FHWA TEXAS DIVISION		SHEET NO.
		1

STATE	DISTRICT	COUNTY	
TEXAS	PAR	HUNT	
CONTROL	SECTION	JOB	HIGHWAY NO.
0642	01	021,ETC.	FM 36,ETC.

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. STP 2021(218)HES

FM 36, ETC.
HUNT COUNTY

ROAD NO	CSJ	DESIGN SPEED MPH	ADT YEAR / ADT		FUNCTIONAL CLASSIFICATION
FM 36	0642-01-021	45	2018	380	MINOR ARTERIAL
			2038	532	
FM 1570	2659-01-012	45	2018	3661	MAJOR COLLECTOR
			2038	4759	
FM 751	1017-04-026	45	2018	9667	MINOR ARTERIAL
			2038	11990	
FM 1564	1496-01-012	50	2018	2518	MAJOR COLLECTOR
			2038	3324	

LIMITS: VARIOUS

CSJ: 0642-01-021
NET LENGTH OF ROADWAY= 2,611 FT = 0.49 MI.
CSJ: 2659-01-012
NET LENGTH OF ROADWAY= 16,700 FT = 3.16 MI.
CSJ: 1017-04-026
NET LENGTH OF ROADWAY= 18,624 FT = 3.53 MI
CSJ: 1469-01-012
NET LENGTH OF ROADWAY= 39,615 FT = 7.50 MI.
NET LENGTH OF BRIDGE= 50 FT = 0.0094 MI.

CSJ 0642-01-021 LIMITS: FROM CR 1096 TO CR 1130
CSJ 2659-01-012 LIMITS: FROM I30 TO SH 66
CSJ 1017-04-026 LIMITS: FROM SH 276 TO 0.152 MI S OF APACHE TRAIL
CSJ 1469-01-012 LIMITS: FROM SH 34 TO US 69

TOTAL PROJECT LENGTH= 77,600 FT = 14.69 MI.

FOR THE CONSTRUCTION OF HAZARD ELIMINATION AND SAFETY
CONSISTING OF INSTALL ADVANCE WARNING SIGNS (CURVE), INSTALL CHEVRONS (CURVE),
PROFILE EDGELINE MARKINGS, PROFILE CENTERLINE MARK,
INSTALL SAFETY TREAT FIXED OBJECTS

2 0 4 8
SCALE IN MILES

END PROJ. FM 36
STA. 105+00.00
CSJ 0642-01-021
REF. MARKER 230-0.002

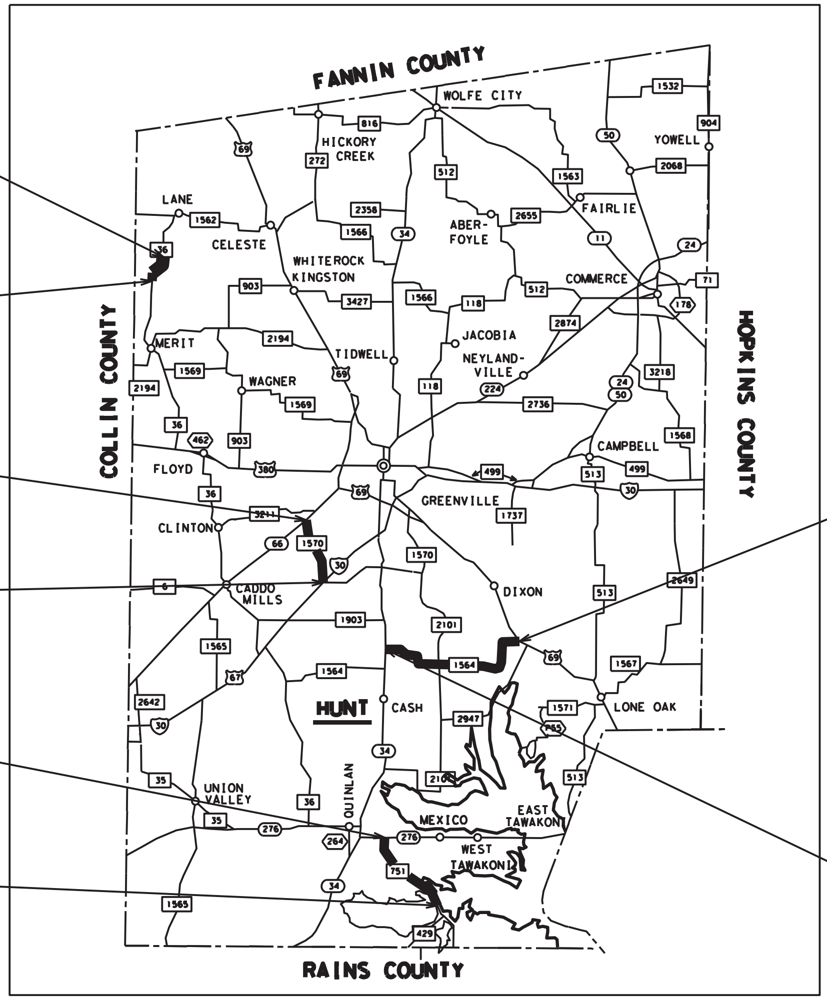
BEGIN PROJ. FM 36
STA. 138+60.00
CSJ 0642-01-021
REF. MARKER 230+0.630

END PROJ. FM 1570
STA. 167+94.22
CSJ 2659-01-012
REF. MARKER 250+0.933

BEGIN PROJ. FM 1570
STA. 000+94.26
CSJ 2659-01-012
REF. MARKER 248-0.246

BEGIN PROJ. FM 751
STA. 318+55.57
CSJ 1017-04-026
REF. MARKER 256-0.051

END PROJ. FM 751
STA. 505+00.00
CSJ 1017-04-026
REF. MARKER 260-0.770



END PROJ. FM 1564
STA. 419+63.44
CSJ 1496-01-012
REF. MARKER 634+0.442

BEGIN PROJ. FM 1564
STA. 022+98.30
CSJ 1496-01-012
REF. MARKER 628-0.651

FINAL PLANS

LETTING DATE:
DATE CONTRACTOR BEGAN WORK:
DATE WORK WAS COMPLETED:
DATE WORK WAS ACCEPTED:
ORIGINAL CONTRACT WORKING DAYS:
USED OF WORKING DAYS
NO. OF CHANGE ORDERS:
FINAL CONTRACT COST:
PERCENT OVER/UNDER RUN:
CONTRACTOR:

I CERTIFY THAT THIS PROJECT WAS BUILT IN ACCORDANCE WITH PLANS AND SPECIFICATIONS.

AREA ENGINEER DATE

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

RECOMMENDED FOR LETTING 10/29/2020
DocuSigned by: James Atkins II
ENGINEER

SUBMITTED FOR LETTING 10/29/2020
DocuSigned by: James Atkins II
ENGINEER

APPROVED FOR LETTING: 10/29/2020
DocuSigned by:
DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 2012)

EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS: N/A

DATE:
FILE:

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3, 3A-3C	GENERAL NOTES
4	ESTIMATE & QUANTITY
5	QUANTITY SUMMARY
	TRAFFIC CONTROL PLAN
6	SEQUENCE OF WORK
	TRAFFIC CONTROL PLAN STANDARDS
# 7-18	BC (1)-14 THRU BC (12)-14
# 19	TCP (2-1)-18
# 20	TCP (2-2)-18
# 21	TCP (3-1)-13
# 22	TCP (3-3)-14
# 23	WZ (STPM)-13
# 24	WZ (UL)-13
# 25	WZ (RS)-16
	ROADWAY DETAILS
26-30	CURVE LAYOUT
	DRAINAGE DETAILS
31	HYDROLOGIC DATA
32-33	CULVERT HYDRAULIC DATA
34-47	CULVERT LAYOUT
48	BCS
	DRAINAGE DETAILS STANDARDS
# 49-50	SCC-3 & 4
# 51-52	SCC-5 & 6
# 53-54	SCC-7
55-56	SCC-9(MOD)
# 57-58	MC-5-20
# 59-60	SETP-CD
# 61	PSET-SC
# 62	PW
	SIGNING
63-66	SUMMARY OF SMALL SIGNS
	SIGNING STANDARDS
# 67	SMD (GEN)-08
# 68	SMD (SLIP-1)-08
# 69	SMD (SLIP-2)-08
# 70	SMD (SLIP-3)-08
	PAVEMENT MARKINGS & DELINEATION
	PAVEMENT MARKINGS & DELINEATION STANDARDS
# 71	PM(1)-20
# 72	PM(2)-20
# 73	PM(3)-20
# 74	D&OM(1)-20
# 75	D&OM(2)-20
# 76	D&OM(3)-20
# 77	D&OM(4)-20
	ENVIRONMENTAL ISSUES
78-84	SW3P LAYOUT
85	STORMWATER POLLUTION PREVENTION PLAN (SW3P)
86	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A "#" HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

James Atkins II, P.E. — NAME
10/29/20 — DATE

INDEX OF SHEETS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		2

DATE: 10/27/2020 4:51:35 PM
FILE: T:\GREENVP\S&E-GAO\0642-01-021 FM 36 HSIP\DESIGN\CAD Plan Sheets\INDEX OF SHEETS.DGN

GENERAL NOTES

General:

This project contains the following modified standard sheets: SCC-9 (MOD)

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

Greenville Area Office
James Atkins II, P.E. - James.Atkins@txdot.gov
Willie Bolden II, P.E. - Willie.Bolden@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.

Dispose of waste materials at an approved site. Furnish written approval from the property owner before disposal of waste materials.

Locate equipment a minimum of 30 feet from roadway when possible. Place signs and barricades as approved.

Stockpile sites for construction materials must be approved. Give at least 48 hours notification prior to stockpiling material.

Item 2 Instructions to Bidders:

View plans on-line or download from the web at:
http://www.txdot.gov/business/letting-bids/plans-online.html

Order plans from any of the plan reproduction companies shown on the web at:
http://www.txdot.gov/business/letting-bids/repro-companies.html

County: HUNT **Control:** 0642-01-021, ETC.

Item 5 Control of the Work:

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.3, Method C.

Working days will be computed and charged in accordance with Article 8.3.1.4 Standard Work Week.

Right and left are determined based upon the forward direction of stationing in the specific control section.

Item 7 Legal Relations and Responsibilities:

No significant traffic generator events identified.

Item 8 Prosecution and Progress:

Before beginning work on this project submit in writing, for approval, a plan of construction operations outlining in detail a sequence of work to be followed.

Provide a Bar Chart progress schedule for this project.

Item 9 Measurement and Payment:

Items of work for the Monthly Estimate will be cut off on the 25th of each month. Items of work performed after the 25th will be processed and paid on the following month's estimate. Material On Hand (MOH) will cut off on the 20th of each month. Special circumstances will be considered on a case by case basis.

Item 100 Preparing Right of Way:

Remove all trees 40 foot from centerline on both sides of roadway. At cross structures, remove trees to ROW line and within 100' of the structure, parallel to the roadway. Remove underbrush and neatly trim trees and overhanging branches to produce a 60' vertical clear area within the limits of Prep ROW. Remove any trees or underbrush that interferes with any construction operation, including relocation of ditches or other drainage elements. Receive approval of equipment used to trim limbs. A boom axe will not be allowed. Remove all trimmed debris from the ROW or mulch all debris and incorporate into the topsoil on State ROW to the satisfaction of the Engineer.

Item 152 Road Grader Work:

Use road grader work to windrow sod (6" depth), construct slopes, construct/repair dirt driveways, prepare driveways for surfacing, grade ditches as necessary to establish drainage and redistribute sod on finished slopes.

Cut ditches to proposed grade in the immediate vicinity of cross drain structures prior to placing Storm Water BMP devices at the early stages of the project.

If excess material is generated under this item, it may be utilized to construct slopes, or wasted as approved.

Item 162 Sodding for Erosion Control:

Provide Bermuda grass sod.

All roll and block sod shall be pinned. Pin roll sod at five foot intervals on both sides of the sod. Pin block sod with a least two pins per block with pins placed near block edges. Pins shall be 11-gauge steel, ungalvanized U shaped staples, having six inch soil/sod penetration length or as directed by the Engineer.

Acquire approval for any change to the location of sodding, as shown in the plans, prior to installation. Placement of erosion protection devices may be altered, as directed, to satisfy the requirements of the SW3P. Refer to the SW3P sheet for the total disturbed area for the project

The final estimate will not be released until 70% establishment of vegetative cover is obtained.

It is the intent of this contract that no disturbance of vegetation occurs as a result of the roadway operations. However, if vegetation is disturbed, treat the disturbed area as follows at no additional costs to the department.

Item 166 Fertilizer:

Apply fertilizer with a ratio of 3-1-2 (N-P-K) over the areas to be seeded. This work will not be paid for directly, but will be considered subsidiary.

Item 168 Vegetative Watering:

Use water trucks equipped with a sprinkler system adequate to permit coverage of the entire seeded area from the roadbed. This equipment must be available to perform watering throughout the duration of vegetative establishment.

Water all seeded areas the day seed is applied. Thereafter, maintain the seeded areas in a well-watered condition throughout the duration of vegetative establishment.

Item 400 Excavation and Backfill for Structures:

Excavation and backfill for bridge, culvert and Safety End Treatment construction/installation will be subsidiary to Item 462, 464, 466, 467 and 472.

Item 403 Temporary Special Shoring

Submit a Temporary Special Shoring Plan to the Engineer a minimum of three weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Item 432 Riprap:

The Engineer may adjust placement of riprap in the field. Filter fabric is required for stone riprap. Bridge demolition waste concrete may be used for stone rip rap. Cut protruding rebar within 2" of concrete surface. Maximum waste concrete cobble size shall match proposed stone rip rap Dmax size.

Item 462 Concrete Box Culverts and Drains

Required excavation and backfill will be subsidiary to this Item.

Item 464 Reinforced Concrete Pipe:

Required excavation and backfill will be subsidiary to this Item.

Concrete pipe collars shall be subsidiary this item.

Item 466 Headwalls and Wingwalls:

Unless shown in plans to obtain from offsite source, obtain headwall and wingwall backfill from ROW and perform grading to shape ditch to headwall/wingwall, per Engineers directions. This work will be subsidiary to this Item.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Removed headwalls and wingwalls may be broken into riprap size pieces (12" average diameter) for use as stone riprap on the project. Cut protruding steel reinforcement flush with concrete pieces. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on the BC standards.

Item 467 Safety End Treatment:

Parallel pipe culverts ~ 30" diameter and smaller require precast SET unless directed by the Engineer to use cast-in-place SETs when precast SETs would project over 3" above surrounding ground surface or when otherwise indicated in the plans. Additional work to install cast in place SETs will be subsidiary to this Item.

Repair damage culvert ends prior to SET installation. Straighten CMP ends by straightening or cutting off damaged ends. Paint cut off ends with zinc paint. Repair minor damaged RCP ends with epoxy mortar. This work will be subsidiary to this Item.

When necessary to close connection gaps, grout precast SETs to culvert ends. Materials, labor and equipment will be subsidiary to this item.

On existing CMP parallel culverts with mitered metal ends, construct concrete cast in place SETs or remove the mitered ends and install precast or cast-in-place SETs. Replace/remove existing mitered metal ends that are not 6:1 or flatter.

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Unless shown in the plans to obtain backfill from offsite source, obtain SET backfill from the Right-of-Way. This work will be subsidiary to this Item.

Placement of concrete Riprap between multiple SETs on multiple barrel culverts will be subsidiary to this Item.
During SET installation, unless indicated otherwise in the plans, match SET flow line grade with the culvert flow line grade.

Removal and disposal of existing headwalls for parallel culverts will be subsidiary to this Item. Removed concrete headwalls and wingwalls may be broken into riprap size pieces (12” average diameter) for use as stone riprap. Cut protruding steel reinforcement. Broken concrete and riprap must be stored according to the requirements for material stockpiles indicated on BC(10)-14.

Item 502 Barricades, Signs and Traffic Handling:

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

All flaggers are required to wear a white hard hat while performing flagging operations.

The traffic control plan for this contract consists of the installation and maintenance of warning signs and other traffic control devices shown in the plans, specification data which may be included in the general notes, applicable provisions of the Texas Manual on Uniform Traffic Control Devices (TMUTCD), traffic control plan sheets included in the plans, standard BC sheets and Item 502 of the Standard Specifications.

Do not begin Item 502, Barricades, Signs, and Traffic Handling, on the roadway until both of the following conditions are met:

1. The work schedule is approved.
2. No more than 5 workdays will pass between the beginning of Item 502 and the actual commencement of roadway work bid items.

The final estimate will be withheld until all disturbed areas are covered with at least 70% perennial vegetative cover.

Correct all deficiencies within the time frame noted on the Traffic Control Device Inspection Form 599. Failure to make corrections within time frame specified may result in no payment for this Item for the month of the noted deficiency.

Provide shadow vehicles equipped with Truck Mounted Attenuators (TMA) as shown on Traffic Control Plan (TCP) standards.

Ensure that all travel lanes are open at night.

Road closures must be approved by the Engineer. Provide a two-week advance notice to the Engineer prior to desired roadway closure period. Begin display of closure information on PCMBs ten days prior to roadway closure.

Item 506 Temporary Erosion, Sedimentation & Environmental Controls:
It is the intent of this contract that no disturbance of vegetation occurs as a result of the roadway operations. However, if vegetation is disturbed, treat the disturbed area as follows at no additional costs to the department.

Place temporary sediment control fence, or an alternative material as approved, to minimize and control the amount of sediment that might enter receiving waters from the disturbed area(s). Maintain the sediment controls in a satisfactory manner until the disturbed area(s) is stabilized. After the area(s) has been stabilized, remove the sediment controls. The location and length of the sediment controls will be determined.

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly, but will be considered subsidiary to the various bid items.

Item 644 Small Roadside Sign Support and Assemblies:

Reuse existing sign blanks. Dispose of foundations, posts, and hardware.

Upon removal of sign assemblies, deliver sign faces to TxDOT office at:
3001 IH 30 East, Greenville TX. Dispose of foundations, posts, and hardware.

Use the Southern Plains style triangular slip base for all post types.

Once the work is completed, the Paris District Traffic Operations office will field verify the need and spacing of chevrons. If this verification results in fewer materials, the Paris District will purchase the excess signs at invoice price.

Remove the existing city street and county road topper from city and county signs and install on the new city street and county road stop sign assemblies. This work will be subsidiary to Item 644.

Stake proposed sign locations and obtain Engineer's approval of locations prior to placing foundations.

Contact the Engineer to obtain updated curve travel speeds before manufacture of curve speed warning signs.

Item 666 Reflectorized Pavement Markings:

No stripe will be placed unless the inspector is present and at least 24 hours advance notice has been given by the Contractor.

Lay out pilot lines for approval 24 hours prior to all final pavement marking applications.

Use equipment with footage counters capable of measuring the linear footage placed. Calibrate counters prior to the beginning of striping operations.
Reduce truck speed enough to ensure that the beads drop onto the stripe and do not roll in the paint film.

Due to problems in traffic handling, do not place a dash center stripe and edge line at the same time.

Contact the Engineer 7 days before pavement marking placement for re-establishment of no-pass zones.

Item 6001 Portable Changeable Message Board:

Two (2) portable changeable message boards are required for advance warning.

Item 6185 Truck Mounted Attenuators:

Shadow vehicles with truck mounted attenuator (TMA) are required on the traffic control plan and TCP standards for this project. The contractor will be responsible for determining if one or more of these traffic control operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

QUANTITY SHEET

CONTROLLING PROJECT ID 0642-01-021 **DISTRICT** Paris **COUNTY** Hunt
HIGHWAY FM 1564, FM 1570, FM 36, FM 751

				0642-01-021		1017-04-026		1496-01-012		2659-01-012		TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB											
		PROJECT ID		**A00127504**		**A00127506**		**A00127590**		**A00127507**			
		COUNTY		**Hunt**		**Hunt**		**Hunt**		**Hunt**			
		HIGHWAY		**FM 36**		**FM 751**		**FM 1564**		**FM 1570**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	100-6003	PREPARING ROW(TREE)(5" TO 12" DIA)	EA					14.000				14.000	
	152-6001	ROAD GRADER WORK (ORD COMP)	STA					14.000				14.000	
	162-6002	BLOCK SODDING	SY					2,557.000				2,557.000	
	168-6001	VEGETATIVE WATERING	MG					15.300				15.300	
	403-6001	TEMPORARY SPL SHORING	SF					1,134.000				1,134.000	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)	CY					44.000				44.000	
	462-6045	CONC BOX CULV (3 FT X 2 FT)(EXTEND)	LF					16.000				16.000	
	462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	LF					130.000				130.000	
	462-6059	CONC BOX CULV (7 FT X 4 FT)(EXTEND)	LF					33.000				33.000	
	462-6114	CONC BOX CULV (9 FT X 3 FT)(EXTEND)	LF					17.000				17.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF					4.000				4.000	
	466-6193	WINGWALL (PW - 2) (HW=4 FT)	EA					2.000				2.000	
	466-6194	WINGWALL (PW - 2) (HW=5 FT)	EA					12.000				12.000	
	466-6195	WINGWALL (PW - 2) (HW=6 FT)	EA					4.000				4.000	
	467-6001	SET (PIPE RUNNER ASSEMBLY)	EA					4.000				4.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA					6.000				6.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA					2.000				2.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA					4.000				4.000	
	480-6001	CLEAN EXIST CULVERTS	EA					9.000				9.000	
	496-6005	REMOV STR (WINGWALL)	EA					19.000				19.000	
	500-6001	MOBILIZATION	LS	2.70%		8.30%		82.10%		6.90%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	1.000		1.000		2.000		1.000		5.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	19.000		11.000				21.000		51.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA							5.000		5.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA					48.000				48.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF			1,455.000						1,455.000	
	666-6283	REF PROF PAV MRK TY I(W)4"(SLD)(090MIL)	LF	5,222.000		37,248.000		79,330.000		33,400.000		155,200.000	
	666-6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	5,222.000		24,500.000		47,120.000		12,824.000		89,666.000	
	666-6291	REF PROF PAV MRK TY I(Y)4"(BRK)(090MIL)	LF			4,800.000		5,720.000		2,340.000		12,860.000	
	672-6007	REFL PAV MRKR TY I-C	EA			73.000						73.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	65.000		547.000		830.000		308.000		1,750.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA					2.000				2.000	
	6185-6002	TMA (STATIONARY)	DAY	2.000		1.000		64.000		2.000		69.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	10.000		30.000		60.000		20.000		120.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000								1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000								1.000	

ESTIMATE & QUANTITY

CK:
DW:
CK:
DN:

SUMMARY OF CROSS CULVERT ITEMS FM 1564 (CSJ: 1496-01-012)

STATION	EXISTING STRUCTURE	152 6001 ROAD GRADER WORK (ORD COMP) STA	403 6001 TEMPORARY SPL SHORING SF	432 6031 RIPRAP (STONE PROTECTION) (12 IN) CY	462 6045 CONC BOX CULV (3 FT X 2 FT) (EXTEND) LF	462 6051 CONC BOX CULV (5 FT X 3 FT) (EXTEND) LF	462 6059 CONC BOX CULV (7 FT X 4 FT) (EXTEND) LF	462 6114 CONC BOX CULV (9 FT X 3 FT) (EXTEND) LF	464 6005 RC PIPE (CL III) (24 IN) LF	466 6193 WINGWALL (PW - 2) (HW=4 FT) EA	466 6194 WINGWALL (PW - 2) (HW=5 FT) EA	466 6195 WINGWALL (PW - 2) (HW=6 FT) EA	467 6001 SET (PIPE RUNNER ASSEMBLY) EA	467 6358 SET (TY II) (18 IN) (RCP) (4: 1) (C) EA	467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C) EA	467 6419 SET (TY II) (30 IN) (RCP) (4: 1) (C) EA	480 6001 CLEAN EXIST CULVERTS EA	496 6005 REMOV STR (WINGWALL) EA	658 6047 INSTL OM ASSM (OM-2Y) (WC)GND EA
47+80	3- 5'X3'X42' RC BOX	1	162	24		54					2							2	4
62+00	2- 5'X3'X42' RC BOX	1	162	20		38					2							2	4
79+00	18"X60' RCP W/SET																1		2
84+63	1- 3'X2'X42' RC BOX	1			16					2								2	2
94+75	24"X42' RCP	1							4						2				2
105+20	2-30"X66' RCP W/SET												4				1		2
113+63	42"X63' RCP W/SET																1		2
144+95	1- 9'X3'X42' RC BOX	1	162					17			2							2	2
154+85	1- 5'X3'X42' RC BOX	1				14					2							2	2
165+55	1- 7'X4'X42' RC BOX	1	243				16					2						2	2
181+70	1- 5'X3'X50' RC BOX	1				8					2						1	1	2
194+50	1- 5'X3'X42' RC BOX	1	162			16					2							2	2
217+80	1- 7'X4'X42' RC BOX	1	243				17					2						2	2
249+00	18"X44' RCP	1												2					2
264+18	24"X54' RCP W/SET																1		2
280+09	18"X44' RCP	1												2					2
286+24	30"X60' RCP W/SET																1		2
316+94	24"X54' RCP W/SET																1		2
322+30	18"X60' RCP	1												2					2
342+45	18"X54' RCP W/SET																1		2
392+52	1- 3'X2'X56' RC BOX																1	2	2
392+64	2-34"X64' RCP	1														4			2
PROJECT TOTALS:		14	1134	44	16	130	33	17	4	2	12	4	4	6	2	4	9	19	48

SUMMARY OF EROSION CONTROL ITEMS FM 1564 (CSJ: 1496-01-012)

LOCATION	EXISTING STRUCTURE	DIRECTION	162 6002 BLOCK SODDING SY	168 6001 VEGETATIVE WATERING MG	FERTILIZER 3-1-2 * LBS
47+80	3- 5'X3'X42' RC BOX	LT/RT	260	1.6	13
62+00	2- 5'X3'X42' RC BOX	LT/RT	250	1.5	12
79+00	18"X60' RCP W/SET	LT/RT			
84+63	1- 3'X2'X42' RC BOX	LT/RT	198	1.2	10
94+75	24"X42' RCP	LT/RT	116	0.7	6
105+20	2-30"X66' RCP W/SET	LT/RT			
113+63	42"X63' RCP W/SET	LT/RT			
144+95	1- 9'X3'X42' RC BOX	LT/RT	244	1.5	12
154+85	1- 5'X3'X42' RC BOX	LT/RT	220	1.3	11
165+55	1- 7'X4'X42' RC BOX	LT/RT	330	2.0	16
181+70	1- 5'X3'X50' RC BOX	LT/RT	110	0.7	5
194+50	1- 5'X3'X42' RC BOX	LT/RT	224	1.3	11
217+80	1- 7'X4'X42' RC BOX	LT/RT	320	1.9	16
249+00	18"X44' RCP	LT/RT	62	0.4	3
264+18	24"X54' RCP W/SET	LT/RT			
280+09	18"X44' RCP	LT/RT	48	0.3	2
286+24	30"X60' RCP W/SET	LT/RT			
316+94	24"X54' RCP W/SET	LT/RT			
322+30	18"X60' RCP	LT/RT	55	0.3	3
342+45	18"X54' RCP W/SET	LT/RT			
392+52	1- 3'X2'X56' RC BOX	LT/RT			
392+64	2-34"X64' RCP	LT/RT	120	0.7	6
	PROJECT TOTALS:		2557	15.3	126

* FOR CONTRACTORS INFORMATION ONLY; 2 CYCLES AT 50 LBS. NITROGEN PER ACRE AT 21-7-14 (NPK) ANALYSIS = 0.0492 LBS/SY/CYCLE
WATERING: BASED ON 2 APPLICATIONS, 0.5" RAINFALL EQUIVALENT = 0.003 MG/SY/CYCLE

SUMMARY OF PAVEMENT MARKING ITEMS

ROADWAY	CSJ	LIMITS FROM	LIMITS TO	LENGTH (FT)	644 6001 IN SM RD SN SUP&AM TY10BWG(1)SA(P) (EA)	644 6076 REMOVE SM RD SN SUP&AM	666 6035 REFL PAV MRK TY I (W)8"(SLD)(090MIL) LF	666 6283 REF PROF PAV MRK TY I(W)4"(SLD)(090MIL) (LF)	666 6287 REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL) (LF)	666 6291 REF PROF PAV MRK TY I(Y)4"(BRK)(090MIL) EA	672 6007 REFL PAV MRKR TY I-C EA	672 6009 REFL PAV MRKR TY II-A-A (EA)
FM 1570	2659-01-012	I-30 FR	SH 66	16700	21	5		33400	12824	2340		308
FM 751	1017-04-026	SH 271	800' S OF APACH TR.	18624	11		1455	37248	24500	4800	73	547
FM 36	0642-01-021	CR 1096	CR 1130	2611	19			5222	5222			65
FM 1564	1496-01-012	SH 34	US 69	39665				79330	47120	5720		830
PROJECT TOTALS:					51	5	1455	155200	89666	12860	73	1750

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN EA	6185 6002 TMA (STATIONARY) DAY	6185 6003 TMA (MOBILE OPERATION) HR
FM 36 (CSJ:0624-01-021)		2	10
FM 1570 (CSJ:2659-01-012)		2	20
FM 751 (CSJ:1017-04-026)		1	30
FM 1564 (CSJ:1496-01-012)	2	64	60
PROJECT TOTALS:	**2**	**69**	**120**

SUMMARY OF REMOVAL ITEMS

LOCATION	100 6003 PREPARING ROW(TREE)(5" TO 12" DIA) STA
FM 1564 (CSJ:1496-01-012)	14
PROEJECT TOTALS:	14

FM 36, ETC.
QUANTITY SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		5

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Phase I ~ Initial Traffic Control

Install project limit traffic control devices (TCD) per the BC standard sheets.

Phase II ~ Culvert Work (Cross Culverts)

Perform off-pavement culvert operations utilizing the applicable TCP (2-1)-18 layout.

Phase III ~ Backfill, deliniator and Sodding Operations

Perform pavement backfill operations, deliniator installation and sodding utilizing TCP(2-1)-18.

Note: Preform backfill and sodding operations after the completion of each structure. Before continuing onto following structure. For the purpose of SW3P measures.

Phase IV ~ Final Profile Pavement Markings

Install final pavement markings using TCP(3-1)-13 and TCP(3-3)-14.

Phase V ~ Project Clean Up

Remove construction debris and waste material utilizing TCP (2-1)-18.

Notes: Prior to a specific construction operation, the traffic control standard specified for the construction phase in this narrative must be evaluated thoroughly for appropriateness. All traffic control operations must adhere to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and the applicable Traffic Control Standards. Construction phase order may be varied when approved by the Engineer. Submit a Work and Traffic Control Sequence plan to the Engineer for approval. Ensure that both travel lanes are open at night. Provide access to private property and Public Roads at all times. Provide pilot car during one lane/two way traffic operations. Road closures must be approved by the Engineer.

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.

10/29/20

FM 36, ETC.
SEQUENCE OF WORK

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		6

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

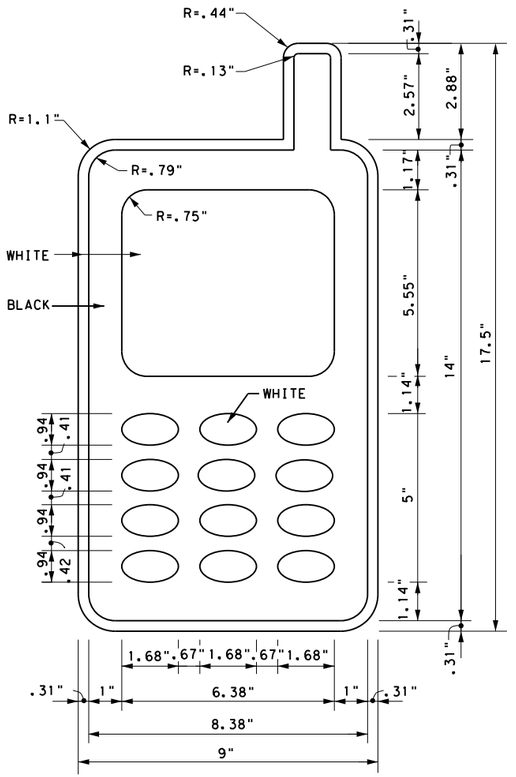
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

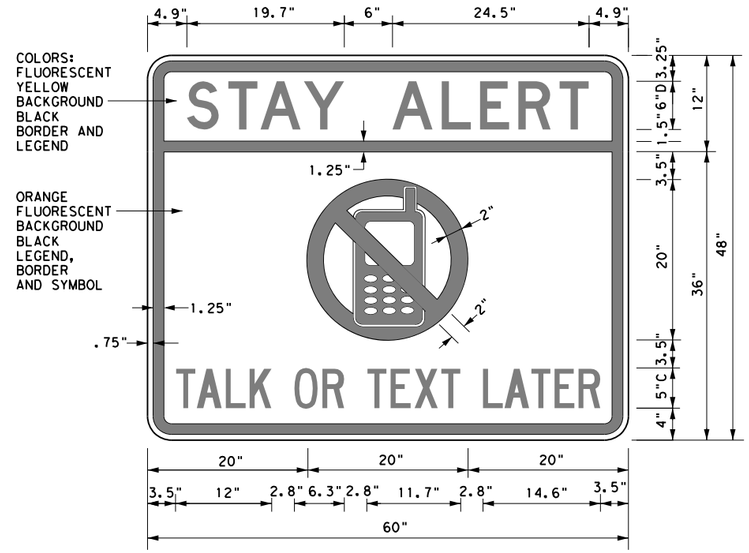
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	PAR	HUNT		7

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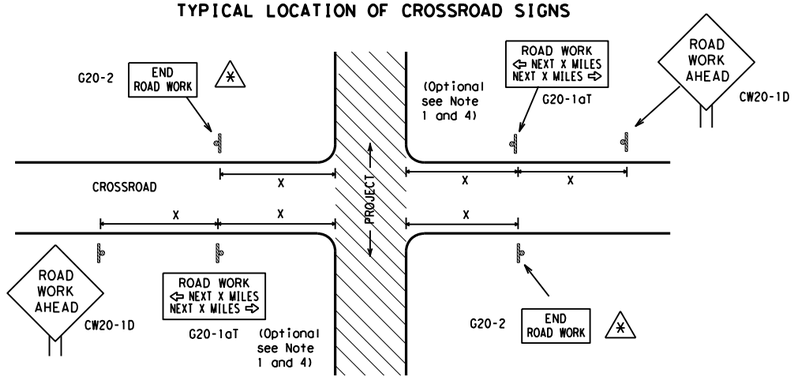
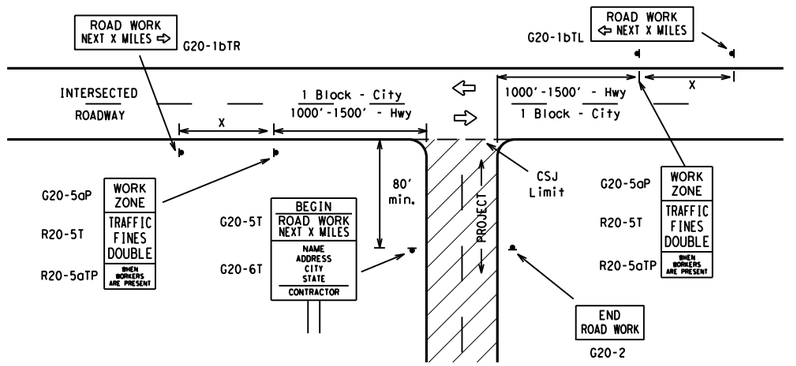
TYPICAL LOCATION OF CROSSROAD SIGNS



(*) 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			SPACING	
Sign Number or Series	Conventional Road	Expressway/ Freeway	Posted Speed	Sign Spacing "X" (Δ)
			MPH	Feet (Apprx.)
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"	30	120
			35	160
			40	240
			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
			55	500[2]
			60	600[2]
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	65	700[2]
			70	800[2]
			75	900[2]
			80	1000[2]
			*	*[3]

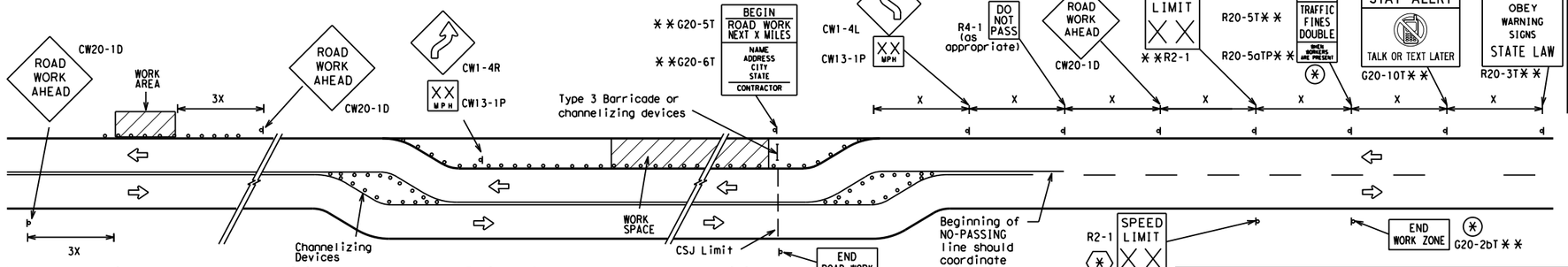
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

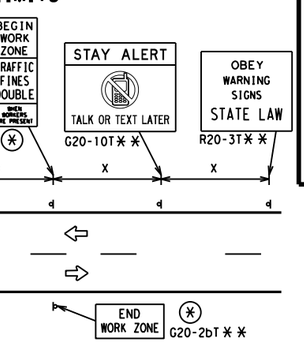
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

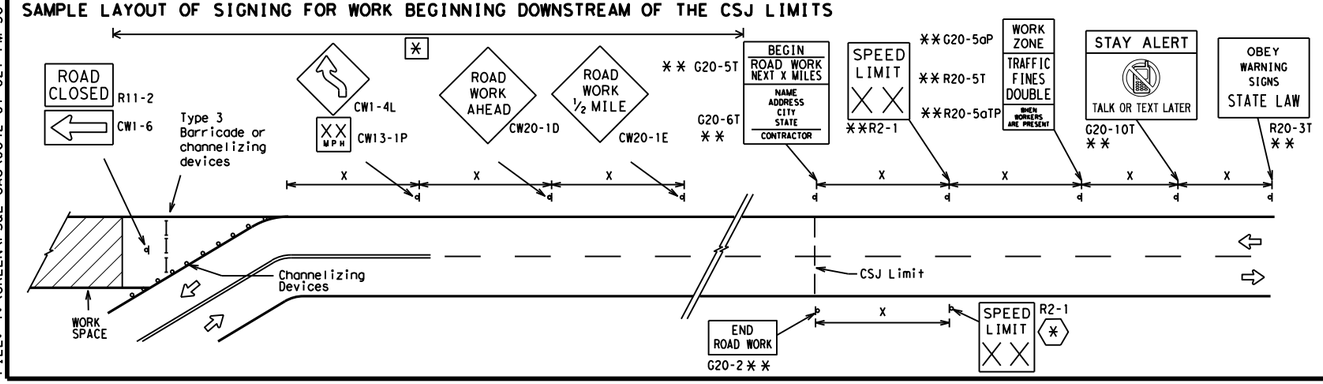


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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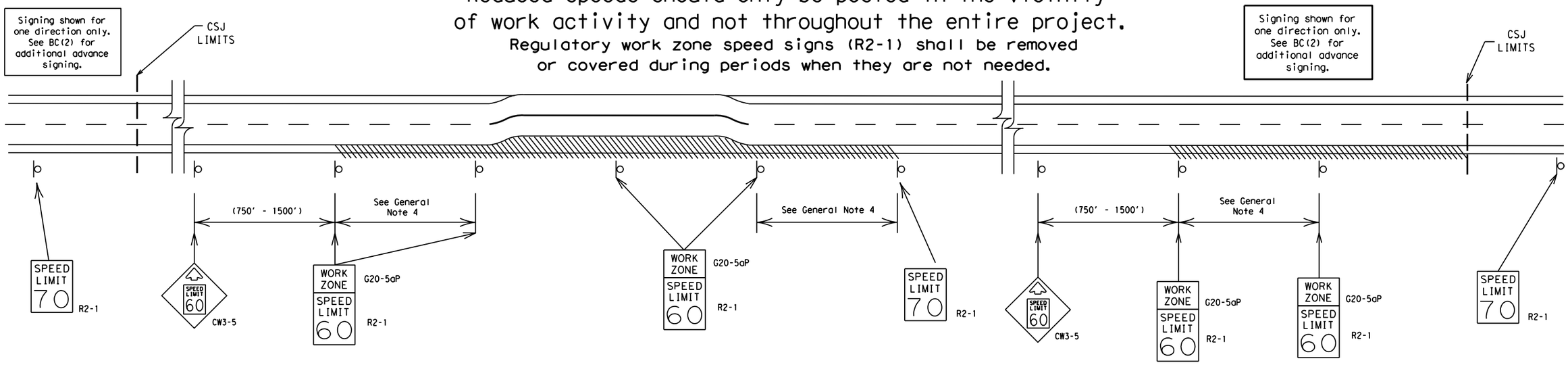
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	HUNT		8

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.

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		9

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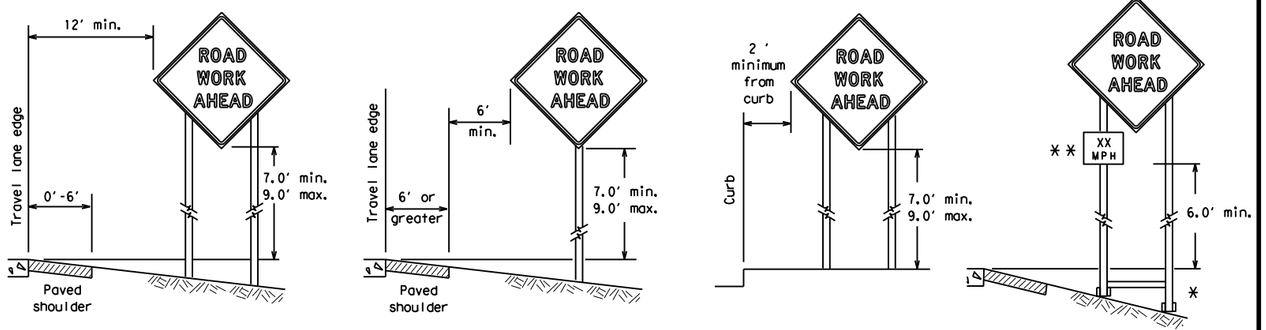
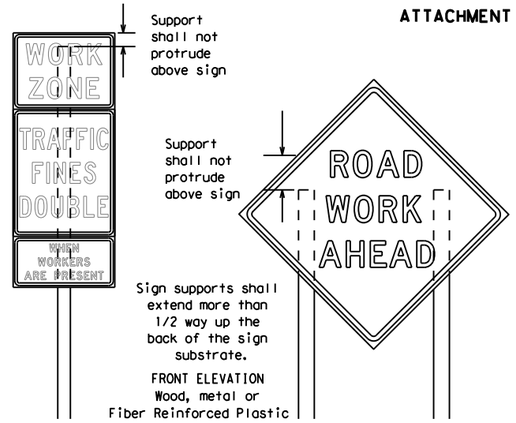
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



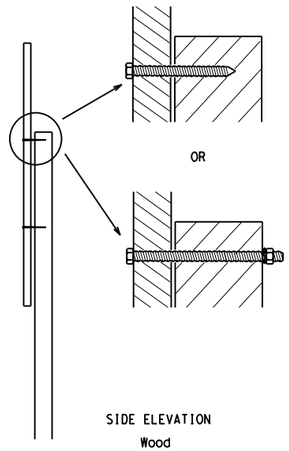
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

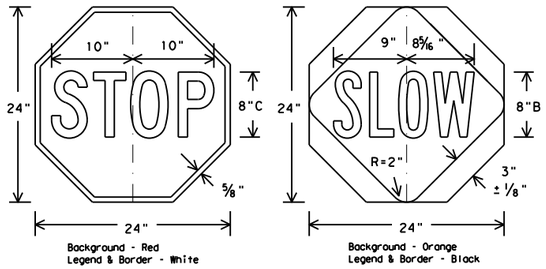


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		10

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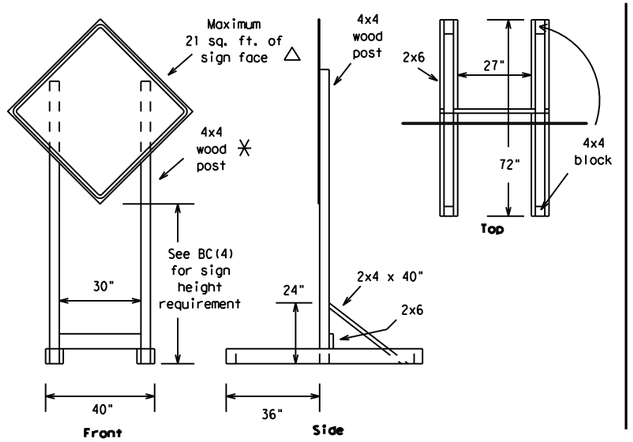
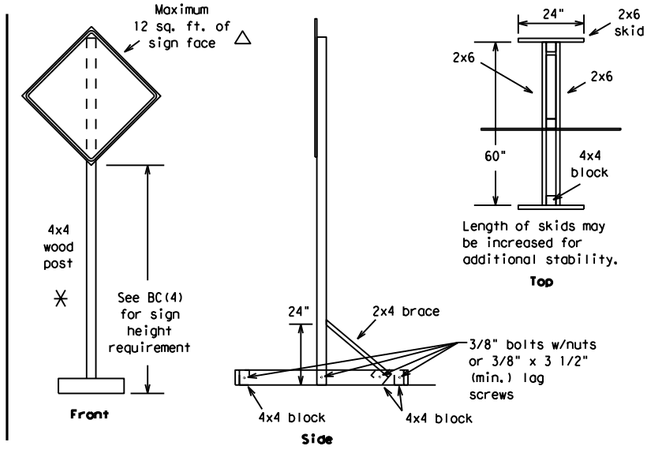
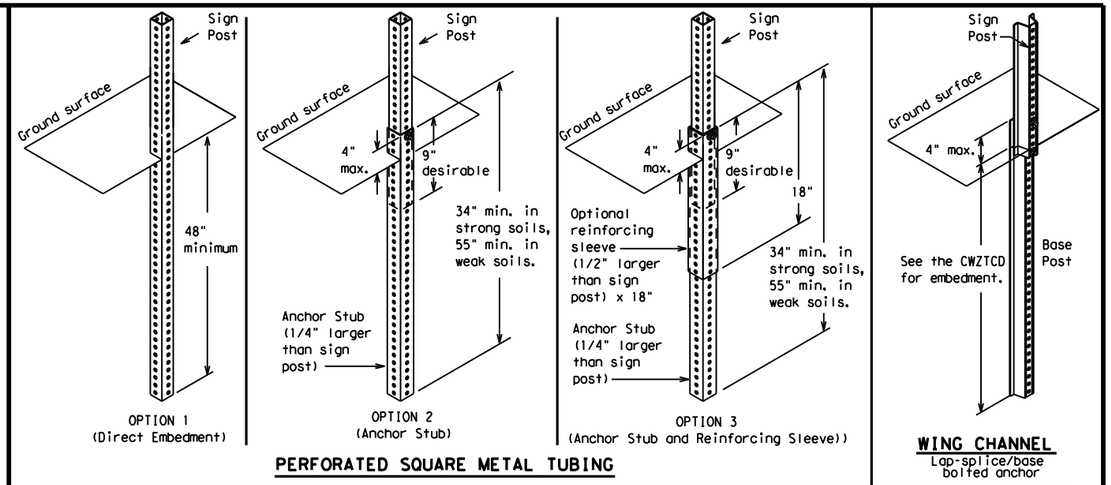




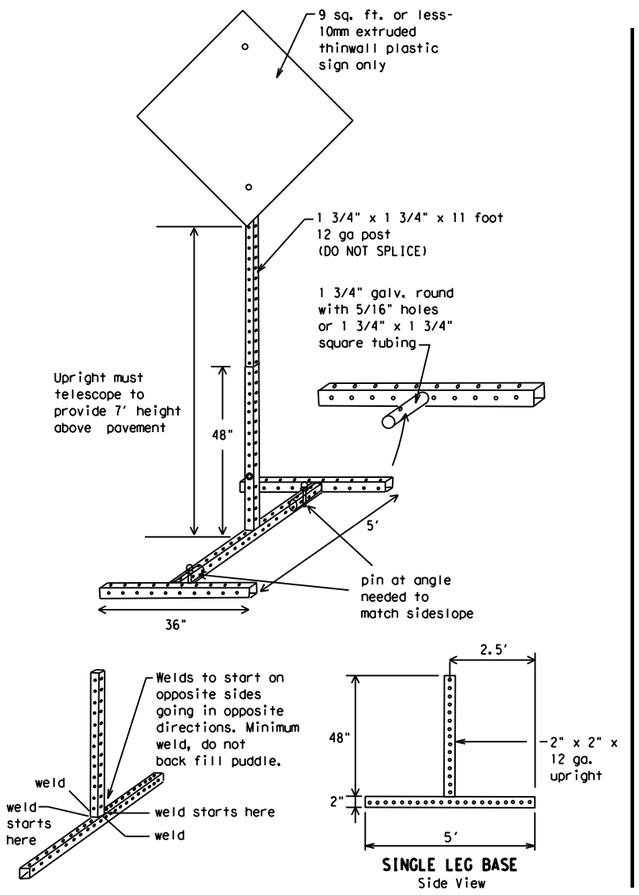
SKID MOUNTED WOOD SIGN SUPPORTS

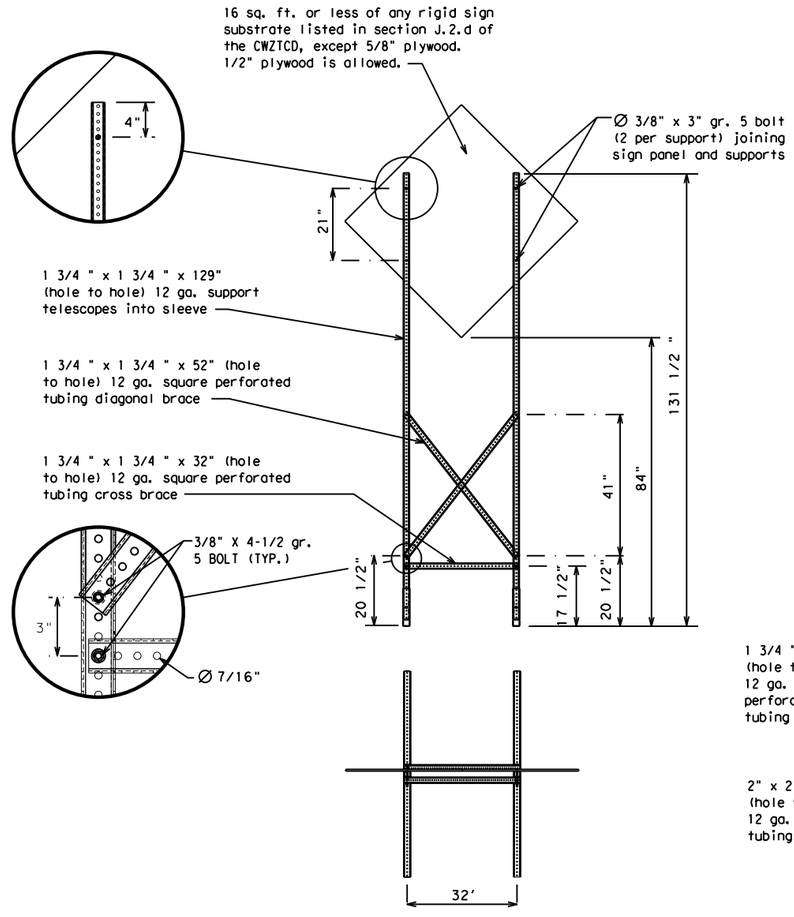
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

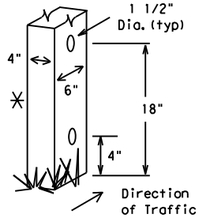


GROUND MOUNTED SIGN SUPPORTS

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.

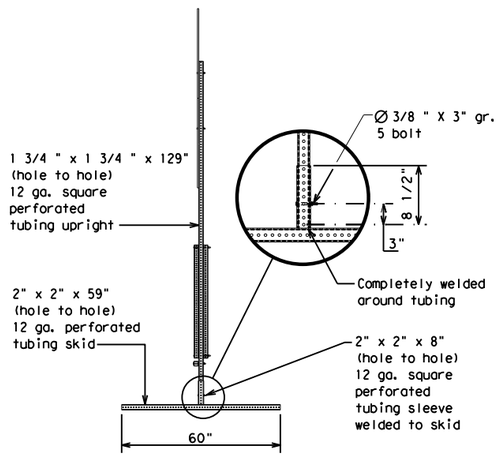






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING 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

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	HUNT		11

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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 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

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	HUNT		12

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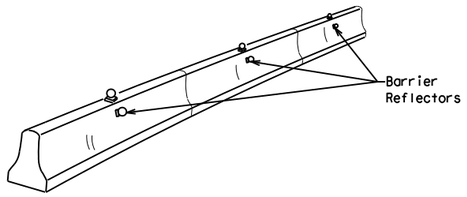
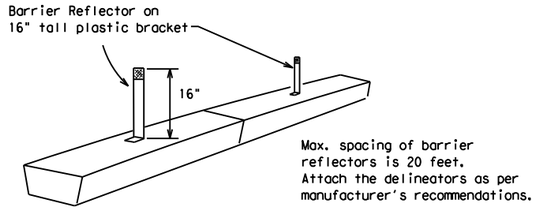
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

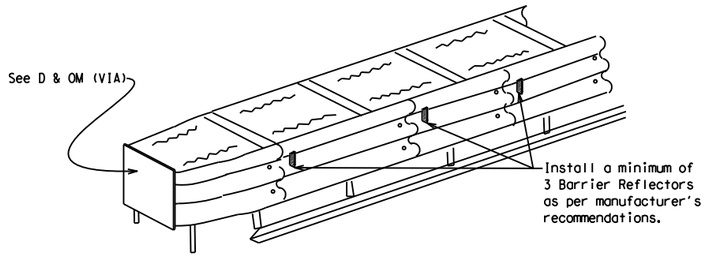


CONCRETE TRAFFIC BARRIER (CTB)

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)

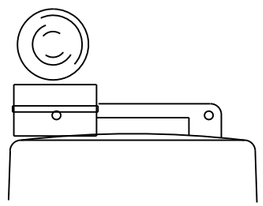


DELINEATION OF END TREATMENTS

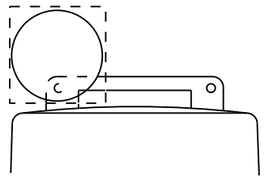
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

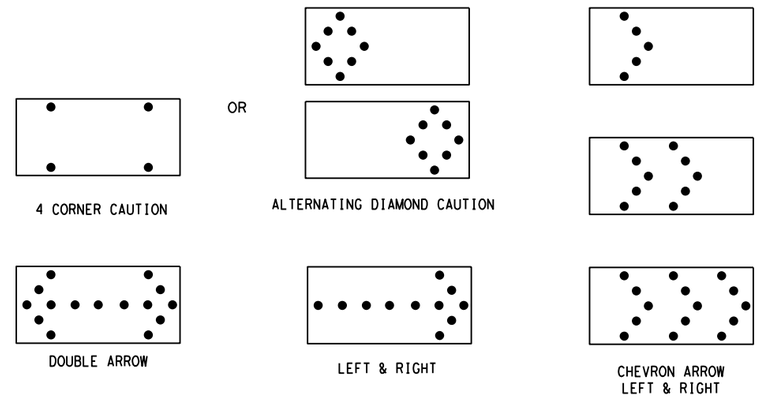
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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	0642	01	021,ETC.	FM 36,ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	HUNT		13

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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:

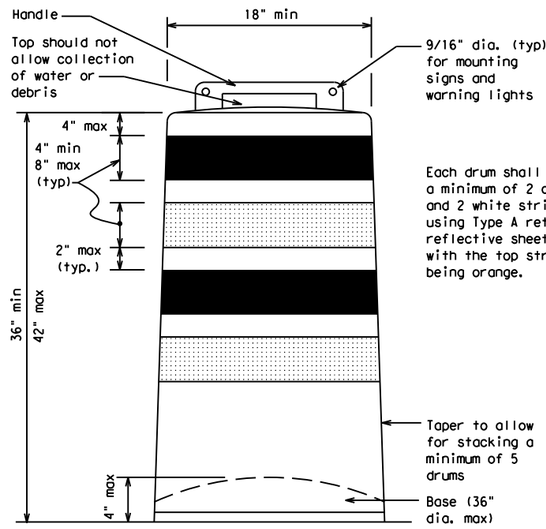
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

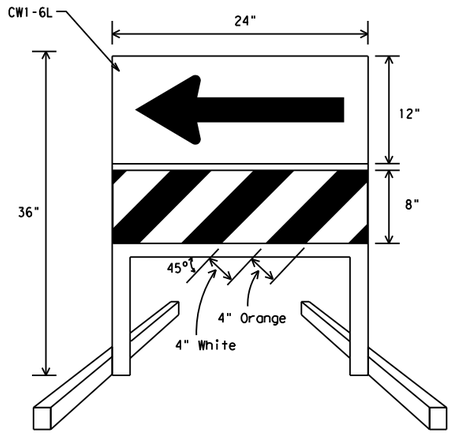
RETROREFLECTIVE SHEETING

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

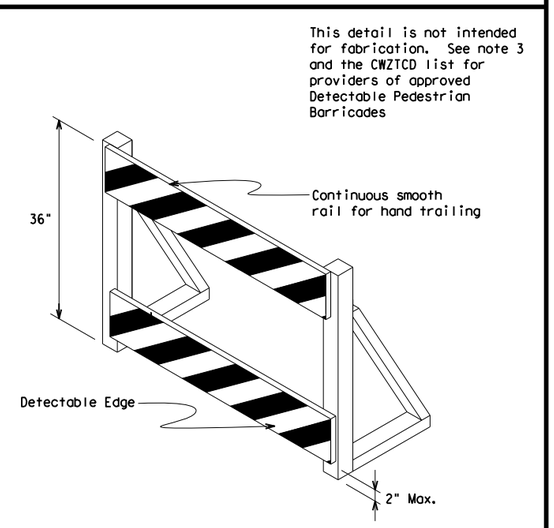
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.





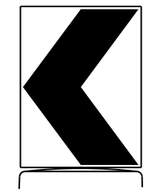
DIRECTION INDICATOR BARRICADE

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.

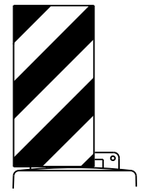


DETECTABLE PEDESTRIAN BARRICADES

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.

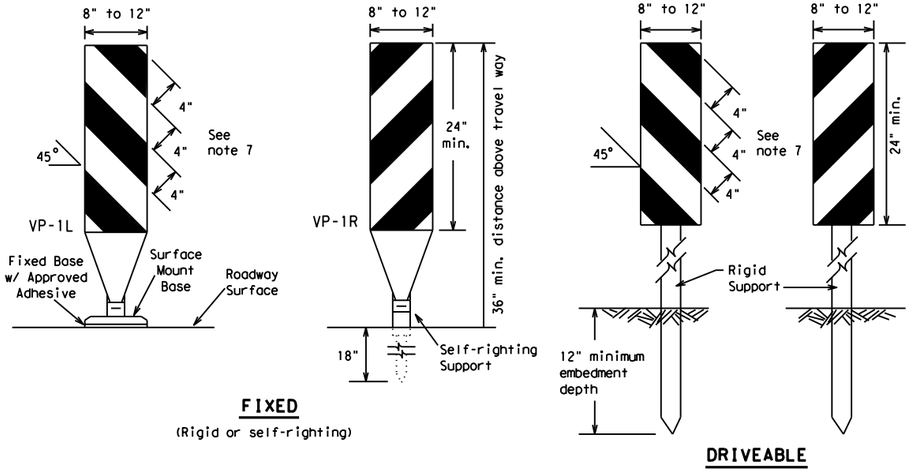
Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

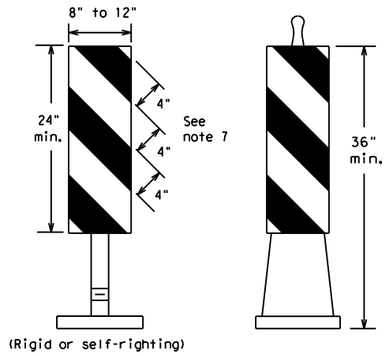
BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	PAR	HUNT		14



FIXED
(Rigid or self-righting)

DRIVEABLE

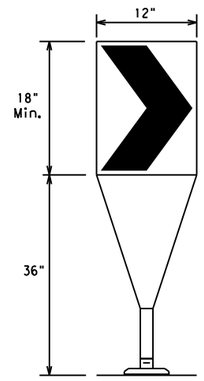


(Rigid or self-righting)

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)



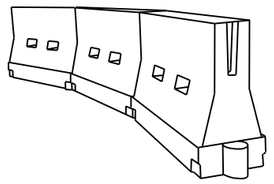
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

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.

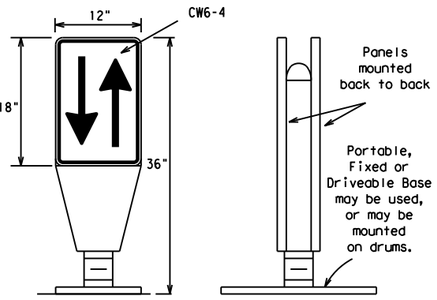
If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS



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)

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	PAR	HUNT		15

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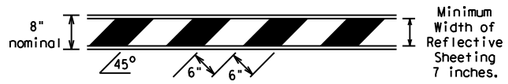
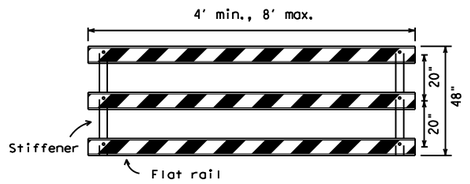
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



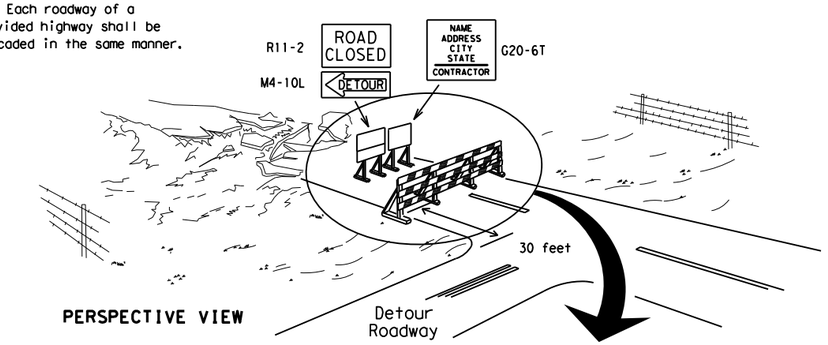
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

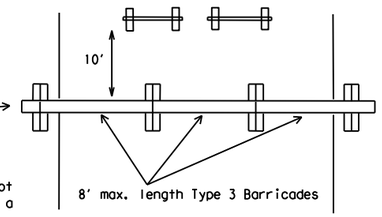
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

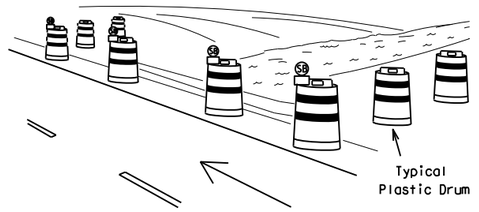
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

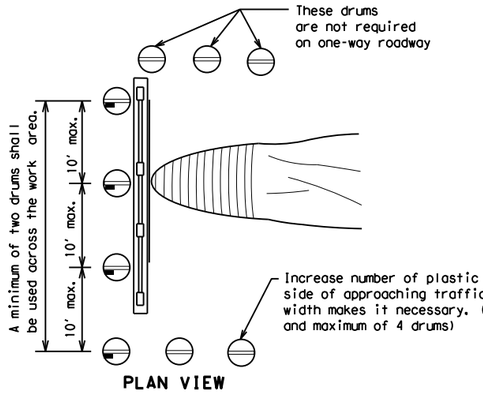
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

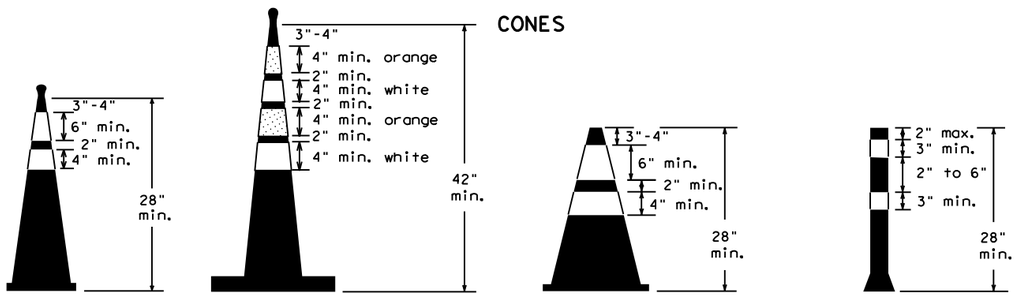
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

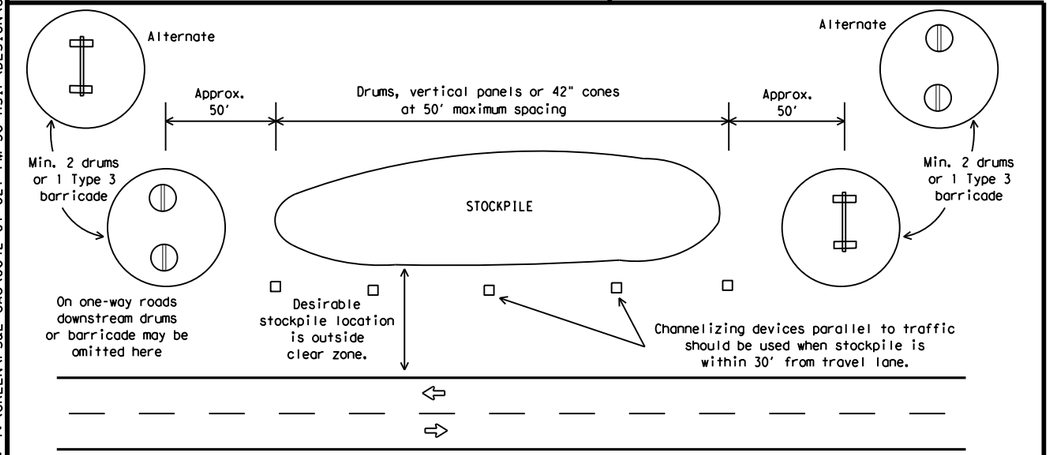
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

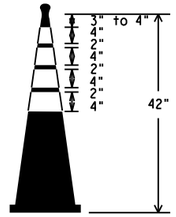
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

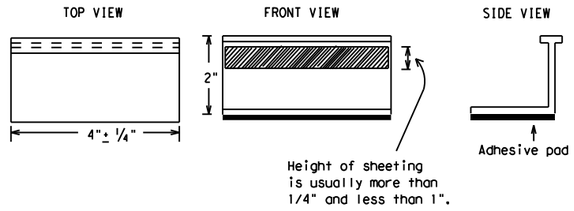
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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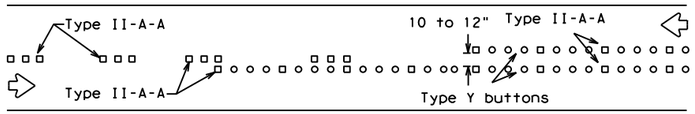
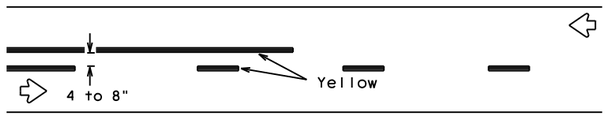
PAVEMENT MARKING PATTERNS

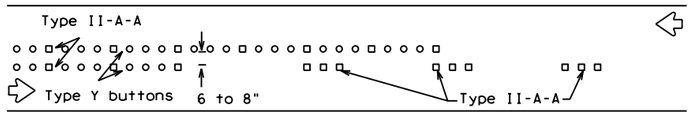
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



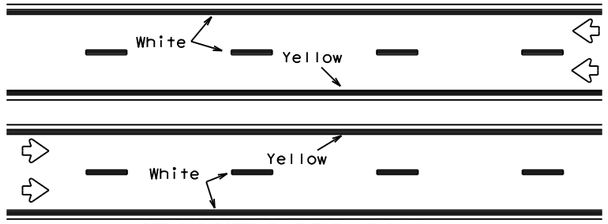
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



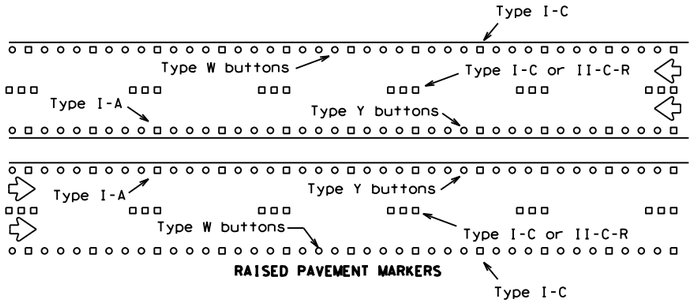
RAISED PAVEMENT MARKERS - PATTERN B

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

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



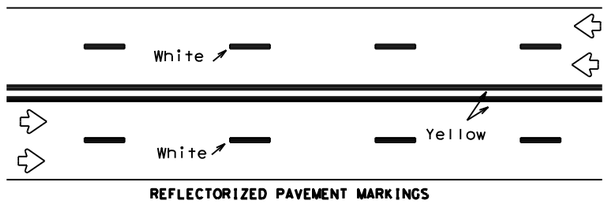
REFLECTORIZED PAVEMENT MARKINGS



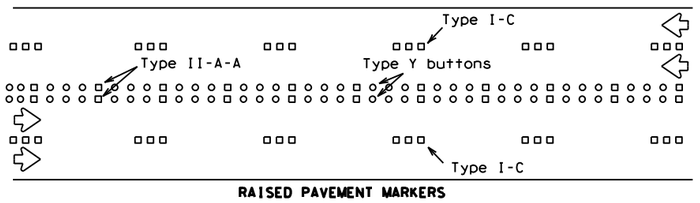
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



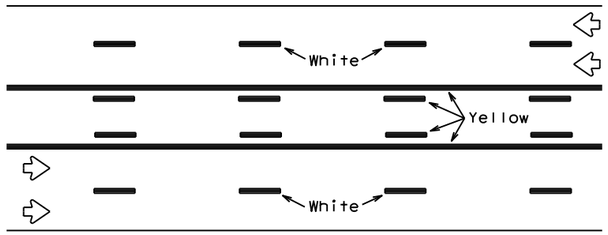
REFLECTORIZED PAVEMENT MARKINGS



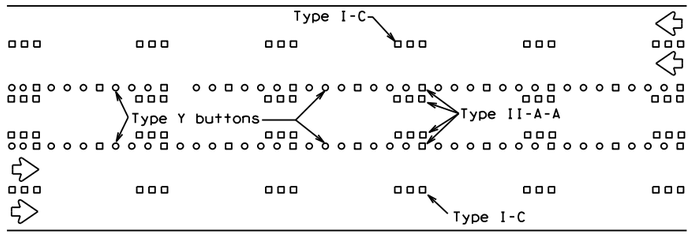
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

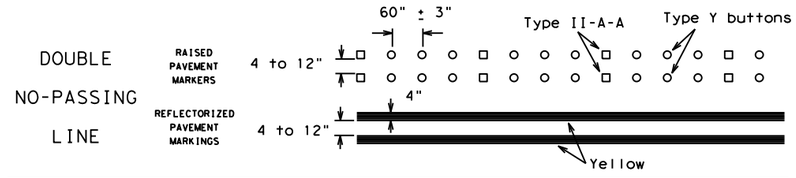
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

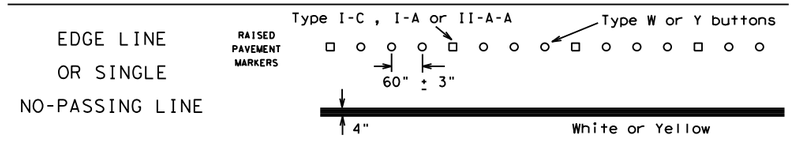
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

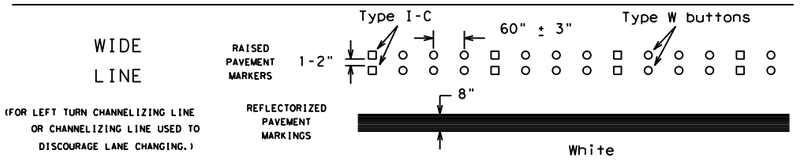


EDGE LINE OR SINGLE NO-PASSING LINE



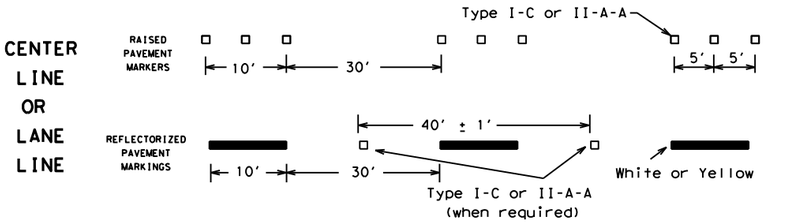
WIDE LINE

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

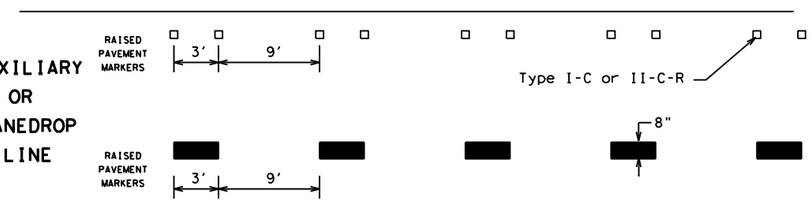


BROKEN LINES

CENTER LINE OR LANE LINE

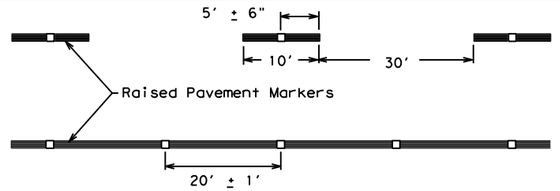


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	PAR	HUNT		18
11-02 8-14				

106

DATE: 10/27/2020 4:52:01 PM
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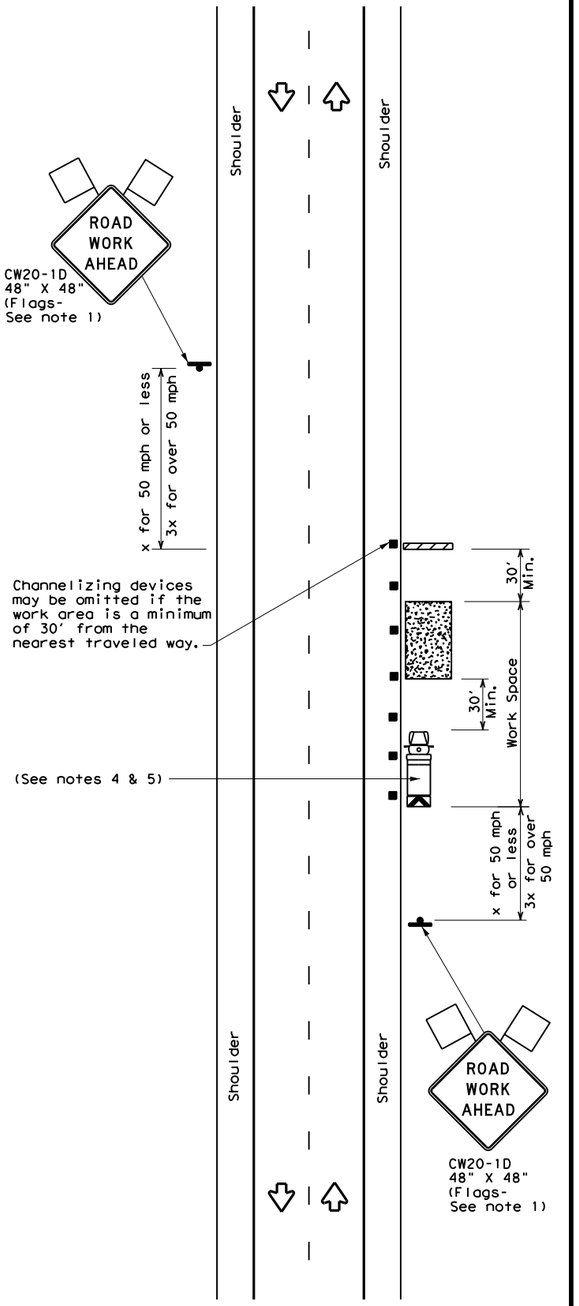
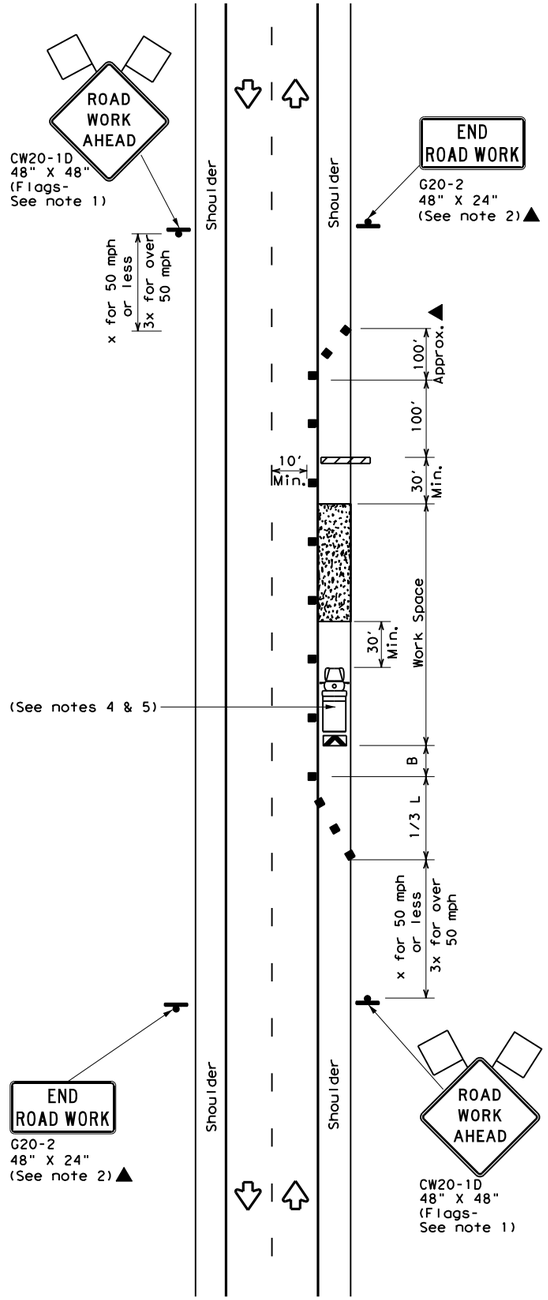


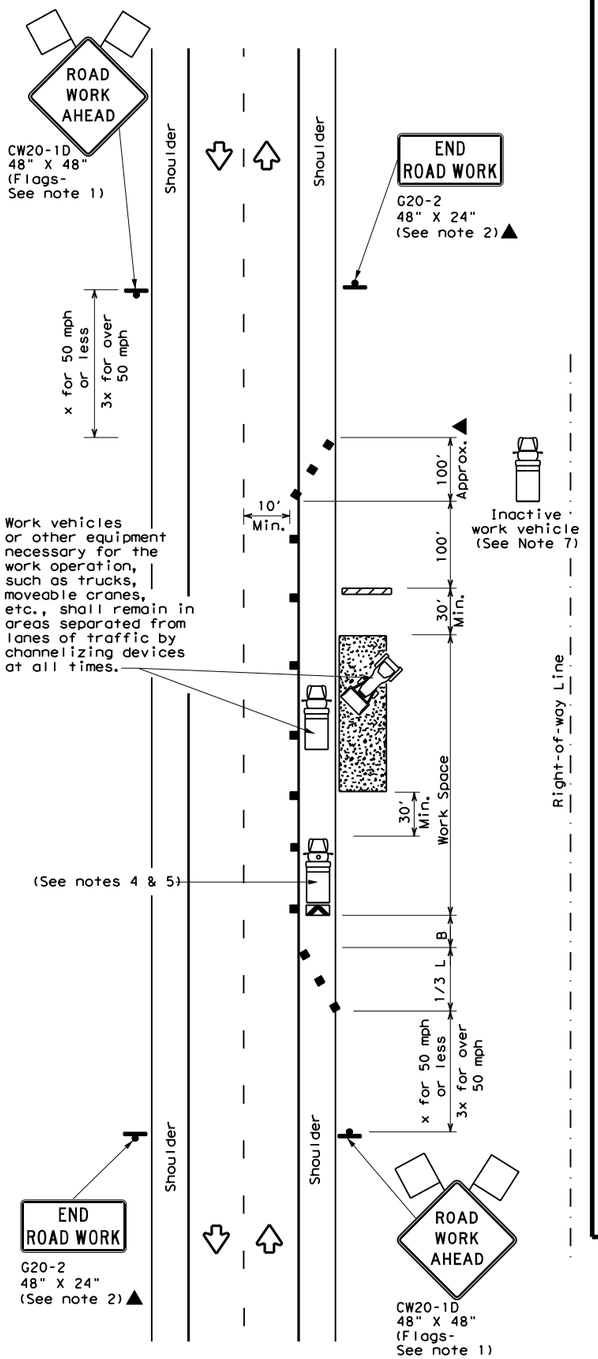
TCP (2-1a)

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	0642	01	021,ETC.	FM 36,ETC.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	PAR	HUNT		19
1-97 2-18				

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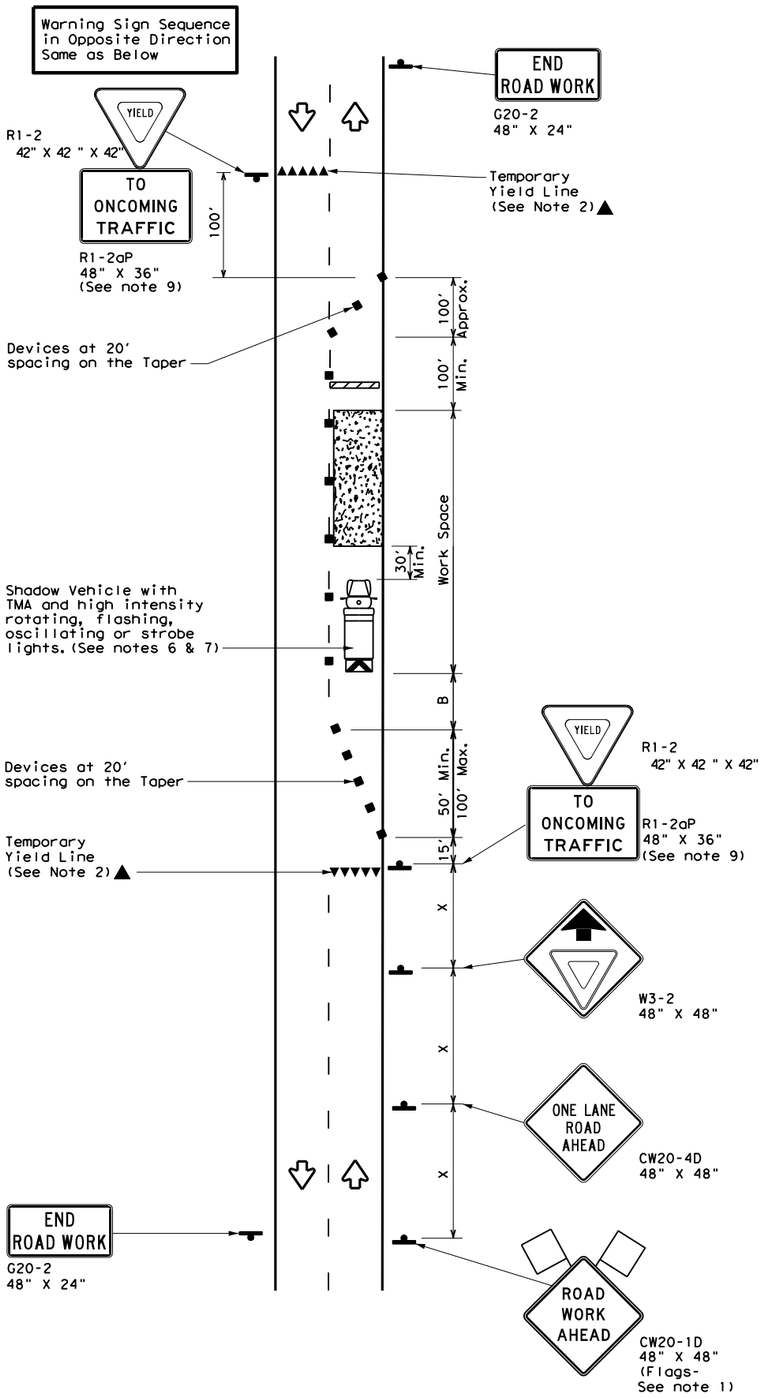
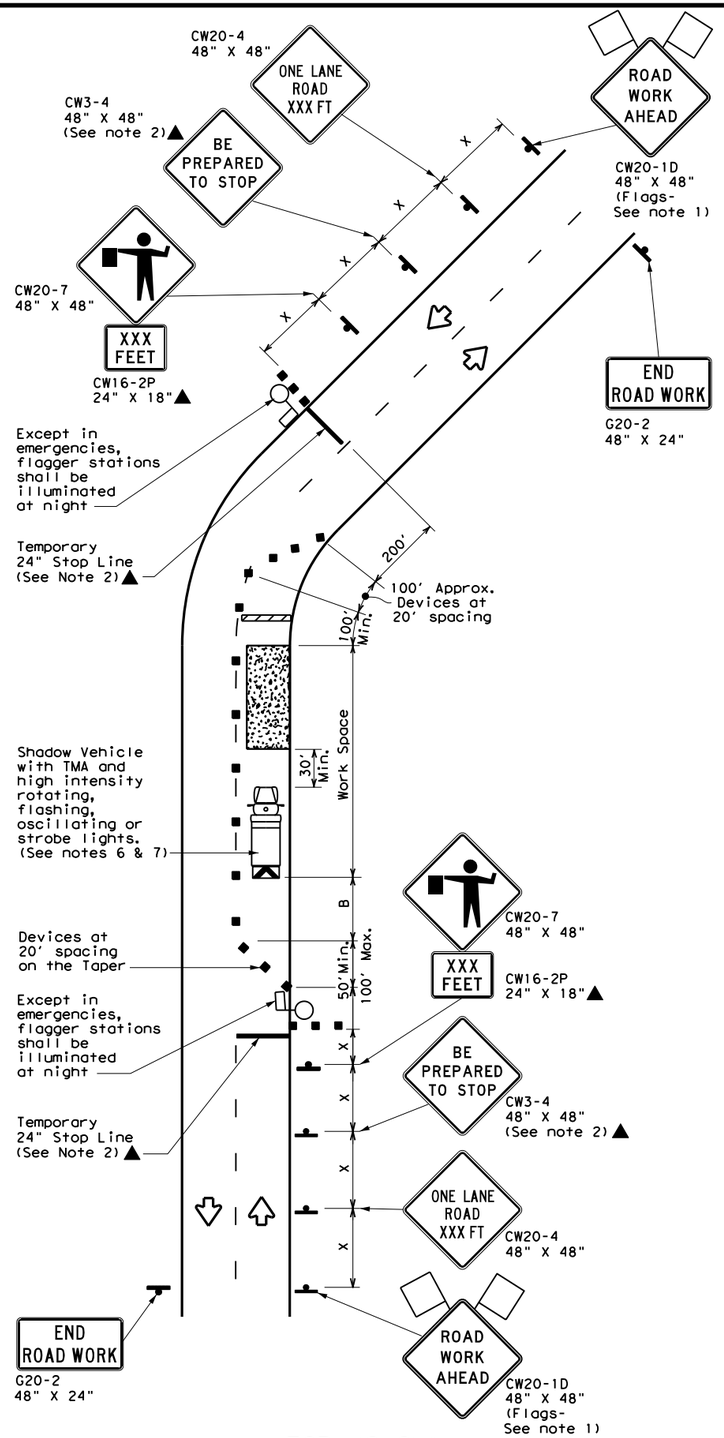


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		20

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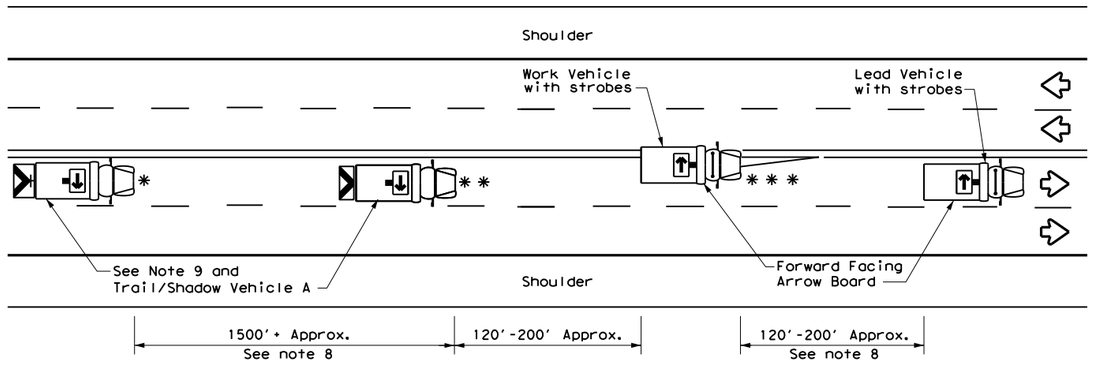
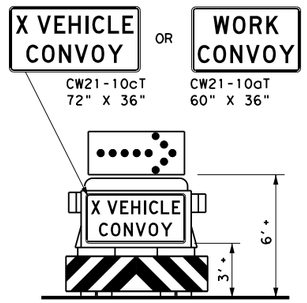


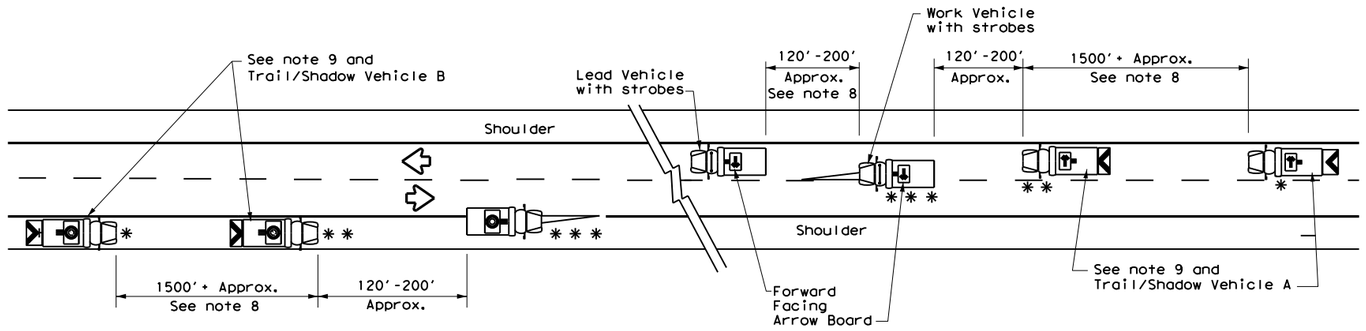
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

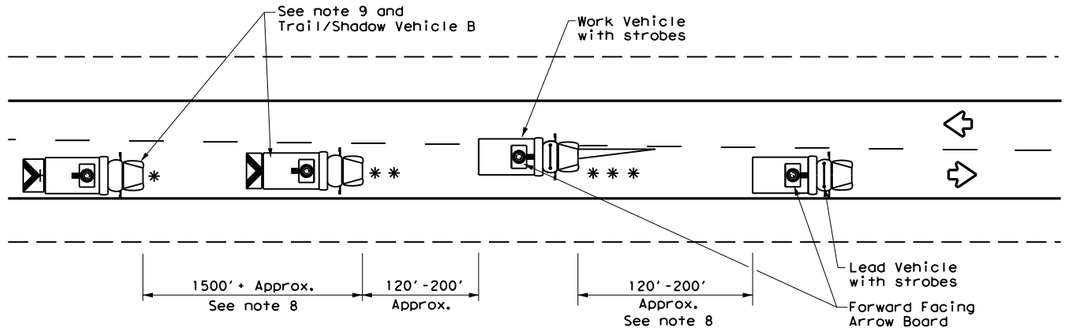


WORK ON SHOULDER

WORK ON TRAVEL LANE

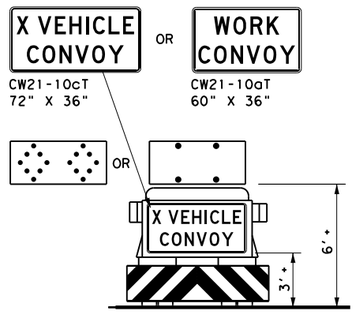
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

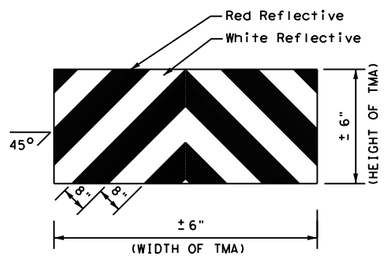
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0642	01	021,ETC.	FM 36,ETC.
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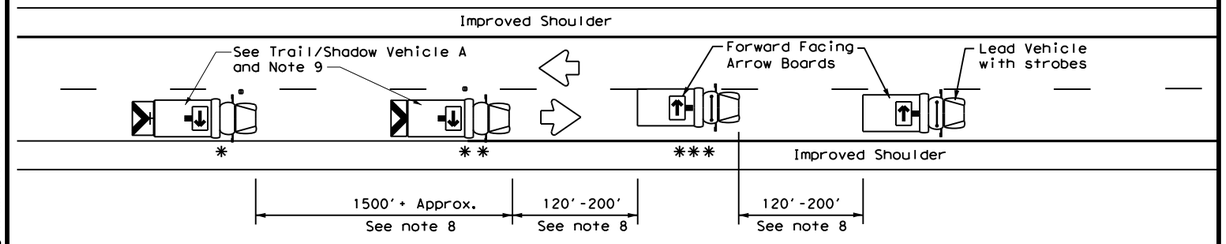
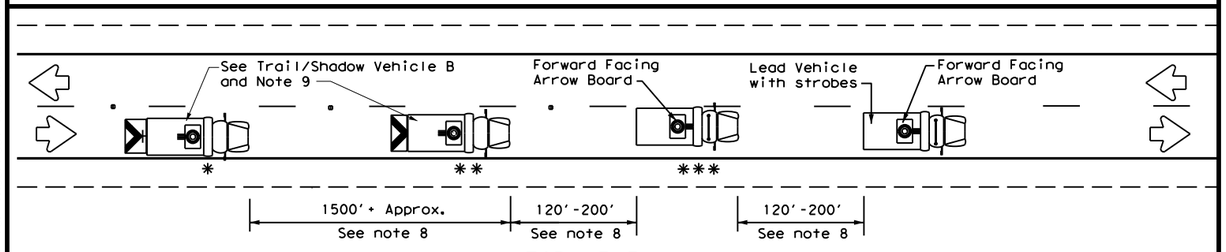


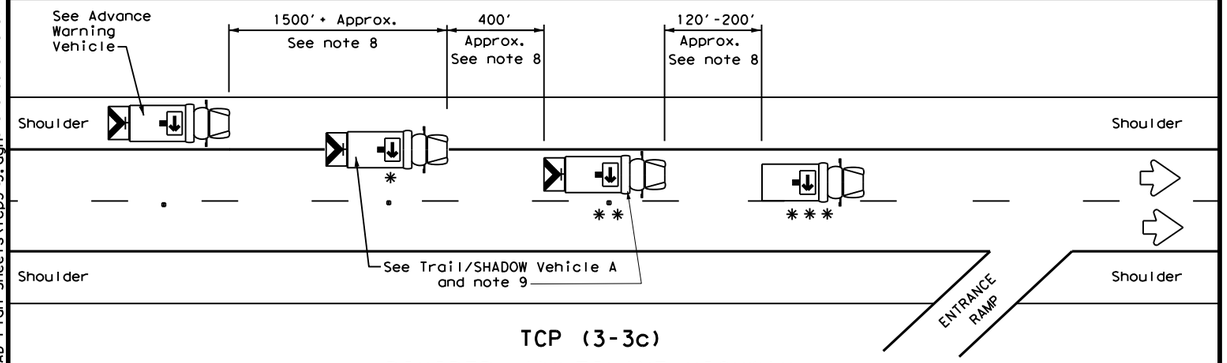
TCP (3-3a)

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



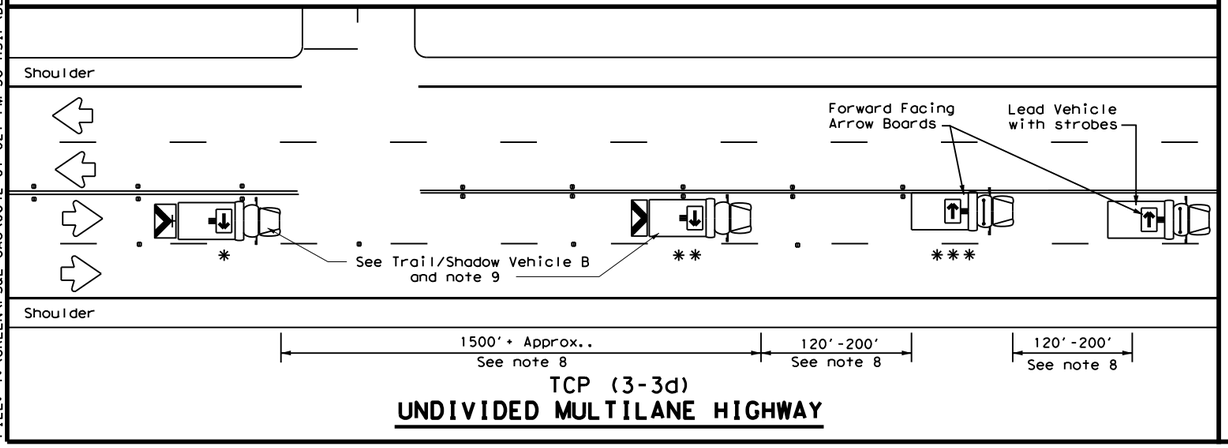
TCP (3-3b)

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



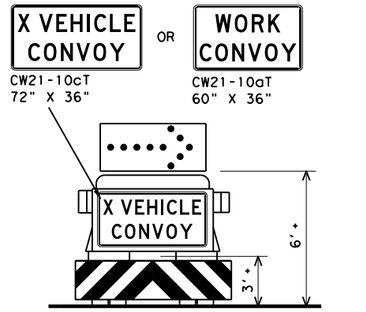
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



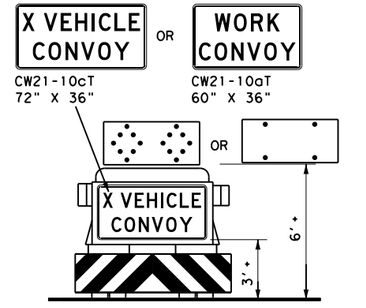
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



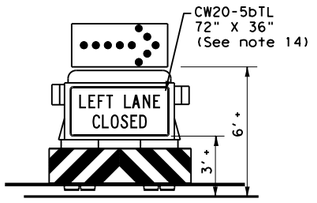
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

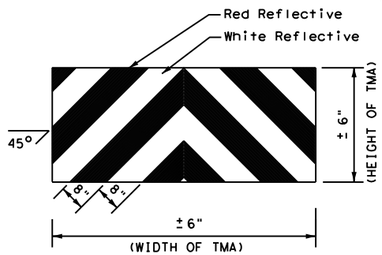


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL
TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	PAR	HUNT		22
1-97 7-14				

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DATE: 10/27/2020 4:52:09 PM
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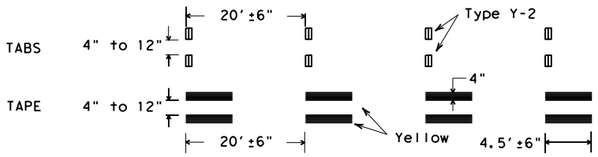
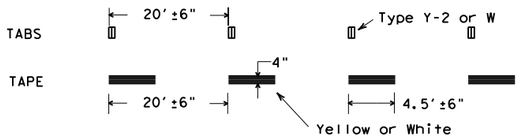
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

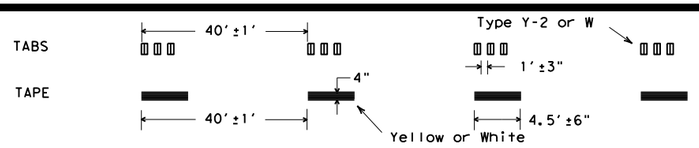


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



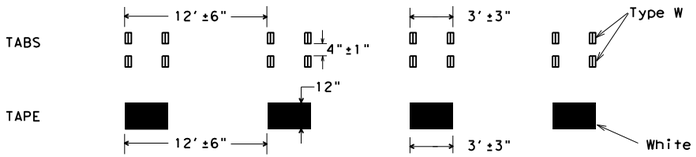
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

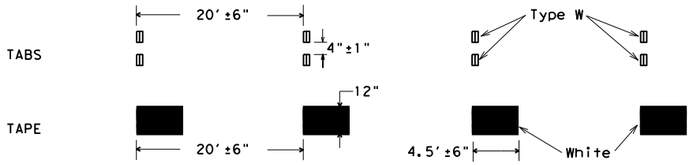


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



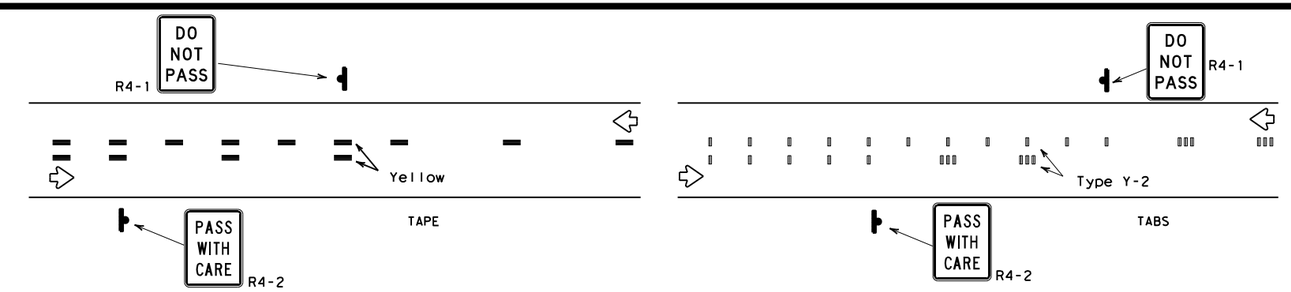
NOTES:

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

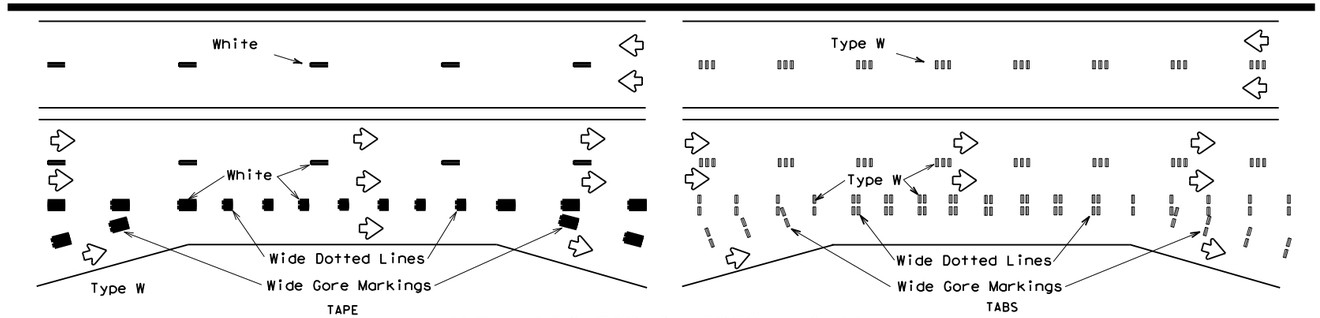
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

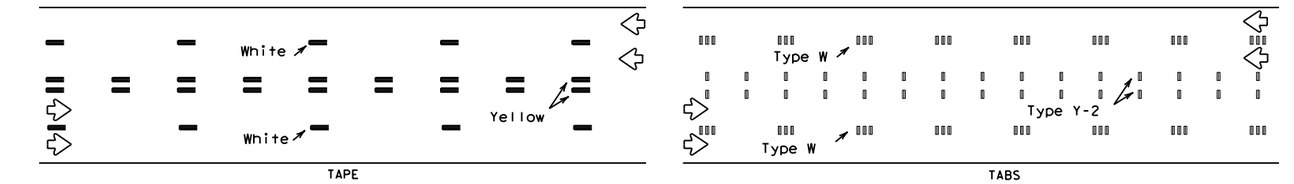
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



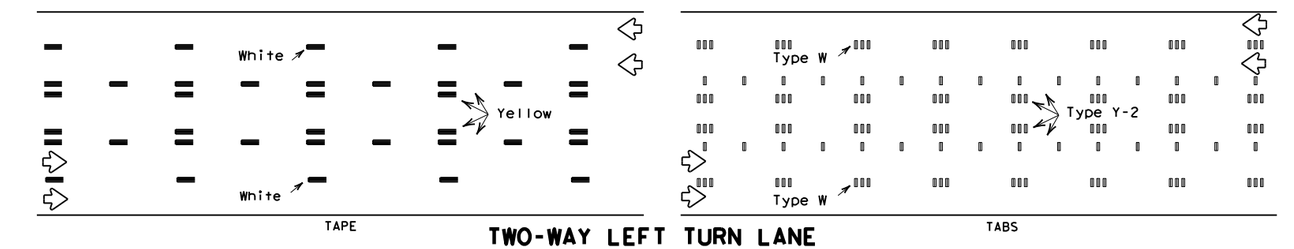
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



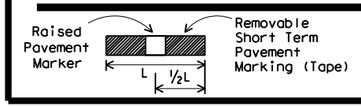
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
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1-97		DIST	COUNTY		SHEET NO.
3-03		PAR	HUNT		23
7-13					

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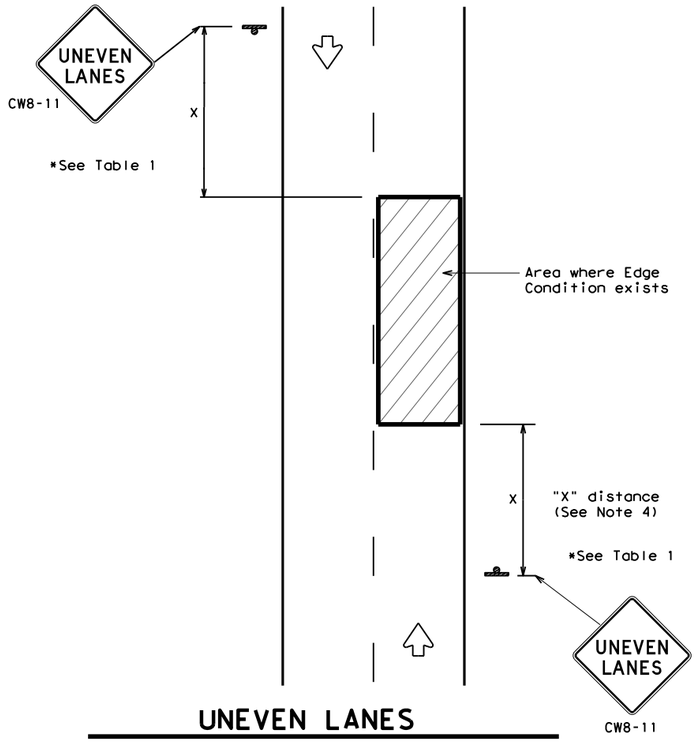
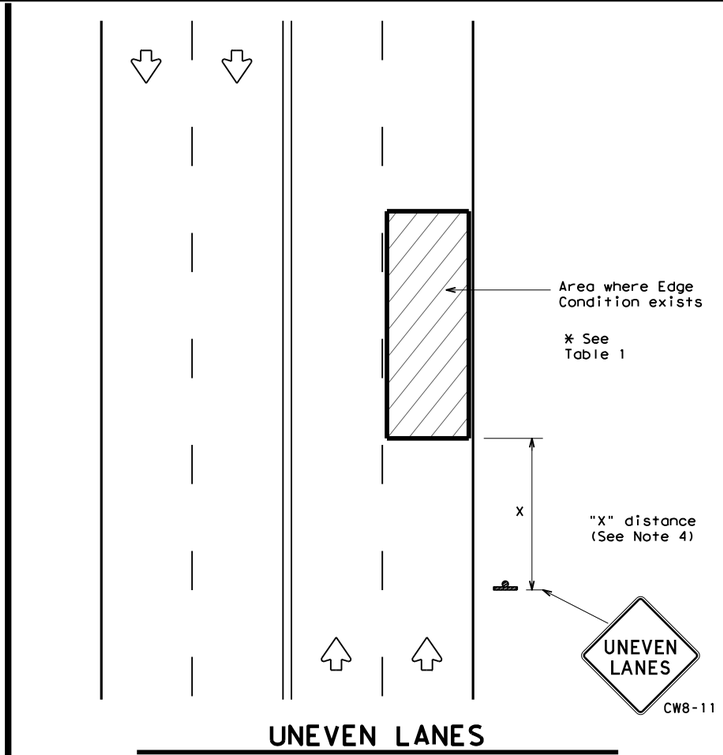
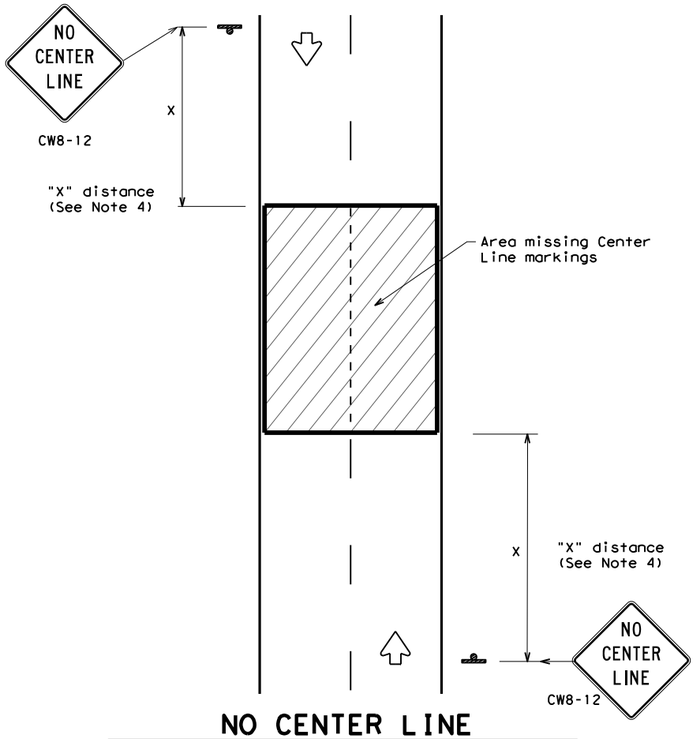


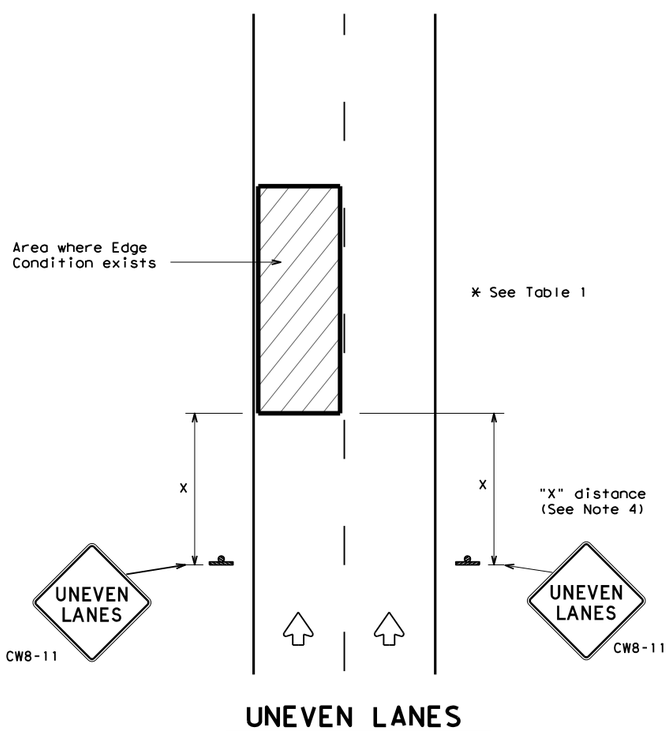
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

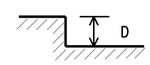
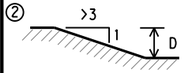
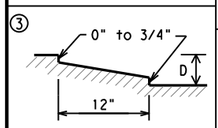
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	PAR	HUNT		24

DATE: 10/27/2020 4:52:13 PM
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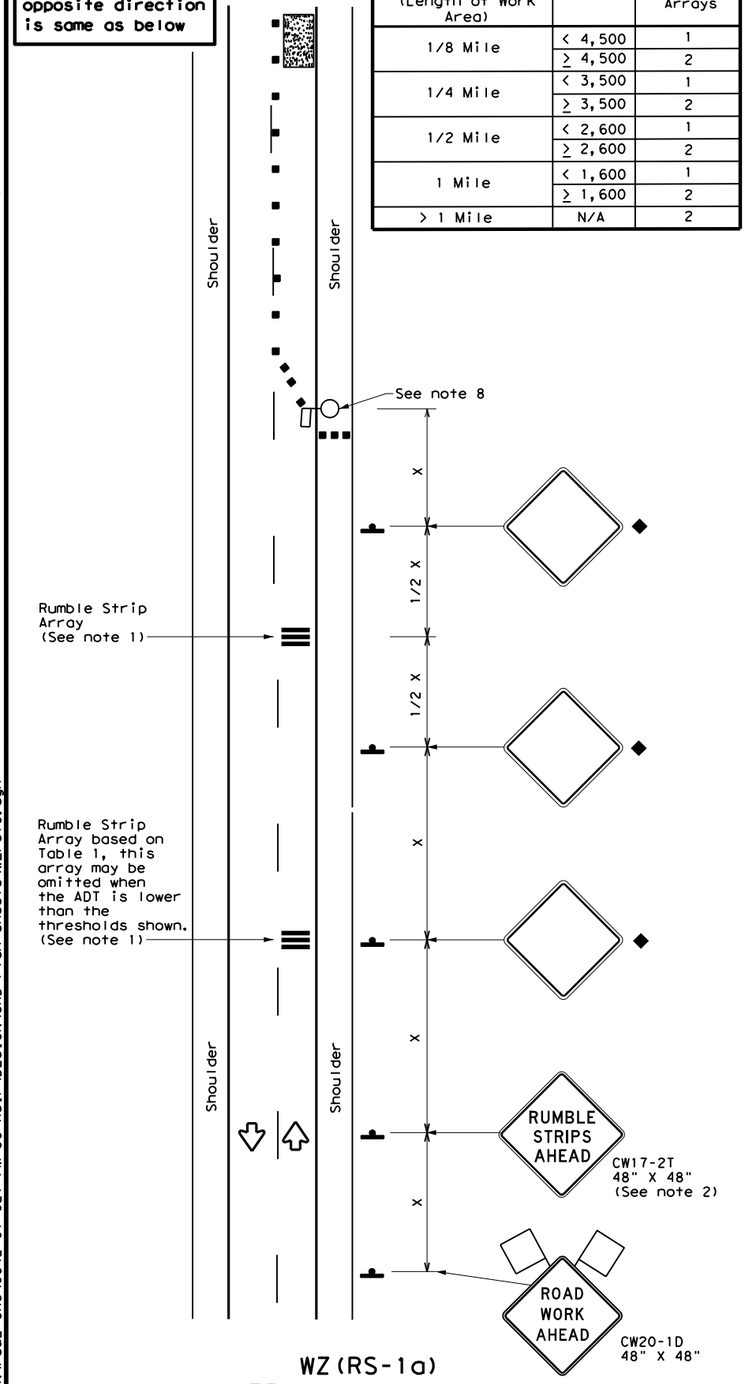
Warning sign and rumble strip sequence in opposite direction is same as below

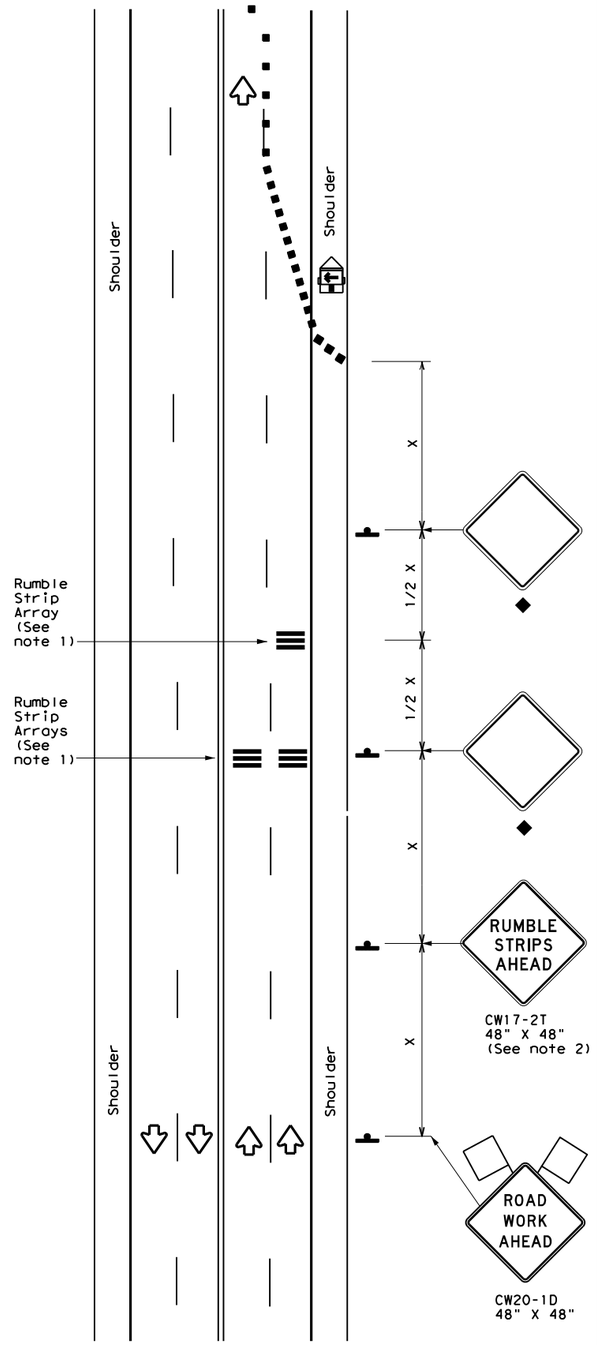
TABLE 1

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

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

TABLE 2

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

Texas Department of Transportation

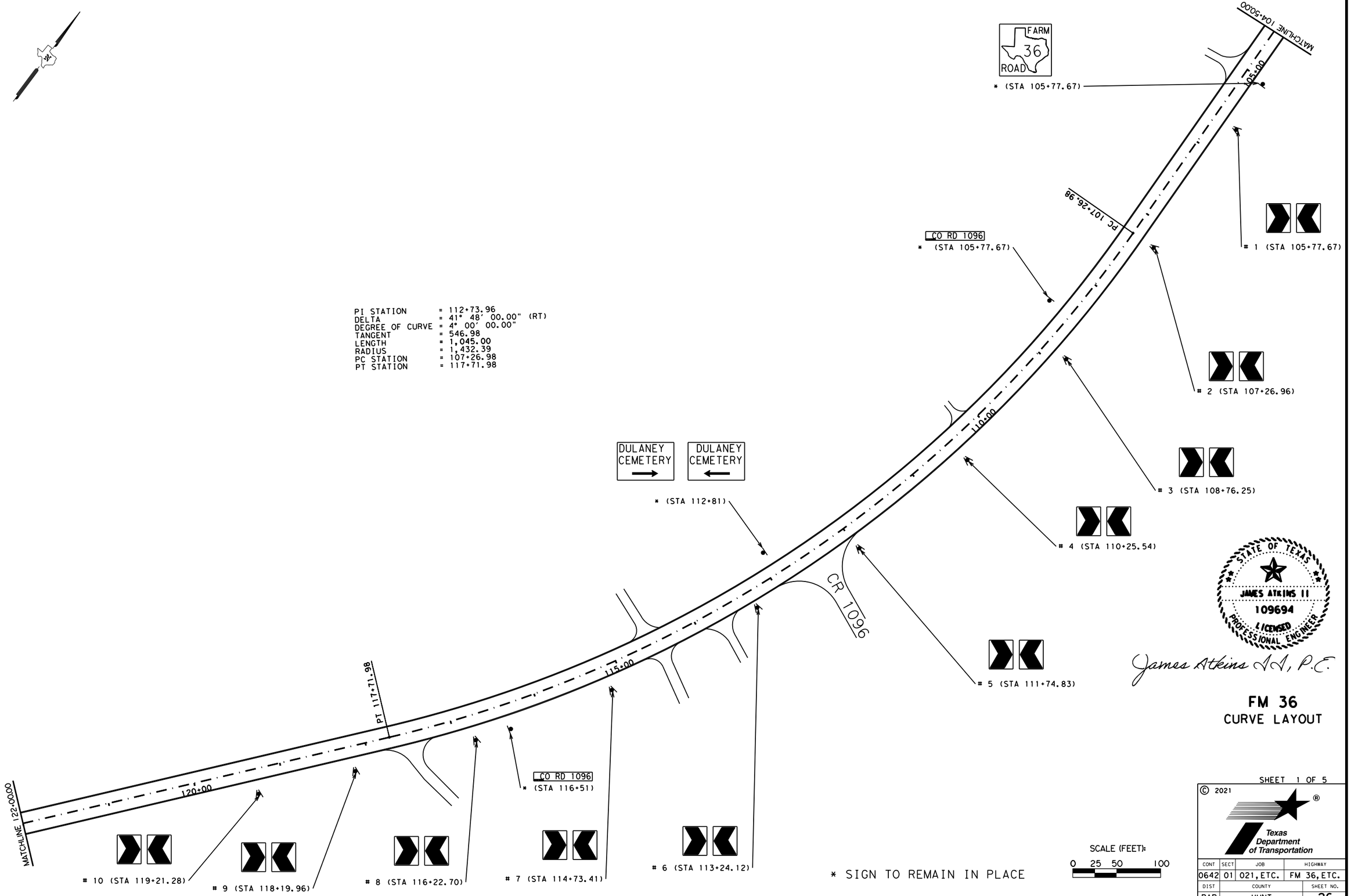
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
2-14	DIST	COUNTY		SHEET NO.
4-16	PAR	HUNT		25

PI STATION	= 112+73.96
DELTA	= 41° 48' 00.00" (RT)
DEGREE OF CURVE	= 4° 00' 00.00"
TANGENT	= 546.98
LENGTH	= 1,045.00
RADIUS	= 1,432.39
PC STATION	= 107+26.98
PT STATION	= 117+71.98



* SIGN TO REMAIN IN PLACE

SCALE (FEET):
0 25 50 100

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.

FM 36
CURVE LAYOUT

SHEET 1 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		26

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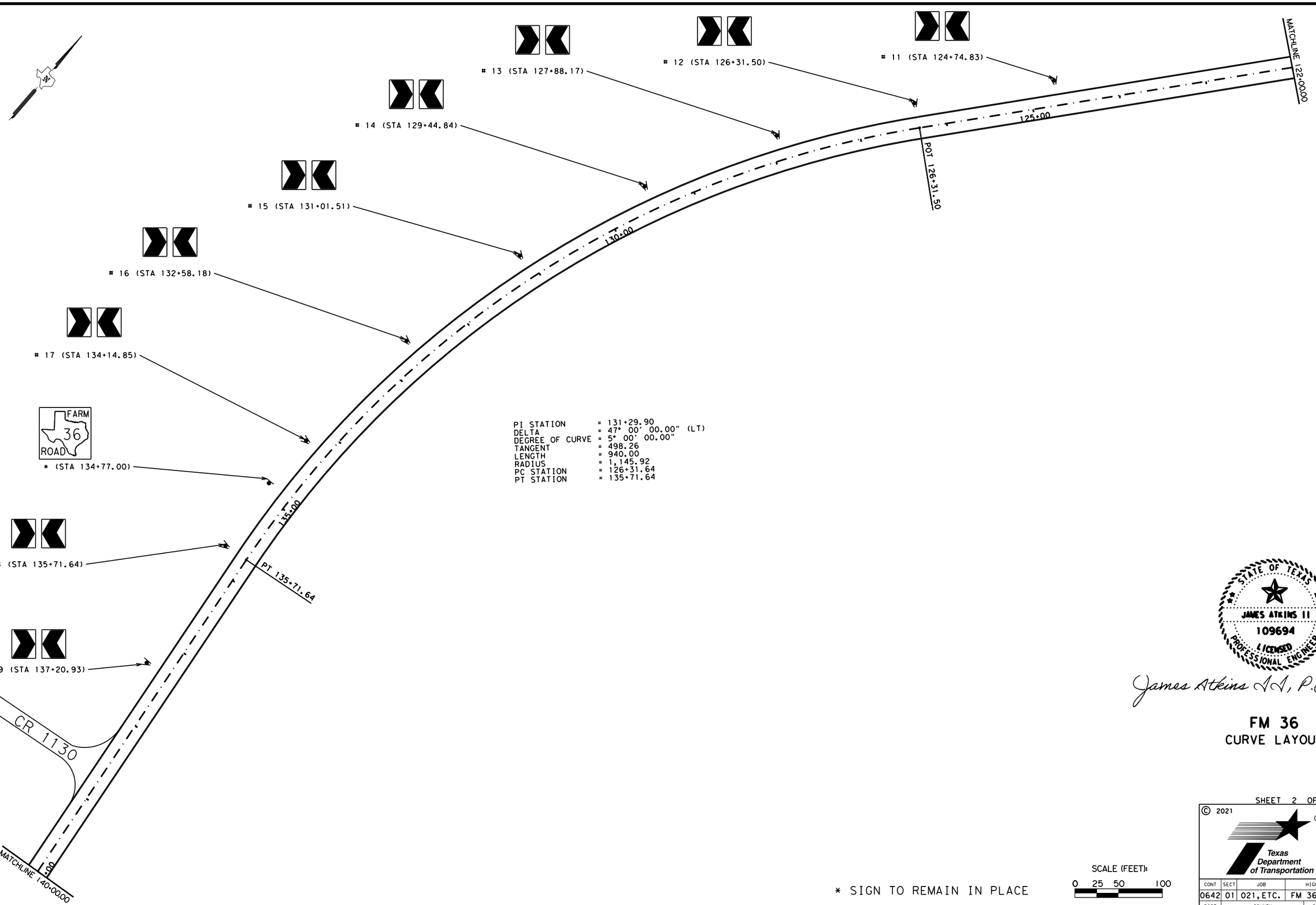

PI STATION = 131+29.90
DELTA = 47° 00' 00.00" (LT)
DEGREE OF CURVE = 5° 00' 00.00"
TANGENT = 498.26
LENGTH = 940.00
RADIUS = 1,145.92
PC STATION = 126+31.64
PT STATION = 135+71.64

* SIGN TO REMAIN IN PLACE

SCALE (FEET): 0 25 50 100

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.

FM 36
CURVE LAYOUT

SHEET 2 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		27

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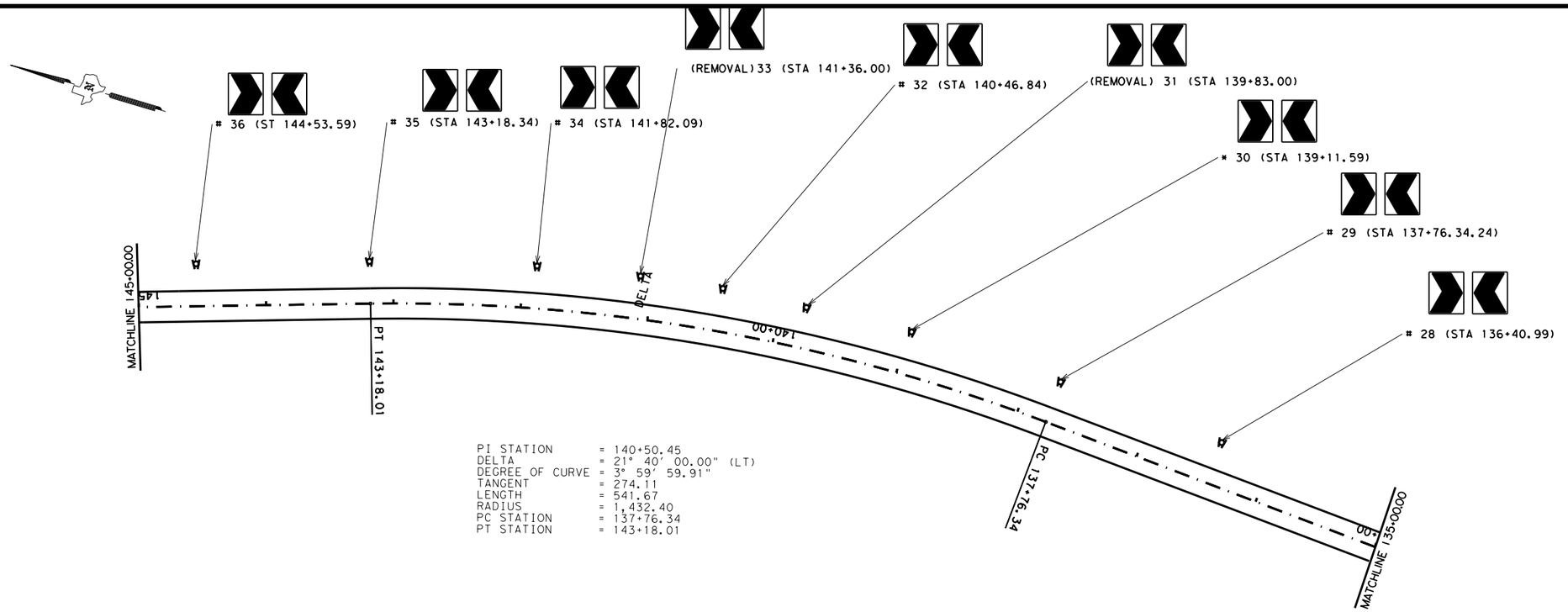

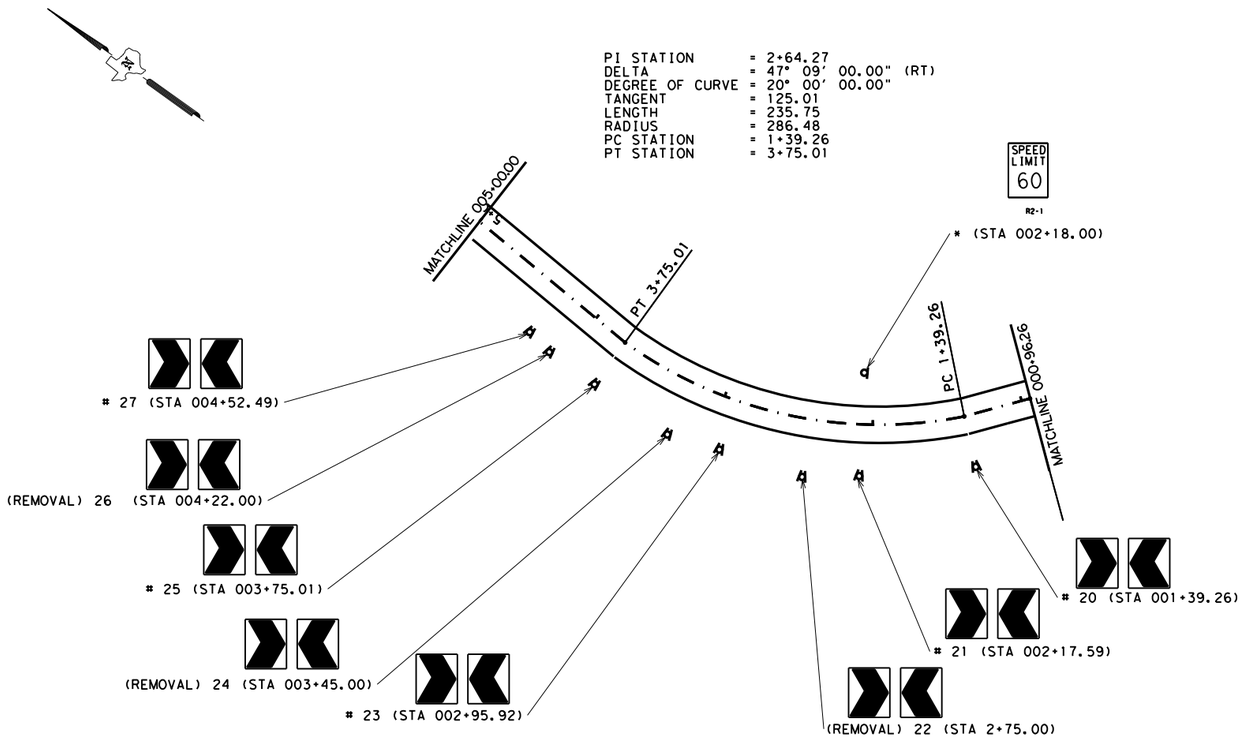

* SIGN TO REMAIN IN PLACE

SCALE (FEET): 0 25 50 100

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.

FM 1570
CURVE LAYOUT

SHEET 3 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		28

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CK:
DW:
CK:
DN:

CADDO MILLS
GREENVILLE

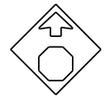
* (STA 162+24.00)

* (STA 161+91.00)

41 (STA 161+44.68)

40 (STA 160+05.84)

39 (STA 158+67.00)



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38 (STA 157+29.84)

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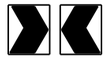
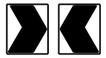
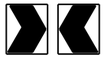


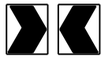
42 (STA 162+81.24)



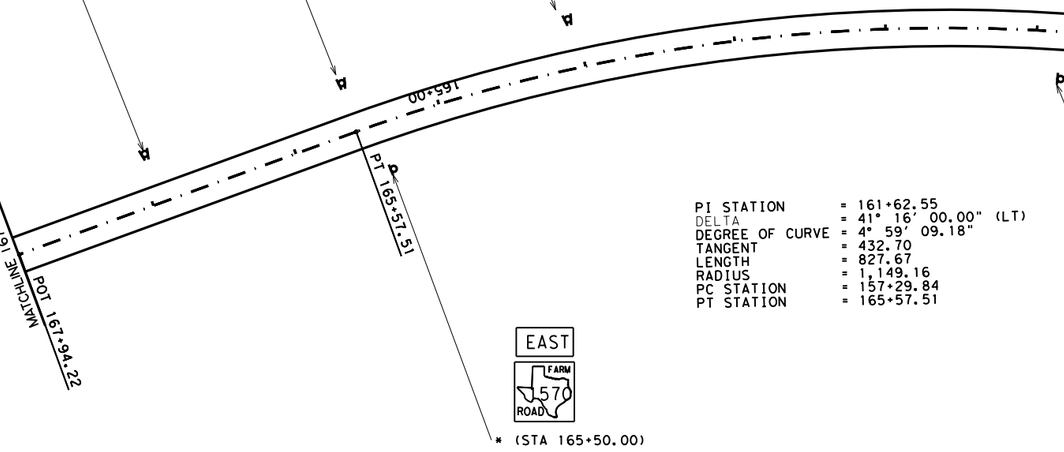
43 (STA 164+19.84)



44 (STA 165+57.51)



45 (STA 166+95.51)



PI STATION = 161+62.55
DELTA = 41° 16' 00.00" (LT)
DEGREE OF CURVE = 4° 59' 09.18"
TANGENT = 432.70
LENGTH = 827.67
RADIUS = 1,149.16
PC STATION = 157+29.84
PT STATION = 165+57.51

EAST
FARM ROAD 1570

* (STA 165+50.00)

SPEED LIMIT 60
R2-1

* (STA 160+95.00)

* SIGN TO REMAIN IN PLACE

SCALE (FEET):
0 25 50 100

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins III, P.E.

10/29/20

FM 1570
CURVE LAYOUT

SHEET 4 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		29

DATE: 10/27/2020 4:52:21 PM
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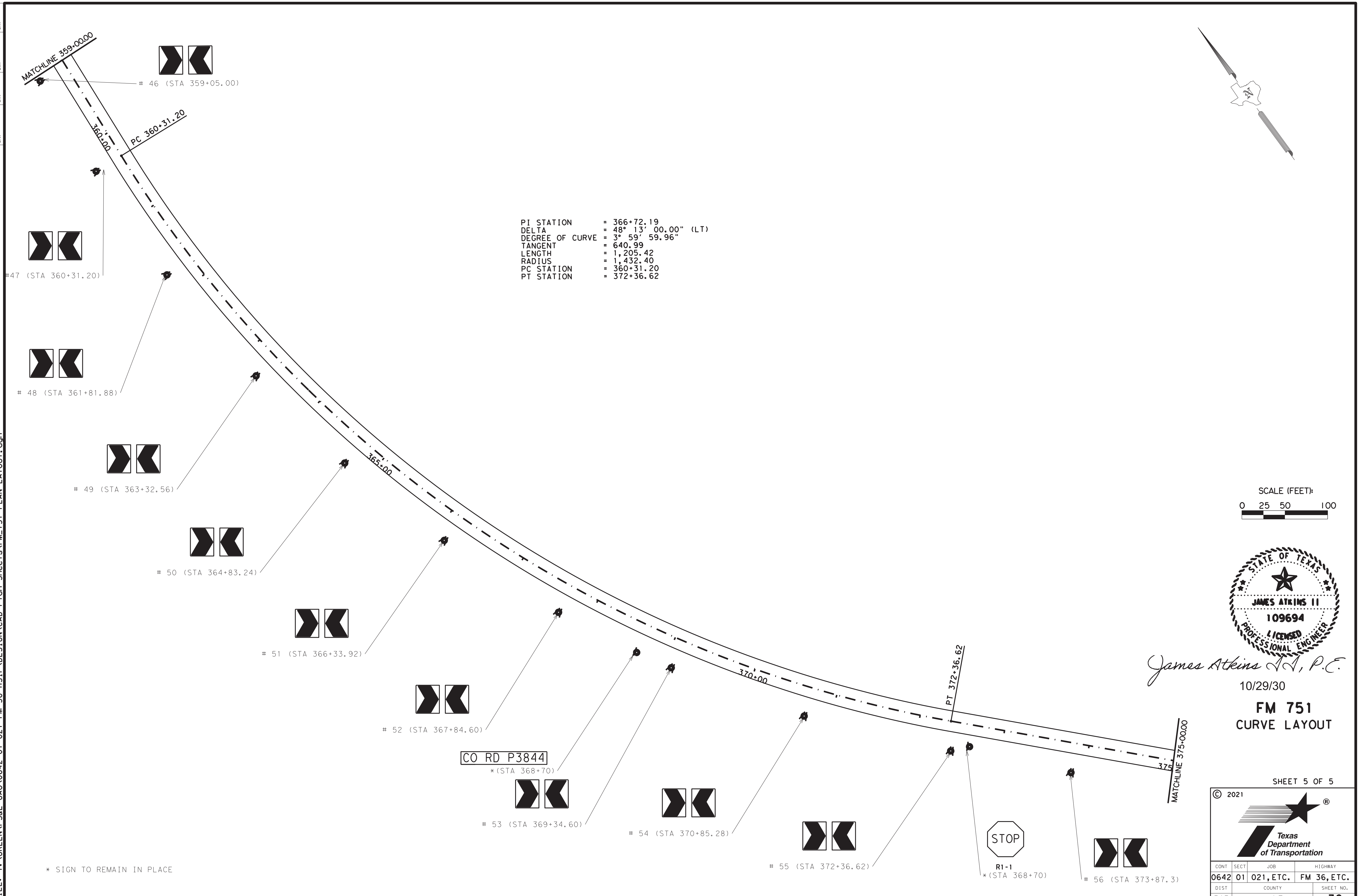

PI STATION	=	366+72.19
DELTA	=	48° 13′ 00.00″ (LT)
DEGREE OF CURVE	=	3° 59′ 59.96″
TANGENT	=	640.99
LENGTH	=	1,205.42
RADIUS	=	1,432.40
PC STATION	=	360+31.20
PT STATION	=	372+36.62

* SIGN TO REMAIN IN PLACE

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/30

FM 751
CURVE LAYOUT

SHEET 5 OF 5

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST		COUNTY	SHEET NO.
PAR		HUNT	30

DATE: 10/27/2020 4:52:23 PM
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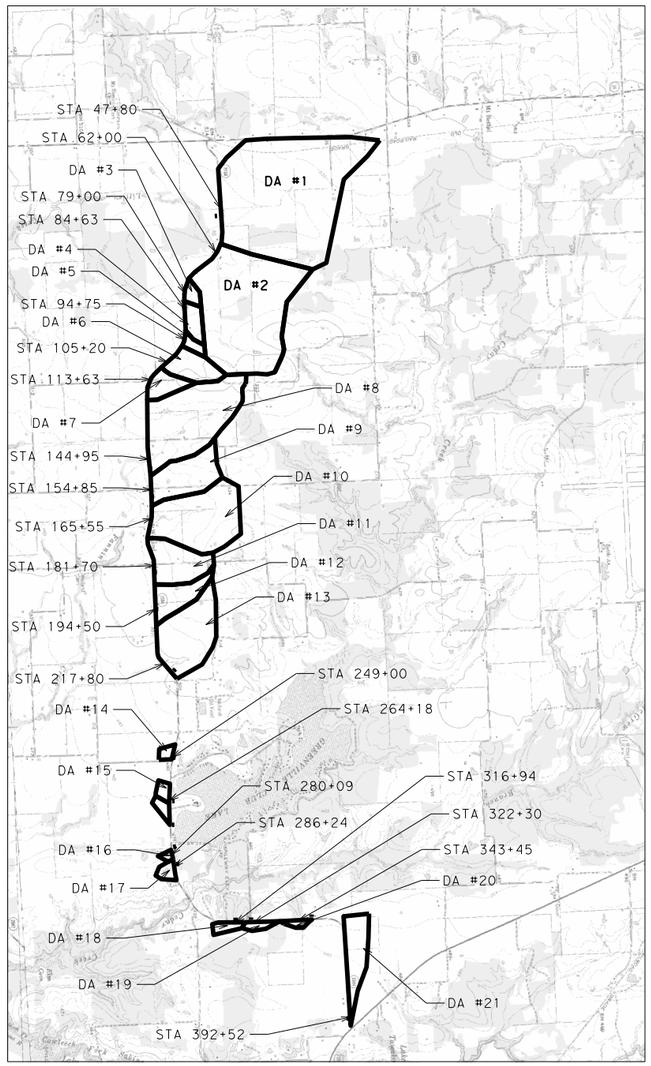

0 .5 1
SCALE IN MILES

NOTES:
DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
DRAINAGE AREAS DETERMINED BY SURVEY DATA, USGS TOPOGRAPHIC MAPS, DIGITAL ELEVATION MODELS, AS-BUILT PLANS AND FIELD OBSERVATIONS. THE RATIONAL METHOD WAS USED FOR HYDROLOGOC ANALYSIS OF DRAINAGE AREAS LESS THAN 200 ACRES.
SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS :HY-8(VER 7.50 FHWA).
CULVERTS EXTENDED LESS THAN TEN PERCENT WERE NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

DETERMINATION OF PEAK DISCHARGES

STATION	ID NO.	AREA (ACRES)	CN	TC (MIN)		5-YEAR	10-YEAR	25-YEAR	100-YEAR
47+80	1	408.95	79	99	DISCHARGES (CFS)	395	500.4	654.6	908.7
62+00	2	284.26	79	67		347.5	440.8	575.8	797.3

DETERMINATION OF PEAK DISCHARGES

STATION	ID NO.	AREA (ACRES)	COEFFICIENT C	TC (MIN)		5-YEAR	10-YEAR	25-YEAR	100-YEAR
79+00	3	8.30	0.30	25.0	INTENSITY (IN/HR)	3.71	4.44	5.18	6.71
					DISCHARGE (CFS)	9.30	11.10	12.90	16.80
84+63	4	16.87	0.30	43.5	INTENSITY (IN/HR)	2.67	3.19	3.72	4.85
					DISCHARGE (CFS)	13.50	16.20	18.80	24.50
94+75	5	7.61	0.33	32.1	INTENSITY (IN/HR)	3.24	3.87	4.52	5.87
					DISCHARGE (CFS)	8.10	9.70	11.30	14.70
105+20	6	36.94	0.31	54.3	INTENSITY (IN/HR)	2.30	2.75	3.21	4.19
					DISCHARGE (CFS)	26.40	31.50	36.80	47.90
113+63	7	23.05	0.31	44.2	INTENSITY (IN/HR)	2.64	3.16	3.68	4.79
					DISCHARGE (CFS)	18.90	22.60	26.30	34.30
144+95	8	163.90	0.31	63.4	INTENSITY (IN/HR)	2.07	2.47	2.89	3.77
					DISCHARGE (CFS)	105.00	125.70	146.60	191.50
154+85	9	69.88	0.29	54.0	INTENSITY (IN/HR)	2.31	2.76	3.22	4.20
					DISCHARGE (CFS)	46.80	56.00	65.30	85.10
165+55	10	133.61	0.29	52.9	INTENSITY (IN/HR)	2.34	2.80	3.27	4.26
					DISCHARGE (CFS)	90.70	108.50	126.50	165.00
181+70	11	59.71	0.30	34.4	INTENSITY (IN/HR)	3.10	3.71	4.33	5.62
					DISCHARGE (CFS)	55.60	66.50	77.50	100.70
194+50	12	39.00	0.30	53.7	INTENSITY (IN/HR)	2.32	2.77	3.23	4.22
					DISCHARGE (CFS)	27.10	32.40	37.80	49.30
217+80	13	101.36	0.30	59.8	INTENSITY (IN/HR)	2.15	2.58	3.01	3.92
					DISCHARGE (CFS)	65.50	78.40	91.40	119.30
249+00	14	5.00	0.32	26.1	INTENSITY (IN/HR)	3.66	4.39	5.12	6.63
					DISCHARGE (CFS)	5.90	7.00	9.40	10.60
264+18	15	6.50	0.32	26.0	INTENSITY (IN/HR)	3.68	4.40	5.14	6.66
					DISCHARGE (CFS)	7.60	9.20	12.20	13.80
280+09	16	2.62	0.28	31.3	INTENSITY (IN/HR)	3.29	3.94	4.59	5.96
					DISCHARGE (CFS)	2.40	2.90	3.40	4.40
286+24	17	7.73	0.28	24.3	INTENSITY (IN/HR)	3.82	4.58	5.35	6.92
					DISCHARGE (CFS)	8.30	9.90	11.60	15.00
316+94	18	7.68	0.32	47.3	INTENSITY (IN/HR)	2.52	3.02	3.52	4.58
					DISCHARGE (CFS)	6.20	7.40	8.60	11.30
322+30	19	6.18	0.32	33.4	INTENSITY (IN/HR)	3.16	3.78	4.41	5.73
					DISCHARGE (CFS)	6.20	7.50	10.00	11.30
343+45	20	4.30	0.32	25.9	INTENSITY (IN/HR)	3.68	4.41	5.14	6.66
					DISCHARGE (CFS)	5.10	6.10	7.10	9.20
392+52	21	46.88	0.32	80.2	INTENSITY (IN/HR)	1.75	2.10	2.45	3.21
					DISCHARGE (CFS)	26.30	31.50	36.80	48.10

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/20

FM 36, ETC.
HYDROLOGIC DATA

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		31

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CROSS CULVERT HYDROLOGIC AND HYDRAULIC DATA (RATIONAL METHOD)

STRUCTURE INLET STA.	DRAINAGE AREA	AREA (AC)	CHANNEL SLOPE (FT/FT)	n	CHANNEL TYPE	HYDRAULIC CONDITION	STRUCTURE DESCRIPTION	STRUCTURE MANNING'S n	STRUCTURE SLOPE (%)	ENTRANCE/ EXIT TYPE		RUNOFF COEFFICIENT	Tc (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY	DEPTH OVERTOPPING ROADWAY (FT)	ROADWAY ELEV. OVERTOP (FT.)
79+00	3			0.03	TRAPEZOIDAL	EXISTING	18"X60' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
84+63	4	16.87	0.0032	0.03	TRAPEZOIDAL	EXISTING	1 - 3' X 2' X 42 RC BOX	0.012	0.71%	LEFT	FW	0.3	43.5	10 YEAR	16.2	520.82	520.5	1.88	-	524.44
										RIGHT	FW			100 YEAR	24.5	521.14	520.75	2.1	-	
						PROPOSED	1 - 3' X 2' X 58 RC BOX	0.012	0.72%	LEFT	PW	0.3	43.5	10 YEAR	16.2	520.82	520.57	1.88	-	524.44
										RIGHT	PW			100 YEAR	24.5	521.14	520.75	2.1	-	
94+75	5	7.61	0.0096	0.03	TRAPEZOIDAL	EXISTING	1 - 24" X 42' RCP	0.012	2.36%	LEFT	PROJ	0.33	32.1	10 YEAR	9.7	529.85	528.17	2.57		533.29
										RIGHT	PROJ			100 YEAR	14.7	530.17	528.29	3	-	
						PROPOSED	1 - 24" X 46' RCP	0.012	2.36%	LEFT	SET	0.33	32.1	10 YEAR	9.7	529.85	528.17	2.57	-	533.29
										RIGHT	SET			100 YEAR	14.7	530.17	528.29	3	-	
105+20	6				TRAPEZOIDAL	EXISTING	2-30"X66' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
113+63	7				TRAPEZOIDAL	EXISTING	42"X63' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
144+95	8	163.9	0.002	0.03	TRAPEZOIDAL	EXISTING	1 - 9' X 3 X 42' RC BOX	0.012	0.76%	LEFT	FW	0.31	63.4	10 YEAR	125.7	518.01	518.25	3.3	-	521.72
										RIGHT	FW			100 YEAR	191.5	518.57	518.89	3.7	-	
						PROPOSED	1 - 9' X 3 X 59' RC BOX	0.012	0.64%	LEFT	PW	0.31	63.4	10 YEAR	125.7	518.01	518.25	3.3	-	521.72
										RIGHT	PW			100 YEAR	191.5	518.57	518.89	3.7	-	
154+85	9	69.88	0.001	0.03	TRAPEZOIDAL	EXISTING	1 - 5' X 3 X 44' RC BOX	0.012	1.14%	LEFT	FW	0.29	54.0	10 YEAR	56	515.02	515.26	2.15	-	517.8
										RIGHT	FW			100 YEAR	85.1	515.13	515.89	2.39	-	
						PROPOSED	1 - 5' X 3 X 58' RC BOX	0.012	1.12%	LEFT	PW	0.29	54.0	10 YEAR	56	515.02	515.26	2.15	-	517.8
										RIGHT	PW			100 YEAR	85.1	515.13	515.87	2.39	-	
165+55	10	133.61	0.001	0.03	TRAPEZOIDAL	EXISTING	1 - 7' X 4' X 42' RC BOX	0.012	2.98%	LEFT	FW	0.29	52.9	10 YEAR	108.5	507.93	507.14	2.41	-	511.52
										RIGHT	FW			100 YEAR	165	508.58	507.8	2.71	-	
						PROPOSED	1 - 7' X 4' X 58' RC BOX	0.012	2.98%	LEFT	PW	0.29	52.9	10 YEAR	108.5	507.93	507.14	2.41	-	511.52
										RIGHT	PW			100 YEAR	165	508.58	507.8	2.71	-	
181+70	11	59.71	0.002	0.03	TRAPEZOIDAL	EXISTING	1 - 5' X 3' X 50' RC BOX	0.012	0.84%	LEFT	FW	0.3	34.4	10 YEAR	66.5	510.24	510.31	2.88	-	514.11
										RIGHT	FW			100 YEAR	100.7	510.83	510.84	3.21	-	
						PROPOSED	1 - 5' X 3' X 58. RC BOX	0.012	0.84%	LEFT	PW	0.3	34.4	10 YEAR	66.5	510.24	510.31	2.88	-	514.11
										RIGHT	PW			100 YEAR	100.7	510.83	510.84	3.21	-	
194+50	12	39	0.0058	0.03	TRAPEZOIDAL	EXISTING	1 - 5' X 3' X 42' RC BOX	0.012	1.40%	LEFT	FW	0.3	53.7	10 YEAR	32.4	507.25	506.69	3.47	-	511.86
										RIGHT	FW			100 YEAR	49.3	507.62	507	3.91	-	
						PROPOSED	1 - 5' X 3' X 58' RC BOX	0.012	1.40%	LEFT	PW	0.3	53.7	10 YEAR	32.4	507.25	506.69	3.47	-	511.86
										RIGHT	PW			100 YEAR	49.3	507.62	507	3.91	-	
217+80	13	101.36	0.003	0.03	TRAPEZOIDAL	EXISTING	1 - 7' X 4' X 42' RC BOX	0.012	1.74%	LEFT	FW	0.3	59.8	10 YEAR	78.4	494.13	493.84	3.42	-	498.8
										RIGHT	FW			100 YEAR	119.3	494.64	494.34	3.84	-	
						PROPOSED	1 - 7' X 4' X 57' RC BOX	0.012	1.74%	LEFT	PW	0.3	59.8	10 YEAR	78.4	494.13	493.84	3.42	-	498.8
										RIGHT	PW			100 YEAR	119.3	494.64	494.34	3.84		
249+00	14	5	0.001	0.03	TRAPEZOIDAL	EXISTING	1 - 18" X 44' RC BOX	0.012	2%	LEFT	PROJ	0.32	26.1	10 YEAR	7	488.51	487.23	1.24	-	490.74
										RIGHT	PROJ			100 YEAR	10.6	488.84	487.48	1.39	-	
						PROPOSED	1 - 18" X 44' RCP	0.012	2%	LEFT	SET	0.32	26.1	10 YEAR	7	488.51	487.23	1.24	-	490.74
										RIGHT	SET			100 YEAR	10.6	488.84	487.48	1.39	-	
264+18	15			0.03	TRAPEZOIDAL	EXISTING	24"X54' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
280+09	16	2.62	0.0416	0.03	TRAPEZOIDAL	EXISTING	1 - 18" X 44' RC BOX	0.012	1.85%	LEFT	PROJ	0.28	31.3	10 YEAR	2.9	473.95	472.87	3.36	-	476.79
										RIGHT	PROJ			100 YEAR	4.4	474.11	472.94	3.73	-	
						PROPOSED	1 - 18" X 44' RCP	0.012	1.85%	LEFT	SET	0.28	31.3	10 YEAR	2.9	473.95	472.87	3.36	-	476.79
										RIGHT	SET			100 YEAR	4.4	474.11	472.94	3.73	-	
286+24	17	7.73		0.03	TRAPEZOIDAL	EXISTING	30"X60' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
316+94	18	7.68		0.03	TRAPEZOIDAL	EXISTING	24"X54' RCP W/SET	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
322+30	19	6.18	0.0694	0.03	TRAPEZOIDAL	EXISTING	1 - 18" X 60' RC BOX	0.012	7.43%	LEFT	PROJ	0.32	33.4	10 YEAR	7.5	473.85	468.07	4.15	-	477.77
										RIGHT	PROJ			100 YEAR	11.3	474.73	468.13	4.6	-	
						PROPOSED	1 - 18" X 60' RCP	0.012	7.43%	LEFT	SET	0.32	33.4	10 YEAR	7.5	473.85	468.07	4.15	-	477.77
										RIGHT	SET			100 YEAR	11.3	474.73	468.13	4.6	-	
342+45	20	4.3		0.03	TRAPEZOIDAL	EXISTING	1- 3'X2'X56' RC BOX	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
						PROPOSED	NO MODIFICATION	0.012		LEFT				10 YEAR						
										RIGHT				100 YEAR						
392+52	21	46.88	0.003	0.03	TRAPEZOIDAL	EXISTING	2 - 34" X 64' RC BOX	0.012	0.44%	LEFT	PROJ	0.32	80.2	10 YEAR	31.5	480.7	480.14	2.76	-	483.33
										RIGHT	PROJ			100 YEAR	48.1	481.22	480.51	3.09	-	
						PROPOSED	2 - 34" X 50' RCP	0.012	0.44%	LEFT	SET	0.32	80.2	10 YEAR	31.5	480.7	480.14	2.76	-	483.33
										RIGHT	SET			100 YEAR	48.1	481.22	480.51	3.09	-	

NOTES:
DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
NRCS CURVE NUMBER LOSS MODEL EMPLOYED IN HYDROLOGIC ANALYSIS.
PEAK FLOWS WERE DETERMINED USING NRCS DIMENSIONLESS UNIT HYDROGRAPH MODELLED IN HEC-HMS.
SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HEC-HMS (VER 4.2, USACE), HY-8 (VER.7.50 FHWA)
PER CUSTOMARY TXDOT ENGINEERING PROCEDURE, CULVERTS EXTENDED LESS THATN TEN PERCENT ARE
NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

PROJ PROJECTING END
FW= FLARED WING
SW= STRAIGHT WING
PW= PARALLEL WING
SET= SAFETY END TREATMENT
DI= DROP INLET

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/20

FM 36, ETC.
CULVERT HYDRAULIC DATA

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST		COUNTY	SHEET NO.
PAR		HUNT	32

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CK:
DW:
CK:
DN:

CROSS CULVERT HYDROLOGIC AND HYDRAULIC DATA (NRCS UNIT HYDROGRAPH)

STRUCTURE INLET STA.	DRAINAGE AREA	AREA (AC)	CHANNEL SLOPE (FT/FT)	n	CHANNEL TYPE	HYDRAULIC CONDITION	STRUCTURE DESCRIPTION	STRUCTURE MANNING'S n	STRUCTURE SLOPE (FT/FT)	ENTRANCE/ EXIT TYPE		NRCS RUNOFF CURVE NUMBER	LAG (MIN)	INTERVAL (MIN)	FLOOD FREQUENCY	FLOW (Q) (CFS)	HEADWATER ELEV (FT)	TAILWATER ELEV (FT)	TAILWATER VELOCITY (FT/S)	DEPTH OVERTOPPING ROADWAY (FT)	ROADWAY ELEV. OVERTOP (FT.)
47+80	1	408.95	0.006	0.03	TRAPOZOIDAL	EXISTING	3 -5' X 3' X 42' RC BOX	0.012	0.0021	LEFT	FW	79	69	10	10 YEAR	500.4	511.24	507.94	6.39	0.24	511.00
										RIGHT	FW				100 YEAR	908.7	512.19	509.56	8.15	1.19	
						PROPOSED	3 -5' X 3' X 60' RC BOX	0.012	0.0021	LEFT	PW	79	69	10	10 YEAR	500.4	508.69	508.33	6.86	-	511.00
										RIGHT	PW				100 YEAR	908.7	511.79	509.56	8.15	0.79	
62+00	2	284.26	0.0116	0.03	TRAPOZOIDAL	EXISTING	2 -5' X 3' X 40' RC BOX	0.012	0.008	LEFT	FW	79	47	10	10 YEAR	440	518.43	515.55	8.49	0.15	518.28
										RIGHT	FW				100 YEAR	797.3	519.54	517.15	10.49	1.26	
						PROPOSED	2 -5' X 3' X 59' RC BOX	0.012	0.008	LEFT	PW	79	47	10	10 YEAR	440	516.5	515.95	9.02	-	518.28
										RIGHT	PW				100 YEAR	797.3	518.93	517.15	10.49	0.65	

NOTES:
DESIGN OF DRAINAGE FACILITIES BASED ON THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019.
NRCS CURVE NUMBER LOSS MODEL EMPLOYED IN HYDROLOGIC ANALYSIS.
PEAK FLOWS WERE DETERMINED USING NRCS DIMENSIONLESS UNIT HYDROGRAPH MODELLED IN HEC-HMS.
SOFTWARE EMPLOYED FOR HYDROLOGIC ANALYSIS: HEC-HMS (VER 4.2, USACE), HY-8 (VER.7.50 FHWA)
PER CUSTOMARY TXDOT ENGINEERING PROCEDURE, CULVERTS EXTENDED LESS THATN TEN PERCENT ARE
NOT ANALYZED WHEN CULVERT HISTORY INDICATES ADEQUATE STORM FLOW CAPACITY AND FLOOD RISKS HAVE NOT CHANGED.

PROJ PROJECTING END
FW= FLARED WING
SW= STRAIGHT WING
PW= PARALLEL WING
SET= SAFETY END TREATMENT
DI= DROP INLET

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STATE OF TEXAS
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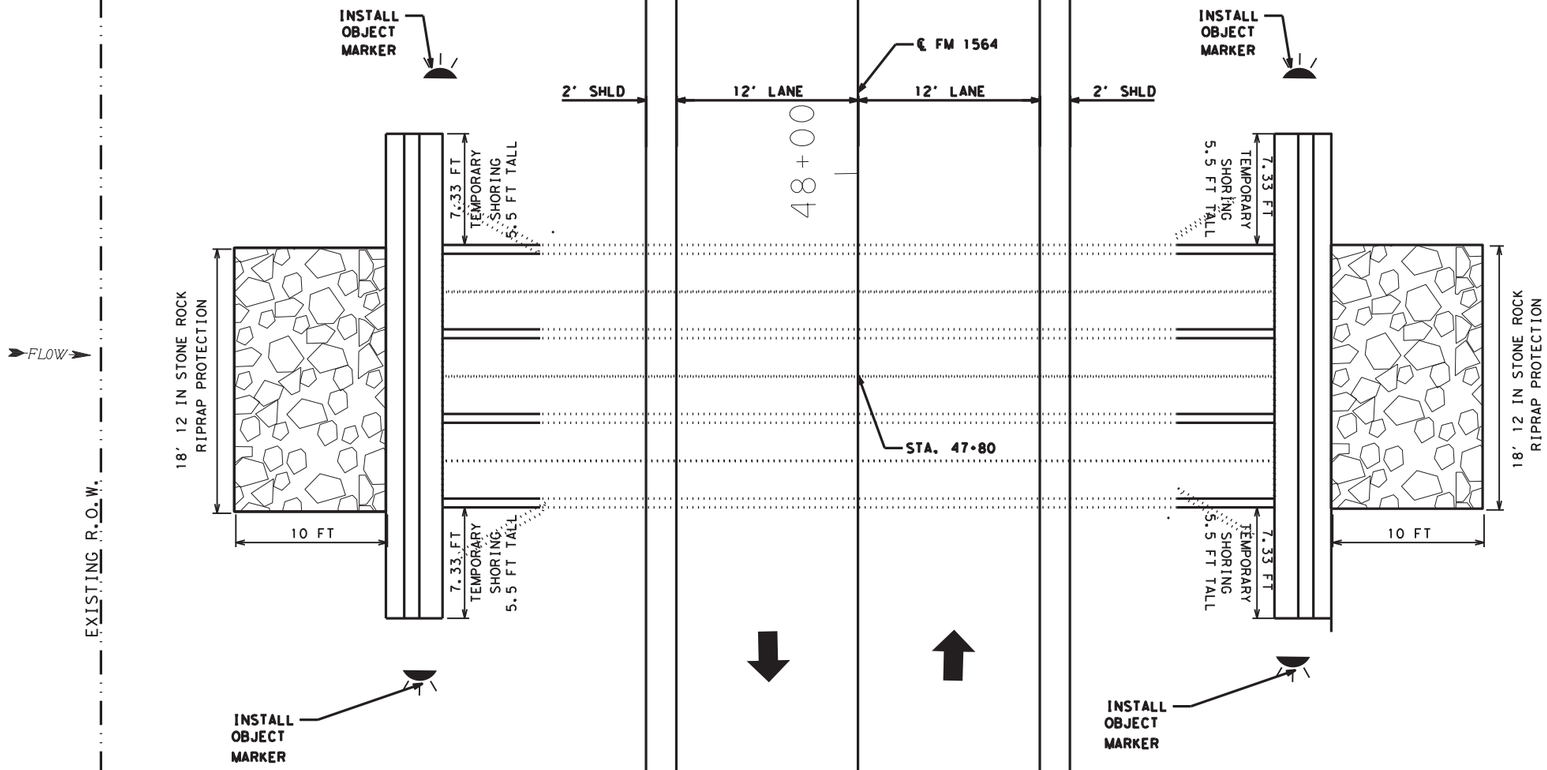
FM 36, ETC.
CULVERT
HYDRAULIC DATA

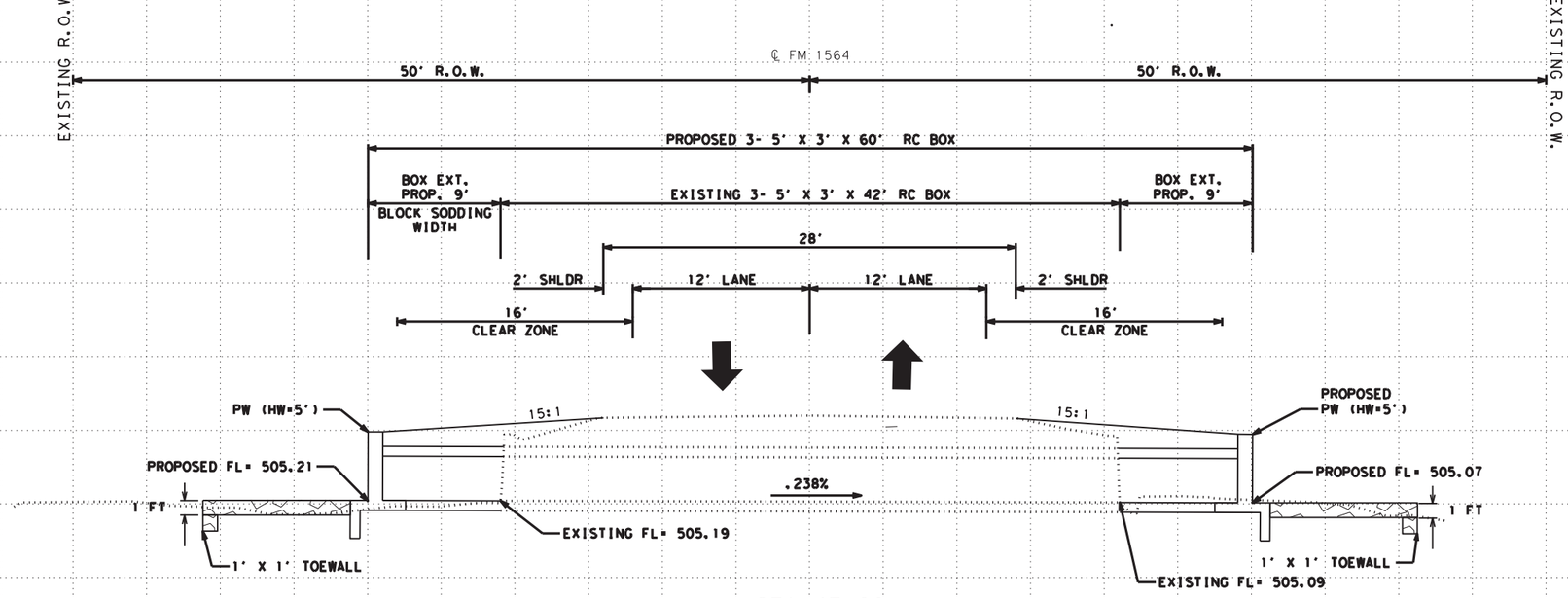
SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		33



ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	260 SY
403-6001	TEMPORARY SPL SHORING	162 SF
432-6031	RIPRAP (STONE PROTECTION)(12 IN)	24 CY
462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	54 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	4 EA



STA. 47+80

EXISTING 3- 5' X 3' X 42' RC BOX

REMOVE EXISTING WINGWALL US & DS

PROPOSED 3- 5' X 3' X 60' RC BOX

INSTALL 9' RC BOX EXT. WITH PW-0 US & DS

GRADE TO FLOW

STANDARDS: PW-0, MC-5-20

BM
N. 7064325.24
E: 2704537.94
Elev: 510.84

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

STATE OF TEXAS
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10/29/20

FM 1564
CULVERT LAYOUT
STA. 47+80

SHEET 1 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		34

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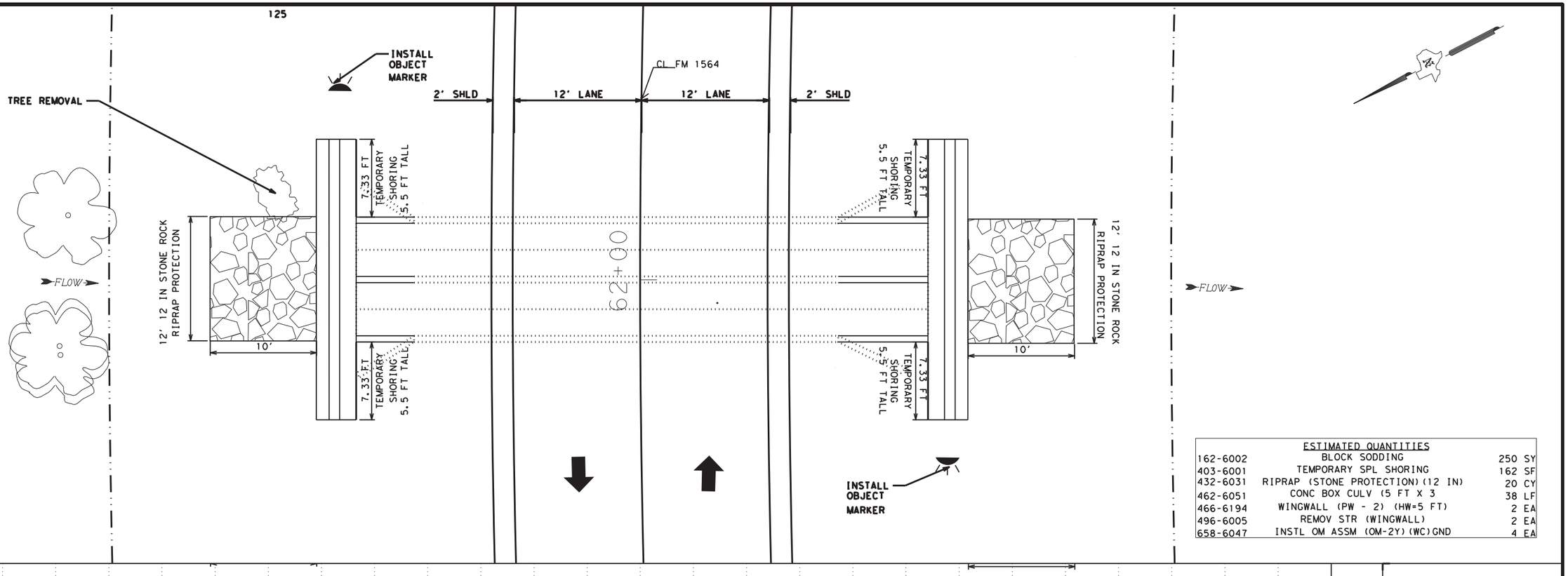
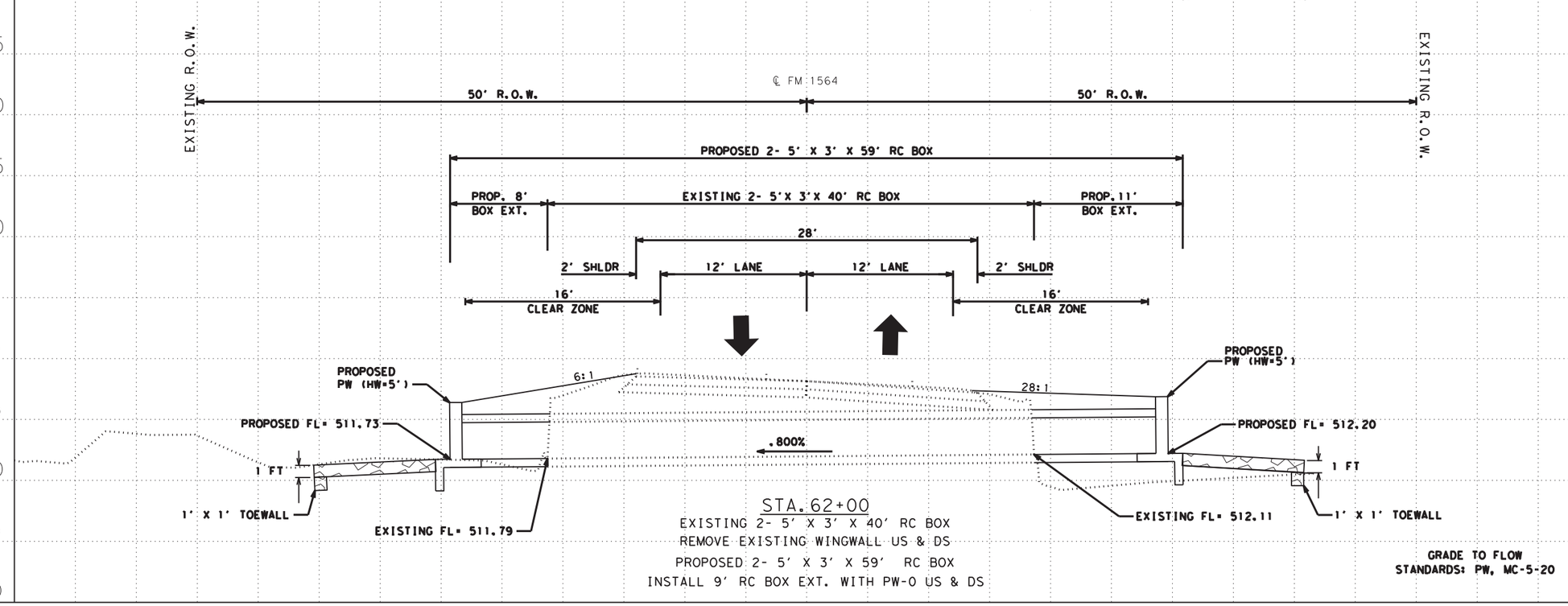


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	250 SY
403-6001	TEMPORARY SPL SHORING	162 SF
432-6031	RIPRAP (STONE PROTECTION)(12 IN)	20 CY
462-6051	CONC BOX CULV (5 FT X 3	38 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	4 EA



STA. 62+00

EXISTING 2- 5' X 3' X 40' RC BOX
REMOVE EXISTING WINGWALL US & DS
PROPOSED 2- 5' X 3' X 59' RC BOX
INSTALL 9' RC BOX EXT. WITH PW-0 US & DS

GRADE TO FLOW
STANDARDS: PW, MC-5-20

BM
N. 7064186.75
E: 2705943.77
Elev: 517.14

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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STA. 62+00

SHEET 2 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		35

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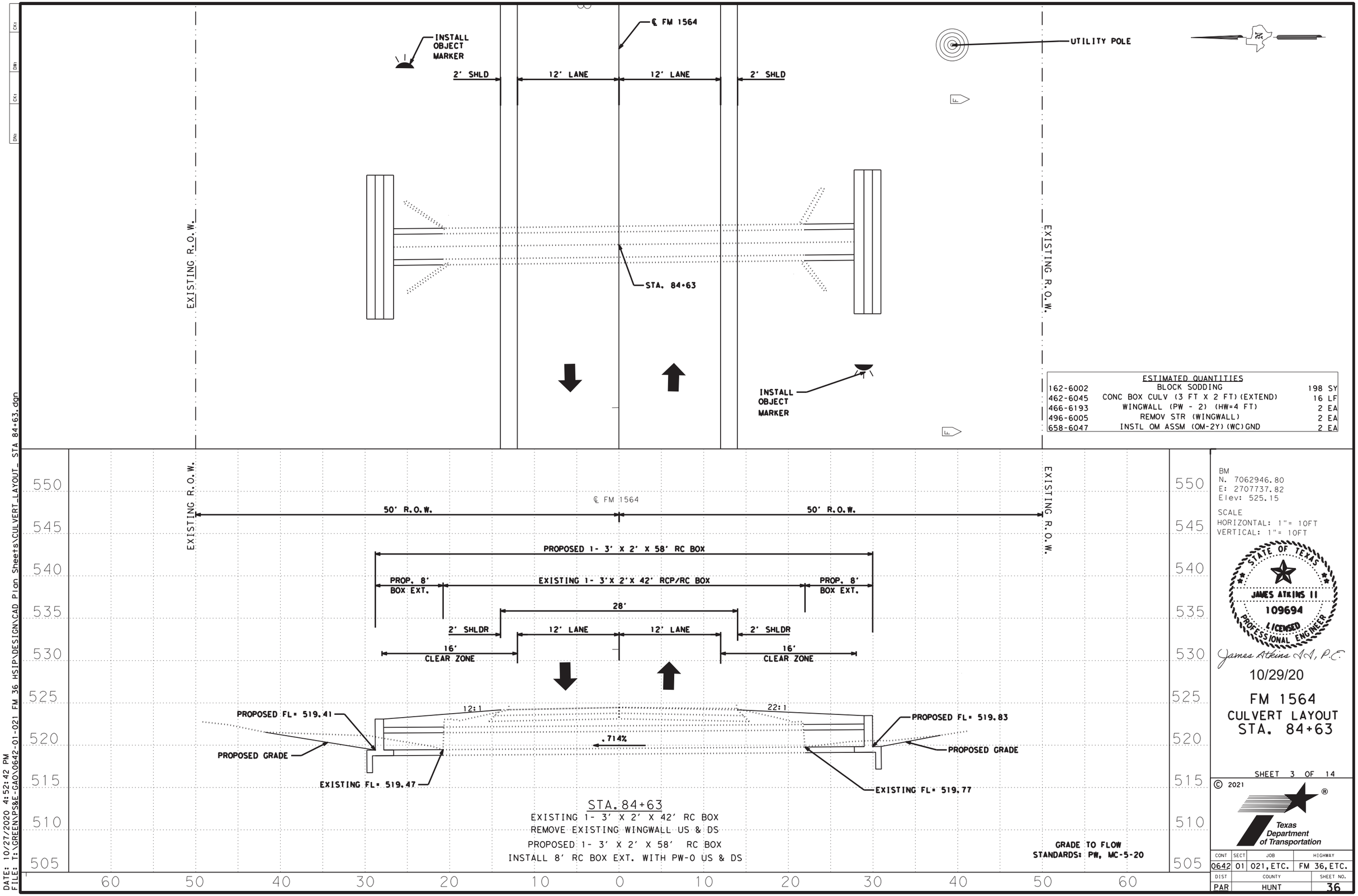

ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	198 SY
462-6045	CONC BOX CULV (3 FT X 2 FT)(EXTEND)	16 LF
466-6193	WINGWALL (PW - 2) (HW=4 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA

STA. 84+63

EXISTING 1- 3' X 2' X 42' RC BOX

REMOVE EXISTING WINGWALL US & DS

PROPOSED 1- 3' X 2' X 58' RC BOX

INSTALL 8' RC BOX EXT. WITH PW-0 US & DS

GRADE TO FLOW

STANDARDS: PW, MC-5-20

BM
N. 7062946.80
E: 2707737.82
Elev: 525.15

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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CULVERT LAYOUT
STA. 84+63

SHEET 3 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.

DIST	COUNTY	SHEET NO.
PAR	HUNT	36

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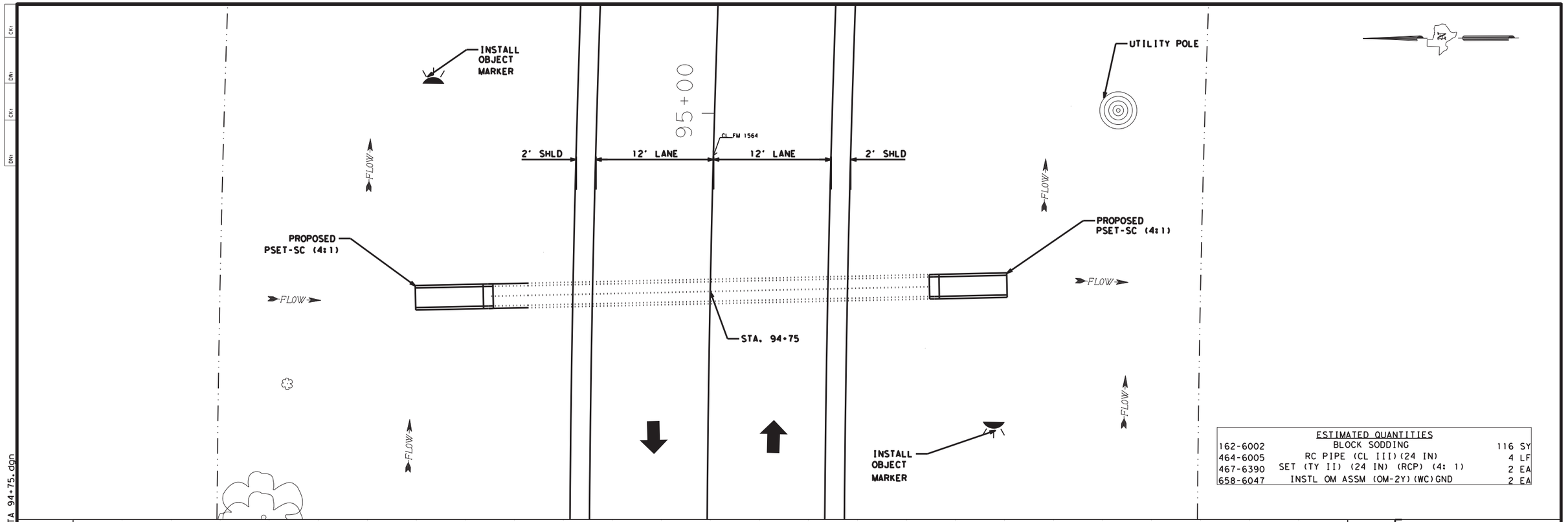
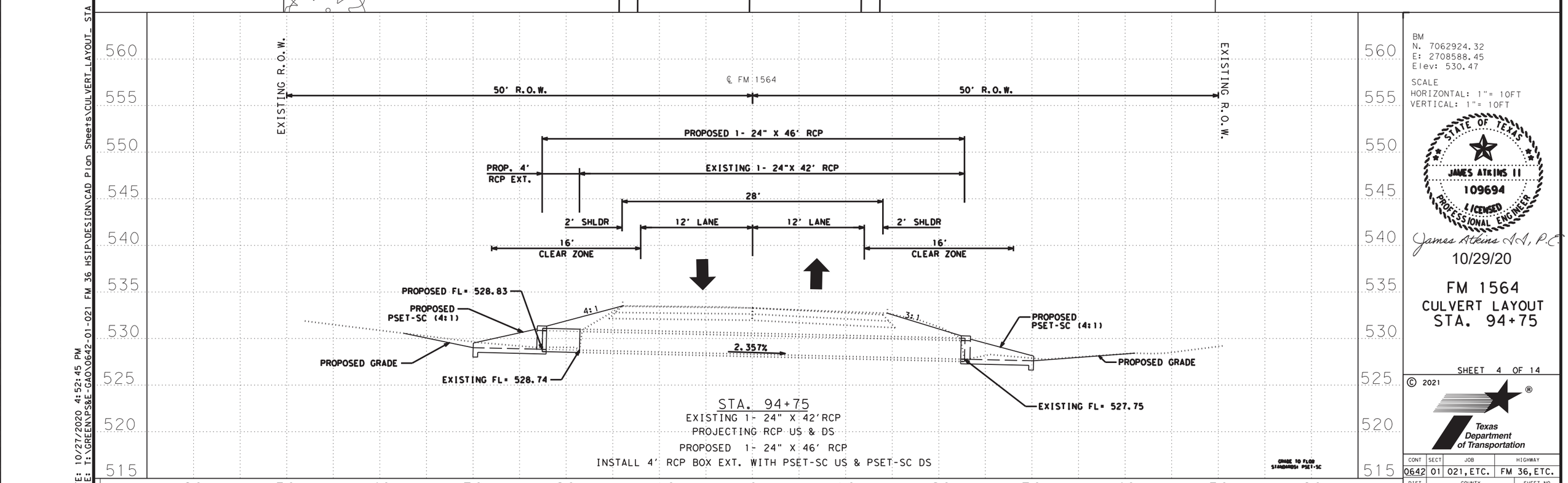


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	116 SY
464-6005	RC PIPE (CL III)(24 IN)	4 LF
467-6390	SET (TY II) (24 IN) (RCP) (4: 1)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 94+75
EXISTING 1- 24" X 42'RCP
PROJECTING RCP US & DS
PROPOSED 1- 24" X 46' RCP
INSTALL 4' RCP BOX EXT. WITH PSET-SC US & PSET-SC DS

BM
N. 7062924.32
E: 2708588.45
Elev: 530.47

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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STA. 94+75

SHEET 4 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		37

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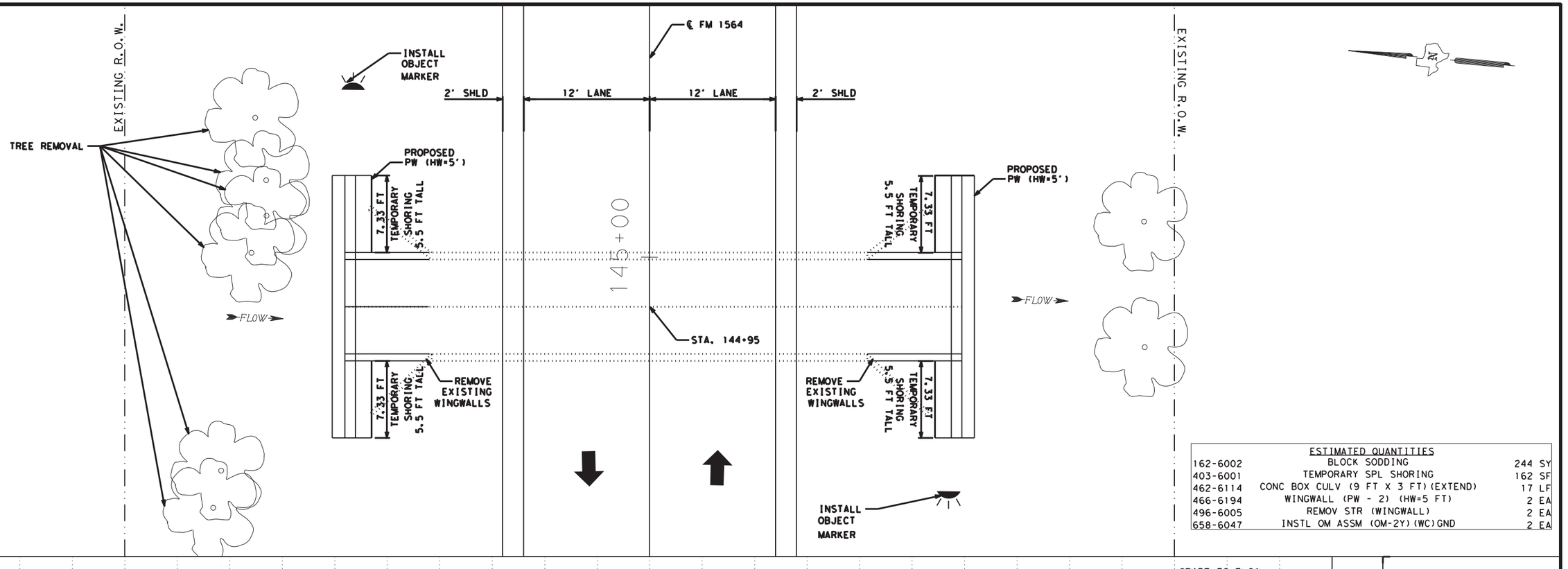
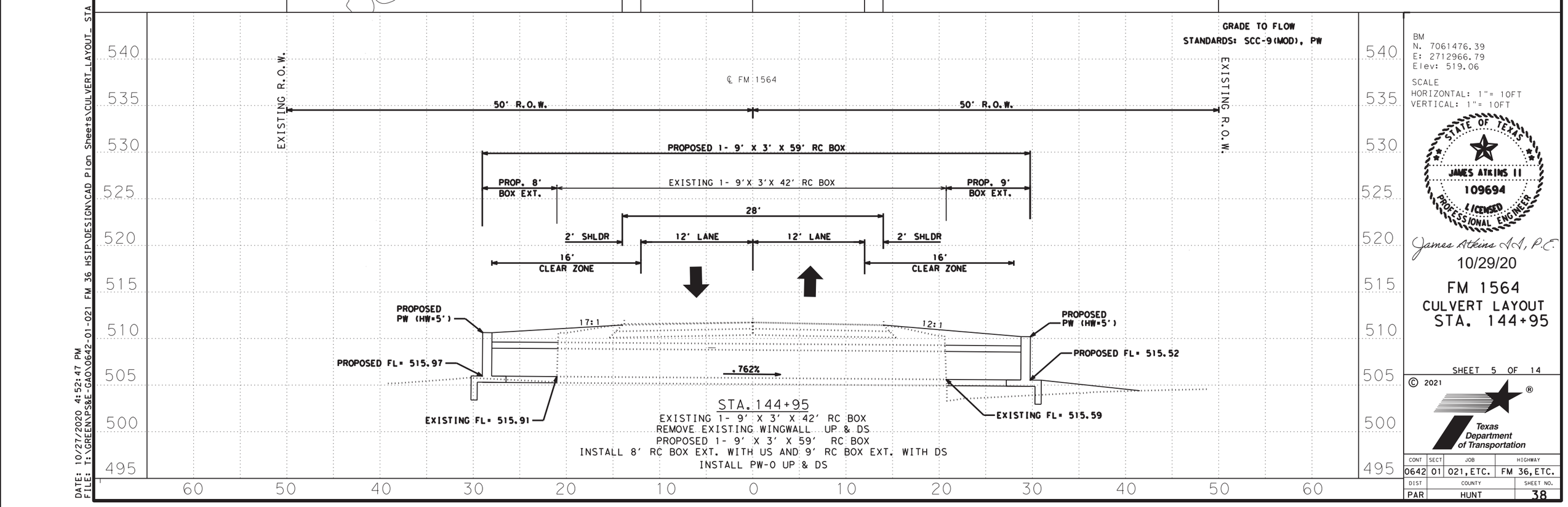


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	244 SY
403-6001	TEMPORARY SPL SHORING	162 SF
462-6114	CONC BOX CULV (9 FT X 3 FT)(EXTEND)	17 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 144+95

EXISTING 1- 9' X 3' X 42' RC BOX
REMOVE EXISTING WINGWALL UP & DS
PROPOSED 1- 9' X 3' X 59' RC BOX
INSTALL 8' RC BOX EXT. WITH US AND 9' RC BOX EXT. WITH DS
INSTALL PW-0 UP & DS

BM
N. 7061476.39
E: 2712966.79
Elev: 519.06

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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STA. 144+95

SHEET 5 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		38

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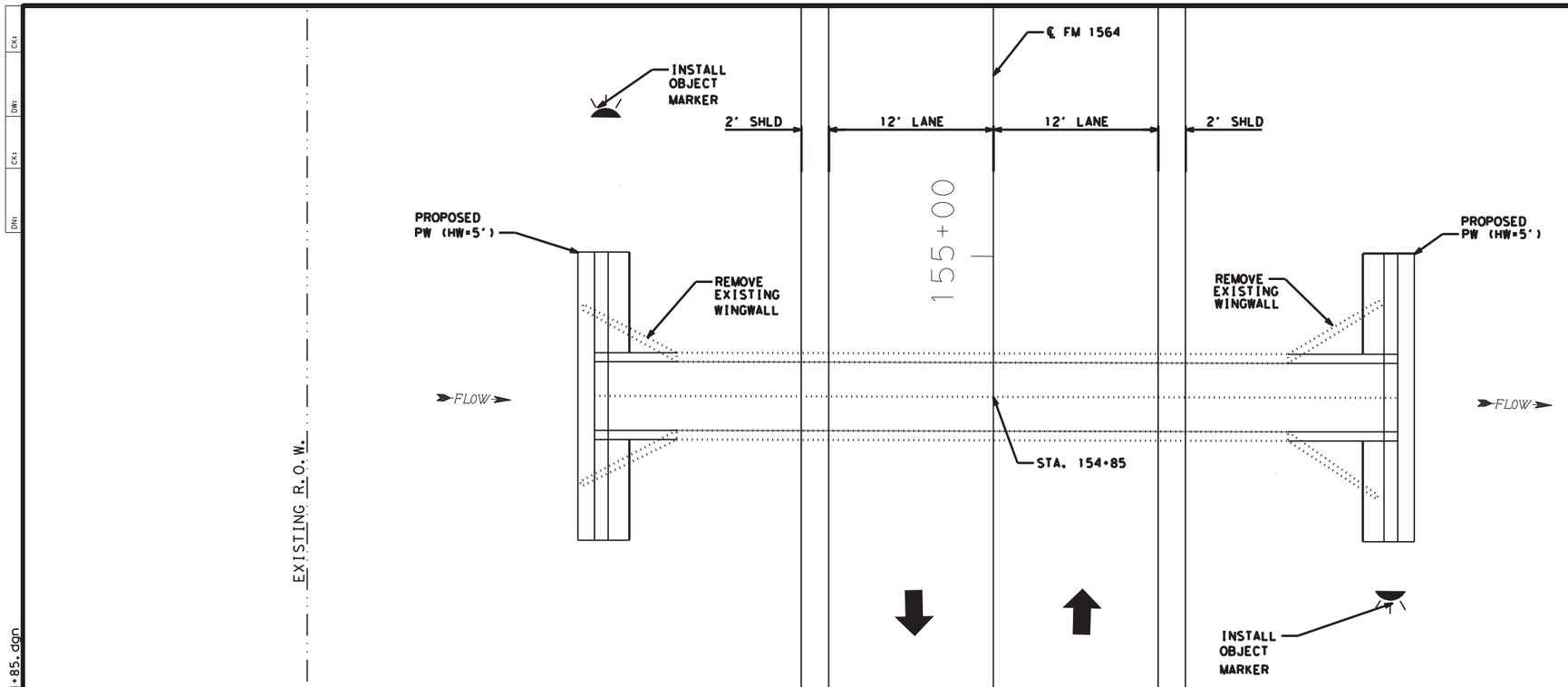
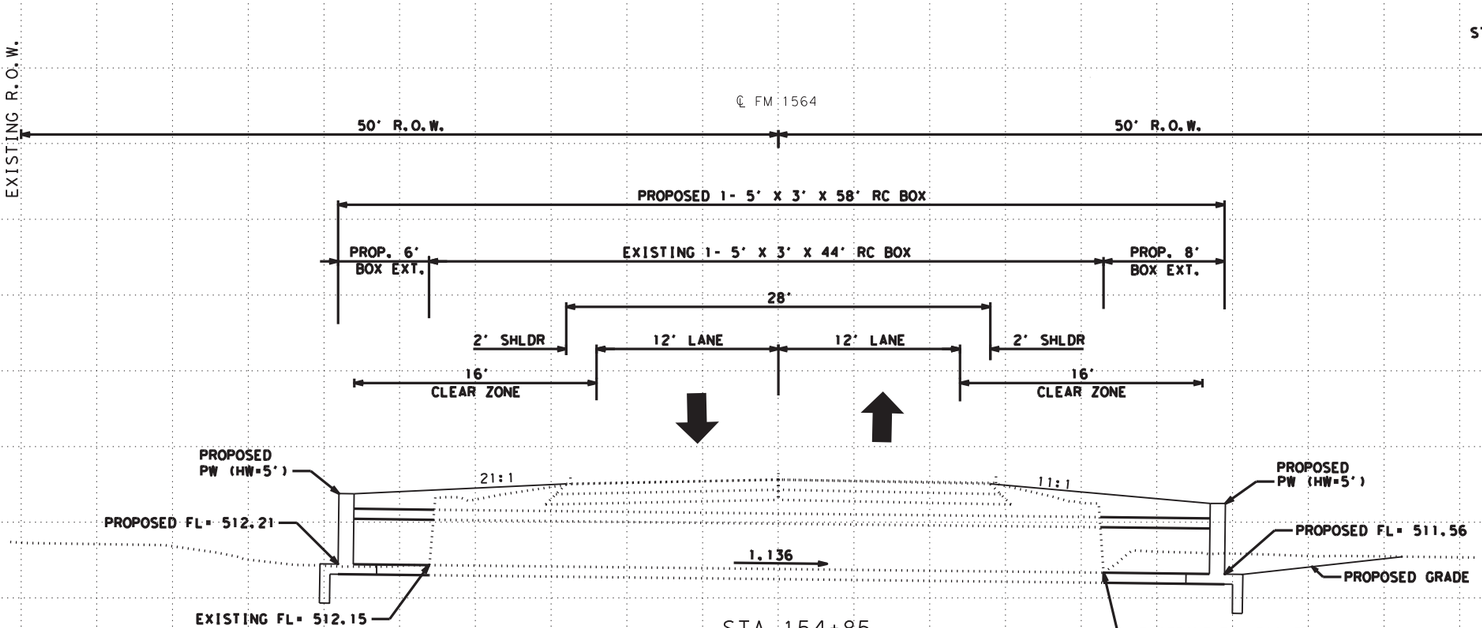


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	220 SY
462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	14 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 154+85

EXISTING 1- 5' X 3' X 44' RC BOX
REMOVE EXISTING WINGWALL US & DS
PROPOSED 1- 5' X 3' X 58' RC BOX
INSTALL 6' RC BOX EXT. US & 9' RC BOX EXT. DS, PW-0 US & DS

BM
N. 7061533.80
E: 2714014.86
Elev: 515.27

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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FM 1564
CULVERT LAYOUT
STA. 154+85

SHEET 6 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		39

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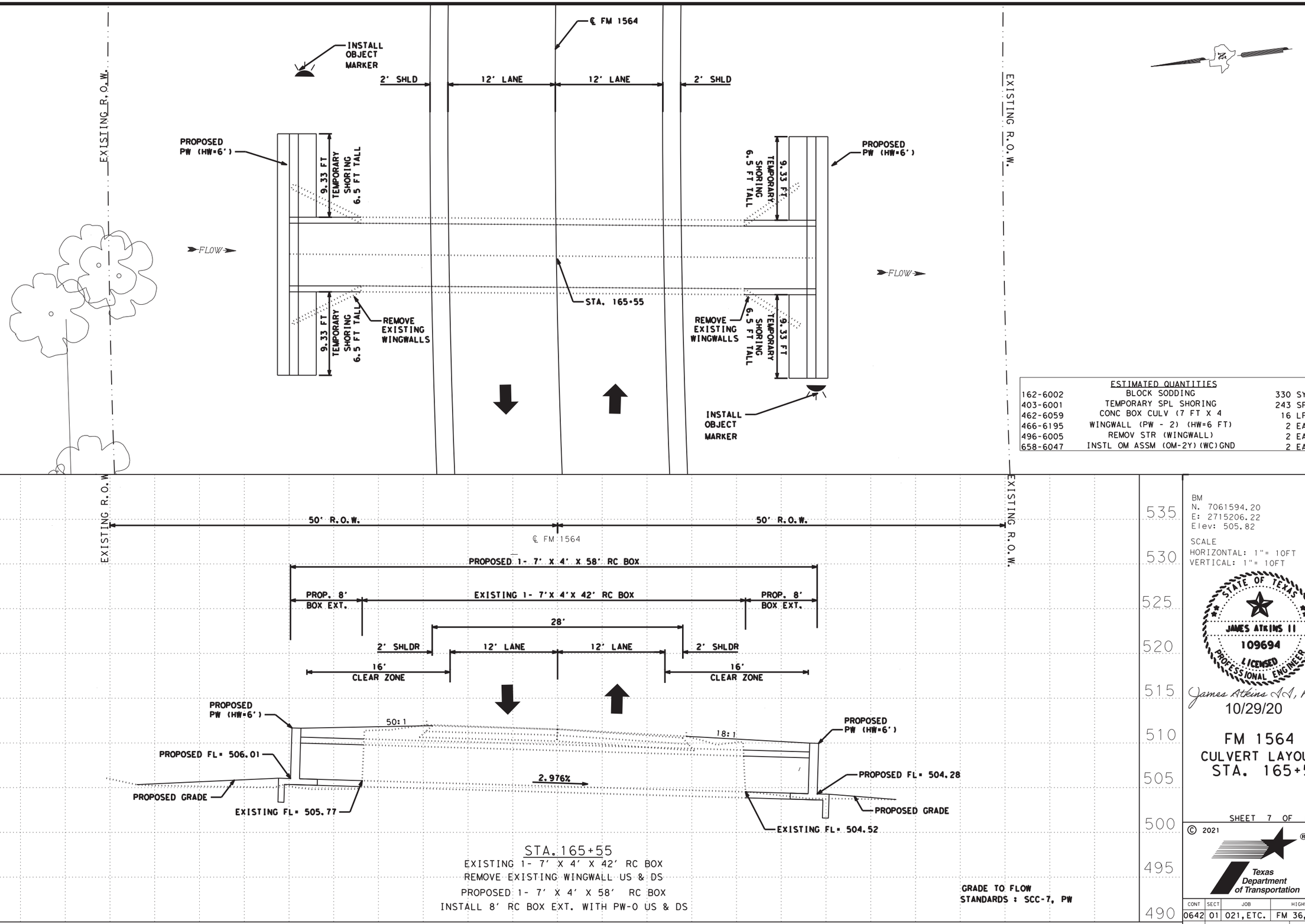

ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	330 SY
403-6001	TEMPORARY SPL SHORING	243 SF
462-6059	CONC BOX CULV (7 FT X 4	16 LF
466-6195	WINGWALL (PW - 2) (HW=6 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA

STA. 165+55

EXISTING 1- 7' X 4' X 42' RC BOX

REMOVE EXISTING WINGWALL US & DS

PROPOSED 1- 7' X 4' X 58' RC BOX

INSTALL 8' RC BOX EXT. WITH PW-0 US & DS

GRADE TO FLOW STANDARDS : SCC-7, PW

BM
N. 7061594.20
E: 2715206.22
Elev: 505.82

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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FM 1564
CULVERT LAYOUT
STA. 165+55

SHEET 7 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		40

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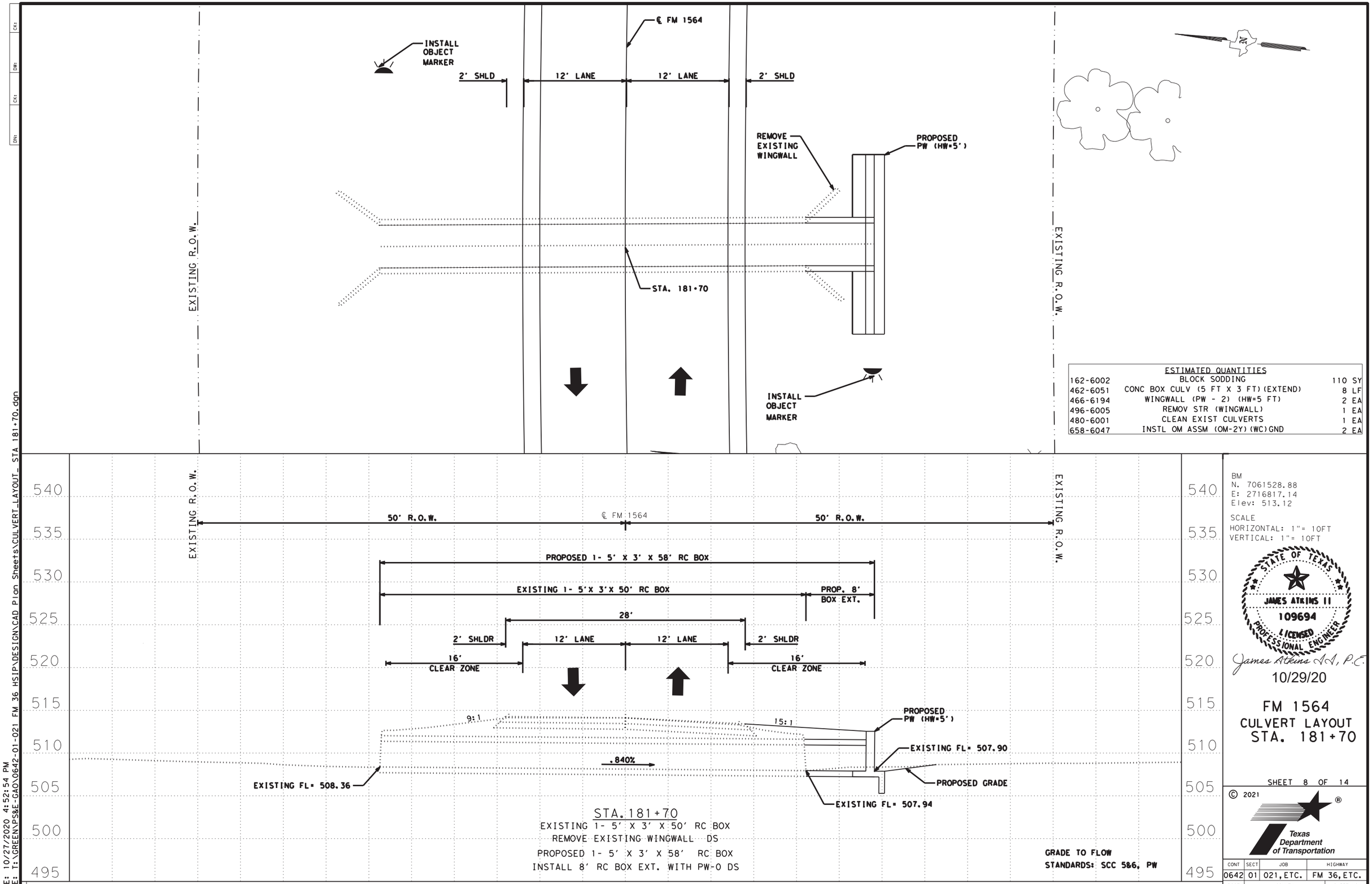

ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	110 SY
462-6051	CONC BOX CULV (5 FT X 3 FT)(EXTEND)	8 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	1 EA
480-6001	CLEAN EXIST CULVERTS	1 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA

STA. 181+70

EXISTING 1- 5' X 3' X 50' RC BOX
REMOVE EXISTING WINGWALL DS
PROPOSED 1- 5' X 3' X 58' RC BOX
INSTALL 8' RC BOX EXT. WITH PW-0 DS

GRADE TO FLOW
STANDARDS: SCC 5&6, PW

BM
N. 7061528.88
E: 2716817.14
Elev: 513.12

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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CULVERT LAYOUT
STA. 181+70

SHEET 8 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.

DIST	COUNTY	SHEET NO.
PAR	HUNT	41

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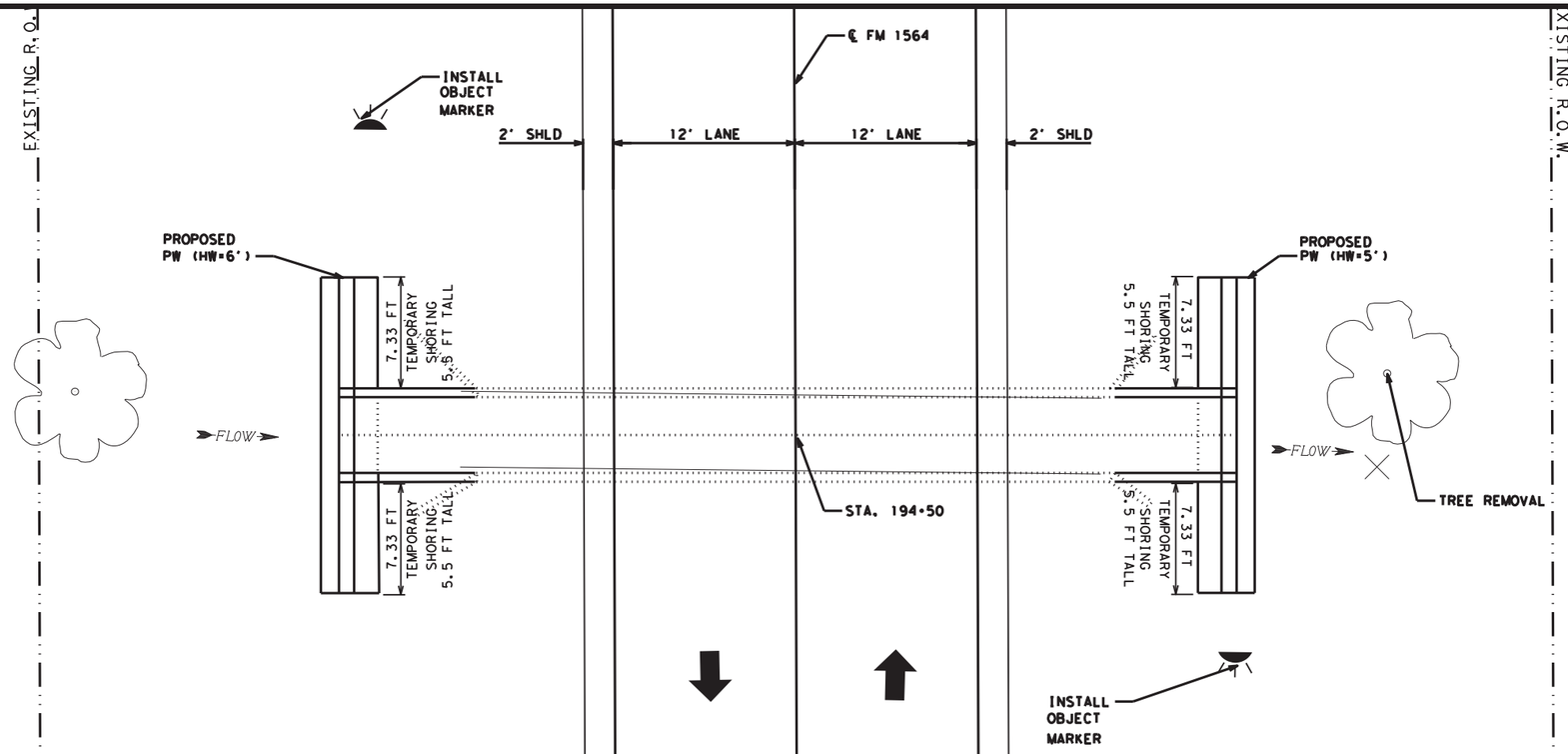
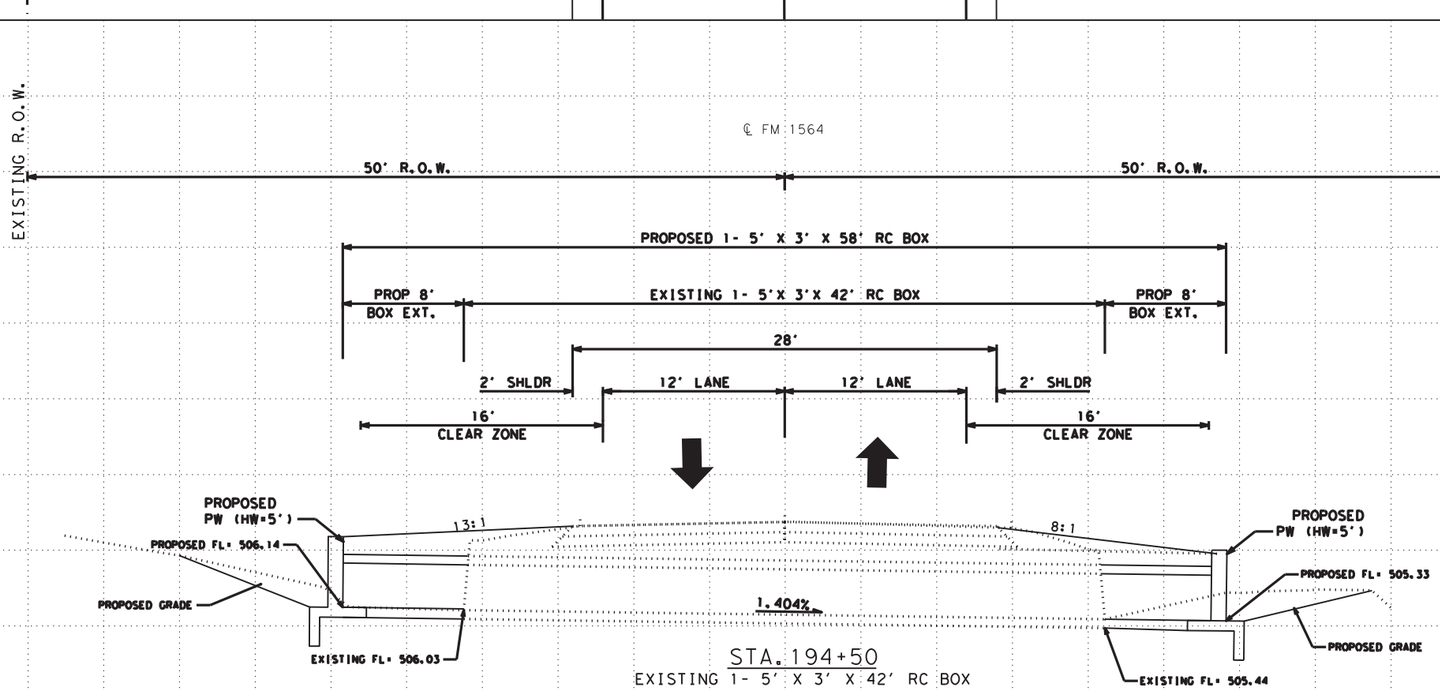


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	224 SY
403-6001	TEMPORARY SPL SHORING	162 SF
462-6051	CONC BOX CULV (5 FT X 3	16 LF
466-6194	WINGWALL (PW - 2) (HW=5 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 194+50

EXISTING 1- 5' X 3' X 42' RC BOX
REMOVE EXISTING WINGWALL US & DS
PROPOSED 1- 5' X 3' X 58' RC BOX
INSTALL 8' RC BOX EXT. WITH PW-0 US & DS

GRADE TO FLOW
STANDARDS: SCC 5&6, PW

BM
N. 7061538.60
E: 2718126.47
Elev: 508.95

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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STA. 194+50

SHEET 9 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		42

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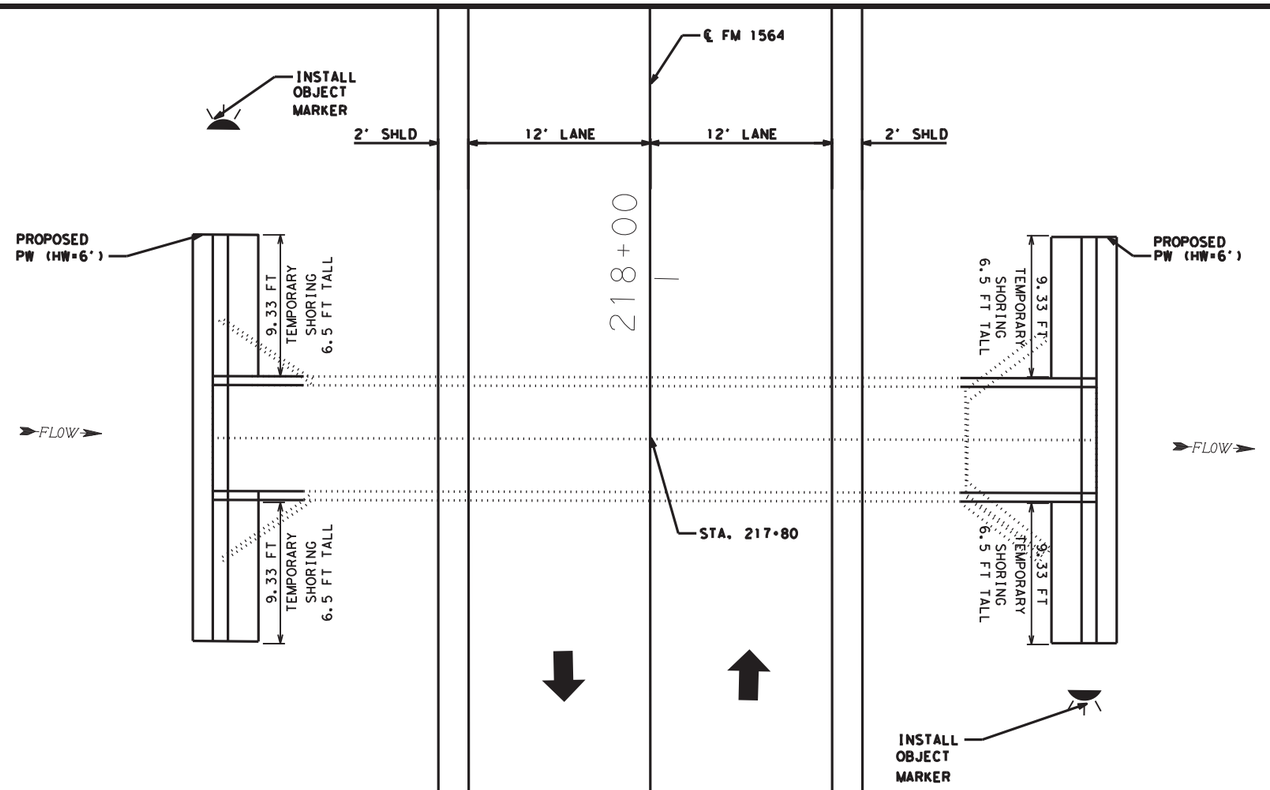
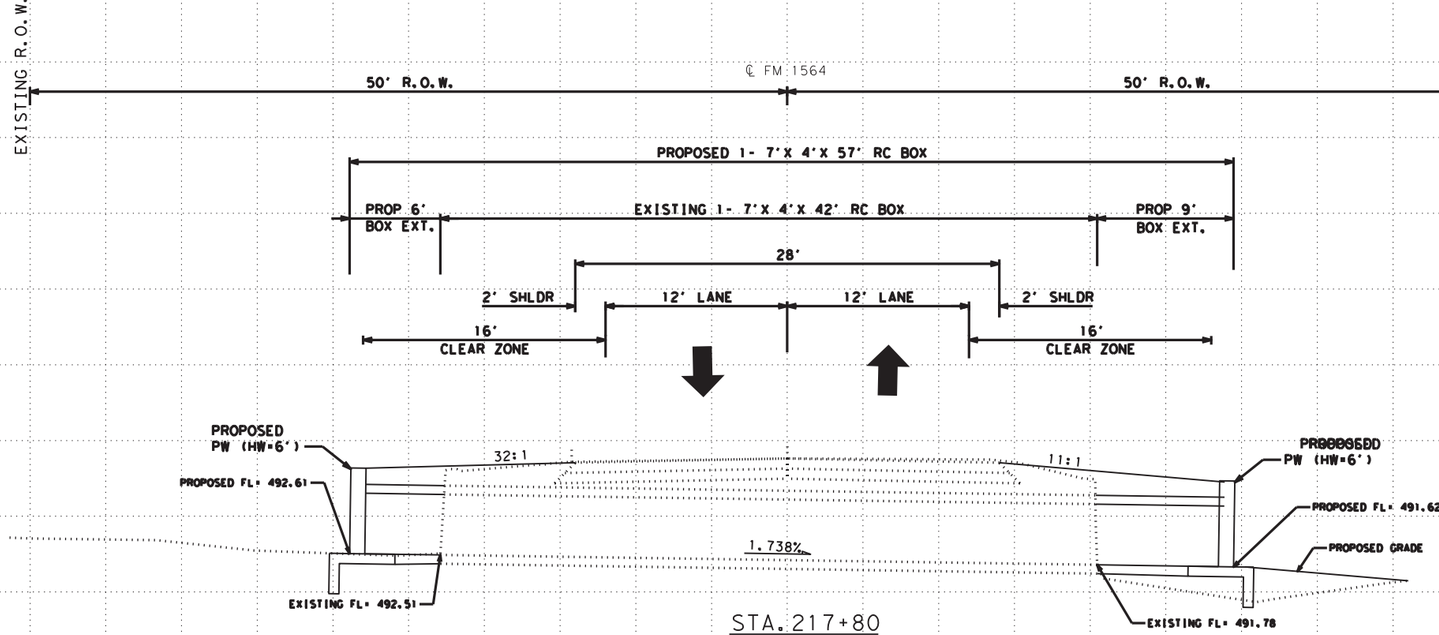


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	320 SY
403-6001	TEMPORARY SPL SHORING	243 SF
462-6059	CONC BOX CULV (7 FT X 4	17 LF
466-6195	WINGWALL (PW - 2) (HW=6 FT)	2 EA
496-6005	REMOV STR (WINGWALL)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 217+80

EXISTING 1- 7' X 4' X 42' RC BOX
REMOVE EXISTING WINGWALL US & DS
PROPOSED 1- 7' X 4' X 57' RC BOX
INSTALL 6' RC BOX EXT. UP, 9' RC BOX EXT. UP, WITH PW-0 US & DS

GRADE TO FLOW
STANDARDS: SCC-7, PW

BM
N. 7061741.86
E: 2720276.46
Elev: 495.42

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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10/29/20

FM 1564
CULVERT LAYOUT
STA. 217+80

SHEET 10 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		43

DATE: 10/27/2020 4:52:59 PM
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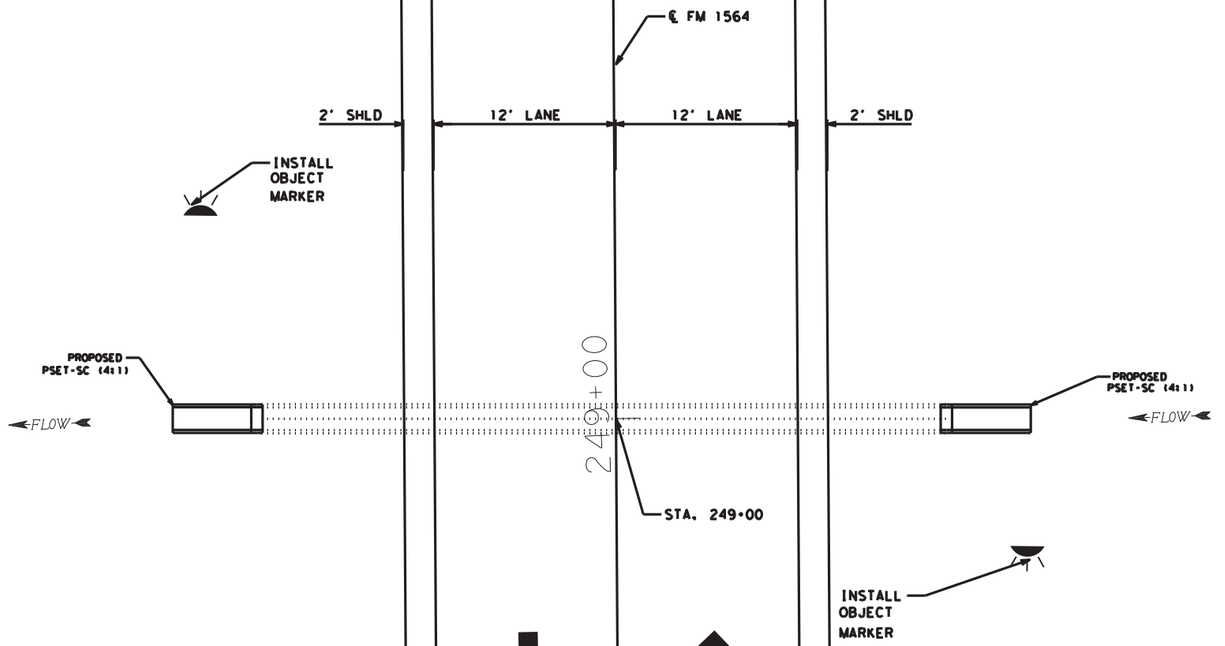
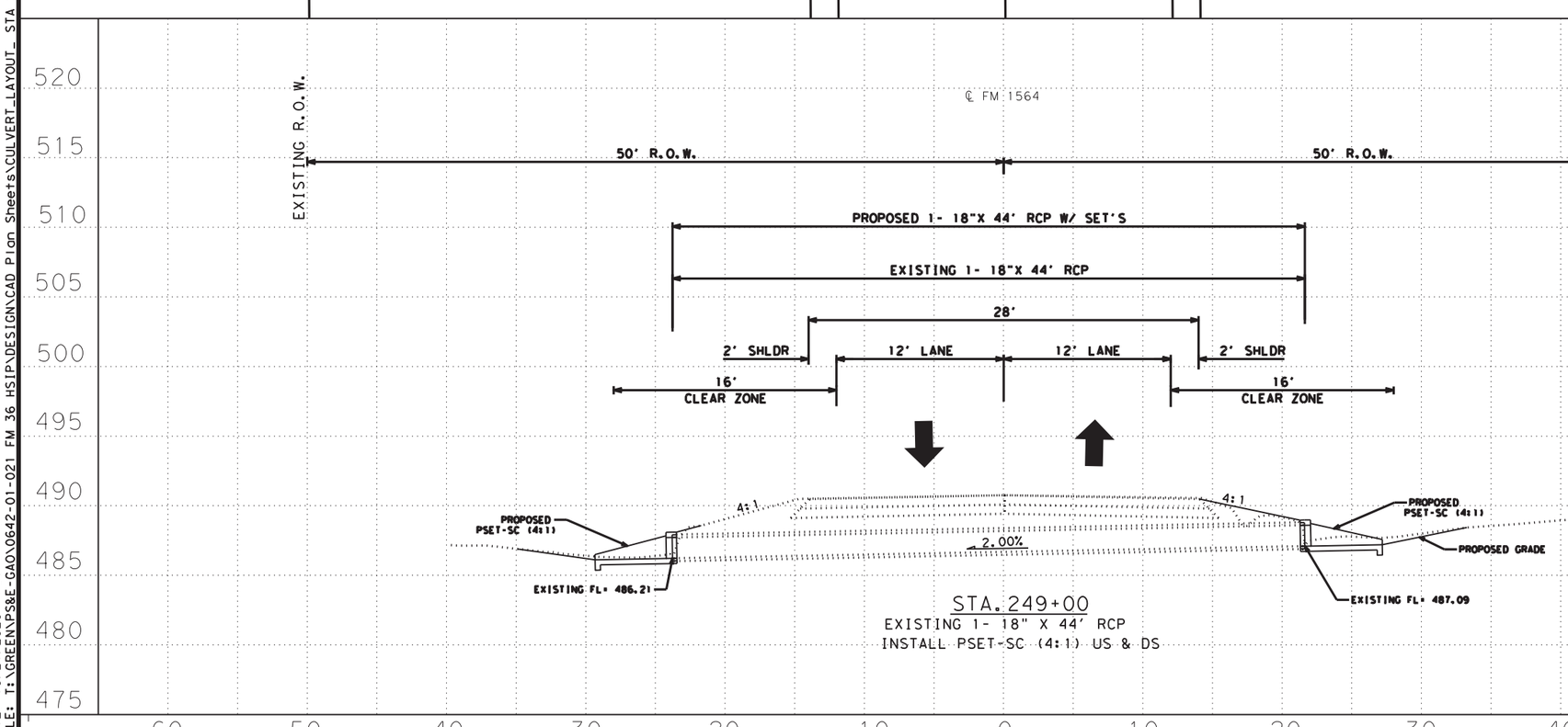


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	62 SY
467-6358	SET (TY II) (18 IN) (RCP) (4: 1)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 249+00
EXISTING 1- 18" X 44' RCP
INSTALL PSET-SC (4:1) US & DS

GRADE TO FLOW
STANDARDS: PSET-SC

BM
N. 7062104.25
E: 2723305.37
Elev: 489.36

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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10/29/20

FM 1564
CULVERT LAYOUT
STA. 249+00

SHEET 11 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		44

DATE: 10/27/2020 4:53:01 PM
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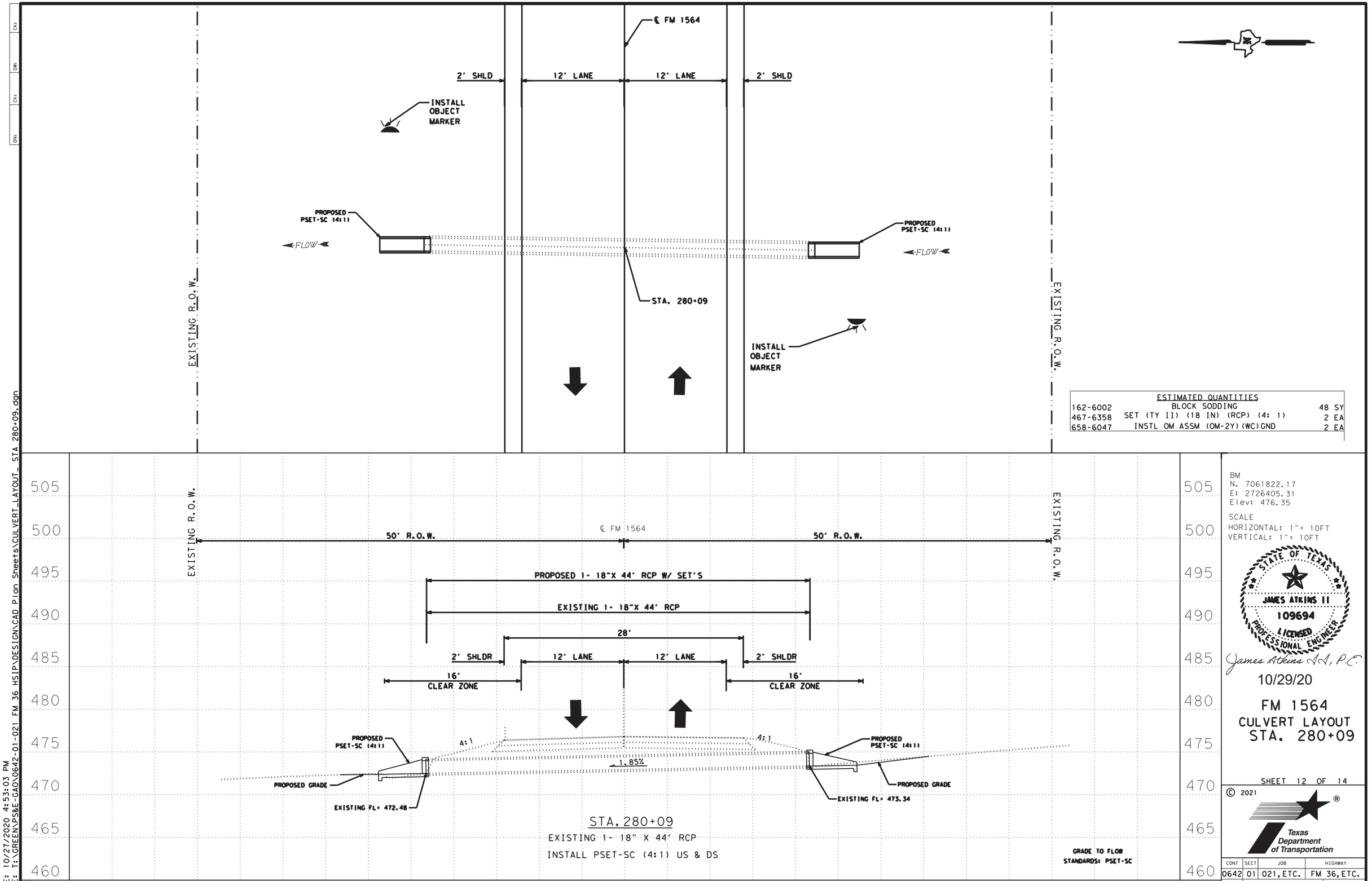

ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	48 SY
467-6358	SET (TY II) (18 IN) (RCP) (4: 1)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA

STA. 280+09

EXISTING 1- 18" X 44' RCP

INSTALL PSET-SC (4:1) US & DS

GRADE TO FLOW

STANDARDS: PSET-SC

BM
N. 7061822.17
E: 2726405.31
Elev: 476.35

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.

10/29/20

FM 1564
CULVERT LAYOUT
STA. 280+09

SHEET 12 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		45

DATE: 10/27/2020 4:53:03 PM
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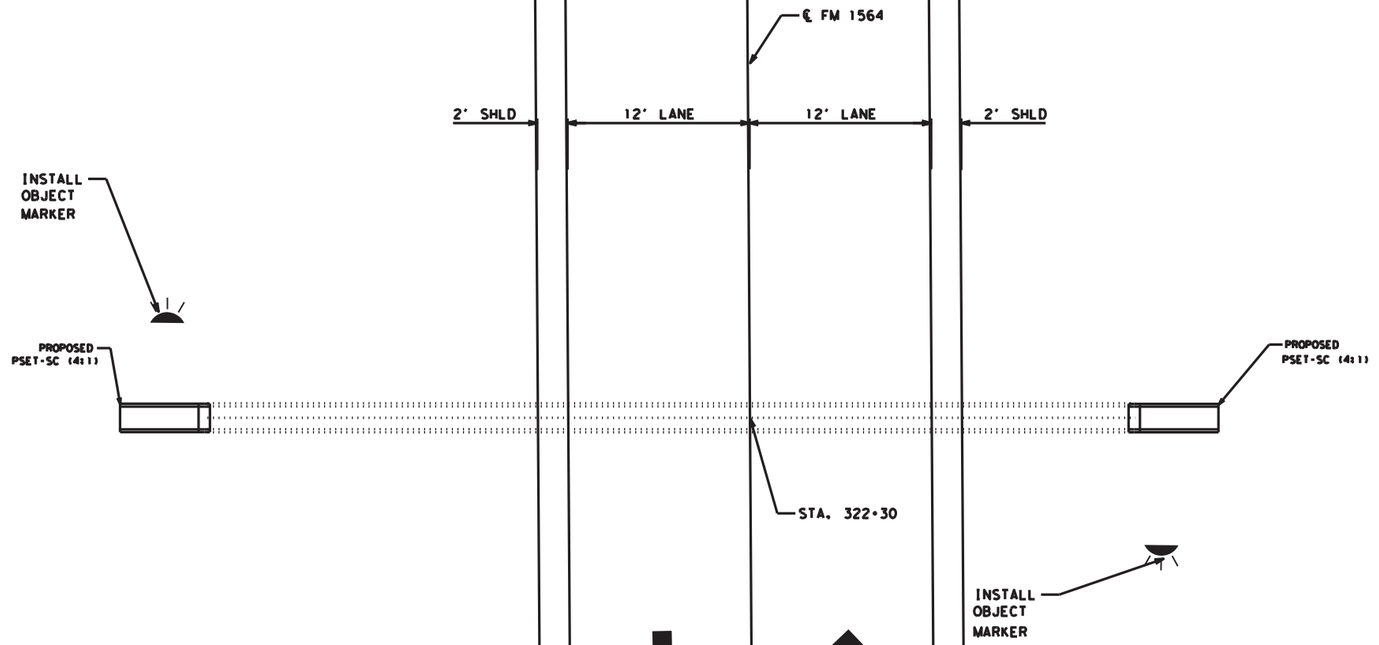
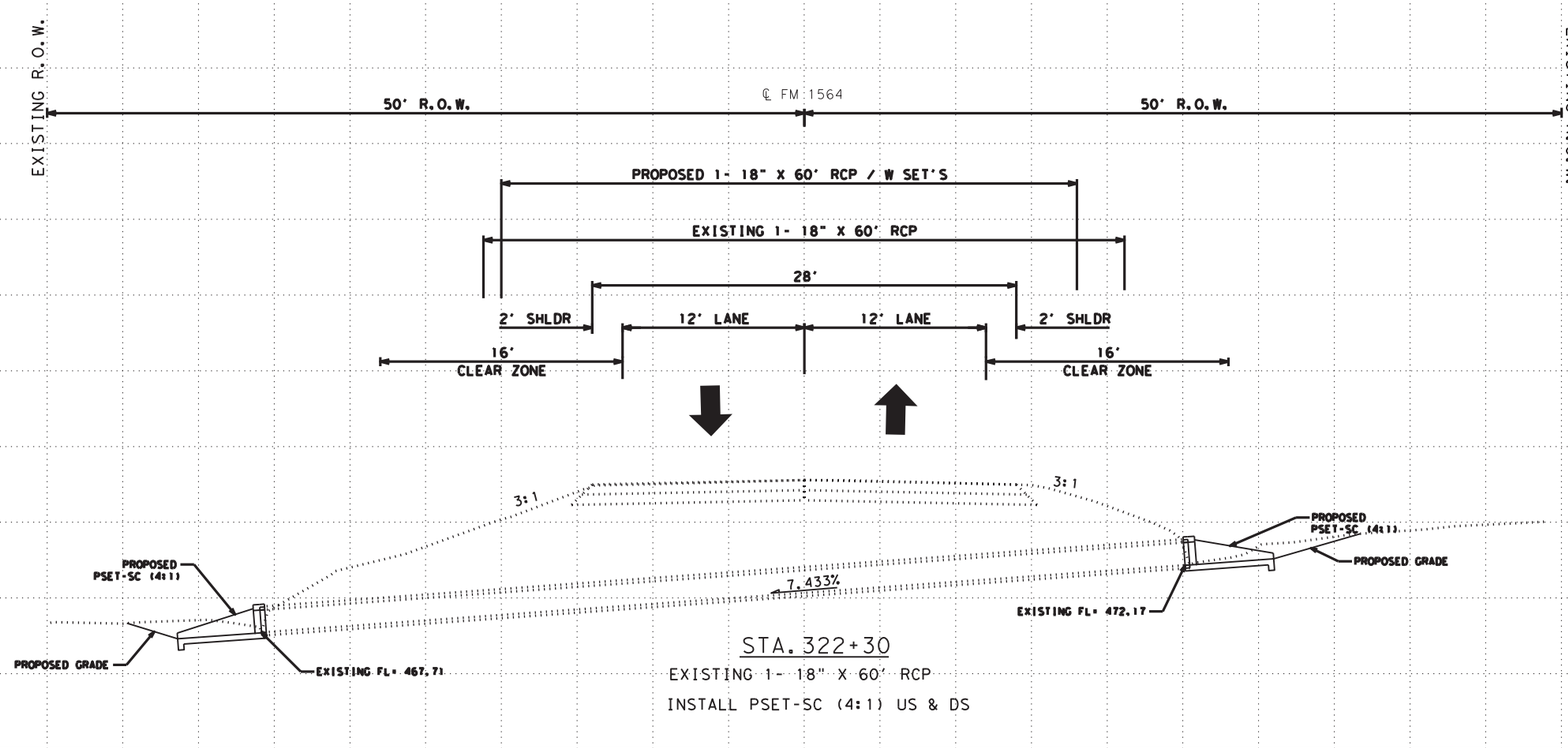


ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	55 SY
467-6358	SET (TY II) (18 IN) (RCP) (4: 1)	2 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA



STA. 322+30

EXISTING 1- 18" X 60' RCP

INSTALL PSET-SC (4:1) US & DS

GRADE TO FLOW

STANDARDS: PSET-SC

BM
N. 7063981.19
E: 2729408.96
Elev: 477.55

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

STATE OF TEXAS
ENGINEER NAME
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins A.A., P.E.
10/29/20

FM 1564
CULVERT LAYOUT
STA. 322+30

SHEET 13 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		46

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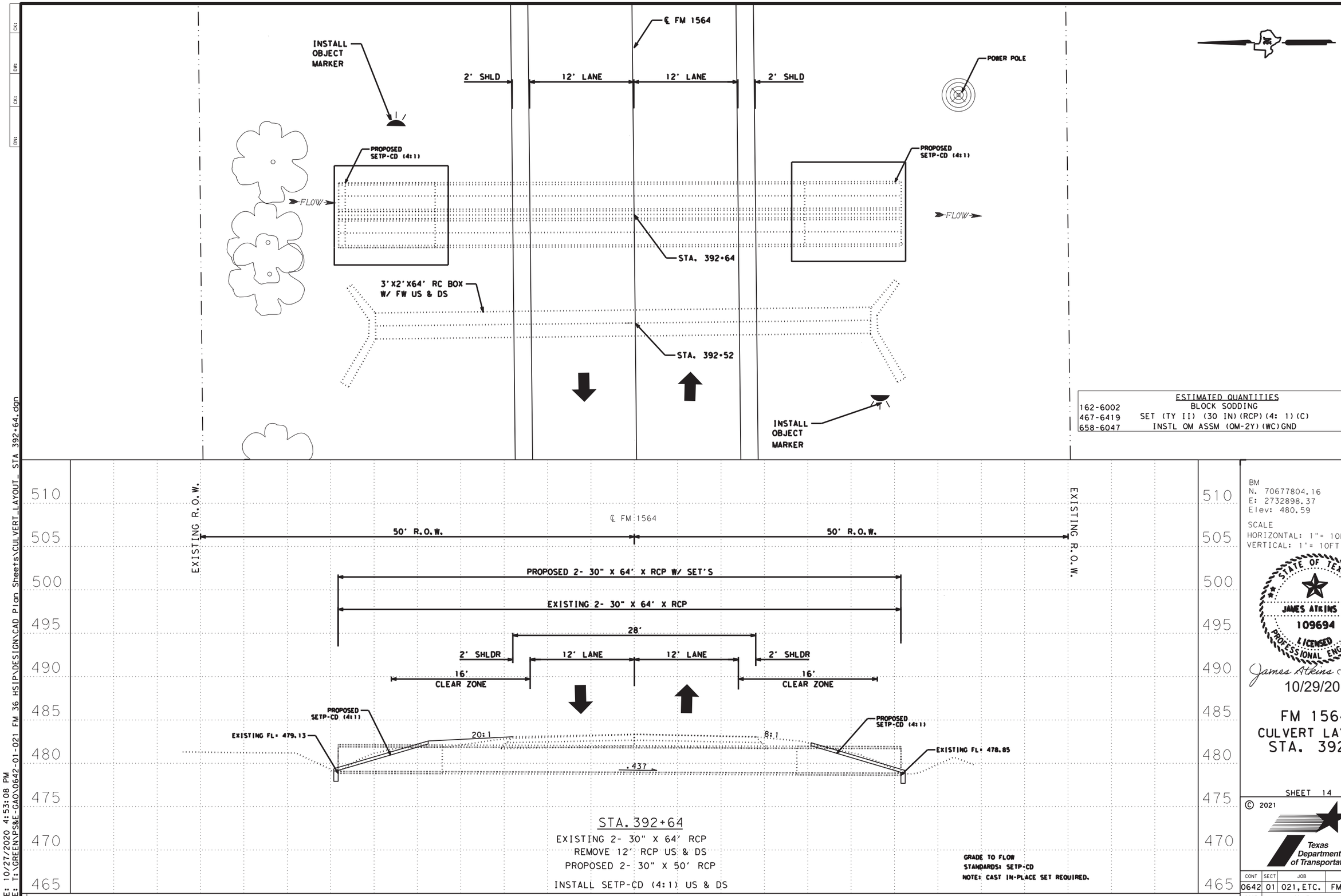

ESTIMATED QUANTITIES		
162-6002	BLOCK SODDING	120 SY
467-6419	SET (TY II) (30 IN)(RCP)(4: 1)(C)	4 EA
658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	2 EA

STA. 392+64

EXISTING 2- 30" X 64' RCP
REMOVE 12' RCP US & DS
PROPOSED 2- 30" X 50' RCP

INSTALL SETP-CD (4:1) US & DS

GRADE TO FLOW
STANDARDS: SETP-CD
NOTE: CAST IN-PLACE SET REQUIRED.

BM
N. 70677804.16
E: 2732898.37
Elev: 480.59

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

STATE OF TEXAS
JAMES ATKINS II
109694
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PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/20

FM 1564
CULVERT LAYOUT
STA. 392+64

SHEET 14 OF 14

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		47

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Culvert Station and/or Creek Name	Description of Box Culert No. Spans ~ Span X Height	Max Fill Height (ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope (SL:1)	T Culvert Top Slab Thick's (in)	U Culvert Wall Thick's (in)	C Estimat Curb Height (ft)	Hw Height of Wing (ft) (1)	A Curb to End of Wingwall (ft)	B Offset of End of Wingwall (ft)	Lw Length of Longest Wingwall (ft)	Ltw Culvert Toewall Length (ft)	Atw Anchor Toewall Length (ft)	Riprap Apron (C.Y.)	Class "C" Conc. (Curb) (CY) (2)	Class "C" Conc. (Wing.) (CY) (3)	Total Wingwall Area (SF)
47+80 (Both)	3 ~ 5' X 3'	1'	MC-5-20	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	17.333	N/A	0.0	1.2	11.4	124
62+00 (Both)	2 ~ 5' X 3'	1'	MC-5-20	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	11.750	N/A	0.0	0.8	10.6	124
84+63 (Both)	1 ~ 3' X 2'	1'	SCC-3&4	PW-2	0	2:1	8"	7"	1.000	3.667	N/A	N/A	6.333	4.167	N/A	0.0	0.4	7.2	90
144+95 (Both)	1 ~ 9' X 3'	1'	SCC-9(MOD)	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	10.167	N/A	0.0	0.8	10.4	124
154+85 (Both)	1 ~ 5' X 3'	1'	SCC-5&6	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	6.167	N/A	0.0	0.4	9.8	124
165+55 (Both)	1 ~ 7' X 4'	1'	SCC-7	PW-2	0	2:1	8"	7"	1.000	5.667	N/A	N/A	9.333	8.167	N/A	0.0	0.6	14.4	200
181+70 (Rt)	1 ~ 5' X 3'	1'	SCC-5&6	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	6.167	N/A	0.0	0.2	4.9	62
194+50 (Both)	1 ~ 5' X 3'	1'	SCC-5&6	PW-2	0	2:1	8"	7"	1.000	4.667	N/A	N/A	7.333	6.167	N/A	0.0	0.4	9.8	124
217+80 (Both)	1 ~ 7' X 4'	1'	SCC-7	PW-2	0	2:1	8"	7"	1.000	5.667	N/A	N/A	9.333	8.167	N/A	0.0	0.6	14.4	200

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins A.A., P.E. 10/29/20
NAME DATE

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		48

DATE: 10/27/2020 4:53:10 PM
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DATE: 10/27/2020 4:53:12 PM
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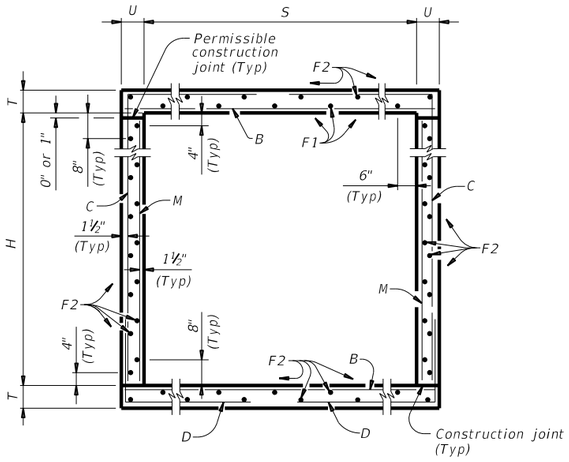
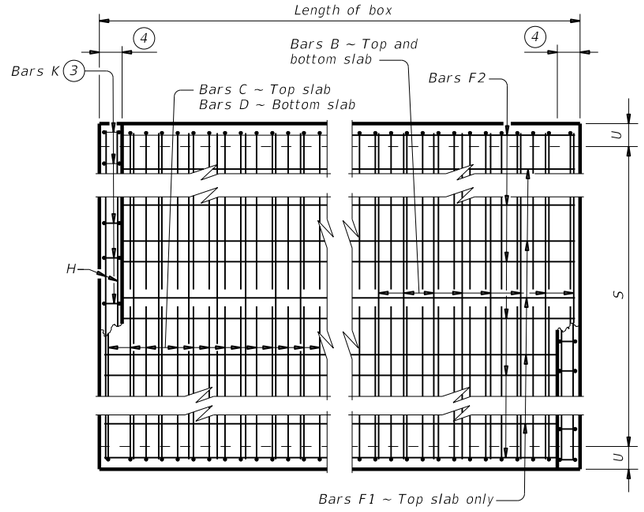
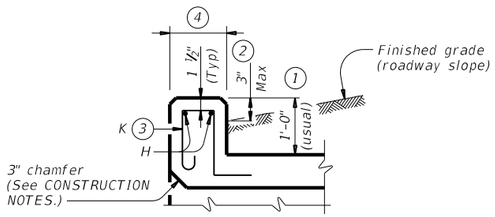


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(4) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

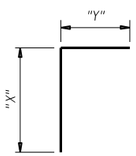
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

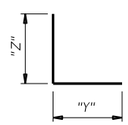
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

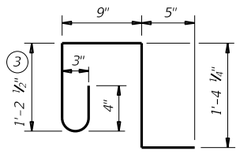
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		49

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
3' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	5' – 5"	391	2' – 7"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	19	39' – 9"	505	3' – 11"	10	10	28	0.292	48.2	0.3	38	12.0	1,966
3' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	6' – 5"	463	3' – 7"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	23	39' – 9"	611	3' – 11"	10	10	28	0.335	54.5	0.3	38	13.7	2,216
4' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	5' – 9"	622	2' – 7"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	21	39' – 9"	558	4' – 11"	13	12	33	0.342	63.6	0.4	46	14.1	2,590
4' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	6' – 9"	730	3' – 7"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.385	70.8	0.4	46	15.8	2,876
4' – 0"	4' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	7' – 9"	839	4' – 7"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	4' – 0"	289	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.428	75.3	0.4	46	17.5	3,058

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		50

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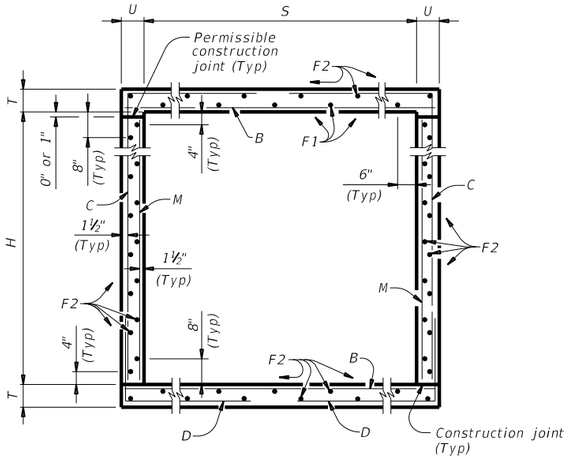
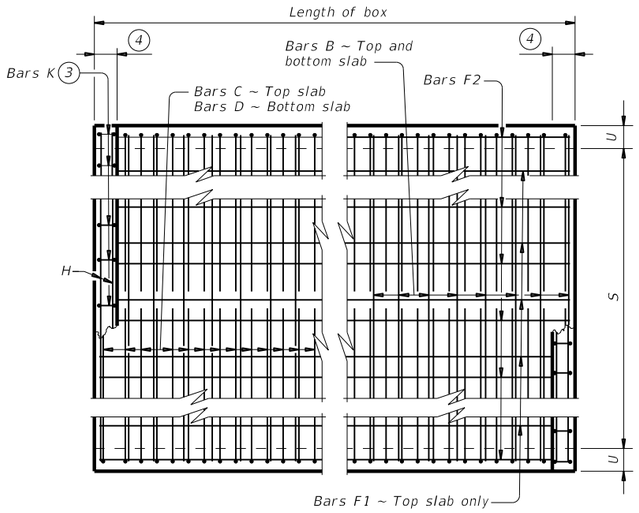


TYPICAL SECTION



PLAN OF REINF STEEL

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(4) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

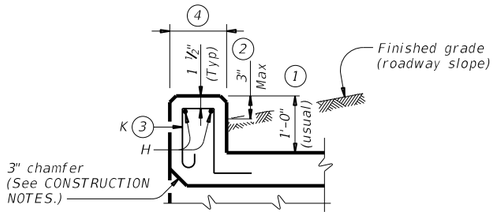
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

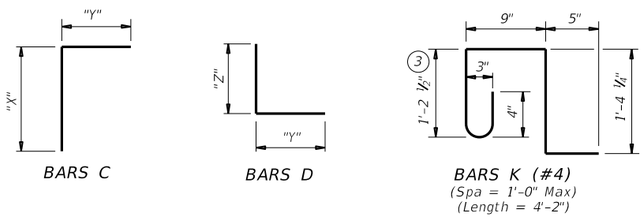
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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



SECTION THRU CURB



BARS C

BARS D

BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		51

SECTION DIMENSIONS				⑤ FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' – 0"	2' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 4"	713	2' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.391	80.8	0.5	55	16.1	3,285
5' – 0"	2' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 5"	723	2' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.429	81.2	0.5	55	17.6	3,304
5' – 0"	3' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 4"	826	3' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.434	88.0	0.5	55	17.8	3,576
5' – 0"	3' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 5"	835	3' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.472	88.5	0.5	55	19.3	3,594
5' – 0"	4' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 4"	939	4' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.477	92.7	0.5	55	19.5	3,762
5' – 0"	4' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 5"	948	4' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.515	93.1	0.5	55	21.1	3,780
5' – 0"	5' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 4"	1,051	5' – 7"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.521	100.0	0.5	55	21.3	4,053
5' – 0"	5' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 5"	1,061	5' – 8"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.559	100.4	0.5	55	22.8	4,072
6' – 0"	2' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	6' – 8"	751	2' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.440	89.4	0.5	63	18.1	3,637
6' – 0"	2' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	6' – 9"	1,141	2' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.485	109.0	0.5	63	19.9	4,422
6' – 0"	2' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	6' – 11"	1,169	2' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	2' – 0"	110	5	39' – 9"	133	25	39' – 9"	664	7' – 1"	19	18	50	0.551	110.2	0.5	69	22.6	4,477
6' – 0"	3' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	7' – 8"	864	3' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.484	96.6	0.5	63	19.9	3,928
6' – 0"	3' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	7' – 9"	1,309	3' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.528	117.6	0.5	63	21.6	4,768
6' – 0"	3' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	7' – 11"	1,338	3' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.601	118.4	0.5	69	24.6	4,806
6' – 0"	4' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	8' – 8"	976	4' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.527	101.3	0.5	63	21.6	4,113
6' – 0"	4' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	8' – 9"	1,478	4' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.571	123.7	0.5	63	23.4	5,010
6' – 0"	4' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	8' – 11"	1,507	4' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.650	124.0	0.5	69	26.5	5,030
6' – 0"	5' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	9' – 8"	1,089	5' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.570	108.5	0.5	63	23.3	4,404
6' – 0"	5' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	9' – 9"	1,647	5' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.614	132.4	0.5	63	25.1	5,357
6' – 0"	5' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	9' – 11"	1,676	5' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	33	39' – 9"	876	7' – 1"	19	18	50	0.700	132.3	0.5	69	28.5	5,360
6' – 0"	6' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	10' – 8"	1,202	6' – 7"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.613	115.8	0.5	63	25.0	4,695
6' – 0"	6' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	10' – 9"	1,816	6' – 8"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.657	141.0	0.5	63	26.8	5,704
6' – 0"	6' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	10' – 11"	1,845	6' – 9"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	37	39' – 9"	982	7' – 1"	19	18	50	0.749	140.5	0.5	69	30.5	5,690

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		52

DATE: 10/27/2020 4:53:21 PM
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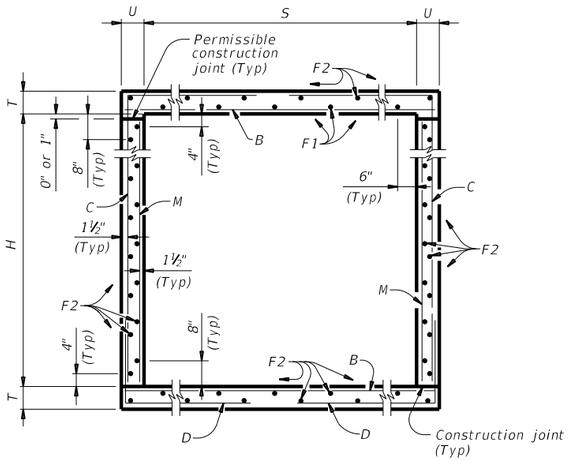
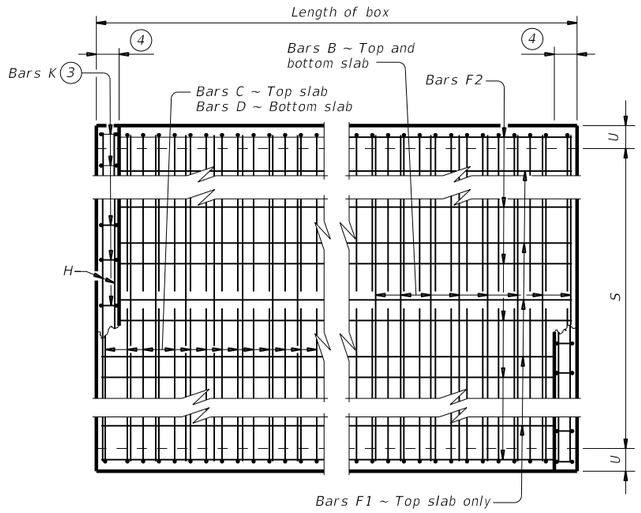
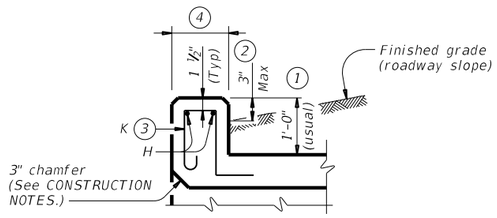


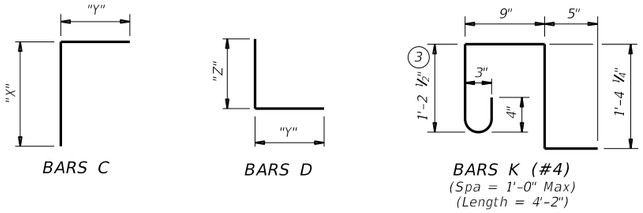
TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB



1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-7

FILE: scc07ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		53

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
7' – 0"	3' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	8' – 0"	1,352	3' – 7"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.533	125.1	0.6	71	21.9	5,076
7' – 0"	3' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	8' – 1"	1,366	3' – 8"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.583	125.8	0.6	71	23.9	5,104
7' – 0"	3' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	8' – 3"	1,394	3' – 9"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.663	126.6	0.6	78	27.1	5,142
7' – 0"	3' – 0"	11"	8"	30'	108	#6	9"	8' – 1"	1,311	162	#5	6"	8' – 4"	1,408	3' – 10"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	3' – 0"	164	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.714	127.3	0.6	78	29.2	5,170
7' – 0"	4' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	9' – 0"	1,521	4' – 7"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.576	131.2	0.6	71	23.6	5,318
7' – 0"	4' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	9' – 1"	1,535	4' – 8"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	31	39' – 9"	823	7' – 11"	21	18	50	0.627	131.9	0.6	71	25.7	5,346
7' – 0"	4' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	9' – 3"	1,563	4' – 9"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.712	132.2	0.6	78	29.1	5,366
7' – 0"	4' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	9' – 4"	1,577	4' – 10"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	4' – 0"	219	5	39' – 9"	133	31	39' – 9"	823	8' – 1"	22	20	56	0.763	149.3	0.6	78	31.1	6,050
7' – 0"	5' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	10' – 0"	1,690	5' – 7"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	35	39' – 9"	929	7' – 11"	21	18	50	0.619	139.9	0.6	71	25.4	5,665
7' – 0"	5' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	10' – 1"	1,704	5' – 8"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	35	39' – 9"	929	7' – 11"	21	18	50	0.670	140.6	0.6	71	27.4	5,693
7' – 0"	5' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	10' – 3"	1,732	5' – 9"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	35	39' – 9"	929	8' – 1"	22	20	56	0.761	140.5	0.6	78	31.1	5,696
7' – 0"	5' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	10' – 4"	1,746	5' – 10"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	5' – 0"	274	5	39' – 9"	133	35	39' – 9"	929	8' – 1"	22	20	56	0.813	157.6	0.6	78	33.1	6,380
7' – 0"	6' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	11' – 0"	1,859	6' – 7"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.663	148.6	0.6	71	27.1	6,013
7' – 0"	6' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	11' – 1"	1,873	6' – 8"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.713	149.3	0.6	71	29.1	6,041
7' – 0"	6' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	11' – 3"	1,901	6' – 9"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.811	148.7	0.6	78	33.1	6,027
7' – 0"	6' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	11' – 4"	1,915	6' – 10"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	82	12"	6' – 0"	329	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.862	165.8	0.6	78	35.1	6,711
7' – 0"	7' – 0"	8"	7"	16'	108	#6	9"	7' – 11"	1,284	162	#5	6"	12' – 0"	2,028	7' – 7"	4' – 5"	162	#5	6"	7' – 1"	1,197	4' – 5"	2' – 8"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.706	154.6	0.6	71	28.8	6,254
7' – 0"	7' – 0"	9"	7"	20'	108	#6	9"	7' – 11"	1,284	162	#5	6"	12' – 1"	2,042	7' – 8"	4' – 5"	162	#5	6"	7' – 2"	1,211	4' – 5"	2' – 9"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	7' – 11"	21	18	50	0.756	155.3	0.6	71	30.8	6,282
7' – 0"	7' – 0"	10"	8"	23'	108	#6	9"	8' – 1"	1,311	162	#5	6"	12' – 3"	2,070	7' – 9"	4' – 6"	162	#5	6"	7' – 4"	1,239	4' – 6"	2' – 10"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.860	157.4	0.6	78	35.0	6,372
7' – 0"	7' – 0"	11"	8"	30'	162	#6	6"	8' – 1"	1,967	162	#5	6"	12' – 4"	2,084	7' – 10"	4' – 6"	162	#5	6"	7' – 5"	1,253	4' – 6"	2' – 11"	108	9"	7' – 0"	505	5	39' – 9"	133	39	39' – 9"	1,036	8' – 1"	22	20	56	0.912	174.5	0.6	78	37.1	7,056

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-7

FILE: scc07ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		54

DATE: 10/27/2020 4:53:25 PM
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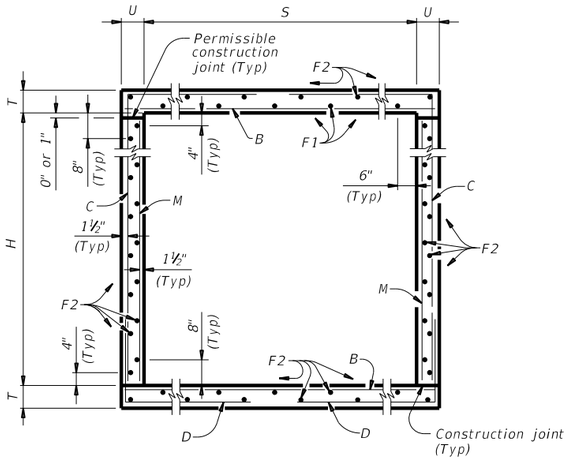
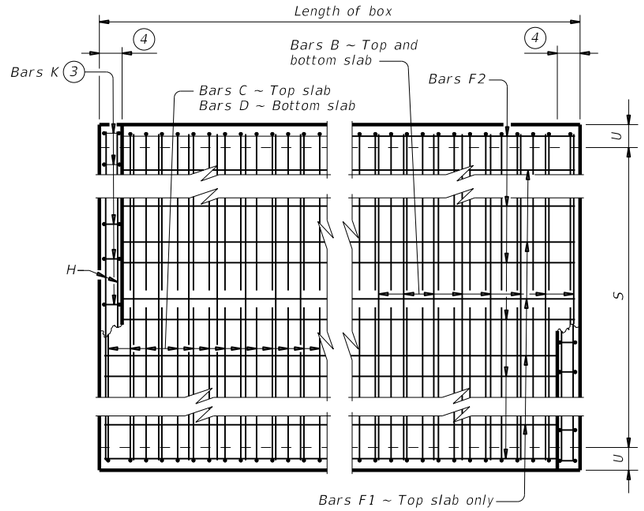
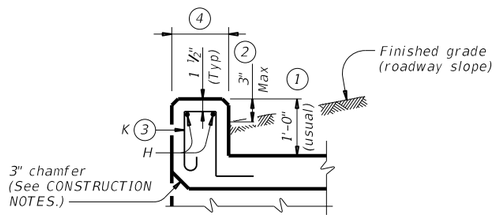


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

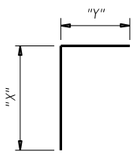
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

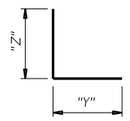
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

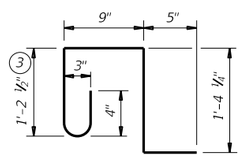
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

James Atkins A.A., P.E. 10/29/20
NAME DATE

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-9(MOD)

FILE: scc09ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		55

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
9' - 0"	3' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	9' - 1"	1,636	3' - 7"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	3' - 0"	216	7	39' - 9"	186	35	39' - 9"	929	9' - 11"	26	22	61	0.595	169.3	0.8	87	24.6	6,859

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E. 10/29/20
NAME DATE

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-9(MOD)

FILE: scc09ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		56

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DATE: 10/27/2020 4:53:29 PM
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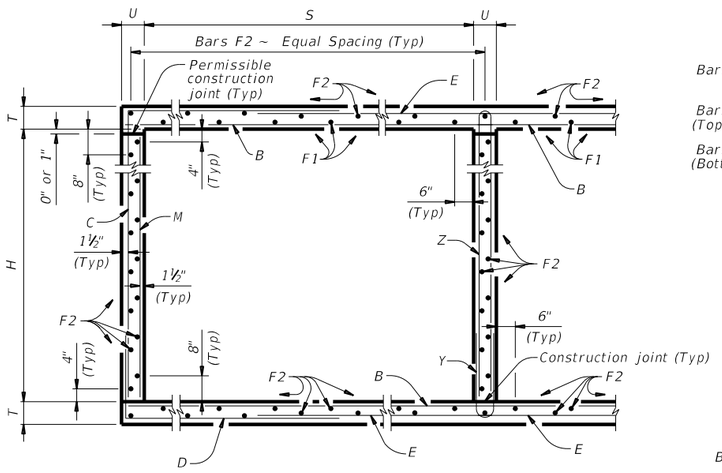
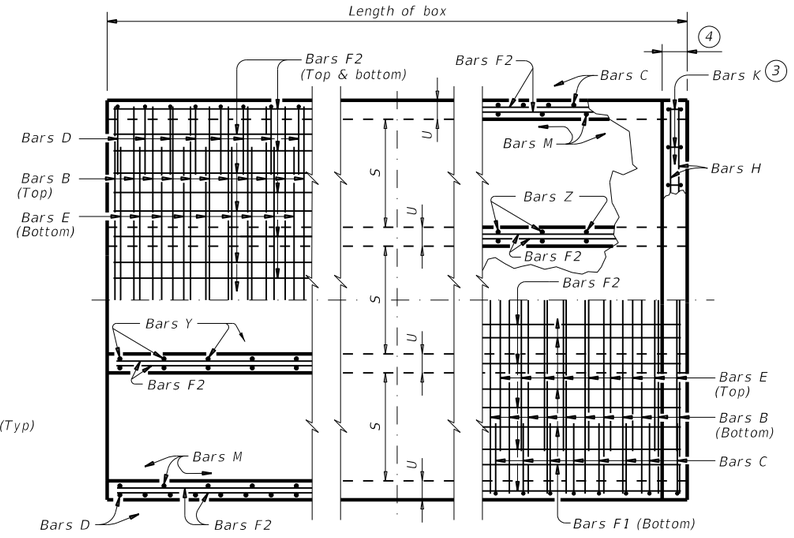
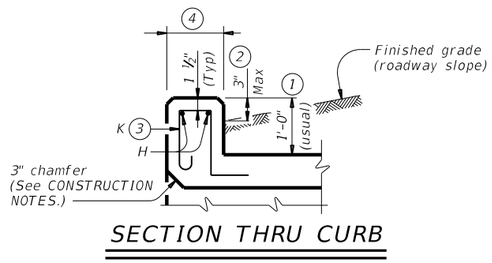


TYPICAL SECTION



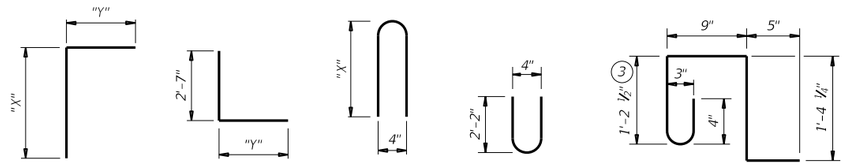
BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 ½"	3'-8 ½"
3'-0"	3'-6 ½"	3'-8 ½"
4'-0"	4'-6 ½"	3'-8 ½"
5'-0"	5'-6 ½"	3'-8 ½"



1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		57

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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	5'-0"	2'-0"	8"	7"	108	#5	9"	11'-6"	1,295	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	38	18"	39'-9"	1,009	108	9"	2'-0"	144	54	9"	4'-7"	165	5'-3"	189	11'-6"	31	26	72	0.710	135.2	0.9	103	29.3	5,510
3	5'-0"	2'-0"	8"	7"	108	#5	9"	17'-1"	1,924	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	54	18"	39'-9"	1,434	108	9"	2'-0"	144	108	9"	4'-7"	331	5'-3"	379	17'-1"	46	38	106	1.029	188.8	1.3	152	42.4	7,705
4	5'-0"	2'-0"	8"	7"	108	#5	9"	22'-8"	2,553	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	70	18"	39'-9"	1,859	108	9"	2'-0"	144	162	9"	4'-7"	496	5'-3"	568	22'-8"	61	48	134	1.348	242.4	1.7	195	55.6	9,891
5	5'-0"	2'-0"	8"	7"	108	#5	9"	28'-3"	3,182	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	86	18"	39'-9"	2,284	108	9"	2'-0"	144	216	9"	4'-7"	661	5'-3"	758	28'-3"	75	60	167	1.667	296.0	2.1	242	68.8	12,082
6	5'-0"	2'-0"	8"	7"	108	#5	9"	33'-10"	3,811	108	#5	9"	6'-3"	704	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	102	18"	39'-9"	2,708	108	9"	2'-0"	144	270	9"	4'-7"	827	5'-3"	947	33'-10"	90	70	195	1.986	349.6	2.5	285	82.0	14,268
2	5'-0"	3'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	44	18"	39'-9"	1,168	108	9"	3'-0"	216	54	9"	4'-7"	165	7'-3"	262	11'-6"	31	26	72	0.775	159.9	0.9	103	31.9	6,497
3	5'-0"	3'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	62	18"	39'-9"	1,646	108	9"	3'-0"	216	108	9"	4'-7"	331	7'-3"	523	17'-1"	46	38	106	1.115	223.5	1.3	152	45.9	9,093
4	5'-0"	3'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	80	18"	39'-9"	2,124	108	9"	3'-0"	216	162	9"	4'-7"	496	7'-3"	785	22'-8"	61	48	134	1.456	287.2	1.7	195	59.9	11,682
5	5'-0"	3'-0"	8"	7"	108	#6	9"	28'-3"	4,583	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	98	18"	39'-9"	2,602	108	9"	3'-0"	216	216	9"	4'-7"	661	7'-3"	1,046	28'-3"	75	60	167	1.796	350.8	2.1	242	73.9	14,274
6	5'-0"	3'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	7'-3"	817	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	116	18"	39'-9"	3,080	108	9"	3'-0"	216	270	9"	4'-7"	827	7'-3"	1,308	33'-10"	90	70	195	2.137	414.5	2.5	285	88.0	16,863
2	5'-0"	4'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	44	18"	39'-9"	1,168	108	9"	4'-0"	289	54	9"	4'-7"	165	9'-3"	334	11'-6"	31	26	72	0.840	166.3	0.9	103	34.5	6,754
3	5'-0"	4'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	62	18"	39'-9"	1,646	108	9"	4'-0"	289	108	9"	4'-7"	331	9'-3"	667	17'-1"	46	38	106	1.202	231.8	1.3	152	49.4	9,422
4	5'-0"	4'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	80	18"	39'-9"	2,124	108	9"	4'-0"	289	162	9"	4'-7"	496	9'-3"	1,001	22'-8"	61	48	134	1.564	297.2	1.7	195	64.3	12,083
5	5'-0"	4'-0"	8"	7"	108	#6	9"	28'-3"	4,583	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	98	18"	39'-9"	2,602	108	9"	4'-0"	289	216	9"	4'-7"	661	9'-3"	1,335	28'-3"	75	60	167	1.926	362.7	2.1	242	79.1	14,748
6	5'-0"	4'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	8'-3"	929	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	116	18"	39'-9"	3,080	108	9"	4'-0"	289	270	9"	4'-7"	827	9'-3"	1,668	33'-10"	90	70	195	2.288	428.1	2.5	285	94.0	17,408
2	5'-0"	5'-0"	8"	7"	108	#6	9"	11'-6"	1,865	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	8'-8"	976	8	18"	39'-9"	212	50	18"	39'-9"	1,328	108	9"	5'-0"	361	54	9"	4'-7"	165	11'-3"	406	11'-6"	31	26	72	0.904	176.7	0.9	103	37.0	7,171
3	5'-0"	5'-0"	8"	7"	108	#6	9"	17'-1"	2,771	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	14'-3"	1,605	12	18"	39'-9"	319	70	18"	39'-9"	1,859	108	9"	5'-0"	361	108	9"	4'-7"	331	11'-3"	812	17'-1"	46	38	106	1.288	245.3	1.3	152	52.8	9,965
4	5'-0"	5'-0"	8"	7"	108	#6	9"	22'-8"	3,677	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	19'-10"	2,234	16	18"	39'-9"	425	90	18"	39'-9"	2,390	108	9"	5'-0"	361	162	9"	4'-7"	496	11'-3"	1,217	22'-8"	61	48	134	1.672	313.9	1.7	195	68.6	12,750
5	5'-0"	5'-0"	8"	7"	108	#6	9"	28'-3"	4,583	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	25'-5"	2,863	20	18"	39'-9"	531	110	18"	39'-9"	2,921	108	9"	5'-0"	361	216	9"	4'-7"	661	11'-3"	1,623	28'-3"	75	60	167	2.056	382.5	2.1	242	84.3	15,540
6	5'-0"	5'-0"	8"	7"	108	#6	9"	33'-10"	5,488	108	#5	9"	9'-3"	1,042	6'-4"	713	108	#5	9"	31'-0"	3,492	24	18"	39'-9"	637	130	18"	39'-9"	3,452	108	9"	5'-0"	361	270	9"	4'-7"	827	11'-3"	2,029	33'-10"	90	70	195	2.439	451.0	2.5	285	100.1	18,326

HL93 LOADING SHEET 2 OF 2

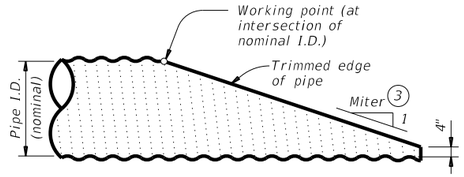
Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
5'-0" SPAN
0' TO 20' FILL

MC-5-20

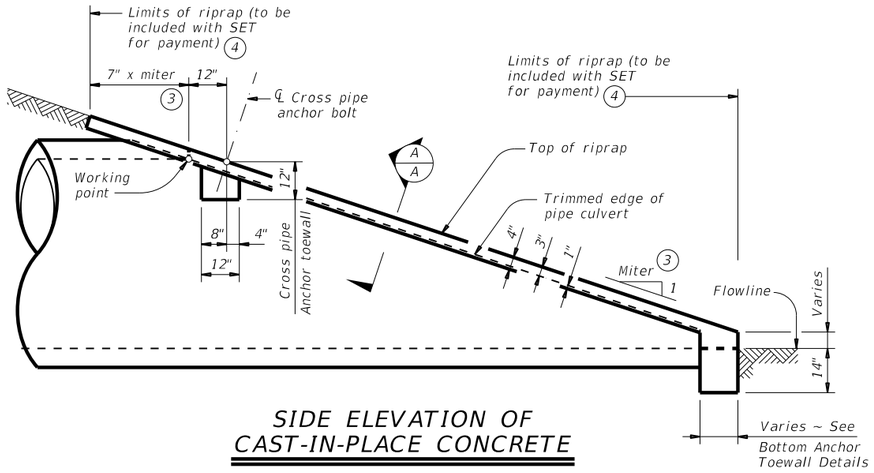
FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		58



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

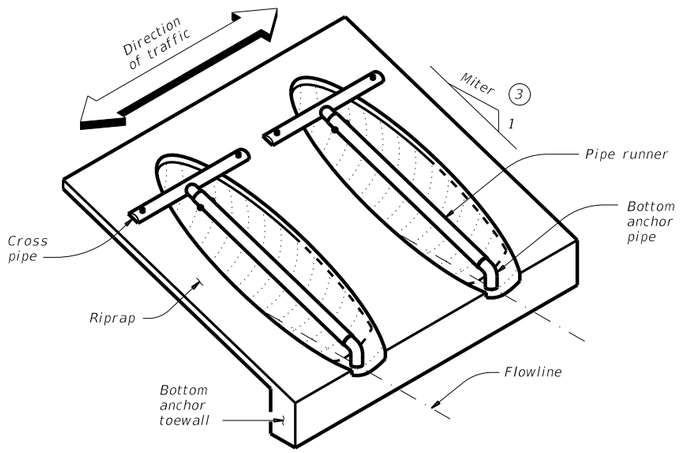
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

DATE: 10/27/2020 4:53:33 PM
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SHEET 1 OF 2

Texas Department of Transportation

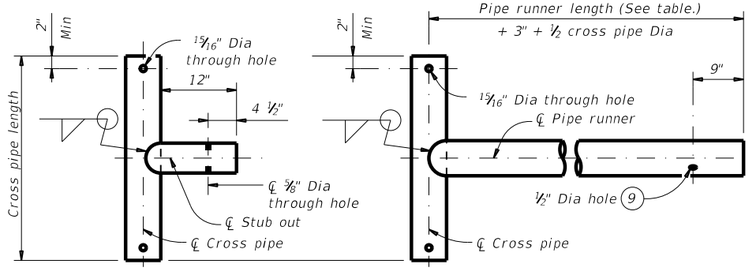
Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

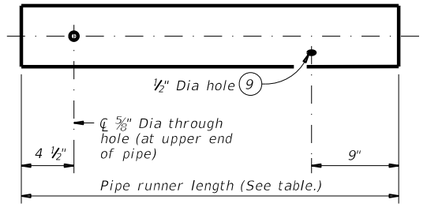
SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		59



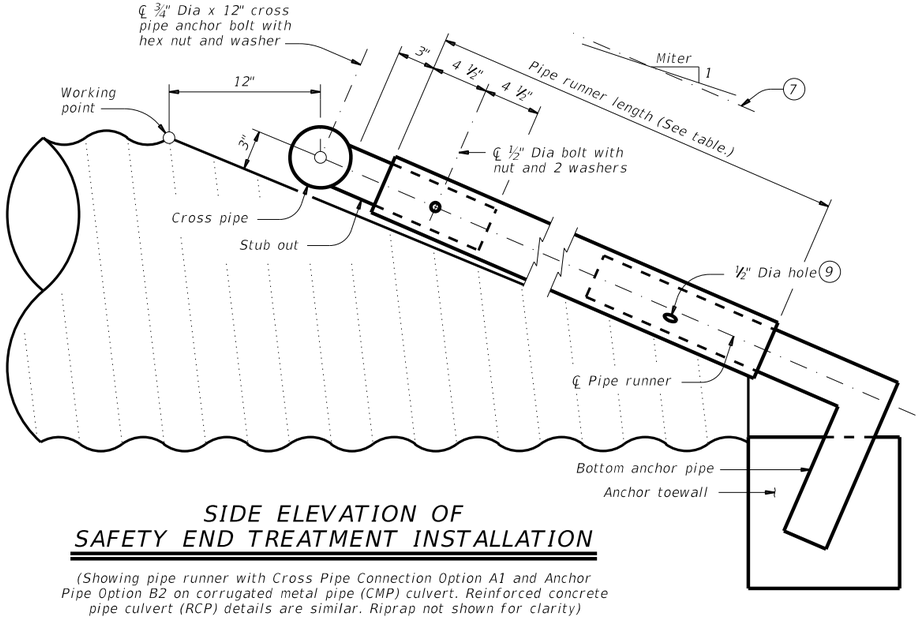
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



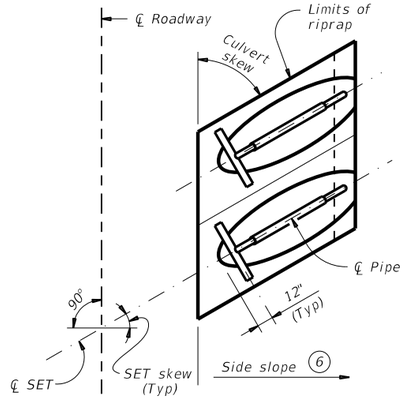
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

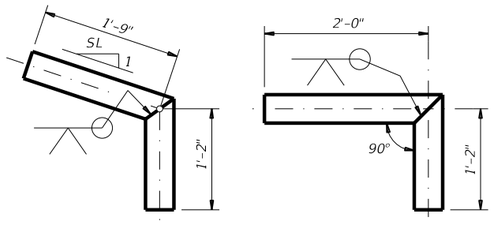


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

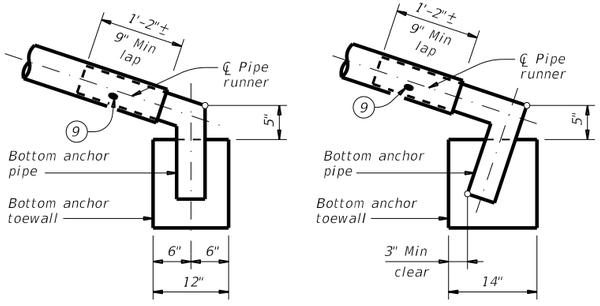


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

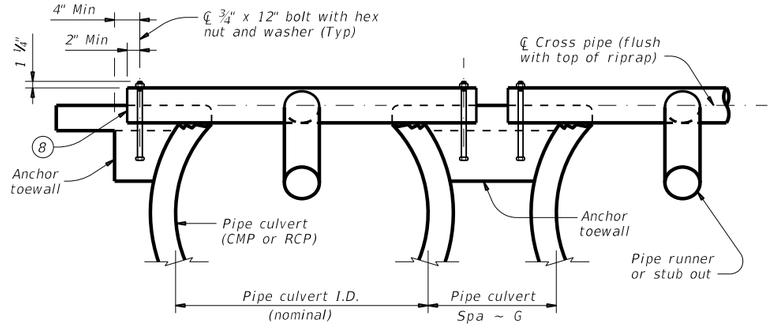
BOTTOM ANCHOR PIPE DETAILS (10)



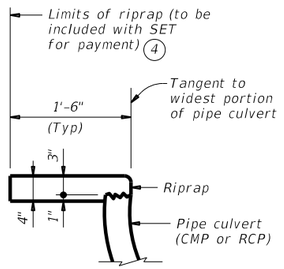
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		60

DATE: 10/27/2020 4:53:35 PM
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DATE: 10/27/2020 4:53:37 PM
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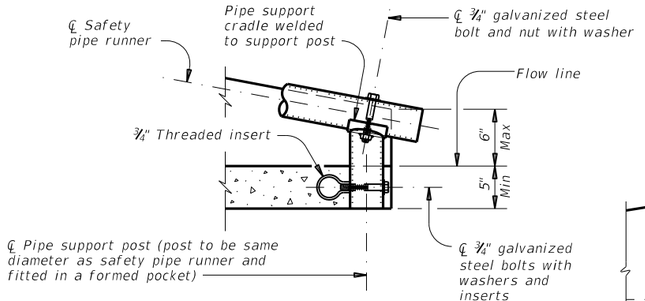
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe Skew	Single Pipe Runners Required	Multiple Pipes Skew	Multiple Pipes Runners Required
12"	2"	1.15"	17.00"	3:1	2' – 11"	≤ 45°	No	≤ 45°	No
				4:1	3' – 6"				
				6:1	4' – 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
				4:1	4' – 7"				
				6:1	6' – 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' – 6"	≤ 45°	No	≤ 45°	No
				4:1	5' – 8"				
				6:1	8' – 0"				
24"	3"	1.95"	31.00"	3:1	6' – 2"	≤ 45°	No	= 30°	No
				4:1	7' – 10"			> 30°	Yes
				6:1	11' – 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' – 10"	= 15°	No	= 15°	No
				4:1	10' – 1"	> 15°	Yes	> 15°	Yes
				6:1	14' – 8"				
36"	4"	2.75"	45.50"	3:1	9' – 5"	= 0°	No	≥ 0°	Yes
				4:1	12' – 3"	> 0°	Yes		
				6:1	17' – 11"				
42"	4 ½"	N/A	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				

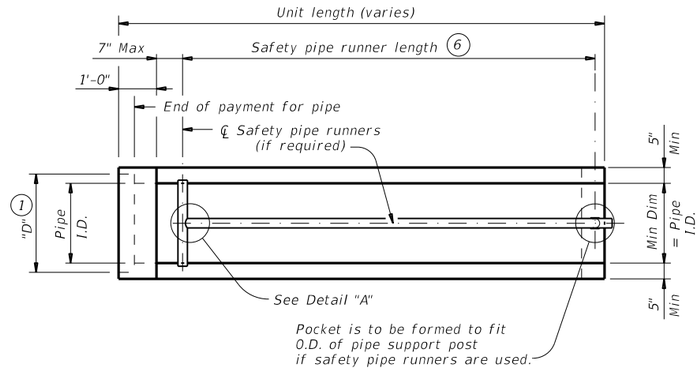


END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

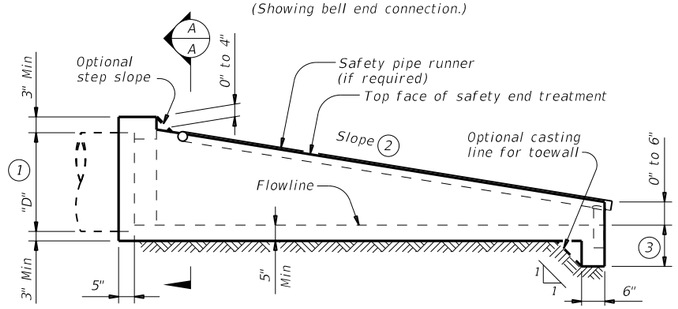
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



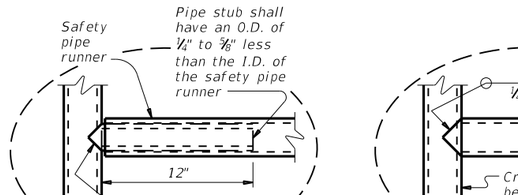
PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

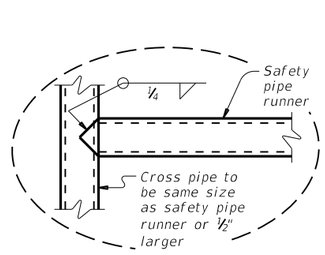
(Showing bell end connection.)



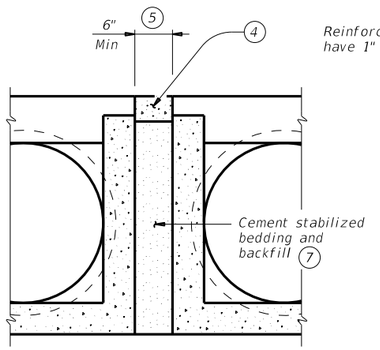
OPTION A

DETAIL A

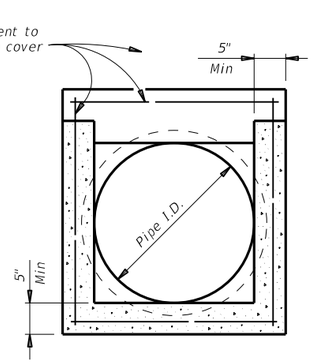
(If required)



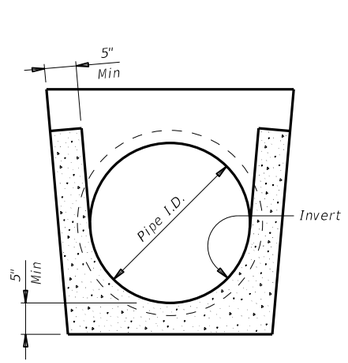
OPTION B



MULTIPLE PIPE INSTALLATION

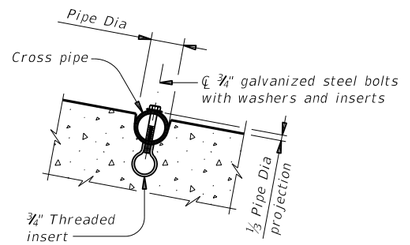


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).
B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		61

DATE: 10/27/2020 4:53:40 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

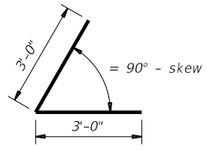
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2–wings) (4)		Estimated Quantities per ft of Toewall (1–toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	48.64	0.406	6.85	0.071
2'–9"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.31	0.424	6.85	0.071
3'–0"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.98	0.444	6.85	0.071
3'–3"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.32	0.462	6.85	0.071
3'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.98	0.480	6.85	0.071
4'–0"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	55.77	0.532	6.85	0.071
4'–6"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	59.77	0.568	6.85	0.071
5'–0"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	63.45	0.632	6.96	0.075
5'–6"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	67.46	0.668	6.96	0.075
6'–0"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	80.67	0.730	7.07	0.078
6'–6"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	85.05	0.768	7.07	0.078
7'–0"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	92.15	0.864	8.07	0.093
7'–6"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	96.54	0.902	8.07	0.093
8'–0"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'–6"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'–6"	6'–0"	2'–10"	2'–2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'–6"	6'–5"	3'–0"	2'–5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'–6"	7'–2"	3'–6"	2'–8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'–6"	7'–8"	3'–9"	2'–11"	1'–0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'–6"	8'–2"	4'–0"	3'–2"	1'–2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'–6"	8'–10"	4'–5"	3'–5"	1'–4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'–6"	9'–6"	4'–10"	3'–8"	1'–6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'–0"	9'–11"	5'–0"	3'–11"	1'–7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2–wings)

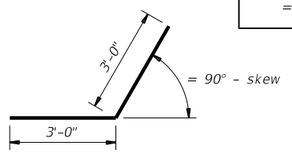
Bar	Size	No.	Spa
D1	#6	~	1'–0"
D2	#6	~	1'–0"
E1	#4	~	1'–0"
F	#4	~	1'–0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'–0"
V	#4	~	1'–0"

TABLE OF TOEWALL REINFORCING

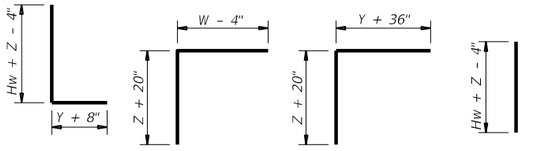
Bar	Size	No.	Spa
J3	#4	~	1'–0"
M2	#4	2	~
E2	#4	~	1'–0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:
(All values are in feet.)

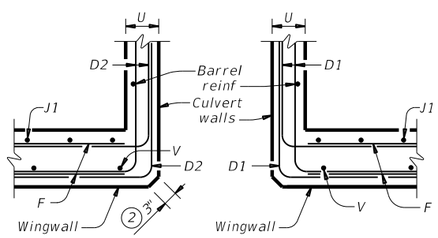
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW–1
= (Hw – 1') (SL) ÷ cosine (θ) for Type PW–2 and Hw ≥ 4'
= (Hw – 0.5') (SL) ÷ cosine (θ) for Type PW–2 and Hw < 4'

For cast–in–place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

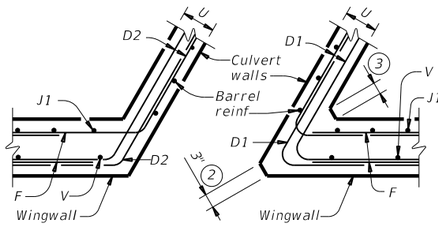
For precast culverts:
Ltw = [(N) (2 U + S) + (N – 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW–1
= (2)(Hw)(Lw) – 6 SF for Type PW–2 and Hw ≥ 4'
= (2)(Hw)(Lw) – 1.5 SF for Type PW–2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

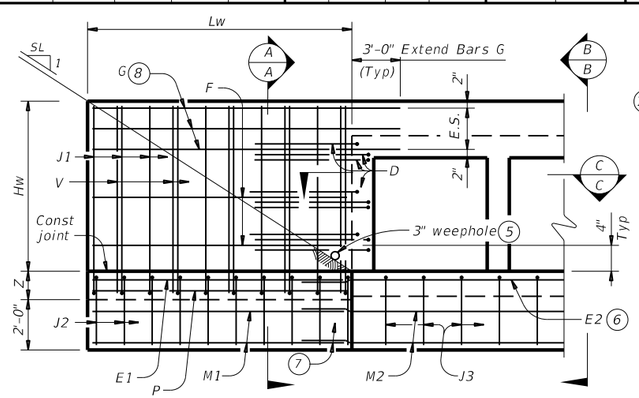
See applicable box culvert standard sheet for S, H, T, and U values.



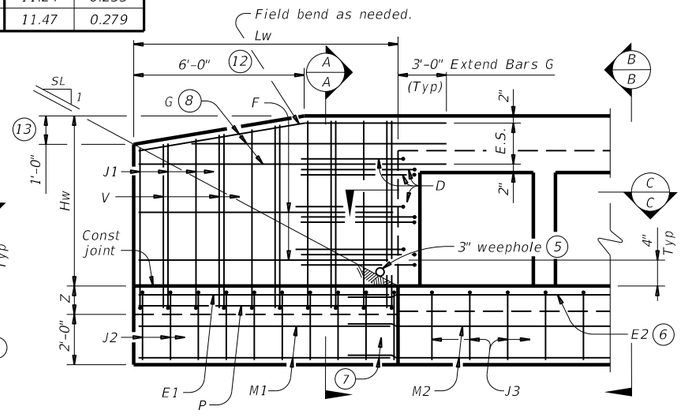
SECTION C-C - PW-1



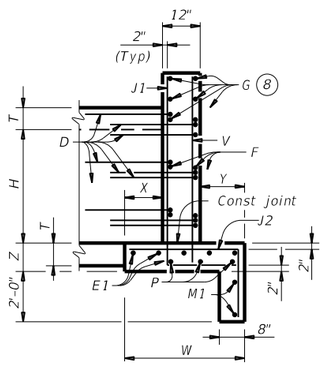
SECTION C-C - PW-2



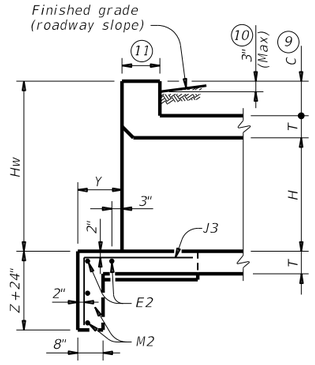
PARTIAL ELEVATION - PW-1



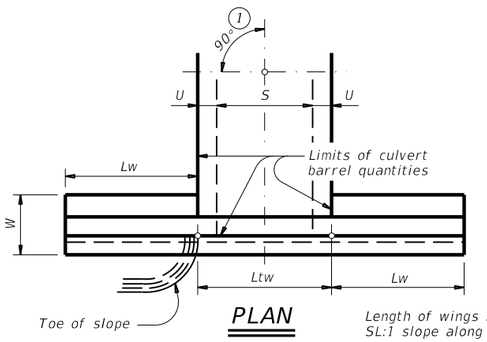
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

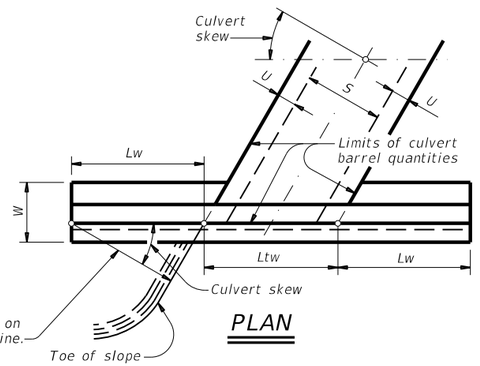


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW–1 wings. Adjust concrete volume for Type PW–2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'–0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'–6" minimum into the wingwall footing.
7. Lap Bars M1 1'–6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'–0" for Hw < 4'.
13. 6" for Hw < 4'.

DESIGNER NOTES:
Type PW–1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW–2 can only be used for applications without a railing mounted to the wingwall.

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

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

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

Texas Department of Transportation
Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		62

SUMMARY OF SMALL SIGNS

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

STATION	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
105+78L	1	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
107+27L	2	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
108+76L	3	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
110+26L	4	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
111+75L	5	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
1113+24L	6	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
114+73L	7	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
116+23L	8	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
118+20L	9	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
119+21L	10	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
124+75R	11	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
126+32R	12	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
127+88R	13	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
129+45R	14	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
131+02R	15	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
132+58R	16	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
134+15R	17	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
135+72R	18	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								
137+21R	19	W1-8R(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8R(L)	<CHEVRON RIGHT>	36X48								

DATE:
FILE:

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

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

http://www.txdot.gov/

NOTE:

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0642	01	021,ETC.	FM 36,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	HUNT		63

SUMMARY OF SMALL SIGNS

STATION	SIGN NO.	SIGN NOMENCLATURE	SIGN <CHEVRON LEFT> (REMOVAL)	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED: P = "Plain", T = "T", U = "U"	1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
1+39L	20	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
2+18L	21	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
2+75L	22	W1-8(L)	<CHEVRON LEFT> (REMOVAL)	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON LEFT> (REMOVAL)	36X48								
2+96L	23	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
3+45L	24	W1-8(L)	<CHEVRON LEFT> (REMOVAL)	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON LEFT> (REMOVAL)	36X48								
3+75L	25	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
4+22L	26	W1-8(L)	<CHEVRON LEFT> (REMOVAL)	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON LEFT> (REMOVAL)	36X48								
4+52L	27	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
136+41R	28	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
137+76R	29	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
139+12R	30	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
139+83R	31	W1-8(L)	<CHEVRON LEFT> (REMOVAL)	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON LEFT> (REMOVAL)	36X48								
140+47R	32	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
141+36R	33	W1-8(L)	<CHEVRON LEFT> (REMOVAL)	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON LEFT> (REMOVAL)	36X48								
141+82R	34	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
143+18R	35	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
144+54R	36	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
155+92R	37	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
157+30R	38	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
158+67R	39	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								

DATE:
FILE:

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

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NOTE:

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
4-16	DIST	COUNTY		SHEET NO.
8-16	PAR	HUNT		64

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SUMMARY OF SMALL SIGNS

STATION	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
160+06R	40	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
161+44R	41	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
162+81R	42	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
164+20R	43	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
165+58R	44	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
166+96R	45	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								

DATE:
FILE:

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0642	01	021,ETC.	FM 36,ETC.
4-16		DIST	COUNTY		SHEET NO.
8-16		PAR	HUNT		65

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SUMMARY OF SMALL SIGNS

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

STATION	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
359+05R	46	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
360+31R	47	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
361+82R	48	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
363+33R	49	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
364+83R	50	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
366+34R	51	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
367+85R	52	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
369+35R	53	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
370+85R	54	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
372+37R	55	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								
373+87R	56	W1-8(L)	<CHEVRON LEFT>	36X48	X		10 BWG	1	SA	P		
		W1-8(R)	<CHEVRON RIGHT>	36X48								

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

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FILE:

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
4-16 8-16	DIST	COUNTY		SHEET NO.
	PAR	HUNT		66

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

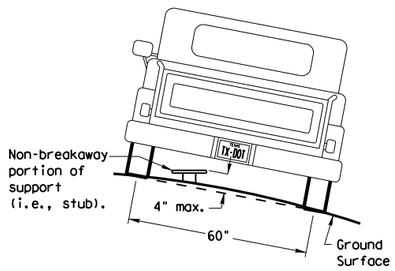
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

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

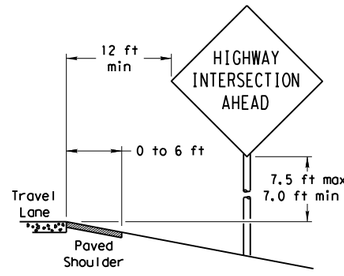
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

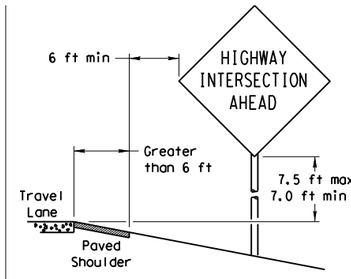
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

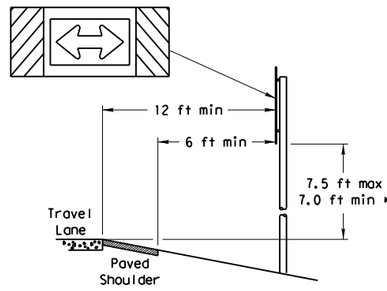
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



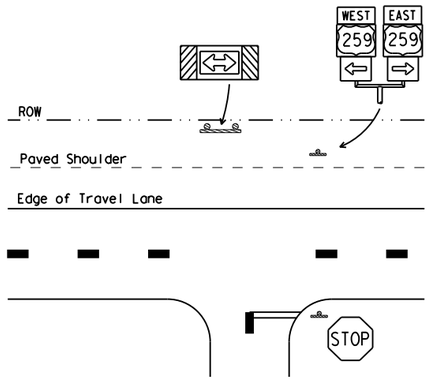
GREATER THAN 6 FT. WIDE

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

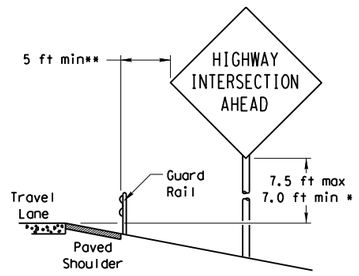
T-INTERSECTION



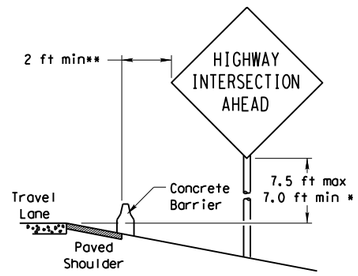
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

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

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

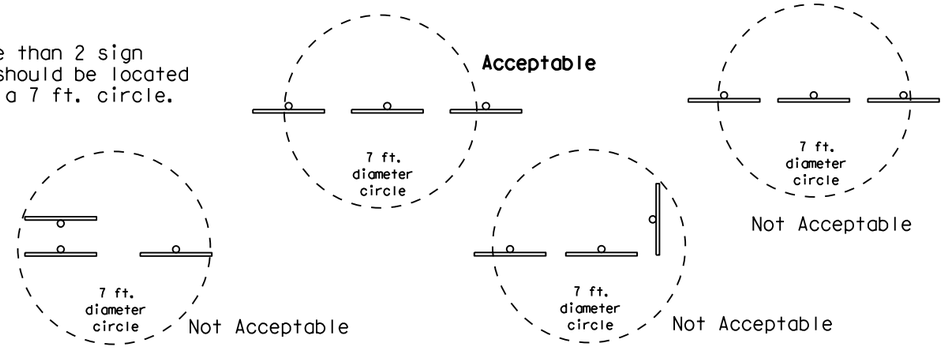
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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

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

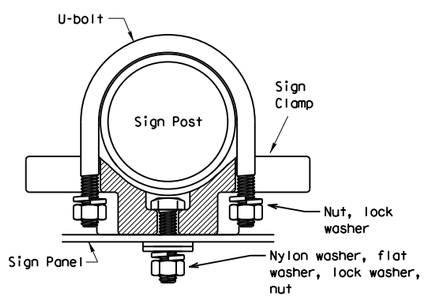
The website address is:
http://www.txdot.gov/publications/traffic.htm

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

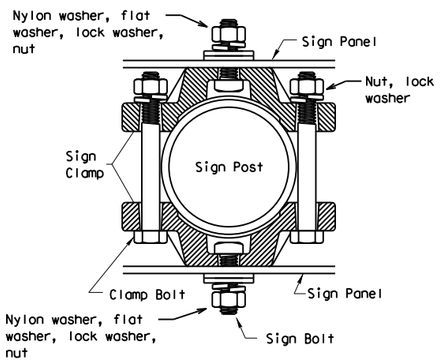


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

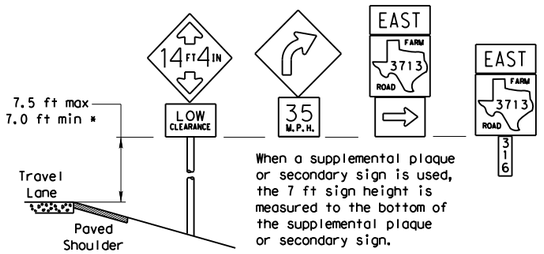
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



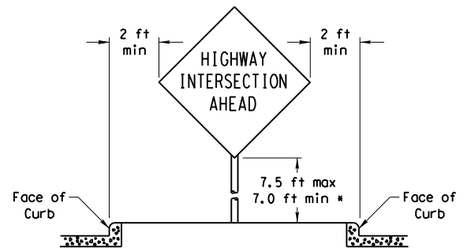
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



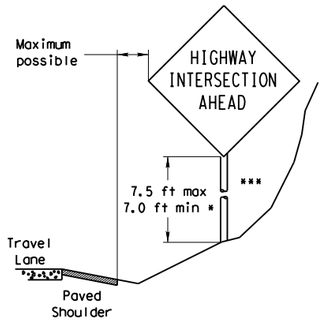
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		67

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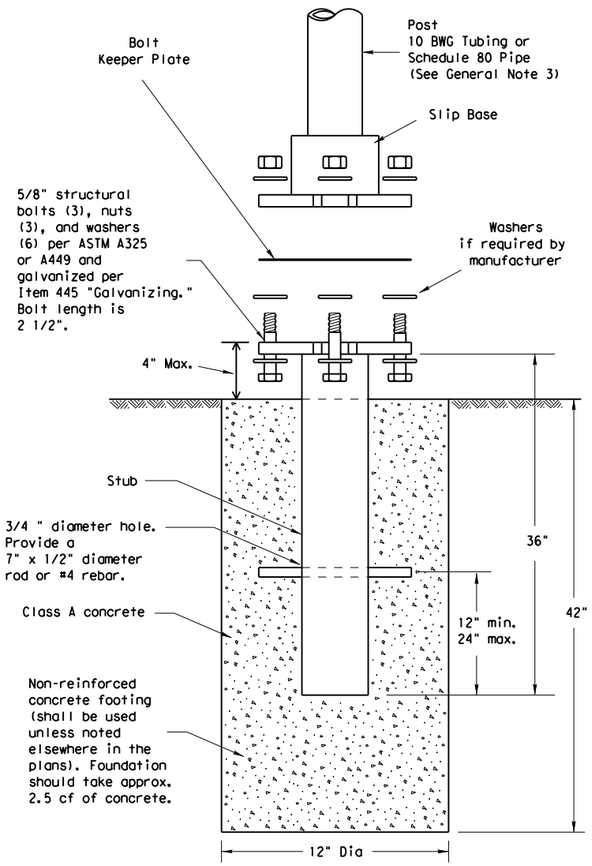
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

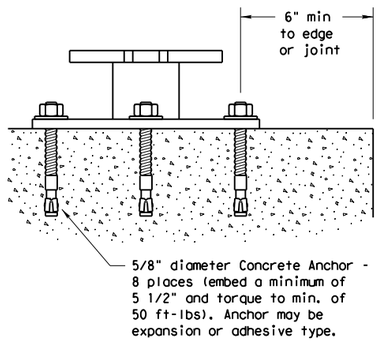
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
PAR	HUNT		68

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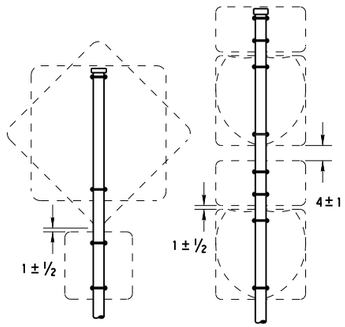

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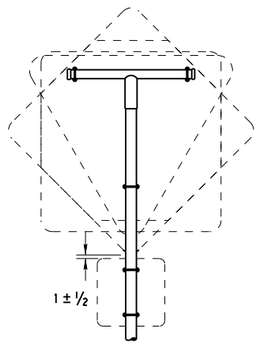

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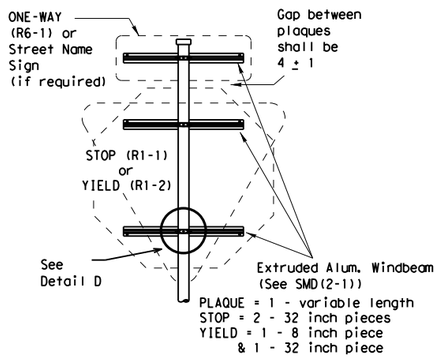

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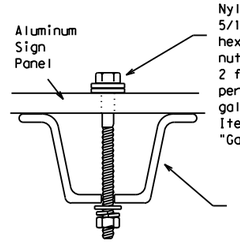
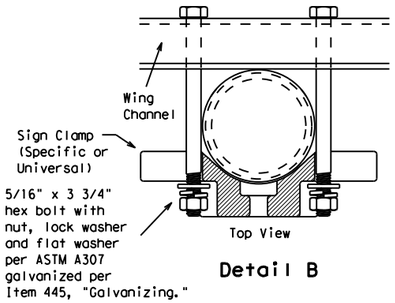
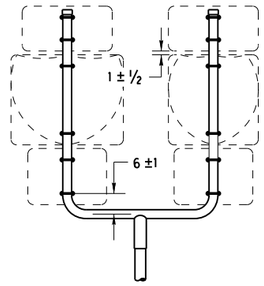


Detail A



Detail B



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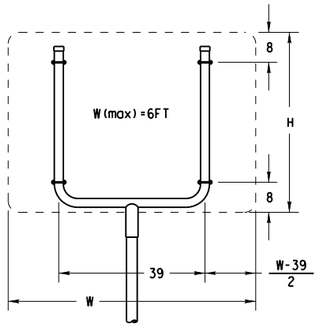

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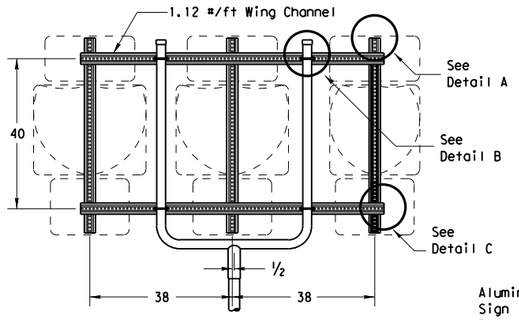
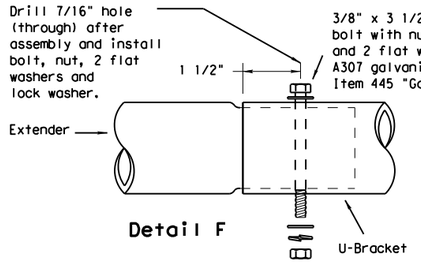
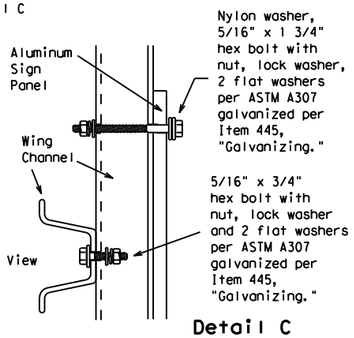


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

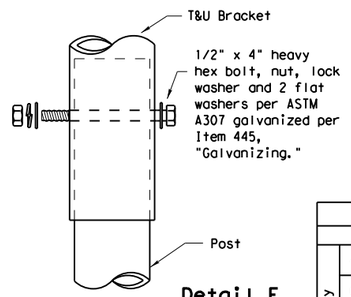


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



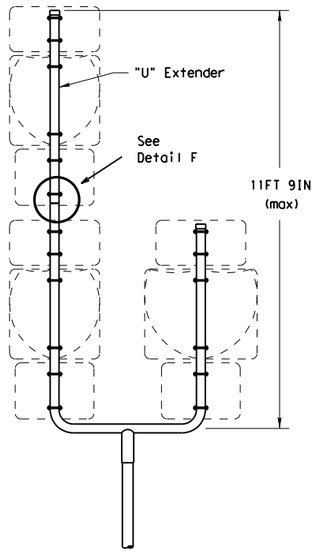
Detail E

GENERAL NOTES:

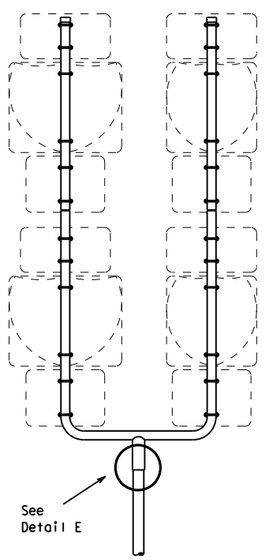
1.

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

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



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



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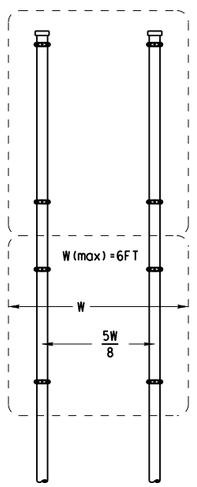
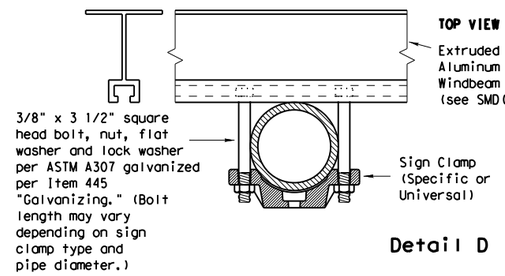
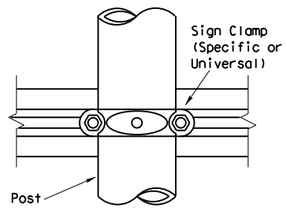


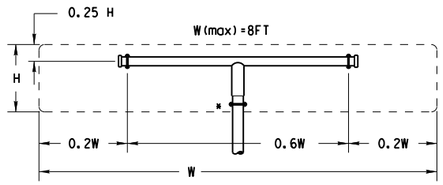
SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



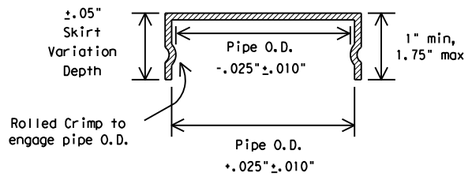
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
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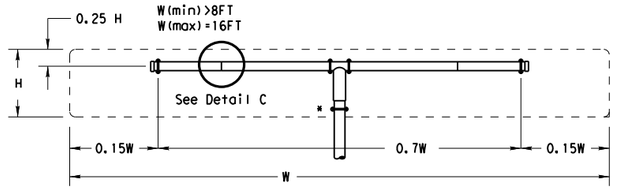
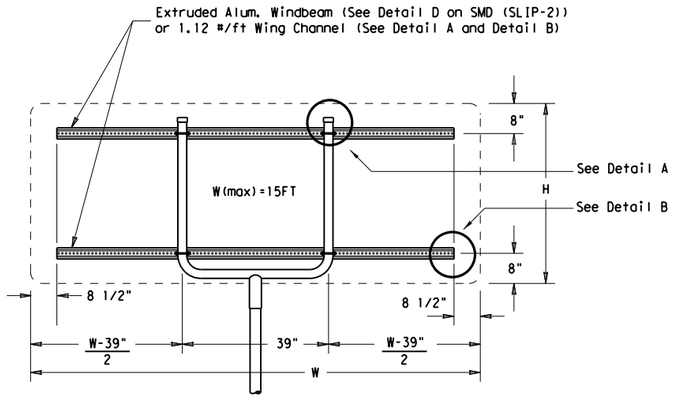
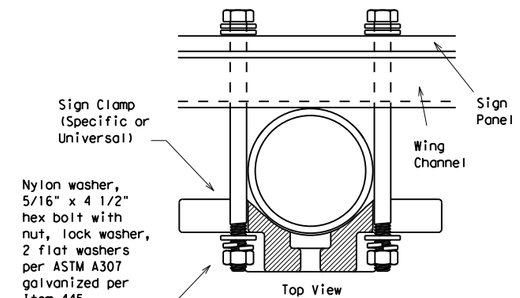


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

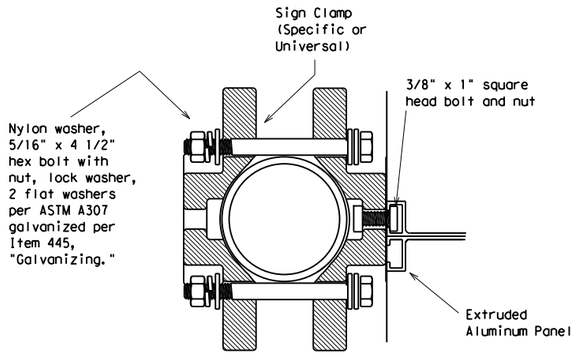


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

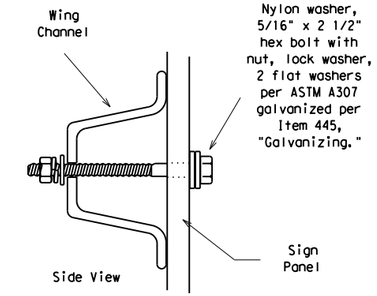


Top View

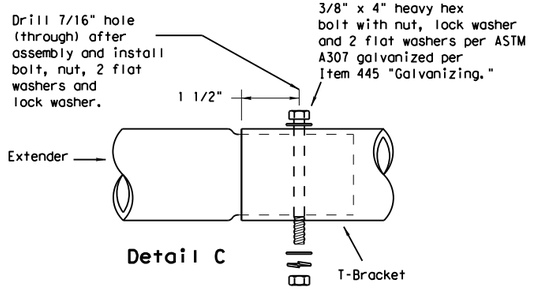
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

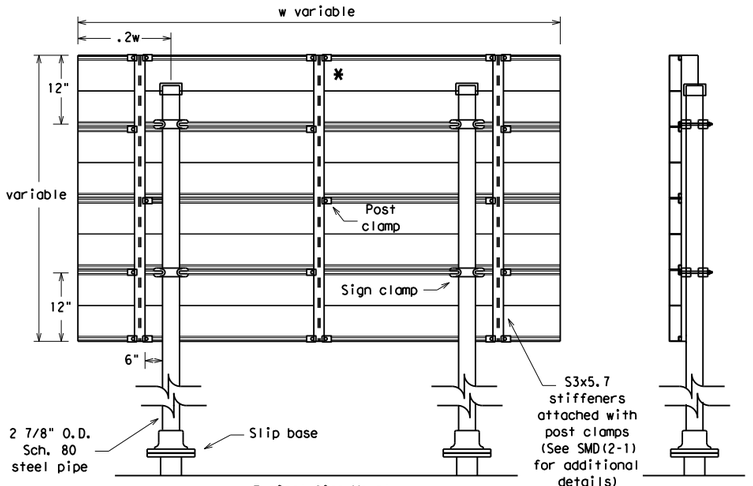


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

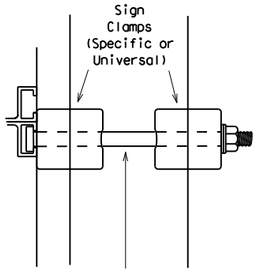


Typical Sign Mount

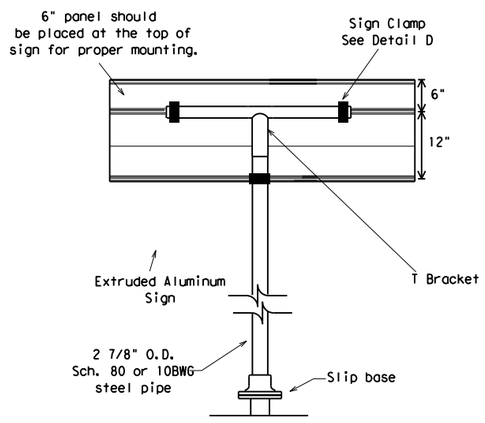
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

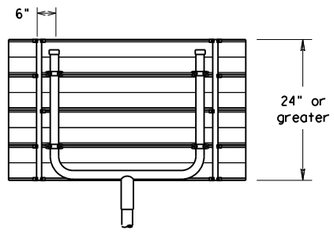
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

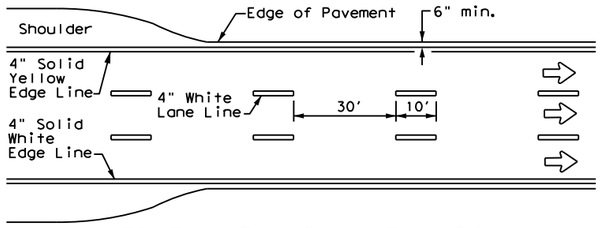
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

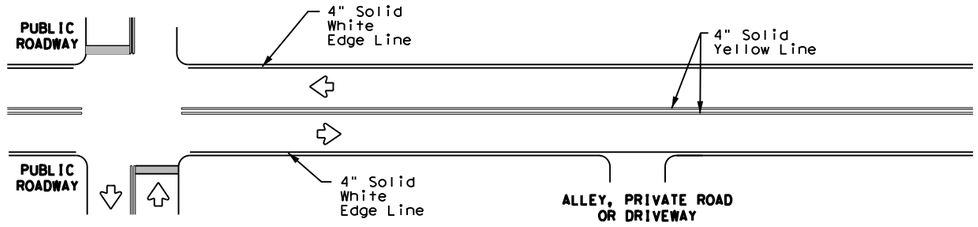
REVISIONS
9-08

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

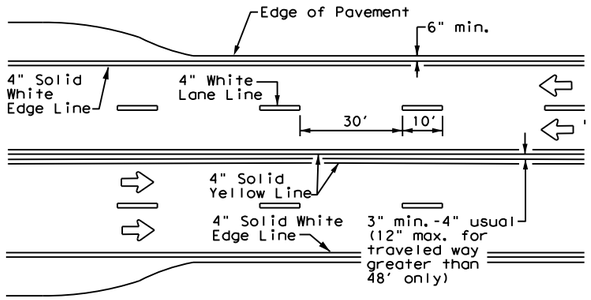
CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		70



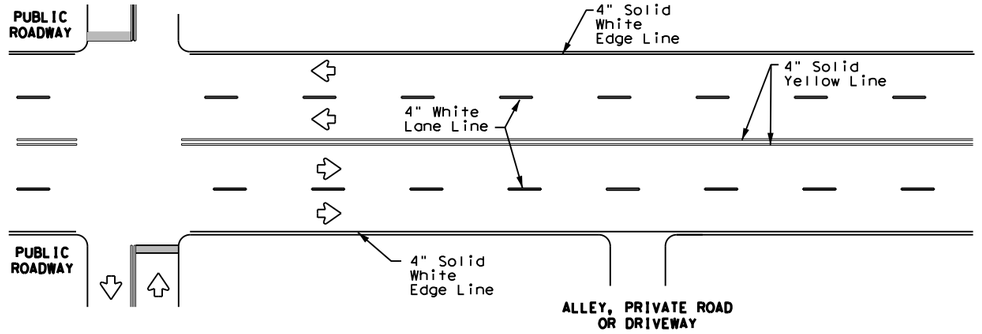
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



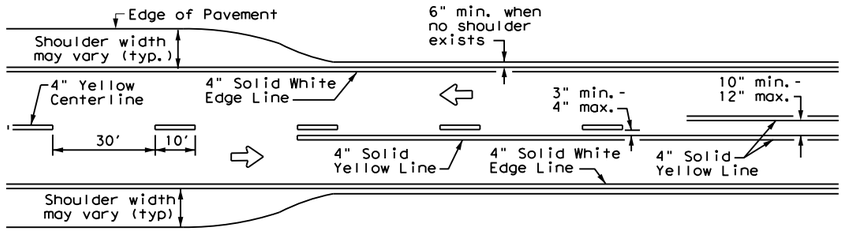
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



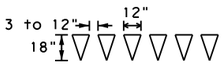
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



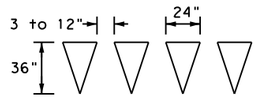
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

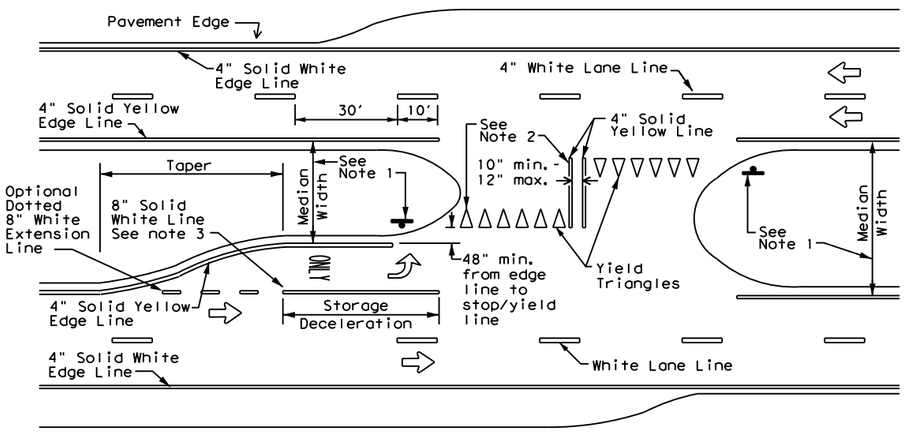


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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

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

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

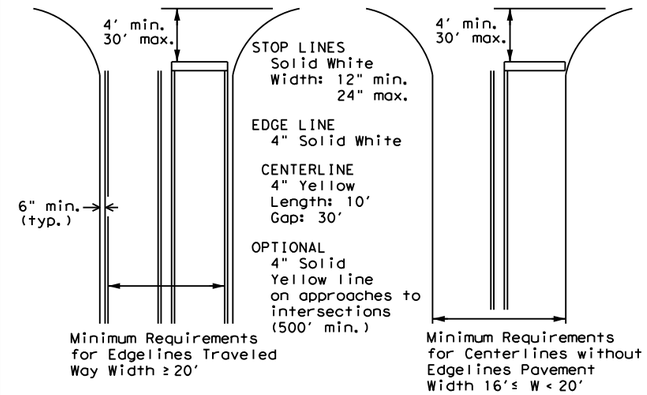
GENERAL NOTES

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

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0642	01	021,ETC.	FM 36,ETC.
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	PAR	HUNT		71

22A

DATE: 10/27/2020 4:53:57 PM
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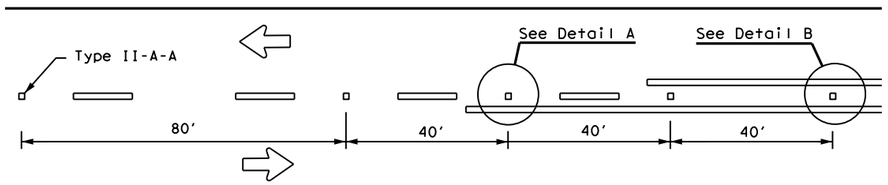
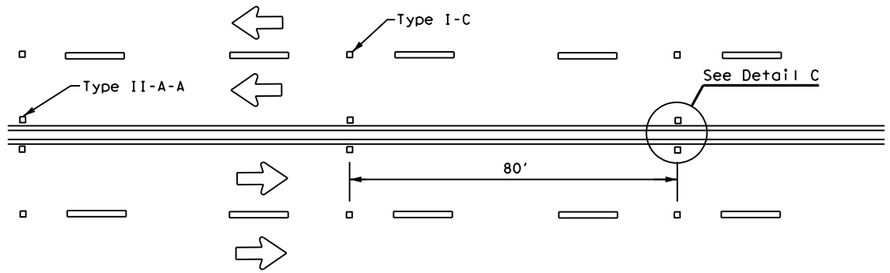
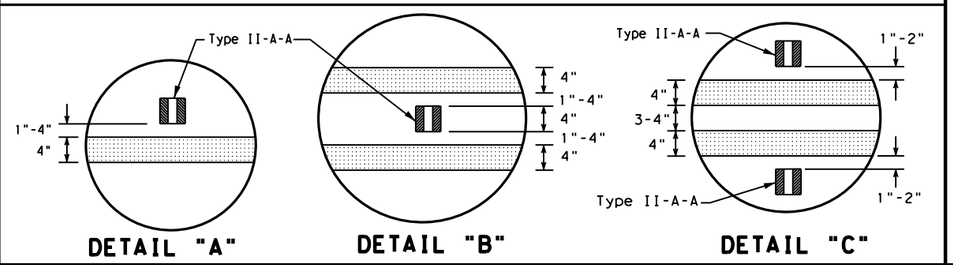
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



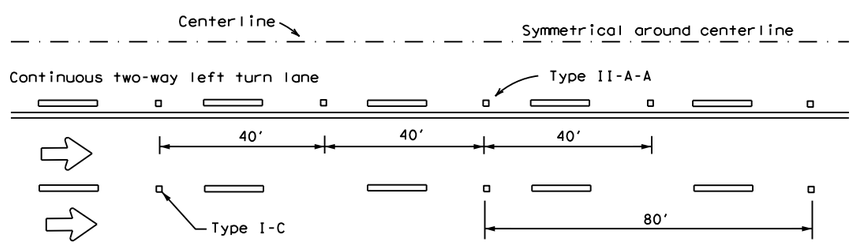
CENTERLINE FOR ALL TWO LANE ROADWAYS



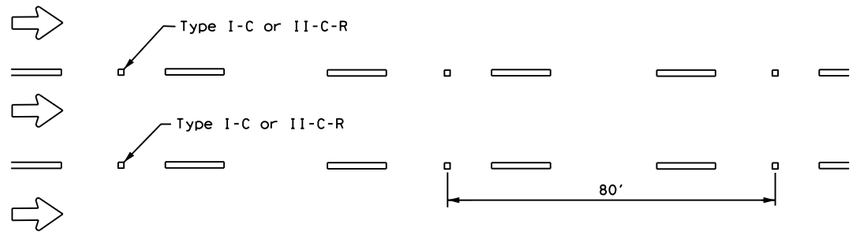
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

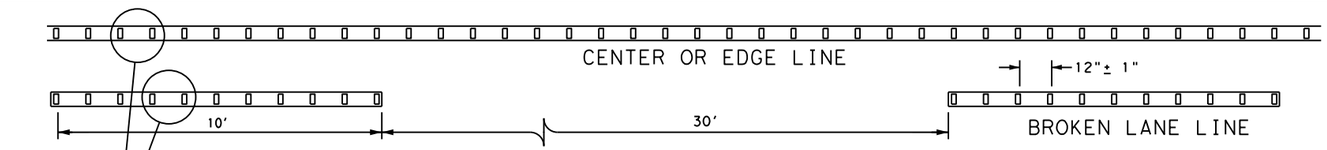


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



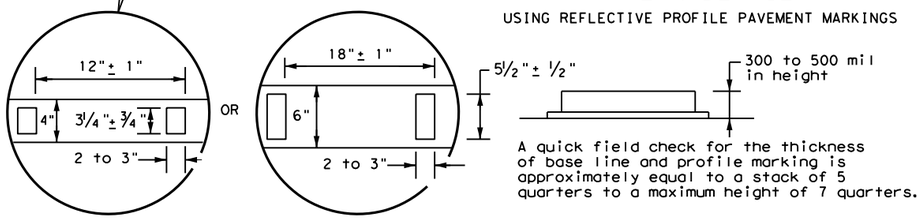
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

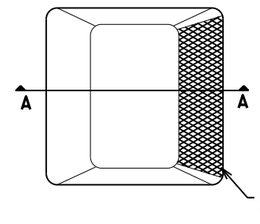
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

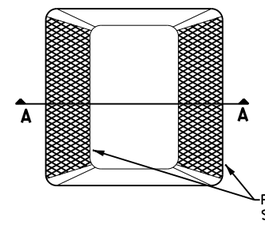
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

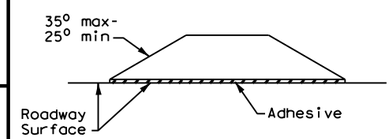
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		72

22B

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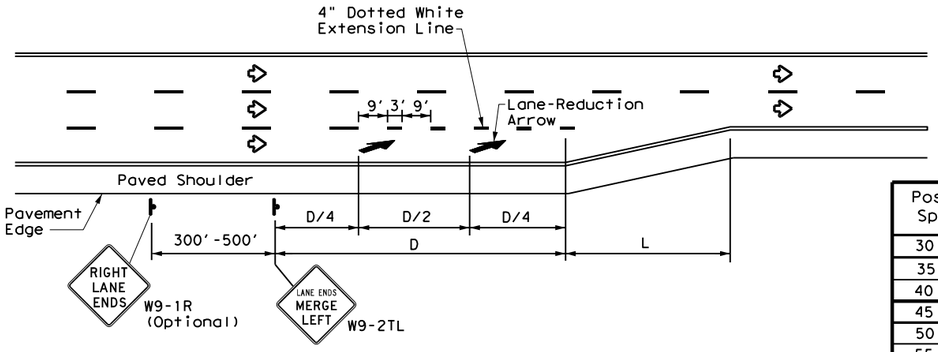
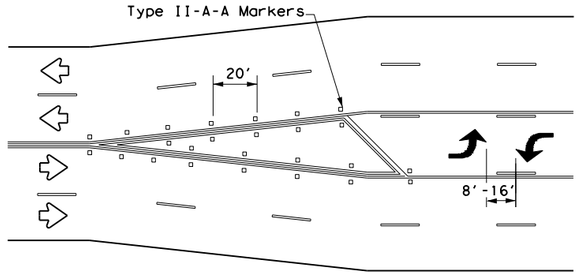


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

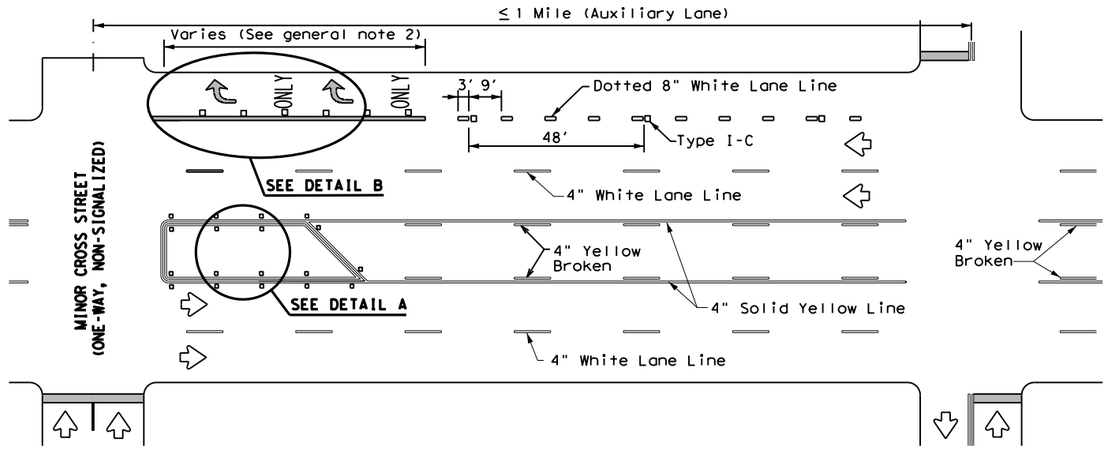
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

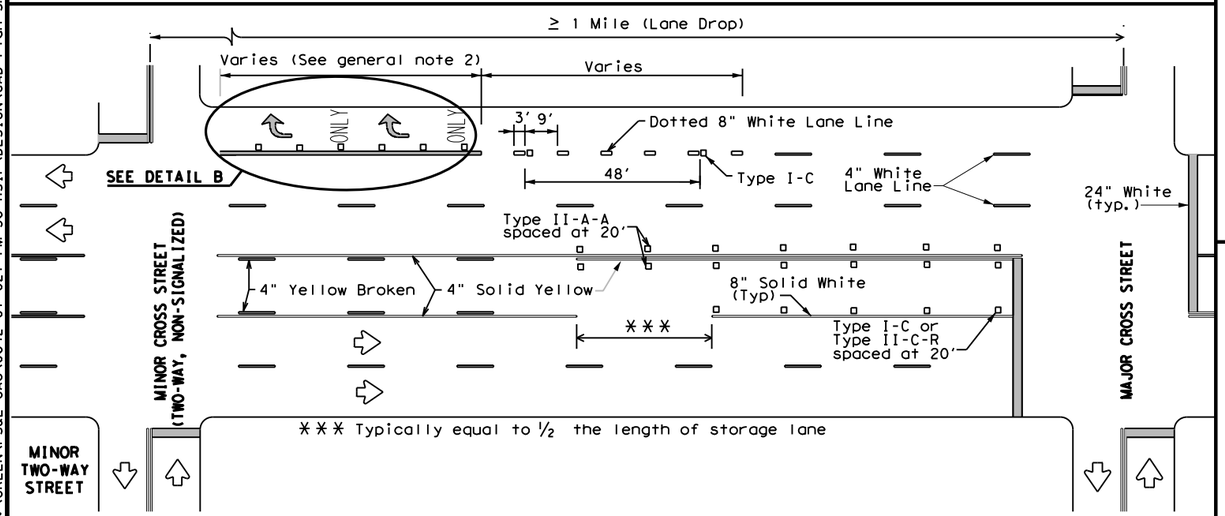
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

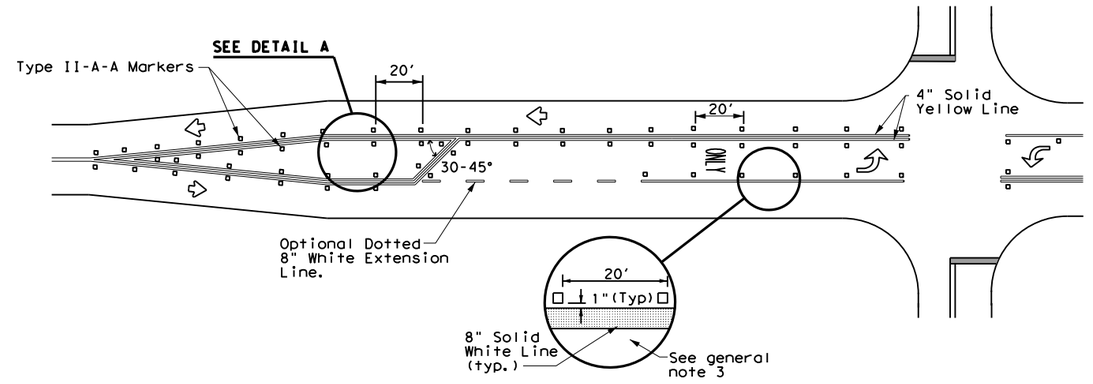
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



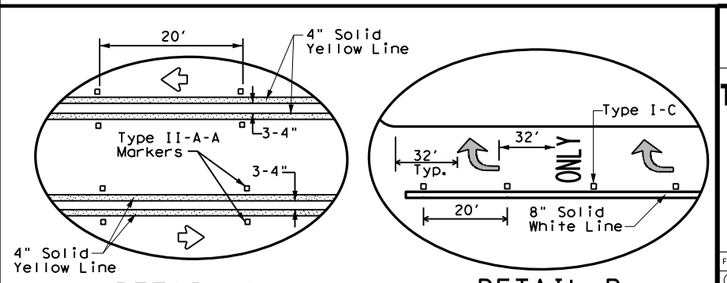
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A DETAIL B

Texas Department of Transportation — Traffic Safety Division Standard

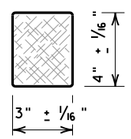
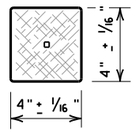
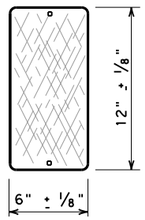
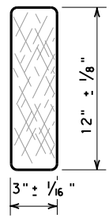
TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS
PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021, ETC.	FM 36, ETC.
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	PAR	HUNT		73
3-03 6-20				

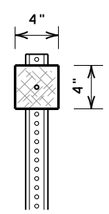
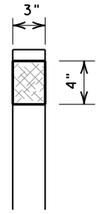
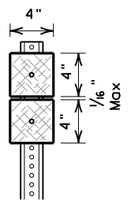
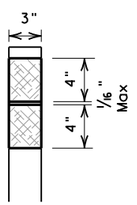
220

DATE: 10/27/2020 4:54:03 PM
FILE: T:\GREENVPS&E-GAO\0642-01-021 FM 36 HSIP\DESIGN\CAD Plan Sheets\dom1-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

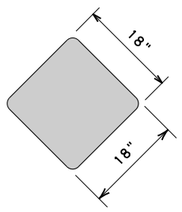
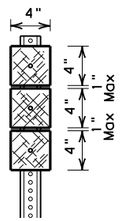
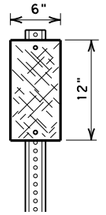
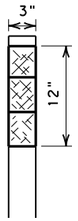
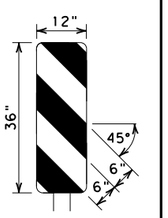
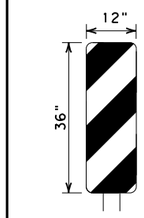
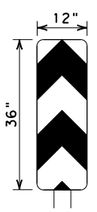
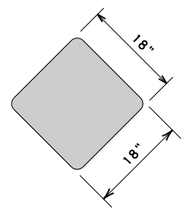
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

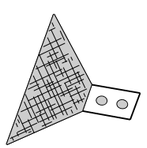
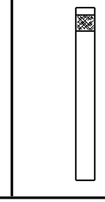
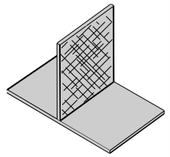
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

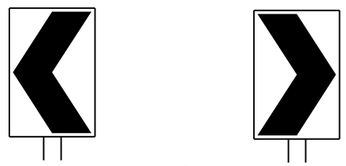
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE

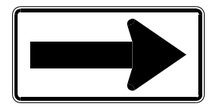


SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

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

ONE DIRECTION LARGE ARROW

DEVICE



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

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	PAR	HUNT		74

20A

DATE: 10/27/2020 4:54:05 PM
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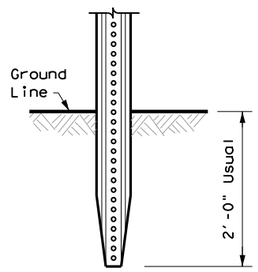
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

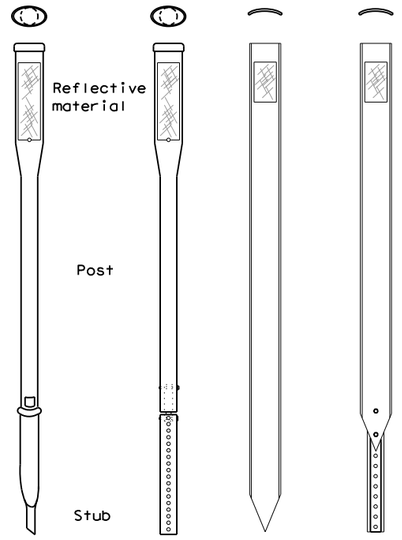


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

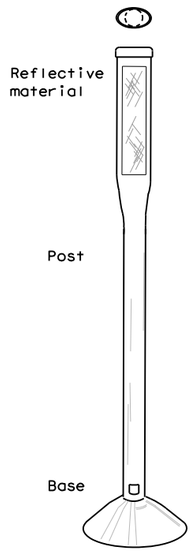
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



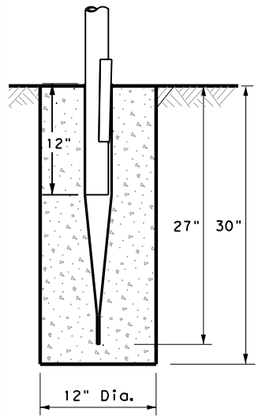
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

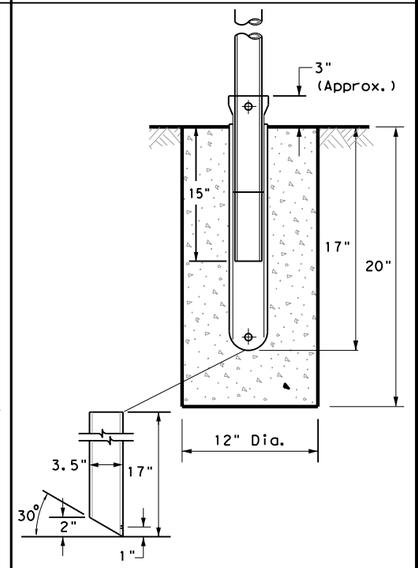
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

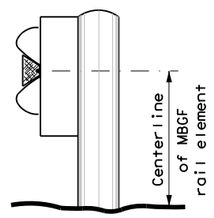
NOTE

1. Install per manufacturer's recommendations.

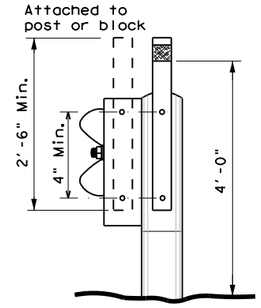
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

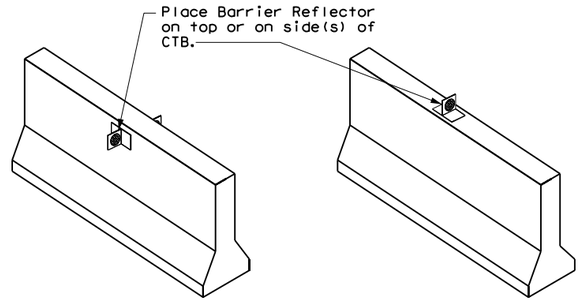
GF1



GF2



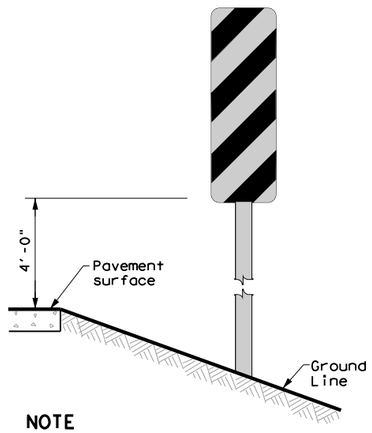
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

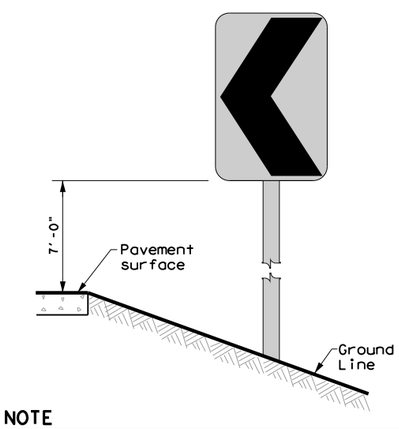
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

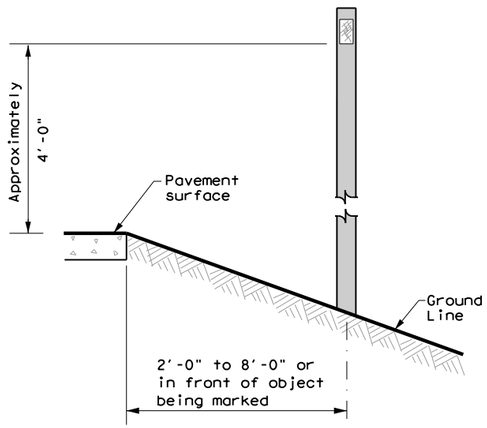
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	PAR	HUNT		75

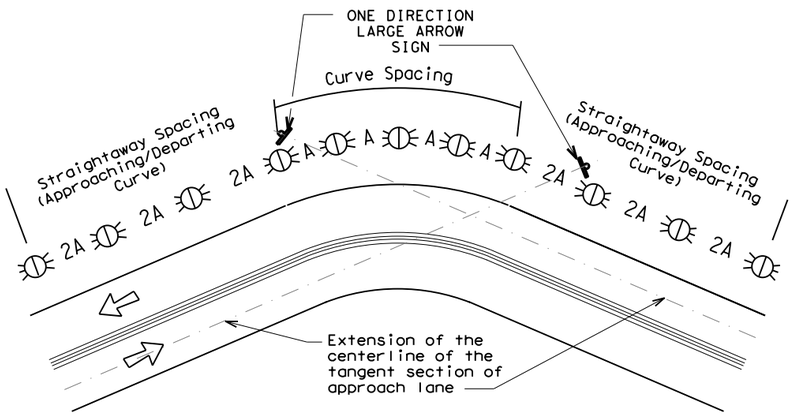
20B

DATE: 10/27/2020 4:54:07 PM
FILE: T:\GREEN\PS&E-GAO\0642-01-021 FM 36 HSIP\DESIGN\CAD Plan Sheets\dom3-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

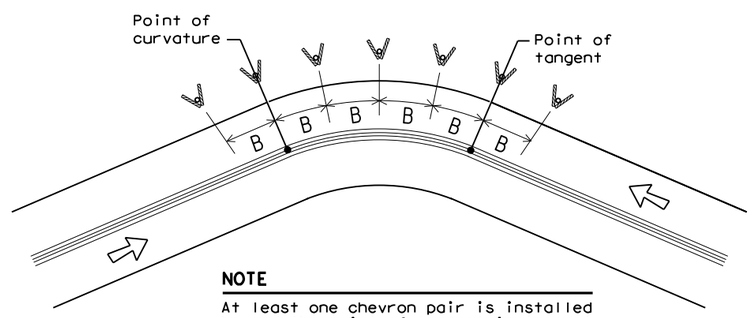
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0642	01	021,ETC.	FM 36,ETC.
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	PAR	HUNT		76

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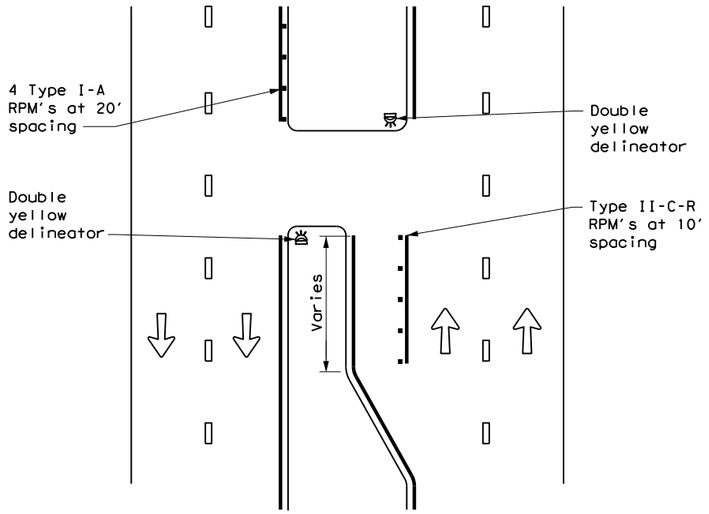
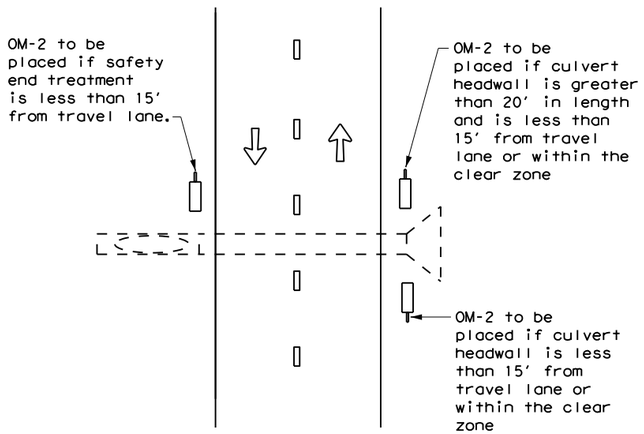
CROSSOVERS



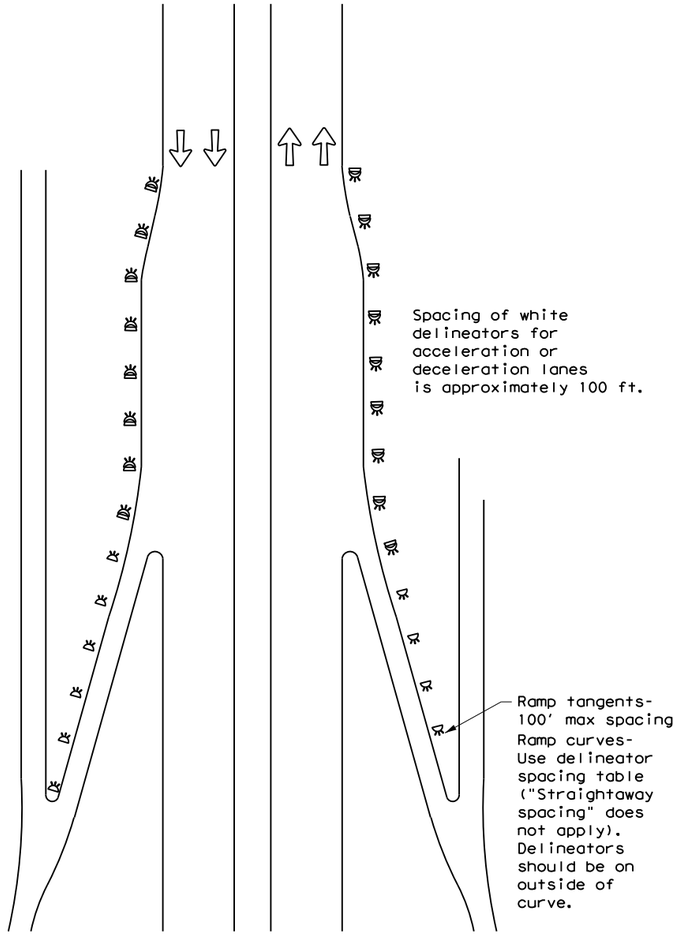
DETAIL 1

FOR CULVERTS WITHOUT MBGF



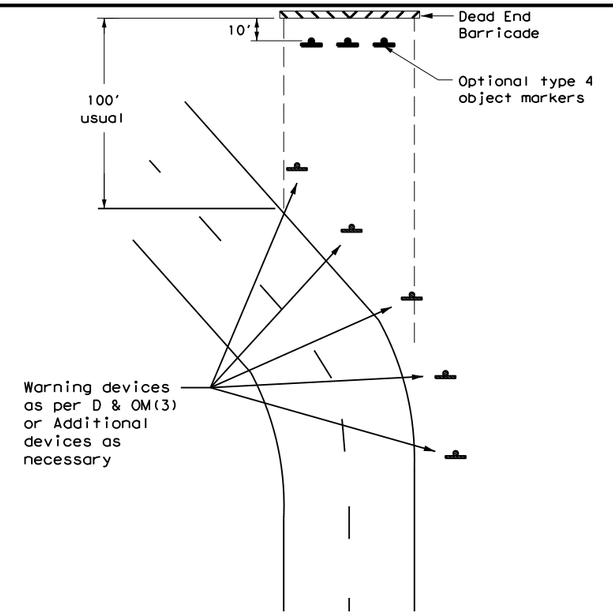
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



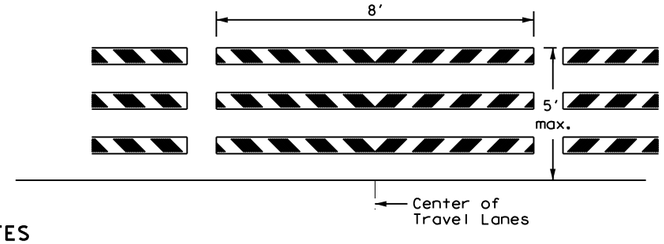
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
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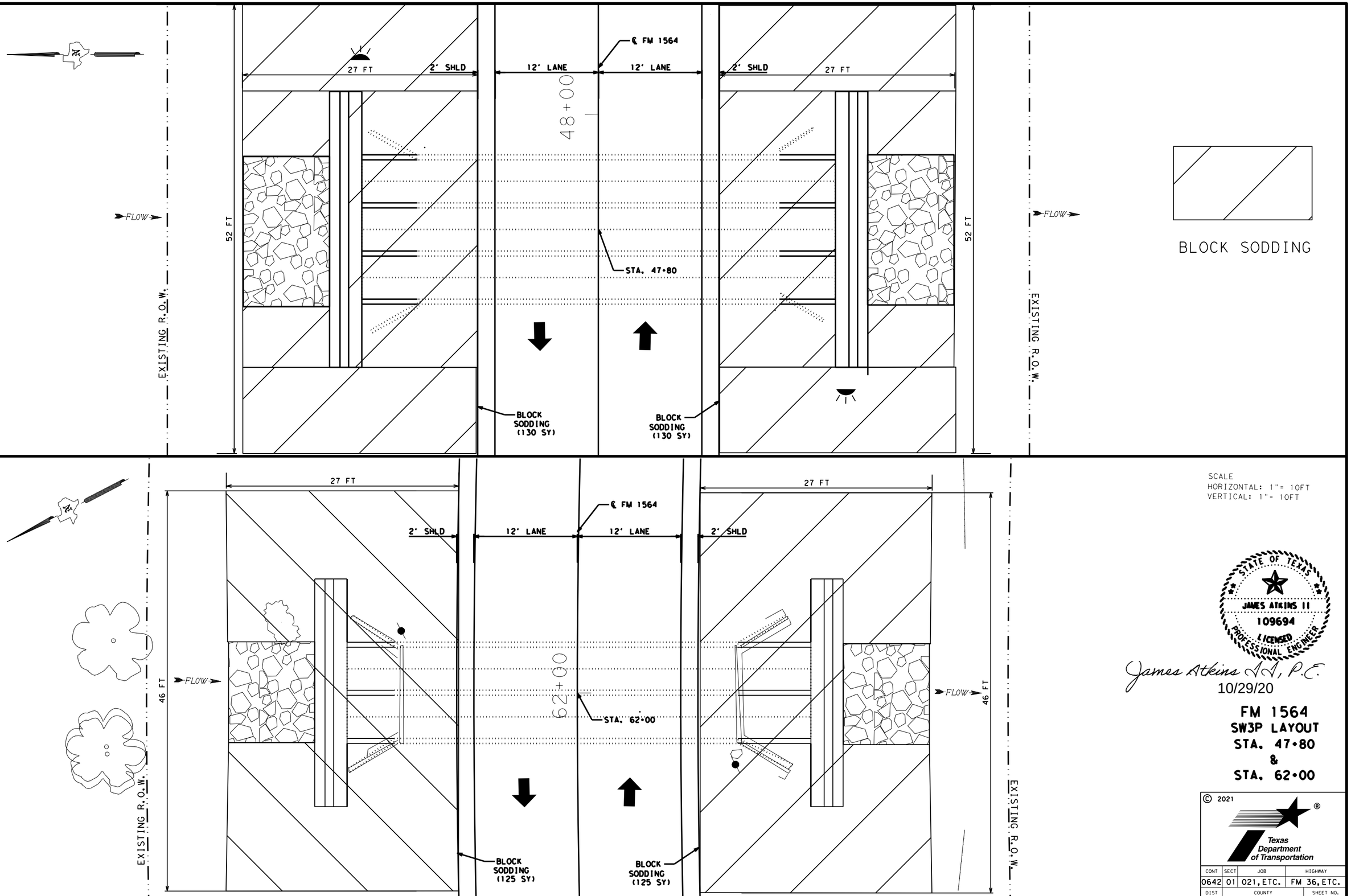
3-15	DIST	COUNTY		SHEET NO.
7-20	PAR	HUNT		77

20D



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DN: | CK: | DW: | CK:

BLOCK SODDING

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/20

FM 1564
SW3P LAYOUT
STA. 47+80
&
STA. 62+00

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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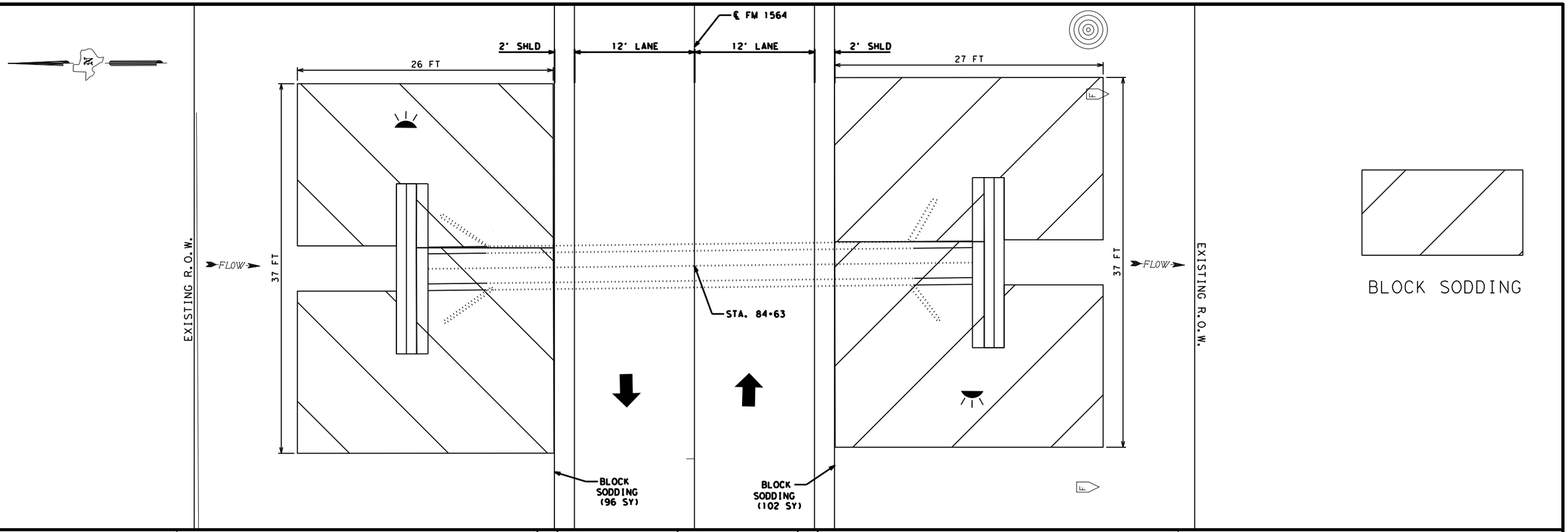

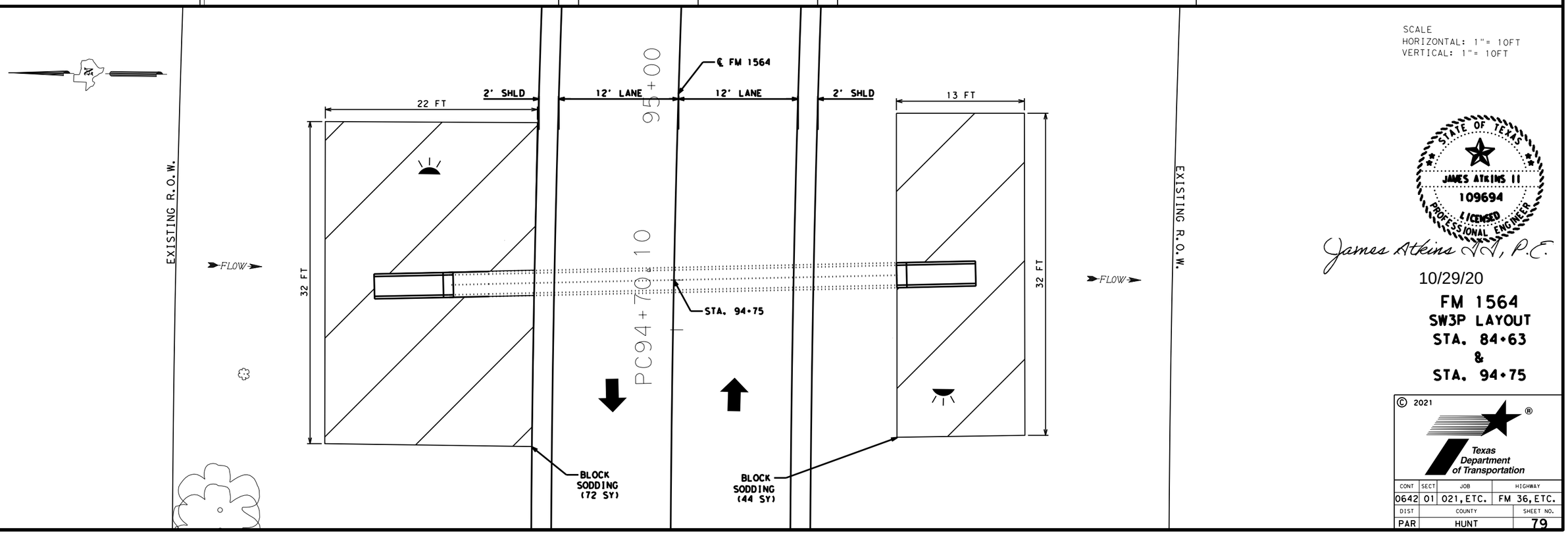

SCALE
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VERTICAL: 1"= 10FT

STATE OF TEXAS
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STA. 84+63
&
STA. 94+75

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CONT	SECT	JOB	HIGHWAY
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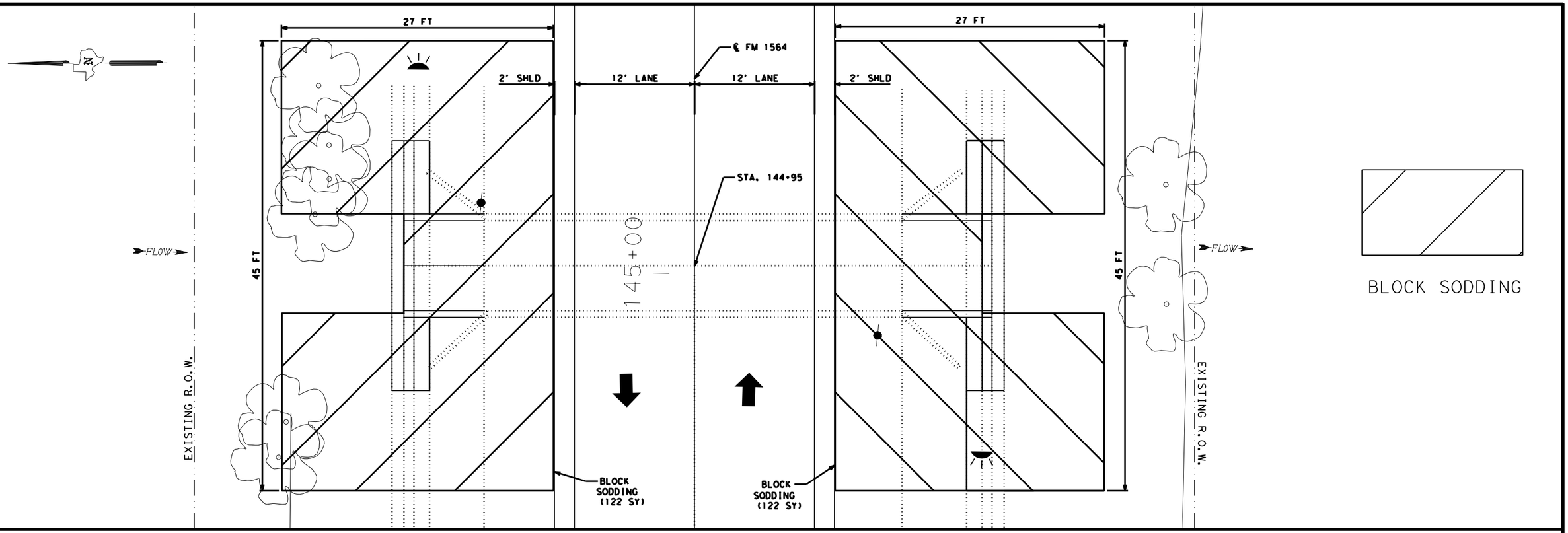

SCALE
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VERTICAL: 1"= 10FT

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FM 1564
SW3P LAYOUT
STA. 144+95
&
STA. 154+85

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CONT	SECT	JOB	HIGHWAY
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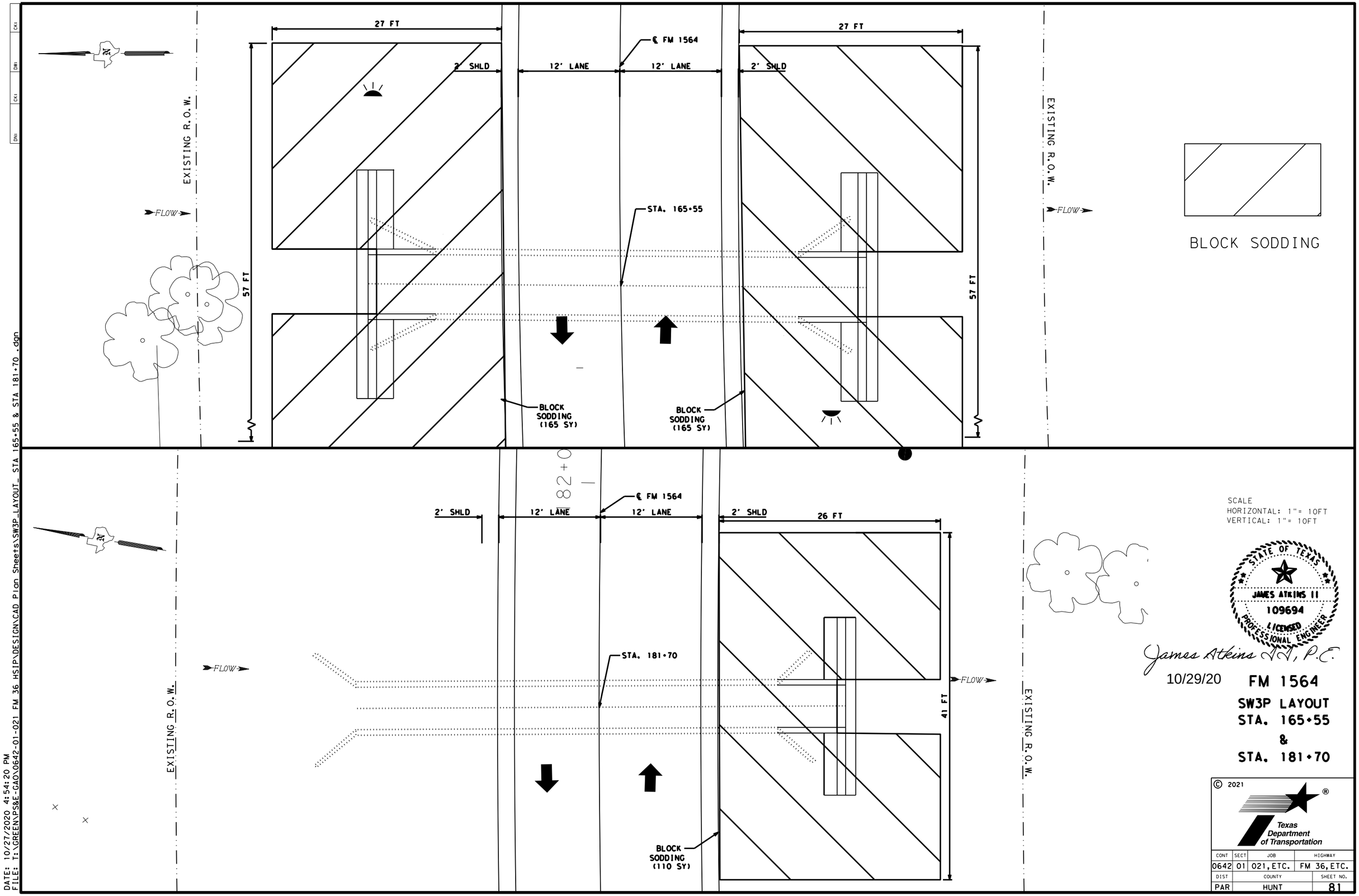

SCALE
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VERTICAL: 1"= 10FT

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STA. 165+55
&
STA. 181+70

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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CK:
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CK:
DN:

EXISTING R.O.W.

27 FT

2' SHLD

12' LANE

℄ FM 1564

12' LANE

27 FT

2' SHLD

EXISTING R.O.W.

FLOW

41 FT

STA. 165+55

41 FT

FLOW

BLOCK SODDING (112 SY)

BLOCK SODDING (112 SY)

BLOCK SODDING

EXISTING R.O.W.

27 FT

2' SHLD

12' LANE

℄ FM 1564

12' LANE

27 FT

2' SHLD

EXISTING R.O.W.

218+00

FLOW

57 FT

STA. 217+80

57 FT

FLOW

BLOCK SODDING (160 SY)

BLOCK SODDING (160 SY)

SCALE
HORIZONTAL: 1"= 10FT
VERTICAL: 1"= 10FT

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James Atkins IV, P.E.
10/29/20

FM 1564

SW3P LAYOUT
STA. 194+50
&
STA. 217+80

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
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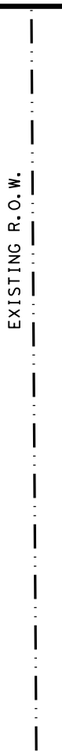
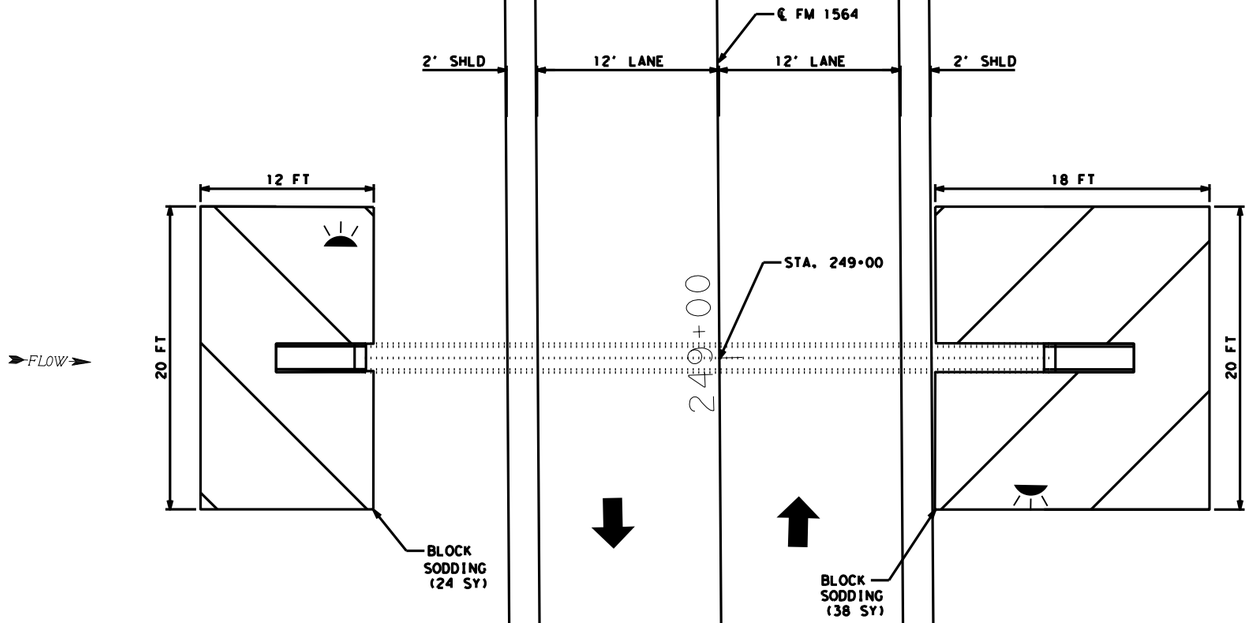
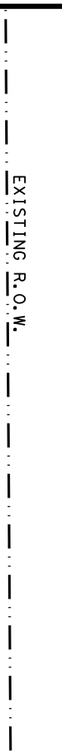
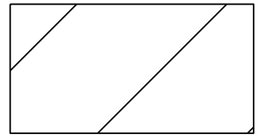
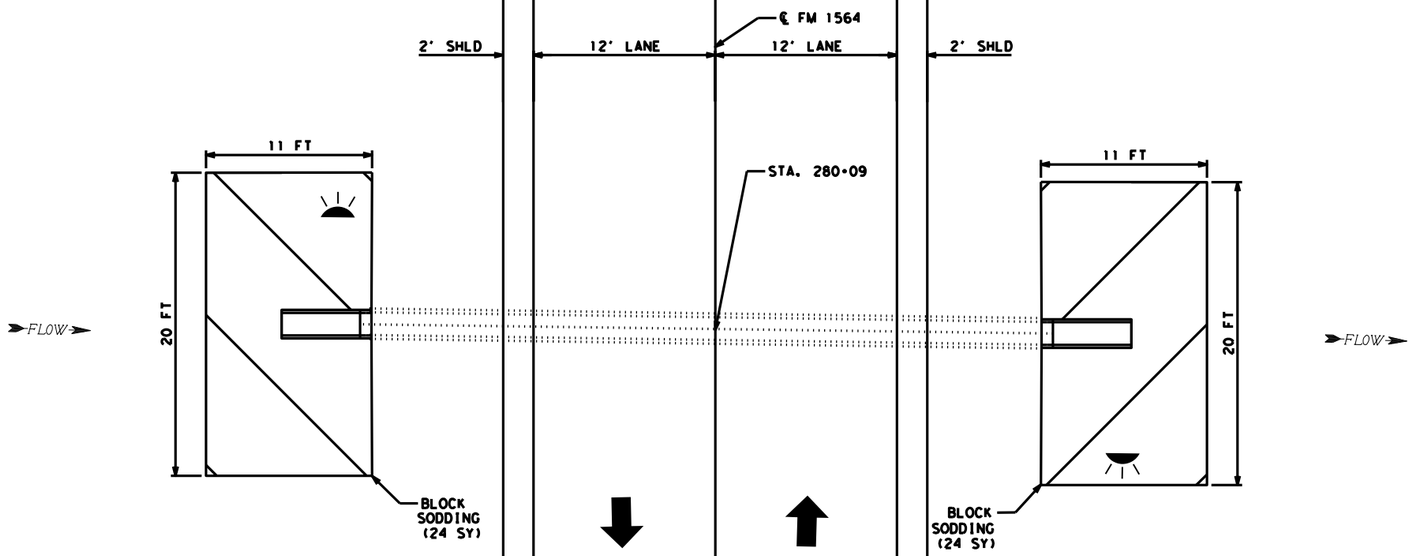


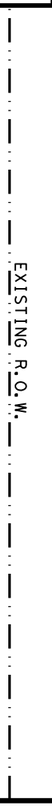






BLOCK SODDING





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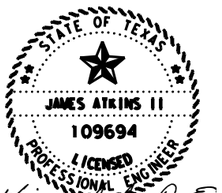
VERTICAL: 1"= 10FT



James Atkins II, P.E.
10/29/20

FM 1564

SW3P LAYOUT
STA. 249+00
&
STA. 280+09

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021, ETC.	FM 36, ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		83

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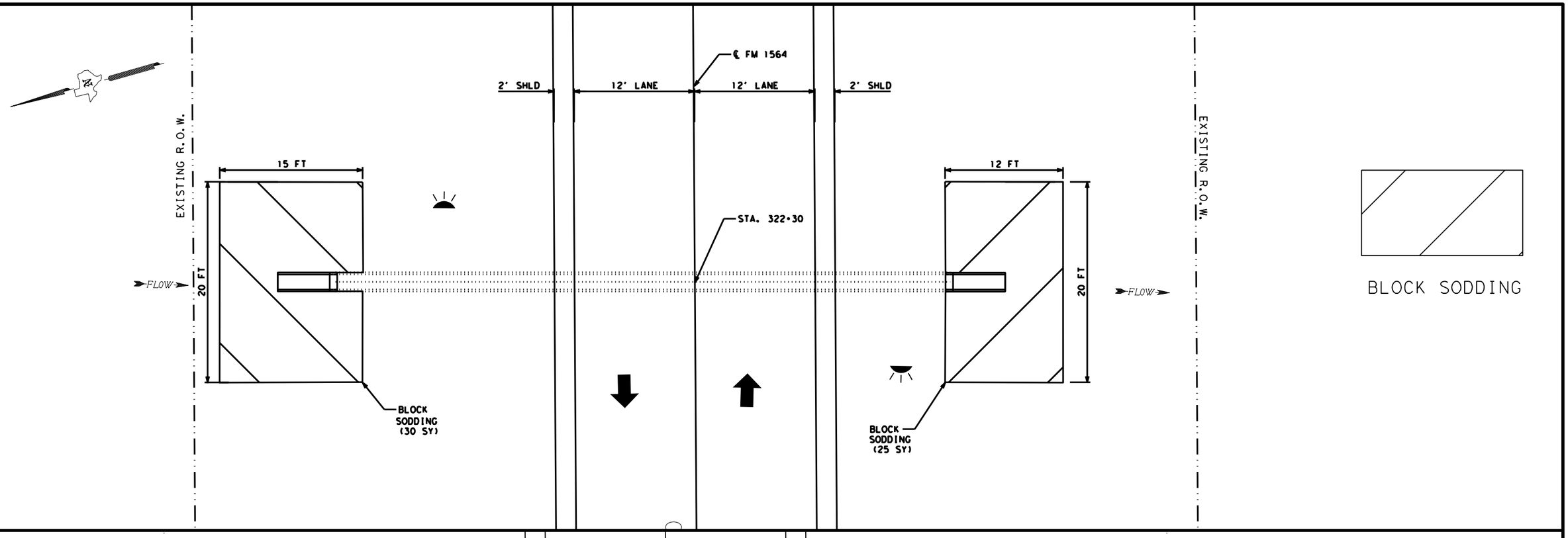

SCALE
HORIZONTAL: 1"= 1OFT
VERTICAL: 1"= 1OFT

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins IV, P.E.
10/29/20

FM 1564
SW3P LAYOUT
STA. 322+30
&
STA. 392+64

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
PAR	HUNT		84

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SITE DESCRIPTION

PROJECT LIMITS: *THIS PROJECT IS IN SOUTH HUNT COUNTY FROM SH 34 TO US 69.*

PROJECT DESCRIPTION: *FOR THE CONSTRUCTION OF SAFETY TREAT FIXED OBJECTS, PROFILE EDGELINE & CENTERLINE MARKINGS.*

MAJOR SOIL DISTURBING ACTIVITIES:

INCLUDES PREP ROW, EMBANKMENT FOR FILL, DITCH GRADING, EROSION AND SEDIMENTARY CONTROLS, AND TOPSOIL WORK FOR FINAL SODDING.

TOTAL PROJECT AREA: *0.526 ACRES*

TOTAL AREA TO BE DISTURBED: *0.526 AC (100%)*

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

The existing soil consists of Crockett loam consisting of deep clayey, moderately low drained soils. Slopes range from 1 to 3 percent. Native grasses and brush cover the existing soil.

NAME OF RECEIVING WATERS:

Block Branch Creek flows approximately 3 miles and empties into Lake Tawakoni in Hunt County.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES & STRUCTURAL PRACTICES:

EROSION CONTROL:

___ TEMPORARY SEEDING
_X_ PERMANENT PLANTING, SODDING, OR SEEDING
___ MULCHING
___ SOIL RETENTION BLANKET
___ BUFFER ZONES
___ PRESERVATION OF NATURAL RESOURCES

OTHER:

DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME AND DO WITHIN 21 DAYS.

SEDIMENTATION CONTROL:

___ SILT FENCES
___ HAY BALES
___ ROCK BERMS
___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
___ DIVERSION DIKE AND SWALE COMBINATIONS
___ PIPE SLOPE DRAINS
___ PAVED FLUMES
___ ROCK BEDDING AT CONSTRUCTION EXIT
___ TIMBER MATTING AT CONSTRUCTION EXIT
___ CHANNEL LINERS
___ SEDIMENT TRAPS
___ SEDIMENT BASINS
___ STORM INLET SEDIMENT TRAP
___ STONE OUTLET STRUCTURES
___ CURBS AND GUTTERS
___ STORM SEWERS
___ VELOCITY CONTROL DEVICES

POST-CONSTRUCTION CONTROLS:

___ RETENTION / IRRIGATION
___ EXTENDED DETENTION BASIN (ie: ROCK BERMS)
___ VEGETATIVE FILTER STRIPS
___ GRASSY SWALES
_X_ VEGETATIVE LINED DRAINAGE DITCHES
___ CONSTRUCTED WET LANDS
___ WET BASINS
___ SAND FILTER SYSTEMS

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

MAJOR SOIL DISTURBING ACTIVITIES SHALL NOT BE PERFORMED UNTIL EMBANKMENT PLACEMENT IS SCHEDULED TO BEGIN WITHIN FIVE (5) WORKING DAYS.

INSTALL EROSION AND SEDIMENTATION CONTROLS PRIOR TO SOIL DISTURBANCE WHENEVER POSSIBLE.

ONCE BEGUN, EARTHWORK ACTIVITIES SHALL BE PROGRESSED WITHOUT DELAY, UNLESS APPROVED BY THE ENGINEER, UNTIL FINAL GRADING IS ACCOMPLISHED.

EROSION CONTROL MEASURES SHALL BE APPLIED IMMEDIATELY UPON COMPLETION OF THE EMBANKMENT PLACEMENT TO MINIMIZE POTENTIAL WATER QUALITY IMPACTS.

REMARKS: *Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, waterbody or streambed.*
The Contractor shall designate a location for, construct, and maintain an area for concrete mixing, handling and delivery equipment to wash out.
Construction staging areas and vehicle maintenance areas shall be constructed by the Contractor in a manner to minimize the runoff of pollutants.
All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

MAINTENANCE: *All erosion and sediment controls will be maintained in good working order. If a repair is necessary, it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The areas adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.*

INSPECTION: *An inspection will be performed by a TxDOT inspector at least once every seven (7) calendar days. An inspection and maintenance report will be made per each inspection. Stormwater controls will be modified as directed by the Engineer based on these reports.*

OTHER EROSION AND SEDIMENT CONTROLS:

WASTE MATERIALS: *All trash and construction debris from the job site will be disposed of by the Contractor at a local dump. No construction materials will be buried on site.*

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): *Any hazardous waste spills shall be reported to the TxDOT Safety Officer in Paris. It shall be the responsibility of the waste owner to provide for the required clean-up. If the owner cannot be determined, the district laboratory shall direct in the clean-up operation.*

SANITARY WASTE: *Any sanitary waste shall be collected from portable units as necessary or as required by local regulation by a licensed sanitary waste management contractor. All sanitary waste from permanent sites will be collected by local sanitary sewer systems.*

OFFSITE VEHICLE TRACKING:

___ HAUL ROADS DAMPENED FOR DUST CONTROL
_X_ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
_X_ EXCESS DIRT ON ROAD REMOVED DAILY
___ STABILIZED CONSTRUCTION ENTRANCE

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL SUBCONTRACTORS ARE AWARE OF AND COMPLY WITH ALL COMPONENTS OF THE SW3P.

STATE OF TEXAS
JAMES ATKINS II
109694
LICENSED
PROFESSIONAL ENGINEER

James Atkins II, P.E.
10/29/20

FM 36, ETC.
STORM WATER POLLUTION PREVENTION PLAN (SW3P)

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0642	01	021,ETC.	FM 36,ETC.
DIST	COUNTY		SHEET NO.
PAR	HUNT		85

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☒ No Action Required ☐ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000

2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.

3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☐ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☒ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

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3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

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V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☒ No Action Required ☐ Required Action

Action No.

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If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☐ No Action Required ☐ Required Action

Action No.

1.

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3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0642	01	021,ETC.	FM 36,ETC.
	DIST	COUNTY		SHEET NO.
	PAR	HUNT		86