FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		1
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	ECTOR, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
6375	31	001	HI 20, ETC

AREA OF DISTURBED SOIL = 0.0 ACRES

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
HIGHWAY ROUTINE MAINTENANCE CONTRACT

TYPE OF WORK:

BRIDGE REPAIR

PROJECT NO. : RMC 637531001

HIGHWAY: HI 20, ETC

LIMITS OF WORK: VARIOUS

INDEX OF SHEETS

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED
PROFESSIONAL ENGINEER

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

DocuSigned by:
Jose A. Renteria, P.E. , 4/5/2021
0AD71A03F9264BE... DATE

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT.

01Title Sheet.dgn

SEE "LOCATION MAP"

EXCEPTIONS: NONE
EQUATIONS: NONE
RR CROSSINGS: SEE RR CROSSING SHEET

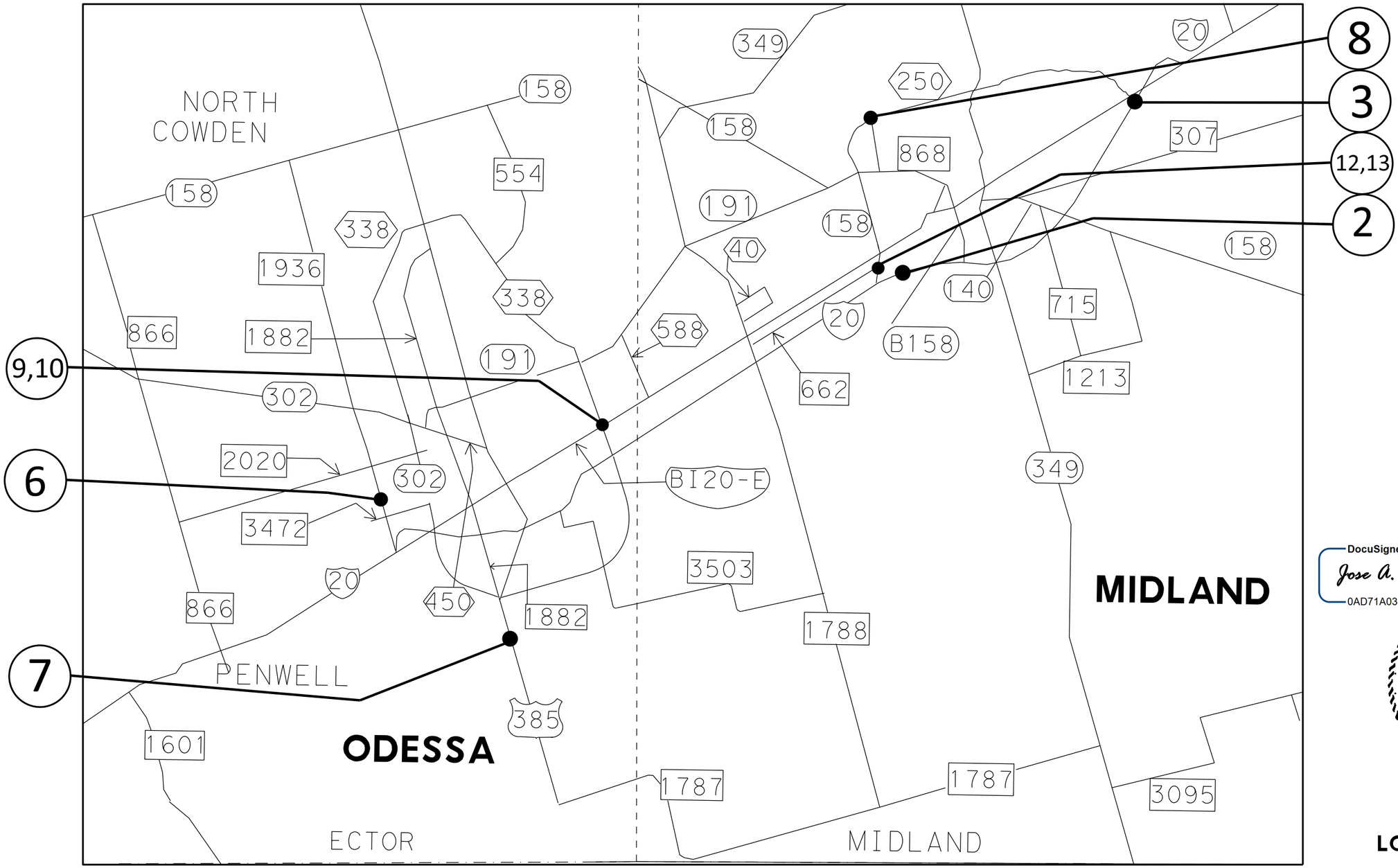
Texas Department of Transportation

SUBMITTED FOR LETTING: 4/5/2021 DATE

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE... MAINTENANCE ENGINEER

APPROVED FOR LETTING: 4/5/2021 DATE

DocuSigned by:
Daylon C. Windham, P.E.
BD08607F6E9645C... DIRECTOR OF OPERATIONS



DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...
4/5/2021

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

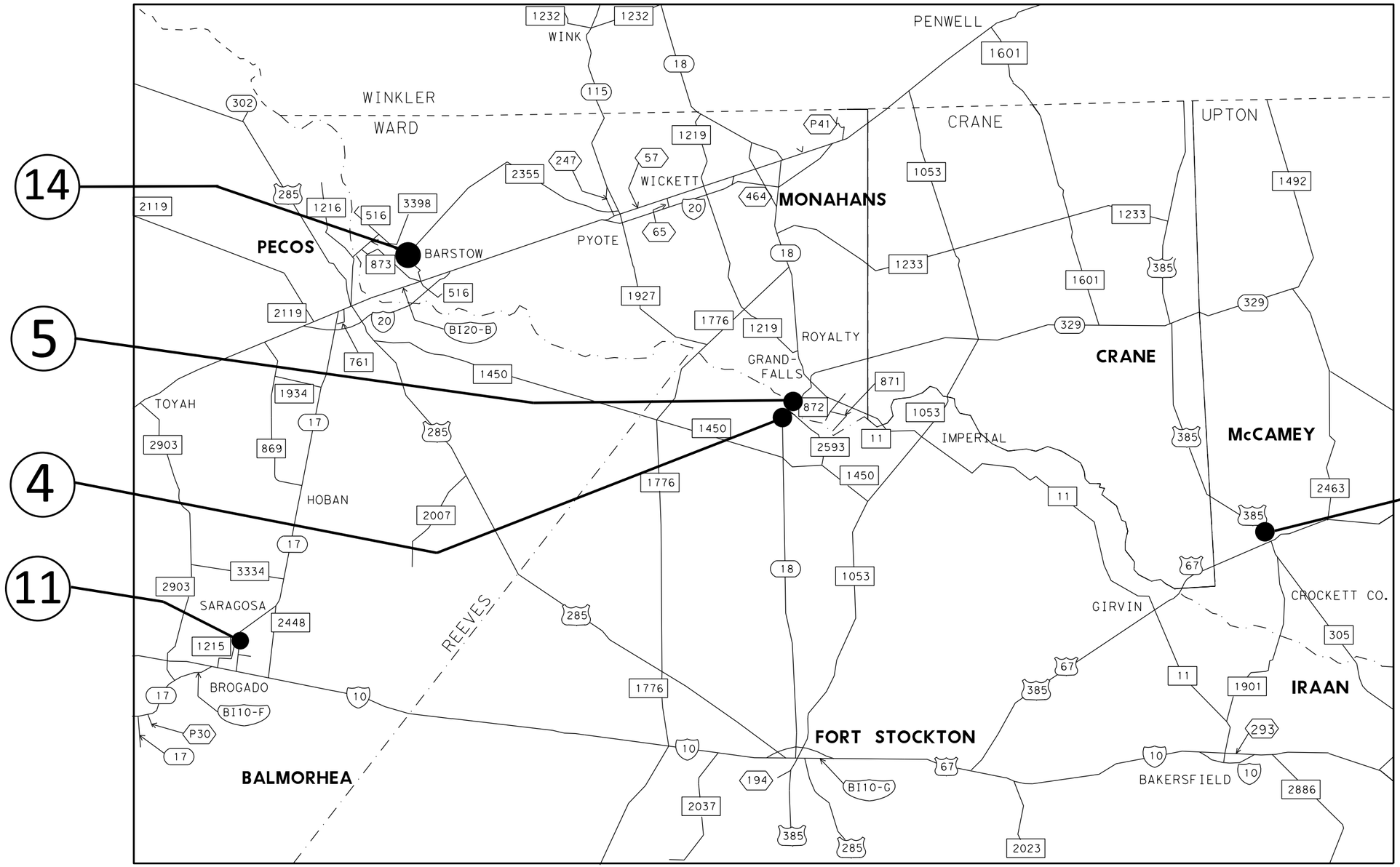
LOCATION MAP

SHEET 1 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		2
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

map-odessa.dgn



4/5/2021

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...

LOCATION MAP

SHEET 2 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		3
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

map-odessa.dgn

	NO	COUNTY	RDWY	FEATURE CROSSED	APPROX. REFERENCE MARKER	LATITUDE & LONGITUDE	NBI #
1	1	McCAMEY	US 385	DRAINAGE DITCH	408+1.712	LAT: 31.14572768 LONG: -102.22978945	06-231-0-0229-04-015
2	2	MIDLAND	HI 20 BUS (SB)	DRAW	317+0.356	LAT: 31.96931085 LONG: -102.12602788	06-165-0-0005-02-015
3	3	MIDLAND	HI 20 (WB)	LOOP 250	143+0.067	LAT: 32.03219444 LONG: -101.9879444	06-165-0-0005-15-269
4	4	MONAHANS	SH 18	IMPERIAL CANAL	374+0.941	LAT: 31.29408889 LONG: -102.8853861	06-186-0-0292-05-008
5	5	MONAHANS	SH 18	PECOS RIVER	372+0.543	LAT: 31.30550868 LONG: -102.8772916	06-238-0-0292-04-026
6	6	ECTOR	FM 1936	MONAHANS DRAW	330+0.079	LAT: 31.8344906 LONG: -102.4410428	06-069-0-1822-01-166
7	7	ECTOR	US 385	DRAW	362+0.239	LAT: 31.7514396 LONG: -102.3610638	06-069-0-0229-01-019
8	8	MIDLAND	LP 250 (WB)	MIDLAND DR	276+0.365	LAT: 32.02926735 LONG: -102.14532439	06-165-0-1188-02-014
9,10	9,10	ECTOR	E SL 338 (NB)	AT BI-20	279+0.12	LAT: 31.87416648 LONG: -102.31005493	06-069-0-2224-01-229
			E SL 338 (SB)	AT BI-20	279+0.12	LAT: 31.87407348 LONG: -102.31023793	06-069-0-2224-01-230
11	11	REEVES	SH 17	Toyah Creek	386+1.506	LAT: 31.02826805 LONG: -103.65319495	06-195-0-0103-02-008
12,13	12,13	MIDLAND	LP 250 NB/ SH 158WB	BI 20 FM 662 AND UP RR	281+0.417	LAT: 31.96046288 LONG:-102.1413309	06-165-0-1188-02-231
			LP 250 SB/ SH 158EB	BI 20 FM 662 AND UP RR	281+0.417	LAT: 31.9617338 LONG: -102.14195417	06-165-0-1188-02-232
14	14	MONAHANS	RM 2355	DRAW	198+0.42	LAT: 31.48526642 LONG: -103.40345053	06-238-0-2806-02-001

map-odessa.dgn

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

4/5/2021

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...

LOCATION MAP

SHEET 3 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		4
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

GENERAL NOTES:

The Area Engineer (or Engineers) listed below will be responsible for oversight of this project once the project has been awarded:

Saul Romero, P.E., Odessa Area Engineer
3901 E. Highway 80
Odessa, Texas 79761
Phone (432) 498-4694
Fax (432) 498-4775
(Odessa Area Office)

If the bidder has any questions concerning preparation and submission of the proposal forms, contact:

David Alvarez, Contract Administrator
3901 E. Highway 80
Odessa, Texas 79761
Phone (432) 498-4640
Fax (432) 498-4680
(Odessa District Office)

The Maintenance Supervisor (or Supervisors) listed below will be the Engineer's representative in charge of the inspection of all work done in this contract.

Zane Honeyfield, Roadway Maintenance Supervisor
3901 E. Highway 80
Odessa, Texas 79761
Phone (432) 552-6767
Fax (432) 552-5201
(Odessa Maintenance Office)

Juan Rodriguez, Roadway Maintenance Supervisor
830 W 5th st.
McCamey, Texas 79752
Phone (432) 652-89-51
Fax (432) 652-8711
(McCamey Maintenance Office)

John Carrasco, Roadway Maintenance Supervisor
5100 W IH 20
Midland, Texas 79703
Phone (432) 694-7951
Fax (432) 694-6164
(Midland Maintenance Office)

George Salcido, Roadway Maintenance Supervisor
3411 S Stockton
Monahans, Texas 79756
Phone (432) 943-3271
Fax (432) 943-9811
(Monahans Maintenance Office)

Raul Melendez, Roadway Maintenance Supervisor
FM 2903, 2 mi N. of Balmorhea
P.O. Box 225
Phone (432) 375-2550
Fax (432) 375-2405
(Balmorhea Maintenance Office) (Reeves County)

Designate in writing the "On The Job Superintendent" authorized to act on behalf of the Contractor. Perform contract work only when the "On The Job Superintendent" is on the job site.

Each contract awarded by the Department stands on its own and 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.

Notify the responsible TxDOT office by telephone by 8:15 A.M. each morning that work is scheduled. Provide work location and time of arrival or reason for not working that day.

Restore surrounding site features which are damaged during construction operations to a condition as good as or better than that which previously existed. This work is at the Contractor's expense.

Minimize vehicles and equipment in construction areas to lessen the impact on existing vegetation. The intent of the plans is to prepare only that portion of the right-of-way necessary for construction. Excess damage to the vegetation in the right-of-way will be repaired at the Contractor's expense as directed.

Provide materials from approved sources.

Item 7. Legal Relations and Responsibilities

Restrict storage of equipment and materials to approved areas. The Engineer will not approve storage in any TxDOT yard.

Dispose of waste generated from servicing equipment on the project properly. Existing utilities (public, private and TxDOT) are present throughout the project. Investigate to determine the utility locations and use caution when excavating in those areas.

If access to the project is required through a new or unapproved driveway (ie. Material sources stockpile location, field office, etc.), obtain an approved "Permit to Construct Access Driveway Facilities on Highway Right of Way" (TxDOT Form 1058) before beginning any construction operations.

Item 8. Prosecution and Progress

The Engineer will give written notice to begin work. Once work has started, prosecute the work continuously to completion.

Maintain ingress and egress to side streets and private property at all times.

GENERAL NOTES

SHEET 1 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		5
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

Item 420: Concrete Structures

Mass concrete will be measured in place.

Item 421: Hydraulic Cement Concrete

Furnish Disposable 4" or 6" cylinder molds and caps that meet testing tolerances.

The Engineer will provide strength testing equipment for acceptance testing.

Furnish type II or IP cement.

All plants and trucks may be inspected and approved by the Engineer in lieu of the NRMCA or non-department Engineer sealed certifications. The criteria and frequency of the Engineer approval of the Engineer approval of plants and trucks in the same used for NRMCS certification.

Item 427: Surface Finishes for Concrete

For Surface Area I, provide a rub finish with the exception of abutments.

Item 467: Safety End Treatment

Provide shop drawings for pipe runners.

Item 502: Barricades, Signs, and Traffic Handling

Furnish, place and maintain all traffic control devices in accordance with the "Texas Manual on Uniform Traffic Control Devices" and traffic control standard sheets as specified herein, or as directed. All work zone or construction signs shall be factory made and in satisfactory condition.

Furnish flaggers to warn equipment operators of approaching traffic.

Relocate or remove temporary signs as necessary. This work is considered subsidiary to various bid items.

Stop work immediately if any major traffic control element such as an advanced warning flashing panel or TMA or PCMS is not in good working order or control setup.

Provide an advanced warning flashing arrow panel as a standby unit on the job site; the standby unit shall be in good working condition and ready for immediate use.

Place chevrons, at a minimum, on every other drum used for outsides of curves, merging tapers and shifting tapers.

Use a guardrail damage ahead (CW21-1) sign in advance of removed section of guardrail.

Vertical panels shall be self-righting.

Item 6001: Portable Changeable Message Sign

Location(s) and duration for PCMS shall be as directed by the Engineer.

Item 6185 - Truck Mounted Attenuator (TMA):

Work site is defined as the locations presented on the plans.

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

TCP 2 Series	Scenario	Required TMA
(2-1)-18	All	1
(2-2)-18	All	1
(2-3)-18	A	1
(2-3)-18	B	2
(2-4)-18	All	1
(2-6)-18	All	1

TCP 5 Series	Scenario	Required TMA
(5-1)-18	A	1
	B	2

TCP 6 Series	Scenario	Required TMA
(6-1)-12	A	1
	B	2
(6-2)-12	All	1
(6-3)-12	All	1

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

When TMAs are specified by the DAY, the unit of measure is for each day required by the contract.

GENERAL NOTES

SHEET 2 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		5A
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

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

When TMAs are specified by the DAY, the unit of measure is for each day required by the contract.

Therefore, 2 total shadow vehicles with TMA will be required for this type of work. 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. Additional TMA's approved by the Engineer will be paid for under Item 6185-6002 TMA (Stationary) by the day.

****
**

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

- David Alvarez David.Alvarez@txdot.gov
- Sergio Miranda Sergio.Miranda@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address: https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting Responses/

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

GENERAL NOTES

SHEET 3 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		5B
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

BRIDGE ITEM SUMMARY

			0401 6001	0420 6057	0427 6004	0429 6004	0429 6008	0438 6009	0454 6008	0454 6009	0467 6004	0544 6001	0544 6003	0776 6053	0780 6004
			FLOWABLE BACKFILL	CL C CONC (WINGWALLS)	SILICONE RESIN PAINT FINISH	CONC STR REPAIR (RAPID DECK REP (PRT DPT))	CONC STR REP (RAPID VERTICAL AND OVERHEAD)	CLEANING EXISTING JOINTS	HEADER TYPE EXPANSION JOINT	JOINT SEALANT	SET (REPLACE PIPE RUNNER)	GUARDRAIL END TREATMENT INSTALL	GUARDRAIL END TREATMENT REMOVE	REPLACE (STEEL RAIL)	CONC CRACK REPAIR (DISCRETE)(ROUT AND SEAL)
LOCATION	*DESCRIPTION*	*NBI #*	CY	CY	SF	SF	SF	LF	CF	LF	EA	EA	EA	LF	LF
1	US 385 at Drainage Ditch	06-231-0-0229-04-015					11.0					4.0	4.0		
2	IH 20 BUS at Draw	06-165-0-0005-02-015					50.0				1.0				
3	IH 20 WB at SL 250	06-165-0-0005-15-269				5.0	40.0								
4	SH 18 at Imperial Canal	06-186-0-0292-05-008					40.0								6.0
5	SH 18 at Pecos Relief	06-238-0-0292-04-026	5.0												
6	FM 1936 at Monahans Draw	06-069-0-1822-01-166				145.0	26.0								60.0
7	US 385 at Draw	06-069-0-0229-01-019					14.0								
8	SL 250 WB at Midland Drive	06-165-0-1188-02-014				32.0	10.0								50.0
9	E SL 338 NB at BI 20	06-069-0-2224-01-229			3,450.0		202.0								
10	E SL 338 SB at BI 20	06-069-0-2224-01-230			3,450.0		309.0								
11	SH 17 at Toyah Creek	06-195-0-0103-02-008					189.0							75.0	224.0
12	W SL 250 NB at BI 20	06-165-0-1188-02-231			2,320.0		158.0								308.0
13	W SL 250 SB at BI 20	06-165-0-1188-02-232			2,320.0		155.0	378.0	14.6	378.0					308.0
14	RM 2355 at Draw	06-238-0-2806-02-001		2.6			82.0								
		TOTAL	**5.0**	**2.6**	**11,540.0**	**182.0**	**1,286.0**	**378.0**	**14.6**	**378.0**	**1.0**	**4.0**	**4.0**	**75.0**	**956.0**

TRAFFIC CONTROL SUMMARY

			6001 6001	6185 6002
			PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)
LOCATION	*DESCRIPTION*	*NBI #*	DAY	DAY
1	US 385 at Drainage Ditch	06-231-0-0229-04-015	6	3
2	IH 20 BUS at Draw	06-165-0-0005-02-015	2	2
3	IH 20 WB at SL 250	06-165-0-0005-15-269	6	6
4	SH 18 at Imperial Canal	06-186-0-0292-05-008	3	3
5	SH 18 at Pecos Relief	06-238-0-0292-04-026	4	2
6	FM 1936 at Monahans Draw	06-069-0-1822-01-166	8	8
7	US 385 at Draw	06-069-0-0229-01-019	2	2
8	SL 250 WB at Midland Drive	06-165-0-1188-02-014	6	6
9	E SL 338 NB at BI 20	06-069-0-2224-01-229	15	15
10	E SL 338 SB at BI 20	06-069-0-2224-01-230	15	15
11	SH 17 at Toyah Creek	06-195-0-0103-02-008	15	15
12	W SL 250 NB at BI 20	06-165-0-1188-02-231	15	15
13	W SL 250 SB at BI 20	06-165-0-1188-02-232	18	18
14	RM 2355 at Draw	06-238-0-2806-02-001	8	4
		TOTAL	**123**	**114**

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

4/5/2021

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...

SUMMARY OF WORK

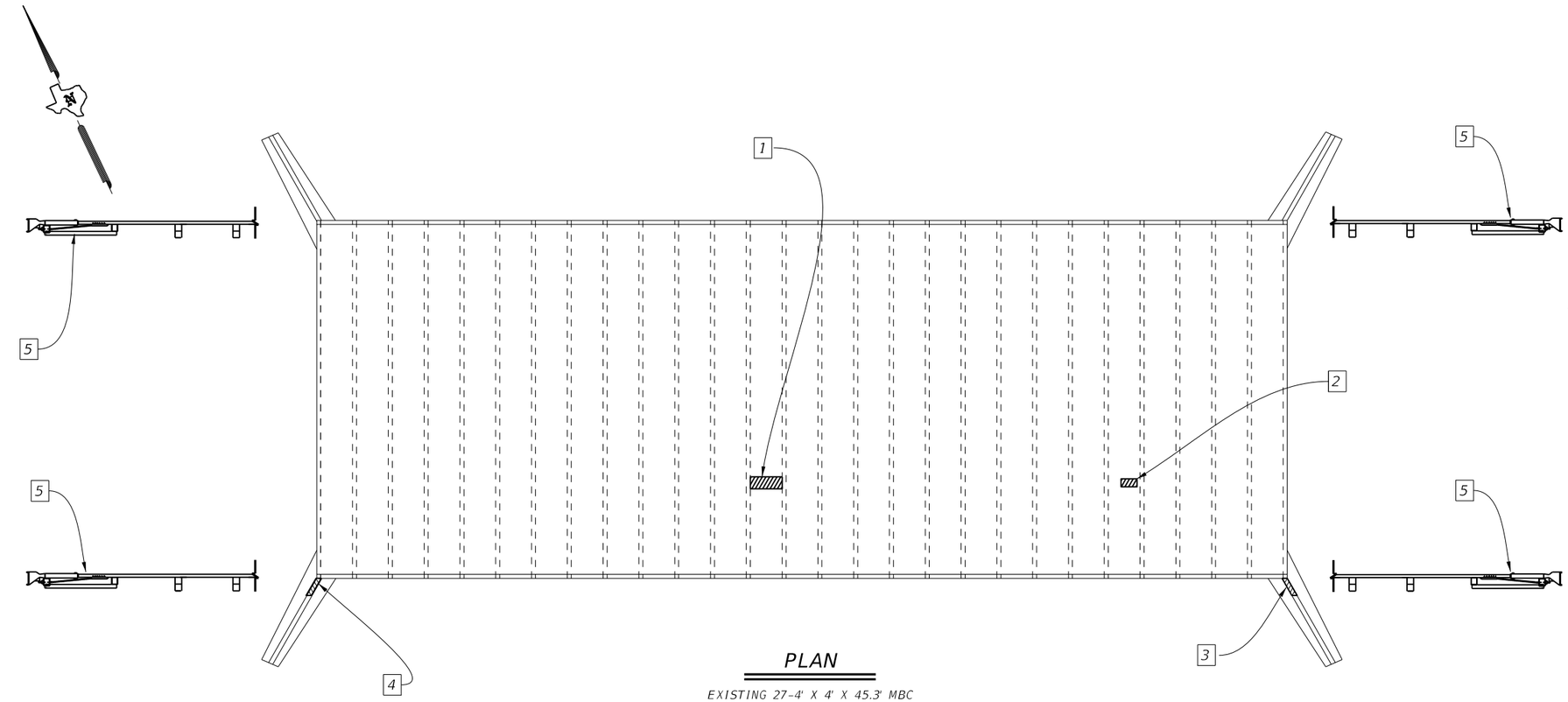
Texas Department of Transportation

FED. RD. DIV. NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 637531001		6
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

QUANTITY SHEET

CONTROLLING PROJECT ID 6375-31-001 **DISTRICT** Odessa **COUNTY** Ector
HIGHWAY IH0020

			CONTROL SECTION JOB		**6375-31-001**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00139388**		
			COUNTY		**Ector**		
			HIGHWAY		**IH0020**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	401-6001	FLOWABLE BACKFILL	CY	5.000		5.000	
	420-6057	CL C CONC (WINGWALLS)	CY	2.600		2.600	
	427-6004	SILICONE RESIN PAINT FINISH	SF	11,540.000		11,540.000	
	429-6004	CONC STR REPAIR(RAPID DECK REP(PRT DPT)	SF	182.000		182.000	
	429-6008	CONC STR REPR(RAPID VERT AND OVERHEAD)	SF	1,286.000		1,286.000	
	438-6009	CLEANING EXISTING JOINTS	LF	378.000		378.000	
	454-6008	HEADER TYPE EXPANSION JOINT	CF	14.600		14.600	
	454-6009	JOINT SEALANT	LF	378.000		378.000	
	467-6004	SET (REPLACE PIPE RUNNER)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	776-6053	REPLACE (STEEL RAIL)	LF	75.000		75.000	
	780-6004	CNC CRCK REPAR(DISCRETE)(ROUT AND SEAL)	LF	956.000		956.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	123.000		123.000	
	6185-6002	TMA (STATIONARY)	DAY	114.000		114.000	



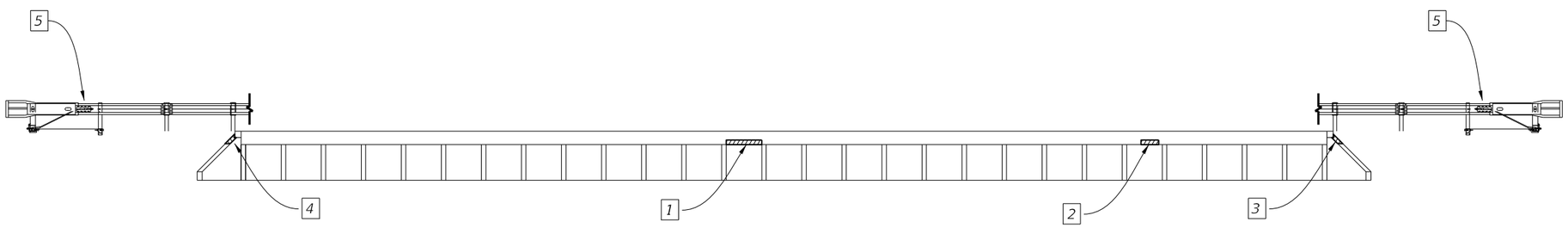
PLAN

EXISTING 27-4' X 4' X 45.3' MBC

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	6
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	2
3	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	2
4	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	1
5	0544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4
	0544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4

1. Spall (~ 4' L x 1.5' W x 0.1' D) with exposed rebar in the top slab of barrel #13 (from Northwest) at the Southwest widening joint.
2. Spall (~ 1.9' L x 0.6' W x 0.1' D) with exposed rebar in the top slab of barrel #23 at the Southwest widening joint.
3. The southeast wingwall is cracked and has a spall of (~ 2.3' L x 0.6' W x 0.2' D) with exposed rebar.
4. The southwest wingwall is cracked and has a spall of (~ 2.0' L x 0.5' W x 0.2' D) with exposed rebar.
5. Remove and replace all corner guardrail end treatments.



ELEVATION

EXISTING 27-4' X 4' X 45.3' MBC

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...
4/5/2021

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

NOT TO SCALE

DATE:

SHEET 1 OF 1

Texas Department of Transportation

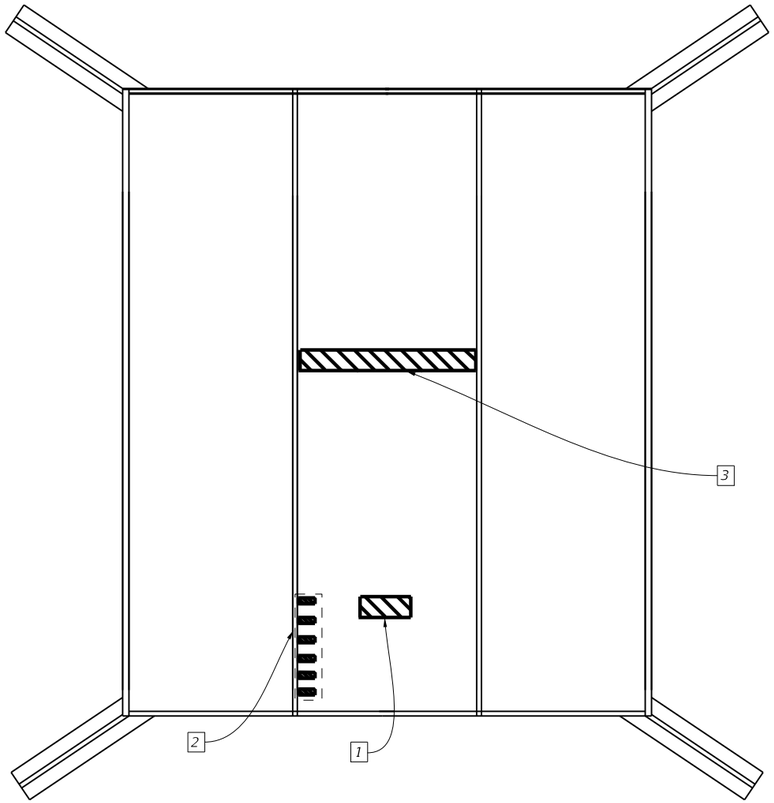
LOCATION #1 REPAIR DETAILS

NBI NO: 06-231-0-0229-04-015

US 385-DRAINAGE DITCH

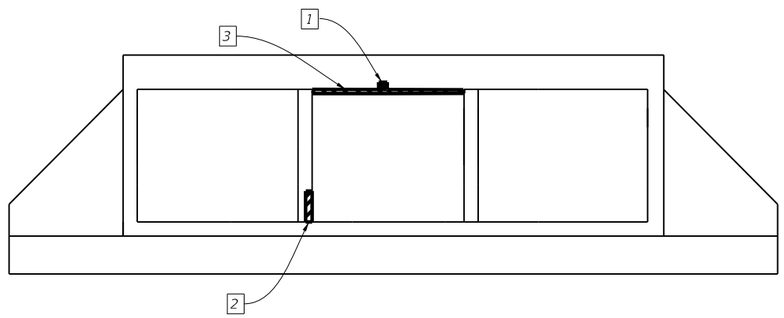
REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		7



PLAN

EXISTING 3-10' X 4' X 132' MBC



ELEVATION

EXISTING 3-10' X 4' X 132' MBC

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	3
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	7
3	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	40
4	0467-6004	SET (REPLACE PIPE RUNNER)	EA	1

1 There is a spall (~3'L x 1' W x 0.2' D) with exposed rebar in the top slab of center barrel along the widening joint.

2 There are several cover spalls (up to 1.3' H X 0.8' W X 0.1' D) with exposed rebar along the bottom edge of center barrel wall..

3 There is a delamination (~10' x 4') in the top slab of center barrel.

4 There is one safety end treatment pipe runner that is in two pieces at the NW end of the center barrel. Refer to sheet 2 of 2

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

DATE:

4/5/2021

STATE OF TEXAS
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137506
LICENSED
PROFESSIONAL ENGINEER

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0AD71A03F9264BE...

NOT TO SCALE

SHEET 1 OF 2

Texas Department of Transportation

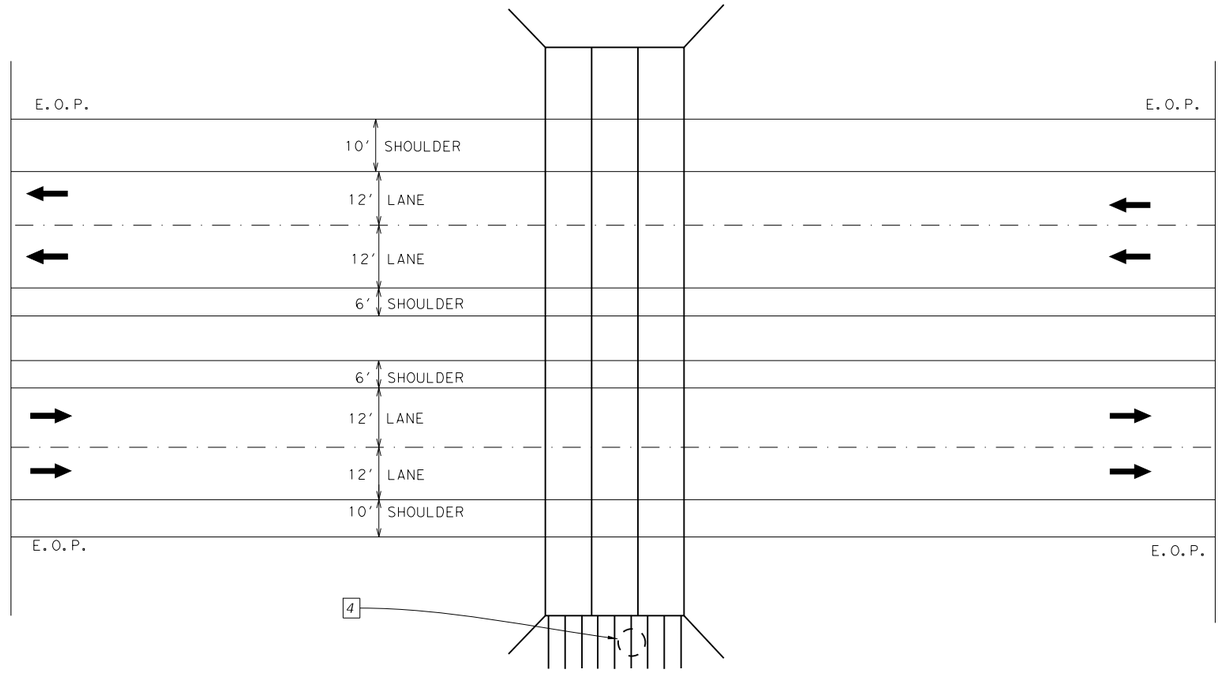
LOCATION #2 REPAIR DETAILS

NBI NO: 06-165-0-0005-02-015

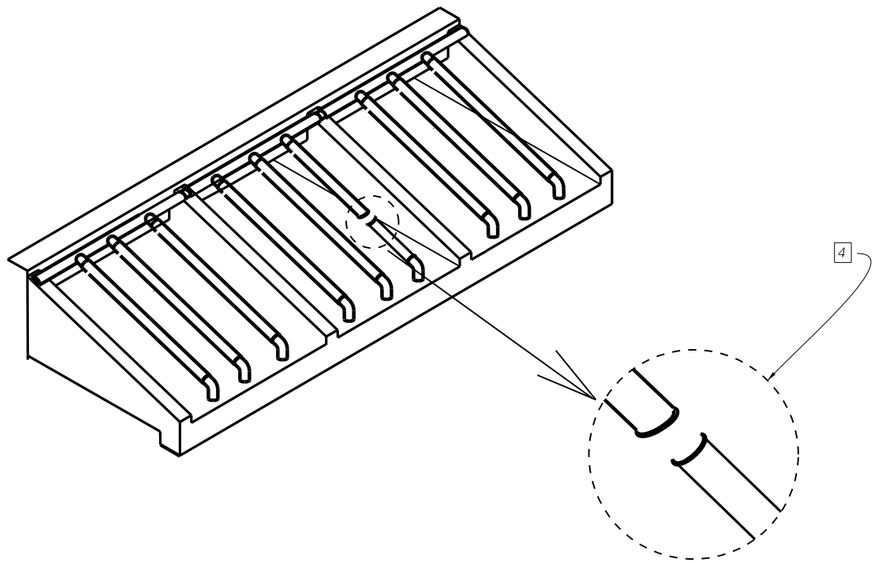
IH 20 BUS AT DRAW

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC		8



PLAN



Repair or replace the cut pipe runner in the safety end treatment at the North side.

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4/5/2021

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SHEET 2 OF 2

Texas Department of Transportation

LOCATION #2 REPAIR DETAILS

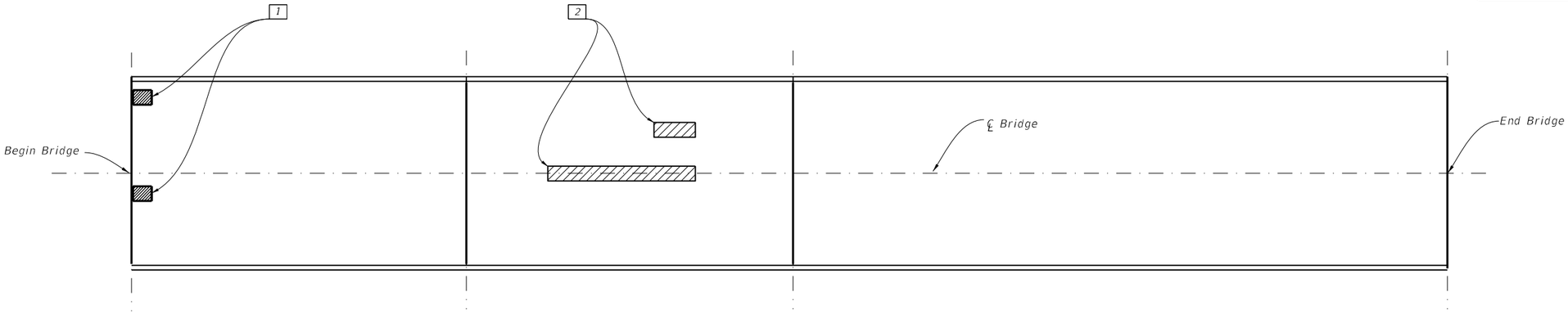
NBI NO: 06-165-0-0005-02-015

IH 20 BUS AT DRAW

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	0DA	ECTOR, ETC		9

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6004	CONC STR REPAIR (RAPID DECK REP(PRT DPT))	SF	5
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	40



PLAN

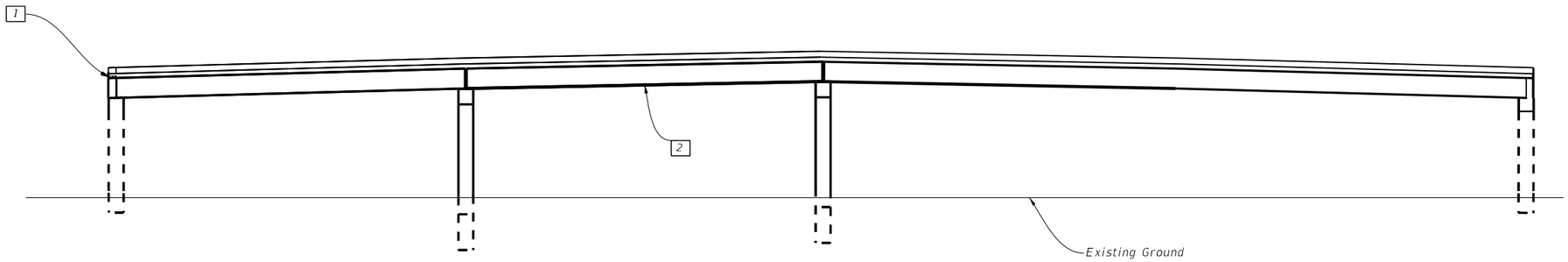
1 There are asphalt patched spalled areas (~ 2' x 2' & ~ 1' x 1') in the Southwest approach slab.

2 There is minor to moderate spalling (~15'L) in beams #2 and 3 (from Northwest) in the Southwest span that was caused by vehicle fire beneath the span.

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).



ELEVATION

SHEET 1 OF 1

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Texas Department of Transportation

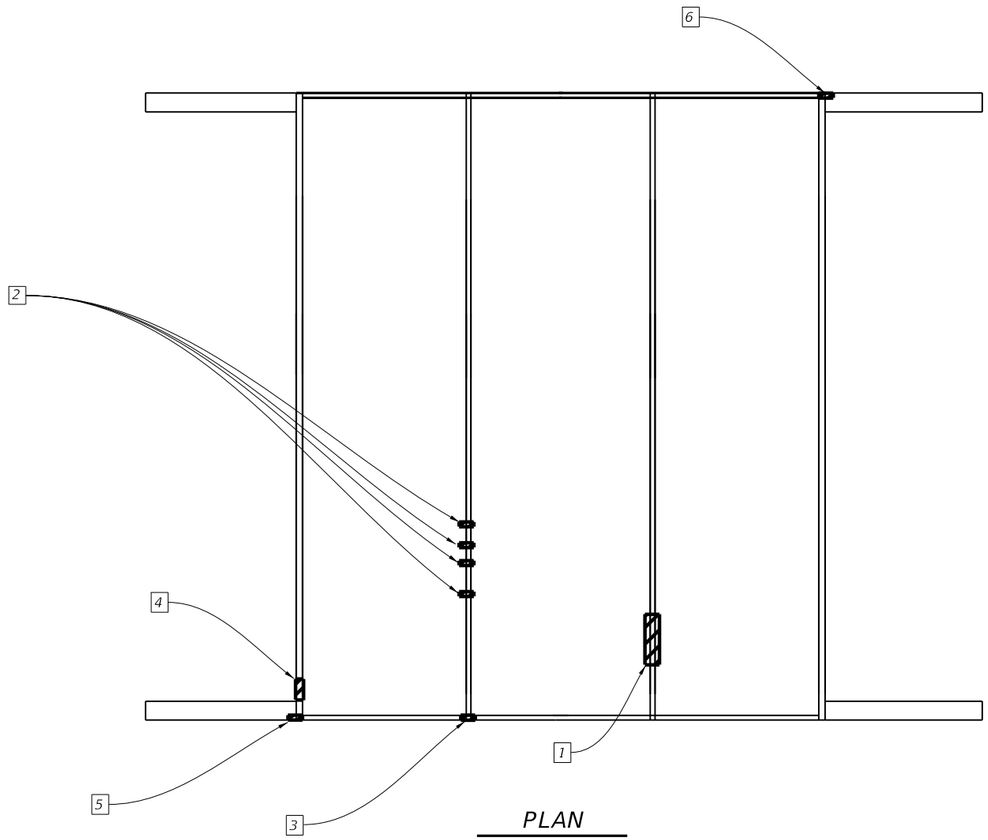
LOCATION #3 REPAIR DETAILS

NBI NO: 06-165-0-0005-15-269

IH 20 WB AT SL 250

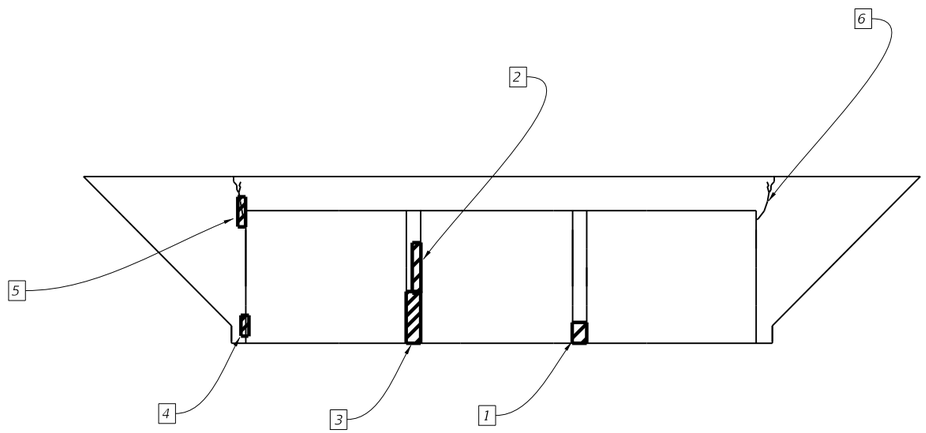
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	0DA	ECTOR, ETC		10

DATE:



PLAN

EXISTING 3-10' X 8' X 64.1' MBC



ELEVATION

EXISTING 3-10' X 8' X 64.1' MBC

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD	SF	13
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD	SF	9
3	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD	SF	10
4	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD	SF	5
5	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD	SF	3
	0780-6004	CNC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	LF	3
6	0780-6004	CNC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	LF	3

1. There is spalling (up to ~ 5' L x 2.5' H x 1" D) with exposed rusted rebar in intermediate wall #3 (from South).
2. There are several spalls (up to ~ 1.5' H x 1.5' W x shallow depth) with exposed rusted rebar.
3. Spall (~3.5 H x 0.8 W x 0.2' D) with exposed rebar at East end of intermediate wall #2 (from South).
4. There is a spall (~ 2' L x 2.5' H x 1" D) rebar at the West end of the South abutment wall.
5. The Southwest wingwall has vertical cracks at the abutment wall and headwall connection with delamination/spalled cracks (up to 1/8") width).
6. The Northeast wingwall has vertical cracks at the abutment wall and headwall connection.

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #4 REPAIR DETAILS

NBI NO: 06-186-0-0292-05-008

SH 18 AT IMPERIAL CANAL

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		11

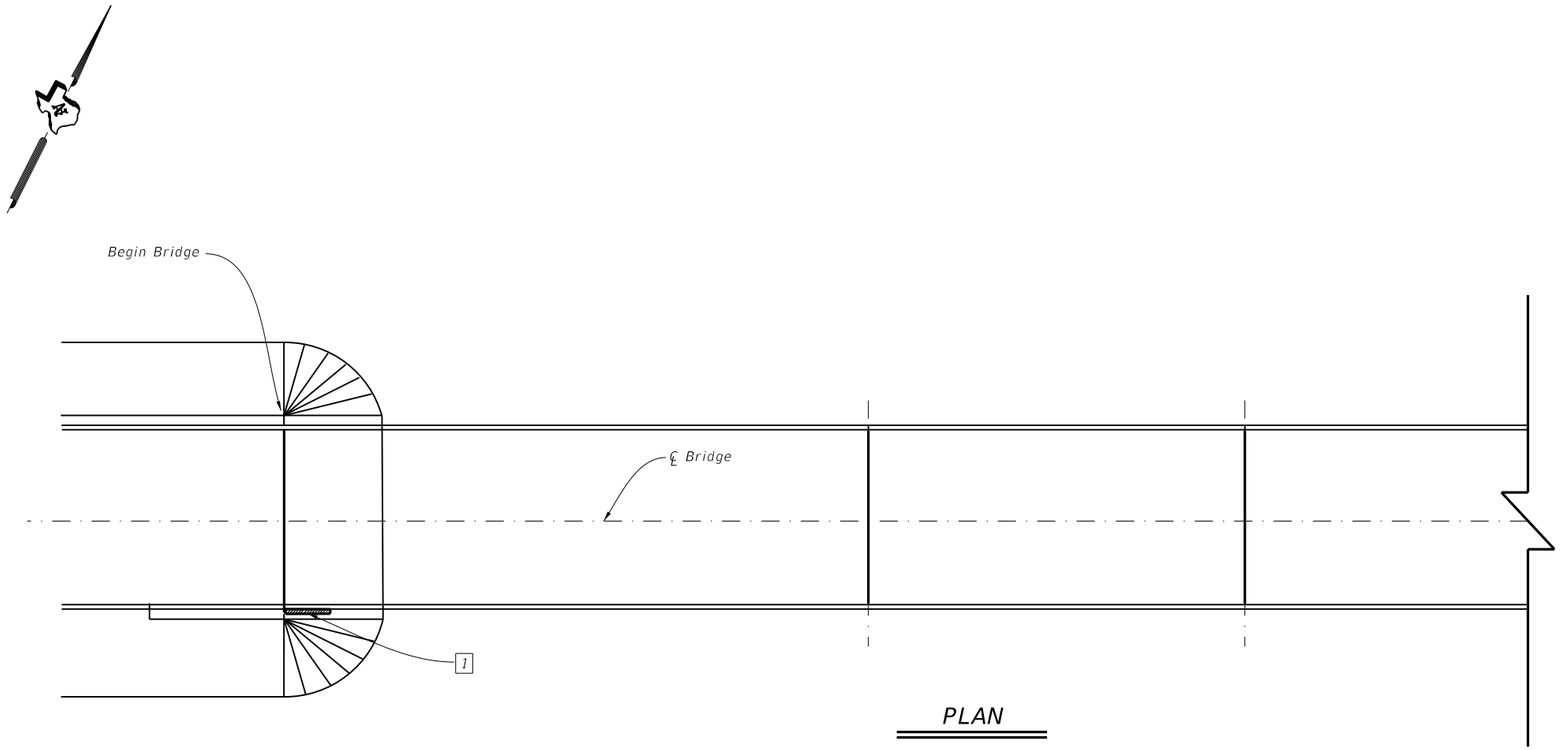
DATE:

NOT TO SCALE

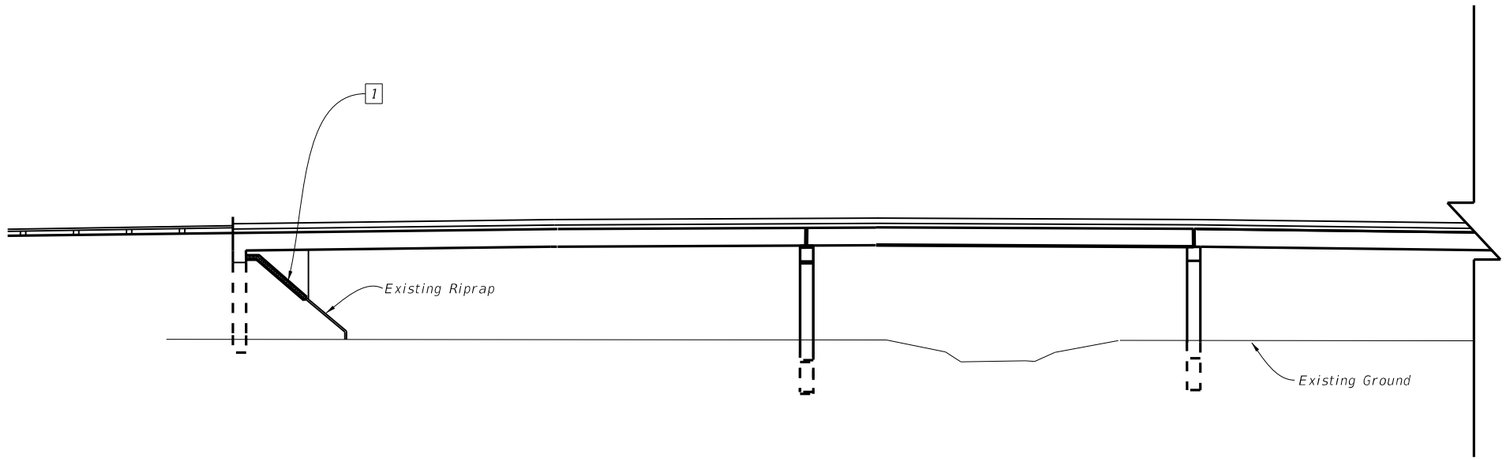
TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0401-6001	FLOWABLE BACKFILL	CY	5

1 The South corner riprap has separated (up to 1.5") from wingwall. Seal gap between the South corner riprap and the South wingwall.



PLAN



ELEVATION

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #5 REPAIR DETAILS

NBI NO: 06-238-0-0292-04-026

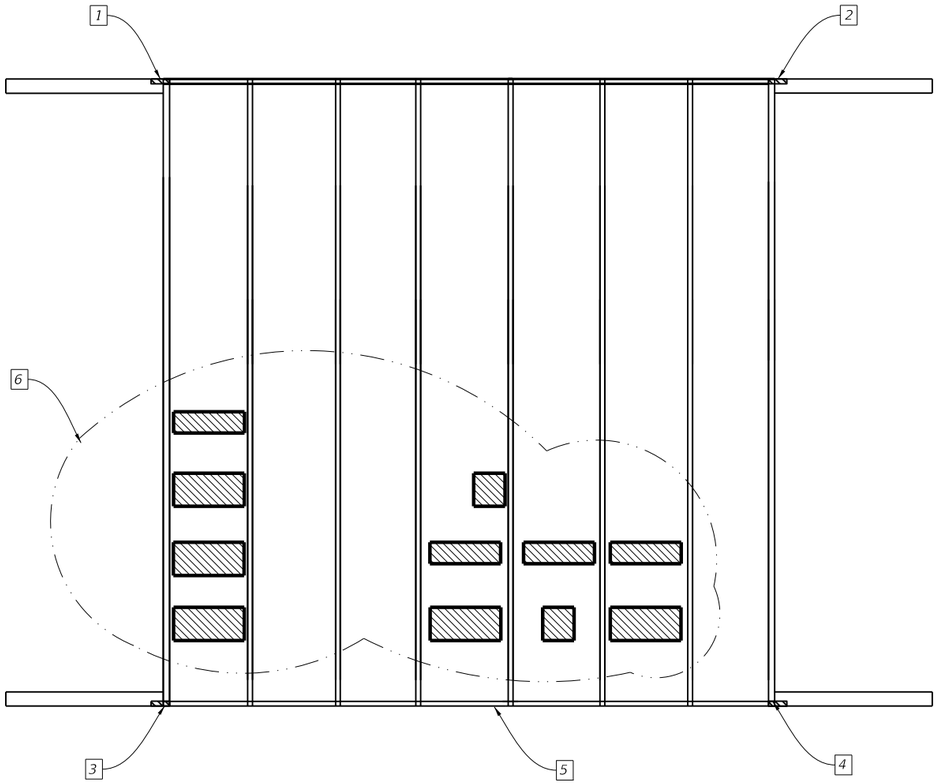
SH 18 AT PECOS RELIEF

DATE:

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	0DA	ECTOR, ETC		12

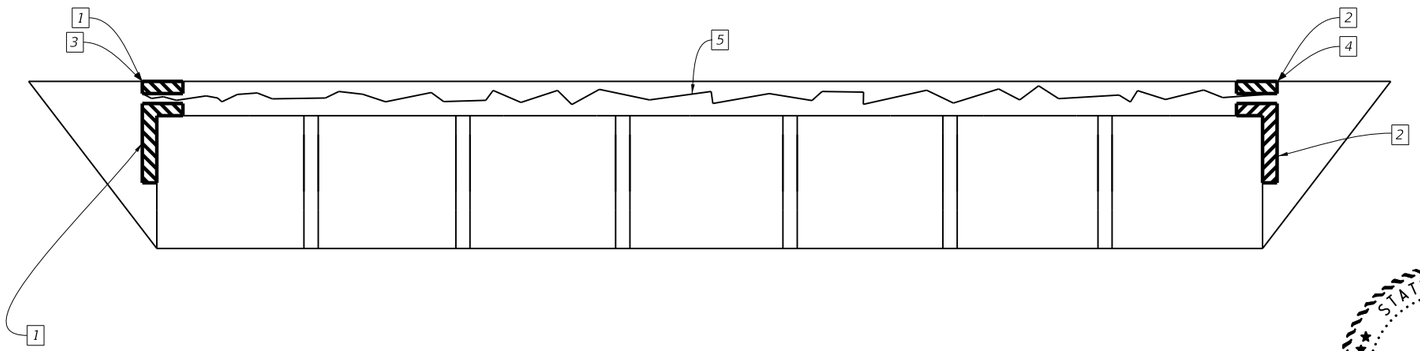
TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	5
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	5
3	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	8
4	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	8
5	0780-6004	CNC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	LF	60
6	0429-6004	CONC STR REP (RAPID DECK REP(PRT DPT))	SF	145



PLAN

EXISTING 7 ~ 8' X 4' MBC



ELEVATION

EXISTING 7 ~ 8' X 4' MBC

1 Northeast corner of culvert has spalling, delamination, and vertical cracking at abutment to wingwall to headwall connection.

2 Southeast corner of culvert has spalling, delamination, and vertical cracking at abutment to wingwall to headwall connection.

3 Northwest corner of culvert has spalling (~0.8' L x 0.6' H x 1'D), delamination and vertical cracking at abutment to wingwall to headwall connection.

4 Southwest corner of culvert has spalling (~ 1.2' L x 0.8' W x 0.2' D), delamination and cracking at abutment to wingwall to headwall connection.

5 There is a horizontal crack (up to 1/4" wide) the full length of the West headwall.

6 There are several spalled areas in the top surface (some have been patched with asphalt).

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

SHEET 1 OF 1

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

4/5/2021

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0AD71A03F9264BE...

DATE:

NOT TO SCALE

Texas Department of Transportation

LOCATION #6 REPAIR DETAILS

NBI NO: 06-069-0-1822-01-166

FM 1936 AT MONAHANS DRAW

REVISIONS

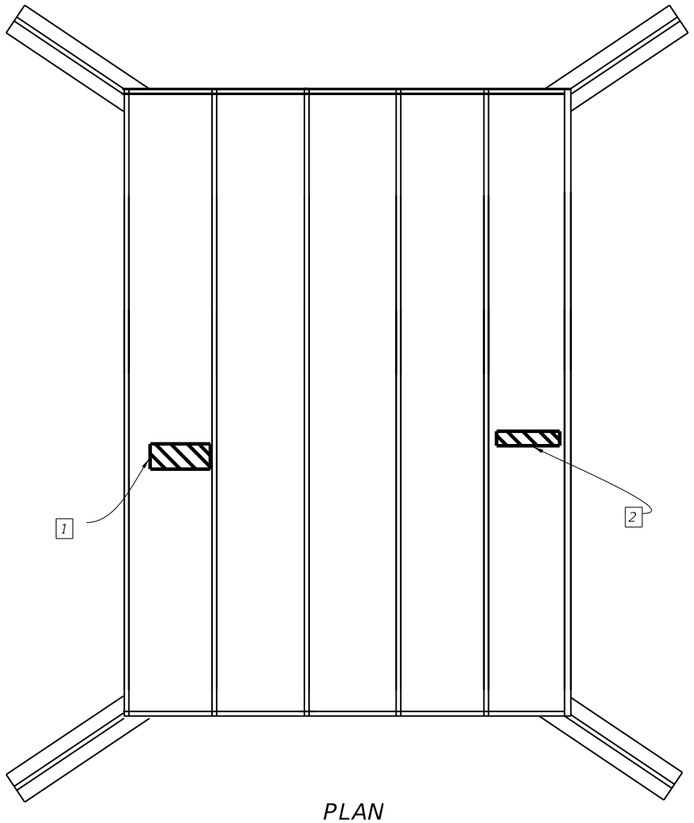
CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC		13

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	12
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	2

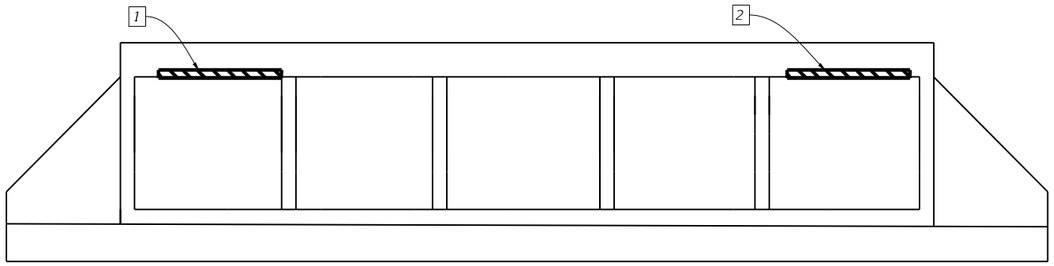
1 There is a spall (~ 4' L x 3' W x 0.2' D) with exposed rebar along the West widening joint in the top slab of the North barrel

2 There is a spall (~ 4' L x 0.5' W x 0.2' D) with exposed rebar along the West widening joint in the top slab of the South barrel.



PLAN

EXISTING 5 ~ 6' X 3' X 166' MBC



ELEVATION

EXISTING 5 ~ 6' X 3' X 166' MBC

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

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4/5/2021

STATE OF TEXAS
JOSE ALVINO RENTERIA
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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #7 REPAIR DETAILS

NBI NO: 06-069-0-0229-01-019

US 385 AT DRAW

NOT TO SCALE

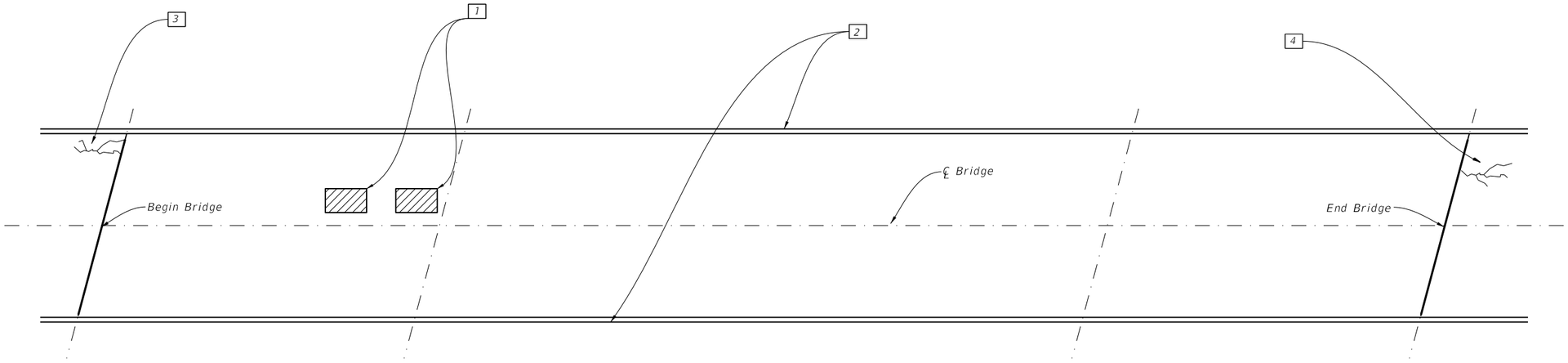
DATE:

REVISIONS

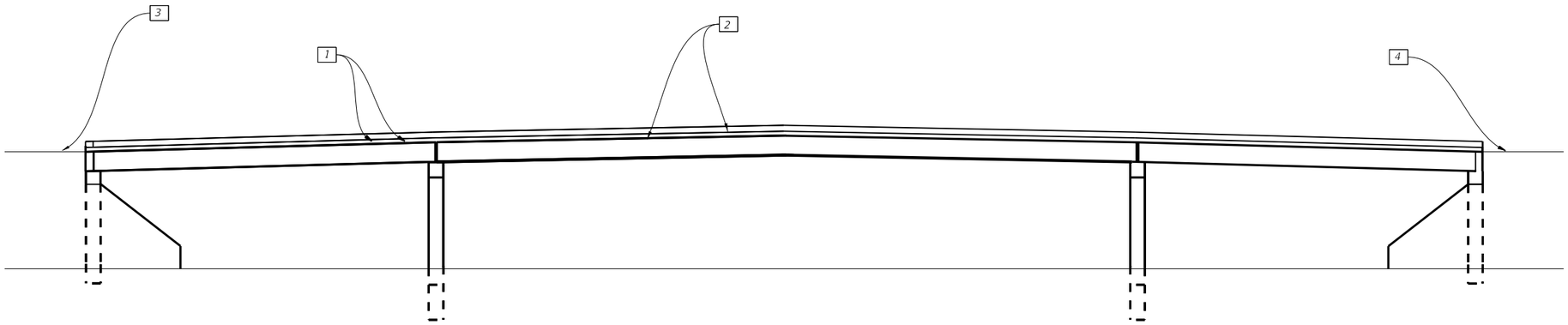
CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		14

TABLE OF ESTIMATED QUANTITIES

LOCATION OF REPAIR	ITEM	DESCRIPTION	UNIT	QTY
1	0429-6004	CONC STR REPAIR (RAPID DECK REP(PRT DPT))	SF	32
2	0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	10
3	0780-6004	CNC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	LF	25
4	0780-6004	CNC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	LF	25



PLAN



ELEVATION

1 There are asphalt patched spalled areas in the passing lane 65' from West armor joint.

2 Areas of T5 railing have small minor spalls with short lengths of exposed corroded rebar.

3 Concrete approach slabs have moderate settlement cracks (up to ~1/8" wide). Seal the moderate settlement cracking at both approaches.

4 Concrete approach slabs have moderate settlement cracks (up to ~1/8" wide). Seal the moderate settlement cracking at both approaches.

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

STATE OF TEXAS
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4/5/2021

DATE:

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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #8 REPAIR DETAILS

NBI NO: 06-165-0-1188-02-014

SL 250 WB AT MIDLAND DRIVE

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		15

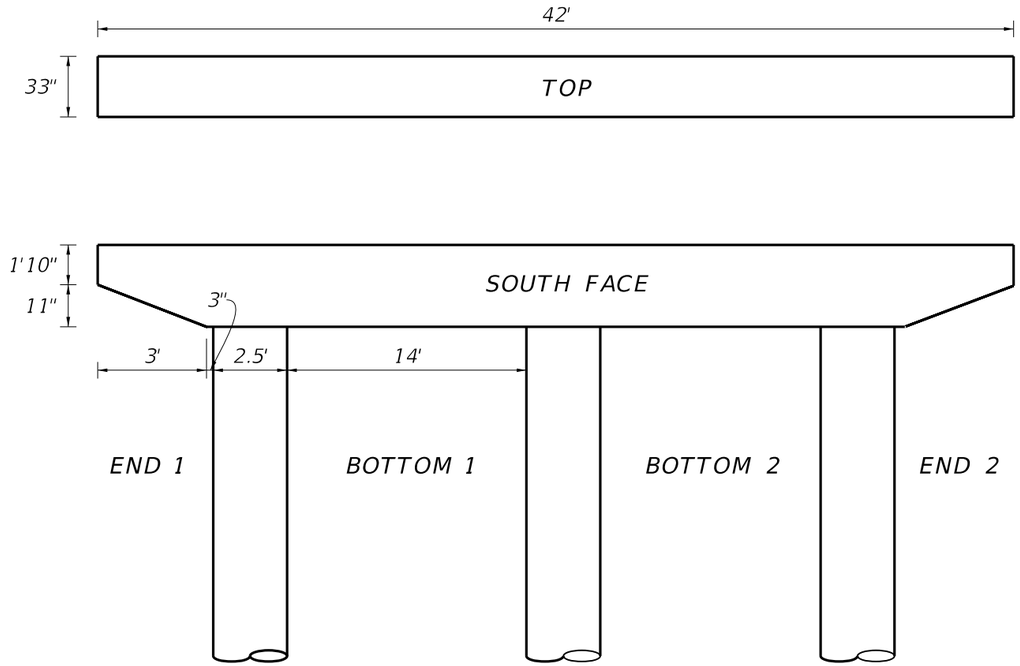


TABLE OF ESTIMATED QUANTITIES			
ITEM	**DESCRIPTION**	**UNIT**	**QTY**
0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	202

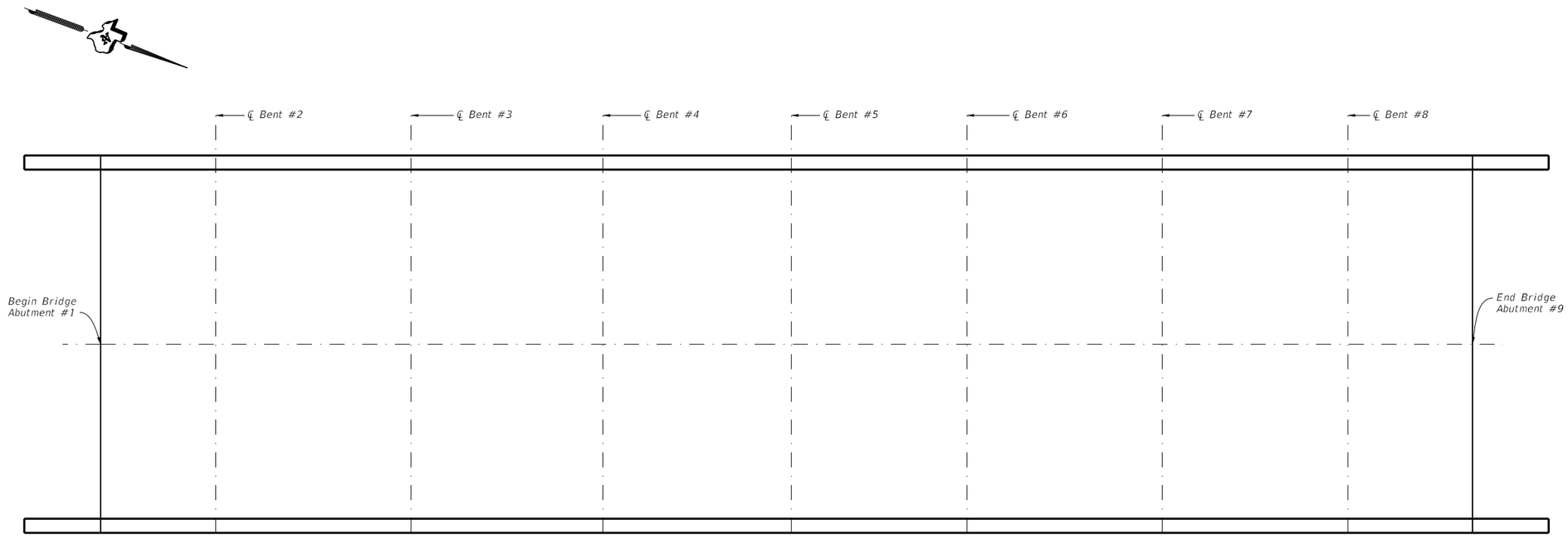
GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

NBI: 06-069-0-2224-01-229 (Northbound Structure)						
	South Face	**North Face**	**Bottom 1**	**Bottom 2**	**End 1**	**End 2**
BENT #2	*8	3		2		3
BENT #3	10	5	15	*40		2
BENT #4	5		2	7		2
BENT #5	15	3	15	15		1
BENT #6			3	1		
BENT #7	2		14	25		2
BENT #8	2					
TOTAL	***202***					

* An additional 6 SF was added for spall repair at SE wingwall near abutment.
** An additional 5 SF was added for spall repair at diaphragm above bent.



PLAN

NOT TO SCALE

STATE OF TEXAS
JOSE ALVINO RENTERIA
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LICENSED PROFESSIONAL ENGINEER

4/5/2021

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Jose A. Renteria, P.E.
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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #9 REPAIR DETAILS

NBI NO: 06-069-0-2224-01-229

E SL 338 NB at BI 20

DATE:
DATE TIME
DOCUMENT NAME

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC		16

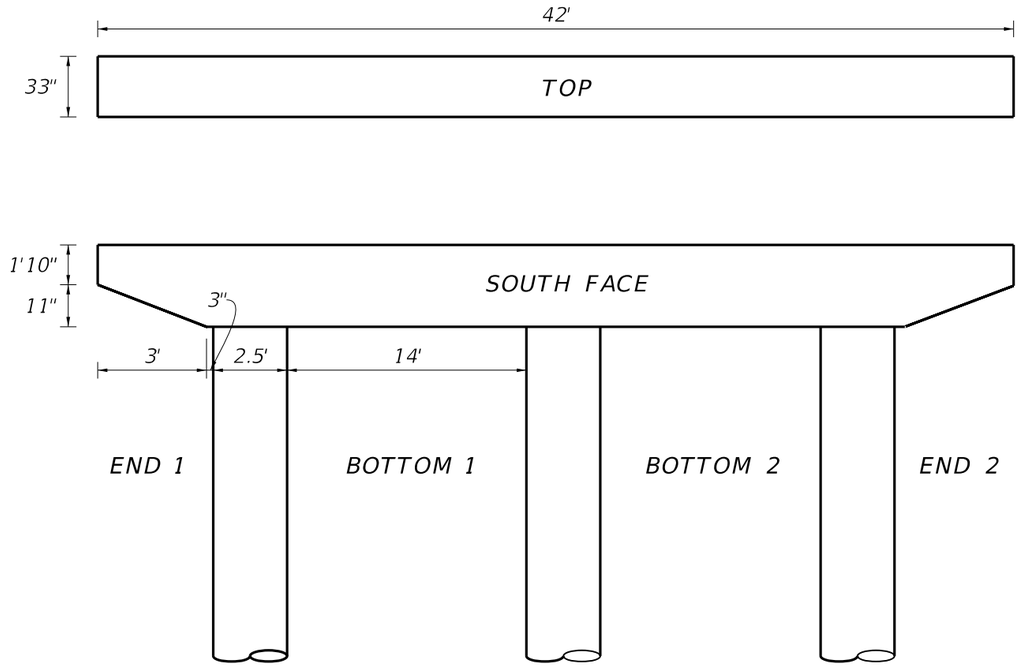


TABLE OF ESTIMATED QUANTITIES			
ITEM	**DESCRIPTION**	**UNIT**	**QTY**
0429-6008	CONC STR REP (RAPID VERTICAL & OVERHEAD)	SF	309

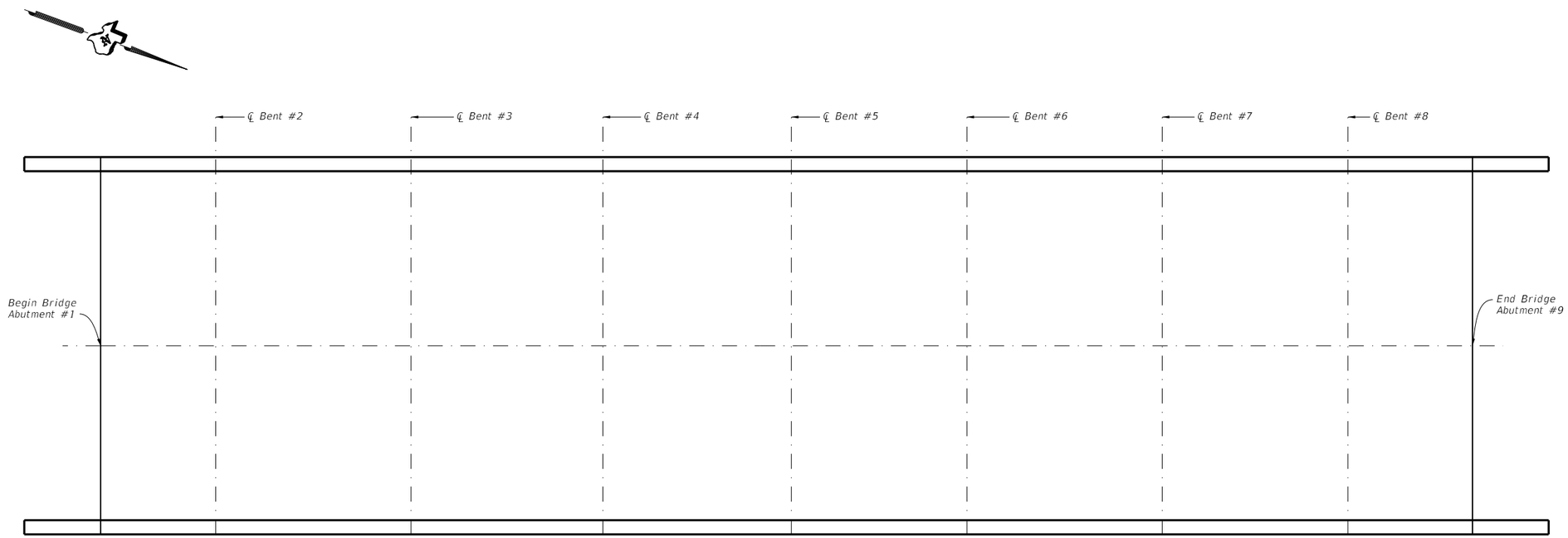
GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

Refer to Concrete Repair Details Sheet for additional info (pg 18).

NBI: 06-069-0-2224-01-230 (Southbound Structure)						
	South Face	**North Face**	**Bottom 1**	**Bottom 2**	**End 1**	**End 2**
BENT #2	40			25		*20
BENT #3		5	6	5		2
BENT #4	20	2		20		
BENT #5		35	15	22		0.5
BENT #6	5	5		18		0.5
BENT #7		5	1	4		1
BENT #8	3	6		40		3
TOTAL	***309***					

* An additional 15 SF was added for spall repair at eastern column.



PLAN

NOT TO SCALE

STATE OF TEXAS
JOSE ALVINO RENTERIA
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LICENSED PROFESSIONAL ENGINEER

4/5/2021

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SHEET 1 OF 1

Texas Department of Transportation

LOCATION #10 REPAIR DETAILS

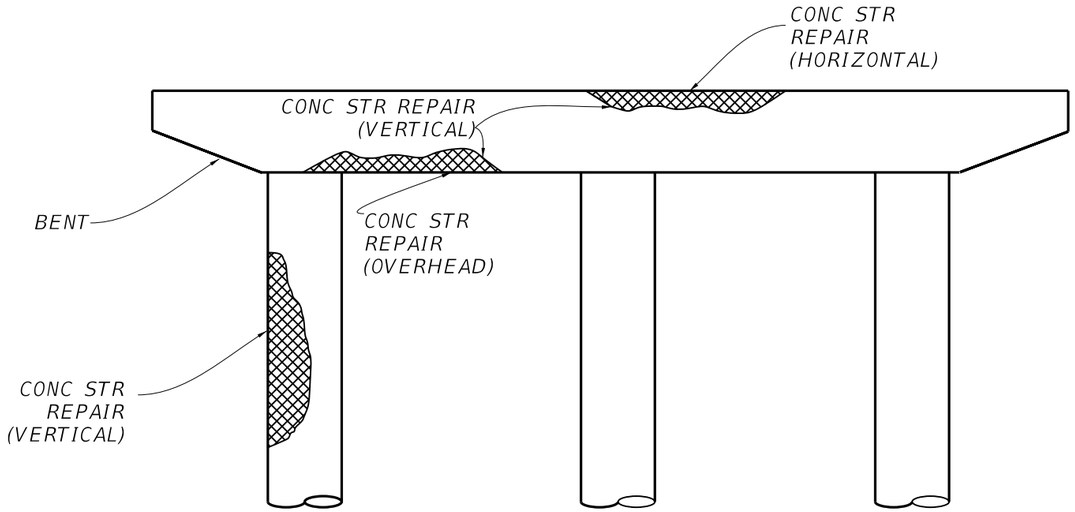
NBI NO: 06-069-0-2224-01-230

E SL 338 SB at BI 20

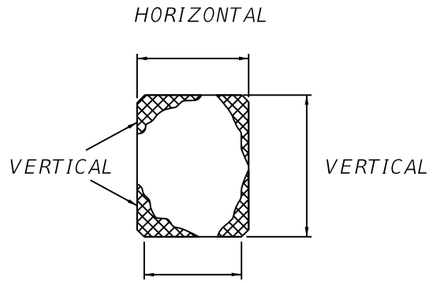
DATE:
DATE TIME
DOCUMENT NAME

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		17



STRUCTURE REPAIR AREAS (TYPICAL)



END OF BENT CAP REPAIR AREAS (TYPICAL)

TYPICAL AREAS OF SPALL REPAIR

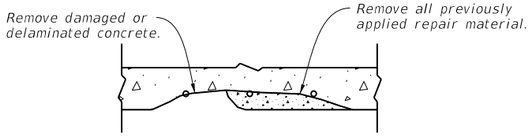
GENERAL NOTES:

All vertical and overhead areas shown here, shall be paid under Bid Item 0429 CONC STR REPAIR (VERTICAL & OVERHEAD). Horizontal areas shall be paid for under Bid Item 429 CONC STR REPAIR (STANDARD).

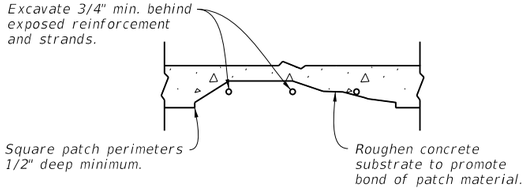
Some areas may require additional reinforcement as detailed in the concrete repair manual and as approved by the Engineer.

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

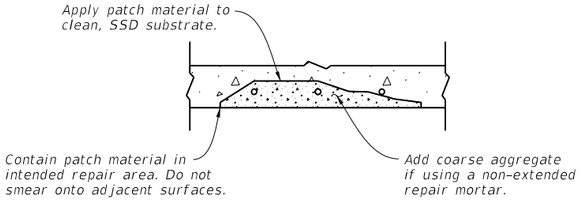
Refer to Concrete Repair Details below for additional info.



DAMAGED CONDITION



EXCAVATION & PREPARATION



PATCHING

CONCRETE REPAIR DETAILS

Refer to the TxDOT "Concrete Repair Manual" for additional guidance.

CONCRETE REPAIR NOTES:

1) Verify extent of damage and repairs prior to proceeding. Immediately notify Engineer if any discrepancies are noted between the plans and actual conditions.

2) Submit detailed repair procedures, including proposed proprietary materials, for approval prior to commencing work.

3) Perform work in accordance with Item 429, "Concrete Structure Repair," and these plans. For patching use a pre-approved Type A repair material per DMS 4655, "Concrete Repair Materials."

4) Remove delaminated, loose, and unsound concrete where indicated on the plans. Remove all previously applied repair material. Use only hand tools or power-driven chipping hammers (15 lb. max) to remove concrete and to excavate behind reinforcing bars.

5) Bend, but do not remove, damaged steel reinforcement to ensure there will be 1" minimum concrete cover in the patch area.

6) Remove rust, oil, and other contaminants from concrete and reinforcing steel surfaces. Just prior to patching blast the repair area using a high-pressure air compressor equipped with filters to remove oil.

7) Pre-bagged repair material:

   - Mixing, use measuring cups or buckets to determine the proper quantity of each component per the manufacturer's requirements, then dispense into a clean container. Mix the components thoroughly until they are well-blended (3 minutes minimum) using a low-speed drill and a "jiffy" type mixing paddle.
   - Do not mix until the surface preparation is complete and the substrate is ready for application of the repair material. Mix only the amount of material necessary for the immediate application.
   - Mixing by hand is not permitted. Do not attempt to make the material workable by over-mixing or adding additional liquid after it begins to set.
   - Add coarse aggregate in accordance with the manufacturer's instructions if using a non-extended repair mortar.

8) Obtain a Saturated Surface-Dry (SSD) substrate just prior to patching using a high-pressure water blast for a brief period (1 minute minimum) or other approved method. Surface may be damp but must be free of standing water.

9) If using a trowel-applied material, apply a bond coat consisting of a thin layer of non-extended repair mortar scrubbed into the substrate. Apply repair material while scrub coat is still wet. Do not exceed the maximum lift depth permitted by the manufacturer. Wet the surface just prior to applying the next lift.

10) Moist cure the patch material for a minimum of 48 hours using wet mats, water spray, ponding, or other method approved by Engineer.

NOT TO SCALE

DATE: DATE, TIME
DOCUMENT NAME

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

4/5/2021

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...

SHEET 1 OF 1

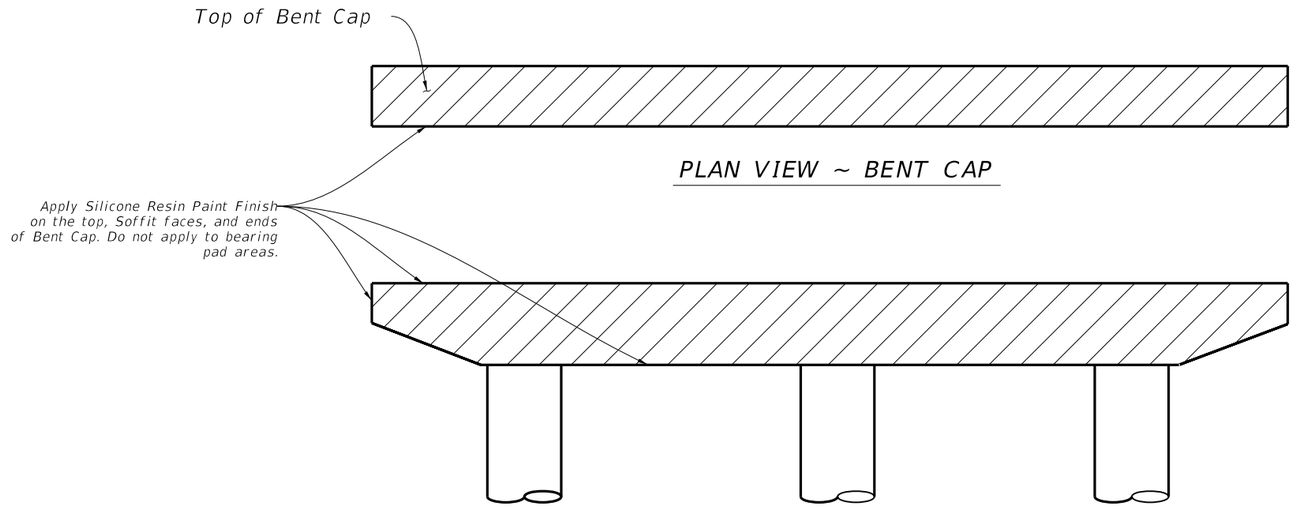
Texas Department of Transportation

LOCATION #9 & #10 CONCRETE REPAIR DETAILS

NBI NO: 06-069-0-2224-01-229, 230

E SL 338 NB/SB at BI 20

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	0DA	ECTOR, ETC		18



PLAN VIEW ~ BENT CAP

ELEVATION VIEW ~ BENT CAP

BENT CAP WATERPROOFING DETAIL

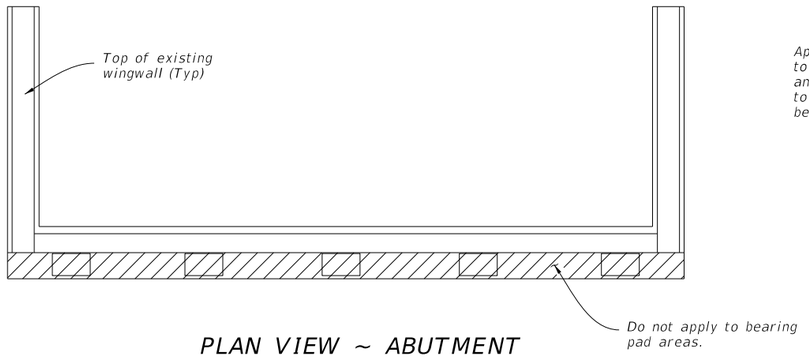
TABLE OF ESTIMATED QUANTITIES

ITEM	DESCRIPTION	UNIT	QTY
0427-6004	SILICONE RESIN PAINT FINISH	SF	*6,900

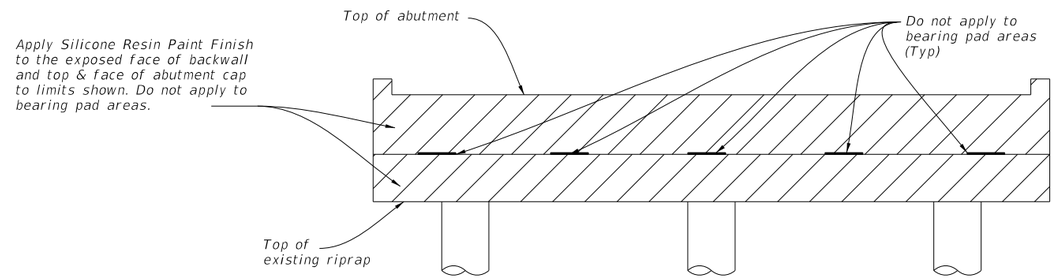
* 3,450 SF per structure (7 bents & 2 abutments).

GENERAL NOTES:

Perform work in accordance with Item 427, "Surface Finishes For Concrete", and meeting the requirements of DMS-8141, "Paint, Silicon Resin For Concrete".



PLAN VIEW ~ ABUTMENT



ELEVATION VIEW ~ ABUTMENT

ABUTMENT WATERPROOFING DETAIL

NOT TO SCALE

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...
4/5/2021

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

SHEET 1 OF 1

Texas Department of Transportation

LOCATION #9 & #10 WATERPROOFING DETAILS

NBI NO: 06-069-0-2224-01-229, 230

E SL 338 NB/SB at BI 20

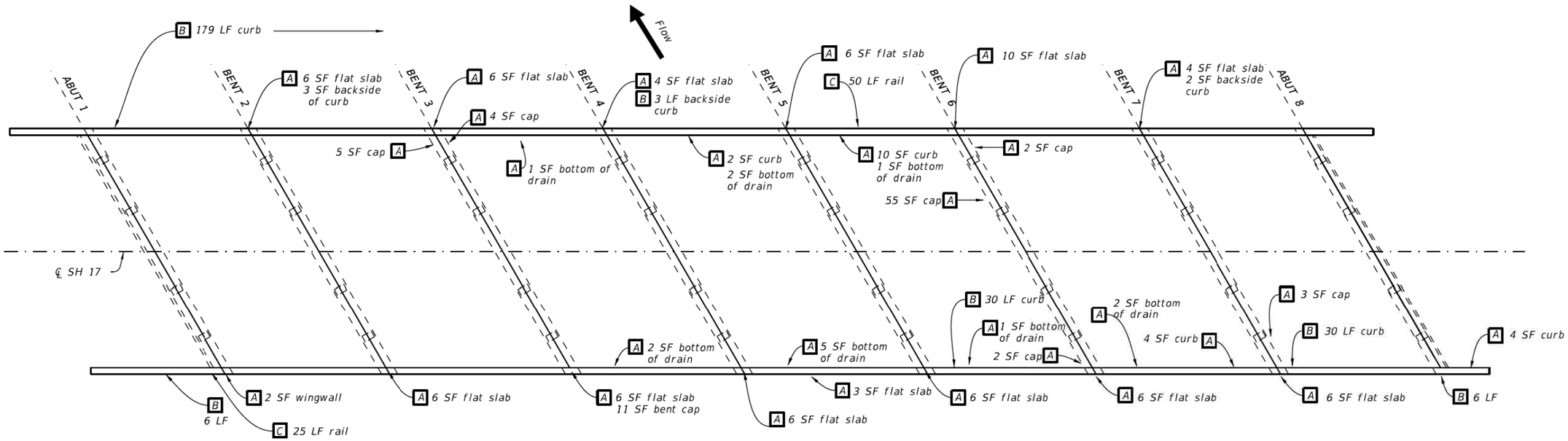
REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		19

DATE: DATE TIME
DOCUMENT NAME

N

A B C See Concrete Repair Details Sheet 2 of 2 for scope of work and quantities.



PLAN VIEW

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/26/21

Texas Department of Transportation

LOCATION #11 REPAIR DETAILS

NBI# 06-195-0-0103-02-008

SH 17 OVER TOYAH CREEK

©TxDOT FEB 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	06	ECTOR, ETC		20

A *Flat Slab Deck Spalls*

(1) *Typical spalling on sides of deck at bents. See estimated locations on Bridge Layout. Field verify exact locations and dimensions.*

A *Bent Cap Concrete Spalls*

(1) *Typical spalling of bent caps. See estimated locations on Bridge Layout. Field verify exact locations and dimensions.*

(1) *Some repair areas indicated do not exhibit visible spalling and will neeed to be identified by sounding the concrete with hammers to determine the location and limits of repairs.*

STATE OF TEXAS
Sarah Jane Raines
127087
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Sarah Raines

3/29/21

Texas Department of Transportation

LOCATION #11
CONCRETE REPAIR DETAILS

NBI# 06-195-0-0103-02-008

SH 17 OVER TOYAH CREEK

REVISIONS

CONT.	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
06	ECTOR, ETC		21

TABLE OF REPAIRS

REPAIR	REPAIR DESCRIPTION/LOCATION	ITEM	ITEM DESCRIPTION	QTY	UNIT
A	Concrete spalling at locations shown on bridge layout. Field Verify. Repair per TxDOT Concrete Repair Manual.	0429 6008	CONC STR REPR(RAPID VERT & OVERHEAD)	189	SF
B	Cracks in structural curb, abutment, wingwalls to be sealed in accordance with TxDOT Concrete Repair Manual.	0780 6004	CONC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	224	LF
C	Replace damaged steel rail on East and West side of bridge.	0776 6053	REPLACE (STEEL RAIL)	75	LF

B Typical Abutment Cracks

C DAMAGED STRUCTURAL CURB & RAILING

GENERAL NOTES:

Existing plans are available upon request.

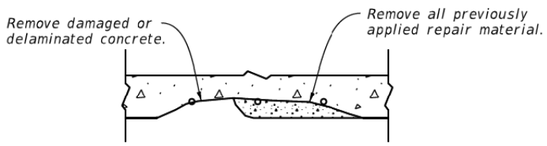
Locations and quantities indicated are based on September 23, 2019 condition assesment. Immediately notify TxDOT if any discrepancies are noted between the plans and actual conditions.

Sound all surfaces to identify and mark all delaminated areas for review and approval by the Engineer. Confirm square footage of repair areas prior to commencing removal and notify Engineer of any discrepencies.

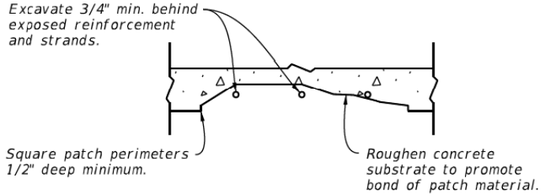
MATERIAL NOTES:

Provide Class S Concrete (f'c = 4000 psi).

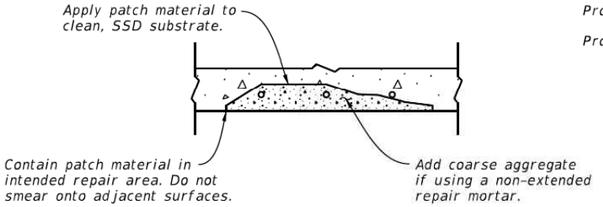
Provide Grade 60 reinforcing.



DAMAGED CONDITION



EXCAVATION & PREPARATION



PATCHING

CONCRETE REPAIR DETAILS

Refer to the TxDOT "Concrete Repair Manual" for additional guidance.

CONCRETE REPAIR NOTES:

1) Verify extent of damage and repairs prior to proceeding. Immediately notify Engineer if any discrepancies are noted between the plans and actual conditions.

2) Submit detailed repair procedures, including proposed proprietary materials, for approval prior to commencing work.

3) Perform work in accordance with Item 429, "Concrete Structure Repair," and these plans. For patching use a pre-approved Type A repair material per DMS 4655, "Concrete Repair Materials."

4) Remove delaminated, loose, and unsound concrete where indicated on the plans. Remove all previously applied repair material. Use only hand tools or power-driven chipping hammers (15 lb. max) to remove concrete and to excavate behind reinforcing bars.

5) Bend, but do not remove, damaged steel reinforcement to ensure there will be 1" minimum concrete cover in the patch area.

6) Remove rust, oil, and other contaminants from concrete and reinforcing steel surfaces. Just prior to patching blast the repair area using a high-pressure air compressor equipped with filters to remove oil.

7) Pre-bagged repair material:

   - Mixing, use measuring cups or buckets to determine the proper quantity of each component per the manufacturer's requirements, then dispense into a clean container. Mix the components thoroughly until they are well-blended (3 minutes minimum) using a low-speed drill and a "jiffy" type mixing paddle.
   - Do not mix until the surface preparation is complete and the substrate is ready for application of the repair material. Mix only the amount of material necessary for the immediate application.
   - Mixing by hand is not permitted. Do not attempt to make the material workable by over-mixing or adding additional liquid after it begins to set.
   - Add coarse aggregate in accordance with the manufacturer's instructions if using a non-extended repair mortar.

8) Obtain a Saturated Surface-Dry (SSD) substrate just prior to patching using a high-pressure water blast for a brief period (1 minute minimum) or other approved method. Surface may be damp but must be free of standing water.

9) If using a trowel-applied material, apply a bond coat consisting of a thin layer of non-extended repair mortar scrubbed into the substrate. Apply repair material while scrub coat is still wet. Do not exceed the maximum lift depth permitted by the manufacturer. Wet the surface just prior to applying the next lift.

10) Moist cure the patch material for a minimum of 48 hours using wet mats, water spray, ponding, or other method approved by Engineer.

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/29/21

Texas Department of Transportation

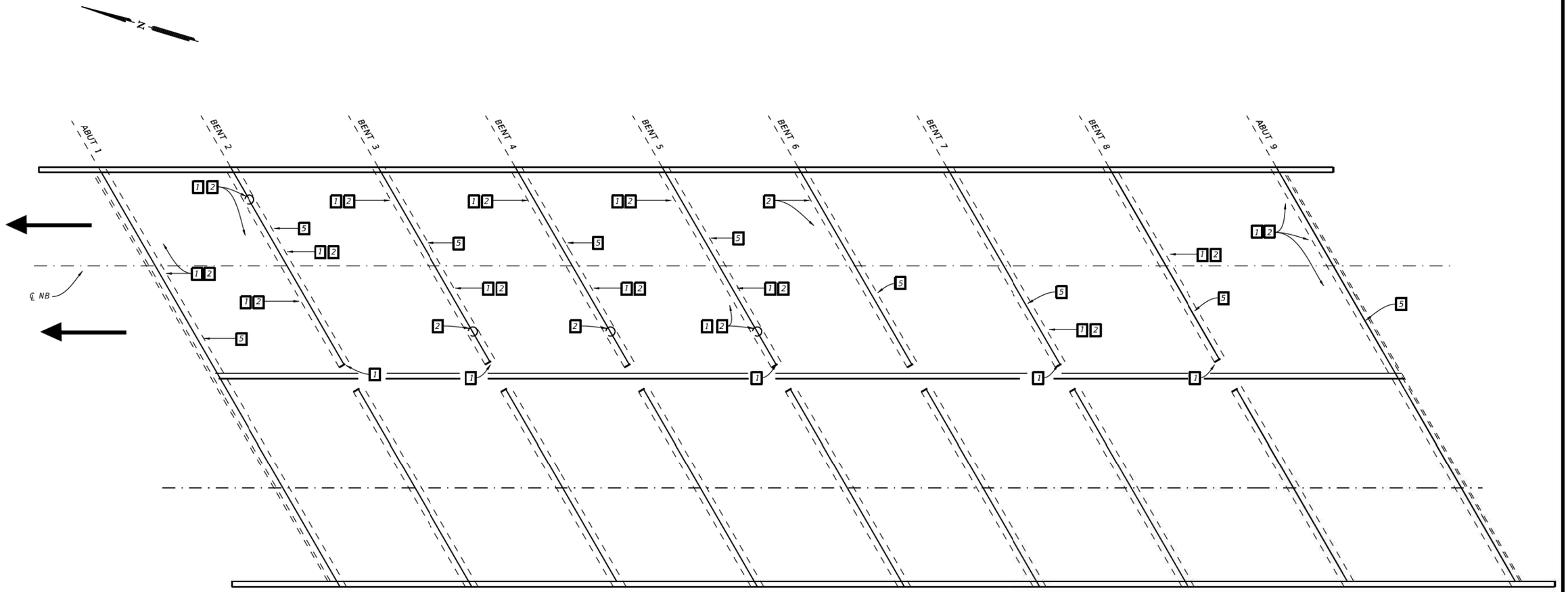
LOCATION #11
CONCRETE REPAIR DETAILS

NBI# 06-195-0-0103-02-008

SH 17 OVER TOYAH CREEK

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
06	ECTOR, ETC		22



1	Item 0429 6008 Concrete Spall Repair
2	0780 6004 Crack Repair
5	0427 6004 Waterproofing

See TABLE OF REPAIRS & ESTIMATED QUANTITIES for scope of work and quantities.

STATE OF TEXAS
Sarah Jane Raines
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3/26/21

SHEET 1 OF 2

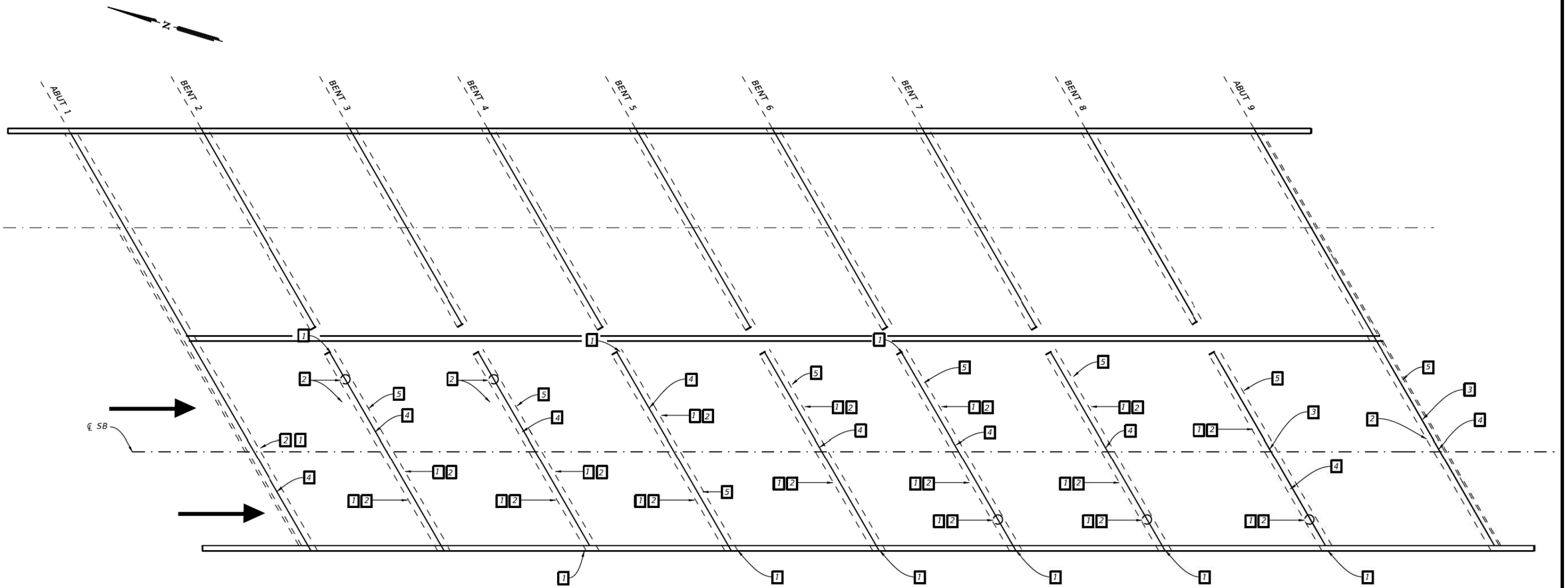
Texas Department of Transportation

LOCATION #12 & #13 REPAIR DETAILS

NBI# 06-165-0-1188-02-231, 232

W SL 250 NB/SB
AT BI 20

©TxDOT FEB 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	0DA	ECTOR, ETC		23



1	Item 0429 6008 Concrete Spall Repair
2	0780 6004 Crack Repair
3	0454 6008 Header Joint Repair
4	0438 6009 0454 6009 Clean & Seal Joints
5	0427 6004 Waterproofing

See TABLE OF REPAIRS & ESTIMATED QUANTITIES for scope of work and quantities.

STATE OF TEXAS
Sarah Jane Raines
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Sarah Raines

3/26/21

SHEET 2 OF 2

Texas Department of Transportation

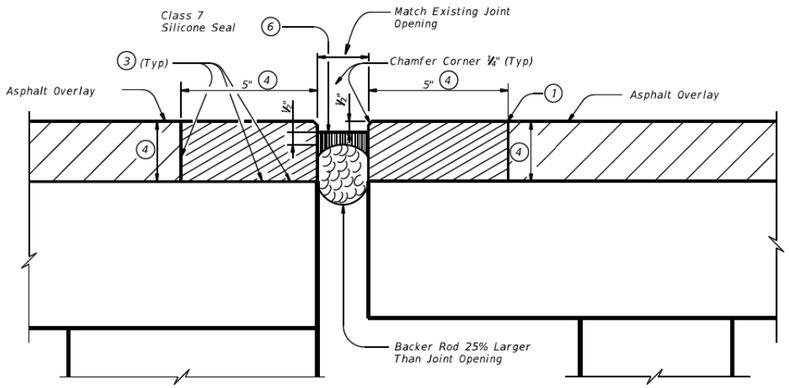
LOCATION #12 & #13 REPAIR DETAILS

NBI# 06-165-0-1188-02-231, 232

W SL 250 NB/SB
AT BI 20

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		24



PROPOSED CONCRETE HEADER TYPE "A"
JOINT REPAIR ~ OPTION "B"

JOINT REPAIR PROCEDURE

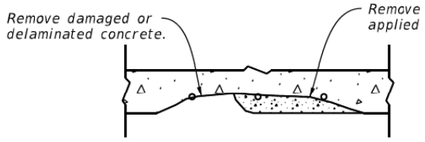
1. Saw cut overlay to top of deck and remove material to expose existing joint.
2. Condition of existing steel angle, plate, or rail must be determined prior to placing nosing/header material. The entire length of existing joint must be checked and any portion that is determined unsound by the Engineer must be removed as directed by the Engineer. The existing seal must be removed and disposed of.
3. Surfaces where nosing/header material is to be placed must be clean and dry in accordance with the manufacturer's specifications. Apply primer to surfaces as directed by manufacturers's specifications.
4. Match the thickness of the header with the thickness of the overlay. The thickness of the overlay is approximately 2" but may vary. If the thickness of the overlay exceeds 3.25", set the width of the header at one and a half times the thickness of the overlay but should not be greater than 8" unless approved by the Engineer.
5. Match existing joint opening or set at the minimum shown below or as directed by the Engineer. Do not cantilever header over joint opening.

   1" at 70° F when distance between joints is 150 feet or less.
   2" at 70° F when distance between joints is greater than 150 feet.
6. Seal when required as Directed by the Engineer. Extend sealant up into rail or curb 6 inches on low side or sides of deck. If the Class 7 Sealant cannot be effectively placed in the vertical position, a Class 4 Sealant is allowed for the extension of the seal into the curb or rail. Prepare surfaces where sealant is to be placed in accordance with manufacturer's specifications.

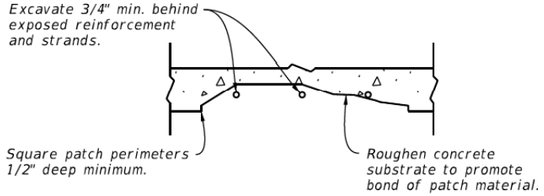
STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED
PROFESSIONAL ENGINEER

Sarah Raines

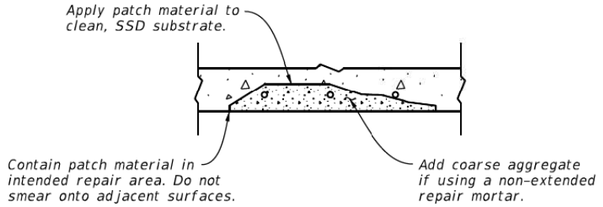
3/26/21



DAMAGED CONDITION



EXCAVATION & PREPARATION



PATCHING

CONCRETE REPAIR DETAILS

Refer to the TxDOT "Concrete Repair Manual" for additional guidance.

GENERAL NOTES:

Existing plans are available upon request.

Locations and quantities indicated are based on a August 27, 2019 inspection. Immediately notify TxDOT if any discrepancies are noted between the plans and actual conditions.

Sound all surfaces to identify and mark all delaminatcd arcas for review and approval by the Engineer. Confirm square footage of repair areas prior to commencing removal and notify Engineer of any discrepencies.

MATERIAL NOTES:

Provide Class S Concrete (f'c = 4000 psi).

Provide Grade 60 reinforcing.

Provide header joint material meeting the requirements of DMS-6140, "Polymer Concrete for Bridge Joint Systems," and as included on the Materials Producer List, "Polymer Cocrete," and the appropriate primer in accordance with manufacturer's specifications. Provide sealant compatible with header joint material in accordance with DMS-6310, "Joint Sealants and Fillers," and included on the Materials Producer List, "Joint Sealers," and the appropriate primer in accordance with manufacturer's specifications.

CONCRETE REPAIR NOTES:

1) Verify extent of damage and repairs prior to proceeding. Immediately notify Engineer if any discrepancies are noted between the plans and actual conditions.
2) Submit detailed repair procedures, including proposed proprietary materials, for approval prior to commencing work.
3) Perform work in accordance with Item 429, "Concrete Structure Repair," and these plans. For patching use a pre-approved Type A repair material per DMS 4655, "Concrete Repair Materials."
4) Remove delaminated, loose, and unsound concrete where indicated on the plans. Remove all previously applied repair material. Use only hand tools or power-driven chipping hammers (15 lb. max) to remove concrete and to excavate behind reinforcing bars.
5) Bend, but do not remove, damaged steel reinforcement to ensure there will be 1" minimum concrete cover in the patch area.
6) Remove rust, oil, and other contaminants from concrete and reinforcing steel surfaces. Just prior to patching blast the repair area using a high-pressure air compressor equipped with filters to remove oil.
7) Pre-bagged repair material:
   - Mixing, use measuring cups or buckets to determine the proper quantity of each component per the manufacturer's requirements, then dispense into a clean container. Mix the components thoroughly until they are well-blended (3 minutes minimum) using a low-speed drill and a "jiffy" type mixing paddle.
   - Do not mix until the surface preparation is complete and the substrate is ready for application of the repair material. Mix only the amount of material necessary for the immediate application.
   - Mixing by hand is not permitted. Do not attempt to make the material workable by over-mixing or adding additional liquid after it begins to set.
   - Add coarse aggregate in accordance with the manufacturer's instructions if using a non-extended repair mortar.
8) Obtain a Saturated Surface-Dry (SSD) substrate just prior to patching using a high-pressure water blast for a brief period (1 minute minimum) or other approved method. Surface may be damp but must be free of standing water.
9) If using a trowel-applied material, apply a bond coat consisting of a thin layer of non-extended repair mortar scrubbed into the substrate. Apply repair material while scrub coat is still wet. Do not exceed the maximum lift depth permitted by the manufacturer. Wet the surface just prior to applying the next lift.
10) Moist cure the patch material for a minimum of 48 hours using wet mats, water spray, ponding, or other method approved by Engineer.

Texas Department of Transportation

LOCATION #12 & #13 CONCRETE REPAIR DETAILS

NBI# 06-165-0-1188-02-231, 232

W SL 250 NB/SB
AT BI 20

©TxDOT FEB 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		25

TABLE OF REPAIRS AND ESTIMATED QUANTITIES

REPAIR LOCATION	REPAIR DESCRIPTION	[1] 0429 6008	[2] 0780 6004	[5] 0427 6004
		CONC STR REPR(RAPID VERT & OVERHEAD)	CONC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	SILICONE RESIN PAINT FINISH
		SF	LF	SF
ABUT 1	Cracking on Abutment cap. Possible spalling –sound concrete with hammer. Apply Waterproofing.	5	30	250
BENT 2	Moderate cracking near bearing areas, bottom, sides, and end of cap. End of cap spalling/exposed rebar. Cracking/ Spalls on Columns. Appply Waterproofing.	20	30	260
BENT 3	Bent caps heavily cracked and spalled with exposed rebar. Cracking and spalling on columns. Apply Waterproofing.	20	50	260
BENT 4	Moderate cracking near bearing areas, bottom, sides, and end of cap. Cracking on columns. Apply Waterproofing.	5	30	260
BENT 5	Moderate cracking near bearing areas, bottom, and sides of cap. Spalling located mostly on bottom of cap and ends of cap. Cracking/Spalls on columns. Apply Waterproofing.	20	30	260
BENT 6	Cracking near bearing areas, ends, bottom and sides of cap. Possible spalling. Spalling on columns. Apply Waterproofing.	5	30	260
BENT 7	Cracking near top of cap, sides, and bottom. Spalling on cap ends with exposed rebar. Apply Waterproofing.	15	50	260
BENT 8	Cracking near bearing areas, and bottom of cap. Apply Waterproofing.	2	28	260
ABUT 9	Moderate to severe cracking on Abutment cap. Possible spalling – sound with hammer. Apply Waterproofing.	5	30	250
Deck Soffit/ Overhang	Spalling, exposed rebar, efflorescence at deck soffits typical above every bent.	56	–	–
Diaphragms	Spalling and exposed rebar on diaphragms at Bent 2 and Bent 8.	5	–	–
Beam 6L at Bent 6	Minor to moderate vertical cracking/delamination in web		5	–
(1)	TOTAL ESTIMATED QUANTITIES	158	308	2320

(1) Some repair areas indicated do not exhibit visible spalling and will neeed to be identified by sounding the concrete with hammers to determine the location and limits of repairs.

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/26/21

Texas Department of Transportation

TABLE OF REPAIRS & ESTIMATED QUANTITIES

NBI# 06-165-0-1188-02-231

W SL 250 NB
AT BI 20

REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
ODA	ECTOR, ETC		26

TABLE OF REPAIRS AND ESTIMATED QUANTITIES

REPAIR LOCATION	REPAIR DESCRIPTION	[1] 0429 6008	[2] 0780 6004	[3] 0454 6008	[4] 0438 6009	[4] 0454 6009	[5] 0427 6004
		CONC STR REPR(RAPID VERT & OVERHEAD)	CONC CRACK REPAIR (DISCRETE)(ROUTE AND SEAL)	HEADER TYPE EXPANSION JT	CLEANING EXISTING JOINTS	JOINT SEALANT	SILICONE RESIN PAINT FINISH
		SF	LF	CF	LF	LF	SF
ABUT 1	Moderate to severe cracking on Abutment cap. Possible spalling- sound with hammer. Apply Waterproofing. Clean & seal joint.	5	30		42	42	250
BENT 2	Moderate cracking near bearing areas, bottom, sides, and end of cap. End of cap spalling/exposed rebar. Cracking/ spalling on Columns. Apply Waterproofing. Clean & Seal joints.	10	30		42	42	260
BENT 3	Bent caps heavily cracked and spalled with exposed rebar. Cracking and spalling on columns. Apply Waterproofing. Clean & seal joints.	20	50		42	42	260
BENT 4	Moderate cracking and spalling near bearing areas, bottom, sides, and end of cap. Cracking on columns. Apply Waterproofing. Clean & seal joint.	20	30		42	42	260
BENT 5	Moderate cracking near bearing areas, bottom, and sides of cap. Spalling located mostly on bottom of cap and ends of cap. Cracking/Spalls on columns. Apply Waterproofing. Clean and seal joint.	10	30		42	42	260
BENT 6	Cracking near bearing areas, ends, bottom and sides of cap. Possible spalling- sound with hammer. Cracking and spalling on columns. Apply Waterproofing. Clean & seal joint.	5	30		42	42	260
BENT 7	Cracking near bearing areas, sides, and bottom. Spalling on cap ends with exposed rebar. Cracking on columns. Apply Waterproofing. Clean & seal joint.	20	50		42	42	260
BENT 8	Cracking near bearing areas, sides and bottom of cap. Spalling mainly on cap ends. Apply silicone paint resin. Repair broken header joint. Clean & Seal.	2	28	7.3	42	42	260
ABUT 9	Moderate to severe cracking on Abutment cap. Possible spalling – sound with hammer. Apply Waterproofing. Repair broken header joint. Clean & seal joint.	5	30	7.3	42	42	250
Deck Soffit/ Overhang	Spalling, exposed rebar, efflorescence at deck soffits typical above every bent.	56	–				
Diaphragms	Spalling and exposed rebar on diaphragms at Bent 7 and 8.	2	–				
(1) TOTAL ESTIMATED QUANTITIES		155	308	14.6	378	378	2320

(1) Some repair areas indicated do not exhibit visible spalling and will needed to be identified by sounding the concrete with hammers to determine the location and limits of repairs.

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/26/21

Texas Department of Transportation

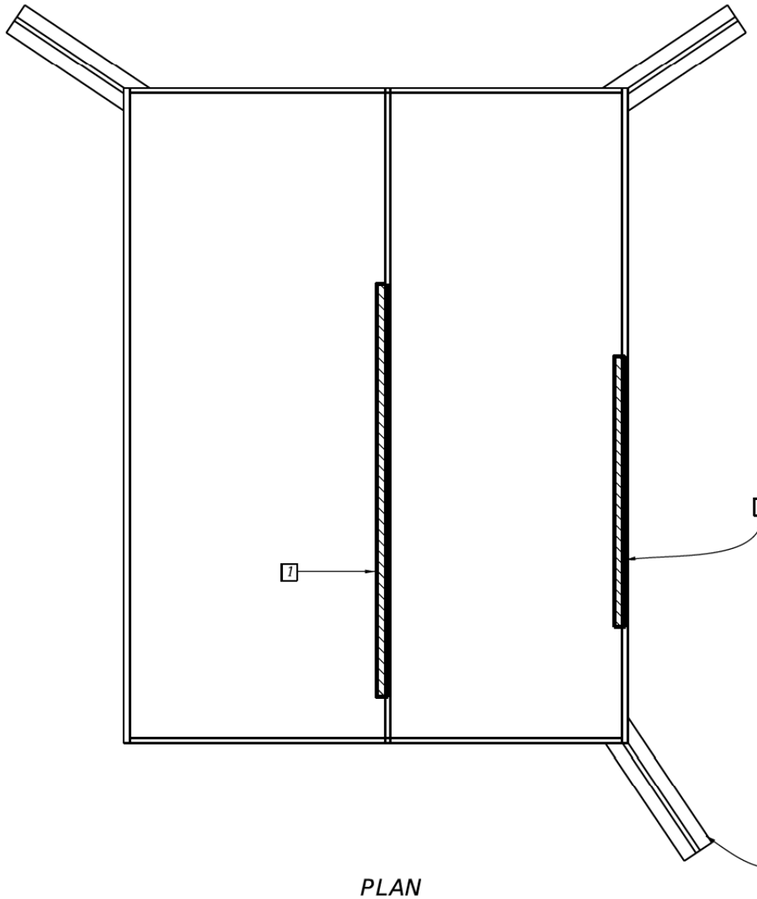
TABLE OF REPAIRS & ESTIMATED QUANTITIES

NBI# 06-165-0-1188-02-232

W SL 250 SB
AT BI 20

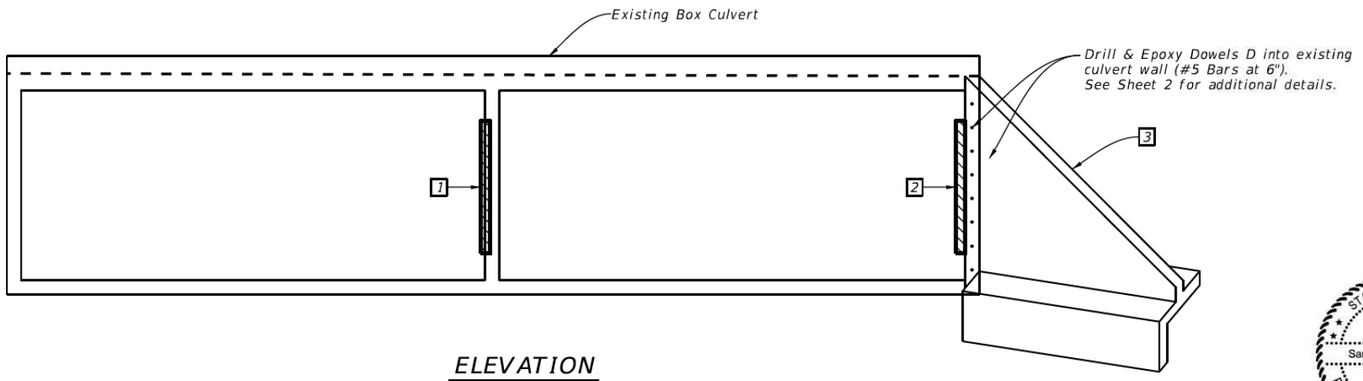
REVISIONS

CONT	SECT	JOB	HIGHWAY
6375	31	001	IH 20, ETC
DIST	COUNTY		SHEET NO.
0DA	ECTOR, ETC		27



PLAN

2 ~ 9'-10" x 4'-0" Multiple Box culverts



ELEVATION

2 ~ 9'-10" x 4'-0" Multiple Box culverts

TABLE OF ESTIMATED QUANTITIES

ITEM	0429 6008	0420 6057
Location of Repair	CONC STR REP(RAPID VERTICAL & OVERHEAD)	CL C CONC (WINGWALLS)
	SF	CY
1	50	
2	32	
3		2.6
Total	82	2.6

1 Moderate to heavy delamination and spalling with exposed rusty rebar. See Sheet 3 for additional details.

2 Moderate to heavy scaling and delamination on outer wall. Repair according to the TxDOT Concrete Repair Manual. See Sheet 3 for additional details.

3 Attach a CIP concrete wingwall and footing to the existing culvert. See Sheet 2 for additional details.

GENERAL NOTES:

Contractor must verify extent of damage and locations prior to ordering materials and beginning work. Notify the Engineer of any discrepancies between plans and actual conditions.

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/29/21

DATE:

Texas Department of Transportation

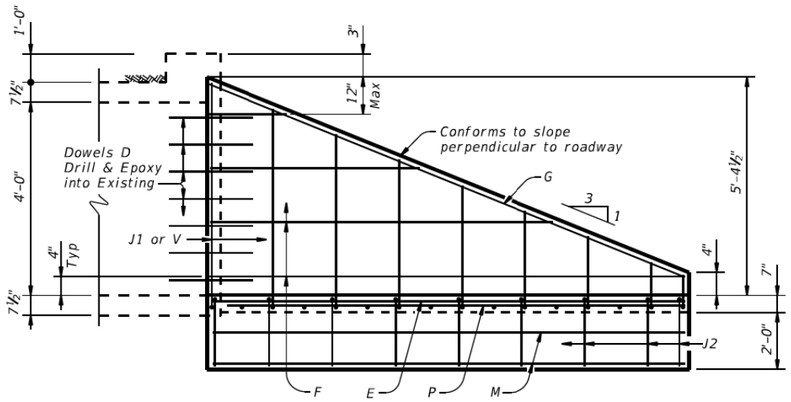
LOCATION #14 REPAIR DETAILS

NBI #: 06-238-0-2806-02-001

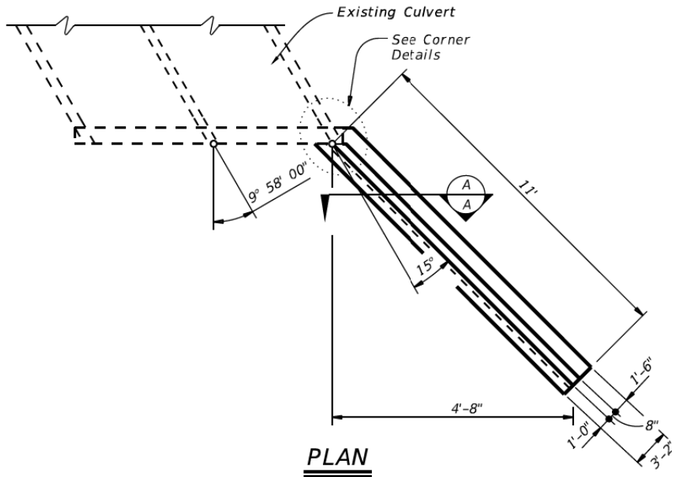
RM 2355 AT DRAW

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	06	ECTOR, ETC		28

DATE:
FILE:

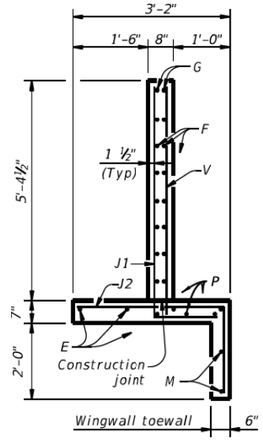


INSIDE ELEVATION

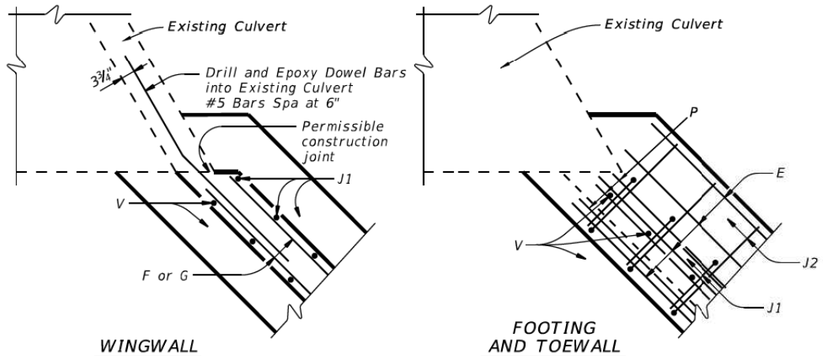


PLAN

TABLE OF ESTIMATED QUANTITIES (1 wing)					
Bar	Size	No.	Spa	Length	Weight
D	#5	7	6"	2'-0"	15
E	#4	3	1'-0"	5'-1½"	10
F	#4	4	1'-0"	5'-1½"	14
G	#6	4	~	10'-9"	65
J1	#4	5	1'-0"	6'-11½"	23
J2	#4	5	1'-0"	5'-1"	17
M	#4	4	~	5'-1½"	14
P	#4	3	1'-0"	5'-1½"	10
V	#4	5	1'-0"	5'-7½"	19
Reinforcing Steel				LB	187
Class "C" Conc (Wingwalls)				CY	2.6



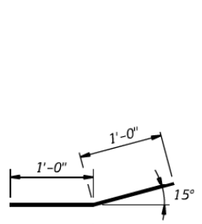
SECTION A-A



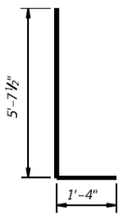
WINGWALL

FOOTING AND TOEWALL

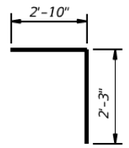
CORNER DETAILS



Dowels D



BARS J1



BARS J2

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

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

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED
PROFESSIONAL ENGINEER

Sarah Raines

3/29/21

SHEET 2 OF 3

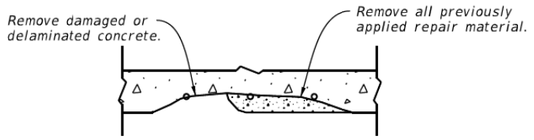
Texas Department of Transportation

LOCATION #14 REPAIR DETAILS

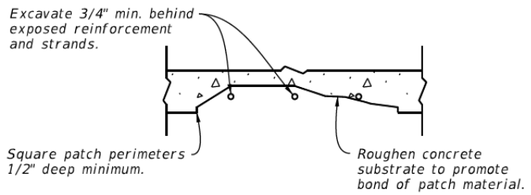
NBI#: 06-238-0-2806-02-001

RM 2355 AT DRAW

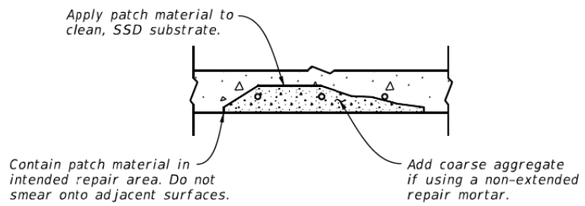
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	06	ECTOR, ETC		29



DAMAGED CONDITION



EXCAVATION & PREPARATION



PATCHING

CONCRETE REPAIR DETAILS

Refer to the TxDOT "Concrete Repair Manual" for additional guidance.

CONCRETE REPAIR NOTES:

1) Verify extent of damage and repairs prior to proceeding. Immediately notify Engineer if any discrepancies are noted between the plans and actual conditions.

2) Submit detailed repair procedures, including proposed proprietary materials, for approval prior to commencing work.

3) Perform work in accordance with Item 429, "Concrete Structure Repair," and these plans. For patching use a pre-approved Type A repair material per DMS 4655, "Concrete Repair Materials."

4) Remove delaminated, loose, and unsound concrete where indicated on the plans. Remove all previously applied repair material. Use only hand tools or power-driven chipping hammers (15 lb. max) to remove concrete and to excavate behind reinforcing bars.

5) Bend, but do not remove, damaged steel reinforcement to ensure there will be 1" minimum concrete cover in the patch area.

6) Remove rust, oil, and other contaminants from concrete and reinforcing steel surfaces. Just prior to patching blast the repair area using a high-pressure air compressor equipped with filters to remove oil.

7) Pre-bagged repair material:

- Mixing, use measuring cups or buckets to determine the proper quantity of each component per the manufacturer's requirements, then dispense into a clean container. Mix the components thoroughly until they are well-blended (3 minutes minimum) using a low-speed drill and a "jiffy" type mixing paddle.
- Do not mix until the surface preparation is complete and the substrate is ready for application of the repair material. Mix only the amount of material necessary for the immediate application.
- Mixing by hand is not permitted. Do not attempt to make the material workable by over-mixing or adding additional liquid after it begins to set.
- Add coarse aggregate in accordance with the manufacturer's instructions if using a non-extended repair mortar.

8) Obtain a Saturated Surface-Dry (SSD) substrate just prior to patching using a high-pressure water blast for a brief period (1 minute minimum) or other approved method. Surface may be damp but must be free of standing water.

9) If using a trowel-applied material, apply a bond coat consisting of a thin layer of non-extended repair mortar scrubbed into the substrate. Apply repair material while scrub coat is still wet. Do not exceed the maximum lift depth permitted by the manufacturer. Wet the surface just prior to applying the next lift.

10) Moist cure the patch material for a minimum of 48 hours using wet mats, water spray, ponding, or other method approved by Engineer.

DATE:

STATE OF TEXAS
Sarah Jane Raines
127087
LICENSED PROFESSIONAL ENGINEER

Sarah Raines

3/29/21

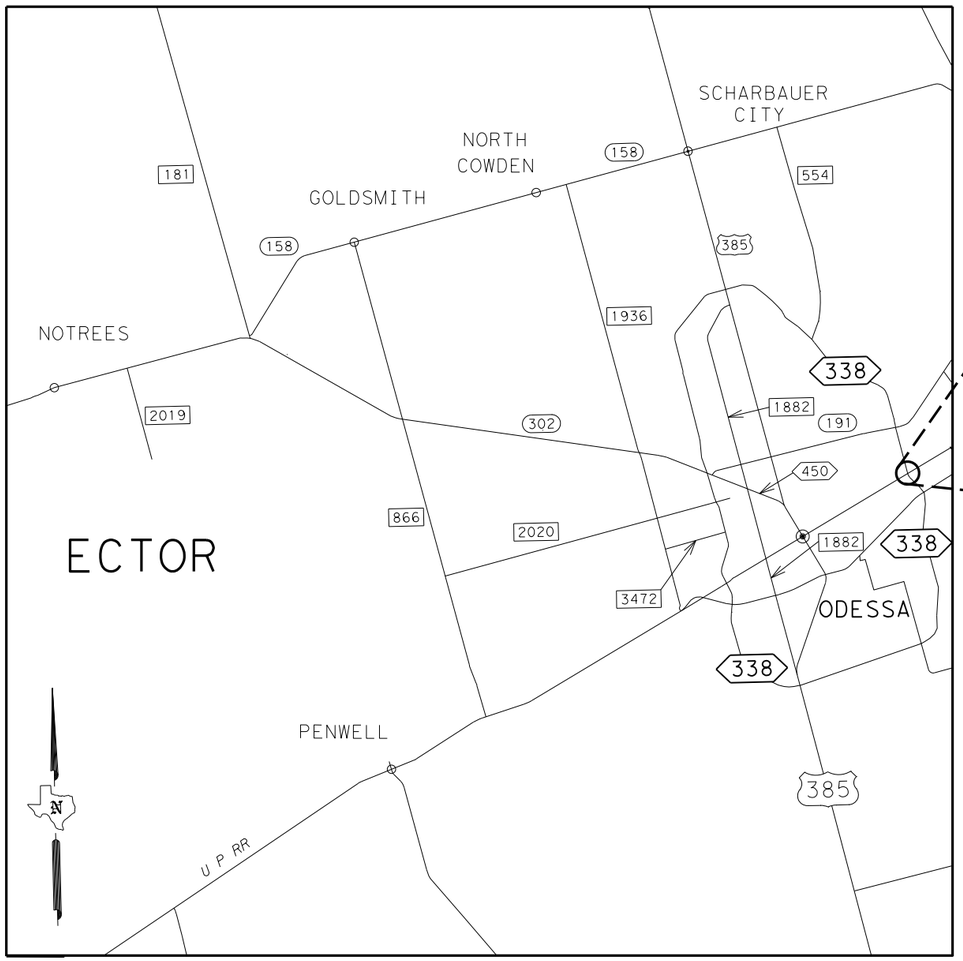
Texas Department of Transportation

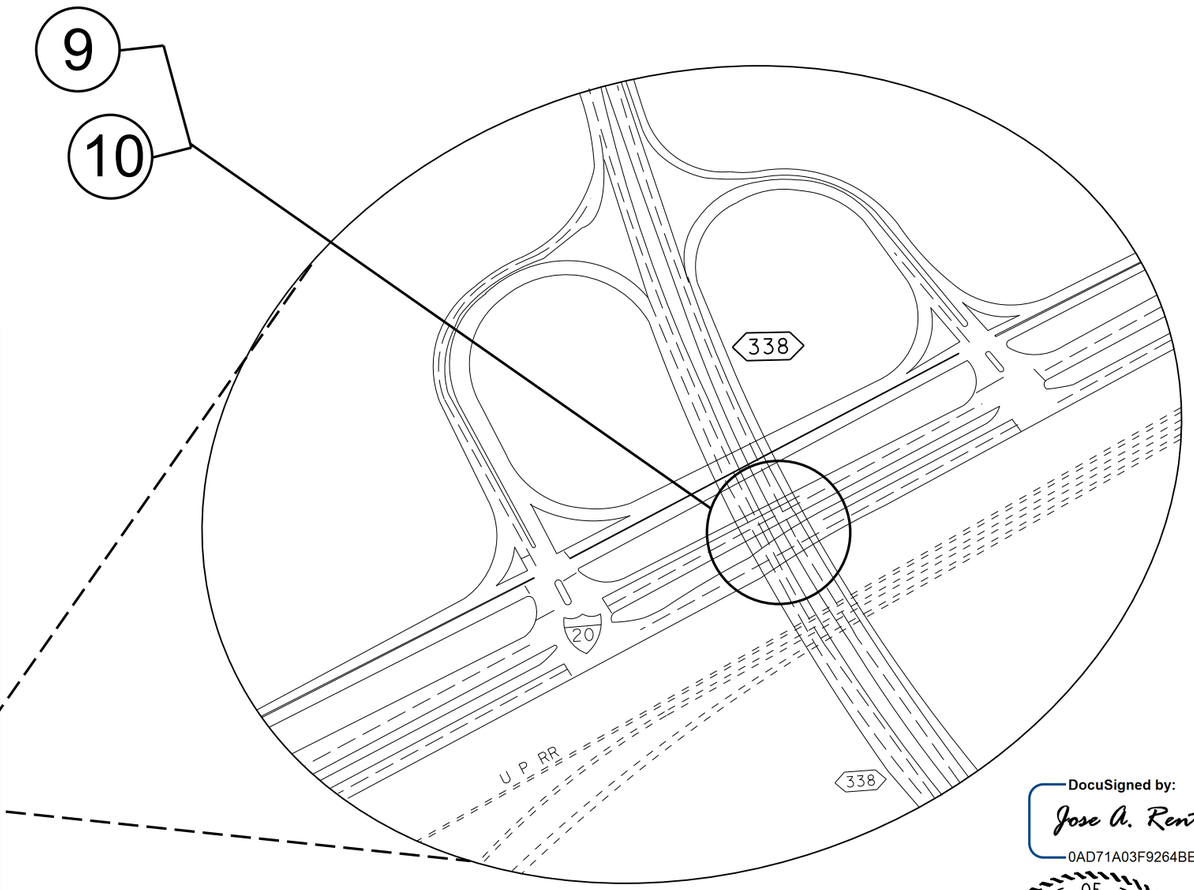
LOCATION #14 REPAIR DETAILS

NBI #: 06-238-0-2806-02-001

RM 2355 AT DRAW

©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	06	ECTOR, ETC		30





LOCATION: 9 & 10

Railroad Company: UNION PACIFIC RAILROAD COMPANY
DOT No.:DOT 796306D
MP: 569.520
RMC: 6375-31-001
Project: 2021 Odessa District Bridge Spall Repair
County: ECTOR
Highway: E SL 338 at E BI 20
Underpass Crossing at Intersection SL 338 at BI 20

map-odessa.dgn

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...
4/5/2021

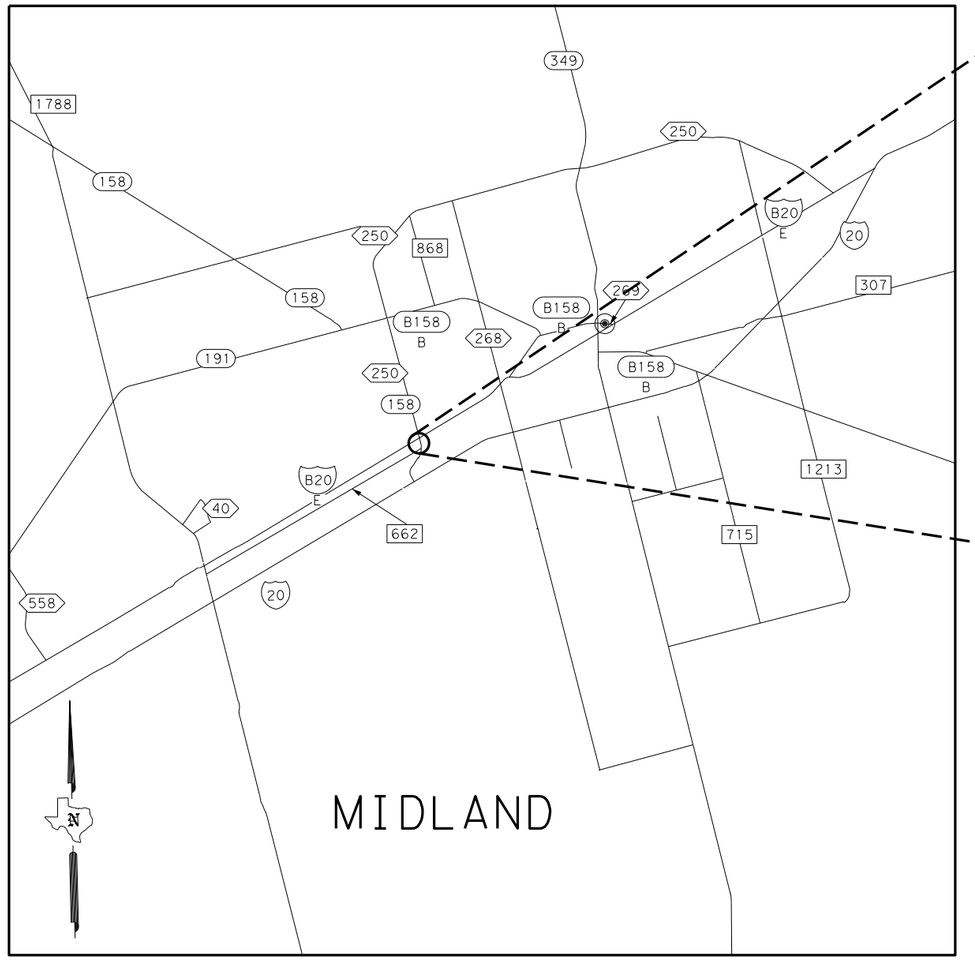
STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

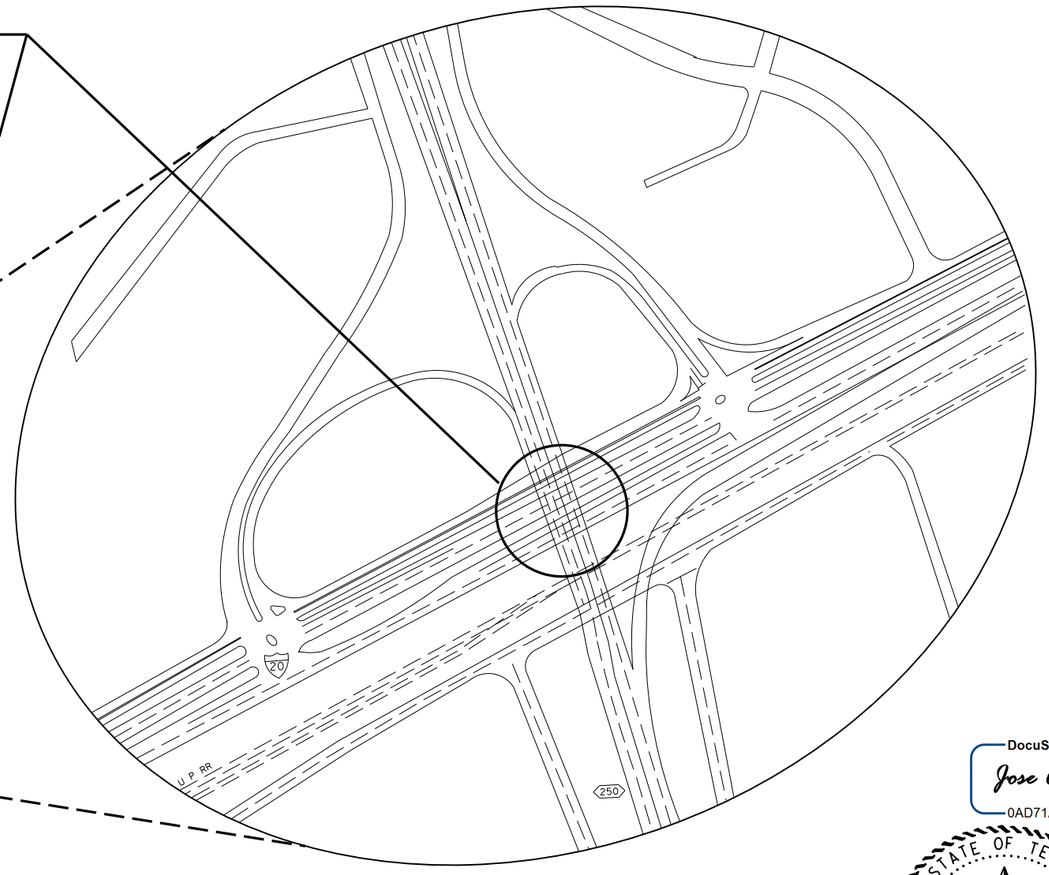
RAILROAD CROSSING

SHEET 1 OF 2

Texas Department of Transportation

FED.RD. DIV.NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 6375-31-001		31
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC





LOCATION: 12 & 13

Railroad Company: UNION PACIFIC RAILROAD COMPANY
DOT No.: DOT 796314V
MP: 557.950
RMC: 6375-31-001
Project: 2021 Odessa District Bridge Spall Repair
County: MIDLAND
Highway: W SL 250 at BI 20
Underpass Crosing at Intersection SH 158 at BI 20

map-odessa.dgn

DocuSigned by:
Jose A. Renteria, P.E.
0AD71A03F9264BE...
4/5/2021

STATE OF TEXAS
JOSE ALVINO RENTERIA
137506
LICENSED PROFESSIONAL ENGINEER

RAILROAD CROSSING

SHEET 2 OF 2

Texas Department of Transportation

FED. RD. DIV. NO.	MAINTENANCE PROJECT NO.		SHEET NO.
6	RMC 6375-31-001		32
STATE	DISTRICT	COUNTY	
TEXAS	ODA	ECTOR, ETC	
CONTROL	SECTION	JOB	HIGHWAY NO.
6375	31	001	IH 20, ETC

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 796306D
Crossing Type: Underpass
RR Company Owning Track at Crossing: UNION PACIFIC RAILROAD COMPANY
Operating RR Company at Track: UNION PACIFIC RAILROAD COMPANY
RR MP: 569.520
RR Subdivision: TOYAH
City: Odessa
County: Ector
CSJ at this Crossing: CSJ: 6375-31-001
Highway/Roadway name crossing the railroad: BI 20
# of regularly scheduled trains per day at this crossing: 0
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: 0.01%

Scope of Work at this Crossing to Be Performed by State Contractor:
CONCRETE REPAIR TO BENT CAPS AND COLUMNS UNDER BRIDGE DECK.

Scope of Work at this Crossing to Be Performed by Railroad Company:
FLAGGING

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

NONE

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 8

On this project, night or weekend flagging is:

- [X] Expected
- [ ] Not Expected

Flagging services will be provided by:

- [ ] Railroad Company: TxDOT will pay flagging invoices
- [X] Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

- [X] UPRR - UP.info@railpros.com
  Call Center 877-315-0513, Select #1 for flagging
- [ ] BNSF - BNSF.info@railpros.com
  Call Center 877-315-0513, Select #1 for flagging
- [ ] KCS - KCS.info@railpros.com
  Call Center 877-315-0513, Select #1 for flagging
  - Bottom Line On-Track Safety Services
  bottomline076@aol.com, 903-767-7630
- [ ] OTHERS

Contractor must incorporate Construction Inspection into anticipated construction schedule.

- [X] Not Required
- [ ] Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

- [ ] Required
- [X] Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit
Railroad Protective Liability	
[ ] Not Required	
[X] Non - Bridge Projects	$2,000,000 / $6,000,000
[ ] Bridge Projects	$5,000,000 / $10,000,000
[ ] Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

- [ ] Not Required
- [X] Required: TxDOT to assist in obtaining (see Item 5, Article 8.3)
  With the following railroad companies: UNION PACIFIC RAILROAD
- [ ] Required: Contractor to obtain (see Item 5, Article 8.4)
  With the following railroad companies:
  Railroad website:

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

- [X] Not Required
- [ ] Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call Union Pacific Railroad Emergency Line
at 888-877-7267
Location: DOT #796306D
RR Milepost: 569.520 Toyah Subdivision

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

SHEET 1 OF 2

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:			
©TxDOT June 2014	CONT	SECT	JOB	HIGHWAY			
REVISIONS	6375	31	001	IH 20, ETC			
3/2020	DIST	COUNTY		SHEET NO.			
	ODA	ECTOR, ETC		33			

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 796314V
Crossing Type: Underpass
RR Company Owning Track at Crossing: UNION PACIFIC RAILROAD COMPANY
Operating RR Company at Track: UNION PACIFIC RAILROAD COMPANY
RR MP: 557.950
RR Subdivision: TOYAH
City: Midland
County: Midland
CSJ at this Crossing: CSJ: 6375-31-001
Highway/Roadway name crossing the railroad: SH 158
# of regularly scheduled trains per day at this crossing: 0
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: 0.01%

Scope of Work at this Crossing to Be Performed by State Contractor:
CONCRETE REPAIR TO BENT CAPS AND COLUMNS UNDER BRIDGE DECK.

Scope of Work at this Crossing to Be Performed by Railroad Company:
FLAGGING

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

NONE

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 8

On this project, night or weekend flagging is:

- [X] Expected
- [ ] Not Expected

Flagging services will be provided by:

- [ ] Railroad Company: TxDOT will pay flagging invoices
- [X] Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

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  Call Center 877-315-0513, Select #1 for flagging
- [ ] KCS - KCS.info@railpros.com
  Call Center 877-315-0513, Select #1 for flagging
  - Bottom Line On-Track Safety Services
  bottomline076@aol.com, 903-767-7630
- [ ] OTHERS

Contractor must incorporate Construction Inspection into anticipated construction schedule.

- [X] Not Required
- [ ] Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

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Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit
Railroad Protective Liability	
[ ] Not Required	
[X] Non - Bridge Projects	$2,000,000 / $6,000,000
[ ] Bridge Projects	$5,000,000 / $10,000,000
[ ] Other	

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- [X] Required: TxDOT to assist in obtaining (see Item 5, Article 8.3)
  With the following railroad companies: UNION PACIFIC RAILROAD
- [ ] Required: Contractor to obtain (see Item 5, Article 8.4)
  With the following railroad companies:
  Railroad website:

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

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VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

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- [ ] Required

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IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call Union Pacific Railroad Emergency Line
at 888-877-7267
Location: DOT #796306D
RR Milepost: 569.520 Toyah Subdivision

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

SHEET 2 OF 2

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:			
©TxDOT June 2014	CONT	SECT	JOB	HIGHWAY			
REVISIONS	6375	31	001	IH 20, ETC			
3/2020	DIST	COUNTY		SHEET NO.			
	ODA	ECTOR, ETC		34			

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DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

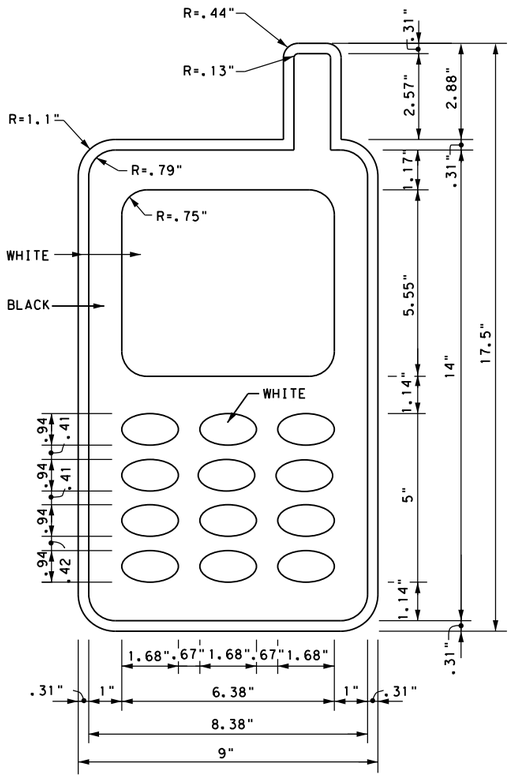
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

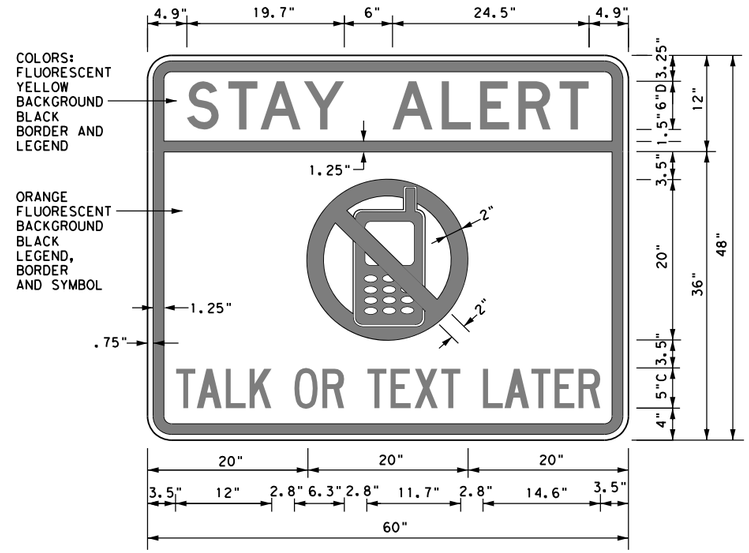
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
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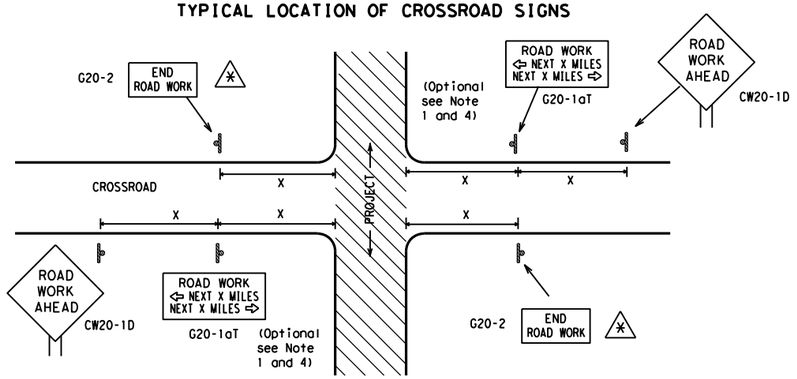
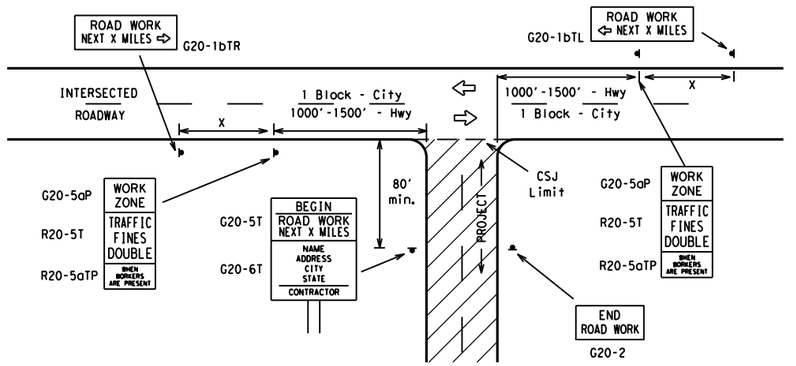
TYPICAL LOCATION OF CROSSROAD SIGNS



✱ 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. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

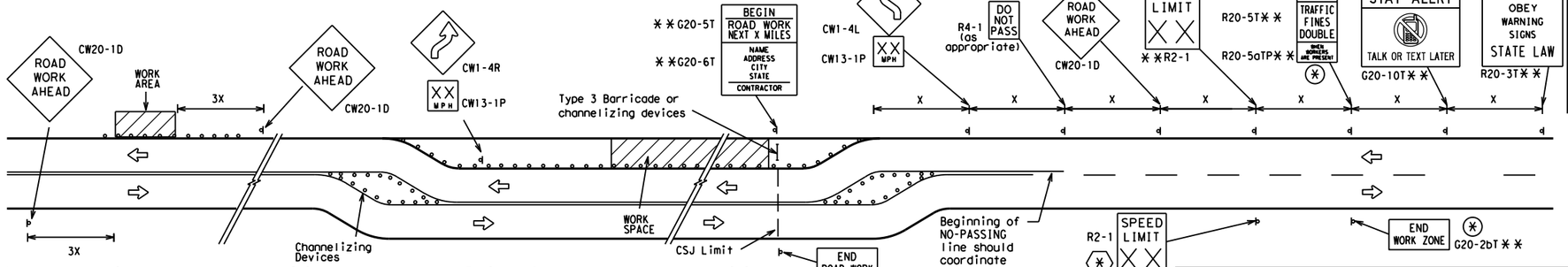
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

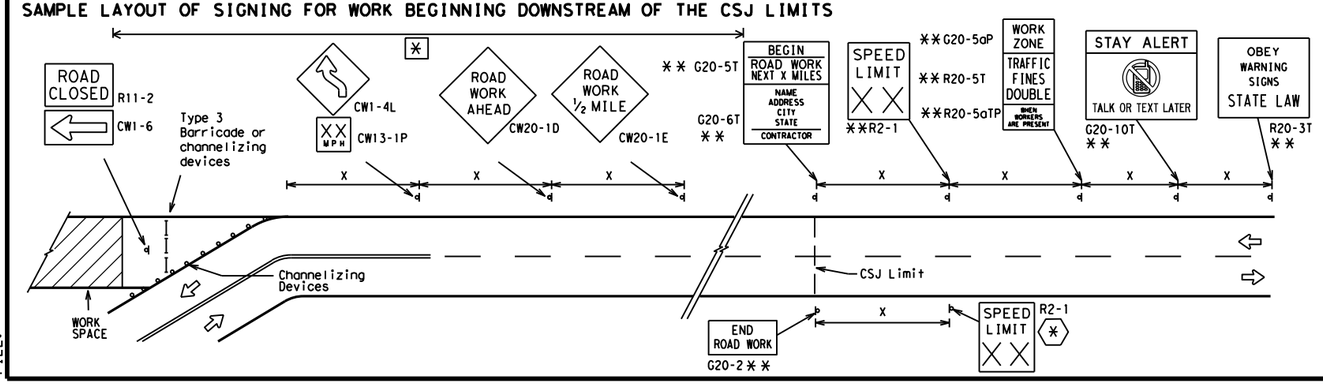
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING 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.

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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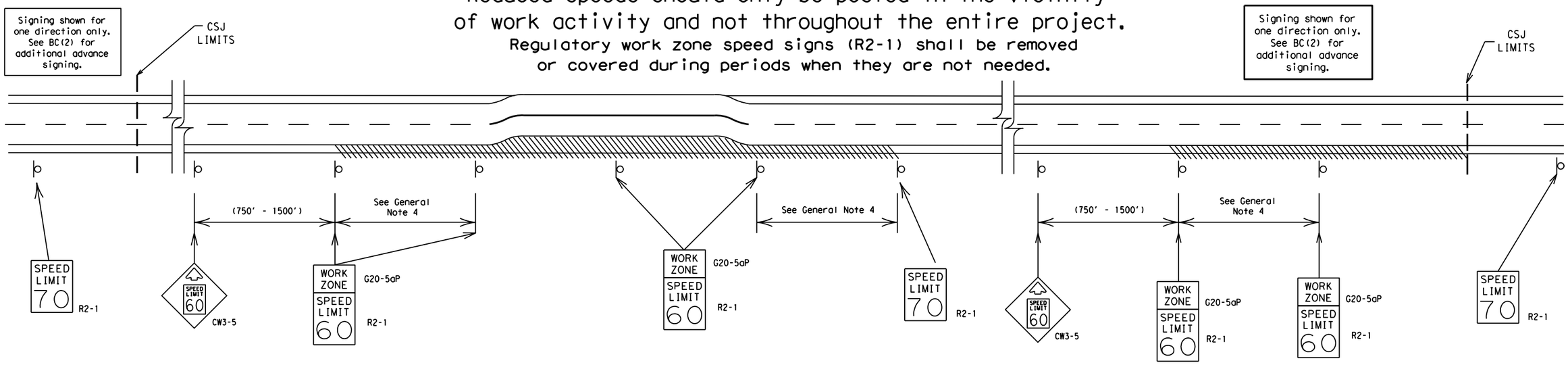
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		37

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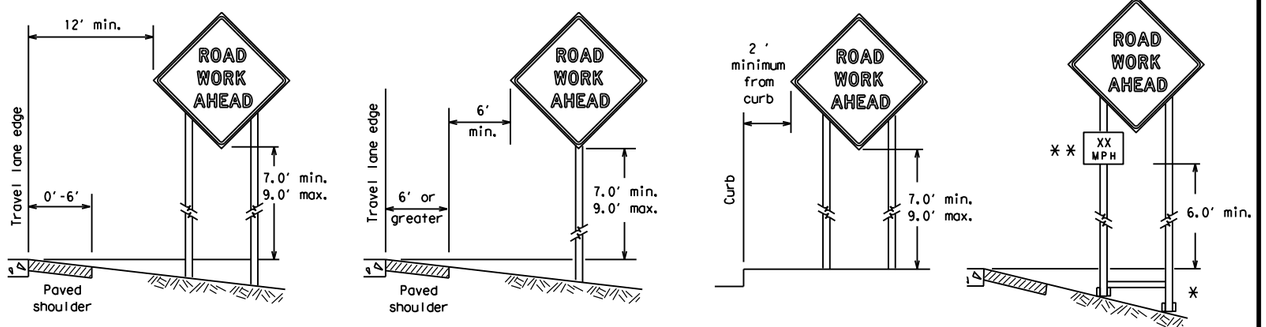
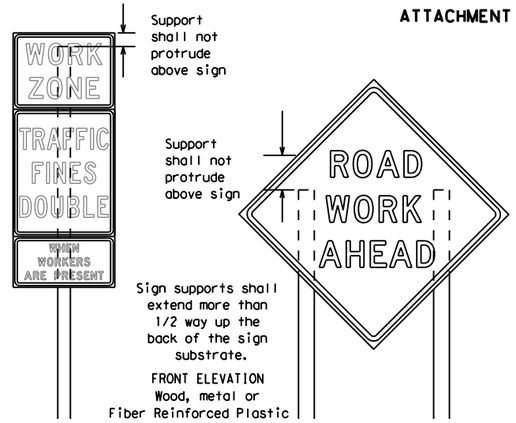
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

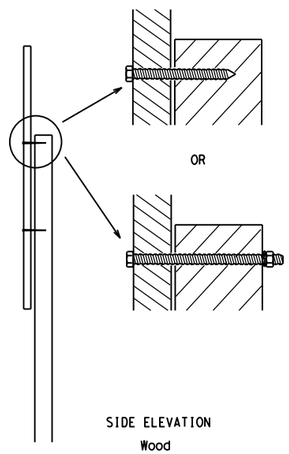


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





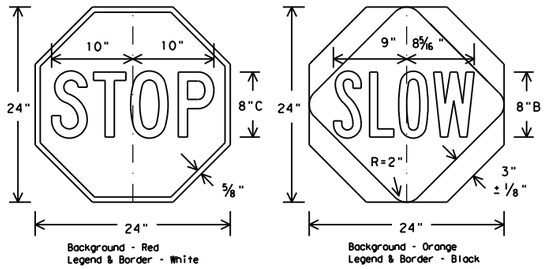
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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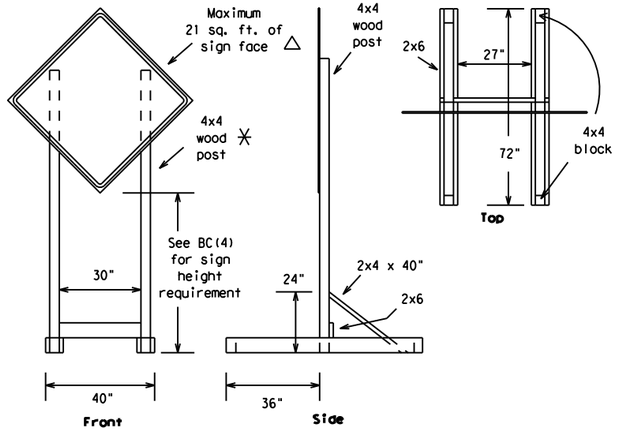
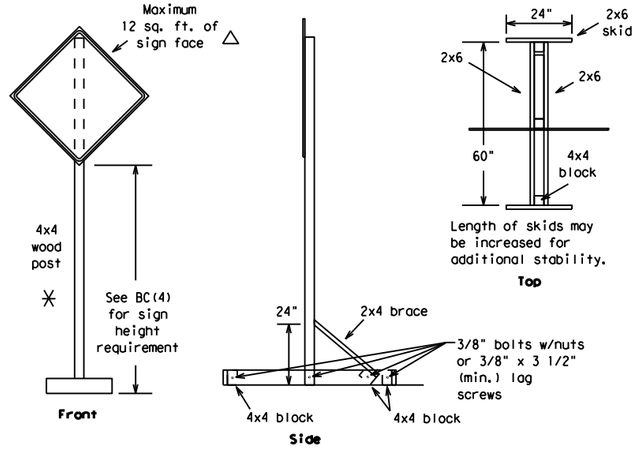
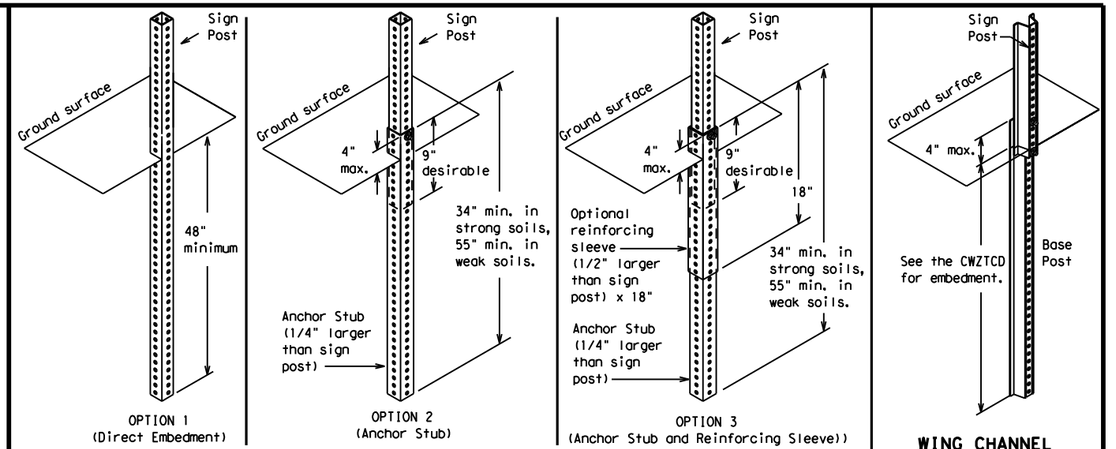
7-13	ODA	ECTOR, ETC		38





SKID MOUNTED WOOD SIGN SUPPORTS

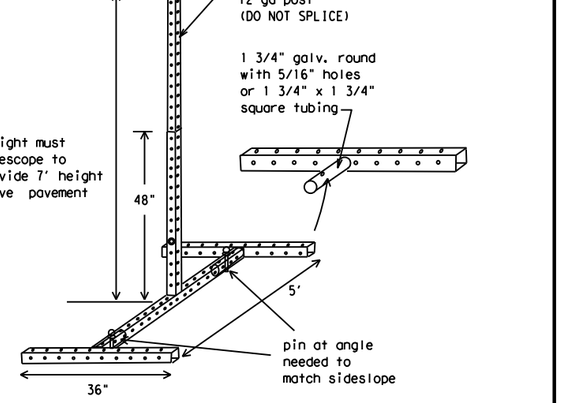
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

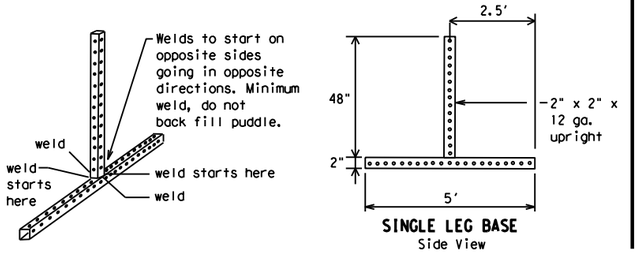


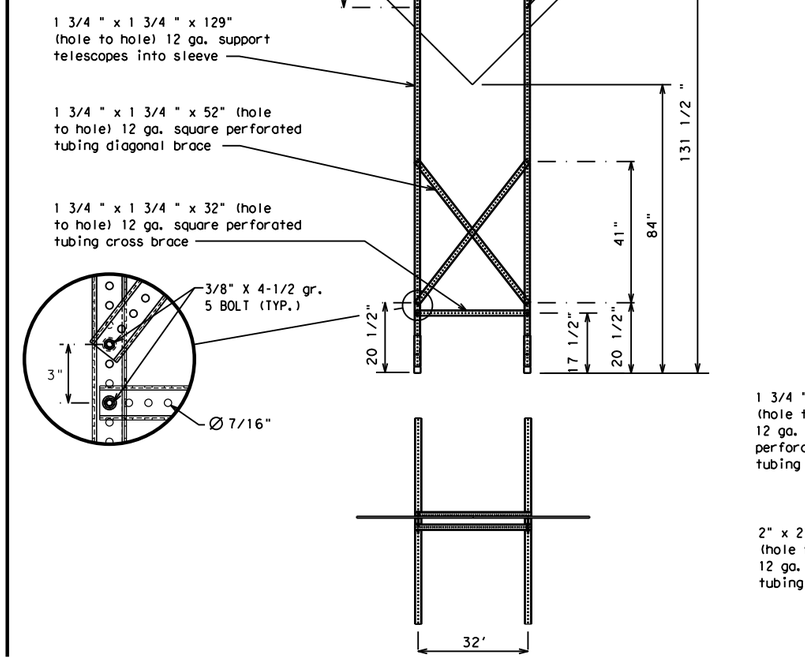
PERFORATED SQUARE METAL TUBING

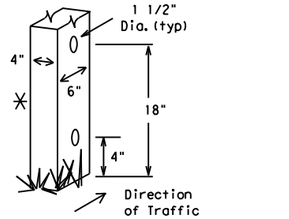
GROUND MOUNTED SIGN SUPPORTS

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



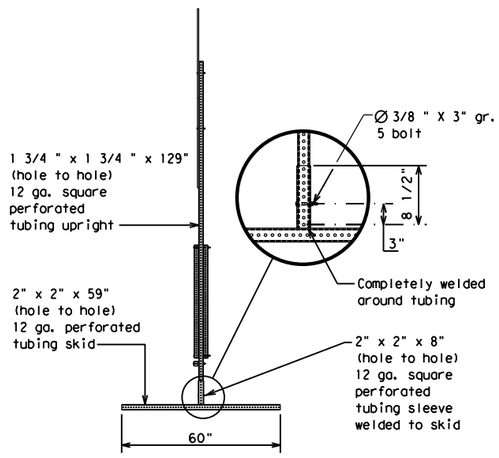






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
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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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ODA	ECTOR, ETC		40

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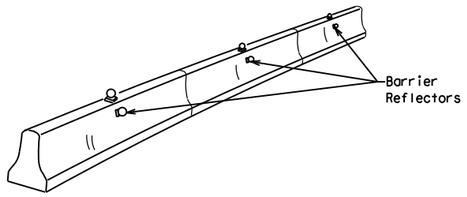
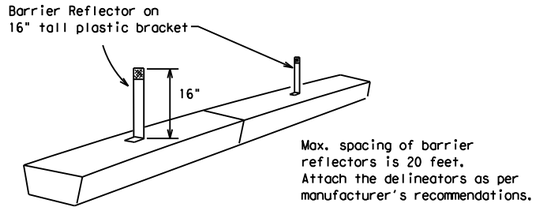
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

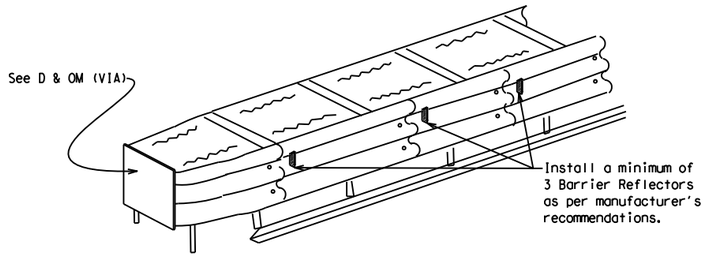


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

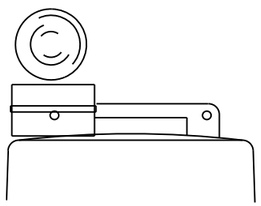


DELINEATION OF END TREATMENTS

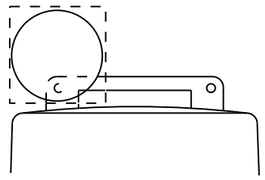
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

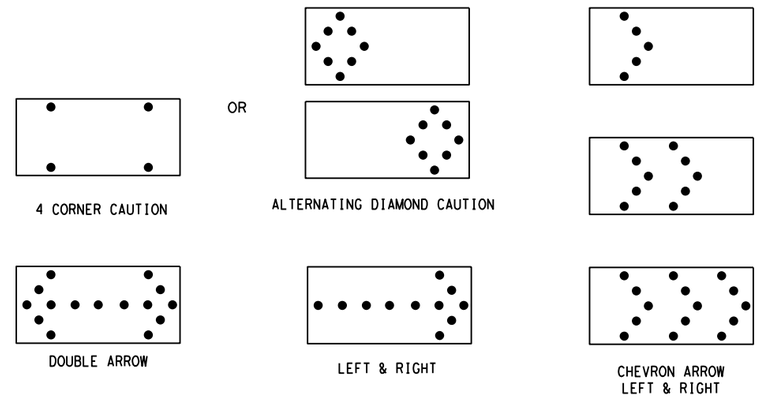
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
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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:

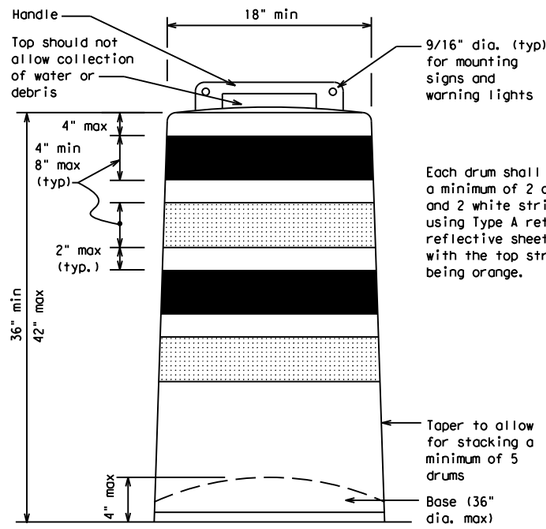
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

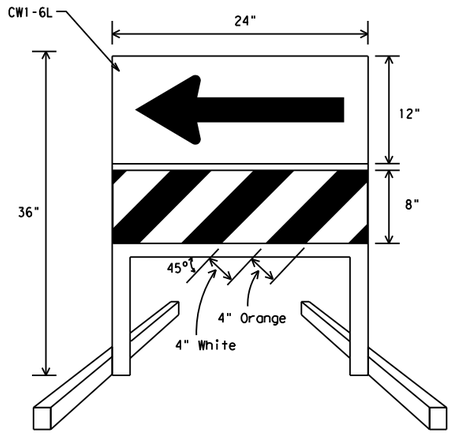
RETROREFLECTIVE SHEETING

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 reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

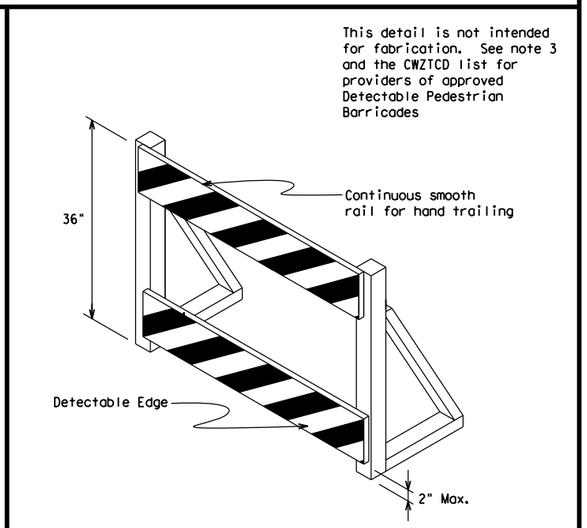
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





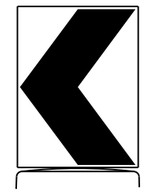
DIRECTION INDICATOR BARRICADE

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

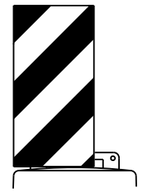


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

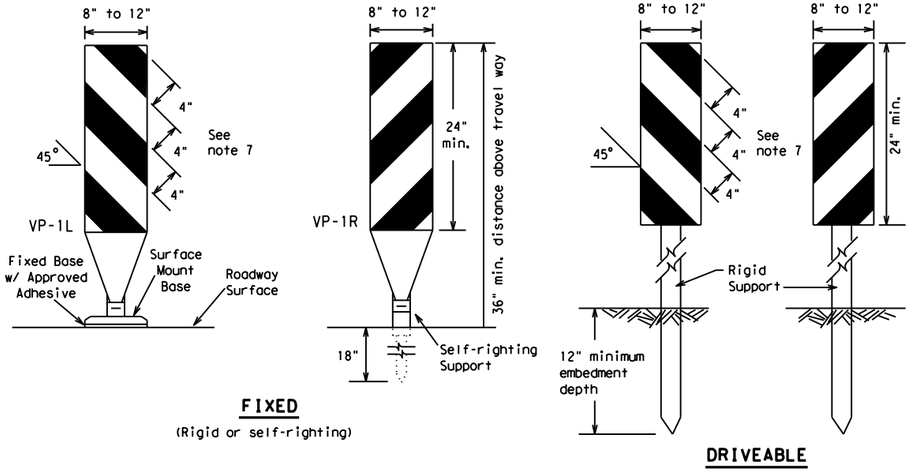
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

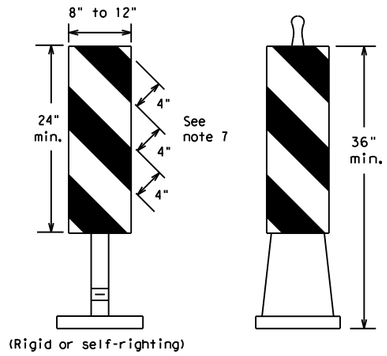
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ODA	ECTOR, ETC		42

DATE:
FILE:



FIXED
(Rigid or self-righting)

DRIVEABLE

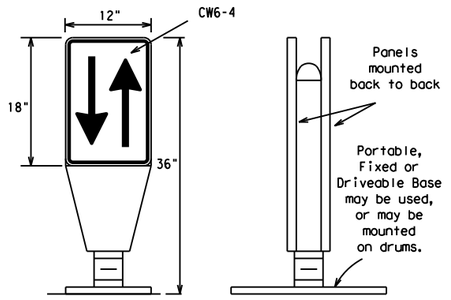


(Rigid or self-righting)

PORTABLE

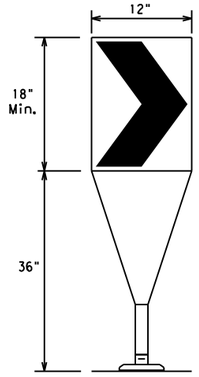
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



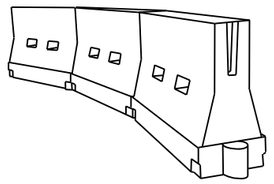
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

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) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	6375	31	001	IH 20, ETC
9-07 8-14	DIST	COUNTY		SHEET NO.
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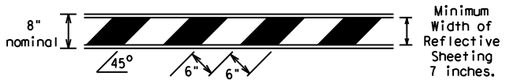
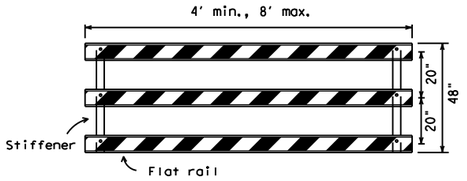
TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



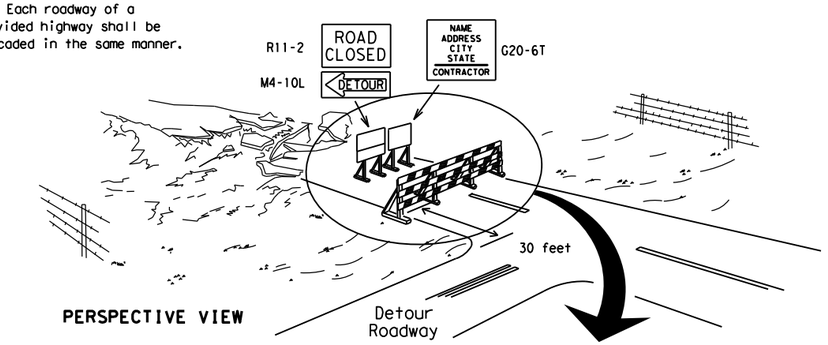
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

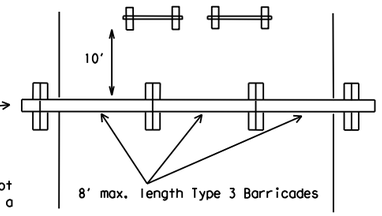
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

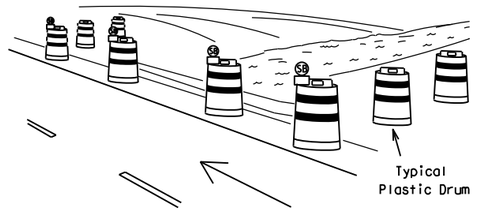
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

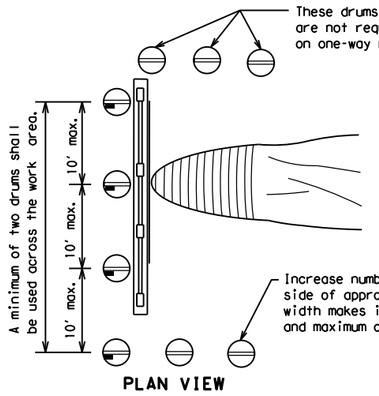
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

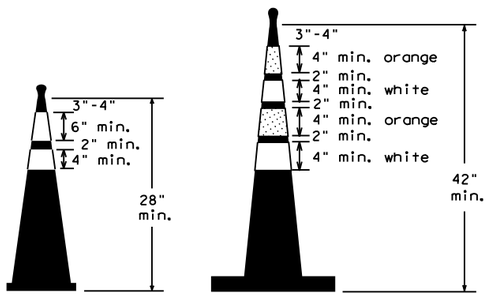
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

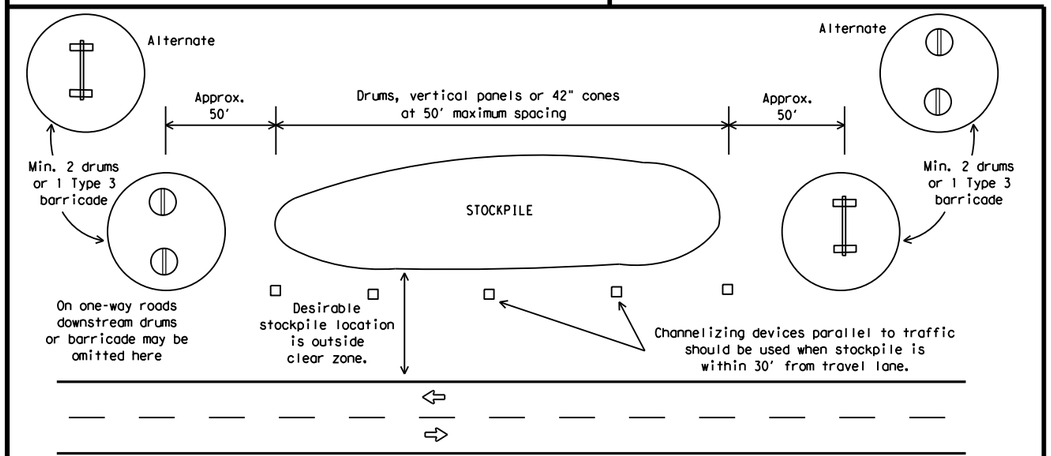
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

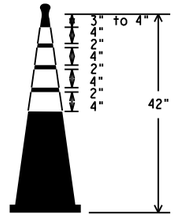
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		44

DATE:
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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.

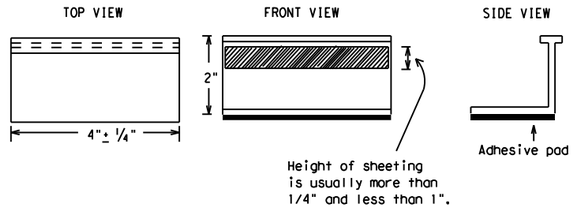
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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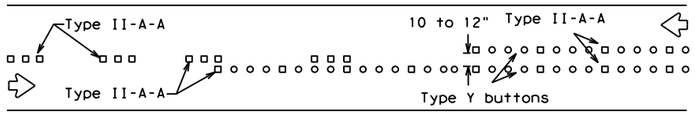
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	ODA	ECTOR, ETC		45
11-02 8-14				

105

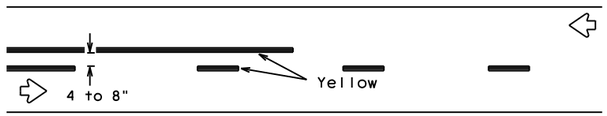
DATE:
FILE:

PAVEMENT MARKING PATTERNS

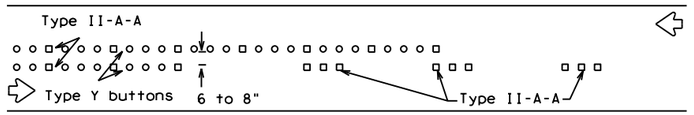
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



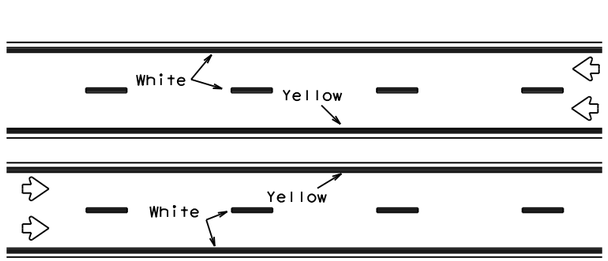
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



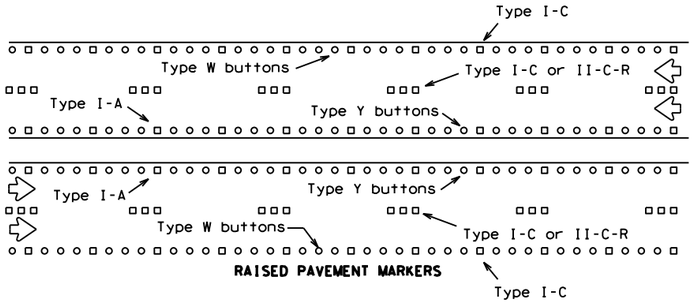
RAISED PAVEMENT MARKERS - PATTERN B

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

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



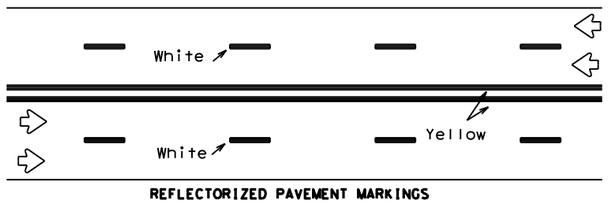
REFLECTORIZED PAVEMENT MARKINGS



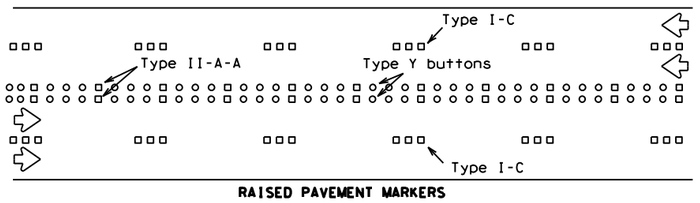
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



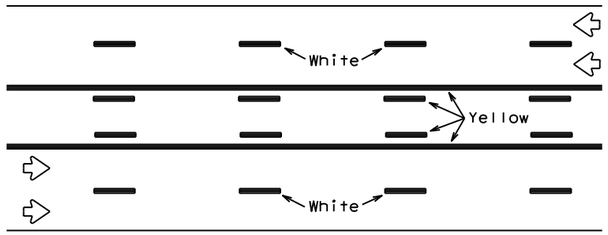
REFLECTORIZED PAVEMENT MARKINGS



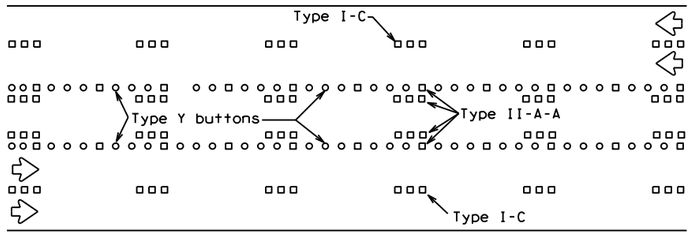
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

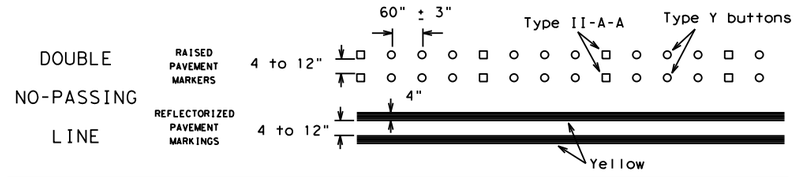
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

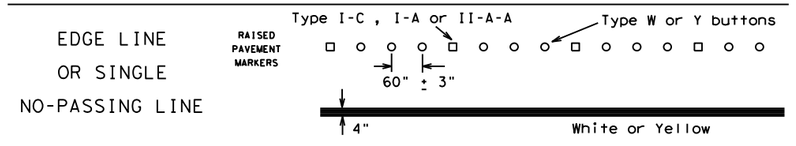
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

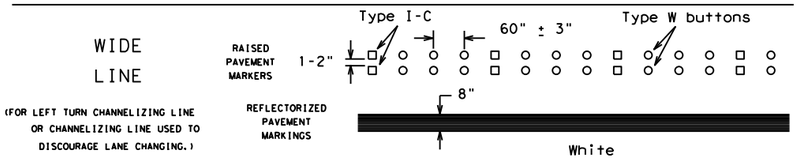


EDGE LINE OR SINGLE NO-PASSING LINE



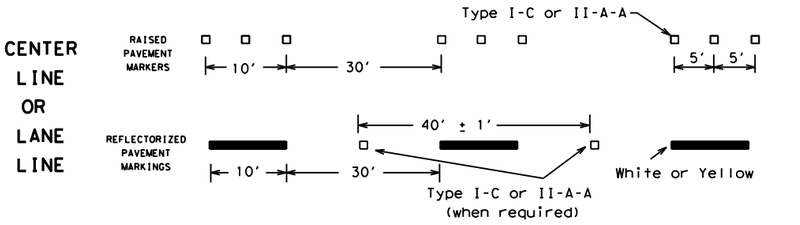
WIDE LINE

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

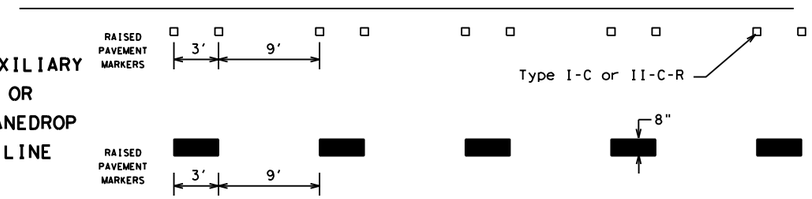


BROKEN LINES

CENTER LINE OR LANE LINE

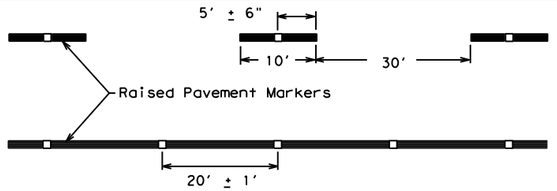


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 7-13	ODA	ECTOR, ETC		46
11-02 8-14				

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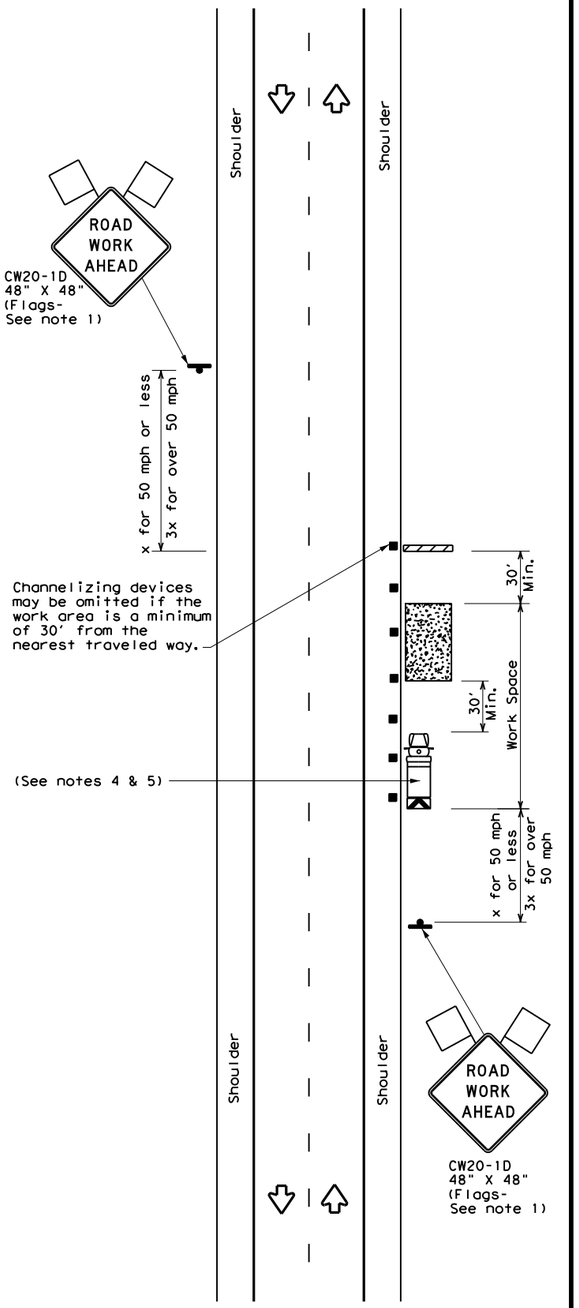
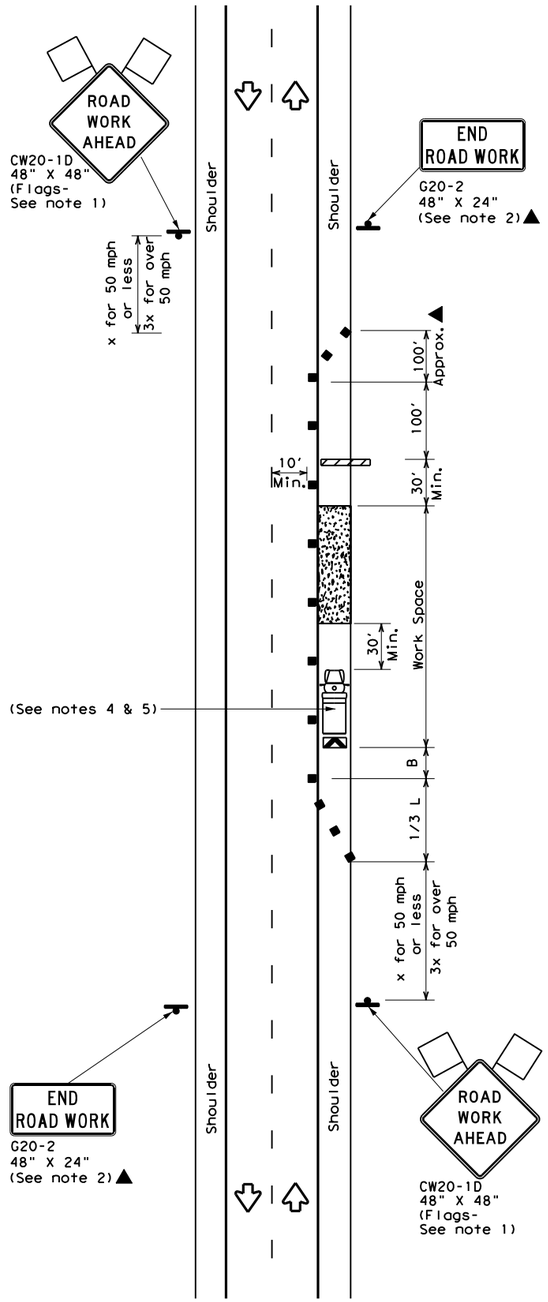


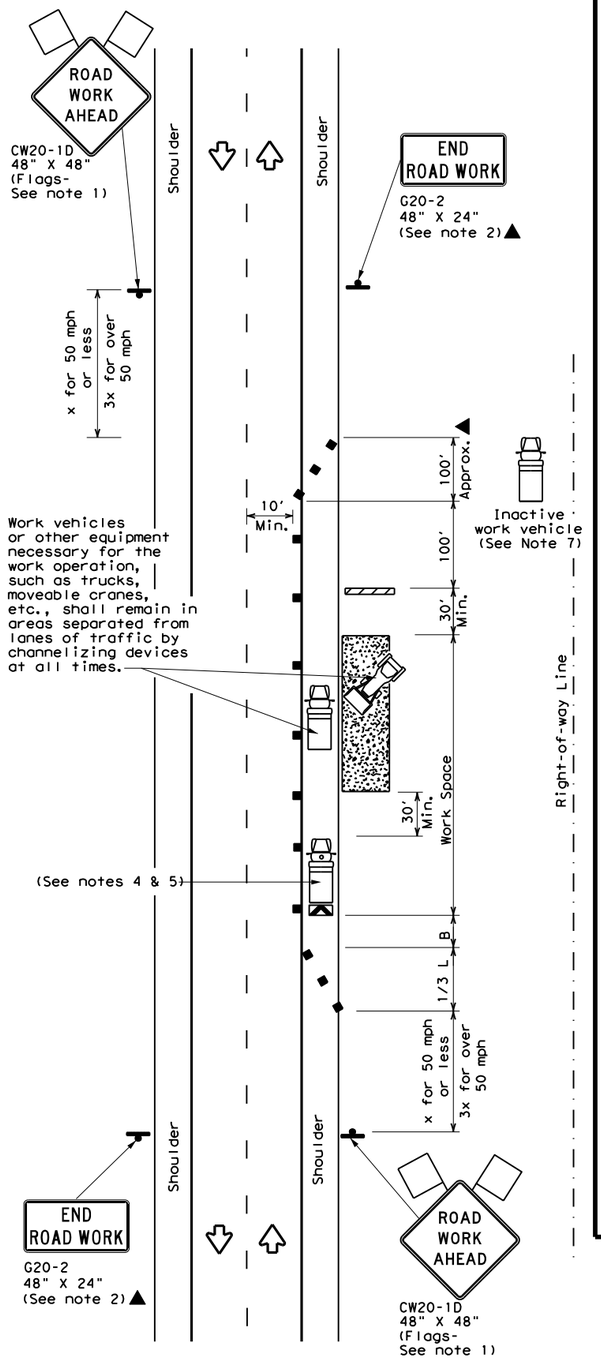
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ODA	ECTOR, ETC		47
1-97 2-18				

DATE:
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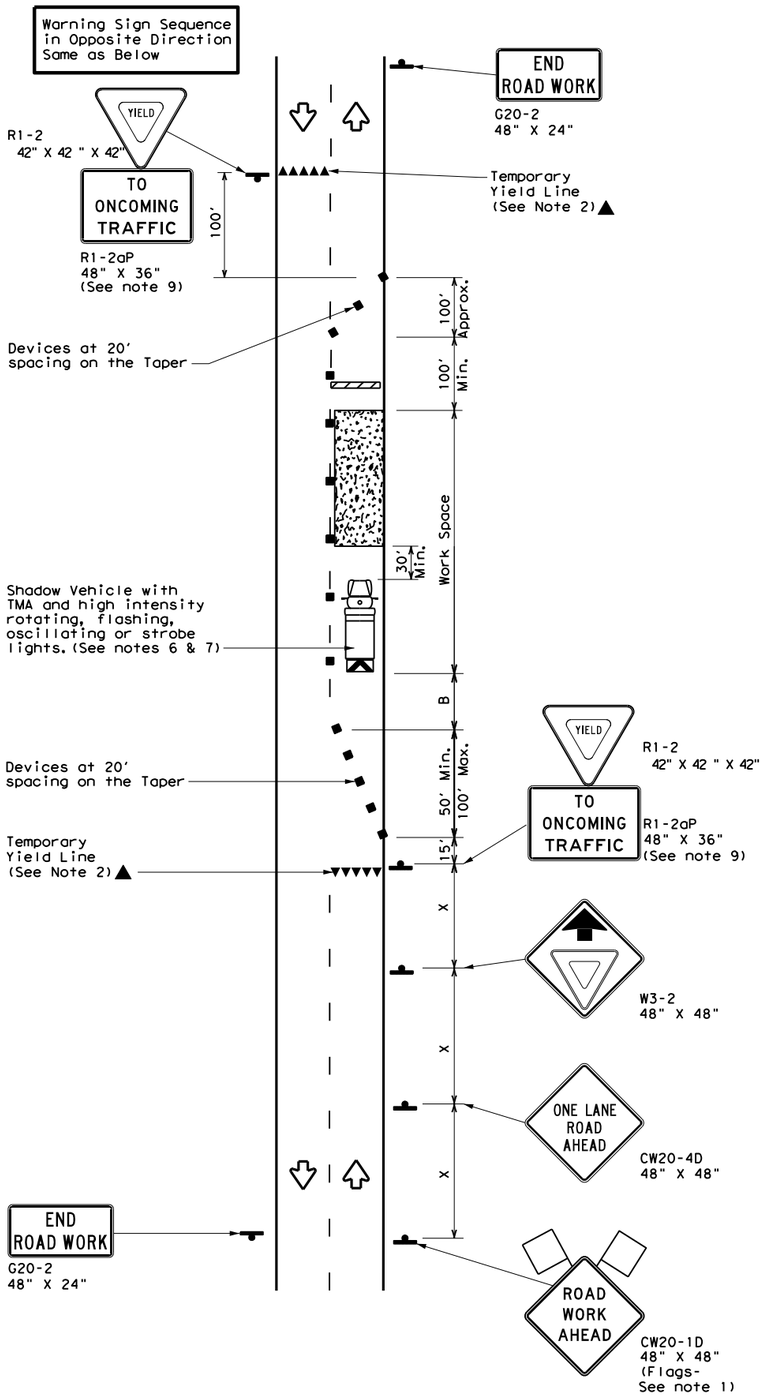
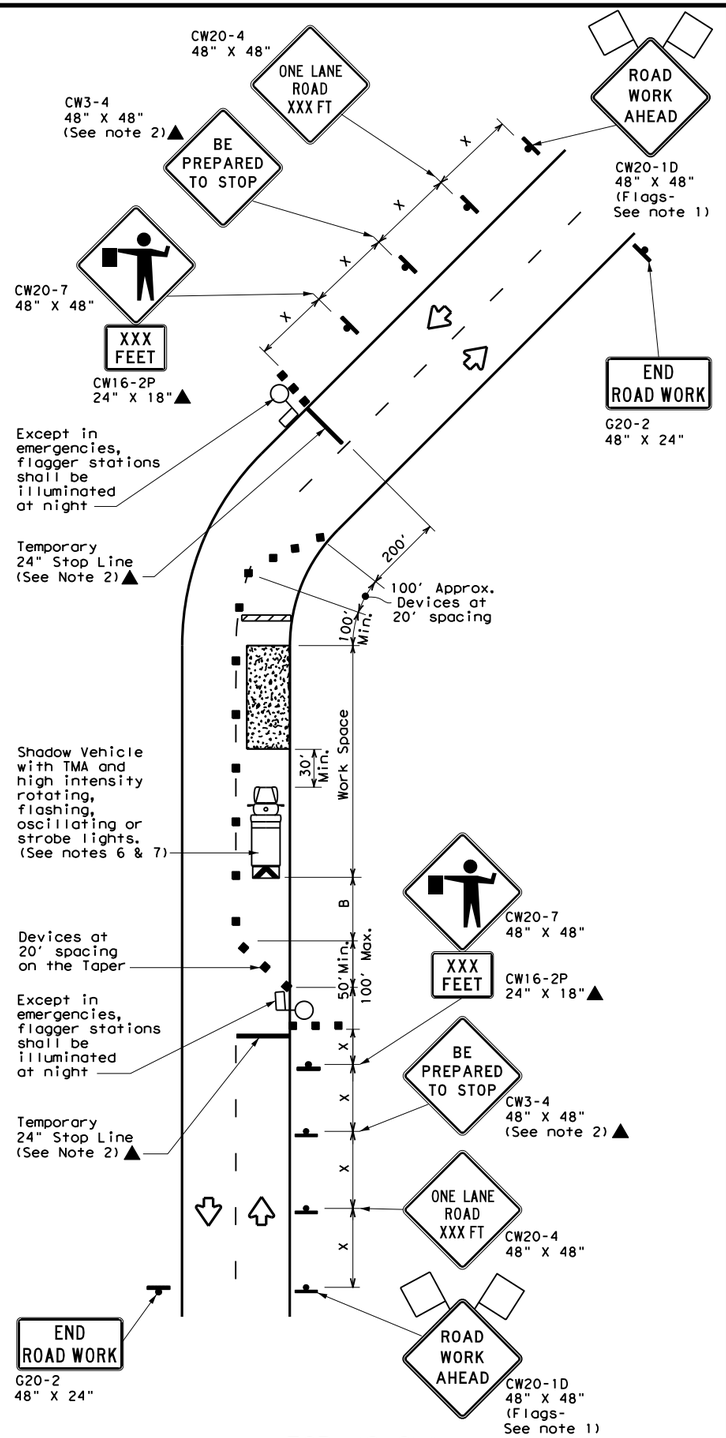


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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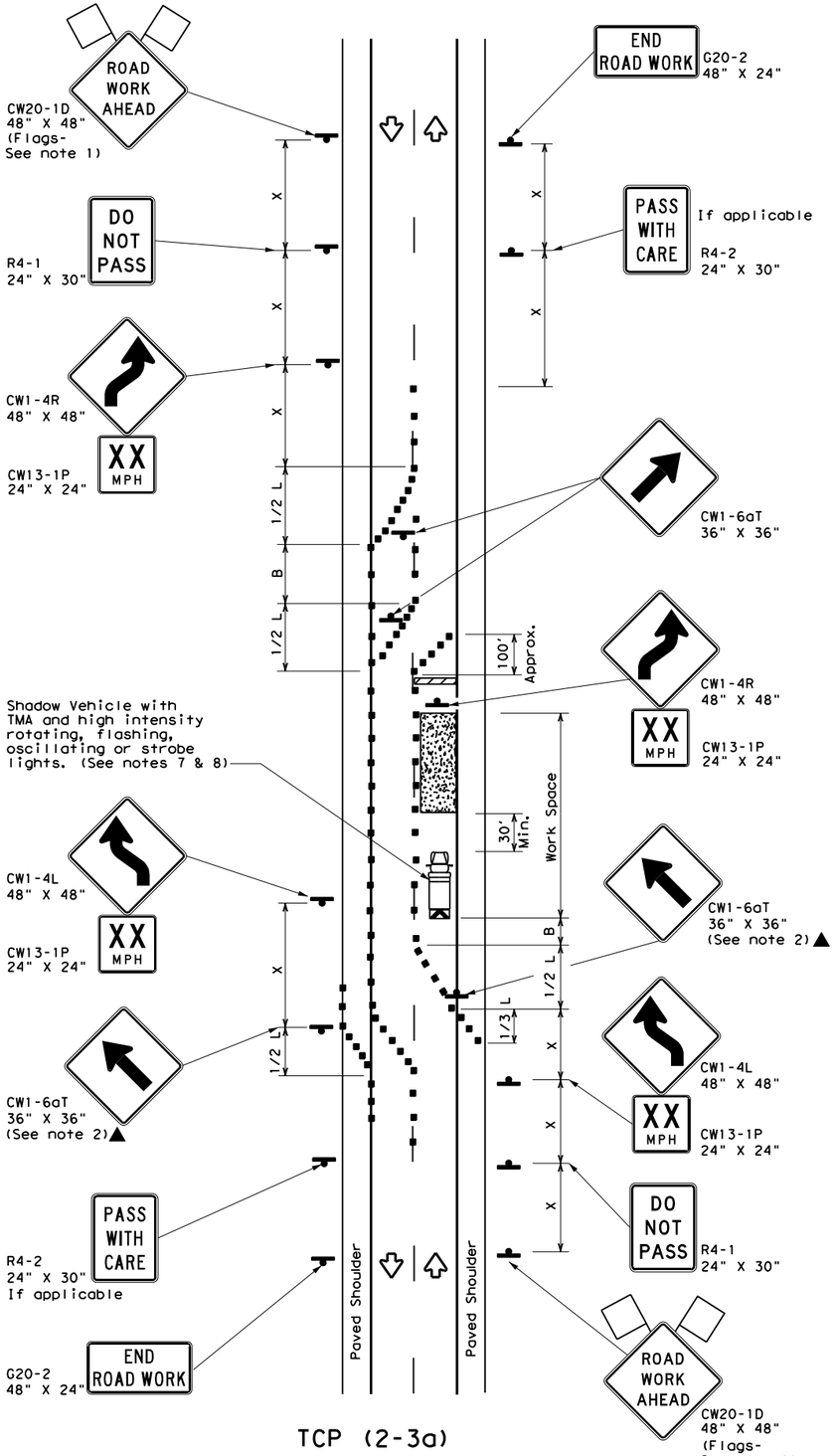
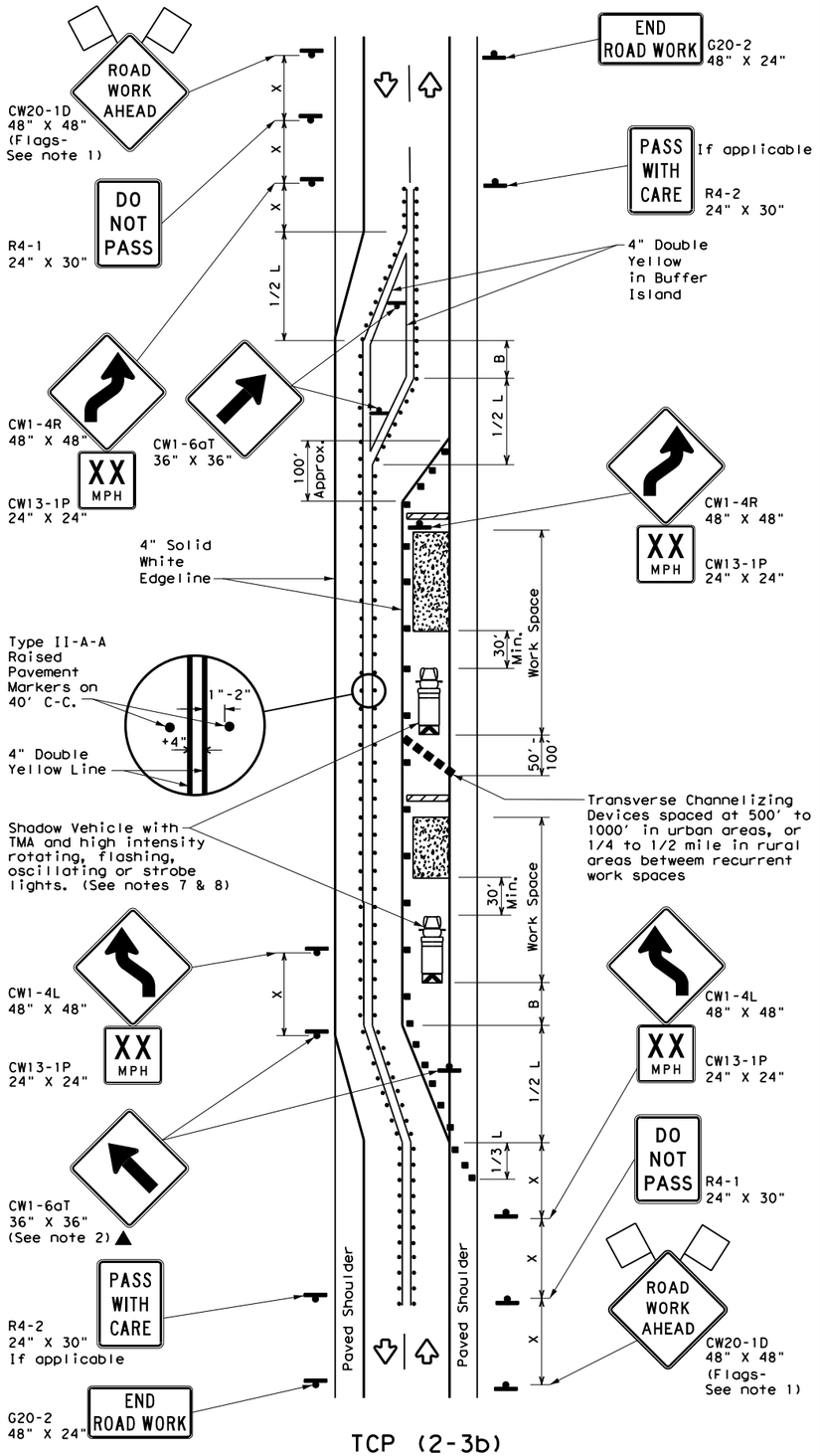


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-3a)

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

Texas Department of Transportation

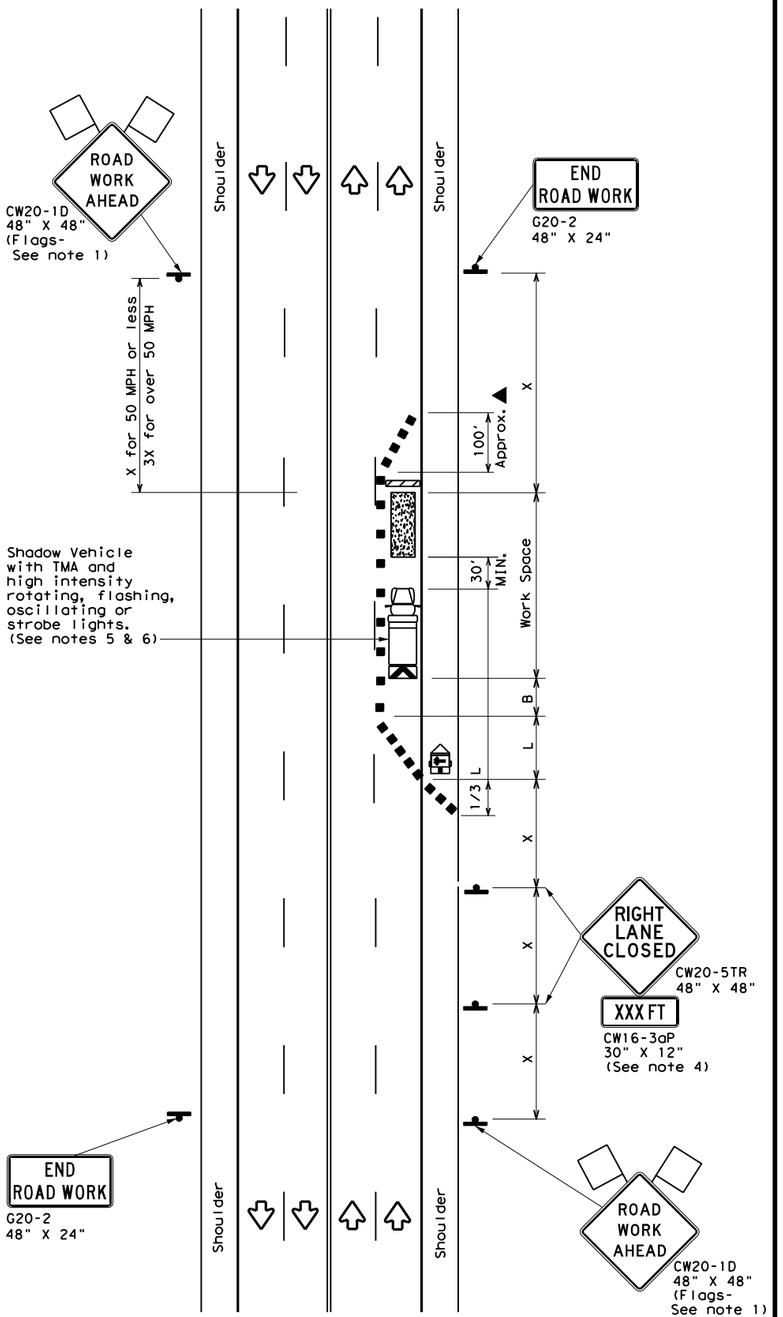
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

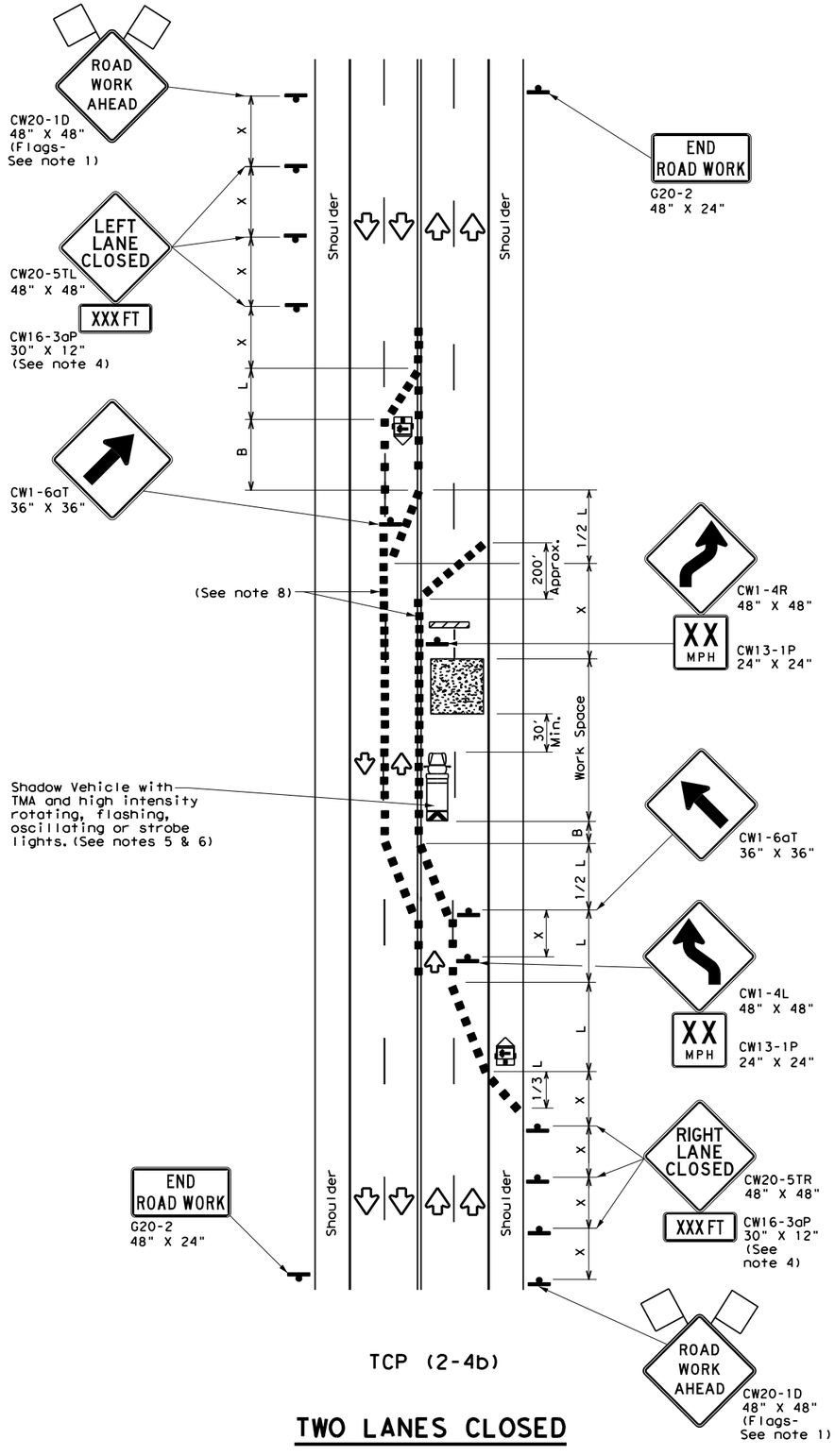
FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	ODA	ECTOR, ETC		49
4-98 2-18				

DATE:
FILE:



TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

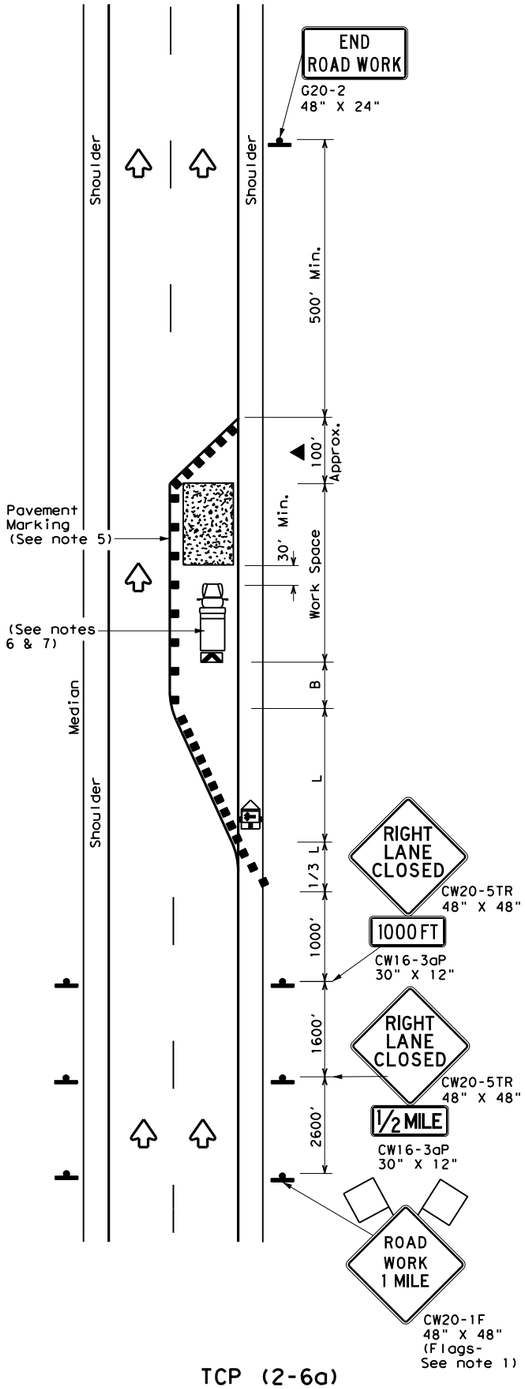
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

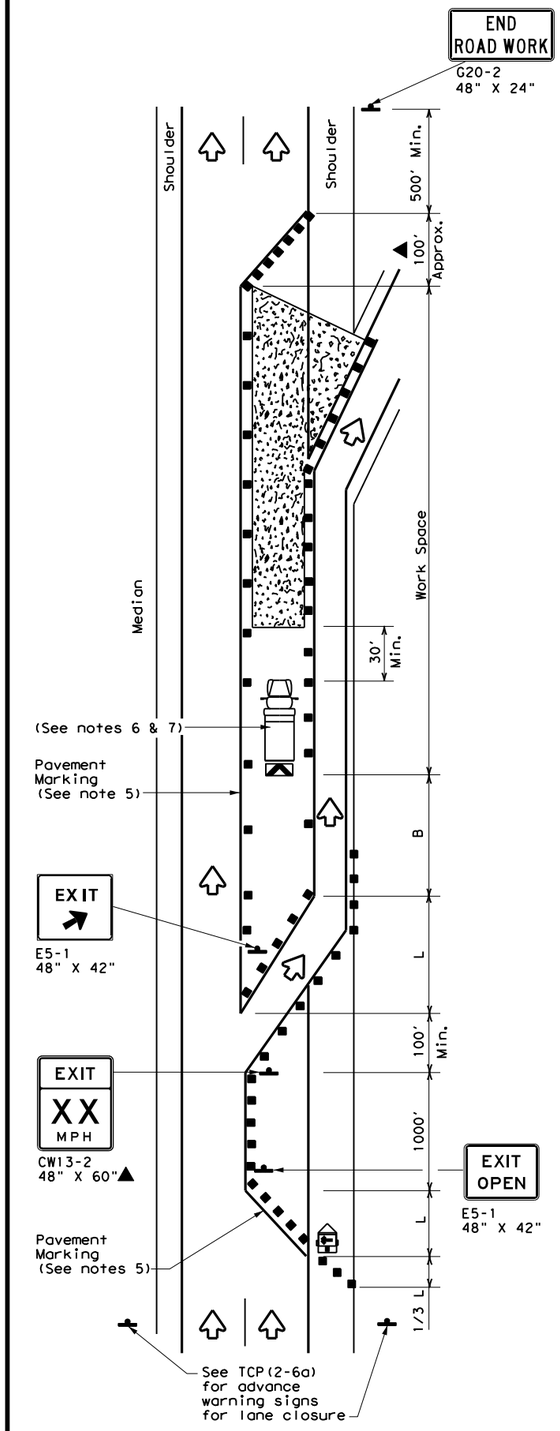
FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	6375	31	001	IH 20, ETC
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	ODA	ECTOR, ETC		50

DATE:
FILE:



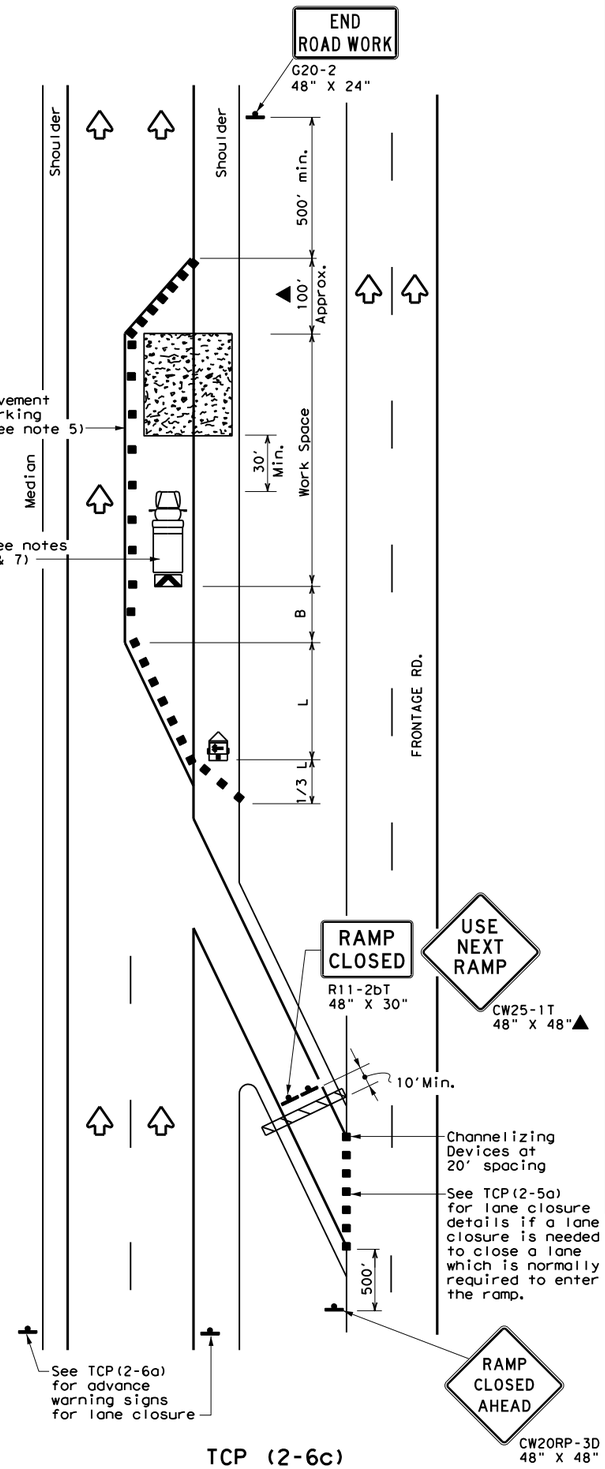
TCP (2-6a)

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	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		51

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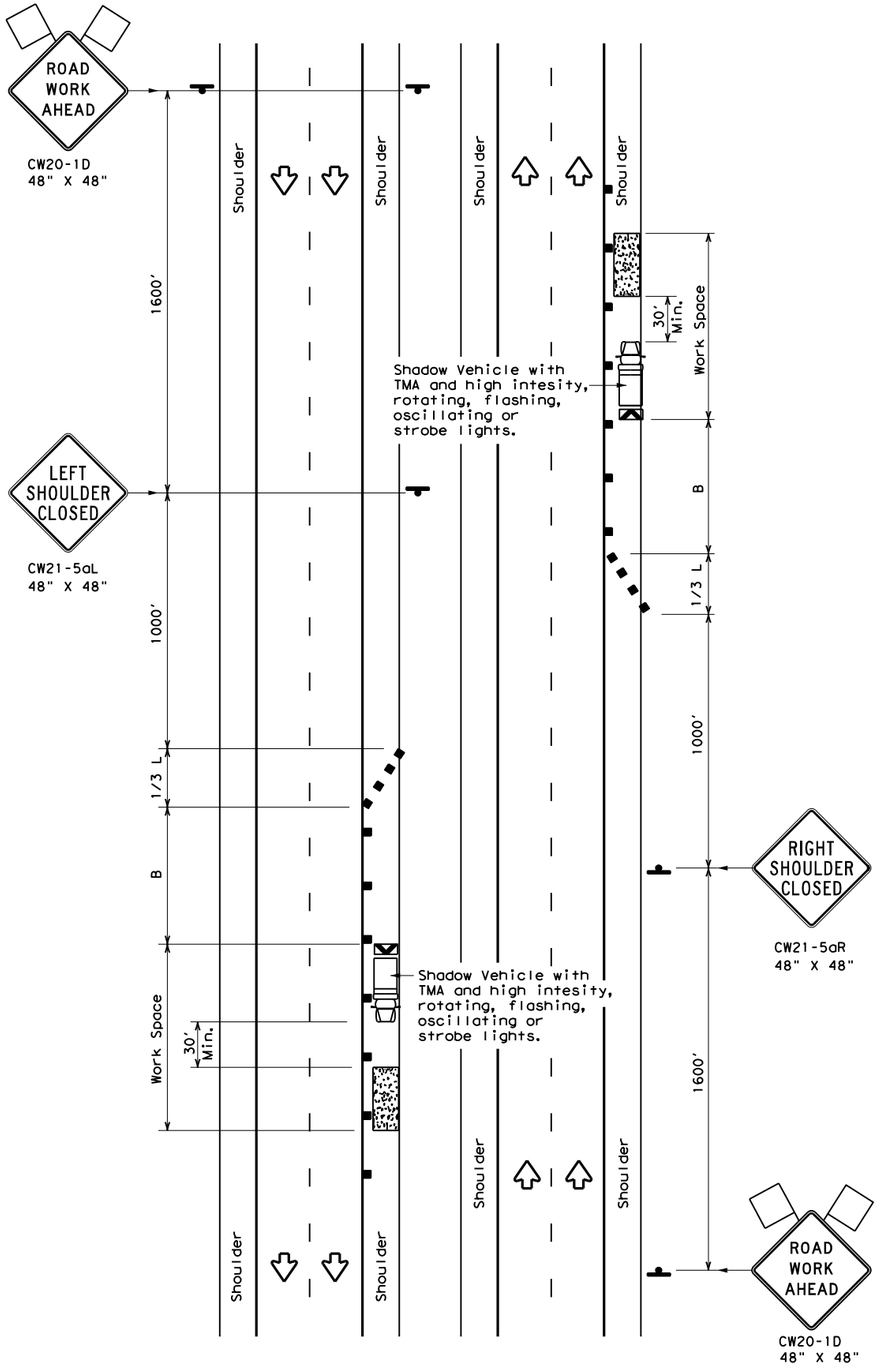
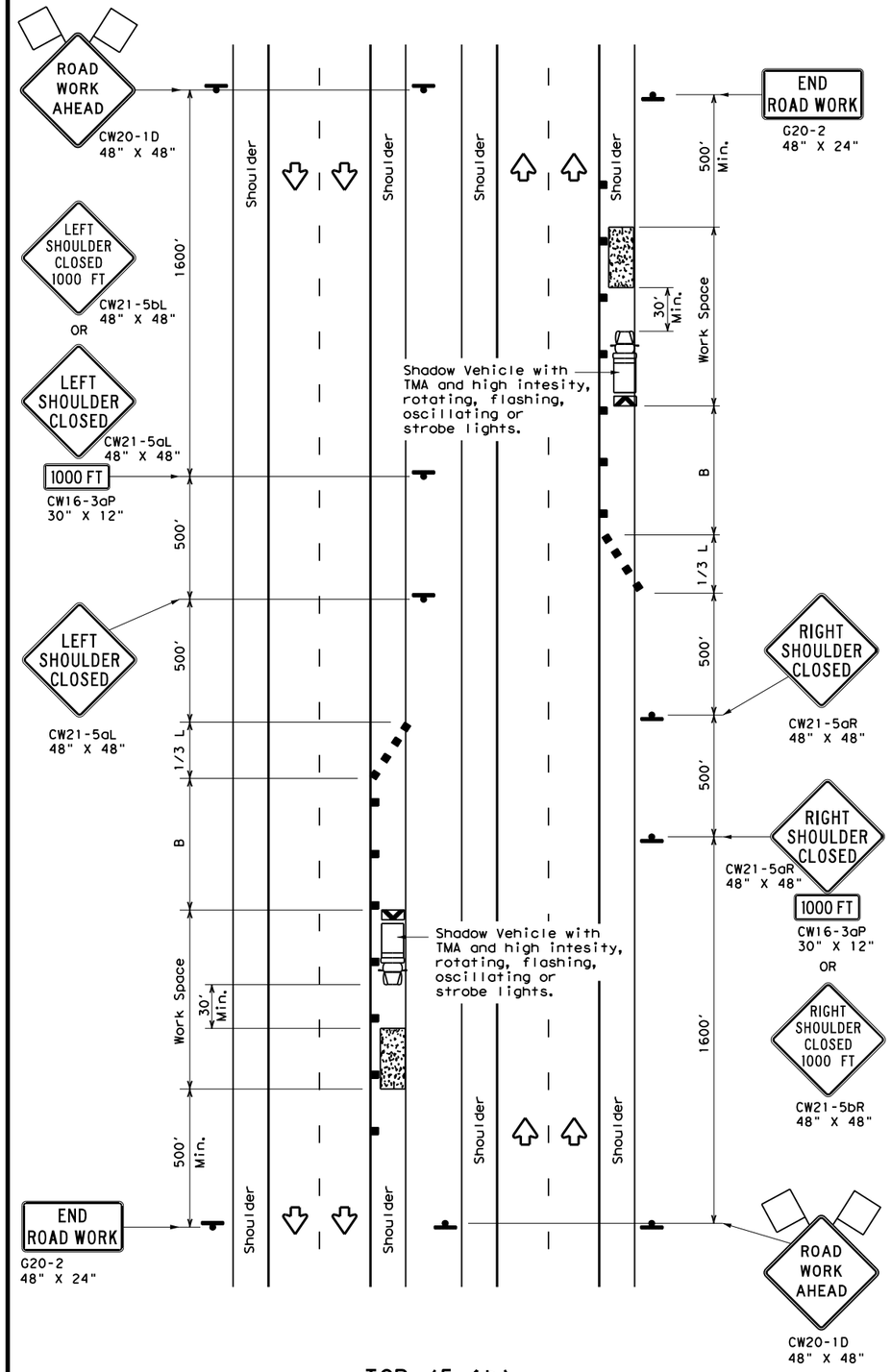
DATE:
FILE:



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

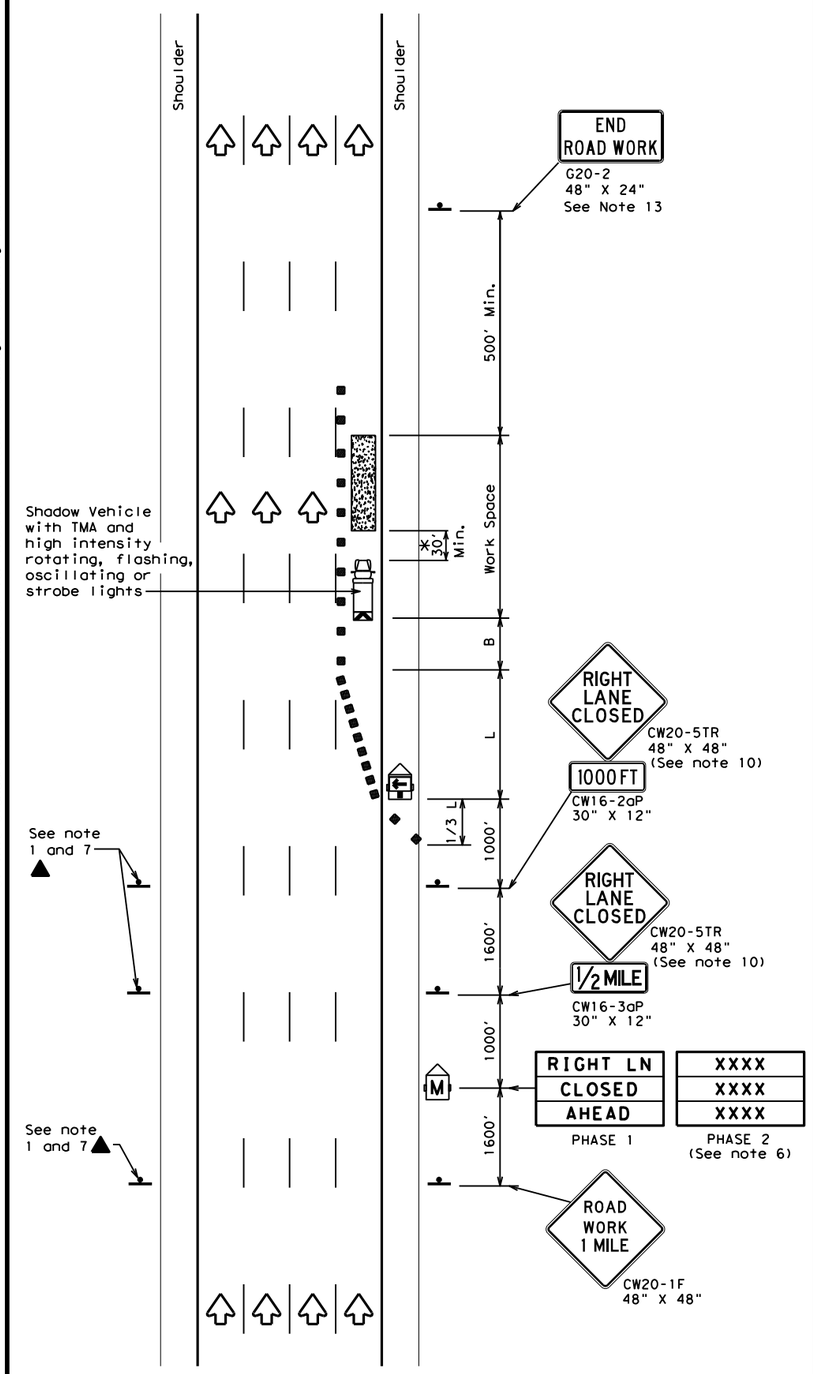
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

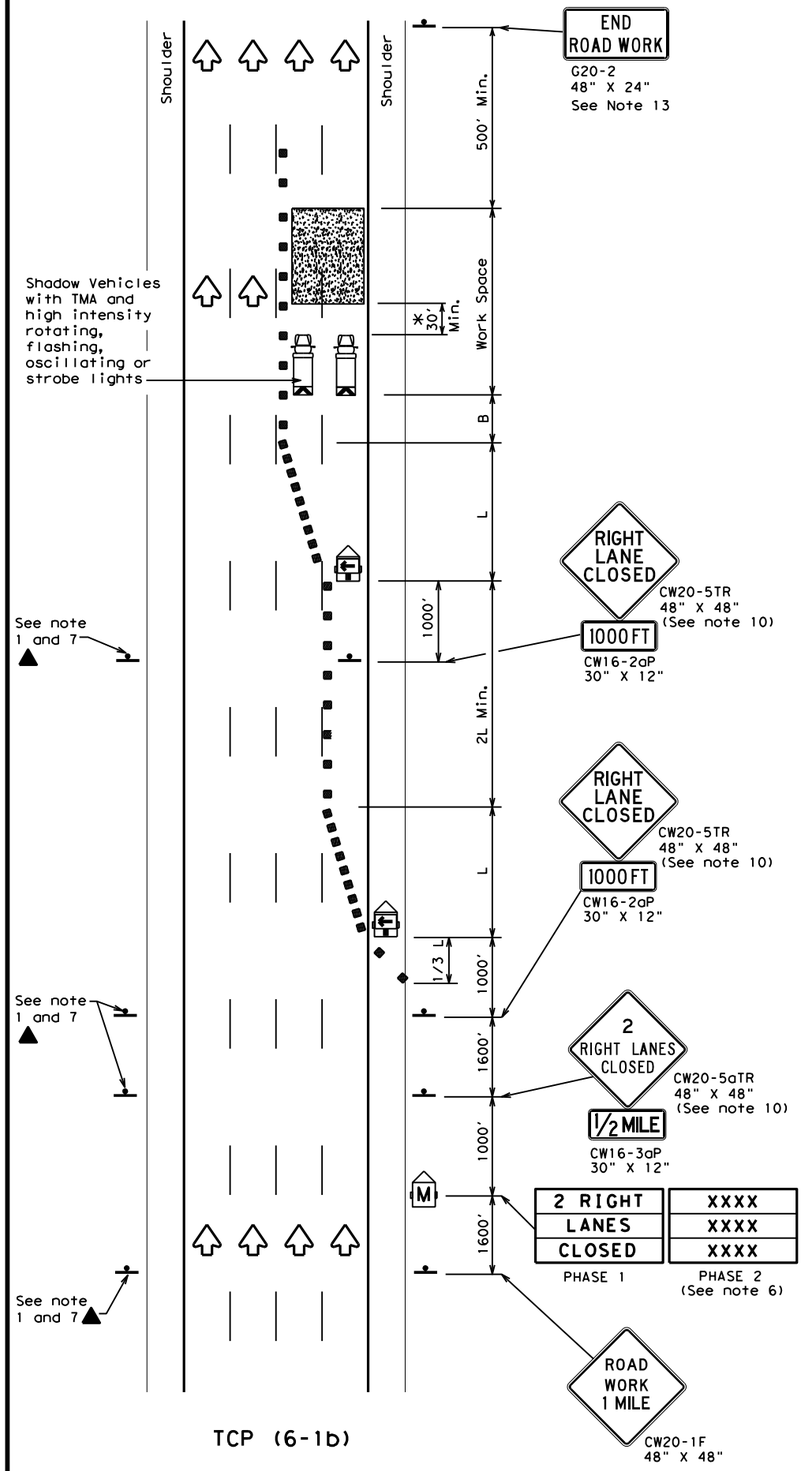
FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	6375	31	001	IH 20, ETC
2-18	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		52

DATE:
FILE:



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.

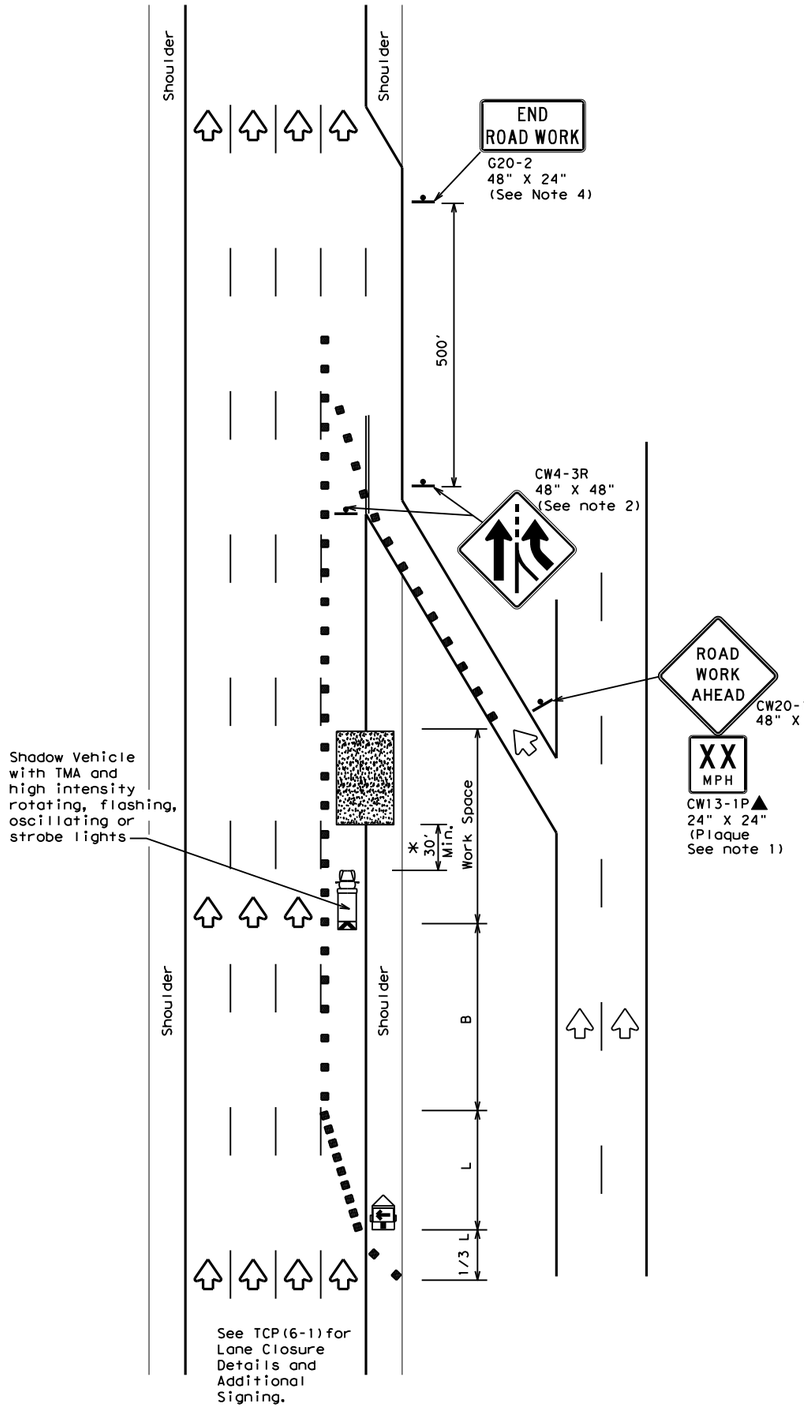
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

TCP(6-1)-12

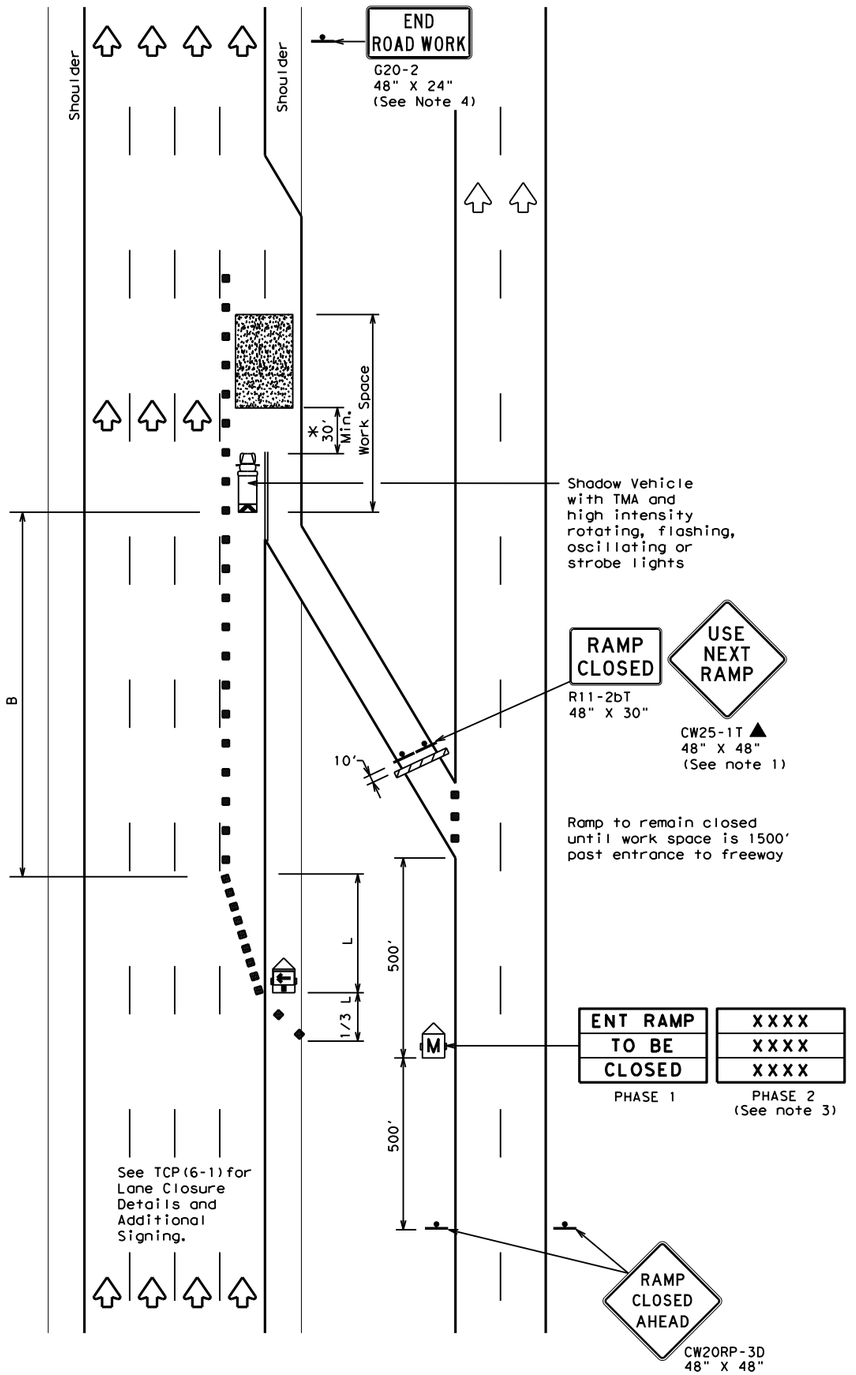
FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-12	6375	31	001	IH 20, ETC
	DIST	COUNTY		SHEET NO.
	ODA	ECTOR, ETC		53

DATE:
FILE:



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	6375	31	001	IH 20, ETC
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC		54

202

DATE:
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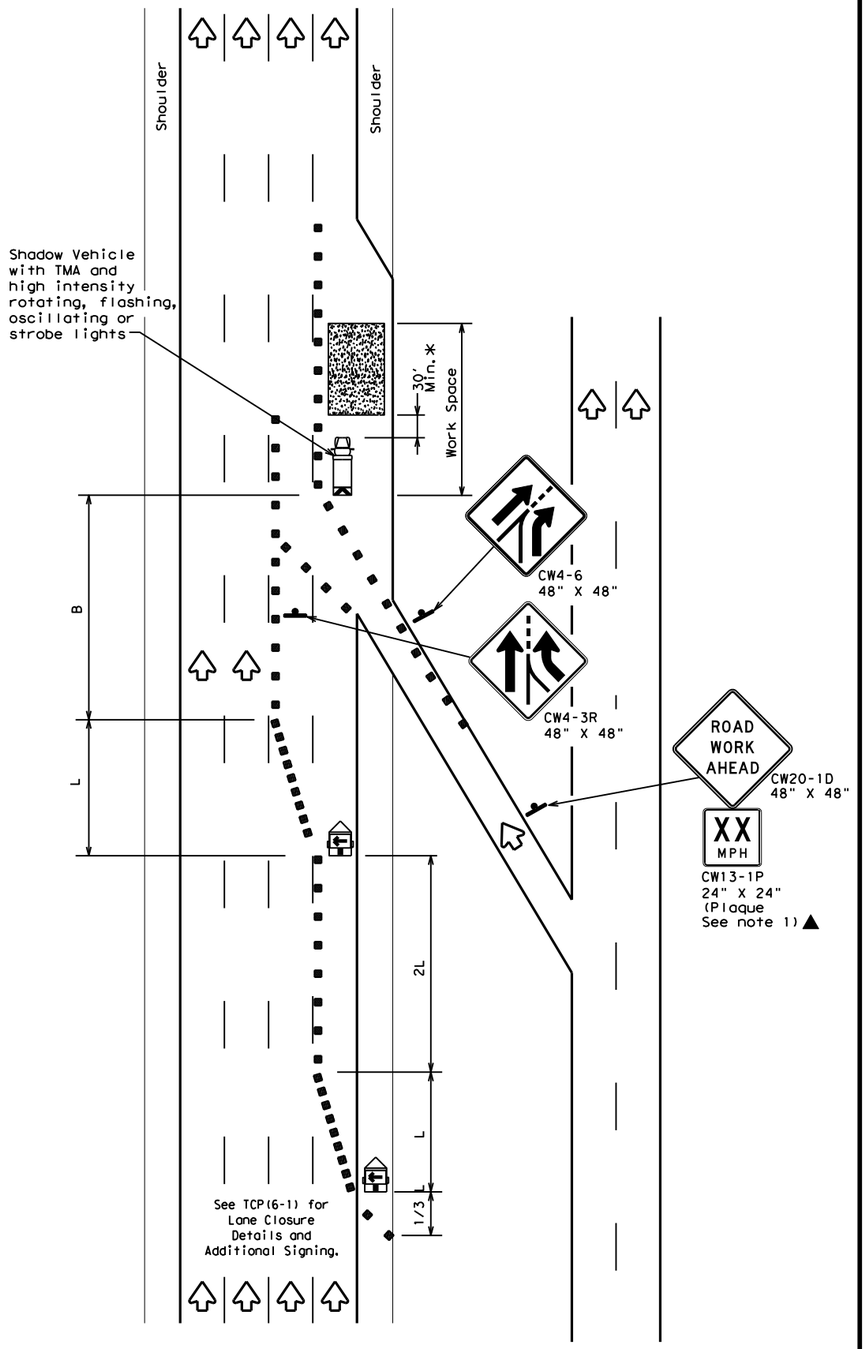
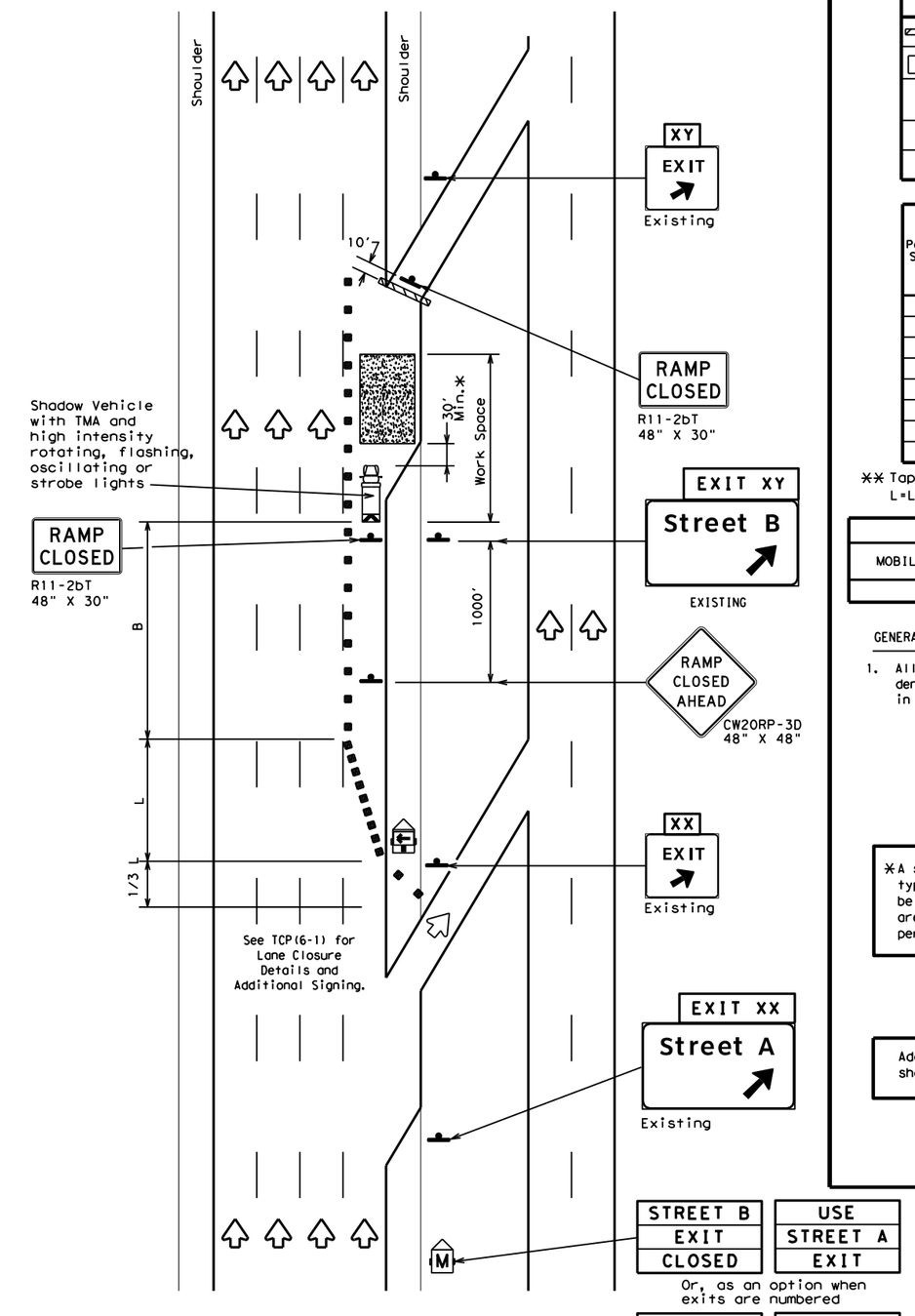


TCP (6-3a)

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" ** 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.

*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
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REVISIONS	6375	31	001	IH 20, ETC
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	ODA	ECTOR, ETC		55