FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	STP 2022(692)HES		1
STATE	STATE DIST.	COUNTY	
TEXAS	SAT	COMAL, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
0915	17	072	CS, ETC.

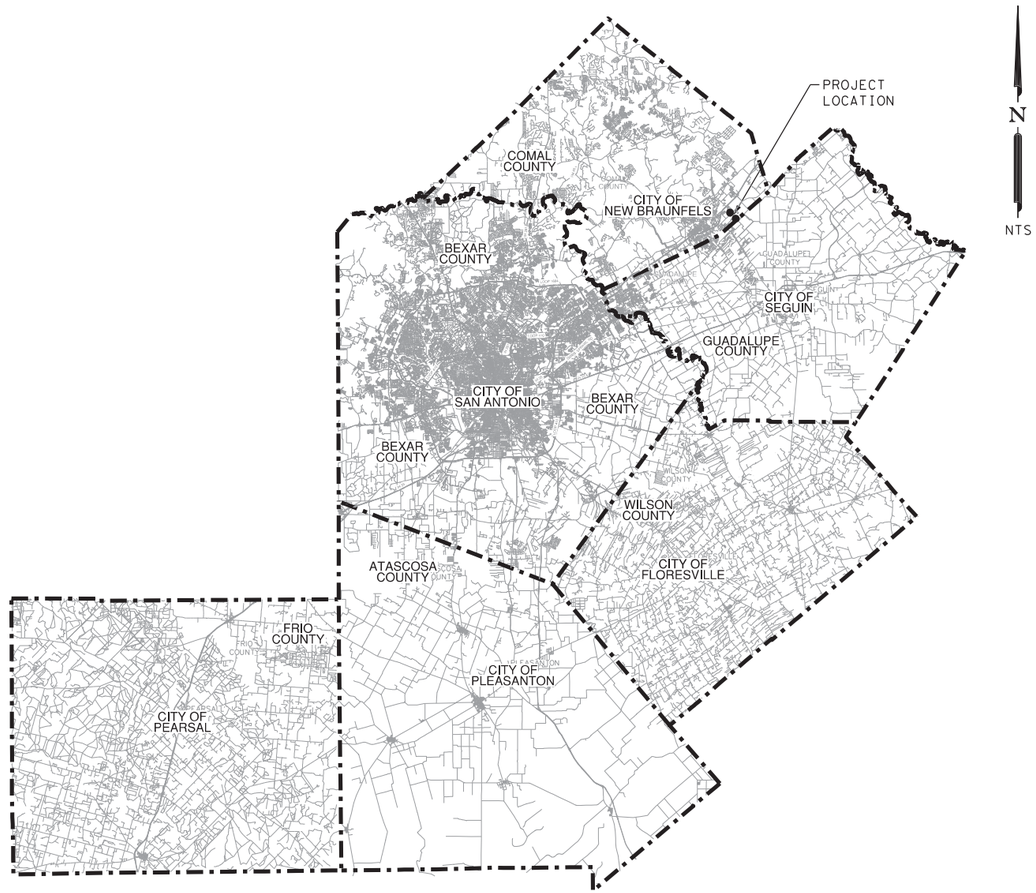
STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT
PROJECT NO. STP 2022(692)HES
CCSJ: 0915-17-072, ETC
COMAL COUNTY
BARBAROSA RD

LIMITS: IN NEW BRAUNFELS ON BARBAROSA RD AT FM 1101
LENGTH= 0.27 MI

FOR WORK CONSISTING OF HAZARD ELIMINATION & SAFETY



DESIGN SPEED = 40 MPH
AREA OF DISTURBED SOIL = 2.58 AC
ADT: 3762

ACCESSIBILITY STANDARDS = PROWAG

REGISTERED ACCESSIBILITY SPECIALIST INSPECTION REQUIRED
TDLR NO. TABS2022020756

THE ABOVE IS REQUIRED IF ANY ONE OF THE FOLLOWING CONDITIONS ARE MET:

1. PEDESTRIAN ELEMENTS GREATER THAN $50,000
2. HIKE AND BIKE TRAIL PROJECTS
3. BUILDING PROJECTS

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR: _____

FINAL PLANS STATEMENT:

THE CONSTRUCTION WORK WAS PERFORMED
IN ACCORDANCE WITH THE PLANS.

_____ P.E. _____
AREA ENGINEER DATE

TEXAS DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

FILE LOCATION AND NAME
T:\Engdata\Standards\Design\TITLESHEET-2014Specs.DGN

LEVELS DISPLAYED

COUNTY _____ PROJ. NO. _____
HWY. NO. _____ LETTING DATE _____
DATE ACCEPTED _____

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND THE 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)

EXCEPTIONS:
EQUATIONS:
R.R. CROSSINGS:

RECOMMENDED FOR ~~4/28/2022~~
DocuSigned by:
Gregg Granato, P.E.
0D08C713B58C45C...

RECOMMENDED FOR ~~4/28/2022~~
DocuSigned by:
Clayton Ripps, P.E.
74F59ACB883D4EB...
PLANNING & DEVELOPMENT

APPROVED FOR ~~4/28/2022~~
DocuSigned by:
Gina E. Gallegos, P.E.
124372CCDF604F5...

Plotted on: 4/25/2022

Design Filename: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\General\1163006_Index_BABR.dgn

GENERAL

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2	INDEX OF SHEETS
3	LOCATION MAP
4, 4A-4G	GENERAL NOTES
5	ESTIMATE AND QUANTITY
6, 6A-6C	QUANTITY SUMMARY SHEET
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THE STANDARD SHEETS SPECIFICALLY SHOWN WITH PRECEDING (#), HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
JUSTIN W. CLARK
116715
LICENSED PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

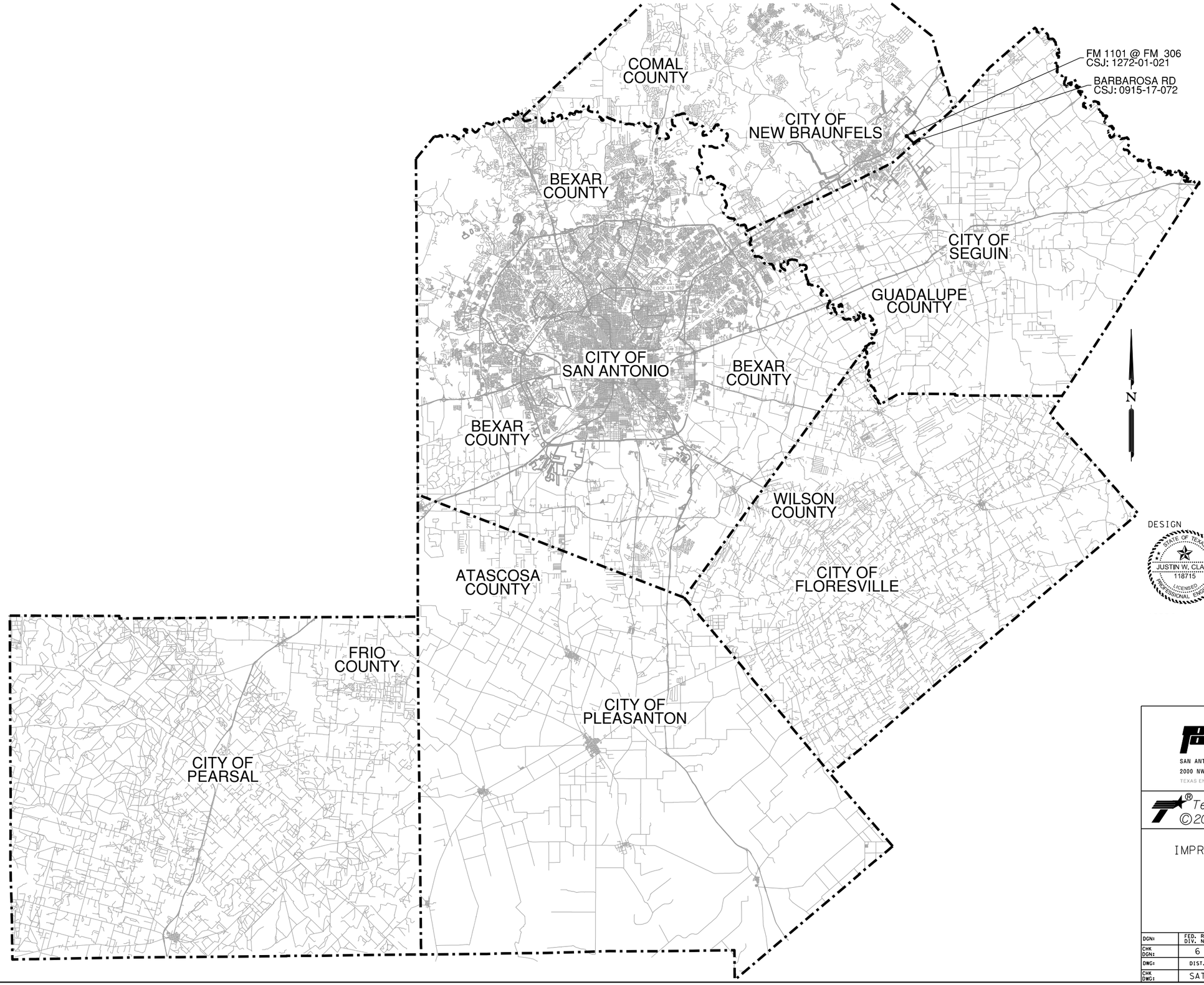
PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

INDEX OF SHEETS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072, ETC.	2



NOT-TO-SCALE

DESIGN

STATE OF TEXAS
JUSTIN W. CLARK
118715
LICENSED
PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

LOCATION MAP

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072, ETC.	3

Plotted on: 4/25/2022

Design Filename: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\General\1163006_GNRL_LMAP_BARB.dgn

**********GENERAL NOTES**********
2014 Specification Book (Revised March 15, 2022)

========== Basis of Estimate ==========

Item	Description	Rate	Area	Quantity
168	Vegetative Watering	15.6 GAL/SY	12,904 SY	201.31 MG
260	Lime Treat Exist Matl (Barb)	20 LB/SY	5384 SY	54.0 Tons
260	Lime Treat Exist Matl (FM306)	15 LB/SY	604 SY	4.6 Tons
310	Asph (Prime Coat)	0.3 GAL/SY	5,384 SY	1,615.20 GAL
3076	Asph (Tack Coat)	0.1 GAL/SY	6,875 SY	687.50 GAL

========== Asphalt Concrete Pavement ==========

Type	Location	Depth	Rate	Area	Quantity
HMA TY-B	Barbarosa	12”	115 LB/SY-IN	411 SY	283.6 Tons
HMA TY-C	Barbarosa	3”	115 LB/SY-IN	5,455 SY	941.0 Tons
HMA TY-D	Barbarosa	2.5”	115 LB/SY-IN	5,643 SY	811.2 Tons

--General--
Contact the Engineer or the City when construction operations are within 400 feet of a signalized intersection to determine/verify the location of loop detectors, conduit, ground-boxes, etc. Repair or replace any signal equipment damaged by construction operations. The method of repair or replacement shall be pre-approved and inspected. Depending on the type and extent of the damage, the Engineer reserves the right to perform the repair or replacement work and the Contractor will be billed for this work.

City of New Braunfels: (830) 221-4049

Remove existing raised pavement markings as the work progresses or as approved. This work is subsidiary to the various bid items. Properly dispose materials removed.

To better fit field conditions, the cross sections may be varied when approved.

If there are waste areas or material source areas, follow the Texas Aggregate Quarry and Pit Safety Act requirements.

Any materials removed and not reused and determined to be salvageable shall be stored within the project limits at an approved location or delivered undamaged to the storage yard as directed.

Properly dispose unsalvageable materials in accordance with local, state, and federal regulations. Deface traffic signs so that they will not reappear in public as signs.

Any sign panels that are adjusted or removed and replaced, shall be done the same workday unless otherwise approved. This work shall be considered subsidiary to Item 502.

Notify the Engineer at least two weeks prior to a proposed traffic pattern change(s) that will require a revision to traffic signals.

Locate and reference all manholes and valves within the construction area with station and offset. Each manhole and valve shall be identified by its owner. No roadwork will begin until this list has been submitted. All valves and manhole covers have to be accessible at all times, therefore; temp. CTB, material stockpiles, etc. cannot be placed over these valves or covers.

Hurricane Evacuation

Hurricane Season is from June 1 thru November 30. As the closest metropolitan city inland from the Texas Coast, the City of San Antonio is a major shelter destination during mandatory hurricane evacuations. As such, planned work zone lane or road closures may be restricted and/or suspended during mandatory hurricane evacuation operations. The District will coordinate these restrictions at a minimum H-120 from any projected impact to the Texas Coast.

No time charges will be made if the Engineer determines that work on the project was impacted by the hurricane.

The Engineer may order changes in the Traffic Control Plan to accommodate evacuation traffic, and may suspend the work, all or in part, to ensure timely completion of this work. All work to implement changes in the Traffic Control Plan will be paid through existing bid prices or through Item 9.5, Force Account. However, the Department will not entertain any request for delay damages, loss of efficiency that may be attributed to the restriction or suspension of road or lane closures, or to changes in the Traffic Control Plan.

Contractor questions on this project are to be addressed to the following individual(s):
Eduardo Villalon, Eduardo.villalon@txdot.gov
Orlando Gallegos, Orlando.gallegos@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 Contractor must measure the vertical clearance at each structure after the final surface of the roadway is completed and provide the vertical clearance measurement to the Engineer.

--Item 5--
Reference all existing striping and other pavement markings to allow these markings to be re-established. Ensure the markings (lane lines, edge lines, ramp gores, etc.) are in line with signs, TMS arrows, etc. located on overhead sign supports.

When a bridge deck is milled, seal coated and overlaid, remove excess material. Do not just broom to the sides of the bridge, under guardrail, etc. Cover or protect all sealed expansion joints and rails on bridges and all railroad tracks encountered as approved. Clean all of these features if they weren't properly protected. This work is subsidiary work to applicable bid items.

Prior to 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 cross-sections in addition to, or instead of, the CD are requested, they will be available at the Engineer's office for borrowing by copying companies at the bidder's expense.

When working near aerial electrical lines or utility poles, comply with Federal, State and local regulations. A horizontal boom or equivalent equipment is required for construction in the vicinity of the NBU electric lines in order to provide vertical clearance of equipment during construction. Contact NBU Electric five (5) week in anticipation of pole bracing. The estimated duration for pole bracing is 6 to 10 weeks (or longer if temporary construction easements are required) after invoice is paid. For de-energizing or sleeving of the overhead electrical lines depicted on the plans, please contact NBU Electric sixteen (16) week in anticipation of needed de-energization. The estimated duration for de-energizing is approximately 4 to 6 weeks (after invoice is paid) but could vary on system scenario and backfeed requirements. De-energizing may not be possible in all instances or may be restricted during specific periods of time due to load demand. Contractor will be reimbursed for the invoice cost for pole bracing and/or de-energizing or sleeving through force account.

Prevention of Migratory Bird Nesting

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

Structures

Bridge and culvert construction operations cannot begin until swallow nesting prevention is implemented, until after October 1 if it's determined that swallow nesting is actively occurring, or until it's determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

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

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

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

Provide a non-intrusive back-up alarm system on all heavy equipment used in close proximity to residential areas. This item is subsidiary to various bid items.

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

--Item 6--
Show the stockpile lot and/or sub lot numbers on all tickets for all materials.

--Item 7--
The total disturbed area within the project is anticipated at less than one (1) acre. Due to this type of construction, the project qualifies for exclusion under the Construction General Permit (CGP) issued by the Texas Commission on Environmental Quality (TCEQ). However, should the sum of the Engineer's anticipated disturbances and the Contractor's (On ROW and off ROW) PSL's equal or exceed the one (1) acre threshold; both TxDOT and the Contractor have project

responsibilities under the CGP that reverts to non-exclusion status. Obtain approval for all non-depicted areas of disturbance that increases the initial soil and vegetation disturbed area estimates before work starts at these locations.

Notify the Engineer of the disturbed acreage within one (1) mile of the project limits. Obtain authorization from the TCEQ for Contractor PSL's for construction support activities on or off ROW.

No significant traffic generators events identified.

--Item 8--
Working days will be computed and charged in accordance with Article 8.3.1.4 Standard work week.

Create and maintain a Critical Path Method (CPM) schedule.

The CPM schedule shall be created and maintained using software fully compatible with version 6.1 of Primavera Project Planner.

--Item 9--
When approved, provide uniformed, off-duty law enforcement officers with marked vehicles during work that requires a lane closure. The officer in marked vehicles shall be located as approved to monitor or direct traffic during the closure. The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Complete the daily tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

Show proof of certification by the Texas Commission on Law Enforcement Standards.

All law enforcement personnel used in Work Zone Traffic Control shall be trained for performing duties in work zones and are required to take "Safe and Effective Use of Law Enforcement Personnel in Work Zones" (Course #133119) which can be found online at the following site: www.nhi.fhwa.dot.gov

Certificates of completion should be available to all who finish the course. These should be kept by the officers in order to substantiate completion when reporting to the work site.

Minimums, scheduling fees, etc. will not be paid; TxDOT will consider paying cancellation fees on a case by case basis.

--Item 100--
Begin clearing operations after trees and other areas of vegetation to be protected have been identified and approved. Install fencing around features to be protected as shown in the plans or directed. Coordinate all right of way clearing operations with the SW3P.

Trim and remove brush and trees within the stations noted in the plans and as needed for construction operations. Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas to the ROW limits. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following: sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 12 ft. vertical clearance under all trees. This work is subsidiary.

Obtain approval for proposed method of tree and brush trimming and removal. Vertical flailing equipment is not allowed. Treat damaged or cut branches, roots and/or stumps of all oak trees with a commercial tree wound dressing. Disinfect all pruning tools with a solution of 70% alcohol before moving from one tree to another. Unless otherwise approved remove all resulting vegetative debris from the ROW within 24 hours. The Engineer can stop all construction operations if the dressing, cut and removal requirements are not followed.

--Item 110--
Where excavation extends beyond a right of way fence, remove and replace the fence to a comparable condition. This work shall be considered subsidiary to the bid item.

--Item 164--
Drill seeding of permanent grasses requires the use of approved grass seeding equipment capable of properly storing and metering the release of small seeds (such as Bermuda grass) separately from fluffy type seeds (such as bluestems). Equipment manufactured for planting grain crops is acceptable for planting temporary cool season seeds, but not for planting the permanent seed mix.

If performing a permanent seeding in an area with established temporary grass cover and mowing is performed instead of tilling, seed and fertilizer may be distributed simultaneously during "Broadcast Seeding" operations, provided each component is applied at the specified rate.

--Item 166--
Use a fertilizer with an analysis of 13-13-13 (50% of the total N must be sulfur coated urea) to apply 60 lbs of actual N per acre. This requires 460 lbs of 13-13-13 per acre or .095 lbs per SY of area.

--Item 168--
Apply vegetative watering as needed to supplement natural rainfall during the vegetation establishment period. Plan quantity of irrigation water is based on the application of a total of 1.3 gal of water each week for each sq. yd. of area that is sodded or seeded. Establishment time

is estimated to be 12 weeks for both sod and permanent seed mixes. Temporary seeding will require less time for establishment. Provide a schedule and coordinate watering cycles and rates per cycle with the Engineer. Obtain approval if the quantity of water to be applied is expected to exceed the plan quantity. Adjust the amount of water applied with each cycle and the number of cycles each wk. according to actual site conditions. Drought or other conditions, as determined by the Engineer, may require the application of supplemental irrigation during hours other than normal working hours.

--Item 302--
Previously tested aggregates found to contain excessive quantities of dust (more than 0.5 percent passing the No. 40 sieve) during precoating, stockpiling or hauling operations, may be rejected. Use Test Method Tex-200-F, Part I for testing.

--Item 3076, 3077, 3079, 3080, 3081, & 3082 --
Table 10 in Item 3076 and Table 11in Item 3077, Hamburg Wheel Test Requirements tested in accordance with Tex-242-F are changed for PG 64-22 or lower and PG 70-22. Minimum number of passes at 12.55 mm Rut Depth, Tested at 50 degrees C will be 5,000 and 10,000 respectively.

Submit a copy of the Tex 233-F production charts on a weekly basis. At the end of the ACP work, provide all originals.

Crushing of aggregate for hot mix and immediate use for production of the mix is not allowed. Stockpile the aggregate until enough material is available for five days of production unless prior approval is provided

Hold a pre-paving meeting one month prior to the placement of the hot mix. The date and time of pre-paving meeting should be coordinated with the Engineer prior to scheduling.

Do not use diesel or solvents as asphalt release agents in production, transportation, or construction. A list of approved asphalt release agents is available from the District Laboratory.

No more than one hot mix lot will be open for any specific type of hot mix, unless authorized. After a lot is open and the Contractor gets approval to change plants, the previous lot will be closed and a new lot will be opened. The numbering for the lots produced at the new plant will start with No. 1. If allowed to switch back to the original or previous plant, the next lot from that plant will resume numbering sequentially from the last lot produced by that plant.

--Item 354--
Retain planed material.

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

--Item 432--
In all riprap slopes, provide 3-inch diameter weep holes at 10 foot maximum spacing and backed with loose graded gravel or crushed stone and galvanized hardware cloth.

In areas where guard fence posts are to be placed in riprap, the riprap shall have an 18 inch +/- blocked out area (round or square). After the posts are installed, the blocked-out area shall be topped off with 4 inches of low strength grout/mortar consisting of about 1 sack of cement per cubic yard of mix.

Match the slope of the Riprap (Mow Strip) to the slope of the adjacent roadway.

--Item 500--
"Materials on Hand" payments will not be considered in determining percentages for mobilization payments.

--Item 502--
Place standard markings no later than 14 days after surface treatment operations are completed.

When advanced warning flashing arrow panels and/or changeable message sign is specified, have one standby unit in good condition at the job site. Standby time shall be considered subsidiary to the bid item.

Treat the pavement drop-offs as shown in the TCP.

After written notification, the time frame is provided on the Form 599 to provide properly maintained signs and barricades before considered in non-compliance. Failure to make corrections as noted may result in payment for this item being withheld.

There are traffic signals at the intersection of FM 1101 at FM 306. Keep the signals in operation at all times except when necessary for specific installation operations, including any modifications to existing signal heads to maintain clear visibility at all times. Adjustment of any signal head will be subsidiary to Item 502. When it is necessary for a signal to be turned off, hire off duty police officers to control the traffic until the signals are back in satisfactory condition.

Moving an existing sign to a temporary location is subsidiary to this Item. Installations with permanent supports at permanent locations will be paid for under the applicable bid item (s).

Mount temporary mailboxes on plastic drum in accordance with Compliant Work Zone Traffic Control Devices, Section K. Mounting and moving the mailbox as needed for the various construction phases is subsidiary to this Item.

Notify the Engineer in writing 10 business days in advance of any temporary or permanent lane, ramp, connector, etc. closures/detours, restrictions to lane widths, alterations to vertical clearances, or modifications to radii. Any other modifications to the roadway that may adversely affect the mobility of oversized/overweight trucks also require 10 business days advance written notice to the Engineer. Unless shown in the TCP, no lane, ramp, connector, etc. closures are allowed during special events. At least one lane has to remain open at all times. Lane closures will not be allowed if this reporting requirement is not met.

For closures not listed in the TCP; the lane closures are limited to between the hours of 9 AM – 4 PM, and at least one lane has to remain open at all times.

Avoid placing stockpiles within the roadway's horizontal clear zone. If a stockpile is placed within the clear zone, address in accordance with the TMUTCD.

Do not place barricades, signs, or any other traffic control devices where they interfere with sight distance at driveways or side streets.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee available to respond on the project for emergencies and for taking corrective measures within 2 hours or within a reasonable time frame as specified by the Engineer.

If Nighttime work is required and work is not behind positive barrier then full TY 3 reflective gear is required to be worn by all workers, hard hat halos are required to be worn by the flaggers at flagging stations, TY III barricades are required to be spaced at 500 ft, and a mandatory night work meeting is required.

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.

Moving or adjustment of traffic signal heads, VIVDS, and radar detection for the purpose of alignment with the shifting of lanes in conjunction with the traffic control plan will be subsidiary to various bid items.

--Item 506--
An Inspector will perform a regularly scheduled SWP3 inspection every 7 calendar days.

Failure to address items noted on the SW3P inspection report within two report cycles may result in the Department stopping all construction operations, exclusive of time charges, or withholding that month's estimate until the SW3P deficiencies are corrected unless the Engineer determines that the area is too wet to correct SW3P deficiencies.

Failure to correctly maintain daily monitoring reports and submitting to TxDOT on a daily/weekly basis may result in the monthly estimate being withheld.

--Item 618--
It might be necessary to cut concrete for placement of conduit. Saw cut existing concrete, remove the concrete from the steel reinforcement (bars or fabric) and bend the steel to install the conduit. After the conduit has been placed, bend the steel back to its original position and back-fill the trench with an approved concrete. This work is subsidiary to this Item.

The conduit depth for illumination under the City of San Antonio streets is 36 inches.

Use materials from Material Producers list as shown on the Construction Division's (CST) web site. Category is "Roadway Illumination and Electrical Supplies."

--Item 628--
Make all arrangements for electrical service, and compliance with local standards and practices for proper installations.

--Item 644--
The wedge anchor system shown on State Standard Sheet SMD (TWT) is not allowed.

The set screw type for Triangular Slipbase Systems is not allowed. Use the following products for the Triangular Slipbase System.

Triangular Slip Base Systems
(For use with 10 BWG and Schedule 80 Round Posts)

Southern Plains Fabrication	SPF Triangular Slipbase Housing	Info@SouthernPlainsFabrication.com http://SouthernPlainsFabrication.com (806) 241-0060
Structural and Steel Products	Triangular Slipbase Breakaway Support	CustServ@s-steel.com http://s-steelcom (800) 782-5804

--Item 662--
Raised reflective pavement markings are required when using work zone reflective pavement markings for lane lines as shown in the standards. The raised reflective pavement markings must be placed during the same operation for installation of the work zone reflective pavement markings and placed before the roadway is open to traffic. These raised reflective pavement markings will be subsidiary to work zone pavement markings.

--Item 666--
Use TY II material (vs. an acrylic or epoxy) as the sealer for the TY I markings, place the TY II a minimum of 14 calendar days (to provide adequate curing) before placing the TY I markings.

Failure to provide the retroreflectometer testing data within the time specified in the specifications will result in non-payment of the bid item.

--Item 672--
Place all adhesive material directly from the heated dispenser to the pavement. Do not use portable or non-heated containers. Use adhesive of sufficient thickness so that when the marker is pressed into the adhesive, 1/8" or more adhesive will remain under 100% of the marker. The adhesive should extend not less than 1/2" but not more than 1 1/2" beyond the perimeter of the marker.

--Item 677--
Obtain approval before using the mechanical method for the elimination of existing thermoplastic pavement markings.

--Item 680--
Furnish and install all required materials and equipment necessary for the complete and operating traffic signal installation at the following intersections:
FM 1101 at FM 306.

All workers installing electrical materials, including conduit in trenches, service poles and all other system electrical apparatus, will be directly supervised by persons who have completed a TxDOT approved course in electrical underground installations. Furnish evidence of satisfactory completion of the underground electrical installation for roadway illumination and signal control course for all personnel responsible for direct supervision of electrical installation work.

The locations shown on the plans for signal pole foundations, controller foundations, conduit and other items may be adjusted to better fit field conditions as approved.

Furnish and install a new Henke Enterprises or Mobotrex eight-phase NEMA TS2 Type 2 controller and cabinet, meeting the requirements of Departmental Materials Specifications DMS-11170. Provide detector panel toggle switches that additionally permit the user to disconnect the

detector. For both ground and pole-mount cabinets, provide cabinet configuration with 16 position load bay.

Deliver TS type 2 controller cabinet and assembly to the TxDOT San Antonio district signal shop for programming and testing two weeks in advance prior to contractor installing equipment in the field. Coordinate drop off and pick up with Jorge Ramos (210) 668-3245.

Connect all field wiring to the controller assembly into the polyphaser. The Signal Shop representative will assist in determining how the detection cables are to be connected, and will also program the controller for operation, hook up the malfunction management unit (MMU) or conflict monitor, detector units, and other equipment, and turn on the controller. Have a qualified technician on the project site to place the traffic signals in operation.

Once final punch list is complete, contractor is allowed to begin flashing signal operations. Signal shall flash for a minimum of 7 days prior to full operation, unless otherwise approved by the Engineer.

Use LED lamps from the prequalified material producer lists as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) material producer list. Category is "Roadway Illumination and Electrical Supplies." under item 610. No substitutions will be allowed for materials found on this list.

Demonstrate that the field wiring is properly installed, install the controller assembly, connect the wiring and turn on the controller.

The following wiring sequence shall be used when connecting signal sections to the cabinet:

Conductor No.	Base Color	Tracer Color	Signal Face
1	Black		Yellow Ball
2	White		Neutral
3	Red		Red Ball
4	Green		Green Ball
5	Orange		Yellow Arrow
6	Blue		Green Arrow
7	White	Black	Spare

All existing signal equipment with the exception of the signal controller and related equipment become the property of the Contractor. Deliver the controller and related equipment to the Signal shop, located at 4615 NW Loop 410 (corner of IH 410 and Callaghan Road) in San Antonio, Texas or to the Area Office as directed.

Use qualified personnel to respond to and diagnose all trouble calls during the thirty-day test period. Repair any malfunction to Contractor-supplied signal equipment. Provide to the Engineer a local telephone number, not subject to frequent changes and available on a 24-hour basis, for reporting trouble calls. Response time to reported calls must be less than 2 hours. Make appropriate repairs within 24 hours. Place a logbook in the controller cabinet and keep a record of each trouble call reported. Notify the Engineer of each trouble call. Do not clear the error log in the conflict monitor or MMU during the thirty-day test period without approval.

Integrate the proposed traffic signal(s) into the existing Advanced Traffic Management System (ATMS) as shown on the plans. Centracs ATMS software, which utilizes Econolite controllers, is currently in use in the San Antonio District. Provide controllers on this project that fully communicate with the existing ATMS software. For use when signal controller is furnished by contractor.

This project includes the installation of at least one cellular modem at the location(s) specified in the plans. Cellular modem(s) and power supply(s) will be furnished by the department. Provide all materials not supplied by the department necessary for the cellular modem installation. All materials provided by the contractor must be new unless otherwise shown on the plans. Equipment provided by the department shall be stored by the department for pick up at the TxDOT San Antonio district office, 4615 NW Loop 410 San Antonio, TX 78229. Prevent damage to all cellular modem components supplied by the department. Replace any component that is damaged or lost during transportation or installation at the contractor’s expense. Verify operation of the cellular modem(s) together with operation of its links; demonstrate that data can be transmitted at a satisfactory rate from the field location to the central location. Demonstrate that the cellular modem(s) data packets are being received at the central site via a networked computer. Transportation, installation and incidentals for installation of the cellular modem(s) shall be considered subsidiary to item 680. For use when a cellular communication link will be established to Transguide.

Provide a submittal compliance matrix with all traffic signal submittals.

Contractor shall be responsible for field verifying the depths of the drill shafts to meet the minimum clearances specified in the plans before ordering materials.

Damage to existing facilities such as traffic signal equipment, conduit, cables, etc. caused by the contractor during construction will be replaced by the contractor at no cost to TxDOT with equipment as approved by the engineer. Replace all pavements, sidewalk, curb, riprap or any item damaged during construction subsidiary to various bid items with no direct payment. Any

damage that was not caused by the contractor during operations will be reimbursed for repair of damage caused by: motor vehicle, watercraft, aircraft, or railroad-train incident, vandalism or acts of God, such as earthquake, tidal wave, tornado, hurricane, or other cataclysmic phenomena of nature.

Ensure that all TMS (Traffic Management System) equipment furnished and installed is completely compatible with the existing hardware and software located within the Transguide operations center (i.e. Transguide central software). The contractor shall contact the traffic management engineer for details on the system network architecture.

Contractor shall be responsible for integrating and testing all new TMS equipment and any existing TMS equipment that is relocated into the existing network management system, subsidiary to the various bid items.

Security against theft and vandalism of all traffic signal equipment is the full responsibility of the contractor until the date of final acceptance of the project by the engineer.

Maintenance of all TMS equipment furnished and installed on this project is the full responsibility of the contractor until date of final acceptance of this project by the engineer. All required documentation must be turned in before TxDOT will accept project for maintenance.

Perform all electrical work in accordance with the National Electrical Code and Texas Department of Transportation Specifications.

In accordance with the Underground Facility Damage Prevention Act (One Call Bill) the phone number for a utility locator is 1-800-545-6005. It is the Contractor's responsibility to make arrangements for utility locators as needed.

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way. Call the TxDOT offices listed below for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages incurred to the above-mentioned utilities when working without having the utilities located prior to excavation.

--Item 682--
Provide all signal heads from the same manufacturer. Pedestrian signals may be by a different manufacturer than the vehicle signal heads.

Cover all signal faces until placed in operation.

All pedestrian signal faces shall be single section LED Type. Die cast polycarbonate is acceptable in lieu of die cast aluminum. All mounting attachments shall be constructed of steel pipe and mounted as shown on the plans.

For all proposed mast arm pole assemblies, use mounting bracket assembly Option "C" as shown on the State Standard Sheet(s) "Single Mast Arm Assemblies".

--Item 684--
Provide an extra 10' for each cable terminating in the controller cabinet. All cables shall be continuous without splices from terminal point to terminal point. All proposed signal cable shall be #12 AWG stranded copper.

--Item 686 & 687--
Provide all signal poles from the same manufacturer. Pedestrian poles may be from a different manufacturer.

--Item 688--
The sealant used for vehicle loop wire must be approved.

The force to activate the control shall be no greater than 5 lb/f. The button placement has to be coordinated with the concrete pad to access the button and if any mounting modifications are needed (extensions, brackets, etc.) to meet ADA and TDLR requirements the adjustment will be subsidiary to Item 688. The concrete pad (if required) shall be paid separately.

The pedestrian push button shall be wired with a 2/C#14 loop detector cable in lieu of a #12 A.W.G. XHHW wire.

Furnish and install new Polara Enterprises accessible pedestrian signals (APS) push buttons or approved equivalent.

--Item 6185--
2 shadow vehicles with TMA will be required for this project. The TMA's will be measured and paid for by the DAY for each TMA/TA set up and operational on the worksite. 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 TMA's needed for the project. See TMA and TA Summary sheet in the plans.

--Item 6292--
Radar presence detection device must utilize true-presence detection. Systems using locking algorithms to attempt presence detection will not be accepted. In addition, radar systems will not be allowed to use extensions/delays or place the controller on locking detection to aid in presence detection.

Radar presence detection device must be able to detect up to 10 lanes with a minimum offset of 6' and have at least 16 zones and channels per unit.

Radar presence detection device must be mounted on the same side of the intersection as the lanes it is set to detect.

Final placement of radar devices shall be approved by the engineer.

Furnish and install new Wavetronix SmartSensor Matrix, or approved equivalent, for radar presence detectors and Wavetronix SmartSensor Advance, or approved equivalent, for radar advanced detection devices.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0915-17-072 **DISTRICT** San Antonio **COUNTY** Comal
HIGHWAY BARBAROSA RD, FM 1101

			CONTROL SECTION JOB		**0915-17-072**		**1272-01-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00177755**		**A00177237**			
			COUNTY		**Comal**		**Comal**			
			HIGHWAY		**BARBAROSA RD**		**FM 1101**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	10.000				10.000	
	104-6001	REMOVING CONC (PAV)		SY			90.000		90.000	
	104-6009	REMOVING CONC (RIPRAP)		SY	207.000				207.000	
	104-6015	REMOVING CONC (SIDEWALKS)		SY			33.000		33.000	
	104-6021	REMOVING CONC (CURB)		LF	157.000		563.000		720.000	
	105-6013	REMOVING STAB BASE & ASPH PAV (9")		SY	2,833.000				2,833.000	
	110-6001	EXCAVATION (ROADWAY)		CY	2,695.000				2,695.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)		CY	445.000				445.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")		SY			72.000		72.000	
	162-6002	BLOCK SODDING		SY			72.000		72.000	
	164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)		SY	4,277.000				4,277.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)		SY	4,277.000				4,277.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)		SY	4,277.000				4,277.000	
	168-6001	VEGETATIVE WATERING		MG	200.180		1.130		201.310	
	216-6001	PROOF ROLLING		HR	8.000				8.000	
	247-6041	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)		CY	2,244.000				2,244.000	
	260-6006	LIME TRT (EXST MATL) (6")		SY			604.000		604.000	
	260-6027	LIME TRT (EXST MATL)(8")		SY	5,384.000				5,384.000	
	260-6043	LIME (HYD, COM OR QK)(SLURRY)		TON	54.000		4.600		58.600	
	310-6001	PRIME COAT (MULTI OPTION)		GAL	1,615.200				1,615.200	
	354-6069	PLANE ASPH CONC PAV (0"- 2 1/2")		SY	188.000				188.000	
	360-6019	CONC PVMT (JOINTED - CPCD) (9")		SY			580.000		580.000	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)		LF			11.000		11.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)		LF			39.000		39.000	
	420-6074	CL C CONC (MISC)		CY	6.600				6.600	
	432-6003	RIPRAP (CONC)(6 IN)		CY	111.600				111.600	
	464-6088	RC PIPE (ARCH)(CL V)(DES 2)		LF	80.000				80.000	
	467-6531	SET (TY II) (DES 2) (RCP) (6: 1) (P)		EA	2.000				2.000	
	471-6003	GRATE & FRAME		EA	18.000				18.000	
	496-6007	REMOV STR (PIPE)		LF	214.000				214.000	
	496-6018	REMOVE STR (CONC)		EA	4.000		4.000		8.000	
	500-6001	MOBILIZATION		LS	1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	5.000		1.000		6.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)		LF	12.000				12.000	
	506-6011	ROCK FILTER DAMS (REMOVE)		LF	12.000				12.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)		SY	234.000				234.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)		SY	234.000				234.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0915-17-072 **DISTRICT** San Antonio **COUNTY** Comal
HIGHWAY BARBAROSA RD, FM 1101

			CONTROL SECTION JOB		**0915-17-072**		**1272-01-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00177755**		**A00177237**			
			COUNTY		**Comal**		**Comal**			
			HIGHWAY		**BARBAROSA RD**		**FM 1101**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	506-6035	SANDBAGS FOR EROSION CONTROL		EA			3.000		3.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	921.000				921.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	921.000				921.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")		LF			105.000		105.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)		LF			105.000		105.000	
	508-6001	CONSTRUCTING DETOURS		SY	578.000				578.000	
	512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)		LF	1,760.000				1,760.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)		LF	80.000				80.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)		LF	1,820.000				1,820.000	
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)		LF	80.000				80.000	
	512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)		LF	1,760.000				1,760.000	
	512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)		LF	80.000				80.000	
	529-6002	CONC CURB (TY II)		LF	929.000		524.000		1,453.000	
	529-6020	CONC CURB & GUTTER (ARMOR CURB)		LF	28.000				28.000	
	530-6004	DRIVEWAYS (CONC)		SY	102.000				102.000	
	530-6005	DRIVEWAYS (ACP)		SY	34.000				34.000	
	531-6001	CONC SIDEWALKS (4")		SY	22.000		73.000		95.000	
	531-6018	CURB RAMPS (TY 1)		SY			33.000		33.000	
	531-6020	CURB RAMPS (TY 3)		SY	35.000				35.000	
	536-6002	CONC MEDIAN		SY			236.000		236.000	
	618-6046	CONDT (PVC) (SCH 80) (2")		LF			187.000		187.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)		LF			468.000		468.000	
	618-6053	CONDT (PVC) (SCH 80) (3")		LF			270.000		270.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)		LF			935.000		935.000	
	620-6009	ELEC CONDR (NO.6) BARE		LF			33.000		33.000	
	620-6010	ELEC CONDR (NO.6) INSULATED		LF			66.000		66.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)		LF			758.000		758.000	
	624-6010	GROUND BOX TY D (162922)W/APRON		EA			3.000		3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	1.000				1.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)		LF	1,517.000		1,402.000		2,919.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)		LF	22.000				22.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)		LF	5,752.000				5,752.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)		LF	326.000		341.000		667.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)		LF	221.000		238.000		459.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)		EA	4.000		2.000		6.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)		EA	2.000		2.000		4.000	
	666-6224	PAVEMENT SEALER 4"		LF	4,044.000		20.000		4,064.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0915-17-072 **DISTRICT** San Antonio **COUNTY** Comal
HIGHWAY BARBAROSA RD, FM 1101

			CONTROL SECTION JOB		**0915-17-072**		**1272-01-021**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00177755**		**A00177237**			
			COUNTY		**Comal**		**Comal**			
			HIGHWAY		**BARBAROSA RD**		**FM 1101**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	666-6226	PAVEMENT SEALER 8"		LF	326.000		341.000		667.000	
	666-6230	PAVEMENT SEALER 24"		LF	221.000		238.000		459.000	
	666-6231	PAVEMENT SEALER (ARROW)		EA	4.000		2.000		6.000	
	666-6232	PAVEMENT SEALER (WORD)		EA	2.000		2.000		4.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)		LF	82.000				82.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)		LF	1,378.000				1,378.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)		LF	2,584.000		20.000		2,604.000	
	672-6007	REFL PAV MRKR TY I-C		EA	40.000		17.000		57.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	122.000				122.000	
	678-6001	PAV SURF PREP FOR MRK (4")		LF	4,044.000		20.000		4,064.000	
	678-6004	PAV SURF PREP FOR MRK (8")		LF	326.000		341.000		667.000	
	678-6008	PAV SURF PREP FOR MRK (24")		LF	221.000		238.000		459.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)		EA	4.000		2.000		6.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)		EA	2.000		2.000		4.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)		EA			1.000		1.000	
	680-6004	REMOVING TRAFFIC SIGNALS		EA			1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)		EA			8.000		8.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)		EA			4.000		4.000	
	682-6003	VEH SIG SEC (12")LED(YEL)		EA			8.000		8.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)		EA			4.000		4.000	
	682-6005	VEH SIG SEC (12")LED(RED)		EA			8.000		8.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)		EA			4.000		4.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)		EA			6.000		6.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM		EA			12.000		12.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)		LF			935.000		935.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)		LF			1,956.000		1,956.000	
	684-6080	TRF SIG CBL (TY C)(14 AWG)(2 CONDR)		LF			935.000		935.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM		EA			1.000		1.000	
	686-6039	INS TRF SIG PL AM(S)1 ARM(36')LUM		EA			1.000		1.000	
	686-6051	INS TRF SIG PL AM(S)1 ARM(48')LUM		EA			2.000		2.000	
	687-6001	PED POLE ASSEMBLY		EA			4.000		4.000	
	688-6001	PED DETECT PUSH BUTTON (APS)		EA			6.000		6.000	
	688-6003	PED DETECTOR CONTROLLER UNIT		EA			1.000		1.000	
	3076-6003	D-GR HMA TY-B PG64-22 (EXEMPT)		TON	283.600				283.600	
	3076-6066	TACK COAT		GAL	687.500				687.500	
	3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)		TON	811.200				811.200	
	3076-6079	D-GR HMA TY-C PG70-22 (EXEMPT)		TON	941.000				941.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0915-17-072 **DISTRICT** San Antonio **COUNTY** Comal
HIGHWAY BARBAROSA RD, FM 1101

				CONTROL SECTION JOB	0915-17-072		1272-01-021		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00177755		A00177237			
				COUNTY	Comal		Comal			
				HIGHWAY	BARBAROSA RD		FM 1101			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL	EST.	FINAL			
	5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	5,384.000				5,384.000		
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	80.000		48.000		128.000		
	6185-6002	TMA (STATIONARY)	DAY	80.000		20.000		100.000		
	6185-6005	TMA (MOBILE OPERATION)	DAY	4.000				4.000		
	6292-6001	RVDS(PRESENCE DETECTION ONLY)	EA			4.000		4.000		
	6292-6002	RVDS(ADVANCE DETECTION ONLY)	EA			2.000		2.000		
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000				1.000		
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000				1.000		
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000				1.000		

CSJ 1272-01-021 TRAFFIC SIGNAL SUMMARY

ITEM	0416-6031	0416-6032	0618-6046	0618-6047	0618-6053	0618-6054	0620-6009	0620-6010
INTERSECTION	DRILL SHAFT (TRF SIG POLE) (30 IN)	DRILL SHAFT (TRF SIG POLE) (36 IN)	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	CONDT (PVC) (SCH 80) (3")	CONDT (PVC) (SCH 80) (3") (BORE)	ELEC CONDR (NO.6) BARE	ELEC CONDR (NO.6) INSULATED
	LF	LF	LF	LF	LF	LF	LF	LF
EXISTING CONDITION								
PROPOSED CONDITION	11	39	187	468	270	935	33	66
TOTALS	11	39	187	468	270	935	33	66

ITEM	0621-6005	0624-6010	0680-6002	0680-6004	0682-6001	0682-6002	0682-6003	0682-6004
INTERSECTION	TRAY CABLE (4 CONDR) (12 AWG)	GROUND BOX TY D (162922)W/APRON	INSTALL HWY TRF SIG (ISOLATED)	REMOVING TRAFFIC SIGNALS	VEH SIG SEC (12")LED(GRN)	VEH SIG SEC (12")LED(GRN ARW)	VEH SIG SEC (12")LED(YEL)	VEH SIG SEC (12")LED(YEL ARW)
	LF	EA	EA	EA	EA	EA	EA	EA
EXISTING CONDITION				1				
PROPOSED CONDITION	758	3	1		8	4	8	4
TOTALS	758	3	1	1	8	4	8	4

ITEM	0682-6005	0682-6006	0682-6018	0682-6054	0684-6009	0684-6012	0684-6080	0686-6035
INTERSECTION	VEH SIG SEC (12")LED(RED)	VEH SIG SEC (12")LED(RED ARW)	PED SIG SEC (LED)(COUNTDOWN)	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	TRF SIG CBL (TY C)(14 AWG)(2 CONDR)	INS TRF SIG PL AM(S)1 ARM(32')LUM
	EA	EA	EA	EA	LF	LF	LF	EA
EXISTING CONDITION								
PROPOSED CONDITION	8	4	6	12	935	1956	935	1
TOTALS	8	4	6	12	935	1956	935	1

ITEM	0686-6039	0686-6051	0687-6001	0688-6001	0688-6003	6001-6001	6292-6001	6292-6002
INTERSECTION	INS TRF SIG PL AM(S)1 ARM(36')LUM	INS TRF SIG PL AM(S)1 ARM(48')LUM	PED POLE ASSEMBLY	PED DETECT PUSH BUTTON (APS)	PED DETECTOR CONTROLLER UNIT	PORTABLE CHANGEABLE MESSAGE SIGN	RVDS(PRESENCE DETECTION ONLY)	RVDS(ADVANCE DETECTION ONLY)
	EA	EA	EA	EA	EA	DAY	EA	EA
EXISTING CONDITION								
PROPOSED CONDITION	1	2	4	6	1	28	4	2
TOTALS	1	2	4	6	1	28	4	2

ITEM	6292-XXX1	6292-XXX2
INTERSECTION	*RVDS(PRESENCE DETECTION ONLY) COMM CABLE	*RVDS(ADVANCE DETECTION ONLY) COMM CABLE
	LF	LF
EXISTING CONDITION		
PROPOSED CONDITION	693	469
TOTALS	693	469

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HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

QUANTITY SUMMARY SHEET

FM 1101 @ FM 306
CSJ: 1272-01-021

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS,ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL,ETC.	0915	17	072,ETC.	6

Plotted on: 4/25/2022

Design Filename: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Summaries\1163006_FM306_QTY_Summary.dgn

TRAFFIC CONTROL QUANTITIES:

ITEM	0502-6001	0508-6001	0512-6009	0512-6010	0512-6033	0512-6034	0512-6057
INTERSECTION	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	PORT CTB (MOVE)(LOW PROF)(TY 1)	PORT CTB (MOVE)(LOW PROF)(TY 2)	PORT CTB (REMOVE)(LOW PROF)(TY 1)
	MO	SY	LF	LF	LF	LF	LF
CSJ 1272-01-021 PHASE 1 - SHEET 1 OF 2							
CSJ 1272-01-021 PHASE 1 - SHEET 2 OF 2							
CSJ 0915-17-072 PHASE 2 - SHEET 1 OF 2		50	760	20			
CSJ 0915-17-072 PHASE 2 - SHEET 2 OF 2		297	100	20			
CSJ 0915-17-072 PHASE 3 - SHEET 1 OF 2		32	700	20	760	20	
CSJ 0915-17-072 PHASE 3 - SHEET 2 OF 2		113	200	20	100	20	
CSJ 0915-17-072 PHASE 4 - SHEET 1 OF 2					740	20	720
CSJ 0915-17-072 PHASE 4 - SHEET 2 OF 2					220	20	80
CSJ 0915-17-072 PHASE 5A - SHEET 1 OF 2		86					740
CSJ 0915-17-072 PHASE 5B - SHEET 2 OF 2							220
CSJ 1272-01-021 SUBTOTAL	1						
CSJ 0915-17-072 SUBTOTAL	5	578	1760	80	1820	80	1760
TOTALS	6	578	1760	80	1820	80	1760

ITEM	0512-6058	0662-6063	0662-6075	0662-6095	6001-6001	6185-6002	6185-6005
INTERSECTION	PORT CTB (REMOVE)(LOW PROF)(TY 2)	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	LF	LF	DAY	DAY	DAY
CSJ 1272-01-021 PHASE 1 - SHEET 1 OF 2		1158					
CSJ 1272-01-021 PHASE 1 - SHEET 2 OF 2		244					
CSJ 0915-17-072 PHASE 2 - SHEET 1 OF 2			11	1416			
CSJ 0915-17-072 PHASE 2 - SHEET 2 OF 2				250			
CSJ 0915-17-072 PHASE 3 - SHEET 1 OF 2		247					
CSJ 0915-17-072 PHASE 3 - SHEET 2 OF 2		125		540			
CSJ 0915-17-072 PHASE 4 - SHEET 1 OF 2	20		11	1544			
CSJ 0915-17-072 PHASE 4 - SHEET 2 OF 2	20	269		250			
CSJ 0915-17-072 PHASE 5A - SHEET 1 OF 2	20	751		1502			
CSJ 0915-17-072 PHASE 5B - SHEET 2 OF 2	20	125		250			
CSJ 1272-01-021 SUBTOTAL		1402			20	20	
CSJ 0915-17-072 SUBTOTAL	80	1517	22	5752	80	80	4
TOTALS	80	2919	22	5752	100	100	4

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

QUANTITY SUMMARY SHEET

BARBAROSA RD @ FM 1101

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	6A

Plotted on: 4/25/2022

Design Filename: P:\124\85\00\Design\Civil\Summaries\1248500_Summaries_TCP.dgn

Plotted on: 4/25/2022

Design Filename: P:\124\85\00\Design\Civil\Summaries\1248500_Summaries_RDWY.dgn

ROADWAY QUANTITIES:

ITEM	0100-6002	0104-6001	0104-6009	0104-6015	0104-6021	0105-6013	0110-6001	0132-6003
INTERSECTION	PREPARING ROW	REMOVING CONC (PAV)	REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	REMOVING CONC (CURB)	REMOVING STAB BASE & ASPH PAV (9")	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(ORD COMP)(TY B)
	STA	SY	SY	SY	LF	SY	CY	CY
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 1 OF 4)		64			324			
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)		26		33	239			
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	3.0		207		157	1072	693.0	183.0
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 3 OF 4)	5.0					1389	1617.0	238.0
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 4 OF 4)	2.0					372	385.0	24.0
CSJ 1272-01-021 SUBTOTAL		90		33	563			
CSJ 0915-17-072 SUBTOTAL	10.0		207		157	2833	2695.0	445.0
TOTALS	10.0	90	207	33	720	2833	2695.0	445.0

ITEM	0160-6003	0162-6002	0164-6003	0164-6009	0164-6011	0168-6001	0216-6001	0247-6041
INTERSECTION	FURNISHING AND PLACING TOPSOIL (4")	BLOCK SODDING	BROADCAST SEED (PERM) (RURAL) (CLAY)	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	VEGETATIVE WATERING	PROOF ROLLING	FL BS (CMP IN PLC)(TYA GR1&2)(FNAL POS)
	SY	SY	SY	SY	SY	MG	HR	CY
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 1 OF 4)								
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	72	72				1.13		
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)			1485	1485	1485	69.50	2.0	589.0
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 3 OF 4)			2380	2380	2380	111.39	5.0	1283.0
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 4 OF 4)			412	412	412	19.29	1.0	372.0
CSJ 1272-01-021 SUBTOTAL	72	72				1.13		
CSJ 0915-17-072 SUBTOTAL			4277	4277	4277	200.18	8.0	2244.0
TOTALS	72	72	4277	4277	4277	201.31	8.0	2244.0

ITEM	0260-6006	0260-6027	0260-6043	0310-6001	0354-6069	0360-6019	0496-6007	0496-6018
INTERSECTION	LIME TRT (EXST MATL) (6")	LIME TRT (EXST MATL)(8")	LIME (HYD, COM OR QK)(SLURRY)	PRIME COAT (MULTI OPTION)	PLANE ASPH CONC PAV (0"- 2 1/2")	CONC PVMT (JOINTED - CPCD) (9")	REMOV STR (PIPE)	REMOVE STR (CONC)
	SY	SY	TON	GAL	SY	SY	LF	EA
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 1 OF 4)	433		3.3			415		
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	171		1.3			165		4
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)		1413	14.2	423.90	188		214	4
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 3 OF 4)		3079	30.8	923.70				
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 4 OF 4)		892	9.0	267.60				
CSJ 1272-01-021 SUBTOTAL	604		4.6			580		4
CSJ 0915-17-072 SUBTOTAL		5384	54.0	1615.20	188		214	4
TOTALS	604	5384	58.6	1615.20	188	580	214	8

ITEM	0529-6002	0530-6004	0530-6005	0531-6001	0531-6018	0531-6020	0536-6002
INTERSECTION	CONC CURB (TY II)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	CONC SIDEWALKS (4")	CURB RAMPS (TY 1)	CURB RAMPS (TY 3)	CONC MEDIAN
	LF	SY	SY	SY	SY	SY	SY
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 1 OF 4)	324						210
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	200			73	33		26
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	342		34	22		35	
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 3 OF 4)	500						
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 4 OF 4)	87	102					
CSJ 1272-01-021 SUBTOTAL	524			73	33		236
CSJ 0915-17-072 SUBTOTAL	929	102	34	22		35	
TOTALS	1453	102	34	95	33	35	236

ITEM	3076-6003	3076-6066	3076-6072	3076-6079	5001-6002
INTERSECTION	D-GR HMA TY-B PG64-22 (EXEMPT)	TACK COAT	D-GR HMA TY-D PG 76-22 (EXEMPT)	D-GR HMA TY-C PG70-22 (EXEMPT)	GEOGRID BASE REINFORCEMENT (TY II)
	TON	GAL	TON	TON	SY
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 1 OF 4)					
CSJ 1272-01-021 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)					
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 2 OF 4)	283.6	314.70	275.2	297.8	1413
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 3 OF 4)		288.50	414.8	497.7	3079
CSJ 0915-17-072 ROADWAY PLAN AND PROFILE (SHEET 4 OF 4)		84.30	121.2	145.5	892
CSJ 1272-01-021 SUBTOTAL					
CSJ 0915-17-072 SUBTOTAL	283.6	687.50	811.2	941.0	5384
TOTALS	283.6	687.50	811.2	941.0	5384

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

QUANTITY SUMMARY SHEET

BARBAROSA RD @ FM 1101

SHEET 2 OF 3

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	6B

SW3P QUANTITIES:

ITEM	0506-6002	0506-6011	0506-6020	0506-6024	0506-6035	0506-6038	0506-6039	0506-6041	0506-6043
INTERSECTION	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	SANDBAGS FOR EROSION CONTROL	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	LF	LF	SY	SY	EA	LF	LF	LF	LF
CSJ 1272-01-021 SW3P (SHEET 1 OF 2)					3			105	105
CSJ 0915-17-072 SW3P (SHEET 1 OF 2)	12	12				296	296		
CSJ 0915-17-072 SW3P (SHEET 2 OF 2)			234	234		625	625		
CSJ 1272-01-021 SUBTOTAL					3			105	105
CSJ 0915-17-072 SUBTOTAL	12	12	234	234		921	921		
TOTALS	12	12	234	234	3	921	921	105	105

DRAINAGE QUANTITIES:

ITEM	0420-6074	0432-6003	0464-6088	0467-6531	0471-6003	0529-6020
INTERSECTION	CL C CONC (MISC)	RIPRAP (CONC)(6 IN)	RC PIPE (ARCH)(CL V)(DES 2)	SET (TY II) (DES 2) (RCP) (6: 1) (P)	GRATE & FRAME	CONC CURB & GUTTER (ARMOR CURB)
	CY	CY	LF	EA	EA	LF
CSJ 0915-17-072 STORM DRAIN PLAN AND PROFILE (SHEET 1 OF 2)	3.3	29.0			9	14
CSJ 0915-17-072 STORM DRAIN PLAN AND PROFILE (SHEET 2 OF 2)	3.3	49.2			9	14
CSJ 0915-17-072 CULVERT LAYOUT CULVERT A (SHEET 1 OF 1)		33.4	80	2		
CSJ 0915-17-072 SUBTOTAL	6.6	111.6	80	2	18	28
TOTALS	6.6	111.6	80	2	18	28

PAVEMENT MARKING QUANTITIES:

ITEM	0644-6001	0666-6036	0666-6048	0666-6054	0666-6078	0666-6224	0666-6226
INTERSECTION	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(ARROW)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	PAVEMENT SEALER 4"	PAVEMENT SEALER 8"
	EA	LF	LF	EA	EA	LF	LF
CSJ 1272-01-021 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)		341	238	2	2	20	341
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)	1	261	221	3	1	849	261
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 2 OF 2)		65		1	1	3195	65
CSJ 1272-01-021 SUBTOTAL		341	238	2	2	20	341
CSJ 0915-17-072 SUBTOTAL	1	326	221	4	2	4044	326
TOTALS	1	667	459	6	4	4064	667

ITEM	0666-6230	0666-6231	0666-6232	0666-6300	0666-6303	0666-6315	0672-6007
INTERSECTION	PAVEMENT SEALER 24"	PAVEMENT SEALER (ARROW)	PAVEMENT SEALER (WORD)	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRKR TY I-C
	LF	EA	EA	LF	LF	LF	EA
CSJ 1272-01-021 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)	238	2	2			20	17
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)	221	3	1	65	262	522	13
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 2 OF 2)		1	1	17	1116	2062	27
CSJ 1272-01-021 SUBTOTAL	238	2	2			20	17
CSJ 0915-17-072 SUBTOTAL	221	4	2	82	1378	2584	40
TOTALS	459	6	4	82	1378	2604	57

ITEM	0672-6009	0678-6001	0678-6004	0678-6008	0678-6009	0678-6016
INTERSECTION	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (4")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)
	EA	LF	LF	LF	EA	EA
CSJ 1272-01-021 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)		20	341	238	2	2
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 1 OF 2)	26	849	261	221	3	1
CSJ 0915-17-072 SIGN AND PAVEMENT MARKINGS (SHEET 2 OF 2)	96	3195	65		1	1
CSJ 1272-01-021 SUBTOTAL		20	341	238	2	2
CSJ 0915-17-072 SUBTOTAL	122	4044	326	221	4	2
TOTALS	122	4064	667	459	6	4

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

QUANTITY SUMMARY SHEET

BARBAROSA RD @ FM 1101

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	6C

Plotted on: 4/25/2022

Design Filename: P:\124\85\00\Design\Civil\Summaries\1248500_Summaries_DRN_SPM_SW3P.dgn

LOC NO.	TCP PHASE	SPECIFIC TCP PLAN SHEET OR TCP STANDARD SHEET	FURNISH TMA/TA	RELOCATE/REUSE TMA/TA	TOTAL TMA/TA PER SET UP	DURATION OF TMA/TA SET UP	6185 6002 TMA (STATIONARY)	6185 6005 TMA (MOBILE OPERATION)
		SHEET NUMBER	EA	EA	EA	DAYS PER TMA/TA USE	DAY	DAY
1	1	TCP (2-5)	1		1	20	20	
2	3	TCP PHASE 3 (SHEET 2 OF 2)		1	1	20	20	
3	4	TCP PHASE 4 (SHEET 2 OF 2)		1	1	18	18	
	5A	TCP PHASE 5A-STEP 1 (SHEET 1 OF 2)		1	1	5	5	
	5B	TCP PHASE 5B-LEVEL UP USING TCP(1-2)		1	1	3	3	
	5B	TCP PHASE 5B-NO LIME PAVE USING TCP(1-3)		1	1	5	5	
	5B	TCP PHASE 5B-OVERLAY USING TCP(1-3) & TCP(1-4)		1	1	13	13	
	5C	TCP PHASE 5C-SW CORNER USING TCP(2-1)		1	1	4	4	
	5C	TCP PHASE 5C-SE CORNER USING TCP(2-1)		1	1	4	4	
	5C	TCP PHASE 5C-NE CORNER USING TCP(2-1)		1	1	4	4	
	5C	TCP PHASE 5C-NW CORNER USING TCP(2-1)		1	1	4	4	
	5C	TCP PHASE 5C-FINAL STRIPING USING TCP(3-3)	1	1	2	2		4
		TOTALS	2				100	4

NOTE.
FURNISH TMA/TA - THE NUMBER OF ATTENUATORS BEING FURNISHED FOR THE SPECIFIC TCP.
RELOCATE/REUSE TMA/TA - THE NUMBER OF ATTENUATORS BEING REUSED FROM A PREVIOUS TCP FOR THE SPECIFIC TCP.
TOTAL TMA/TA PER SET UP = (FURNISH TMA/TA) + (RELOCATE/REUSE TMA/TA)
DURATION OF TMA/TA SET UP - THE NUMBER OF DAYS THE ATTENTUATORS WILL BE USED FOR THE SPECIFIC TCP.
TMA/TA (STATIONARY) = (TOTAL TMA/TA PER SET UP) X (THE DURATION OF TMA/TA SET UP)
TMA/TA (MOBILE OPERATION) = (TOTAL TMA/TA PER SET UP) X (THE DURATION OF TMA/TA SET UP)

TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA) SUMMARY SHEET

FILE: tma.dgn	DN: TxDOT	CK:		CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS 3/2018	0915	17	072	CS, ETC.
	DIST	COUNTY		
	SAT	COMAL		
	FEDERAL AID PROJECT			SHEET NO.
				7

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\General\124500_Prj.dgn

BEGIN WORK
BEGIN CSJ 1272-01-021
STA 95+16.6

END CSJ 1272-01-021
BEGIN CSJ 0915-17-072
STA 100+88.1

END WORK
END CSJ 0915-17-072
STA 110+25.0

NEW BRAUNFELS
Pop 27,334

COMAL COUNTY
GUADALUPE COUNTY

NEW BRAUNFELS MUNICIPAL AIRPORT

0 1000 2000 3000
SCALE: 1"= 2000'

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED
PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

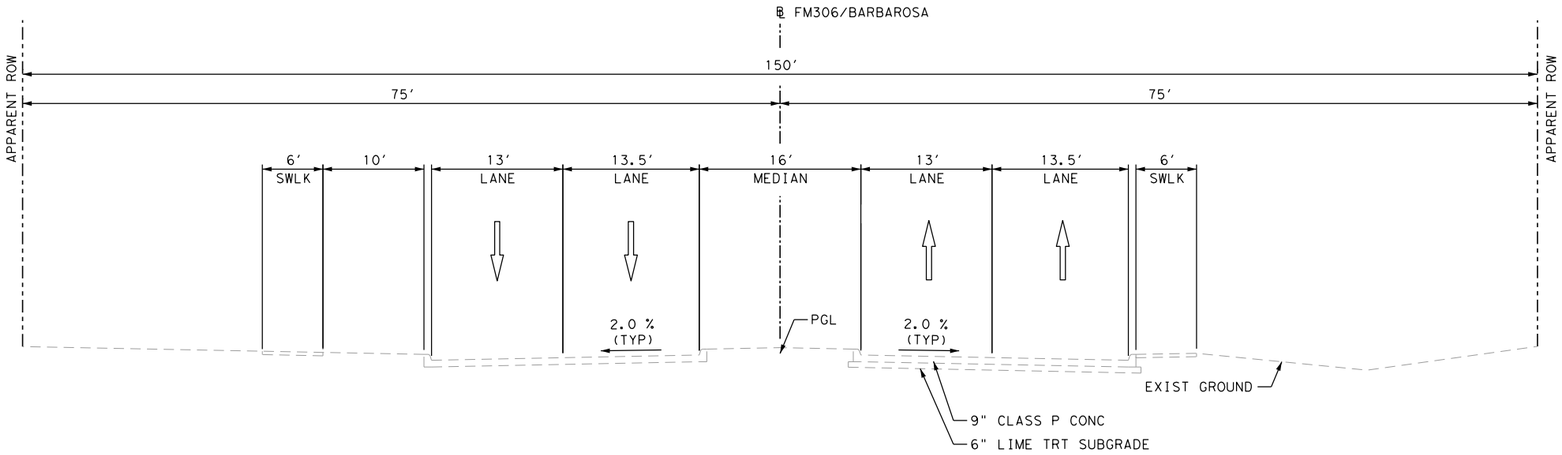
City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

PROJECT BARBAROSA RD
LOCATION MAP

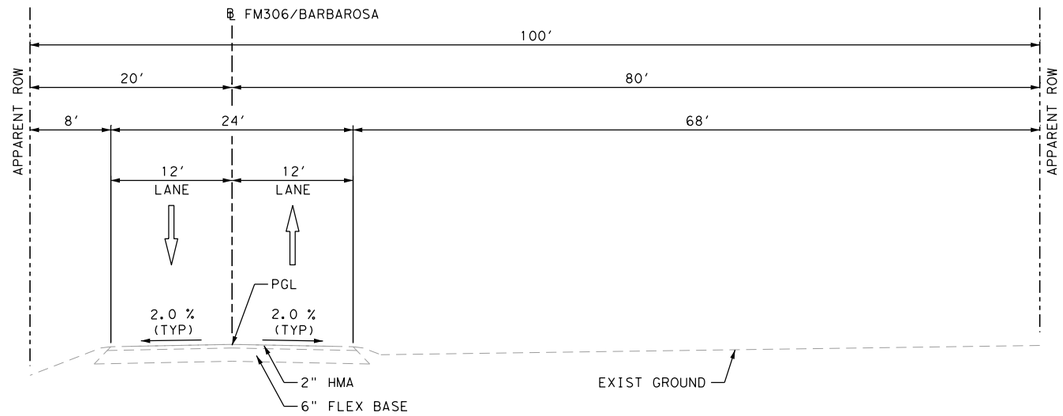
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	8



FM 306 CREEKSIDE CROSSING

STA 95+16.6 - STA 100+88.1
N.T.S.



BARBAROSA RD

STA 100+88.1 - STA 110+25.0
N.T.S.

NOT TO SCALE

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
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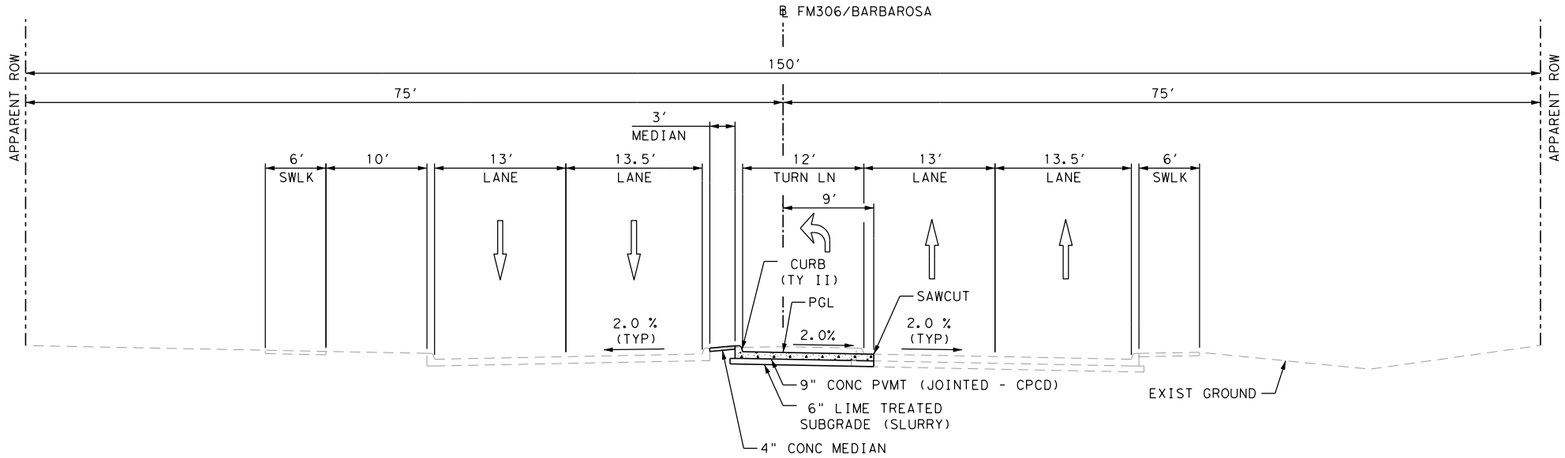
City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

EXISTING TYPICALS

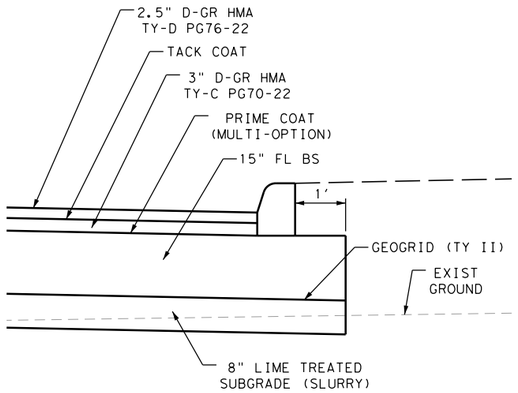
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	9



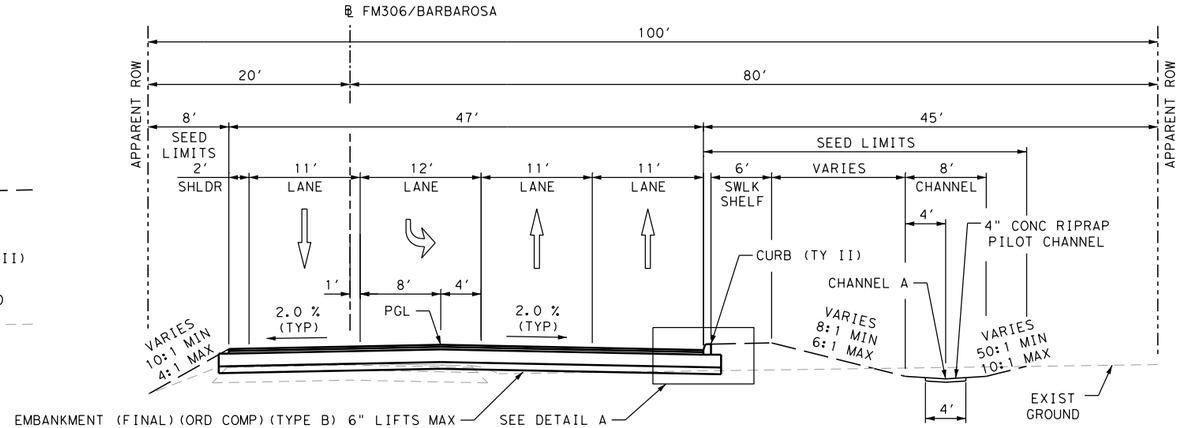
FM 306 CREEKSIDE CROSSING

STA 95+16.6 - STA 100+88.1
N.T.S.



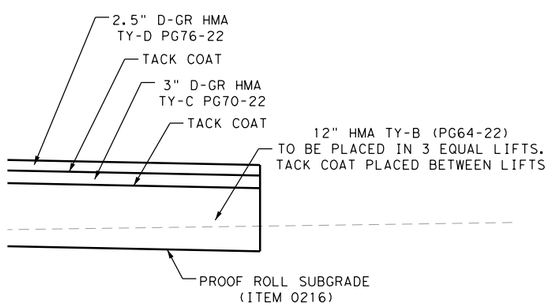
DETAIL A: FULL DEPTH CONSTRUCTION

N.T.S.



BARBAROSA RD

STA 101+49 - STA 110+25
N.T.S.



NO-LIME PAVEMENT

N.T.S.

NOT TO SCALE

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED
PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
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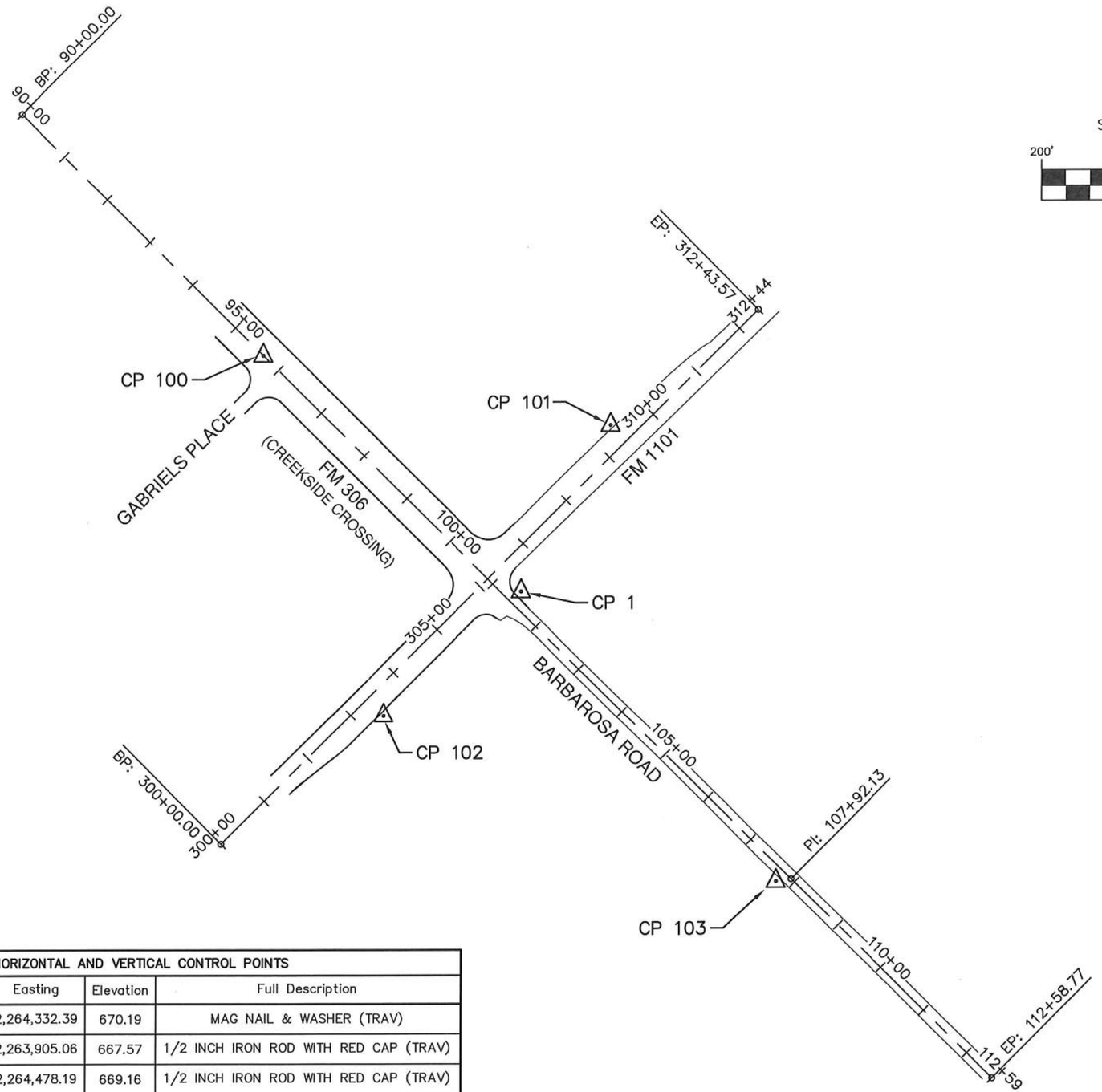
City of New Braunfels

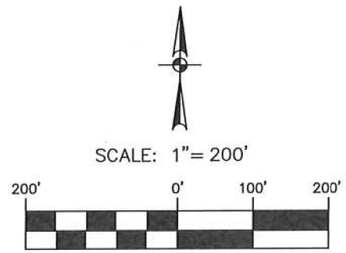
HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

PROPOSED TYPICALS

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	10





NOTES:

1. COORDINATES SHOWN ARE DISPLAYED AS SURFACE VALUES IN US SURVEY FEET, BASED ON THE NORTH AMERICAN DATUM OF 1983 (2011) EPOCH 2010.00 FROM THE TEXAS COORDINATE SYSTEM ESTABLISHED FOR THE SOUTH CENTRAL ZONE, WITH A SURFACE ADJUSTMENT FACTOR OF 1.00014 APPLIED, AS OBTAINED FROM RTK OBSERVATIONS USING THE TXDOT VRS NETWORK.

2. ELEVATIONS SHOWN ARE BASED ON NAVD88 (GEOID 18), OBTAINED BY RTK METHODS USING THE TXDOT VRS NETWORK, AND FINALIZED BY BALANCING A CLOSED DOUBLE RUN DIGITAL LEVEL LOOP.

LEGEND

△	CONTROL POINT
CP	CONTROL POINT
FM	FARM TO MARKET ROAD
(TRAV)	MARKED "TRAVERSE"

HORIZONTAL AND VERTICAL CONTROL POINTS

Point #	Northing	Easting	Elevation	Full Description
1	13,811,446.65	2,264,332.39	670.19	MAG NAIL & WASHER (TRAV)
100	13,811,835.03	2,263,905.06	667.57	1/2 INCH IRON ROD WITH RED CAP (TRAV)
101	13,811,719.73	2,264,478.19	669.16	1/2 INCH IRON ROD WITH RED CAP (TRAV)
102	13,811,242.47	2,264,106.25	671.61	MAG NAIL & WASHER (TRAV)
103	13,810,968.43	2,264,752.61	670.61	1/2 INCH IRON ROD WITH RED CAP (TRAV)

STATE OF TEXAS
REGISTERED
ANGELA MARIE WELLER
5981
PROFESSIONAL
LAND SURVEYOR

08/27/2021

REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

Texas Department of Transportation

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

HORIZONTAL AND VERTICAL CONTROL

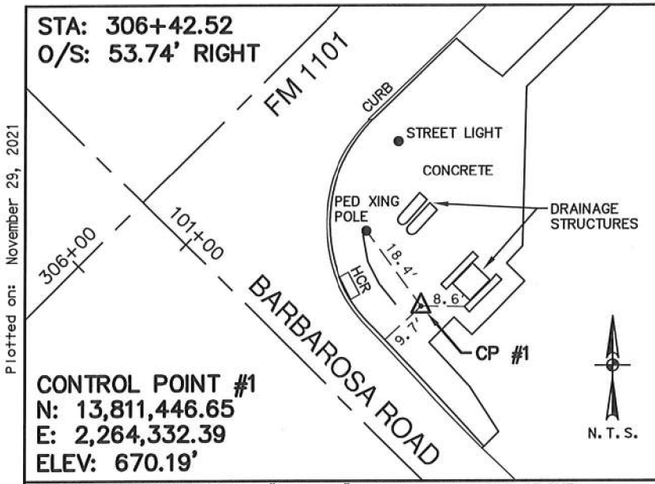
BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

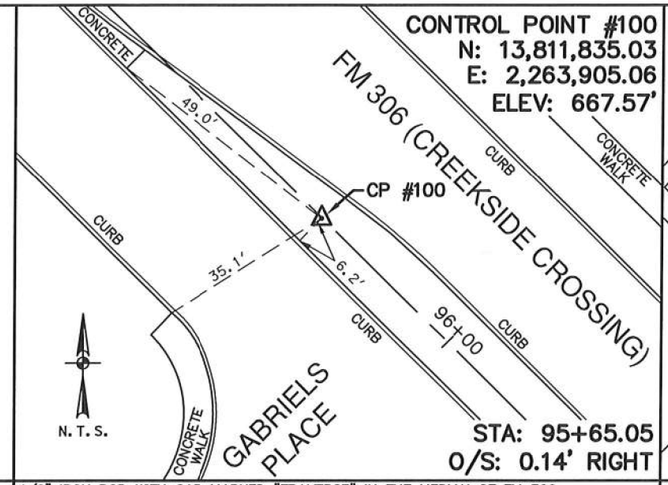
DGN: SLS	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN: AMW		TEXAS				---
DWG: SLS	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: AMW	15	COMAL	0915	17	072	11

Plotted on: November 29, 2021

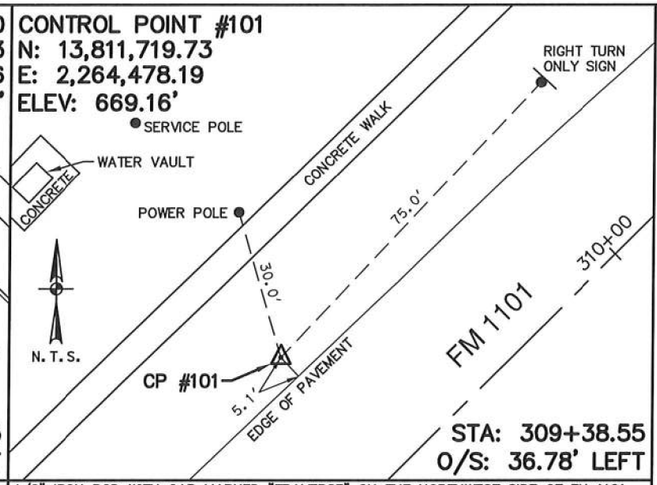
Design Filename: N:\Transpo\Civil\12485-00\Control Sheets\CT 12485-00.dwg



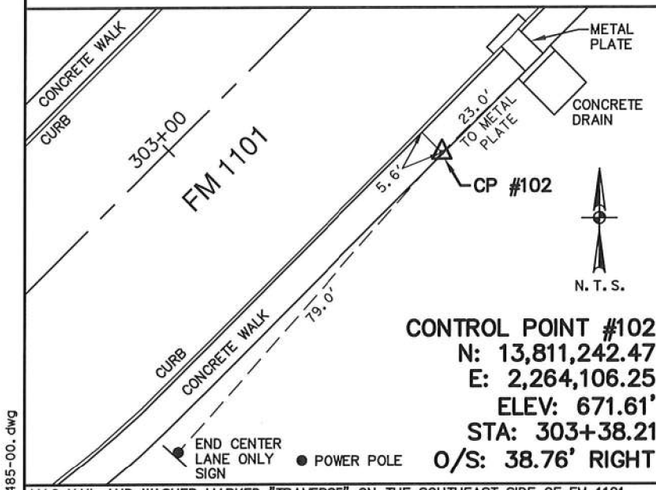
MAG NAIL AND WASHER MARKED "TRAVERSE" AT THE EAST CORNER OF THE INTERSECTION OF FM 1101 AND BARBAROSA ROAD.



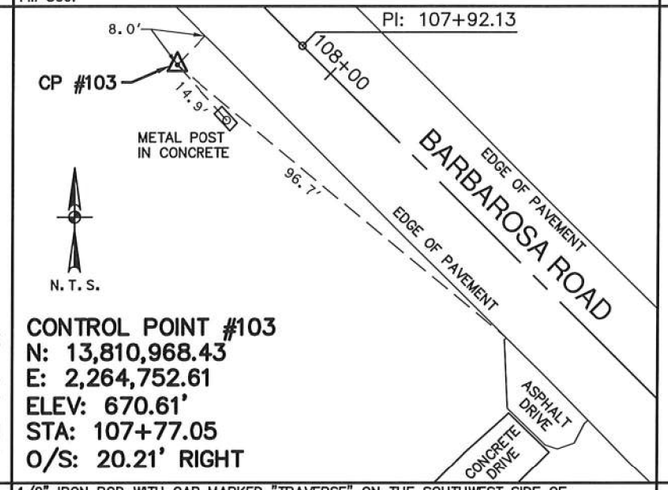
1/2" IRON ROD WITH CAP MARKED "TRAVERSE" IN THE MEDIAN OF FM 306 APPROXIMATELY 35 FEET NORTHWEST OF THE INTERSECTION OF GABRIELS PLACE AND FM 306.



1/2" IRON ROD WITH CAP MARKED "TRAVERSE" ON THE NORTHWEST SIDE OF FM 1101 APPROXIMATELY 320 FEET NORTHEAST OF THE INTERSECTION OF FM 1101 AND FM 306.



MAG NAIL AND WASHER MARKED "TRAVERSE" ON THE SOUTHEAST SIDE OF FM 1101 APPROXIMATELY 280 FEET SOUTHWEST OF THE INTERSECTION OF FM 1101 AND FM 306.



1/2" IRON ROD WITH CAP MARKED "TRAVERSE" ON THE SOUTHWEST SIDE OF BARBAROSA ROAD APPROXIMATELY 690 FEET SOUTHEAST OF THE INTERSECTION OF FM 1101 AND BARBAROSA ROAD.

NOTES:

1. COORDINATES SHOWN ARE DISPLAYED AS SURFACE VALUES IN US SURVEY FEET, BASED ON THE NORTH AMERICAN DATUM OF 1983 (2011) EPOCH 2010.00 FROM THE TEXAS COORDINATE SYSTEM ESTABLISHED FOR THE SOUTH CENTRAL ZONE, WITH A SURFACE ADJUSTMENT FACTOR OF 1.00014 APPLIED, AS OBTAINED FROM RTK OBSERVATIONS USING THE TXDOT VRS NETWORK.

2. ELEVATIONS SHOWN ARE BASED ON NAVD88 (GEOID 18), OBTAINED BY RTK METHODS USING THE TXDOT VRS NETWORK, AND FINALIZED BY BALANCING A CLOSED DOUBLE RUN DIGITAL LEVEL LOOP.

LEGEND

CP	CONTROL POINT
CP	CONTROL POINT
N.T.S.	NOT TO SCALE
STA	STATION
O/S	OFFSET

STATE OF TEXAS
REGISTERED
ANGELA MARIE WELLER
5981
PROFESSIONAL
LAND SURVEYOR

08/27/2021

REV. NO.	DATE	DESCRIPTION	BY

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
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City of New Braunfels

Texas Department of Transportation

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

HORIZONTAL AND VERTICAL CONTROL

BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

DGN: SLS	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN: AMW		TEXAS				---
DW: SLS	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DW: AMW	15	COMAL	0915	17	072	12

Plotted on: November 29, 2021

Design Filename: N:\Transpo\Civil\12485-00\Control Sheets\CT 12485-00.dwg

Plotted on: 4/20/2022

℄ FM306/BARBAROSA ALIGNMENT

Beginning chain BARBCL description
Feature: Geom_Centerline

Point BARBCL1	N	13,812,232.50	E	2,263,503.44	Sta 90+00.00
Course from BARBCL1 to BARBCL3 S 45° 18′ 42" E Dist 1,800.00					
Point BARBCL3	N	13,810,966.66	E	2,264,783.14	Sta 108+00.00
Course from BARBCL3 to BARBCL4 S 45° 15′ 18" E Dist 458.77					
Point BARBCL4	N	13,810,643.70	E	2,265,108.98	Sta 112+58.77

Ending chain BARBCL description

℄ FM1101 ALIGNMENT

Beginning chain FM1101CL description
Feature: Geom_Centerline

Point 13	N	13,811,031.20	E	2,263,839.32	Sta 300+00.00
Course from 13 to 14 N 45° 06′ 06" E Dist 1,243.57					
Point 14	N	13,811,908.97	E	2,264,720.21	Sta 312+43.57

Ending chain FM1101CL description

DESIGN

STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

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Texas Department of Transportation

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

HORIZONTAL ALIGNMENT DATA

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	13

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Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\TCP\1248500_TCP_NARR.dgn

DETOURS, BARRICADES, WARNING SIGNS, SEQUENCE OF WORK, ETC.

THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENTS OF ITEM 7, "LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC", OF THE STANDARD SPECIFICATIONS. IN ADDITION TO THESE REQUIREMENTS, THE FOLLOWING PROVISIONS SHALL ALSO GOVERN ON THIS CONTRACT:

1. GENERAL

(1) TRAFFIC MUST BE HANDLED THROUGHOUT THE PROJECT DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING A SAFE AND COMFORTABLE PASSAGE FOR VEHICULAR AND PEDESTRIAN TRAFFIC WITH MINIMAL INCONVENIENCE TO THE PUBLIC, AS SHOWN IN THE PLANS OR AS DIRECTED/APPROVED BY THE ENGINEER.

(2) THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY MAJOR RECOMMENDED MODIFICATION BY THE CONTRACTOR SHALL INCLUDE ANY CHANGES TO THE VARIOUS BID ITEMS, IMPACT TO TRAFFIC, EFFECT OF OVERALL PROJECT IN TIME AND COST, ETC. IF THIS PROPOSAL IS IMPLEMENTED, THE CONTRACTOR WILL BE RESPONSIBLE FOR DEVELOPING DETAILED PLAN SHEETS TO BE SEALED BY A LICENSED PROFESSIONAL ENGINEER FOR INCLUSION WITH THE CHANGE ORDER. THE CONTRACTOR CANNOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED PHASE/SEQUENCE UNLESS WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER. IF AT ANY TIME DURING CONSTRUCTION THE CONTRACTOR'S PROPOSED PLAN OF OPERATION FOR HANDLING TRAFFIC DOES NOT PROVIDE FOR SAFE AND COMFORTABLE MOVEMENT, THE CONTRACTOR WILL IMMEDIATELY CHANGE THEIR OPERATION TO CORRECT THE UNSATISFACTORY CONDITION.

(3) DO NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT AT ANY LOCATION THAT WILL CONSTITUTE A HAZARD AND WILL ENDANGER TRAFFIC.

(4) THE CONTRACTOR WILL PROVIDE ADVANCE NOTIFICATION TO THE ENGINEER OF IMPENDING / UPCOMING LANE CLOSURES FOR ALL TEMPORARY AND / OR PERMANENT LANE, RAMP, CONNECTOR, FRONTAGE, SHOULDER, ETC. CLOSURES OR DETOURS. SEE GENERAL NOTES FOR NOTIFICATION REQUIREMENTS.

(5) ACCESS TO ADJOINING PROPERTY MUST BE MAINTAINED AT ALL TIMES.

(6) TEMPORARY DRAINAGE IS THE RESPONSIBILITY OF THE CONTRACTOR.

(7) AT NO TIME SHALL TWO CONSECUTIVE INTERSECTING ROADWAYS BE CLOSED AT ONE TIME DURING CONSTRUCTION.

(8) AT NO TIME SHALL TWO CONSECUTIVE RAMPS BE CLOSED AT ONE TIME DURING CONSTRUCTION OR OVERLAY OPERATIONS.

(9) UNLESS OTHERWISE NOTED IN THE PLANS AND/OR AS DIRECTED BY THE ENGINEER, DAILY LANE CLOSURES SHALL BE LIMITED ACCORDING TO THE FOLLOWING RESTRICTIONS:
NIGHTTIME AND WEEKEND LANE CLOSURES TO BE COORDINATED WITH AREA ENGINEER. CONTACT INFORMATION PROVIDED IN SECTION G-17 OF THE GENERAL NOTES.
NO LANE CLOSURES WILL BE PERMITTED FOR THE FOLLOWING DATES AND/OR SPECIAL EVENTS:
BETWEEN DECEMBER 15 AND JANUARY 1.
WEDNESDAY BEFORE THANKSGIVING THRU THE SUNDAY AFTER THANKSGIVING
SATURDAY AND SUNDAY BEFORE MEMORIAL DAY AND LABOR DAY.
SATURDAY OR SUNDAY WHEN JULY 4 FALLS ON A FRIDAY OR MONDAY.
ELECTION DAYS (BEXAR COUNTY ONLY)
EASTER WEEKENDS (APRIL 9, 2023 AND MARCH 31, 2024)

(10) REMOVAL AND DISPOSAL OF EXISTING ABANDONED UTILITIES (EITHER PREVIOUSLY ABANDONED OR ABANDONED DURING THIS PROJECT) REQUIRED TO SUPPORT THIS PROJECT'S CONSTRUCTION SHALL BE PERFORMED UNDER THE OVERALL PREPARE RIGHT-OF-WAY ITEM (ITEM 100).

(11) COORDINATE WITH ADJACENT PROJECTS.

(12) COVER PERMANENT SIGNS IF NOT USED. THIS IS SUBSIDIARY TO ITEM 502.

(13) EXCAVATION WITHIN 5 FEET OF AN EXISTING NBU POWER POLE WILL REQUIRE POLE BRACING. CONTACT NBU ELECTRIC (GREGORY THOMAS, P.E., GTHOMAS@NBUTEXAS.COM) (830-608-8953) TO COORDINATE POLE BRACING 5 WEEKS PRIOR TO CONSTRUCTION IN THE AREA.

(14) COORDINATE WITH THE CITY OF NEW BRAUNFELS OR TXDOT FOR SIGNAL TIMING REVISIONS, AS NECESSARY.

(15) CONTRACTOR IS NOT PERMITTED TO WORK IN AREAS WITH ONGOING UTILITY RELOCATION OR ROW ACQUISITION.

2. SEQUENCE OF WORK

(1) THE PROJECT WILL BE CONSTRUCTED IN (5) PHASES. BEFORE THE COMMENCEMENT OF EACH PHASE, INSTALL ADVANCE WARNING SIGNS, TEMPORARY SIGNS AND BARRICADES AS SHOWN ON THE PLANS AND/OR AS DIRECTED/APPROVED BY THE ENGINEER. DAILY LANE CLOSURES WILL BE USED IN ACCORDANCE WITH STATE TCP STANDARDS. DROP OFF CONDITIONS OF GREATER THAN 2" MUST HAVE A 3:1 SLOPE AT THE END OF EACH DAY, AS WELL AS THROUGHOUT THE PROJECT WHERE ACCESS TO ADJACENT PROPERTIES IS ALLOWED TO DRIVEWAYS AND SIDE STREETS.

(2) PREPARING ROW / REMOVAL OF EXISTING ITEMS TO BE DONE ONLY IN AREAS WHERE WORK IS OCCURING, AS PER THE PHASES NOTED BELOW.

(3) PLANING, SURFACE TREATMENTS AND OVERLAYS SHALL BE PERFORMED IN THE DIRECTION OF TRAFFIC. BEGIN SURFACE CONSTRUCTION ON HIGH SIDE OF ROAD TO AVOID WATER PONDING ISSUES.

(4) A BRIEF DESCRIPTION OF THESE PHASES ARE AS FOLLOWS:

PHASE 1

1. PLACE ADVANCE WARNING SIGNS ALONG THE PROJECT PER TXDOT BC, TCP, AND WZ STANDARD SHEETS.
2. INSTALL STORM WATER POLLUTION PREVENTION DEVICES IN ACCORDANCE WITH THE LAYOUTS.
3. PLACE TRAFFIC CONTROL DEVICES AND INSTALL WORK ZONE PAVEMENT MARKINGS AS SHOWN ON PLANS. COVER SIGNS IN CONFLICT WITH CURRENT PHASE.
4. USING TCP(2-5) SHIFT TRAFFIC TO PHASE 1 CONFIGURATION.
5. BEGIN WITH PHASE 1 CONSTRUCTION AS SHOWN IN THE PLANS
6. PLACE CHANNELIZING DEVICES AND TY-III BARRICADES TO PREVENT VEHILCES FROM ENTERING NEW CONSTRUCTION AFTER PHASE 1 IS COMPLETE. CHANNELIZING DEVICES AND BARRICADES TO BE REMOVED AFTER PHASE 5C IS COMPLETE.
7. REMOVE COVERS ON EXISTING SMALL SIGNS

PHASE 2

1. ADJUST/INSTALL TRAFFIC CONTROL DEVICES INCLUDING PEDESTRIAN DETOUR ROUTE. TRAFFIC TO REMAIN IN EXISTING CONFIGURATION.
2. INSTALL STORM WATER POLLUTION PREVENTION DEVICES IN ACCORDANCE WITH THE LAYOUTS.
3. BEGIN WITH PHASE 2 CONSTRUCTION AS SHOWN IN THE PLANS. CONSTRUCT BARBAROSA PAVEMENT STRUCTURE EXCLUDING FINAL LIFT OF HMA TY-D. CONSTRUCTION INCLUDES DITCH-A, CONCRETE CURB, ARMOR CURB AND DRIVEWAY.
4. CONSTRUCT TEMPORARY PAVEMENT AS SHOWN IN THE PLANS

PHASE 3

1. ADJUST/INSTALL TRAFFIC CONTROL DEVICES AND INSTALL WORK ZONE PAVEMENT MARKINGS AS SHOWN ON PLANS.
2. USING TCP(2-3) SHIFT TRAFFIC TO PHASE 3 CONFIGURATION.
3. BEGIN WITH PHASE 3 CONSTRUCTION AS SHOWN IN THE PLANS. CONSTRUCT BARBAROSA PAVEMENT STRUCTURE EXCLUDING FINAL LIFT OF HMA TY-D.
4. CONSTRUCT TEMPORARY PAVEMENT AS SHOWN IN THE PLANS.

PHASE 4

1. ADJUST TRAFFIC CONTROL DEVICES AND INSTALL WORK ZONE PAVEMENT MARKINGS AS SHOWN ON PLANS.
2. USING TCP(2-3) SHIFT TRAFFIC TO PHASE 4 CONFIGURATION.
3. BEGIN WITH PHASE 4 CONSTRUCTION AS SHOWN IN THE PLANS. CONSTRUCT BARBAROSA PAVEMENT STRUCTURE EXCLUDING FINAL LIFT OF HMA TY-D.

PHASE 5A

1. PHASE 4 TRAFFIC CONTROL DEVICES AND PAVEMENT MARKINGS TO REMAIN UNTIL PHASE 5A-STEP 1 IS COMPLETE.
2. BEGIN CONSTRUCTION OF CULVERT A WITH PHASE 5A-STEP 1 AS SHOWN IN THE PLANS. WORK INCLUDES DOWNSTREAM SAFETY END TREATMENT AND CHANNEL GRADING. EXISTING STRUCTURE TO BE REMOVED AFTER PHASE 5A-STEP 2 IS COMPLETE.
3. INSTALL TEMPORARY PAVEMENT AS SHOWN IN THE PLANS.
4. REMOVE PHASE 4 TRAFFIC CONTROL DEVICES AND TEMPORARY PAVEMENT INSTALLED IN PREVIOUS PHASES.
5. INSTALL PHASE 5A WORK ZONE PAVEMENT MARKINGS AS SHOWN ON PLANS.
6. FINALIZE CULVERT A CONSTRUCTION WITH PHASE 5A-STEP 2 CONSTRUCTION AS SHOWN IN THE PLANS. WORK INCLUDES COMPLETING DITCH-A, CHANNEL GRADING AND UPSTREAM SAFETY END TREATMENT.
7. REMOVE OLD CULVERT STRUCTURE AFTER CONSTSRUCTION OF CULVERT A IS COMPLETE. WORK INCLUDES REMOVING CONCRETE PIPE, SAFETY END TREATMENTS AND CHANNEL GRADING TO ENSURE POSITIVE DRAINAGE FLOW.

PHASE 5B

1. PHASE 5A TRAFFIC CONTROL DEVICES AND PAVEMENT MARKINGS TO REMAIN UNTIL FINAL LIFT OF HMA TY D IS INSTALLED.
2. USING TCP(1-2), SHIFT TRAFFIC ON FM1101 TO CONSTRUCT LEVEL-UP PAVEMENT ALONG FM1101.
3. USING TCP(1-3), FINALIZE LEVEL UP PAVEMENT ALONG BARBAROSA. WORK INCLUDES CONCRETE CURB AT THE INTERSECTION. SIDEWALKS AND TRAFFIC SIGNALS WILL BE INSTALLED DURING PHASE 5C.
4. PLACE FINAL LIFT OF HMA TY-D UTILIZING TCP(1-3) & TCP(1-4).

PHASE 5C

1. BEGIN WITH PHASE 5C CONSTRUCTION AS SHOWN IN THE PLANS USING TCP (2-1).
2. INSTALL PROPOSED TRAFFIC SIGNALS AND REMOVE OLD EQUIPMENT PER TRAFFIC SIGNAL PLANS.
3. INSTALL SIDEWALKS, FINAL STRIPING, PROPOSED SMALL SIGNS, AND PERMANENT SEEDING.
4. REMOVE CHANNELIZING DEVICES AND BARRICADES FROM PHASE 1

DESIGN

JULIAN GARCIA 127271 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

JOHN A. TYLER 105193 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

Texas Department of Transportation

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL NARRATIVE

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	14

Plotted on: 4/20/2022

5. SHIFT TRAFFIC TO FINAL CONFIGURATION.

3. SAFETY

(1) THE CONTRACTOR WILL PROVIDE, CONSTRUCT AND MAINTAIN BARRICADES AND SIGNS IN ACCORDANCE WITH STATE STANDARDS. ANY SIGNS REQUIRED THAT ARE NOT DETAILED IN THE STANDARD SHEETS SHALL BE IN CONFORMANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" AND THE "STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS."

(2) BARRICADES AND WARNING SIGNS SHALL BE PLACED AS INDICATED ON THE PLANS. THIS SHALL BE CONSIDERED THE MINIMUM REQUIRED TO PROVIDE FOR THE SAFETY OF TRAFFIC DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN OTHER SUCH BARRICADES AND SIGNS DEEMED NECESSARY BY THE ENGINEER OR AS DIRECTED BY FIELD CONDITIONS, TO PROVIDE FOR THE PASSAGE OF TRAFFIC IN SAFETY AT ALL TIMES.

(3) THE CONTRACTOR SHALL PROVIDE AND MAINTAIN FLAGGERS AS DIRECTED/APPROVED BY THE ENGINEER, AT SUCH POINTS, AND FOR SUCH PERIODS OF TIME AS MAY BE REQUIRED, TO PROVIDE FOR THE SAFETY OF THE TRAVELING PUBLIC AND THE CONTRACTOR'S PERSONNEL.

(4) THE CONTRACTOR SHALL KEEP THE ROADWAY CLEAN AND FREE OF DIRT OR OTHER MATERIALS DURING HAULING OPERATIONS. IF THE CONTRACTOR DOES NOT MAINTAIN A CLEAN ROADWAY, THEY SHALL CEASE ALL CONSTRUCTION OPERATIONS, WHEN DIRECTED BY THE ENGINEER, TO CLEAN THE ROADWAY TO THE SATISFACTION OF THE ENGINEER.

4. HAULING EQUIPMENT

(1) THE USE OF RUBBER-TIRED EQUIPMENT WILL BE REQUIRED FOR MOVING DIRT OR OTHER MATERIALS ALONG OR ACROSS PAVEMENTED SURFACES. WHERE THE CONTRACTOR DESIRES TO MOVE ANY EQUIPMENT NOT LICENSED FOR OPERATION ON PUBLIC HIGHWAYS, ON OR ACROSS PAVEMENT. THEY SHALL PROTECT THE PAVEMENT FROM DAMAGE AS DIRECTED / APPROVED BY THE ENGINEER.

(2) THROUGHOUT CONSTRUCTION OPERATIONS, THE CONTRACTOR WILL BE REQUIRED TO CONDUCT THEIR HAULING OPERATIONS IN A MANNER SUCH THAT VEHICLES WILL NOT HAUL OVER PREVIOUSLY RECOMPACTED SUBGRADE OR COMPACTED BASE MATERIAL, EXCEPT IN SHORT SECTIONS FOR DUMPING MANIPULATIONS.

5. FINAL CLEAN UP

UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE AND FINAL PAYMENT IS MADE, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE SITE ALL SURPLUS AND DISCARDED MATERIALS AND DEBRIS OF EVERY KIND AND LEAVE THE ENTIRE PROJECT IN A SMOOTH, NEAT AND SIGHTLY CONDITION.

6. PAYMENT

ALL BARRICADES, SIGNS, AND FLAGGERS SHALL BE SUBSIDIARY TO ITEM 502 BARRICADES, SIGNS AND TRAFFIC HANDLING. ALL EROSION AND SEDIMENT CONTROL DEVICES WILL BE PAID FOR UNDER ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS. ALL WORK ZONE PAVEMENT MARKINGS WILL BE PAID FOR UNDER ITEM 662 WORK ZONE PAVEMENT MARKINGS. ALL OTHER WORK AND MATERIALS SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS UNLESS OTHERWISE INDICATED IN THE PLANS.

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL NARRATIVE

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	15

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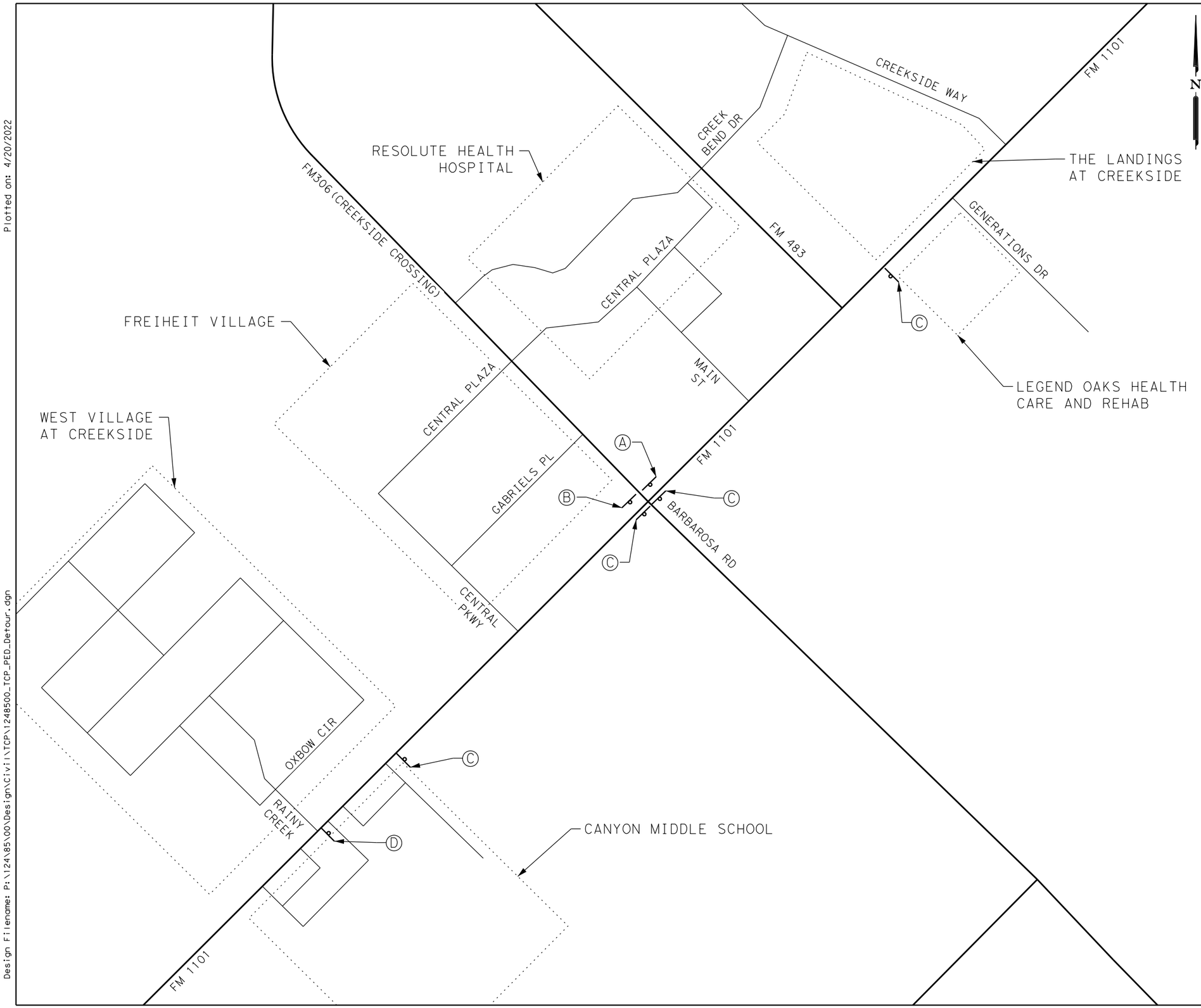

LEGEND

SIDEWALK CLOSED → CROSS HERE	Ⓐ	R9-11AR 24"X12"
SIDEWALK CLOSED ← CROSS HERE	Ⓑ	R9-11AL 24"X12"
SIDEWALK CLOSED	Ⓒ	R9-9 24"X12"
SIDEWALK CLOSED AHEAD ← CROSS HERE	Ⓓ	R9-11L 24"X12"

NOTES

1. CONTRACTOR TO COVER PEDESTRIAN SIGNAL HEADS IN CONFLICT WITH PROPOSED PEDESTRIAN DETOUR.

NOT TO SCALE

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PEDESTRIAN DETOUR

BARBAROSA RD

CSJ: 0915-17-072

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	16

Plotted on: 4/20/2022

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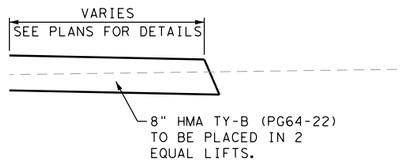
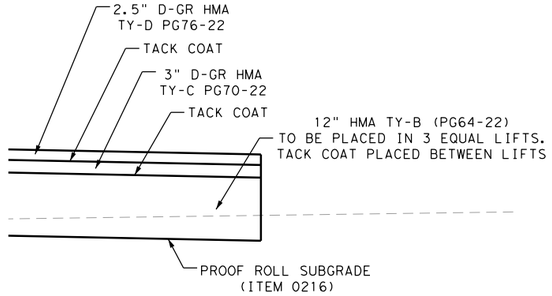


TEMPORARY PAVEMENT DETAIL

N.T.S.



NO-LIME PAVEMENT

N.T.S.

SEE TCP PHASE 3 FOR LOCATION

NOT TO SCALE

DESIGN

JULIAN GARCIA
127271
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

JOHN A. TYLER, P.E. — 4/20/2022 DATE

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City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL DETAILS

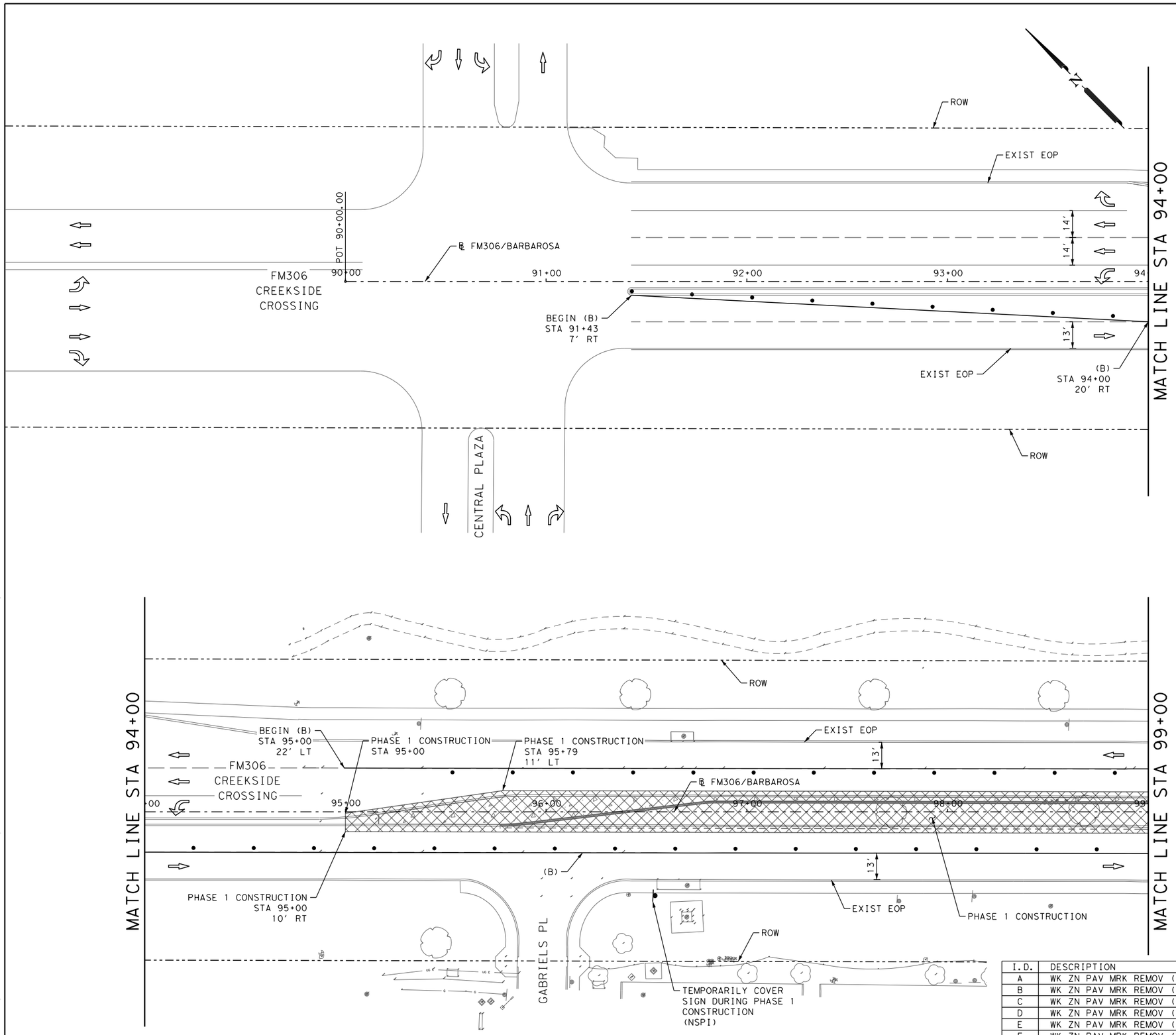
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	17

Plotted on: 4/20/2022
Design Filename: P:\124\85\00\Design\Civil\TCP\1248500_TCP_Details.dgn

CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	1158



NOTES:
1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

- PROPOSED TEMPORARY PAVEMENT
- EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE
- TYPE III BARRICADE
- SIGN
- LOW PROFILE CONCRETE BARRIER (LPCB)
- OPPOSITE TRAFFIC LANE DIVIDER
- CHANNELIZING DEVICES
- TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS · JULIAN GARCIA · 127271 · LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 1

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	18

Plotted on: 4/20/2022

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Plotted on: 4/20/2022

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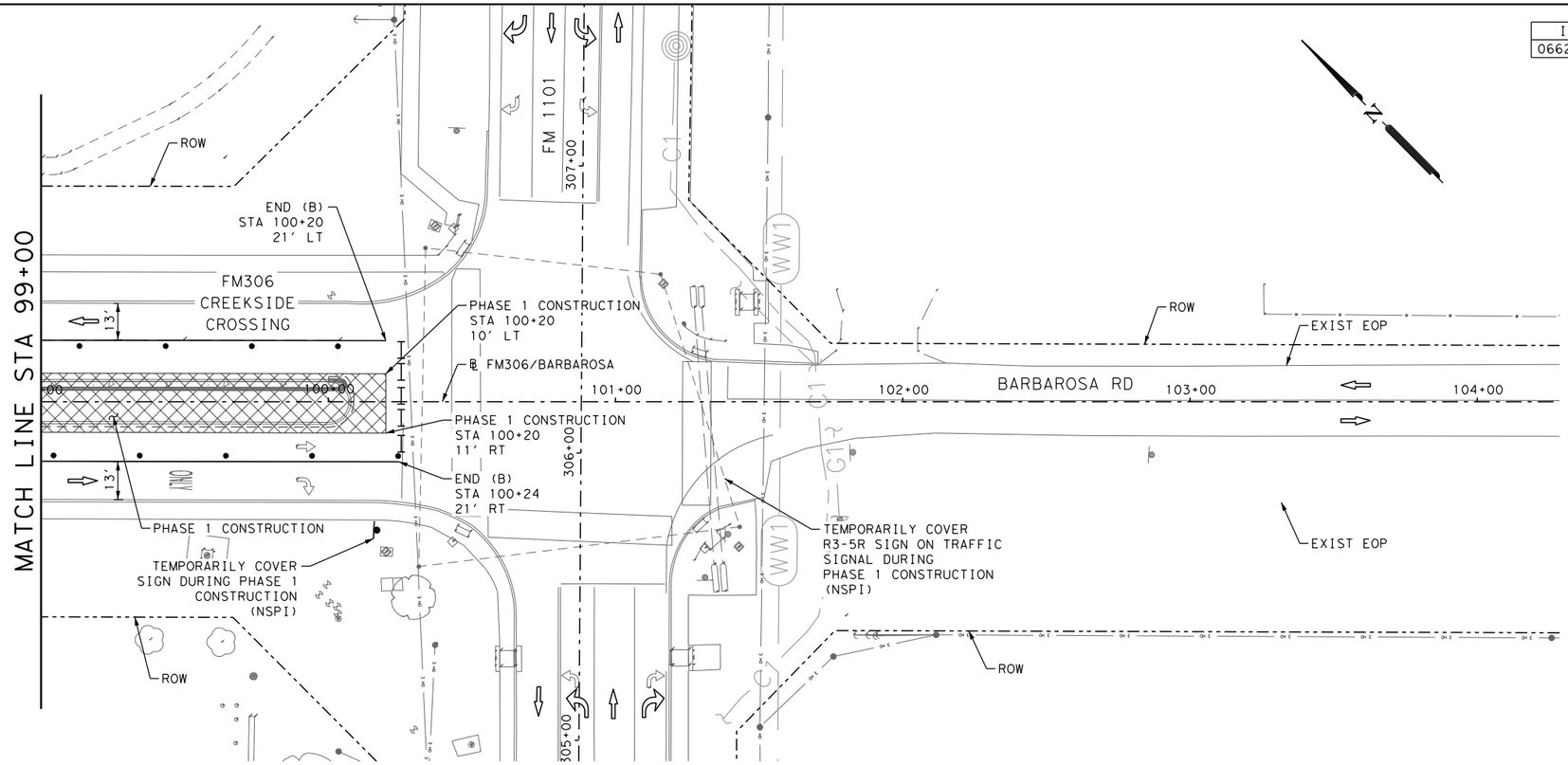

CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	244

NOTES:
1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
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3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS
JULIAN GARCIA
127271
LICENSED
PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

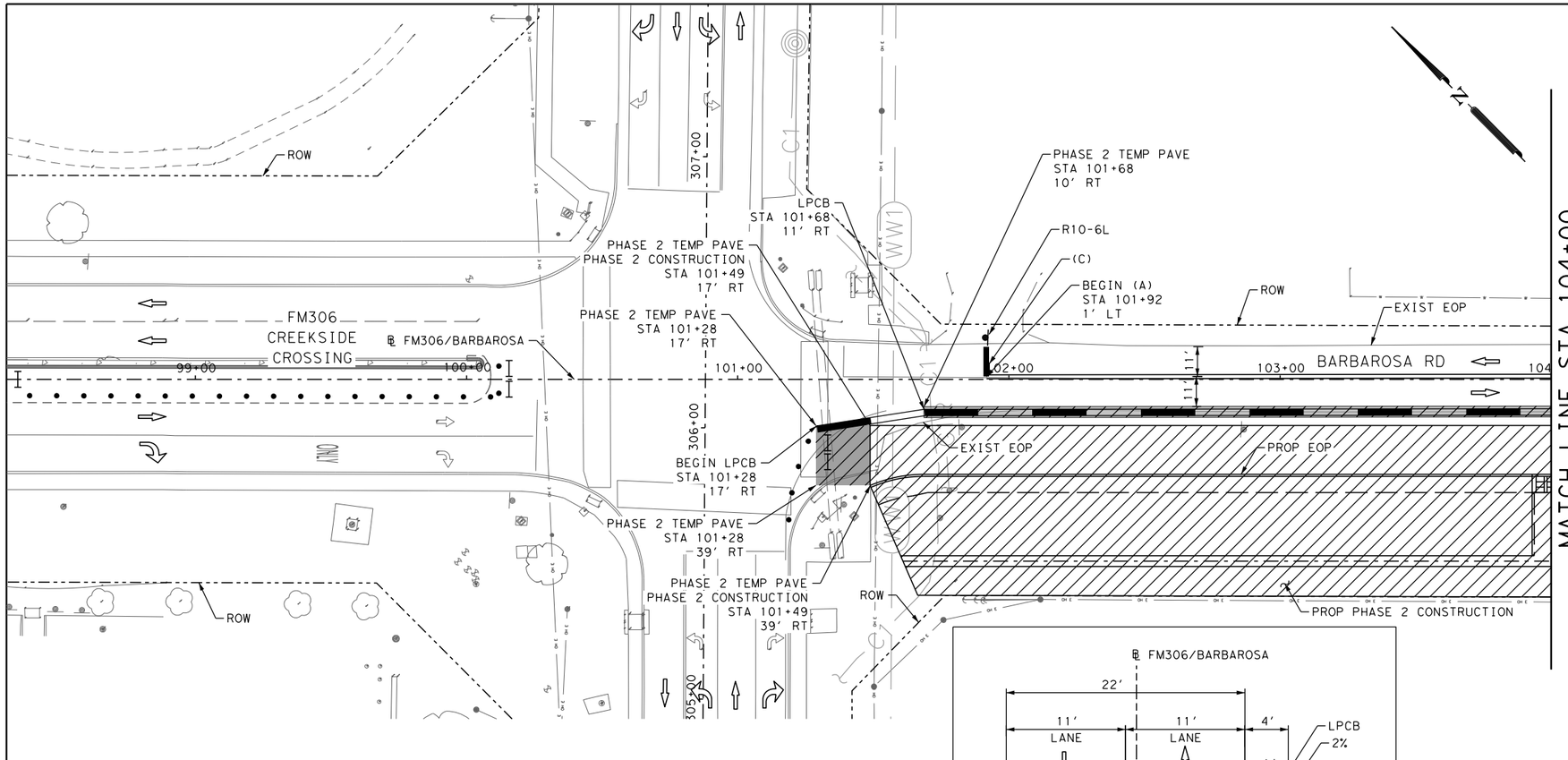
TRAFFIC CONTROL PHASE 1

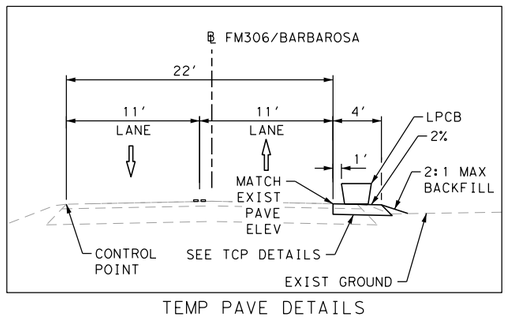
BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

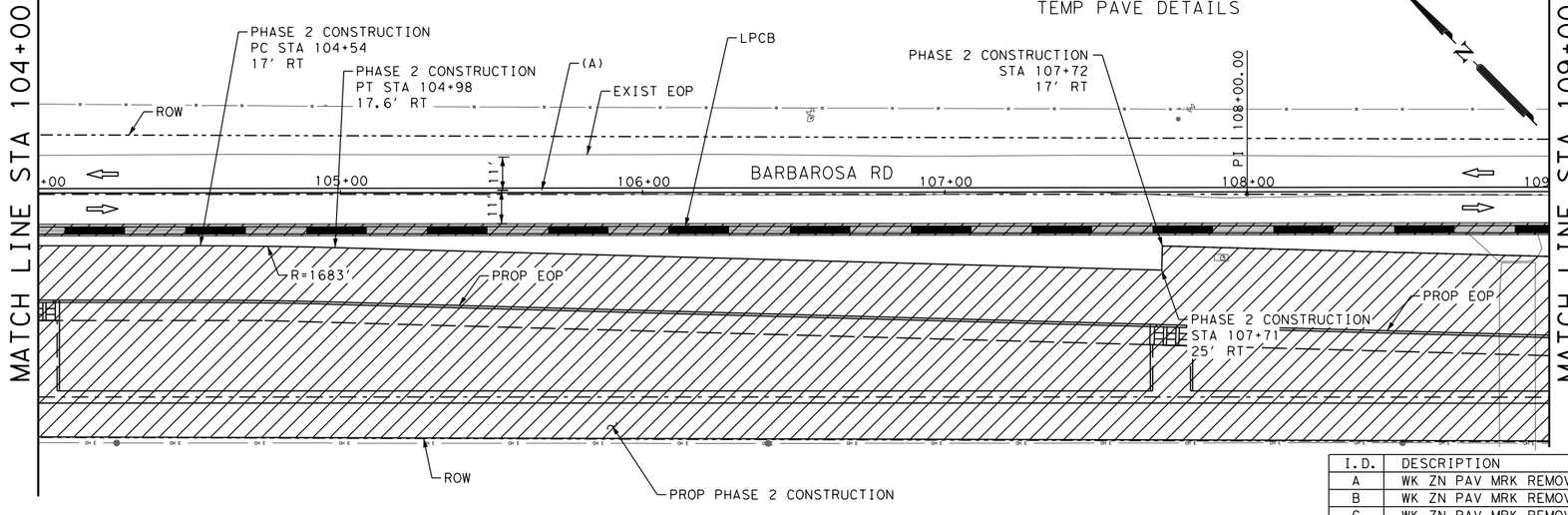
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	19

ITEM	DESCRIPTION	UNIT	QTY
0508-6001	CONSTRUCTING DETOURS	SY	50
0512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	760
0512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	20
0662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	11
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1416





TEMP PAVE DETAILS



I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

NOTES:
1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS
JULIAN GARCIA
127271
LICENSED
PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 2

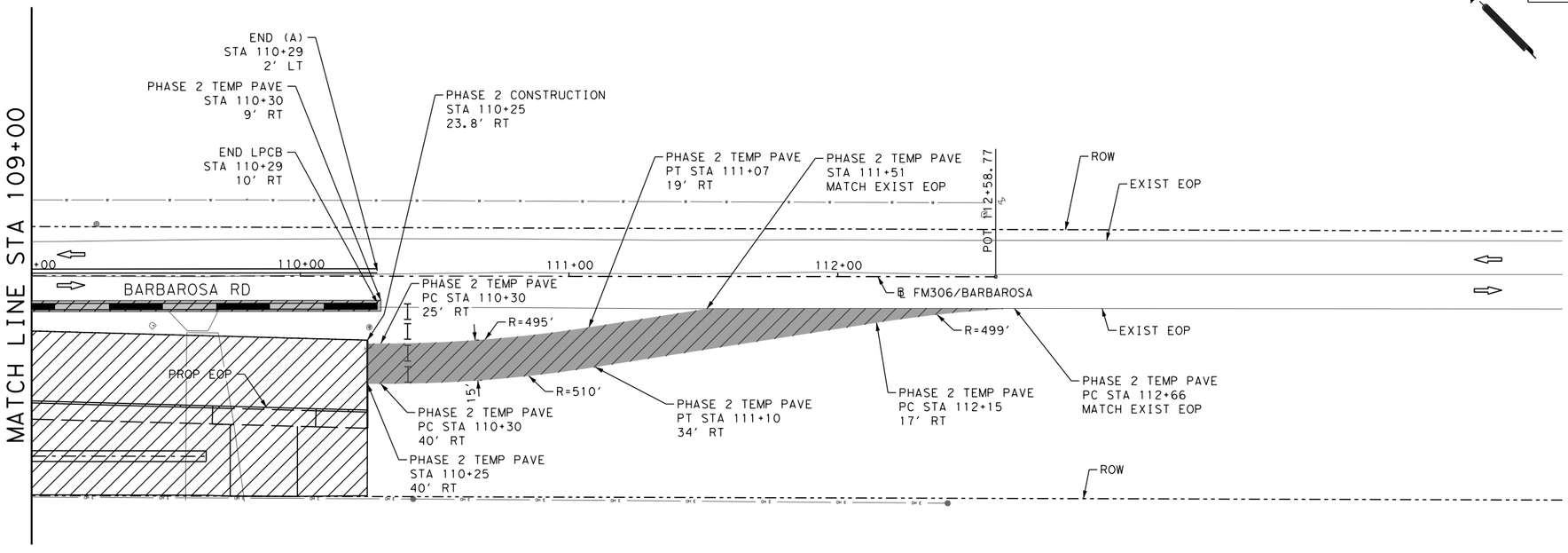
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	20

Plotted on: 4/20/2022
Design Filename: P:\124X85\00\Design\Civil\TCP\1248500_TCP_Phase02_Sheet01.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0508-6001	CONSTRUCTING DETOURS	SY	297
0512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	100
0512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	20
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	250



NOTES:
1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 2

BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	21

Plotted on: 4/20/2022

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CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0508-6001	CONSTRUCTING DETOURS	SY	32
0512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	700
0512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	20
0512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	760
0512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	20
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	247

NOTES:
1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS · JULIAN GARCIA · 127271 · LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

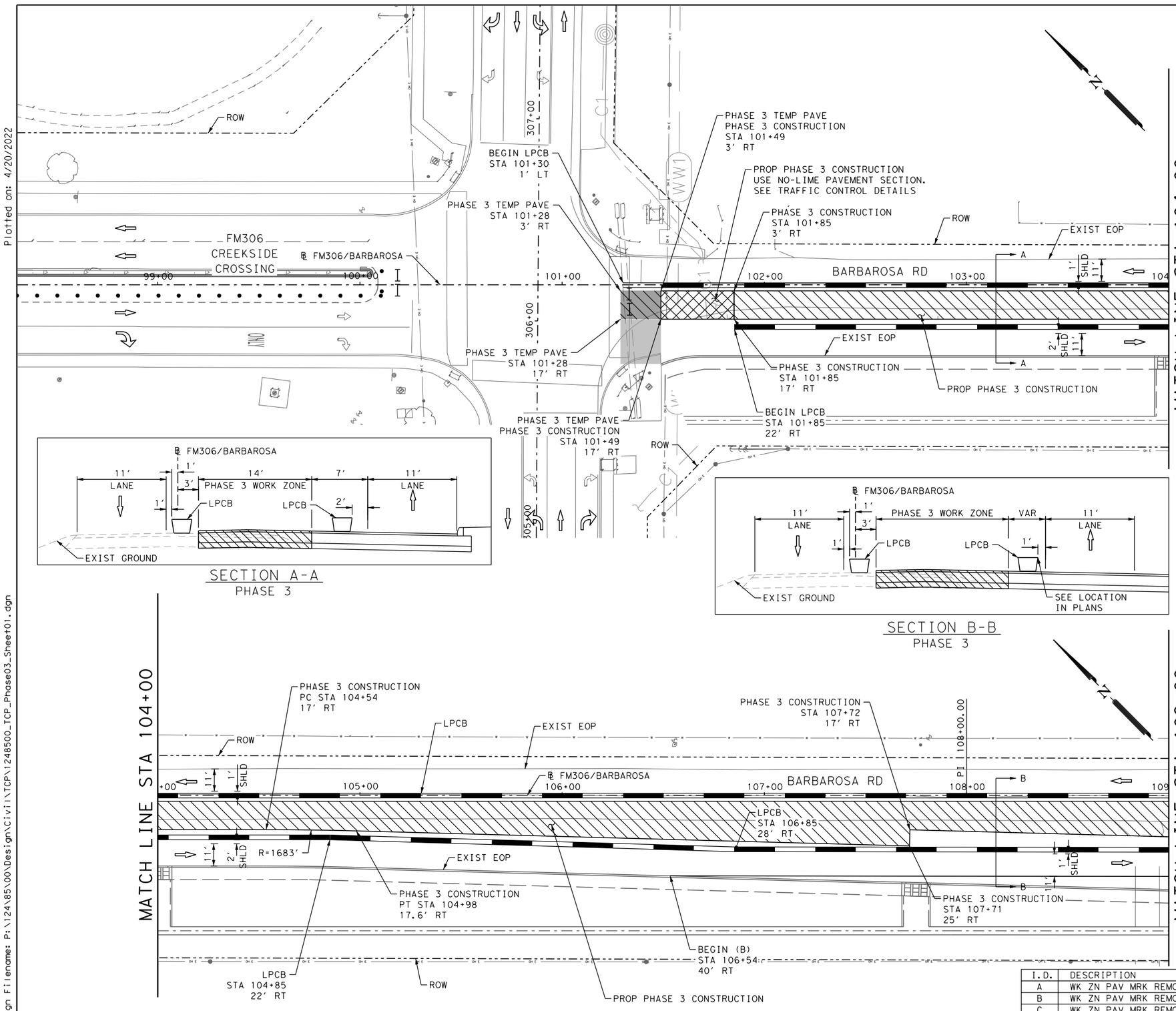
HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 3

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	22



I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

Plotted on: 4/20/2022

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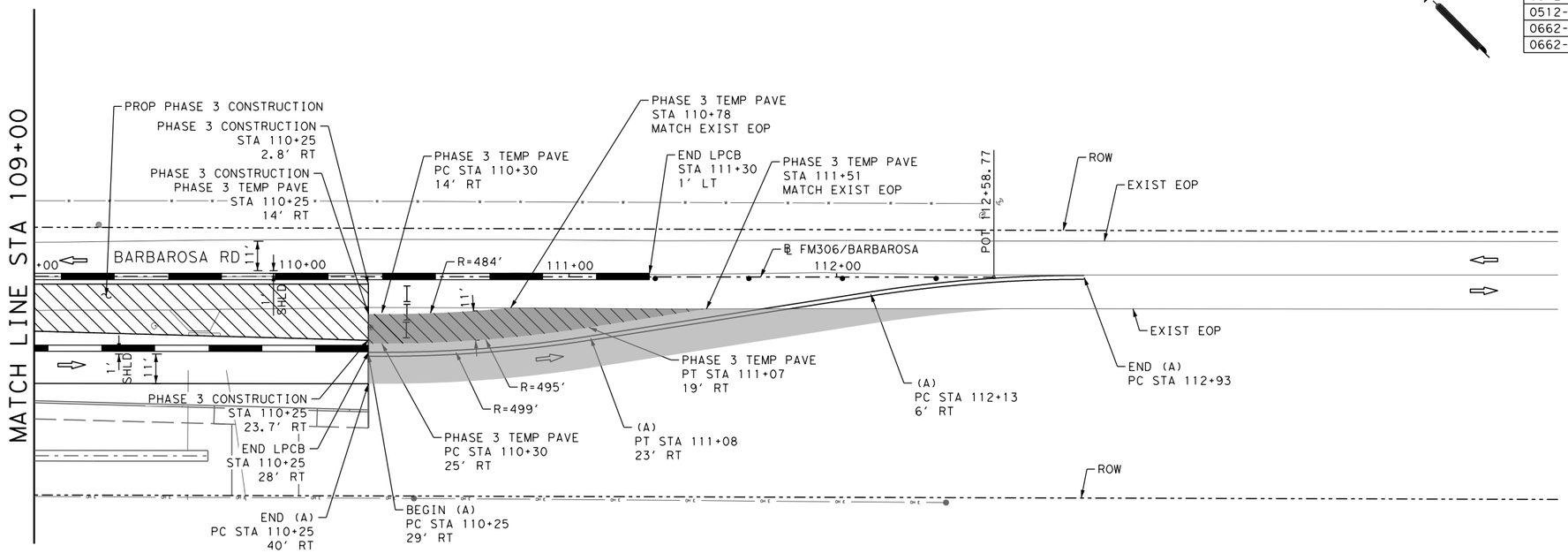
CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0508-6001	CONSTRUCTING DETOURS	SY	113
0512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	200
0512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	20
0512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	100
0512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	20
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	125
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	540



NOTES:
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4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 3

BARBAROSA RD
CSJ: 0915-17-072

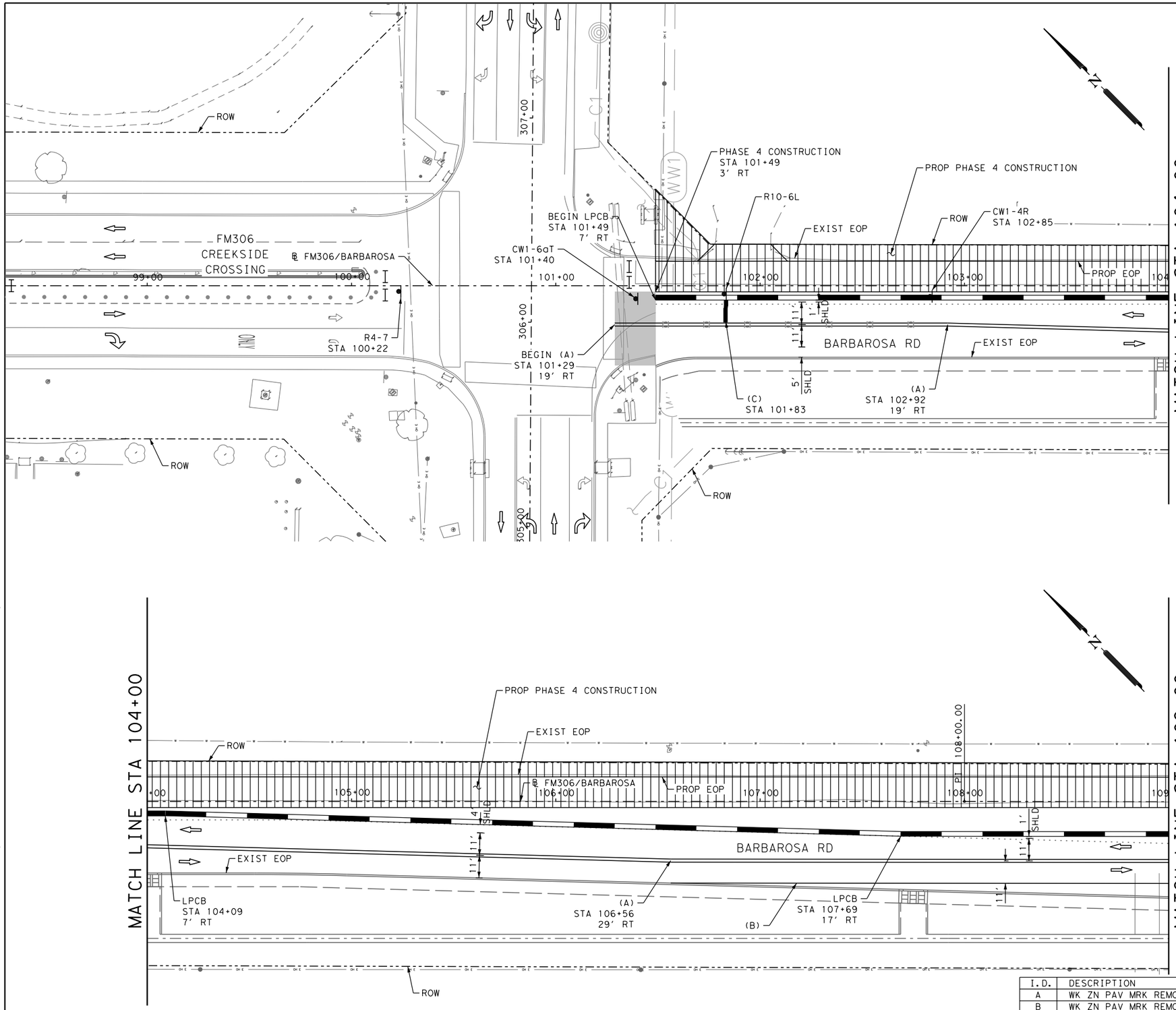
SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	23

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\TCP\1248500_TCP_Phase03_Sheet02.dgn

ITEM	DESCRIPTION	UNIT	QTY
0512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	740
0512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	20
0512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	720
0512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	20
0662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	11
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1544



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6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

- PROPOSED TEMPORARY PAVEMENT
- EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE
- TYPE III BARRICADE
- SIGN
- LOW PROFILE CONCRETE BARRIER (LPCB)
- OPPOSITE TRAFFIC LANE DIVIDER
- CHANNELIZING DEVICES
- TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS
JULIAN GARCIA
127271
LICENSED
PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. 4/20/2022 DATE

I.D.	DESCRIPTION
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C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 4

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

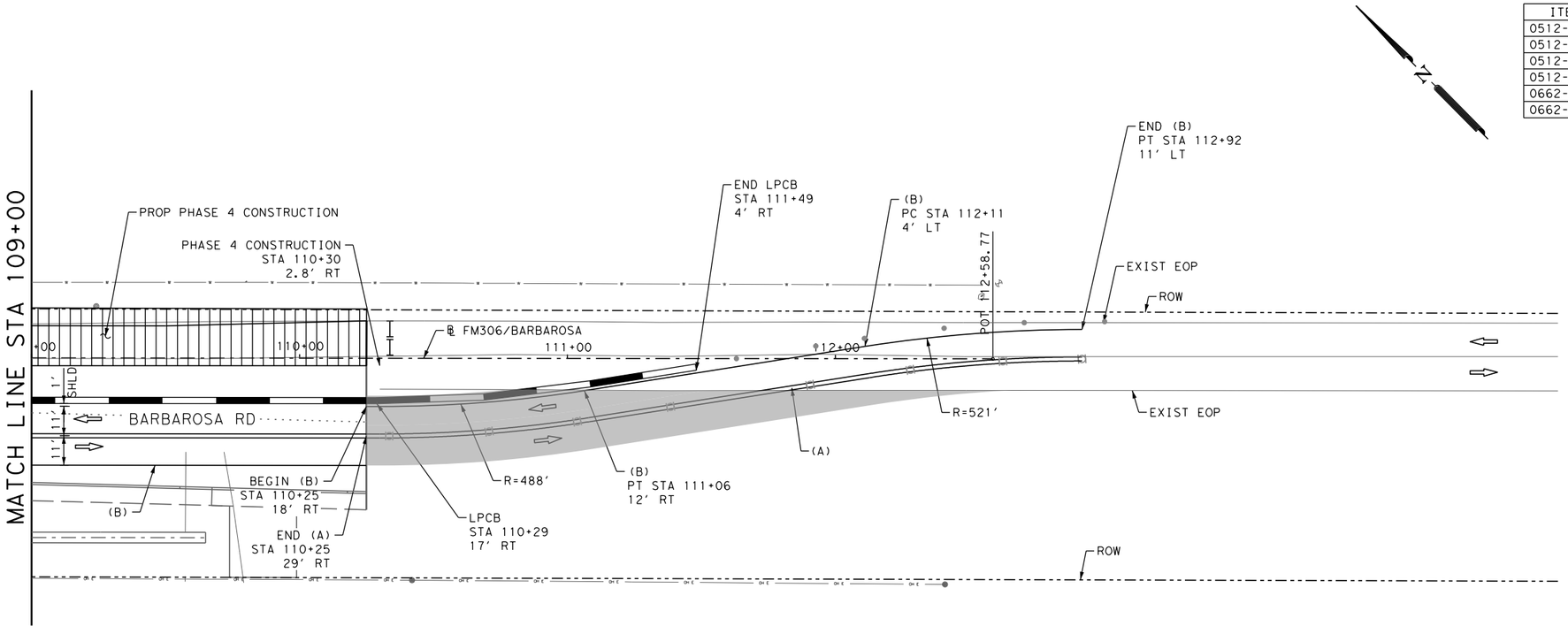
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	24

Plotted on: 4/20/2022

Design Filename: P:\124X85\00\Design\Civil\TCP\1248500_TCP_Phase04_Sheet01.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	220
0512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	20
0512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	80
0512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	20
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	269
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	250



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6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
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C	WK ZN PAV MRK REMOV (W) 24" (SLD)
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E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 4

BARBAROSA RD
CSJ: 0915-17-072

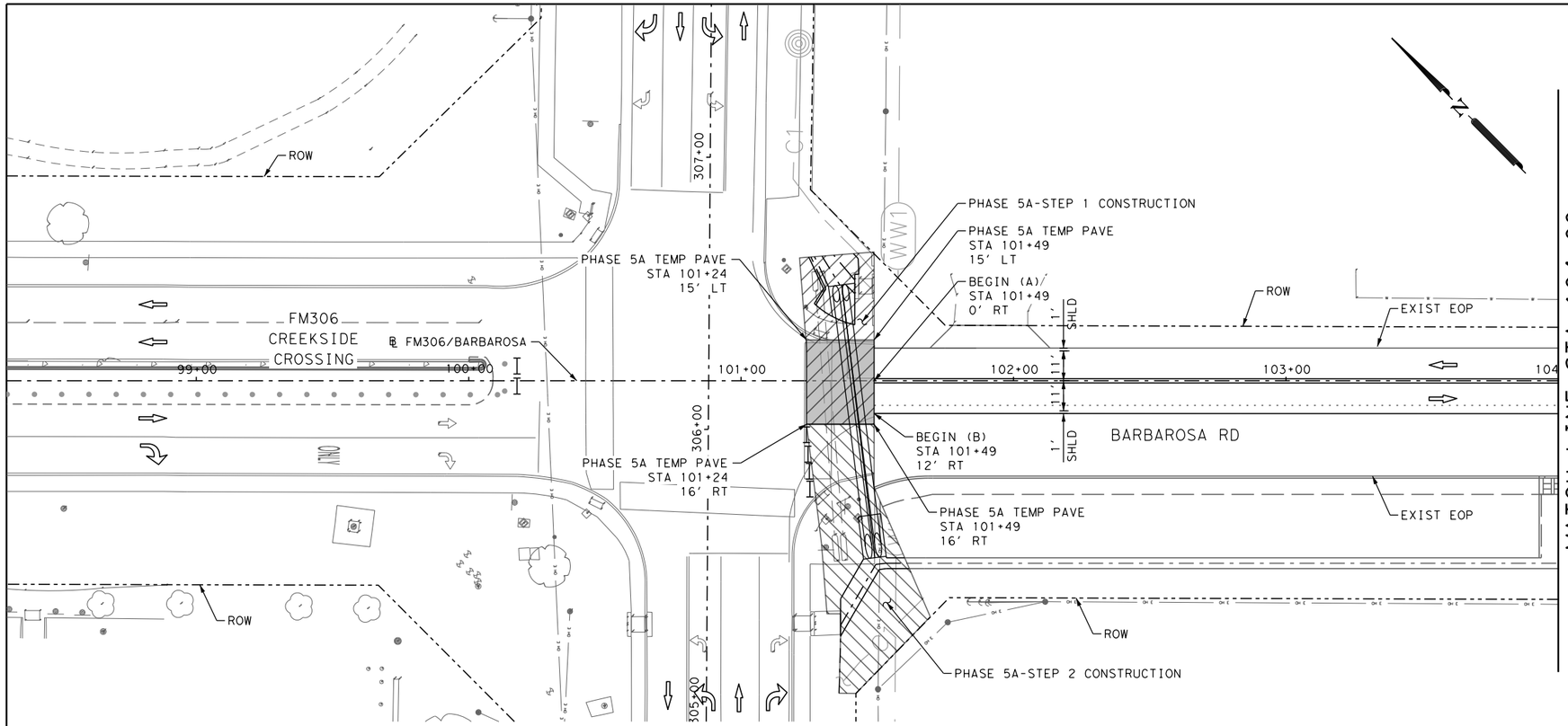
SHEET 2 OF 2

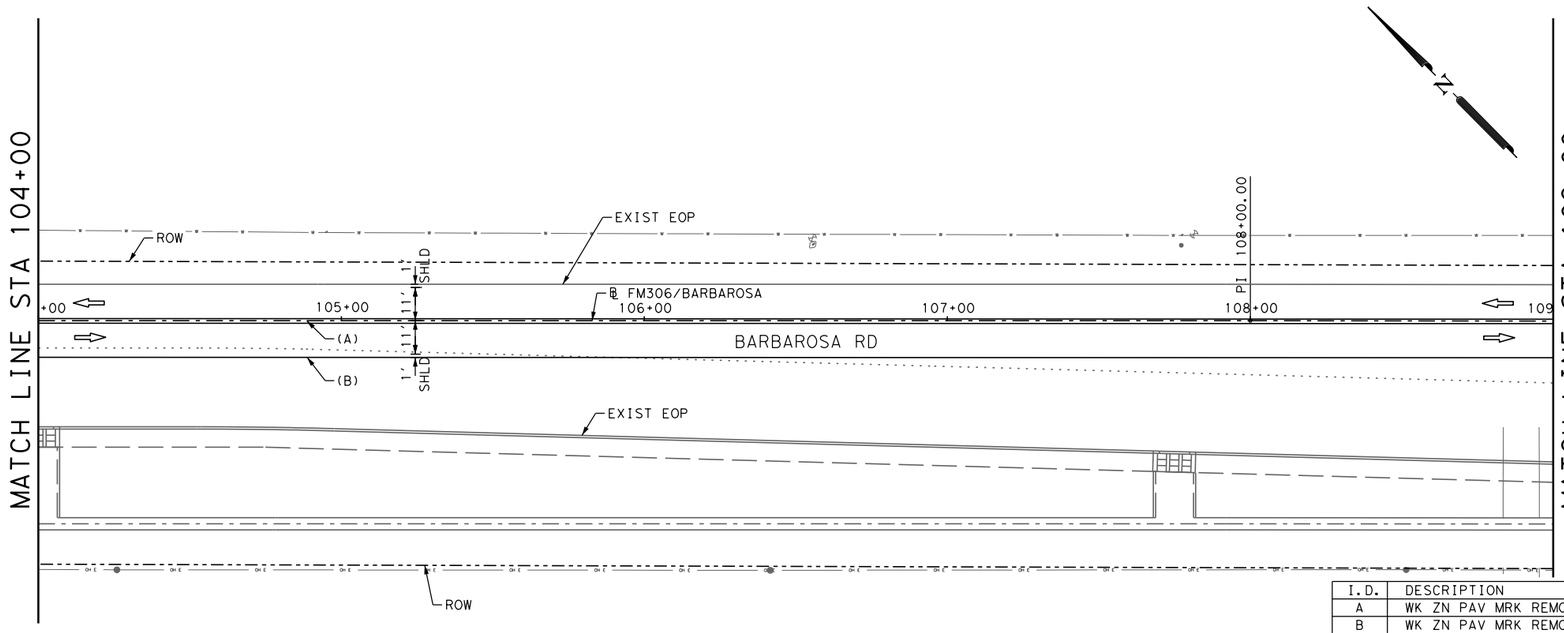
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	25

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\TCP\1248500_TCP_Phase04_Sheet02.dgn

ITEM	DESCRIPTION	UNIT	QTY
0508-6001	CONSTRUCTING DETOURS	SY	86
0512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	740
0512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	20
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	751
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1502





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E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

NOTES:
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5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS · JULIAN GARCIA · 127271 · LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 5A

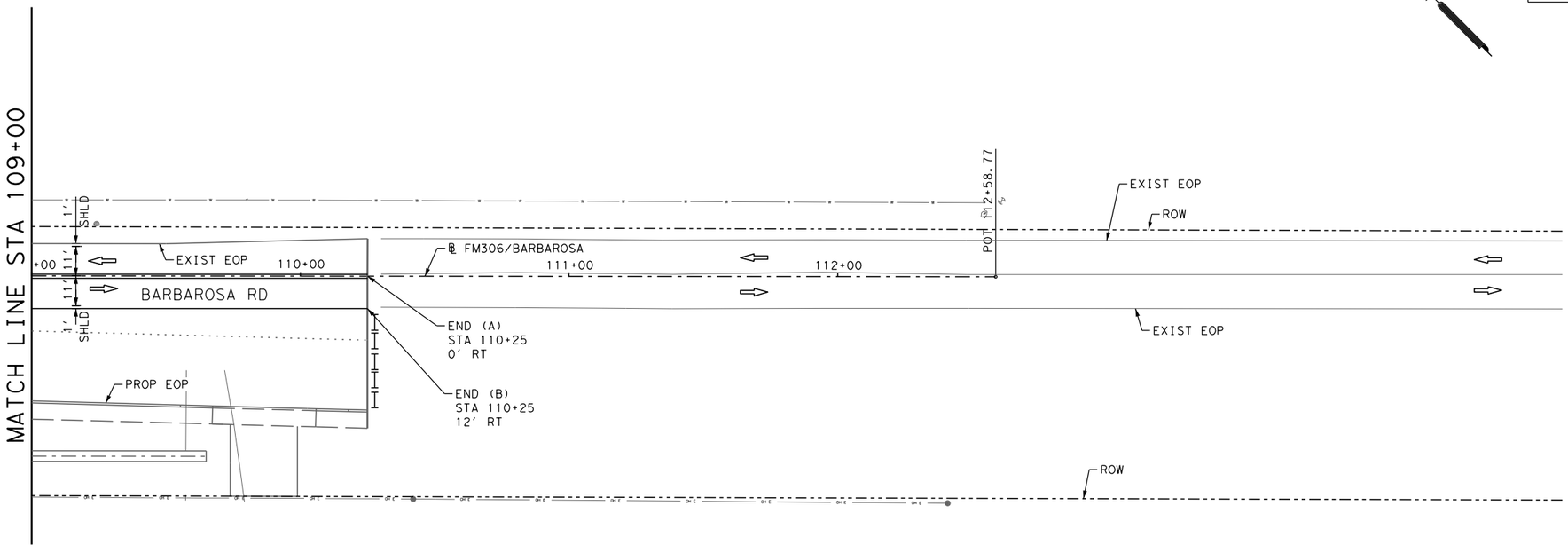
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	26

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\TCP\1248500_TCP_Phase05a_Sheet01.dgn

ITEM	DESCRIPTION	UNIT	QTY
0512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	220
0512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	20
0662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	125
0662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	250



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6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

- PROPOSED TEMPORARY PAVEMENT
- EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE
- TYPE III BARRICADE
- SIGN
- LOW PROFILE CONCRETE BARRIER (LPCB)
- OPPOSITE TRAFFIC LANE DIVIDER
- CHANNELIZING DEVICES
- TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
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C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
E	WK ZN PAV MRK REMOV (ARROW)
F	WK ZN PAV MRK REMOV (WORD)

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 5A

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	27

Plotted on: 4/20/2022

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Plotted on: 4/20/2022

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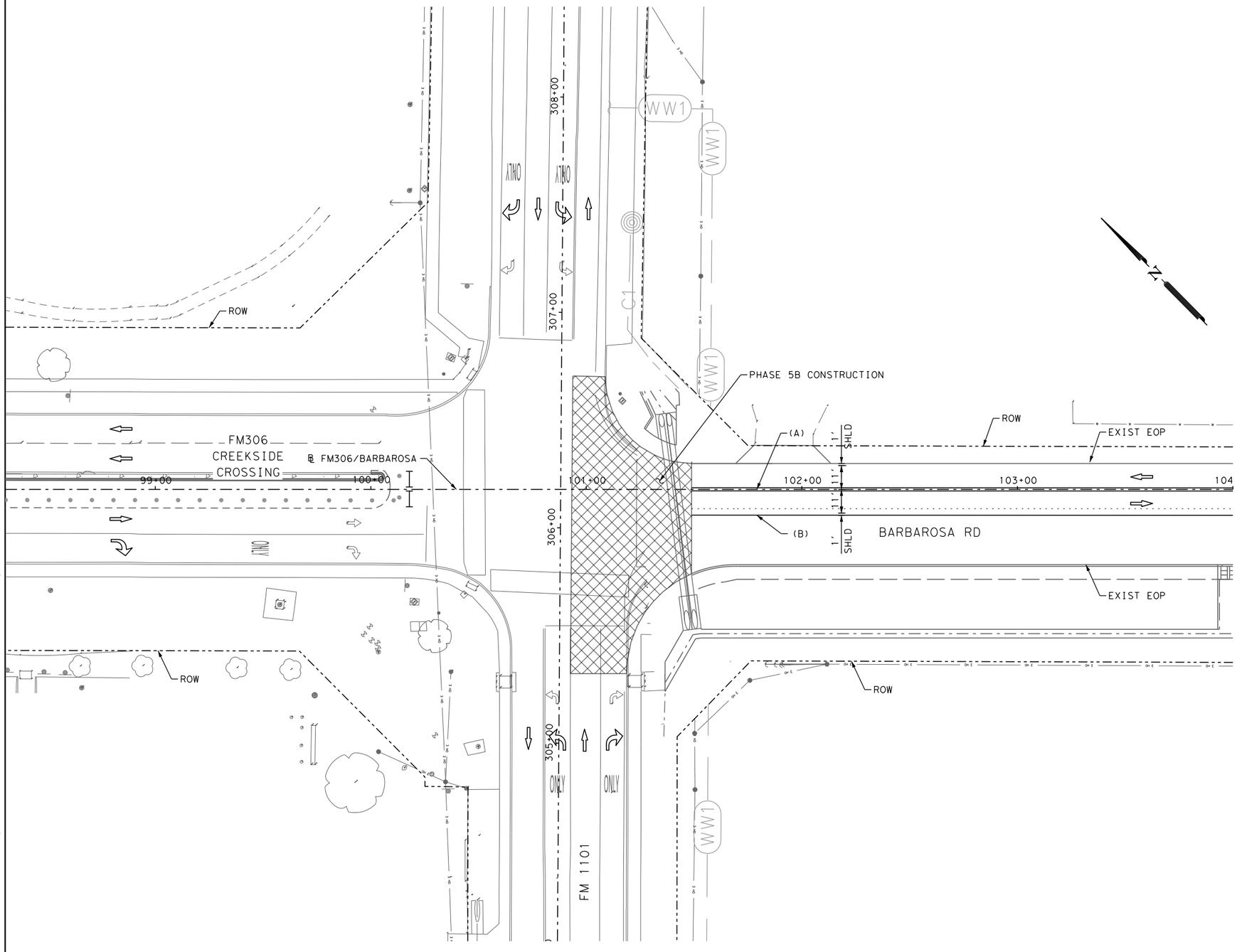

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B	WK ZN PAV MRK REMOV (W) 4" (SLD)
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F	WK ZN PAV MRK REMOV (WORD)

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY

NOTES:
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LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE — SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER — CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

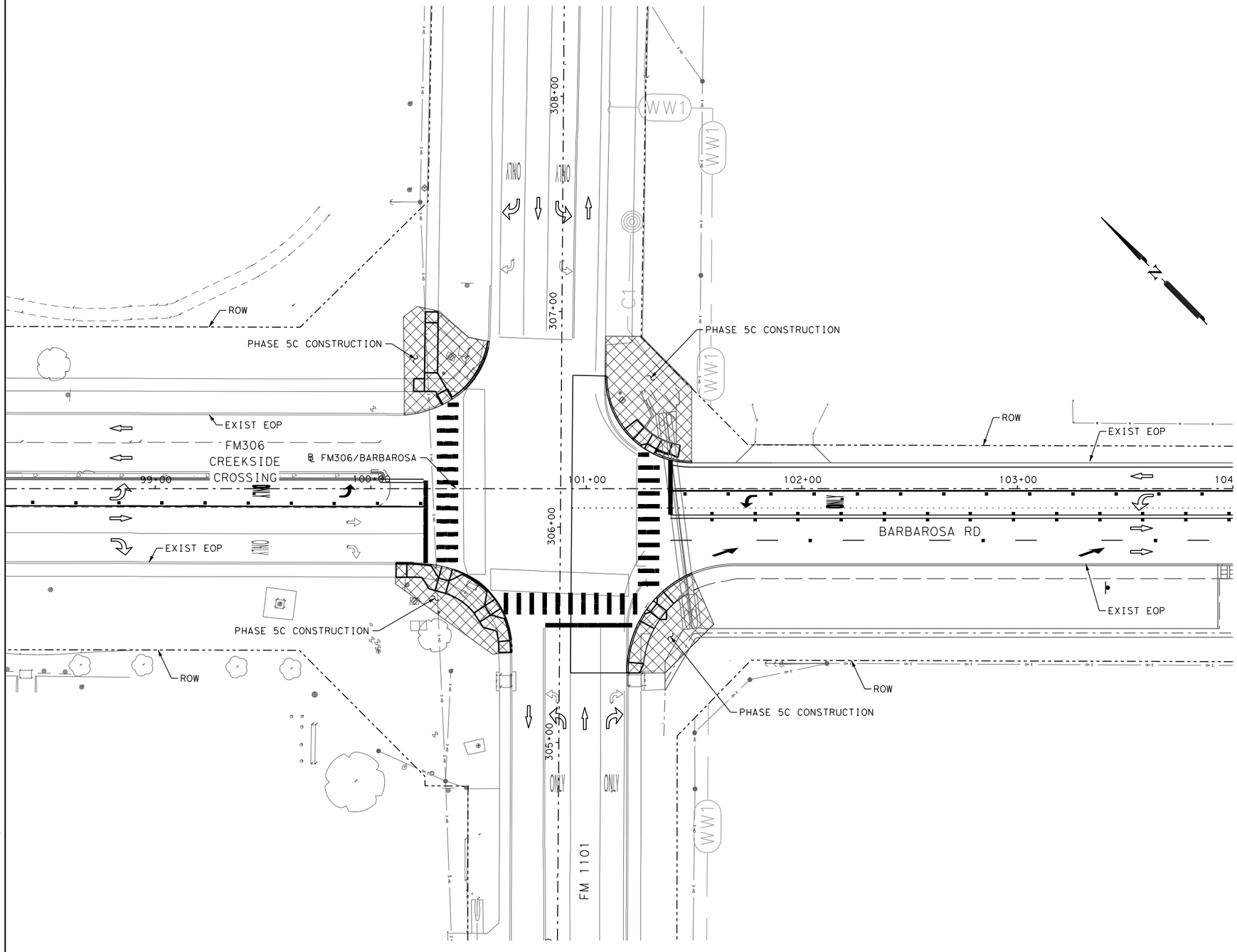
TRAFFIC CONTROL PHASE 5B

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	28

ITEM	DESCRIPTION	UNIT	QTY



I.D.	DESCRIPTION
A	WK ZN PAV MRK REMOV (Y) 4" (SLD)
B	WK ZN PAV MRK REMOV (W) 4" (SLD)
C	WK ZN PAV MRK REMOV (W) 24" (SLD)
D	WK ZN PAV MRK REMOV (W) 4" (BRK)
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F	WK ZN PAV MRK REMOV (WORD)

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1. FOR ADDITIONAL DETAILS SEE TxDOT TCP STANDARD SHEETS.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK.
3. EXISTING PAVEMENT MARKINGS CONFLICTING WITH WORK ZONE PAVEMENT MARKINGS SHALL BE REMOVED. THIS WORK IS CONSIDERED SUBSIDIARY TO THE WORK ZONE PAVEMENT MARKING ITEMS.
4. SEE TRAFFIC CONTROL PLAN NARRATIVE FOR MORE INFORMATION
5. A TAPERED LOW PROFILE CONCRETE BARRIER SHALL BE USED AT THE END OF EACH SEGMENT OF BARRIER, UNLESS OTHERWISE NOTED.
6. ALL LPCB MUST BE PINNED PER TXDOT LPCB-13

LEGEND

PROPOSED TEMPORARY PAVEMENT

EXISTING TEMPORARY PAVEMENT FROM PREVIOUS PHASE

TYPE III BARRICADE SIGN

LOW PROFILE CONCRETE BARRIER (LPCB)

OPPOSITE TRAFFIC LANE DIVIDER CHANNELIZING DEVICES

TRAFFIC FLOW ARROWS

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — JULIAN GARCIA — 127271 — LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

TRAFFIC CONTROL PHASE 5C

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	29

Plotted on: 4/20/2022

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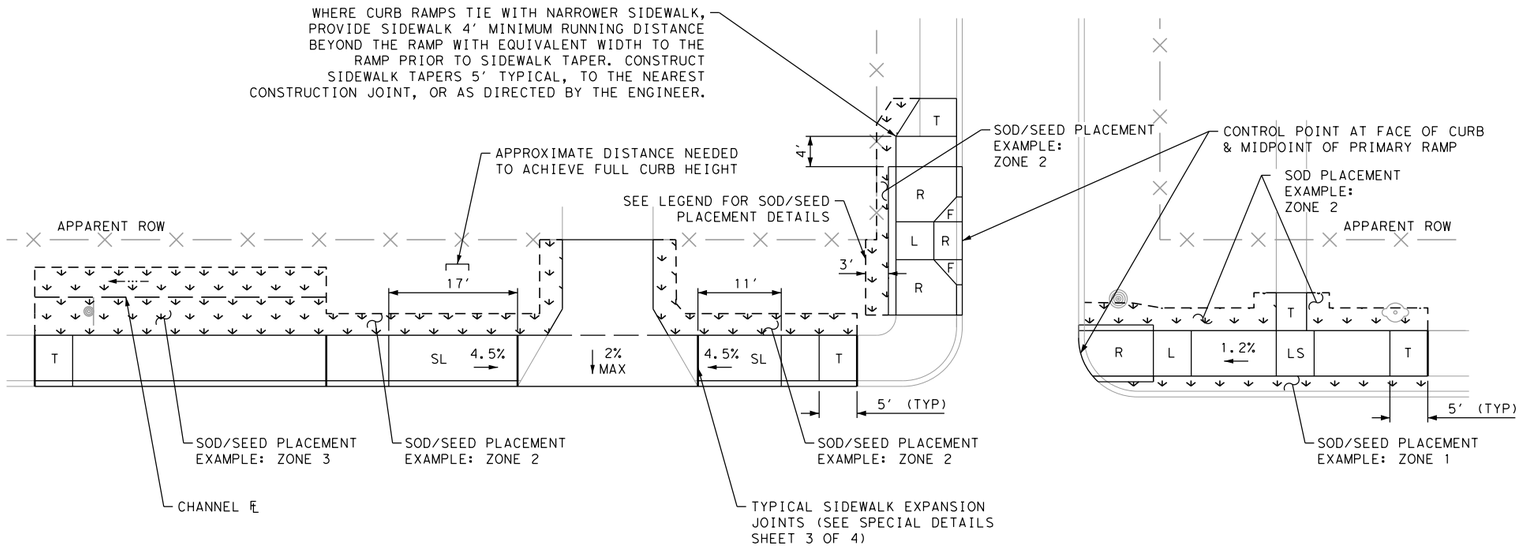
Plotted on: 4/20/2022

SAMPLE PLAN LAYOUT



NOT TO SCALE

LEGEND OF SYMBOLS

	DRAINAGE FLOW DIRECTION		PI POINT
FH	FIRE HYDRANT		UTILITY POLE
GM	GAS METER		SEWER CLEANOUT
GV	GAS VALVE		SIGN
	GUY ANCHOR		TREE/BUSHES
	IRRIGATION	WM	WATER METER
	MAIL BOX	WV	WATER VALVE
	MANHOLE	X.X%	EXISTING ROADWAY OR DRIVEWAY SLOPE
NSPI	NO SEPARATE PAY ITEM	X.X%	PROPOSED ROADWAY, SIDEWALK OR DRIVEWAY SLOPE
G	EX UNDERGROUND GAS	℄	BASE LINE
W	EX UNDERGROUND WATER	PGL	PROFILE GRADE LINE
SS	EX UNDERGROUND STORM SEWER		TRAFFIC FLOW ARROW
UE	EX UNDERGROUND ELECTRIC	APPARENT ROW	APPARENT RIGHT OF WAY LINE
OE	EX OVERHEAD ELECTRIC		DRAINAGE FLOW ARROW
	EXISTING FENCE	TOC	TOP OF CURB
CTV	CABLE PEDESTAL	FOC	FACE OF CURB
T	TELEPHONE MANHOLE		BLOCK SOD
	FUTURE WORK BY OTHERS		
	EXISTING FEATURES		

PLANAR SLOPE DESIGNATIONS

- F = FLARE (10:1 OR LESS) MEASURED AT FACE OF CURB
- R = RAMP (CROSS SLOPE NOT TO EXCEED 2 PERCENT; LONGITUDINAL NOT TO EXCEED 8.3 PERCENT)
- L = LANDING (SHALL NOT EXCEED 2 PERCENT SLOPE IN ANY DIRECTION)
- L1 = SHARED LANDING (SHALL NOT EXCEED 2 PERCENT SLOPE IN ANY DIRECTION)
- LS = LEVEL SIDEWALK (SHALL NOT EXCEED 2 PERCENT SLOPE IN ANY DIRECTION)
- SL = SLOPED SIDEWALK. IF INDICATED, CONSTRUCT SLOPED SIDEWALK AT LONGITUDINAL SLOPE SHOWN ON THE PLANS. OTHERWISE LONGITUDINAL SLOPES MAY NOT EXCEED 5 PERCENT, CROSS SLOPES MAY NOT EXCEED 2 PERCENT
- T = TAPER SIDEWALK WIDTH TO NEAREST EXISTING PANEL JOINT (5' TYP)
- SDWK = SIDEWALK
- DRWY = DRIVEWAY

TYPICAL LIMITS OF SOD/SEED PLACEMENT ARE AS FOLLOWS:

ZONE 1: PLACE SOD/SEED BETWEEN THE BACK OF CURB AND PROPOSED IMPROVEMENTS (SIDEWALK, DRIVEWAY, RIPRAP, ETC.)

ZONE 2: PLACE SOD/SEED 3' BEYOND PROPOSED IMPROVEMENTS

IF THE SPACE BETWEEN THE IMPROVEMENTS AND THE ROW IS LESS THAN 3', PLACE SOD/SEED BETWEEN PROPOSED IMPROVEMENTS AND THE ROW

ZONE 3: PLACE SOD/SEED WITHIN THE LIMITS OF SOIL DISTURBANCE DUE TO EXCAVATION OR EMBANKMENT AS DIMENSIONED ON THE PLANS

PLACE SOD/SEED AS DIRECTED BY THE ENGINEER

NOTES

1. FLARE (F), RAMP (R), AND LANDING (L), DIRECTLY IN CONTACT WITH THE CURB RAMP ARE PAID FOR UNDER ITEM 531 "CURB RAMPS"
2. LEVEL SIDEWALK (LS) AND RAMPS (R) NOT DIRECTLY IN CONTACT WITH THE CURB RAMP ARE PAID FOR UNDER ITEM 531 "SIDEWALK"

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

SPECIAL DETAILS

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	30

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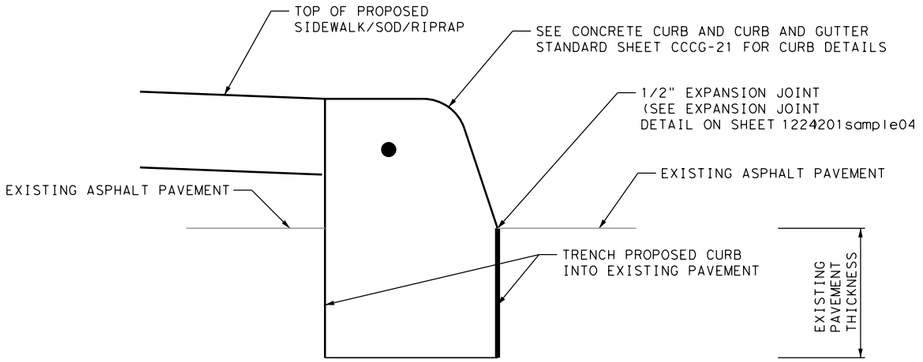
Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\General\1248500sample01.dgn

CURB TRENCH DETAIL

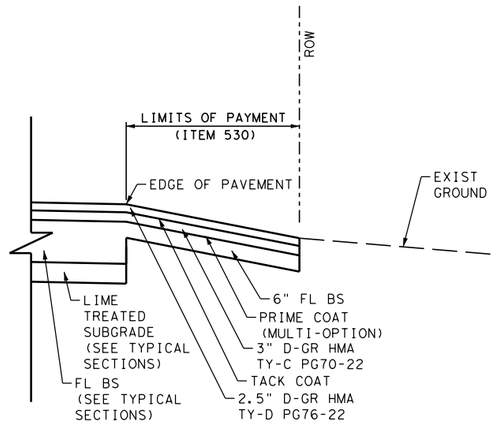
USE WHEN INSTALLING A CURB INTO EXISTING ASPHALT PAVEMENT



NOTES:

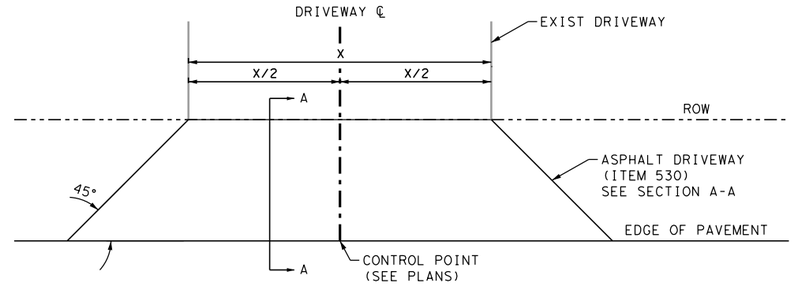
1. VERTICAL DOWELING PROPOSED CURB INTO EXISTING PAVEMENT IS NOT PERMITTED
2. NO ADDITIONAL PAYMENT SHALL BE MADE FOR ADDITIONAL CONCRETE REQUIRED TO MATCH EXISTING PAVEMENT THICKNESS

ASPHALT DRIVEWAY DETAIL (ITEM 530)



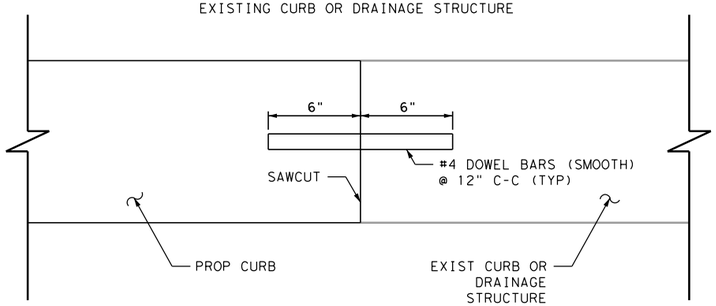
SECTION A-A

N.T.S.



CURB TIE-IN DETAIL

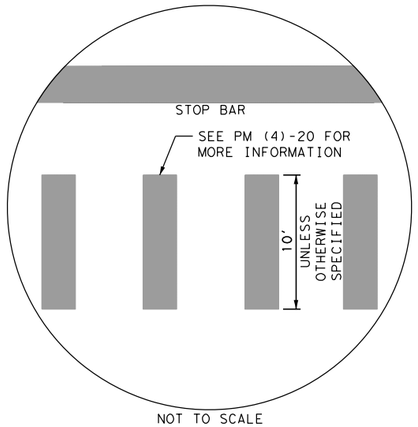
USE WHEN INSTALLING A CURB ABUTTING AN EXISTING CURB OR DRAINAGE STRUCTURE



NOTES:

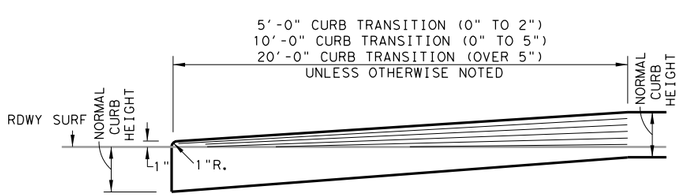
1. DOWEL BARS TO BE DRILLED INTO EXISTING CONCRETE.
2. GROUT OR EPOXY BARS INTO EXISTING CONCRETE AS APPROVED BY THE ENGINEER.

HIGH VISIBILITY LONGITUDINAL CROSSWALK DETAIL

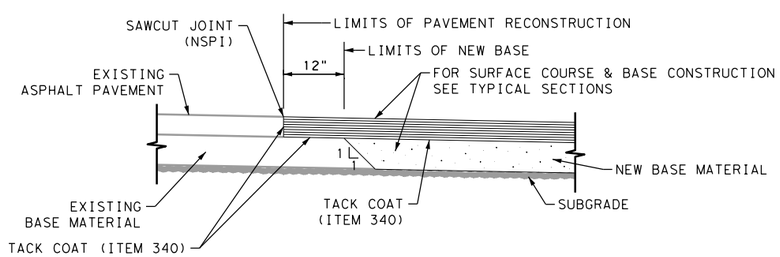


NOT TO SCALE

TYPICAL TRANSITION FOR CONCRETE CURB ENDS



PAVEMENT JUNCTION DETAIL



NOT TO SCALE

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

SPECIAL DETAILS

BARBAROSA RD

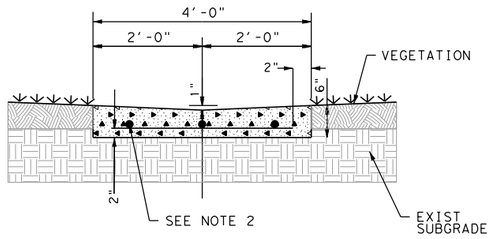
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	31

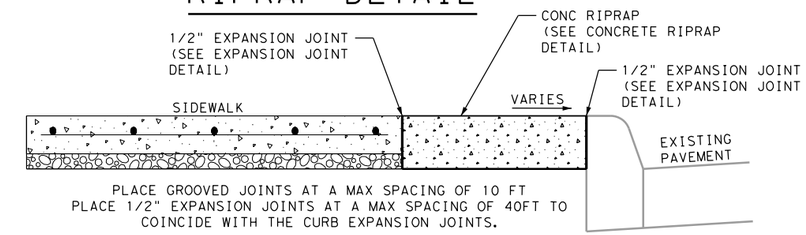
Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\General\1248500sample01.dgn

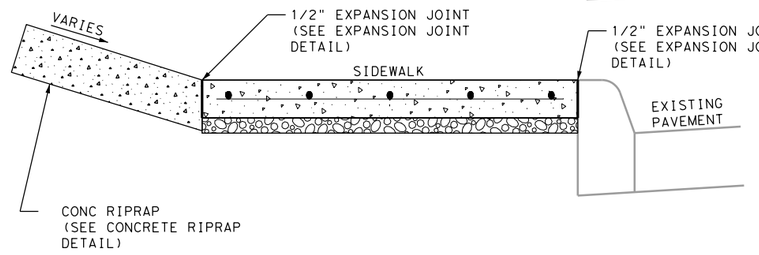
RIPRAP PILOT CHANNEL DETAIL (ITEM 432)



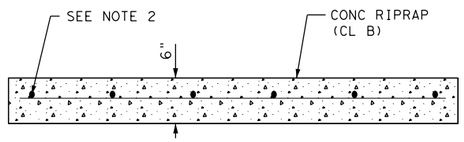
RIPRAP DETAIL



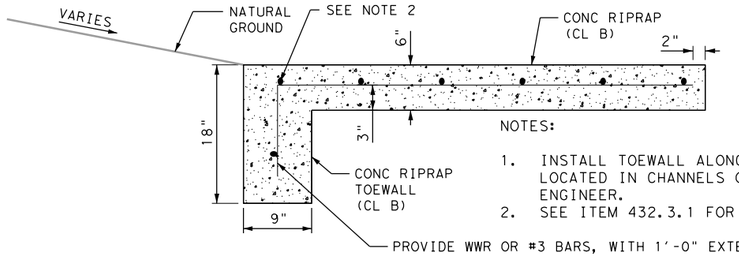
PLACE GROOVED JOINTS AT A MAX SPACING OF 10 FT
PLACE 1/2" EXPANSION JOINTS AT A MAX SPACING OF 40FT TO COINCIDE WITH THE CURB EXPANSION JOINTS.



CONCRETE RIPRAP DETAIL



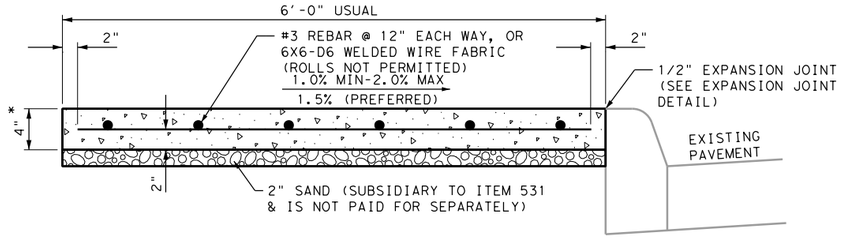
CONCRETE RIPRAP W/ TOEWALL DETAIL



NOTES:

1. INSTALL TOEWALL ALONG PERIMETER OF RIPRAP LOCATED IN CHANNELS OR AS DIRECTED BY THE ENGINEER.
2. SEE ITEM 432.3.1 FOR REINFORCEMENT DETAILS

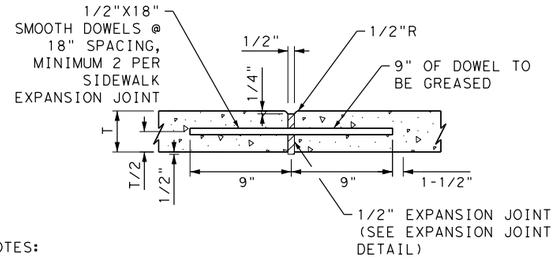
SIDEWALK DETAILS



PLACE GROOVED JOINTS IN THE SIDEWALK AT A MAX SPACING OF 6 FT
PLACE 1/2" EXPANSION JOINTS AT A MAX SPACING OF 40FT TO COINCIDE WITH THE CURB EXPANSION JOINTS.

* UNLESS OTHERWISE SHOWN

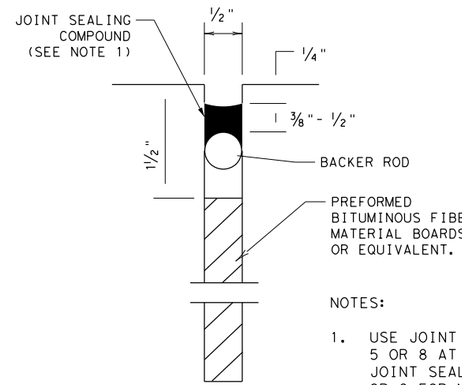
SIDEWALK EXPANSION JOINT DETAIL



NOTES:

1. SIDEWALK EXPANSION JOINT DOWELS ARE CONSIDERED SUBSIDIARY TO ITEM 531.
2. SIDEWALK EXPANSION JOINTS SHALL BE INSTALLED AT MAXIMUM 40 FT INTERVALS, COINCIDE WITH CURB EXPANSION JOINT, CONNECTIONS TO EXISTING CONCRETE, CONNECTIONS TO PROPOSED CONCRETE DRIVEWAYS, WHERE DAILY WORK TERMINATES, AND AS DIRECTED BY THE ENGINEER.

EXPANSION JOINT DETAIL



NOTES:

1. USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4, 5, 7, OR 8 FOR MAINTAINING EXISTING JOINTS.

NOT TO SCALE

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

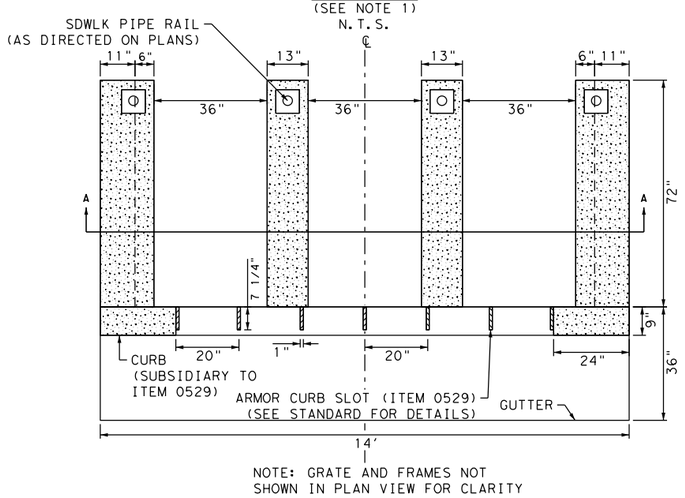
SPECIAL DETAILS

BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	32

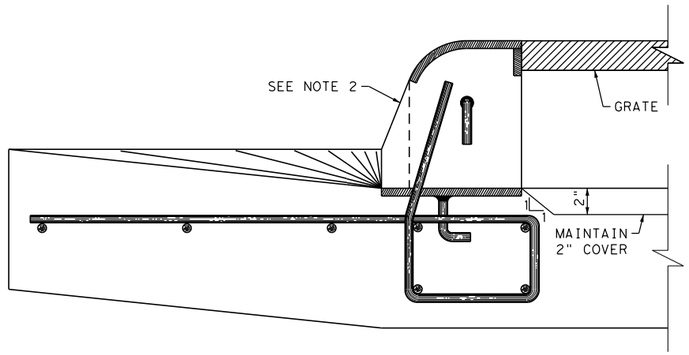
SIDEWALK (TYPE A) DETAIL

PLAN
(SEE NOTE 1)
N.T.S.



NOTE: GRATE AND FRAMES NOT SHOWN IN PLAN VIEW FOR CLARITY

ARMOR CURB SLOT DETAIL
N.T.S.



NOTES:

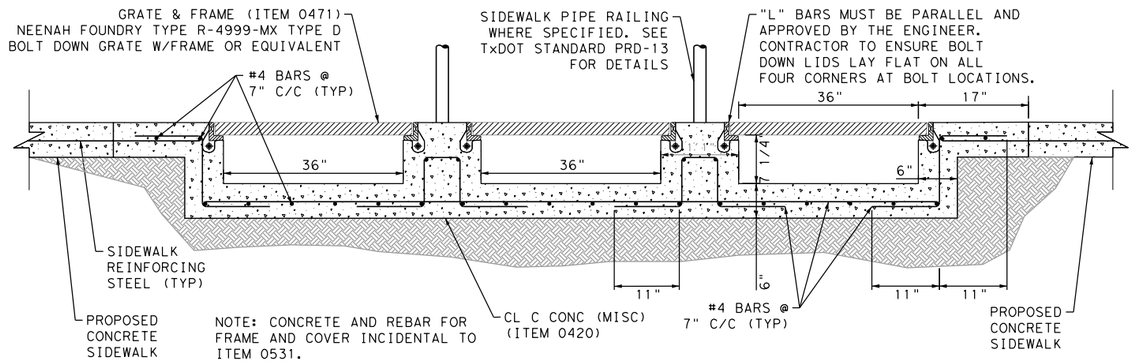
1) SIDEWALK (TY A) IS PAID SEPARATELY UNDER THE FOLLOWING PAY ITEMS UNLESS OTHERWISE SHOW:

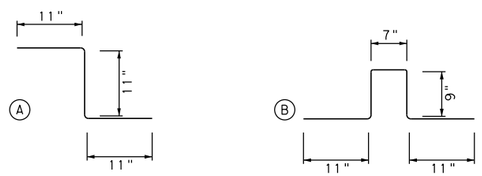
   ITEM 0104-6029 REMOVING CONC (CURB OR CURB & GUTTER)
   ITEM 0471-6003 GRATE & FRAME
   ITEM 0529-6020 CONC CURB & GUTTER (ARMOR CURB)
   ITEM 0420-6074 CL C CONC (MISC)

2) SEE ARMOR CURB SLOT DETAIL FOR ADDITIONAL INFORMATION

NOT TO SCALE

SECTION A-A
N.T.S.





REINFORCING STEEL DETAIL

TABLE OF REINFORCING STEEL			
BAR	SIZE	SPAN	NO.
A	#4	2'-9"	20
B	#4	3'-11"	20

DESIGN

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

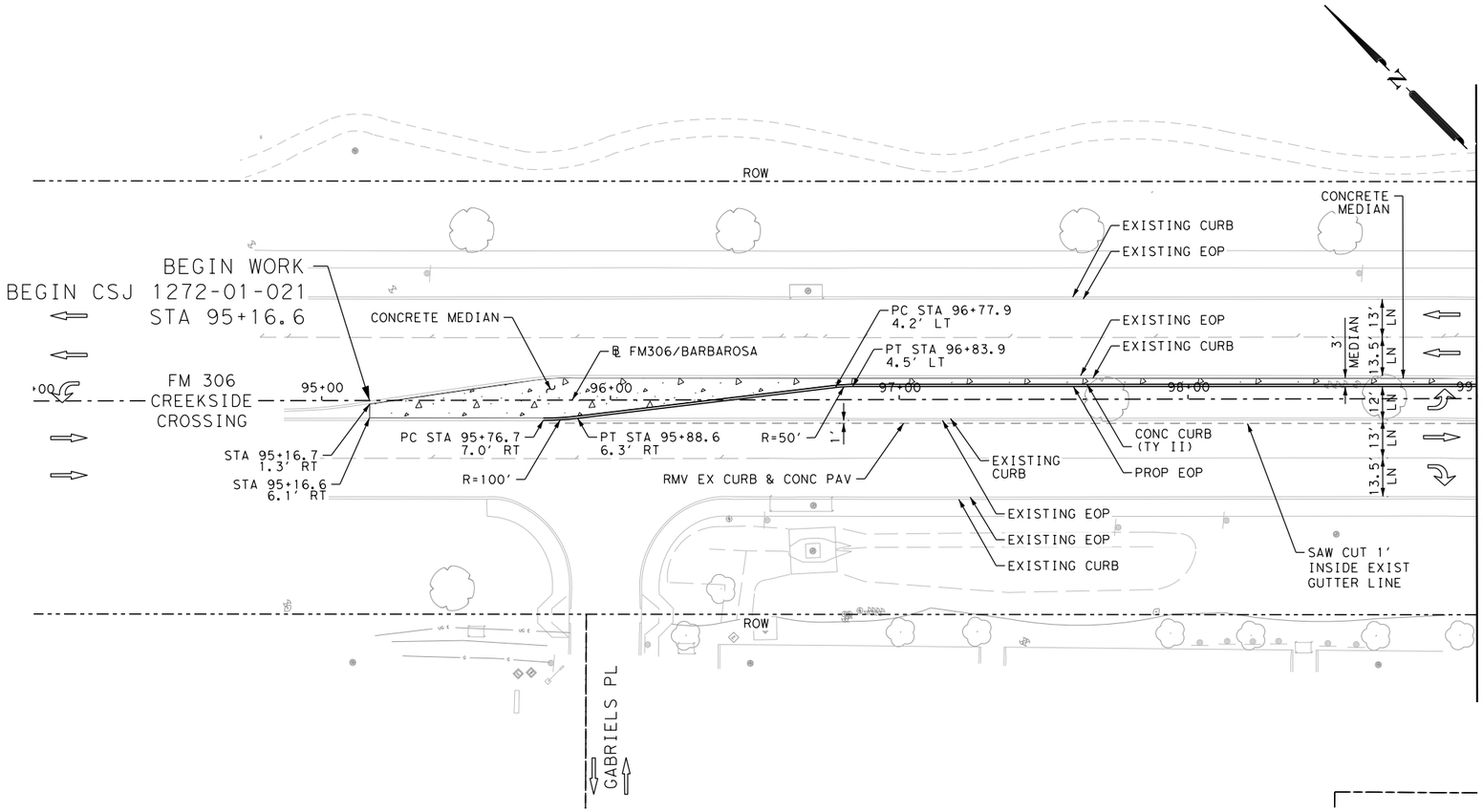
SPECIAL DETAILS

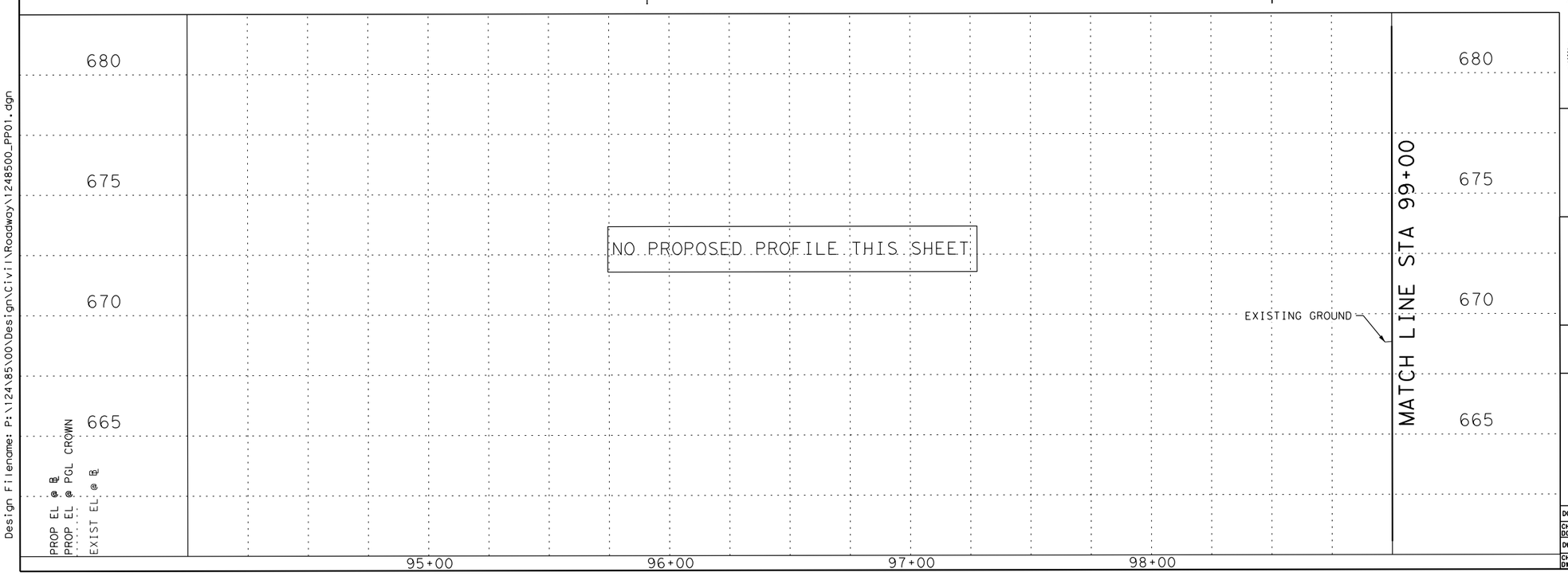
BARBAROSA RD
CSJ: 0915-17-072

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	33

CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0104-6001	REMOVING CONC (PAV)	SY	64
0104-6021	REMOVING CONC (CURB)	LF	324
0260-6006	LIME TRT (EXST MATL) (6")	SY	433
0260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	3.3
0360-6019	CONC PVMT (JOINTED - CPCD) (9")	SY	415
0529-6002	CONC CURB (TY II)	LF	324
0536-6002	CONC MEDIAN	SY	210





LEGEND

- SIDEWALK SHELF
- SAW CUT
- TRAFFIC FLOW
- RAPID CONSTRUCTION PAVEMENTS (MILL/OVERLAY + NO-LIME PAVEMENT)
- LIMITS OF FUTURE WORK BY OTHERS
- CONC MEDIAN

NOTES

1. REFERENCE SPECIAL DETAILS FOR SAMPLE PLAN LAYOUT, SOD/SEED LIMITS, & ADDITIONAL LEGEND OF SYMBOLS.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR HORIZONTAL ALIGNMENT DATA.
3. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

ROADWAY PLAN AND PROFILE

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 4

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	34

Plotted on: 4/20/2022

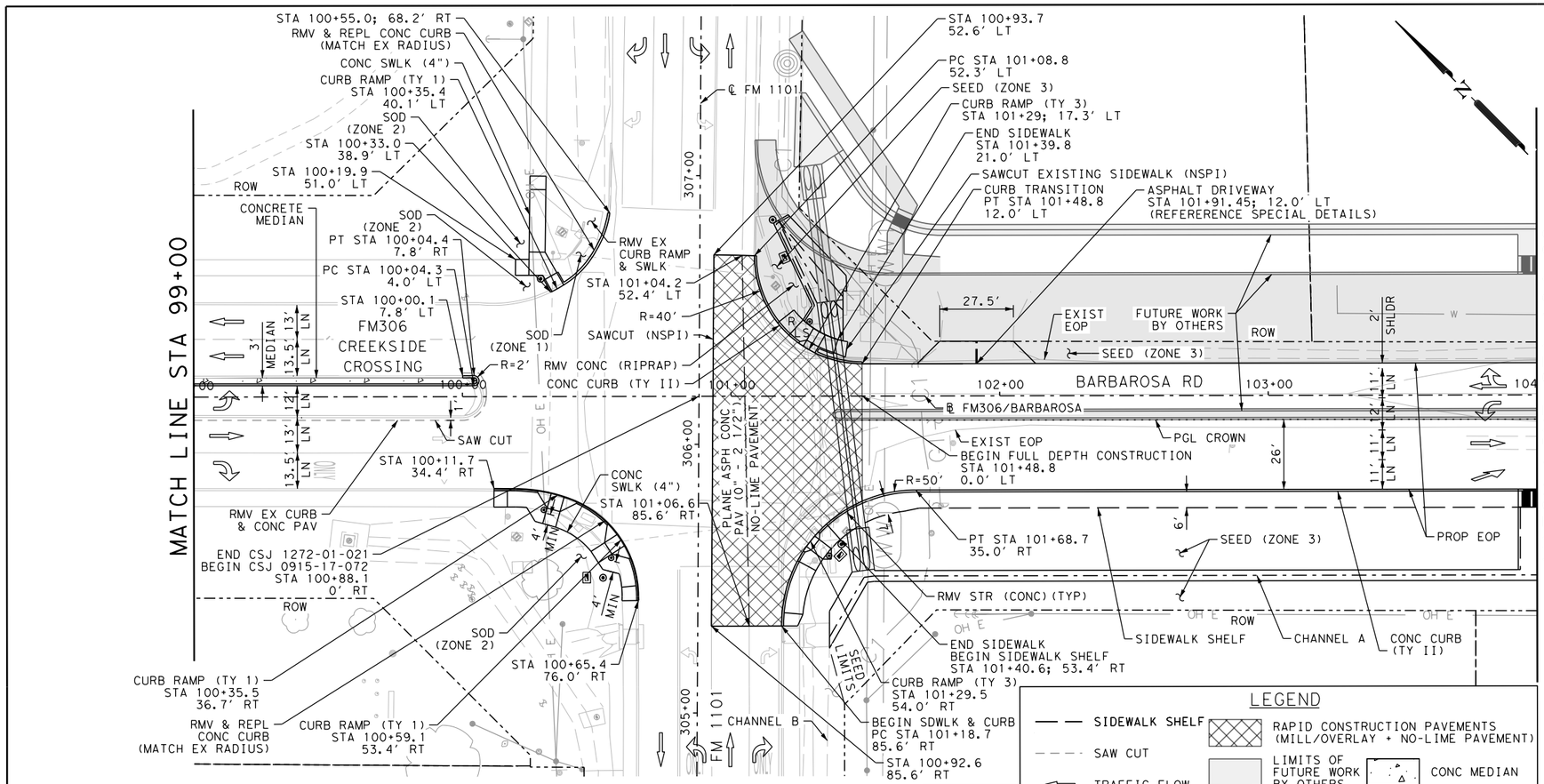
Design Filename: P:\124\85\00\Design\Civil\Roadway\1248500_PP01.dgn

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\Roadway\1248500_PP02.dgn

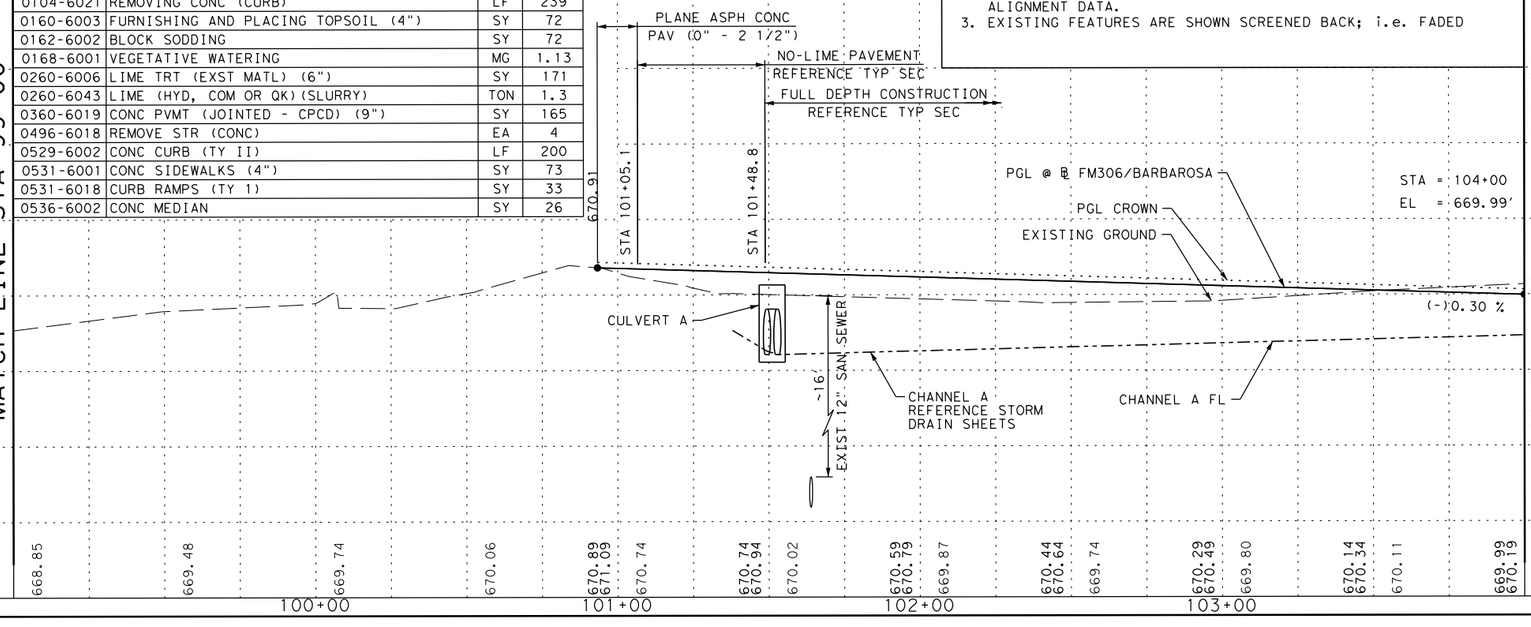
CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0100-6002	PREPARING ROW	STA	3.0
0104-6009	REMOVING CONC (RIPRAP)	SY	207
0104-6021	REMOVING CONC (CURB)	LF	157
0105-6013	REMOVING STAB BASE & ASPH PAV (9")	SY	1072
0110-6001	EXCAVATION (ROADWAY)	CY	693.0
0132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	183.0
0164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	SY	1485
0164-6009	BROADCAST SEED (TEMP) (WARM)	SY	1485
0164-6011	BROADCAST SEED (TEMP) (COOL)	SY	1485
0168-6001	VEGETATIVE WATERING	MG	69.50
0216-6001	PROOF ROLLING	HR	2.0
0247-6041	FL BS (CMP IN PLC)(TYA GR1&2)(FNAL POS)	CY	589.0
0260-6027	LIME TRT (EXST MATL)(8")	SY	1413
0260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	14.2
0310-6001	PRIME COAT (MULTI OPTION)	GAL	423.90
0354-6069	PLANE ASPH CONC PAV (0"- 2 1/2")	SY	188
0496-6007	REMOV STR (PIPE)	LF	214
0496-6018	REMOVE STR (CONC)	EA	4
0529-6002	CONC CURB (TY II)	LF	342
0530-6005	DRIVEWAYS (ACP)	SY	34
0531-6001	CONC SIDEWALKS (4")	SY	22
0531-6020	CURB RAMPS (TY 3)	SY	35
3076-6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	283.6
3076-6066	TACK COAT	GAL	314.70
3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	275.2
3076-6079	D-GR HMA TY-C PG70-22 (EXEMPT)	TON	297.8
5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	1413



CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0104-6001	REMOVING CONC (PAV)	SY	26
0104-6015	REMOVING CONC (SIDEWALKS)	SY	33
0104-6021	REMOVING CONC (CURB)	LF	239
0160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	72
0162-6002	BLOCK SODDING	SY	72
0168-6001	VEGETATIVE WATERING	MG	1.13
0260-6006	LIME TRT (EXST MATL) (6")	SY	171
0260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	1.3
0360-6019	CONC PVMT (JOINTED - CPCD) (9")	SY	165
0496-6018	REMOVE STR (CONC)	EA	4
0529-6002	CONC CURB (TY II)	LF	200
0531-6001	CONC SIDEWALKS (4")	SY	73
0531-6018	CURB RAMPS (TY 1)	SY	33
0536-6002	CONC MEDIAN	SY	26



0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

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HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

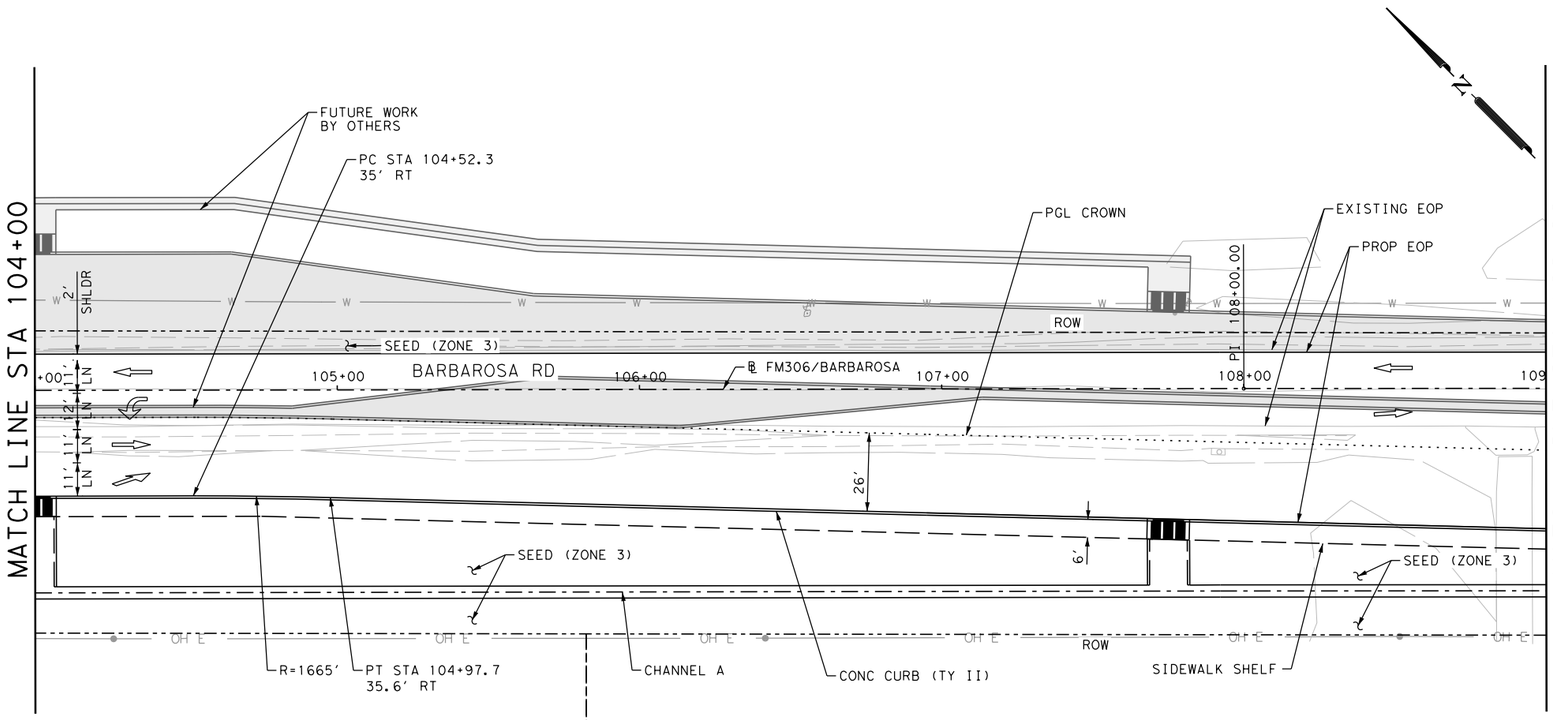
ROADWAY PLAN AND PROFILE

BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 4

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	35

ITEM	DESCRIPTION	UNIT	QTY
0100-6002	PREPARING ROW	STA	5.0
0105-6013	REMOVING STAB BASE & ASPH PAV (9")	SY	1389
0110-6001	EXCAVATION (ROADWAY)	CY	1617.0
0132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	238.0
0164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	SY	2380
0164-6009	BROADCAST SEED (TEMP) (WARM)	SY	2380
0164-6011	BROADCAST SEED (TEMP) (COOL)	SY	2380
0168-6001	VEGETATIVE WATERING	MG	111.39
0216-6001	PROOF ROLLING	HR	5.0
0247-6041	FL BS (CMP IN PLC)(TYA GR1&2)(FNAL POS)	CY	1283.0
0260-6027	LIME TRT (EXST MATL)(8")	SY	3079
0260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	30.8
0310-6001	PRIME COAT (MULTI OPTION)	GAL	923.70
0529-6002	CONC CURB (TY II)	LF	500
3076-6066	TACK COAT	GAL	288.50
3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	414.8
3076-6079	D-GR HMA TY-C PG70-22 (EXEMPT)	TON	497.7
5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	3079



LEGEND

- SIDEWALK SHELF
- SAW CUT
- TRAFFIC FLOW
- RAPID CONSTRUCTION PAVEMENTS (MILL/OVERLAY + NO-LIME PAVEMENT)
- LIMITS OF FUTURE WORK BY OTHERS
- CONC MEDIAN

NOTES

1. REFERENCE SPECIAL DETAILS FOR SAMPLE PLAN LAYOUT, SOD/SEED LIMITS, & ADDITIONAL LEGEND OF SYMBOLS.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR HORIZONTAL ALIGNMENT DATA.
3. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

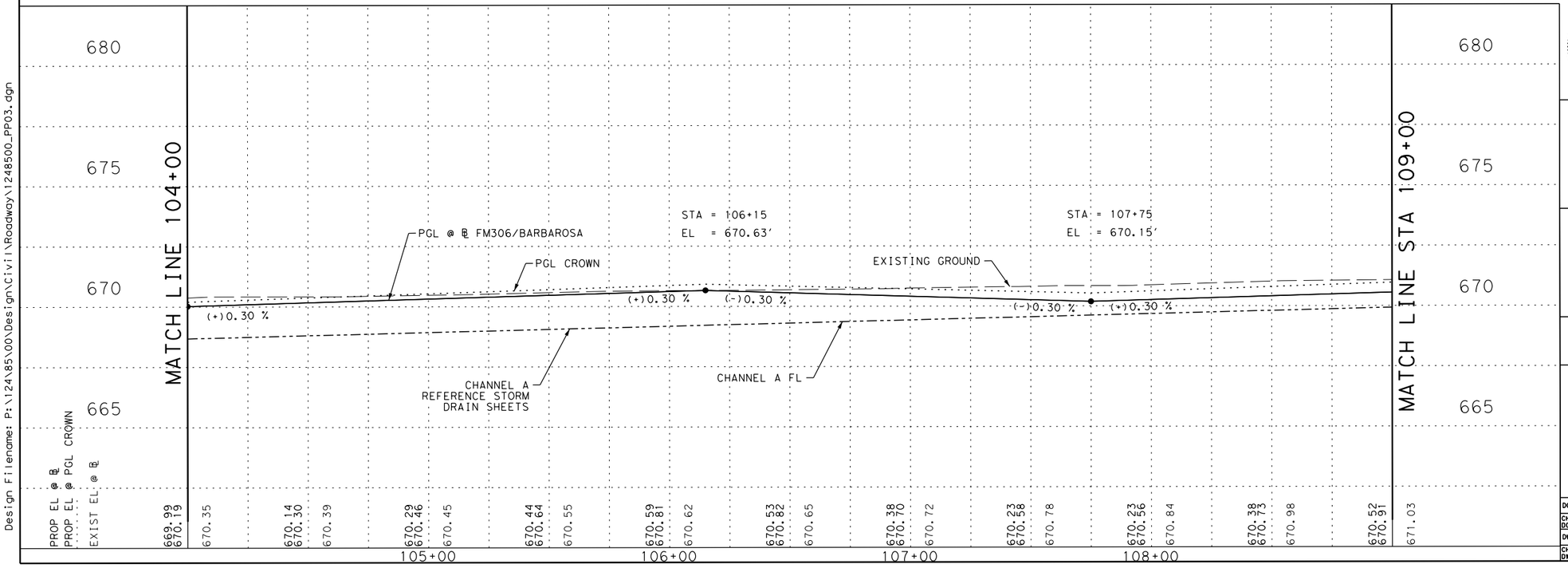
STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE



PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

Texas Department of Transportation ©2022

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

ROADWAY PLAN AND PROFILE

BARBAROSA RD
CSJ: 0915-17-072

SHEET 3 OF 4

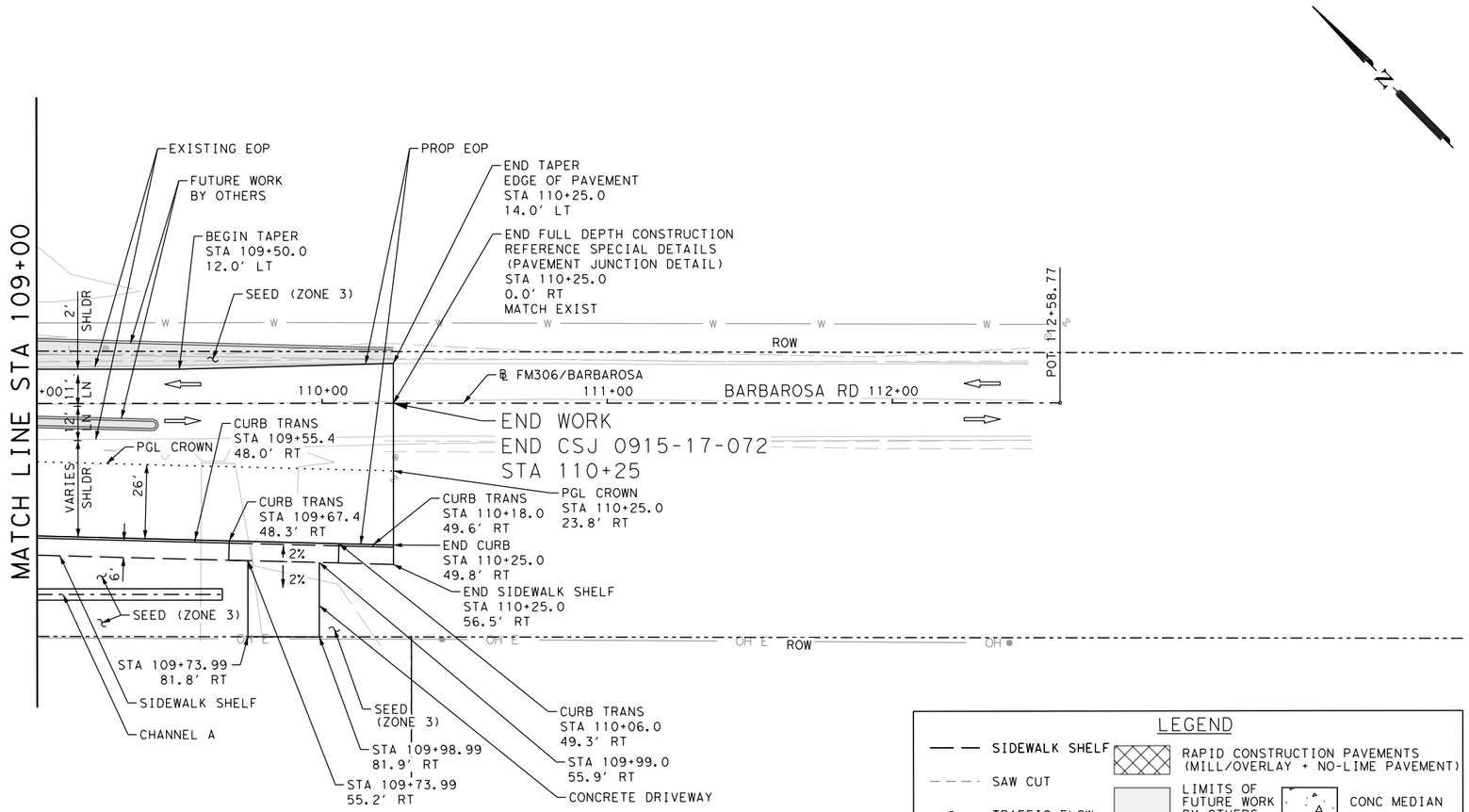
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	36

Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\Roadway\1248500_PP03.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0100-6002	PREPARING ROW	STA	2.0
0105-6013	REMOVING STAB BASE & ASPH PAV (9")	SY	372
0110-6001	EXCAVATION (ROADWAY)	CY	385.0
0132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	24.0
0164-6003	BROADCAST SEED (PERM) (RURAL) (CLAY)	SY	412
0164-6009	BROADCAST SEED (TEMP) (WARM)	SY	412
0164-6011	BROADCAST SEED (TEMP) (COOL)	SY	412
0168-6001	VEGETATIVE WATERING	MG	19.29
0216-6001	PROOF ROLLING	HR	1.0
0247-6041	FL BS (CMP IN PLC)(TYA GR1&2)(FNAL POS)	CY	372.0
0260-6027	LIME TRT (EXST MATL)(8")	SY	892
0260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	9.0
0310-6001	PRIME COAT (MULTI OPTION)	GAL	267.60
0529-6002	CONC CURB (TY II)	LF	87
0530-6004	DRIVEWAYS (CONC)	SY	102
3076-6066	TACK COAT	GAL	84.30
3076-6072	D-GR HMA TY-D PG 76-22 (EXEMPT)	TON	121.2
3076-6079	D-GR HMA TY-C PG70-22 (EXEMPT)	TON	145.5
5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	892

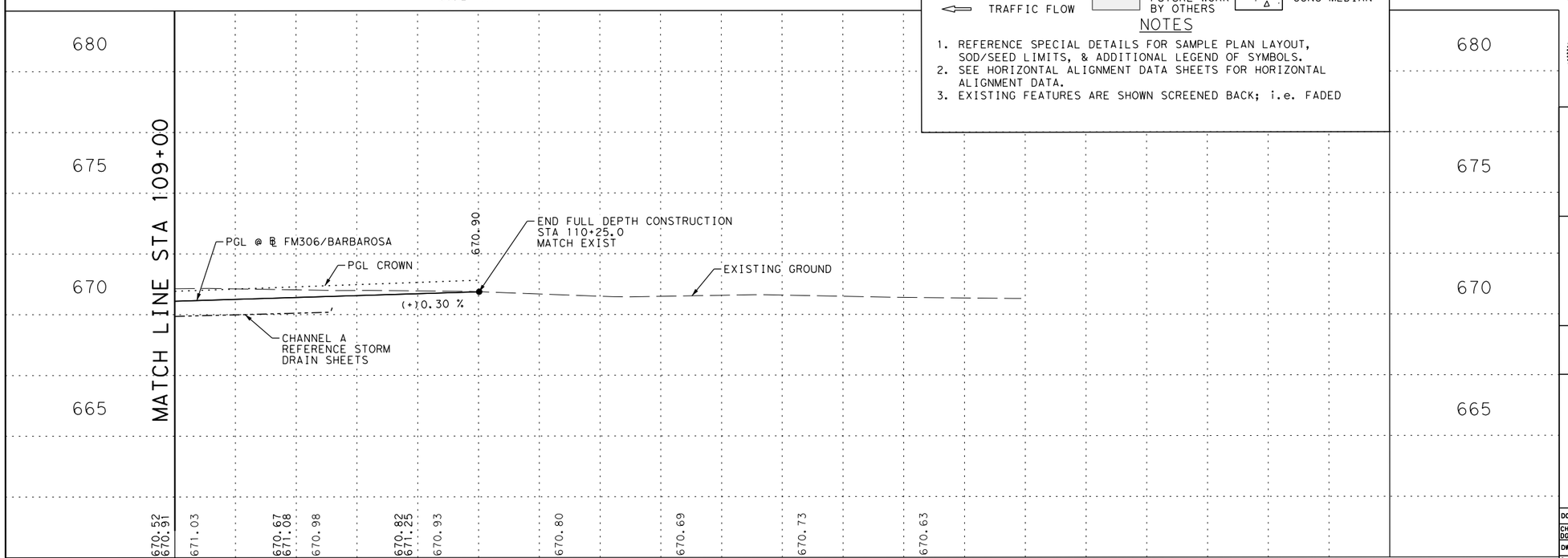


LEGEND

- SIDEWALK SHELF
- SAW CUT
- TRAFFIC FLOW
- RAPID CONSTRUCTION PAVEMENTS (MILL/OVERLAY + NO-LIME PAVEMENT)
- LIMITS OF FUTURE WORK BY OTHERS
- CONC MEDIAN

NOTES

1. REFERENCE SPECIAL DETAILS FOR SAMPLE PLAN LAYOUT, SOD/SEED LIMITS, & ADDITIONAL LEGEND OF SYMBOLS.
2. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR HORIZONTAL ALIGNMENT DATA.
3. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED



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SCALE: PLAN 1"= 50' PROFILE 1"= 5'

DESIGN

STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED · PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED · PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

ROADWAY PLAN AND PROFILE

BARBAROSA RD
CSJ: 0915-17-072

SHEET 4 OF 4

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	37

Plotted on: 4/20/2022

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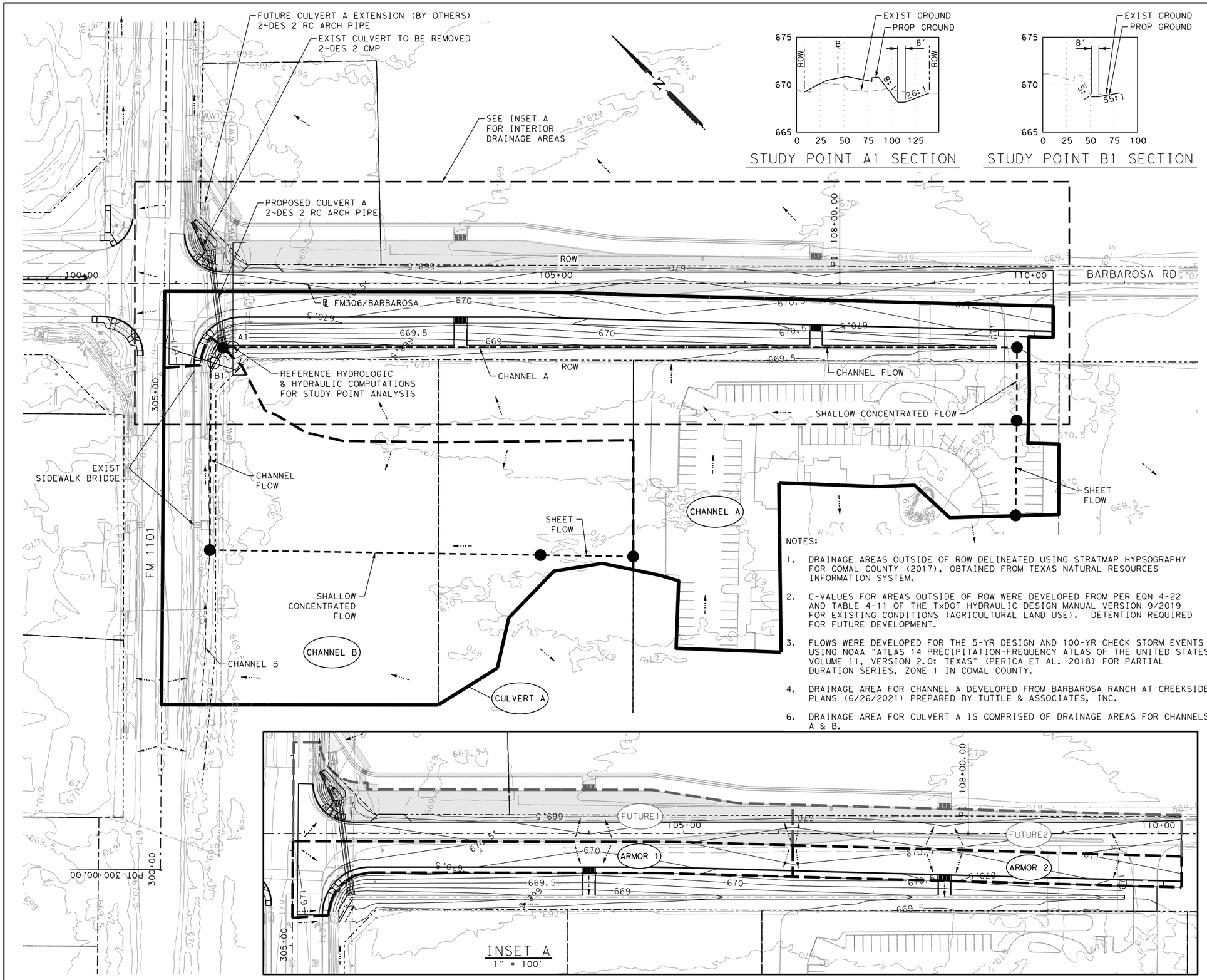
Plotted on: 4/20/2022

Design Filename: P:\124985\00\Design\Civil\Drainage\1248500_DA01.dgn



STUDY POINT A1 SECTION

STUDY POINT B1 SECTION

LEGEND

- X1 — DRAINAGE AREA (THIS PROJECT)
- X1 — DRAINAGE AREA (FUTURE BY OTHERS)
- FLOW ARROW
- EXTERNAL DRAINAGE AREA BOUNDARY
- INTERNAL DRAINAGE AREA BOUNDARY (THIS PROJECT)
- INTERNAL DRAINAGE AREA BOUNDARY (FUTURE BY OTHERS)
- TIME OF CONCENTRATION PATH AND FLOW REGIME CHANGE LOCATIONS
- A1 — CHANNEL STUDY POINT LOCATION
- FUTURE WORK BY OTHERS
- 670 — EXIST CONTOUR
- 670 — PROPOSED CONTOUR

0 50 100 150
SCALE: 1"= 100'

NOTES:

1. DRAINAGE AREAS OUTSIDE OF ROW DELINEATED USING STRATMAP HYPSOGRAPHY FOR COMAL COUNTY (2017), OBTAINED FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEM.
2. C-VALUES FOR AREAS OUTSIDE OF ROW WERE DEVELOPED FROM PER EQN 4-22 AND TABLE 4-11 OF THE TxDOT HYDRAULIC DESIGN MANUAL VERSION 9/2019 FOR EXISTING CONDITIONS (AGRICULTURAL LAND USE). DETENTION REQUIRED FOR FUTURE DEVELOPMENT.
3. FLOWS WERE DEVELOPED FOR THE 5-YR DESIGN AND 100-YR CHECK STORM EVENTS USING NOAA "ATLAS 14 PRECIPITATION-FREQUENCY ATLAS OF THE UNITED STATES, VOLUME 11, VERSION 2.0: TEXAS" (PERICA ET AL. 2018) FOR PARTIAL DURATION SERIES, ZONE 1 IN COMAL COUNTY.
4. DRAINAGE AREA FOR CHANNEL A DEVELOPED FROM BARBAROSA RANCH AT CREEKSIDE PLANS (6/26/2021) PREPARED BY TUTTLE & ASSOCIATES, INC.
6. DRAINAGE AREA FOR CULVERT A IS COMPRISED OF DRAINAGE AREAS FOR CHANNELS A & B.

INSET A
1" = 100'

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED
PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
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City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

DRAINAGE AREA MAP

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	38

Plotted on: 4/20/2022

INLET HYDRAULIC COMPUTATIONS (5-YR)

SAG INLET COMPUTATIONS																							
ID	TYPE	DESCRIPTION	CHAIN	STATION	OFFSET	DRAINAGE AREA ID	LENGTH	INLET PERIMETER	INLET AREA	CURB DEPRESSION	AREA REDUCTION FACTOR	PERIMETER REDUCTION FACTOR	AREA DISCHARGE	CAPACITY	SPREAD SLOPE 1	SPREAD WIDTH 1	SPREAD SLOPE 2	SPREAD WIDTH 2	SPREAD N	ALLOWABLE PONDED WIDTH	COMPUTED PONDED WIDTH (LT)	COMPUTED PONDED WIDTH (RT)	ALLOWABLE PONDED DEPTH	COMPUTED PONDED DEPTH
							FT	FT	FT^2	FT			CFS	CFS	%	FT	%	FT		FT	FT	FT	FT	FT
ARMOR 1	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	104+00.00	35.03 'RT	ARMOR 1	10.000	n/a	n/a	0.208	n/a	n/a	2.56	3.2	2.0	26.0	0.0	0.0	0.015	11.00	10.374	8.913	0.22	0.19
ARMOR 2	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	107+90.00	43.59 'RT	ARMOR 2	10.000	n/a	n/a	0.208	n/a	n/a	1.76	3.2	2.0	26.0	0.0	0.0	0.015	11.00	7.754	8.865	0.22	0.15
FUTURE1	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	104+00.00	45.75 'LT	FUTURE1	10.000	n/a	n/a	0.208	n/a	n/a	3.90	4.6	2.0	54.0	0.0	0.0	0.015	14.00	12.148	10.436	0.28	0.25
FUTURE2	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	107+90.00	24.86 'LT	FUTURE2	10.000	n/a	n/a	0.208	n/a	n/a	2.32	4.6	2.0	42.0	0.0	0.0	0.015	14.00	8.598	9.831	0.28	0.18

INLET HYDRAULIC COMPUTATIONS (100-YR)

SAG INLET COMPUTATIONS																							
ID	TYPE	DESCRIPTION	CHAIN	STATION	OFFSET	DRAINAGE AREA ID	LENGTH	INLET PERIMETER	INLET AREA	CURB DEPRESSION	AREA REDUCTION FACTOR	PERIMETER REDUCTION FACTOR	AREA DISCHARGE	CAPACITY	SPREAD SLOPE 1	SPREAD WIDTH 1	SPREAD SLOPE 2	SPREAD WIDTH 2	SPREAD N	ALLOWABLE PONDED WIDTH	COMPUTED PONDED WIDTH (LT)	COMPUTED PONDED WIDTH (RT)	ALLOWABLE PONDED DEPTH	COMPUTED PONDED DEPTH
							FT	FT	FT^2	FT			CFS	CFS	%	FT	%	FT		FT	FT	FT	FT	FT
ARMOR 1	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	104+00.00	35.03 'RT	ARMOR 1	10.000	n/a	n/a	0.208	n/a	n/a	4.61	3.2	2.0	26.0	0.0	0.0	0.015	11.00	12.938	11.115	0.22	0.28
ARMOR 2	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	107+90.00	43.59 'RT	ARMOR 2	10.000	n/a	n/a	0.208	n/a	n/a	3.18	3.2	2.0	26.0	0.0	0.0	0.015	11.00	9.669	11.056	0.22	0.22
FUTURE1	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	104+00.00	45.75 'LT	FUTURE1	10.000	n/a	n/a	0.208	n/a	n/a	7.03	4.6	2.0	54.0	0.0	0.0	0.015	14.00	15.150	13.015	0.28	0.37
FUTURE2	C	(1-ARM CURB)(1-SDWLK BRDG)	BARBCL	107+90.00	24.86 'LT	FUTURE2	10.000	n/a	n/a	0.208	n/a	n/a	4.19	4.6	2.0	42.0	0.0	0.0	0.015	14.00	10.723	12.260	0.28	0.26

DRAINAGE AREA COMPUTATIONS (5-YR)

RUNOFF COMPUTATIONS - RATIONAL METHOD							
AREA ID	AREA (AC)	C	CA	Tc (MIN)	INTENSITY (IN/HR)	DISCHARGE (CFS)	TO INLET / JUNCTION
ARMOR 1	0.45	0.90	0.40	10	6.35	2.56	ARMOR 1
ARMOR 2	0.31	0.90	0.28	10	6.35	1.76	ARMOR 2
CHANNEL A	4.12	0.51	2.10	32	3.65	7.66	CHANNEL A
CHANNEL B	2.94	0.46	1.35	25	4.17	5.63	CHANNEL B
CULVERT A	7.05	0.49	3.45	25	4.17	14.40	CULVERT A
FUTURE1	0.68	0.90	0.61	10	6.35	3.90	FUTURE 1
FUTURE2	0.41	0.90	0.37	10	6.35	2.32	FUTURE 2

DRAINAGE AREA COMPUTATIONS (100-YR)

RUNOFF COMPUTATIONS - RATIONAL METHOD							
AREA ID	AREA (AC)	C	CA	Tc (MIN)	INTENSITY (IN/HR)	DISCHARGE (CFS)	TO INLET / JUNCTION
ARMOR 1	0.45	0.90	0.40	10	11.44	4.61	ARMOR 1
ARMOR 2	0.31	0.90	0.28	10	11.44	3.18	ARMOR 2
CHANNEL A	4.12	0.51	2.10	32	6.96	14.63	CHANNEL A
CHANNEL B	2.94	0.46	1.35	25	7.87	10.61	CHANNEL B
CULVERT A	7.05	0.49	3.45	25	7.87	27.16	CULVERT A
FUTURE1	0.68	0.90	0.61	10	11.44	7.03	FUTURE 1
FUTURE2	0.41	0.90	0.37	10	11.44	4.19	FUTURE 2

CHANNEL HYDRAULIC COMPUTATIONS

				5-YR					100-YR					CAPACITY				
STUDY POINT	STATION	DRAINAGE AREA ID	CHANNEL SLOPE	DISCHARGE	DEPTH OF FLOW	FREEBOARD	SHEAR STRESS	VELOCITY	DISCHARGE	DEPTH OF FLOW	FREEBOARD	SHEAR STRESS	VELOCITY	DISCHARGE	DEPTH OF FLOW	FREEBOARD	SHEAR STRESS	VELOCITY
			FT / FT	CU FT / SEC	FT	FT	LBS / SQ FT	FT / SEC	CU FT / SEC	FT	FT	LBS / SQ FT	FT / SEC	CU FT / SEC	FT	FT	LBS / SQ FT	FT / SEC
A1	101+60	CHANNEL A	0.0025	7.66	0.4	0.57	0.04	1.3	14.63	0.55	0.42	0.06	1.56	51.06	0.97	0	0.09	2.2
B1	101+40	CHANNEL B	0.021	5.63	0.19	0.21	0.18	2.35	10.61	0.25	0.15	0.22	2.73	28.46	0.4	0	0.33	3.6

TIME OF CONCENTRATION COMPUTATIONS

NRCS METHOD TIME OF CONCENTRATION PARAMETERS BY FLOW TYPE																									
DESIGN ELEMENT	TOTAL LENGTH	SHEET							SHALLOW CONCENTRATED							CHANNEL								TOTAL
		LENGTH	MANNING'S N-VALUE	P2	UP ELEV	DOWN ELEV	SLOPE	TIME	LENGTH	SURFACE TYPE	SURFACE COEFF.	UP ELEV	DOWN ELEV	SLOPE	TIME	LENGTH	FLOW TYPE	UP ELEV	DOWN ELEV	SLOPE	AREA	WETTED PERIMETER	TIME	TIME OF CONCENTRATION
	(FT)	(FT)		(IN)	(FT)	(FT)	(FT/FT)	(MIN)	(FT)			(FT)	(FT)	(FT)/FT)	(MIN)	(FT)		(FT)	(FT)	(FT)/FT)	SF	FT	(MIN)	(MIN)
CHANNEL A	1,021	100	0.17	4.05	670.7	670.3	0.0040	18.3	83	UNPAVED	16.13	670.3	669.7	0.007	1.0	838	CHANNEL	669.7	668	0.002	4.0	12.1	13.1	32.4
CHANNEL B	680	100	0.17	4.05	670.5	670	0.0050	16.8	348	UNPAVED	16.13	670	668.6	0.004	5.7	232	CHANNEL	668.6	668	0.003	7.3	19.5	2.9	25.4

INLET TYPE ABBREVIATIONS

C = CURB
G = GRATE
C & G = CURB & GRATE

NOTES:

1. RATIONAL METHOD USED FOR DRAINAGE AREAS LESS THAN 200 AC FOR PEAK FLOW CALCULATIONS.
2. 10 MIN. MINIMUM WAS USED FOR TIME OF CONCENTRATION CALCULATIONS.

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

HYDROLOGIC & HYDRAULIC COMPUTATIONS

BARBAROSA RD @ FM 1101

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	39

Design Filename: P:\124\85\00\Design\Civil\Drainage\1248500_HYDCOMP01.dgn

Plotted on: 4/20/2022

EXISTING (CORRECTED EFFECTIVE)

****

Straight Culvert

Inlet Elevation (invert): 667.88 ft, Outlet Elevation (invert): 667.62 ft

Culvert Length: 86.78 ft, Culvert Slope: 0.0030

****

Site Data - Structure #4_CORR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 667.88 ft

Outlet Station: 86.78 ft

Outlet Elevation: 667.62 ft

Number of Barrels: 2

Culvert Data Summary - Structure #4_CORR

Barrel Shape: Pipe Arch

Barrel Span: 24.00 in

Barrel Rise: 18.00 in

Barrel Material: Steel or Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0250

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

Tailwater Channel Data - Structure #4_CORR

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0016

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	670.82	0.1600
2	22.13	670.38	0.1600
3	22.97	670.96	0.0130
4	28.97	671.05	0.0350
5	40.74	667.60	0.0350
6	62.53	669.16	0.0350
7	65.70	669.16	0.0000

Roadway Data for Crossing: Structure #4_CORR

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

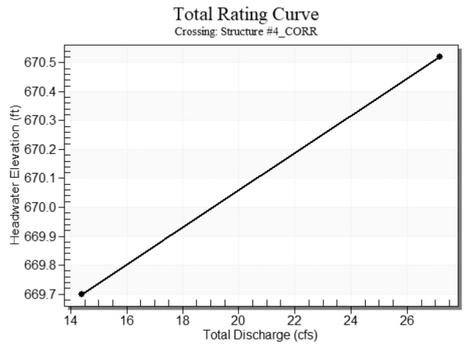
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	0.00	671.10
1	8.17	671.08
2	14.15	670.92
3	21.53	671.03
4	29.77	670.98
5	36.50	670.92
6	44.49	670.78
7	51.23	670.22
8	57.21	669.72

Roadway Surface: Paved

Roadway Top Width: 52.50 ft

Rating Curve Plot for Crossing: Structure #4_CORR



Water Surface Profile Plot for Culvert: Structure #4_CORR

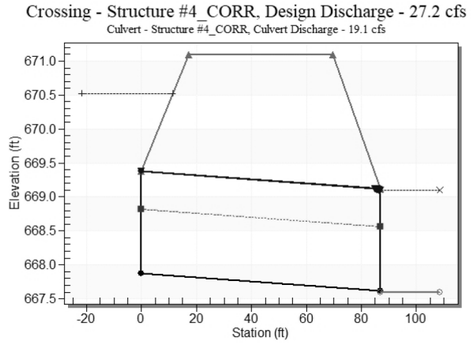


Table 1 - Summary of Culvert Flows at Crossing: Structure #4_CORR

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Structure #4_CORR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
669.70	5-YR	14.40	14.40	0.00	1
670.52	100-YR	27.16	19.11	8.06	5
669.72	Overtopping	14.53	14.53	0.00	Overtopping

Table 2 - Culvert Summary Table: Structure #4_CORR

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-YR	14.40	14.40	669.70	1.324	1.820	7-M2t	1.500	0.798	1.161	1.181	3.481	1.187
100-YR	27.16	19.11	670.52	1.690	2.815	7-M2t	1.500	0.942	1.479	1.499	3.961	1.392

Table 3 - Downstream Channel Rating Curve (Crossing: Structure #4_CORR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
14.40	668.78	1.18	1.19	0.12	0.27
27.16	669.10	1.50	1.39	0.15	0.28

NOTES:

1. CULVERT HYDRAULIC PERFORMANCE MODELED USING HY-8 V 7.5
2. STRUCTURE #4_CORR REPRESENTS EXISTING CONDITIONS TAKEN FROM AS-BUILT PLANS (CSJ 1272-01-016, 10/3/2019) WITH CORRECTIONS TO HYDROLOGIC AND HYDRAULIC PARAMETERS.

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

Texas Department of Transportation

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

HYDRAULIC DATA CULVERT A

BARBAROSA RD @ FM 1101

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	40

Design Filename: P:\124X85\00\Design\Civil\Drainage\1248500_HYDDATA01.dgn

Plotted on: 4/20/2022

PROPOSED

Straight Culvert

Inlet Elevation (invert): 667.98 ft, Outlet Elevation (invert): 667.65 ft

Culvert Length: 80.00 ft, Culvert Slope: 0.0041

Site Data - Culvert A

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 667.98 ft

Outlet Station: 80.00 ft

Outlet Elevation: 667.65 ft

Number of Barrels: 2

Culvert Data Summary - Culvert A

Barrel Shape: Pipe Arch

Barrel Span: 28.50 in

Barrel Rise: 18.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Channel Data - Culvert A

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0016

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	0.00	670.82	0.1600
2	22.13	670.38	0.1600
3	22.97	670.96	0.0130
4	28.97	671.05	0.0350
5	40.74	667.65	0.0350
6	62.53	669.16	0.0350
7	65.70	669.16	0.0000

Roadway Data for Crossing: Culvert A

Roadway Profile Shape: Constant Roadway Elevation

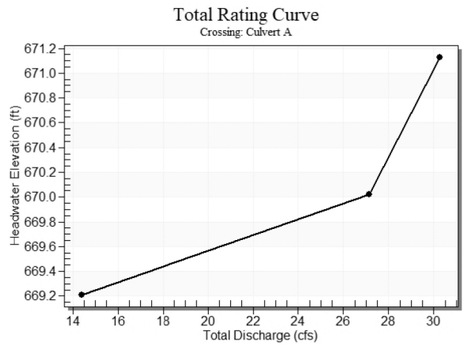
Crest Length: 430.00 ft

Crest Elevation: 670.19 ft

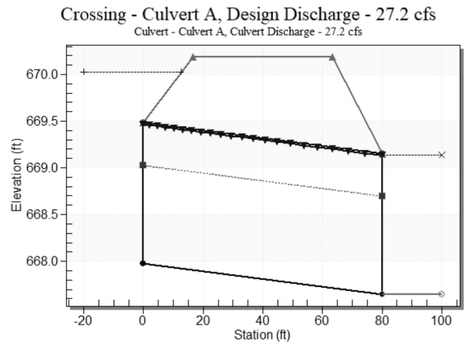
Roadway Surface: Paved

Roadway Top Width: 47.00 ft

Rating Curve Plot for Crossing: Culvert A



Water Surface Profile Plot for Culvert: Culvert A



NOTES:

1. CULVERT HYDRAULIC PERFORMANCE MODELED USING HY-8 V 7.5
2. STRUCTURE #4_CORR REPRESENTS EXISTING CONDITIONS TAKEN FROM AS-BUILT PLANS (CSJ 1272-01-016, 10/3/2019) WITH CORRECTIONS TO HYDROLOGIC AND HYDRAULIC PARAMETERS.

Table 1 - Summary of Culvert Flows at Crossing: Culvert A

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
669.21	5-YR	14.40	14.40	0.00	1
670.02	100-YR	27.16	27.16	0.00	1
670.19	Overtopping	30.27	30.27	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert A

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5-YR	14.40	14.40	669.21	1.132	1.232	1-S1t	0.709	0.736	1.168	1.168	2.930	1.179
100-YR	27.16	27.16	670.02	1.973	2.041	3-M2t	1.500	1.049	1.482	1.482	4.882	1.382

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert A)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
14.40	668.82	1.17	1.18	0.12	0.27
27.16	669.13	1.48	1.38	0.15	0.28

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED
PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

Texas Department of Transportation

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

HYDRAULIC DATA CULVERT A

BARBAROSA RD @ FM 1101

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	41

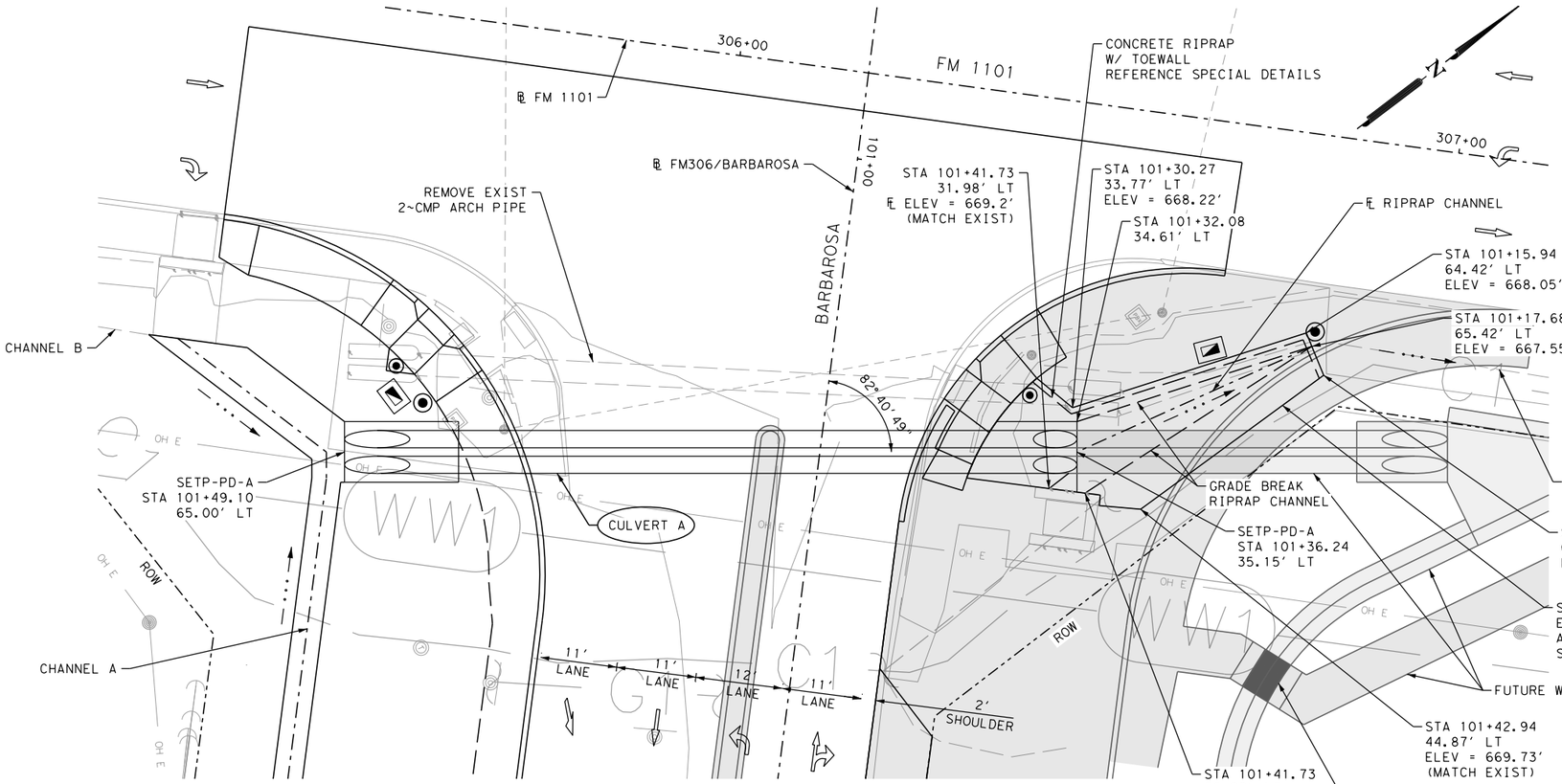
Design Filename: P:\124\85\00\Design\Civil\Drainage\1248500_HYDDATA01.dgn

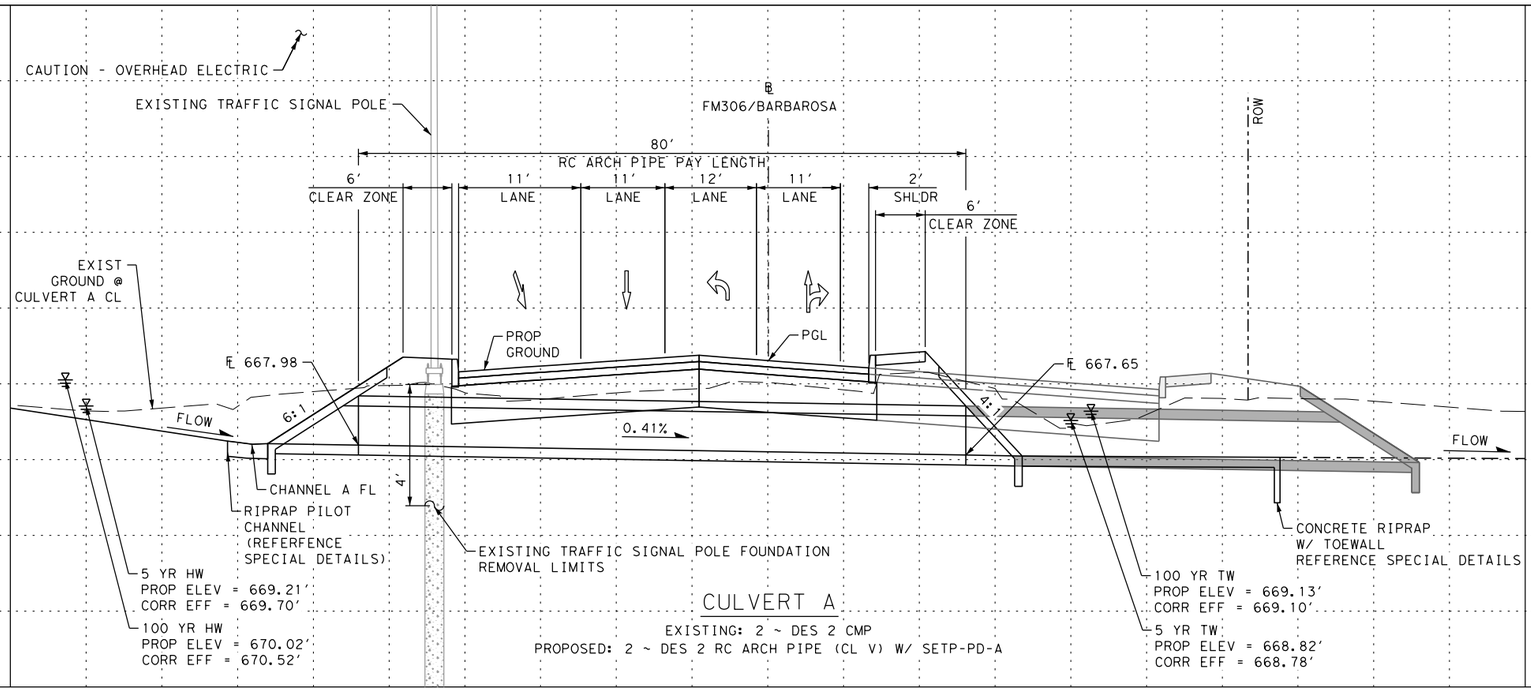
Plotted on: 4/20/2022

Design Filename: P:\12485\00\Design\Civil\Drainage\1248500_CULV_A.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0432-6003	RIPRAP (CONC)(6 IN)	CY	33.4
0464-6088	RC PIPE (ARCH)(CL V)(DES 2)	LF	80
0467-6531	SET (TY II) (DES 2) (RCP) (6: 1) (P)	EA	2





CULVERT A

EXISTING: 2 ~ DES 2 CMP

PROPOSED: 2 ~ DES 2 RC ARCH PIPE (CL V) W/ SETP-PD-A

LEGEND

ELEMENTS IN THIS PROJECT	FUTURE ELEMENTS BY OTHERS	
CI-1A	CI-1A	STRUCTURE & DESIGNATION
		DRAINAGE STRUCTURES
		LIMITS OF FUTURE WORK BY OTHERS

NOTES

1. SEE PERTINENT STRUCTURE LAYOUT OR PROFILE FOR ADDITIONAL DETAILS OF EACH STRUCTURE.
2. ALL PIPES ARE NORMAL TO AND STRAIGHT FROM STRUCTURE TO STRUCTURE UNLESS OTHERWISE SHOWN.
3. ANGLES AS SHOWN HEREON INDICATE DEVIATIONS OF PIPE ALIGNMENT FROM BEING NORMAL TO PROPOSED STRUCTURE.

0 10 20

SCALE: PLAN 1"= 20' PROFILE 1"= 2'

DESIGN

STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED · PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED · PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

CULVERT LAYOUT CULVERT A

BARBAROSA RD

CSJ: 0915-17-072

SHEET 1 OF 1

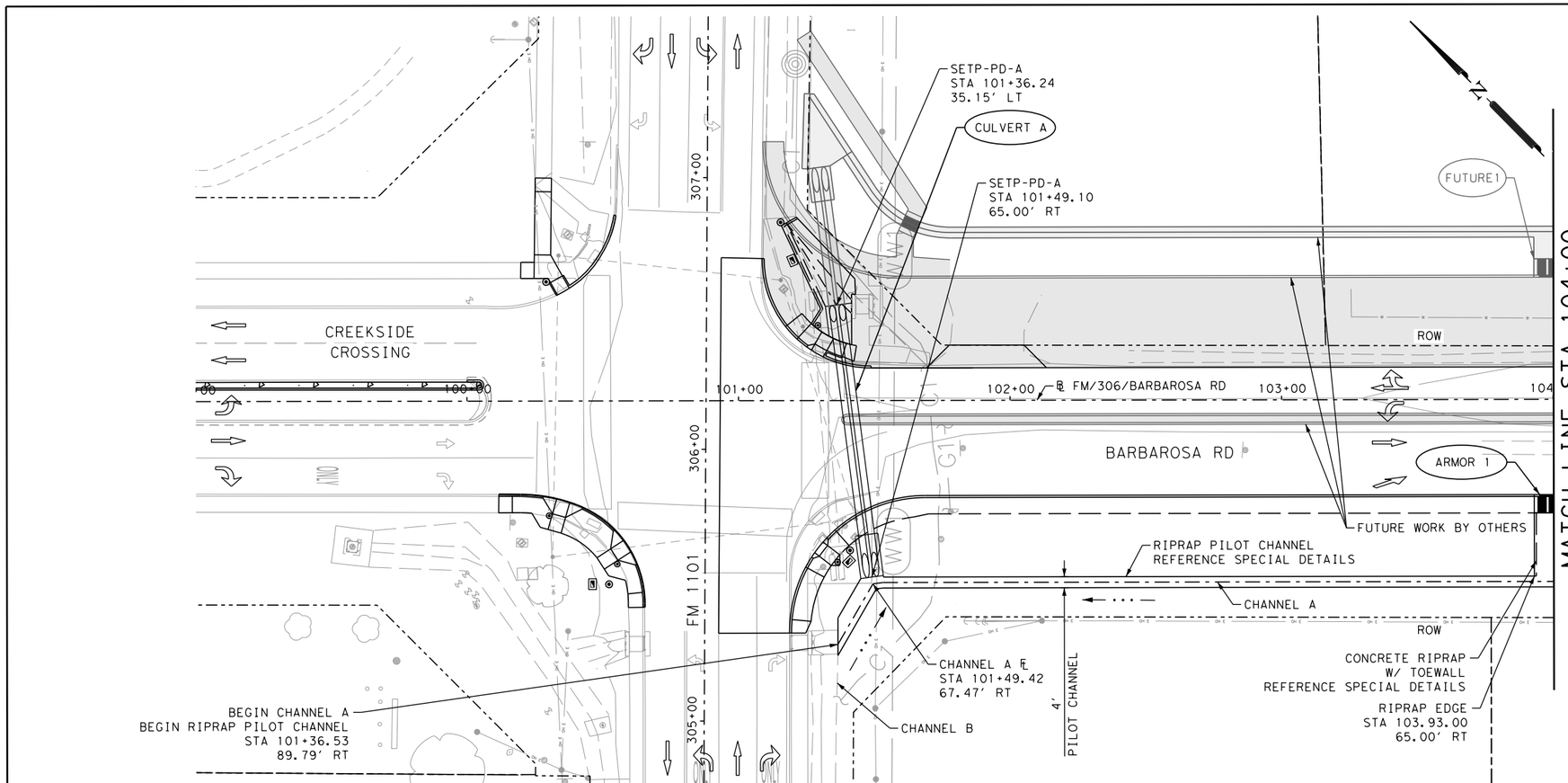
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	42

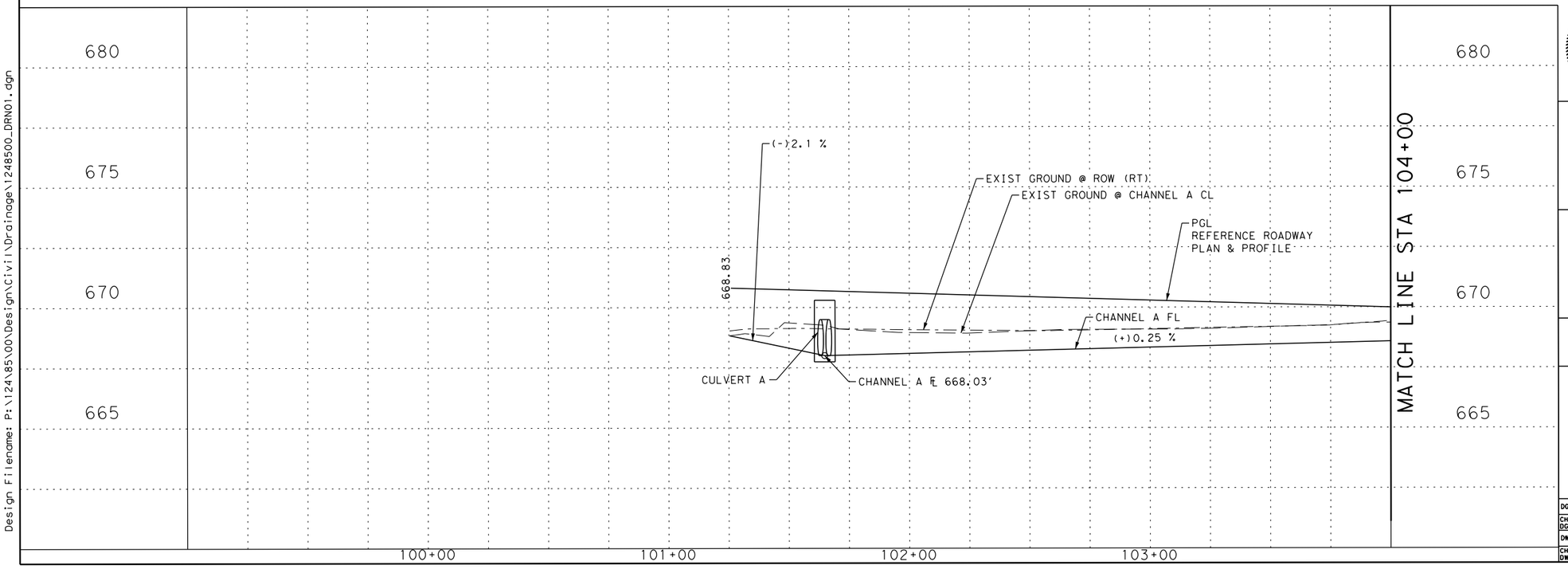
Plotted on: 4/20/2022

Design Filename: P:\124\85\00\Design\Civil\Drainage\1248500_DRN01.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0420-6074	CL C CONC (MISC)	CY	3.3
0432-6003	RIPRAP (CONC)(6 IN)	CY	29.0
0471-6003	GRATE & FRAME	EA	9
0529-6020	CONC CURB & GUTTER (ARMOR CURB)	LF	14





LEGEND

ELEMENTS IN THIS PROJECT | FUTURE ELEMENTS BY OTHERS

CI-1A | CI-1A — STRUCTURE & DESIGNATION

DRAINAGE STRUCTURES

LIMITS OF FUTURE WORK BY OTHERS

NOTES

1. SEE PERTINENT STRUCTURE LAYOUT OR PROFILE FOR ADDITIONAL DETAILS OF EACH STRUCTURE.
2. ALL PIPES ARE NORMAL TO AND STRAIGHT FROM STRUCTURE TO STRUCTURE UNLESS OTHERWISE SHOWN.
3. ANGLES AS SHOWN HEREON INDICATE DEVIATIONS OF PIPE ALIGNMENT FROM BEING NORMAL TO PROPOSED STRUCTURE.

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 10'

DESIGN

STATE OF TEXAS — TYLER PAYNE DUBE — 118612 — LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS — JOHN A. TYLER — 105193 — LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

STORM DRAIN PLAN AND PROFILE

BARBAROSA RD

CSJ: 0915-17-072

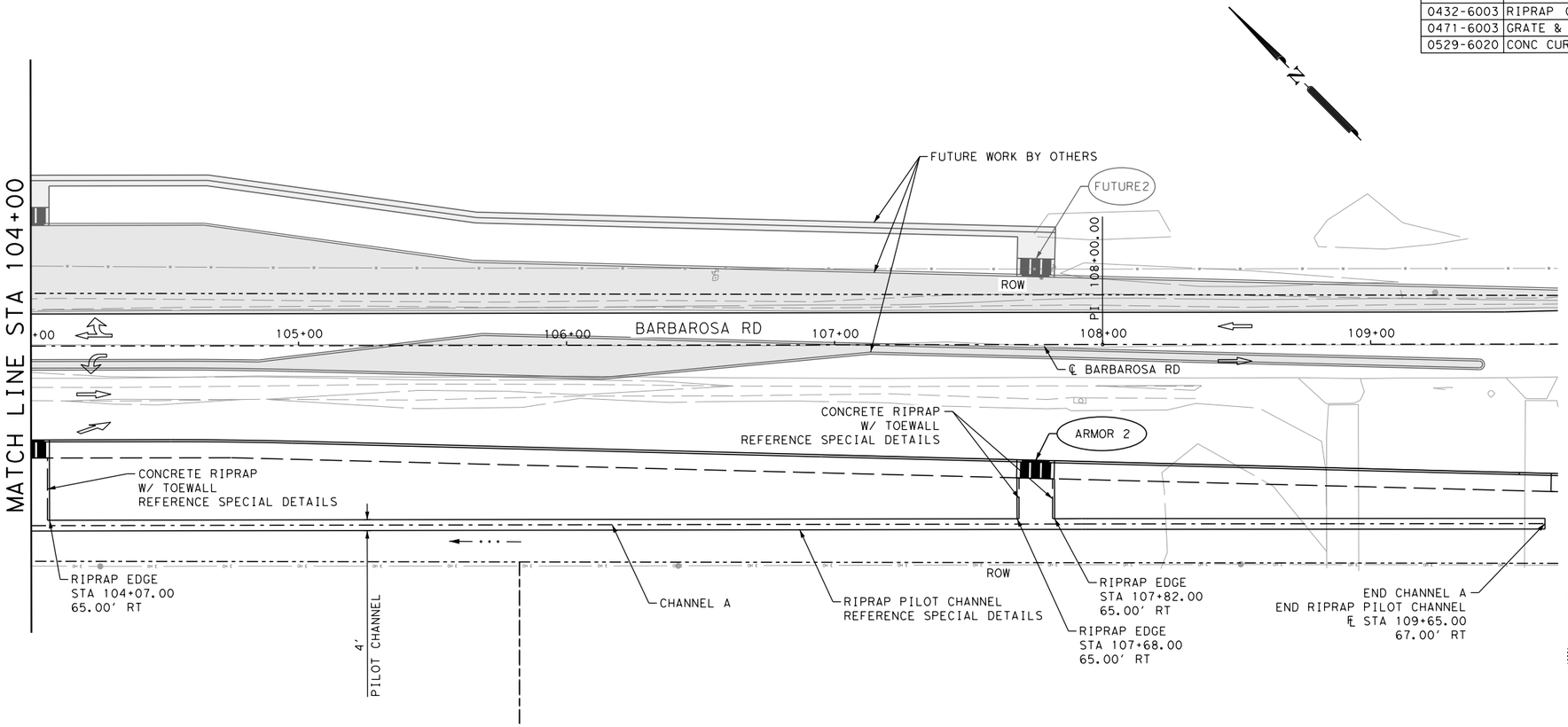
SHEET 1 OF 2

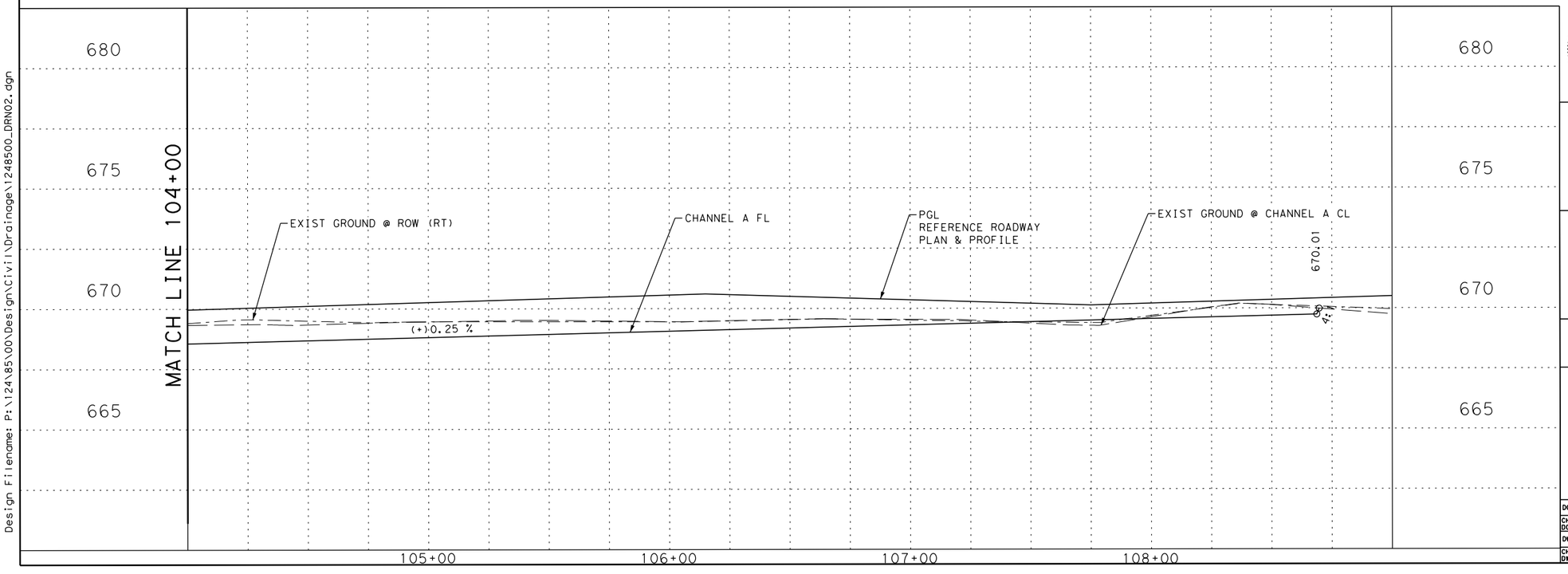
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	43

Plotted on: 4/20/2022

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0420-6074	CL C CONC (MISC)	CY	3.3
0432-6003	RIPRAP (CONC)(6 IN)	CY	49.2
0471-6003	GRATE & FRAME	EA	9
0529-6020	CONC CURB & GUTTER (ARMOR CURB)	LF	14





LEGEND

ELEMENTS IN THIS PROJECT	FUTURE ELEMENTS BY OTHERS	
CI-1A	CI-1A	STRUCTURE & DESIGNATION
		DRAINAGE STRUCTURES
		LIMITS OF FUTURE WORK BY OTHERS

NOTES

1. SEE PERTINENT STRUCTURE LAYOUT OR PROFILE FOR ADDITIONAL DETAILS OF EACH STRUCTURE.
2. ALL PIPES ARE NORMAL TO AND STRAIGHT FROM STRUCTURE TO STRUCTURE UNLESS OTHERWISE SHOWN.
3. ANGLES AS SHOWN HEREON INDICATE DEVIATIONS OF PIPE ALIGNMENT FROM BEING NORMAL TO PROPOSED STRUCTURE.

0 25 50

SCALE: PLAN 1"= 50' PROFILE 1"= 10'

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

STORM DRAIN PLAN AND PROFILE

BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	44

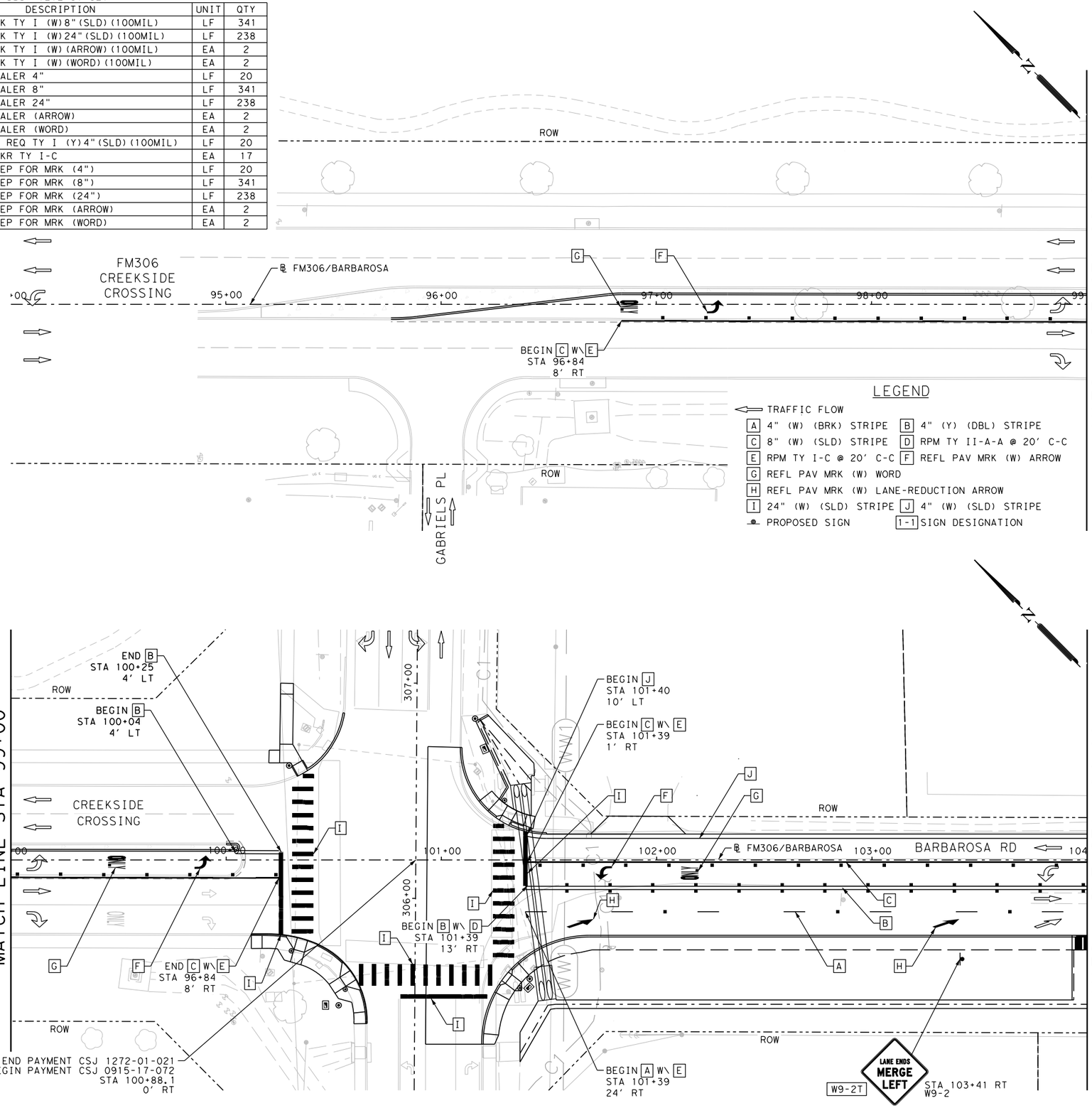
Design Filename: P:\124\85\00\Design\Civil\Drainage\1248500_DRN02.dgn

Plotted on: 4/20/2022

Design Filename: P:\124X85\00\Design\Civil\Traffic\1248500_SPM01.dgn

CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	341
0666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	238
0666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	2
0666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2
0666-6224	PAVEMENT SEALER 4"	LF	20
0666-6226	PAVEMENT SEALER 8"	LF	341
0666-6230	PAVEMENT SEALER 24"	LF	238
0666-6231	PAVEMENT SEALER (ARROW)	EA	2
0666-6232	PAVEMENT SEALER (WORD)	EA	2
0666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	20
0672-6007	REFL PAV MRKR TY I-C	EA	17
0678-6001	PAV SURF PREP FOR MRK (4")	LF	20
0678-6004	PAV SURF PREP FOR MRK (8")	LF	341
0678-6008	PAV SURF PREP FOR MRK (24")	LF	238
0678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	2
0678-6016	PAV SURF PREP FOR MRK (WORD)	EA	2



CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1
0666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	261
0666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	221
0666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3
0666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	1
0666-6224	PAVEMENT SEALER 4"	LF	849
0666-6226	PAVEMENT SEALER 8"	LF	261
0666-6230	PAVEMENT SEALER 24"	LF	221
0666-6231	PAVEMENT SEALER (ARROW)	EA	3
0666-6232	PAVEMENT SEALER (WORD)	EA	1
0666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	65
0666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	262
0666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	522
0672-6007	REFL PAV MRKR TY I-C	EA	13
0672-6009	REFL PAV MRKR TY II-A-A	EA	26
0678-6001	PAV SURF PREP FOR MRK (4")	LF	849
0678-6004	PAV SURF PREP FOR MRK (8")	LF	261
0678-6008	PAV SURF PREP FOR MRK (24")	LF	221
0678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	3
0678-6016	PAV SURF PREP FOR MRK (WORD)	EA	1

NOTES

1. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD.
2. FOR ADDITIONAL DETAILS SEE TXDOT TYPICAL STANDARD SHEETS.
3. EXISTING FEATURES ARE SHOWN IN GREY AND ARE TO REMAIN UNLESS NOTED.
4. ALL PAVEMENT MARKINGS SHALL RECEIVE TYPE I MARKINGS AND TYPE II APPLICATION.
5. TYPE II MARKINGS SHALL BE USED AS PAVEMENT SEALER.

0 25 50 75
SCALE: 1"= 50'

DESIGN

STATE OF TEXAS
TYLER PAYNE DUBE
118612
LICENSED
PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

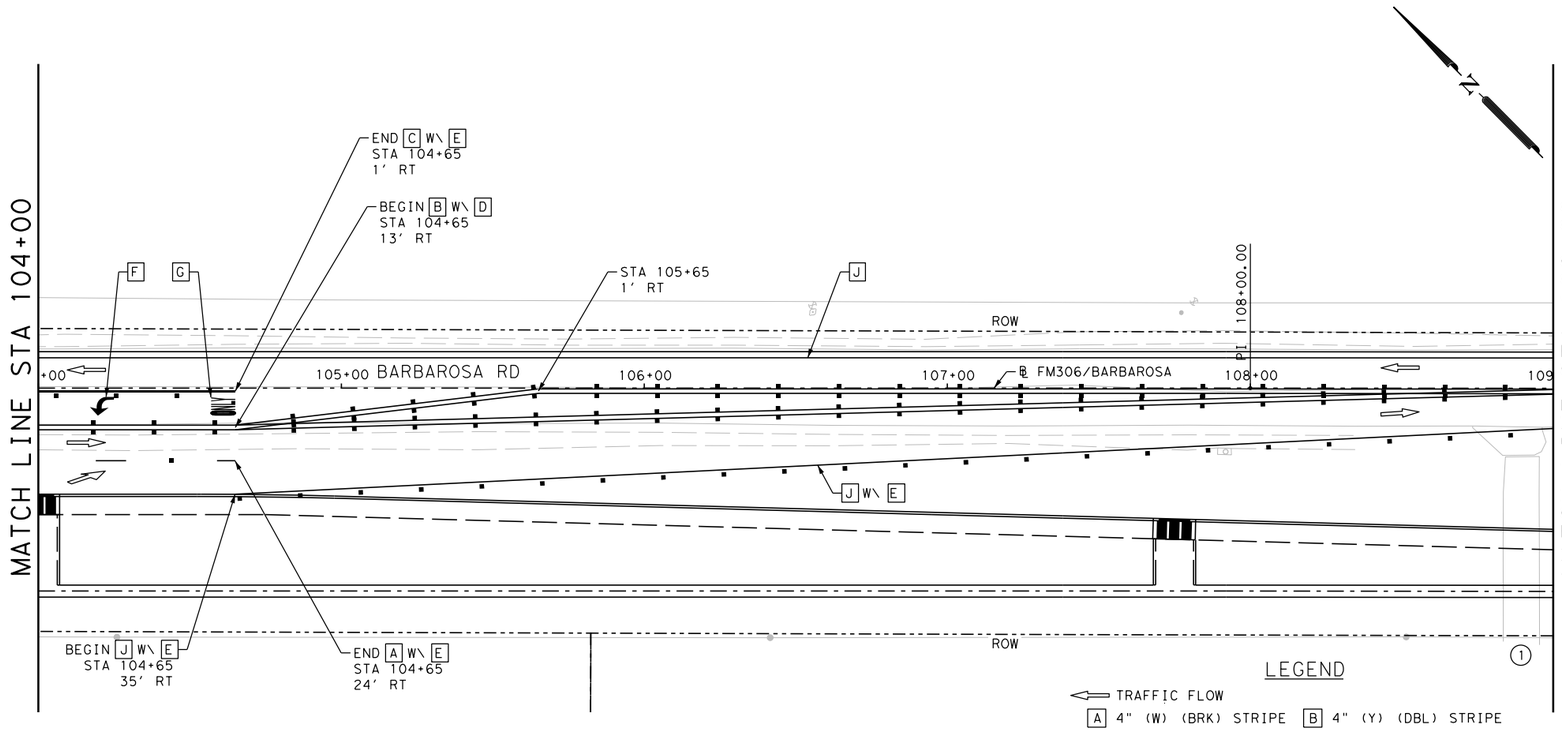
SIGN AND PAVEMENT MARKINGS

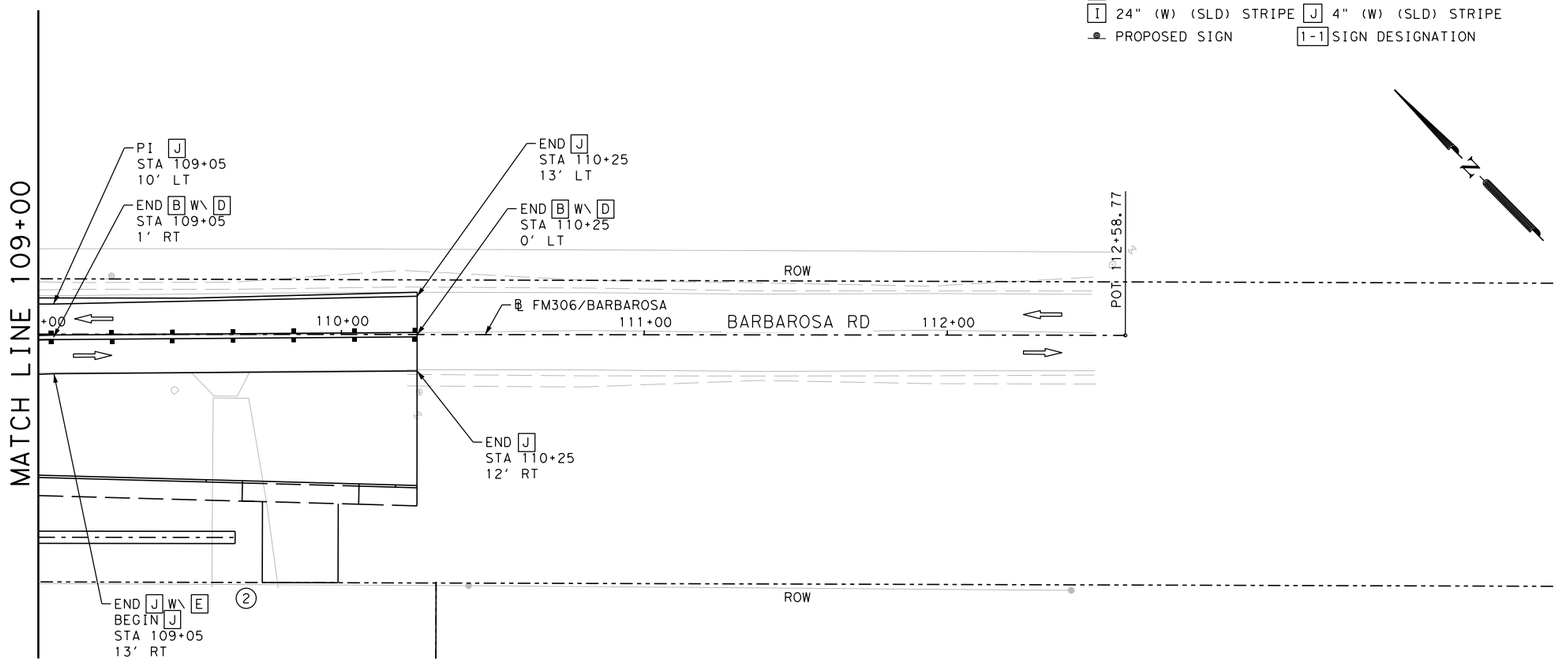
BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	45

ITEM	DESCRIPTION	UNIT	QTY
0666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	65
0666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	1
0666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	1
0666-6224	PAVEMENT SEALER 4"	LF	3195
0666-6226	PAVEMENT SEALER 8"	LF	65
0666-6231	PAVEMENT SEALER (ARROW)	EA	1
0666-6232	PAVEMENT SEALER (WORD)	EA	1
0666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	17
0666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1116
0666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2062
0672-6007	REFL PAV MRKR TY I-C	EA	27
0672-6009	REFL PAV MRKR TY II-A-A	EA	96
0678-6001	PAV SURF PREP FOR MRK (4")	LF	3195
0678-6004	PAV SURF PREP FOR MRK (8")	LF	65
0678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	1
0678-6016	PAV SURF PREP FOR MRK (WORD)	EA	1





LEGEND

- TRAFFIC FLOW
- A 4" (W) (BRK) STRIPE
- B 4" (Y) (DBL) STRIPE
- C 8" (W) (SLD) STRIPE
- D RPM TY II-A-A @ 20' C-C
- E RPM TY I-C @ 20' C-C
- F REFL PAV MRK (W) ARROW
- G REFL PAV MRK (W) WORD
- H REFL PAV MRK (W) LANE-REDUCTION ARROW
- I 24" (W) (SLD) STRIPE
- J 4" (W) (SLD) STRIPE
- PROPOSED SIGN
- 1-1 SIGN DESIGNATION

NOTES

1. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE TXDOT MUTCD.
2. FOR ADDITIONAL DETAILS SEE TXDOT TYPICAL STANDARD SHEETS.
3. EXISTING FEATURES ARE SHOWN IN GREY AND ARE TO REMAIN UNLESS NOTED.
4. ALL PAVEMENT MARKINGS SHALL RECEIVE TYPE I MARKINGS AND TYPE II APPLICATION.
5. TYPE II MARKINGS SHALL BE USED AS PAVEMENT SEALER.

0 25 50 75
SCALE: 1"= 50'

DESIGN

STATE OF TEXAS · TYLER PAYNE DUBE · 118612 · LICENSED PROFESSIONAL ENGINEER

TYLER PAYNE DUBE, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

SIGN AND PAVEMENT MARKINGS

BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	46

Plotted on: 4/20/2022

Design Filename: P:\124X85\00\Design\Civil\Traffic\1248500_SPM02.dgn

Plotted on: 4/20/2022

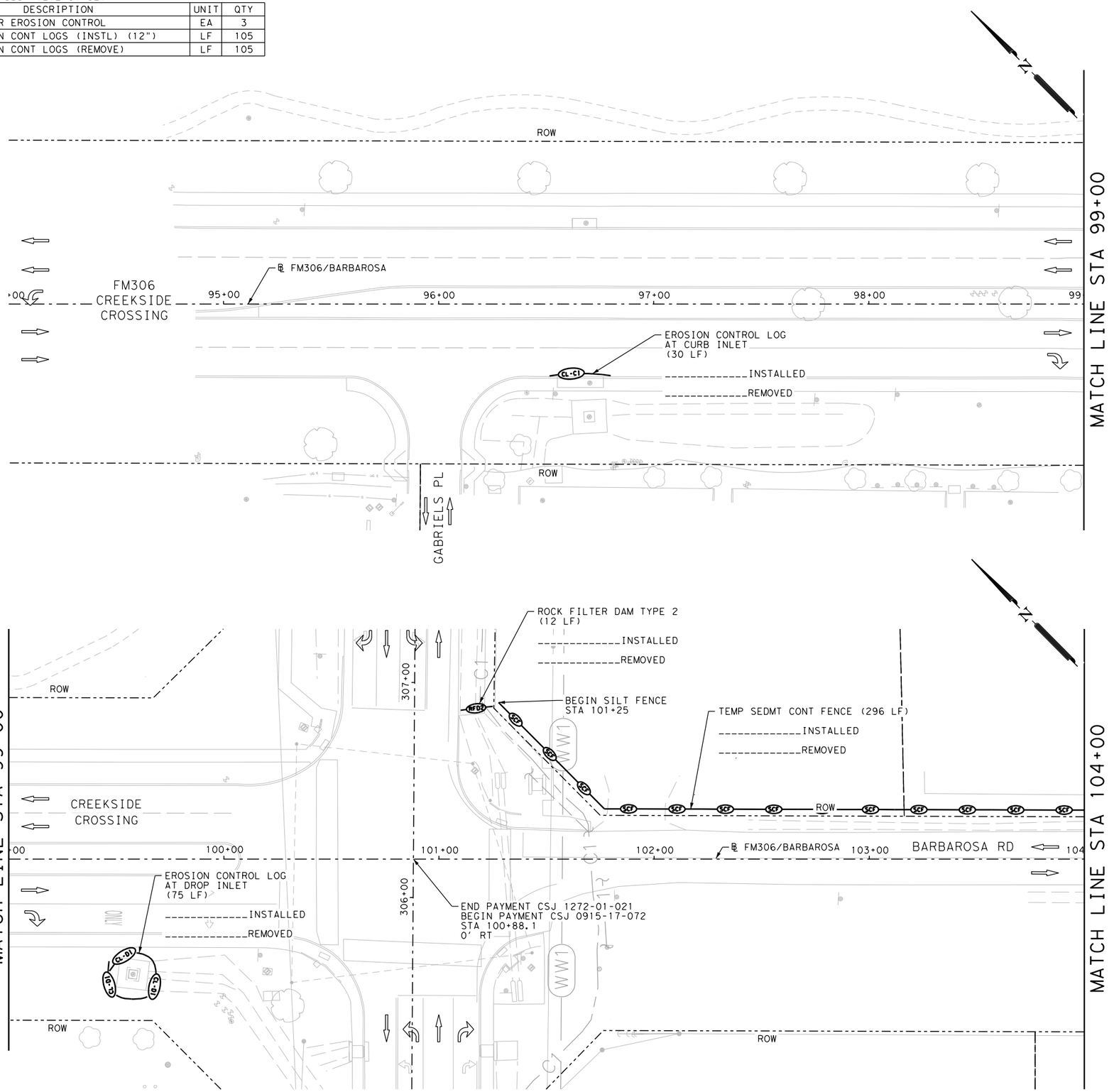
Design Filename: P:\124\85\00\Design\Civil\SW3P\1248500_SW3P01.dgn

CSJ: 1272-01-021

ITEM	DESCRIPTION	UNIT	QTY
0506-6035	SANDBAGS FOR EROSION CONTROL	EA	3
0506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	105
0506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	105

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	12
0506-6011	ROCK FILTER DAMS (REMOVE)	LF	12
0506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	296
0506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	296



0 25 50 75
SCALE: 1"= 50'

DESIGN

STATE OF TEXAS
JULIAN GARCIA
127271
LICENSED
PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

SW3P LAYOUT

BARBAROSA RD
CSJ: 0915-17-072

SHEET 1 OF 2

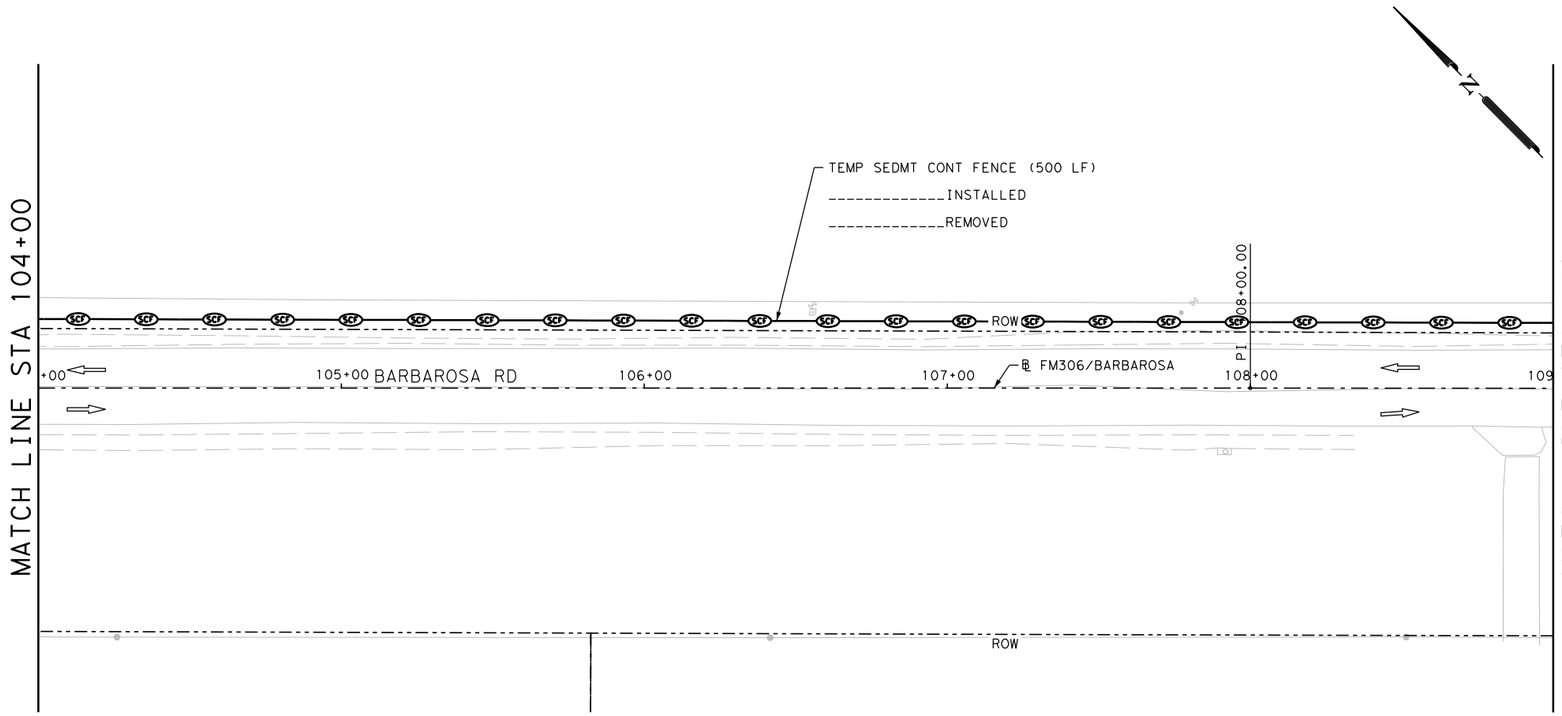
DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	47

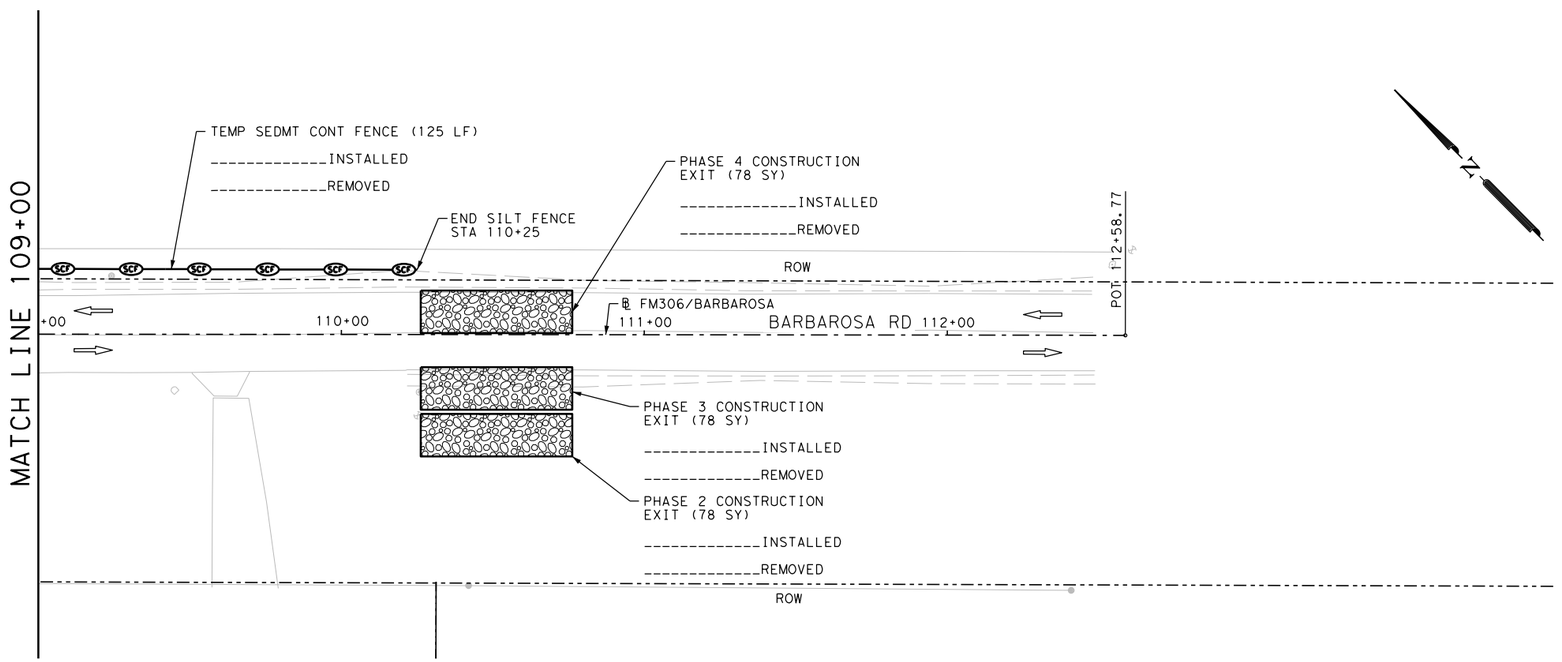
Plotted on: 4/20/2022

Design Filename: P:\124X85\00\Design\Civil\SW3P\1248500_SW3P02.dgn

CSJ: 0915-17-072

ITEM	DESCRIPTION	UNIT	QTY
0506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	234
0506-6024	CONSTRUCTION EXITS (REMOVE)	SY	234
0506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	625
0506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	625





0 25 50 75
SCALE: 1"= 50'

DESIGN

STATE OF TEXAS · JULIAN GARCIA · 127271 · LICENSED PROFESSIONAL ENGINEER

JULIAN GARCIA, P.E. — 4/20/2022 DATE

APPROVAL

STATE OF TEXAS · JOHN A. TYLER · 105193 · LICENSED PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. — 4/20/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

City of New Braunfels

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

SW3P LAYOUT

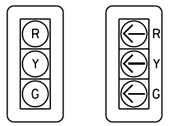
BARBAROSA RD
CSJ: 0915-17-072

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC.
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072	48

EXISTING TRAFFIC SIGNALS

12" SIGNAL FACES
12" LED SIGNAL SECTIONS W/ BACKPLATES



1 QTY: 8 | 2 QTY: 2

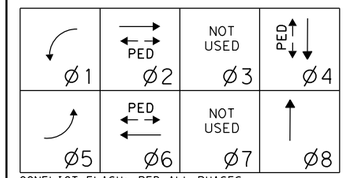
12" PEDESTRIAN HEADS
12" LED SIGNAL FACE

W1 THRU W6 QTY: 6

EXISTING TRAFFIC SIGNS

SIGN	DESCRIPTION	DESIGNATION
LEFT TURN SIGNAL	R10-10L (30"X36")	S1
ONLY	R3-5R (30"X36")	S2

EXISTING PHASE DIAGRAM

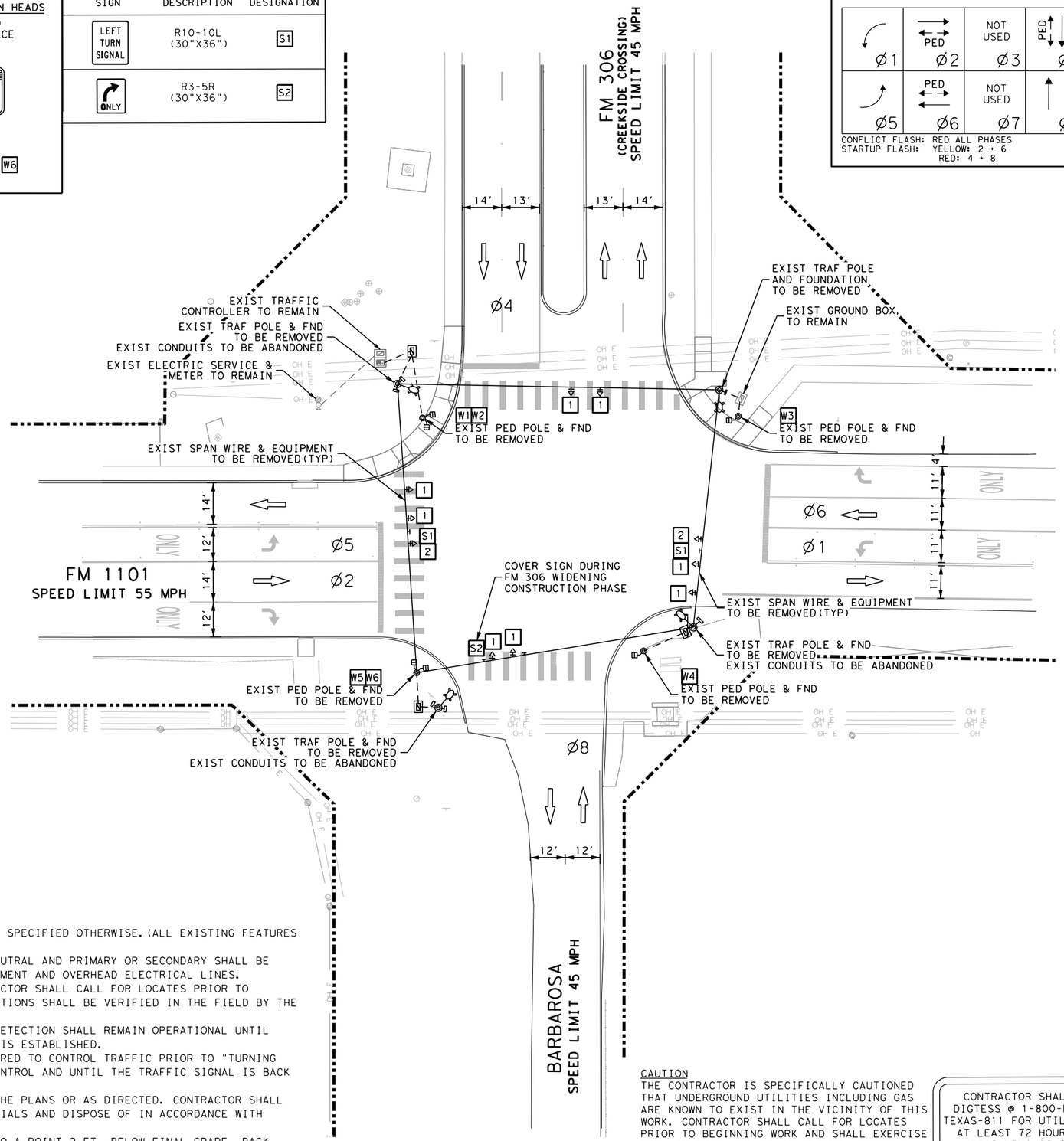


CONFLICT FLASH: RED ALL PHASES
STARTUP FLASH: YELLOW: 2 + 6
RED: 4 + 8

I.D.	ITEM	DESCRIPTION	UNIT	QTY
	0680-6004	REMOVING TRAFFIC SIGNALS	EA	1

LEGEND

SYMBOL	DESCRIPTION
	RIGHT-OF-WAY
	TRAFFIC FLOW
	CONTROLLER CABINET
	SPAN WIRE
	CONDUIT
	ELECTRIC SERVICE & METER
	TIMBER POLE
	TRAFFIC POLE & FND
	PEDESTRIAN SIGNAL
	TRAFFIC SIGNAL HEAD
	MAST ARM SIGN
	LUMINAIRE
	VIVDS CAMERA
	RADAR DETECTION DEVICE(RPDD)
	GROUND MOUNTED SIGN
OHE	OVERHEAD ELECTRIC



0 20 40 60
SCALE: 1" = 40'

DESIGN

STATE OF TEXAS
JUSTIN W. CLARK
118715
LICENSED PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

NOTES
1. ALL DIMENSIONS SHOWN ARE IN FEET UNLESS SPECIFIED OTHERWISE. (ALL EXISTING FEATURES ARE SHOWN SCREENED BACK i.e. FADED).
2. MINIMUM CLEARANCE OF 10' RADIUS FROM NEUTRAL AND PRIMARY OR SECONDARY SHALL BE MAINTAINED BETWEEN TRAFFIC SIGNAL EQUIPMENT AND OVERHEAD ELECTRICAL LINES.
3. UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO COMMENCING EXCAVATION. ALL UTILITY LOCATIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
4. THE EXISTING TRAFFIC SIGNAL INCLUDING DETECTION SHALL REMAIN OPERATIONAL UNTIL TEMPORARY OR PERMANENT TRAFFIC CONTROL IS ESTABLISHED.
5. AN OFF- DUTY UNIFORMED OFFICER IS REQUIRED TO CONTROL TRAFFIC PRIOR TO "TURNING OFF" THE INTERSECTION TRAFFIC SIGNAL CONTROL AND UNTIL THE TRAFFIC SIGNAL IS BACK TO SATISFACTORY OPERATION.
6. REMOVE AND SALVAGE ALL ITEMS SHOWN ON THE PLANS OR AS DIRECTED. CONTRACTOR SHALL ACCEPT OWNERSHIP OF UNSALVAGEABLE MATERIALS AND DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS.
7. REMOVE ABANDONED CONCRETE FOUNDATIONS TO A POINT 2 FT. BELOW FINAL GRADE. BACK FILL HOLE WITH MATERIAL EQUAL IN COMPOSITION AND DENSITY TO THE SURROUNDING AREA.

CAUTION
THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT UNDERGROUND UTILITIES INCLUDING GAS ARE KNOWN TO EXIST IN THE VICINITY OF THIS WORK. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO BEGINNING WORK AND SHALL EXERCISE CAUTION WHEN INSTALLING SIGNAL EQUIPMENT INCLUDING POLE FOUNDATIONS AND CONDUITS

CONTRACTOR SHALL CONTACT DIGTESS @ 1-800-DIG-TESS OR TEXAS-811 FOR UTILITY LOCATION AT LEAST 72 HOURS PRIOR TO BEGINNING CONSTRUCTION

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

EXISTING CONDITIONS

FM 1101 @ FM 306
CSJ: 0017-07-138

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072, ETC.	49

Plotted on: 4/25/2022
Design Filename: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Traffic\1163006_XSIG07_FM1101.dgn

PROPOSED TRAFFIC SIGNALS

12" SIGNAL FACES
12" LED SIGNAL SECTIONS
W/ REFLECTIVE BACKPLATES

1 QTY: 8 | 2 QTY: 4

12" PEDESTRIAN HEADS
12" LED
SIGNAL FACE

W1 THRU W5
QTY: 5

PROPOSED TRAFFIC SIGNS

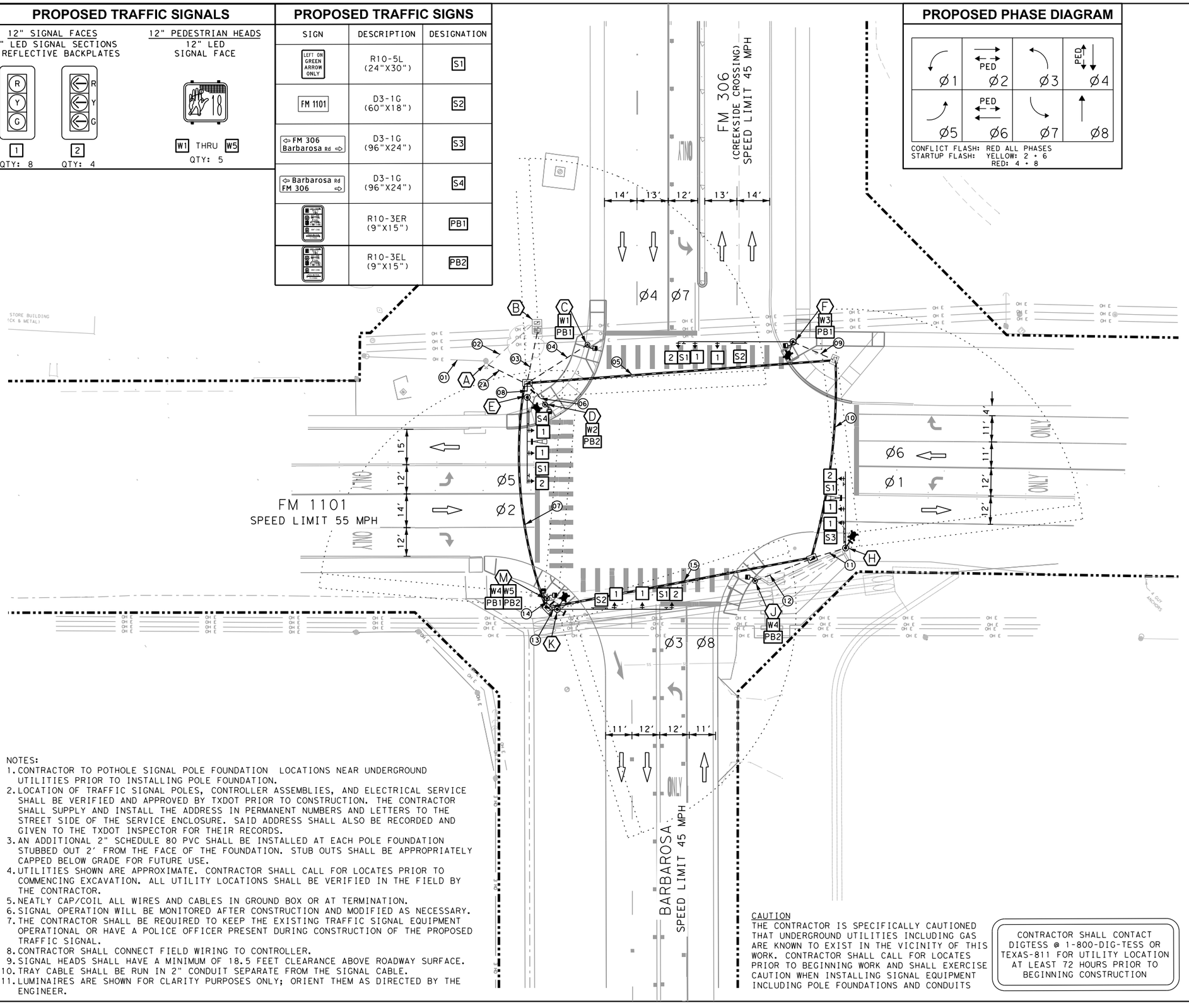
SIGN	DESCRIPTION	DESIGNATION
LEFT ON GREEN ARROW ONLY	R10-5L (24"X30")	S1
FM 1101	D3-1G (60"X18")	S2
⇦ FM 306 Barbarosa Rd ⇨	D3-1G (96"X24")	S3
⇦ Barbarosa Rd FM 306 ⇨	D3-1G (96"X24")	S4
	R10-3ER (9"X15")	PB1
	R10-3EL (9"X15")	PB2

PROPOSED PHASE DIAGRAM

CONFLICT FLASH: RED ALL PHASES
STARTUP FLASH: YELLOW: 2 + 6
RED: 4 + 8

LEGEND

SYMBOL	DESCRIPTION
	RIGHT-OF-WAY
	TRAFFIC FLOW
	EXIST CONTROLLER CABINET
	EXIST ELEC/METER SERVICE
	GROUND BOX W/APRON
	CONDUIT(TRENCH)
	CONDUIT(BORE)
	TRAFFIC POLE & FND
	MAST ARM SIGN
	MAST ARM STREET NAME SIGN
	PEDESTRIAN SIGNAL
	TRAFFIC SIGNAL HEAD
	LUMINAIRE
	CCTV CAMERA
	RADAR DETECTION DEVICE(RADD)
	RADAR DETECTION DEVICE(RPDD)
05	CABLE/CONDUIT RUN
D	POLE/EQUIPMENT IDENTIFIER
ONE	EXIST OVERHEAD ELECTRIC



0 20 40 60
SCALE: 1" = 40′

DESIGN

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

NOTES:
1. CONTRACTOR TO POTHOLE SIGNAL POLE FOUNDATION LOCATIONS NEAR UNDERGROUND UTILITIES PRIOR TO INSTALLING POLE FOUNDATION.
2. LOCATION OF TRAFFIC SIGNAL POLES, CONTROLLER ASSEMBLIES, AND ELECTRICAL SERVICE SHALL BE VERIFIED AND APPROVED BY TXDOT PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL SUPPLY AND INSTALL THE ADDRESS IN PERMANENT NUMBERS AND LETTERS TO THE STREET SIDE OF THE SERVICE ENCLOSURE. SAID ADDRESS SHALL ALSO BE RECORDED AND GIVEN TO THE TXDOT INSPECTOR FOR THEIR RECORDS.
3. AN ADDITIONAL 2" SCHEDULE 80 PVC SHALL BE INSTALLED AT EACH POLE FOUNDATION STUBBED OUT 2′ FROM THE FACE OF THE FOUNDATION. STUB OUTS SHALL BE APPROPRIATELY CAPPED BELOW GRADE FOR FUTURE USE.
4. UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO COMMENCING EXCAVATION. ALL UTILITY LOCATIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
5. NEATLY CAP/COIL ALL WIRES AND CABLES IN GROUND BOX OR AT TERMINATION.
6. SIGNAL OPERATION WILL BE MONITORED AFTER CONSTRUCTION AND MODIFIED AS NECESSARY.
7. THE CONTRACTOR SHALL BE REQUIRED TO KEEP THE EXISTING TRAFFIC SIGNAL EQUIPMENT OPERATIONAL OR HAVE A POLICE OFFICER PRESENT DURING CONSTRUCTION OF THE PROPOSED TRAFFIC SIGNAL.
8. CONTRACTOR SHALL CONNECT FIELD WIRING TO CONTROLLER.
9. SIGNAL HEADS SHALL HAVE A MINIMUM OF 18.5 FEET CLEARANCE ABOVE ROADWAY SURFACE.
10. TRAY CABLE SHALL BE RUN IN 2" CONDUIT SEPARATE FROM THE SIGNAL CABLE.
11. LUMINAIRES ARE SHOWN FOR CLARITY PURPOSES ONLY; ORIENT THEM AS DIRECTED BY THE ENGINEER.

CAUTION
THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT UNDERGROUND UTILITIES INCLUDING GAS ARE KNOWN TO EXIST IN THE VICINITY OF THIS WORK. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO BEGINNING WORK AND SHALL EXERCISE CAUTION WHEN INSTALLING SIGNAL EQUIPMENT INCLUDING POLE FOUNDATIONS AND CONDUITS

CONTRACTOR SHALL CONTACT DIGTESS @ 1-800-DIG-TESS OR TEXAS-811 FOR UTILITY LOCATION AT LEAST 72 HOURS PRIOR TO BEGINNING CONSTRUCTION

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

PROPOSED SIGNAL LAYOUT

FM 1101 @ FM 306
CSJ: 0017-07-138

SHEET 2 OF 4

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072,ETC.	50

Plotted on: 4/25/2022
Design Filename: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Traffic\1163006_TSIG07_FM1101.dgn

CONDUIT & CONDUCTOR SCHEDULE

RUN NUMBER				01	02	24	03	04	05		06	07		08		09		10		11		12	13		14	15	
CONDUIT SIZE IN INCHES				-	2	2	3	2	3	2	2	3	2	3	2	3	2	3	2	3	2	2	3	2	2	3	2
NUMBER OF CONDUITS				-	1	2	3	1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1
LENGTH OF RUN (FT)				-	30	20	25	30	130	130	10	95	95	10	10	20	20	85	85	15	15	25	10	10	10	115	115
TRENCH (T) /BORE (B) /EXIST (E)				E	E	T	T	T	B	B	T	B	B	T	T	T	T	B	B	T	T	T	T	T	T	B	B
CABLE	CIRCUIT			NUMBER OF CONDUCTORS																							
#6 XHHW (SOLID)	120 POWER HOT			1																							
	120 POWER COMMON			1																							
#6 BARE (SOLID)	BARE BOND GROUND			1																							
#8 BARE (SOLID)	BARE BOND GROUND				2	3	1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	2	1		
7 COND. #12 AWG TYPE "A", STRANDED	TRAFFIC SIGNALS	ø	2+5			2		2										2		2							
		ø	1+6			2								2													
		ø	3+8			2		2								2											
		ø	4+7			2						2											2				
4 COND. #12 AWG TYPE "A", STRANDED	PED. SIGNALS	POLE	C			1	1																				
			D			1					1																
			F			1		1								1											
			J			1		1										1				1					
			M			2						2													2		
2 COND. #14 AWG TYPE "C", STRANDED	PED. APS PUSH BUTTONS	POLE	C			1	1																				
			D			1					1																
			F			1		1								1											
			J			1		1										1				1					
			M			2						2													2		
4 COND, #12 AWG TRAY CABLE	LUMINAIRE	POLE	E		1										1												
			F		1					1							1										
			H		1					1									1		1						
			K		1								1											1			
POWER & DATA CABLE	RADD	POLE	E			1								1													
			H			1		1										1		1							
POWER & DATA CABLE	RPDD	POLE	E			1								1													
			H			1		1										1		1							
			K			2						2											2				

CABLES PULLED BY CPS

EXISTING ELECTRICAL SERVICE DATA

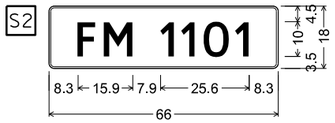
Electrical Service Description (see ED (4) - 03)	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amp	Two-Pole Contact or Amps	Panelbd/ Loadcenter Amp Rating	Circuit No.	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
ELEC SERV TY D (120/240)070(NS)SS(E)TP(O)	3"	3/#6	N/A	2P/100	70	100	A(SIGNAL) B(LUM)	1P/50 1P/20	40 15	7.6

POLE & EQUIPMENT INFORMATION

ID	DESCRIPTION/ATTACHMENTS	NORTHING	EASTING	FND. ELEV
(A)	EXISTING NBU ENERGY FREESTANDING PEDESTAL AND METER W/ TXDOT TYPE D SERVICE	N/A	N/A	N/A
(B)	EXISTING NEW BRAUNFELS TRAFFIC SIGNAL CONTROLLER ON TXDOT BASE-MOUNT FOUNDATION.	N/A	N/A	N/A
(C)	INSTALL 10 FT PEDESTAL POLE ON 6' DRILLED SHAFT FND (24-A) W/ ONE LED COUNTDOWN PEDESTRIAN SIGNAL HEAD, ONE APS PUSH BUTTON, ONE R10-4B (L/R) SIGN AS ILLUSTRATED.	2263889.3	13809544.6	FLUSH W/ SIDEWALK
(D)	INSTALL 10 FT PEDESTAL POLE ON 6' DRILLED SHAFT FND (24-A) W/ ONE LED COUNTDOWN PEDESTRIAN SIGNAL HEAD, ONE APS PUSH BUTTON, ONE R10-4B (L/R) SIGN AS ILLUSTRATED.	2263894.5	13809514.3	FLUSH W/ SIDEWALK
(E)	INSTALL 30' SMA-80 ON 13' DRILLED SHAFT FND(36-A)W/ 36' MAST ARM, ONE LUMINAIRE(LED), ONE STREET NAME SIGN, ONE RPDD DEVICE, ONE RADD DEVICE, THREE SIGNAL HEADS W/ ONE R10-5L SIGN, AS ILLUSTRATED.	2263887.1	13809511.2	LEVEL W/ CROWN OF ROAD
(F)	INSTALL 30' SMA-80 ON 13' DRILLED SHAFT FND(36-A)W/ 48' MAST ARM, ONE LUMINAIRE(LED), ONE STREET NAME SIGN, ONE RPDD DEVICE, ONE RADD DEVICE, ONE LED COUNTDOWN PEDESTRIAN SIGNAL HEAD, ONE APS PUSH BUTTON, ONE R10-4B (L/R), THREE SIGNAL HEADS W/ ONE R10-5L SIGN, AS ILLUSTRATED.	2263949.0	13809606.5	LEVEL W/ CROWN OF ROAD
(H)	INSTALL 30' SMA-80 ON 11' DRILLED SHAFT FND(30-A)W/ 32' MAST ARM, ONE LUMINAIRE(LED), ONE STREET NAME SIGN, ONE RPDD DEVICE, ONE RADD DEVICE, THREE SIGNAL HEADS W/ ONE R10-5L SIGN, AS ILLUSTRATED.	2264025.8	13809561.3	LEVEL W/ CROWN OF ROAD
(J)	INSTALL 10 FT PEDESTAL POLE ON 6' DRILLED SHAFT FND (24-A) W/ ONE LED COUNTDOWN PEDESTRIAN SIGNAL HEAD, ONE APS PUSH BUTTON, ONE R10-4B (L/R) SIGN AS ILLUSTRATED.	2264009.8	13809519.6	FLUSH W/ SIDEWALK
(K)	INSTALL 30' SMA-80 ON 13' DRILLED SHAFT FND(36-A)W/ 48' MAST ARM, ONE LUMINAIRE(LED), ONE STREET NAME SIGN, ONE RPDD DEVICE, THREE SIGNAL HEADS W/ ONE R10-5L SIGN, AS ILLUSTRATED.	2263963.4	13809458.8	LEVEL W/ CROWN OF ROAD
(M)	INSTALL 10 FT PEDESTAL POLE ON 6' DRILLED SHAFT FND (24-A) W/ TWO LED COUNTDOWN PEDESTRIAN SIGNAL HEADS, TWO APS PUSH BUTTON, TWO R10-4B (L/R) SIGN AS ILLUSTRATED.	2263952.6	13809457.7	FLUSH W/ SIDEWALK

*SIGNS SHALL BE ATTACHED TO POLES AND MAST ARMS AS SHOWN ON PLANS.

S2

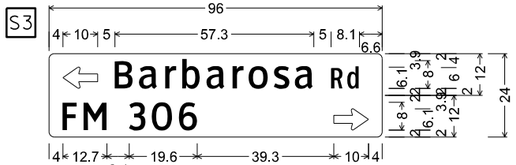


D3-1G(7) 10in;
1.5" Radius, 0.5" Border, White on Green;
"FM 1101", ClearviewHwy-3-W;

S3

D3-1G(5) 8in (2 Lines);
1.5" Radius, No border, None on Green;
Standard Arrow Custom 10.0" X 6.1" 180° White;
"FM 306" White, ClearviewHwy-3-W;
1.5" Radius, No border, None on Green;
"Barbarosa" White, ClearviewHwy-3-W;
"Rd" White, ClearviewHwy-2-W;
Standard Arrow Custom 10.0" X 6.1" 0° White;

S3



D3-1G(5) 8in (2 Lines);
1.5" Radius, No border, None on Green;
Standard Arrow Custom 10.0" X 6.1" 180° White;
"Barbarosa" White, ClearviewHwy-3-W;
"Rd" White, ClearviewHwy-2-W;
1.5" Radius, No border, None on Green;
"FM 306" White, ClearviewHwy-3-W;
Standard Arrow Custom 10.0" X 6.1" 0° White;

POLE SCHEDULE

				POLE	⟨C⟩	⟨D⟩	⟨E⟩	⟨F⟩	⟨H⟩	⟨J⟩	⟨K⟩	⟨M⟩
				POLE TYPE	PED	PED	SMA-80	SMA-80	SMA-80	PED	SMA-80	PED
				POLE HEIGHT (FT)	10	10	30	30	30	10	30	10
				MAST ARM LENGTH (FT)	N/A	N/A	36	48	32	N/A	48	N/A
				FOUNDATION TYPE	24-A	24-A	36-A	36-A	30-A	24-A	36-A	24-A
				FOUNDATION DEPTH (FT)	6	6	13	13	11	6	13	6
CABLE	CIRCUIT			NUMBER OF CONDUCTORS								
#8 BARE (SOLID)					1	1	1	1	1	1	1	1
7 COND. #12 AWG TYPE "A", STRANDED	TRAFFIC SIGNALS	ø	1+6				3					
		ø	2+5						3			
		ø	3+8					3				
		ø	4+7								3	
4 COND. #12 AWG TYPE "A", STRANDED	PED. SIGNALS	POLE	C		1							
			D			1						
			F					1				
			J							1		
			M									2
2 COND. #14 AWG TYPE "C", STRANDED	PED. APS PUSH BUTTONS	POLE	C		1							
			D			1						
			F					1				
			J							1		
			M									2
4 COND, #12 AWG TRAY CABLE	LUMINAIRE	POLE	E				1					
			F					1				
			H						1			
			K								1	
POWER & DATA CABLE	RADD	POLE	E				1					
			H						1			
POWER & DATA CABLE	RPDD	POLE	E				1					
			H						1			
			K								2	

ITEM	DESCRIPTION	UNIT	QTY
0416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	11
0416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	39
0618-6046	CONDT (PVC) (SCH 80) (2")	LF	187
0618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	468
0618-6053	CONDT (PVC) (SCH 80) (3")	LF	270
0618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	935
0620-6009	ELEC CONDR (NO.6) BARE	LF	33
0620-6010	ELEC CONDR (NO.6) INSULATED	LF	66
0621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	758
0624-6010	GROUND BOX TY D (162922)W/APRON	EA	3
0680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1
0682-6001	VEH SIG SEC (12")LED(GRN)	EA	8
0682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	4
0682-6003	VEH SIG SEC (12")LED(YEL)	EA	8
0682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4
0682-6005	VEH SIG SEC (12")LED(RED)	EA	8
0682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	4
0682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	6
0682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	12
0684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	935
0684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	1956
0684-6080	TRF SIG CBL (TY C)(14 AWG)(2 CONDR)	LF	935
0686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1
0686-6039	INS TRF SIG PL AM(S)1 ARM(36')LUM	EA	1
0686-6051	INS TRF SIG PL AM(S)1 ARM(48')LUM	EA	2
0687-6001	PED POLE ASSEMBLY	EA	4
0688-6001	PED DETECT PUSH BUTTON (APS)	EA	6
0688-6003	PED DETECTOR CONTROLLER UNIT	EA	1
6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	28
6292-6001	RVDS(PRESENCE DETECTION ONLY)	EA	4
6292-6002	RVDS(ADVANCE DETECTION ONLY)	EA	2
6292-XXX1	*RVDS(PRESENCE DETECTION ONLY) COMM CABL	LF	693
6292-XXX2	*RVDS(ADVANCE DETECTION ONLY) COMM CABL	LF	469

DESIGN

STATE OF TEXAS
JUSTIN W. CLARK
118715
LICENSED PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

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HIGHWAY SAFETY IMPROVEMENT PROGRAM FY 22

CONDUIT & CONDUCTOR SCHEDULE

FM 1101 @ FM 306
CSJ: 1272-01-021

SHEET 4 OF 4

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072,ETC.	51

Plotted on: 4/25/2022

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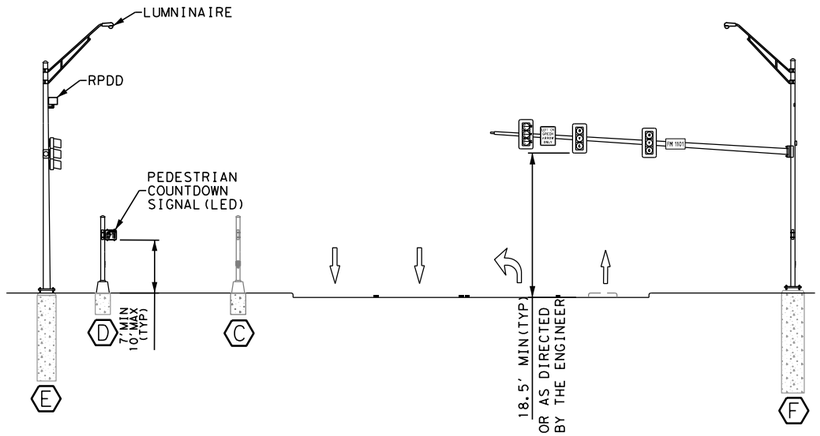

NORTHBOUND FM 306

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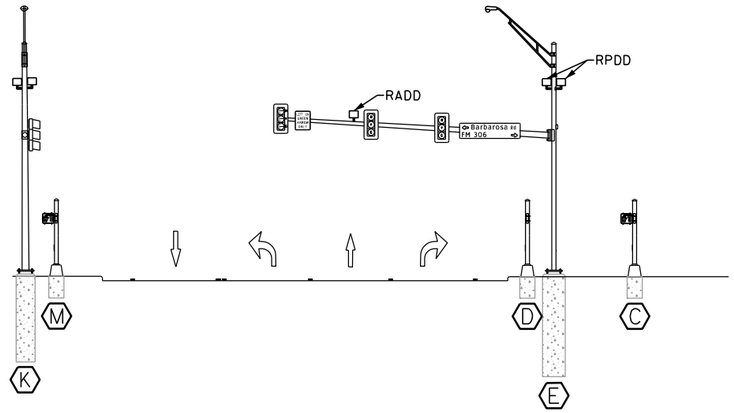
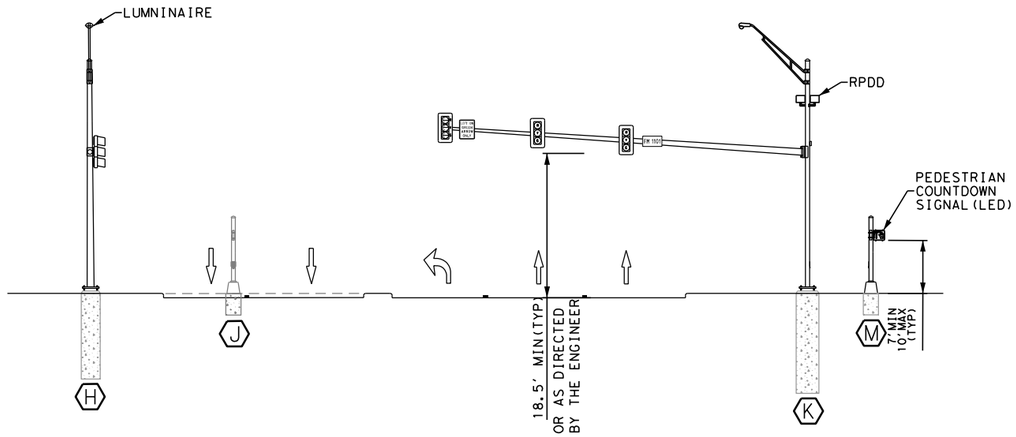


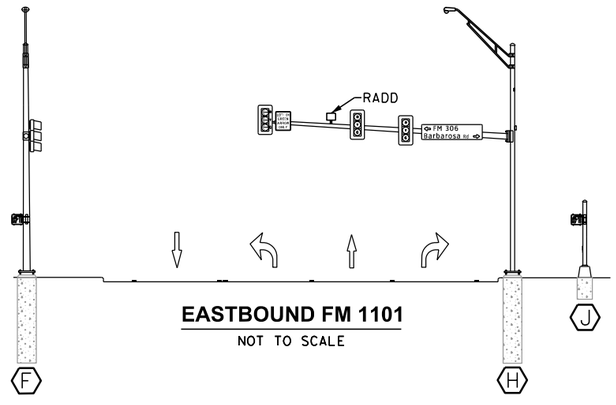
WESTBOUND FM 1101

NOT TO SCALE



SOUTHBOUND BARBAROSA

NOT TO SCALE



EASTBOUND FM 1101

NOT TO SCALE

NOTES:
1. CONTRACTOR SHALL POTHOLE SIGNAL POLE LOCATIONS NEAR UNDERGROUND UTILITIES PRIOR TO INSTALLING POLE FOUNDATION.
2. MINIMUM CLEARANCE OF 40" RADIUS FROM NEUTRAL AND 10' RADIUS FROM PRIMARY OR SECONDARY SHALL BE MAINTAINED BETWEEN PROPOSED TRAFFIC SIGNAL EQUIPMENT AND EXISTING OVERHEAD ELECTRICAL LINES.
3. ALL SIGNAL HEADS SHALL HAVE BACK PLATES.
4. SEE "SINGLE MAST ARM ASSEMBLY"(SMA-80), "LONG MAST ARM ASSEMBLY"(LMA-12), AND "DUEL MAST ARM ASSEMBLY"(DMA-80) STANDARDS FOR SIGNAL POLE AND MAST ARM DETAILS.
5. SEE "TRAFFIC SIGNAL POLE FOUNDATION"(TS-FD) AND "LONG MAST ARM ASSEMBLY"(LMA) STANDARDS FOR DRILLED SHAFT DETAILS.
6. SEE "MISCELLANEOUS TRAFFIC SIGNAL DETAILS"(MTS) STANDARD FOR PEDESTAL POLE DETAILS.
7. SIGNAL HEADS SHALL HAVE A MINIMUM OF 18.5 FEET CLEARANCE ABOVE ROADWAY SURFACE.

DESIGN

STATE OF TEXAS
JUSTIN W. CLARK
118715
LICENSED
PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

PAPE-DAWSON ENGINEERS
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TEXAS ENGINEERING FIRM #470 | TEXAS SURVEYING FIRM #10028800

HIGHWAY SAFETY
IMPROVEMENT PROGRAM FY 22

ELEVATION VIEWS

FM 1101 @ FM 306
CSJ: 0215-01-055

DGN:	FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	SEE TITLE SHEET			CS, ETC
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	SAT	COMAL	0915	17	072, ETC.	52

Plotted on: 4/25/2022
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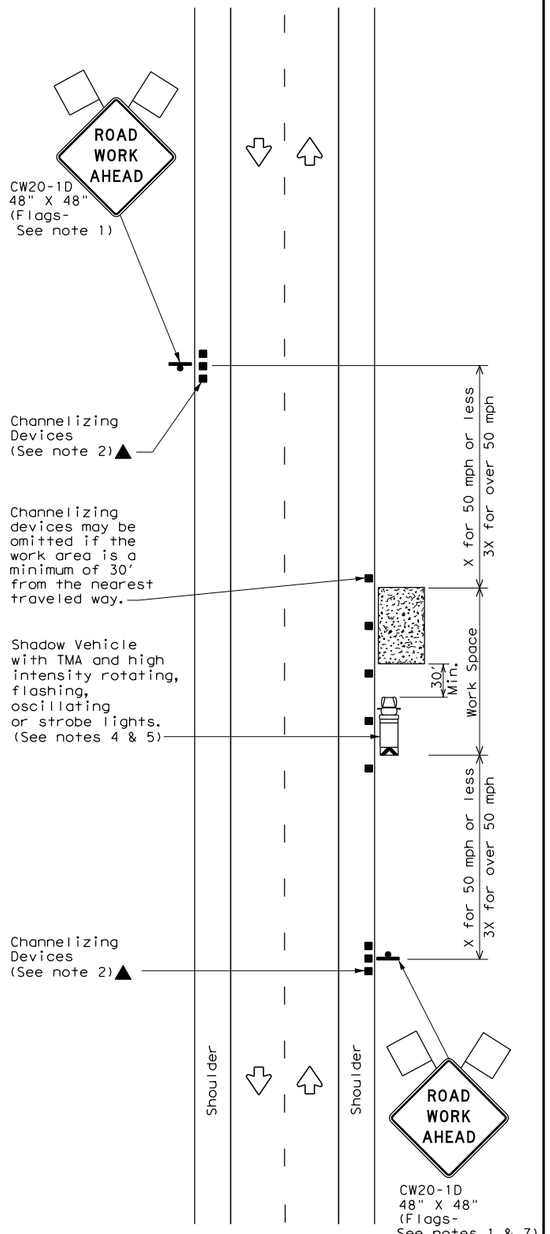
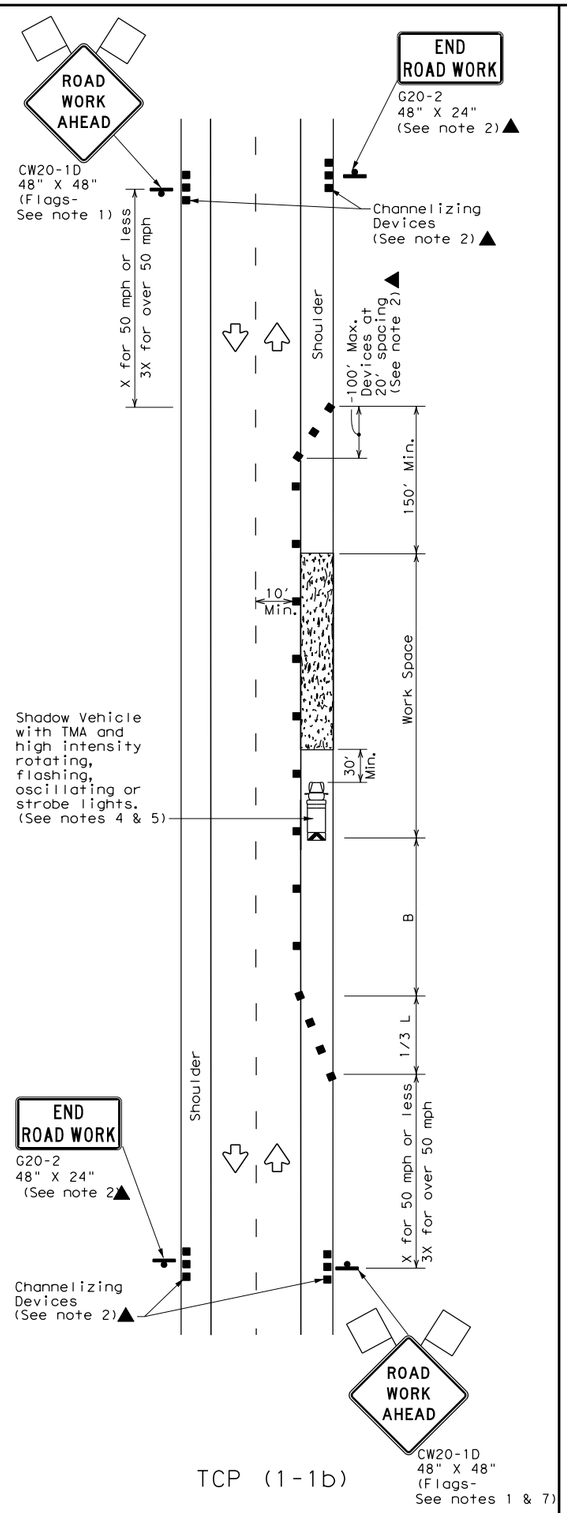


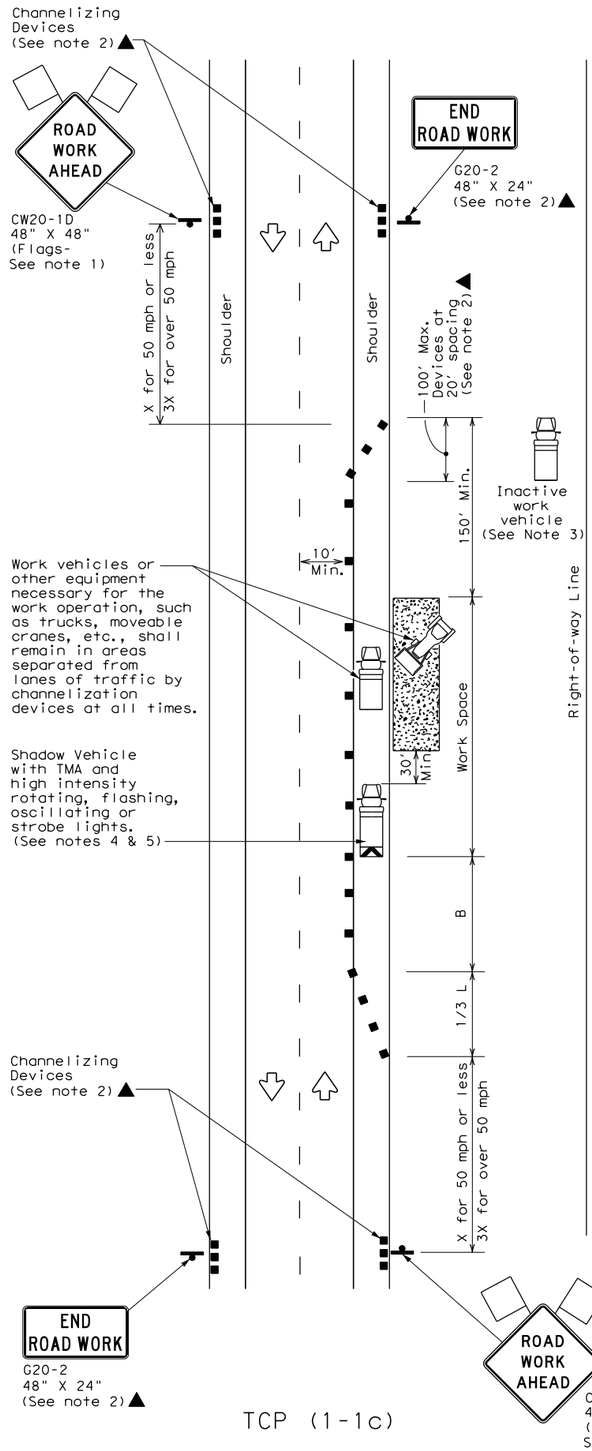
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. 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 wider work spaces.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. 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(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SAT	COMAL		53
1-97 2-18				

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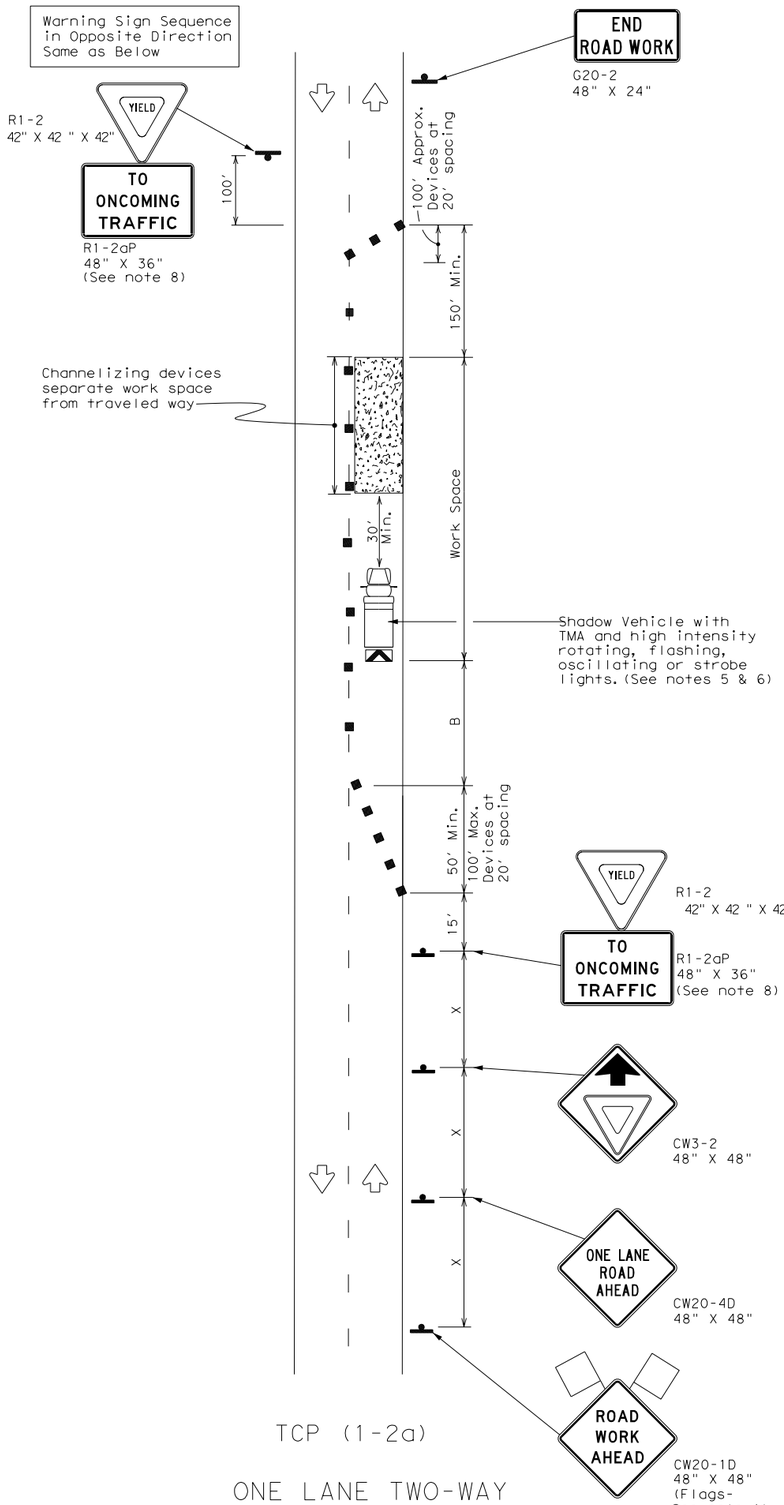
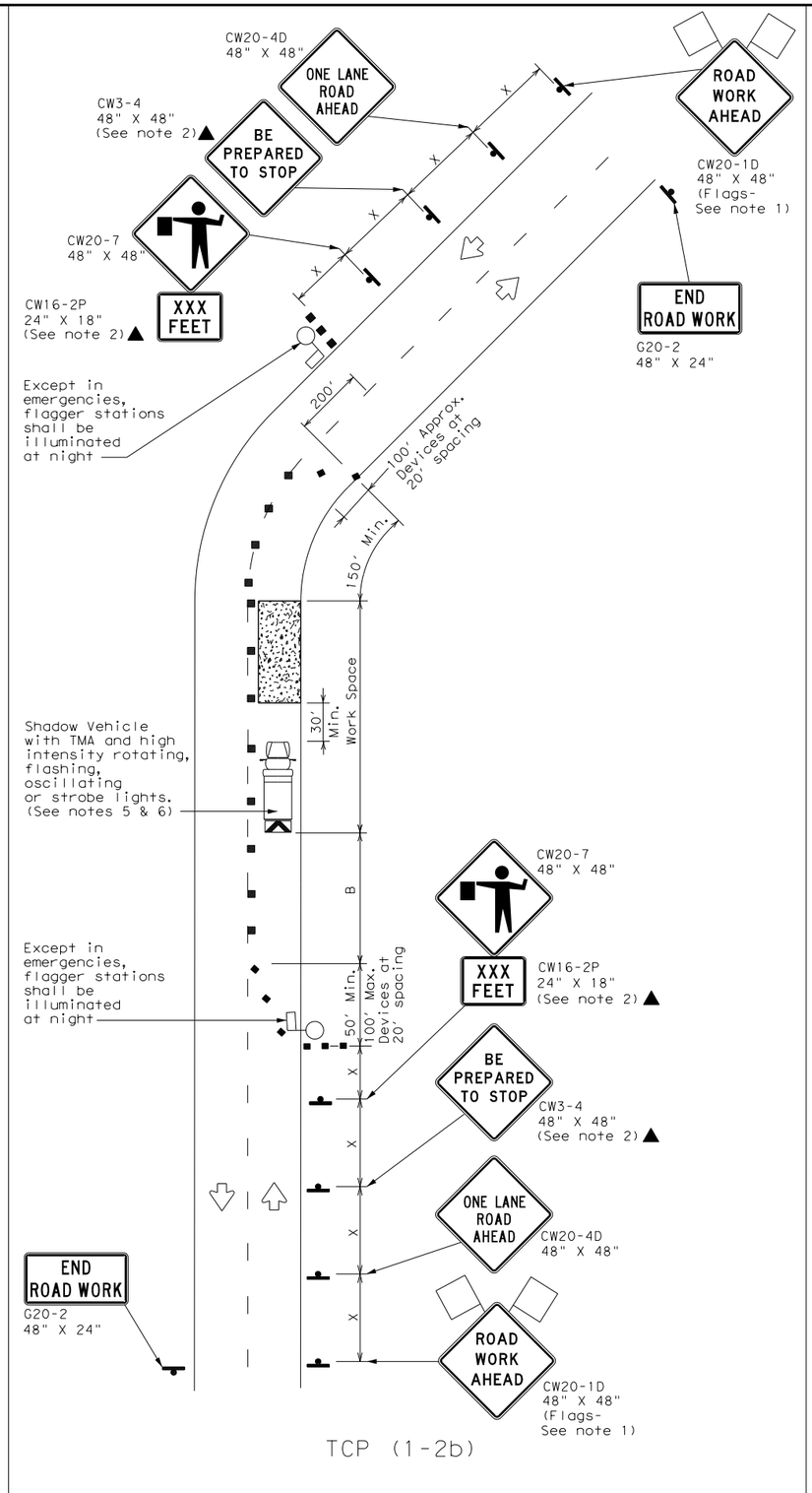
DATE:
FILE:



TCP (1-2a)

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. 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.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98	0915	17	072	CS, ETC
2-94 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	SAT	COMAL		54

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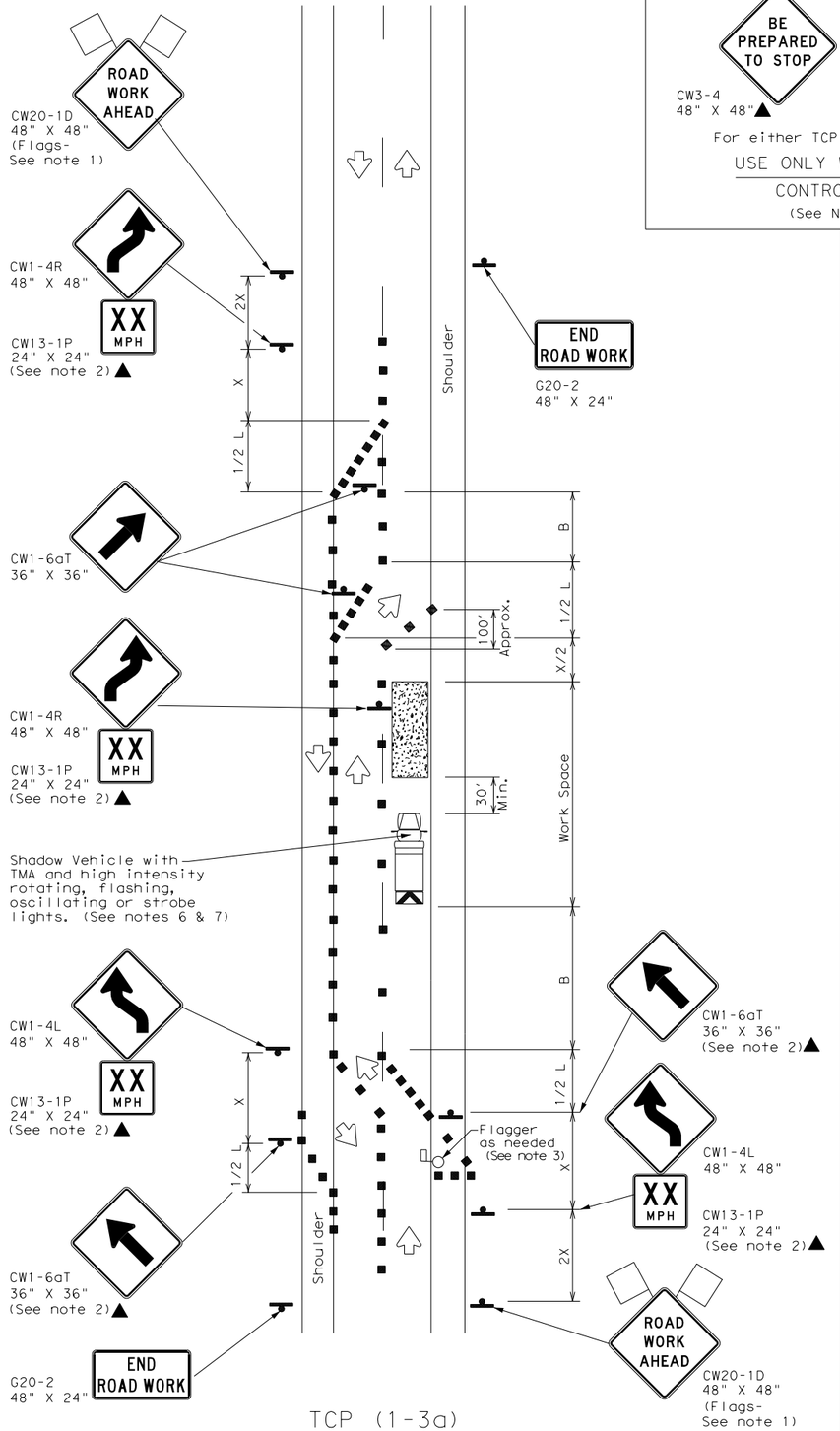
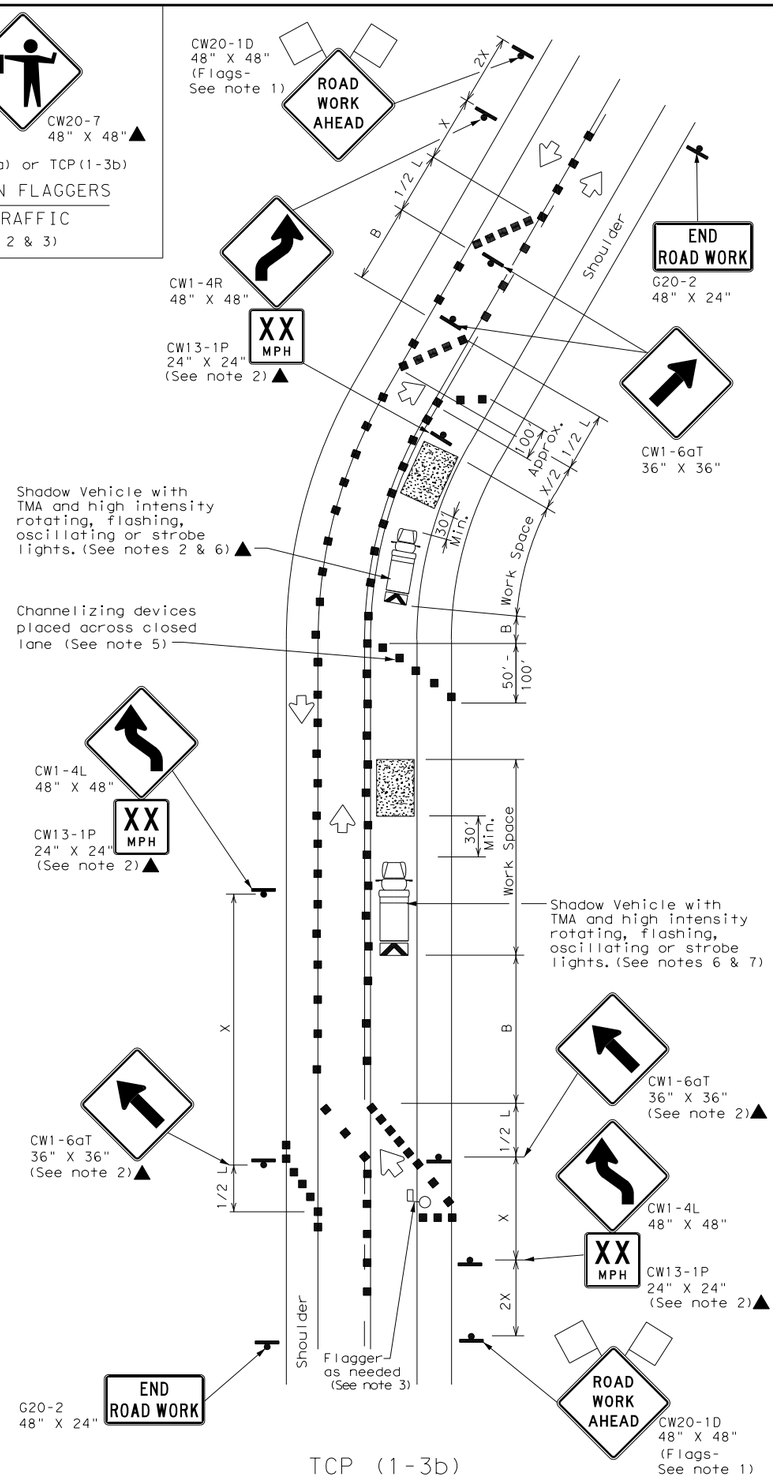
DATE:
FILE:



TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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 elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
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 wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SAT	COMAL		55
1-97 2-18				

153

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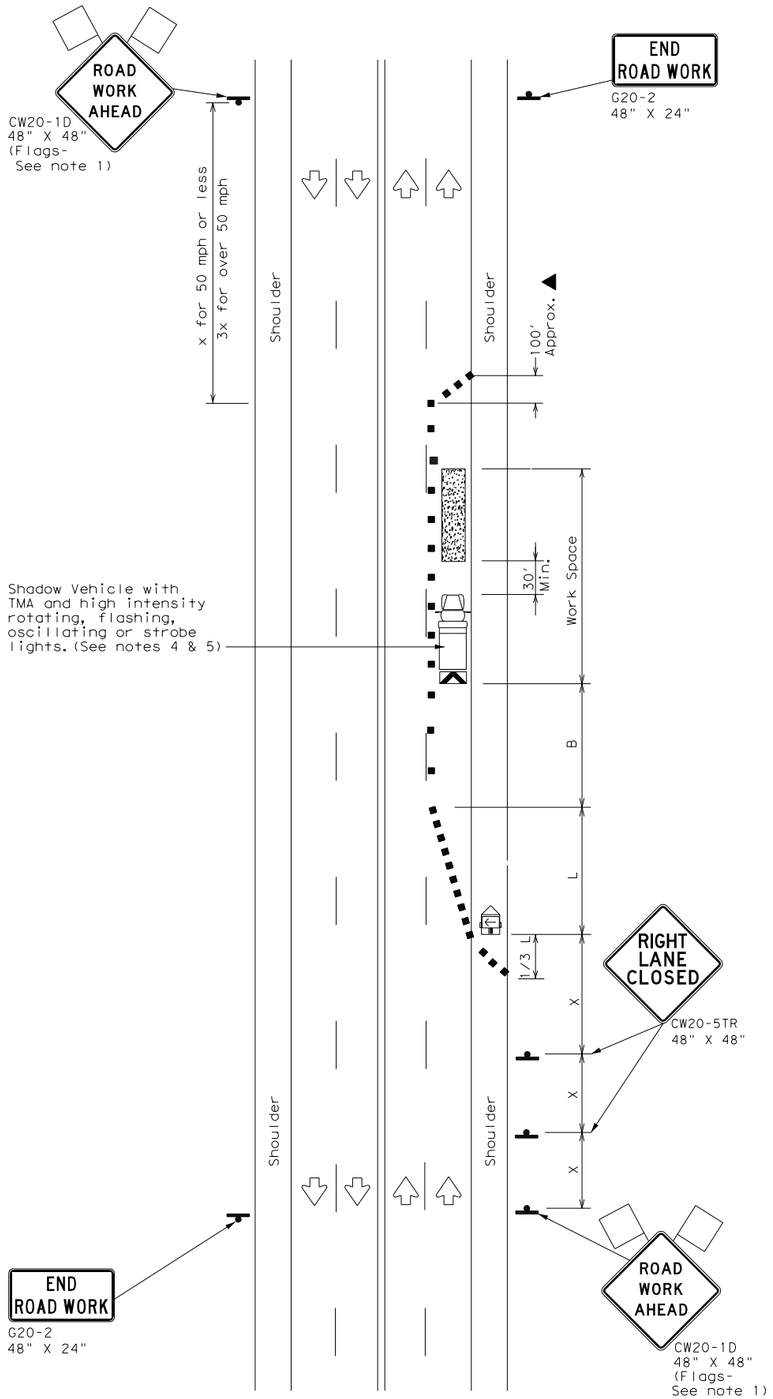
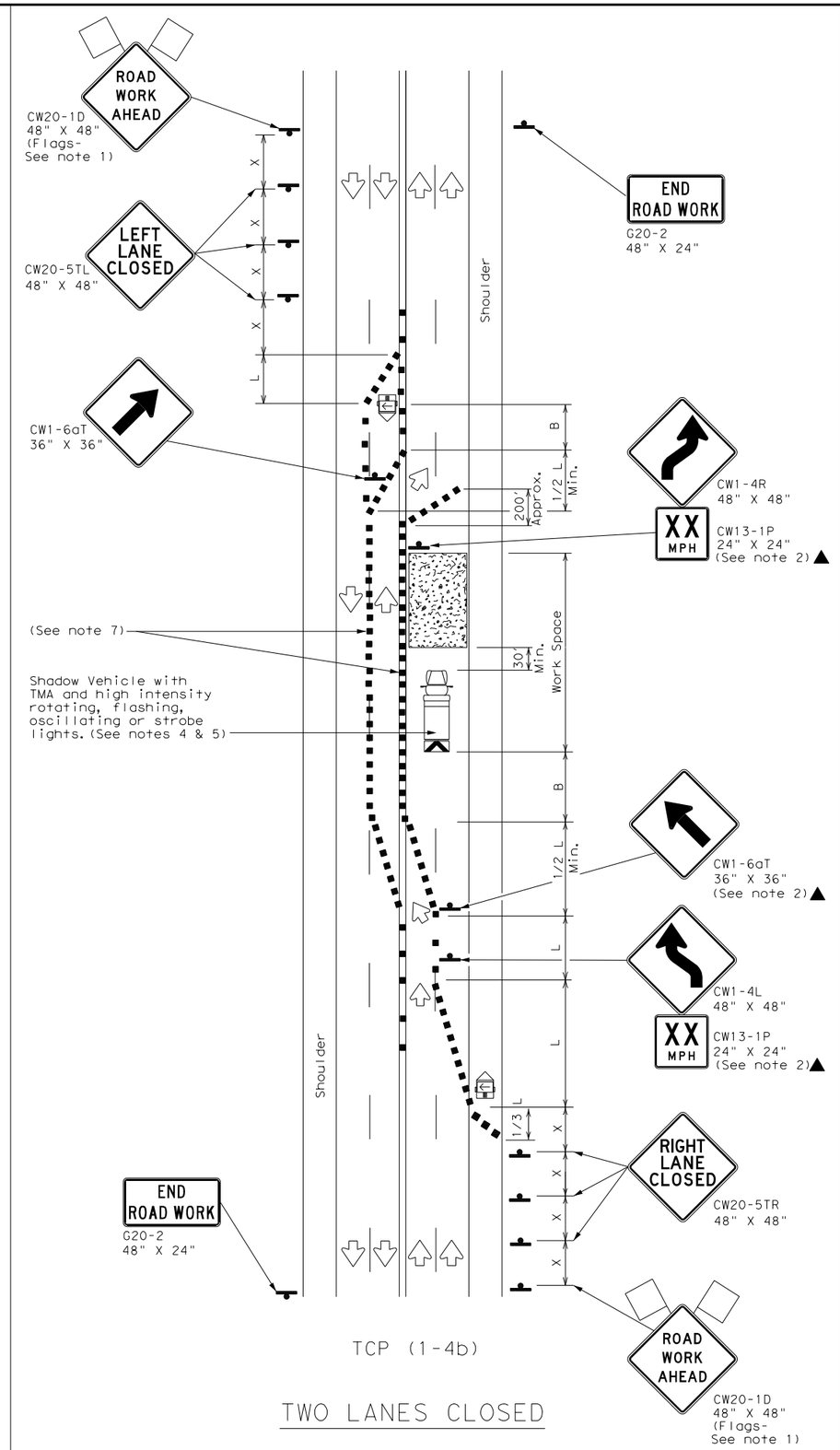
DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. 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 wider work spaces.

TCP (1-4a)

6. If this TCP is used for a left lane closure , CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SAT	COMAL		56
1-97 2-18				

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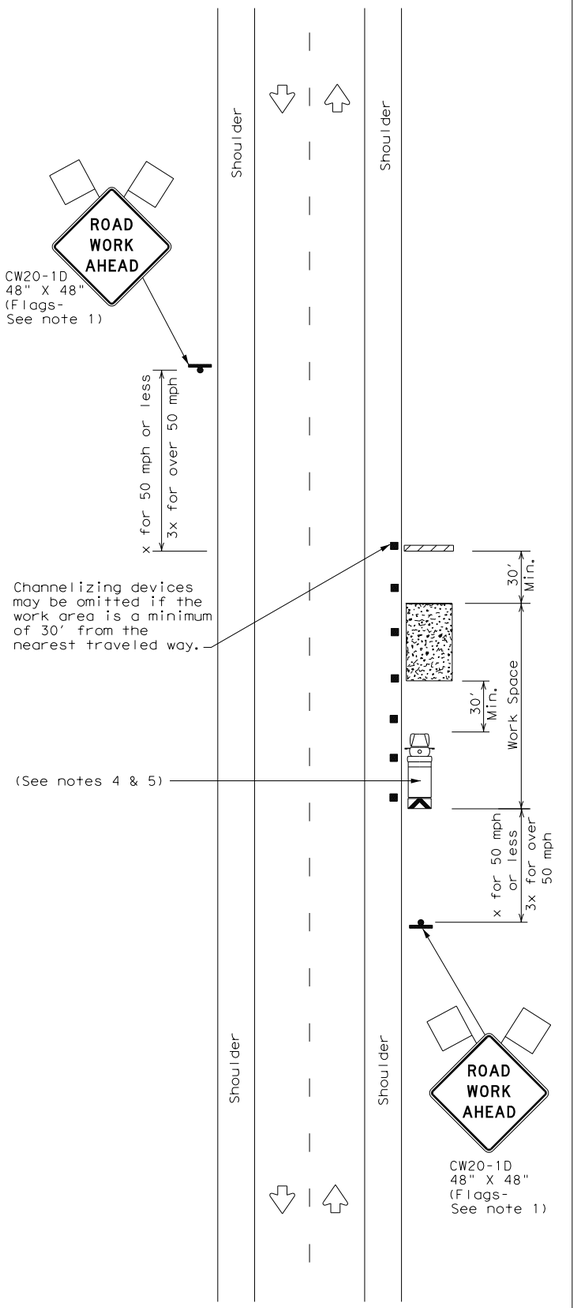
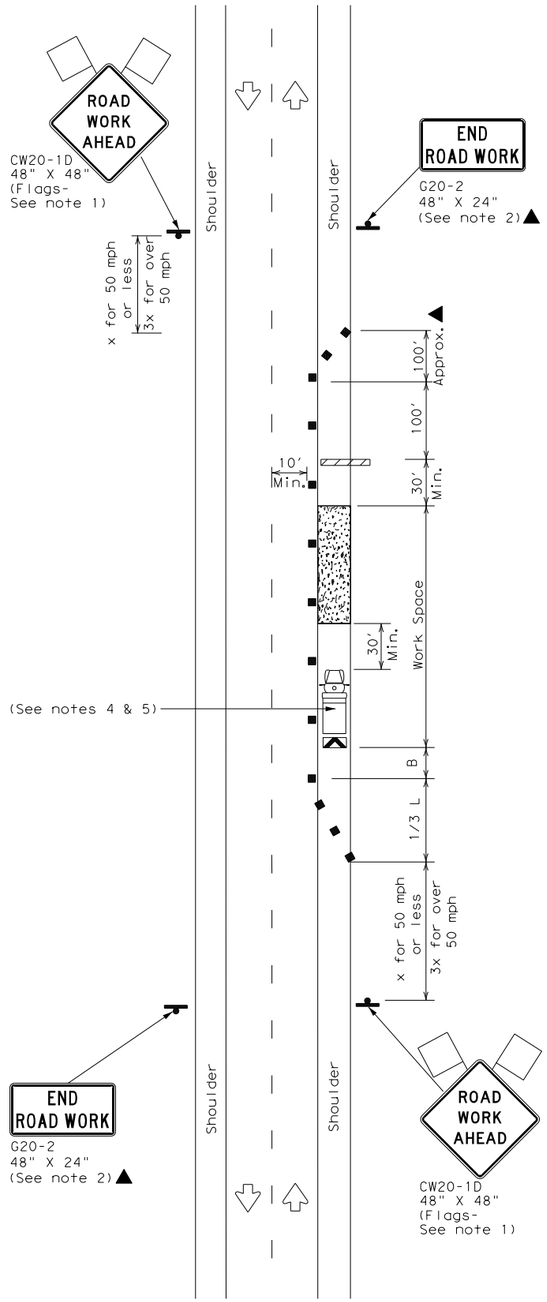
DATE:
FILE:



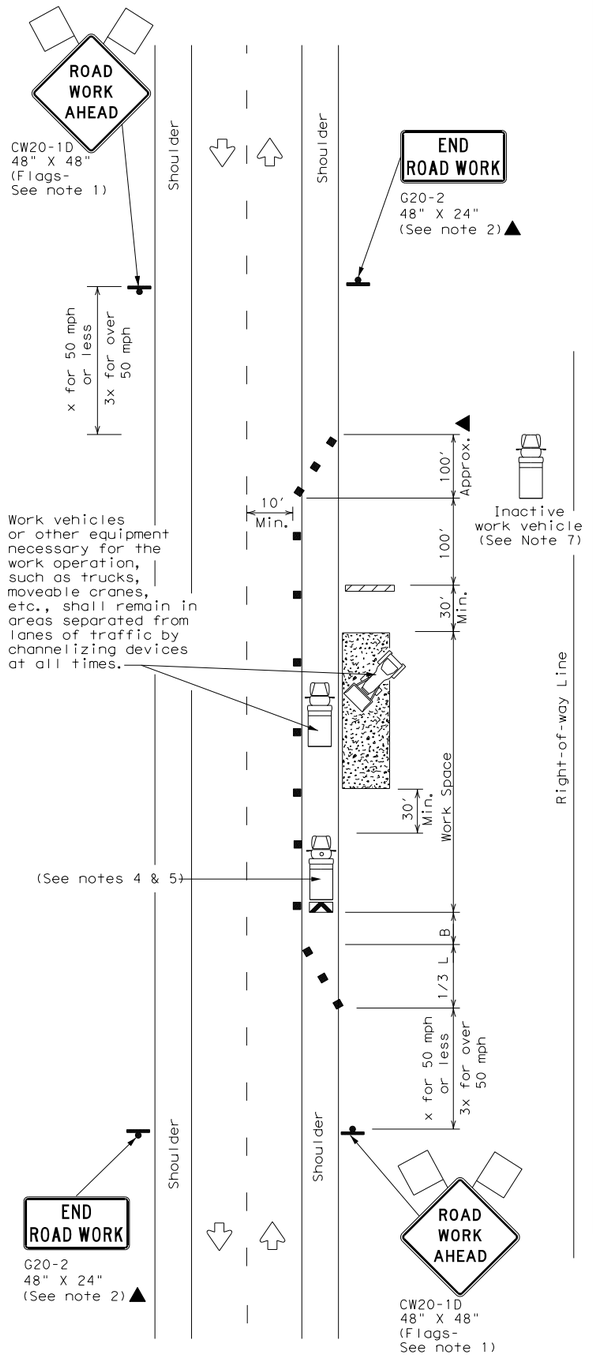
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

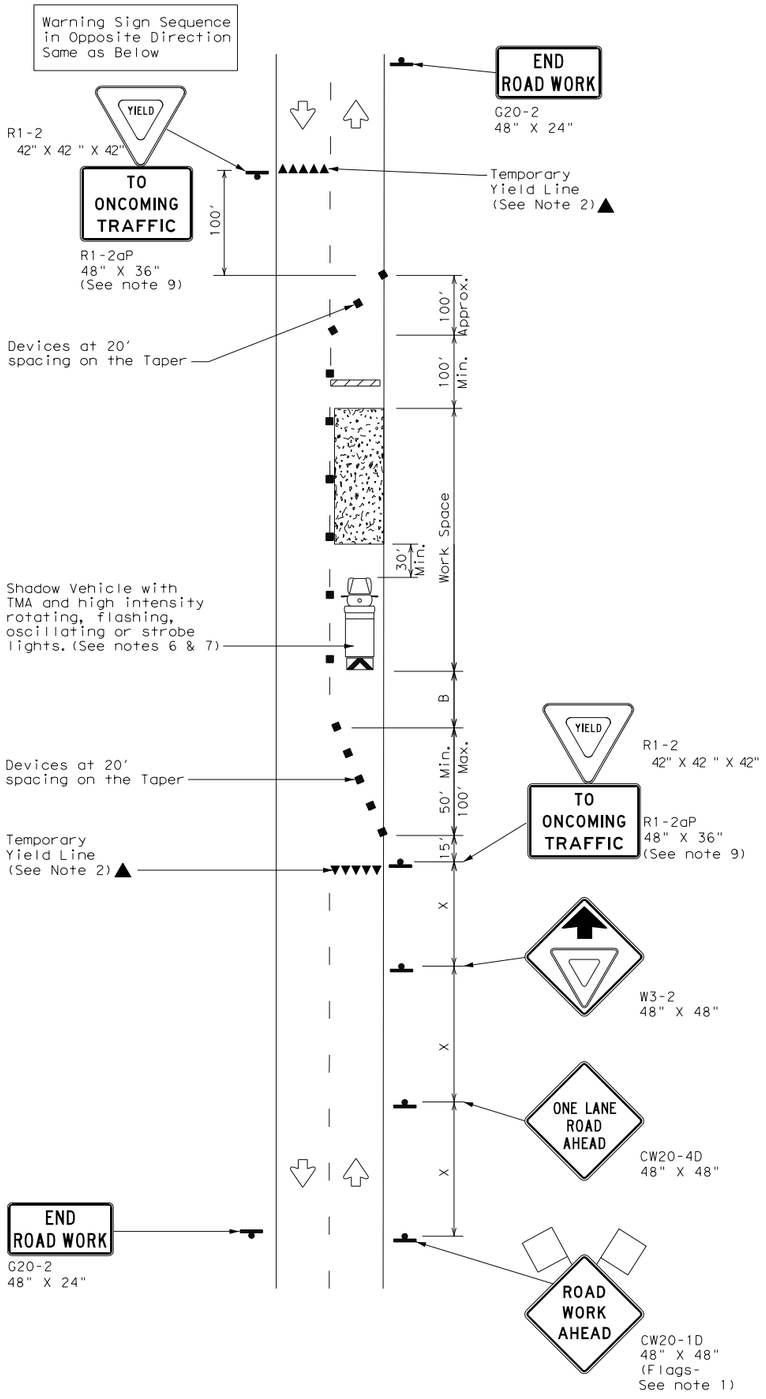
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

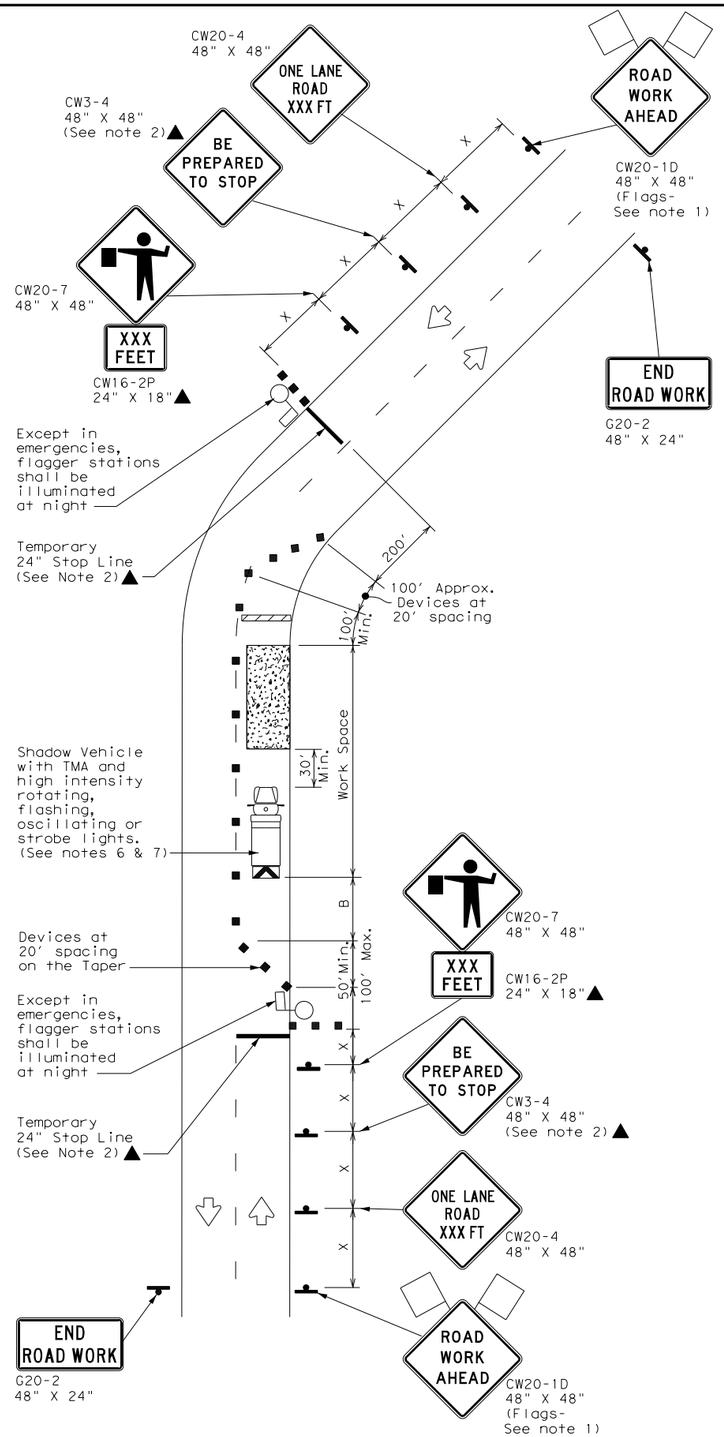
FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	SAT	COMAL		57
1-97 2-18				

161

DATE:
FILE:



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



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		58

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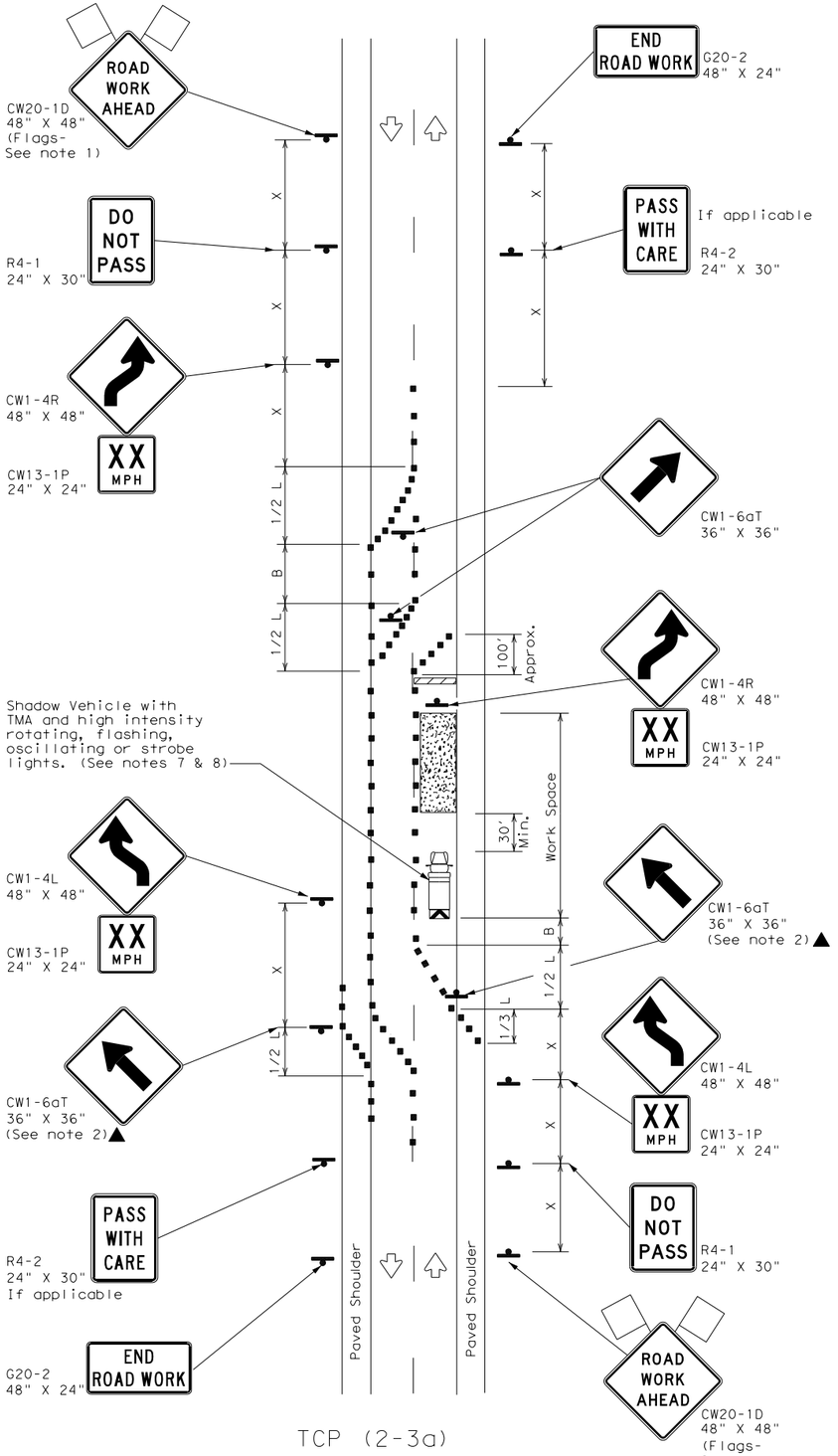
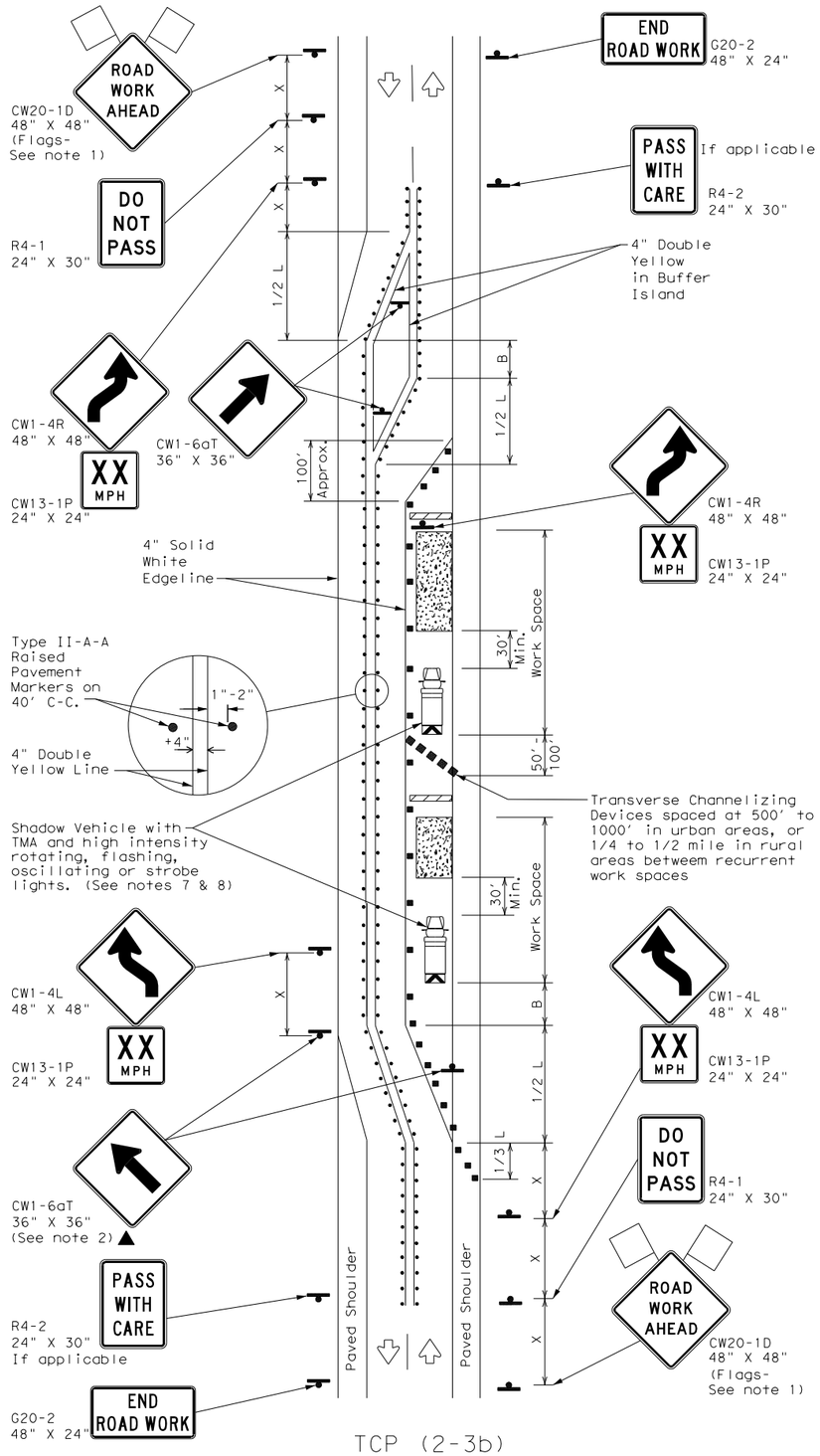
DATE:
FILE:



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

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	SAT	COMAL		59
4-98 2-18				

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DATE:
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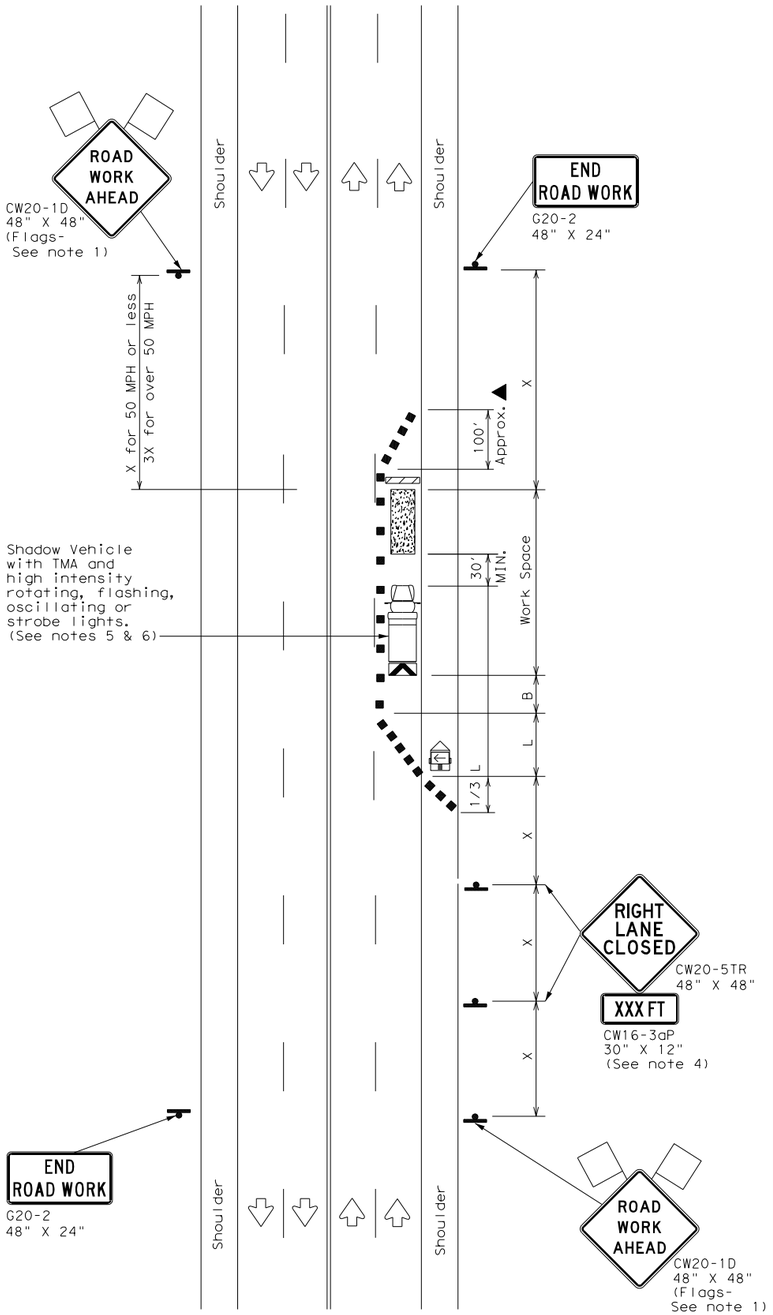
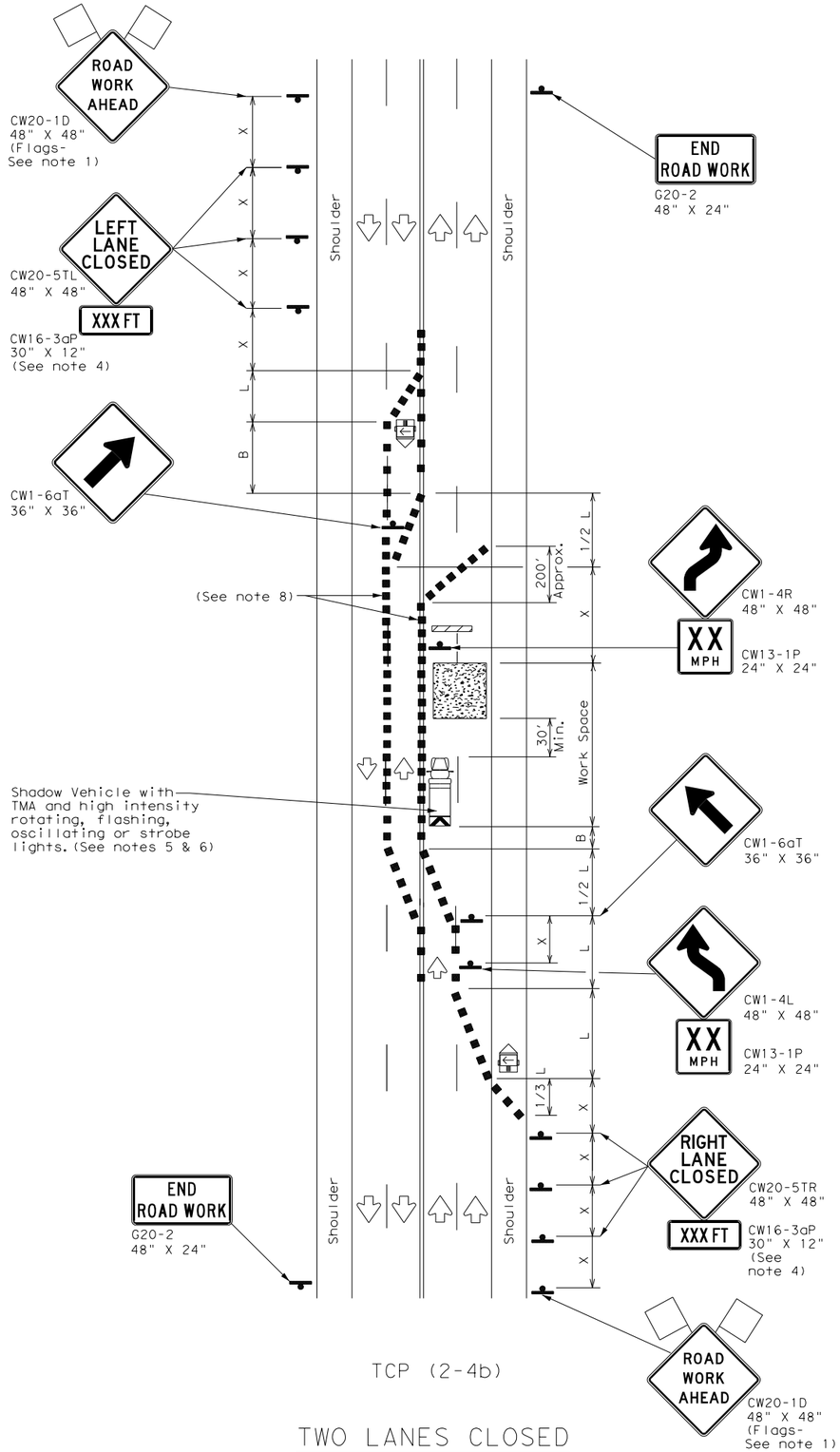


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. 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.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED"signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation

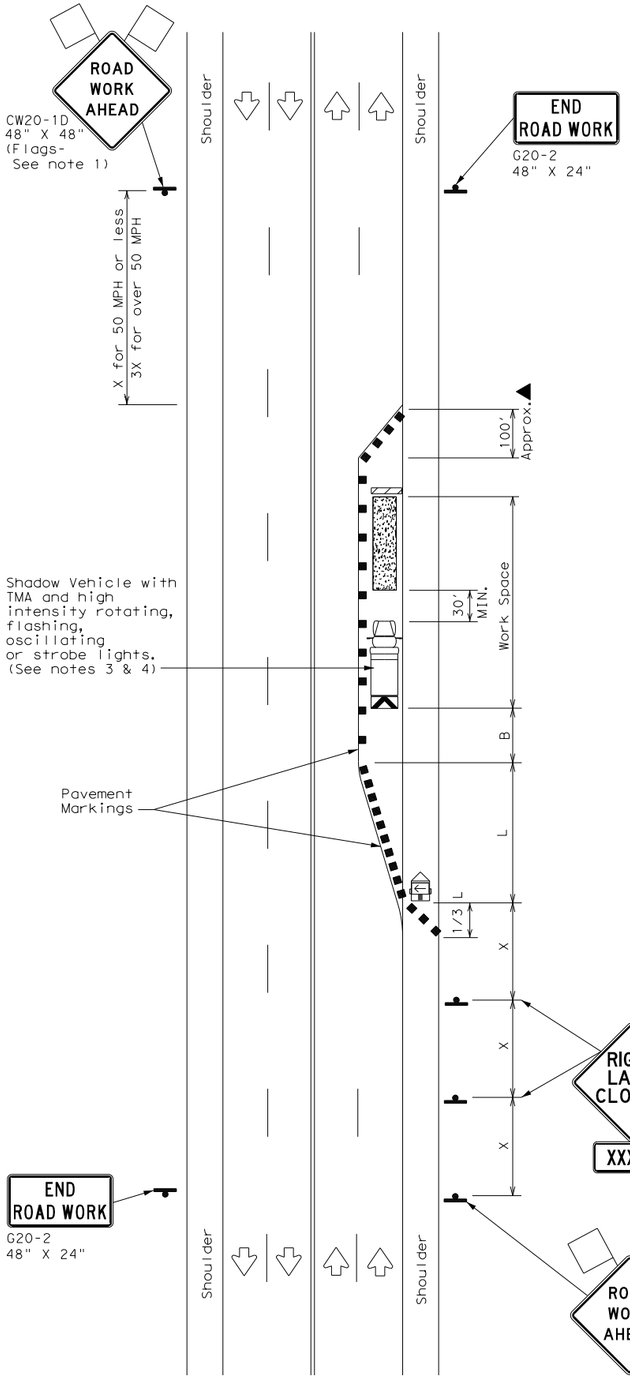
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

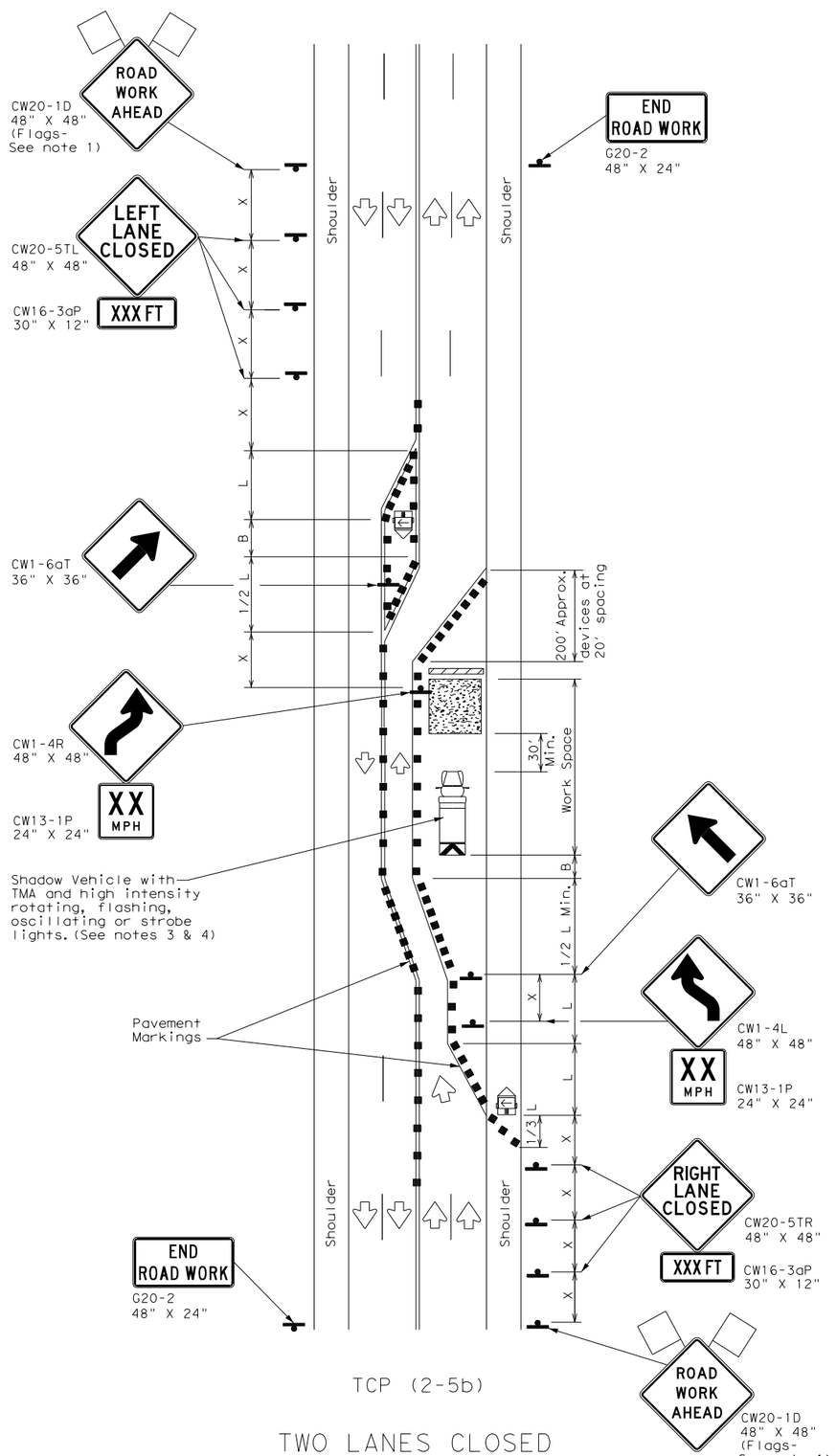
FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0915	17	072	CS, ETC
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	SAT	COMAL		60

DATE:
FILE:



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. 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 eposure 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 substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

6. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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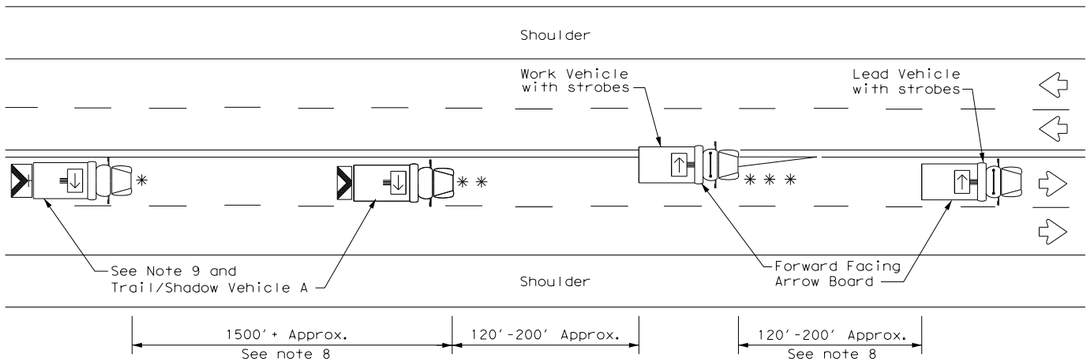
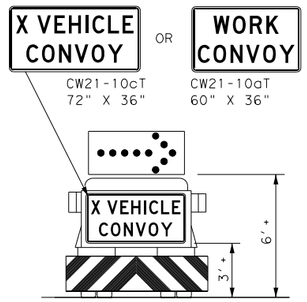
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18				61

165



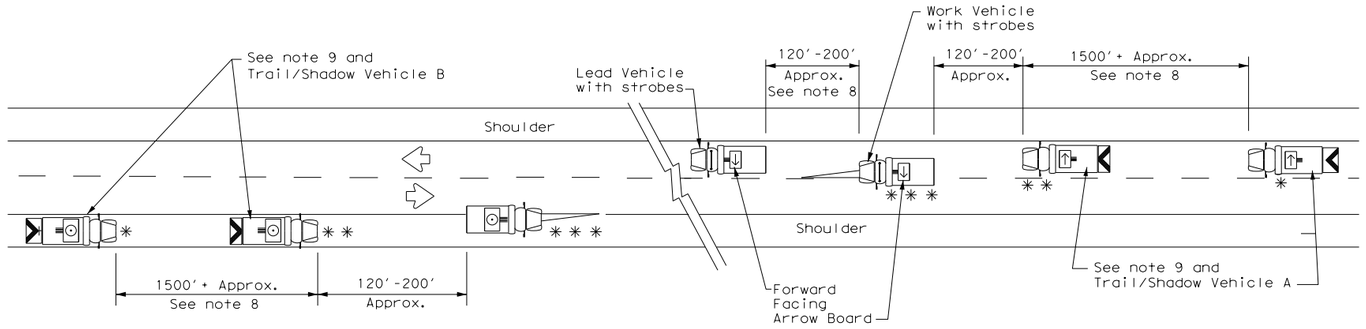
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

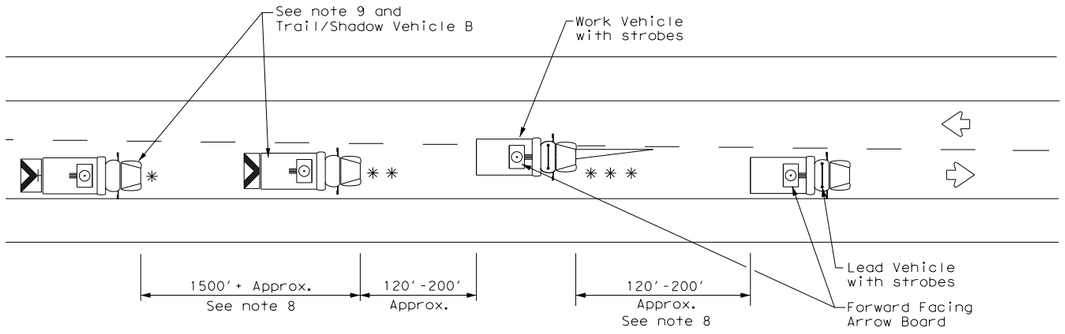


WORK ON SHOULDER

WORK ON TRAVEL LANE

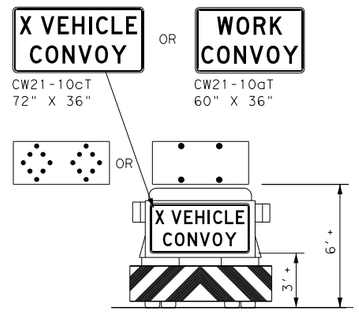
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

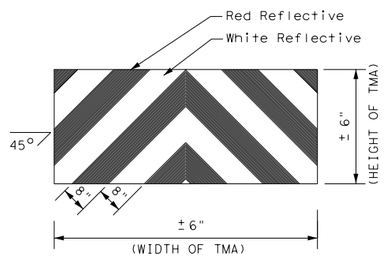
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0915	17	072	CS, ETC
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	SAT	COMAL		62

DATE:
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DATE:
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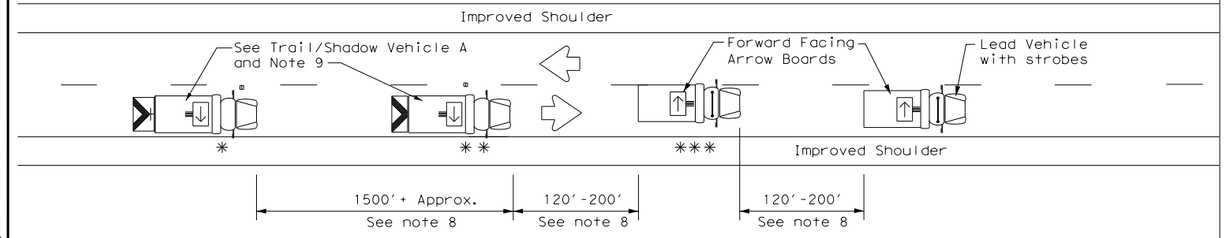
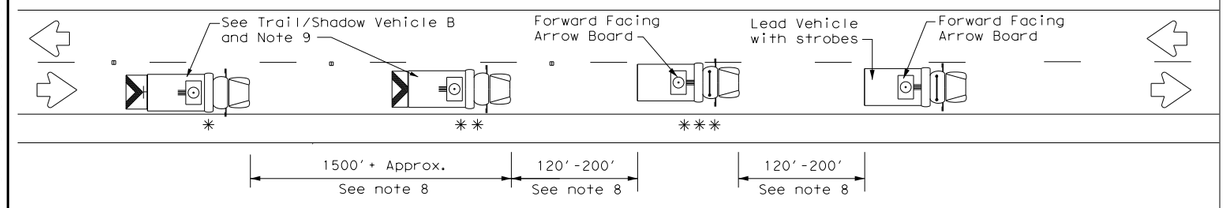


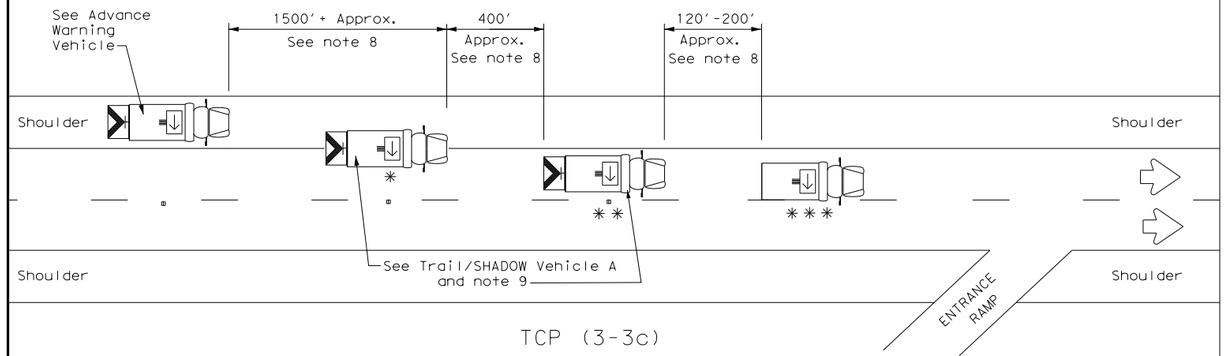
TCP (3-3a)

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



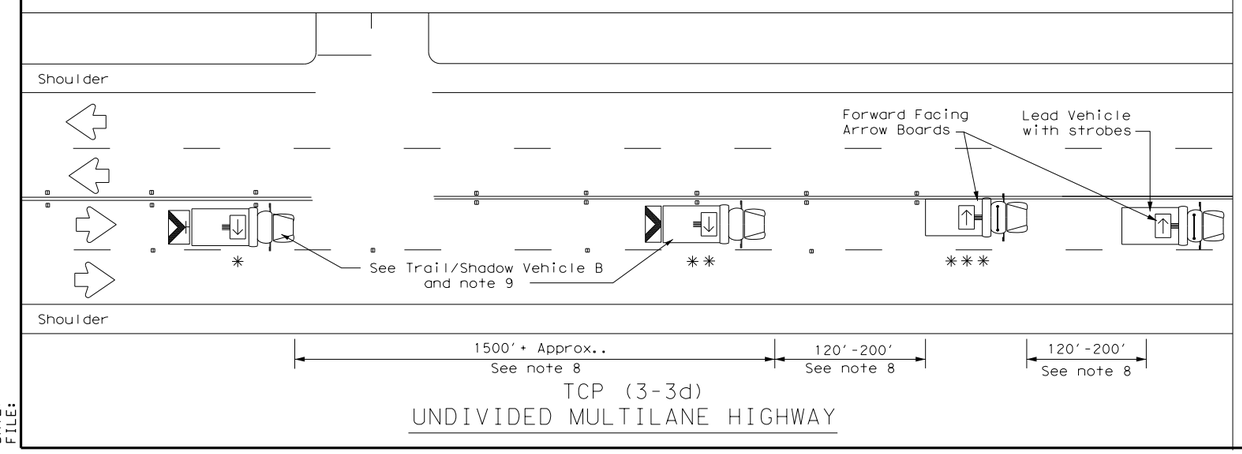
TCP (3-3b)

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



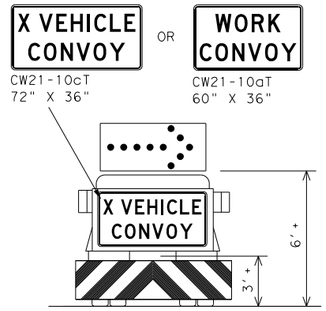
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



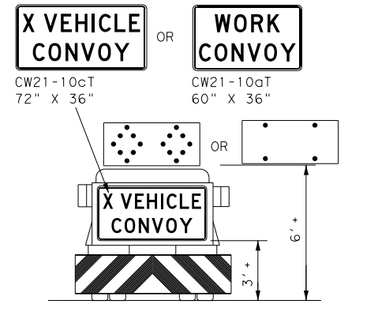
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



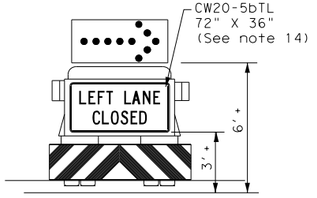
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

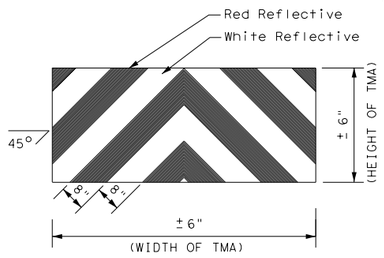


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	SAT	COMAL		63
1-97 7-14				

DATE:
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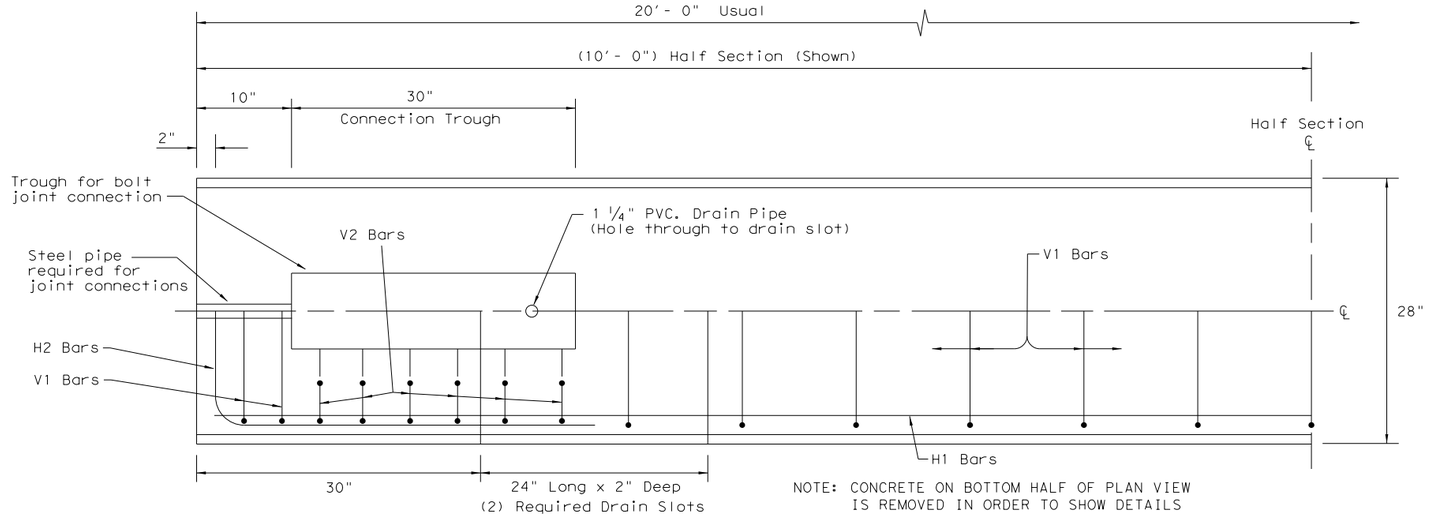
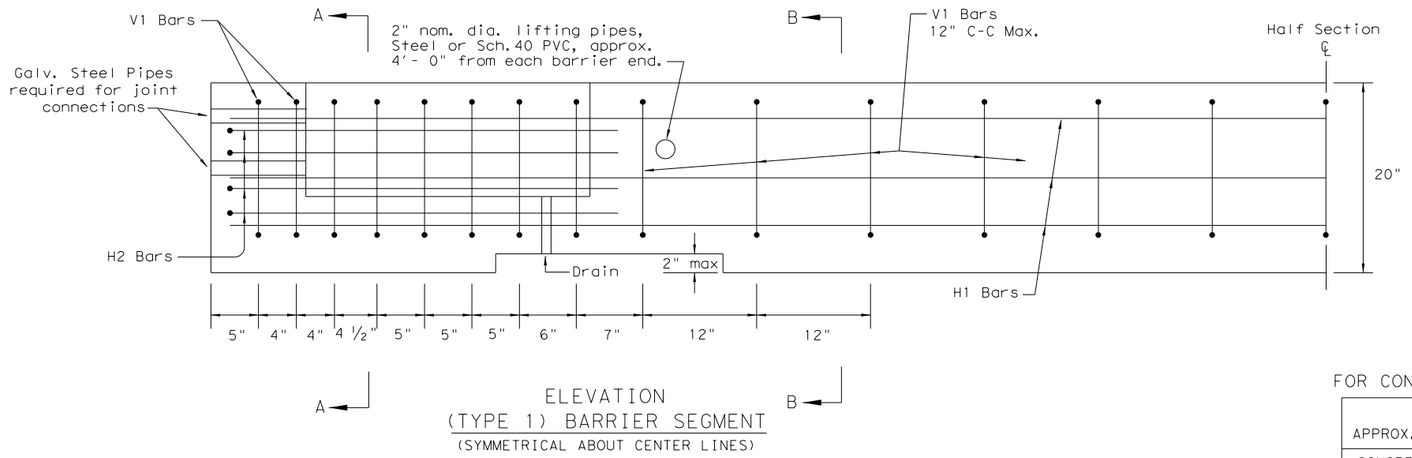
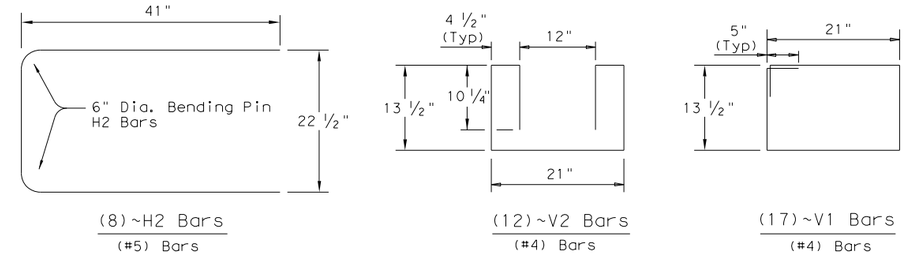


NOTE: CONCRETE ON BOTTOM HALF OF PLAN VIEW IS REMOVED IN ORDER TO SHOW DETAILS

PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



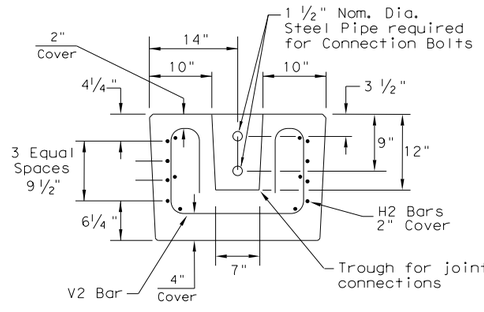
(8)~H2 Bars
(#5) Bars

(12)~V2 Bars
(#4) Bars

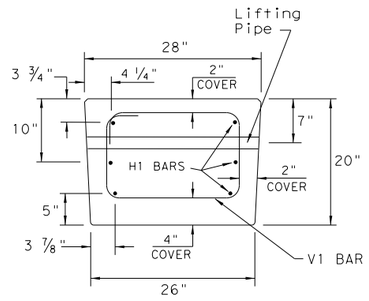
(17)~V1 Bars
(#4) Bars

REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A



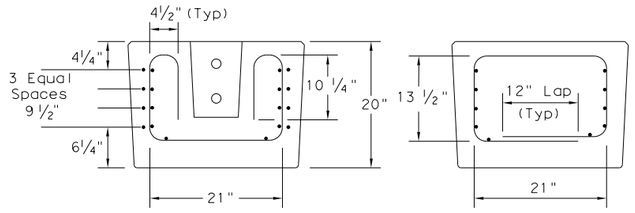
SECTION B-B

GENERAL NOTES

1. Low Profile Concrete Barrier (LPCB), is approved for use in temporary work zone locations, where the posted speed is 45 mph, or less.
2. Concrete shall be Class H for precast barrier with a minimum compressive strength of 3,600 psi.
3. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
4. Precast LPCB barrier length shall be 20 ft.
5. All barrier edges shall have ¾" chamfer or a tooled radius.
6. Joint connection hardware shall be in accordance with Item 449, "Anchor Bolts." and is considered subsidiary.
7. Steel pipe required for joint connection bolts shall be galvanized in accordance with Item 445,"Galvanizing."
8. Welded wire reinforcement (WWR) may be used in lieu of conventional reinforcement for Type 1 barrier, and shall meet the requirements shown.

FOR CONTRACTORS INFORMATION ONLY

(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000



SECTION A-A

SECTION B-B

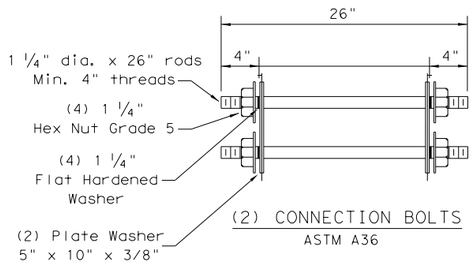
(WWR) GENERAL NOTES

1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to the first wire shall not exceed 3".

REQUIRED (WWR) WIRE DESIGN

8 ~ (D31) Horizontal Wires (Equally spaced)
10 ~ (D20) Horizontal Wires (Equally spaced)
29 ~ (D20) Vertical Wires (Spaced as shown in Elevation View)

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING



(2) CONNECTION BOLTS
ASTM A36

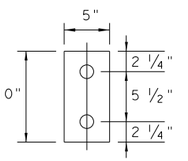


PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

SHEET 1 OF 2

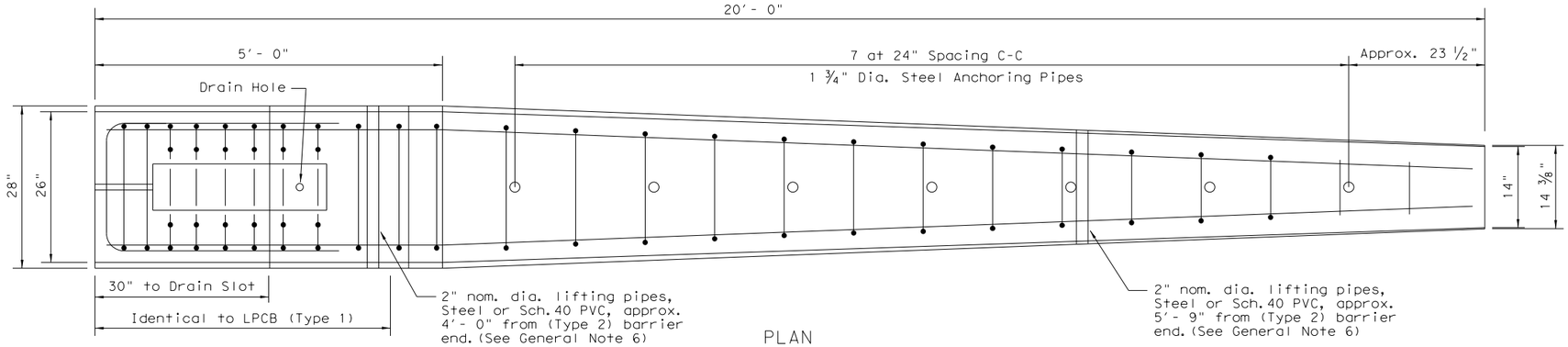
Texas Department of Transportation

Design Division Standard

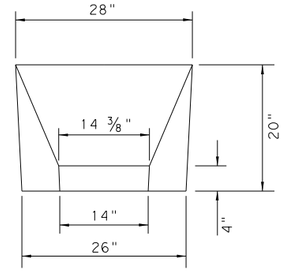
LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 1)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		64

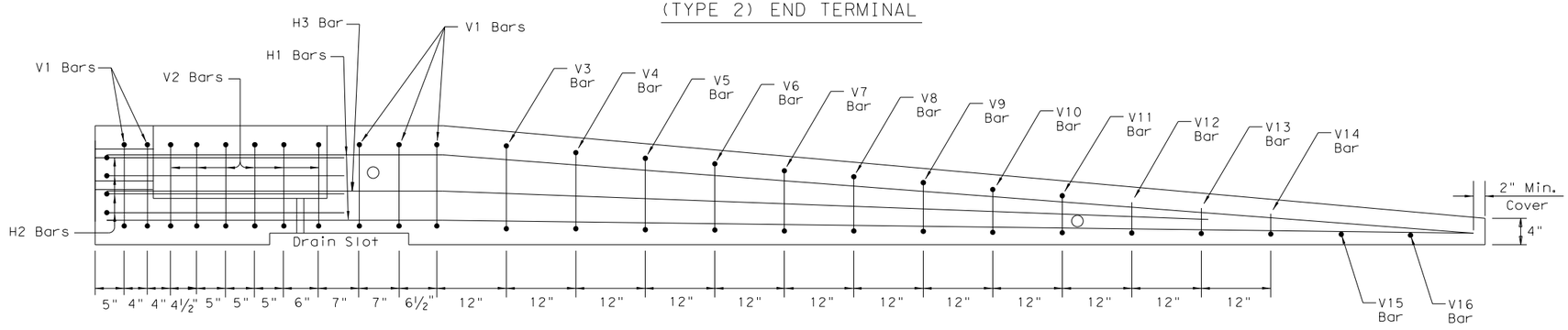
DATE:
FILE:



PLAN
(TYPE 2) END TERMINAL



APPROACH VIEW

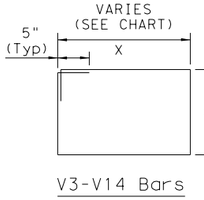


ELEVATION
(TYPE 2) END TERMINAL

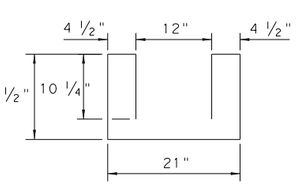
Note:
Anchoring pipes not shown in Elevation View

TYPE 2 - NOTES

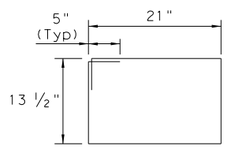
1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement of the end treatment. The use of non-pinned end treatment does not affect the performance or the deflection of the Low-Profile barrier system.
4. The anchor pins are all the same length and are to be driven flush with the top of the (Type 2) barrier surface.
5. The bends in the H3 and H1 bars are slight, no formal bend is necessary.
6. The Type 2 barrier segment must be lifted from the rear first, to prevent cracking of sloped section.
7. See LPCB sheet 1 for additional information.



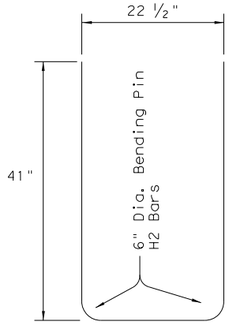
V3-V14 Bars



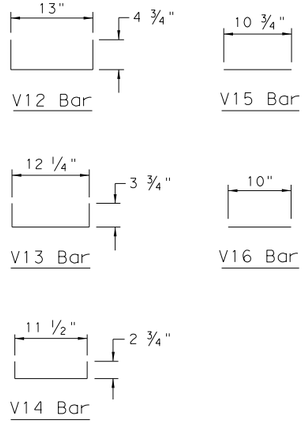
(6)~V2 Bars



(5)~V1 Bars



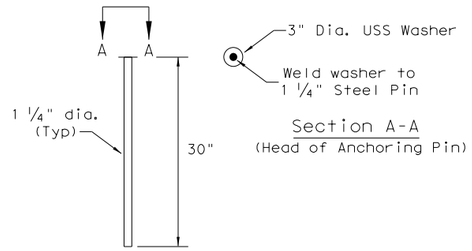
(4)~H2 Bars
(#5) Bars



Note: All V Bars are (#4)

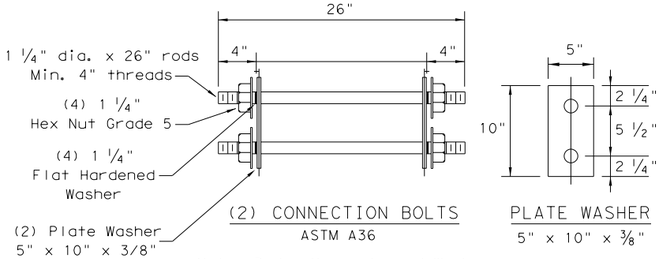
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL



Section A-A
(Head of Anchoring Pin)

(7) Anchor Pins
ASTM A36 Steel
(See Note 3)

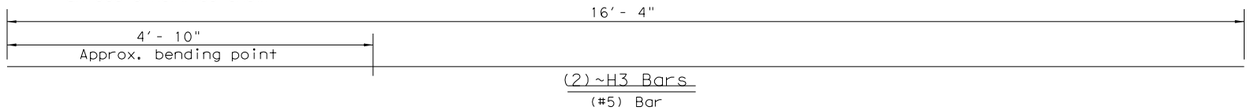


(2) CONNECTION BOLTS
ASTM A36

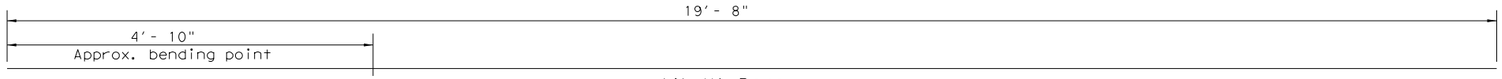
PLATE WASHER
5" x 10" x ⅜"

Note: Rods, Hex nuts and Washers shall be Galvanized.

Note: Use 2" Dia. Bending Pin, unless otherwise shown



(2)~H3 Bars
(#5) Bar



Note: Bends on H1 and H3 bars are slight and do not require formal bends.

(4)~H1 Bars
(#5) Bar

FOR CONTRACTORS INFORMATION ONLY

(TYPE 2) APPROX. QUANTITIES		20 FT. SECTION
CONCRETE	CY	1.65
REINFORCING STEEL	LBS	240
TOTAL BARRIER WT.	LBS	7000

Texas Department of Transportation

Design Division Standard

LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	0915	17	072	CS, ETC
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	SAT	COMAL		66

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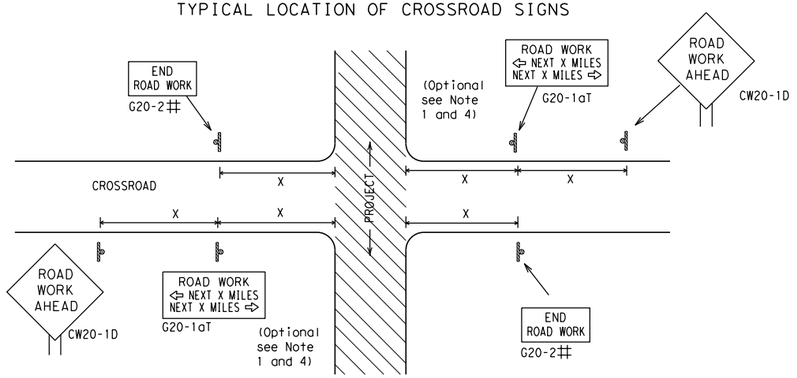
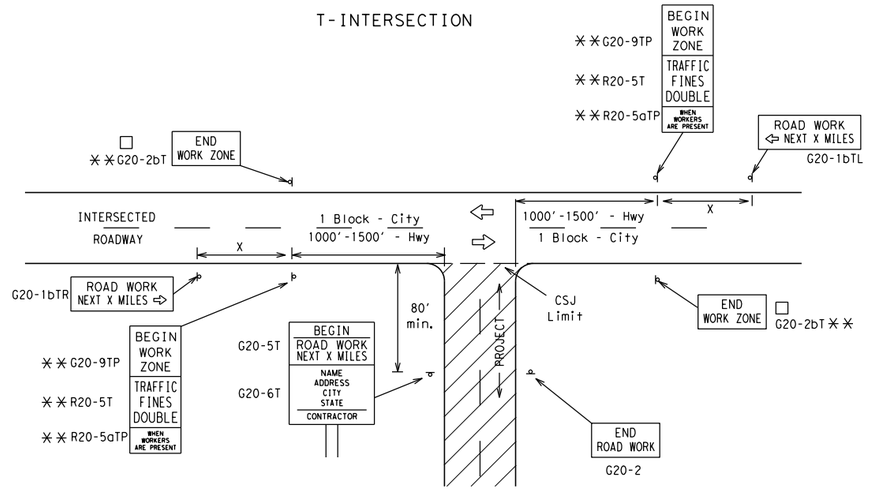
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

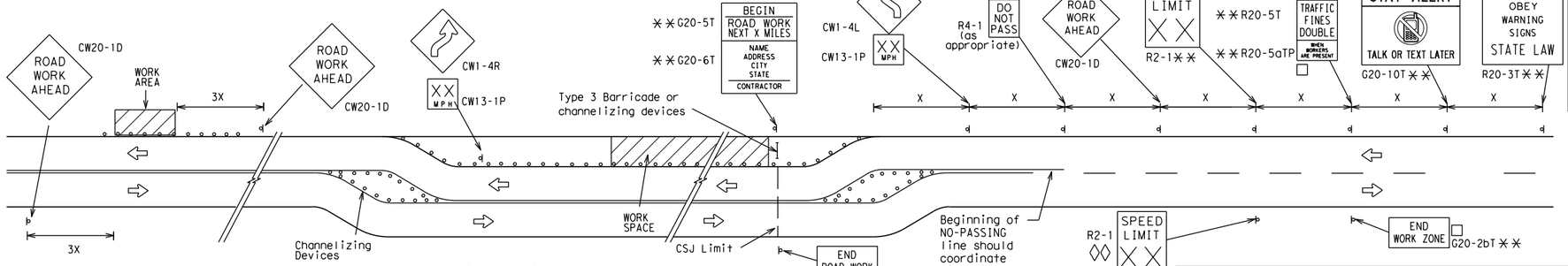
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

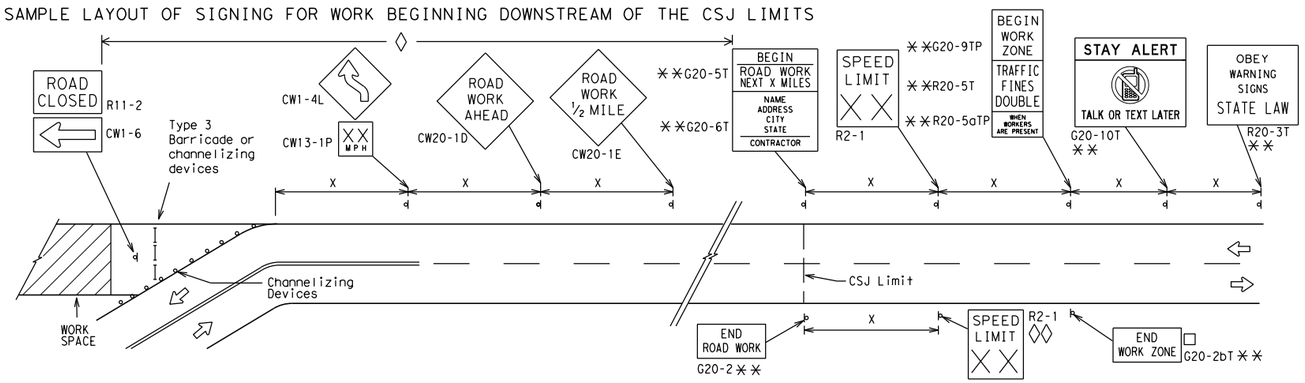
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	SAT	COMAL		67

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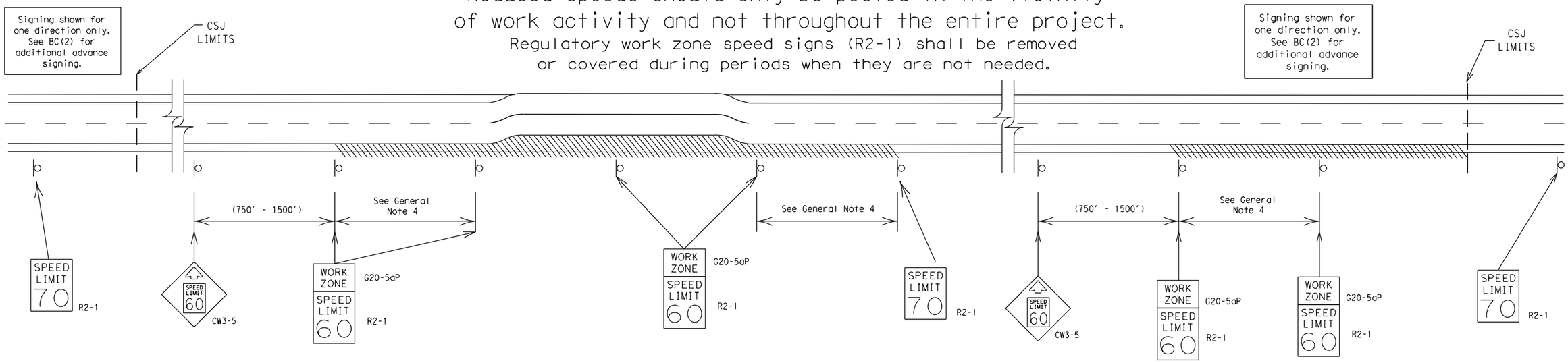
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 traveled way.

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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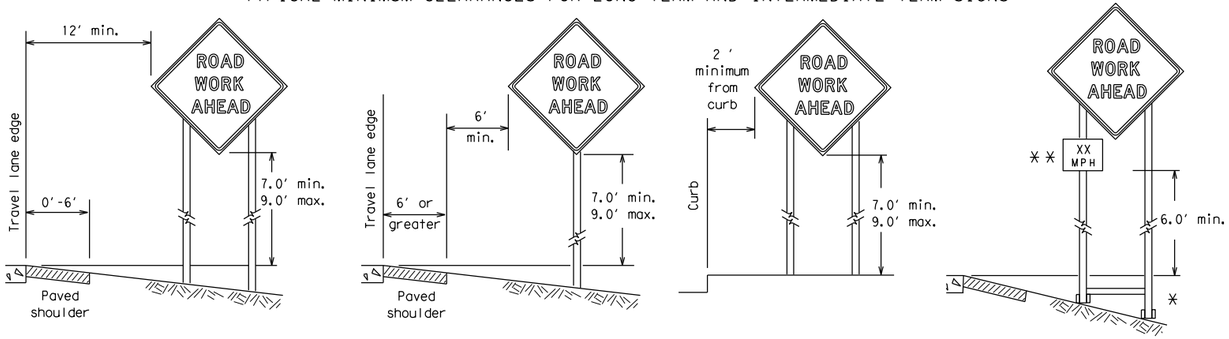
7-13 5-21	SAT	COMAL		68

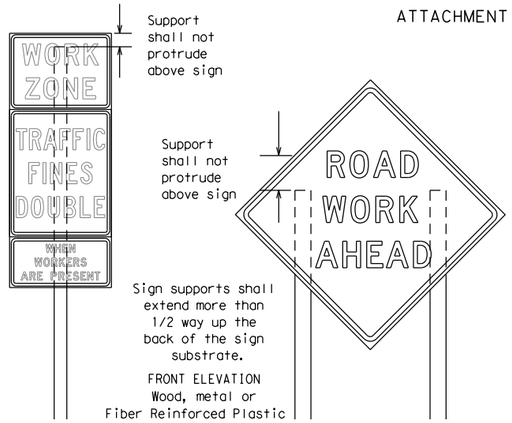
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

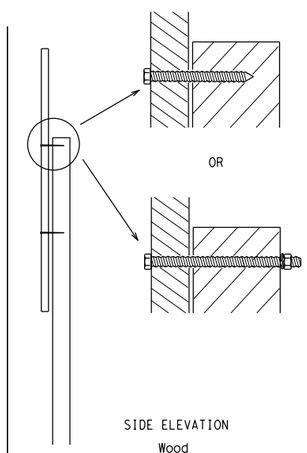


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





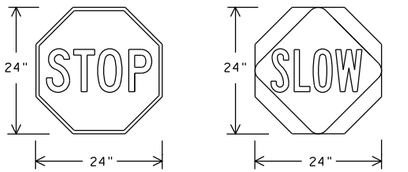
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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7-13 5-21	SAT	COMAL		69

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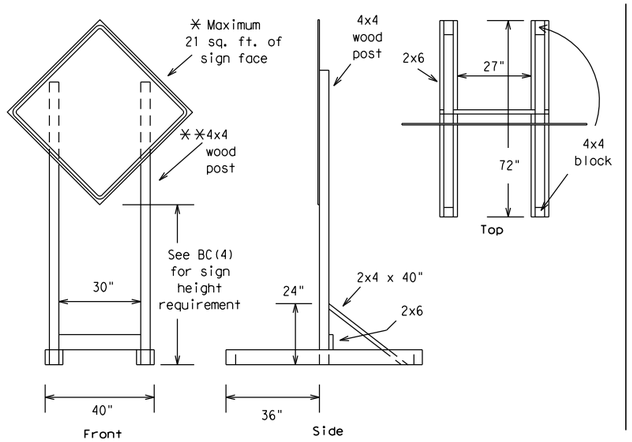
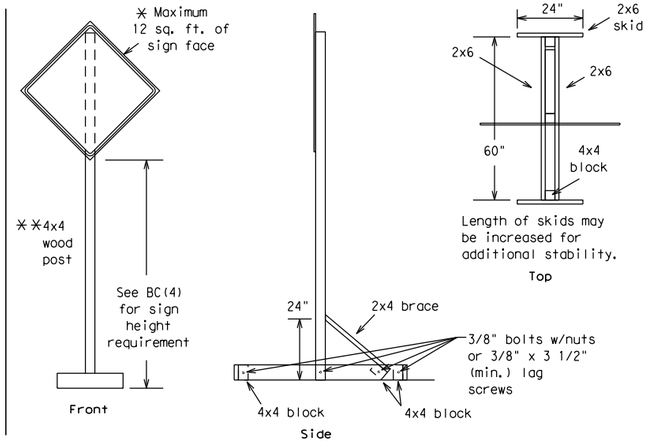
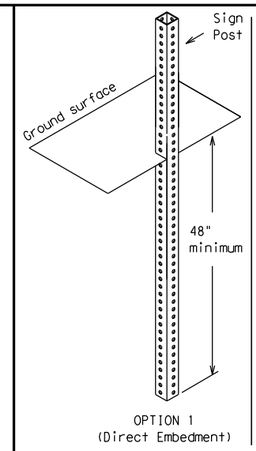
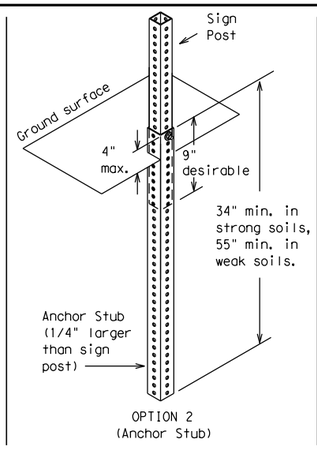


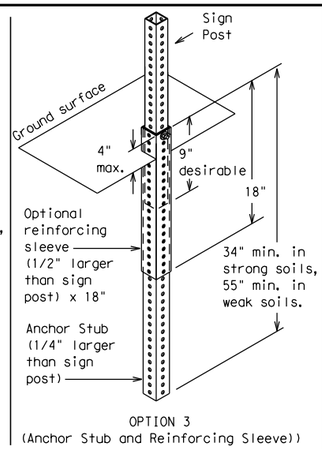


SKID MOUNTED WOOD SIGN SUPPORTS

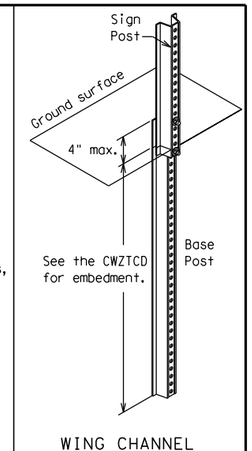
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







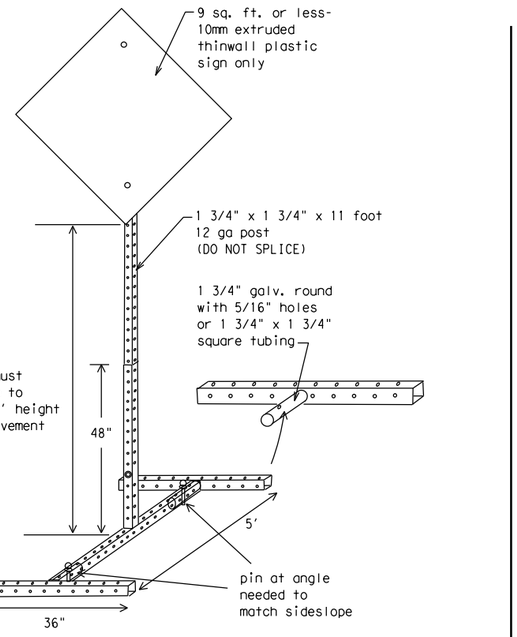
PERFORATED SQUARE METAL TUBING

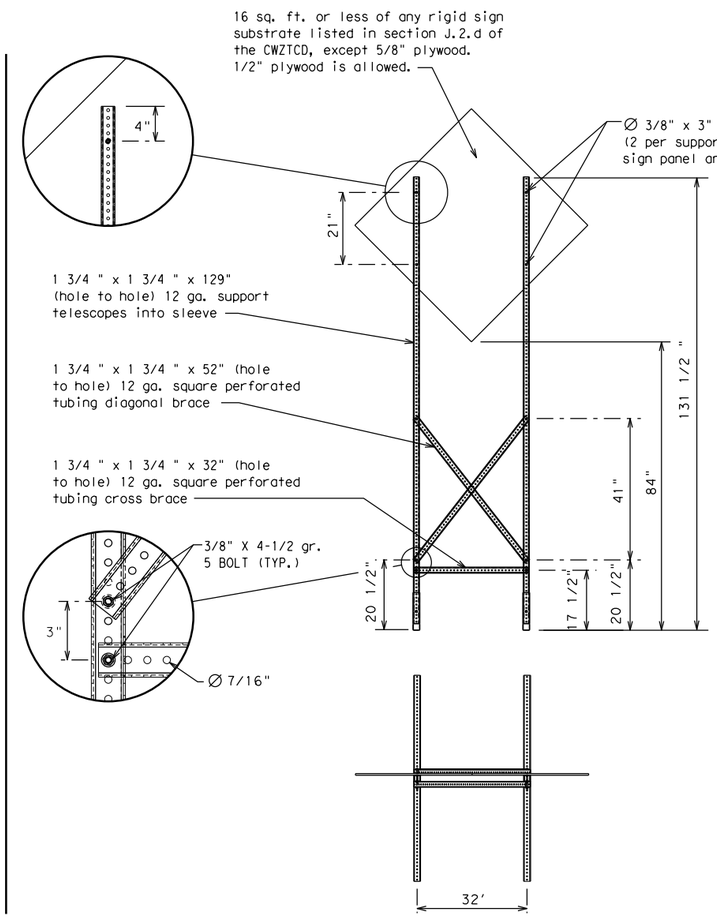


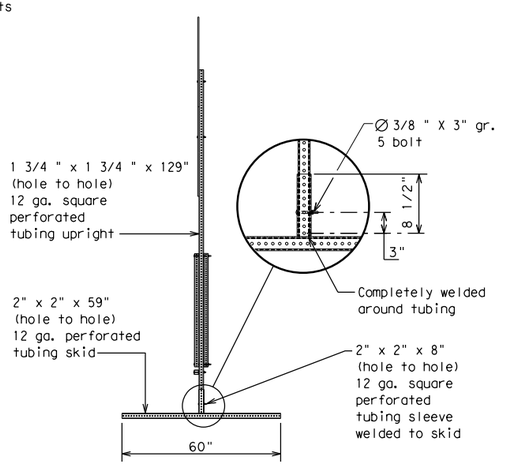
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SAT	COMAL		70

DATE: 4/25/2022 11:22:23 AM
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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7-13 5-21	SAT	COMAL		71

DATE: 4/25/2022 11:22:24 AM
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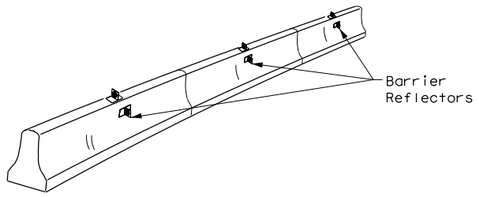
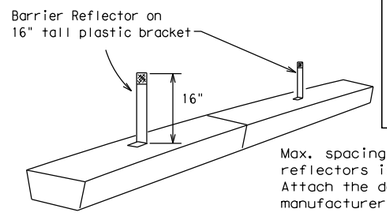
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



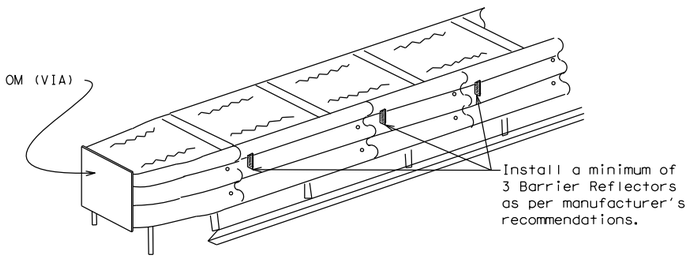
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

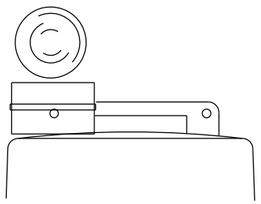
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

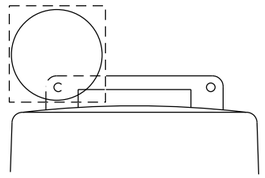
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

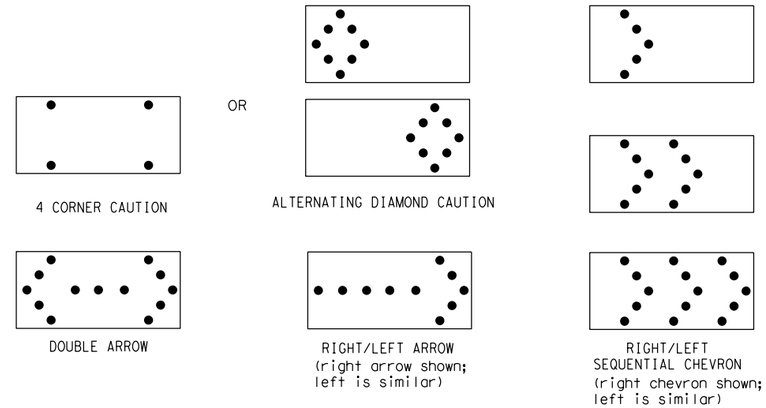
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

RIGHT/LEFT ARROW
(right arrow shown;
left is similar)

RIGHT/LEFT
SEQUENTIAL CHEVRON
(right chevron shown;
left is similar)

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SAT	COMAL		72

101

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

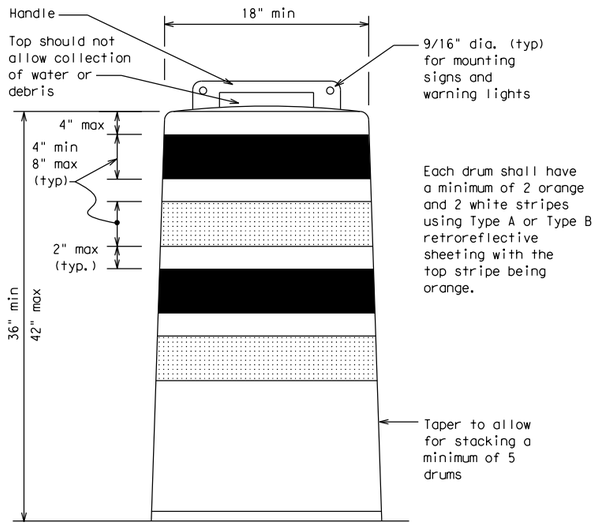
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

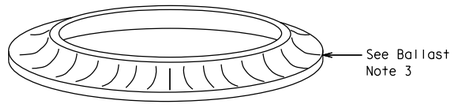
RETROREFLECTIVE SHEETING

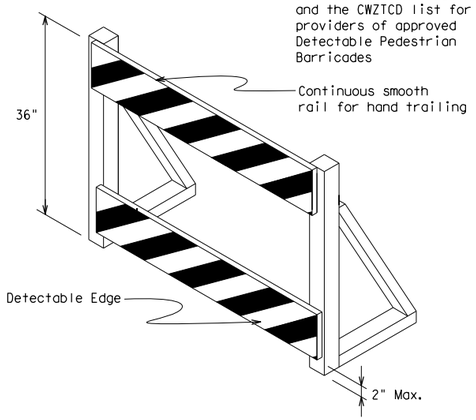
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

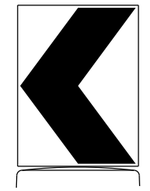




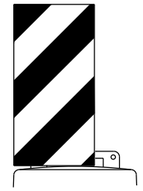


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	SAT	COMAL		73
7-13				

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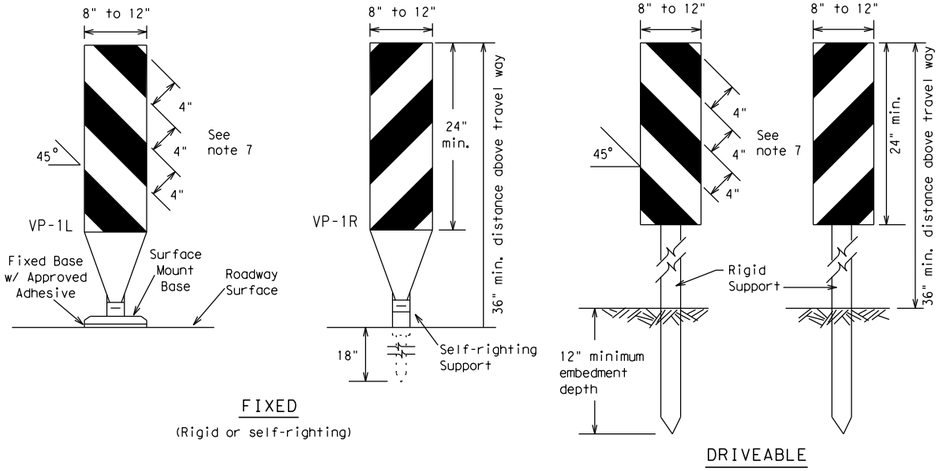
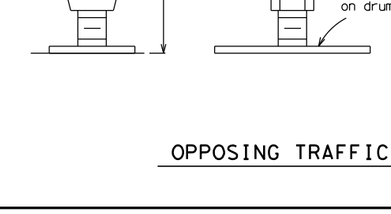


FIXED

(Rigid or self-righting)

DRIVEABLE

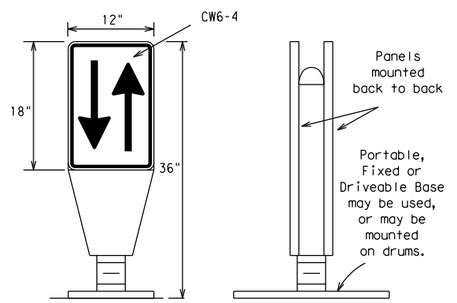


(Rigid or self-righting)

PORTABLE

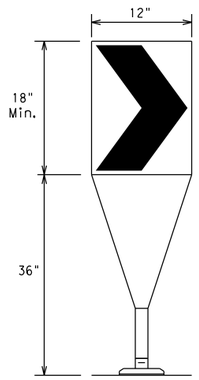
VERTICAL PANELS (VPs)

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



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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.



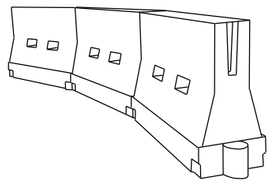
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

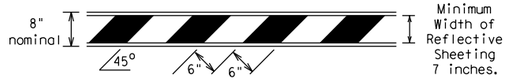
BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SAT	COMAL		74

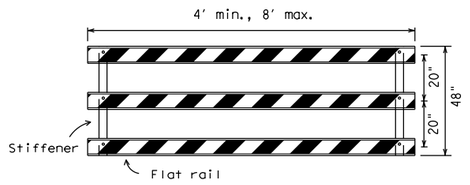
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



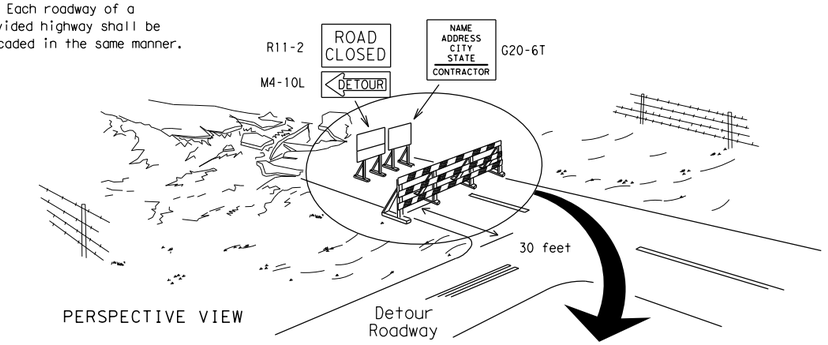
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

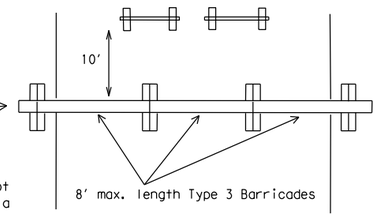
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

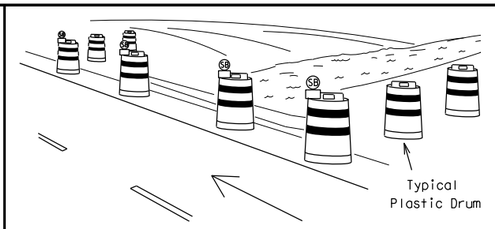
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

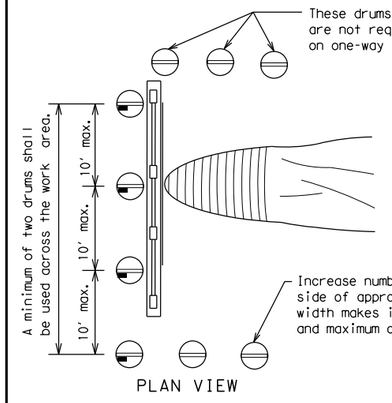
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

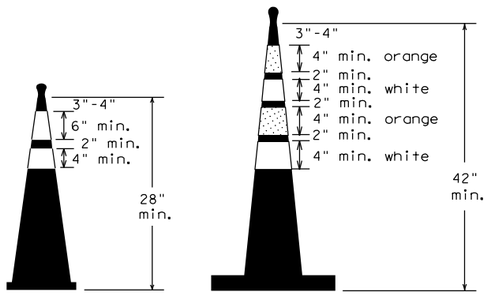
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



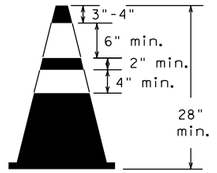
PLAN VIEW

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

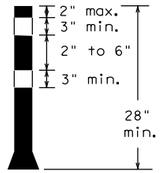
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

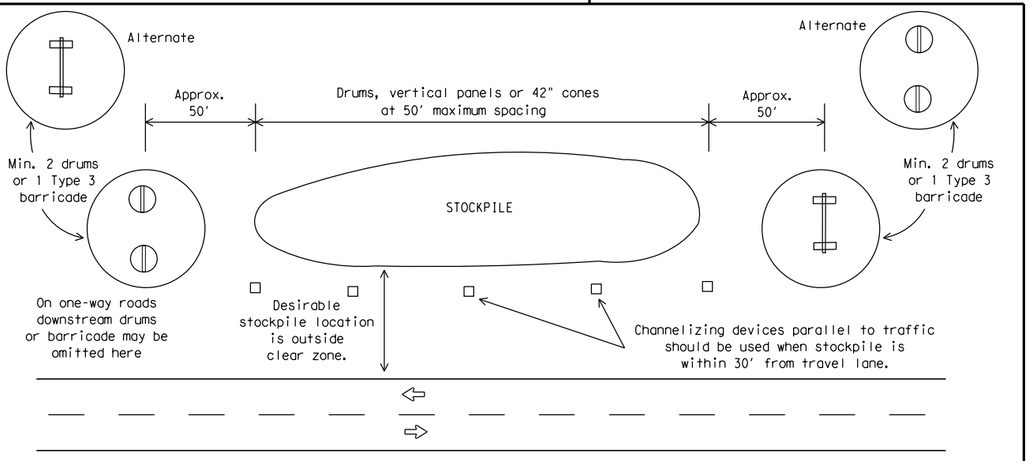


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

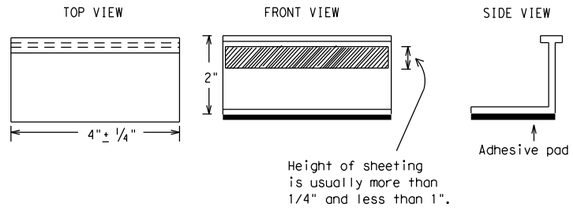
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 2-98 9-07 5-21 1-02 7-13 11-02 8-14	0915	17	072	CS, ETC
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	SAT	COMAL		76

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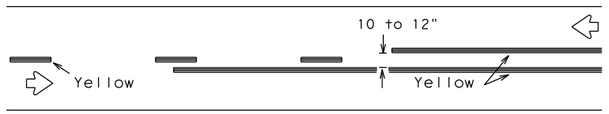
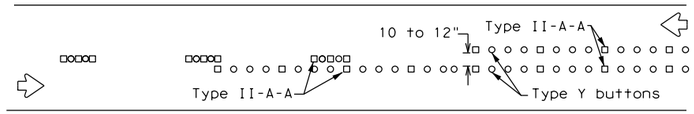
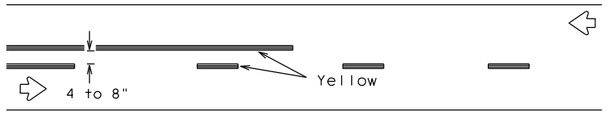
PAVEMENT MARKING PATTERNS



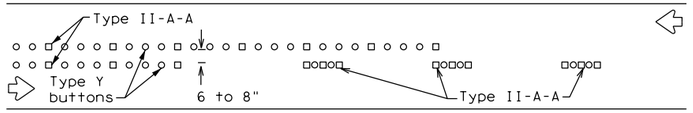
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



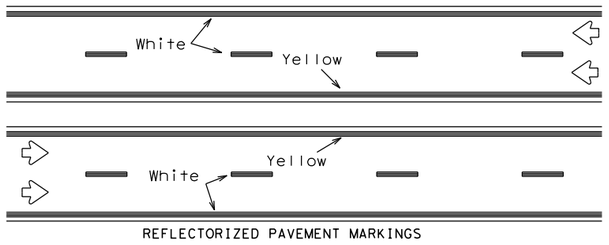
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



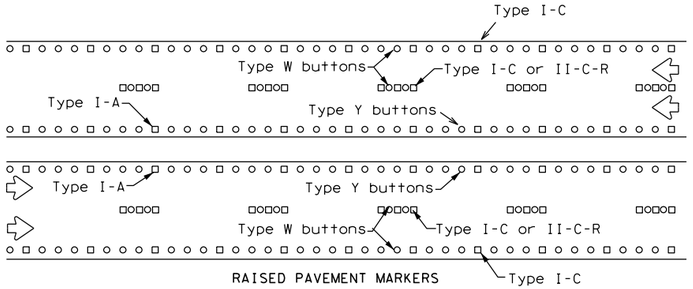
RAISED PAVEMENT MARKERS - PATTERN B

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

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



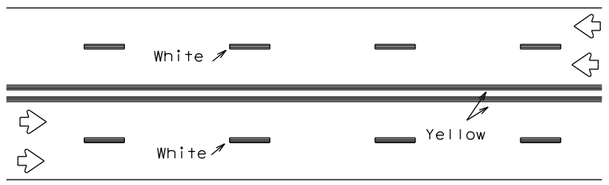
REFLECTORIZED PAVEMENT MARKINGS



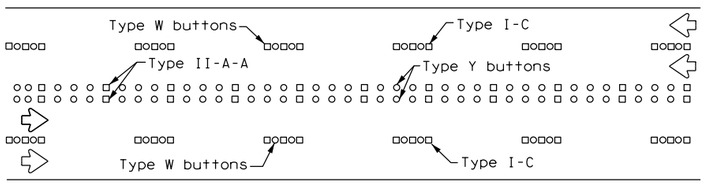
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



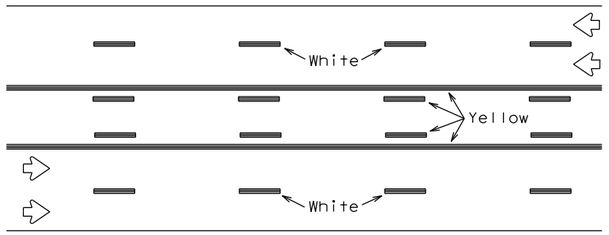
REFLECTORIZED PAVEMENT MARKINGS



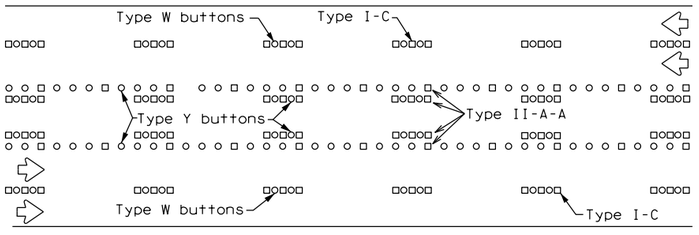
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

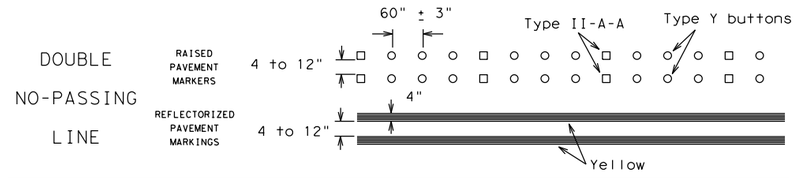
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

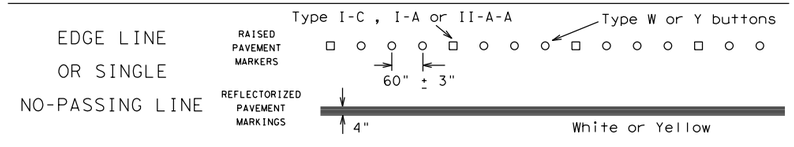
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

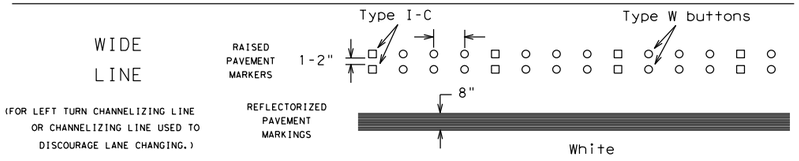


EDGE LINE OR SINGLE NO-PASSING LINE



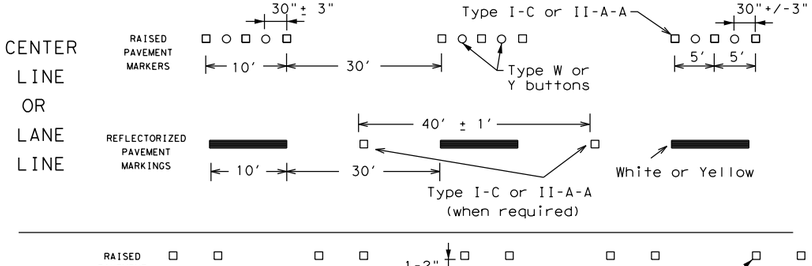
WIDE LINE

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

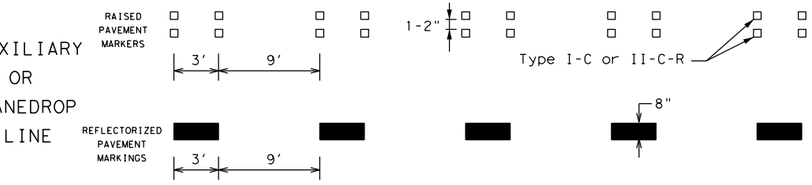


BROKEN LINES

CENTER LINE OR LANE LINE

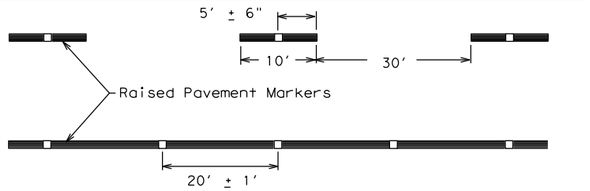


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		77

DATE: 4/25/2022 11:22:39 AM
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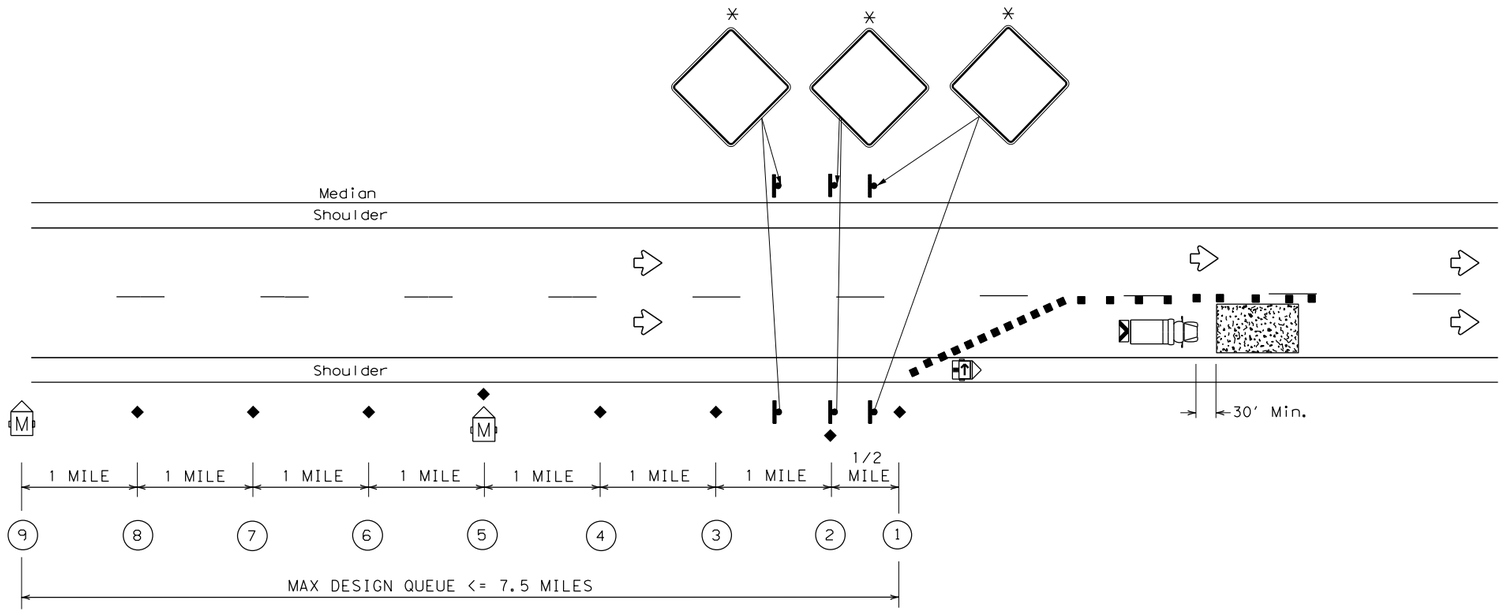
* Signs are for illustrative purposes only. Signs type and placement will vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

LEGEND			
	Work Area		Traffic Flow
	Sign		Portable Traffic Sensor
	Channelizing Devices		Truck Mounted Attenuator (TMA)
(1)	Location		Flag
	Heavy Work Vehicle		Trailer Mounted Flashing Arrow Board
M	Portable Changeable Message Sign (PCMS)		



Type I - QUEUE DETECTION SYSTEM

(Max Design Queue <= 7.5 Miles)

GENERAL NOTES

1. Unless project conditions and manufacturer's specifications dictate otherwise, the number of PCMS, static signs and spacing of sensors will be as shown in the plans.
2. Temporary Queue Detection System devices shall be operational only while work is actually in progress or a definite need exists.
3. Refer to TCP and BC Traffic Engineering Standard sheets for additional information regarding the type and placement of temporary traffic control devices.
4. The viewing angle of the sensors should not be blocked.
5. Sensor at location (1) may be mounted on the Flashing Arrow Board Trailer in the taper if spacing is adequate.
6. Pay item should be paid under Special Specification "Temporary Queue Detection System".
7. See Standard sheet WZ-ITS(2) for operational guidelines for PCMS messages.

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY QUEUE DETECTION SYSTEM TYPE 1 (Queue <= 7.5 Miles)

WZ-ITS(1)-19

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	SAT	COMAL		78

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OPERATIONAL GUIDELINES FOR PCMS MESSAGES

Message at (9)	Last 5 MIN Speed Averages V(MPH)				Message at (5)	Last 5 MIN Speed Averages V(MPH)			
	Sensor at (8)	Sensor at (7)	Sensor at (6)	Sensor at (5)		Sensor at (4)	Sensor at (3)	Sensor at (2)	Sensor at (1)
ROAD WORK AHEAD	> 45	> 45	> 45	> 45	ROAD WORK AHEAD	> 45	> 45	> 45	> 45
ROAD WORK AHEAD	> 45	> 45	> 45	> 45	SLOW TRAFFIC 3 MILES	> 45	> 45	> 45	25 < V < 45
ROAD WORK AHEAD	> 45	> 45	> 45	> 45	SLOW TRAFFIC 2 MILES	> 45	> 45	25 < V < 45	25 < V < 45
ROAD WORK AHEAD	> 45	> 45	> 45	> 45	SLOW TRAFFIC 1 MILE	> 45	25 < V < 45	25 < V < 45	25 < V < 45
ROAD WORK AHEAD	> 45	> 45	> 45	> 45	SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC 3 MILES	> 45	> 45	> 45	25 < V < 45	SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC 2 MILES	> 45	> 45	25 < V < 45	25 < V < 45	SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC 1 MILE	> 45	25 < V < 45	25 < V < 45	25 < V < 45	SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45	SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC AHEAD	> 25	> 25	> 25	> 25	STOPPED TRAFFIC 3 MILES	> 25	> 25	> 25	<= 25
SLOW TRAFFIC AHEAD	> 25	> 25	> 25	> 25	STOPPED TRAFFIC 2 MILES	> 25	> 25	<= 25	<= 25
SLOW TRAFFIC AHEAD	> 25	> 25	> 25	> 25	STOPPED TRAFFIC 1 MILE	> 25	<= 25	<= 25	<= 25
SLOW TRAFFIC AHEAD	> 25	> 25	> 25	> 25	STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25
STOPPED TRAFFIC 3 MILES	> 25	> 25	> 25	<= 25	STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25
STOPPED TRAFFIC 2 MILES	> 25	> 25	<= 25	<= 25	STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25
STOPPED TRAFFIC 1 MILE	> 25	<= 25	<= 25	<= 25	STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25
STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25	STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25

Texas Department of Transportation | Traffic Safety Division Standard

TEMPORARY QUEUE DETECTION SYSTEM TYPE 1 (Queue <= 7.5 Miles)

WZ-ITS(2)-19

FILE: wz-its(1)-19.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2019	CONT	SECT	JOB	HIGHWAY
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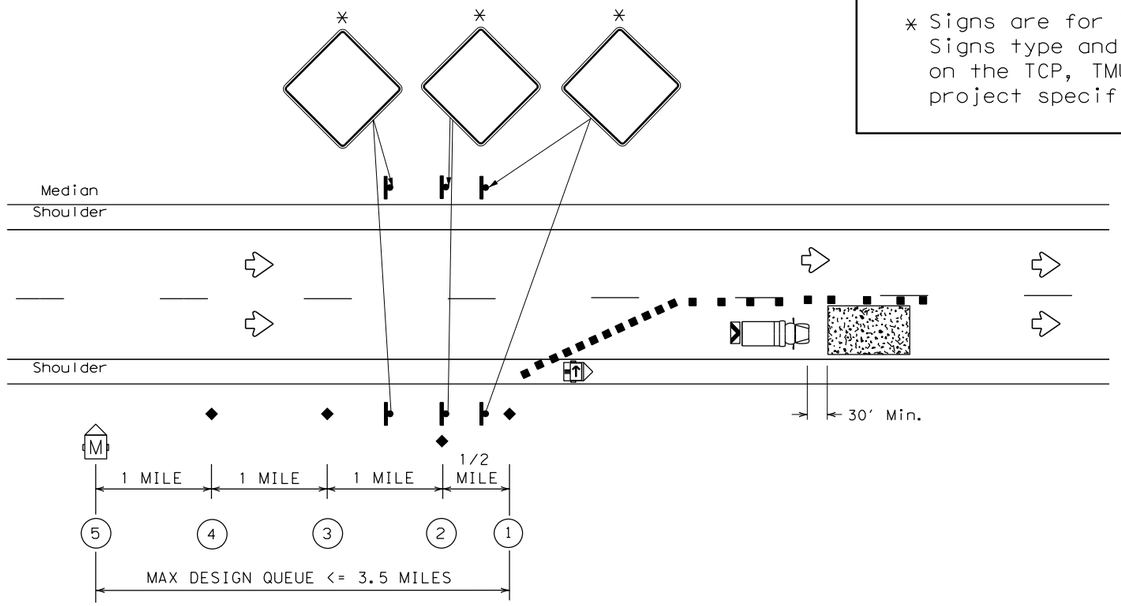

* Signs are for illustrative purposes only. Signs type and placement will vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

Type 2 - QUEUE DETECTION SYSTEM

(Max Design Queue <=3.5 Miles)

OPERATIONAL GUIDELINE FOR PCMS MESSAGES				
Message at (5)	Last 5 MIN Speed Averages V(MPH)			
	Sensor at (4)	Sensor at (3)	Sensor at (2)	Sensor at (1)
ROAD WORK AHEAD	> 45	> 45	> 45	> 45
SLOW TRAFFIC 3 MILES	> 45	> 45	> 45	25 < V < 45
SLOW TRAFFIC 2 MILES	> 45	> 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC 1 MILE	> 45	25 < V < 45	25 < V < 45	25 < V < 45
SLOW TRAFFIC AHEAD	25 < V < 45	25 < V < 45	25 < V < 45	25 < V < 45
STOPPED TRAFFIC 3 MILES	> 25	> 25	> 25	<= 25
STOPPED TRAFFIC 2 MILES	> 25	> 25	<= 25	<= 25
STOPPED TRAFFIC 1 MILE	> 25	<= 25	<= 25	<= 25
STOPPED TRAFFIC AHEAD	<= 25	<= 25	<= 25	<= 25

LEGEND			
	Work Area		Traffic Flow
	Sign		Portable Traffic Sensor
	Channelizing Devices		Truck Mounted Attenuator (TMA)
(1)	Location		Flag
	Heavy Work Vehicle		Trailer Mounted Flashing Arrow Board
M	Portable Changeable Message Sign (PCMS)		

GENERAL NOTES

1. Unless project conditions and manufacturer's specifications dictate otherwise, the number of PCMS, static signs and spacing of sensors will be as shown in the plans.
2. Temporary Queue Detection System devices shall be operational only while work is actually in progress or a definite need exists.
3. Refer to TCP and BC Traffic Engineering Standard sheets for additional information regarding the type and placement of temporary traffic control devices.
4. The viewing angle of the sensors should not be blocked.
5. Sensor at location (1) may be mounted on the Flashing Arrow Board Trailer in the taper if spacing is adequate.
6. Pay item should be paid under Special Specification "Temporary Queue Detection System".

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY QUEUE DETECTION SYSTEM TYPE 2

(Queue <= 3.5 Miles)

WZ-ITS(3)-19

FILE: wz-its(3)-19.dgn	DN:	CK:	DW:	CK:
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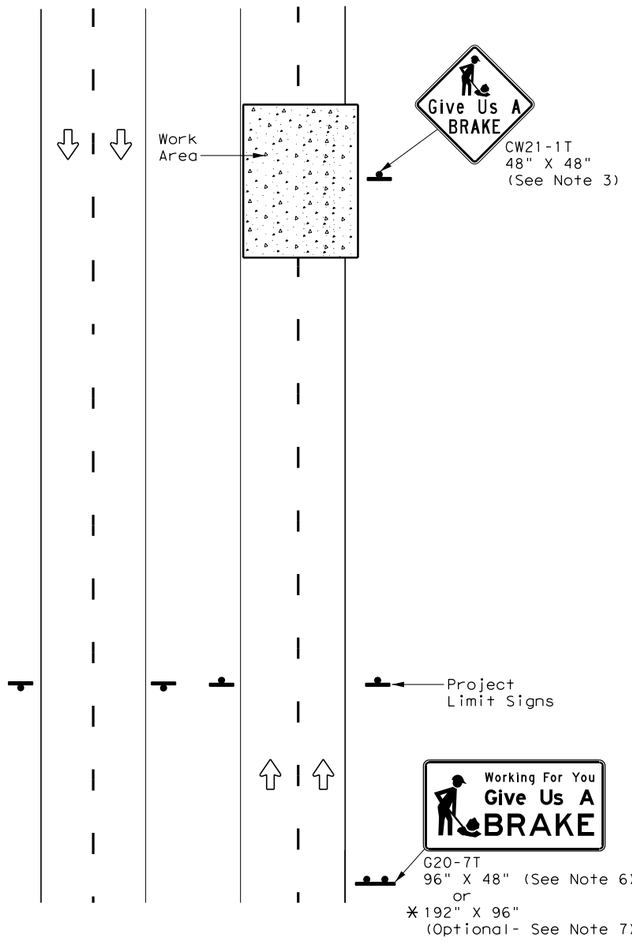
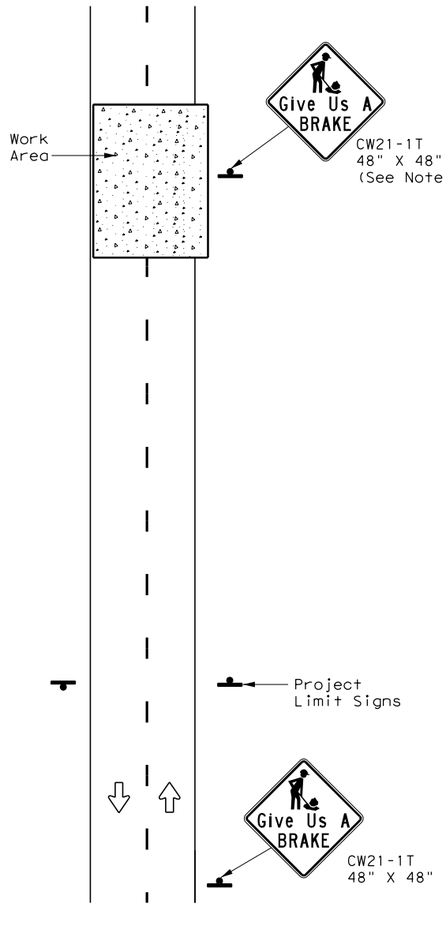


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
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	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

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
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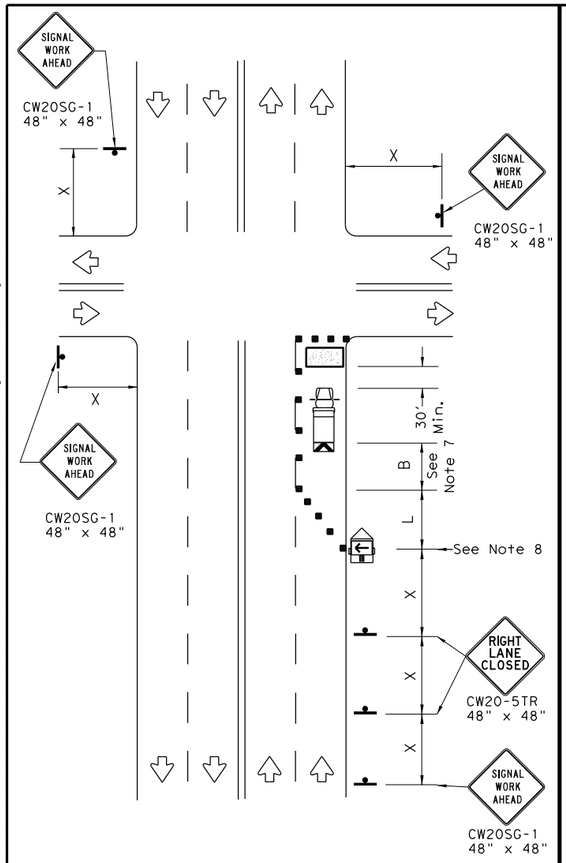
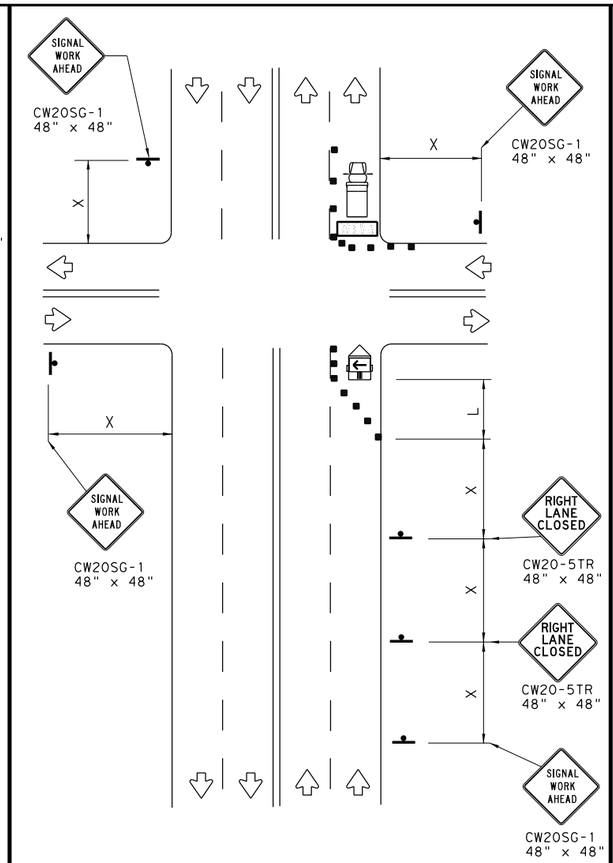
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	SAT	COMAL		81

116



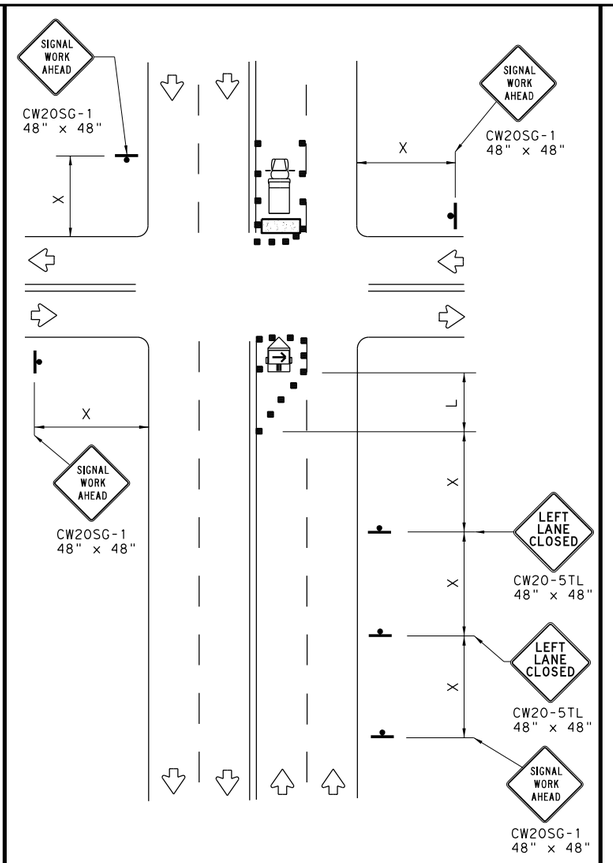
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

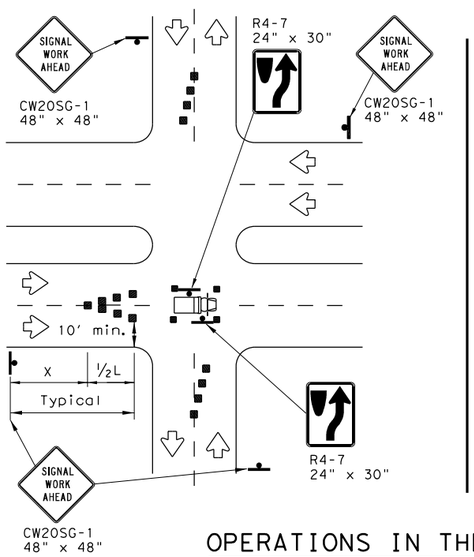
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

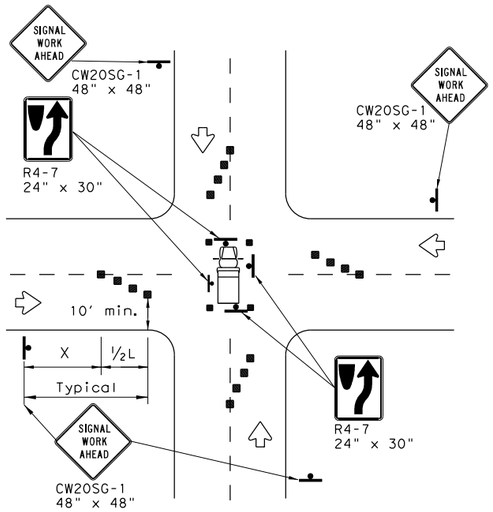
Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35	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

* Conventional Roads Only

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

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





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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4-98 3-03	SAT	COMAL		82

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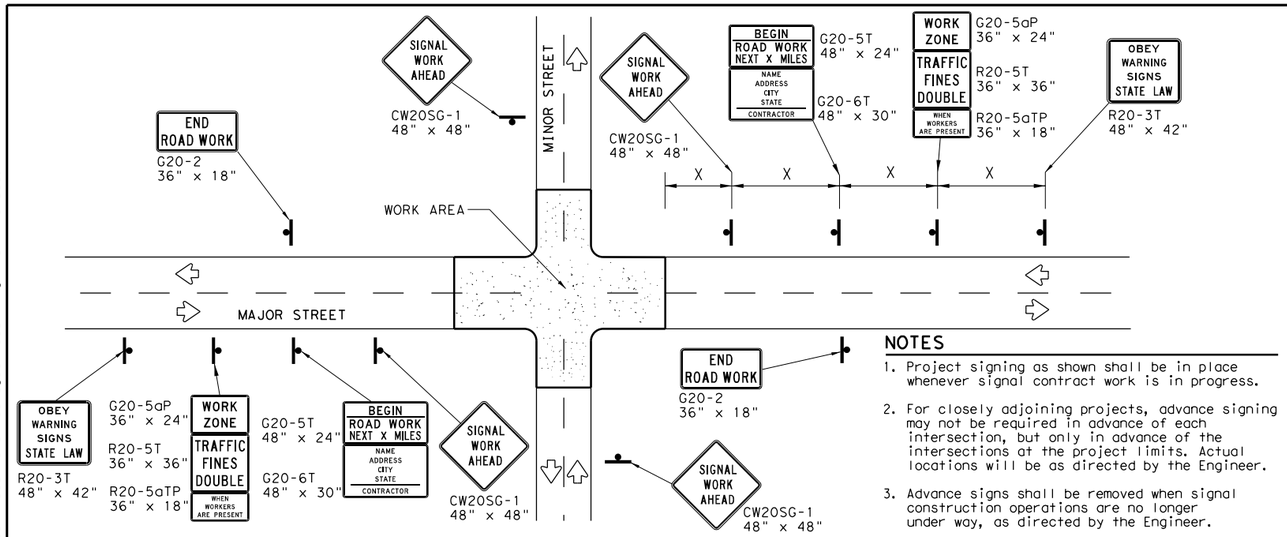


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

DURATION OF WORK

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

SIGN MOUNTING HEIGHT

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

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

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

SIGN SUPPORT WEIGHTS

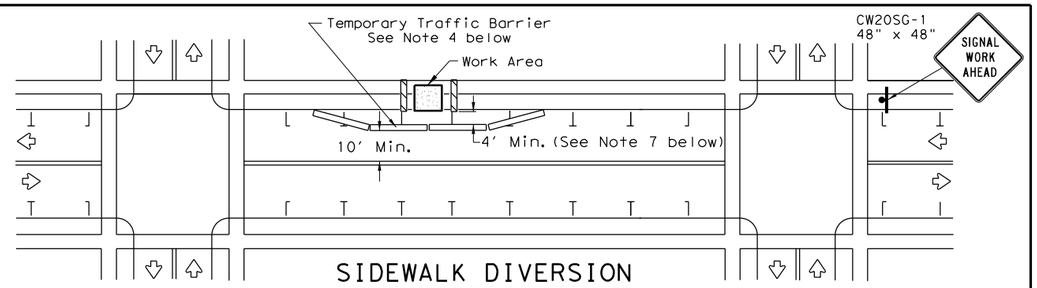
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

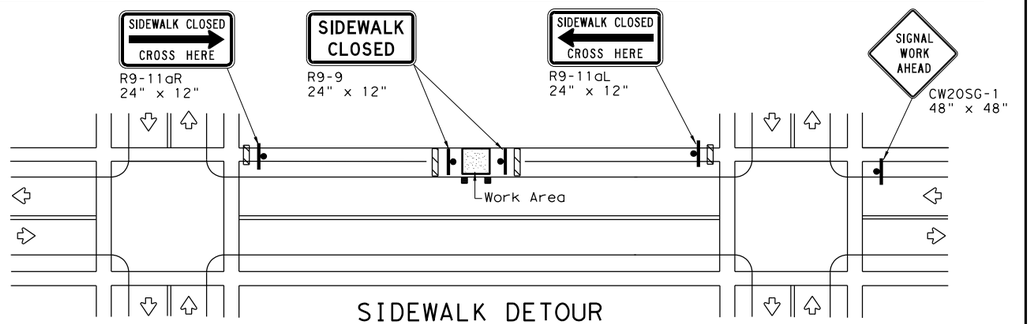
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

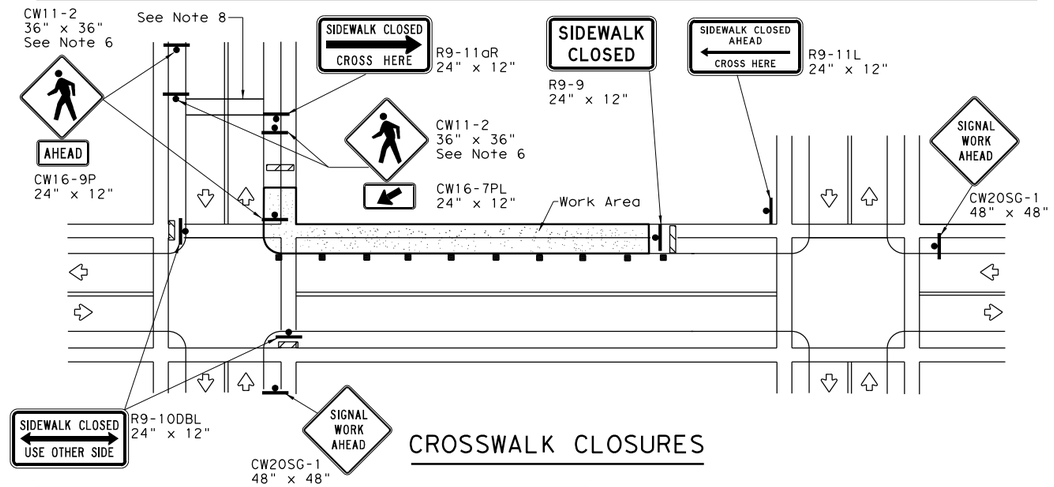
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	SAT	COMAL		83

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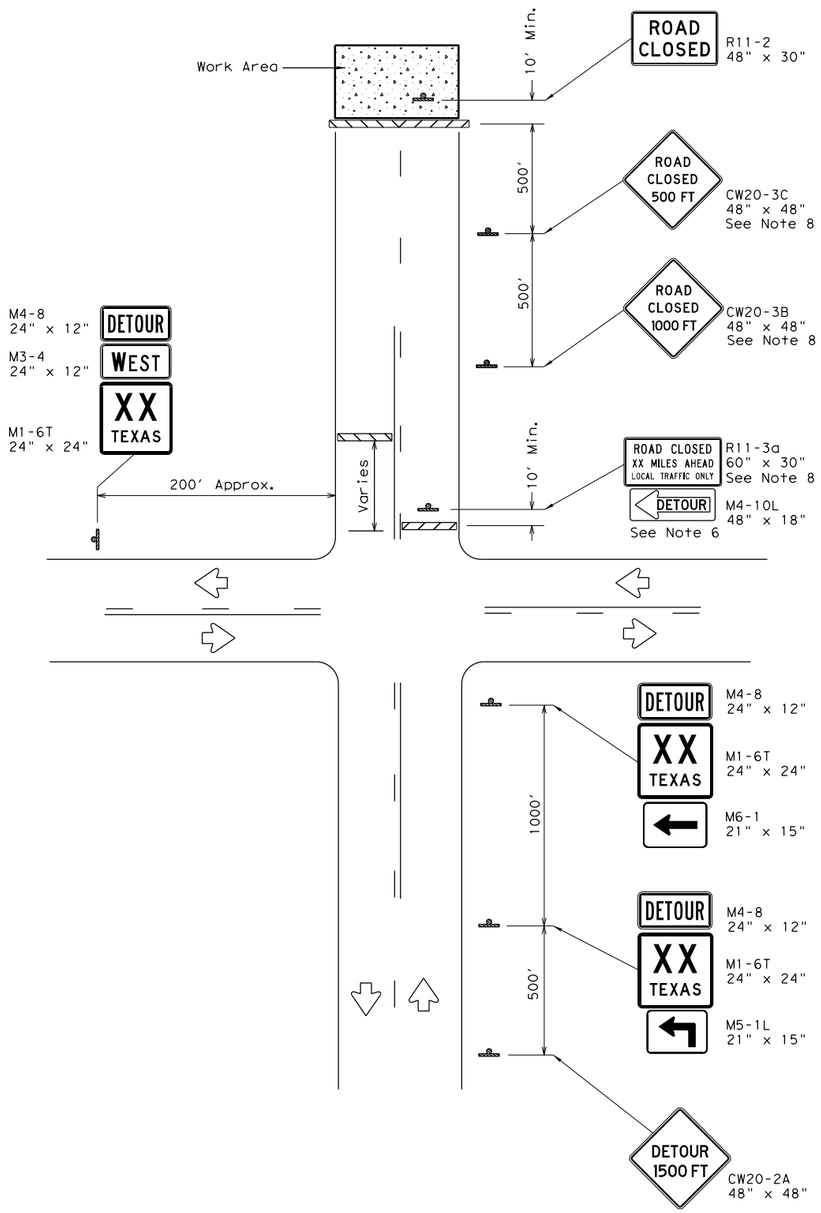
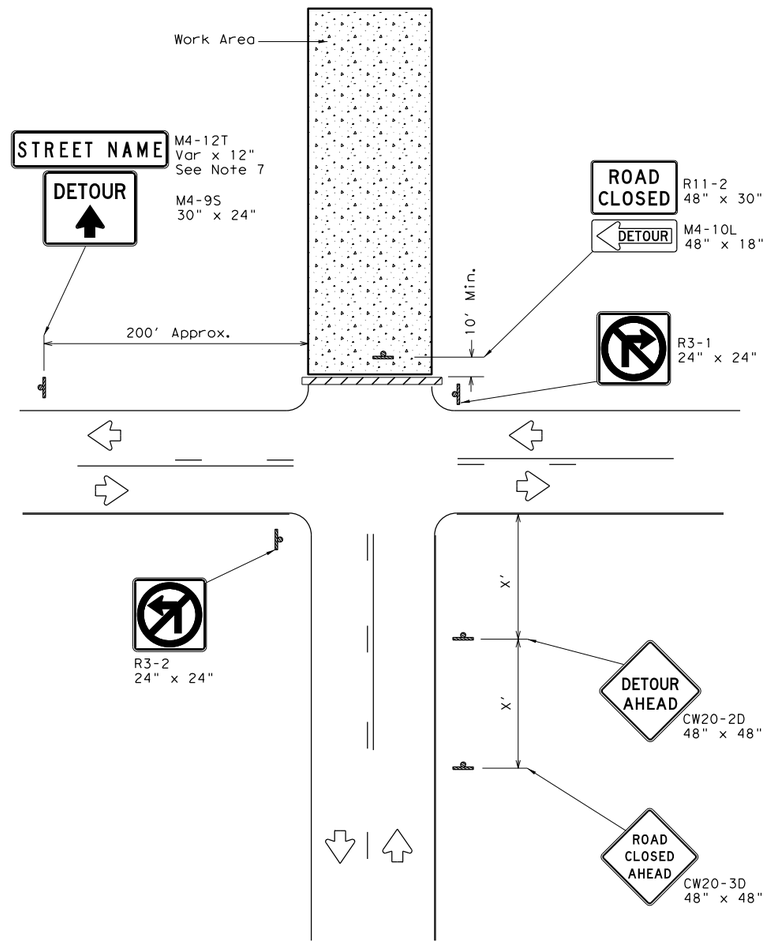


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

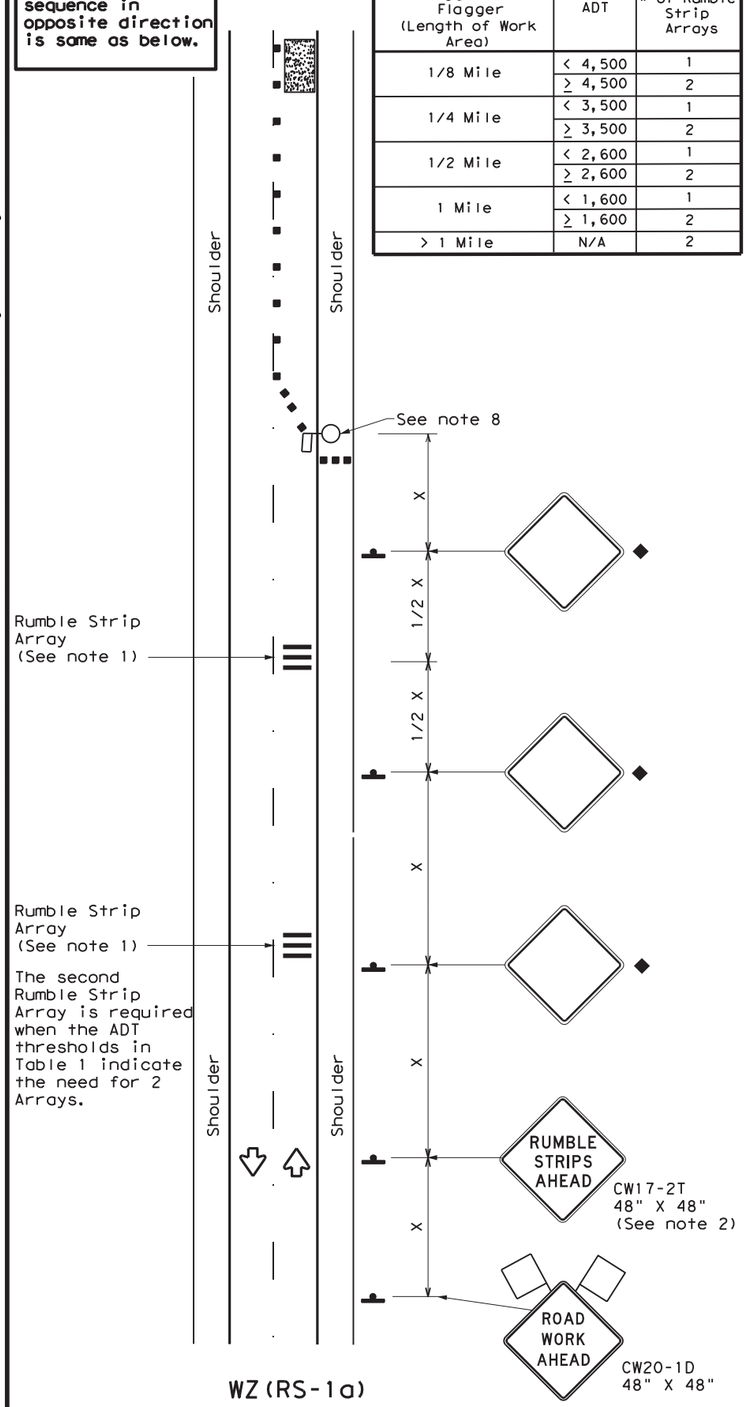
WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	SAT	COMAL		84

DATE:
FILE:

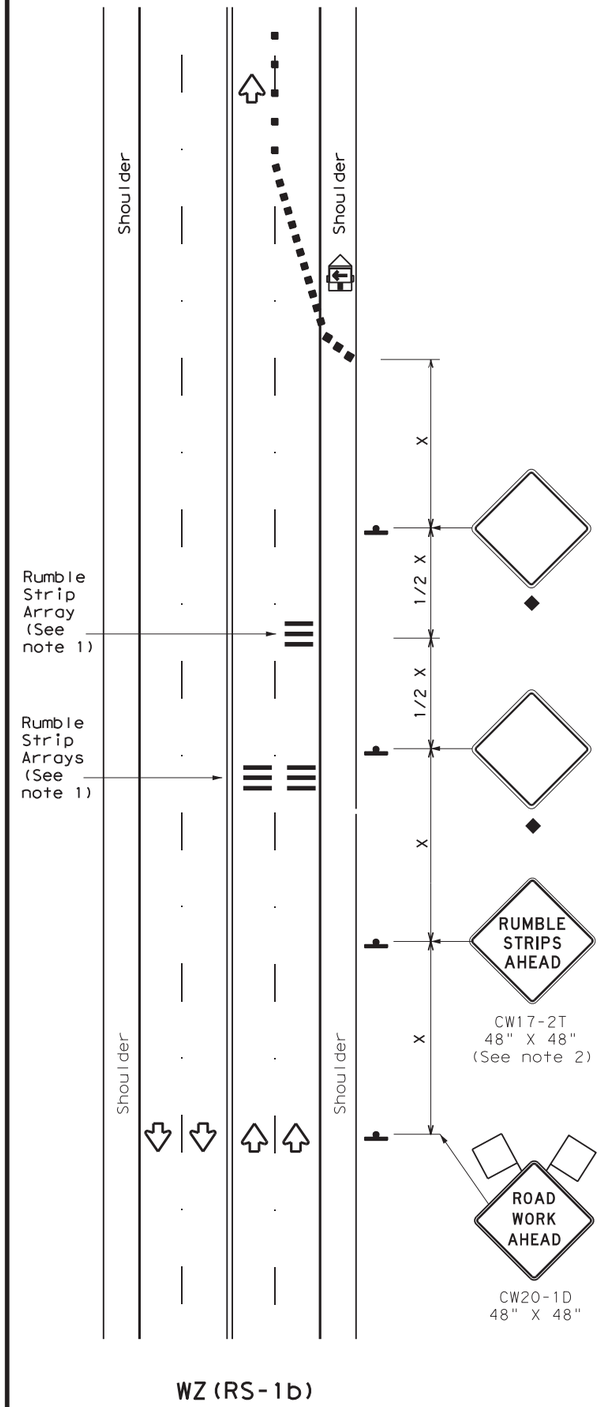
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0915	17	072	CS
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117

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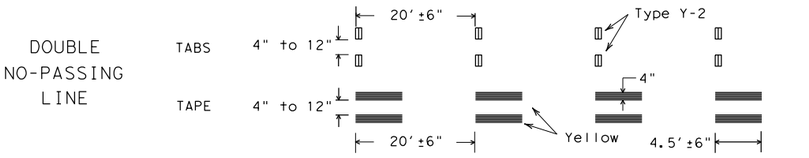
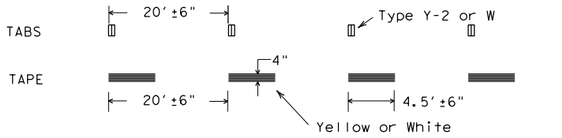
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

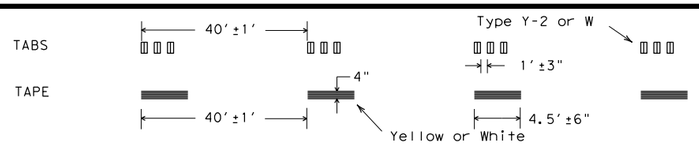


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



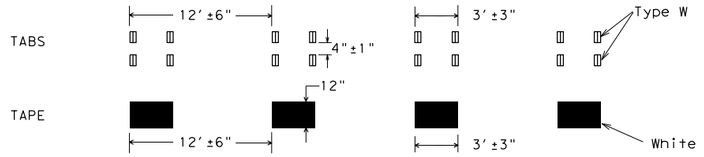
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

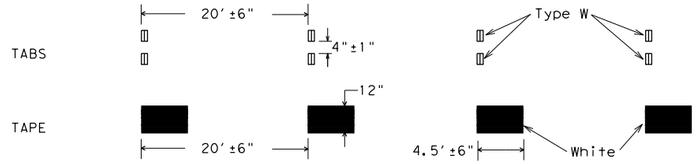


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



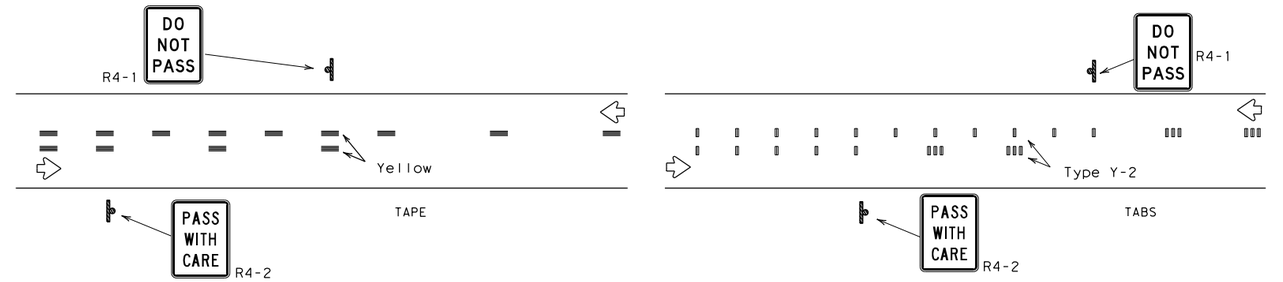
NOTES:

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

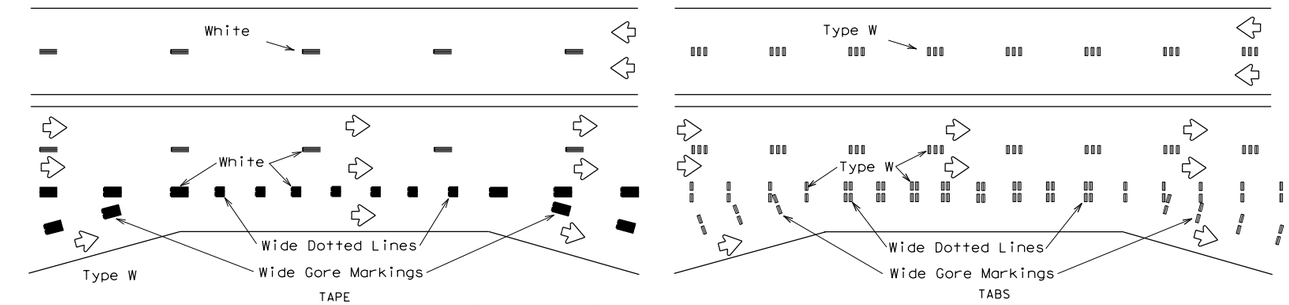
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

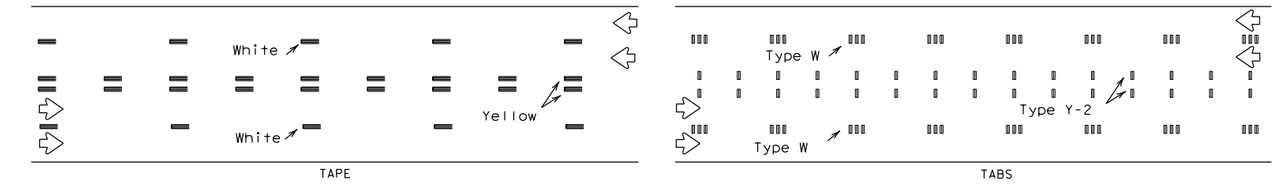
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



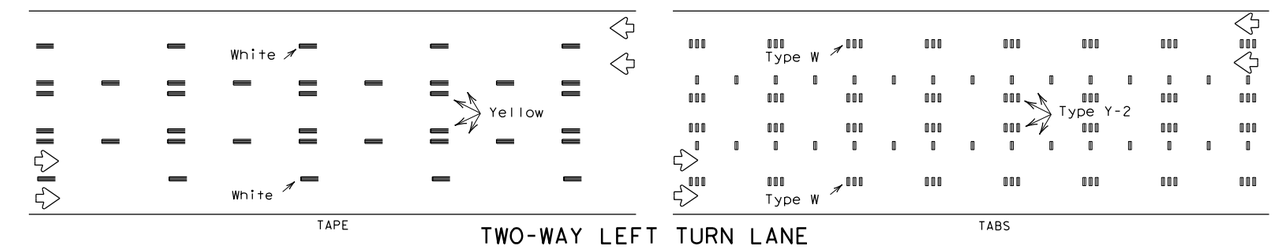
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



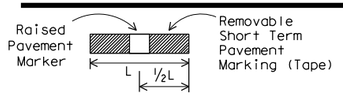
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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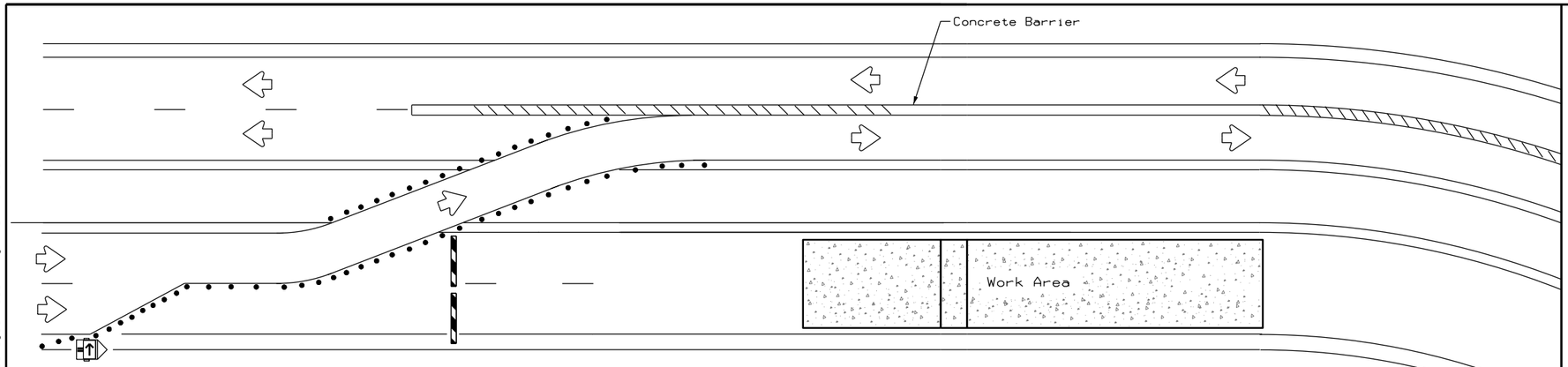
3-03		SAT	COMAL		86
7-13					

111



NOTES:

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

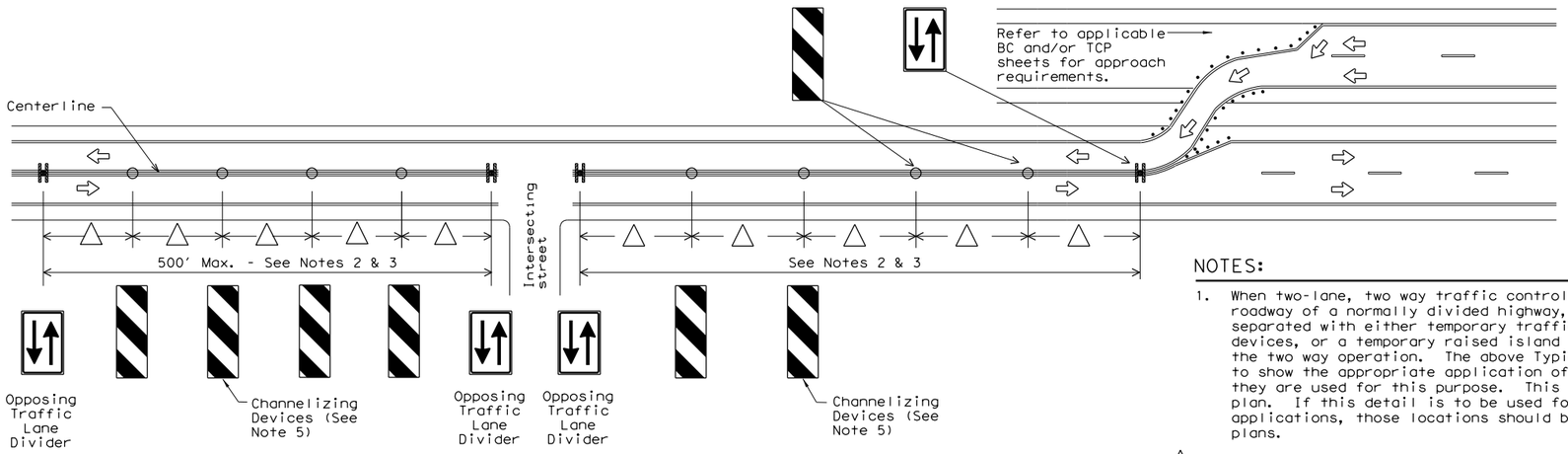
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

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

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



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

NOTES:

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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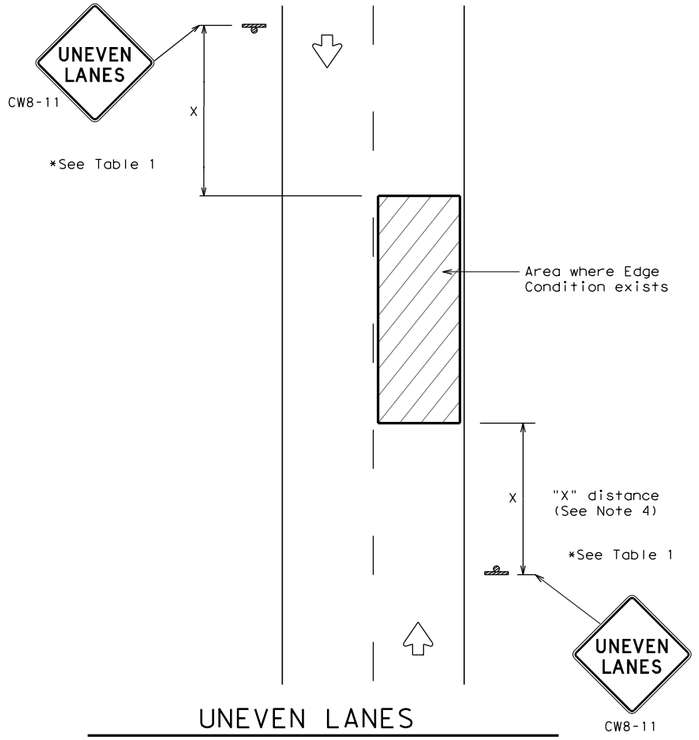
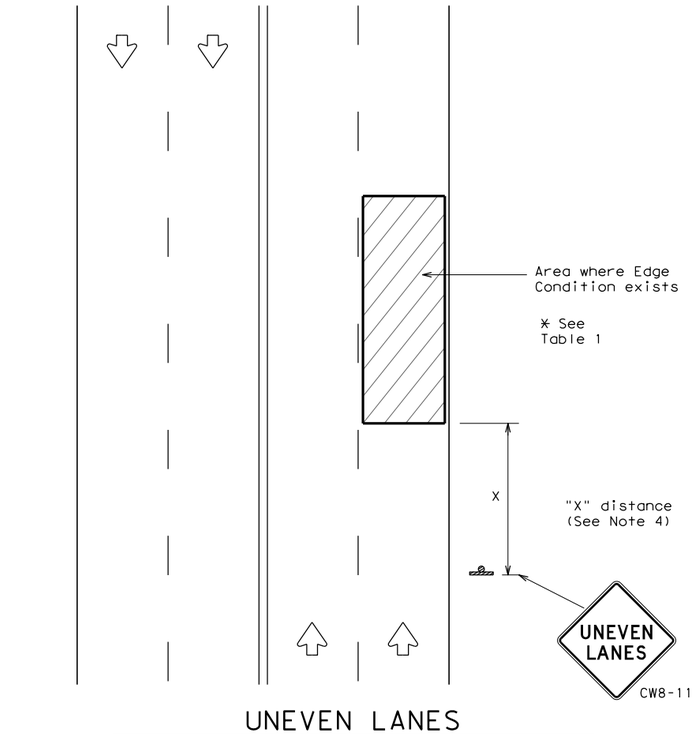
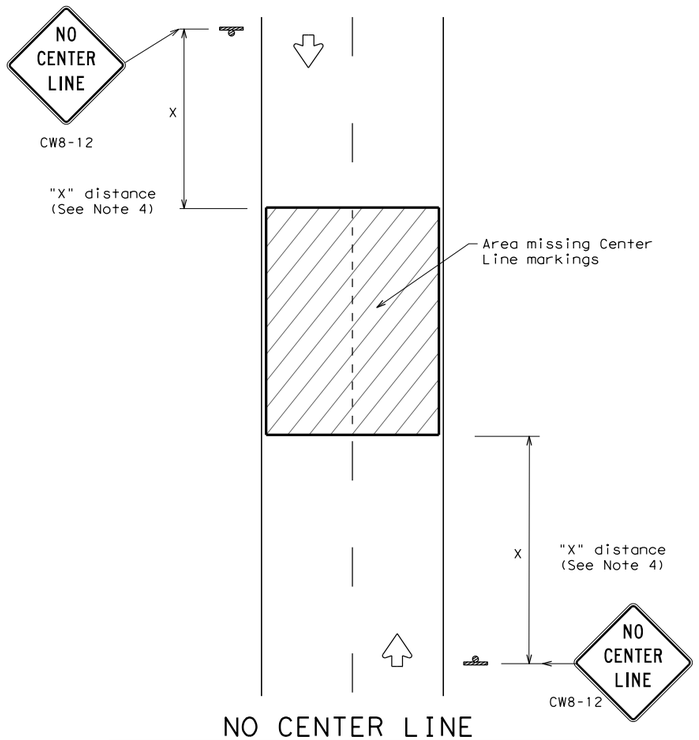


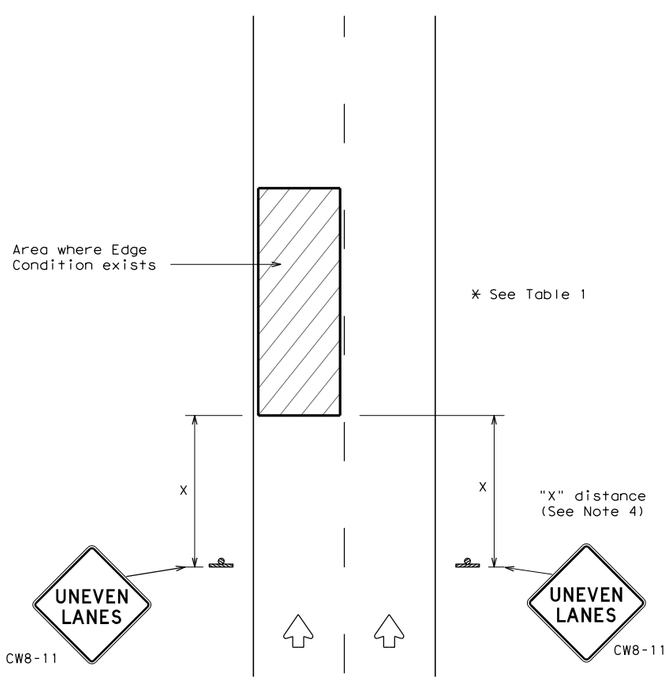
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

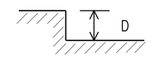
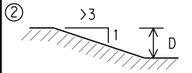
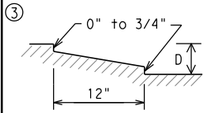
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	SAT	COMAL		88

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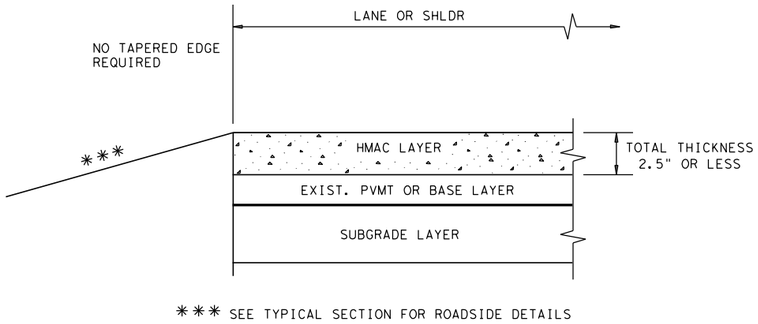
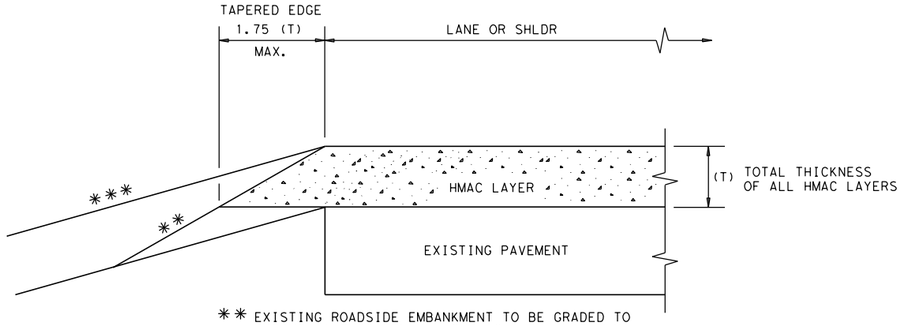


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 1

THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS

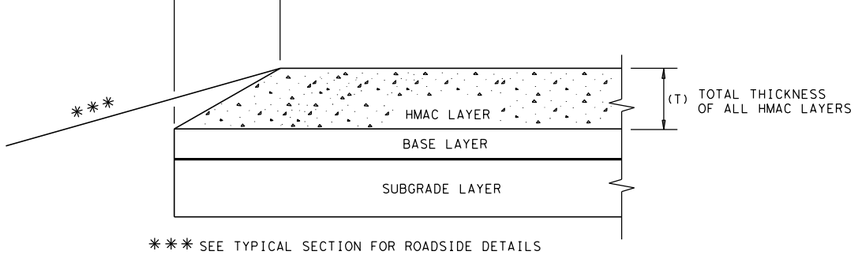


** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2

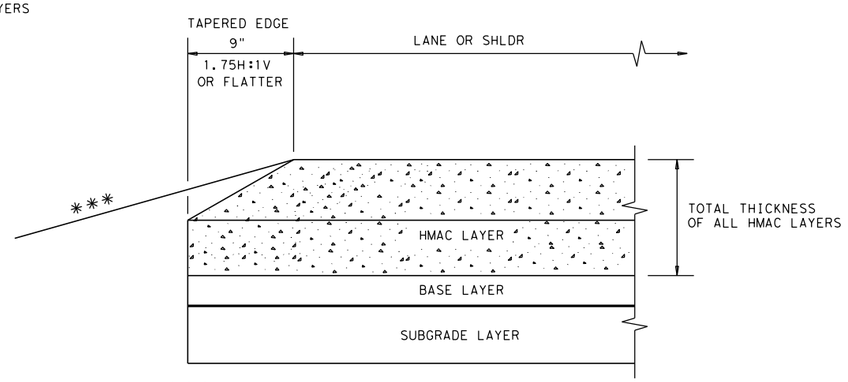
OVERLAY OF EXISTING PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3

NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4

NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

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

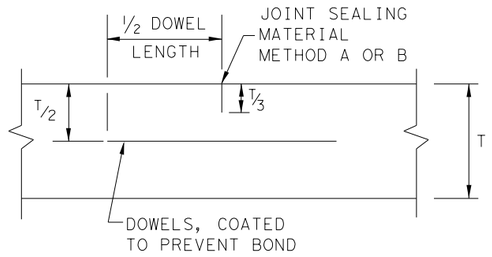
Texas Department of Transportation

Design Division Standard

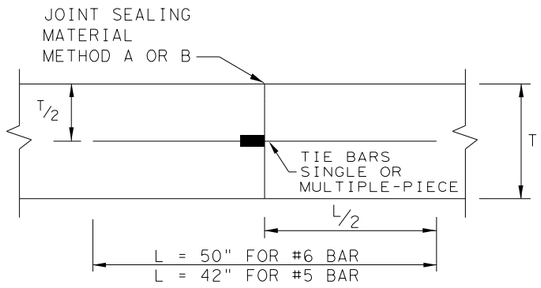
TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

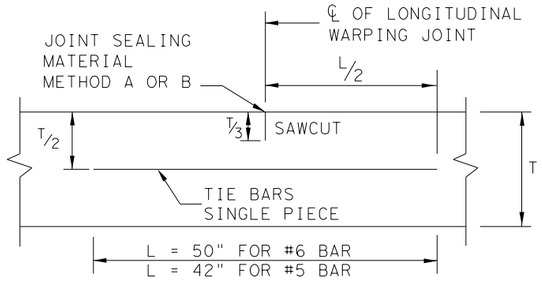
FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
©TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		89



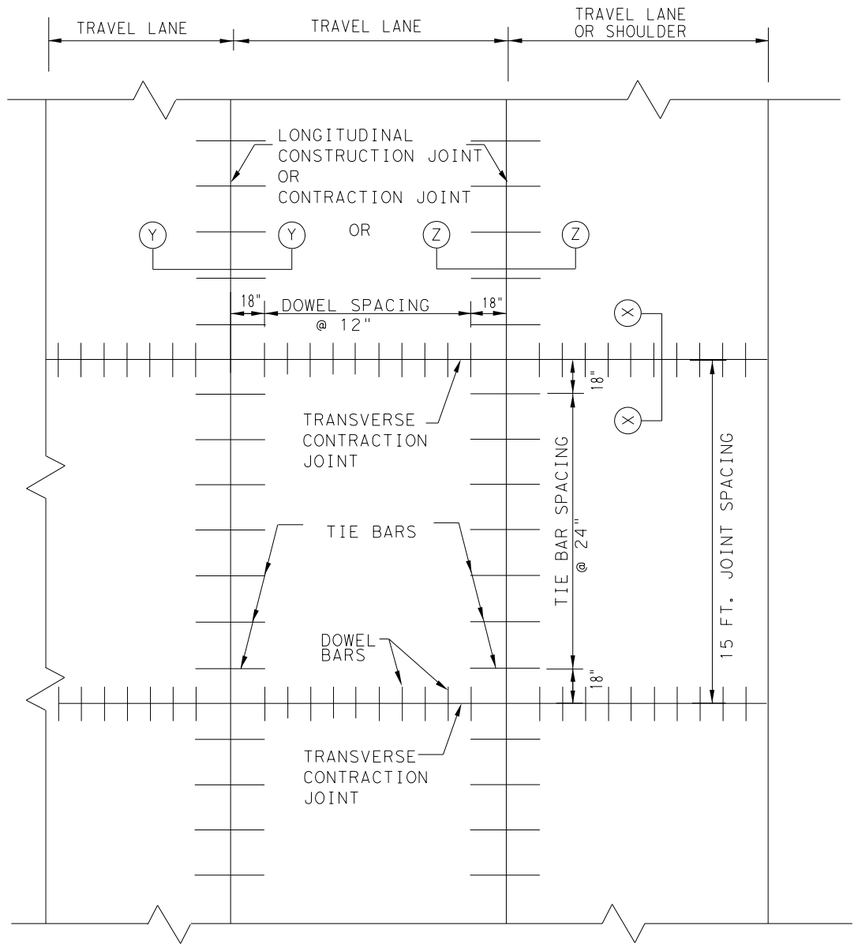
TRANSVERSE CONTRACTION JOINT
SECTION X-X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y-Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z-Z



TYPICAL PAVEMENT LAYOUT
PLAN VIEW (NOT TO SCALE)

GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDIANL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLABTHICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

TABLE NO. 1 DOWELS (SMOOTH BARS)

SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

TABLE NO. 2 TIE BARS (DEFORMED BARS)

SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

Texas Department of Transportation — Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
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	SAT	COMAL		90

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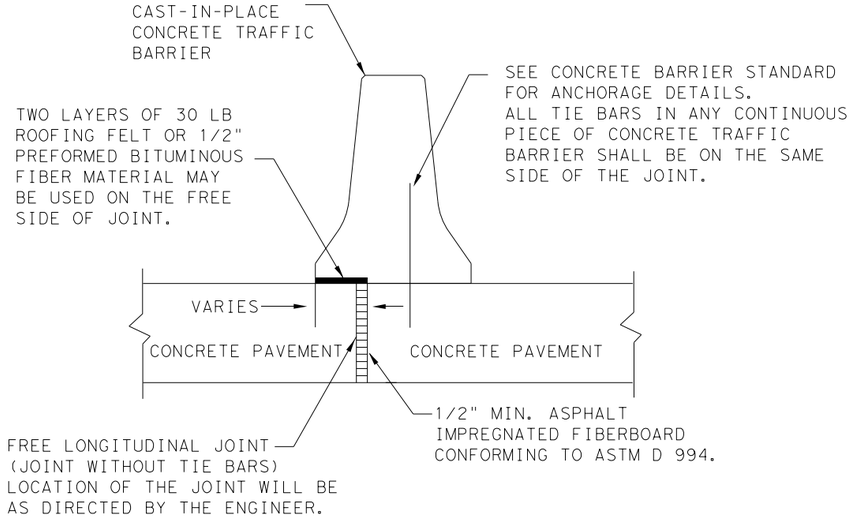
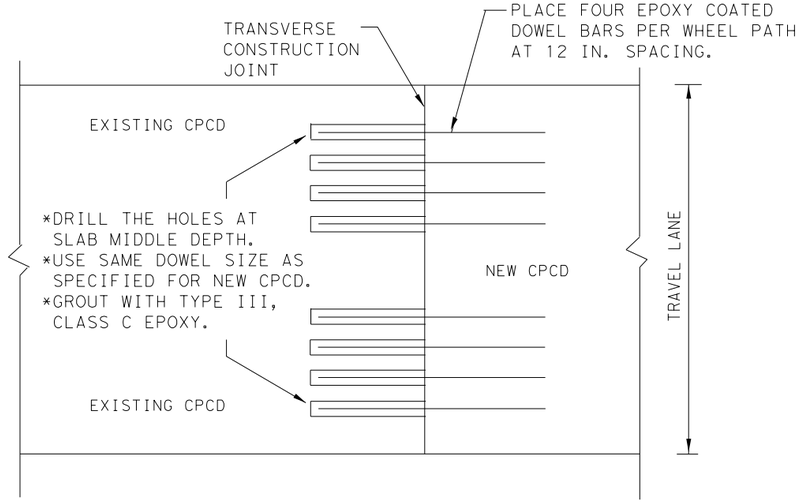
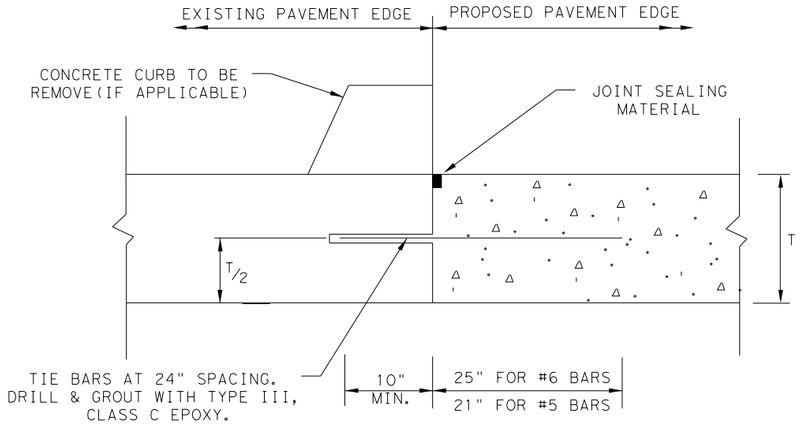


FREE LONGITUDINAL JOINT DETAIL

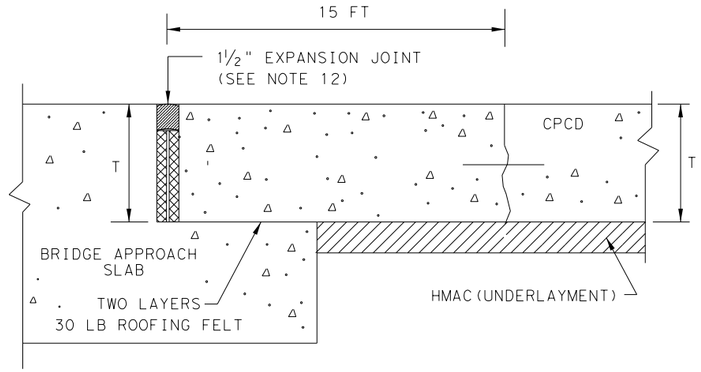


TRANSVERSE JOINT DETAIL
EXISTING CPCD TO NEW CPCD
PLAN VIEW (NOT TO SCALE)



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

LONGITUDINAL WIDENING JOINT DETAIL



TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		91

DATE: 4/25/2022
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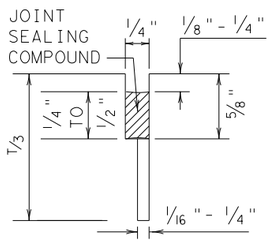
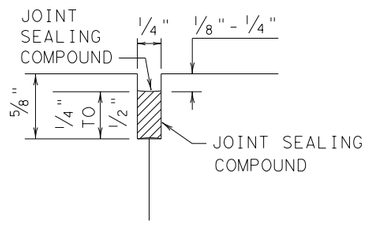
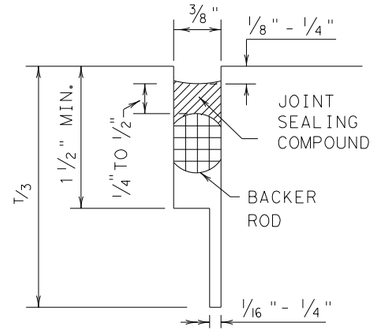
METHOD B: JOINT SEALING COMPOUND



LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



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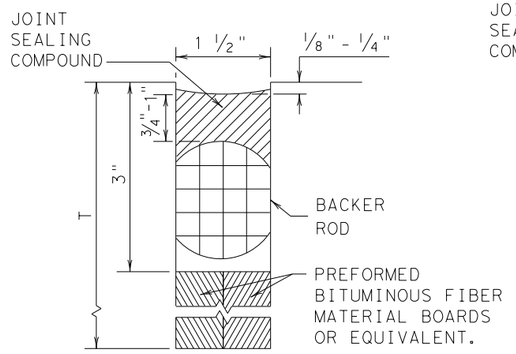
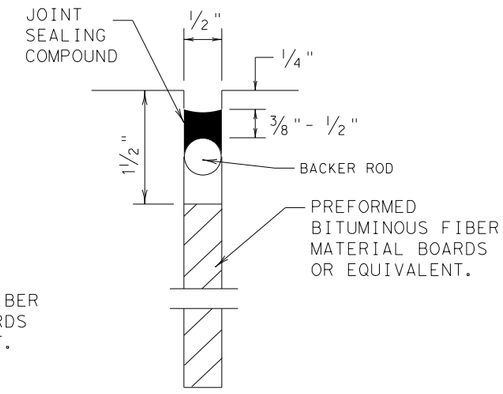
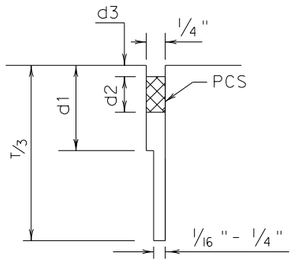


TRANSVERSE FORMED EXPANSION JOINT

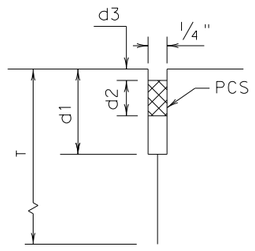


FORMED ISOLATION JOINT

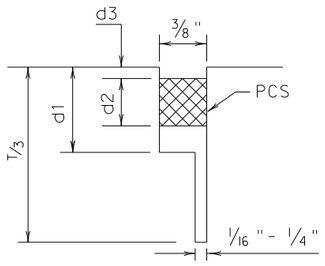
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



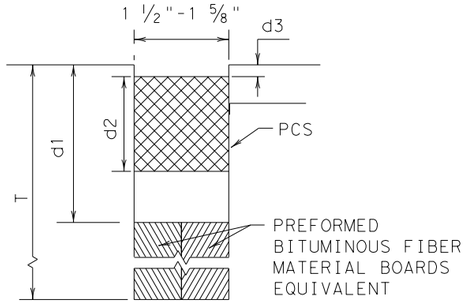
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation

Design Division Standard

CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
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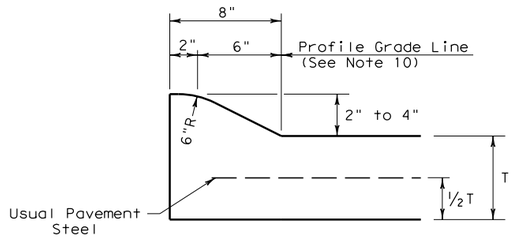
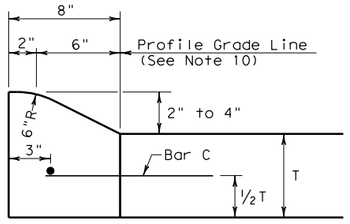
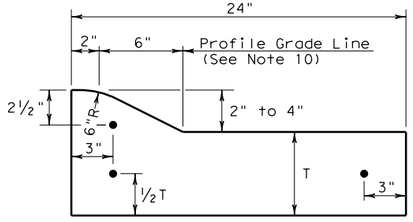


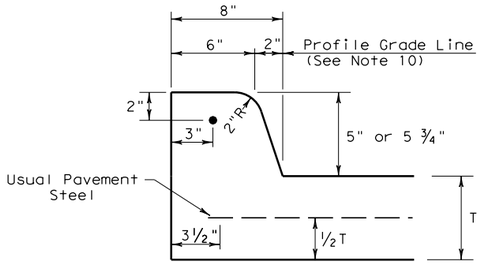
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



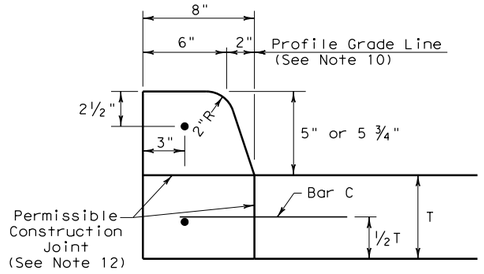
TYPE I CURB
2" - 4" HEIGHT



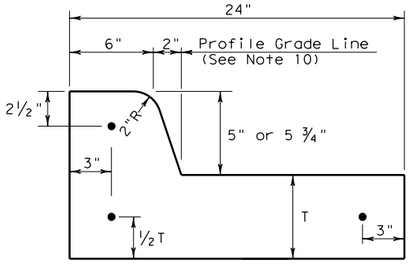
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



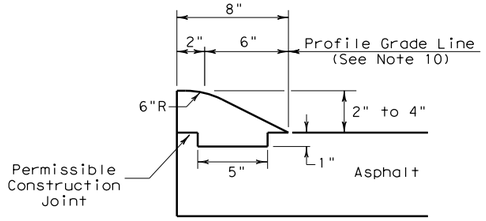
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



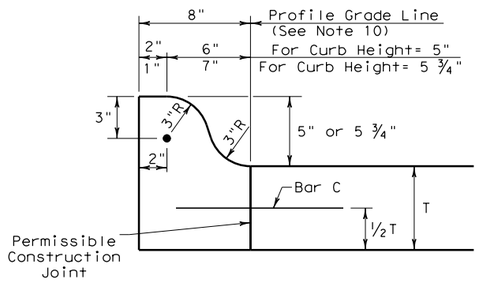
TYPE II CURB
5" - 5 ¾" HEIGHT



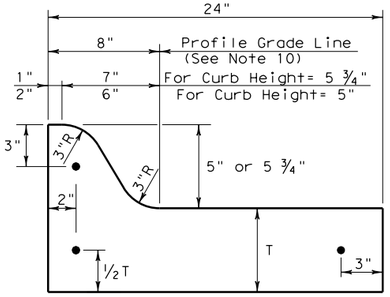
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



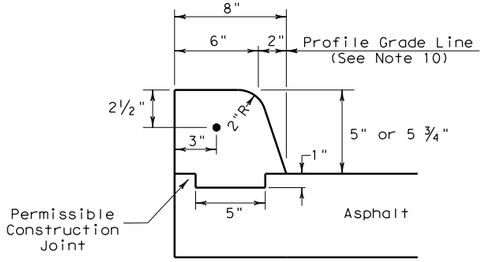
TYPE III CURB (KEYED)
2" - 4" HEIGHT



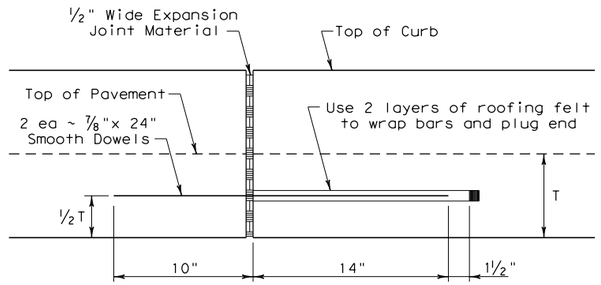
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

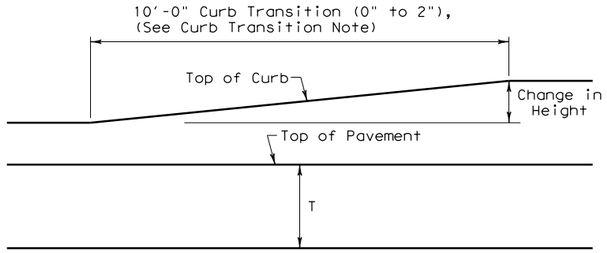


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

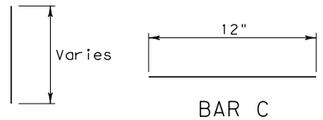
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.



BAR B

BAR C

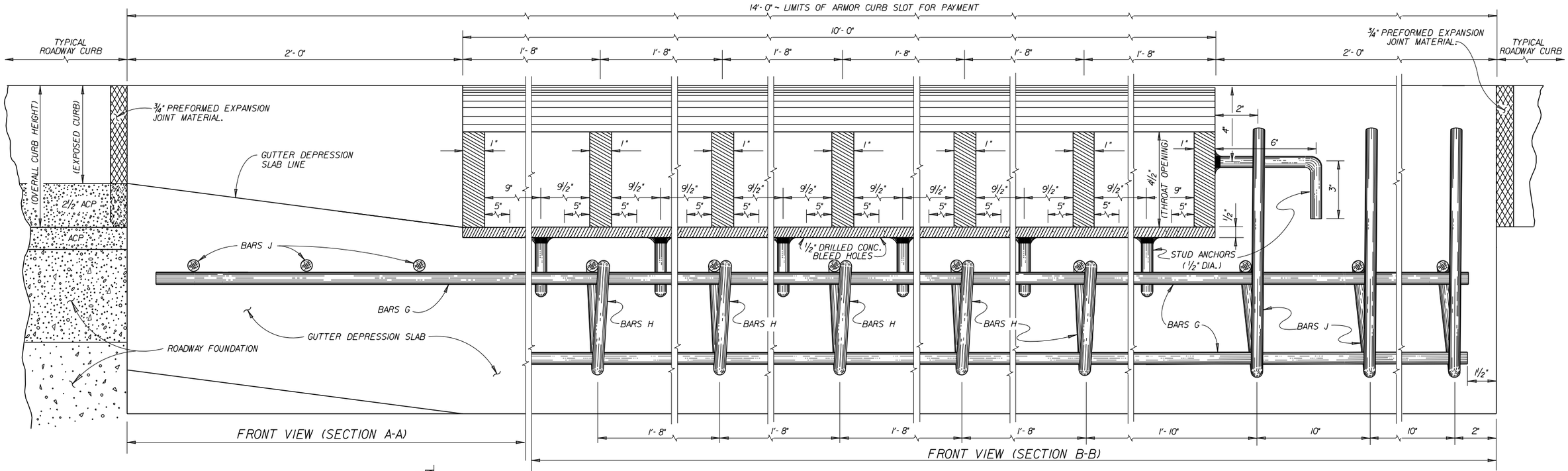
Texas Department of Transportation

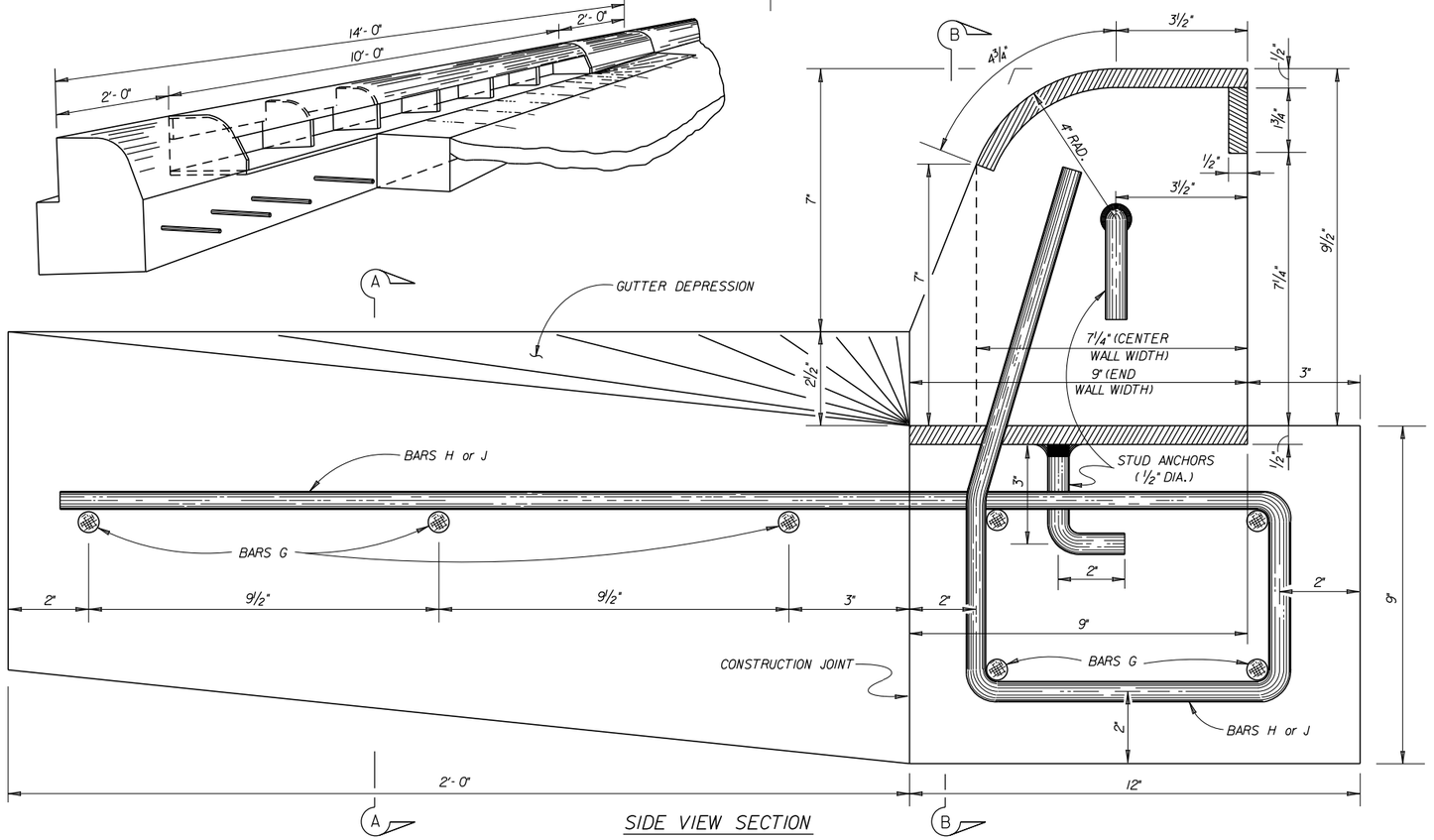
Design Division Standard

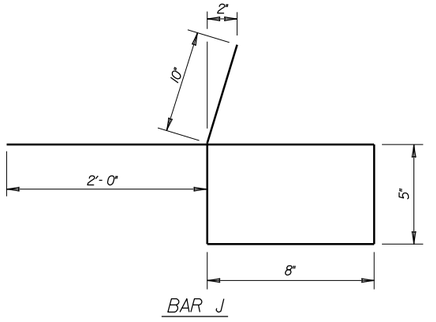
CONCRETE CURB AND CURB AND GUTTER

CCCG-21

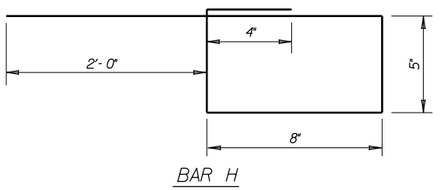
FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
© TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		93







BAR J



BAR H

ESTIMATED QUANTITIES
FOR REINFORCING STEEL & CONCRETE

BAR	NO.	SIZE	SPAC.	LENGTH	WEIGHT
G	7	#4	SHOWN	13'-9"	64
H	5	#4	1'-8"	4'-6"	15
J	6	#4	8"	5'-0"	20
TOTAL WEIGHT *				LBS.	99
CONCRETE FOR FOUNDATION *				C.Y.	0.47
CONCRETE FOR GUTTER DEPRESSION *				C.Y.	0.78

STRUCTURAL STEEL FOR ARMOR CURB SLOT		
STUD ANCHORS (1/2" DIA.)	LBS.	3.5
STEEL PLATE	LBS.	451
TOTAL WEIGHT *	LBS.	454.5

* FOR CONTRACTORS INFO ONLY.

GENERAL NOTES:

ALL CONCRETE SHALL BE CL."A".

ALL STEEL SHALL BE ASTM A36.

ALL DIMENSIONS RELATING TO REINFORCING STEEL ARE TO CENTER OF BARS.

ALL SIDES OF ARMOR CURB SLOT AND STUD ANCHORS SHALL BE 1/4" FILLET WELDS.

ALL EXPOSED STRUCTURAL STEEL (ARMOR) SHALL BE GALVANIZED UNDER ITEM 445.

ALL EXPOSED EDGES ON ARMOR CURB SHALL RECEIVE A 1/8" BEVEL.

THE SHAPE OF THE TYPICAL ROADWAY CURB SHALL TRANSITION TO THE ARMOR CURB AS APPROVED BY THE ENGINEER.

ARMOR CURB SLOT

WITH CONCRETE FOUNDATION

SAN ANTONIO DISTRICT STANDARDS

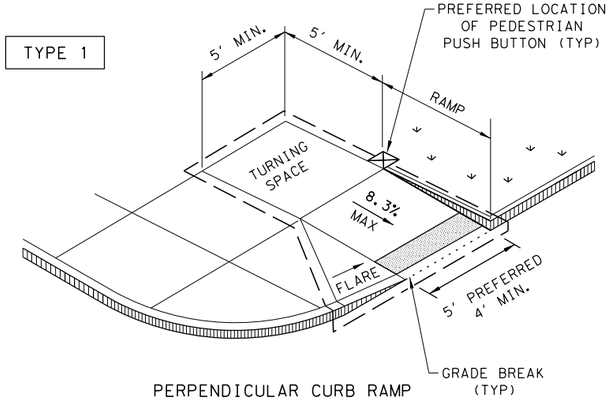
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		94
STATE	STATE DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONT.	SECT.	JOB	HIGHWAY NO.
0915	17	072, ETC.	CS, ETC

10/95
REV. 07/01
REV. 12/04

STRUCTURE DESIGN
/BRIDGE/STDS/ARMORCURB.DGN

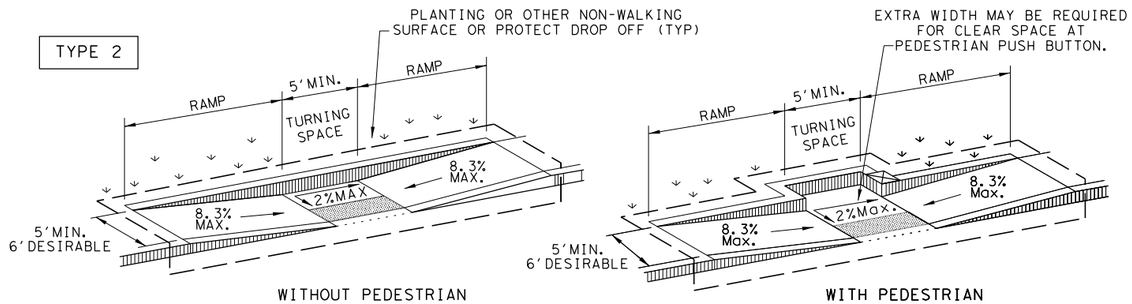
DATE: 4/25/2022
FILE: P:\116130\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Traffic Signals\ped18.dgn

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

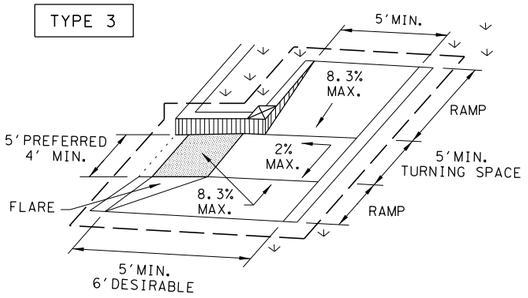


WITHOUT PEDESTRIAN PUSH BUTTON

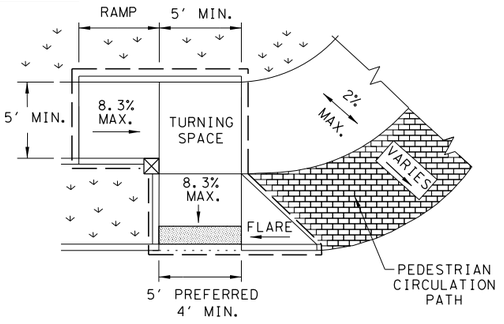
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

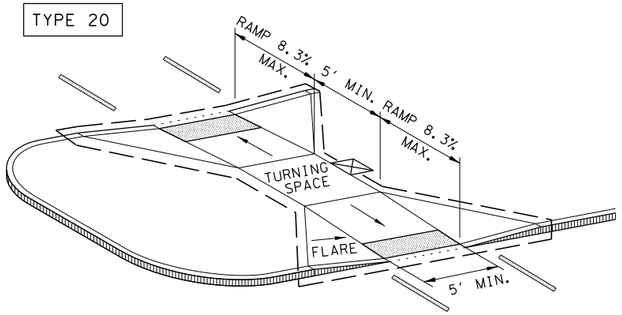


TYPE 6



COMBINATION CURB RAMPS

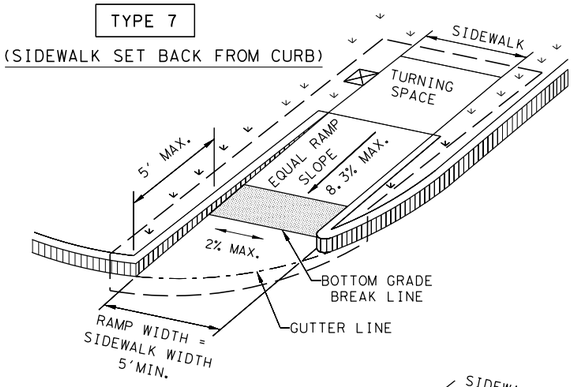
TYPE 20



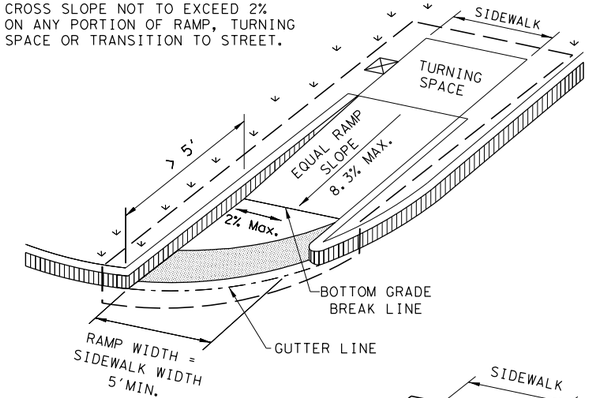
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

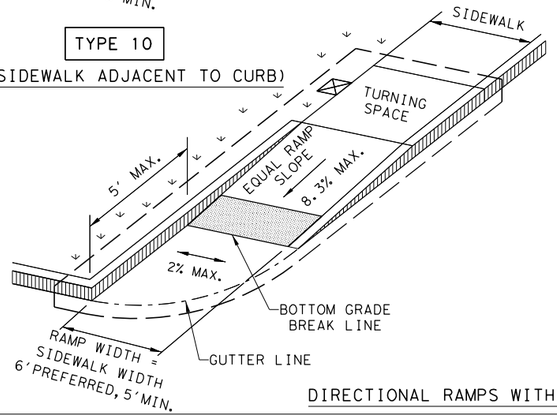


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

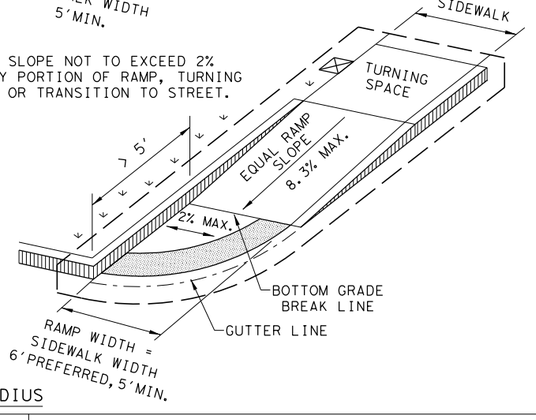


TYPE 10

(SIDEWALK ADJACENT TO CURB)

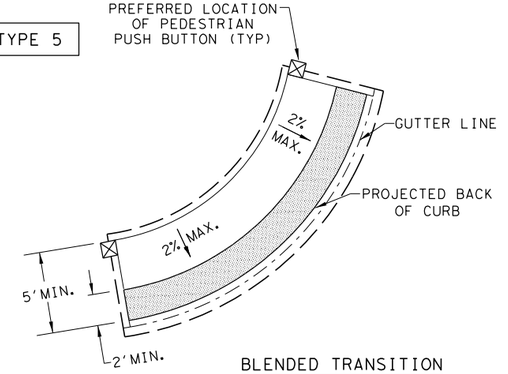


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

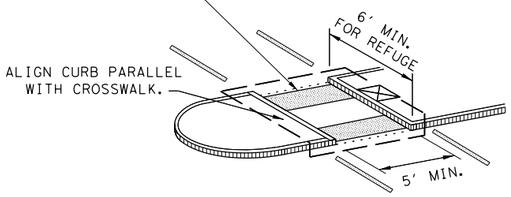
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

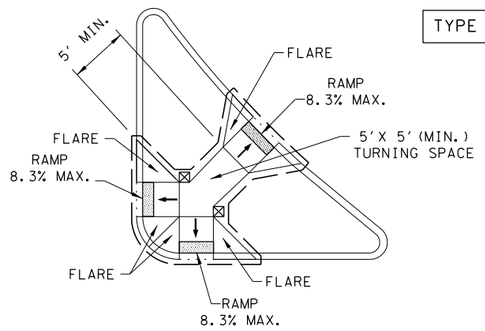
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



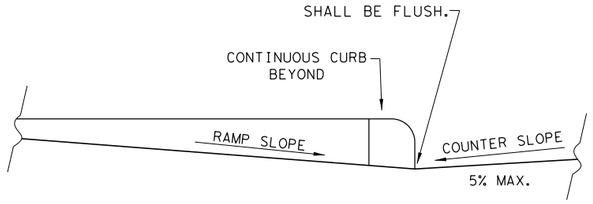
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
REVISED 08,2005	DIST	COUNTY		SHEET NO.
REVISED 06,2012	SAT	COMAL		95
REVISED 01,2018				

DATE: 4/25/2022
FILE: P:\1161\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Traffic Signals\ped18.dgn

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

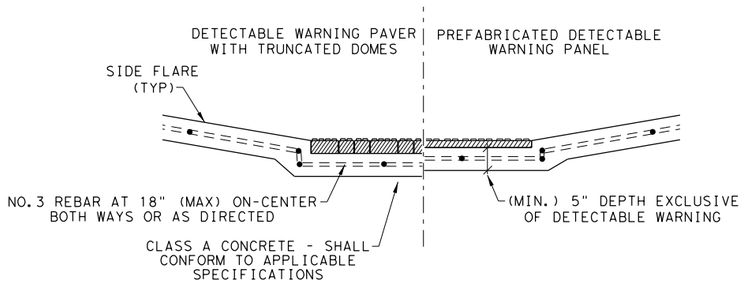
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

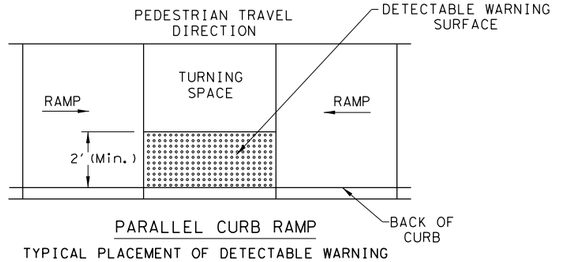
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.



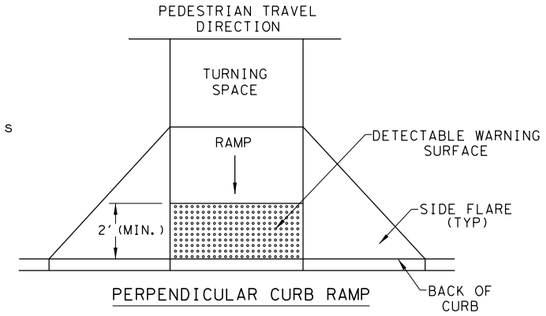
SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

DETECTABLE WARNING SURFACE DETAILS



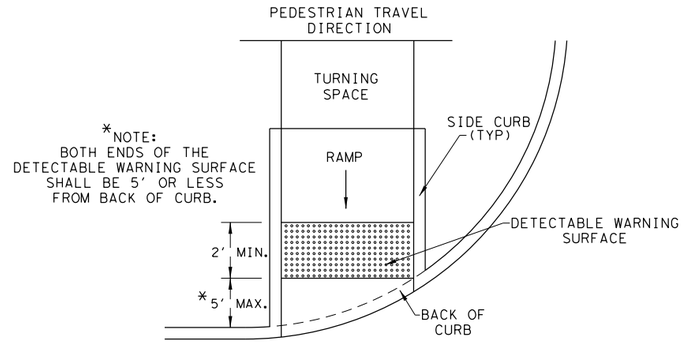
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

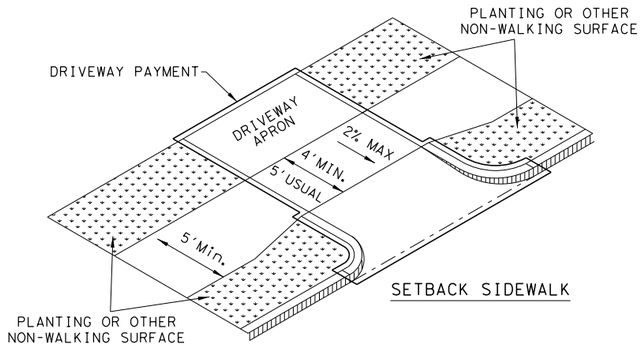
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

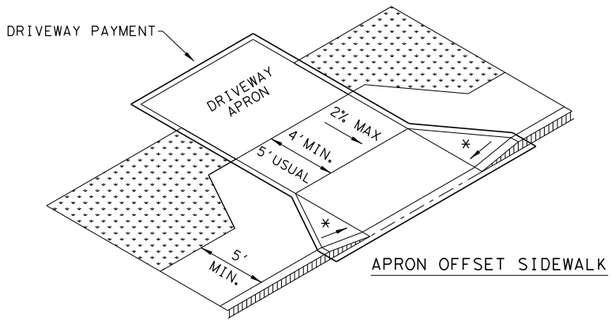
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0915	17	072	CS, ETC	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.	
	SAT	COMAL		96	

DATE: 4/25/2022
FILE: P:\716\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Traffic Signals\ped18.dgn

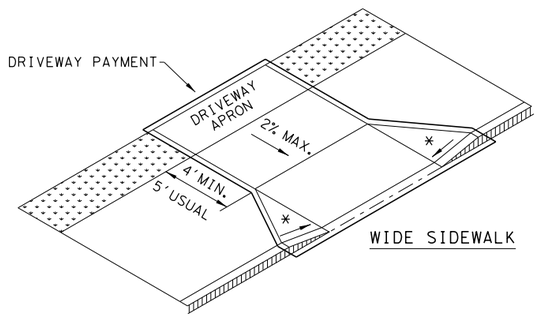
SIDEWALK TREATMENT AT DRIVEWAYS



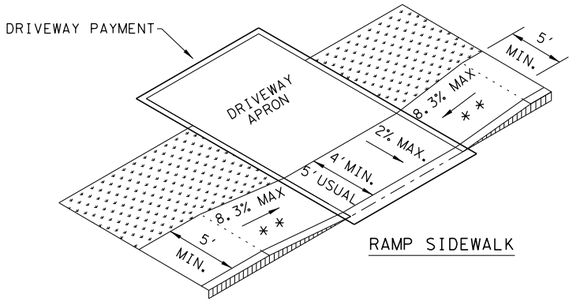
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

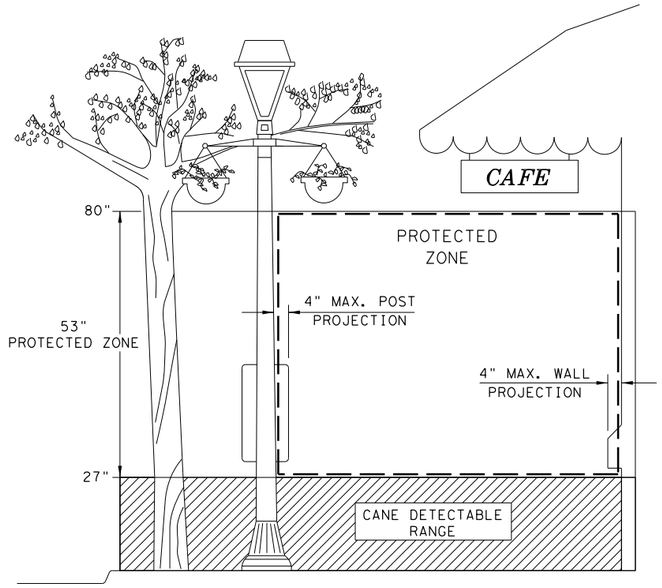


RAMP SIDEWALK

NOTES:

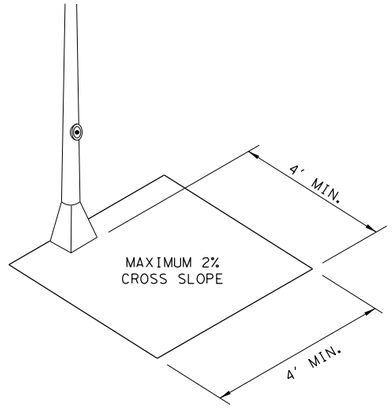
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

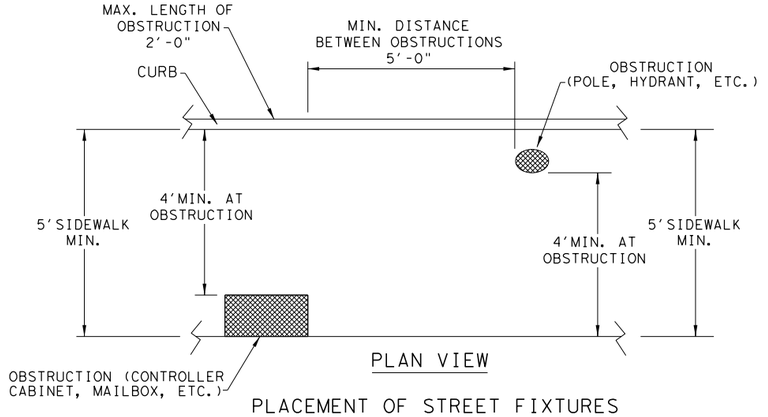


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



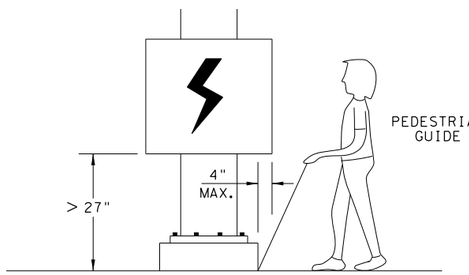
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



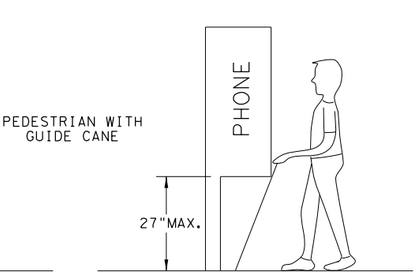
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

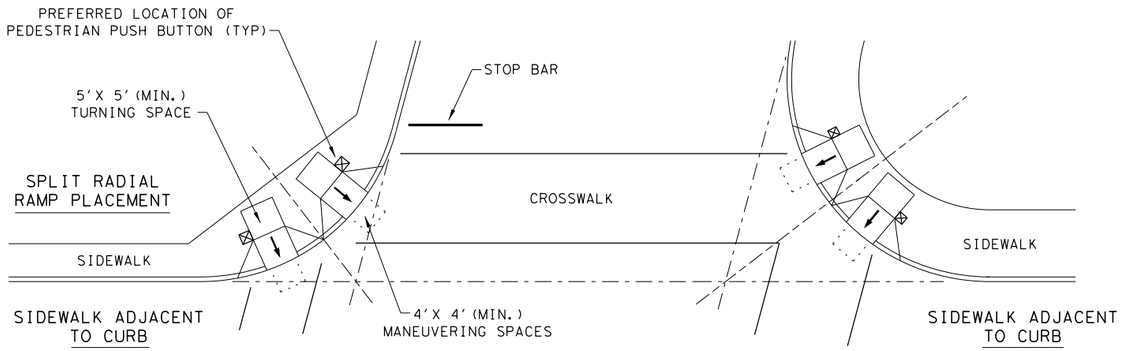
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0915	17	072	CS, ETC	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.	
	SAT	COMAL		97	

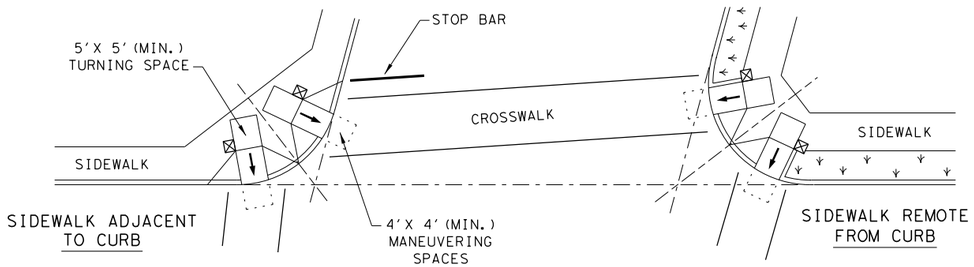
DATE: 4/25/2022
FILE: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Traffic Signals\ped18.dgn

TYPICAL CROSSING LAYOUTS

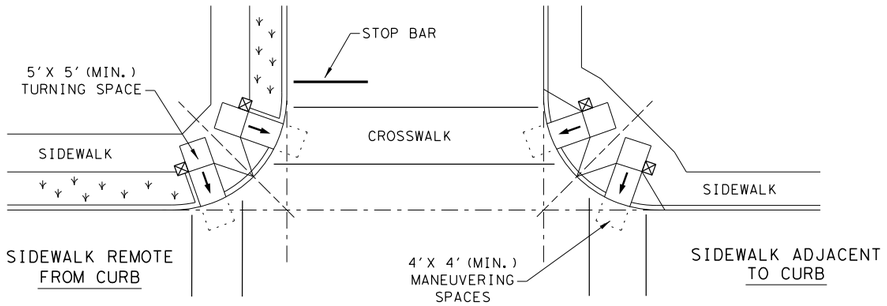
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



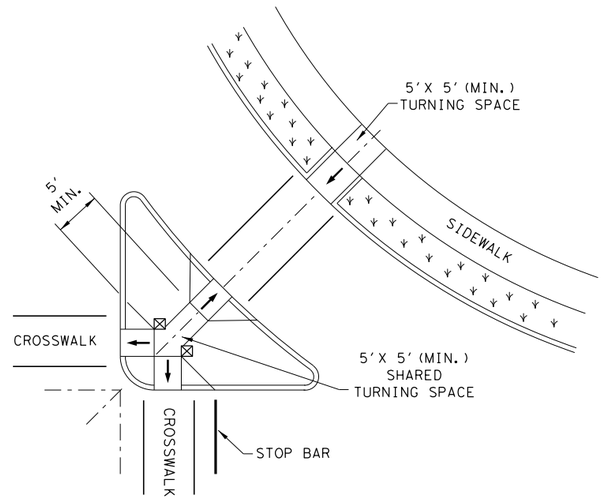
SKEWED INTERSECTION WITH "LARGE" RADIUS



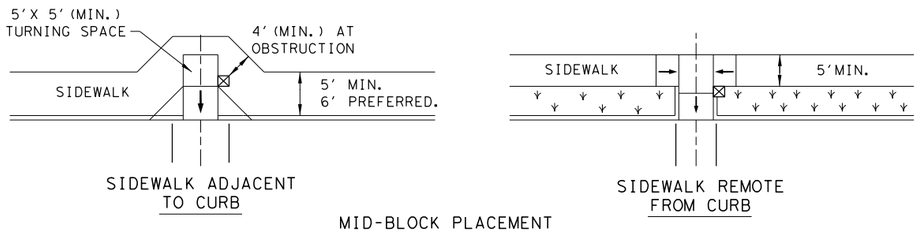
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

SHEET 4 OF 4

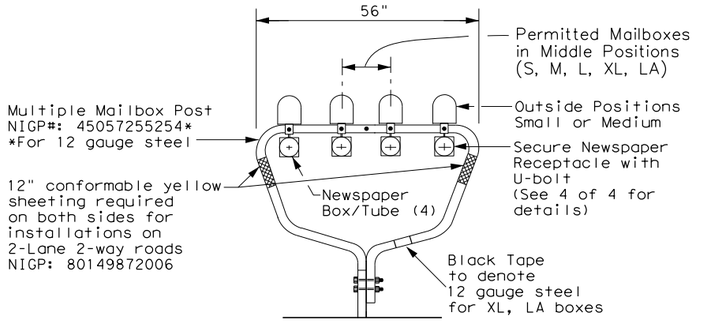
Texas Department of Transportation | Design Division Standard

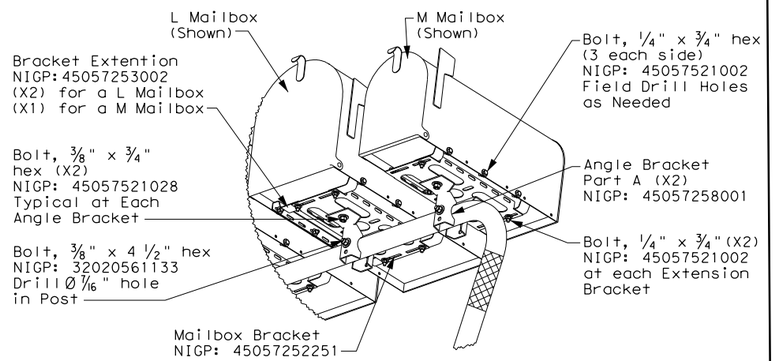
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

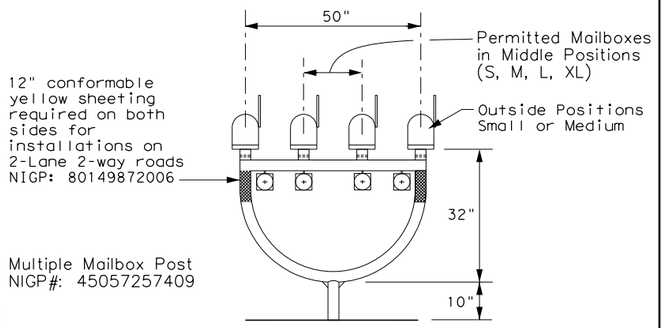
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	SAT	COMAL		98

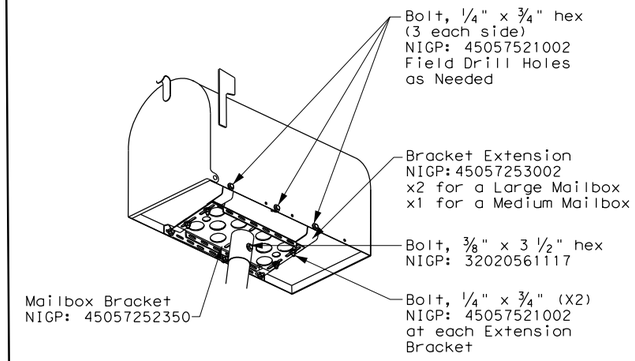
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

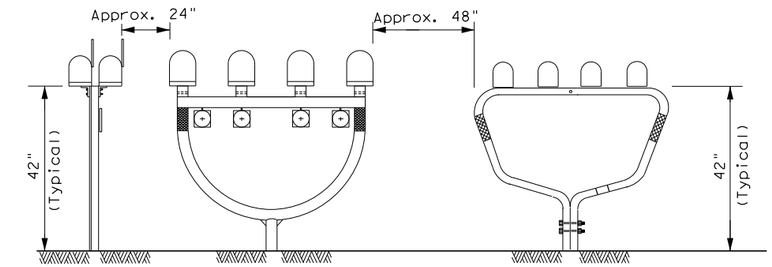
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

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

GENERAL NOTES:

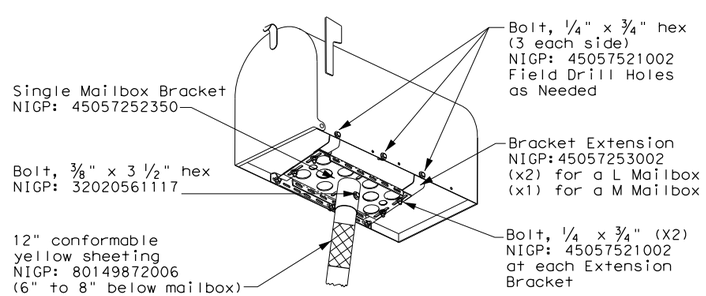
1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight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

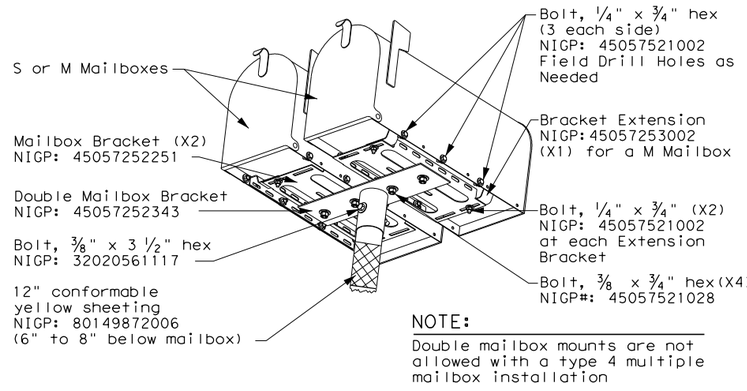
TYPICAL INSTALLATION MEASUREMENTS



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

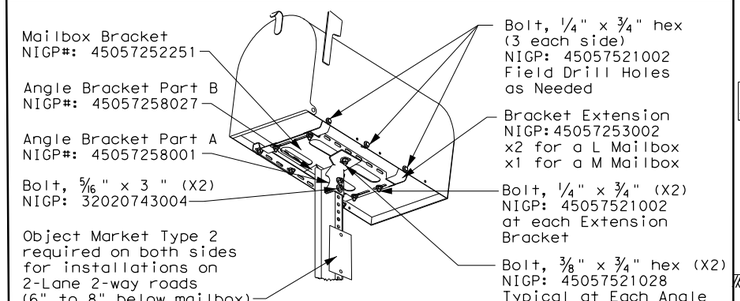
TYPE 2 and 4 - SINGLE/DOUBLE

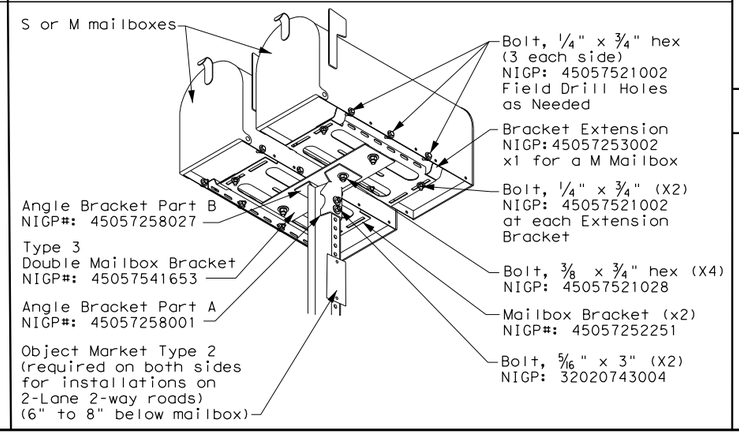




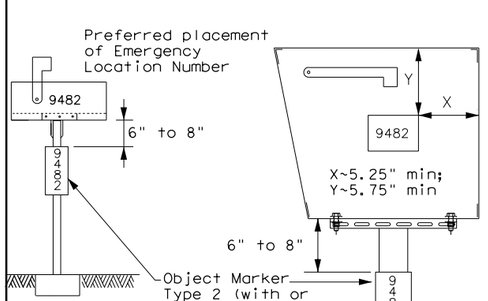
NOTE:
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

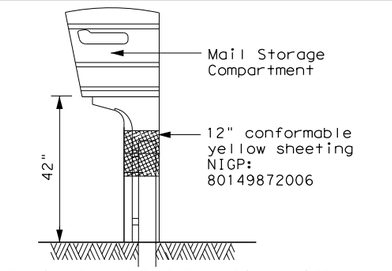


NOTES:

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

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

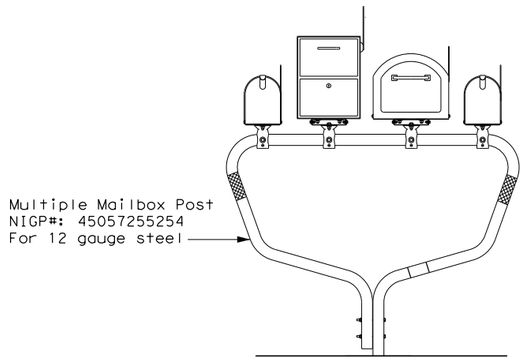
MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		99

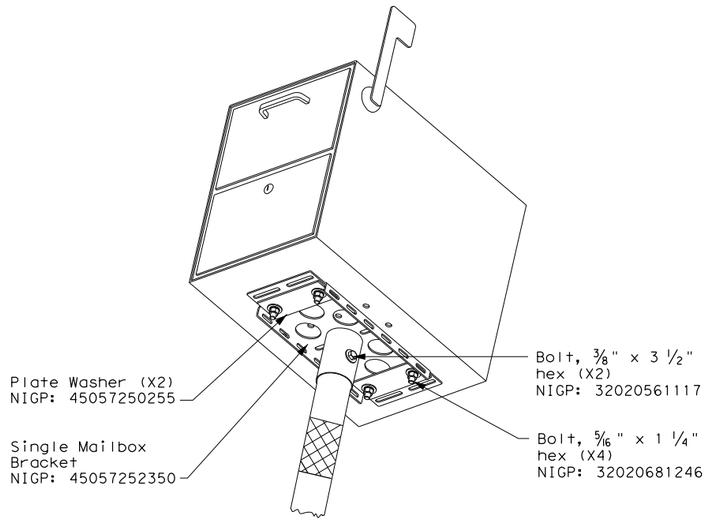
DATE:
FILE:

DATE:
FILE:

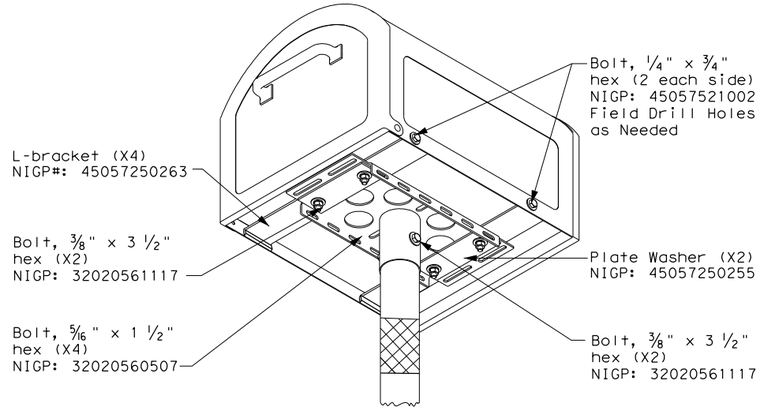
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

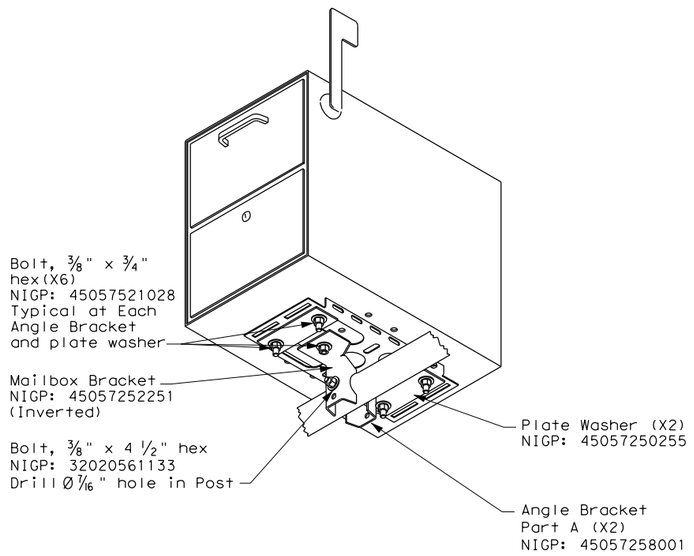


TYPE 2/4 - SINGLE XL MAILBOX

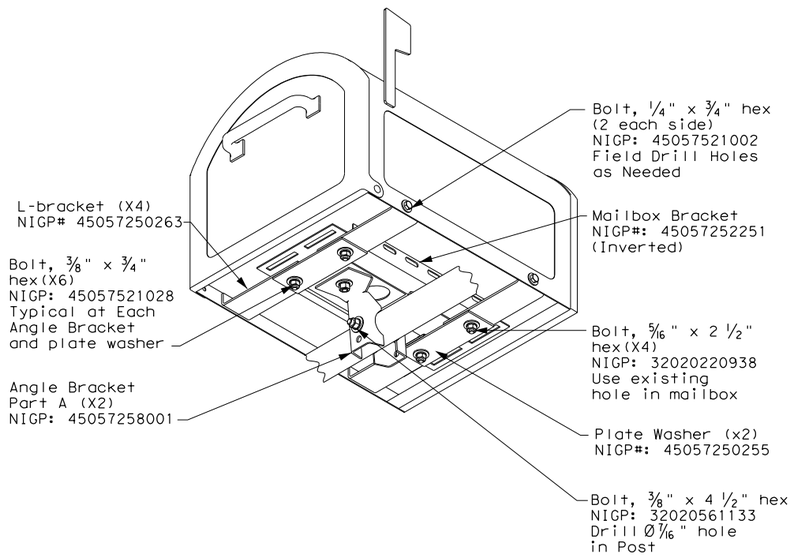


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

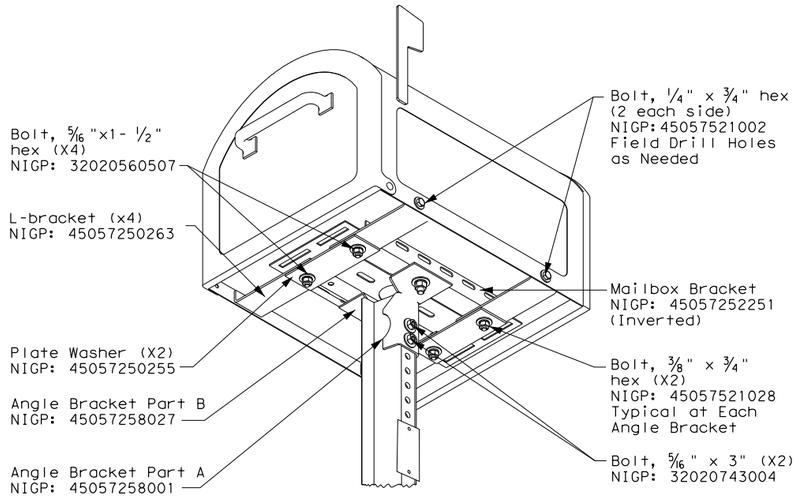
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation

Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

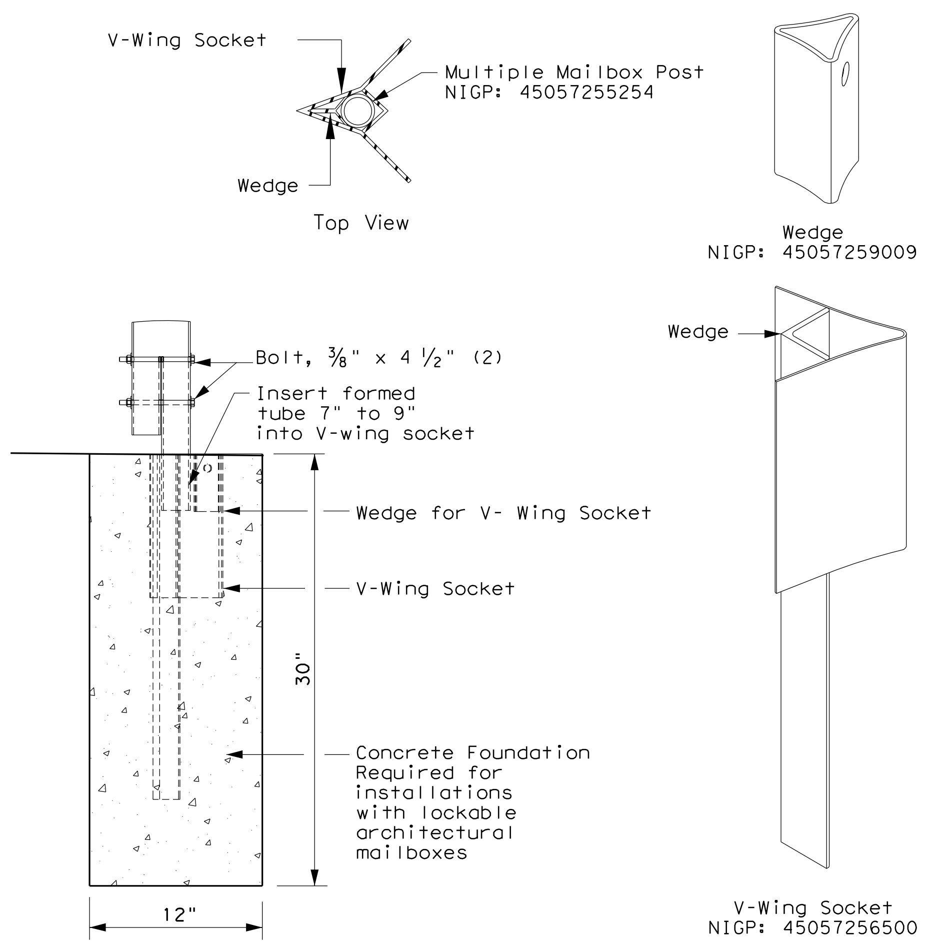
MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		100

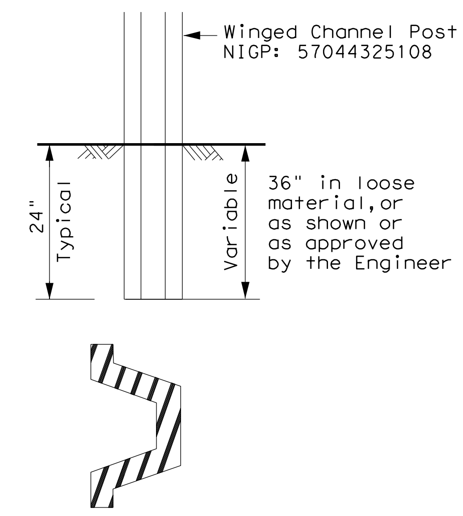
DATE: 4/25/2022

TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



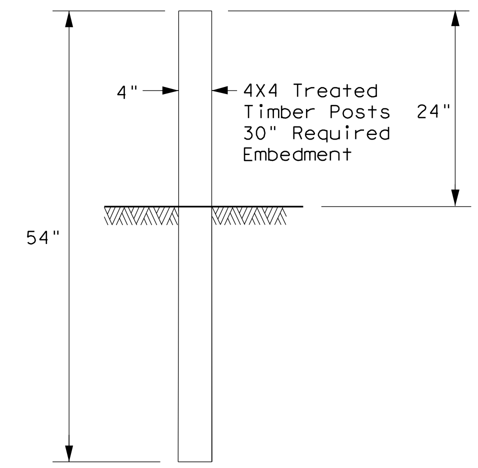
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

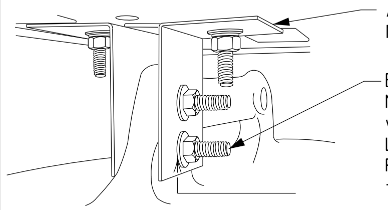
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



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

TYPE 6 - TEMPORARY MAILBOX SUPPORT



Angle bracket (x2)
NIGP: 45057251055

Bolt, 3/8" x 3/4 " hex (x4)
NIGP: 45057521028
w/ USS Flat Washers (2 each)
Lock Washer, and Hex Nut
Field drill hole in drum handle for this bolt.

Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

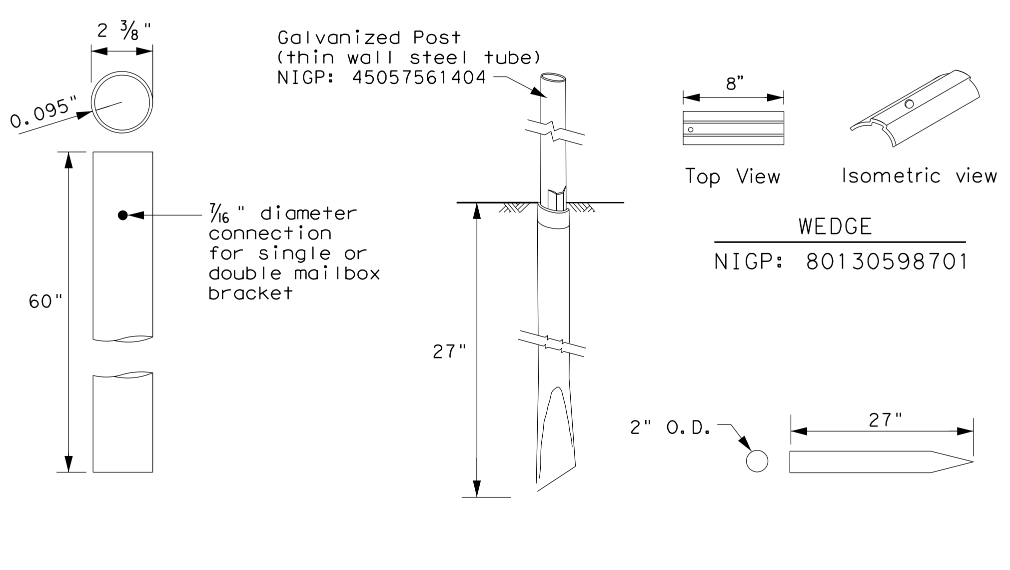
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

TYPE 2 - SUPPORT/FOUNDATION

Thin Wall Steel Tube w/Wedge Anchor System



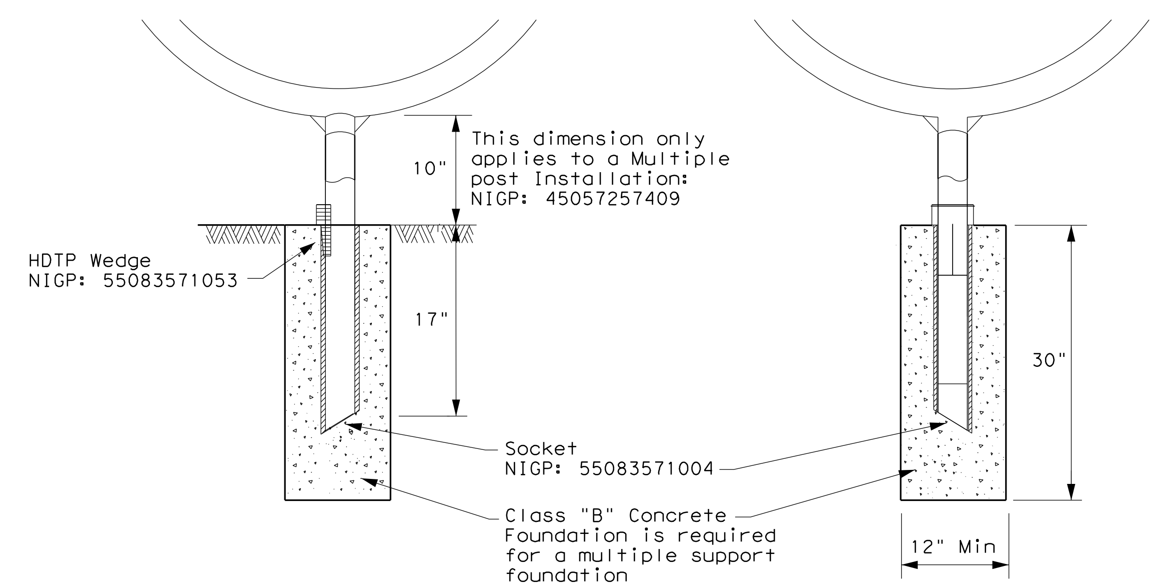
WEDGE
NIGP: 80130598701

MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION

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



SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015	0915	17	072	CS, ETC
6/2005 1/2011	DIST		COUNTY	SHEET NO.
11/2006 7/2014	SAT		COMAL	101

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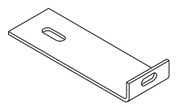
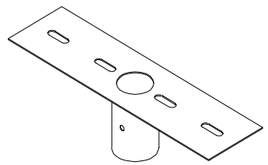
DATE: 4/25/2022 11:23:44 AM
FILE: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Roadway\mb-21(4).dgn

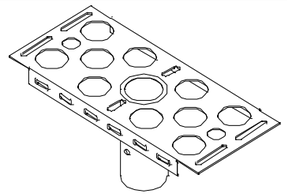
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



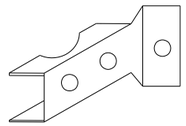
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



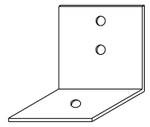
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



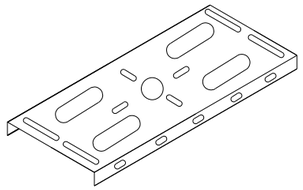
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



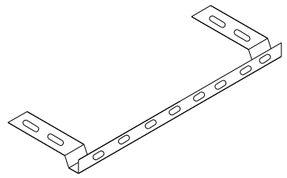
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



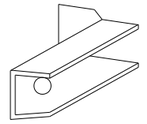
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



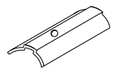
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



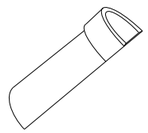
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



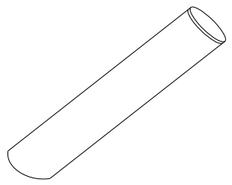
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

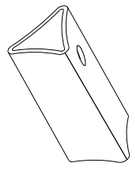


NIGP: 55083571053
Type 4 Mailbox Wedge

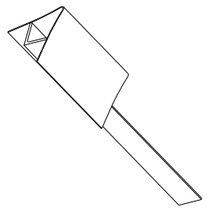


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

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

NOTES:

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

BID CODES FOR CONTRACTS

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

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

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

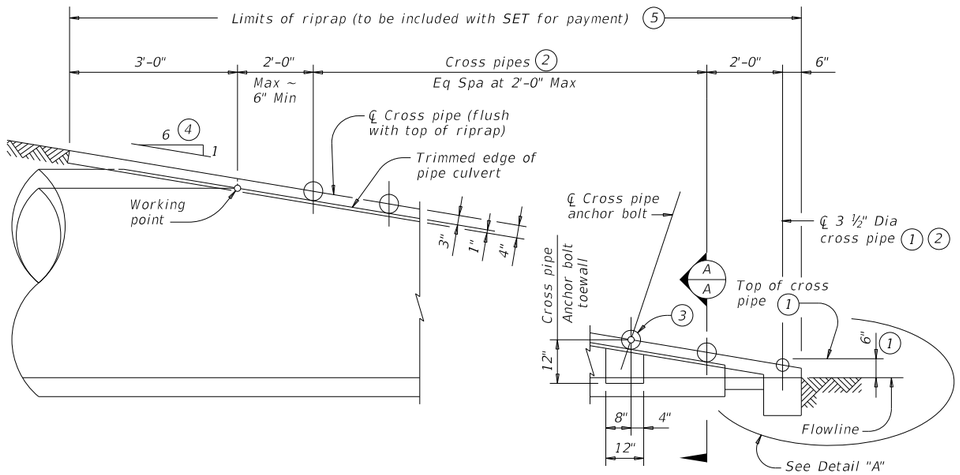
Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		102



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. pipe runners not shown for clarity.)

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES 2

Corrugated Metal Pipe (CMP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	17"	13"	1' – 0"	N/A	2' – 8"	2' – 5"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	21"	15"	1' – 2"	N/A	3' – 1"	2' – 11"		
3	0.9	28"	20"	1' – 5"	N/A	3' – 9"	3' – 9"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	35"	24"	1' – 8"	4' – 4"	4' – 6"	4' – 7"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	42"	29"	1' – 11"	4' – 11"	5' – 2"	5' – 5"		
6	1.4	49"	33"	2' – 2"	5' – 6"	5' – 11"	6' – 3"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	57"	38"	2' – 5"	6' – 2"	6' – 8"	7' – 2"		
8	1.8	64"	43"	2' – 10"	6' – 9"	7' – 6"	8' – 2"		
9	1.9	71"	47"	3' – 2"	7' – 4"	8' – 3"	9' – 1"		

Reinforced Concrete Pipe (RCP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	22"	13 ½"	1' – 0"	N/A	3' – 1"	2' – 10"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	26"	15 ½"	1' – 2"	N/A	3' – 6"	3' – 4"		
3	0.9	28 ½"	18"	1' – 5"	N/A	3' – 10"	3' – 9 ½"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	36 ¼"	22 ½"	1' – 8"	4' – 5"	4' – 7"	4' – 8 ¼"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	43 ¾"	26 5/8"	1' – 11"	5' – 1"	5' – 4"	5' – 6 ¾"		
6	1.4	51 ½"	31 5/16"	2' – 2"	5' – 8"	6' – 1"	6' – 5 ¼"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	58 ½"	36"	2' – 5"	6' – 4"	6' – 10"	7' – 3 ½"		
8	1.8	65"	40"	2' – 10"	6' – 10"	7' – 7"	8' – 3"		
9	1.9	73"	45"	3' – 2"	7' – 6"	8' – 5"	9' – 3"		

1. The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.
2. Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.
3. Install the third Cross Pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
4. Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
5. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap".
6. Quantities shown are for one end of one pipe culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

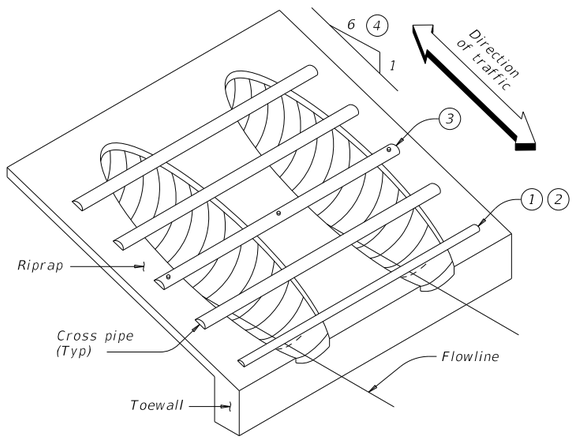
GENERAL NOTES:

Pipe runners are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

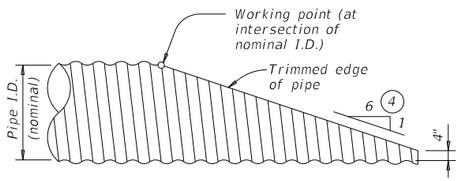
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the price bid for each safety end treatment.



ISOMETRIC VIEW OF TYPICAL INSTALLATION



NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details at reinforced concrete cipe (RCP) culvert are similar.)

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

FILE: setppase-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	SAT	COMAL		103

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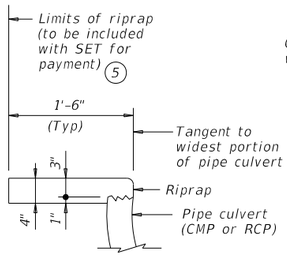
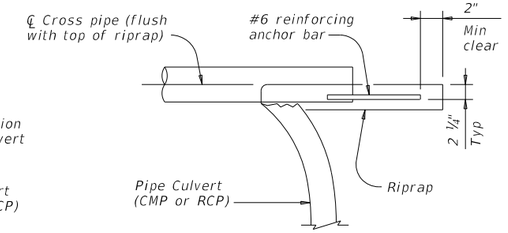
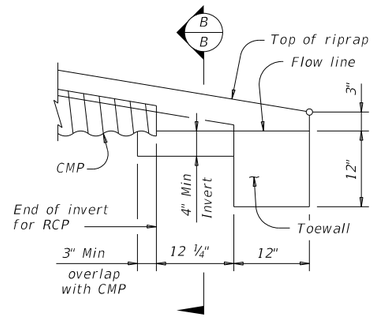


SHOWING TYPICAL PIPE CULVERT AND RIPRAP

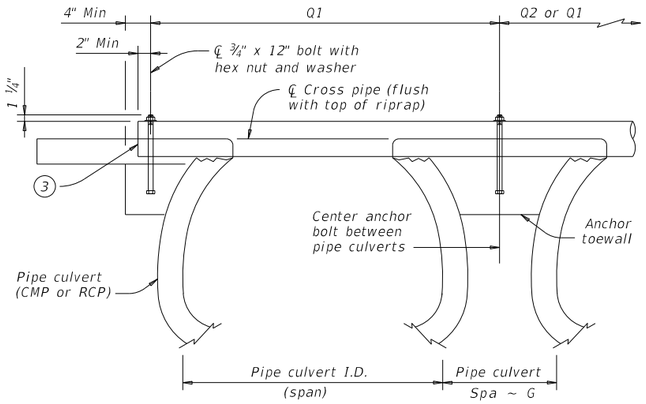


SHOWING CROSS PIPE WITH ANCHOR BAR



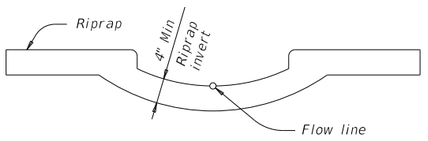
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



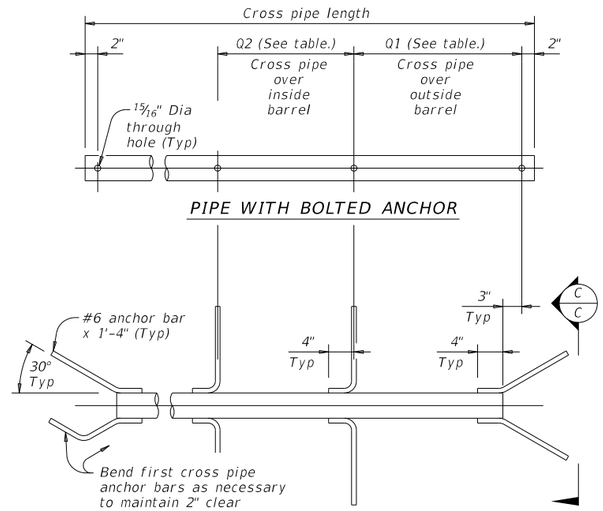
SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

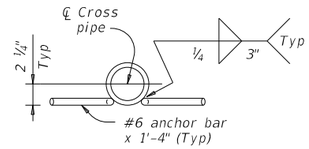


SECTION B-B

(Cross pipes not shown for clarity.)



PIPE WITH ANCHOR BARS



SECTION C-C

CROSS PIPE DETAILS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	SAT	COMAL		104

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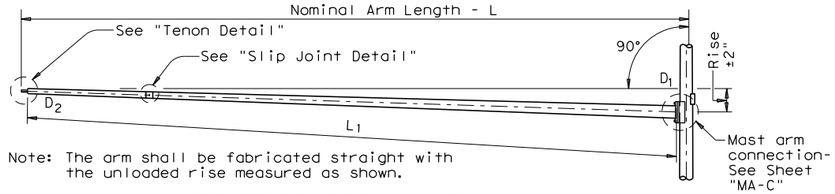
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

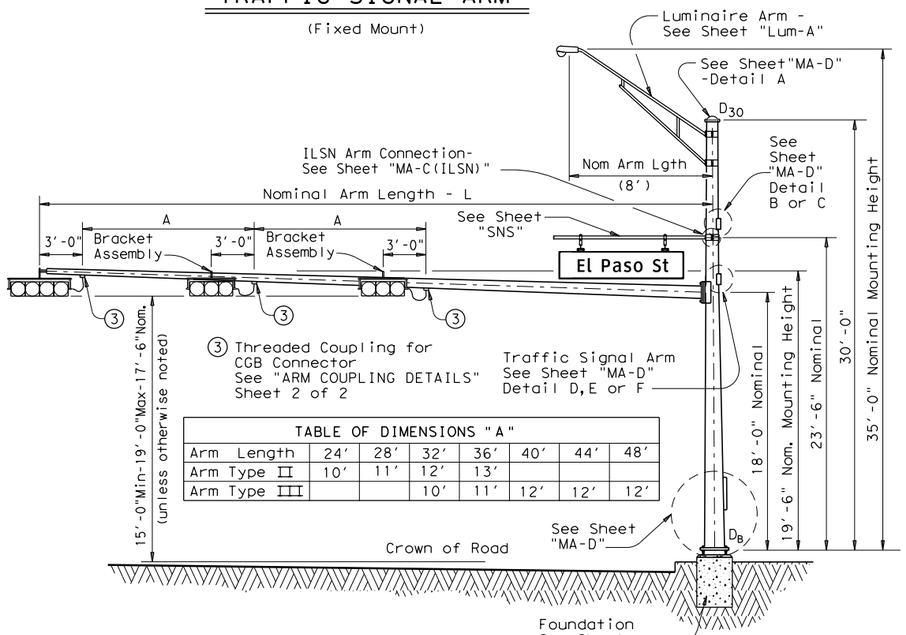


TABLE OF DIMENSIONS "A"							
Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80	1	32S-80		32-80	
36	36L-80	1	36S-80		36-80	
40	40L-80		40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80	2	48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	1
36			36II-80		36III-80	1
40					40III-80	
44					44III-80	
48					48III-80	2

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	4

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	1
1 ¾"	3'-10"	3

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0915	17	072	CS, ETC
DIST	COUNTY		SHEET NO.
SAT	COMAL		105

122A

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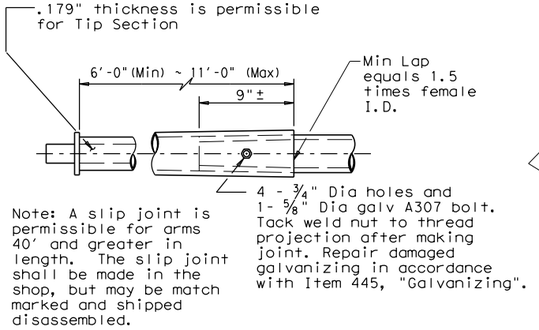
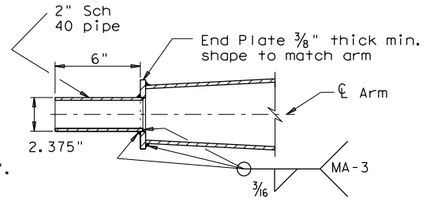


SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

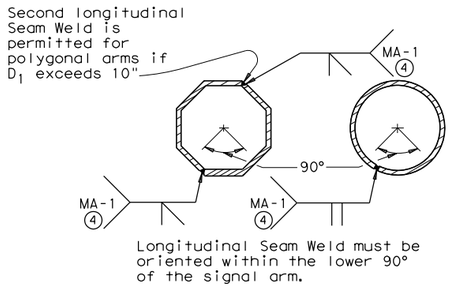
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

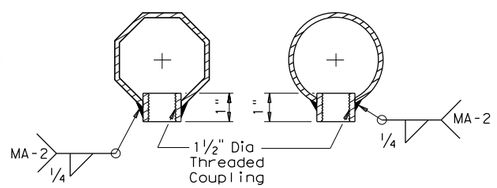
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

④ 60% Min. penetration 100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
SAT	COMAL		106

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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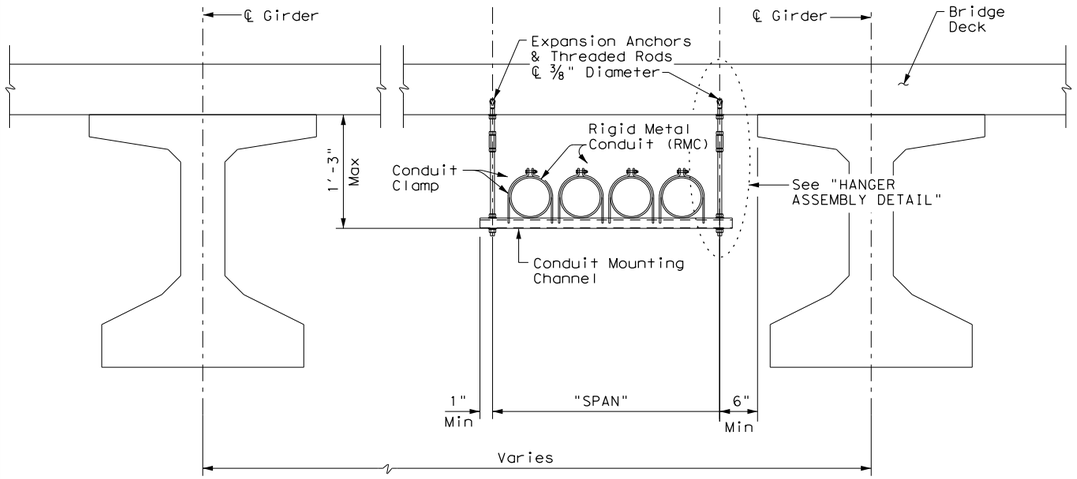
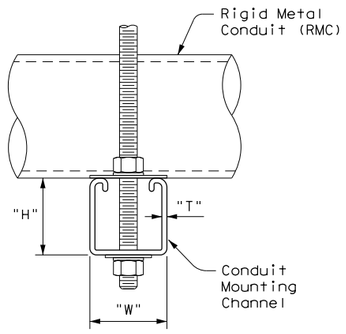
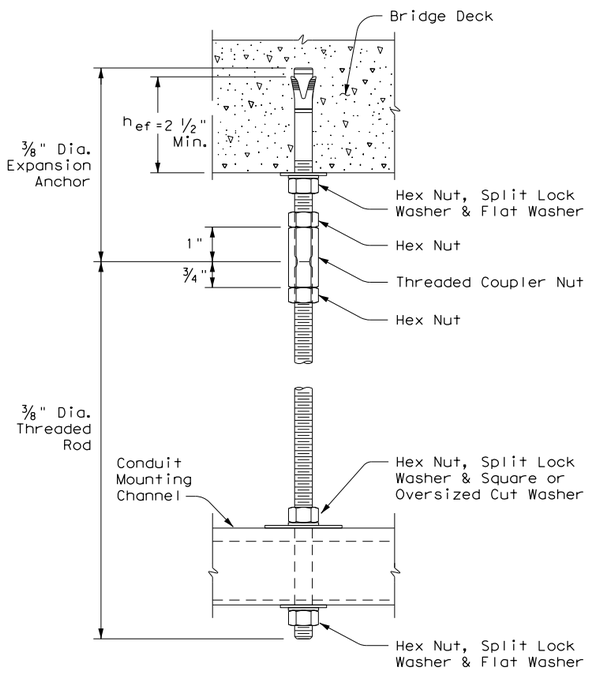


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

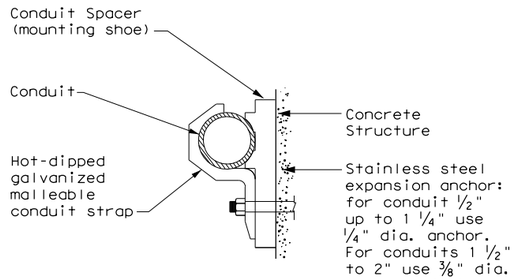
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

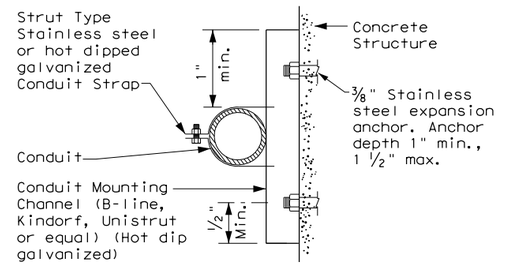




HANGER ASSEMBLY DETAIL

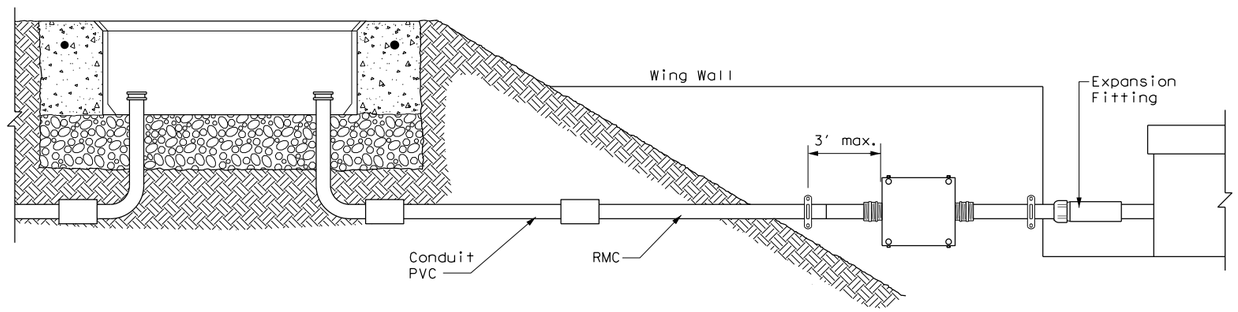
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.

4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef})as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

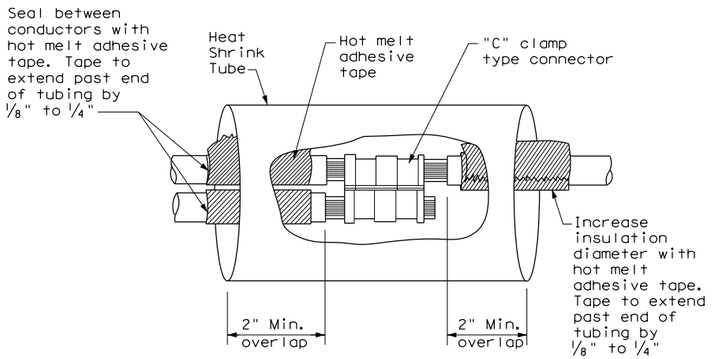
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

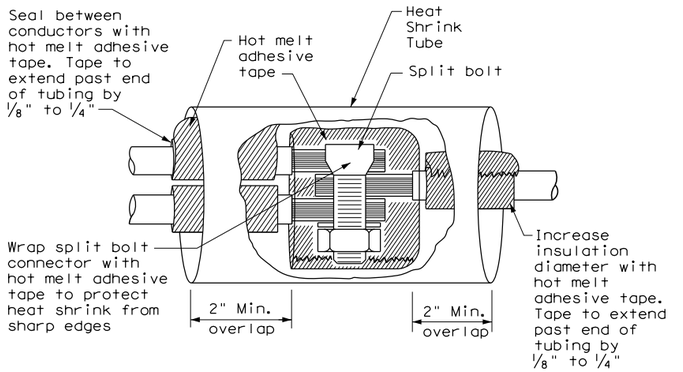
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

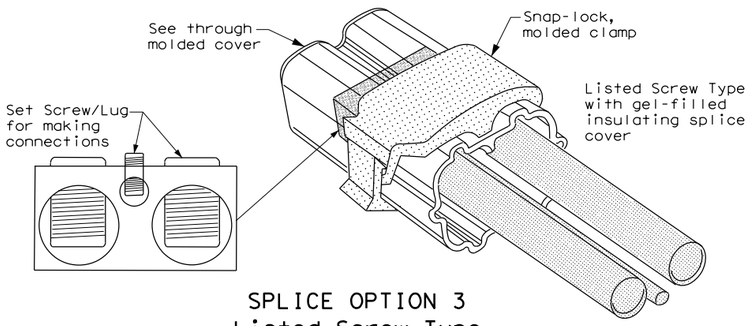
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0915	17	072	CS, ETC
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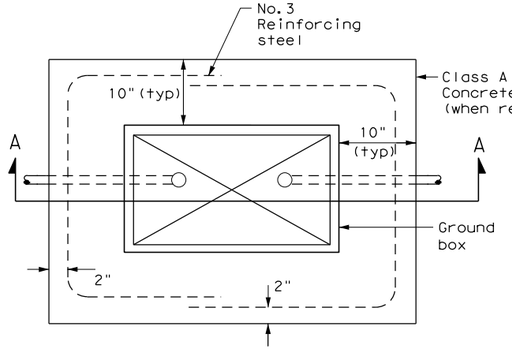
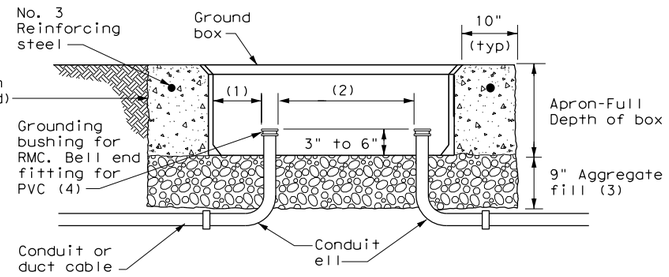


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

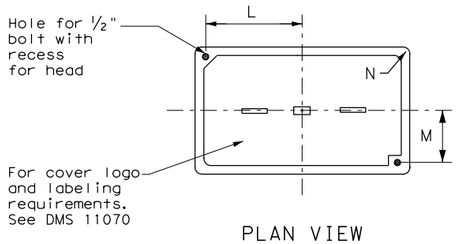
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

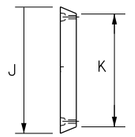
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



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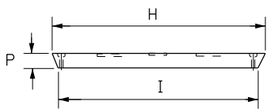

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

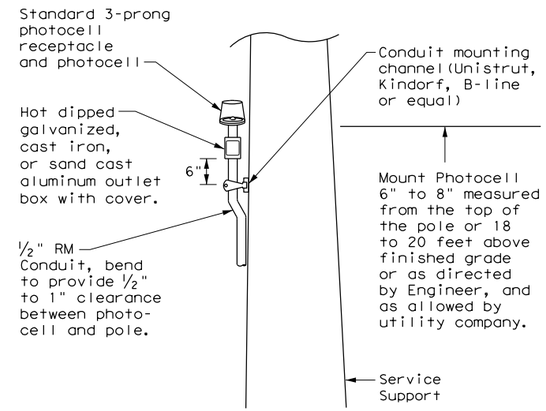
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating 000 indicates main lug only/ Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
- (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  - GS= Galvanized steel("off the shelf")
  - SS= Stainless steel(Custom Enclosure)See MPL
  - AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  - (E)= Inside Service/Enclosure Mounted
  - (T)= Top of pole
  - (L)= Luminaire mounted
  - (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  - GC= Granite concrete
  - OC= Other concrete
  - TP= Timber pole
  - SP= Steel pole
  - SF= Steel frame
  - OT= Pole by others or paid for separately
  - EX= Existing pole
  - TS= Service on traffic signal pole
  - PS= Pedestal Service
- O= Overhead Service Feed from Utility
- U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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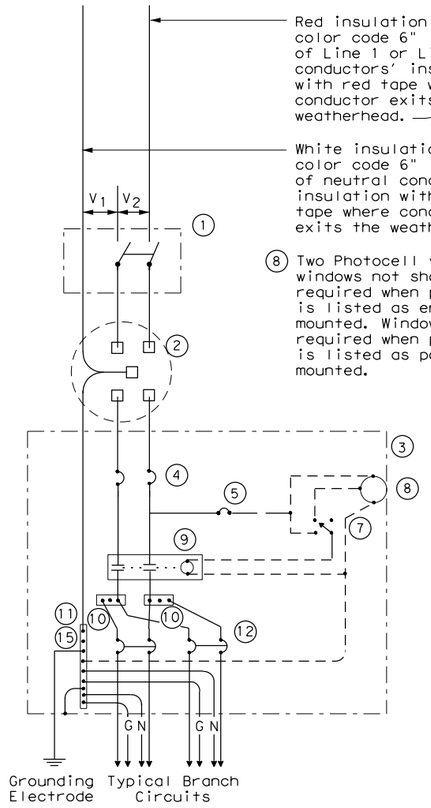
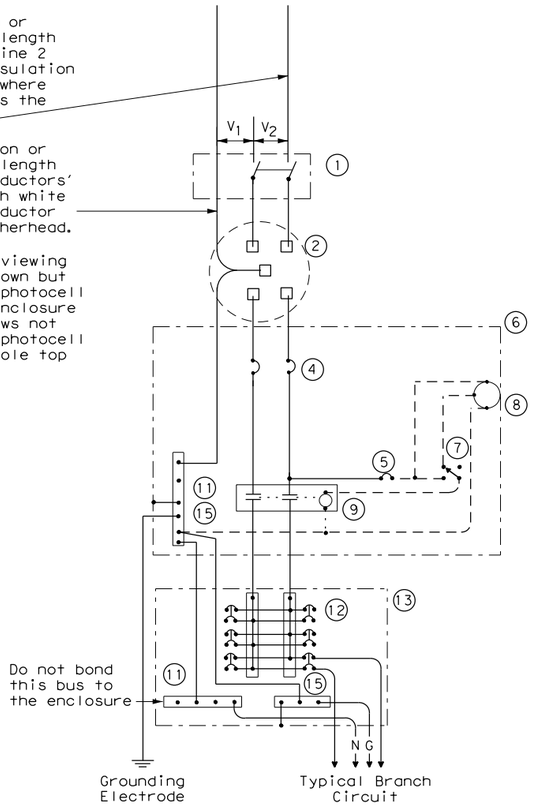
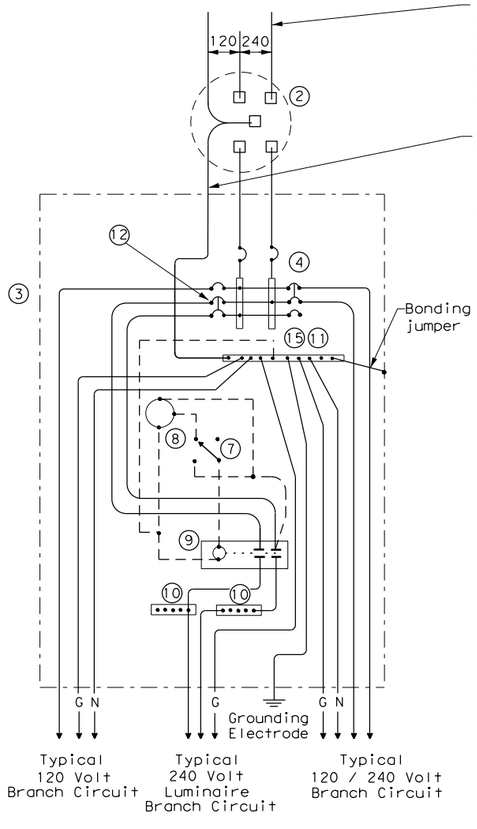


SCHEMATIC TYPE A
THREE WIRE

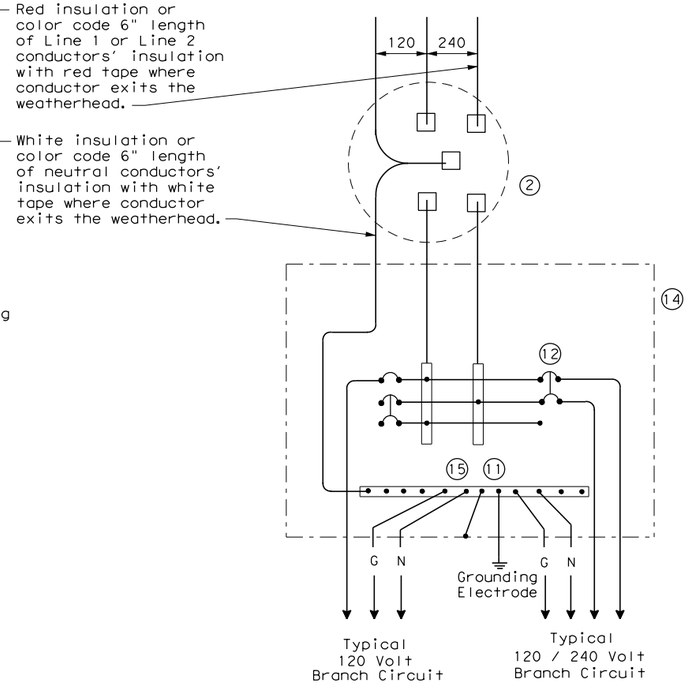
8 Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

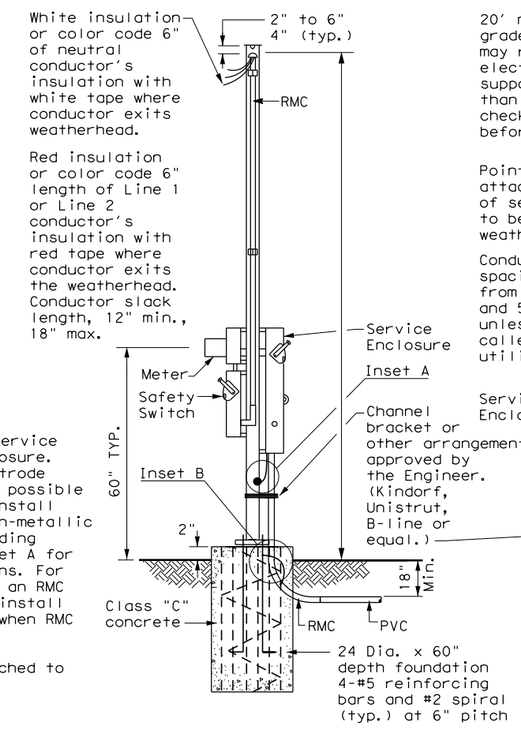
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

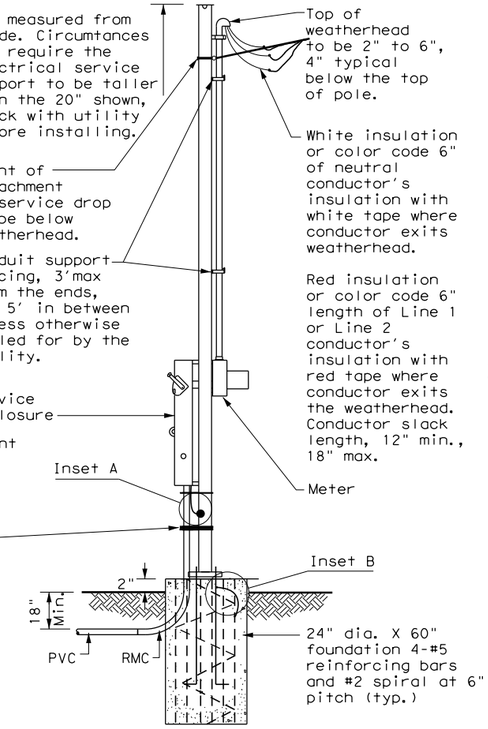
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

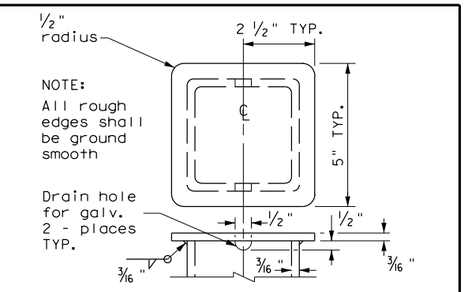


WITH SAFETY SWITCH

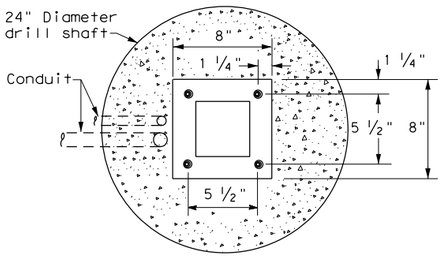


WITHOUT SAFETY SWITCH

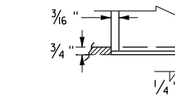
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

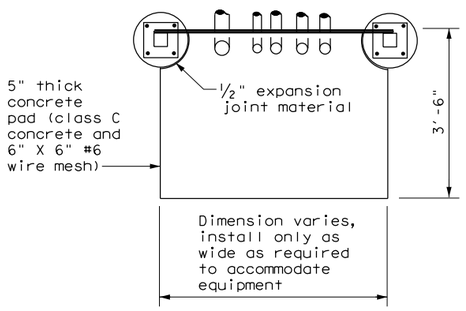


BASE PLATE DETAIL



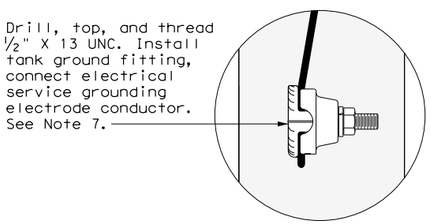
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



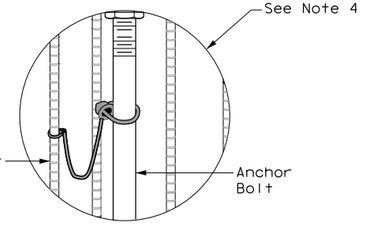
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

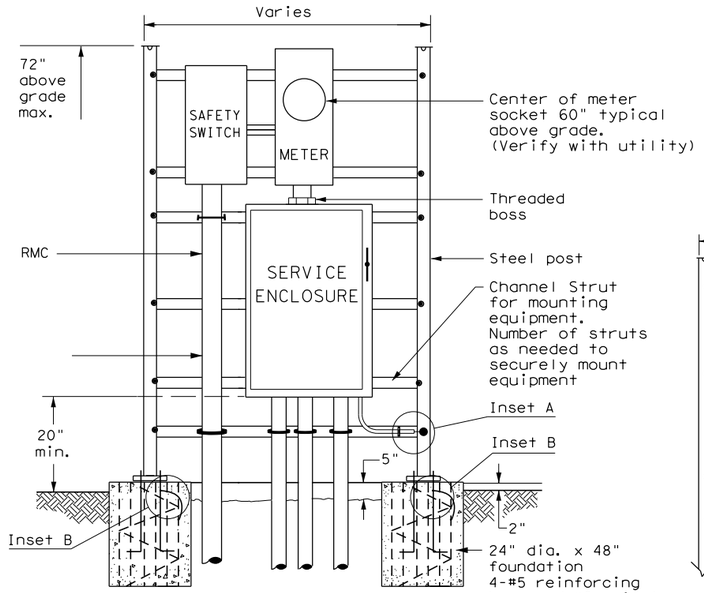


FRONT VIEW

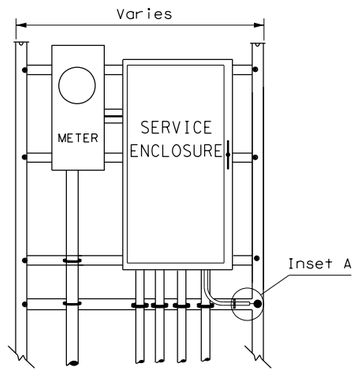
INSET A



INSET B

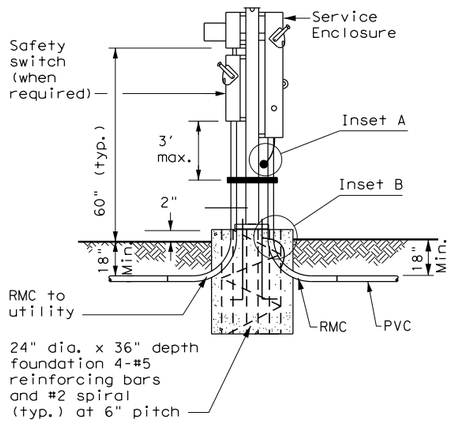


WITH SAFETY SWITCH
FRONT VIEW

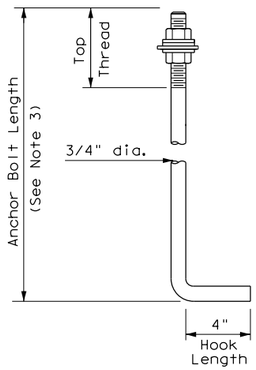


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
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	SAT	COMAL		113

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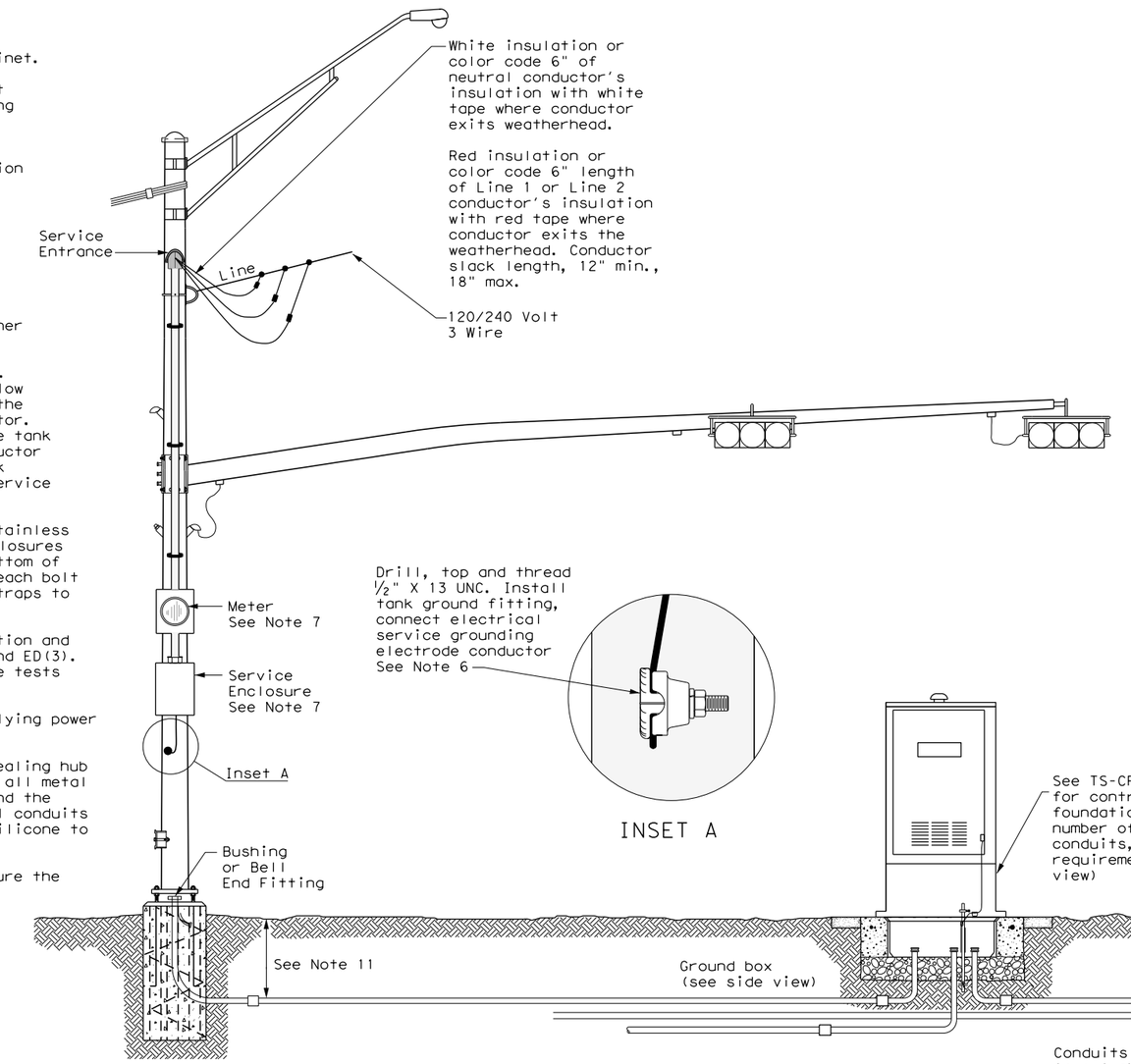
TRAFFIC SIGNAL NOTES

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".

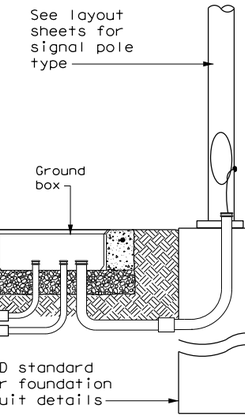


SIGNAL POLE WITH SERVICE

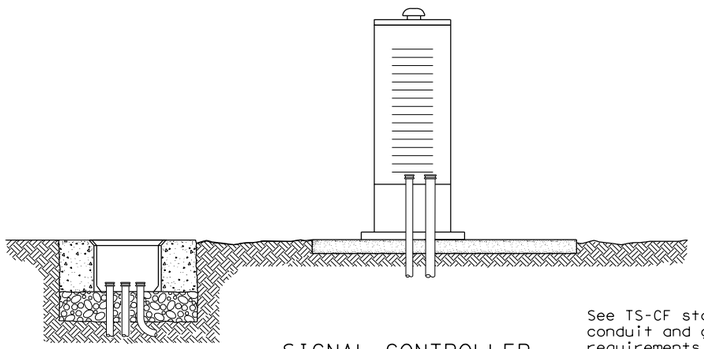
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A

SIGNAL CONTROLLER FRONT VIEW



SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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PEDESTAL SERVICE NOTES

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS)11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services. "Provide pedestal electrical services as listed on the Material Producers list (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.

2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.

3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.

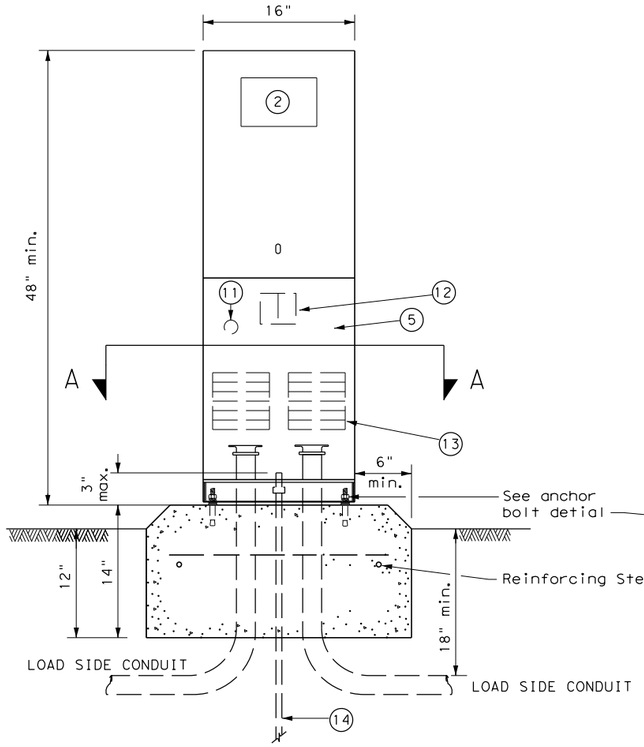
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."

5. Install ½ in. X 2 ⁷⁄₁₆ in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a ½ in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.

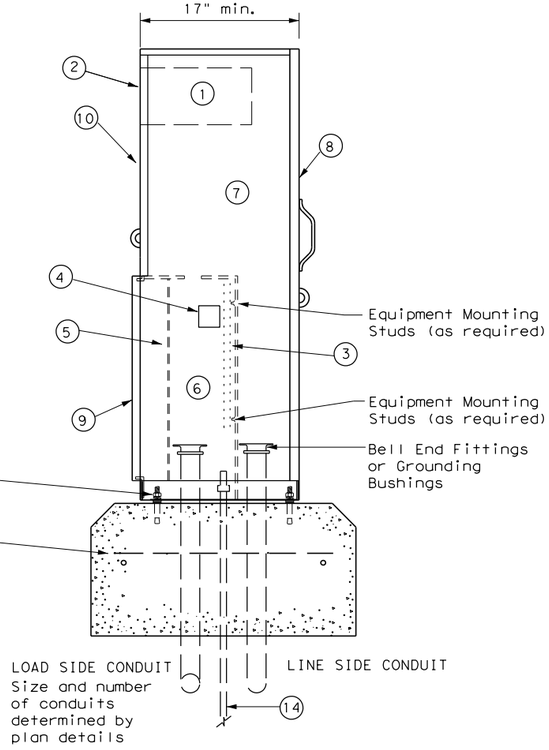
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than ⅛ in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of ⅛ in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within ¼ in. Repair rocking or movement of the service enclosure at no additional cost to the department.

7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.

8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

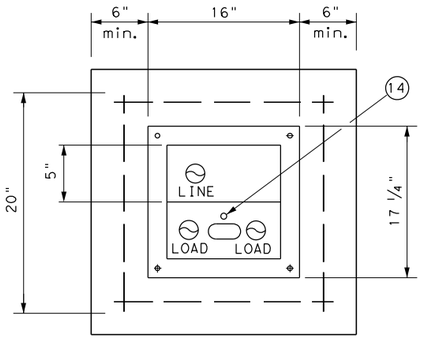


FRONT VIEW

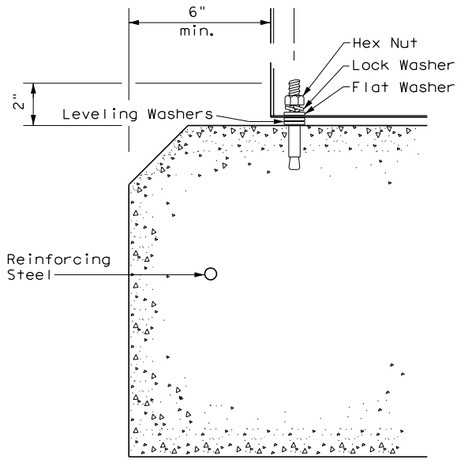


SIDE VIEW

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.



SECTION A-A



ANCHOR BOLT DETAIL

LEGEND	
1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (When required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" X 10'

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
ELECTRICAL SERVICE SUPPORT
PEDESTAL SERVICE TYPE PS

ED(9)-14

FILE: ed9-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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TIMBER POLE(TP)SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC)and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

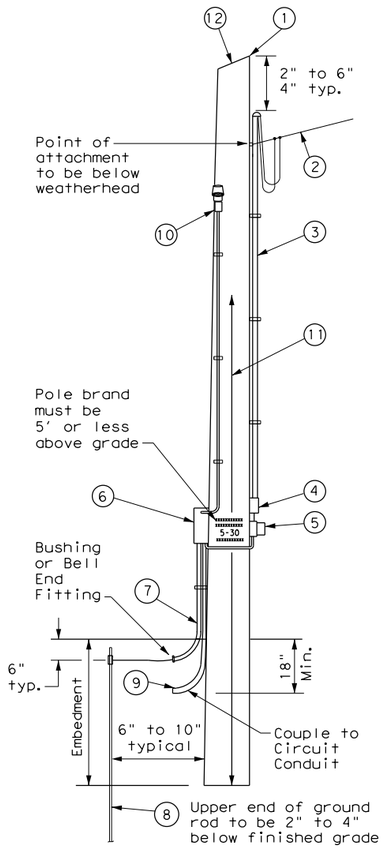
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

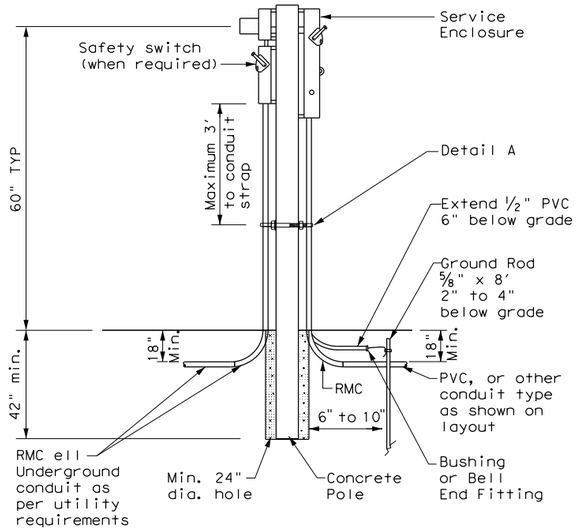


SERVICE SUPPORT TYPE TP (O)

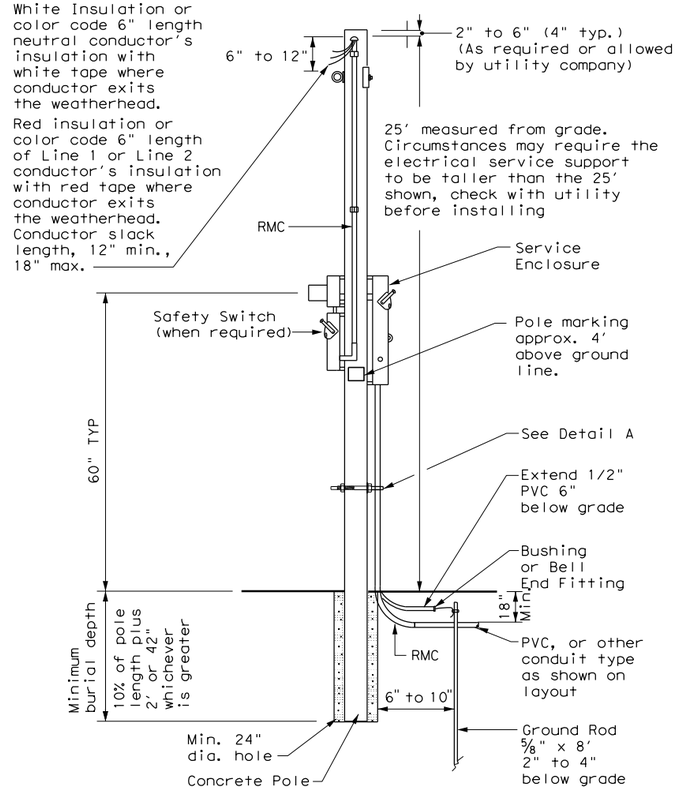
GRANITE CONCRETE(GC)& OTHER CONCRETE(OC)NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

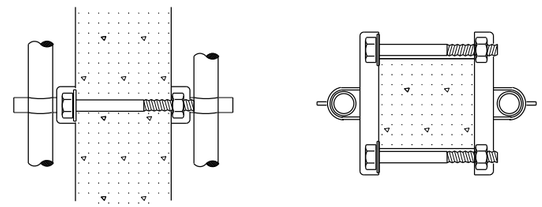
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT
Underground(U)



CONCRETE SERVICE SUPPORT
Overhead(O)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

FILE: ed10-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.

2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.

3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.

4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.

5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."

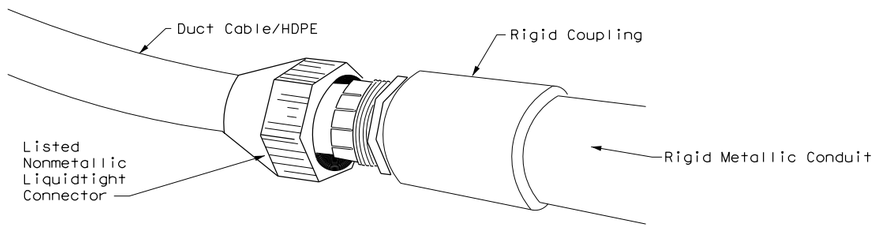
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.

7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.

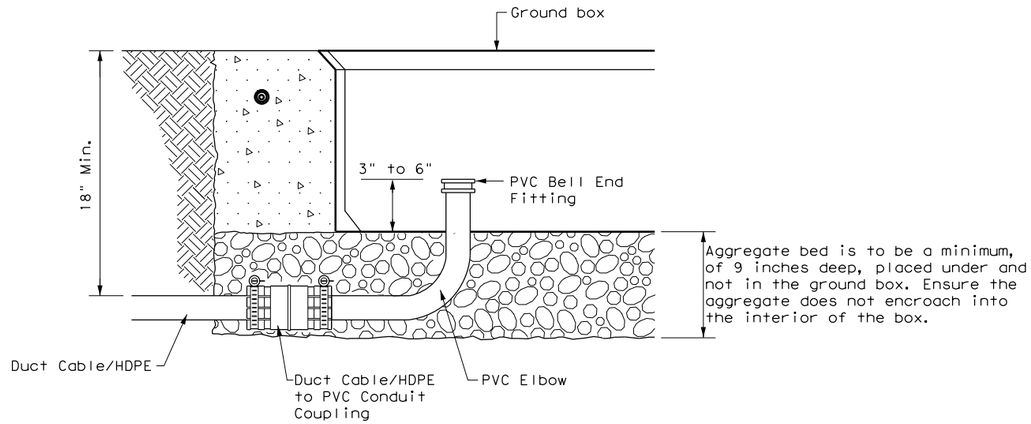
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.

9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

DUCT CABLE/HDPE TO PVC



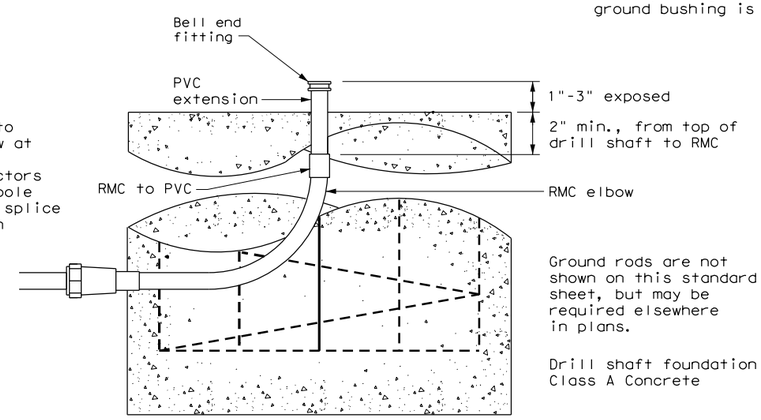
DUCT CABLE/HDPE TO RMC



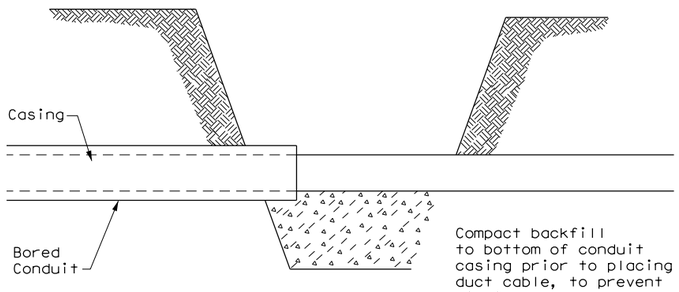
DUCT CABLE/HDPE AT GROUND BOX

When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.

Couple duct to conduit elbow at foundations. Ensure conductors extend into pole base. Do not splice conductors in conduit.



DUCT CABLE / HDPE AT FOUNDATION



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.

2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

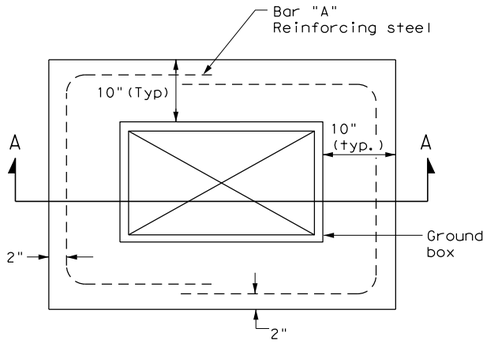
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

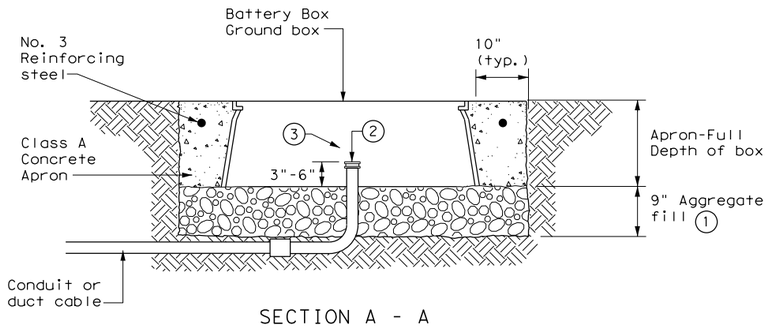
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.

3. Cast battery box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.

4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



PLAN VIEW



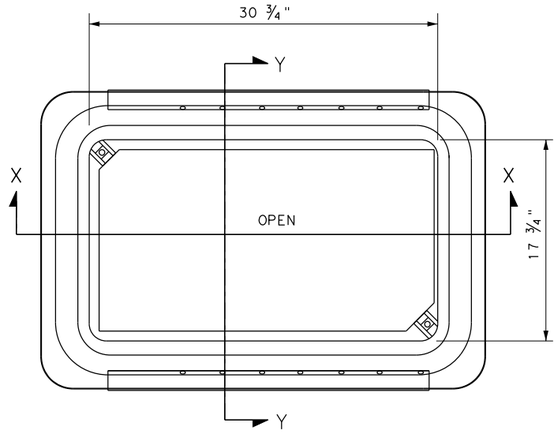
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

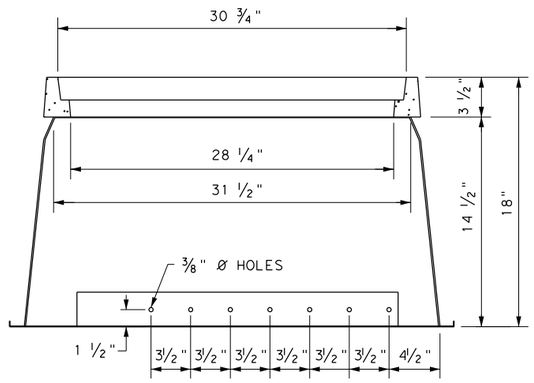
(1) Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.

(2) Install bushing or bell end fitting on the upper end of all ells.

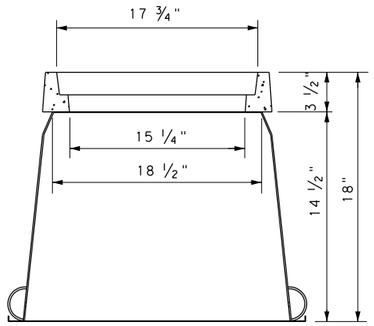
(3) Install all conduits in a neat and workmanlike manner.



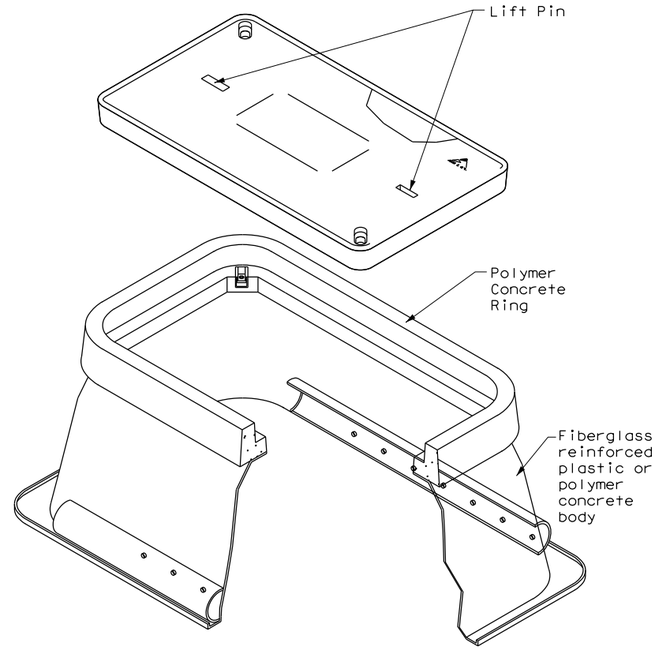
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
BATTERY BOX
GROUND BOXES

ED(12)-14

FILE: ed12-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT			
©TxDOT October 2014	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0915	17	072		CS, ETC		
	DIST	COUNTY			SHEET NO.		
	SAT	COMAL			118		

71M

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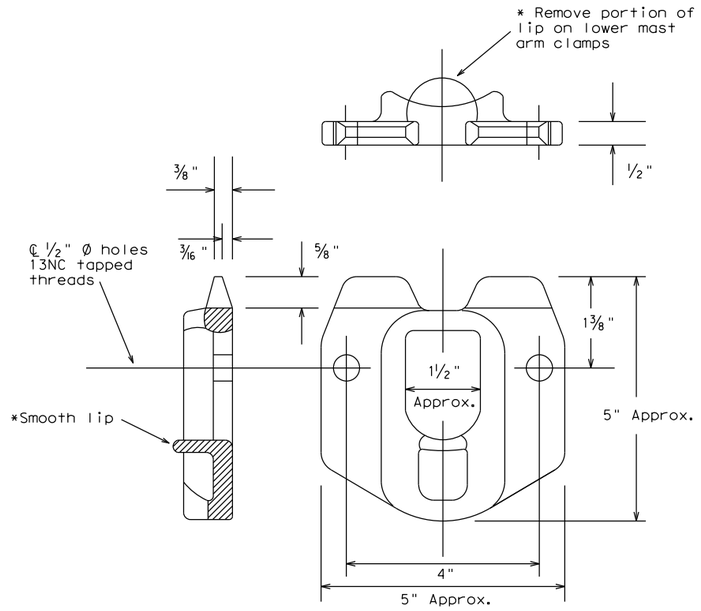
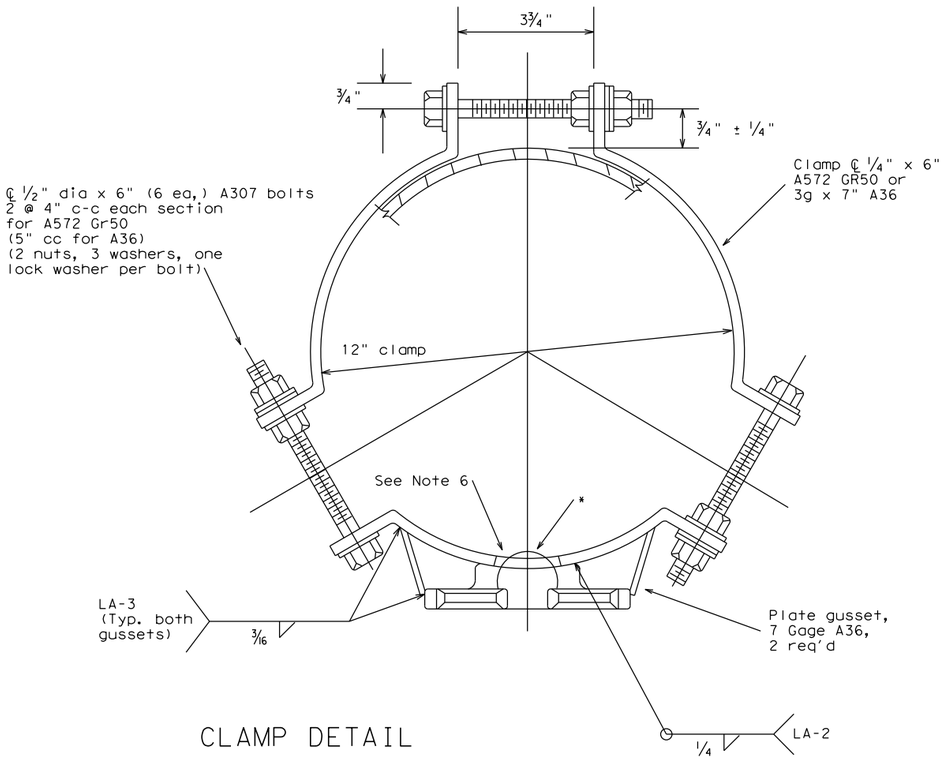
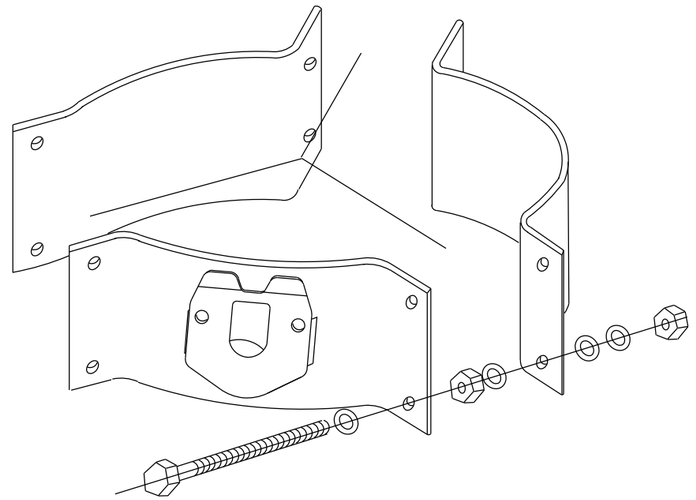


POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, 1/2in. X 1 1/2in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

© TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99	0915	17	072	CS, ETC
1-12	DIST	COUNTY		SHEET NO.
	SAT	COMAL		119

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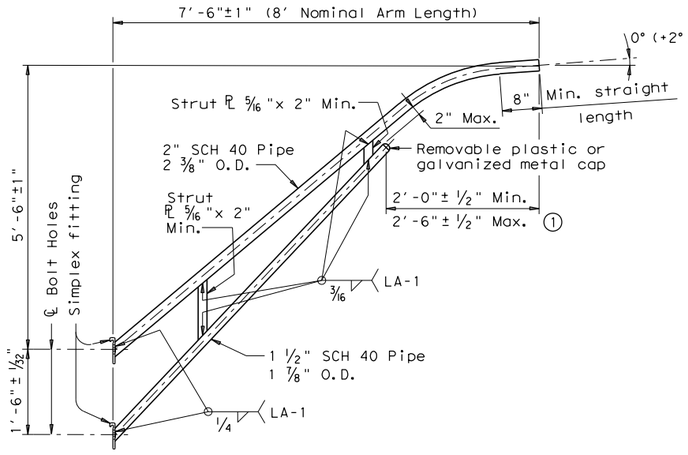
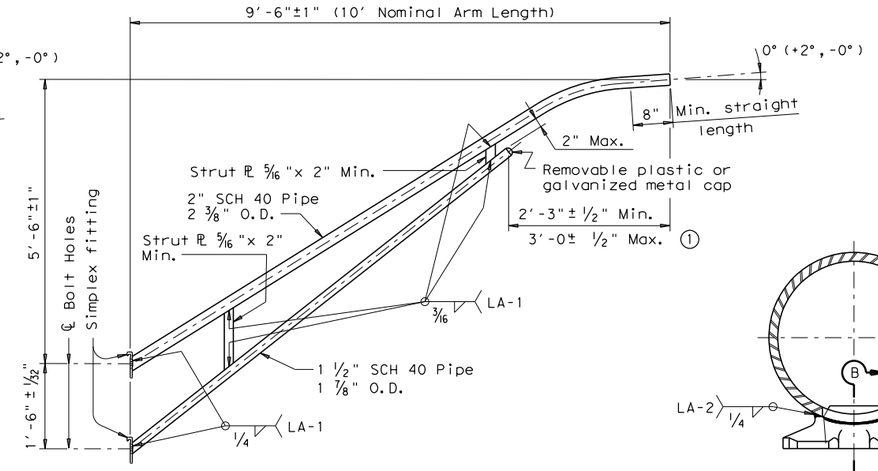
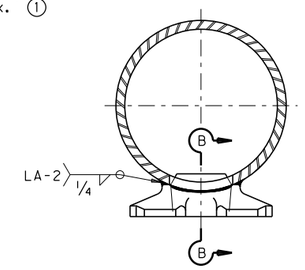


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

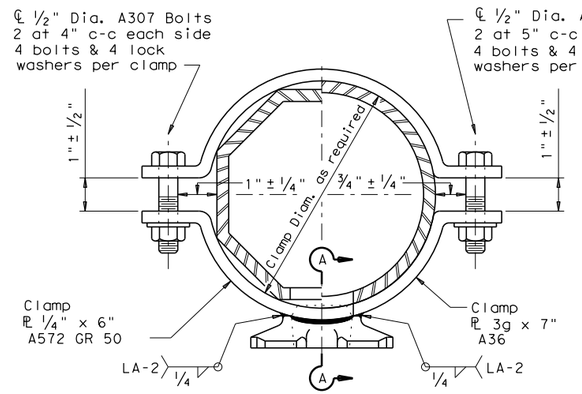
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

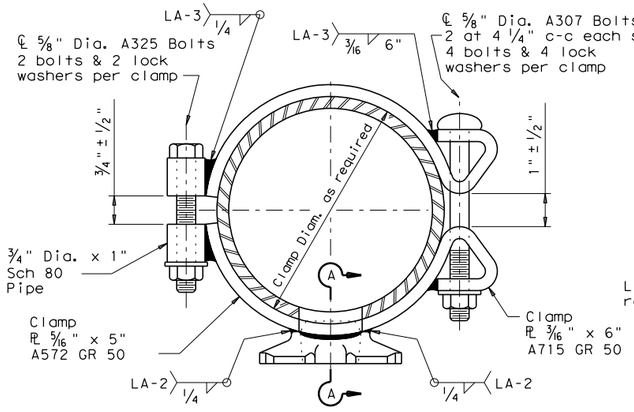
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



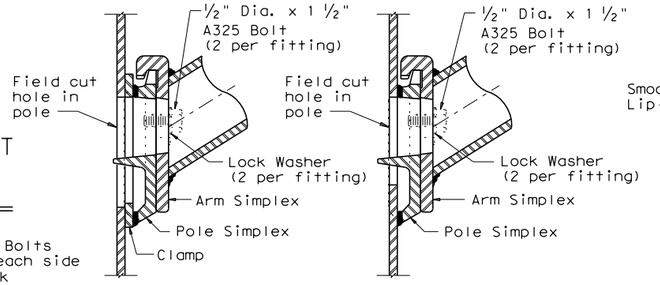
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



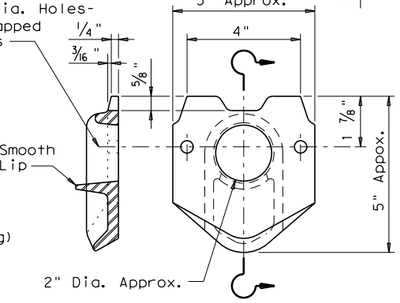
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

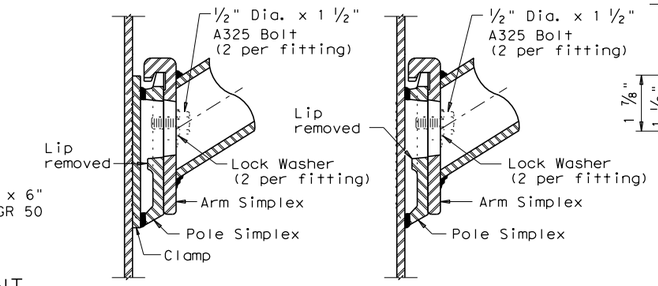


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

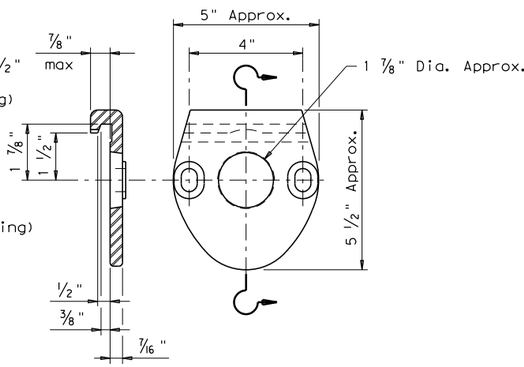


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

DN: LEH	CK: JSY	DW: LTT	CK: TEB

REVISIONS	CONT	SECT	JOB	HIGHWAY
5-96	0915	17	072	CS, ETC
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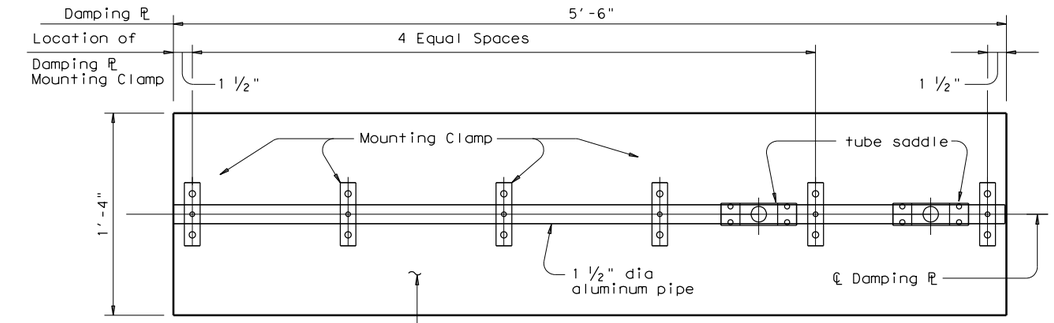
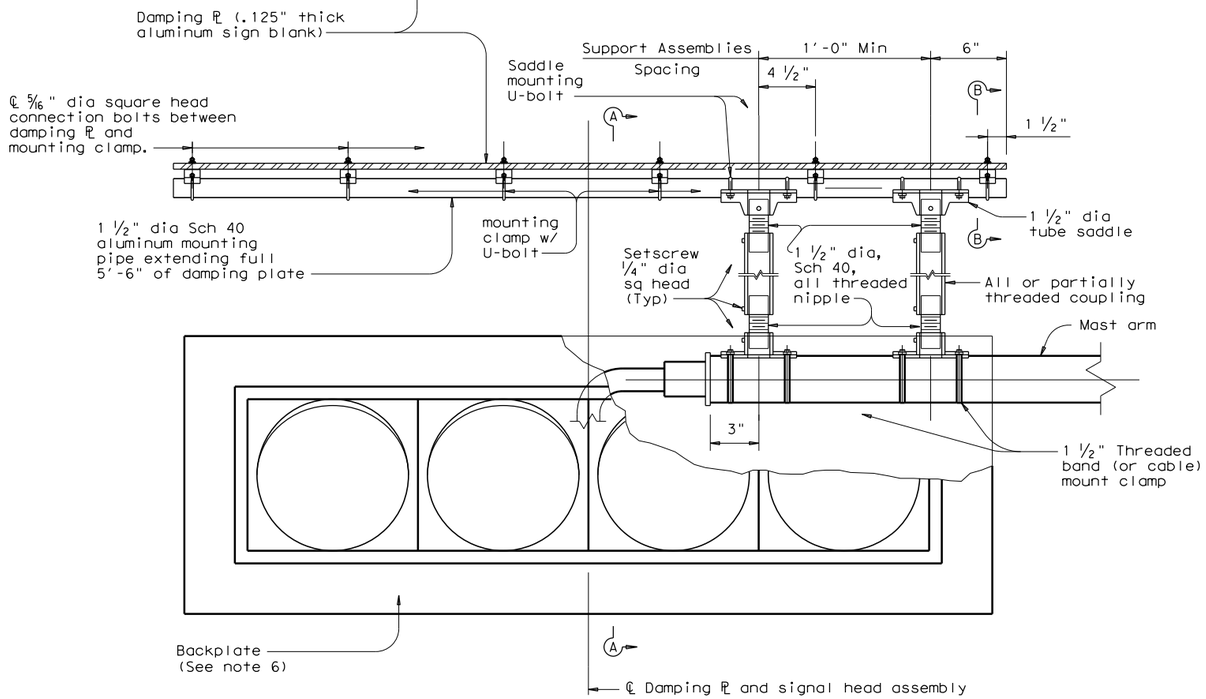


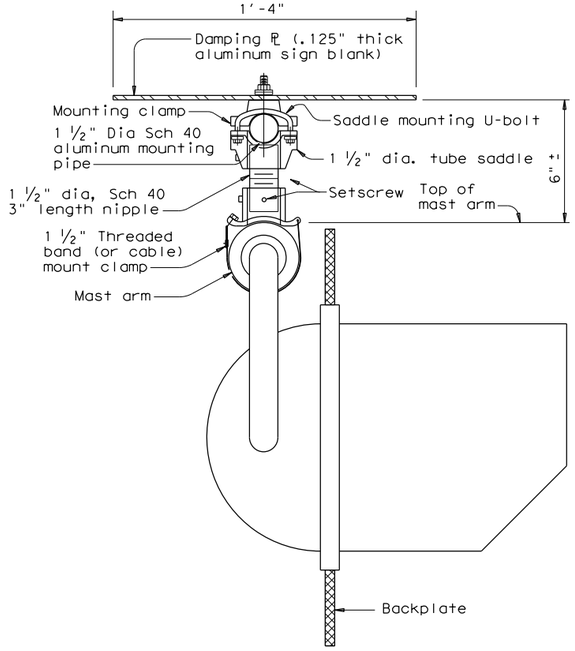
PLAN



ELEVATION

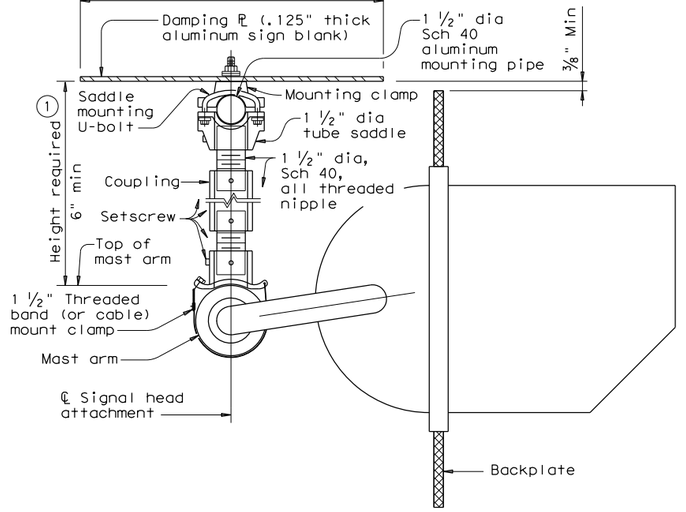
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



SECTION A-A

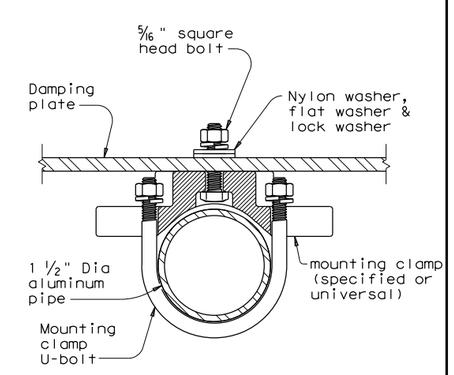
(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.

3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 6-20	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		121

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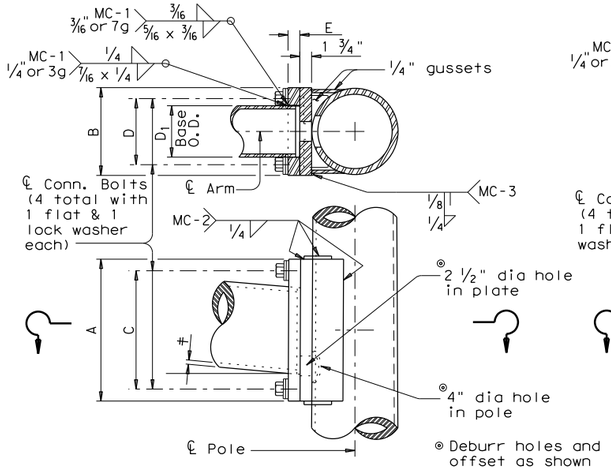
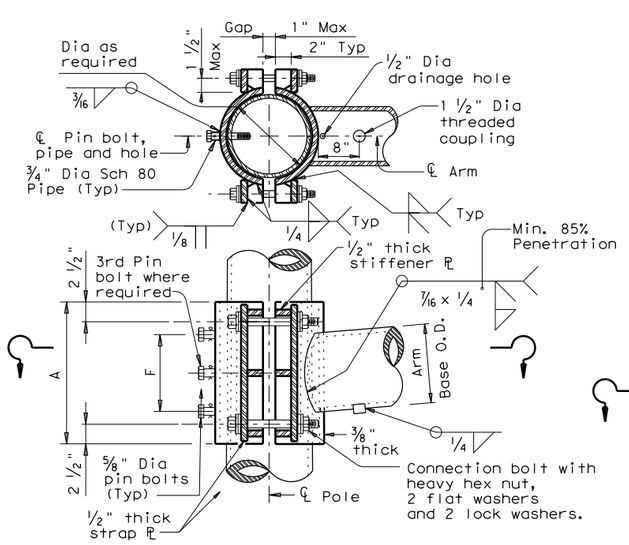
ARM SIZE D_1 in.	ARM SIZE ǂ in.	A in.	B in.	C in.	D in.	E in.	CONN BOLT DIA in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



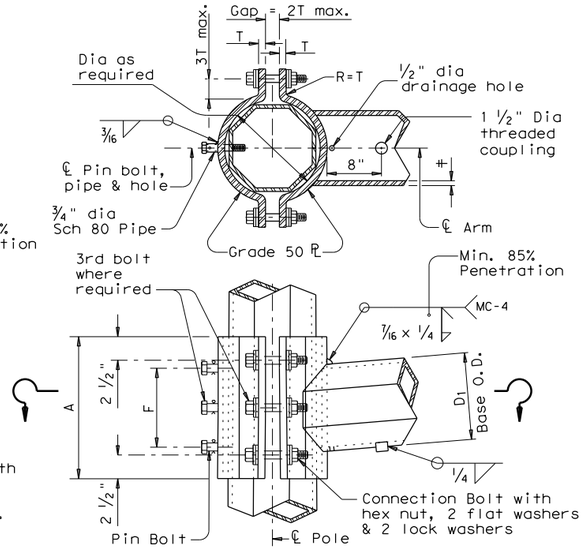
FIXED MOUNT DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ǂ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 ¼	3	5/8
9.5	.239	18	12	4	1 ¼	3	5/8
10.0	.239	18	12	4	1 ¼	3	5/8



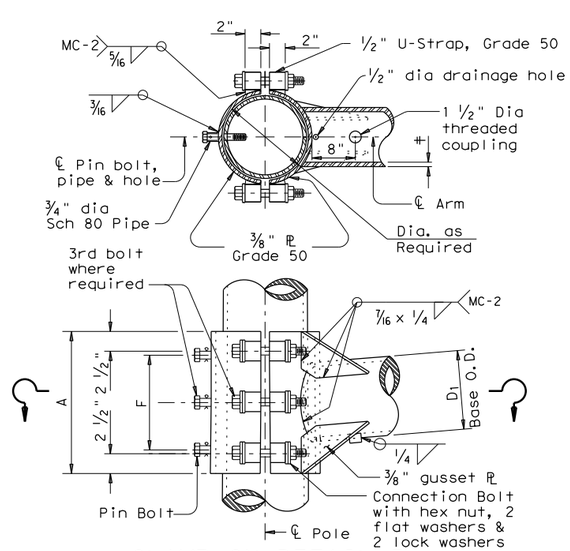
CLAMP-ON DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ǂ in.	A in.	F in.	T in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
7.0	.179	12	6	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

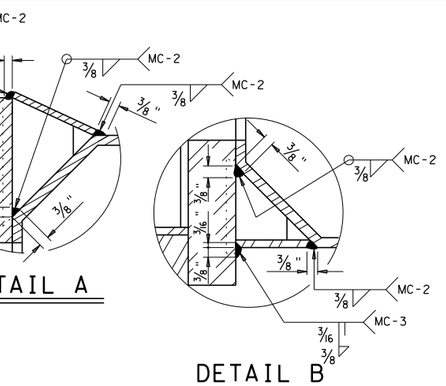


CLAMP-ON DETAIL 2

ARM SIZE D_1 in.	ARM SIZE ǂ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

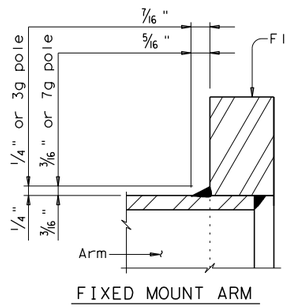


CLAMP-ON DETAIL 3

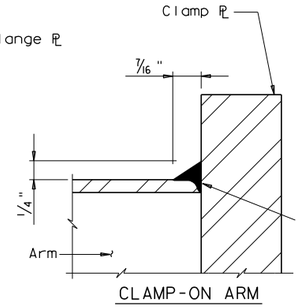


DETAIL A

DETAIL B



FIXED MOUNT ARM



CLAMP-ON ARM

ARM BASE WELD DETAILS

ARM SIZE D_1 in.	ARM SIZE ǂ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 9/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
5-09
1-12

CONT	SECT	JOB	HIGHWAY
0915	17	072	CS, ETC
DIST	COUNTY		SHEET NO.
SAT	COMAL		122

126A

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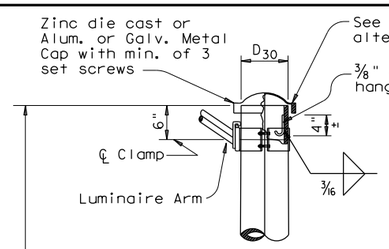
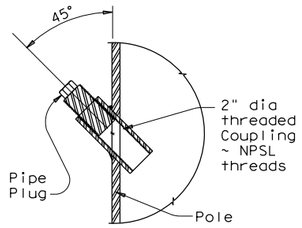
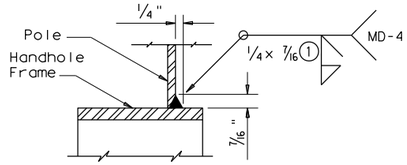


DETAIL A

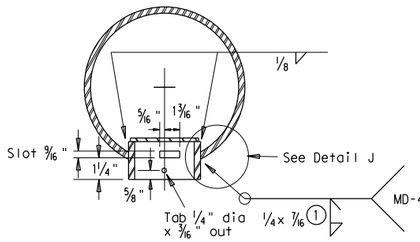
(for pole with luminaire)



POLE COUPLING DETAIL

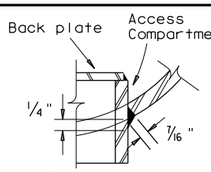


DETAIL G

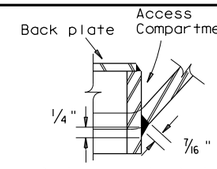


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

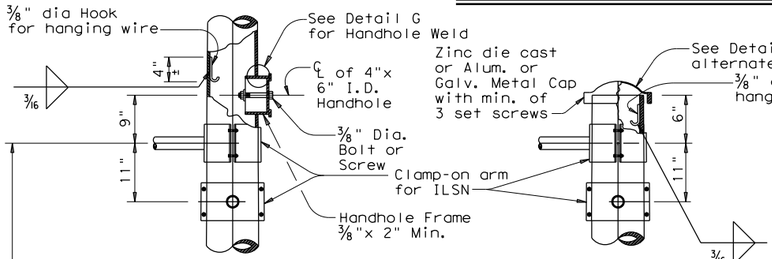


Round Pole



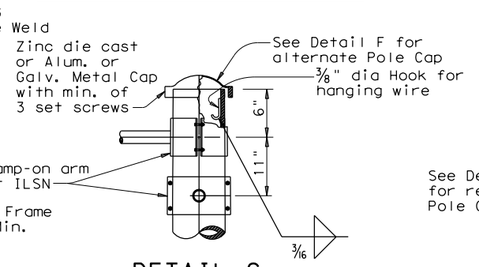
Polygonal Pole

DETAIL J

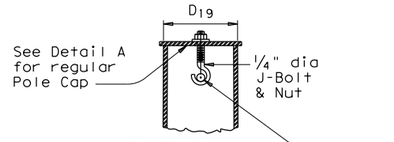


DETAIL B

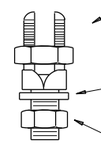
(If ILSN applied)



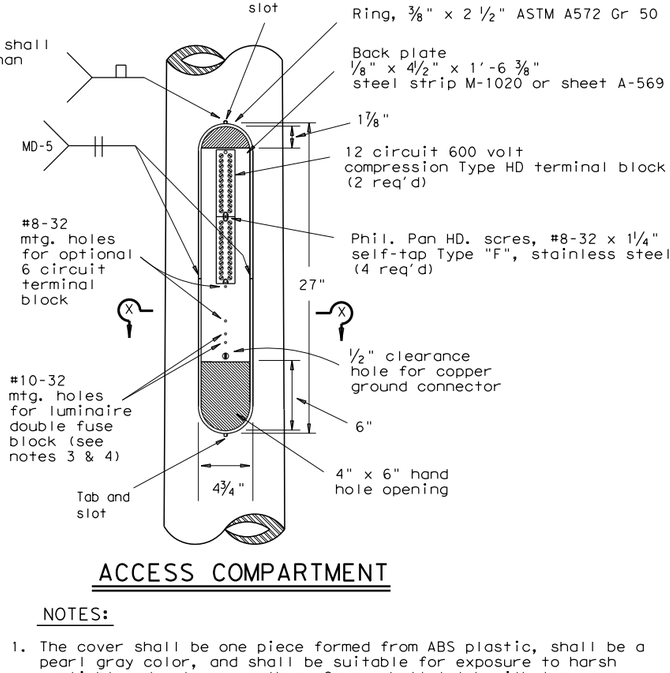
DETAIL C



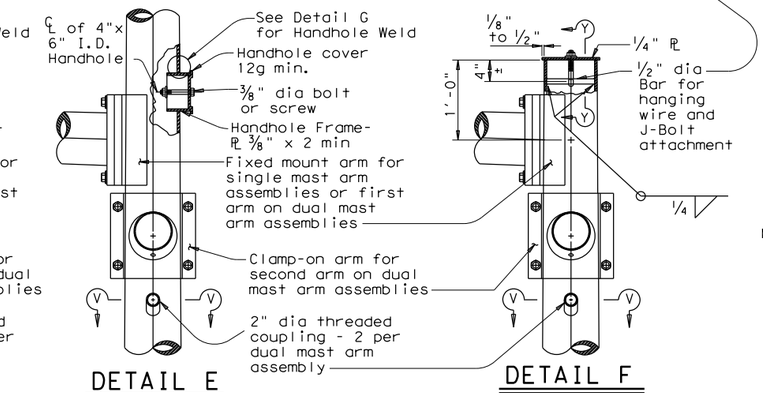
SECTION Y-Y



COPPER GROUND CONNECTOR



ACCESS COMPARTMENT



DETAIL D

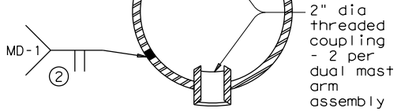
(for 30' pole with luminaire and ILSN sign)

DETAIL E

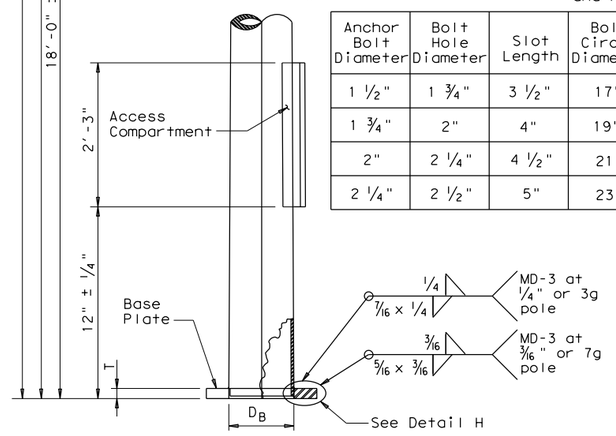
(for 24' pole with ILSN sign and no luminaire)

DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

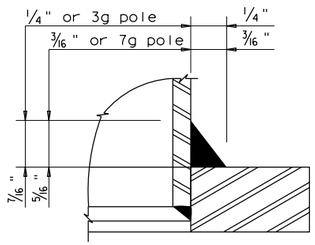


SECTION V-V

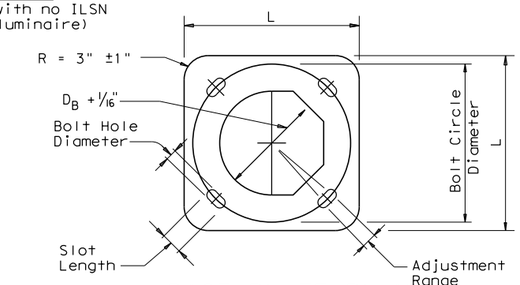


POLE ELEVATION

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
0915	17	072	CS, ETC
DIST	COUNTY		SHEET NO.
SAT	COMAL		123

MOUNTING LOCATIONS

PRESENCE (RPDD)

① PREFERRED PLACEMENT FOR MAST ARMS, STRAIN POLES AND TIMBER POLES. ON MAST ARM POLES, MOUNT BELOW CONNECTION OF MAST ARM TO A MINIMUM OF 15 FT., MOUNT AS HIGH AS POSSIBLE TO A MAXIMUM OF 30 FT ON STRAIN AND TIMBER POLES.

② PREFERRED PLACEMENT FOR MAST ARMS. MOUNT ON AND BELOW MAST ARM ON NEAR SIDE OF ARM.

③ ALTERNATE PLACEMENT LOCATION. MOUNT AS HIGH AS POSSIBLE TO A MAXIMUM OF 30 FT TO PREVENT OCCLUSION OF THE LEFT TURN LANES. THIS PLACEMENT TO BE USED ONLY IF RPDD CANNOT BE MOUNTED IN THE PREFERRED PLACEMENT LOCATIONS.

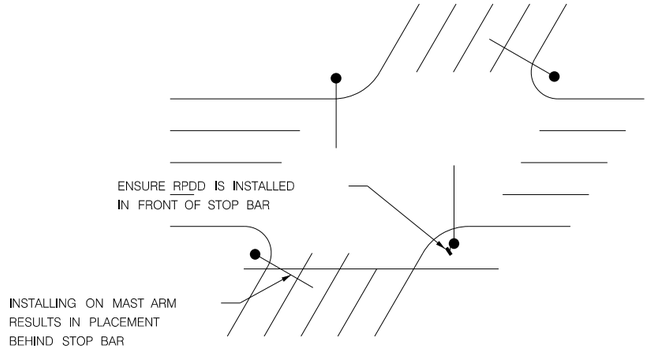
ADVANCE (RADD)

Ⓐ PREFERRED PLACEMENT FOR MAST ARMS. ALIGN RADD WITH CENTER OF TRAVEL LANES.

Ⓑ ALTERNATE PLACEMENT FOR MAST ARMS. MOUNT ON BACK SIDE OF OPPOSING MAST ARM.

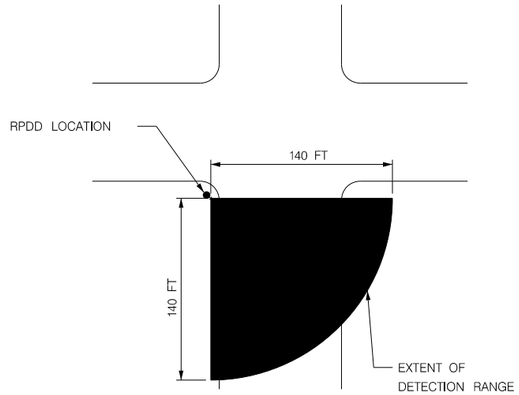
Ⓒ STRAIN OR TIMBER POLE PLACEMENT. MOUNT ON NEAR SIDE POLE.

Ⓓ ALTERNATE STRAIN OR TIMBER POLE PLACEMENT. MOUNT LUMINAIRE ARM ON NEAR SIDE POLE WITH A MAXIMUM 40 FT MOUNTING HEIGHT.



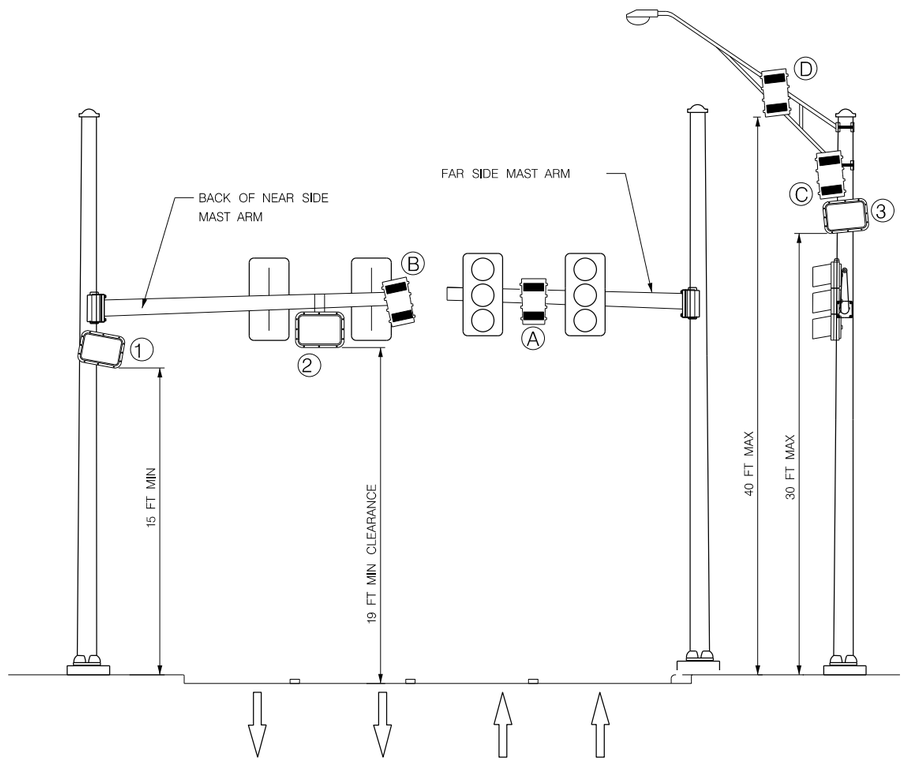
SKEWED INTERSECTION RPDD PLACEMENT

NTS



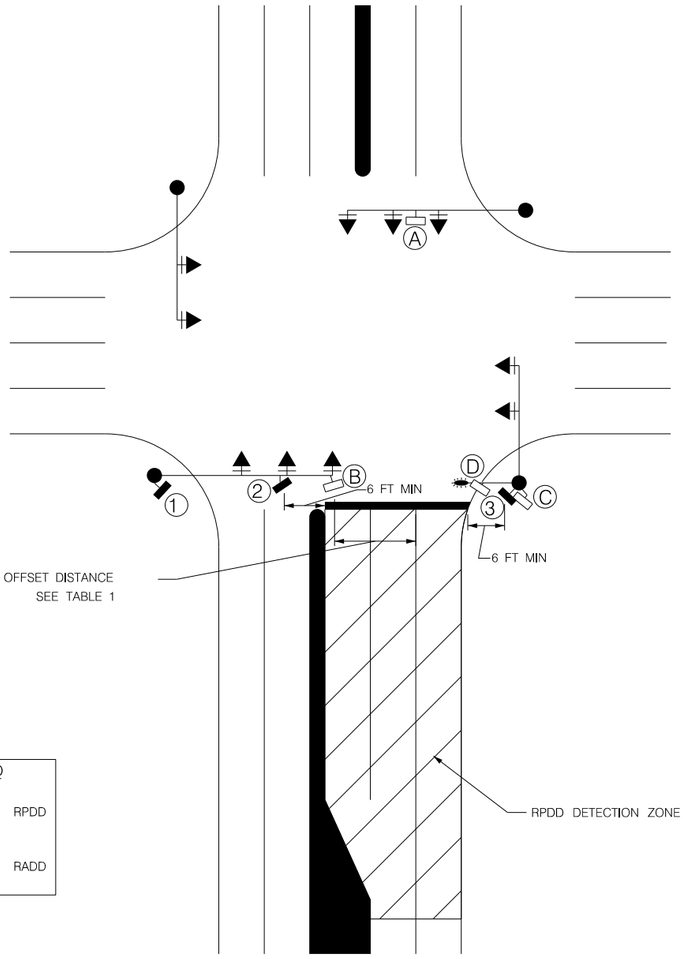
TYPICAL RPDD DETECTION RANGE

NTS



ELEVATION VIEW

NTS



PLAN VIEW

NTS

LEGEND

OR RPDD

OR RADD

NOTES:

1) A MINIMUM 6 FT HORIZONTAL OFFSET MUST BE MAINTAINED BETWEEN THE RPDD AND THE DETECTION ZONE

2) THE RPDD SHALL BE MOUNTED SUCH THAT AT LEAST 20 FT ALONG THE FARTHEST LANE TO BE MONITORED IS WITHIN THE FIELD OF VIEW OF THE RPDD

3) AIM RPDD AT THE CENTER OF THE LANES TO BE MONITORED, APPROXIMATELY 50 FT FROM THE RPDD UNIT

4) MOUNT RPDD SO THAT ITS FIELD OF VIEW IS NOT OCCLUDED BY POLES, SIGNS, OR OTHER STRUCTURES

5) RADD MOUNTING HEIGHT SHALL NOT BE LESS THAN 17 FT OR GREATER THAN 40 FT. RADD MOUNTING LOCATION SHALL HAVE A MAXIMUM 50 FT LATERAL OFFSET FROM CENTER OF TRAVEL LANES TO BE MONITORED

Texas Department of Transportation

San Antonio District Standard

RADAR PRESENCE DETECTOR (RPDD)
RADAR ADVANCED DETECTION DEVICE (RADD)
PLACEMENT

SCALE: NS — RPDD-RADD-20

REVISIONS	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
MAR 2020	6			124
	STATE	DIST.	COUNTY	
	TEXAS	SAT	COMAL	
	CONT.	SECT.	JOB	HIGHWAY NO.
	0915	17	072,ETC.	CS,ETC.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC:

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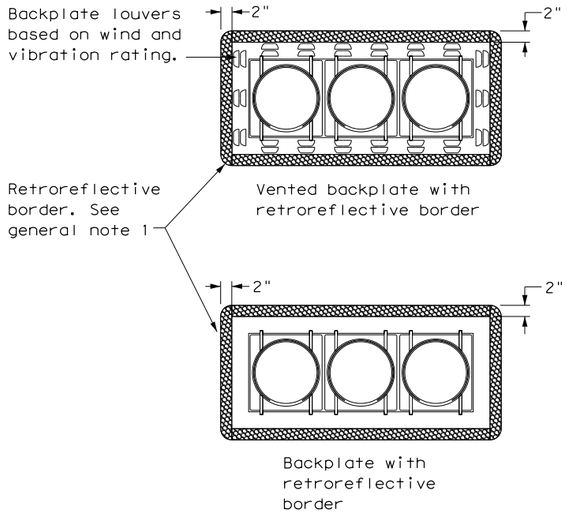
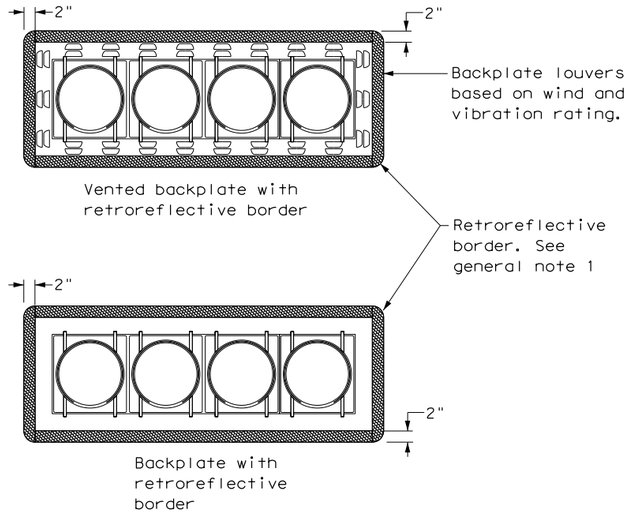
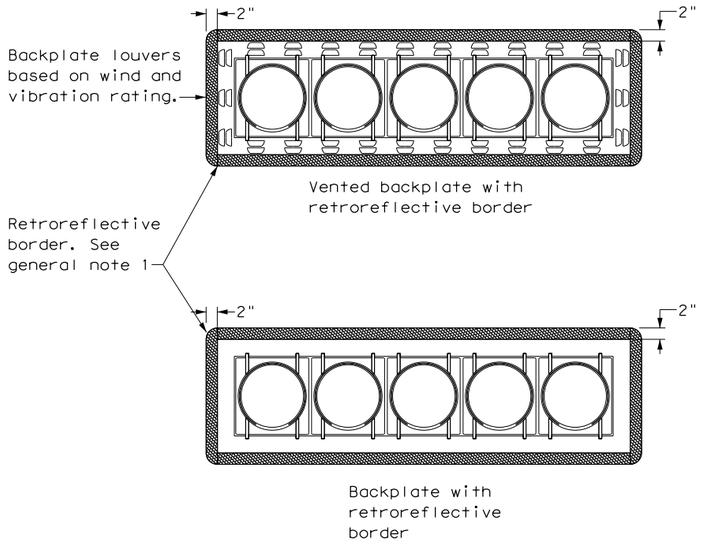


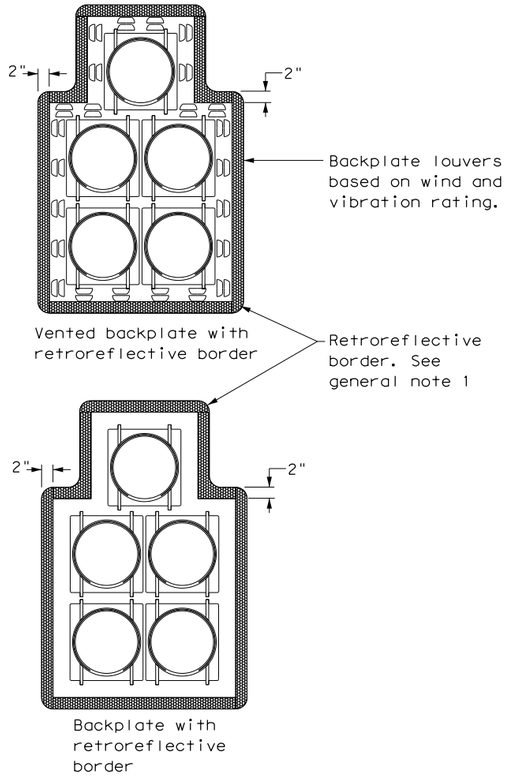
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



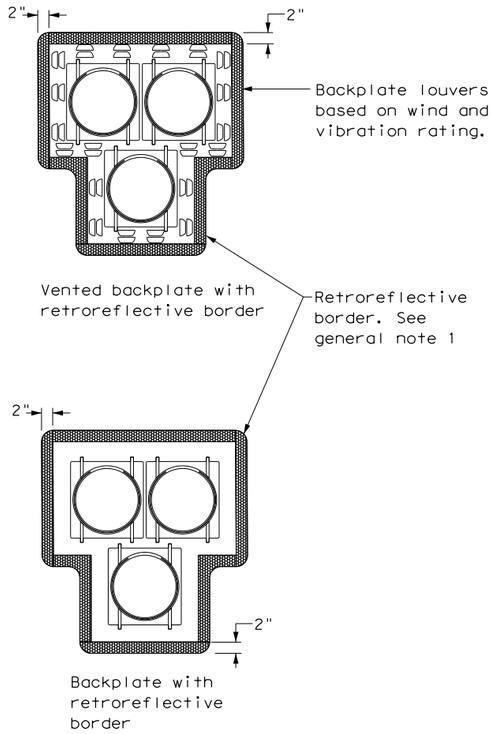
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		125

DATE: 4/25/2022 11:25:39 AM
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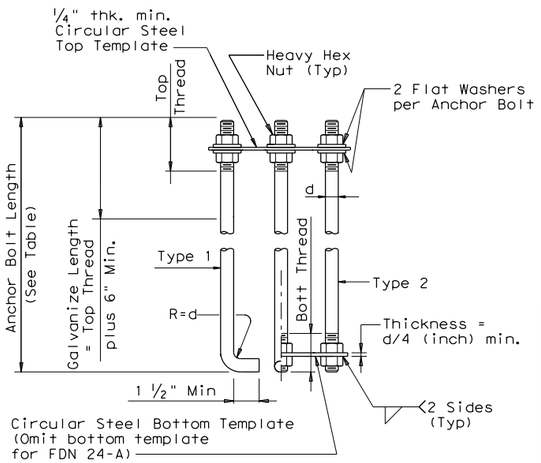
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

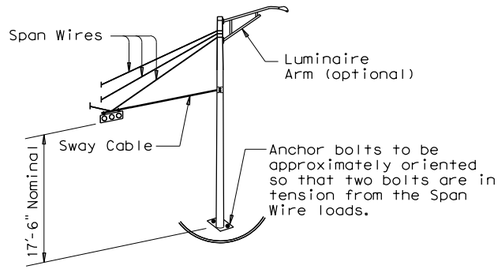
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



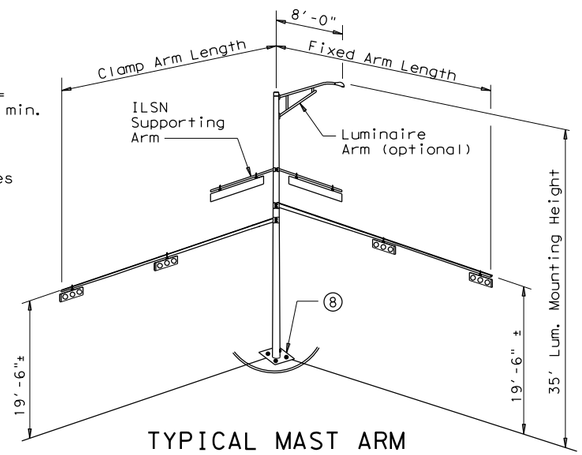
HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

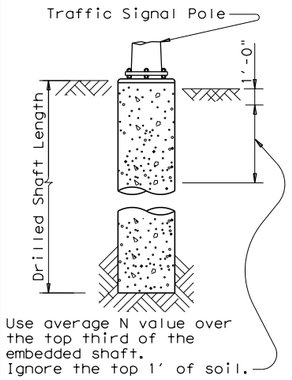
⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



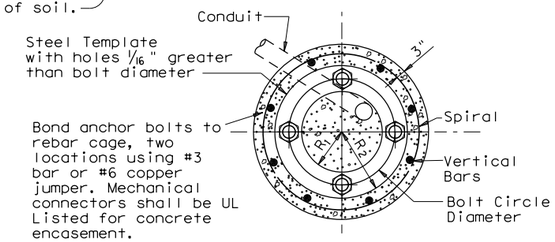
TYPICAL STRAIN POLE ASSEMBLY



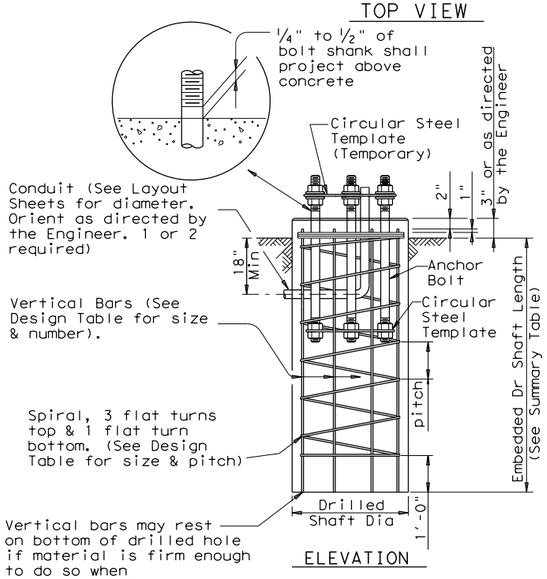
TYPICAL MAST ARM ASSEMBLY



Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.



TOP VIEW



ELEVATION

FOUNDATION DETAILS

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
FM 1101 AT FM 306	10	24-A	4	24				
	10	30-A	1		11			
	10	36-A	3			13		
TOTAL DRILLED SHAFT LENGTHS				24	11	39		

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

DESIGN

STATE OF TEXAS
JUSTIN W. CLARK
118715
LICENSED PROFESSIONAL ENGINEER

JUSTIN W. CLARK, P.E. — 4/25/2022 DATE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

REVISIONS	DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
5-96 11-99 1-12	CONT	SECT	JOB	HIGHWAY
	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		126

DATE: 4/25/2022 11:25:52 AM
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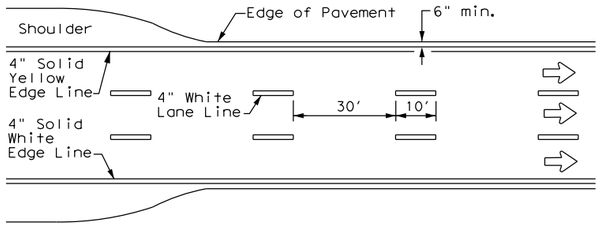
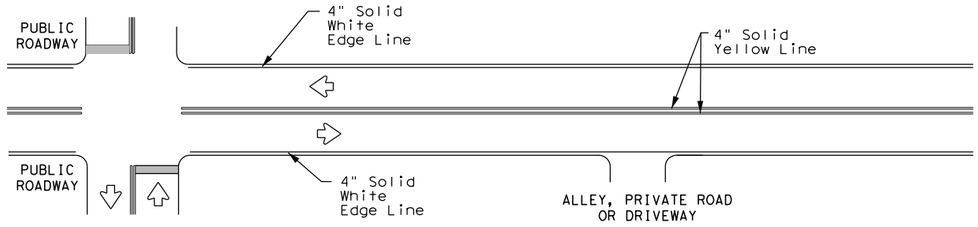
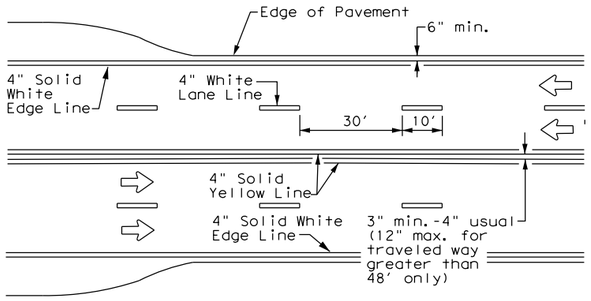


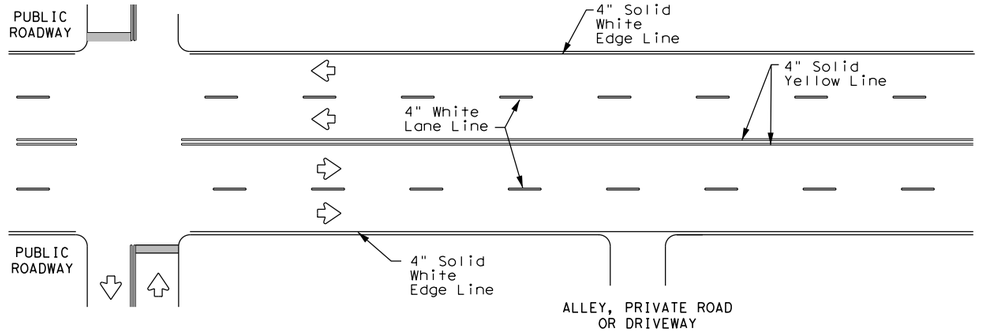
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



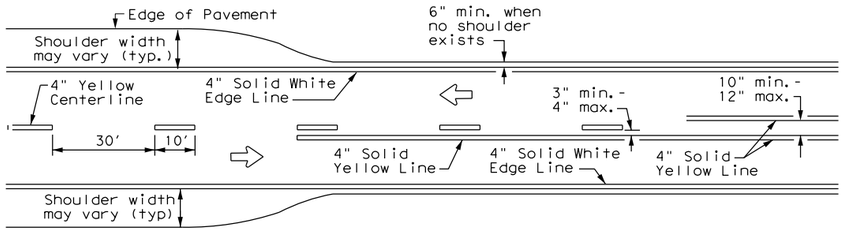
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



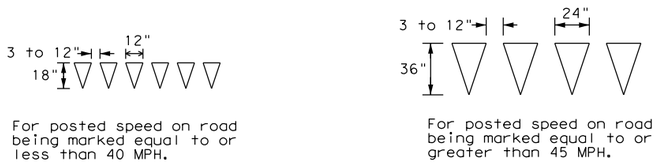
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



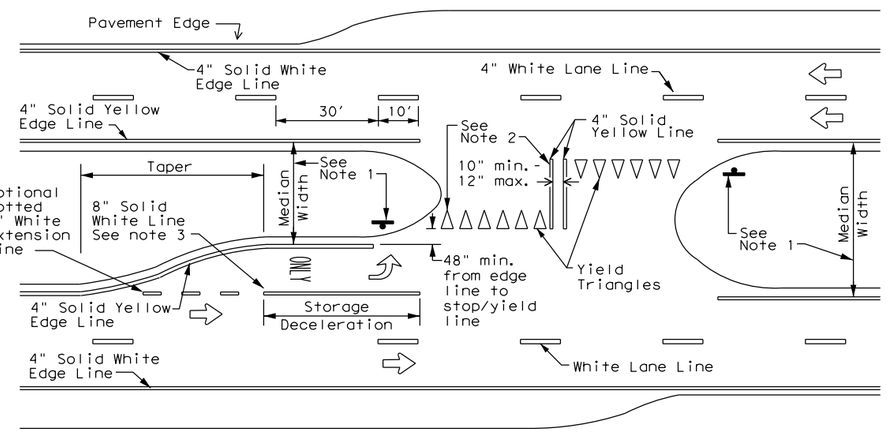
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



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.

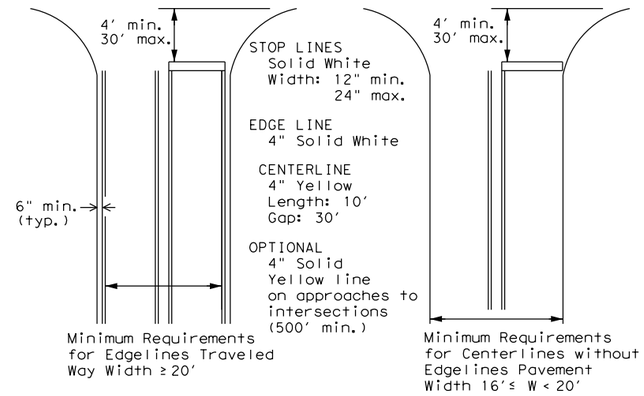
GENERAL NOTES

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

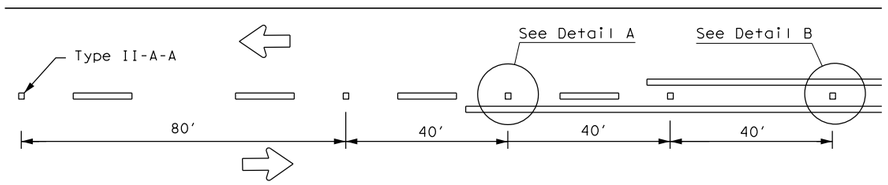
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

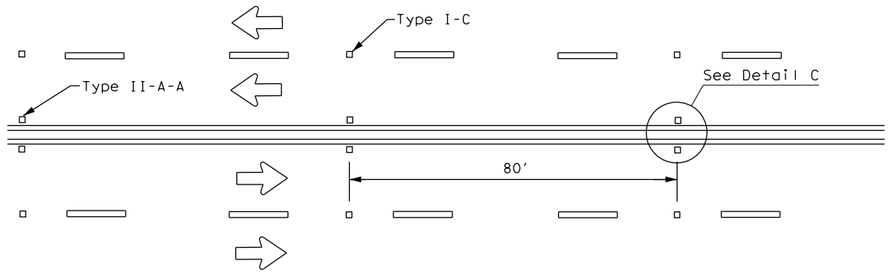
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0915	17	072	CS, ETC
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	SAT	COMAL		127

22A

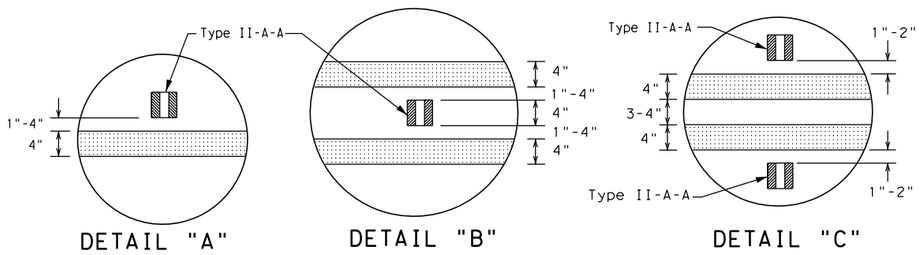
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



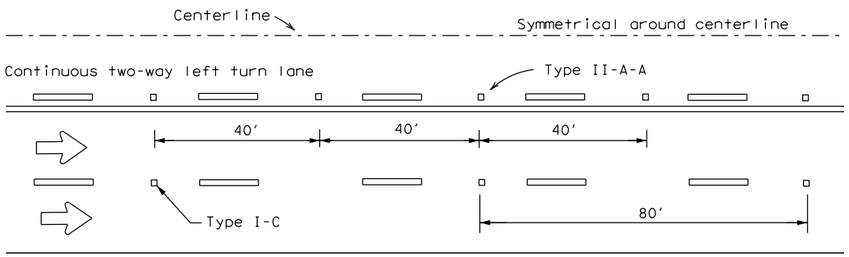
CENTERLINE FOR ALL TWO LANE ROADWAYS



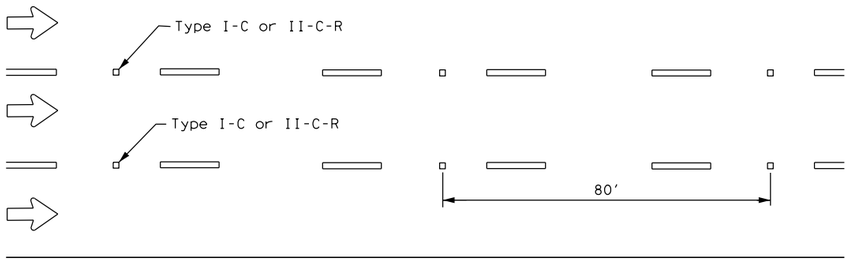
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

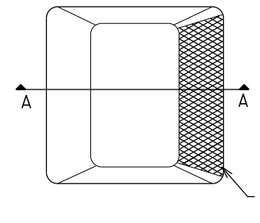


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

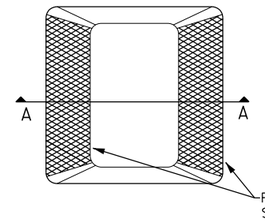
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

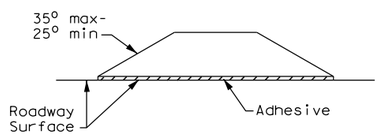
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

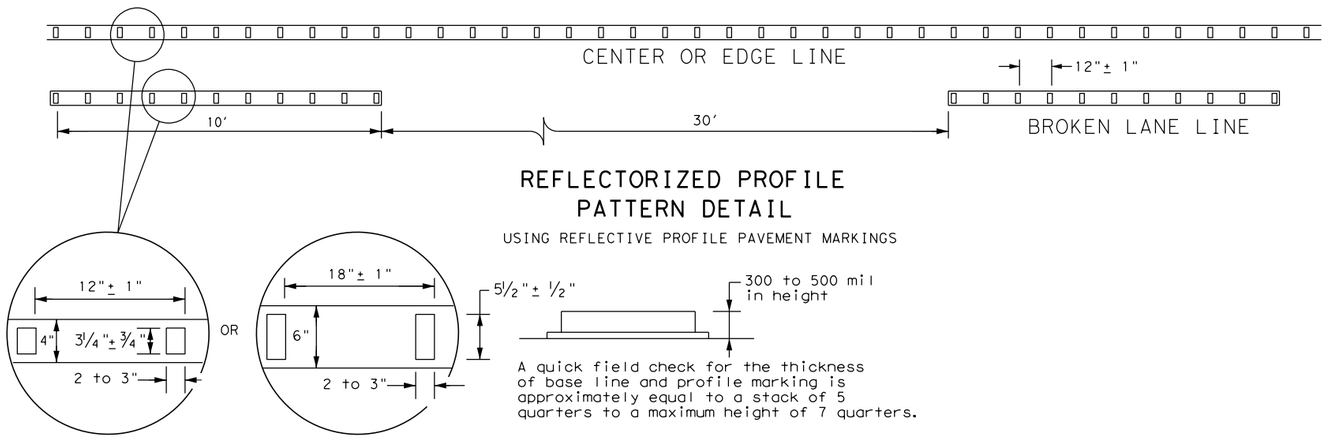


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS

PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		128

22B

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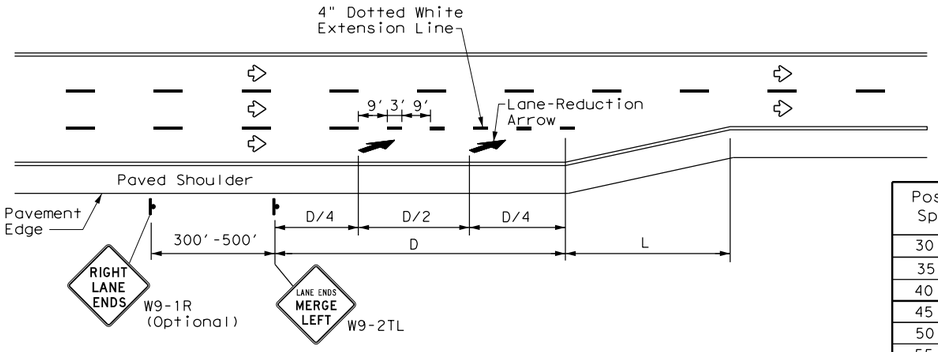
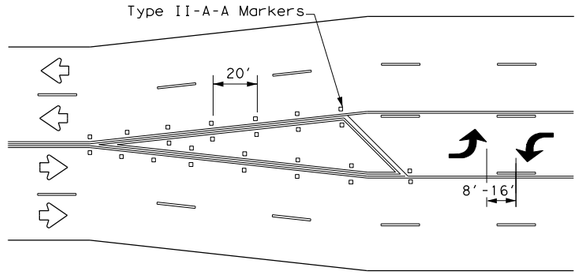


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

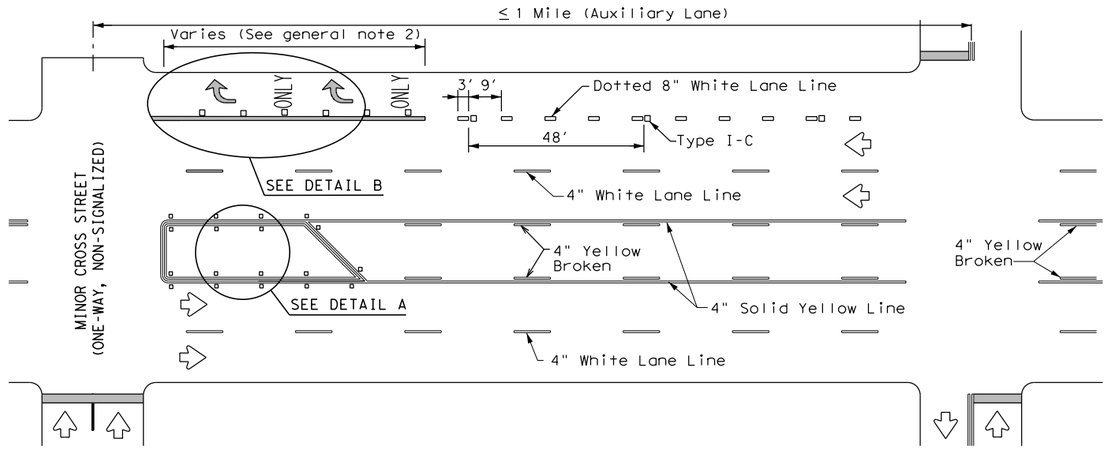
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

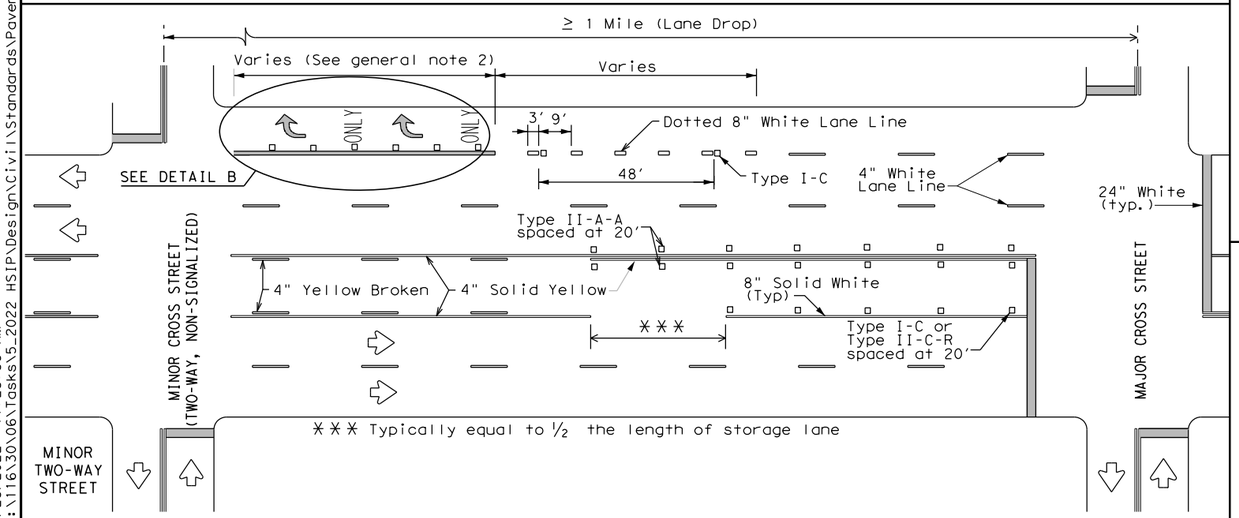
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

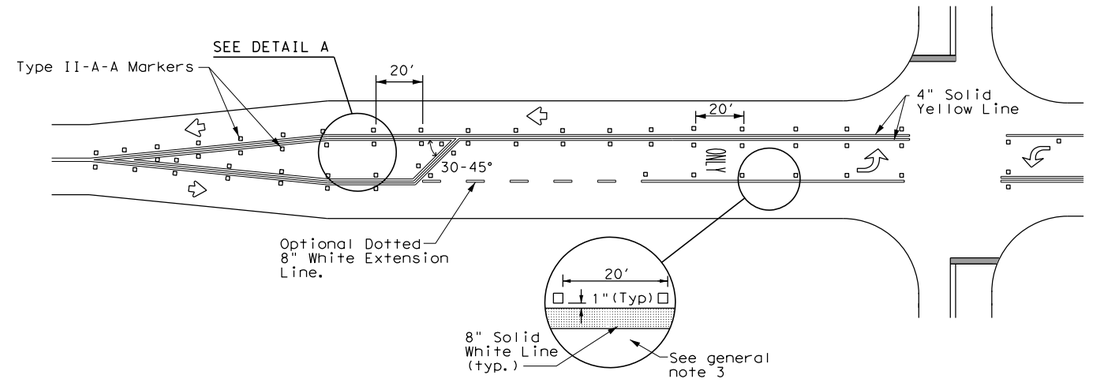
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



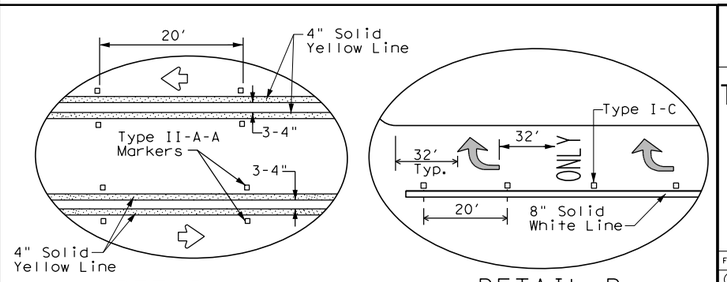
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-20

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©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	SAT	COMAL		129
3-03 6-20				

22C

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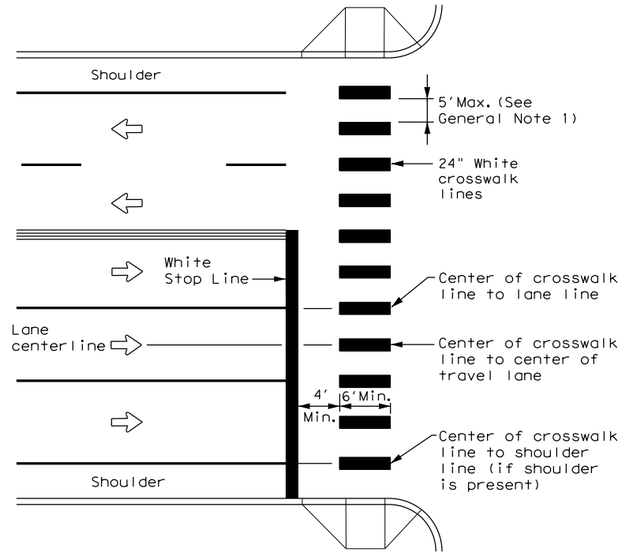


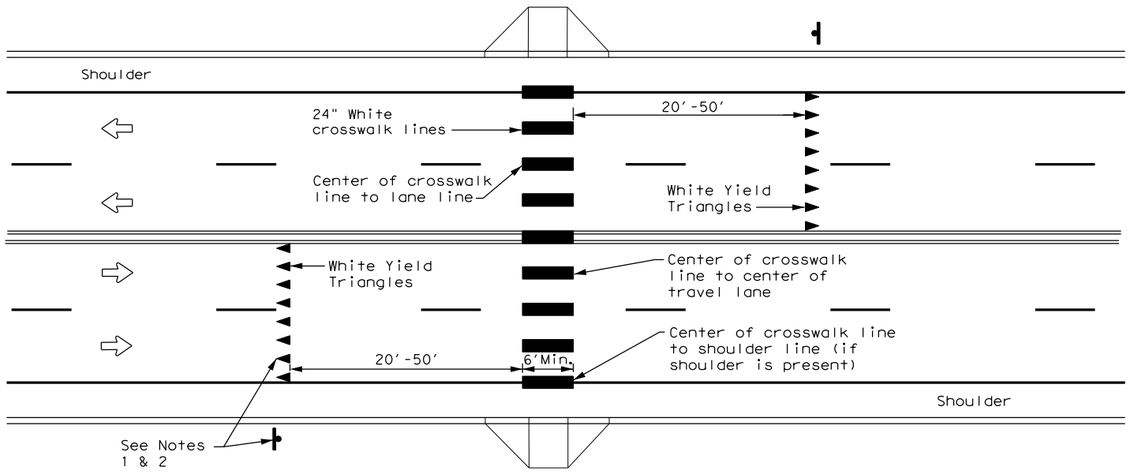
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar/Yield Triangles and Crosswalk shall be approved by the Engineer in the field.

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

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



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES

1. Use yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		130

22D

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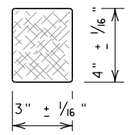
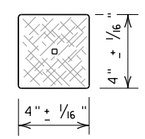
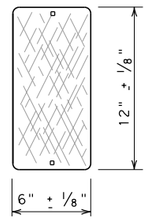
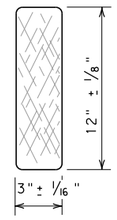
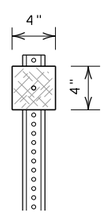
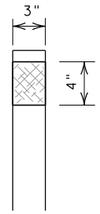
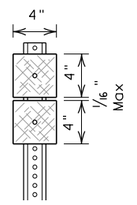
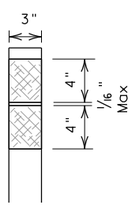
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
- S = Single
- D = Double

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

REFLECTOR UNIT SIZE
- 1 or 2

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

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

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

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

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

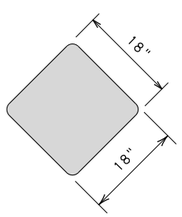
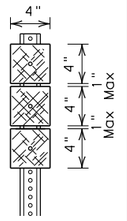
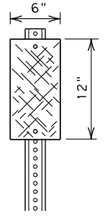
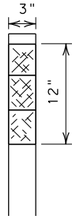
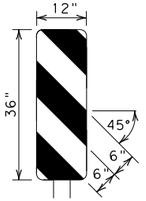
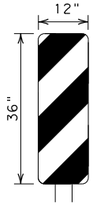
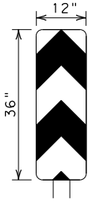
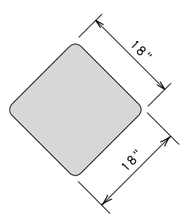
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker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

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

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

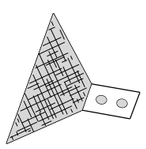
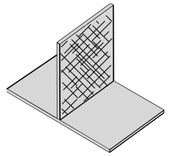
DIRECTION
If Required
- BI = Bi-Directional

OBJECT MARKERS

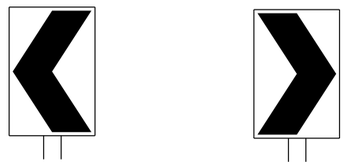
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

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

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SAT	COMAL		131

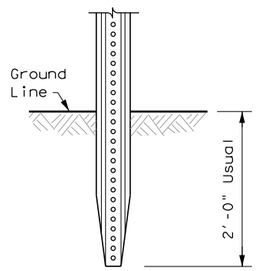
20A

DATE: 4/25/2022 11:26:07 AM
FILE: P:\116330\06\Tasks\5_2022 HSIP\Design\Civil\Standards\PavementMarkers\dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

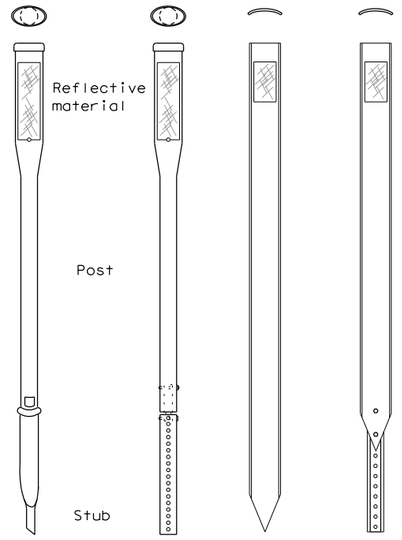


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

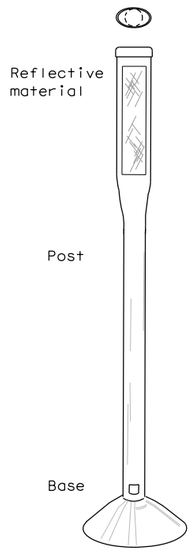
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



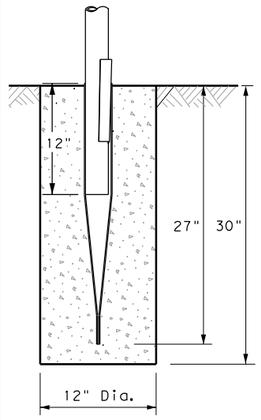
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

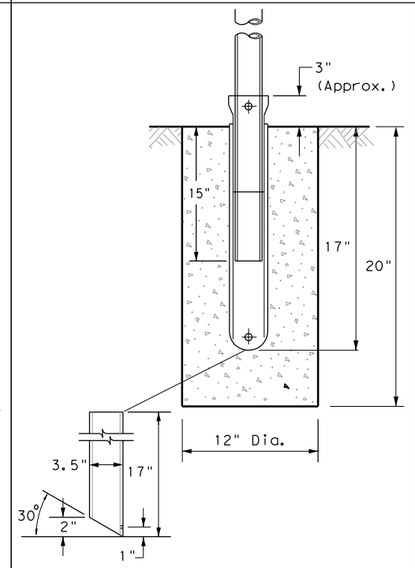
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

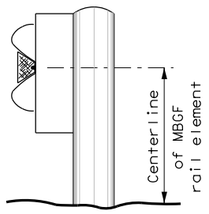
NOTE

1. Install per manufacturer's recommendations.

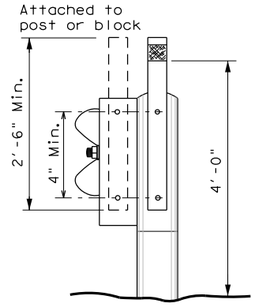
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

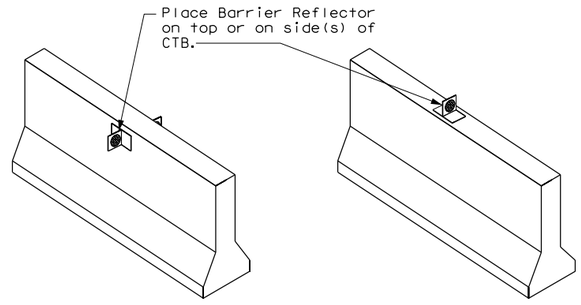
GF1



GF2



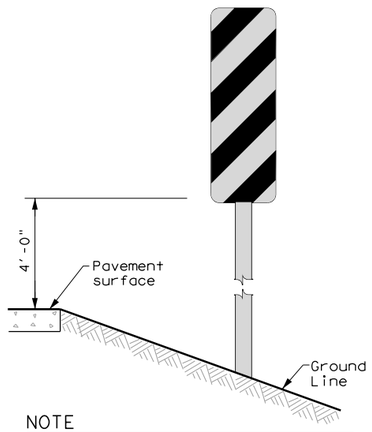
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

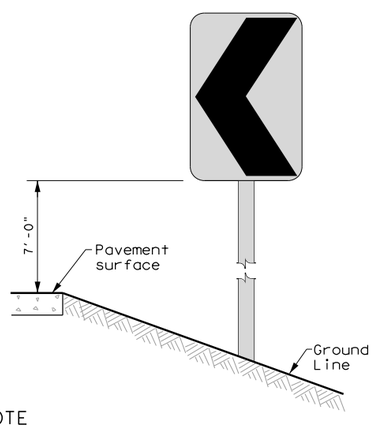
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

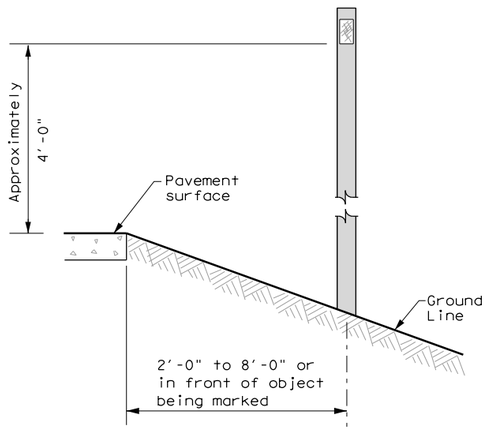
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SAT	COMAL		132

20B

DATE: 4/25/2022 11:26:10 AM
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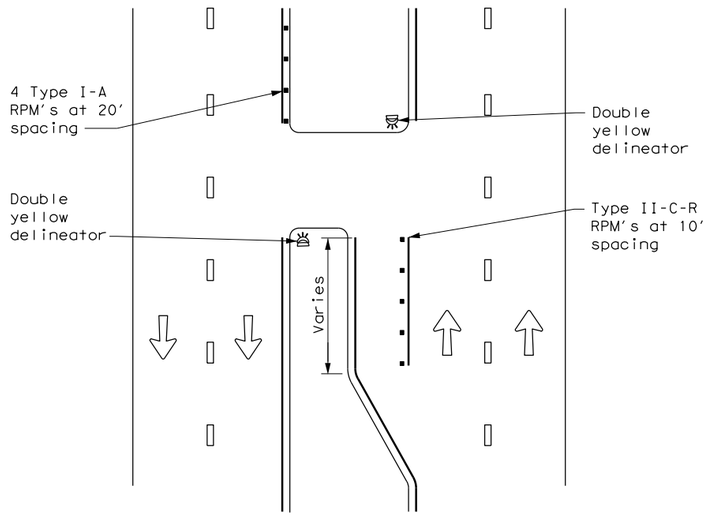
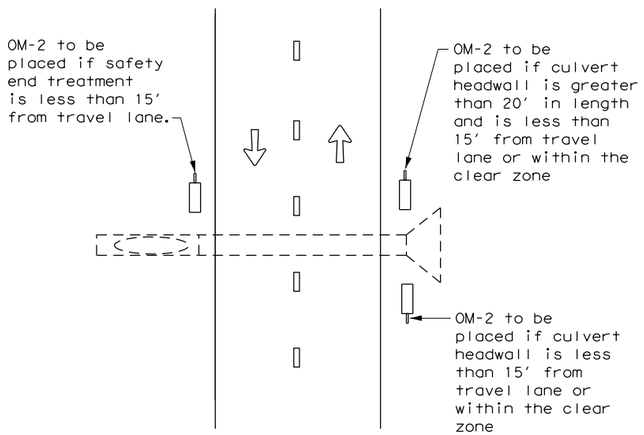
CROSSOVERS



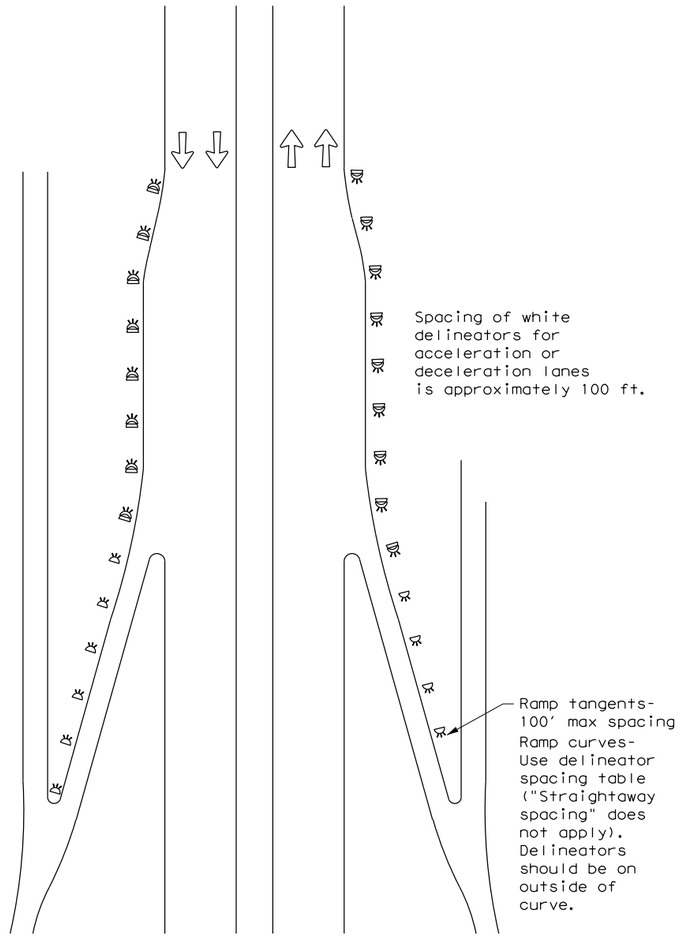
DETAIL 1

FOR CULVERTS WITHOUT MBGF



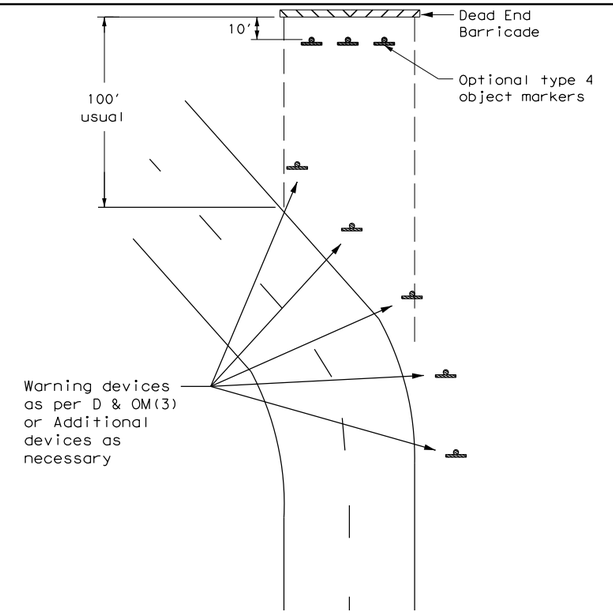
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



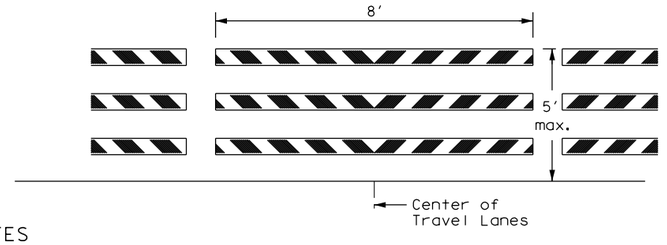
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
3-15	DIST	COUNTY		SHEET NO.
7-20	SAT	COMAL		133

20D

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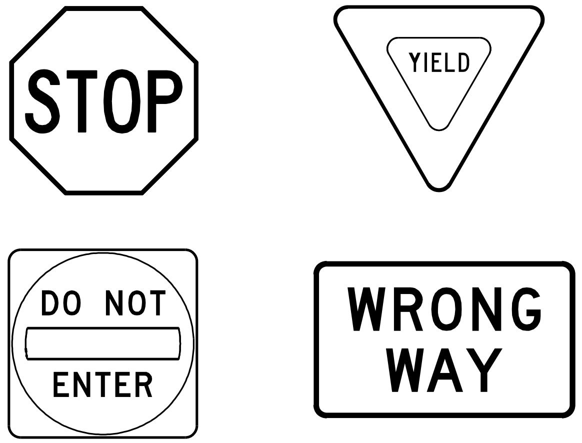
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(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

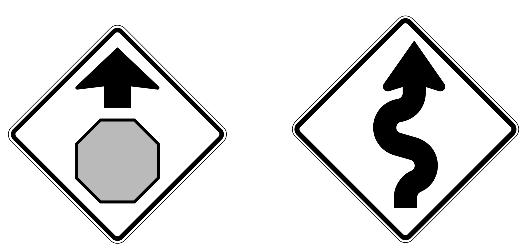
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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	0915	17	072	CS, ETC			
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.			
	SAT	COMAL		134			

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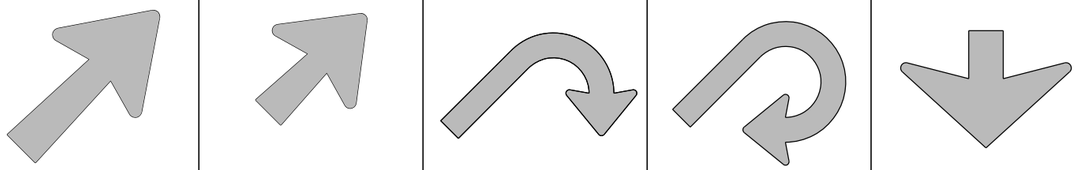
ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

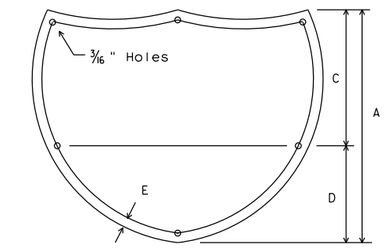
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

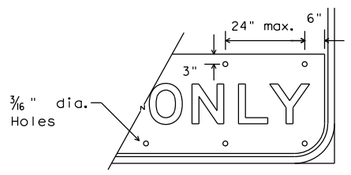
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

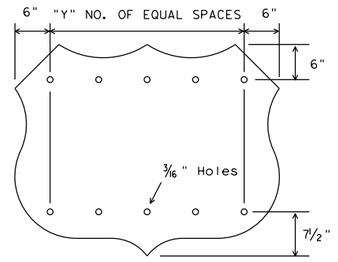


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

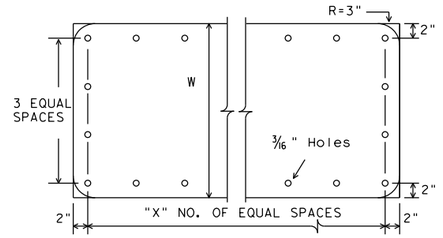


EXIT ONLY PANEL



U.S. ROUTE MARKERS

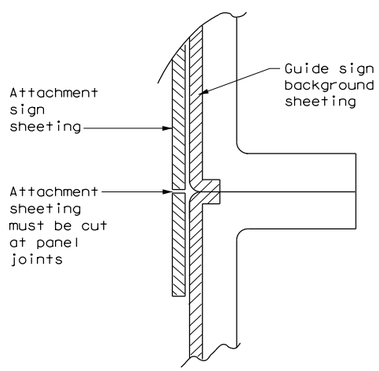
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

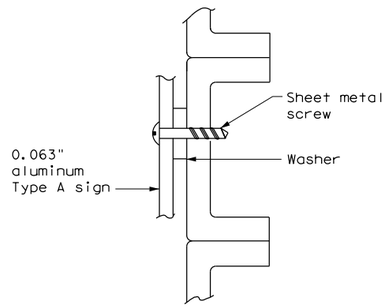
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



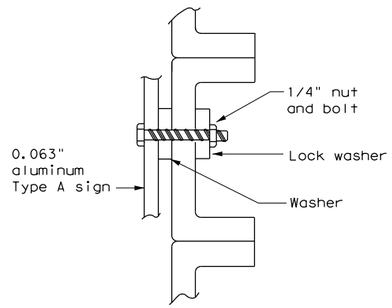
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



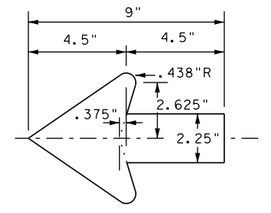
NUT/BOLT ATTACHMENT

NOTE:

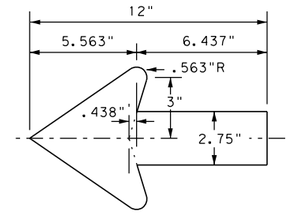
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0915	17	072	CS, ETC
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SAT	COMAL		135

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)

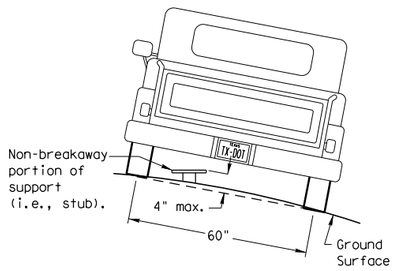
Anchor Type

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

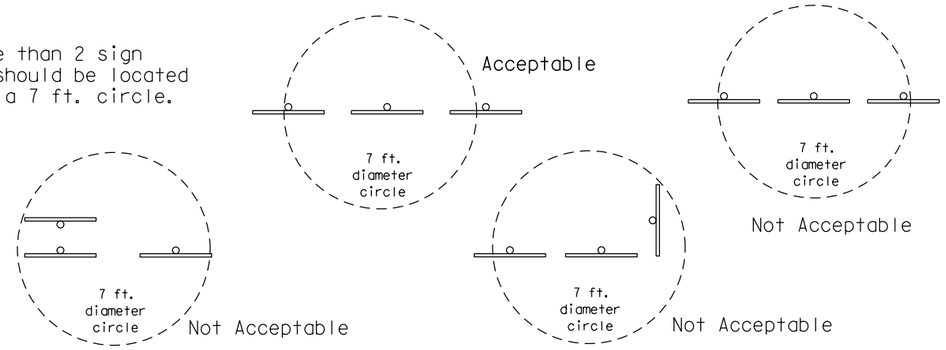
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
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



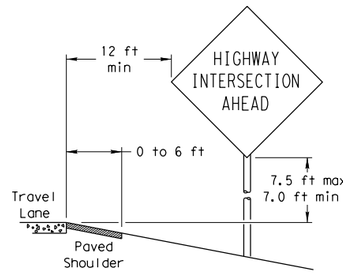
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

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



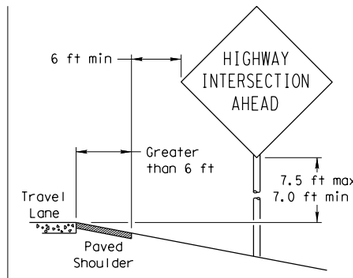
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

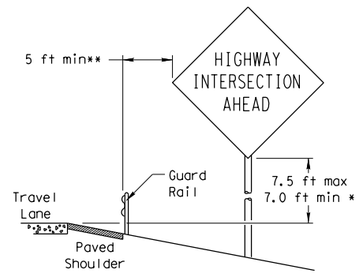
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



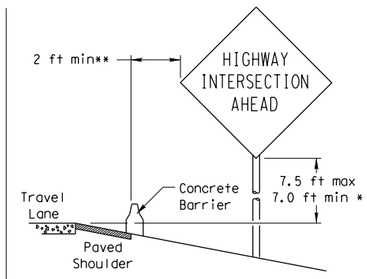
GREATER THAN 6 FT. WIDE

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



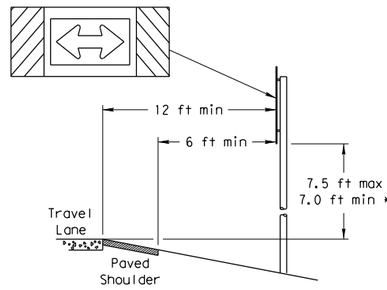
BEHIND GUARDRAIL



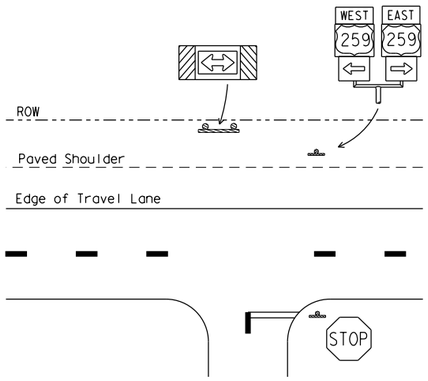
BEHIND CONCRETE BARRIER

**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.

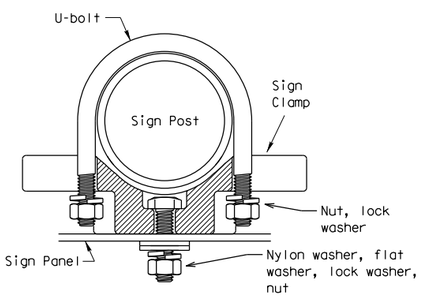
The maximum values may be increased when directed by the Engineer.

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

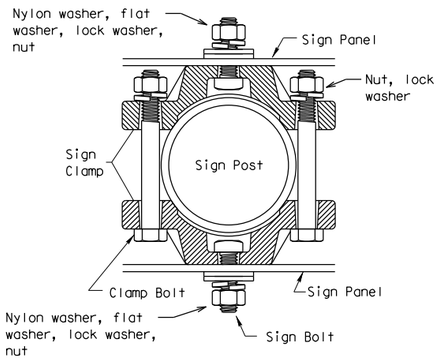
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



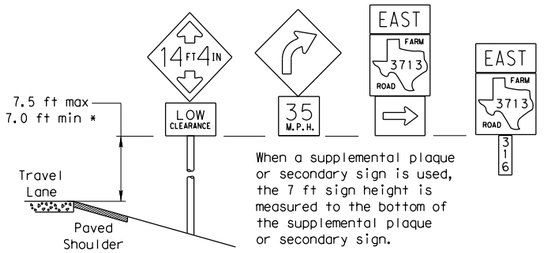
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

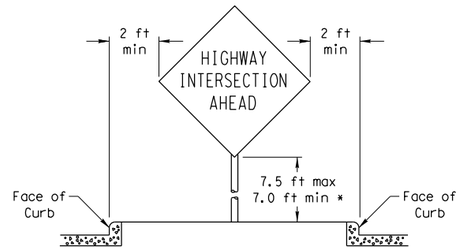
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



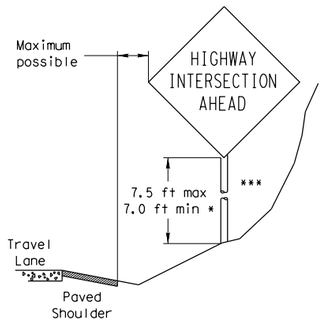
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
0915	17	072	CS, ETC
DIST	COUNTY		SHEET NO.
SAT	COMAL		136

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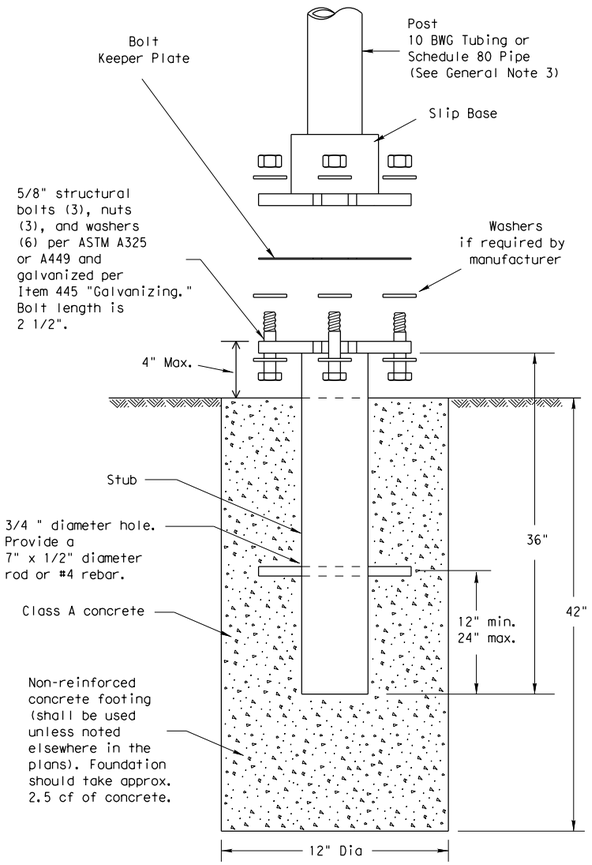
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

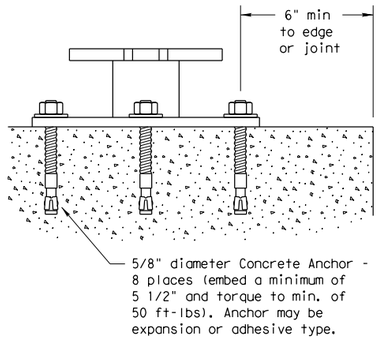
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

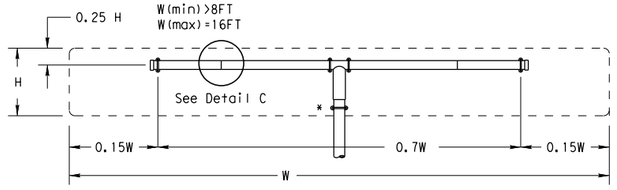
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 9-08			

CONT	SECT	JOB	HIGHWAY
0915	17	072	CS, ETC

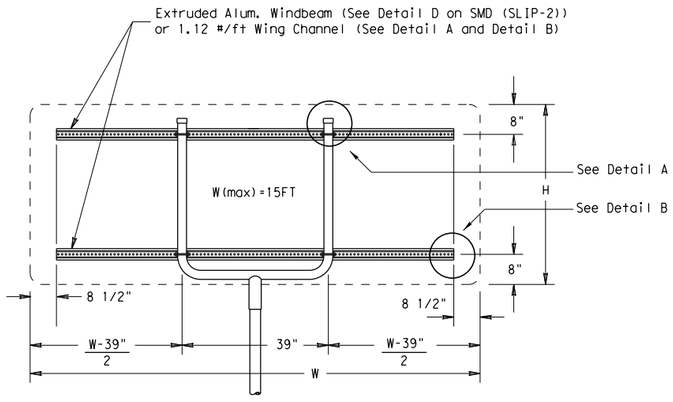
DIST	COUNTY	SHEET NO.
SAT	COMAL	137

DATE: 4/25/2022 11:26:38 AM
FILE: P:\16\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\Signing\smds3.dgn

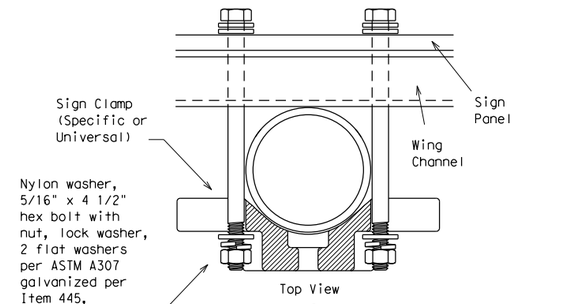


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

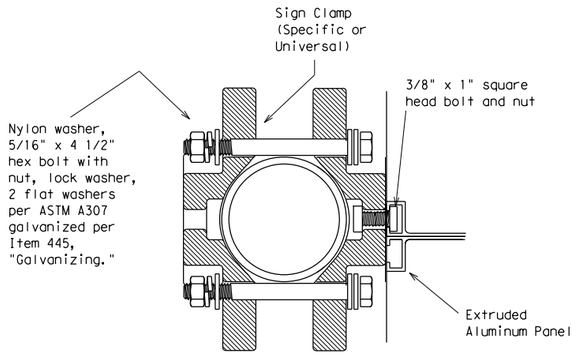
(* - See Note 12)



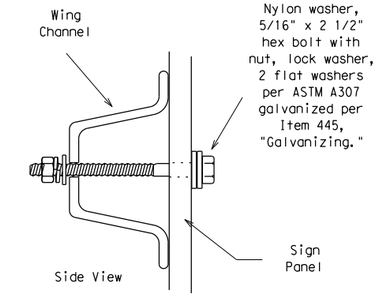
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



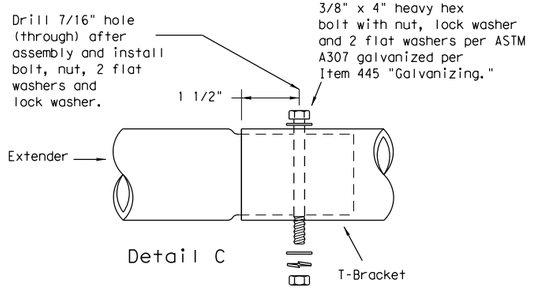
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

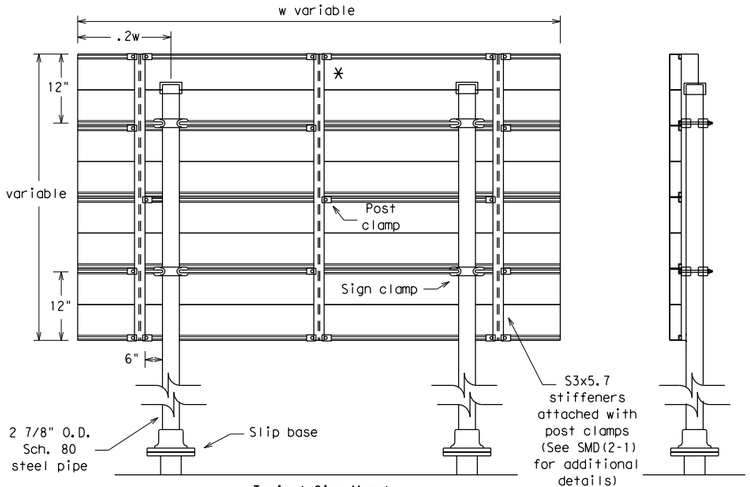


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

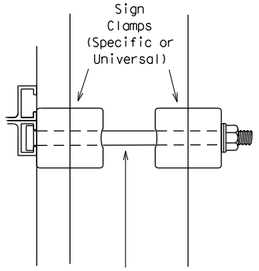


Typical Sign Mount

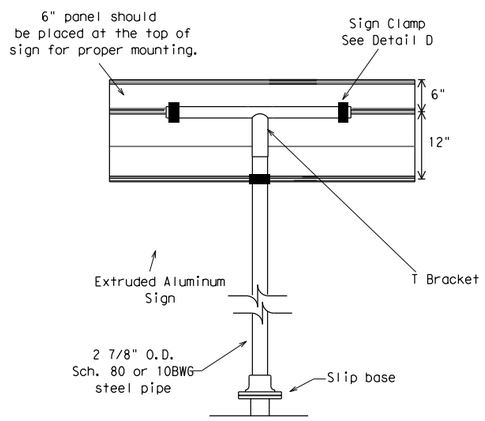
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

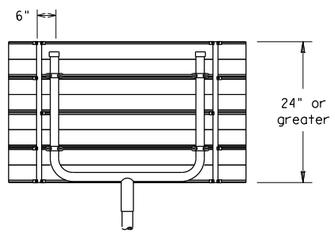
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		138

TEMPORARY SEDIMENT CONTROL FENCE

SCF

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SECTION A-A

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	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		139

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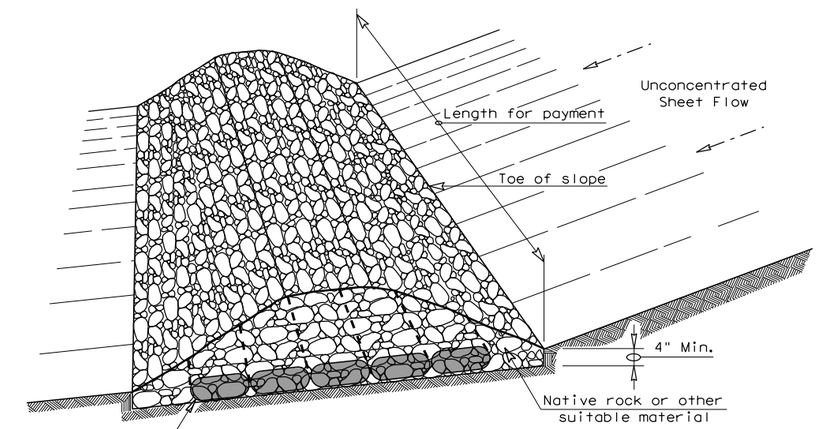
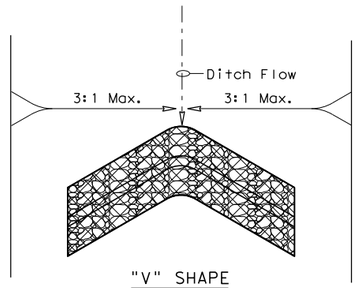
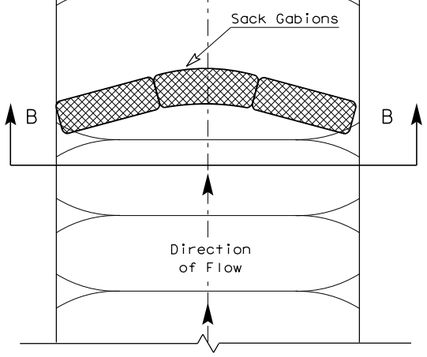


FILTER DAM AT TOE OF SLOPE

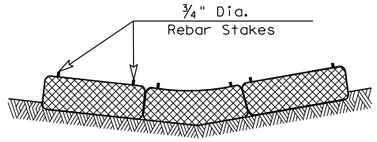
RFD1



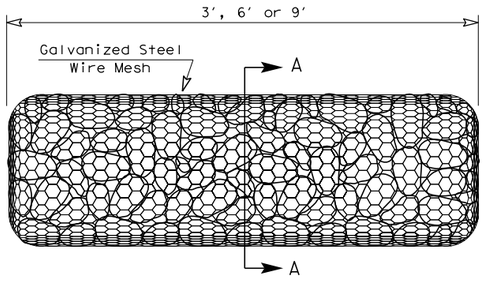
"V" SHAPE
PLAN VIEW



PLAN VIEW

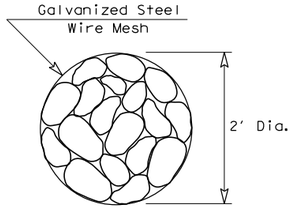


SECTION B-B

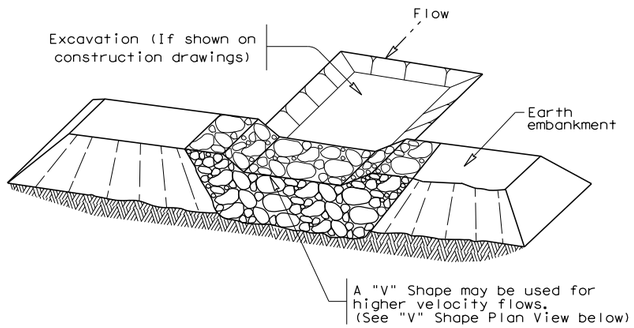


TYPE 4 (SACK GABIONS)

RFD4

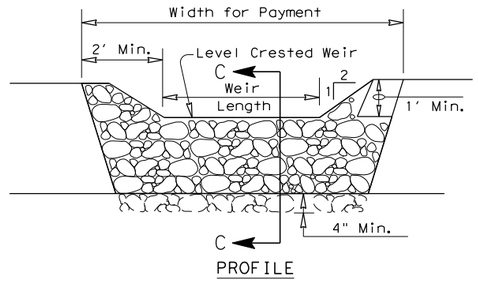


SECTION A-A

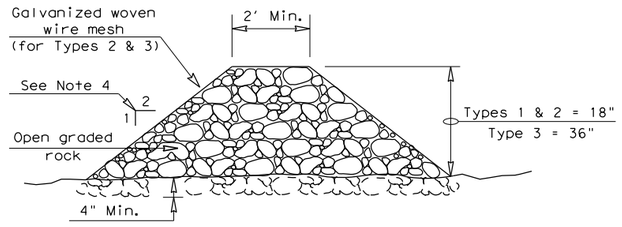


FILTER DAM AT SEDIMENT TRAP

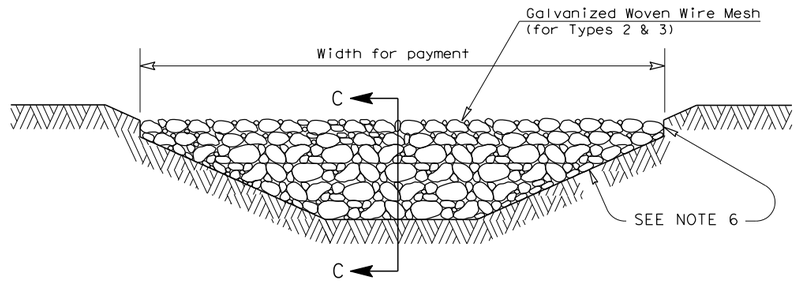
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

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.

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.

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	0915	17	072		CS, ETC	
	DIST	COUNTY			SHEET NO.	
	SAT	COMAL			140	

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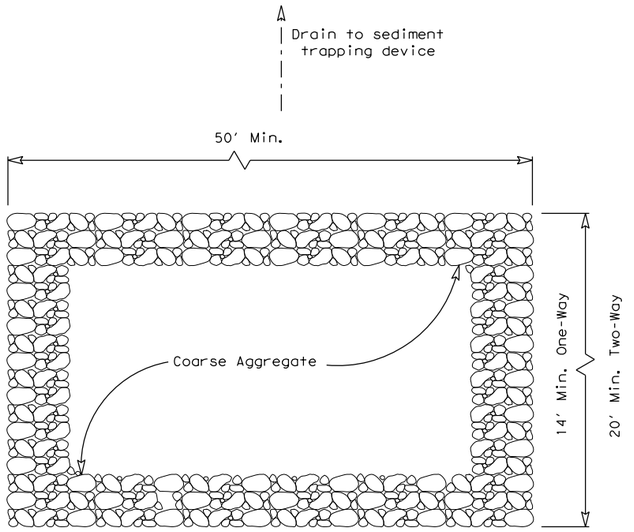
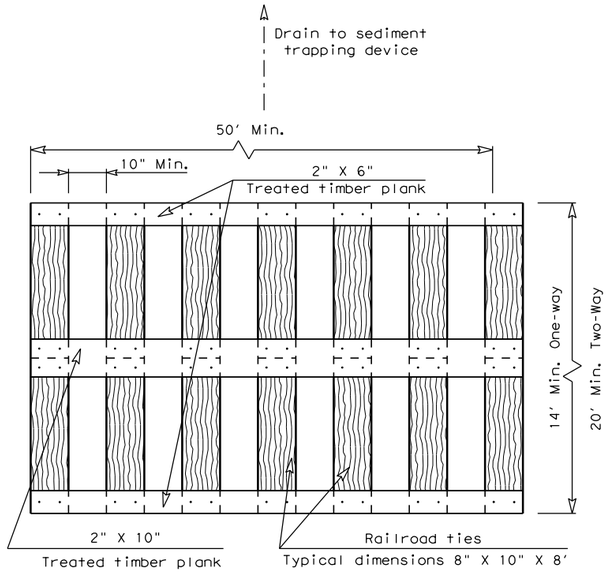
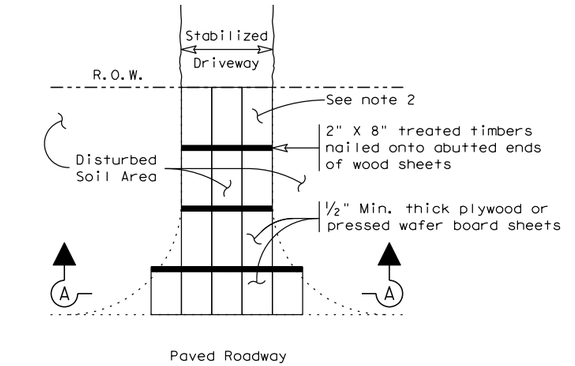


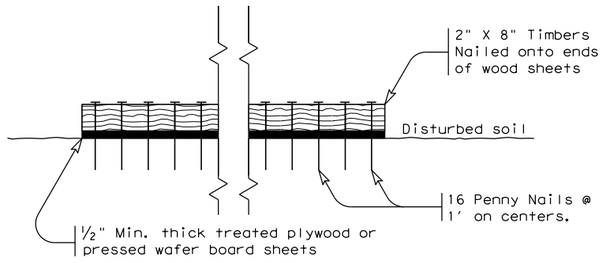
PLAN VIEW



PLAN VIEW



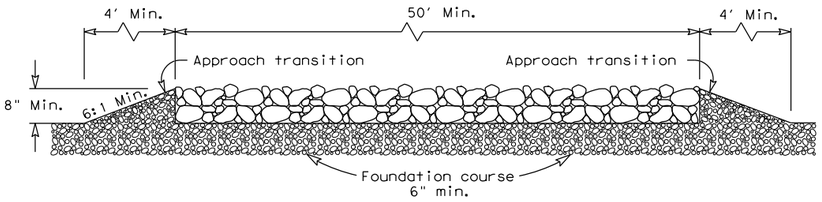
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



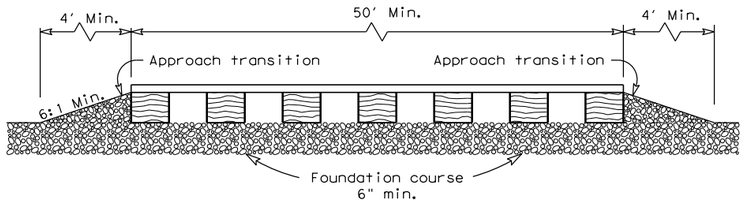
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		141

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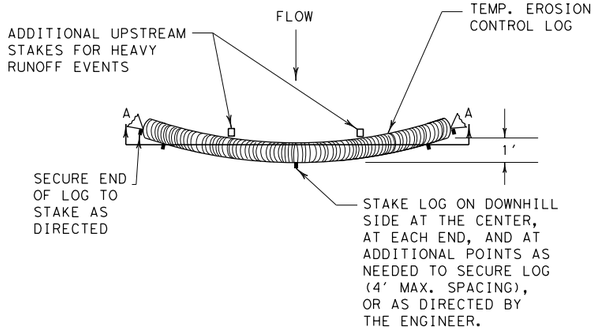
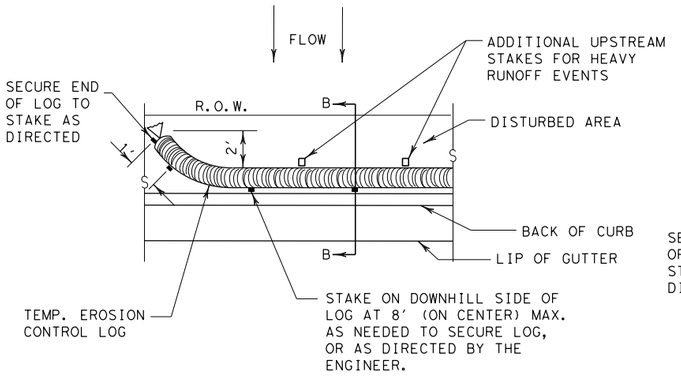


PLAN VIEW



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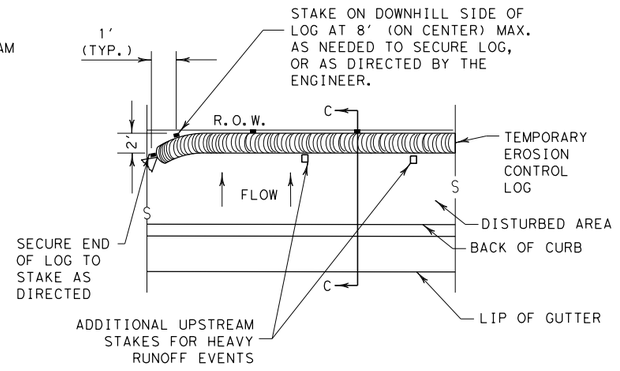

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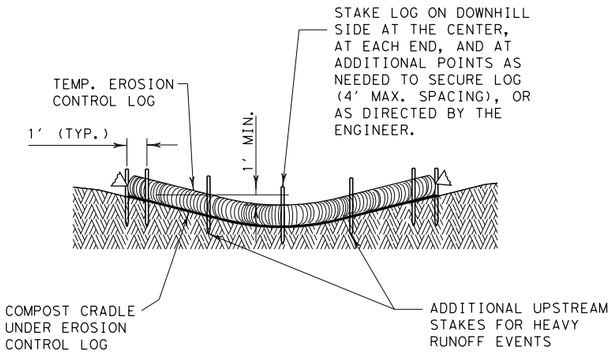
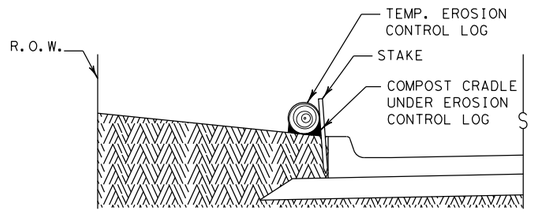


SECTION A-A

EROSION CONTROL LOG DAM

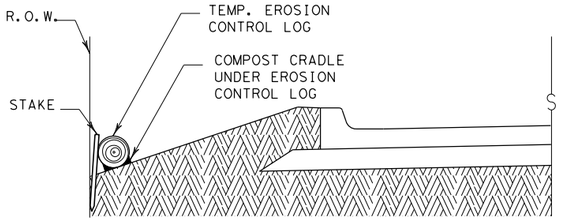
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



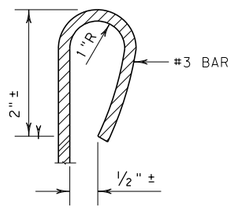
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW

LEGEND

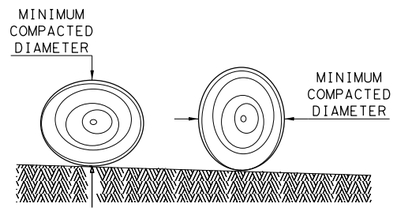
- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0915	17	072		CS, ETC		
	DIST	COUNTY			SHEET NO.		
	SAT	COMAL			142		

DATE: 4/25/2022
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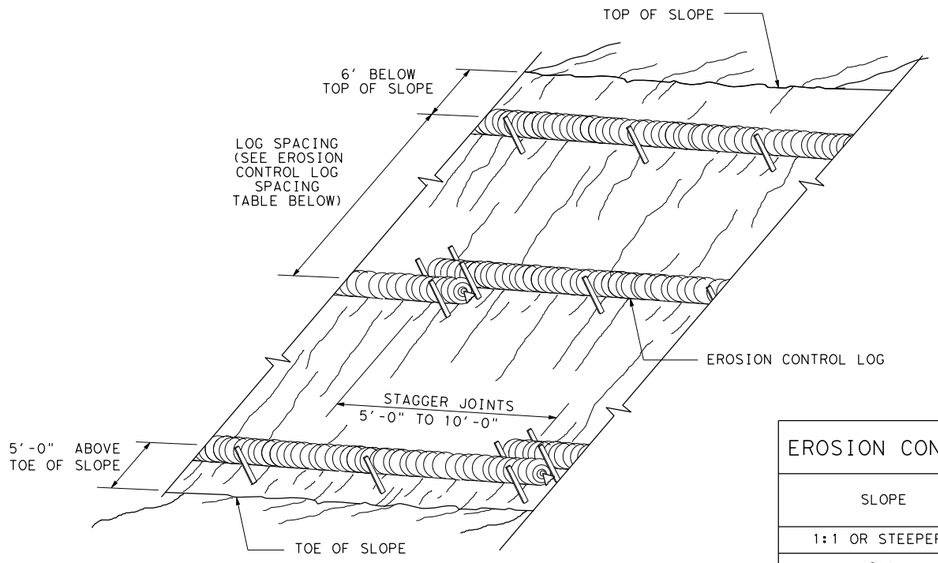
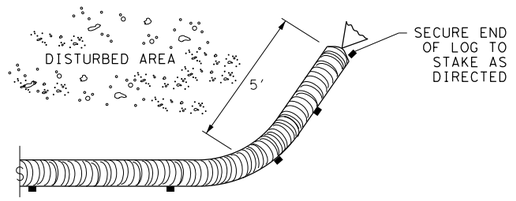


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

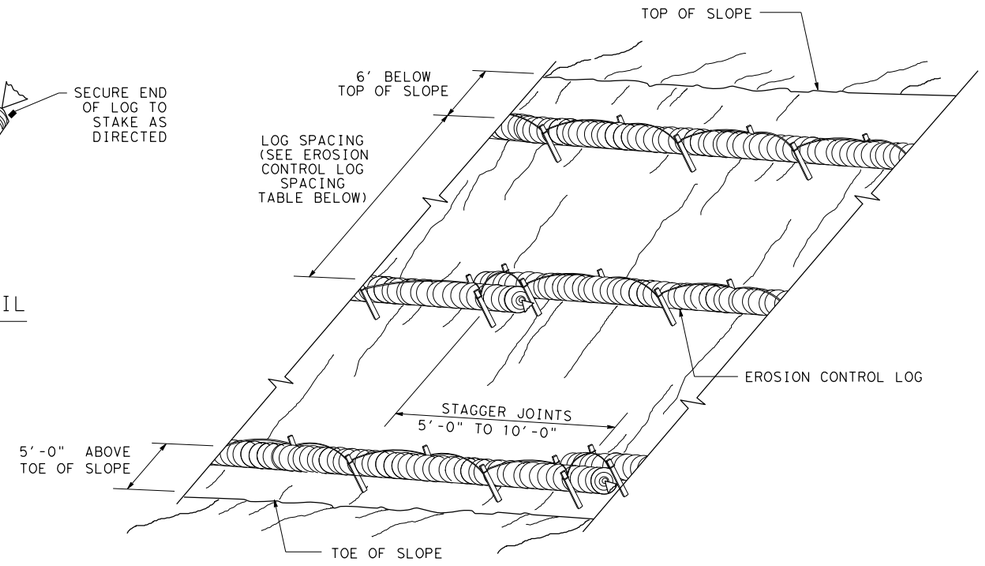
CL-SST



END SECTION RAP DETAIL

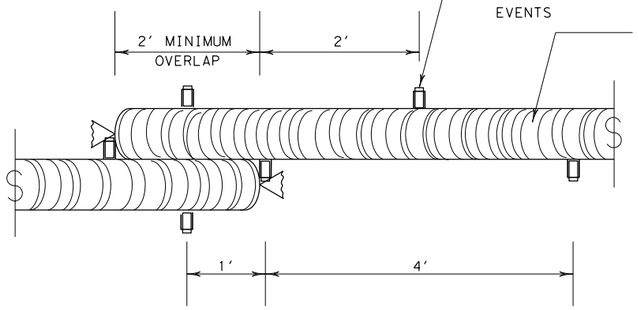
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5′	10′	15′	20′
2:1	10′	20′	30′	40′
3:1	15′	30′	45′	60′
4:1 OR FLATTER	20′	40′	60′	80′

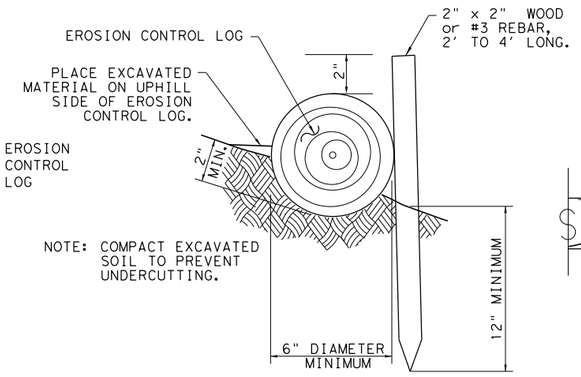
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

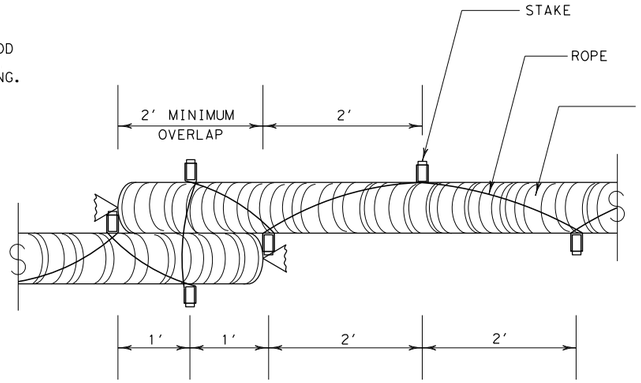




STAKE AND TRENCHING ANCHORING DETAIL

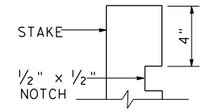
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

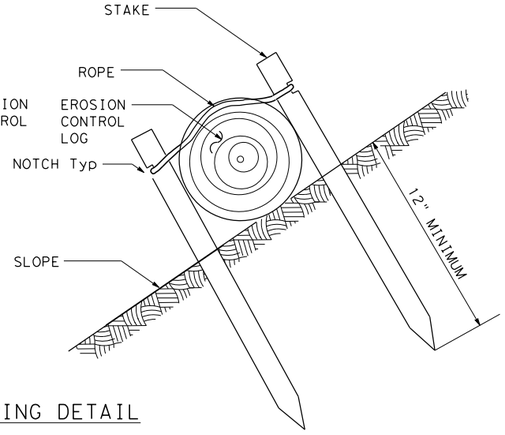


STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL



SHEET 2 OF 3

Texas Department of Transportation | Design Division Standard

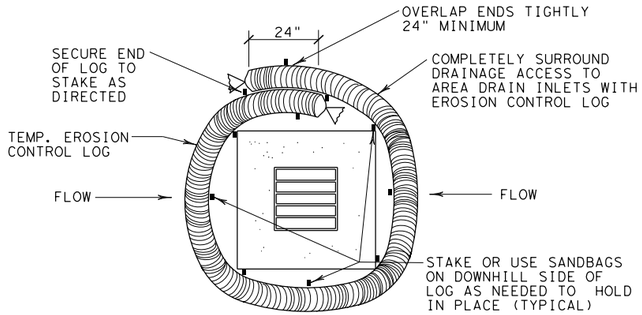
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

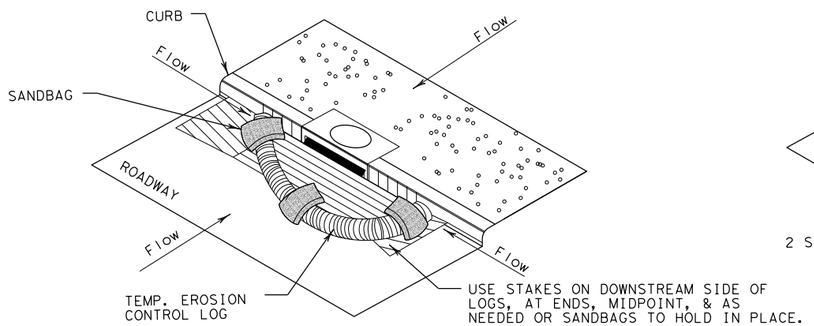
FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0915	17	072		CS, ETC	
	DIST	COUNTY				SHEET NO.
	SAT	COMAL				143

DATE: 4/25/2022
FILE: P:\116\30\06\Tasks\5_2022 HSIP\Design\Civil\Standards\SW3P\ec916.dgn



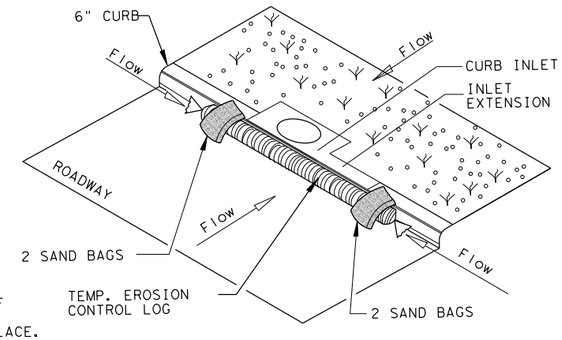
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

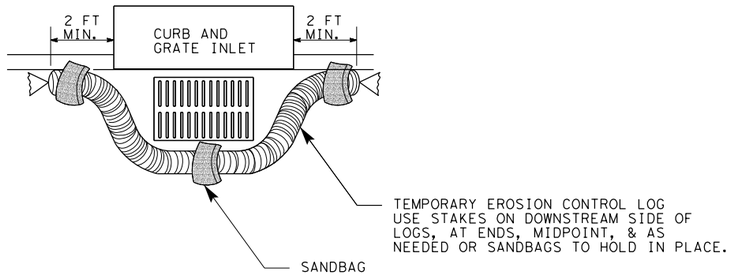
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

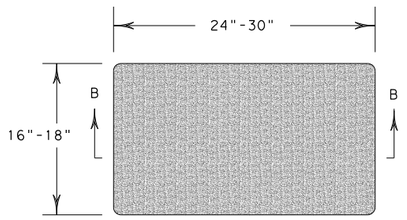
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		144

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit (CGP) required for projects with 1 or more acres distrubed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the Storm Water Pollution Prevention Plan (SW3P) and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and Texas Commission on Environmental Quality (TCEQ), Environmental Protection Agency (EPA) or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, Contractor shall submit Notice of Intent (NOI) to TCEQ and the Engineer.
5. NOI required: ☐Yes ☒No

Note: If amount of soil disturbance changes, permit requirements may change.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

US Army Corps of Engineers (USACE) Permit required for filling, dredging, excavating or other work in any potential USACE jurisdictional water, such as, rivers, creeks, streams, or wetlands.

The Contractor shall adhere to all of the terms and conditions associated with the following permit(s):

☒ No Permit Required
☐ Nationwide Permit (NWP) 14 - Pre-construction Notice (PCN) not Required
☐ Nationwide Permit 14 - PCN Required
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices (BMPs) planned to control erosion, sedimentation and post-project total suspended solids (TSS).

1.

2.

3.

4.

401 Best Management Practices: (Not applicable if no USACE permit)

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	☐ Sedimentation Chambers
		☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162,164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. MIGRATORY BIRD NESTS: Schedule construction activities as needed to meet the following requirements:

   A. Do not remove or destroy any active migratory bird nests (nests containing eggs and/or flightless birds) at any time of year. If there are any active nests, they shall not be removed until the nests become inactive.

   B. On/in structures, if there are any active nests, they shall not be removed until all nests become inactive. After inactive nests are removed and/or before nest activity begins, deterrent materials may be applied to the structures to prevent future nest building.

2. See Item 5 in General Notes.
3.
4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediated area, and contact the Engineer immediately.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the follwing are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Does the project involve the demolition of a span bridge?

☐ Yes ☒ No (No further action required)

If "Yes", a pre- demolition notification must be submitted to the Texas Department of State Health Services. The contractor shall contact TxDOT's Project Engineer 25 calendar days prior to the demolition of the bridges(s) on the project to assist with the notification.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

EPIC SHEET FOR CSJ: 0915-17-072 & 1272-01-021
BARBAROSA PROJECT

Texas Department of Transportation
San Antonio District Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic_2015-10-09_SAT.dgn	DN: TxDOT	CK: TxDOT	DW: BW	CK: GAG
©TxDOT OCTOBER 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0915	17	072	CS, ETC
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		145

Note To Designer:
1. Do not alter Sheet Design or Font style, size or weight - match text attributes.
2. If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from it's relative position.

A. GENERAL SITE DATA

1. PROJECT LIMITS: *IN NEW BRAUNFELS ON BARBAROSA RD AT FM 1101*

2. PROJECT SITE MAPS:
   - *Project Latitude 29.717330 Project Longitude -98.069140*
   - *Project Location Map: Shown on Title Sheet*
   - *Drainage Patterns: Shown on Drainage Area Maps (Sheet 38)*
   - *Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Shown on Typical Sections (Sheet 10)*
   - *Major Controls and Locations of Stabilization Practices: Shown on SW3P Sheets (Sheets 47-48)*
   - *Project Specific Locations: Off-site waste, borrow, or storage areas are not part of this SW3P.*
   - *Surface Waters and Discharge Locations: Shown on Drainage and Culvert Layout Sheets (Sheet 42)*

3. PROJECT DESCRIPTION: *FOR WORK CONSISTING OF HAZARD ELIMINATION AND SAFETY*

Non-Joint Bid Utilities are not part of this SW3P.

4. FOR MAJOR SOIL DISTURBING ACTIVITIES SEQUENCE OF EVENTS:

1. *Install controls down-slope of work area and initiate inspection and maintenance activities.*
2. *Begin phased construction with interim stabilization practices. Adjust erosion and sedimentation controls during construction to meet requirements and changing conditions and as directed/approved by the Engineer.*
3. *Major soil disturbing activities may include but are not limited to: right-of-way preparation, cut and/or fill to improve roadway profile, final grading and placement of topsoil and the following (if marked):*

   _X_ *Placement of road base*
   _X_ *Exstensive ditch grading*
   _X_ *Upgrading or replacing culverts or bridges*
   ____ *Temporary detour road(s)*
   ____ *Other:* _____

5. EXISTING AND PROPOSED CONDITIONS:

Description of existing vegetative cover: AGRICULTURAL VEGATATION, TREES, SHRUBS
Percentage of existing vegetative cover: 0.54%
Existing vegetative cover:(mark one)
____ *Thick or uniformly established*
_X_ *Thin and Patchy*
____ *None or minimal cover*
Description of soils: CLAY SOILS
Site Acreage: 4.68 *Acreage disturbed: 2.58*
Site runoff coefficient (pre-construction): *Site runoff coefficient (post-construction):*

6. RECEIVING WATERS: *(Mark all that apply)*

_X_ *A classified stream does not pass through project.*
____ *A classified stream passes through project. Name* _____ *Segment Number* _____
Name of receiving waters that will receive discharges from disturbed areas of the project: Alligator Creek
Site is in a Municipal Separate Storm Sewer System (MS4).
MS4 Operator (name): _____

B. BEST MANAGEMENT PRACTICES

General timing or sequence for implementation of BMPs shall be as required and/or as directed/approved by the Engineer to provide adequate controls. BMPs shown on plan sheets are to be considered "proposed" unless/until install date is shown. BMPs are to reduce sediments from road construction activities.

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T, P SEEDING
____ MULCHING (Hay or Straw)
____ BUFFER ZONES
____ PLANTING
____ COMPOST/MULCH FILTER BERM
____ SODDING
____ PRESERVATION OF NATURAL RESOURCES
____ FLEXIBLE CHANNEL LINER
____ RIGID CHANNEL LINER
____ SOIL RETENTION BLANKET
____ COMPOST MANUFACTURED TOPSOIL
P OTHER: BLOCK SODDING

2. STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T SILT FENCES
____ HAY BALES
T ROCK FILTER DAMS
____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____ DIVERSION DIKE AND SWALE COMBINATIONS
____ PIPE SLOPE DRAINS
____ PAVED FLUMES
T ROCK BEDDING AT CONSTRUCTION EXIT
____ TIMBER MATTING AT CONSTRUCTION EXIT
____ CHANNEL LINERS
____ SEDIMENT TRAPS
____ SEDIMENT BASINS
____ STORM INLET SEDIMENT TRAP
____ STONE OUTLET STRUCTURES
____ CURBS AND GUTTERS
____ STORM SEWERS
____ VELOCITY CONTROL DEVICES
T OTHER: *BIODEG EROSION CONTROL LOGS*

3. STORM WATER MANAGEMENT:

The proposed facility was designed in consideration of hydraulic design standards to convey stormwater in a manner that is protective of public safety and property. The control of erosion from the facility is inherent to the design. Additional factors affecting post-construction stormwater at the project location include:(mark all that apply)

____ *Existing or new vegetation provides natural filtration.*
____ *The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.*
____ *Project includes permanent sedimentation controls (other than grass).*
_X_ *Velocities do not require dissipation devices.*
____ *Velocity-dissipation devices included in the design.*
____ *Other :* _____
_____

4. NON-STORM WATER DISCHARGES:

Off-site discharges are prohibited except as follows:

1. *Discharges from fire fighting activities and/or fire hydrant flushings.*
2. *Vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed).*
3. *Plain water used to control dust.*
4. *Plain water originating from potable water sources.*
5. *Uncontaminated groundwater, spring water or accumulated stormwater.*
6. *Foundation or footing drains where flows are not contaminated with process materials such as solvents.*
7. *Other:* _____

Concrete truck wash water discharges on the site should be prohibited or minimized. If allowed by the Engineer, they must be managed in a manner so as not to contaminate surface water. They must not be located in areas of concentrated flow. Concrete truck wash-out locations must be shown on the SW3P Layout and included in the inspections.

Hazardous material spill/leak shall be prevented or minimized. At a minimum, this includes asphalt products, fuels, oils, lubricants, solvents, paints, acids, concrete curing compounds and chemical additives for soil stabilization. BMPs shall be implemented to the storage areas of these products. All spills must be cleaned and disposed properly and reported to the Engineer. Report any release at or above the reportable quantity during a 24 hour period to the National Response Center at 1-800-424-8802.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed before the next anticipated storm event but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by protecting storm sewer inlets.

2. INSPECTION:

For areas of the construction site that have not been finally stabilized, areas used for storage of materials, structural control measures, and locations where vehicles enter or exit the site, personnel provided by the permittee and familiar with the SW3P must inspect disturbed areas at least once every seven (7) calendar days. An Inspection and Maintenance Report shall be prepared for each inspection and the controls shall be revised on the SW3P within seven (7) calendar days following the inspection.

3. WASTE MATERIALS:

All non-hazardous municipal waste materials such as litter, rubbish, trash and garbage located on or originating from the project shall be collected and stored in a securely lidded metal dumpster, provided by the Contractor. The dumpster shall be emptied as necessary or as required by local regulation and the trash shall be hauled to a permitted disposal facility. The burying of non-hazardous municipal waste on the project shall not be permitted. Construction material waste sites, stockpiles and haul roads shall be constructed to minimize and control the amount of sediment that may enter receiving waters. Construction material waste sites shall not be located in any wetland, water body or stream bed. Construction staging areas and vehicle maintenance areas shall be constructed in a manner to minimize the runoff of pollutants.

4. OFFSITE VEHICLE TRACKING:

Off-site vehicle tracking of sediments and the generation of dust must be minimized. Excess sediments on road shall be removed on a regular basis as directed/approved by the Engineer.

5. OTHER:

See the EPIC sheet for additional environmental information.

Design Consultant Logo here - delete block if not applicable

 Texas Department of Transportation

STATE OF TEXAS
JOHN A. TYLER
105193
LICENSED
PROFESSIONAL ENGINEER

JOHN A. TYLER, P.E. 4/20/2022 DATE

REVISION DATE: 10/12

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CS, ETC
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	SHEET NO.
0915	17	072,ETC.	146