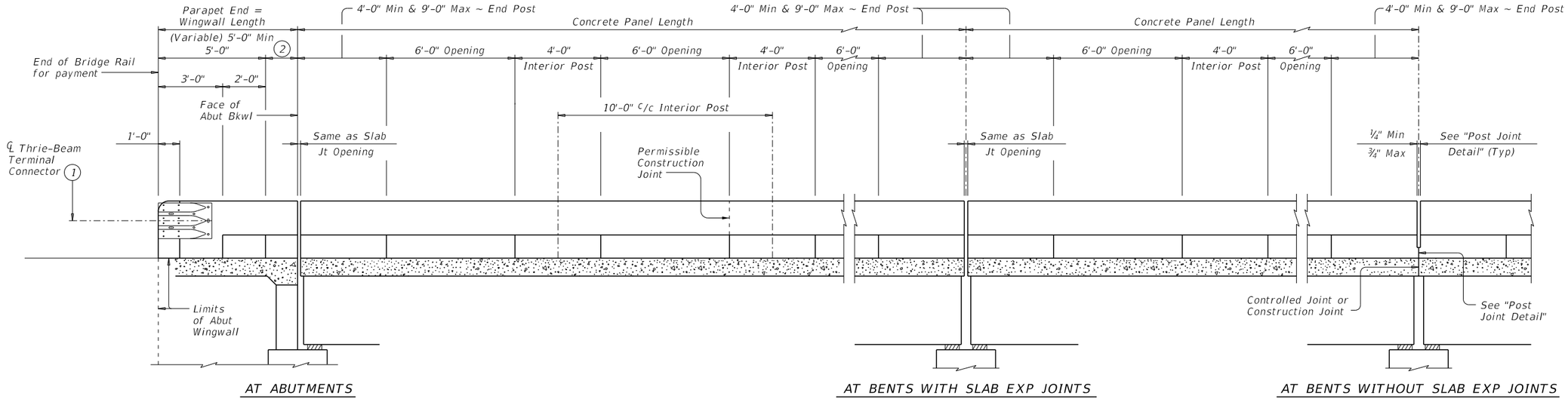
Texas Department of Transportation | Bridge Division Standard

PERMANENT METAL DECK FORMS

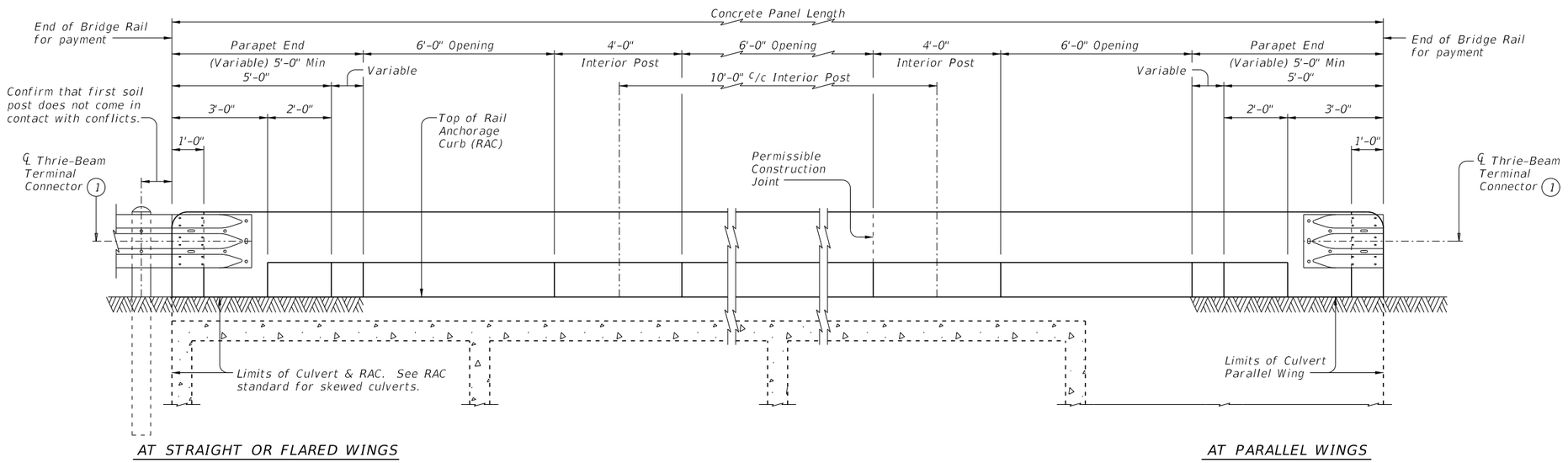
PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	126

DATE: 3/16/2021 12:19
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH



ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

(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) *Wingwall Length minus 5'-0" (Varies)*

DATE: 3/16/2021 12:19
FILE: pw://ts-pw.bentley.com:ts-pw-01/Documents/0223.001 WA 1 - CR FM SH of other files/rlstd005-19.dgn

SHEET 1 OF 3

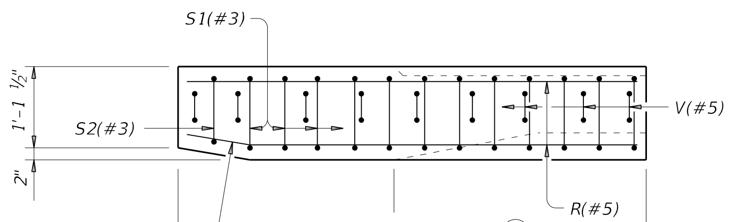
Texas Department of Transportation

Bridge Division Standard

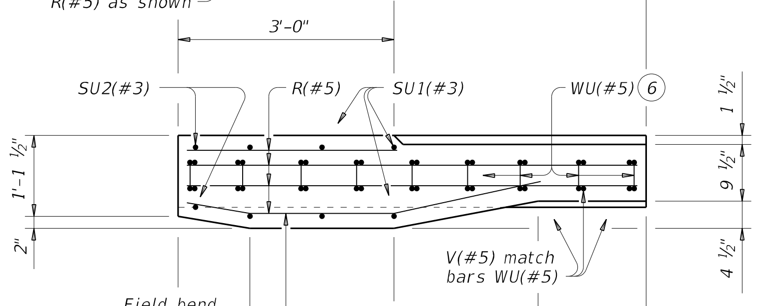
TRAFFIC RAIL

TYPE T223

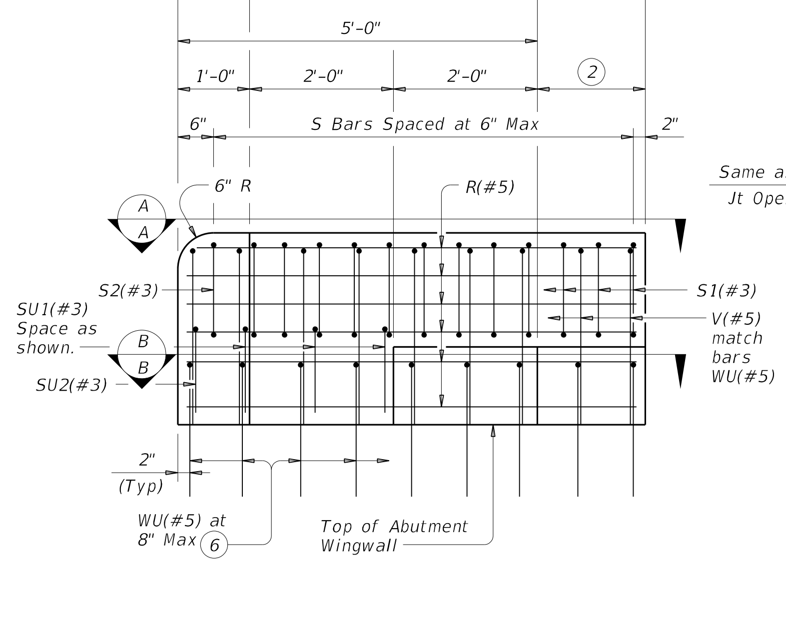
FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		127



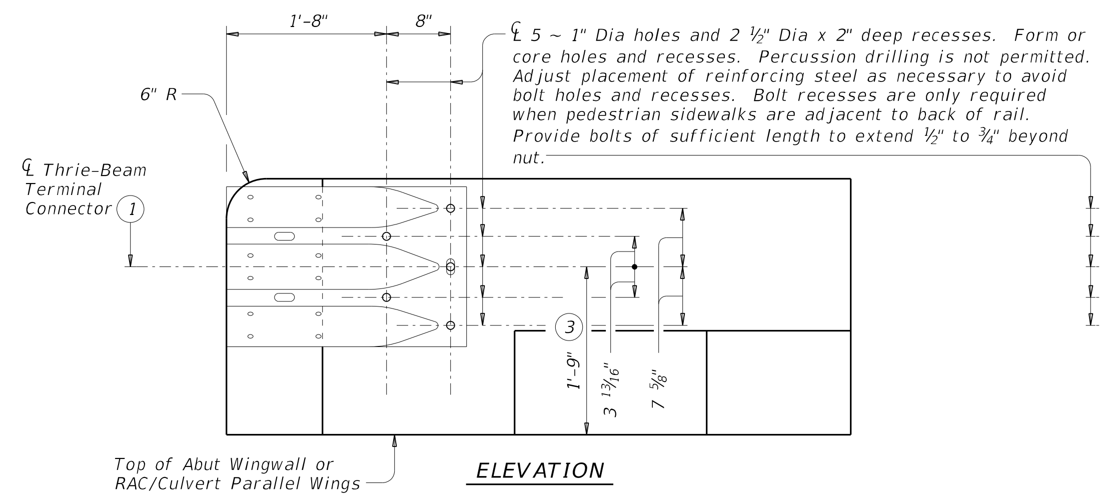
SECTION A-A (5)



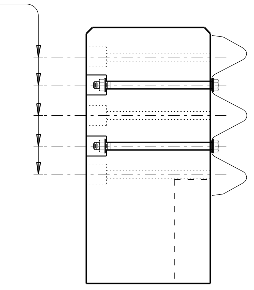
SECTION B-B



PARAPET END
AT ABUT WINGWALL (6)

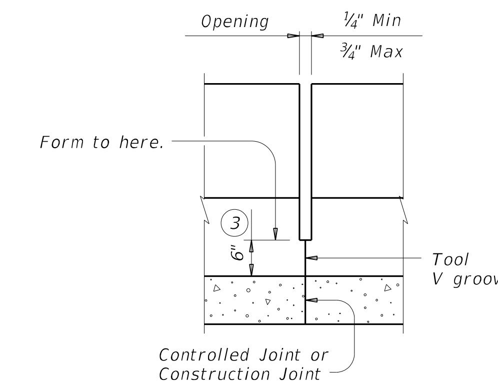


ELEVATION



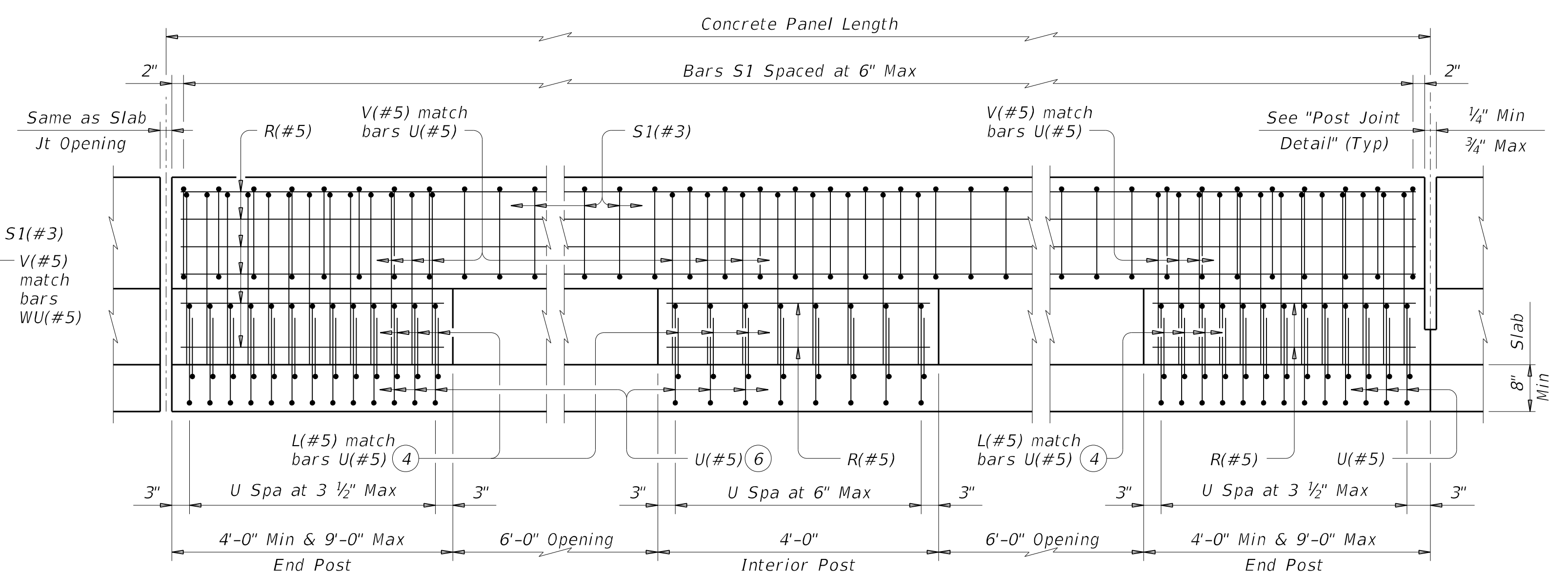
SECTION

TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



AT SLAB
EXPANSION JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT
SLAB EXPANSION JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(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) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on achorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

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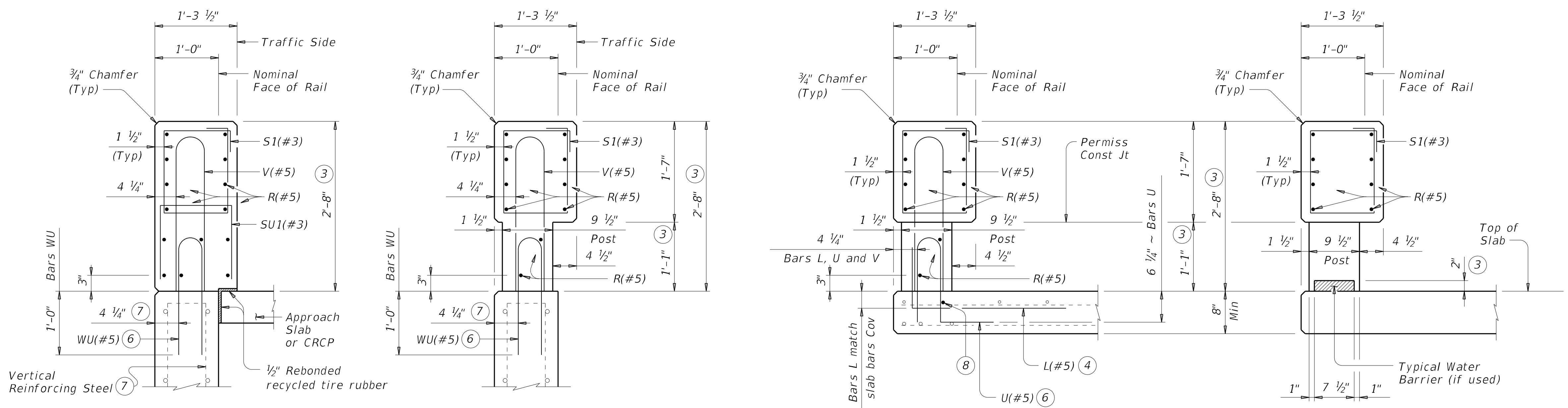
Texas Department of Transportation — Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		128



SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

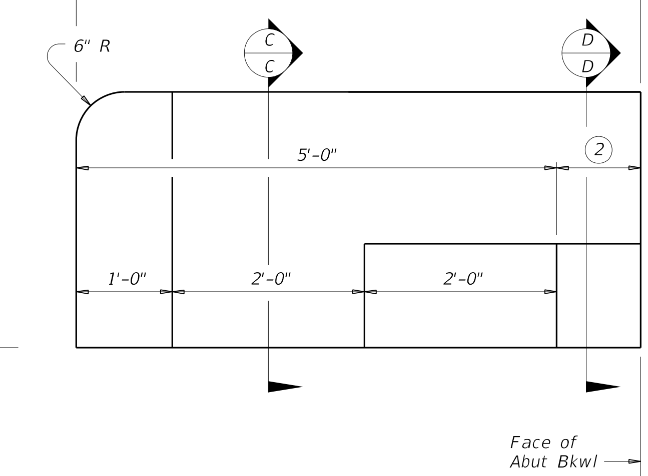
SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL

Sections on box culverts similar.



ELEVATION AT ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

Chamfer all exposed corners.

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 Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

This rail has been evaluated by full-scale crash test to meet MASH TL-3 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 are not required for this rail.

Average weight of railing with no overlay is 358 plf.

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

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

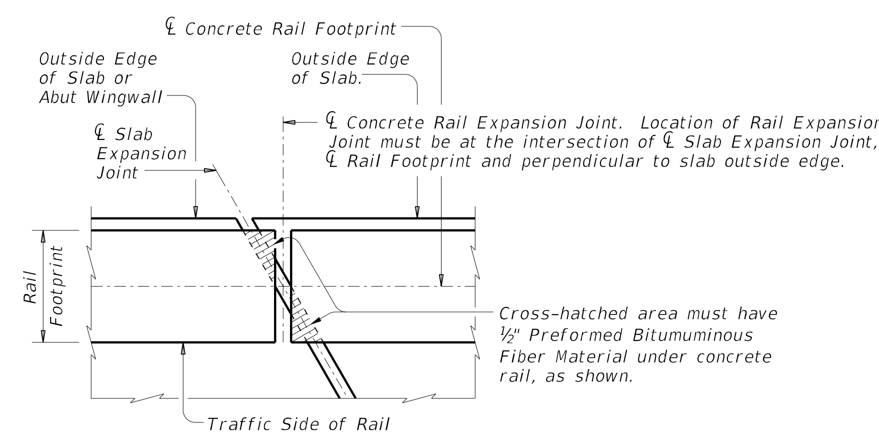
(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

(7) When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.

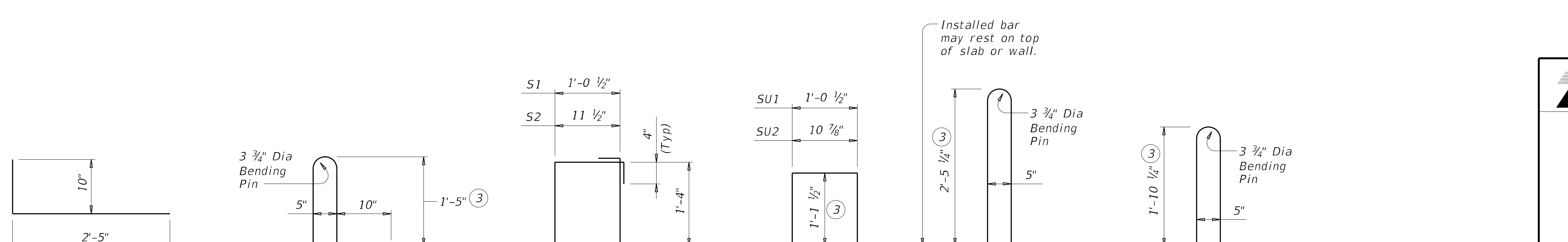
(8) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(9) At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway surface without overlay.



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.



BARS L (#5)

BARS U (#5) (9)

BARS S (#3)

BARS SU (#3)

BARS V (#5) (9)

BARS WU (#5)

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0288	03	032	SH 16
	DIST		COUNTY	SHEET NO.
	BWD		EASTLAND	129

During the planning phase of project development the following environmental permits, issues, and commitments have been developed during coordination with resource agencies, local governmental entities, and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities, as additional environmental clearances may be required.

I. Clean Water Act, Sec. 402 Texas Pollutant Discharge Elimination System

(Addresses CGP and MS4 Storm Water requirements for the project.)

(In the event that the Contractor implements a PSL on or within one mile of the project, a Site Notice and/or a NOI will apply.)

☐ No Action Required ☑ Required Action

Action No. 1

The project disturbs less than one acre of surface area. The contractor is responsible for the PSL as defined in the Standard Specifications for construction and Maintenance of Highways, Street, and Bridges (2014 Edition, Section 7.7.6, Page 42). The total disturbed acreage is the combined acreage to be disturbed on the project and the contractor's PSL.

The EPIC must be updated if the disturbed area increases to one or more acres during the course of construction (refer to following sections). It may become necessary to post a site notice and/or NOI for the project and/or PSL.

Commitment No. 1

Refer to the SW3P Plan Sheet, BMPs and Detail. It will address sweeping, chemical storage, sanitary waste, and all other management practices.

MS4 operators that receives discharge from the project: -N/A-

II. Clean Water Act, Section 401 and 404 Compliance

(Addresses Nationwide Permits, Individual Permits, and Wetlands.)

(Filling, dredging, or excavating in any water bodies, rivers, creeks, streams, wetlands, or wet area is prohibited unless specified in the USACE permit and approved by the Engineer.)

(When temporary fill is implemented, only stated TxDOT standards will be used unless written authorization for an alternative is obtained from the Engineer. No equipment is allowed in any stream channel below the Ordinary High Water Mark except on temporary stream crossings or drill pads.)

☐ No Action Required ☑ 404 Permit and 401 Certification Required

Permit	Required Action	Waters of the US	App. Plan Sheet(s)
NWP #14	Adher to permit and associated general conditions	Bear Creek	SW3P Layout

Best Management Practices for applicable 401 General Conditions:

General Condition 12 - Categories I and II BMPs required

Category I (Erosion Control)

- ☑ Temporary Vegetation
- ☐ Mulch
- ☐ Interceptor Swale
- ☐ Erosion Control Compost
- ☑ Compost Filter Berms and Socks
- ☐ Blankets, Matting
- ☐ Sod
- ☐ Diversion Dike
- ☐ Mulch Filter Berms and Socks
- ☐ Compost Blankets

Category II (Sedimentation Control)

- ☐ Sand Bag Berm
- ☑ Silt Fence
- ☐ Triangular Filter Dike
- ☐ Stone Outlet Sediment Traps
- ☐ Erosion Control Compost
- ☐ Compost Filter Berms and Socks
- ☑ Rock Berm
- ☐ Hay Bale Dike
- ☐ Brush Berms
- ☐ Sediment Basins
- ☐ Mulch Filter Berms and Socks

General Condition 25 - Category III BMPs required

Category III (Post-Construction TSS Control)

- ☐ Retention/Irrigation
- ☐ Extended Detention Basin
- ☑ Vegetative Filter Strips
- ☐ Grassy Swales
- ☐ Erosion Control Compost
- ☐ Compost Filter Berms and Socks
- ☐ Constructed Wetlands
- ☐ Wet Basins
- ☐ Vegetation-Lined Ditches
- ☐ Sand Filter Systems
- ☐ Mulch filter Berms and Socks
- ☐ Sedimentation Chambers

III. Cultural Resources

(Addresses any special circumstances associated with cultural resources, such as archeological or historic sites.)

(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.	Station (Rt/Lt)	Commitment
1.	---	---

IV. Vegetation Resources

(Addresses any special circumstances associated with vegetation, such as large trees to be avoided, or mitigation that will occur as part of the project.)

☐ No Action Required ☑ Required Action

Action No.	Station (Rt/Lt)	Commitment
1.	All	Avoid non-mow locations for stockpiles and equipment parking/storage.
2.	Project Limits	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.

V. Federal Listed, Proposed, Threatened, Endangered Species, Critical Habitat, State Listed Species, Candidate Species, and Migratory Bird Treaty Act (MBTA)

(Addresses any special habitat that may need to be avoided, lists any threatened or endangered species where habitat was observed and might be impacted within the project area, and lists any precautions such as nesting seasons for migratory birds.)

☐ No Action Required ☑ Required Action

Species Potentially within Project Area & Description

Habitat Description

The Contractor is to be aware that if bats or active bird nests are identified during construction; they are to stop work and contact The Brownwood District Environmental Coordinator, Andrew Chisholm, 325) 643-0442. When choosing locations for storing equipment or placing other Project Specific Locations (PSLs), burrows should be avoided as these may contain species of concern. Any species entering the work area shall be left alone and allowed to leave the construction area unharmed.

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, or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. Migration patterns would not be affected by the proposed project. The contractor will remove all old migratory bird nests from any structure where work would be done from September 1 through the end of February. In addition, the contractor will be prepared to prevent migratory birds from building nests between March 1 and August 31, per the Environmental Permits, Issues, and Commitments (EPIC) plans. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young shall be avoided.

VI. Hazardous Material or Contamination Issues

(Addresses any previously identified high risk sites associated with hazardous materials that may be encountered during construction.)

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.

Contractor will follow all applicable storage and management requirements for liquid oil products, liquid petroleum products, and other chemical liquids as per 40 CFR 112 (a.k.a. SPCC) and/or TCEQ Construction General Permit for storm water management.

Contact the Engineer if any of the following are detected:
- Dead or distressed vegetation (not identified as normal)
- Trash piles, drums, canisters, barrels, etc.
- Undesirable smells/odors
- Underground storage tanks
- Evidence of leaching or seepage of substances
- Any other evidence indicating possible hazardous materials or contamination discovered on-site

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

☑ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing an asbestos assessment/inspection.
Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☑ No

If "Yes", then TxDOT must retain a Texas Department of State Health Services (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 10 working days prior to scheduled abatement and/or demolition.

If "No", then TxDOT is still required to notify DSHS 10 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.

Bridges on this project may contain Lead-Containing Paint (LCP) or other items that contain lead. The location of (LCP) is identified in the General Notes. Item 6.10.1.2 in the 2014 TxDOT Standard Specifications shall be utilized for this project.

VII. Other Environmental Issues

(Addresses any other environmental issues that may not have been covered in other sections.)

☑ No Action Required ☐ Required Action

Action No.	Station (Rt/Lt)	Commitment
1.	---	---

LIST OF ABBREVIATIONS

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

ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC) LESS THAN 1 ACRE

Texas Department of Transportation
BROWNWOOD DISTRICT

CONT	SECT	JOB	HIGHWAY
0288	03	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	EASTLAND		130

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 0288-03-032 SH 16 at Bear Creek

Latitude = 32.486578
Longitude = -98.519736

LOCATION MAPS:

Refer to title sheet for project location map.

PROJECT DESCRIPTION:

CSJ 0288-03-032

For the construction of: Replacement of bridge consisting of: Replace bridge and approaches

MAJOR SOIL DISTURBING ACTIVITIES:

The major soil disturbing activities for this project will consist of preparation of R.O.W., removing existing structure, excavation work, embankment work for the construction of the bridge and roadway, and placement and removal of erosion controls.

TOTAL PROJECT AREA:	3.10 AC.
TOTAL AREA TO BE DISTURBED:	1.70 AC.

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 0288-03-032
Surrounding land is used as pasture range and 85% of the R.O.W. vegetative cover is predominantly comprised of various native grasses and wild flowers.

NAME OF RECEIVING WATERS:

CSJ 0288-02-032
Runoff from project flows into Segment #1230 (Lake Palo Pinto) of the Brazos River Basin.

EROSION AND SEDIMENT CONTROLS

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
All erosion controls will be maintained in good working order. If a repair is necessary, it will be made at the earliest possible date, but no later than seven (7) calendar days after the ground has dried sufficiently to prevent further damage from equipment. The areas around creeks and drainage ways shall have priority over other areas on the project site.

INSPECTION:
An inspection will be performed by a TxDOT inspector at least once every seven (7) calendar days. An inspection and maintenance report will be made per each inspection. Stormwater controls will be modified as directed by the Engineer based on these reports.

WASTE MATERIALS:
Any waste materials generated during construction will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up will be done in accordance with federal, state, and local regulations.

SANITARY WASTE:
Sanitary waste from portable units will be collected by a licensed sanitary waste management contractor.

OFF SITE VEHICLE TRACKING AND DUST CONTROL:

__X__ DUST CONTROL (OFF SITE) AS NEEDED- PER ENGINEER
____ HAUL ROADS DAMPENED FOR DUST CONTROL
____ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
__X__ EXCESS DIRT ON ROAD REMOVED DAILY
____ STABILIZED CONSTRUCTION ENTRANCE

REMARKS:
Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body or stream bed. Construction staging area and vehicle maintenance area shall be constructed by the contractor in a manner to minimize the runoff pollutants. All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, false work, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

For off R.O.W. facilities the contractor shall comply with TCEQ requirements.

The contractor is responsible for ensuring that all subcontractors are aware of and comply with all components of the SW3P per Item 506.

Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end shall be subsidiary to Item 506.

Sedimentation Basins - Since the area disturbed is less than 10 acres per drainage area; a sedimentation basin is not required.

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	

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

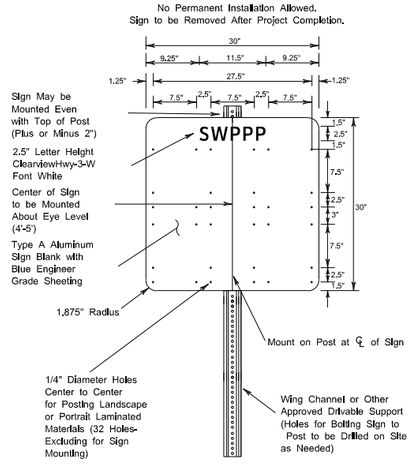
The order of activities will be as follows:

1. Preserve existing vegetative cover as much as possible.
2. Install temporary sediment control fencing and other items as shown on plans prior to any soil disturbing activities.
3. Perform bridge work, roadway work, and perform any necessary excavation, embankment and grading, temporary seeding, and signage.
4. Place permanent seeding as shown in the plans and as directed by the Engineer.

STORM WATER MANAGEMENT:

Storm water will be carried by side road ditches which will empty into the various natural runoff channels.

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



Texas Department of Transportation
Brownwood District Office
2495 Highway 183 North
Brownwood Texas, 76802

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED
PROFESSIONAL ENGINEER
4/22/2021

SH 16
AT BEAR CREEK

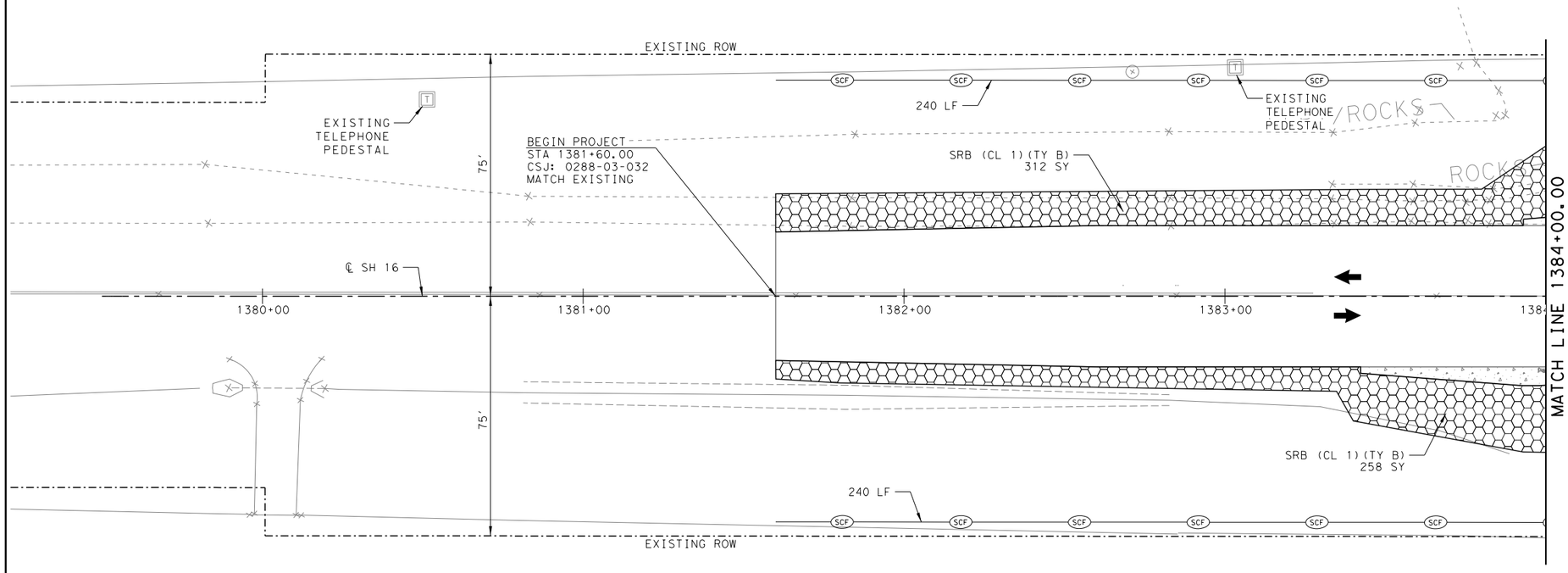
BROWNWOOD DIST.
STORM WATER POLLUTION PREVENTION PLAN

Texas Department of Transportation®

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0288	03	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	EASTLAND		131

DATE: 4/22/2021 11:00
FILE: pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/ESD/SHIG_EC_PL_01.dgn



ITEM	DESCRIPTION	UNIT	QUANTITY
164-6001	BROADCAST SEED (PERM)(RURAL)(SANDY)	SY	570
164-6009	BROADCAST SEED (TEMP)(WARM)	SY	285
164-6011	BROADCAST SEED (TEMP)(COOL)	SY	285
SUBSIDIARY	FERTILIZER	TON	0.02
168-6001	VEGETATIVE WATERING	MG	26
169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	570
506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	0
506-6011	ROCK FILTER DAMS (REMOVE)	LF	0
506-6038	TEMPORARY SEDIMENT CONTROL FENCE INSTL	LF	480
506-6039	TEMPORARY SEDIMENT CONTROL FENCE REMOVE	LF	480

0 20 40
SCALE: 1" = 40'

N

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD2 — ROCK FILTER DAMS
- SEEDING / SRB (CL 1 TY B)

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/19/2021

RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

SW3P LAYOUT

SHEET 1 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		132

pw://tts-pw.bentley.com:tts-pw-01/Documents/0223.001 WA 1 - CR FM SH Comanche Eastland Co/Cadd/Plan Sheets/ESCP/SH16_EC_PL_02.dgn
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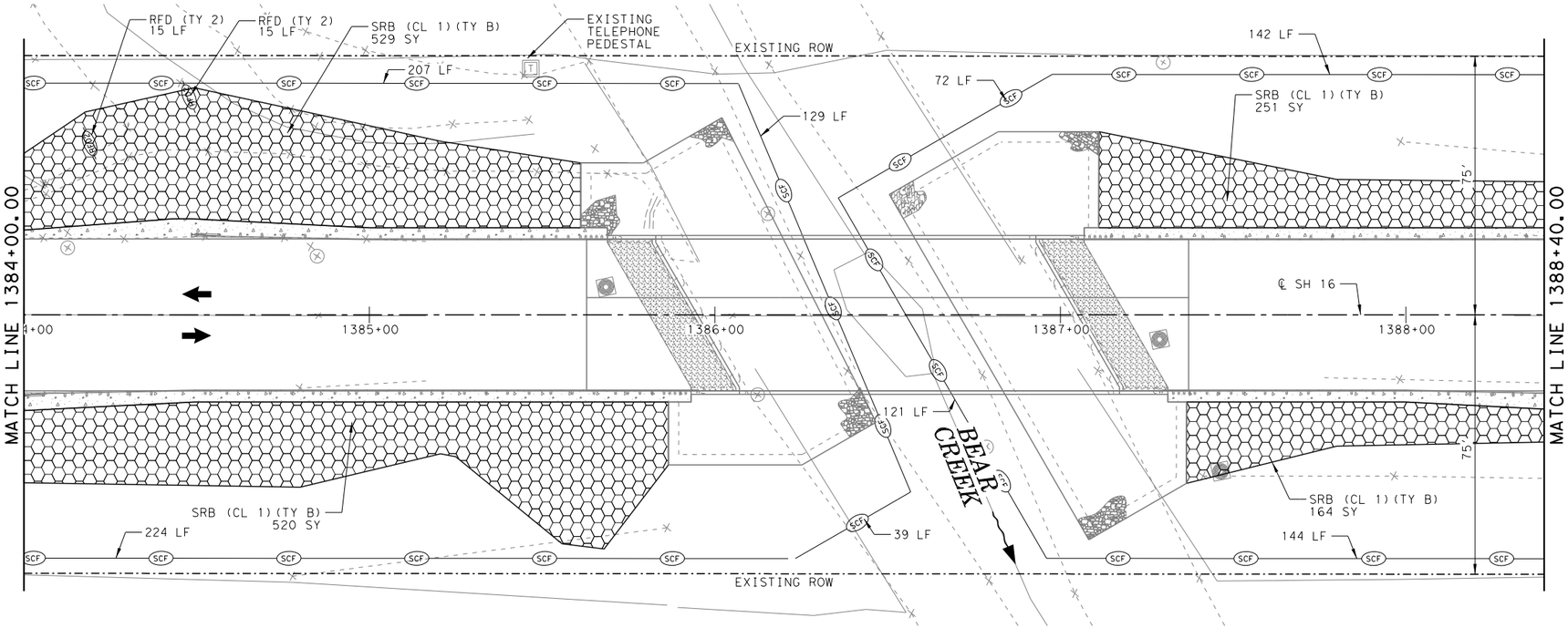


0 20 40
SCALE: 1" = 40'

N

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFD2 — ROCK FILTER DAMS
- SEEDING / SRB (CL 1 TY C)

ITEM	DESCRIPTION	UNIT	QUANTITY
164-6001	BROADCAST SEED (PERM)(RURAL)(SANDY)	SY	1464
164-6009	BROADCAST SEED (TEMP)(WARM)	SY	732
164-6011	BROADCAST SEED (TEMP)(COOL)	SY	732
SUBSIDIARY	FERTILIZER	TON	0.05
168-6001	VEGETATIVE WATERING	MG	66
169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	1464
506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	30
506-6011	ROCK FILTER DAMS (REMOVE)	LF	30
506-6038	TEMPORARY SEDIMENT CONTROL FENCE INSTL	LF	1078
506-6039	TEMPORARY SEDIMENT CONTROL FENCE REMOVE	LF	1078

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED
PROFESSIONAL ENGINEER
3/19/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

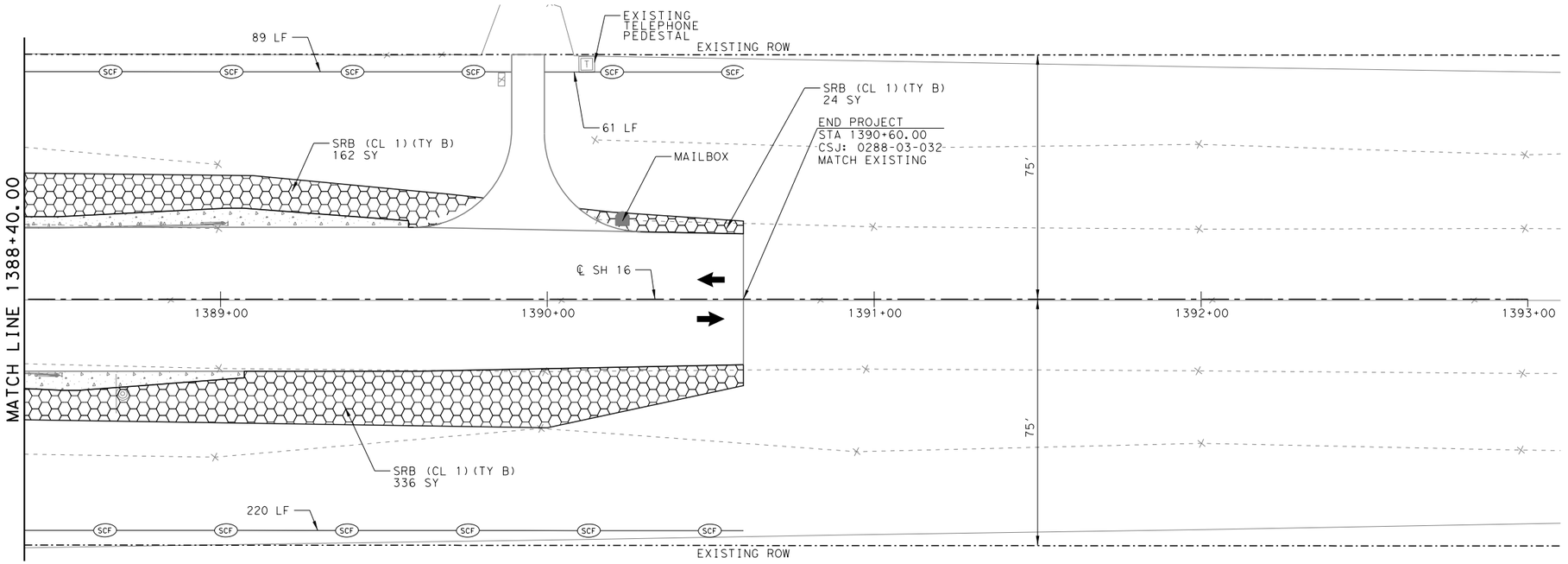
TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

SH 16 AT BEAR CREEK

SW3P LAYOUT

SHEET 2 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		133



0 20 40
SCALE: 1" = 40'

N

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- RFDZ — ROCK FILTER DAMS
- SEEDING / SRB (CL 1 TY C)

ITEM	DESCRIPTION	UNIT	QUANTITY
164-6001	BROADCAST SEED (PERM)(RURAL)(SANDY)	SY	522
164-6009	BROADCAST SEED (TEMP)(WARM)	SY	261
164-6011	BROADCAST SEED (TEMP)(COOL)	SY	261
SUBSIDIARY	FERTILIZER	TON	0.02
168-6001	VEGETATIVE WATERING	MG	24
169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	522
506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	0
506-6011	ROCK FILTER DAMS (REMOVE)	LF	0
506-6038	TEMPORARY SEDIMENT CONTROL FENCE INSTL	LF	370
506-6039	TEMPORARY SEDIMENT CONTROL FENCE REMOVE	LF	370

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHRISTOPHER N. TOMESCU
94687
LICENSED PROFESSIONAL ENGINEER
3/19/2021

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

TEXAS TRANSPORTATION SOLUTIONS, INC. Firm #F-19297

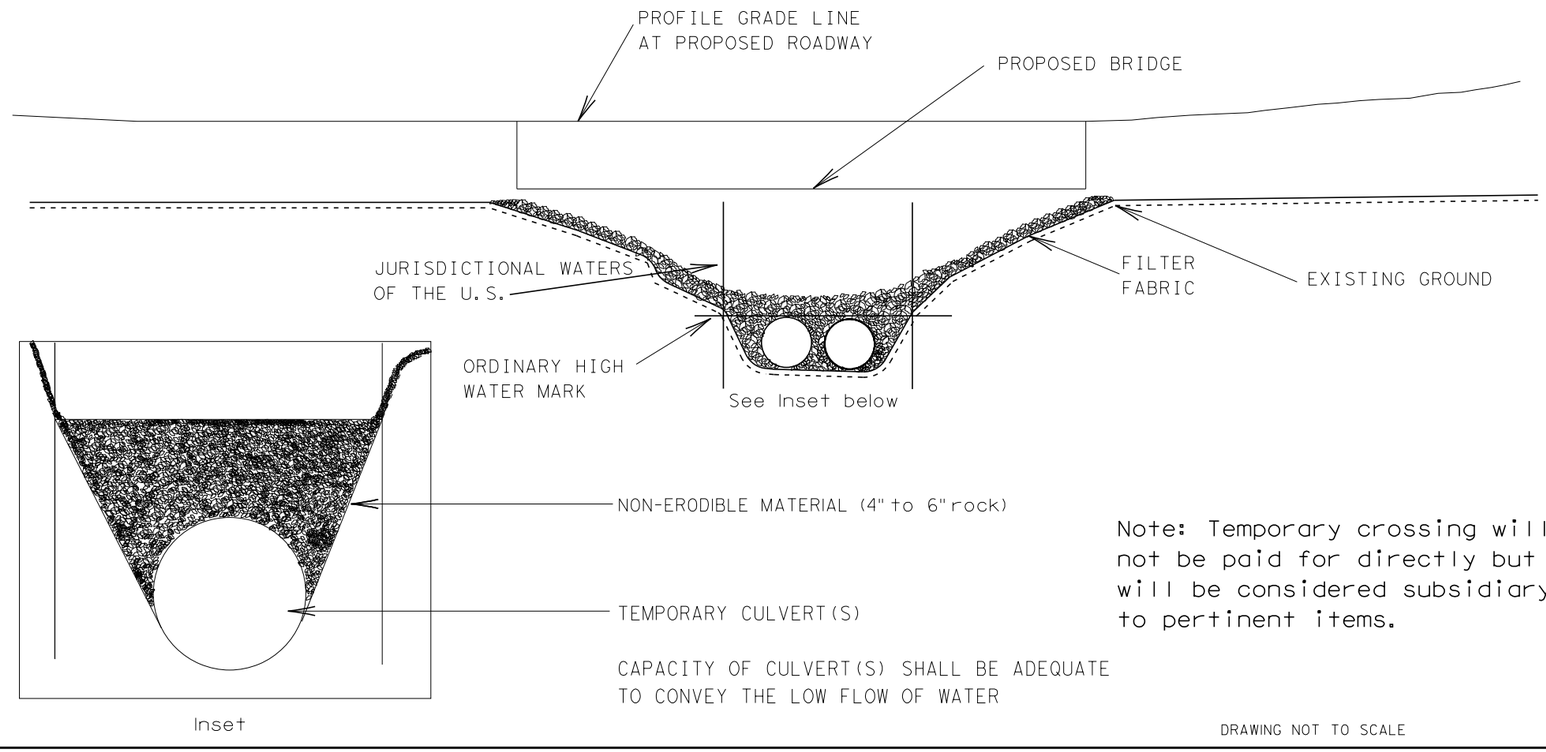
SH 16 AT BEAR CREEK

SW3P LAYOUT

SHEET 3 OF 3

FED. RD DIV. No.	CONTROL No.	SECTION No.	JOB No.	HIGHWAY No.
6	0288	03	032	SH 16
STATE	DISTRICT	COUNTY		SHEET No.
TEXAS	BWD	EASTLAND		134

TEMPORARY CROSSING



Note: Temporary crossing will not be paid for directly but will be considered subsidiary to pertinent items.

DRAWING NOT TO SCALE

SH 16
TEMPORARY CROSSING
DETAIL
0288-03-032

CONT	SECT	JOB	HIGHWAY
0288	03	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	EASTLAND		135

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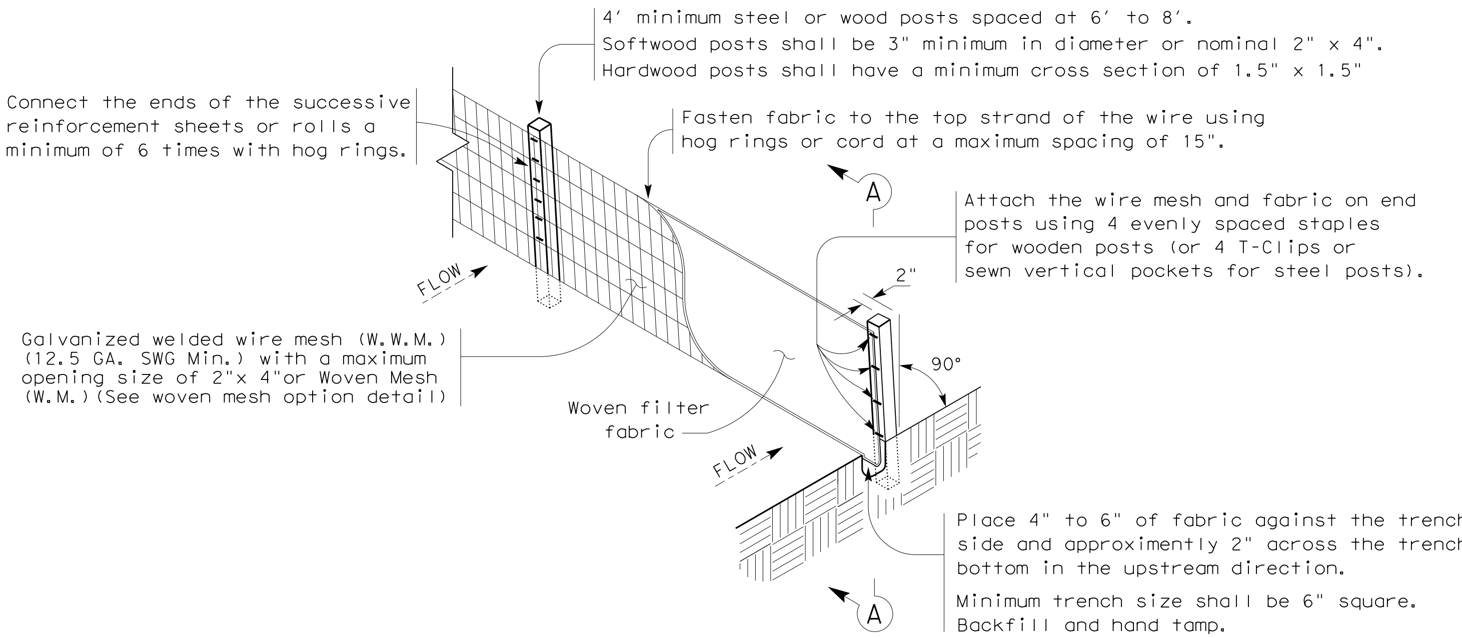
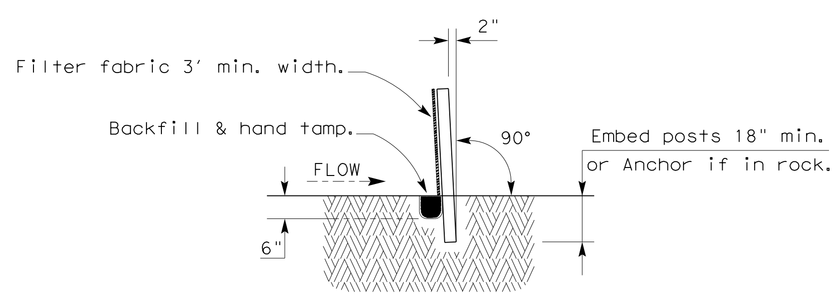
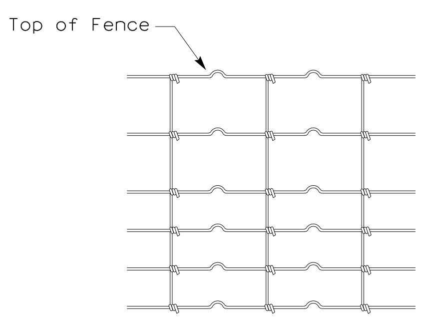


TEMPORARY SEDIMENT CONTROL FENCE

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.

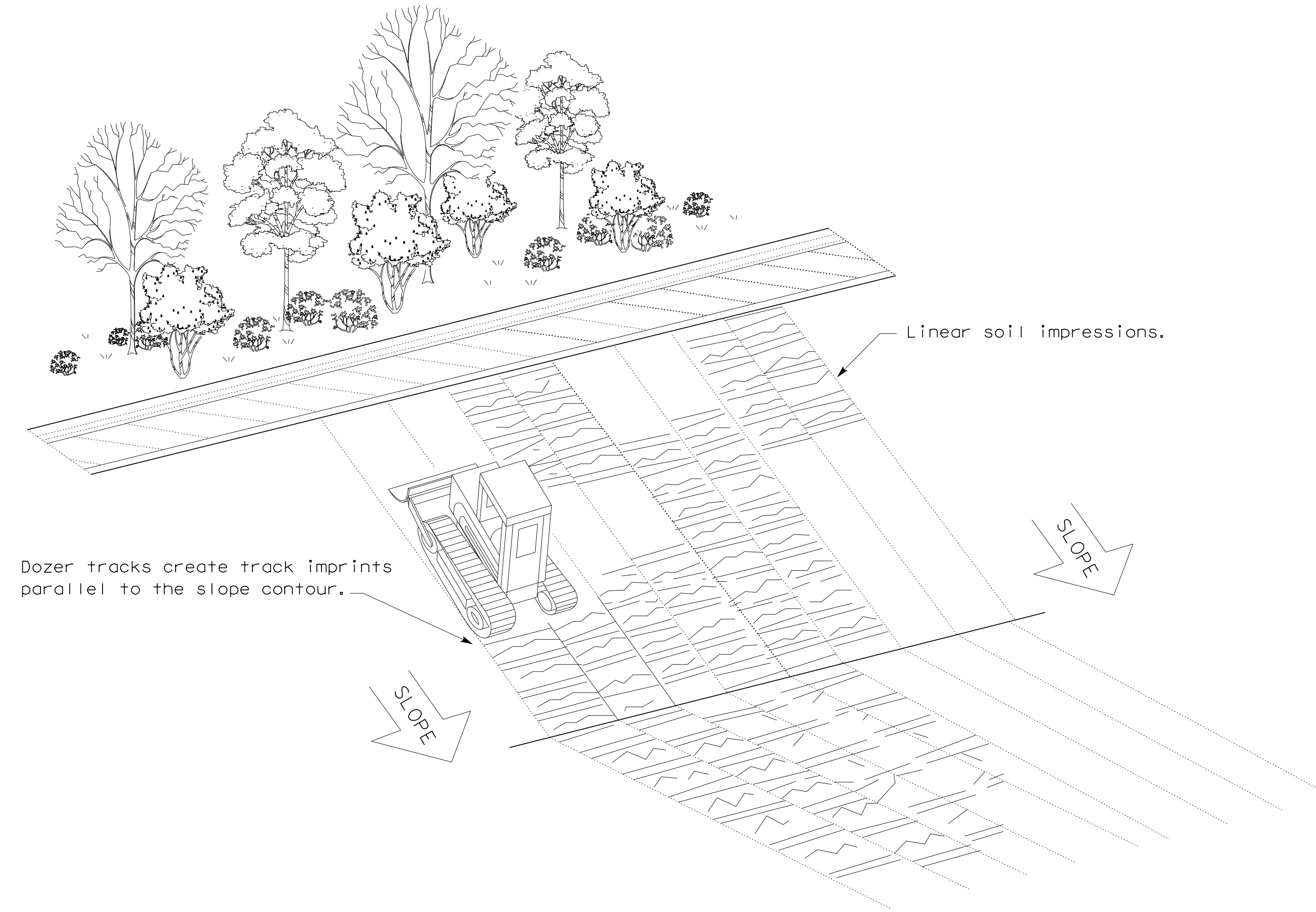
LEGEND

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	0288	03	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	EASTLAND		136

DATE: 3/16/2021
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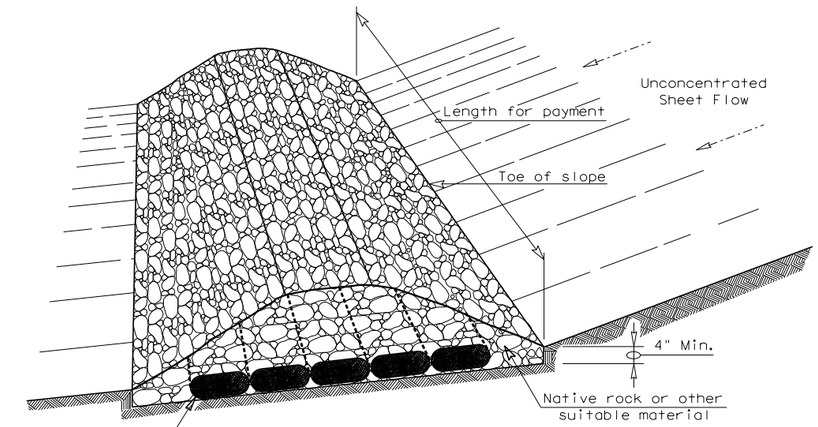
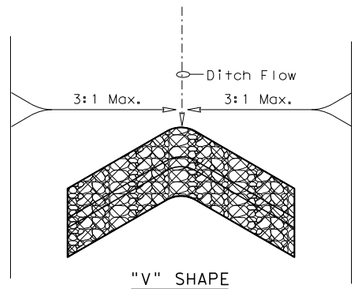
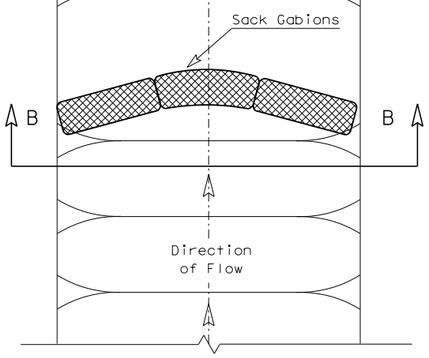


FILTER DAM AT TOE OF SLOPE

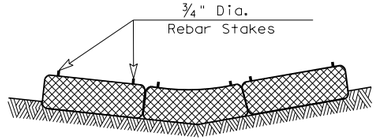
RFD1



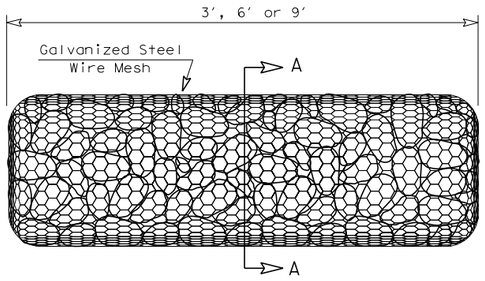
"V" SHAPE
PLAN VIEW



PLAN VIEW

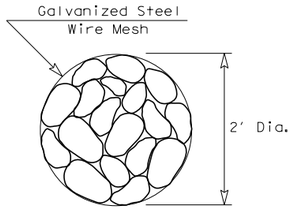


SECTION B-B

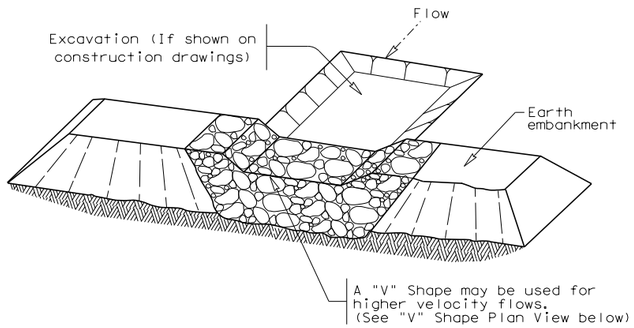


TYPE 4 (SACK GABIONS)

RFD4

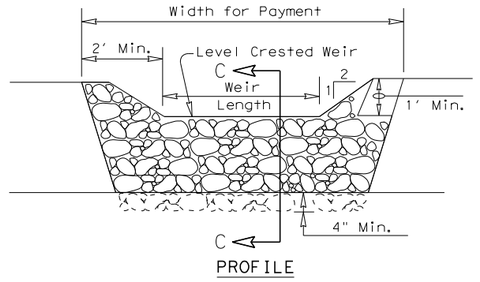


SECTION A-A

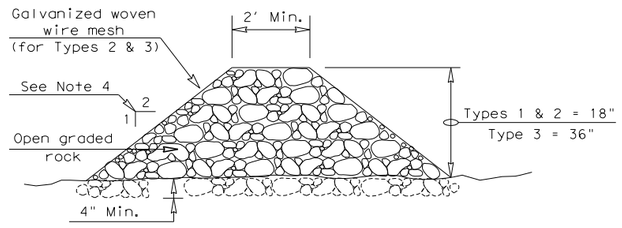


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

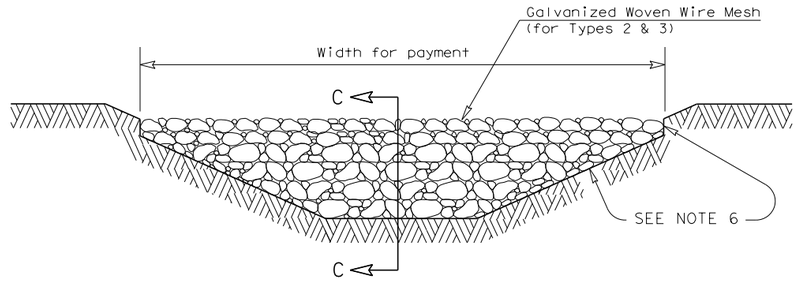
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0288	03	032		SH 16		
	DIST	COUNTY					SHEET NO.
	BWD	EASTLAND					137