STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
HIGHWAY ROUTINE MAINTENANCE CONTRACT

GRAPHICS FILE	MAINTENANCE PROJECT NO.			SHEET NO.
DN	RMC-644354001			1
CHECKED NP	STATE	STATE DIST.	COUNTY	
	TEXAS	DALLAS	DALLAS	
CHECKED DN	CONT.	SECT.	JOB	HIGHWAY NO.
	6443	54	001	IH0020

TYPE OF WORK:

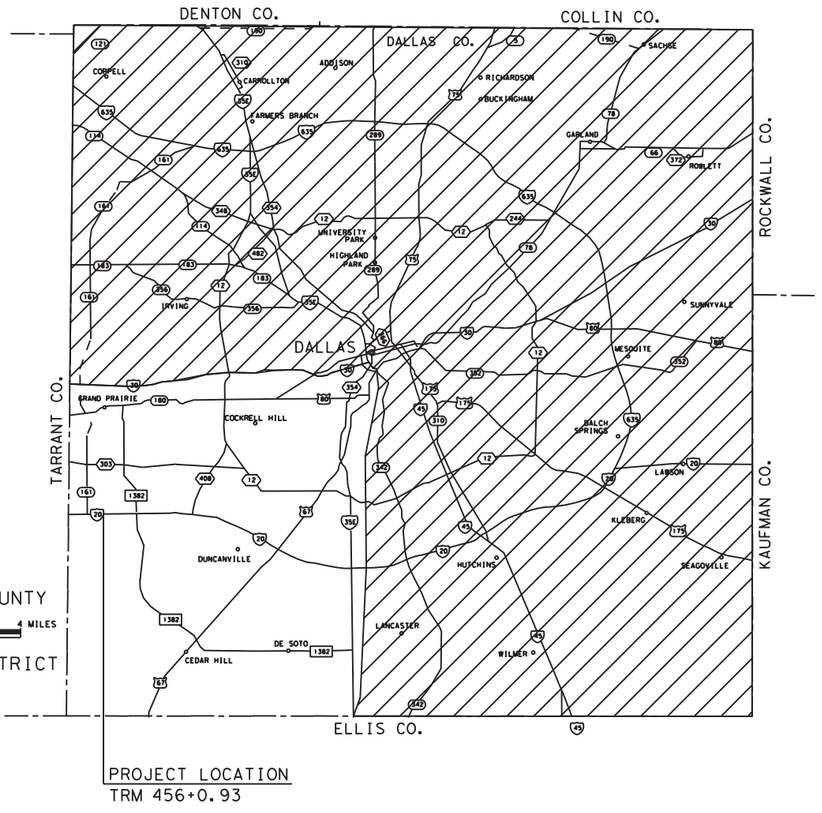
DRAINAGE IMPROVEMENT AND/OR REPAIRS

PROJECT NO. : RMC-644354001

HIGHWAY : IH0020

LIMITS : ON IH 20 AT CARRIER PKWY

INDEX OF SHEETS



THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE APPLICABLE TO THIS PROJECT.

DocuSigned by: AA914E3EC8AC415...

____ , PE 4/25/2023 DATE

STATE OF TEXAS
DUNG HUY NGUYEN
128595
LICENSED PROFESSIONAL ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION NOVEMBER 1, 2014 AND SPECIAL SPECIFICATION ITEMS INCLUDED IN THE CONTRACT SHALL GOVERN ON THIS PROJECT.

LEVELS DISPLAYED
1 2 3 4

Texas Department of Transportation

RECOMMENDED FOR LETTING

DocuSigned by: 91B8F2112C2C409... 4/28/2023

AREA ENGINEER

RECOMMENDED FOR LETTING

DocuSigned by: David Morren, P.E. 72258D0350B94E4... 5/1/2023

DISTRICT MAINTENANCE ENGINEER

RECOMMENDED FOR LETTING

DocuSigned by: JEFFREY BUSH 345B765EB03F406... 5/4/2023

DIRECTOR OF OPERATIONS

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 6443-54-001 **DISTRICT** Dallas **COUNTY** Dallas
HIGHWAY IH0020

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**6443-54-001**			
		PROJECT ID		**A00197030**			
		COUNTY		**Dallas**			
		HIGHWAY		**IH0020**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	161-6017	COMPOST MANUF TOPSOIL (4")	SY	326.000		326.000	
	162-6002	BLOCK SODDING	SY	326.000		326.000	
	168-6001	VEGETATIVE WATERING	MG	49.000		49.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	39.000		39.000	
	420-6002	CL A CONC (MISC)	CY	1.800		1.800	
	432-6002	RIPRAP (CONC)(5 IN)	CY	14.500		14.500	
	465-6126	INLET (COMPL)(PSL)(FG)(3FTX3FT-3FTX3FT)	EA	8.000		8.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	2.000		2.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	500.000		500.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	500.000		500.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	35.000		35.000	
	6185-6002	TMA (STATIONARY)	DAY	66.000		66.000	

GENERAL NOTES:

General:

This project consists of performing "Drainage Improvement and/or Repair" on IH 20 in the Southwest Dallas County Maintenance Section.

Sequence of work will be approved.

The Department reserves the right to revise schedule as it deems necessary.

Provide and maintain a dedicated email address for receipt of work orders and correspondence throughout the term of this contract. Acknowledgement of emailed work order/callouts is required no more than 12 hr. from notification.

Contractor's attention is called to the fact that all adjoining pavement sections will be protected during all phases of construction and any damages incurred due to Contractor's operation will be repaired and replaced at the Contractor's expense.

Each contract awarded by the Department stands on its own as such, is separate from other contracts. A Contractor awarded multiple contracts, must be capable and sufficiently staffed to concurrently process any or all contracts at the same time.

Coordinate work through:

Terry Blocker
4777 E. Hwy 80
Mesquite, Texas 75150
214-320-6234

Bids will be received at 4777 E. Hwy 80, Mesquite, Texas 75150-6643.

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

Terry Blocker Terry.Blocker@txdot.gov
Nathan Petter Nathan.Petter@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

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

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

Attention is directed to the possible presence of underground utilities owned by the Texas Department of Transportation (irrigation, signal, illumination and surveillance, communication, and control) on the right of way. Call the Department for locates at 214-320-6682 and 214-320-6205 48 hr. in advance of excavation. Contact the appropriate department of the local city or town a minimum of 48 hr. in advance of excavation.

If overhead or underground power lines need to be de-energized, contract the electrical service provider to perform this work. Cost associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

Item 2 – Instructions to Bidders:

This project includes plan sheets that are not part of the bid proposal.

Order plans from any Reproduction Company listed at:

http://www.dot.state.tx.us/business/contractors_consultants/repro_companies.htm

View or download plans at:

http://www.dot.state.tx.us/business/plansonline/plansonline.htm

Item 3 – Award and Execution of Contract:

This contract is Site Specific.

After written notification, work will be continuously prosecuted to completion.

The work order letter will include all roadways contained on the Summary Sheet.

Item 7 – Legal Relations and Responsibilities:

Pre-construction safety meeting will be conducted with Contractor's personnel prior to work beginning on a continuously prosecuted contract or before each callout work request.

Attendance of this meeting will not be paid directly but considered subsidiary to the various bid items.

Do not obtain law enforcement personnel without requesting in writing 48 hr. prior to need and the Engineer's written approval. The Department may compensate the Contractor for providing full time, off-duty, uniformed, law enforcement personnel, and patrol car. The law enforcement personnel may be required for assistance with traffic control for lane or ramp closures or other situations that dictate the need for law enforcement officers as directed. Off-duty law enforcement personnel will have transportation jurisdiction and full police powers. Law enforcement personnel will show proof of certification by the Texas Commission on Law Enforcement (TCOLE). This will be paid under "Force Account – Law Enforcement Personnel". TxDOT Form 318 will be utilized.

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

Holiday restrictions – the Engineer may decide that no lane closures or construction operations will be allowed during the restricted periods listed in the following holiday schedule. TxDOT has the right to lengthen, shorten, or otherwise modify these restricted periods as actual, or expected, traffic conditions may warrant. Working days will not be charged for these restricted periods. No additional compensation will be allowed for these restricted closures (i.e., overhead, delays, stand-by, barricades or any other associated cost impacts).

- New Year's Eve and Day (noon on December 31 thru 10 P.M. January 1)
- Easter Holiday weekend (noon on Friday thru 10 P.M. Sunday)
- Memorial Day weekend (noon on Friday thru 10 P.M. Monday)
- Independence Day (noon on July 3 thru 10 P.M. on July 5)
- Labor Day weekend (noon on Friday thru 10 P.M. Monday)
- Thanksgiving Holiday (noon on Wednesday thru 10 P.M. Sunday)
- Christmas Holiday (noon on December 23 thru 10 P.M. December 26)

Holiday restrictions for Independence Day, Thanksgiving Holiday, and the Christmas Holiday may be extended for the "week of" due to the nature of work being performed and the work location at the discretion of the Engineer for safety of the traveling public.

Roadway closures during the following key dates and/or special events are prohibited.

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Event Restrictions – No Lane Closures that restricts or interferes with traffic will be allowed for the regional events set forth below. This affects IH30, IH30 HOV, IH35E, and IH35E HOV. TxDOT has the right to lengthen, shorten, or otherwise modify these restrictions as actual traffic conditions may warrant. TxDOT also has the right to modify the list of major events as they are added, renamed, rescheduled, or as warranted.

- State Fair of Texas (no lane closures after 6 A.M. on Fridays through 9 P.M. on Sundays; no full closures for any direction of any facility from opening day through the closing day).
- The University of Texas vs. University of Oklahoma football game (no lane closures beginning 4 hr. prior to the event and ending 3 hr. following event completion).
- The First Responder Bowl (no lane closures beginning 3 hr. prior to the event and ending 2 hr. following the event completion).
- Dallas Mavericks Home Games (no lane closure beginning 2 hr. prior to the event and ending ½ hr. following event commencement with no full lane closures considered until 2 hr. following event completion).
- Dallas Stars Home Games (no lane closure beginning 2 hr. prior to the event and ending ½ hr. following event commencement with no full lane closures considered until 2 hr. following event completion).
- Texas Rangers Home Games (no lane closure beginning 2 hr. prior to the event and ending ½ hr. following event commencement with no full lane closures considered until 2 hr. following event completion).
- Dallas Cowboys Home Games (no lane closure beginning 2 hr. prior to the event and ending ½ hr. following event commencement with no full lane closures considered until 2 hr. following event completion).
- Major Events at the American Airline Center, Globe Life Park in Arlington, AT&T Stadium with expected attendance exceeding 15,000 (no lane closures beginning 2 hr. prior to event and ending ½ hr. following event commencement with no full closures considered until 2 hr. following event completion).
- Major Downtown Dallas Events (restrictions will be considered on a case-by-case basis). This category could include, but is not limited to, parades for sports championships, major political events, major Art District Events, and large athletic events such as marathons.

Item 8 – Prosecution and Progress:

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

Nighttime work is allowed in accordance with Article 8.3.3.

Liquidated damages will be charged for each working day exceeding the time allowed in the work order letter.

The Lane Closure Assessment Fee is shown on the following table. The fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, regardless of the duration of the lane closure or obstruction.

Table 1
Lane Closure Assessment Fee Table

Roadway	Amount Per Lane Per Hour
IH 20	$4,000

Contractor will submit a bar chart or CPM chart for progress of schedule. Present work to begin no later than 7 calendar days from the work order letter unless otherwise approved.

Item 9 – Measurement and Payment:

Payment for police officer hours under force account method will not exceed the duration of the lane closure. Time will begin when set up operations commence and end when the closure is removed.

Item 162 – Sodding for Erosion Control:

Contractor will use an approved staking method for Block Sod that is to be placed on slopes greater than 4:1. Sod lost to improper staking will be replaced at the Contractor's expense.

Item 420 – Concrete Structures:

Apply an ordinary surface finish to all concrete surfaces within the same day after form removal.

Item 421 – Hydraulic Cement Concrete:

Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (Site Manager).

Mix Design templates may be downloaded at:

http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html

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All test molds will be furnished by the Contractor and will be maintained in proper condition. Provide personnel to transport the test samples to a curing location as directed, remove from the mold to a curing tank. Concrete will not be placed when impending weather conditions arise, and it is determined rainfall may occur. If rainfall should begin after the placement operations begin, the Contractor will provide coverage to protect the work. If texture of the pavement is destroyed or damaged, Contractor will restore the pavement texture by grooving or as directed.

Item 500 – Mobilization:

Mobilization is lump sum.

Item 502 – Barricades, Signs, and Traffic Handling:

Provide traffic control in compliance with the latest edition of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), the "Traffic Control Standard Sheets" (TCSS), and as directed.

All work requiring lane closures will be performed Sunday through Thursday between 9:00 P.M. and 5:00 A.M., unless otherwise approved.

Close no more than one lane at a time, unless otherwise approved. Provide proposed lane closure information to the Engineer by 1 P.M. on the day prior to the proposed closures. Furnish information for Monday closures or closures following a national or state holiday on the last office workday prior to the closures. Do not close lanes if the above reporting requirements have not been met.

All work on traveled roadway surfaces will generally be performed at night.

Weekend work will be allowed with prior approval, except for emergency work.

Maximum length of lane closure will be 2 miles.

Traffic Control Plans with a lane closure causing backups of 10 minutes or greater in duration will be modified by the Engineer.

Erect barricades and signs in locations not obstructing the traveling public's view of the normal roadway signing or necessary sight distance.

Provide sufficient and qualified staff and equipment to revise the traffic control as directed.

Trailer all slow-moving vehicles (designed to operate 25 mph or less) crossing freeway main lanes.

When moving unlicensed equipment on or across any pavement or public highways, protect the pavement from all damage using an acceptable method.

Equipment and materials will not be left within 30 ft. of the travel lane during non-working hours.

The work performed, materials furnished and all labor, tools, and equipment necessary to complete the work for Non-Site-Specific locations under this Item will not be measured or paid for directly but will be considered subsidiary to the various bid items of this contract.

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

Item 506 – Temporary Erosion, Sedimentation, and Environmental Controls:

Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devises and are discharged into the restricted areas before the next rain event or within 24 hr. of the discharge. This work will be considered subsidiary to the various bid items.

Item 6001 – Portable Changeable Message Sign:

Provide Portable Changeable Message Signs (PCMS) units as approved.

PCMS will be placed as directed.

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Item 6185 – Truck Mounted Attenuator (TMA):

The total number of truck mounted attenuators (TMA) required when utilizing the traffic control standards are shown in the tables below.

TCP 1 Series	Scenario	Required TMA/TA
(1-5)-18		1

TCP 2 Series	Scenario	Required TMA/TA
(2-6)-18	All	1

TCP 5 Series	Scenario		Required TMA/TA
(5-1)-18	A	B	1

TCP 6 Series	Scenario		Required TMA/TA	
(6-1)-12	A	B	1	2
(6-2)-12 / (6-3)-12	All		1	
(6-4)-12	A	B	1	2
(6-5)-12	A	B	1	2
(6-8)-14 / (6-9)-14	All		1	

Shadow vehicles equipped for truck mounted attenuators (TMA) for mobile and stationary operations must be available for use at any time as determined by the Engineer.

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 needed for the project for those times per plan requirements. Additional TMAs used that are not specified in the plans in which the Contractor expects compensation will require prior approval from the Engineer.

When TMA's are paid by the hour or day, "ready for operation" is defined as all equipment, material, personnel, etc. are present on the project ready to begin work.

SUMMARY OF DRAINAGE

SITE	INLET ID	LOCATION	402 6001 TRENCH EXCAVATION PROTECTION	420 6002 CL A CONC (MISC) **	432 6002 RIPRAP (CONC)(5 IN) ***	465 6126 INLET (COMPL)(PSL)(FG)(3FTX3FT-3FTX3FT) ****	*DAYS ALLOWED TO COMPLETE
			LF	CY	CY	EA	DAYS
	PROPOSED INLETS						
1	CB#2A	CENTERLINE WBFR = STA. 102+56, 47' RT	13			1	3
2	CB#3A	CENTERLINE WBFR = STA. 102+63, 47' RT				1	3
3	CB#4	CENTERLINE WBFR = STA. 102+70, 47' RT				1	3
4	CB#2B	CENTERLINE IH 20 = STA. 103+16, 0' LT	13			1	3
5	CB#3B	CENTERLINE IH 20 = STA. 103+23, 0' LT				1	3
6	CB#1A	CENTERLINE R2NEB = STA. 17+65, 24' LT	13			1	3
7	CB#1B	CENTERLINE R2NEB = STA. 17+80, 25' RT				1	3
8	CB#2C	CENTERLINE R2NEB = STA. 17+88, 25' RT				1	3
	EXISTING INLET						
9	E-1	CENTERLINE WBFR = STA. 103+70, 63' RT		0.6			1
10	F-1	CENTERLINE IH 20 = STA. 103+65, 0' LT		0.6			1
11	G-1	CENTERLINE R2NEB = STA. 18+46, 28' RT		0.6			1
12	V-DITCH (4'X110')				6.8		3
13	V-DITCH (4'X125')				7.7		3
		PROJECT TOTALS	**39**	**1.8**	**14.5**	**8**	**33**

*TOTAL WORKING DAYS PER REFERENCE NO. (SITE LOCATION) TO COMPLETE THE WORK.
**QUANTITY FOR RIPRAP AROUND EXISTING INLETS E-1, F-1, G-1.
***EXCAVATION FOR V-DITCHES WILL BE SUBSIDIARY TO ITEM 420 AND ITEM 432.
****THIS ITEM IS FOR CAST-IN-PLACE INLET WITH PRECAST LID AS SHOWN ON "CAST IN PLACE DROP INLET CONNECTION". SAW CUTTING AND REMOVALS AT EXISTING CULVERTS WILL BE SUBSIDIARY TO ITEM 465.

SUMMARY OF EROSION CONTROL

SITE	LOCATION	161 6017 COMPOST MANUF TOPSOIL (4")	162 6002 BLOCK SODDING	168 6001 VEGETATIVE WATERING	506 6042 BIODEG EROSN CONT LOGS (INSTL) (18")	506 6043 BIODEG EROSN CONT LOGS (REMOVE)	*DAYS ALLOWED TO COMPLETE
		SY	SY	MG	LF	LF	DAYS
1	RMC-644354001	326	326	49	500	500	2
	PROJECT TOTALS	**326**	**326**	**49**	**500**	**500**	**2**

*TOTAL WORKING DAYS PER REFERENCE NO. (SITE LOCATION) TO COMPLETE THE WORK.

IH0020

QUANTITY SUMMARY

DESIGN	FED.RD. DIV.NO.	MAINTENANCE PROJECT		HIGHWAY NO.
DN	6	RMC-644354001		IH0020
GRAPHICS DN	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK NP	TEXAS	DALLAS	DALLAS	4
CHECK NP	CONTROL	SECTION	JOB	
	6443	54	001	

GENERAL NOTES:

1. INSTALL BARRICADES AND ADVANCED WARNING SIGNS PER BC STANDARDS, TCP STANDARDS WORK ZONE STANDARDS AND/OR AS DIRECTED BY THE ENGINEER. THE SIGNS, BARRICADES, OR OTHER WARNING DEVICES SHOWN SHALL BE CONSIDERED MINIMUM AND ADDITIONAL SIGNS, BARRICADES, OR WARNING DEVICES DEEMED NECESSARY BY THE ENGINEER OR DICTATED BY FIELD CONDITIONS SHALL BE PROVIDED ACCORDING TO ALL APPLICABLE STANDARDS. ADDITIONAL SIGNS OR BARRICADES WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE SUBSIDIARY TO THE BID ITEM "BARRICADES, SIGNS, AND TRAFFIC HANDLING"

2. INSTALL TEMPORARY SW3P EROSION CONTROL MEASURES BEFORE (BUT NO SOONER THAN TWO WEEKS PRIOR) SOIL DISTURBANCE OR POTENTIAL POLLUTANT-GENERATING ACTIVITIES IN THEIR CONTROL AREA. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN TWO WEEKS OF VEGETATION ESTABLISHMENT IN THEIR CONTROL AREA, OR AS APPROVED BY THE ENGINEER.

3. SUBMIT A DETAILED SCHEDULE OF WORK TO THE PROJECT ENGINEER FOR APPROVAL PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF WORK (SEE BELOW).

4. SUBMIT ANY REQUEST TO ALTER SEQUENCE OF OPERATION OF TRAFFIC CONTROL PLANS TO THE ENGINEER FOR WRITTEN APPROVAL PRIOR TO BEGIN OF CONSTRUCTION ADDITIONAL COST OR TIME IS AT THE EXPENSE OF THE CONTRACTOR.

5. MAINTAIN TEMPORARY SIGNS WITHIN THE PROJECT LIMITS AND COVER OR REMOVE ANY EXISTING SIGN OR PAVEMENT MARKING THAT CONFLICTS WITH TCP TO AVOID CONFUSION FOR THE TRAVELING PUBLIC.TEMPORARY SIGNING SHALL BE PLACED AS NEEDED DURING ALL PHASES. PAYMENT FOR THIS WORK SHALL BE SUBSIDIARY TO ITEM 502 BARRICADES.

6. THE COMPLETE CLOSURE OF ANY ROADWAY REQUIRES THE APPROVAL OF THE ENGINEER.

7. MAINTAIN TEMPORARAY AND POSITIVE DRAINAGE THROUGHOUT ALL PHASES OF CONSTRUCTION. THIS WORK WILL BE SUBSIDIARY TO VARIOUS BID ITEMS.

8. NIGHTLY LANE CLOSURES BETWEEN THE HOURS OF 9PM-5AM WILL BE PERMITTED ON IH 20 MAINLANES. WITH THE ENGINEER'S APPROVAL, LONG TERM SINGLE LANE CLOSURE ON EB AND/OR WB IH 20 FRONTAGE ROADS ARE PERMITTED.

SUGGESTED SEQUENCE OF CONSTRUCTION:

PHASE 1

1. INSTALL ADVANCED WARNING SIGNS, WORK ZONE SIGNAGE, AND CHANNELIZING DEVICES ON THE IH 20 EBFR AND/OR EBML.

2. INSTALL STORM WATER POLLUTION PREVENTION DEVICES NEEDED FOR THIS PHASE.

3. CONSTRUCT V-DITCH AS SHOWN IN THE PLANS. CONSTRUCT CONCRETE RIPRAP APRON ON INLET G-1 AS SHOWN IN THE PLANS.

4. CONSTRUCT TRENCH EXCAVATION PROTECTION AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. INSTALL INLETS CB#1B AND CB#2C AS SHOWN IN THE PLANS.

4. INSTALL PERMANENT SW3P STABILIZATION AS SHOWN IN PLANS FOR THIS PHASE.

PHASE 2

1. INSTALL ADVANCED WARNING SIGNS, WORK ZONE SIGNAGE, AND CHANNELIZING DEVICES ON THE IH 20 EBML AND/OR WBML.

2. INSTALL STORM WATER POLLUTION PREVENTION DEVICES NEEDED FOR THIS PHASE.

3. CONSTRUCT TRENCH EXCAVATION PROTECTION ON AREAS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. INSTALL INLETS CB#1A, CB#2B, AND CB#3B AS SHOWN IN THE PLANS. CONSTRUCT CONCRETE RIPRAP APRON ON INLET F-1 AS SHOWN IN THE PLANS.

4. INSTALL PERMANENT SW3P STABILIZATION AS SHOWN IN PLANS FOR THIS PHASE.

PHASE 3 AND 4

1. REPEAT PHASE 2 STEPS 1 THROUGH 4 FOR THE IH 20 WBML AND WBFR TO CONSTRUCT INLETS CB#2A, CB#3A, AND CB#4 ALONG WITH THE CONCRETE RIPRAP APRON FOR INLET E-1.

PHASE 5

1. PERFORM FINAL PROJECT CLEANUP.

STATE OF TEXAS
DUNG HUY NGUYEN
128595
LICENSED
PROFESSIONAL ENGINEER

P.E. 4/21/2023
Signature of Registrant & Date

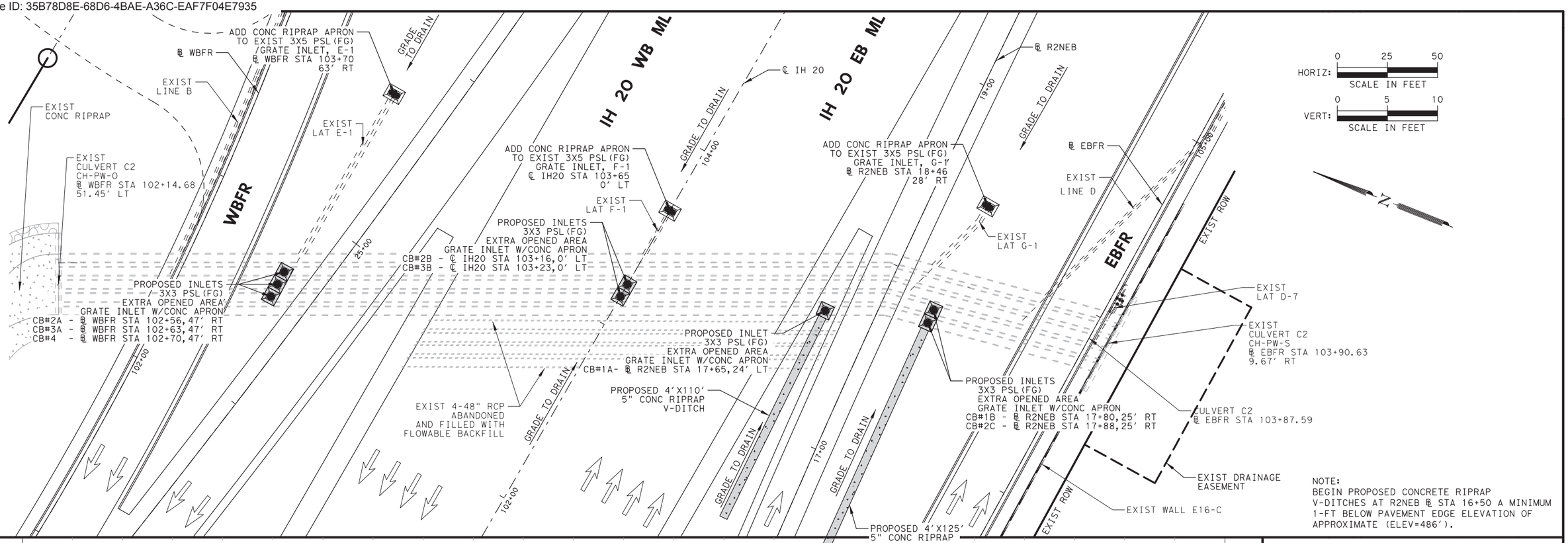
Texas Department of Transportation

IH0020

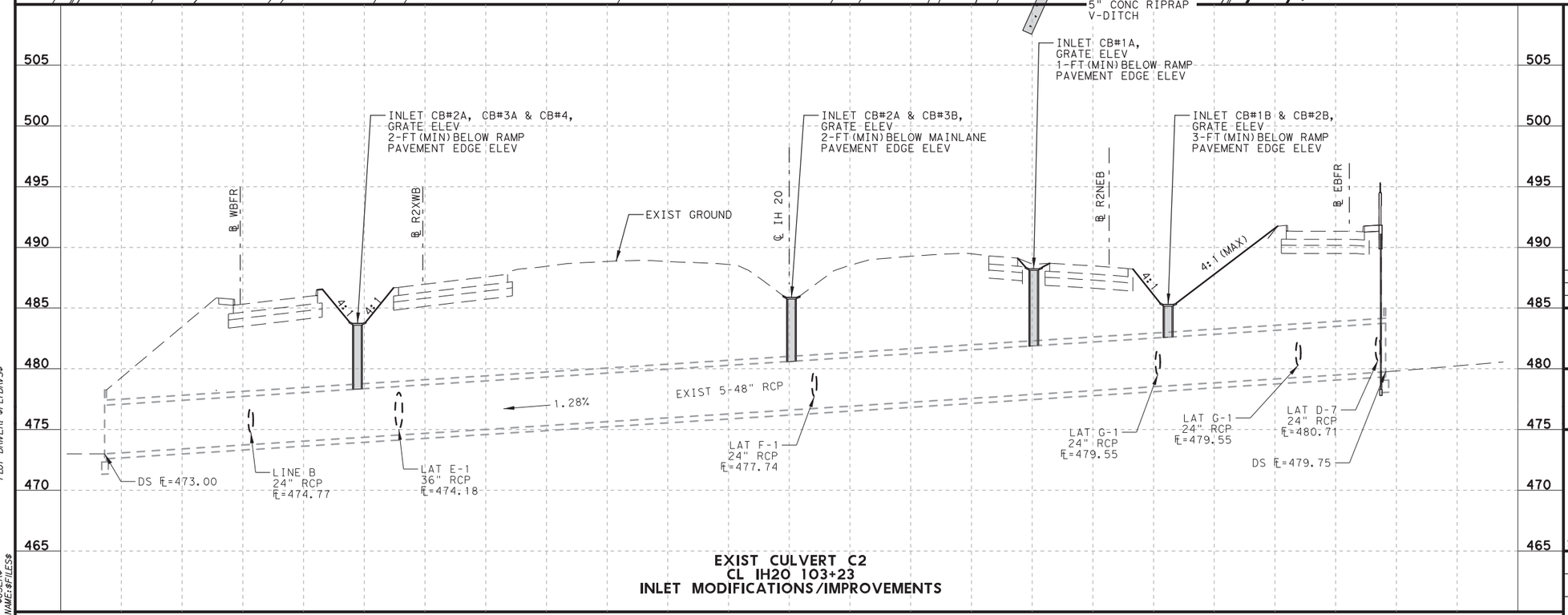
TCP NARRATIVE

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
DN	6	SEE TITLE SHEET		IH0020
GRAPHICS DN	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK NP	TEXAS	18	DALLAS	5
CHECK DN	CONTROL	SECTION	JOB	
	6443	54	001	



NOTE:
BEGIN PROPOSED CONCRETE RIPRAP V-DITCHES AT R2NEB ℄ STA 16+50 A MINIMUM 1-FT BELOW PAVEMENT EDGE ELEVATION OF APPROXIMATE (ELEV=486').



EXIST CULVERT C2
CL IH20 103+23
INLET MODIFICATIONS/IMPROVEMENTS

MV Engineering, Inc. - F-9474

STATE OF TEXAS
ROBERT K. LINDSEY
86979
LICENSED
PROFESSIONAL ENGINEER

Robert K. Lindsey 03-06-2023

NO.	DATE	REVISION	APPROVED

Texas Department of Transportation

IH 20

INLET MODIFICATIONS (CULVERT C2 STA 103+23)

SCALE: 1"=50' HORIZONTAL
1"=10' VERTICAL

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
CHECK	DAL	SEE TITLE SHEET	IH 20
DRAWN	STATE	DISTRICT	COUNTY
CHECK	TEXAS	DAL	DALLAS
	CONTROL	SECTION	JOB
	6443	54	001

SHEET NO. 6

PENTABLE: $PENTBLS$
SCALE: $SCALESHORT$
PLOT DRIVER: $PLTDRVS$
DATE: $DATE$
TIME: $TIME$
USER: $USER$
FILE NAME: $FILES$

INLET CAPACITY		
Inlet(s) E-1	**Inlet(s) F-1**	**Inlet(s) G-1**
(Exist 3x5, depth=2.5') 32.7 cfs	(Exist 3x5, depth=2') 29.3 cfs	(Exist 3x5, depth=1.5') 25.4 cfs
(Prop 3x3 extra open area, depth=2') 20.9 cfs	(Prop 3x3 extra open area, depth=2') 20.9 cfs	(Prop 3x3 extra open area, depth=1.5') 18.1 cfs
(Prop 3x3 extra open area, depth=2') 20.9 cfs	(Prop 3x3 extra open area, depth=2') 20.9 cfs	(Prop 3x3 extra open area, depth=1.5') 18.1 cfs
(Prop 3x3 extra open area, depth=2') 20.9 cfs		
Capacity 95.4 cfs	**Capacity 71.1 cfs**	**Capacity 61.6 cfs**

PROPOSED INLET TOP ELEVATION				
Inlets	**Approx. STA**	**Approx. Offset (LT/RT)**	**Approx. Elev (ft)**	**Approx. Inlet Height (ft)**
CB#2A,	BL WBFR 102+56	47 RT	484.6	
CB#3A, &	BL WBFR 102+63	47 RT	484.6	6
CB#4	BL WBFR 102+70	47 RT	484.6	
CB#2B	CL IH20 103+16	0 LT	485.2	5
CB#3B	CL IH20 103+23	0 LT	485.2	
CB#1A	BL R2NEB 17+65	24 LT	486.7	6
CB#1B	BL R2NEB 17+80	25 RT	485.4	2
CB#2C	BL R2NEB 17+88	25 RT	485.4	

DITCH ELEVATION			
LT: 4'x110' of 5" CONC Riprap v-ditch *			
Beg STA/Offset	*Approx. Elev (ft)*	*End STA*	*Approx. Elev (ft)*
BL R2NEB STA 16+50/28 (LT)	487	BL R2NEB 17+65 (Inlet CB#1A)/24 (LT)	486.7
RT: 4'x125' of 5" CONC Riprap v-ditch *			
Beg STA/Offset	*Approx. Elev (ft)*	*End STA*	*Approx. Elev (ft)*
BL R2NEB STA 16+50/16 (RT)	486	BL R2NEB 17+80 (Inlet CB#1B)/25 (RT)	485.4

*REFER TO CRR STANDARD FOR MORE INFORMATION.

STATE OF TEXAS
DUNG HUY NGUYEN
128595
LICENSED
PROFESSIONAL ENGINEER

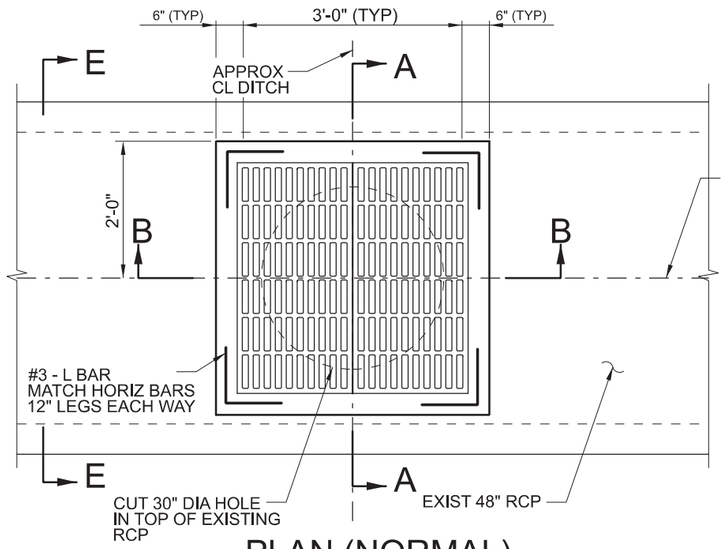
DocuSigned by:
AA914E3EC8AC415...
P.E. 4/25/2023
Signature of Registrant & Date

Texas Department of Transportation

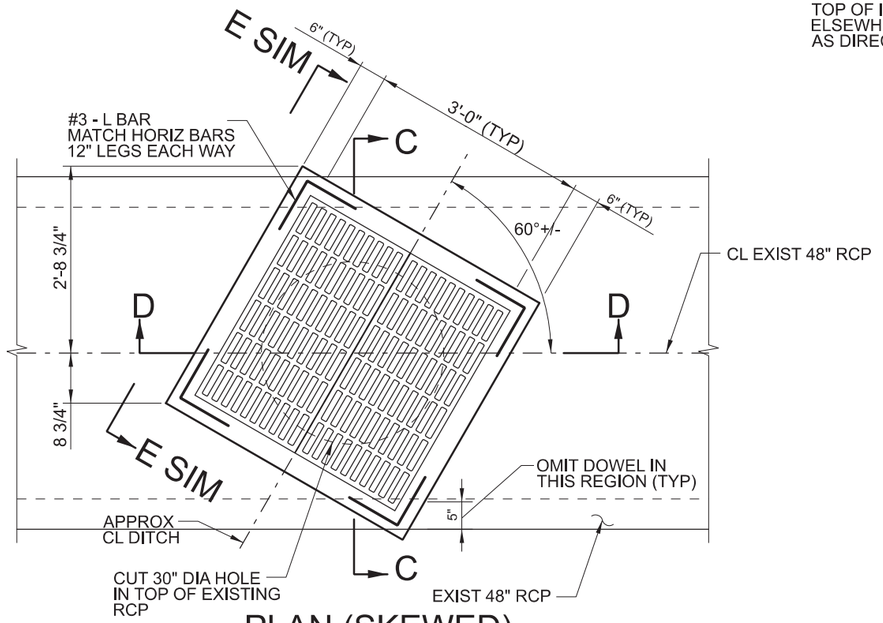
IH0020
MISCELLANEOUS DRAINAGE INFORMATION

DESIGN	FED. RD. DIV. NO.	MAINTENANCE PROJECT		HIGHWAY NO.
DN	6	RMC-644354001		IH0020
GRAPHICS DN	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK NP	TEXAS	DALLAS	DALLAS	7
CHECK NP	CONTROL	SECTION	JOB	
	6443	54	001	

DATE:
FILE:



PLAN (NORMAL)



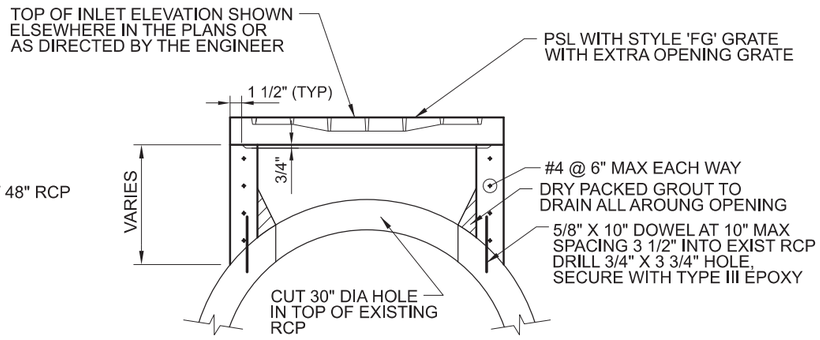
PLAN (SKEWED)

MATERIAL NOTES:

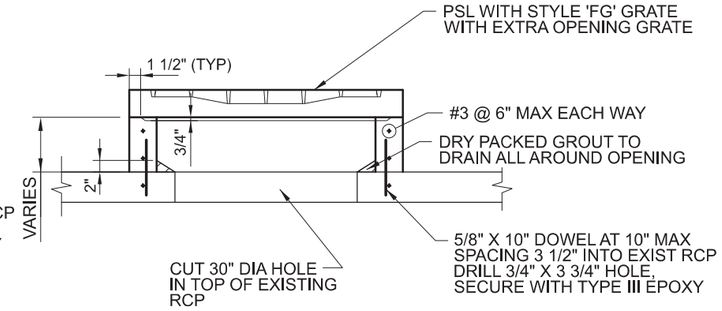
1. Provide Class "C" concrete in accordance with Item 421 and having a minimum compressive strength of 3,600 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of 1 ½" to reinforcing steel from inside surfaces. Place short span reinforcing steel closest to surface.
4. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
5. Provide extra capacity cast iron standard grate, unless noted otherwise elsewhere in plans.

INSTALLATION NOTES:

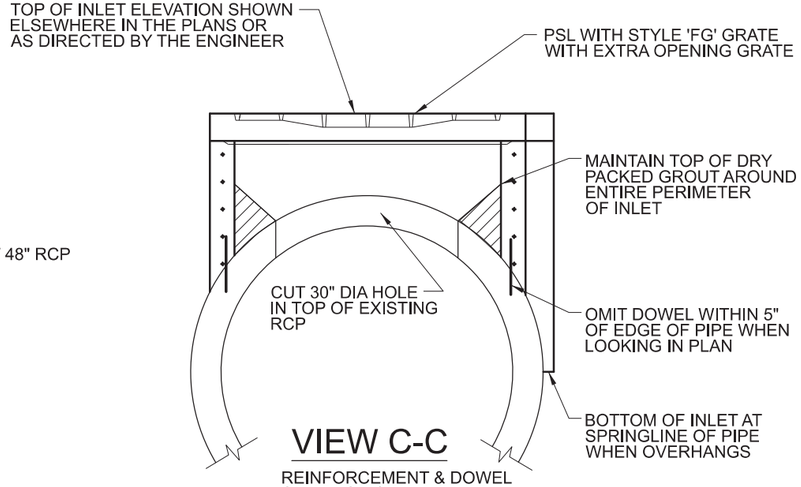
1. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendation. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
2. Do not grout rubber gasket joints without Manufacturer's recommendation.
3. Orient long dimension of grate slots perpendicular to direction of traffic, unless noted otherwise on plans.



SECTION A-A

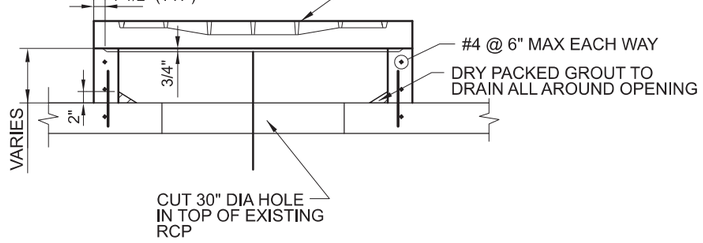


SECTION B-B

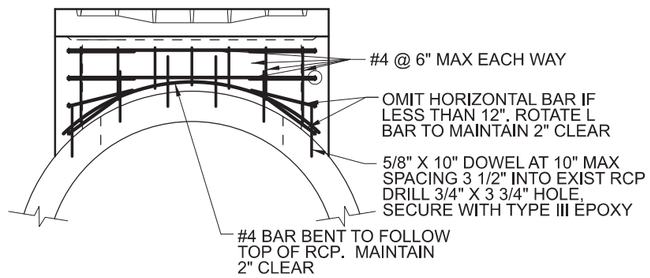


VIEW C-C

REINFORCEMENT & DOWEL
SAME AS NORMAL INLET



SECTION D-D



VIEW E-E

MV Engineering, Inc.,
TBPE Reg No. F-9474

STATE OF TEXAS
ROBERT K. LINDSEY
86979
LICENSED
PROFESSIONAL ENGINEER

Robert K Lindsey 03-03-2023

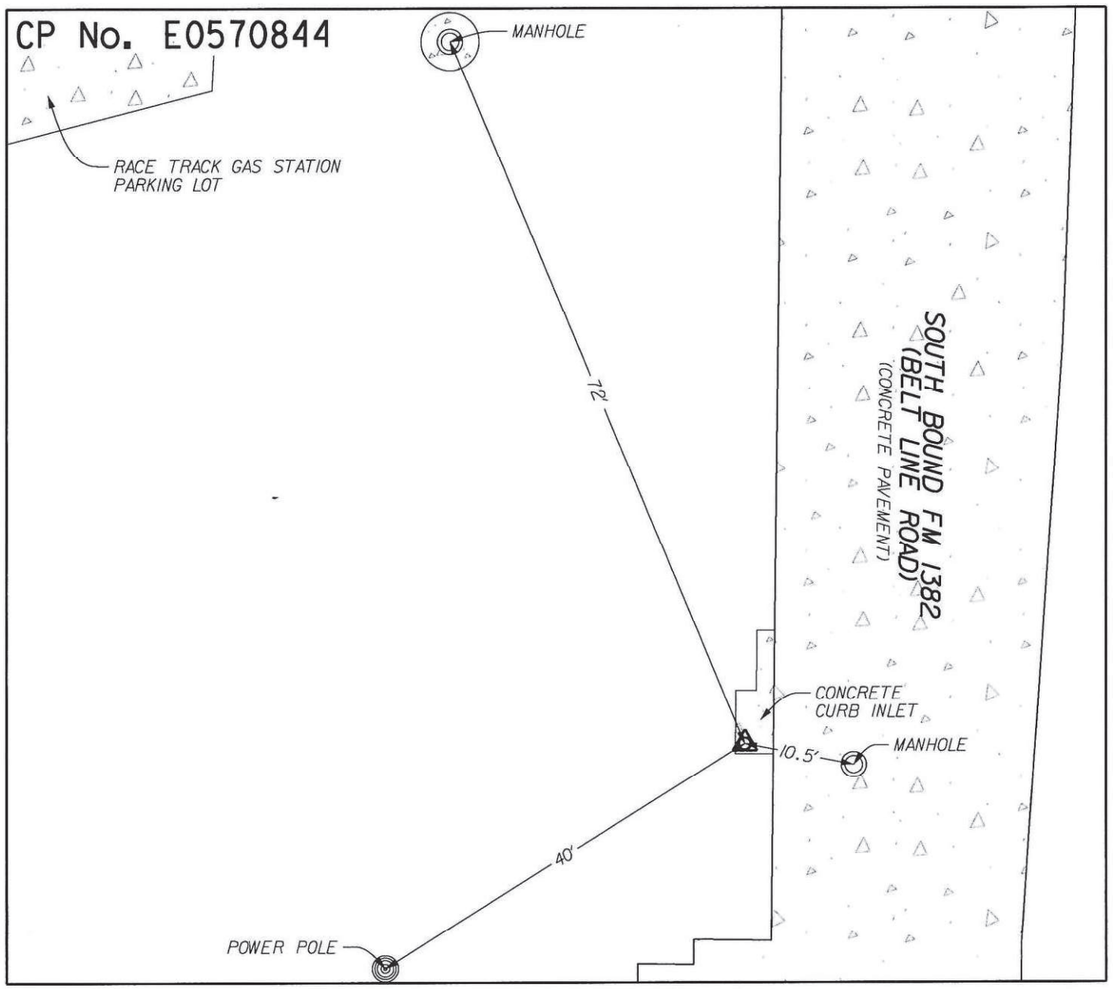
HL93 LOADING

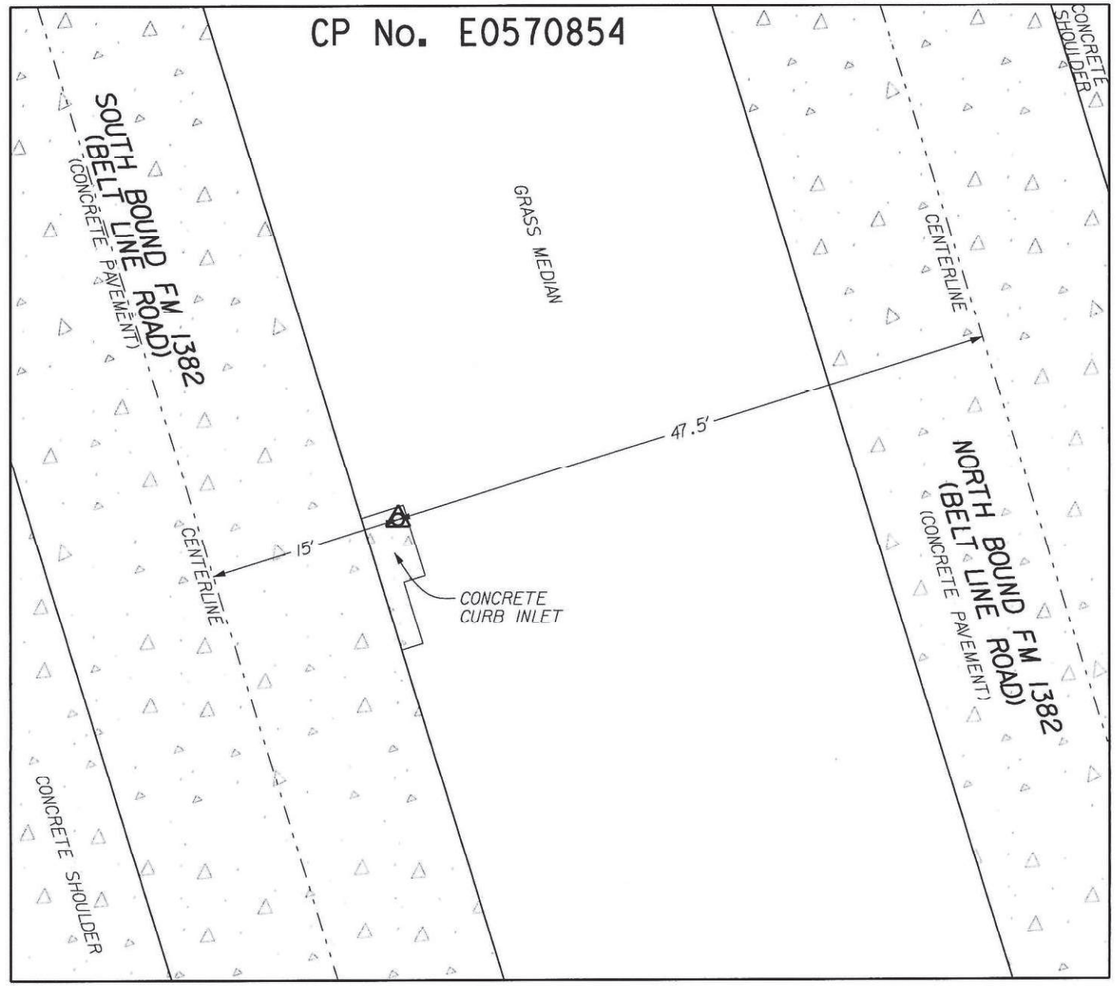
Texas Department of Transportation

Bridge Division Standard

CAST IN PLACE DROP INLET CONNECTION

FILE:	DN:	CK:	DW:	CK:
©TxDOT 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
	DIST	COUNTY		SHEET NO.
	DAL	DALLAS		8





CONTROL POINT No. E0570844

APPROXIMATE LOCATION:

WITHIN WEST R.O.W. OF SOUTH BOUND FM 1382 (BELT LINE ROAD), +/- 595' SOUTH OF THE INTERSECTION OF IH 20 EAST BOUND FRONTAGE ROAD AND SOUTH BOUND FM 1382.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570844".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES, US SURVEY FEET, TEXAS COORDINATE SYSTEM NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202 GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,930,984.543
EASTING: 2,434,895.808
NAVD 88 ELEVATION= 472.12'

CONTROL POINT No. E0570854

APPROXIMATE LOCATION:

WITHIN EAST R.O.W. OF SOUTH BOUND FM 1382 (BELT LINE ROAD), +/- 2,106' SOUTH OF THE INTERSECTION OF IH 20 EAST BOUND FRONTAGE ROAD AND SOUTH BOUND FM 1382.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570844".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES, US SURVEY FEET, TEXAS COORDINATE SYSTEM NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202 GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,929,504.644
EASTING: 2,435,149.117
NAVD 88 ELEVATION= 467.53'

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON 07/08/2014.

STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL
LAND SURVEYOR
9-4-14

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

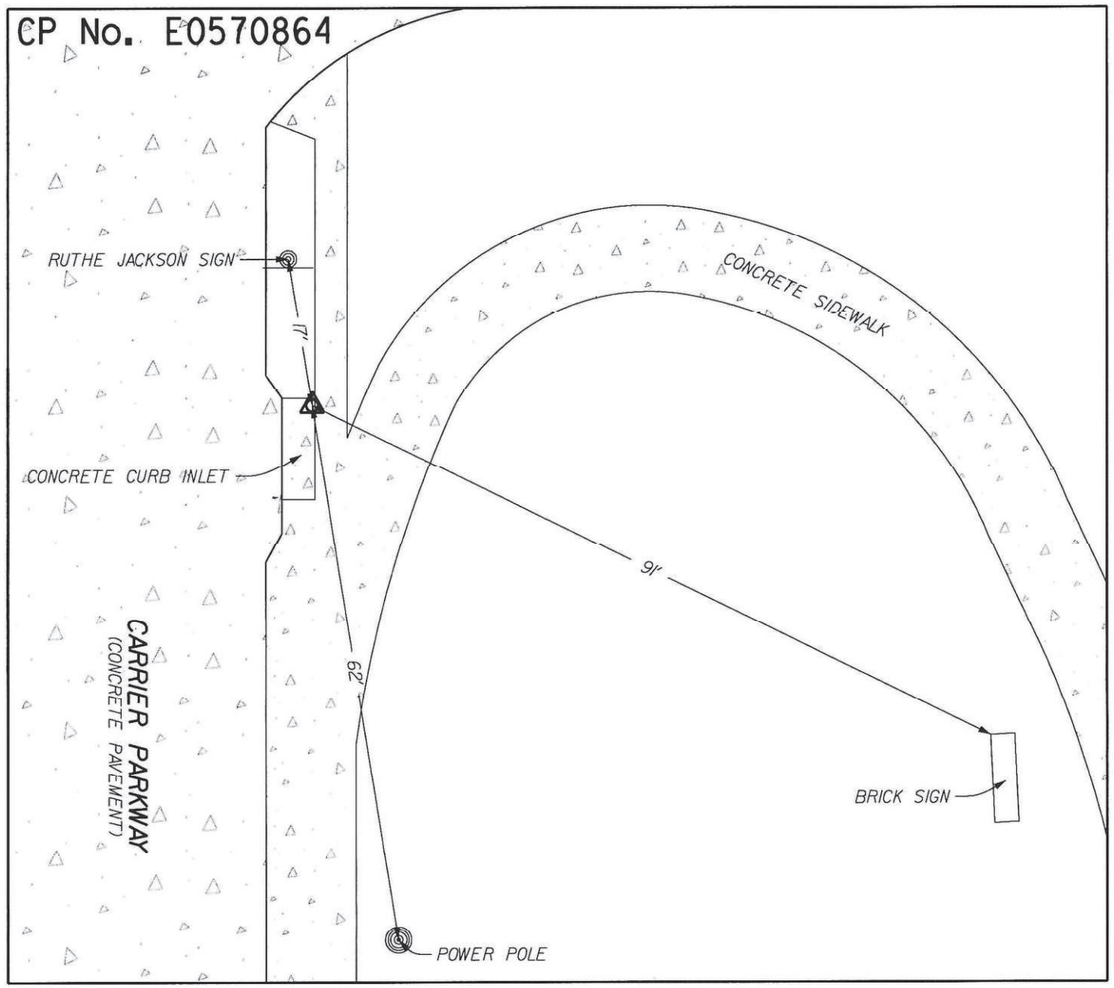
LTRA
LINA T. RAMEY & ASSOCIATES, INC.
1349 Empire Central, Suite 900
Dallas, Texas 75247 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPLS REGISTRATION NO. 10140700

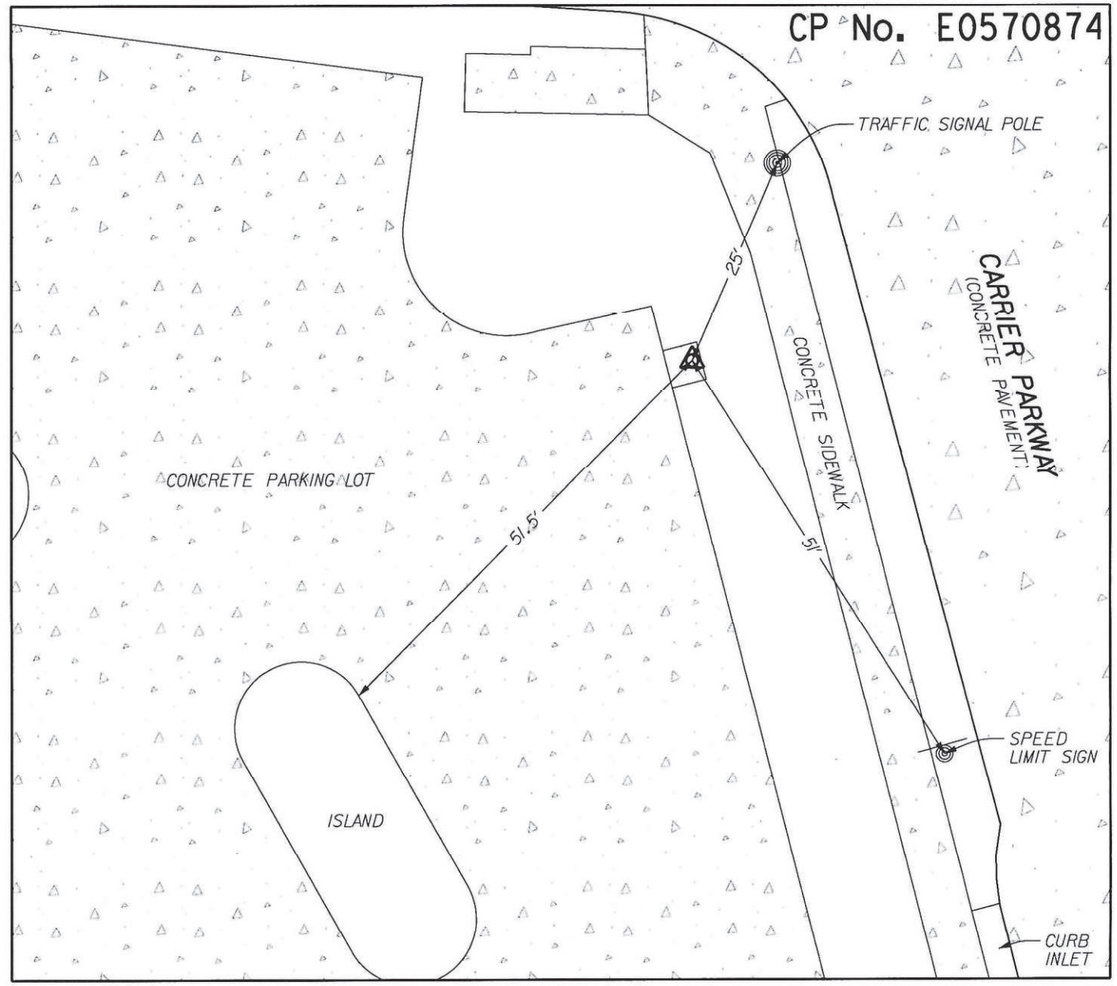
Texas Department of Transportation

IH 20
SURVEY CONTROL

SCALE: "N.T.S." SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	RMC-644354001		IH 20
GRAPHICS M.R	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK M.R	TEXAS	DALLAS	DALLAS	9
CHECK C.F.	CONTROL	SECTION	JOB	
	6443	54	001	





CONTROL POINT No. E0570864

APPROXIMATE LOCATION:

WITHIN EAST R.O.W. OF CARRIER PARKWAY, +/- 447' NORTH OF THE INTERSECTION OF IH 20 WEST BOUND FRONTAGE ROAD AND CARRIER PARKWAY.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570864".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES,
US SURVEY FEET, TEXAS COORDINATE SYSTEM
NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202
GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,933,475.707
EASTING: 2,428,278.843
NAVD 88 ELEVATION= 482.17'

CONTROL POINT No. E0570874

APPROXIMATE LOCATION:

WITHIN WEST R.O.W. OF CARRIER PARKWAY, +/- 505' SOUTH OF THE INTERSECTION OF IH 20 EAST BOUND FRONTAGE ROAD AND CARRIER PARKWAY.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570874".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES,
US SURVEY FEET, TEXAS COORDINATE SYSTEM
NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202
GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,932,067.643
EASTING: 2,428,220.817
NAVD 88 ELEVATION= 492.53'

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON 07/08/2014.

STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL
LAND SURVEYOR

Christopher R. Freeman

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

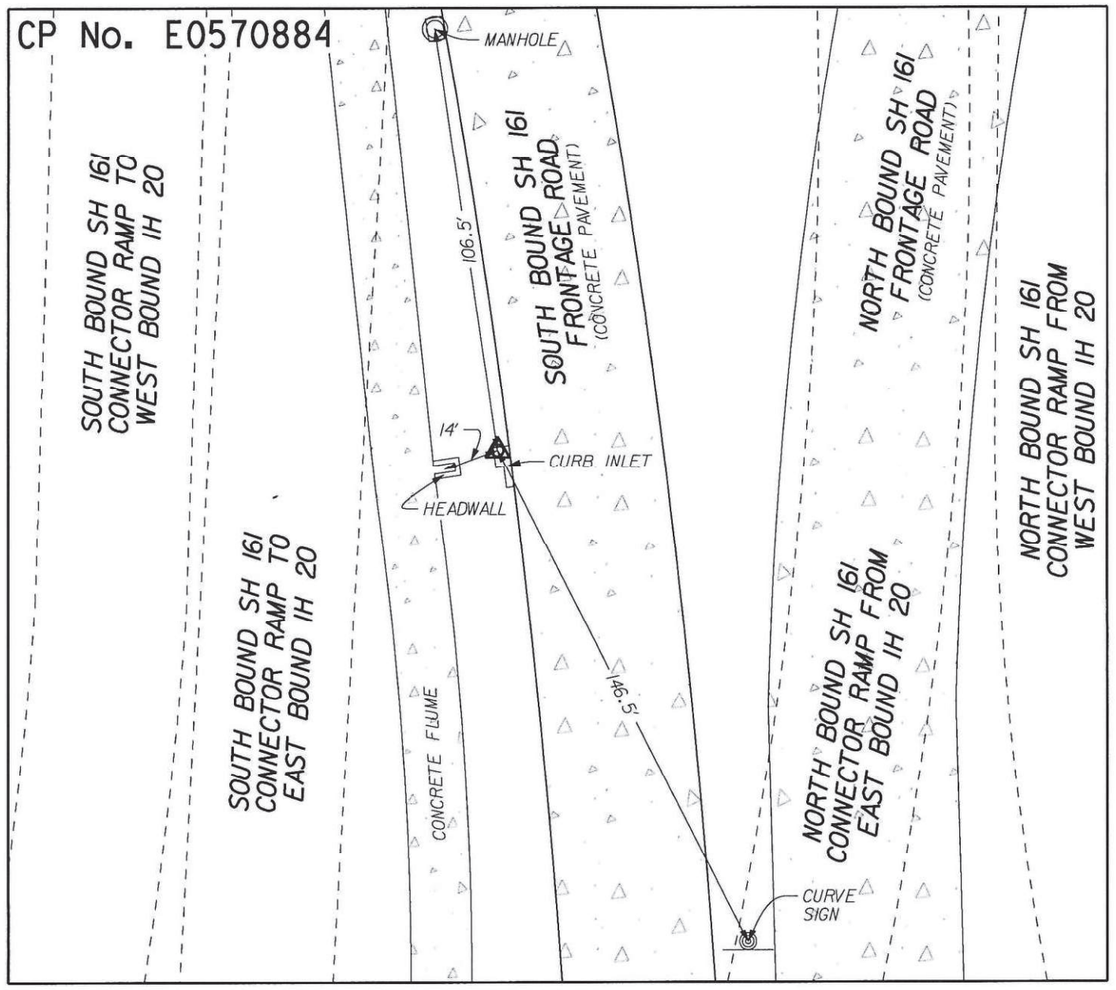
LINA T. RAMEY & ASSOCIATES, INC.
1349 Empire Central, Suite 900
Dallas, Texas 75247 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPLS REGISTRATION NO. 10140700

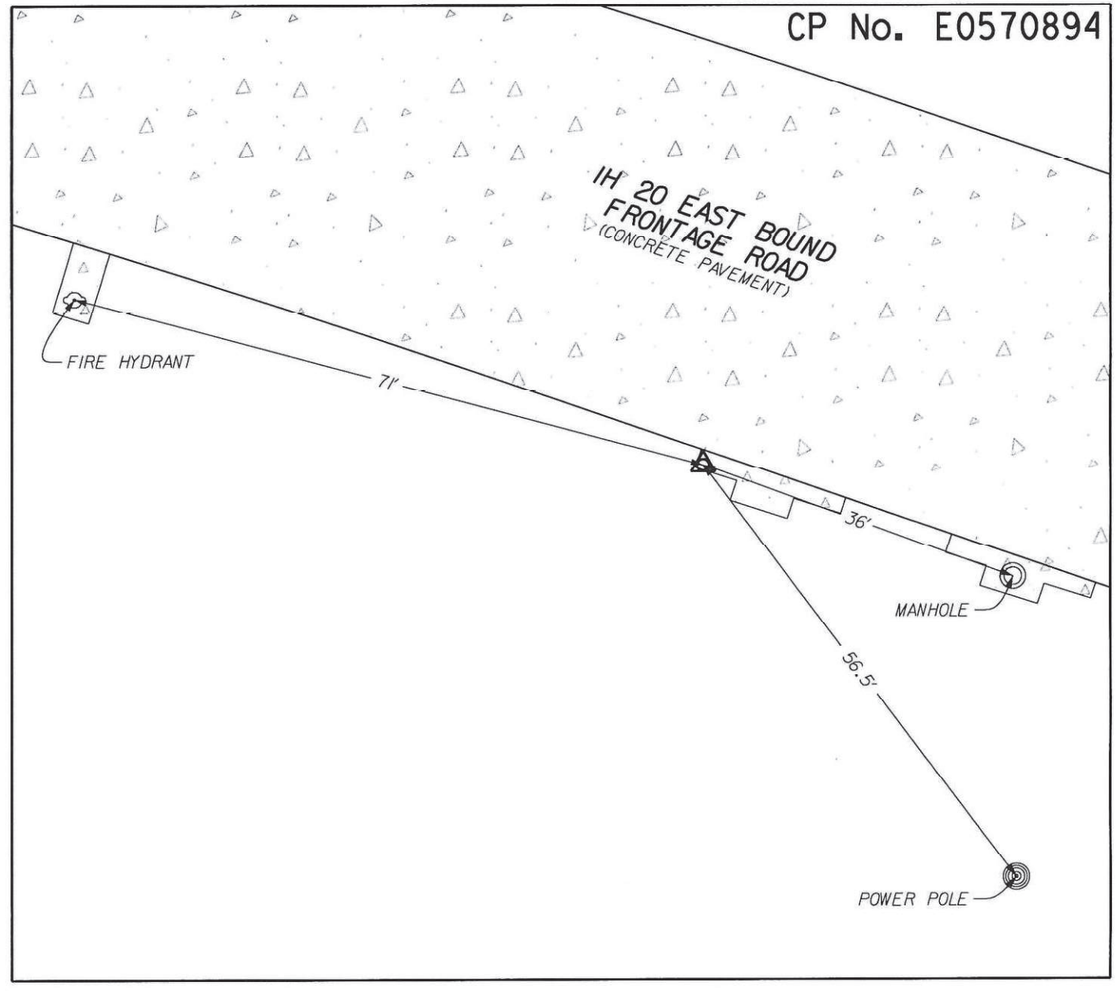
Texas Department of Transportation

IH 20
SURVEY CONTROL

SCALE: "N.T.S." SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS M.R	6	RMC-644354001		IH 20
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK M.R	TEXAS	DALLAS	DALLAS	10
	CONTROL	SECTION	JOB	
CHECK C.F.	6443	54	001	





CONTROL POINT No. E0570884

APPROXIMATE LOCATION:

WITHIN WEST R.O.W. OF SOUTH BOUND SH 161 FRONTAGE ROAD, +/- 762' NORTH OF THE INTERSECTION OF IH 20 WEST BOUND FRONTAGE ROAD AND SOUTH BOUND SH 161 FRONTAGE ROAD.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570884".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES,
US SURVEY FEET, TEXAS COORDINATE SYSTEM
NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202
GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,933,971.207
EASTING: 2,422,909.430
NAVD 88 ELEVATION= 522.63'

CONTROL POINT No. E0570894

APPROXIMATE LOCATION:

WITHIN SOUTH R.O.W. OF IH 20 EAST BOUND FRONTAGE ROAD, +/- 345' WEST OF THE INTERSECTION OF IH 20 EAST BOUND FRONTAGE ROAD AND SOUTH BOUND LAKE RIDGE PARKWAY.

DATE SET: 07/08/2014
MONUMENT: A 2" ALUMINUM DISK SET ON CONCRETE WITH APPOXY MARKED "TEXAS DALLAS GPS E0570894".
HORIZONTAL COORDINATES ARE SURFACE COORDINATES,
US SURVEY FEET, TEXAS COORDINATE SYSTEM
NAD 83, (EPOCH 2002) NORTH CENTRAL ZONE 4202
GEOID 2012A AS DERIVED FROM THE TxDOT VRS NETWORK

ELEVATIONS ARE NAVD 88 AS DERIVED FROM THE TxDOT VRS NETWORK

DALLAS COUNTY SURFACE ADJUSTMENT FACTOR: 1.000136506

NORTHING: 6,932,704.879
EASTING: 2,422,650.362
NAVD 88 ELEVATION= 528.06'

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON 07/08/2014.

STATE OF TEXAS
REGISTERED
CHRISTOPHER R. FREEMAN
5701
PROFESSIONAL
LAND SURVEYOR

Christopher R. Freeman

CHRISTOPHER R. FREEMAN - R.P.L.S. NO. 5701

LINA T. RAMEY & ASSOCIATES, INC.
1349 Empire Central, Suite 900
Dallas, Texas 75247 - 214-979-1144
FIRM REGISTRATION NO. F-782
TBPLS REGISTRATION NO. 10140700

Texas Department of Transportation

IH 20 SURVEY CONTROL

SCALE: "N. T. S." SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS M.R	6	RMC-644354001		IH 20
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK M.R	TEXAS	DALLAS	DALLAS	11
CHECK C.F.	CONTROL	SECTION	JOB	
	6443	54	001	

℄ IH20 "IH 20 MAIN LANES"

Beginning chain IH20 description
==

Point IH20100 N 6,933,000.76 E 2,421,268.95 Sta 20+00.00 (A-BEG)

Course from IH20100 to PC IH20-1 N 89° 24' 59.03" E Dist 4,876.78

Curve Data [A-1]

Curve IH20-1					
P.I. Station	73+17.02	N	6,933,054.92	E	2,426,585.70
Delta =	8° 47' 15.13" (RT)				
Degree =	1° 00' 00.00"				
Tangent =	440.24				
Length =	878.75				
Radius =	5,729.58				
External =	16.89				
Long Chord =	877.89				
Mid. Ord. =	16.84				
P.C. Station	68+76.78	N	6,933,050.43	E	2,426,145.48
P.T. Station	77+55.54	N	6,932,992.10	E	2,427,021.43
C.C.		N	6,927,321.15	E	2,426,203.84
Back	= N 89° 24' 59.03" E				
Ahead	= S 81° 47' 45.84" E				
Chord Bear	= S 86° 11' 23.41" E				

Course from PT IH20-1 to IH20200 S 81° 47' 45.84" E Dist 9,144.46

Point IH20200 N 6,931,687.21 E 2,436,072.31 Sta 169+00.00 (A-END)

==
Ending chain IH20 description

℄ EBFR "EASTBOUND FRONTAGE ROAD"

Beginning chain EBFR description
==

Point EBFR100 N 6,932,720.88 E 2,422,611.43 Sta 32+42.21 (B-BEG)

Course from EBFR100 to PC EBFR-1 S 72° 09' 45.85" E Dist 52.51

Curve Data [B-1]

Curve EBFR-1					
P.I. Station	34+13.99	N	6,932,668.25	E	2,422,774.95
Delta =	18° 17' 17.79" (LT)				
Degree =	7° 43' 56.01"				
Tangent =	119.27				
Length =	236.52				
Radius =	741.00				
External =	9.54				
Long Chord =	235.52				
Mid. Ord. =	9.42				
P.C. Station	32+94.72	N	6,932,704.79	E	2,422,661.41
P.T. Station	35+31.24	N	6,932,669.19	E	2,422,894.23
C.C.		N	6,933,410.17	E	2,422,888.39
Back	= S 72° 09' 45.85" E				
Ahead	= N 89° 32' 56.36" E				
Chord Bear	= S 81° 18' 24.74" E				

Course from PT EBFR-1 to PC EBFR-2 N 89° 32' 56.36" E Dist 259.91

Curve Data [B-2]

Curve EBFR-2					
P.I. Station	39+18.75	N	6,932,672.24	E	2,423,281.72
Delta =	19° 00' 43.59" (LT)				
Degree =	7° 31' 08.87"				
Tangent =	127.60				
Length =	252.85				
Radius =	762.00				
External =	10.61				
Long Chord =	251.69				
Mid. Ord. =	10.46				
P.C. Station	37+91.15	N	6,932,671.24	E	2,423,154.13
P.T. Station	40+44.00	N	6,932,714.76	E	2,423,402.03
C.C.		N	6,933,433.22	E	2,423,148.13
Back	= N 89° 32' 56.36" E				
Ahead	= N 70° 32' 12.77" E				
Chord Bear	= N 80° 02' 34.56" E				

Curve Data [B-3]

Curve EBFR-3					
P.I. Station	42+94.28	N	6,932,798.15	E	2,423,638.01
Delta =	18° 56' 44.77" (RT)				
Degree =	3° 49' 10.99"				
Tangent =	250.28				
Length =	496.00				
Radius =	1,500.00				
External =	20.74				
Long Chord =	493.74				
Mid. Ord. =	20.45				
P.C. Station	40+44.00	N	6,932,714.76	E	2,423,402.03
P.T. Station	45+40.00	N	6,932,800.41	E	2,423,888.28
C.C.		N	6,931,300.48	E	2,423,901.83
Back	= N 70° 32' 12.77" E				
Ahead	= N 89° 28' 57.54" E				
Chord Bear	= N 80° 00' 35.15" E				

Course from PT EBFR-3 to PC EBFR-4 N 89° 28' 57.54" E Dist 96.60

℄ EBFR "EASTBOUND FRONTAGE ROAD" (CONT'D)

Curve Data [B-4]

Curve EBFR-4					
P.I. Station	46+71.50	N	6,932,801.60	E	2,424,019.78
Delta =	0° 39' 59.47" (LT)				
Degree =	0° 57' 17.75"				
Tangent =	34.90				
Length =	69.80				
Radius =	6,000.00				
External =	0.10				
Long Chord =	69.80				
Mid. Ord. =	0.10				
P.C. Station	46+36.60	N	6,932,801.29	E	2,423,984.88
P.T. Station	47+06.39	N	6,932,802.32	E	2,424,054.67
C.C.		N	6,938,801.04	E	2,423,930.70
Back	= N 89° 28' 57.54" E				
Ahead	= N 88° 48' 58.07" E				
Chord Bear	= N 89° 08' 57.81" E				

Course from PT EBFR-4 to PC EBFR-5 N 88° 48' 58.07" E Dist 516.59

Curve Data [B-5]

Curve EBFR-5					
P.I. Station	54+67.11	N	6,932,818.04	E	2,424,815.22
Delta =	27° 26' 18.97" (RT)				
Degree =	5° 43' 46.48"				
Tangent =	244.13				
Length =	478.89				
Radius =	1,000.00				
External =	29.37				
Long Chord =	474.33				
Mid. Ord. =	28.53				
P.C. Station	52+22.98	N	6,932,813.00	E	2,424,571.14
P.T. Station	57+01.87	N	6,932,710.05	E	2,425,034.17
C.C.		N	6,931,813.21	E	2,424,591.80
Back	= N 88° 48' 58.07" E				
Ahead	= S 63° 44' 42.96" E				
Chord Bear	= S 77° 27' 52.44" E				

Curve Data [B-6]

Curve EBFR-6					
P.I. Station	59+74.83	N	6,932,589.30	E	2,425,278.96
Delta =	44° 02' 05.75" (LT)				
Degree =	8° 29' 17.75"				
Tangent =	272.96				
Length =	518.77				
Radius =	675.00				
External =	53.10				
Long Chord =	506.10				
Mid. Ord. =	49.23				
P.C. Station	57+01.87	N	6,932,710.05	E	2,425,034.17
P.T. Station	62+20.65	N	6,932,672.65	E	2,425,538.88
C.C.		N	6,933,315.41	E	2,425,332.76
Back	= S 63° 44' 42.96" E				
Ahead	= N 72° 13' 11.29" E				
Chord Bear	= S 85° 45' 45.83" E				

Course from PT EBFR-6 to PC EBFR-7 N 72° 13' 11.29" E Dist 515.16

Curve Data [B-7]

Curve EBFR-7					
P.I. Station	69+98.29	N	6,932,910.12	E	2,426,279.39
Delta =	29° 24' 53.51" (RT)				
Degree =	5° 43' 46.48"				
Tangent =	262.48				
Length =	513.39				
Radius =	1,000.00				
External =	33.88				
Long Chord =	507.77				
Mid. Ord. =	32.77				
P.C. Station	67+35.81	N	6,932,829.96	E	2,426,029.44
P.T. Station	72+49.20	N	6,932,857.18	E	2,426,536.48
C.C.		N	6,931,877.73	E	2,426,334.81
Back	= N 72° 13' 11.29" E				
Ahead	= S 78° 21' 55.20" E				
Chord Bear	= N 86° 55' 38.04" E				

Course from PT EBFR-7 to PC EBFR-8 S 78° 21' 55.20" E Dist 1,065.67

Curve Data [B-8]

Curve EBFR-8					
P.I. Station	84+77.29	N	6,932,609.51	E	2,427,739.33
Delta =	6° 11' 52.73" (RT)				
Degree =	1° 54' 35.49"				
Tangent =	162.42				
Length =	324.53				
Radius =	3,000.00				
External =	4.39				
Long Chord =	324.37				
Mid. Ord. =	4.39				
P.C. Station	83+14.87	N	6,932,642.27	E	2,427,580.25
P.T. Station	86+39.39	N	6,932,559.77	E	2,427,893.95
C.C.		N	6,929,703.91	E	2,426,975.24
Back	= S 78° 21' 55.20" E				
Ahead	= S 72° 10' 02.47" E				
Chord Bear	= S 75° 15' 58.84" E				

Course from PT EBFR-8 to PC EBFR-9 S 72° 10' 02.47" E Dist 148.89

STATE OF TEXAS
WEIYIH TEE
98478
LICENSED
PROFESSIONAL ENGINEER
03/20/2017

NO.	DATE	REVISION	APPROVED

Stantec
2435 N CENTRAL EXPY, SUITE 750
RICHARDSON, TEXAS 75080
P 214-468-8200
F 214-468-8266
Firm # F-6324

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WT	6	SEE TITLE SHEET		IH 20
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
KW	TEXAS	DAL	DALLAS	12
DRAWN	CONTROL	SECTION	JOB	
CK	6443	54	001	
CHECK				
CH				

℄ EBFR "EASTBOUND FRONTAGE ROAD"

Curve Data *----------* B-9

```
Curve EBFR-9
P.I.  Station              91+01.47  N      6,932,418.26  E      2,428,333.84
Delta          =     25° 13′ 14.54" (LT)
Degree         =      4° 05′ 33.20"
Tangent        =            313.20
Length         =            616.26
Radius         =          1,400.00
External       =             34.61
Long Chord     =            611.29
Mid. Ord.      =             33.77
P.C.  Station              87+88.27  N      6,932,514.18  E      2,428,035.68
P.T.  Station              94+04.53  N      6,932,458.54  E      2,428,644.44
C.C.                                 N      6,933,846.92  E      2,428,464.42
Back          = S  72° 10′ 02.47" E
Ahead         = N  82° 36′ 42.98" E
Chord Bear    = S  84° 46′ 39.75" E
```

Curve Data *----------* B-10

```
Curve EBFR-10
P.I.  Station              96+56.25  N      6,932,490.91  E      2,428,894.07
Delta          =     14° 20′ 49.34" (RT)
Degree         =      2° 51′ 53.13"
Tangent        =            251.72
Length         =            500.81
Radius         =          2,000.02
External       =             15.78
Long Chord     =            499.50
Mid. Ord.      =             15.66
P.C.  Station              94+04.53  N      6,932,458.54  E      2,428,644.44
P.T.  Station              99+05.34  N      6,932,460.41  E      2,429,143.94
C.C.                                 N      6,930,475.12  E      2,428,901.62
Back          = N  82° 36′ 42.98" E
Ahead         = S  83° 02′ 27.68" E
Chord Bear    = N  89° 47′ 07.65" E
```

Course from PT EBFR-2 to PC EBFR-3 S 83° 02′ 27.68" E Dist 759.68

Curve Data *----------* B-11

```
Curve EBFR-11
P.I.  Station             109+27.97  N      6,932,336.51  E      2,430,159.03
Delta          =     10° 01′ 05.87" (RT)
Degree         =      1° 54′ 35.49"
Tangent        =            262.95
Length         =            524.56
Radius         =          3,000.00
External       =             11.50
Long Chord     =            523.89
Mid. Ord.      =             11.46
P.C.  Station             106+65.02  N      6,932,368.37  E      2,429,898.02
P.T.  Station             111+89.57  N      6,932,259.73  E      2,430,410.52
C.C.                                 N      6,929,390.47  E      2,429,534.55
Back          = S  83° 02′ 27.68" E
Ahead         = S  73° 01′ 21.80" E
Chord Bear    = S  78° 01′ 54.74" E
```

Curve Data *----------* B-12

```
Curve EBFR-12
P.I.  Station             114+71.03  N      6,932,177.55  E      2,430,679.71
Delta          =     10° 43′ 09.57" (LT)
Degree         =     13° 54′ 35.49"
Tangent        =            281.45
Length         =            561.26
Radius         =          3,000.00
External       =             13.17
Long Chord     =            560.44
Mid. Ord.      =             13.12
P.C.  Station             111+89.57  N      6,932,259.73  E      2,430,410.52
P.T.  Station             117+50.84  N      6,932,146.87  E      2,430,959.49
C.C.                                 N      6,935,128.99  E      2,431,286.50
Back          = S  73° 01′ 21.80" E
Ahead         = S  83° 44′ 31.37" E
Chord Bear    = S  78° 22′ 56.59" E
```

Course from PT EBFR-4 to PC EBFR-5 S 83° 44′ 31.37" E Dist 923.64

℄ EBFR "EASTBOUND FRONTAGE ROAD" (CONTINUED)

Curve Data *----------* B-13

```
Curve EBFR-13
P.I.  Station             127+79.90  N      6,932,034.70  E      2,431,982.42
Delta          =      4° 01′ 31.54" (LT)
Degree         =      1° 54′ 35.49"
Tangent        =            105.43
Length         =            210.77
Radius         =          3,000.00
External       =              1.85
Long Chord     =            210.73
Mid. Ord.      =              1.85
P.C.  Station             126+74.48  N      6,932,046.19  E      2,431,877.62
P.T.  Station             128+85.25  N      6,932,030.59  E      2,432,087.77
C.C.                                 N      6,935,028.31  E      2,432,204.64
Back          = S  83° 44′ 31.37" E
Ahead         = S  87° 46′ 02.92" E
Chord Bear    = S  85° 45′ 17.14" E
```

Course from PT EBFR-5 to PC EBFR-6 S 87° 46′ 02.92" E Dist 163.66

Curve Data *----------* B-14

```
Curve EBFR-14
P.I.  Station             132+41.92  N      6,932,016.69  E      2,432,444.18
Delta          =      7° 21′ 45.47" (RT)
Degree         =      1° 54′ 35.49"
Tangent        =            193.02
Length         =            385.51
Radius         =          3,000.00
External       =              6.20
Long Chord     =            385.24
Mid. Ord.      =              6.19
P.C.  Station             130+48.91  N      6,932,024.21  E      2,432,251.31
P.T.  Station             134+34.41  N      6,931,984.52  E      2,432,634.50
C.C.                                 N      6,929,026.49  E      2,432,134.44
Back          = S  87° 46′ 02.92" E
Ahead         = S  80° 24′ 17.45" E
Chord Bear    = S  84° 05′ 10.18" E
```

Course from PT EBFR-6 to PC EBFR-7 S 80° 24′ 17.45" E Dist 1,228.67

Curve Data *----------* B-15

```
Curve EBFR-15
P.I.  Station             149+65.60  N      6,931,729.29  E      2,434,144.27
Delta          =      5° 46′ 22.01" (RT)
Degree         =      0° 57′ 17.75"
Tangent        =            302.52
Length         =            604.52
Radius         =          6,000.00
External       =              7.62
Long Chord     =            604.27
Mid. Ord.      =              7.61
P.C.  Station             146+63.08  N      6,931,779.72  E      2,433,845.98
P.T.  Station             152+67.61  N      6,931,649.12  E      2,434,435.97
C.C.                                 N      6,925,863.66  E      2,432,845.87
Back          = S  80° 24′ 17.45" E
Ahead         = S  74° 37′ 55.44" E
Chord Bear    = S  77° 31′ 06.45" E
```

Curve Data *----------* B-16

```
Curve EBFR-16
P.I.  Station             154+73.99  N      6,931,594.43  E      2,434,634.97
Delta          =     11° 02′ 16.47" (LT)
Degree         =      2° 40′ 56.59"
Tangent        =            206.39
Length         =            411.50
Radius         =          2,136.00
External       =              9.95
Long Chord     =            410.86
Mid. Ord.      =              9.90
P.C.  Station             152+67.61  N      6,931,649.12  E      2,434,435.97
P.T.  Station             156+79.10  N      6,931,578.84  E      2,434,840.77
C.C.                                 N      6,933,708.75  E      2,435,002.04
Back          = S  74° 37′ 55.44" E
Ahead         = S  85° 40′ 11.91" E
Chord Bear    = S  80° 09′ 03.67" E
```

Course from PT EBFR-8 to EBFR2 S 85° 40′ 11.91" E Dist 96.20

Point EBFR2 N 6,931,571.58 E 2,434,936.69 Sta 157+75.30 B-END

==========

Ending chain EBFR description

STATE OF TEXAS
JEFF STRONG
105180
LICENSED
PROFESSIONAL ENGINEER
03/20/17

NO.	DATE	REVISION	APPROVED

LTRA
LINA T. RAMEY & ASSOCIATES, INC.
3320 Belt Line Rd
Farmers Branch, Texas 75234
Firm Registration No. F-782

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JBS		SEE TITLE SHEET		IH 20
DRAWN WAV	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LTR	TEXAS	DAL	DALLAS	13
CHECK LTR	CONTROL	SECTION	JOB	
	6443	54	001	

PENTABLE: IH20_LTRA_TXDOT _Pen.tbl
SCALE: is100
PLOT DRIVER: TXDOT_PDF_BW.pltt
DATE: 3/20/2017
TIME: 11:50:01 AM
USER: twatson
FILE NAME: ...\03_IH20_ALIGN_DATA-I01.dgn

EBFRBY "EB FRONTAGE RD BYPASS"

Beginning chain EBFRBY description

				Curve Data C-1			
Curve EBFRBY-1							
P.I. Station			49+94.22	N	6,932,823.31	E	2,424,392.78
Delta	=	1° 40′ 50.15"	(LT)				
Degree	=	1° 08′ 45.30"					
Tangent	=		73.34				
Length	=		146.66				
Radius	=		5,000.00				
External	=		0.54				
Long Chord	=		146.65				
Mid. Ord.	=		0.54				
P.C. Station			49+20.88	N	6,932,821.80	E	2,424,319.46
P.T. Station			50+67.54	N	6,932,826.98	E	2,424,466.02
C.C.				N	6,937,820.73	E	2,424,216.15
Back	= N	88° 48′ 58.07" E					
Ahead	= N	87° 08′ 07.93" E					
Chord Bear	= N	87° 58′ 33.00" E					

Course from PT EBFRBY-1 to PC EBFRBY-2 N 87° 08′ 07.93" E Dist 176.02

				Curve Data C-2			
Curve EBFRBY-2							
P.I. Station			53+63.87	N	6,932,841.79	E	2,424,761.98
Delta	=	6° 53′ 05.78"	(RT)				
Degree	=	2° 51′ 53.24"					
Tangent	=		120.31				
Length	=		240.33				
Radius	=		2,000.00				
External	=		3.62				
Long Chord	=		240.19				
Mid. Ord.	=		3.61				
P.C. Station			52+43.56	N	6,932,835.77	E	2,424,641.82
P.T. Station			54+83.89	N	6,932,833.35	E	2,424,881.99
C.C.				N	6,930,838.27	E	2,424,741.77
Back	= N	87° 08′ 07.93" E					
Ahead	= S	85° 58′ 46.30" E					
Chord Bear	= S	89° 25′ 19.19" E					

				Curve Data C-3			
Curve EBFRBY-3							
P.I. Station			57+66.55	N	6,932,813.53	E	2,425,163.95
Delta	=	10° 45′ 53.66"	(LT)				
Degree	=	1° 54′ 35.49"					
Tangent	=		282.66				
Length	=		563.65				
Radius	=		3,000.00				
External	=		13.29				
Long Chord	=		562.82				
Mid. Ord.	=		13.23				
P.C. Station			54+83.89	N	6,932,833.35	E	2,424,881.99
P.T. Station			60+47.54	N	6,932,846.73	E	2,425,444.65
C.C.				N	6,935,825.97	E	2,425,092.33
Back	= S	85° 58′ 46.30" E					
Ahead	= N	83° 15′ 20.04" E					
Chord Bear	= N	88° 38′ 16.87" E					

				Curve Data C-4			
Curve EBFRBY-4							
P.I. Station			64+88.12	N	6,932,898.47	E	2,425,882.18
Delta	=	6° 04′ 10.82"	(RT)				
Degree	=	0° 41′ 22.13"					
Tangent	=		440.58				
Length	=		880.33				
Radius	=		8,310.00				
External	=		11.67				
Long Chord	=		879.91				
Mid. Ord.	=		11.65				
P.C. Station			60+47.54	N	6,932,846.73	E	2,425,444.65
P.T. Station			69+27.87	N	6,932,903.66	E	2,426,322.72
C.C.				N	6,924,594.23	E	2,426,420.59
Back	= N	83° 15′ 20.04" E					
Ahead	= N	89° 19′ 30.86" E					
Chord Bear	= N	86° 17′ 25.45" E					

Ending chain EBFRBY description

WBFR "WESTBOUND FRONTAGE ROAD"

Beginning chain WBFR description

Point WBFR100 N 6,933,229.86 E 2,423,284.57 Sta 40+00.00 (D-BEG)

Course from WBFR100 to PC WBFR-1 N 89° 24′ 26.30" E Dist 1,237.17

				Curve Data D-1			
Curve WBFR-1							
P.I. Station			53+92.73	N	6,933,244.26	E	2,424,677.23
Delta	=	11° 50′ 30.35"	(LT)				
Degree	=	3° 49′ 10.99"					
Tangent	=		155.56				
Length	=		310.02				
Radius	=		1,500.00				
External	=		8.04				
Long Chord	=		309.47				
Mid. Ord.	=		8.00				
P.C. Station			52+37.17	N	6,933,242.65	E	2,424,521.67
P.T. Station			55+47.19	N	6,933,277.76	E	2,424,829.14
C.C.				N	6,934,742.57	E	2,424,506.16

WBFR "WESTBOUND FRONTAGE ROAD"(CONT'D)

Back	= N	89° 24′ 26.30" E
Ahead	= N	77° 33′ 55.95" E
Chord Bear	= N	83° 29′ 11.13" E

				Curve Data D-2			
Curve WBFR-2							
P.I. Station			57+36.29	N	6,933,318.48	E	2,425,013.81
Delta	=	14° 22′ 15.29"	(RT)				
Degree	=	3° 49′ 10.99"					
Tangent	=		189.11				
Length	=		376.23				
Radius	=		1,500.00				
External	=		11.87				
Long Chord	=		375.24				
Mid. Ord.	=		11.78				
P.C. Station			55+47.19	N	6,933,277.76	E	2,424,829.14
P.T. Station			59+23.42	N	6,933,312.09	E	2,425,202.81
C.C.				N	6,931,812.94	E	2,425,152.13
Back	= N	77° 33′ 55.95" E					
Ahead	= S	88° 03′ 48.76" E					
Chord Bear	= N	84° 45′ 03.60" E					

Course from PT WBFR-2 to PC WBFR-3 S 88° 03′ 48.76" E Dist 1,312.01

				Curve Data D-3			
Curve WBFR-3							
P.I. Station			75+63.92	N	6,933,256.65	E	2,426,842.38
Delta	=	6° 16′ 03.27"	(RT)				
Degree	=	0° 57′ 17.75"					
Tangent	=		328.50				
Length	=		656.34				
Radius	=		6,000.00				
External	=		8.99				
Long Chord	=		656.01				
Mid. Ord.	=		8.97				
P.C. Station			72+35.43	N	6,933,267.75	E	2,426,514.07
P.T. Station			78+91.77	N	6,933,209.78	E	2,427,167.52
C.C.				N	6,927,271.18	E	2,426,311.33
Back	= S	88° 03′ 48.76" E					
Ahead	= S	81° 47′ 45.48" E					
Chord Bear	= S	84° 55′ 47.12" E					

Course from PT WBFR-3 to PC WBFR-4 S 81° 47′ 45.48" E Dist 553.55

				Curve Data D-4			
Curve WBFR-4							
P.I. Station			85+75.71	N	6,933,112.18	E	2,427,844.47
Delta	=	9° 56′ 10.97"	(LT)				
Degree	=	3° 49′ 10.99"					
Tangent	=		130.39				
Length	=		260.13				
Radius	=		1,500.00				
External	=		5.66				
Long Chord	=		259.81				
Mid. Ord.	=		5.64				
P.C. Station			84+45.32	N	6,933,130.79	E	2,427,715.41
P.T. Station			87+05.45	N	6,933,116.12	E	2,427,974.80
C.C.				N	6,934,615.44	E	2,427,929.45
Back	= S	81° 47′ 45.48" E					
Ahead	= N	88° 16′ 03.54" E					
Chord Bear	= S	86° 45′ 50.97" E					

				Curve Data D-5			
Curve WBFR-5							
P.I. Station			88+35.85	N	6,933,120.06	E	2,428,105.14
Delta	=	9° 56′ 11.39"	(RT)				
Degree	=	3° 49′ 10.99"					
Tangent	=		130.40				
Length	=		260.14				
Radius	=		1,500.00				
External	=		5.66				
Long Chord	=		259.81				
Mid. Ord.	=		5.64				
P.C. Station			87+05.45	N	6,933,116.12	E	2,427,974.80
P.T. Station			89+65.59	N	6,933,101.46	E	2,428,234.20
C.C.				N	6,931,616.81	E	2,428,020.15
Back	= N	88° 16′ 03.54" E					
Ahead	= S	81° 47′ 45.07" E					
Chord Bear	= S	86° 45′ 50.77" E					

Course from PT WBFR-5 to PC WBFR-6 S 81° 47′ 45.07" E Dist 233.41

				Curve Data D-6			
Curve WBFR-6							
P.I. Station			94+22.78	N	6,933,036.21	E	2,428,686.71
Delta	=	8° 31′ 54.98"	(RT)				
Degree	=	1° 54′ 35.49"					
Tangent	=		223.78				
Length	=		446.73				
Radius	=		3,000.00				
External	=		8.33				
Long Chord	=		446.32				
Mid. Ord.	=		8.31				
P.C. Station			91+99.00	N	6,933,068.15	E	2,428,465.22
P.T. Station			96+45.73	N	6,932,971.77	E	2,428,901.01
C.C.				N	6,930,098.85	E	2,428,037.11
Back	= S	81° 47′ 45.07" E					
Ahead	= S	73° 15′ 50.10" E					
Chord Bear	= S	77° 31′ 47.58" E					

Course from PT WBFR-6 to PC WBFR-7 S 73° 15′ 50.10" E Dist 264.82

STATE OF TEXAS
WEIYIH TEE
98478
LICENSED
PROFESSIONAL ENGINEER

03/20/2017

NO.	DATE	REVISION	APPROVED

Stantec
2435 N CENTRAL EXPY, SUITE 750
RICHARDSON, TEXAS 75080
P 214-468-8200
F 214-468-8266
Firm # F-6324

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 3 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
WT	6	SEE TITLE SHEET	IH 20
CHECK KW	STATE	DISTRICT	COUNTY
DRAWN CK	TEXAS	DAL	DALLAS
CHECK CH	CONTROL	SECTION	JOB
	6443	54	001

SHEET NO. 14

PENTABLE: IH20_Stantec_TxDOT_Pen.tbl
SCALE: $SCALESHORT$
PLOT DRIVER: TXDOT_PDF_BW.plt
FILE NAME: c:\users\ctcharter\dms_documents\dw_working\dms7690\03_IH20_ALIGN_DATA-02.dgn
DATE: 3/20/2017
TIME: 4:43:26 PM
USER:

℄ WBFR "WESTBOUND FRONTAGE ROAD"

Curve Data *----------* D-7

```
Curve WBFR-7
P.I.  Station          101+33.24  N       6,932,831.39  E       2,429,367.86
Delta        =    16° 53′ 19.54" (LT)
Degree       =     3° 49′ 10.99"
Tangent      =            222.69
Length       =            442.15
Radius       =         1,500.00
External     =             16.44
Long Chord   =            440.55
Mid. Ord.    =             16.26
P.C.  Station           99+10.55  N       6,932,895.52  E       2,429,154.61
P.T.  Station          103+52.69  N       6,932,831.98  E       2,429,590.55
C.C.                              N       6,934,331.98  E       2,429,586.55
Back         = S  73° 15′ 50.10" E
Ahead        = N  89° 50′ 50.37" E
Chord Bear   = S  81° 42′ 29.86" E
```

Curve Data *----------* D-8

```
Curve WBFR-8
P.I.  Station          108+33.45  N       6,932,833.26  E       2,430,071.31
Delta        =     9° 09′ 44.01" (RT)
Degree       =     0° 57′ 17.75"
Tangent      =            480.76
Length       =            959.47
Radius       =         6,000.00
External     =             19.23
Long Chord   =            958.44
Mid. Ord.    =             19.17
P.C.  Station          103+52.69  N       6,932,831.98  E       2,429,590.55
P.T.  Station          113+12.16  N       6,932,757.98  E       2,430,546.13
C.C.                              N       6,926,832.00  E       2,429,606.54
Back         = N  89° 50′ 50.37" E
Ahead        = S  80° 59′ 25.62" E
Chord Bear   = S  85° 34′ 17.63" E
```

Course from PT WBFR-2 to PC WBFR-3 S 80° 59′ 25.62" E Dist 638.14

Curve Data *----------* D-9

```
Curve WBFR-9
P.I.  Station          121+01.00  N       6,932,634.45  E       2,431,325.24
Delta        =     2° 52′ 39.05" (RT)
Degree       =     0° 57′ 17.75"
Tangent      =            150.70
Length       =            301.33
Radius       =         6,000.00
External     =              1.89
Long Chord   =            301.30
Mid. Ord.    =              1.89
P.C.  Station          119+50.30  N       6,932,658.05  E       2,431,176.40
P.T.  Station          122+51.64  N       6,932,603.40  E       2,431,472.71
C.C.                              N       6,926,732.07  E       2,430,236.81
Back         = S  80° 59′ 25.62" E
Ahead        = S  78° 06′ 46.58" E
Chord Bear   = S  79° 33′ 06.10" E
```

Course from PT WBFR-3 to PC WBFR-4 S 78° 06′ 46.58" E Dist 538.557

Curve Data *----------* D-10

```
Curve WBFR-10
P.I.  Station          130+45.34  N       6,932,439.92  E       2,432,249.39
Delta        =     4° 52′ 12.25" (LT)
Degree       =     0° 57′ 17.75"
Tangent      =            255.15
Length       =            509.99
Radius       =         6,000.00
External     =              5.42
Long Chord   =            509.84
Mid. Ord.    =              5.42
P.C.  Station          127+90.19  N       6,932,492.47  E       2,431,999.71
P.T.  Station          133+00.18  N       6,932,408.75  E       2,432,502.63
C.C.                              N       6,938,363.81  E       2,433,235.61
Back         = S  78° 06′ 46.58" E
Ahead        = S  82° 58′ 58.82" E
Chord Bear   = S  80° 32′ 52.70" E
```

Course from PT WBFR-4 to PC WBFR-5 S 82° 58′ 58.82" E Dist 1,199.88

Curve Data *----------* D-11

```
Curve WBFR-11
P.I.  Station          146+94.64  N       6,932,238.39  E       2,433,886.64
Delta        =     3° 42′ 53.62" (LT)
Degree       =     0° 57′ 17.75"
Tangent      =            194.58
Length       =            389.02
Radius       =         6,000.00
External     =              3.15
Long Chord   =            388.95
Mid. Ord.    =              3.15
P.C.  Station          145+00.06  N       6,932,262.16  E       2,433,693.52
P.T.  Station          148+89.08  N       6,932,227.19  E       2,434,080.90
C.C.                              N       6,938,217.22  E       2,434,426.50
Back         = S  82° 58′ 58.82" E
Ahead        = S  86° 41′ 52.44" E
Chord Bear   = S  84° 50′ 25.63" E
```

℄ WBFR "WESTBOUND FRONTAGE ROAD" (CONTINUED)

Curve Data *----------* D-12

```
Curve WBFR-12
P.I.  Station          152+25.81  N       6,932,207.79  E       2,434,417.07
Delta        =     6° 25′ 27.53" (RT)
Degree       =     0° 57′ 17.75"
Tangent      =            336.73
Length       =            672.75
Radius       =         6,000.00
External     =              9.44
Long Chord   =            672.40
Mid. Ord.    =              9.43
P.C.  Station          148+89.08  N       6,932,227.19  E       2,434,080.90
P.T.  Station          155+61.83  N       6,932,150.90  E       2,434,748.95
C.C.                              N       6,926,237.15  E       2,433,735.29
Back         = S  86° 41′ 52.44" E
Ahead        = S  80° 16′ 24.91" E
Chord Bear   = S  83° 29′ 08.68" E
```

Course from PT WBFR-6 to WBFR2 S 80° 16′ 24.91" E Dist 184.77

Point WBFR2 N 6,932,119.69 E 2,434,931.07 Sta 157+46.60 (D-END)

==========

Ending chain WBFR description

NO.	DATE	REVISION	APPROVED

LTRA

LINA T. RAMEY & ASSOCIATES, INC.
3320 Belt Line Rd
Farmers Branch, Texas 75234
Firm Registration No. F-782

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 4 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	HIGHWAY NO.
JBS		SEE TITLE SHEET	IH 20
DRAWN WAV	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LTR	TEXAS	DAL	DALLAS	15
CHECK LTR	CONTROL	SECTION	JOB	
	6443	54	001	

DATE: 3/20/2017
TIME: 11:51 AM
USER: lwatson
FILE NAME: ...\03_IH20_AUGN_DATA\02.dgn
PENTABLE: IH20_LTRA_TXDOT _Pen.tbl
SCALE: 1=100
PLOT DRIVER: TXDOT_PDF_BW.plt

℄ R5XEB "EASTBOUND IH20 EXIT TO ROBINSON"

```
Beginning chain R5XEB description
==============================================================================

                              Curve Data  [E-1]
                             *-----------*
Curve R5XEB-1
P.I.  Station           14+78.69  N      6,932,943.11  E      2,423,059.65
Delta        =     10° 56' 14.96" (RT)
Degree       =      1° 08' 45.30"
Tangent      =            478.69
Length       =            954.48
Radius       =          5,000.00
External     =             22.86
Long Chord   =            953.03
Mid. Ord.    =             22.76
P.C.  Station           10+00.00  N      6,932,938.24  E      2,422,580.99
P.T.  Station           19+54.48  N      6,932,857.08  E      2,423,530.55
C.C.                              N      6,927,938.50  E      2,422,631.91
Back         = N 89° 24' 59.03" E
Ahead        = S 79° 38' 46.01" E
Chord Bear   = S 85° 06' 53.49" E

                              Curve Data  [E-2]
                             *-----------*
Curve R5XEB-2
P.I.  Station           21+44.79  N      6,932,822.88  E      2,423,717.76
Delta        =     10° 52' 16.45" (LT)
Degree       =      2° 51' 53.24"
Tangent      =            190.31
Length       =            379.48
Radius       =          2,000.00
External     =              9.03
Long Chord   =            378.91
Mid. Ord.    =              8.99
P.C.  Station           19+54.48  N      6,932,857.08  E      2,423,530.55
P.T.  Station           23+33.95  N      6,932,824.59  E      2,423,908.07
C.C.                              N      6,934,824.51  E      2,423,890.01
Back         = S 79° 38' 46.01" E
Ahead        = N 89° 28' 57.54" E
Chord Bear   = S 85° 04' 54.23" E

==============================================================================
Ending chain R5XEB description
```

℄ R6XEB "SOUTHBOUND SH 161 EXIT TO CARRIER"

```
Beginning chain R6XEB description
==============================================================================

                              Curve Data  [Y-1]
                             *-----------*
Curve R6XEB-1
P.I.  Station           11+61.78  N      6,932,881.47  E      2,424,611.55
Delta        =      3° 56' 33.77" (RT)
Degree       =      1° 13' 08.61"
Tangent      =            161.78
Length       =            323.42
Radius       =          4,700.00
External     =              2.78
Long Chord   =            323.36
Mid. Ord.    =              2.78
P.C.  Station           10+00.00  N      6,932,876.41  E      2,424,449.86
P.T.  Station           13+23.42  N      6,932,875.41  E      2,424,773.22
C.C.                              N      6,928,178.71  E      2,424,596.95
Back         = N 88° 12' 23.67" E
Ahead        = S 87° 51' 02.56" E
Chord Bear   = S 89° 49' 19.44" E

                              Curve Data  [Y-2]
                             *-----------*
Curve R6XEB-2
P.I.  Station           16+04.45  N      6,932,864.87  E      2,425,054.05
Delta        =      4° 57' 04.79" (LT)
Degree       =      0° 52' 53.30"
Tangent      =            281.03
Length       =            561.71
Radius       =          6,500.00
External     =              6.07
Long Chord   =            561.54
Mid. Ord.    =              6.07
P.C.  Station           13+23.42  N      6,932,875.41  E      2,424,773.22
P.T.  Station           18+85.13  N      6,932,878.61  E      2,425,334.74
C.C.                              N      6,939,370.83  E      2,425,016.99
Back         = S 87° 51' 02.56" E
Ahead        = N 87° 11' 52.65" E
Chord Bear   = N 89° 40' 25.05" E

Course from PT R6XEB-2 to PC R6XEB-3 N 87° 11' 52.65" E Dist 555.23

                              Curve Data  [Y-3]
                             *-----------*
Curve R6XEB-3
P.I.  Station           26+70.91  N      6,932,917.02  E      2,426,119.58
Delta        =      3° 38' 51.83" (RT)
Degree       =      0° 47' 28.96"
Tangent      =            230.54
Length       =            460.93
Radius       =          7,240.00
External     =              3.67
Long Chord   =            460.86
Mid. Ord.    =              3.67
P.C.  Station           24+40.36  N      6,932,905.75  E      2,425,889.31
P.T.  Station           29+01.30  N      6,932,913.62  E      2,426,350.10
C.C.                              N      6,925,674.41  E      2,426,243.24
Back         = N 87° 11' 52.65" E
Ahead        = S 89° 09' 15.52" E
Chord Bear   = N 89° 01' 18.56" E

==============================================================================
Ending chain R6XEB description
```

STATE OF TEXAS
WEIYIH TEE
98478
LICENSED
PROFESSIONAL ENGINEER

03/20/2017

NO.	DATE	REVISION	APPROVED

Stantec
2435 N CENTRAL EXPY, SUITE 750
RICHARDSON, TEXAS 75080
P 214-468-8200
F 214-468-8266
Firm # F-6324

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 5 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WT	6	SEE TITLE SHEET		IH 20
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
KW	TEXAS	DAL	DALLAS	16
DRAWN	CONTROL	SECTION	JOB	
CK	6443	54	001	
CHECK				
CH				

DATE: 3/20/2017
TIME: 4:53:57 PM
USER:
FILE NAME: c:\users\ckancharla\my documents\pw_working\dmsf1690\03_IH20_ALIGN_DATA-03.dgn
PENTABLE: IH20_Stantec_TxDOT_Pen.tbl
SCALE: $SCALESHORT$
PLOT DRIVER: TXDOT_PDF_BW.plt

℄ R1NEB "ROBINSON ENTRANCE TO EASTBOUND IH20"

Beginning chain R1NEB description

Curve Data F-1

Curve R1NEB-1					
P.I. Station	11+86.34	N	6,932,740.84	E	2,427,280.01
Delta =	14° 09′ 44.91″ (LT)				
Degree =	3° 49′ 10.99″				
Tangent =	186.34				
Length =	370.77				
Radius =	1,500.00				
External =	11.53				
Long Chord =	369.83				
Mid. Ord. =	11.44				
P.C. Station	10+00.00	N	6,932,778.42	E	2,427,097.51
P.T. Station	13+70.77	N	6,932,749.06	E	2,427,466.17
C.C.		N	6,934,247.60	E	2,427,400.01
Back	= S 78° 21′ 55.20″ E				
Ahead	= N 87° 28′ 19.89″ E				
Chord Bear	= S 85° 26′ 47.66″ E				

Curve Data F-2

Curve R1NEB-2					
P.I. Station	17+90.02	N	6,932,767.55	E	2,427,885.01
Delta =	9° 35′ 09.52″ (RT)				
Degree =	1° 08′ 45.30″				
Tangent =	419.25				
Length =	836.53				
Radius =	5,000.00				
External =	17.55				
Long Chord =	835.56				
Mid. Ord. =	17.48				
P.C. Station	13+70.77	N	6,932,749.06	E	2,427,466.17
P.T. Station	22+07.31	N	6,932,716.04	E	2,428,301.07
C.C.		N	6,927,753.93	E	2,427,686.69
Back	= N 87° 28′ 19.89″ E				
Ahead	= S 82° 56′ 30.59″ E				
Chord Bear	= S 87° 44′ 05.35″ E				

Course from PT R1NEB-2 to RNEB12 S 82° 56′ 30.59″ E Dist 731.86

Point RNEB12 N 6,932,626.11 E 2,429,027.39 Sta 29+39.17 (F-END)

Ending chain R1NEB description

℄ R1NWB "CARRIER ENTRANCE TO WESTBOUND IH20"

Beginning chain R1NWB description

Curve Data G-1

Curve R1NWB-1					
P.I. Station	9+50.00	N	6,933,096.57	E	2,426,904.71
Delta =	0° 59′ 05.54″ (RT)				
Degree =	0° 59′ 05.54″				
Tangent =	50.00				
Length =	100.00				
Radius =	5,817.58				
External =	0.21				
Long Chord =	100.00				
Mid. Ord. =	0.21				
P.C. Station	9+00.00	N	6,933,102.17	E	2,426,855.02
P.T. Station	10+00.00	N	6,933,090.12	E	2,426,954.29
C.C.		N	6,927,321.15	E	2,426,203.84
Back	= S 83° 34′ 23.58″ E				
Ahead	= S 82° 35′ 18.04″ E				
Chord Bear	= S 83° 04′ 50.81″ E				

Curve Data G-2

Curve R1NWB-2					
P.I. Station	12+98.35	N	6,933,051.64	E	2,427,250.15
Delta =	11° 59′ 39.55″ (LT)				
Degree =	2° 01′ 02.85″				
Tangent =	298.35				
Length =	594.53				
Radius =	2,840.00				
External =	15.63				
Long Chord =	593.44				
Mid. Ord. =	15.54				
P.C. Station	10+00.00	N	6,933,090.12	E	2,426,954.29
P.T. Station	15+94.53	N	6,933,075.47	E	2,427,547.55
C.C.		N	6,935,906.40	E	2,427,320.65
Back	= S 82° 35′ 18.04″ E				
Ahead	= N 85° 25′ 02.42″ E				
Chord Bear	= S 88° 35′ 07.81″ E				

Curve Data G-3

Curve R1NWB-3					
P.I. Station	18+00.45	N	6,933,091.93	E	2,427,752.82
Delta =	4° 43′ 00.66″ (RT)				
Degree =	1° 08′ 45.30″				
Tangent =	205.93				
Length =	411.62				
Radius =	5,000.00				
External =	4.24				
Long Chord =	411.51				
Mid. Ord. =	4.24				
P.C. Station	15+94.53	N	6,933,075.47	E	2,427,547.55
P.T. Station	20+06.15	N	6,933,091.45	E	2,427,958.75
C.C.		N	6,928,091.46	E	2,427,947.04
Back	= N 85° 25′ 02.42″ E				
Ahead	= S 89° 51′ 56.92″ E				
Chord Bear	= N 87° 46′ 32.75″ E				

Ending chain R1NWB description

STATE OF TEXAS
WEIYIH TEE
98478
LICENSED
PROFESSIONAL ENGINEER

03/20/2017

NO.	DATE	REVISION	APPROVED

Stantec
2435 N CENTRAL EXPY, SUITE 750
RICHARDSON, TEXAS 75080
P 214-468-8200
F 214-468-8266
Firm # F-6324

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 6 OF 7

DESIGN WT	FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO. SEE TITLE SHEET		HIGHWAY NO. IH 20
CHECK KW	STATE TEXAS	DISTRICT DAL	COUNTY DALLAS	SHEET NO. 17
DRAWN CK / CHECK CH	CONTROL 6443	SECTION 54	JOB 001	

DATE: 3/20/2017
TIME: 4:03:46 PM
USER:
FILE NAME: c:\users\ckancharla\my documents\pw_working\dms\7690\03_IH20_ALIGN_DATA-04.dgn
PENTABLE: IH20_Stantec_TxDOT_Pen.tbl
SCALE: $SCALESHORT$
PLOT DRIVER: TXDOT_PDF_BW.plt

℄ R2NEB "CARRIER ENTRANCE TO EASTBOUND IH20"

Beginning chain R2NEB description

Point RNEB21 N 6,932,497.56 E 2,428,821.64 Sta 10+00.00 (H-BEG)

Course from RNEB21 to PC R2NEB-1 N 87° 44′ 06.47" E Dist 246.09

Curve Data *----------* H-1

Curve R2NEB-1					
P.I. Station	17+95.76	N	6,932,529.01	E	2,429,616.77
Delta =	10° 28′ 07.69"	(RT)			
Degree =	0° 57′ 17.75"				
Tangent =	549.68				
Length =	1,096.29				
Radius =	6,000.00				
External =	25.13				
Long Chord =	1,094.77				
Mid. Ord. =	25.02				
P.C. Station	12+46.09	N	6,932,507.29	E	2,429,067.53
P.T. Station	23+42.38	N	6,932,450.57	E	2,430,160.82
C.C.		N	6,926,511.97	E	2,429,304.64
Back =	N 87° 44′ 06.47" E				
Ahead =	S 81° 47′ 45.84" E				
Chord Bear =	S 87° 01′ 49.69" E				

Ending chain R2NEB description

℄ R2XWB "WESTBOUND IH20 EXIT TO CARRIER"

Beginning chain R2XWB description

Point RXWB21 N 6,932,899.42 E 2,429,051.34 Sta 20+00.00 (I-BEG)

Course from RXWB21 to PC R2XWB-1 S 73° 15′ 50.10" E Dist 293.39

Curve Data *----------* I-1

Curve R2XWB-1					
P.I. Station	27+40.96	N	6,932,686.05	E	2,429,760.91
Delta =	8° 31′ 55.75"	(LT)			
Degree =	0° 57′ 17.75"				
Tangent =	447.57				
Length =	893.48				
Radius =	6,000.00				
External =	16.67				
Long Chord =	892.66				
Mid. Ord. =	16.62				
P.C. Station	22+93.39	N	6,932,814.93	E	2,429,332.30
P.T. Station	31+86.88	N	6,932,622.18	E	2,430,203.90
C.C.		N	6,938,560.78	E	2,431,060.09
Back =	S 73° 15′ 50.10" E				
Ahead =	S 81° 47′ 45.84" E				
Chord Bear =	S 77° 31′ 47.97" E				

Ending chain R2XWB description

℄ R3NWB "BELT LINE ENTRANCE TO WESTBOUND IH20"

Beginning chain R3NWB description

Curve Data *----------* J-1

Curve R3NWB-1					
P.I. Station	32+56.75	N	6,932,446.03	E	2,431,425.69
Delta =	4° 54′ 02.40"	(LT)			
Degree =	0° 57′ 17.75"				
Tangent =	256.75				
Length =	513.20				
Radius =	6,000.00				
External =	5.49				
Long Chord =	513.04				
Mid. Ord. =	5.49				
P.C. Station	30+00.00	N	6,932,482.67	E	2,431,171.56
P.T. Station	35+13.20	N	6,932,431.24	E	2,431,682.02
C.C.		N	6,938,421.27	E	2,432,027.74
Back =	S 81° 47′ 45.84" E				
Ahead =	S 86° 41′ 48.25" E				
Chord Bear =	S 84° 14′ 47.05" E				

Course from PT R3NWB-1 to PC R3NWB-2 S 86° 41′ 48.25" E Dist 735.25

Curve Data *----------* J-2

Curve R3NWB-2					
P.I. Station	43+45.71	N	6,932,383.27	E	2,432,513.15
Delta =	3° 42′ 49.43"	(RT)			
Degree =	1° 54′ 35.49"				
Tangent =	97.26				
Length =	194.45				
Radius =	3,000.00				
External =	1.58				
Long Chord =	194.42				
Mid. Ord. =	1.58				
P.C. Station	42+48.45	N	6,932,388.87	E	2,432,416.05
P.T. Station	44+42.90	N	6,932,371.39	E	2,432,609.68
C.C.		N	6,929,393.86	E	2,432,243.19
Back =	S 86° 41′ 48.25" E				
Ahead =	S 82° 58′ 58.82" E				
Chord Bear =	S 84° 50′ 23.54" E				

Ending chain R3NWB description

℄ R3XEB "EASTBOUND IH20 EXIT TO BELT LINE"

Beginning chain R3XEB description

Curve Data *----------* K-1

Curve R3XEB-1					
P.I. Station	43+51.93	N	6,932,230.54	E	2,431,687.01
Delta =	6° 42′ 49.17"	(RT)			
Degree =	0° 57′ 17.75"				
Tangent =	351.93				
Length =	703.05				
Radius =	6,000.00				
External =	10.31				
Long Chord =	702.65				
Mid. Ord. =	10.29				
P.C. Station	40+00.00	N	6,932,280.76	E	2,431,338.68
P.T. Station	47+03.05	N	6,932,139.94	E	2,432,027.08
C.C.		N	6,926,342.16	E	2,430,482.50
Back =	S 81° 47′ 45.84" E				
Ahead =	S 75° 04′ 56.67" E				
Chord Bear =	S 78° 26′ 21.26" E				

Curve Data *----------* K-2

Curve R3XEB-2					
P.I. Station	50+12.66	N	6,932,060.24	E	2,432,326.25
Delta =	5° 27′ 14.75"	(LT)			
Degree =	0° 52′ 53.30"				
Tangent =	309.61				
Length =	618.75				
Radius =	6,500.00				
External =	7.37				
Long Chord =	618.51				
Mid. Ord. =	7.36				
P.C. Station	47+03.05	N	6,932,139.94	E	2,432,027.08
P.T. Station	53+21.80	N	6,932,009.34	E	2,432,631.65
C.C.		N	6,938,420.87	E	2,433,700.37
Back =	S 75° 04′ 56.67" E				
Ahead =	S 80° 32′ 11.42" E				
Chord Bear =	S 77° 48′ 34.04" E				

Ending chain R3XEB description

℄ R4NEB "DECHMAN ENTRANCE TO EASTBOUND IH20"

Beginning chain R4NEB description

Curve Data *----------* L-1

Curve R4NEB-1					
P.I. Station	51+56.66	N	6,931,876.01	E	2,433,420.36
Delta =	11° 55′ 30.05"	(LT)			
Degree =	3° 49′ 10.99"				
Tangent =	156.66				
Length =	312.20				
Radius =	1,500.00				
External =	8.16				
Long Chord =	311.63				
Mid. Ord. =	8.11				
P.C. Station	50+00.00	N	6,931,902.12	E	2,433,265.89
P.T. Station	53+12.20	N	6,931,882.38	E	2,433,576.89
C.C.		N	6,933,381.14	E	2,433,515.91
Back =	S 80° 24′ 17.45" E				
Ahead =	N 87° 40′ 12.50" E				
Chord Bear =	S 86° 22′ 02.47" E				

Curve Data *----------* L-2

Curve R4NEB-2					
P.I. Station	56+81.69	N	6,931,897.40	E	2,433,946.08
Delta =	9° 23′ 16.91"	(RT)			
Degree =	1° 16′ 23.66"				
Tangent =	369.49				
Length =	737.33				
Radius =	4,500.00				
External =	15.14				
Long Chord =	736.51				
Mid. Ord. =	15.09				
P.C. Station	53+12.20	N	6,931,882.38	E	2,433,576.89
P.T. Station	60+49.53	N	6,931,852.00	E	2,434,312.78
C.C.		N	6,927,386.10	E	2,433,759.83
Back =	N 87° 40′ 12.50" E				
Ahead =	S 82° 56′ 30.59" E				
Chord Bear =	S 87° 38′ 09.04" E				

Ending chain R4NEB description

STATE OF TEXAS
JEFF STRONG
105180
LICENSED
PROFESSIONAL ENGINEER
03/20/17

NO.	DATE	REVISION	APPROVED

LTRA
LINA T. RAMEY & ASSOCIATES, INC.
3320 Belt Line Rd
Farmers Branch, Texas 75234
Firm Registration No. F-782

Texas Department of Transportation

IH 20 FR
HORIZONTAL ALIGNMENT DATA

SHEET 7 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JBS		SEE TITLE SHEET		IH 20
DRAWN WAV	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK LTR	TEXAS	DAL	DALLAS	18
CHECK LTR	CONTROL	SECTION	JOB	
	6443	54	001	

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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	6443	54	001	IH0020
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	18	DALLAS		19

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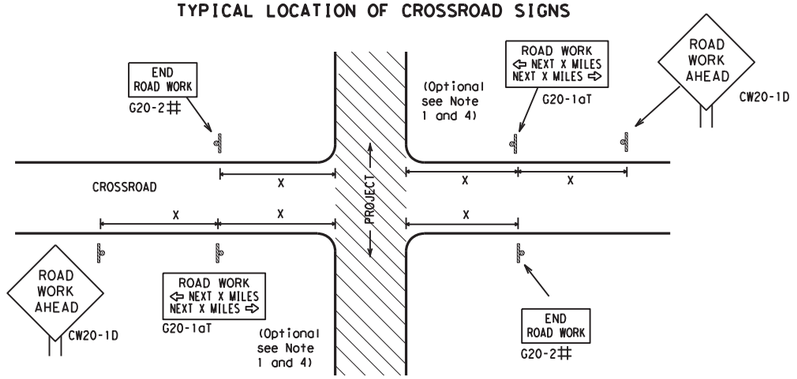
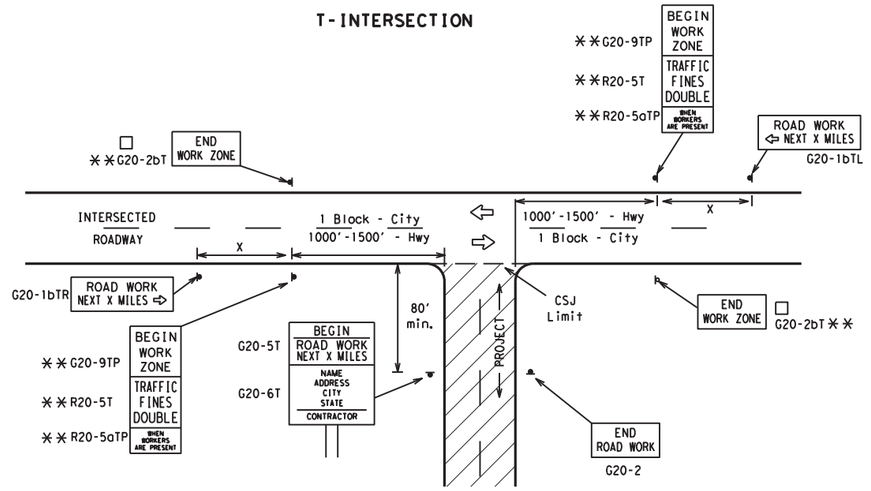
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

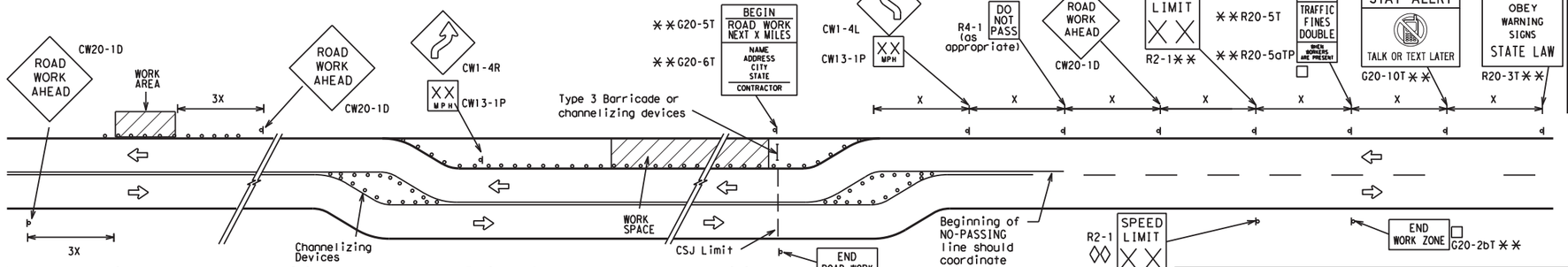
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

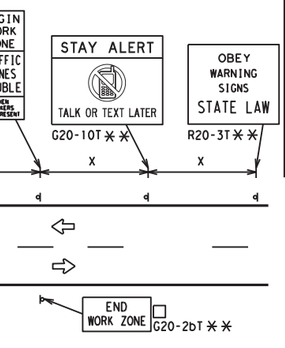
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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

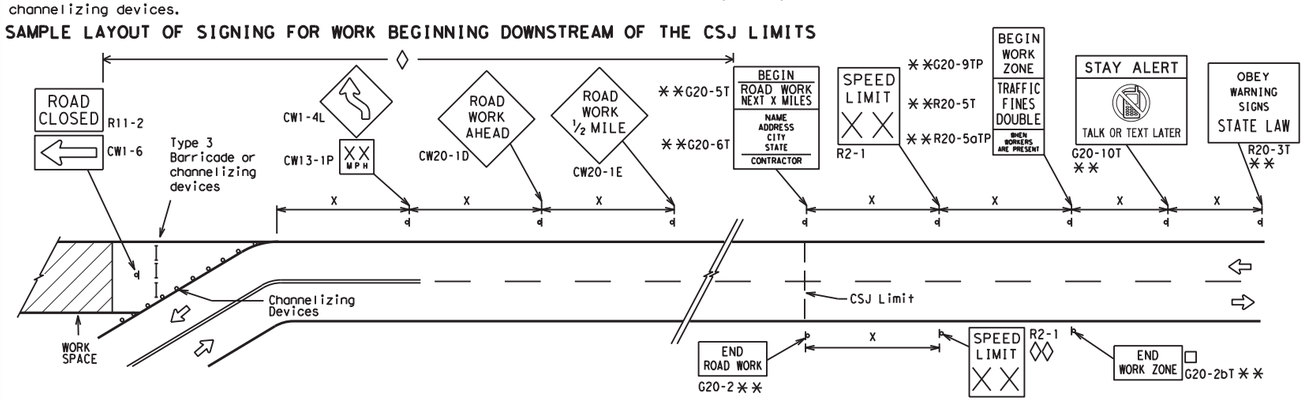


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

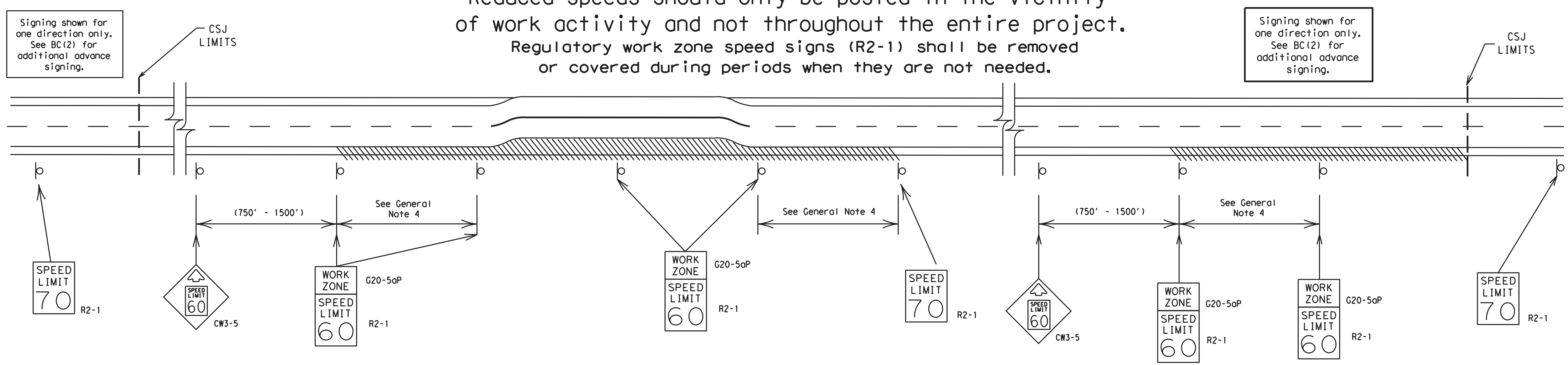
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	DALLAS		20

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.

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Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	6443	54	001	IH0020
	DIST		COUNTY	SHEET NO.
	18		DALLAS	21

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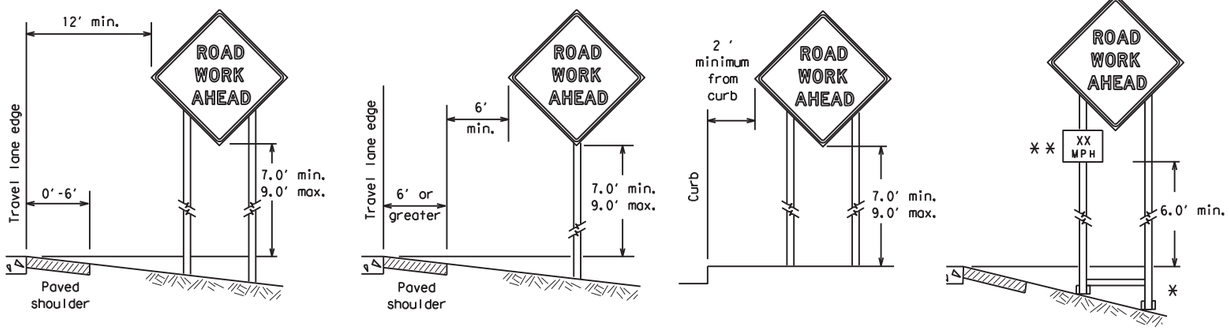
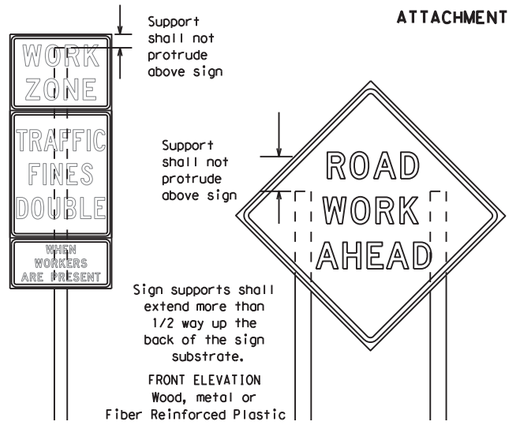
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



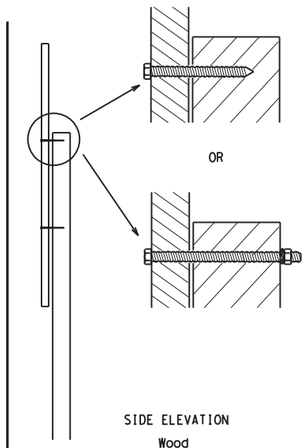
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

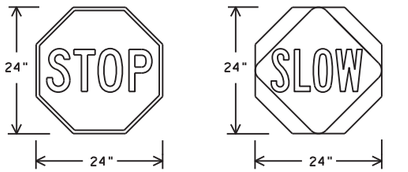
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	DALLAS		22

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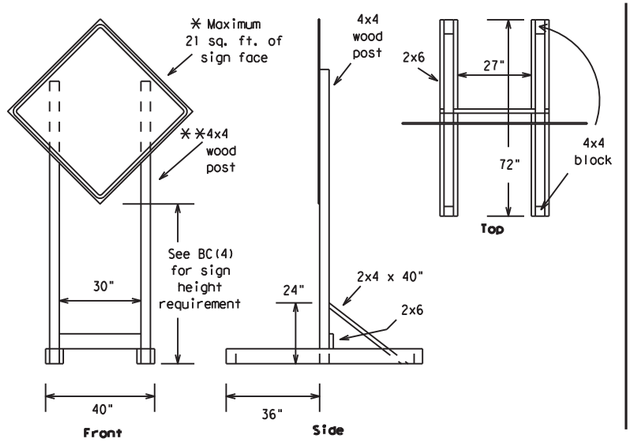
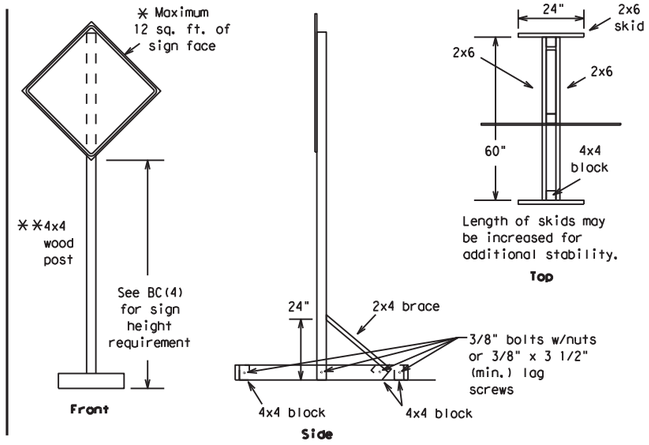
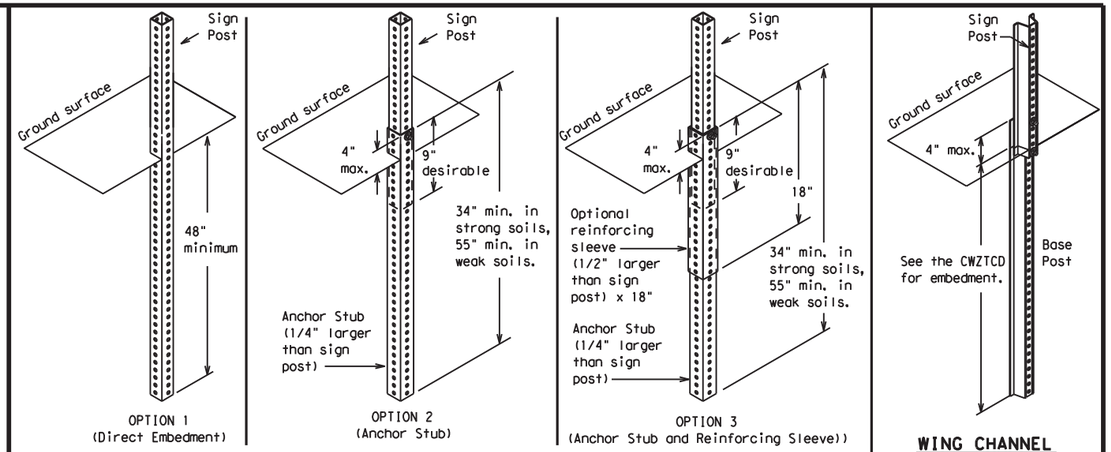




SKID MOUNTED WOOD SIGN SUPPORTS

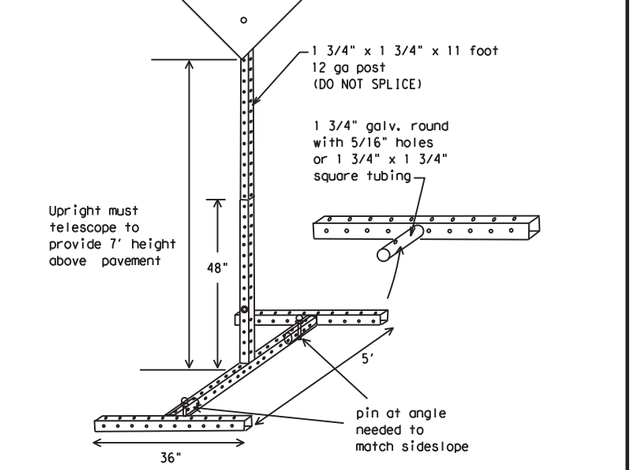
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

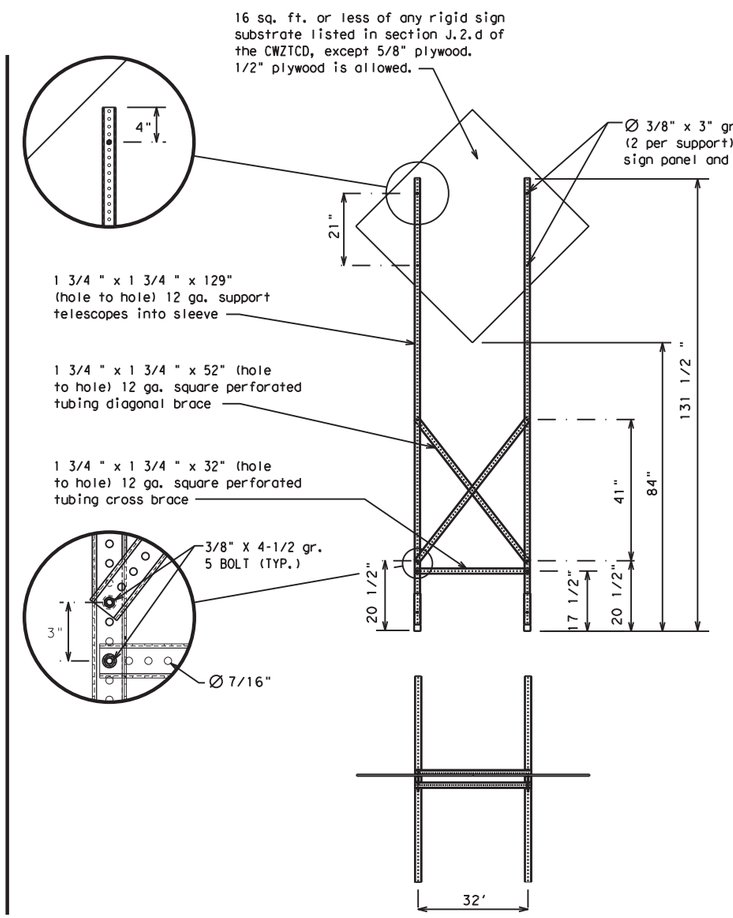


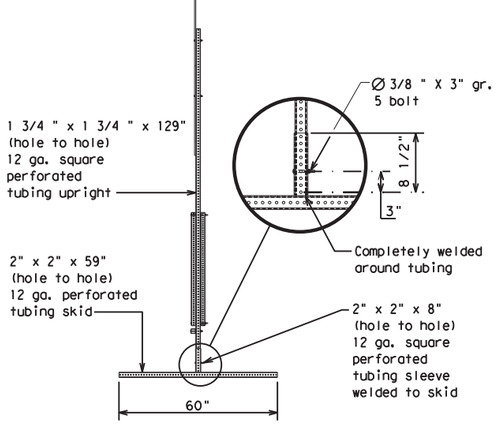
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	DALLAS		23

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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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9-07 8-14		DIST	COUNTY		SHEET NO.
7-13 5-21		18	DALLAS		24

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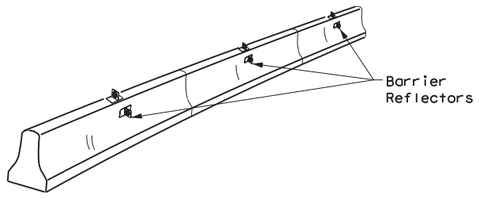
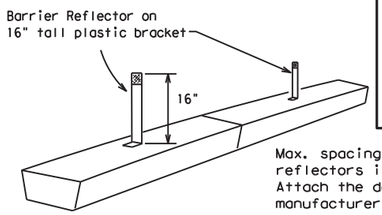
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

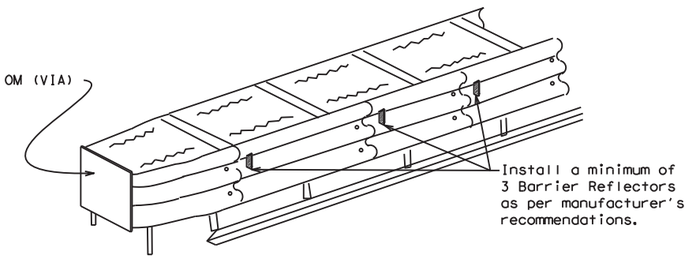


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

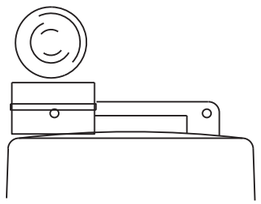


DELINEATION OF END TREATMENTS

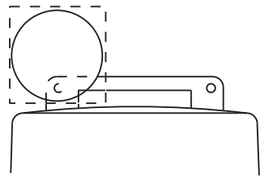
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

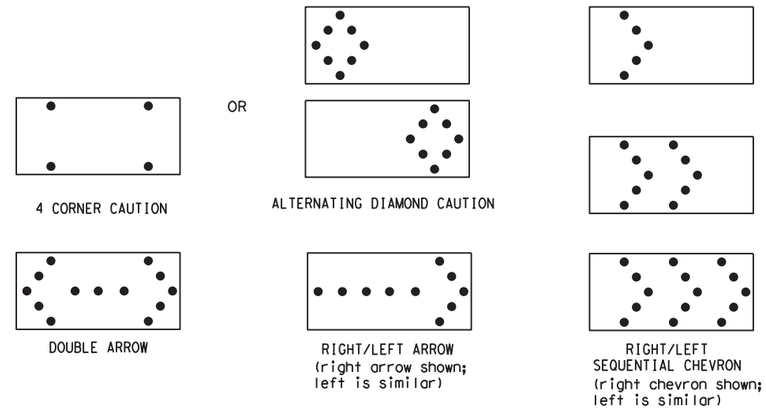
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	DALLAS		25

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

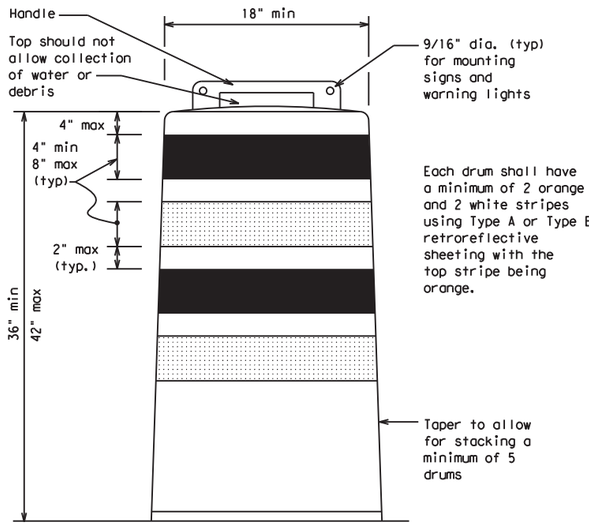
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

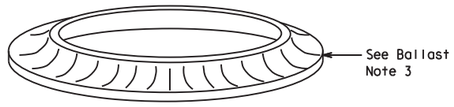
RETROREFLECTIVE SHEETING

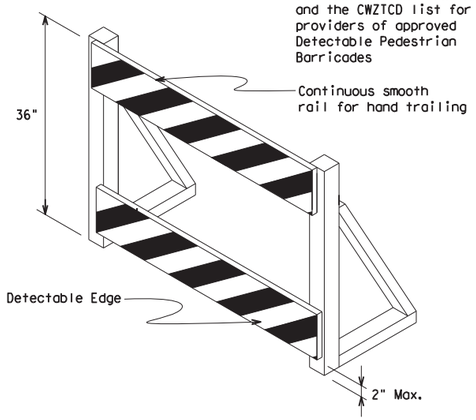
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.



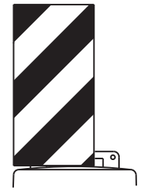




DETECTABLE PEDESTRIAN BARRICADES

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
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REVISIONS	6443	54	001	IH0020
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	18	DALLAS		26
7-13				

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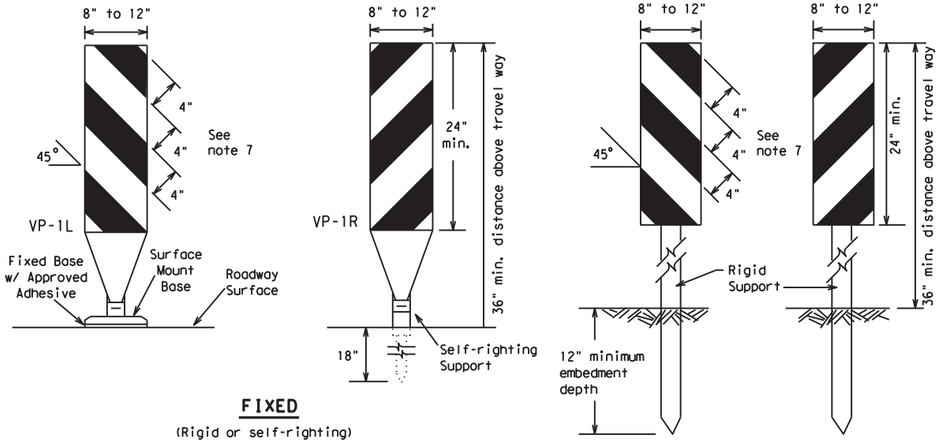
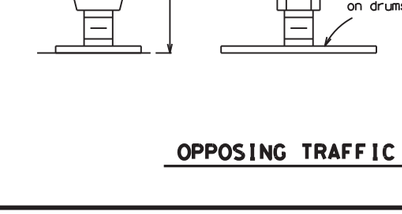


FIXED
(Rigid or self-righting)

DRIVEABLE

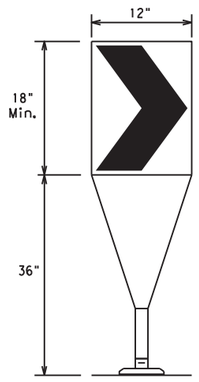


(Rigid or self-righting)

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.



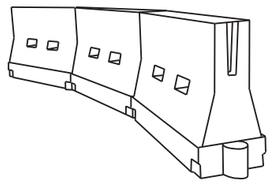
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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)

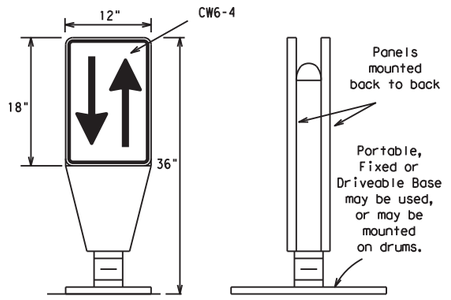
1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application 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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
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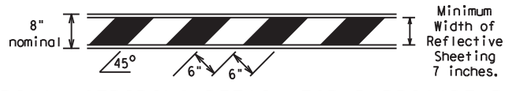
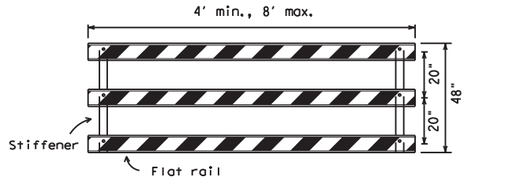
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



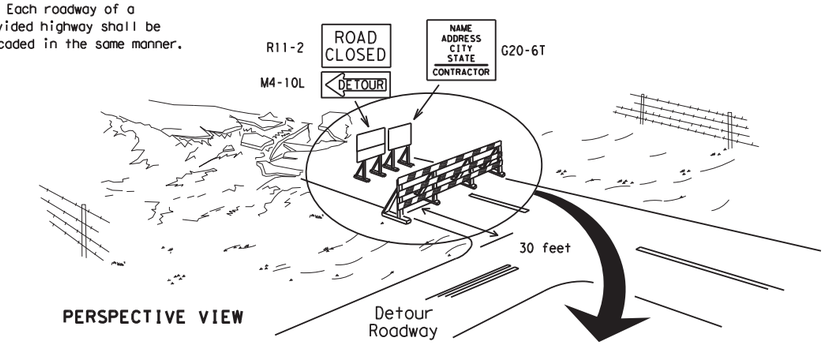
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

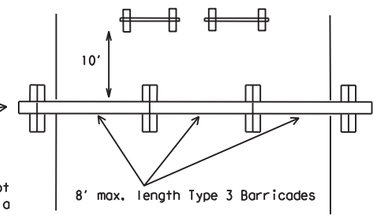
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

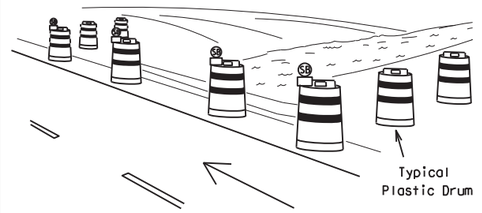
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

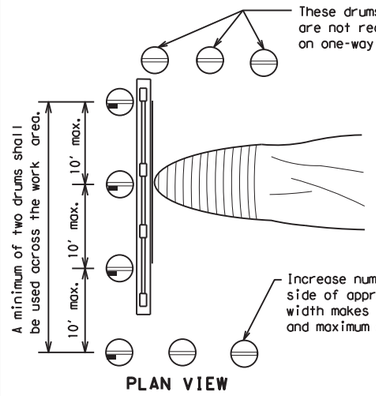
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

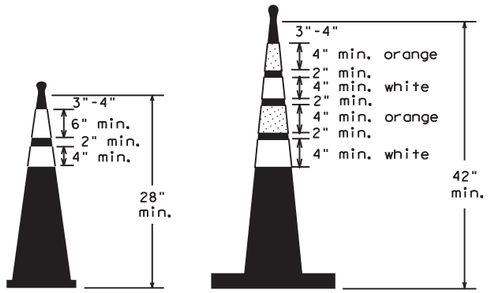
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

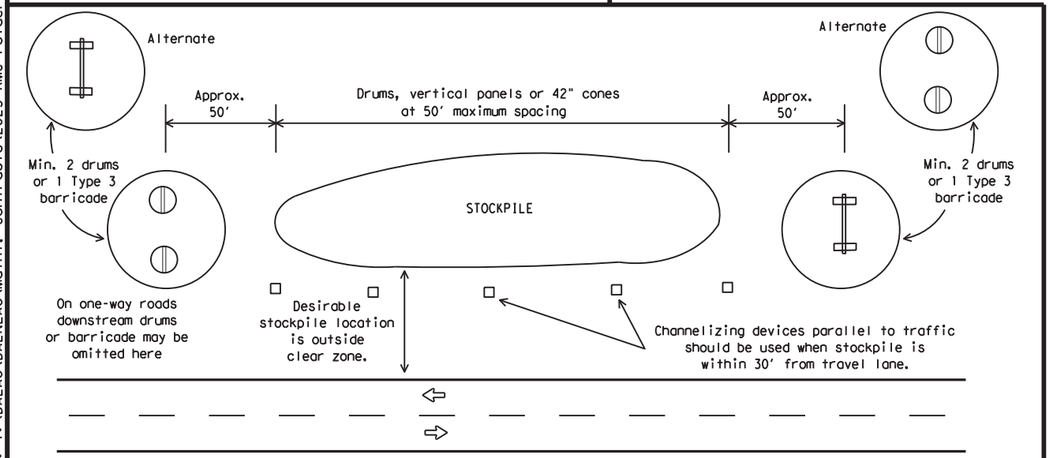
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	18	DALLAS		28

104

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

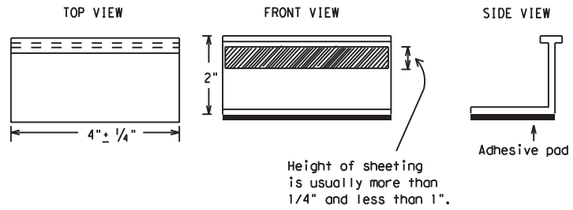
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	18	DALLAS		29
11-02 8-14				

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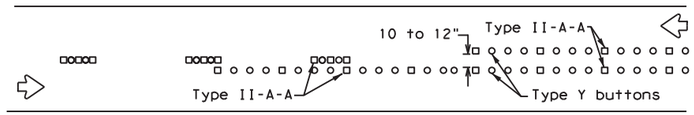
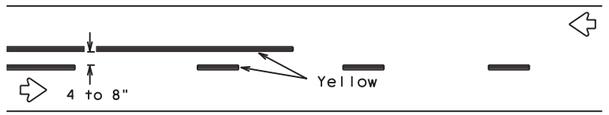
PAVEMENT MARKING PATTERNS

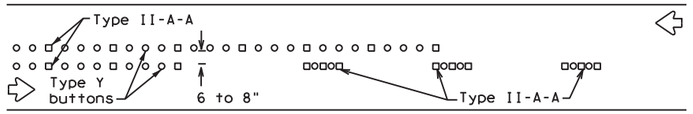
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



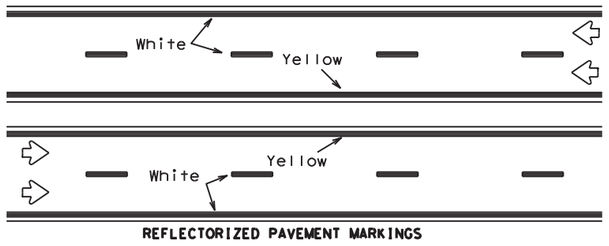
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



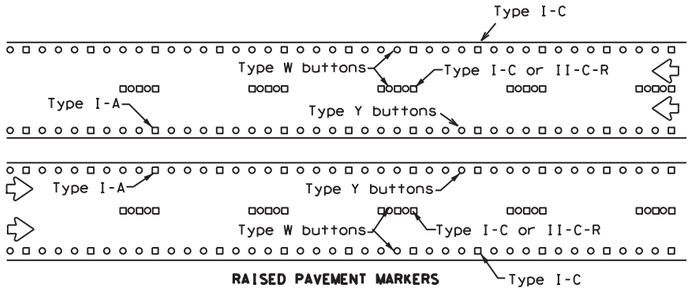
RAISED PAVEMENT MARKERS - PATTERN B

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

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



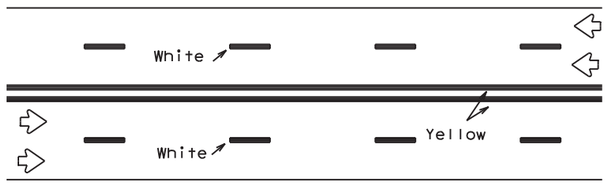
REFLECTORIZED PAVEMENT MARKINGS



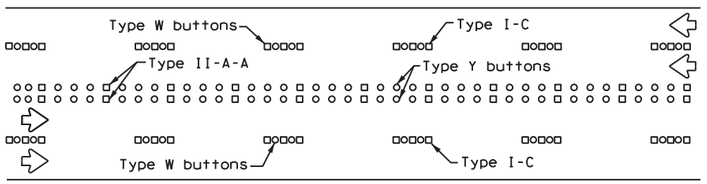
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



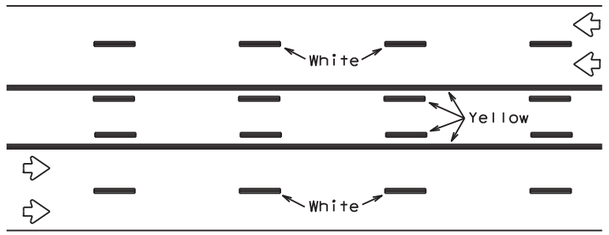
REFLECTORIZED PAVEMENT MARKINGS



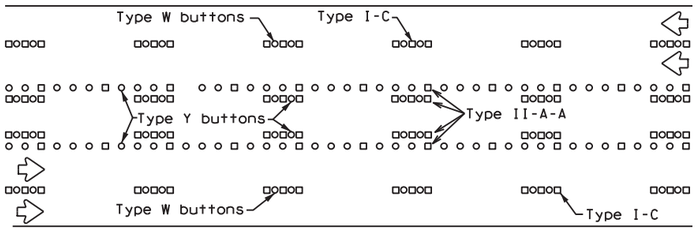
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

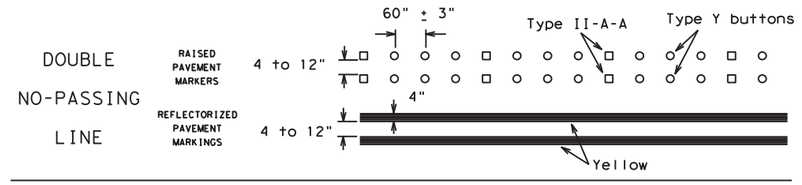
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

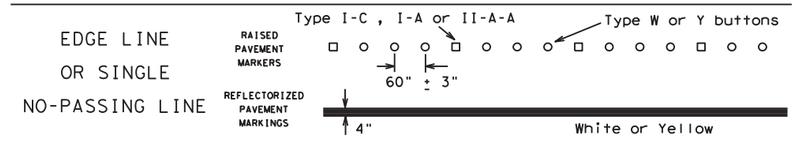
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

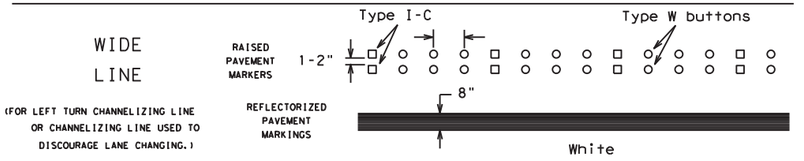


EDGE LINE OR SINGLE NO-PASSING LINE



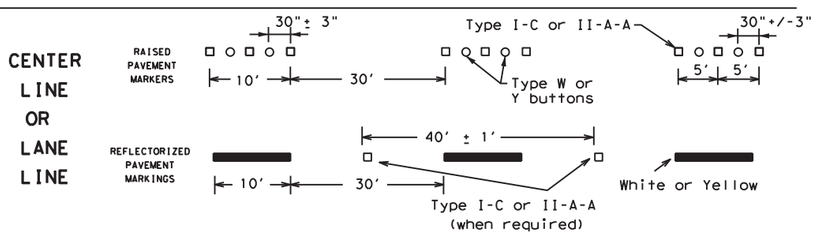
WIDE LINE

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

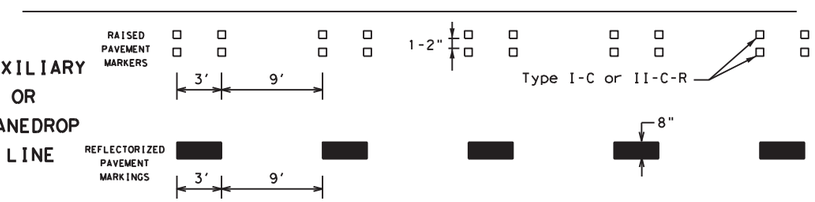


BROKEN LINES

CENTER LINE OR LANE LINE

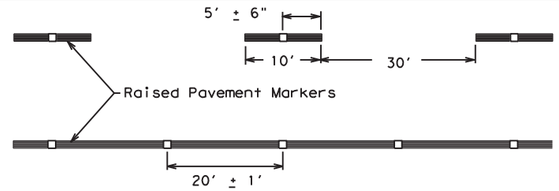


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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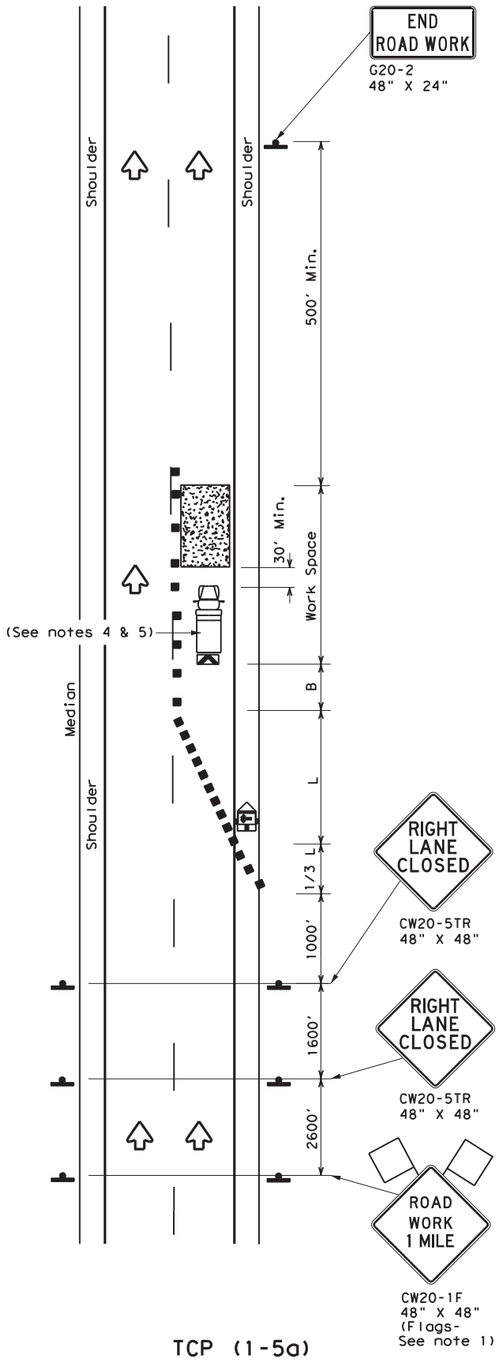
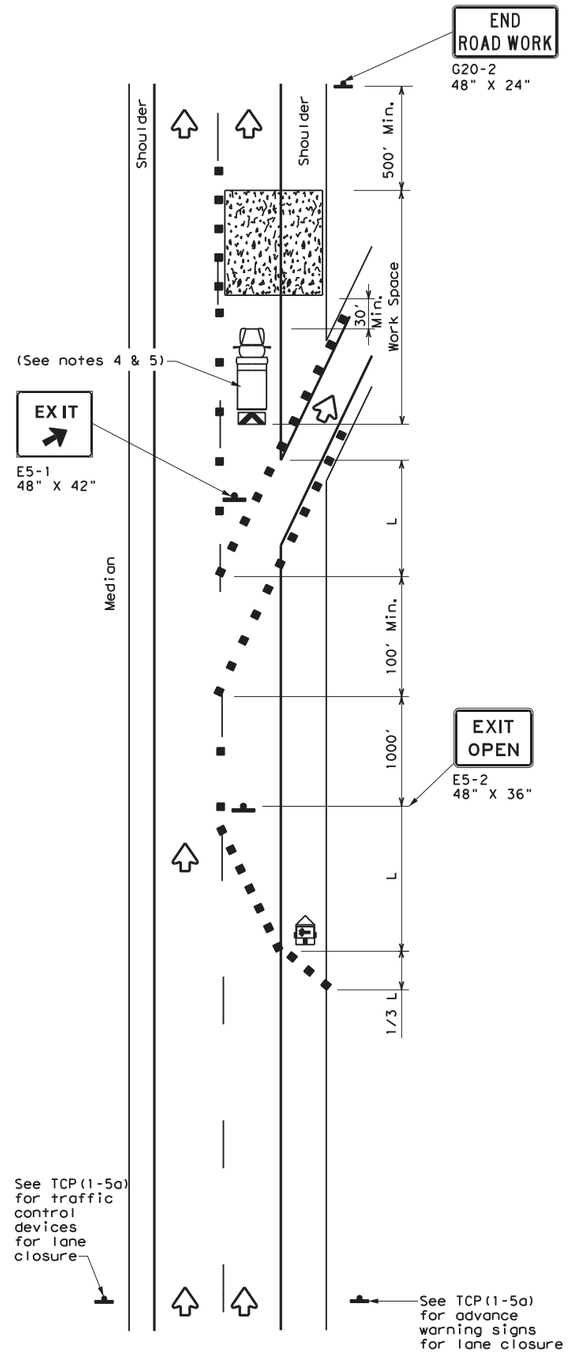


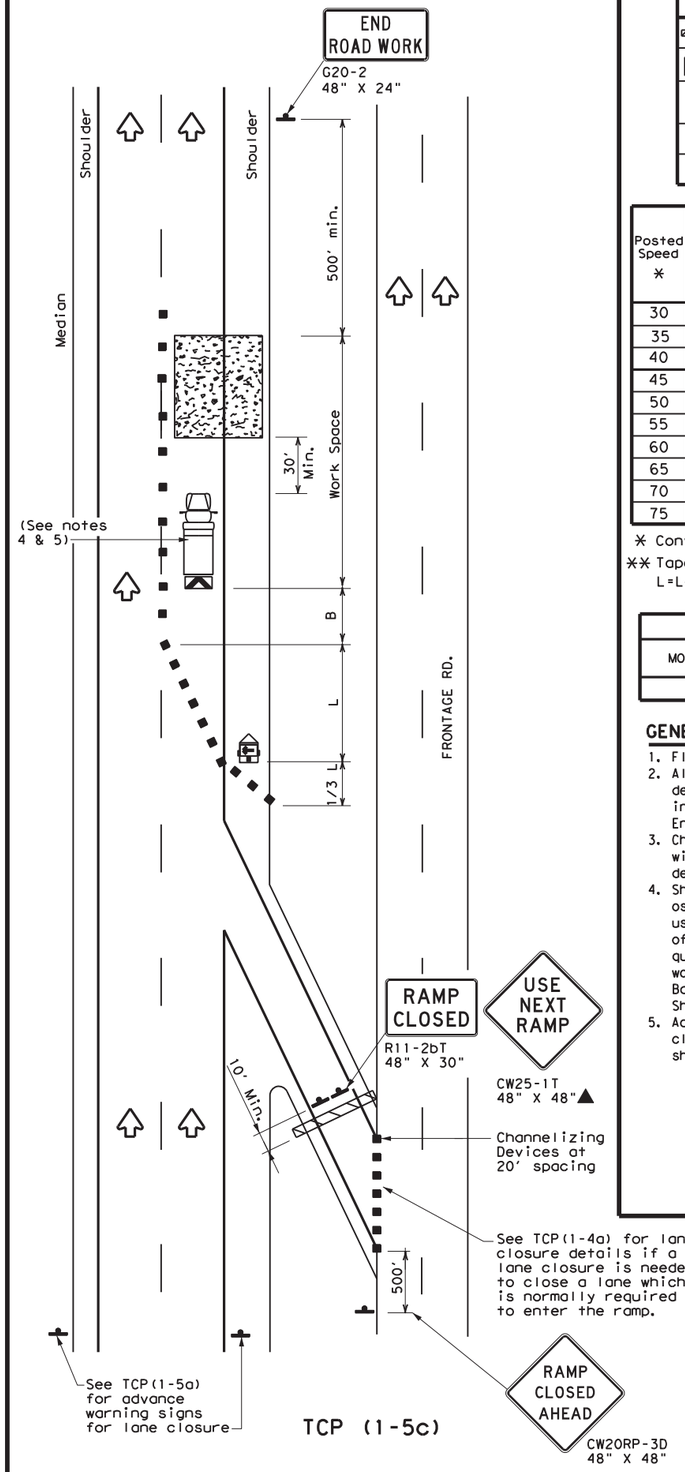
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
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 in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
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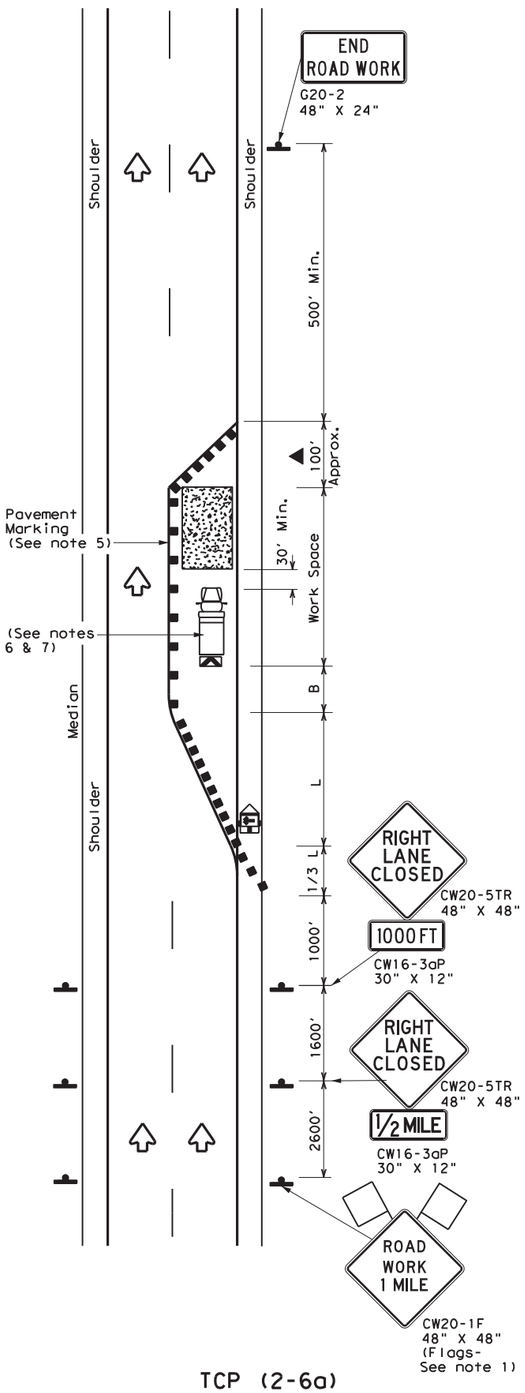
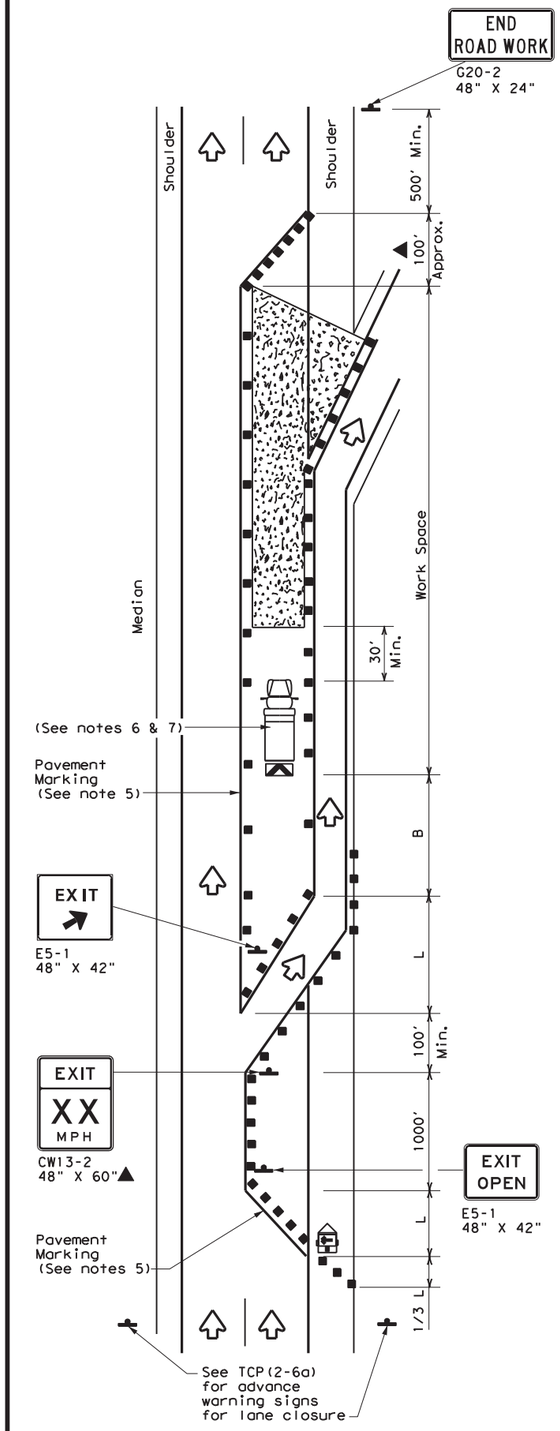


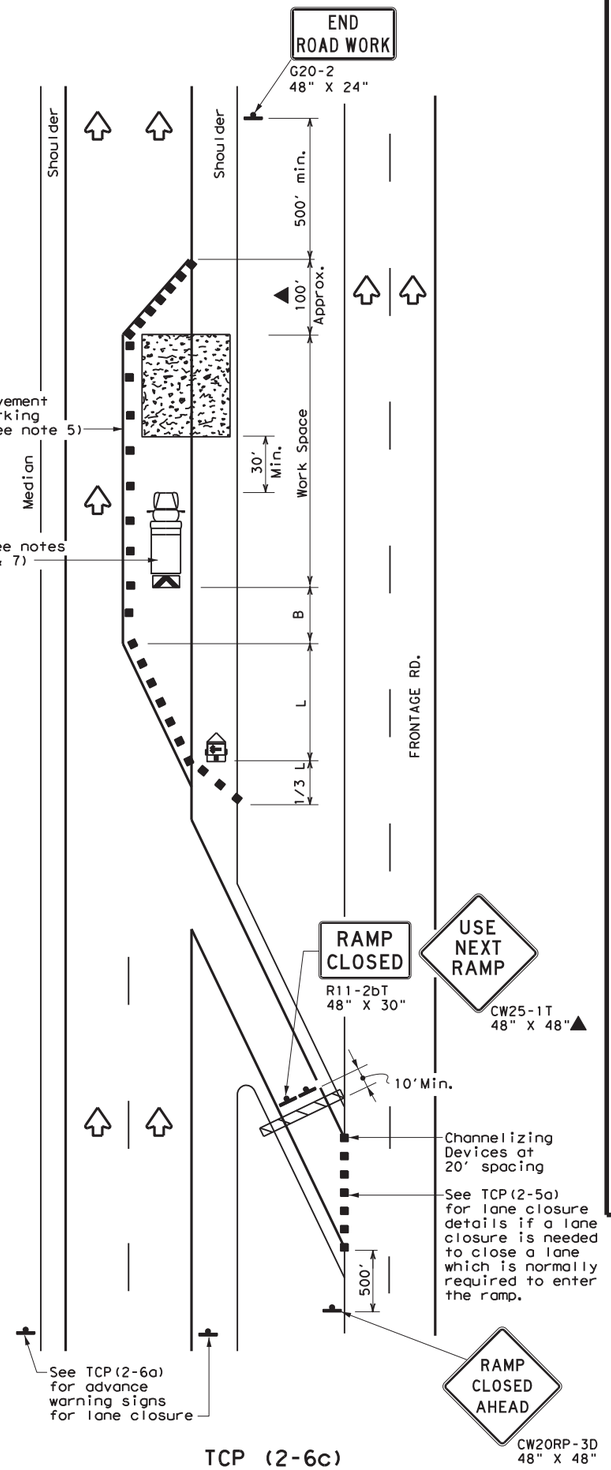
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. 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.
7. 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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	6443	54	001	IH0020
	DIST	COUNTY		SHEET NO.
	18	DALLAS		32

DATE: 4/25/2023 10:27:10 AM
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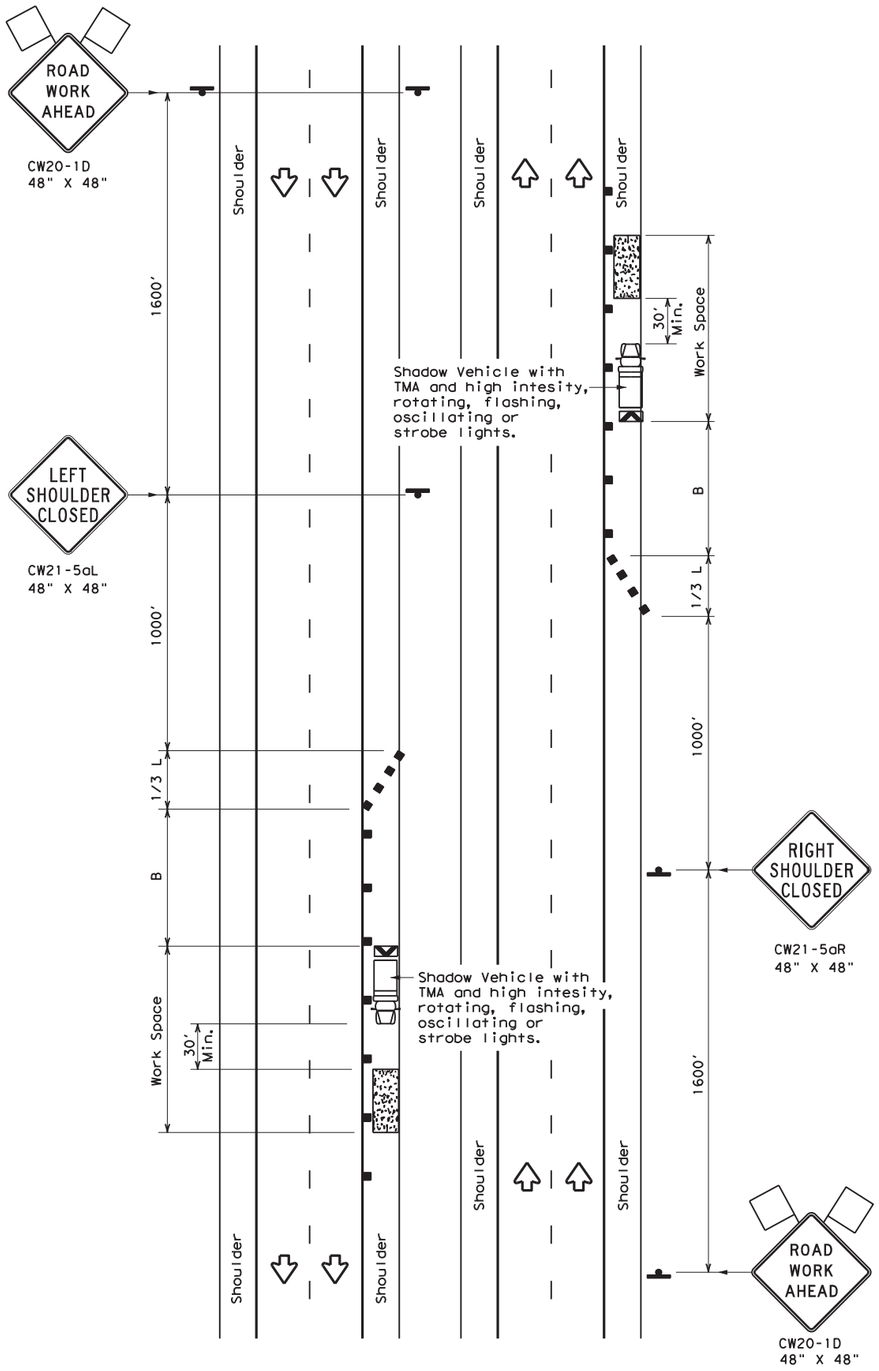
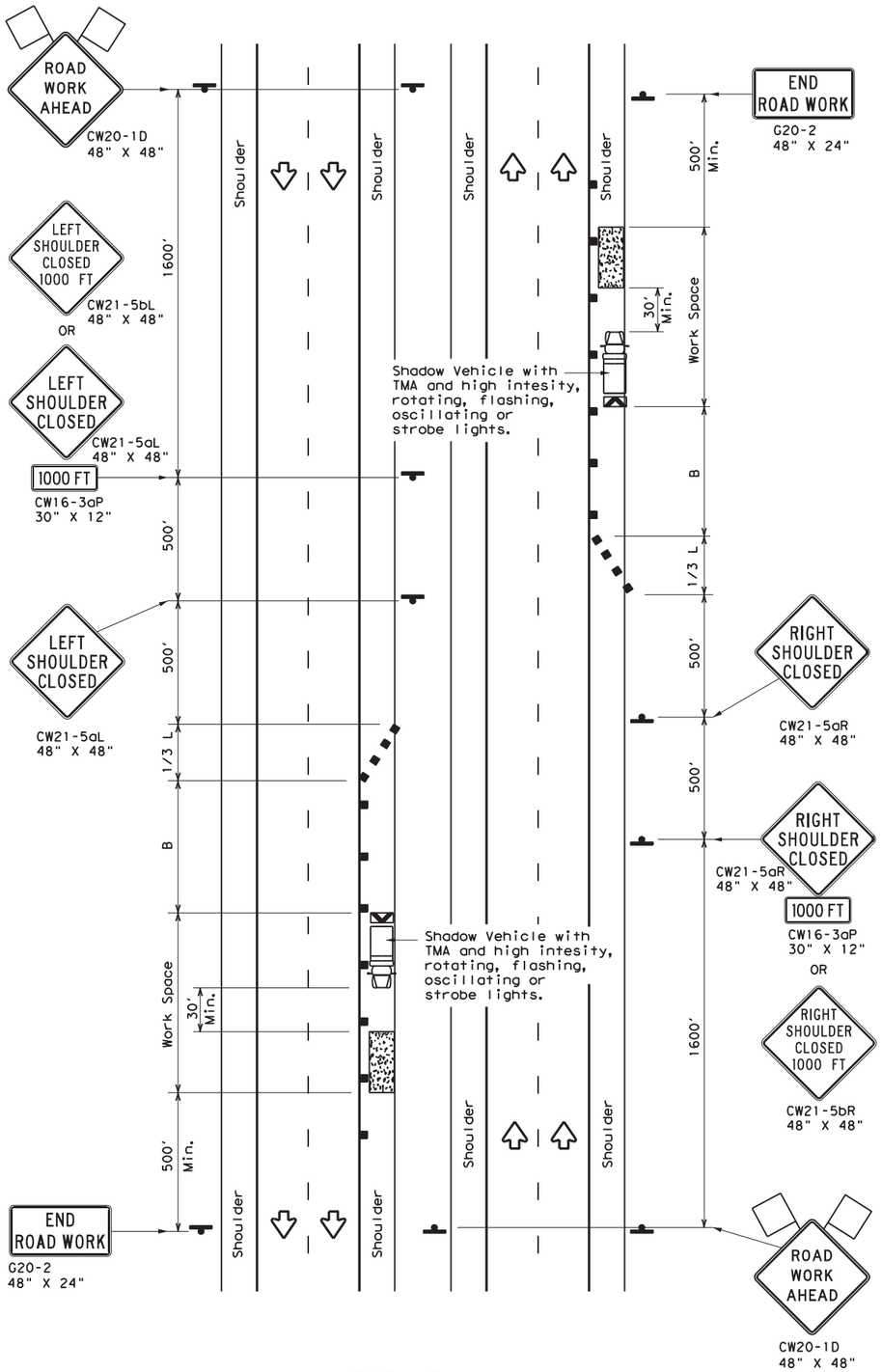


TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* 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(5-1a)	TCP(5-1b)	TCP(5-1b)	

GENERAL NOTES

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely effecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	6443	54	001	IH0020
	DIST	COUNTY		SHEET NO.
	18	DALLAS		33

DATE: 4/25/2023 10:27:11 AM
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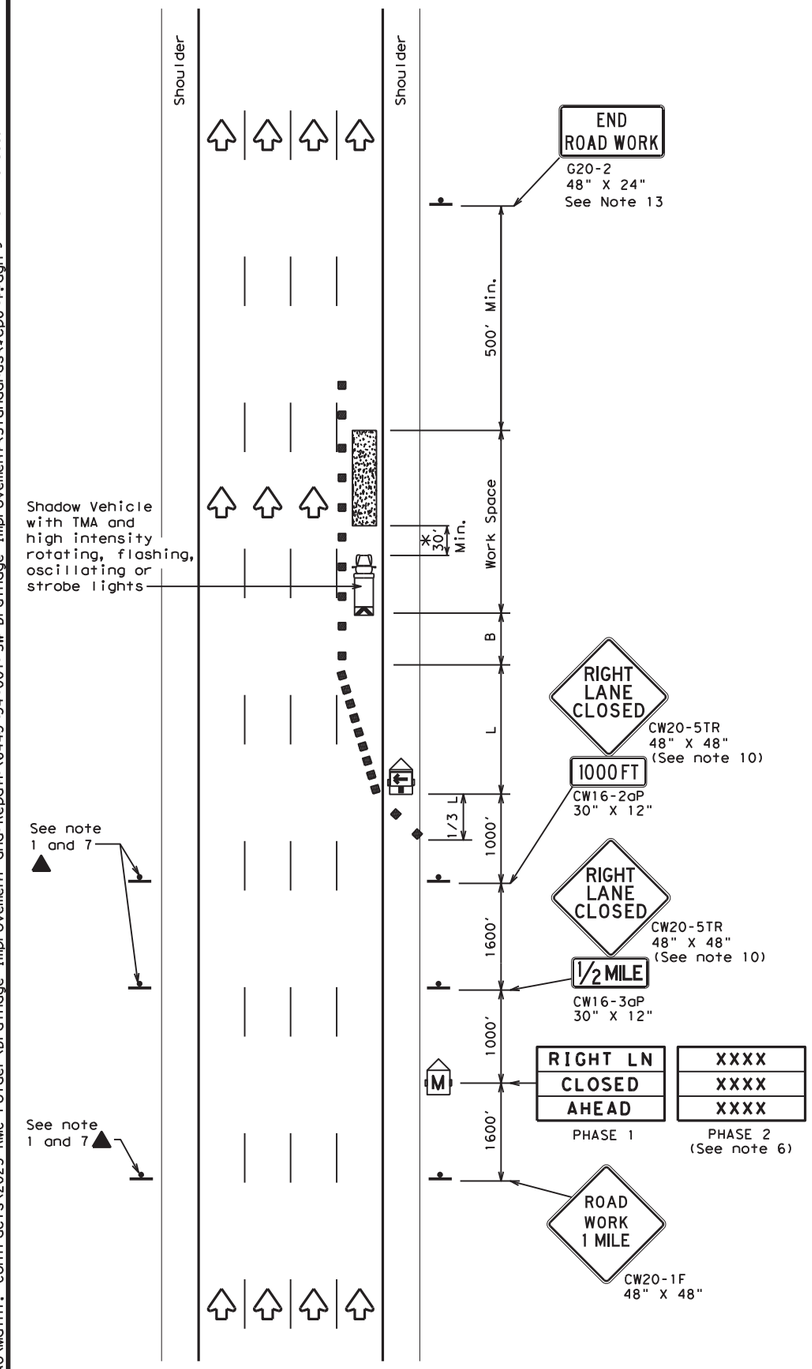
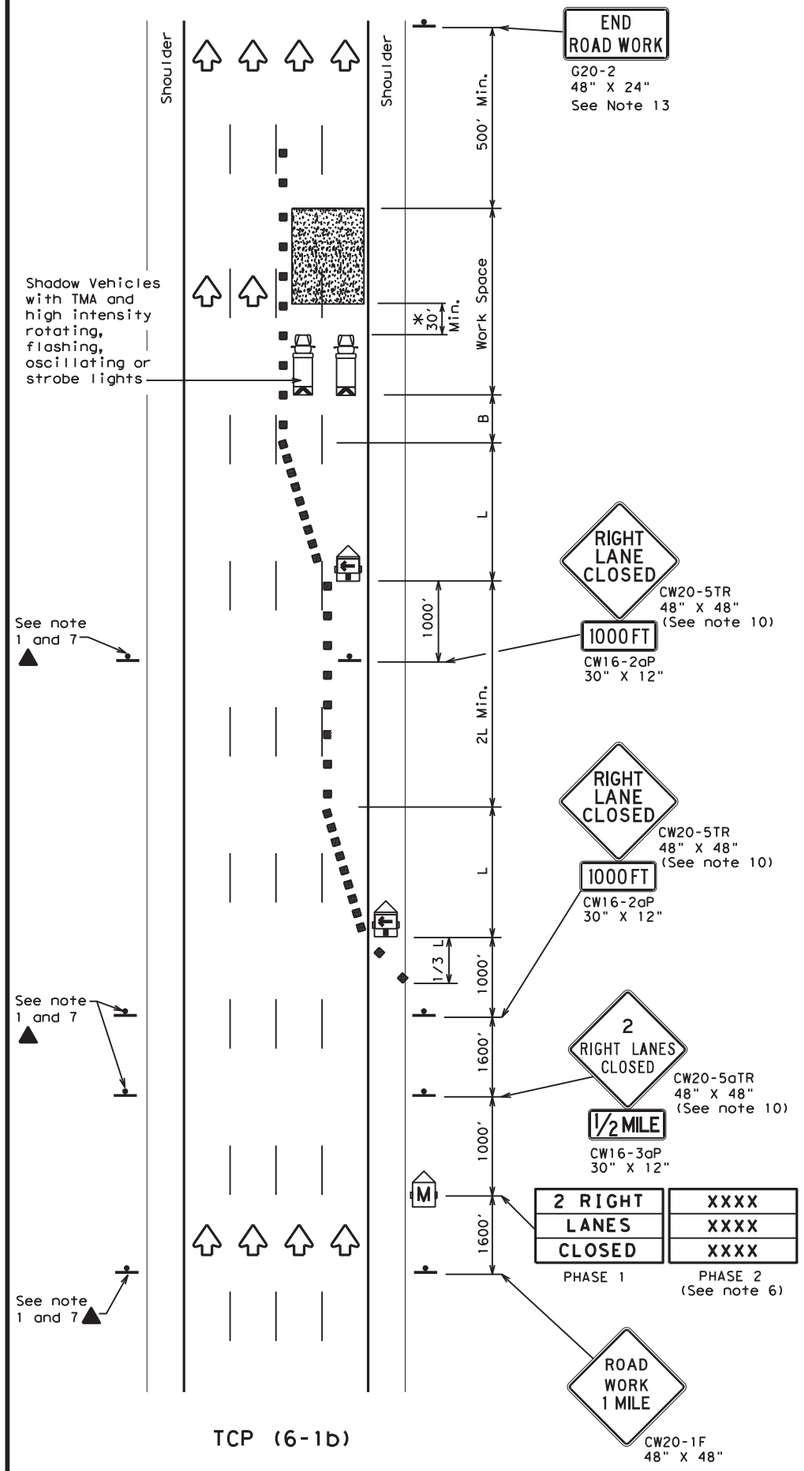


TCP (6-1a)

TYPICAL FREEWAY ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY TWO LANE CLOSURE

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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. Drums or 42"cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
6. Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
11. When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
12. For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
13. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
8-12	DIST	COUNTY		SHEET NO.
	18	DALLAS		34

DATE: 4/25/2023 10:27:12 AM
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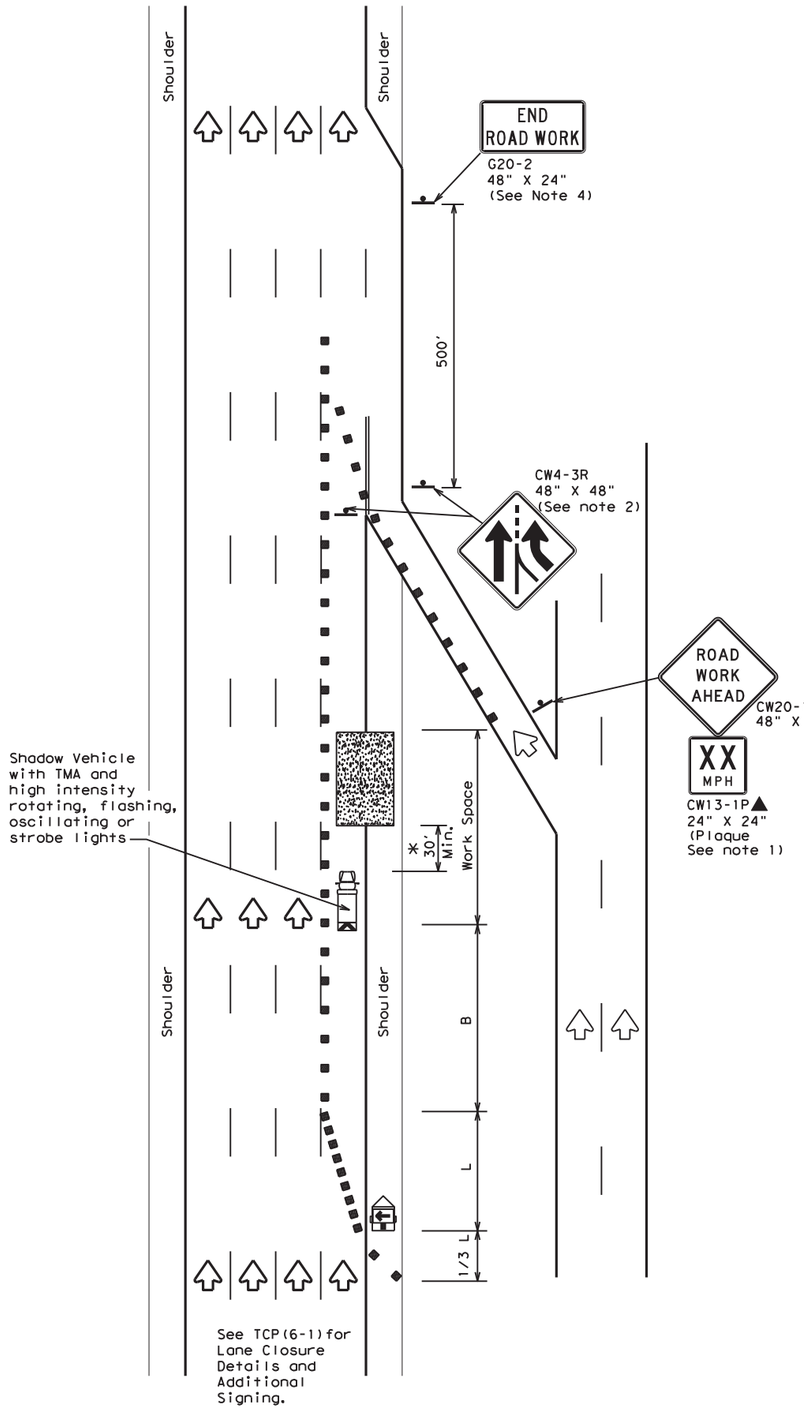
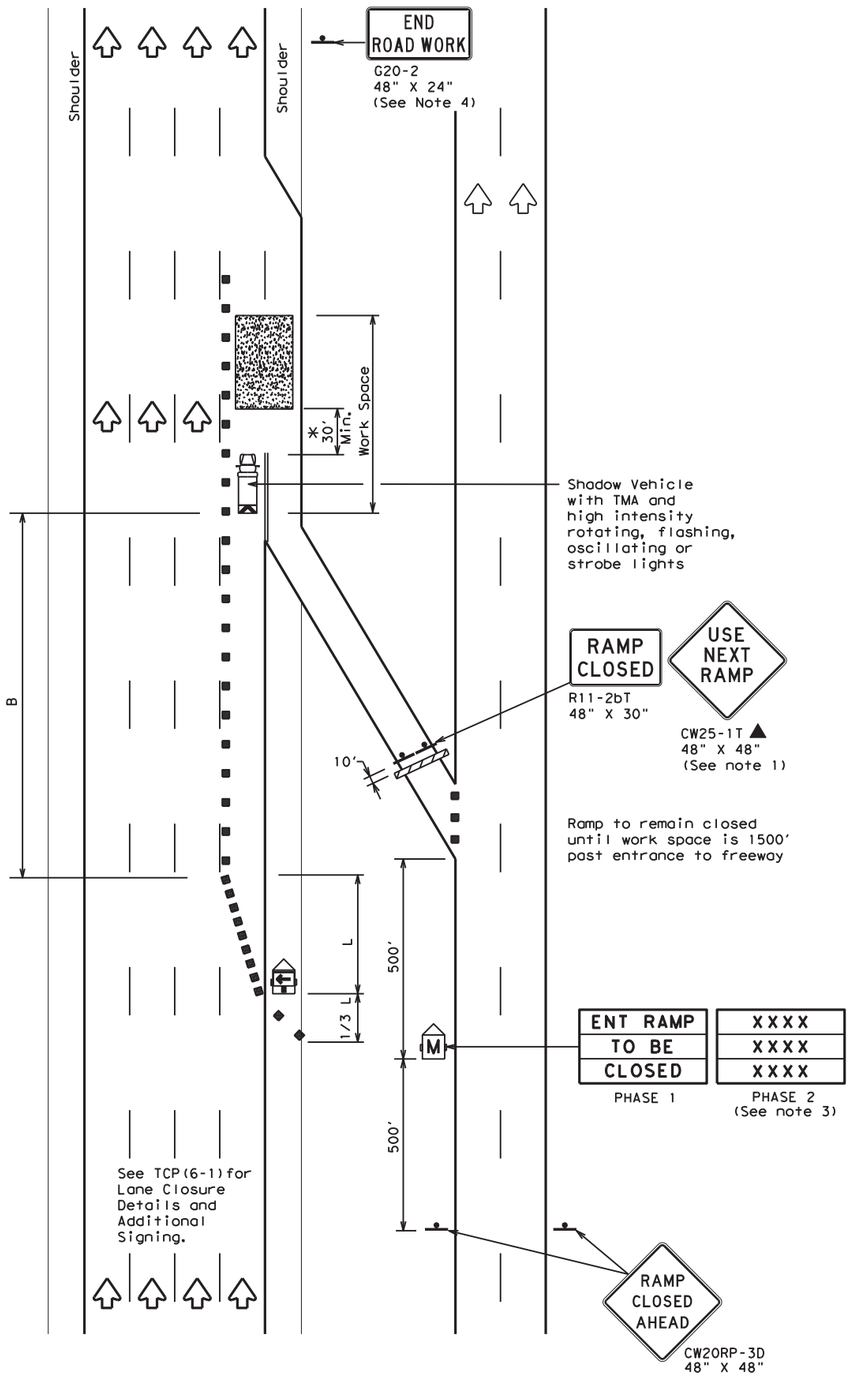


TCP (6-2a)

ENTRANCE RAMP OPEN
WORK WITHIN 500' OF RAMP



TCP (6-2b)

ENTRANCE RAMP 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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
3. See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
4. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP(6-2)-12

FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	18	DALLAS		35

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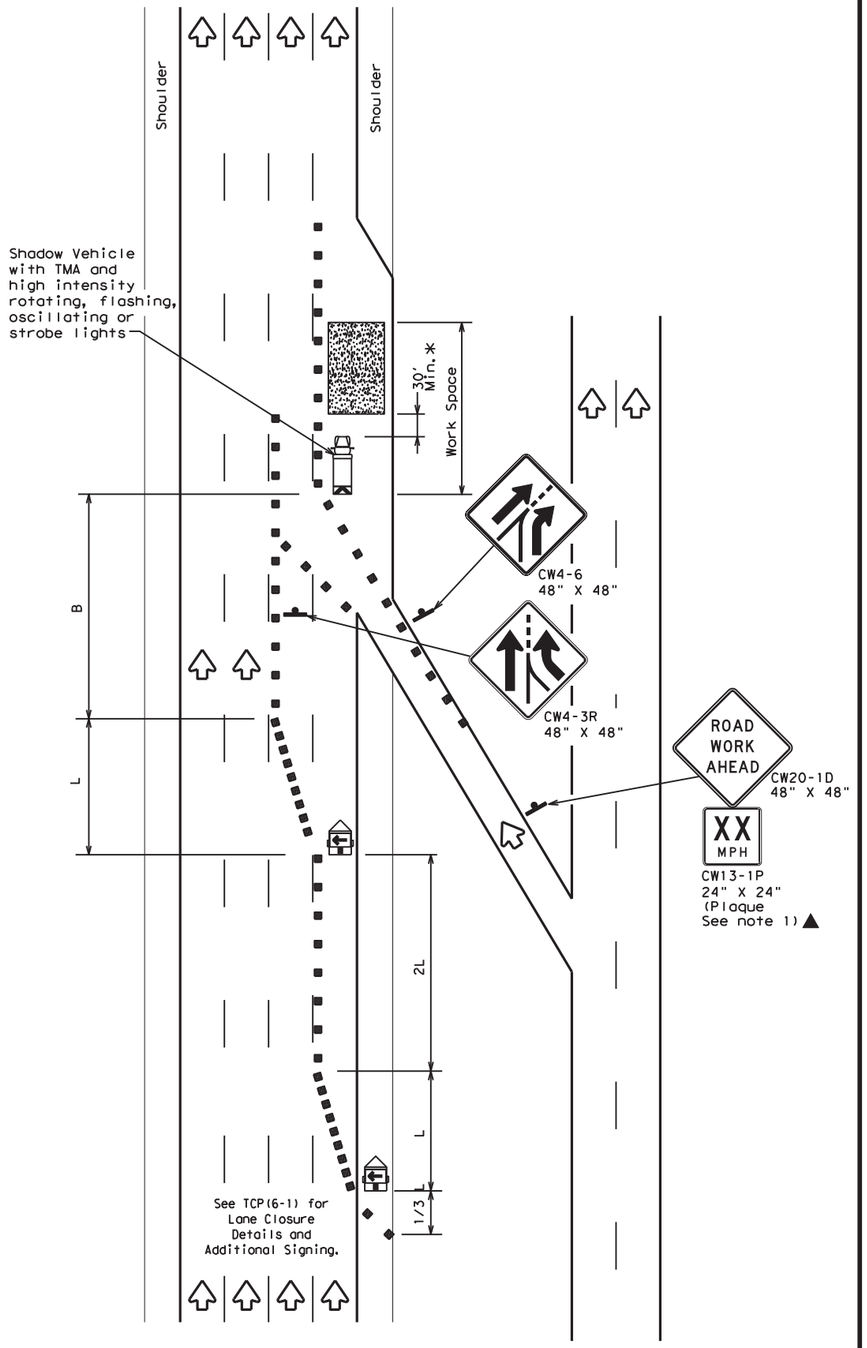
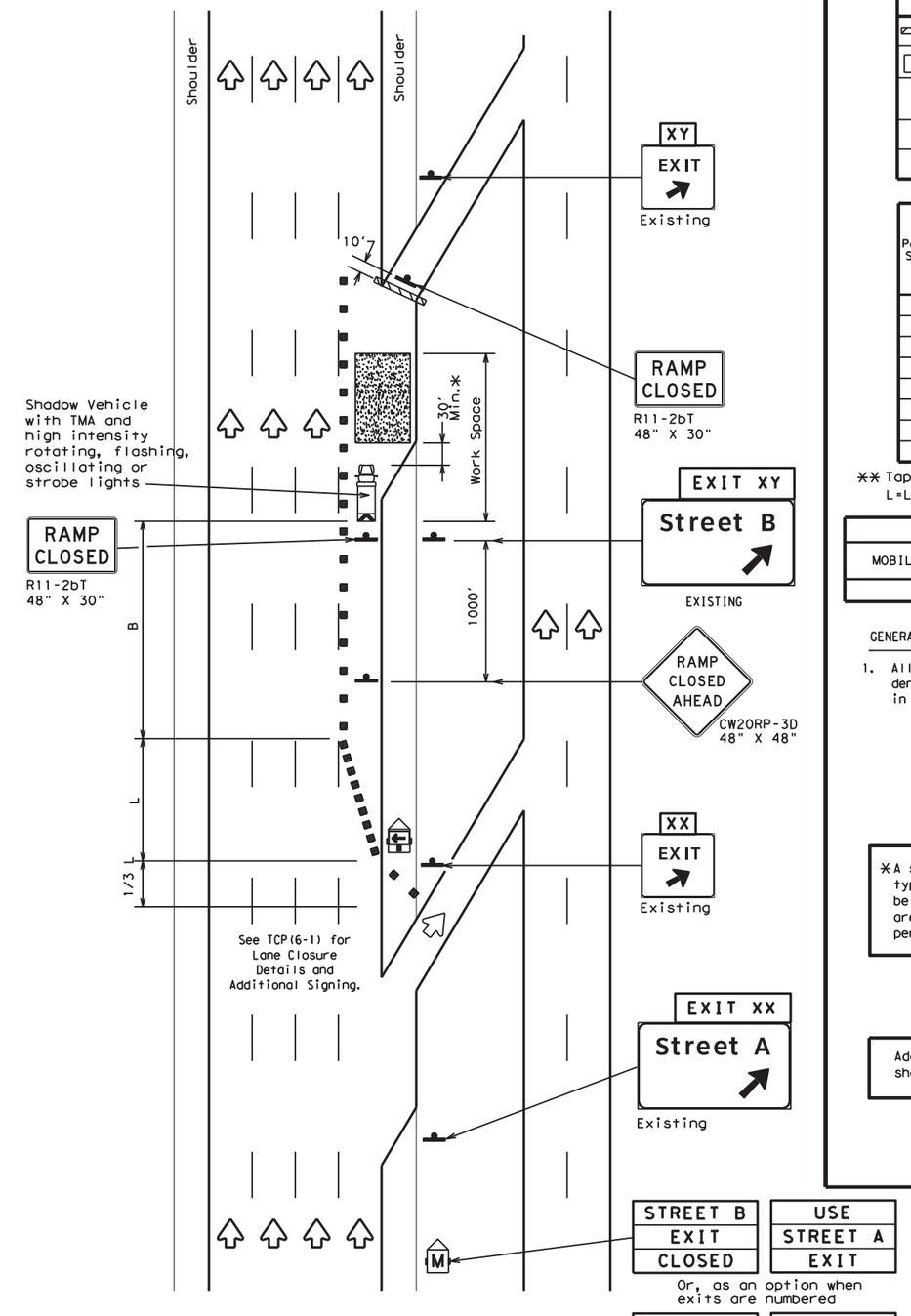


TCP (6-3a)

ENTRANCE RAMP OPEN



TCP (6-3b)

EXIT RAMP CLOSED

TRAFFIC EXITS PRIOR TO CLOSED RAMP

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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND RAMP

TCP(6-3)-12

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	18	DALLAS		36

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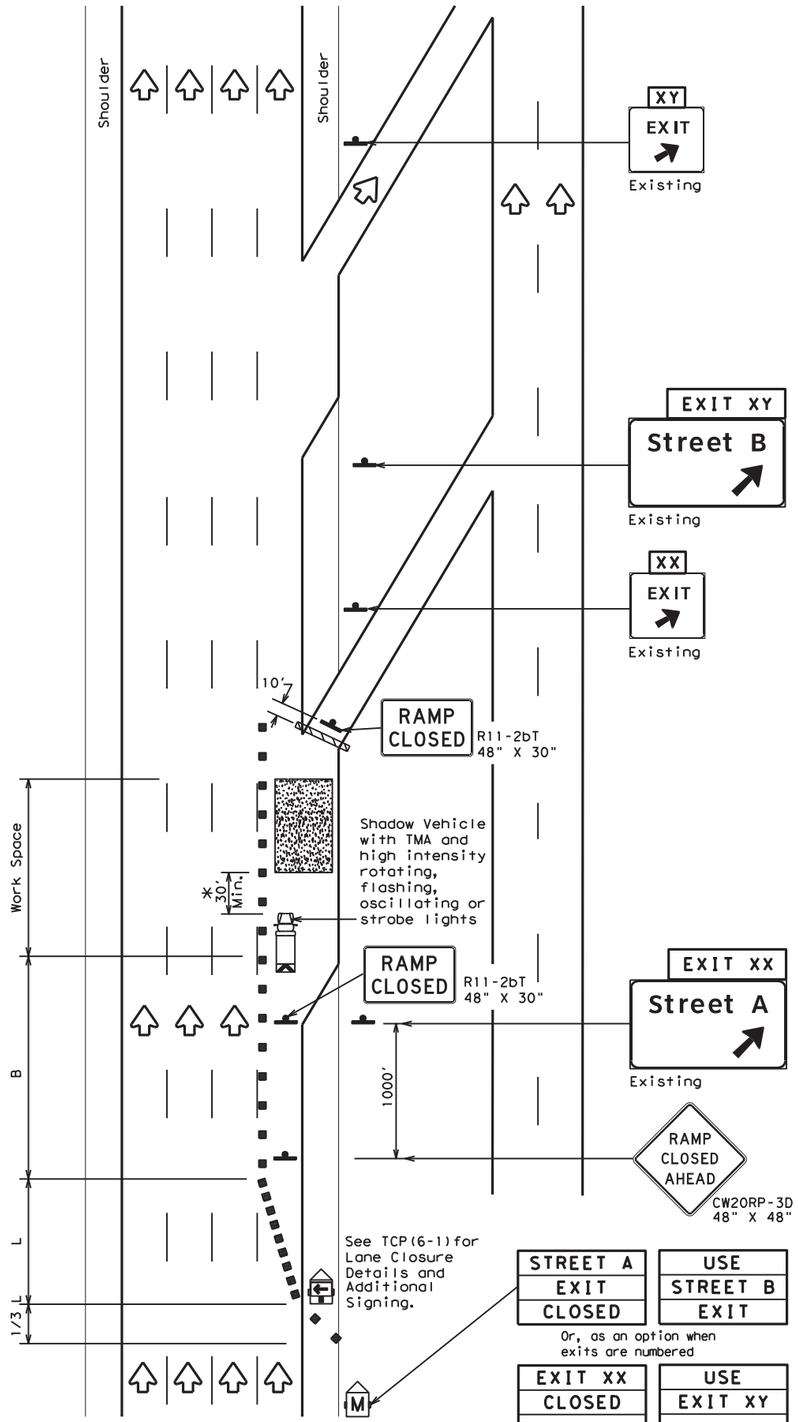
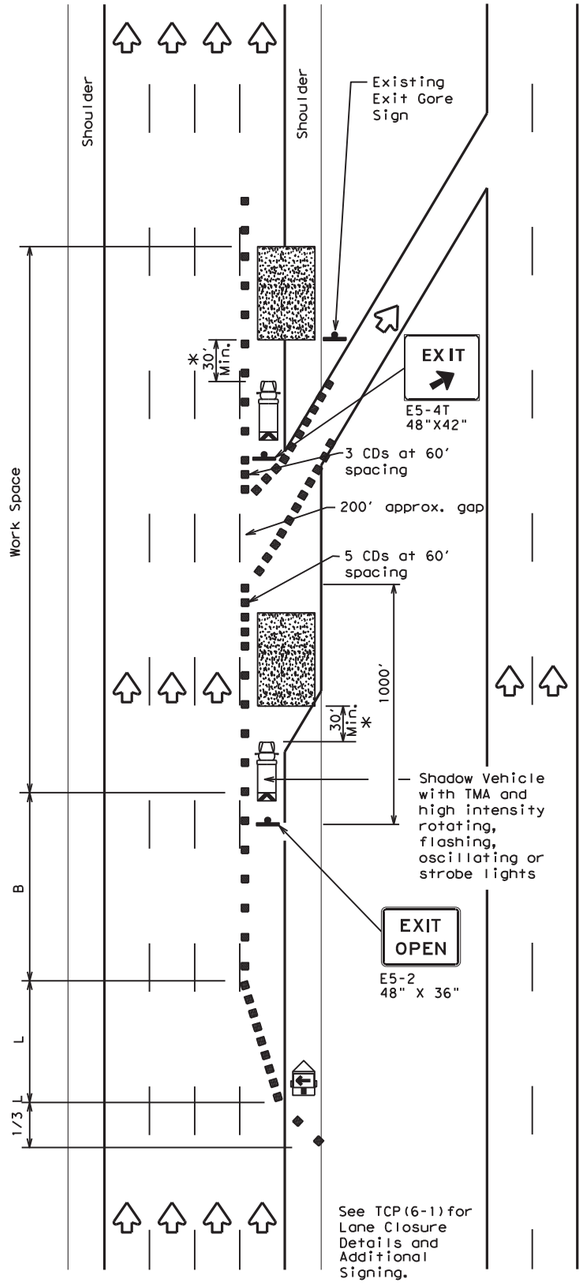


TCP (6-4a)

EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)

EXIT RAMP OPEN

LEGEND

	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC Standards for sign details.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP(6-4)-12

FILE: tcp6-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	18	DALLAS		37

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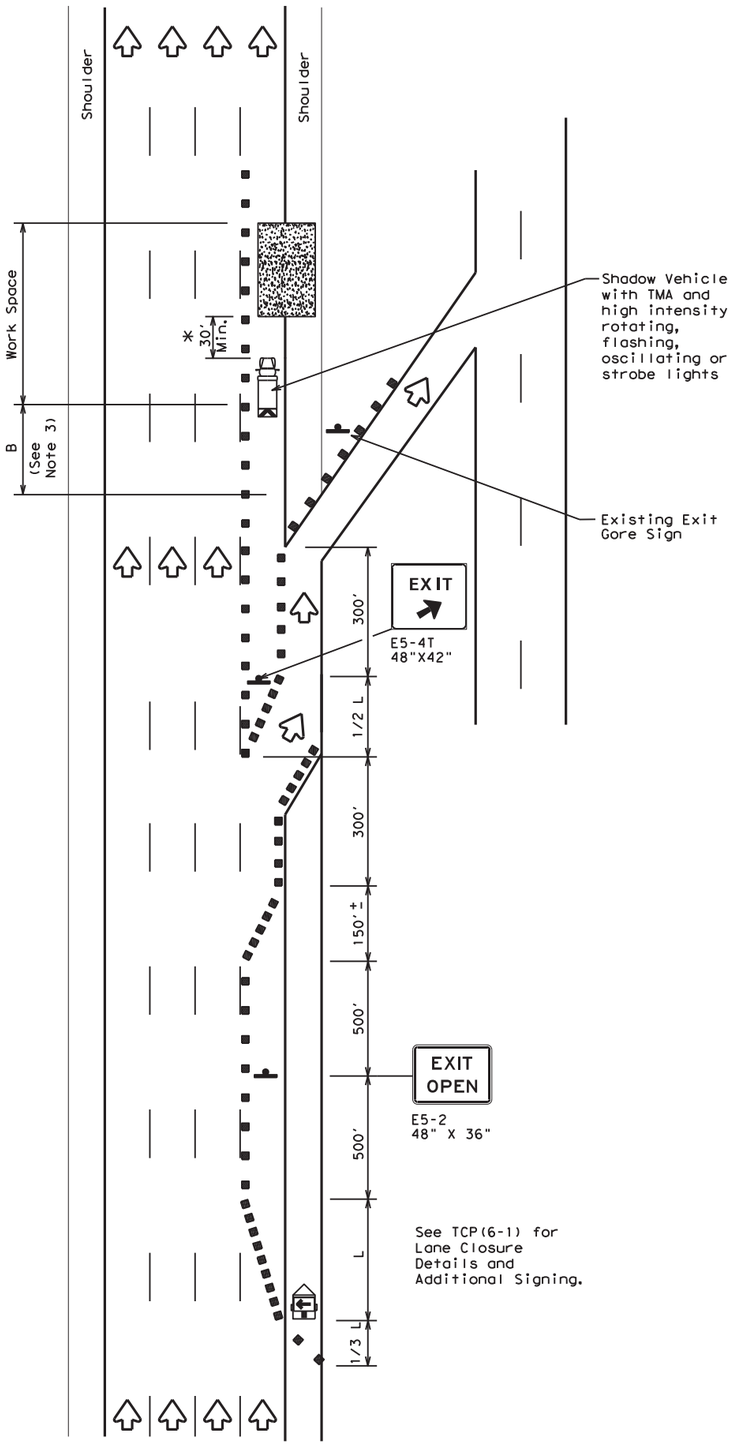
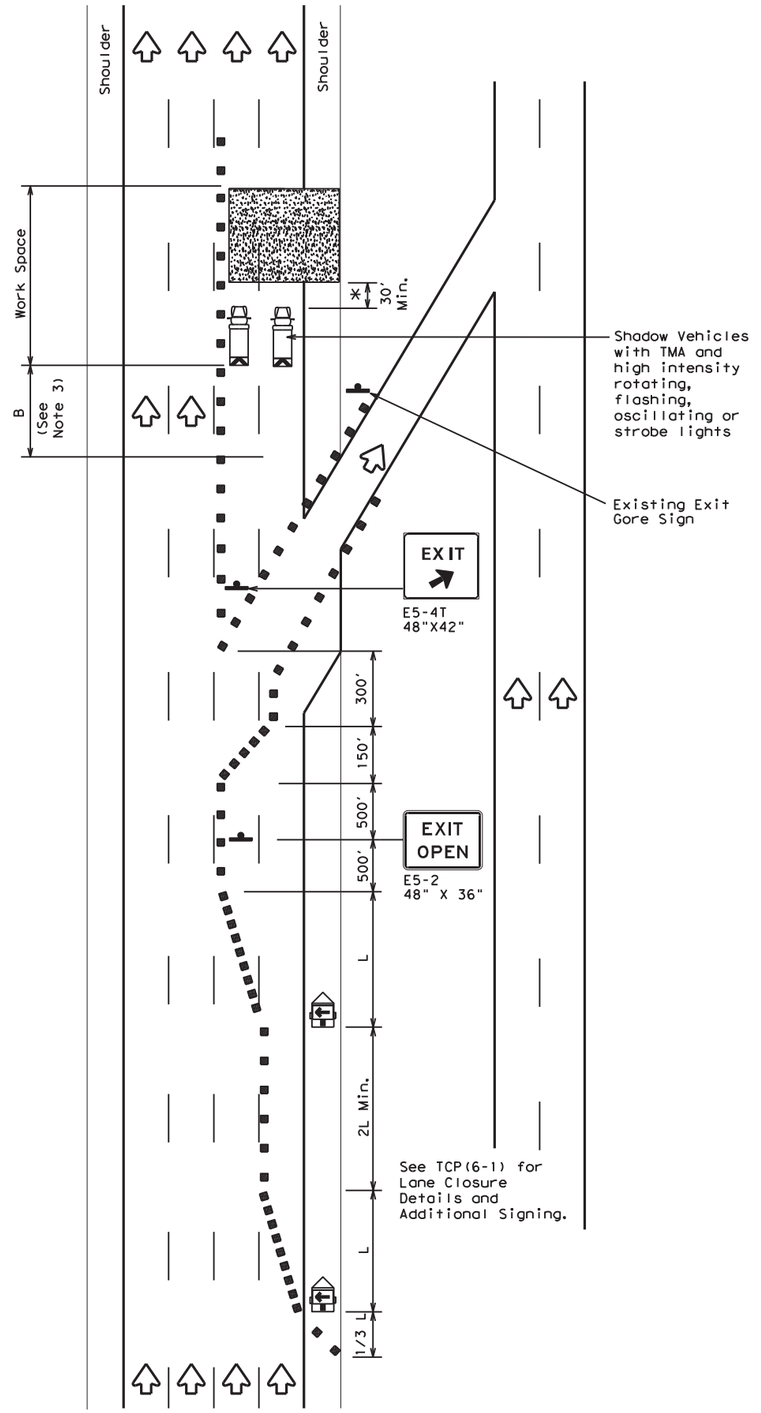


TCP (6-5a)

EXIT RAMP OPEN



TCP (6-5b)

EXIT RAMP OPEN
TWO LANE CLOSURE WITHIN 1500' PAST EXIT RAMP

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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. See BC standards for sign details.
3. If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA BEYOND EXIT RAMP

TCP(6-5)-12

FILE: tcp6-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT Feburary 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	6443	54	001	IH0020
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	18	DALLAS		38

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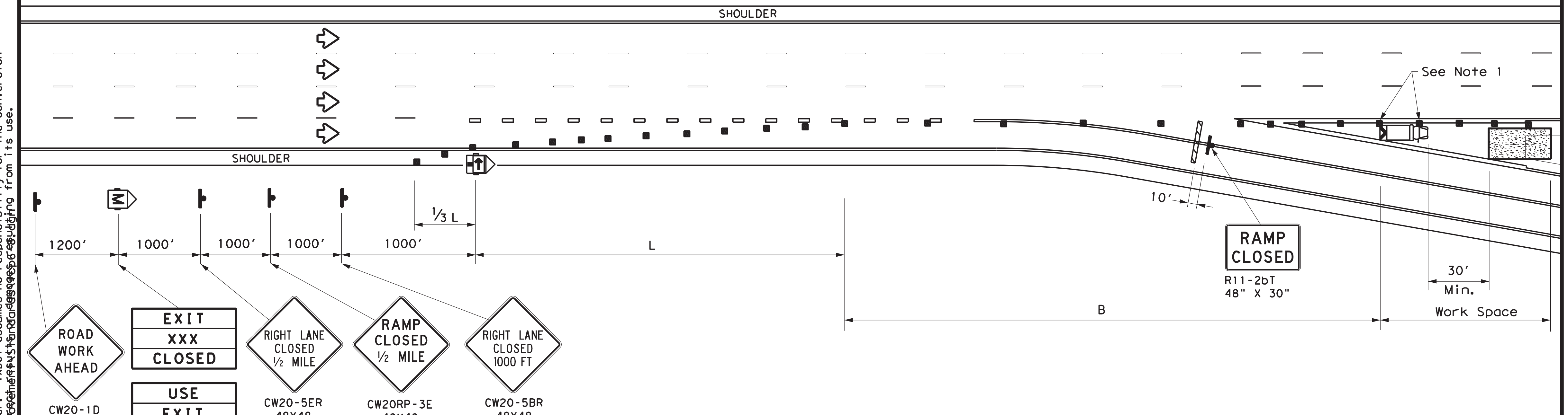
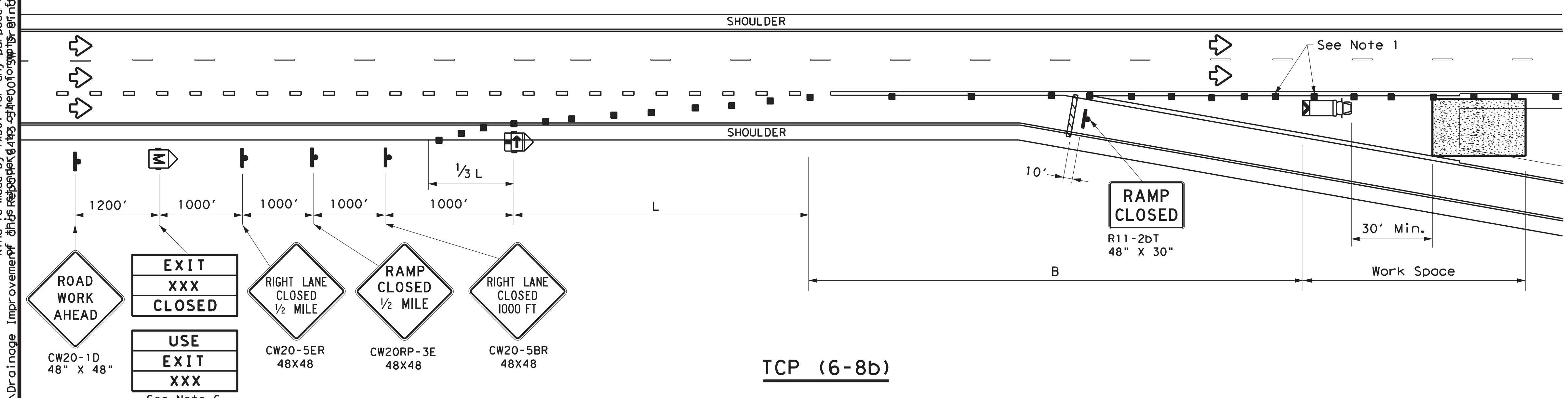
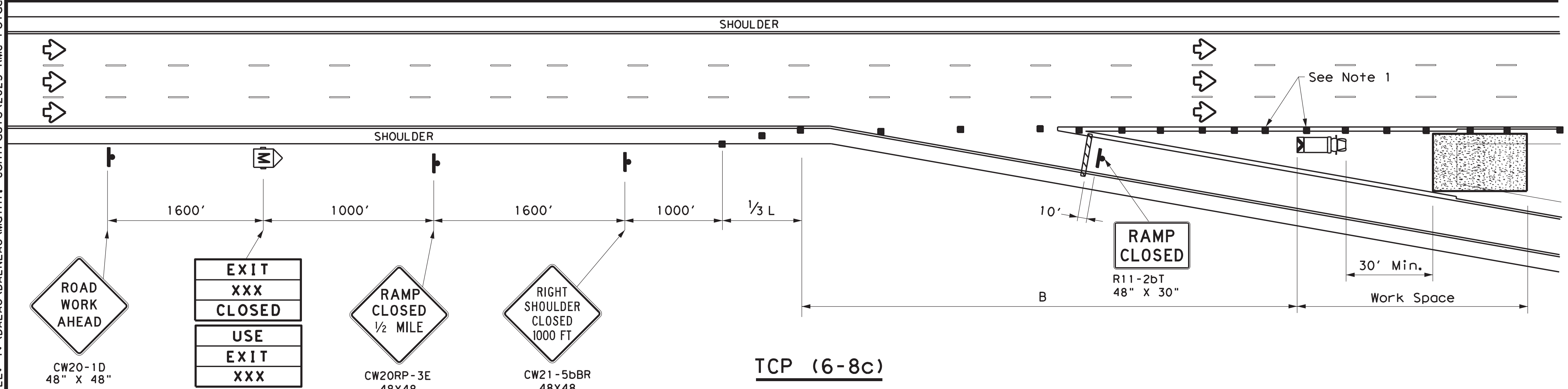


TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

LEGEND

Symbol	Description	Symbol	Description
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. Place channelizing devices in the gore at 20' spacing.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
5. Truck mounted attenuator is required.
6. The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW20RP-3D) Sign.
7. Roadway ADT should be greater than 10,000.

Texas Department of Transportation

Traffic Operations Division Standard

WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

TCP(6-8)-14

FILE:	tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	February 2014	CONT	SECT	JOB	HIGHWAY
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		18		DALLAS	39

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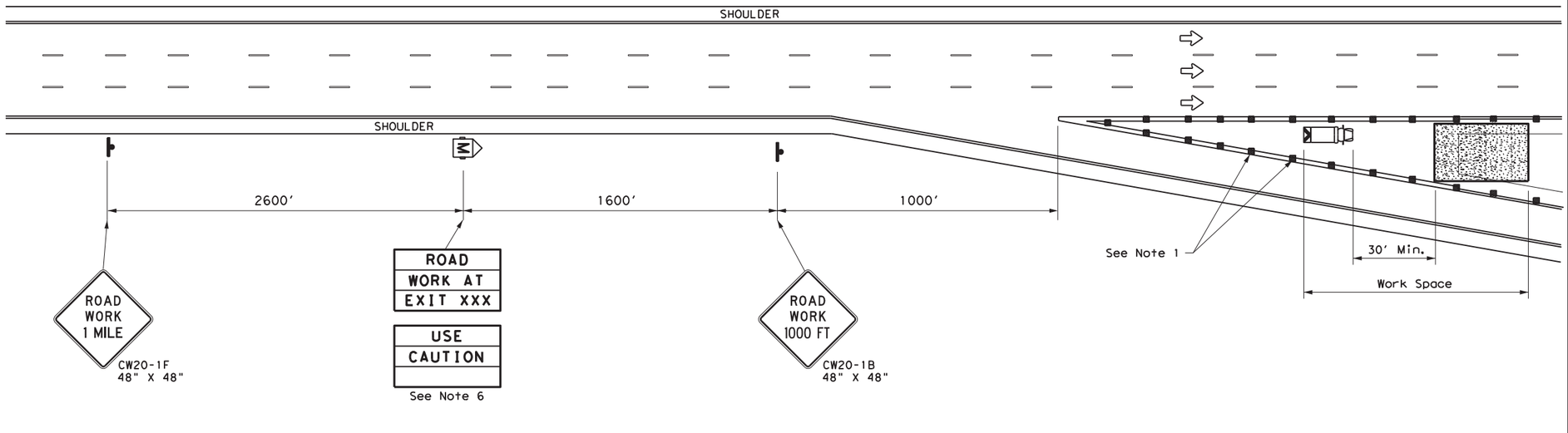
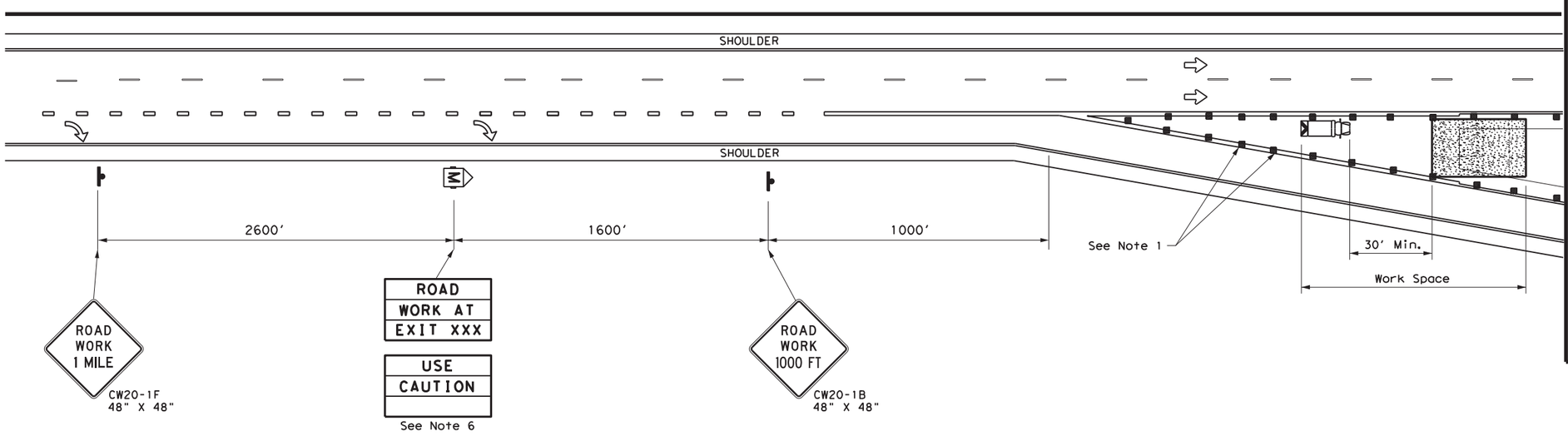


TCP (6-9a)



TCP (6-9b)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	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 "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

** 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. Place channelizing devices in the gore at 20' spacing.
2. See the Standard Highway Sign Design for Texas (SHSD) for sign details.
3. The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
4. When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) and TCP(6-8) for traffic control details.
5. Truck mounted attenuators are required.
6. The PCMS may be omitted if replaced with a "ROAD WORK ½ MILE" (CW20-1E).
7. Roadway ADT should be less than 10,000.

Texas Department of Transportation

Traffic Operations Division Standard

WORK IN EXIT GORE FOR ADT LESS THAN 10,000

TCP(6-9)-14

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©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
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	18	DALLAS		40

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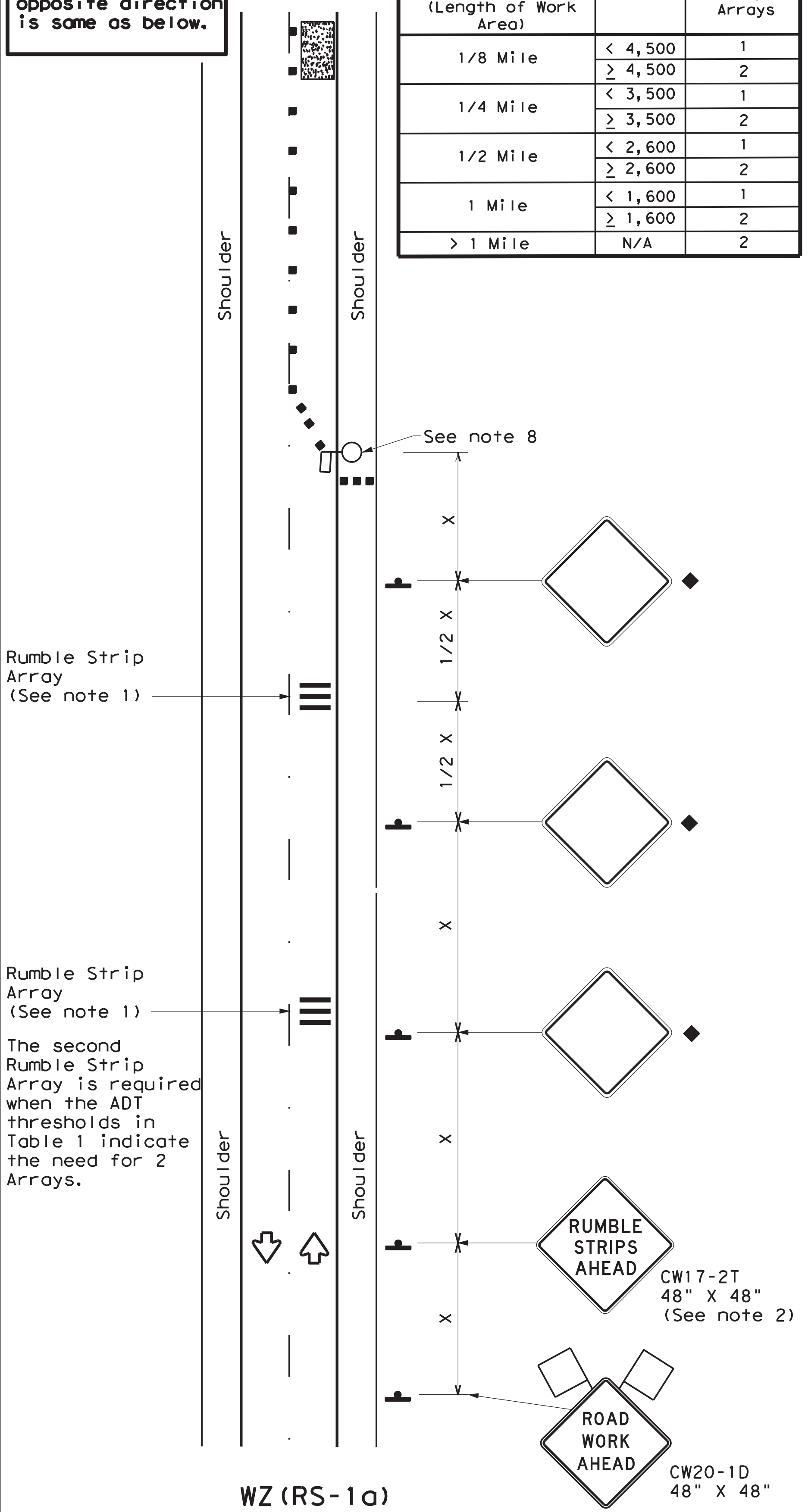
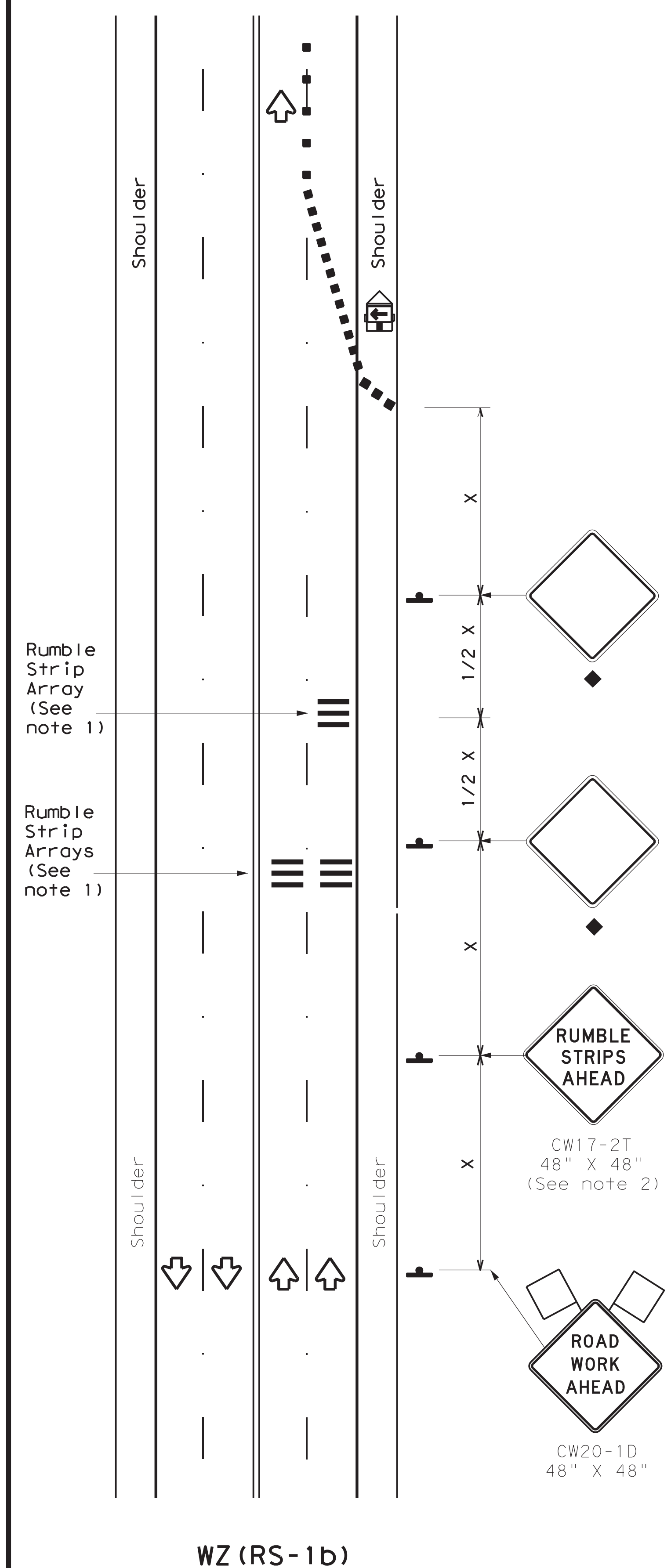
Warning sign and rumble strip sequence in opposite direction is same as below.

TABLE 1

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



RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



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.

TABLE 2

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

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel		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.

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

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© TxDOT November 2012	CONT 6443	SECT 54	JOB 001	HIGHWAY IH0020
REVISIONS 2-14 1-22 4-16	DIST 18		COUNTY DALLAS	SHEET NO. 41

117

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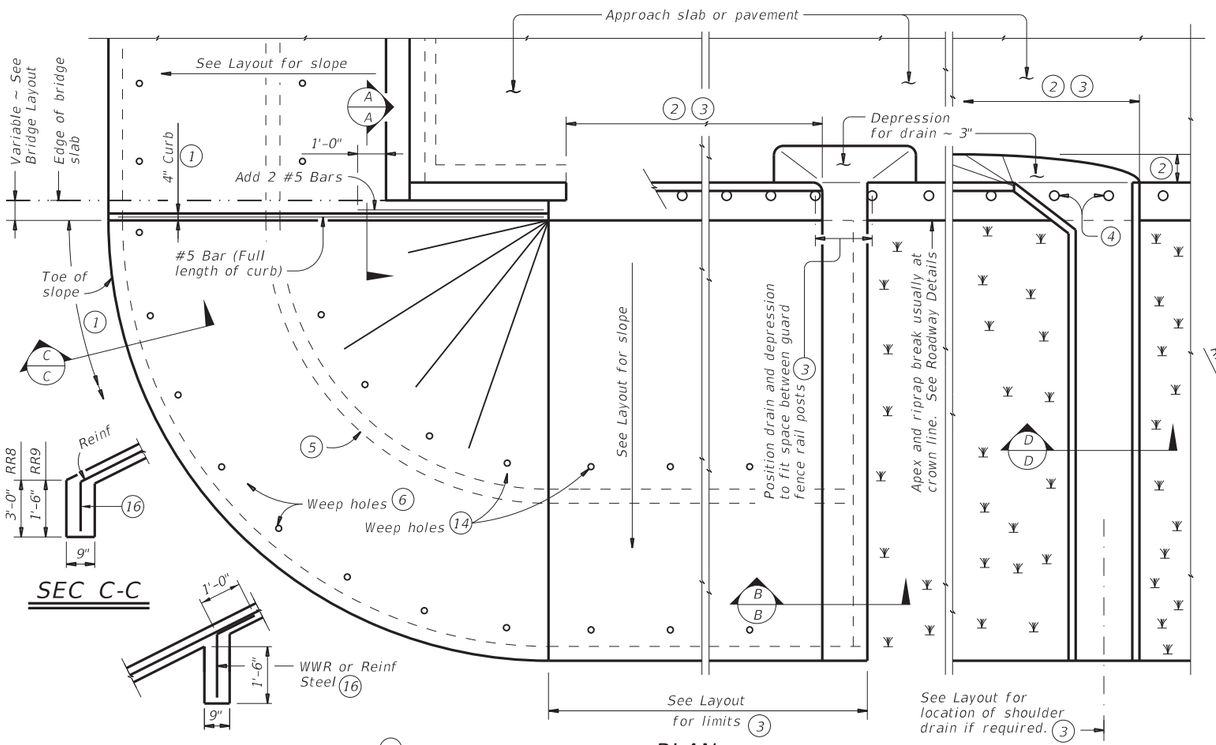
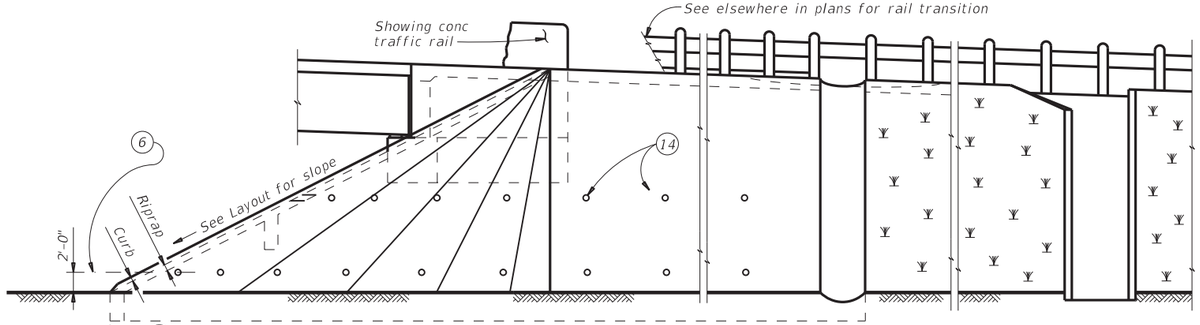


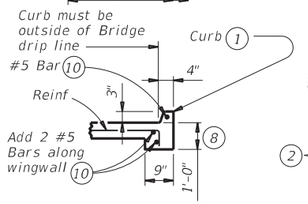
PLAN

SEC C-C

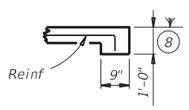
INTERMEDIATE TOEWALL



ELEVATION

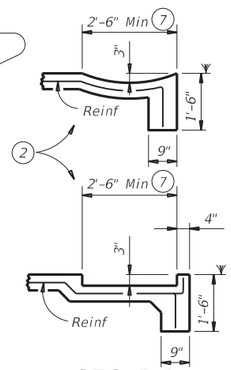


SEC A-A



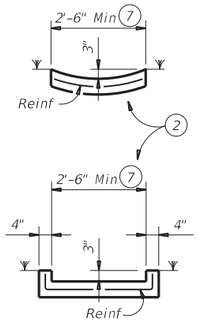
SEC B-B

(No drain)



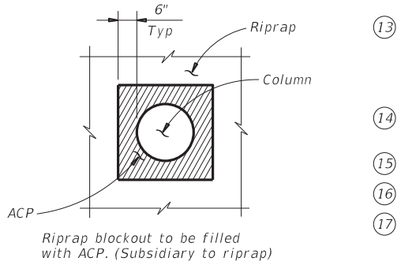
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

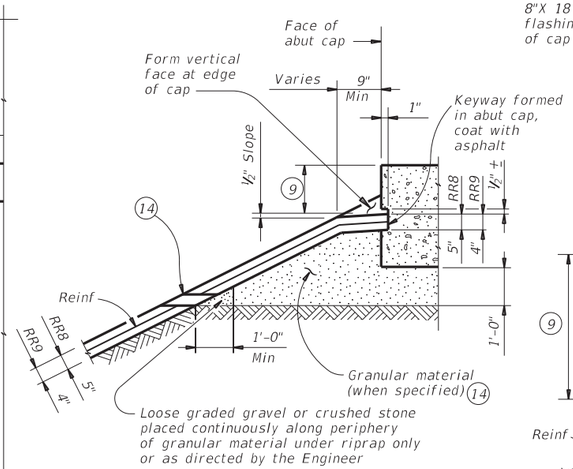
(Shoulder drain)



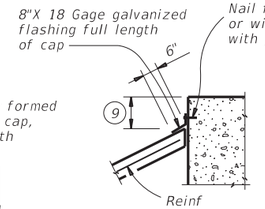
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

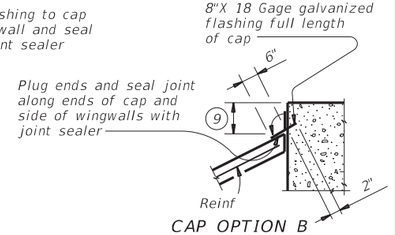
(As directed by the Engineer)



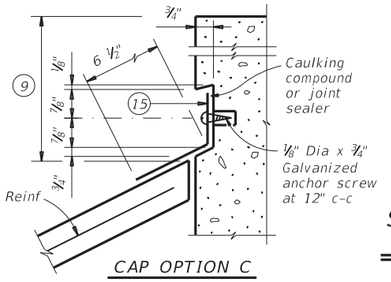
SHOWING KEYWAY OPTION



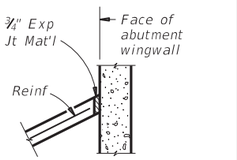
CAP OPTION A



CAP OPTION B

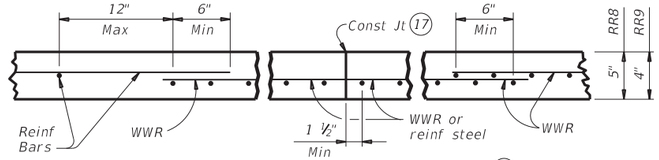


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

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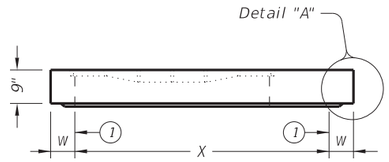
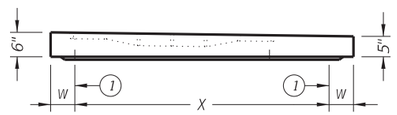
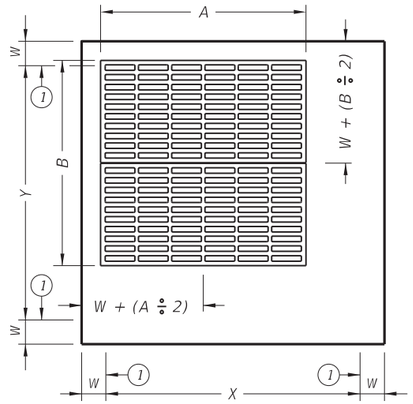


STYLE 'FG'

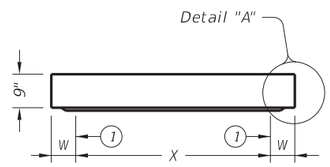
ORIENT TAPER TO CORRESPOND WITH ROADWAY CROSS-SLOPE.



STYLE 'SFG'
ELEVATION VIEW



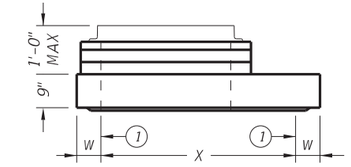
PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



ELEVATION VIEW

STYLE 'SL'

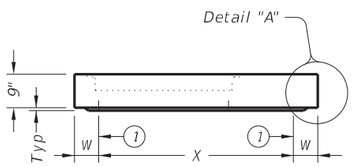
PLAN VIEW
NO OPENINGS



ELEVATION VIEW

STYLE 'RH'

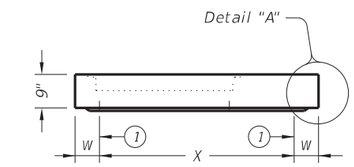
PLAN VIEW
SHIP LOOSE RING & COVER



ELEVATION VIEW

STYLE 'RC'

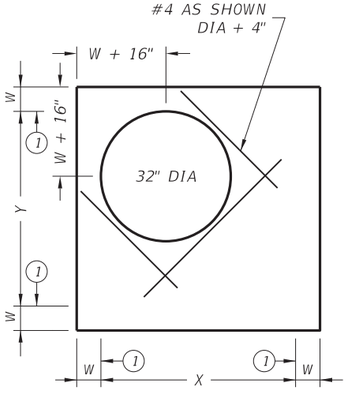
PLAN VIEW
32" DIA CAST-IN RING & COVER

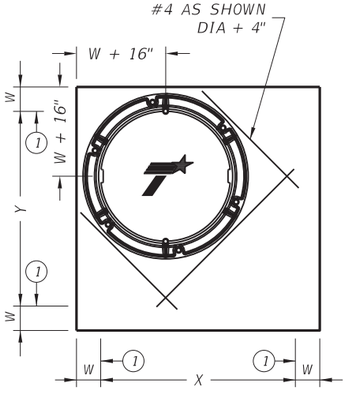


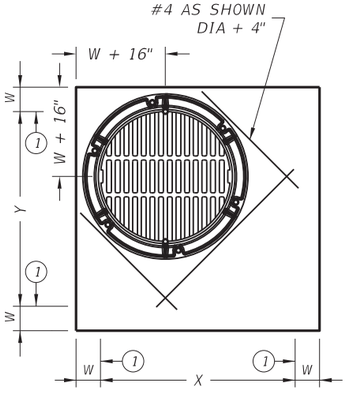
ELEVATION VIEW

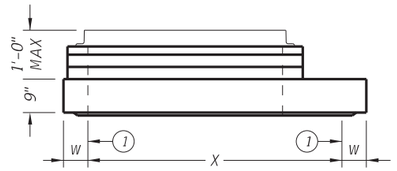
STYLE 'RG'

PLAN VIEW
32" DIA CAST-IN RING & GRATE

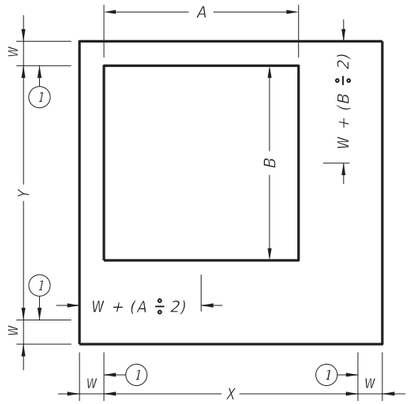




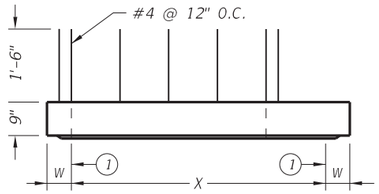




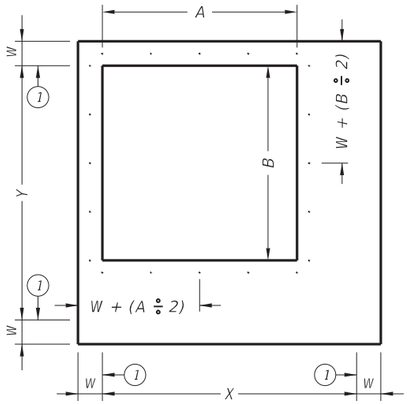
ELEVATION VIEW



PLAN VIEW
SHIP LOOSE FRAME & GRATE
STYLE 'SH'



ELEVATION VIEW



PLAN VIEW
EXPOSED REBAR
STYLE 'S1'

(1) Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST SLAB LID

PSL

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	18	DALLAS		43

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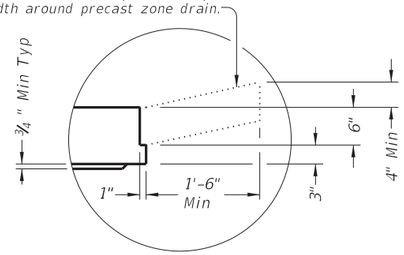
Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in²/ft	0.37 in²/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in²/ft	0.37 in²/ft
SFG	3'x3'	6"	3'x3'	0.32 in²/ft	0.32 in²/ft
SL	4'x4'	6"	n/a	0.34 in²/ft	0.34 in²/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in²/ft	0.41 in²/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in²/ft	0.41 in²/ft
SFG	4'x4'	6"	4'x4'	0.32 in²/ft	0.32 in²/ft
SL	3'x5'	6"	n/a	0.39 in²/ft	0.39 in²/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in²/ft	0.48 in²/ft
SFG	3'x5'	6"	3'x5'	0.32 in²/ft	0.32 in²/ft
SL	4'x5'	6"	n/a	0.42 in²/ft	0.42 in²/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in²/ft	0.42 in²/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in²/ft	0.66 in²/ft
SL	5'x5'	6"	n/a	0.36 in²/ft	0.36 in²/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in²/ft	0.43 in²/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in²/ft	0.63 in²/ft
SL	5'x6'	6"/8"	n/a	0.48 in²/ft	0.48 in²/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in²/ft	0.60 in²/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in²/ft	0.60 in²/ft
SL	6'x6'	6"/8"	n/a	0.43 in²/ft	0.43 in²/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in²/ft	0.59 in²/ft
SL	8'x8'	8"/10"	n/a	0.45 in²/ft	0.45 in²/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in²/ft	0.45 in²/ft

(2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of ¾" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation

Bridge Division Standard

PRECAST SLAB LID

PSL

FILE: prestd05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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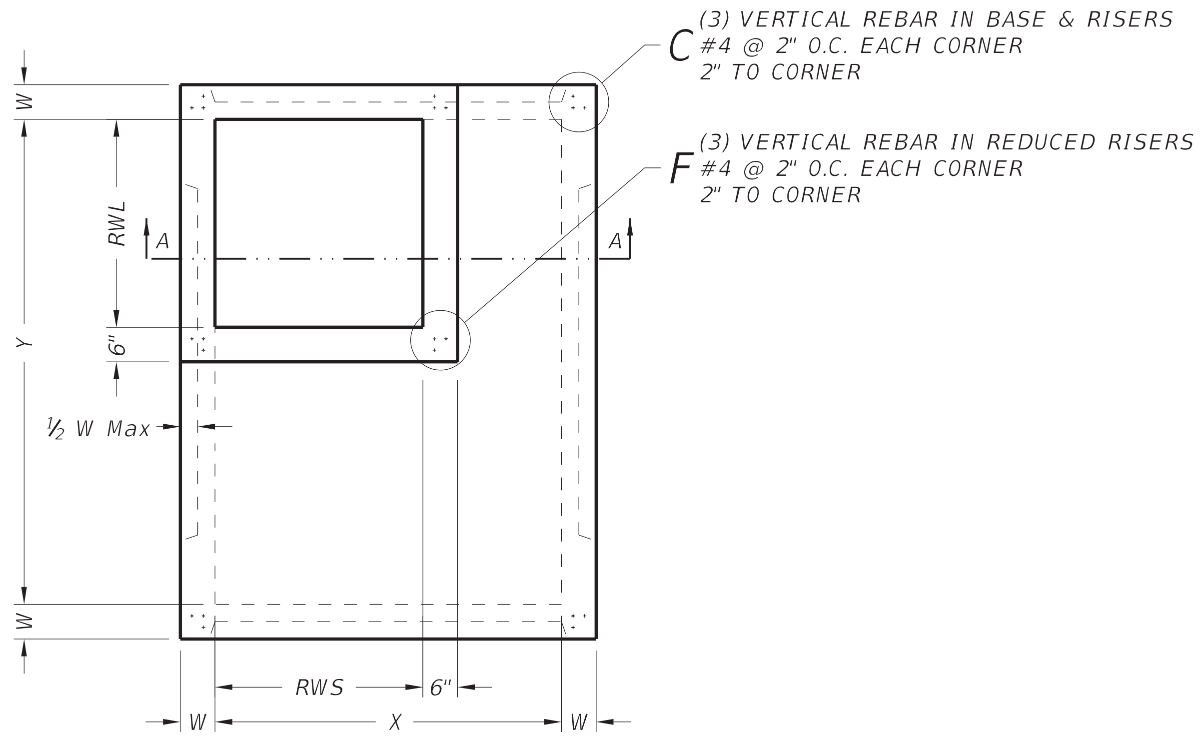
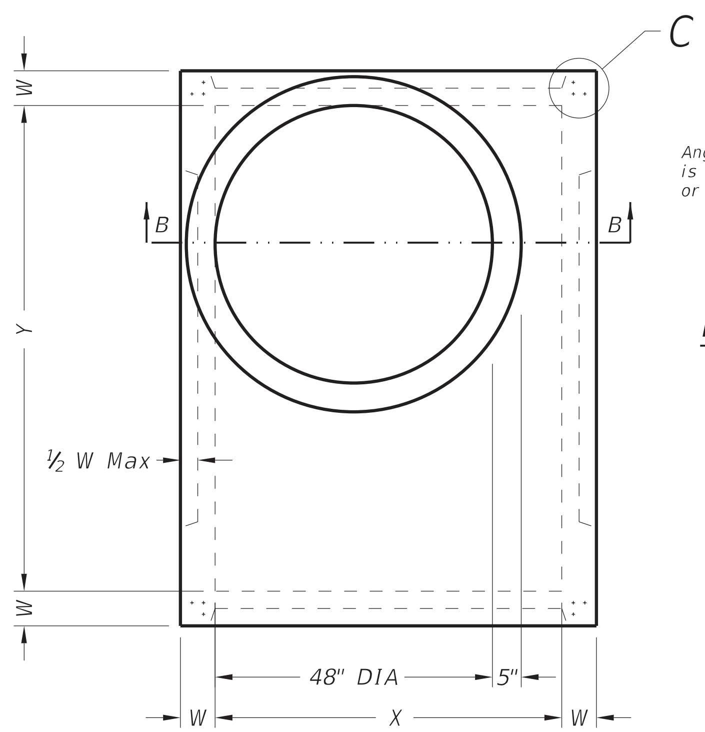
REVISIONS	6443	54	001	IH0020
	DIST	COUNTY		SHEET NO.
	18	DALLAS		44



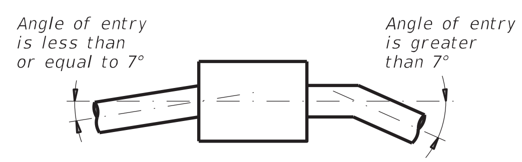
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



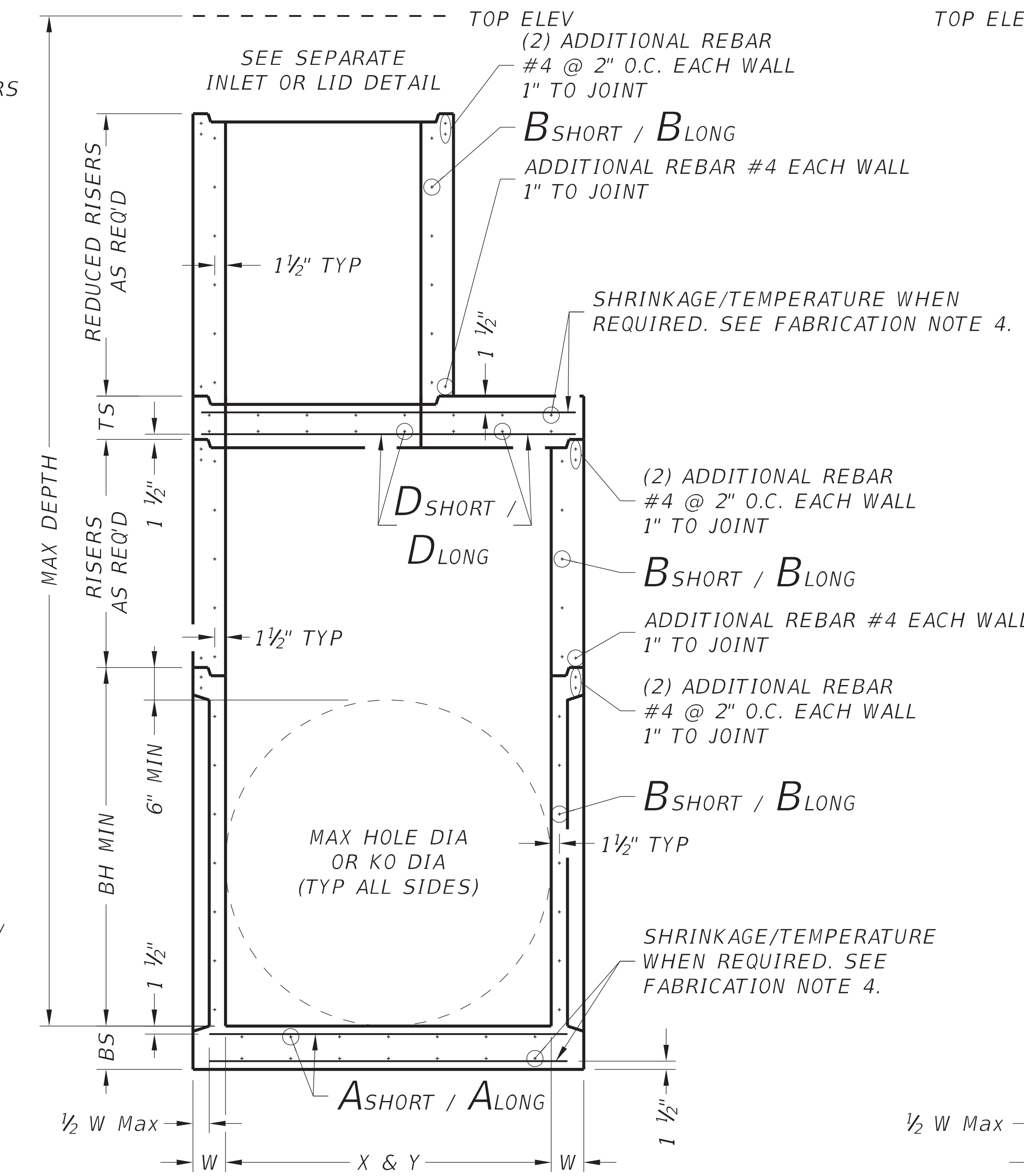
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



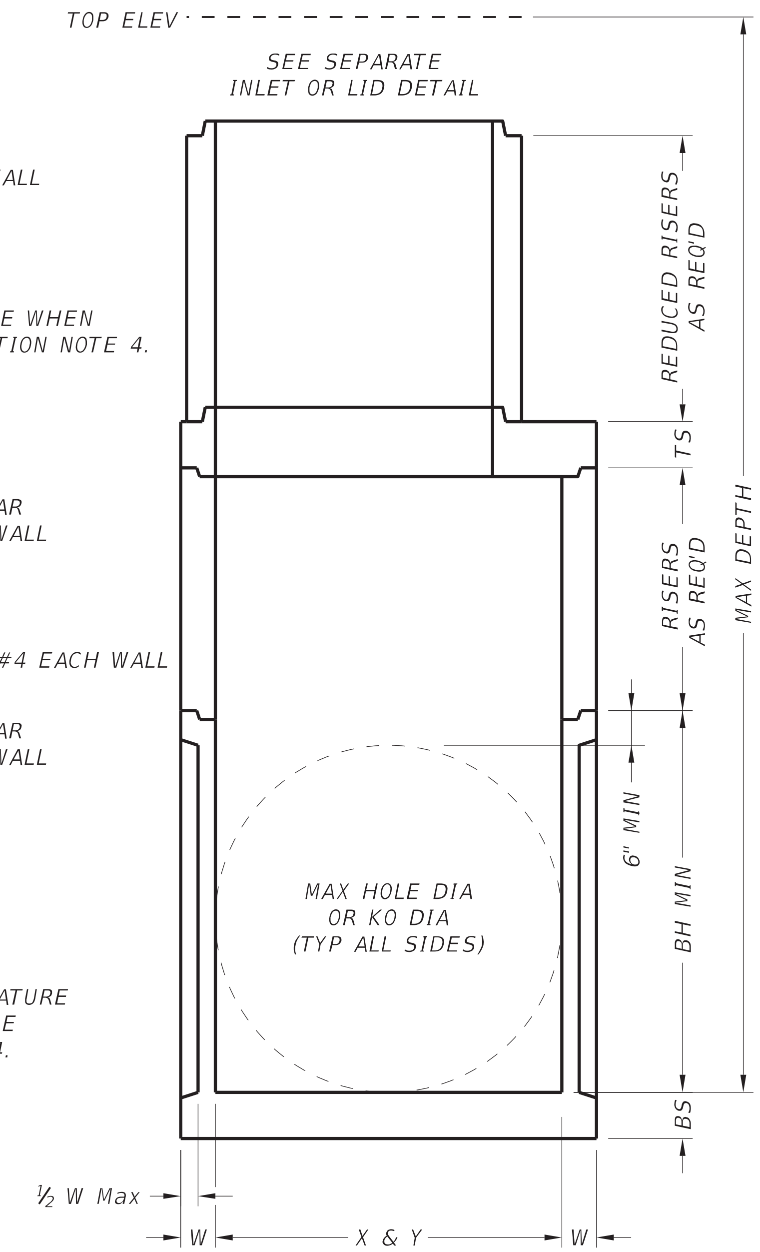
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

Cover dimensions are clear dimensions, unless noted otherwise.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 6443	SECT 54	JOB 001	HIGHWAY IH0020
REVISIONS	DIST 18		COUNTY DALLAS	SHEET NO. 45

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SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)		PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)		TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	
		Pure Live Seed Rate**		Pure Live Seed Rate**		Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th						Pure Live Seed Rate**
					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

TXDOT REFERENCE MATERIALS:

- * "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" 2014
- "A GUIDANCE TO ROADSIDE VEGETATION ESTABLISHMENT" 2004
- ONLINE TRAINING COURSE: MNT415 REVEGETATION DURING CONSTRUCTION
- DALLAS DISTRICT "VEGETATION ESTABLISHMENT GUIDELINES"

SODDING FOR EROSION CONTROL ITEM 162* BLOCK SOD (BERMUDA) SY

BLOCK OR ROLL SOD	COMMON NAME	BOTANICAL NAME
	Common Bermuda Grass	Cynodon dactylon

SODDING NOTES:
1. Refer to Item 162 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Place sod between the average date of the last freeze in the Spring and 6 weeks before the average date of the first freeze in the Fall, per the Texas Almanac for the project area.
3. Place sod only AFTER soil surface preparation is complete as detailed in this sheet. Dry soil may require pre-watering.
4. Place all sod (blocks or rolls) within 24 hours of delivery to the site, and keep moist from the time it is dug up until it is planted. Sod with dried roots will not be accepted.
5. Place sod with joints alternating on each row to prevent all joints from lining up, and place blocks firmly against adjacent blocks. Roll, tamp and trim sod per Item 162.3.
6. Place fertilizer promptly AFTER sodding operation is complete in each area.
7. Water sod immediately following placement, and continue Vegetative Watering per Item 168.

VEGETATIVE WATERING FOR ESTABLISHING SEED AND SOD ITEM 168* VEGETATIVE WATERING MG

WATERING SCHEDULE

SEASON (Usual Months)	RATE	TIME SCHEDULE	TOTAL WATER ESTIMATE
SPRING & FALL (March, April, May, October)	7,000 gallons/acre per working day	Vegetative watering for seed shall begin on the day after rainfall described below and continue for 60 consecutive working days; vegetative watering for sod shall begin on the day the sod is placed and continue for a minimum of 15 consecutive working days.	420,000 gallons/acre (60 working days)
SUMMER (June, July, August, September)	12,000 gallons/acre per working day		720,000 gallons/acre (60 working days)
WINTER (November through February)	1,000 gallons/acre per working day	Vegetative watering for seed and/or sod shall begin on the day after placement for 15 consecutive working days	15,000 gallons/acre (15 working days)

Notes: Rate and frequency may be adjusted, with the approval of the Engineer, to meet site conditions (especially with sod).
For informational purposes only: 1,000 gallons equals 1 MG

VEGETATIVE WATERING NOTES:
1. Refer to Item 168 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Use clean water free of industrial waste and other substances harmful to vegetation growth, per Item 168.2.
3. Use Vegetative Watering to keep the seed bed moist during germination; not to provide initial watering. After drill seeding, postpone watering operations until site receives at least 1/2-inch of natural rainfall in a single day. Delay watering operations for warm season grasses until soil temperature exceeds 70 degrees F.
4. For sod, water immediately.
5. All water distribution equipment shall be furnished and operated to provide water at a uniform and controllable rate. Use a metering device on all watering equipment.
6. Evenly distribute water over entire area designated for seeding and/or sodding, using even spray patterns that do not disturb seed bed and/or dislodge seed from seed bed.
7. Do not water between the hours of 12:00 p.m. and 6:00 p.m. when daytime temperatures exceed 95 degrees F.
8. After initial establishment period, continue intermittent watering of newly established seed or sod at a rate of approximately 1-inch water/week, during summer months until end of contract.
9. If 1/4-inch or more of rainfall occurs on site on any given working day, no vegetative watering will be needed on that working day. (Note: 1/4-inch rain equals 7,000 gallons of water per acre.)
10. Should the Contractor fail to apply the specified amount of water within the time allowed, any seed or sod in poor condition shall be replaced, fertilized, and watered at Contractor's expense.

**Note: The amount of Pure Live Seed (PLS) in one pound of bulk seed is based on three factors: % Purity, % Germination, and % Dormant. Use the following formula to calculate PLS in bulk seed: PLS = % Purity X (% Germination + % Dormant) Ensure that the specified amount of pure live seed is placed.

ROADSIDE MOWING ITEM 730* PROJECT MAINTENANCE AC

MOWING NOTES:
1. During project construction, once seed is established, use mowing to promote permanent grasses by mowing any remaining temporary grasses.
2. Also mow established turf and ROW grasses in designated areas of project limits as specified or directed by Engineer.
3. Remove litter and debris prior to mowing.
4. Do not mow on wet ground when soil rutting can occur.
5. Hand-trim around obstructions and stormwater control devices as needed.
6. Maintain paved surfaces free of tracked soils and clipped vegetation.

SEQUENCE OF WORK:

- CULTIVATE SURFACE SOIL.
- PREPARE / PLACE TOPSOIL, OR
- PREPARE / PLACE COMPOST MANUFACTURED TOPSOIL.
- APPLY FERTILIZER AND THEN PLACE SEEDING, OR
- PLACE SOD AND THEN APPLY FERTILIZER.
- CONDUCT VEGETATIVE WATERING.
- CONDUCT ROADSIDE MOWING, AS DIRECTED.

Texas Department of Transportation

VEGETATION ESTABLISHMENT SHEET

(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CPB	6	RMC-644354001		IH0020
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DN	TEXAS	DALLAS	DALLAS	46
CHECK	CONTROL	SECTION	JOB	
NP	6443	54	001	
CHECK				
DN				

DATE